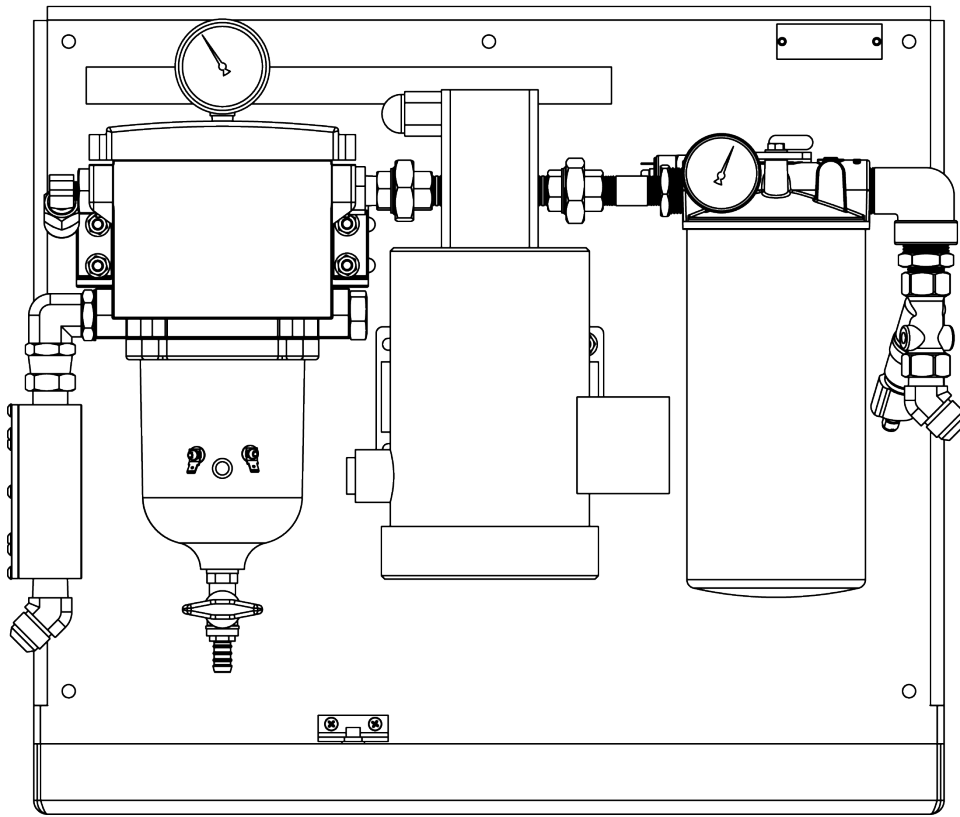




# **FPS MX-F Instruction, Operating, & Maintenance Manual**

**COMPACT FUEL MAINTENANCE SYSTEM**

*REV0302MXF010220*



# Table of Contents

<b>Table of Contents</b> .....	<b>2</b>
<b>General Overview</b> .....	<b>4</b>
FPS MX-F Specifications .....	4
<b>System Components</b> .....	<b>5</b>
Control and Safety Devices.....	5
Pump/Motor.....	5
Primary Filter/Water Separator .....	5
Fuel Conditioner.....	5
Fine Filter .....	5
Plumbing .....	5
Auto Water Drain (AWD) Assembly – <i>If Applicable</i> .....	5
Auto Filter Drain (AFD) Assembly – <i>If Applicable</i> .....	6
Manual Additive Injection – <i>If Applicable</i> .....	6
Auto Additive Injection Assembly – <i>If Applicable</i> .....	6
<b>System Operation</b> .....	<b>7</b>
Pump Operation .....	7
Alarms .....	7
Auto Water Drain (AWD) – <i>If Applicable</i> .....	8
Auto Filter Drain (AFD) – <i>If Applicable</i> .....	8
Manual Additive Injection – <i>If Applicable</i> .....	8
Auto Additive Injection – <i>If Applicable</i> .....	8
<b>Primary Inspection</b> .....	<b>9</b>
Checklist.....	9
<b>Installation</b> .....	<b>10</b>
Mounting .....	10
Electrical.....	10
Field Connections – <i>If Applicable</i> .....	10
Plumbing .....	10
Typical Plumbing Installation (Schematically) .....	11
Important Installation Precautions.....	11
<b>Controller</b> .....	<b>12</b>
Setting the Current Date and Time (SFC 50 or SFC-55) .....	12
Programming the Timer (SFC-50 or SFC-55) .....	12
Setting the Current Date and Time (TSC-7000) – <i>If Applicable</i> .....	12
Programming the Timer (TSC-7000) – <i>If Applicable</i> .....	12
Touchscreen Menu Structure (TSC-7000) – <i>If Applicable</i> .....	13
Modbus TCP/IP Communication (TSC-7000) – <i>If Applicable</i> .....	13
<b>Priming the System</b> .....	<b>14</b>
Priming Procedure .....	14
<b>Commissioning/Initial Start-Up</b> .....	<b>15</b>
Gauge Venting .....	15
Switch Adjustments.....	15
Internal Pressure Relief Adjustment.....	15
Initial Test Procedures .....	16
<b>Maintenance</b> .....	<b>17</b>
Preventative Maintenance.....	17
Servicing the Primary Filter/Water Separator.....	17
Servicing the Fine Filter .....	18
Replacement Filter Chart .....	18
Auto Water Drain (AWD) – <i>If Applicable</i> .....	18
Auto Additive Injection – <i>If Applicable</i> .....	19



**Troubleshooting ..... 20**  
Symptom Troubleshooting Guide..... 20

**AXI International Limited Warranty ..... 21**  
Warranty Claim Procedure ..... 22

**Technical Assistance and Ordering..... 23**  
Accessories and Additional Configuration Parameters ..... 23  
Replacement Filter Elements ..... 23  
System Identification ..... 23

# General Overview

## FPS MX-F Specifications

Nominal Flow Rate.....	4 GPM/240 GPH (15 LPM/984.2 LPH) 1,920 gallons (7,268 liters) per 8-hour shift 5,760 gallons (21,804 liters) per 24-hour shift
Primary Filter.....	10 or 30 $\mu$ Particulate or 60 $\mu$ Stainless Steel Screen with Centrifugal Water Separator
Secondary Filter.....	1, 3, 10, or 25 $\mu$ Fine Filter or 3, 10 $\mu$ Water Block
Fuel Conditioner.....	LG-X 1500 Inline Magnetic Conditioner
Plumbing.....	Black Iron
Inlet Port.....	3/4" Equivalent - JIC 37° Flare
Outlet Port.....	3/4" Equivalent - JIC 37° Flare
System Back Plate.....	Powder Coated Aluminum
Operating Temperature (TSC-7000).....	41 - 122°F (5 - 50°C)*
Operating Temperature (SFC-50 or 55).....	41 - 104°F (5 - 40°C)
Electrical.....	120V/60Hz/15A/1Ph or 230V/50Hz/15A/1Ph*
Pump.....	1/3 HP Spur Gear Pump
Suction Capability (Primed).....	15ft. vertical lift or 100ft. horizontal run (lines >1", primed)
Timer.....	Incorporated PLC-based timer
Maximum Fluid Viscosity.....	5 cSt
Outline Dimensions.....	≈ 23" x 26" x 9" (58 x 69 x 23 cm) (H x W x D)
System Weight.....	≈ 70lbs. (31.8kg)

**\*Note: It is the user's responsibility to ensure safe operating conditions for the system to be ran.**

\*At 50 Hz., nominal flow rate decreases from 4 GPM/240 GPH to 3.2 GPM/192 GPH.

**!WARNING! This system is not meant for use with gasoline or any other flammable liquids having a flash point less than 100°F (37.8° C). Use with gasoline or any flammable liquids at a temperature exceeding their flash point presents an immediate explosion and fire hazard.**

# System Components

## Control and Safety Devices

- System Controller
  - Incorporated PLC-based Timer
  - Memory retention during power outages
  - Alarm Indicator Light(s)
  - Control Circuit Breakers (CB1, CB2)
  - **SFC-50 or SFC-55:**
    - Pump Control Selector Switch {Hand (Manual) / Off / Auto}
    - System Power Indicator Light
    - Pump Running Indicator Light(s)
    - Alarm Reset Push Button
  - **TSC-7000 – *If Applicable:***
    - HMI Touchscreen Control
- Water Detection Alarm Module
- Vacuum & Pressure Switches
- Flow Switch
- Leak Detection Float Switch

## Pump/Motor

- ¾ HP Gear Pump

## Primary Filter/Water Separator

- Fuel Filter
  - Standard-issue back-flushable 30-micron hydrophobic filter cartridge (other filter elements available)
- Water Separator
- One Pair of Water Detection Sensor Probes
- Drain Valve

## Fuel Conditioner

- Inline Magnetic Fuel Conditioner

## Fine Filter

- Standard-issue 3µ fine filter cartridge (other filter elements available)

## Plumbing

- Black Iron

## Auto Water Drain (AWD) Assembly – *If Applicable*

- Accessory Pump
- Additional Water Detection Alarm Module
- Additional Pair of Water Detection Sensor Probes
- Solenoid Drain Valve
- Basket Strainer
- Water Collection Drum
  - High Water Level Float Switch



## **Auto Filter Drain (AFD) Assembly - *If Applicable***

- Accessory Pump
- Flexible Suction/Return Lines
- Check Valve

## **Manual Additive Injection - *If Applicable***

- System Ball Valve
- Additive Injection Port
- Injection Port Ball Valve

## **Auto Additive Injection Assembly - *If Applicable***

- Accessory Pump
- Flexible Suction/Return Lines
- Additive Injection Flow Sensor
- Solenoid Valve
- Additive Container
- Float Switch/Container Port Assembly

# System Operation

Apply control power to unit. Place control breakers (CB1, CB2) for the System Controller in the “ON” position.

## Pump Operation

### Automatic Mode:

Switch the system to “Auto” mode via the System Controller. During the time intervals set up by the user, the pump will start and run until the scheduled runtime has ended. See the Controller section for setting scheduled run times.

### Manual Mode:

Switch the system to “Manual” mode via the System Controller. The pump motor will run until the system is switched off, into “Auto” mode, or an alarm has been tripped.

## Alarms

### Alarms featured on the system include:

- Leak Detection (system shutdown, alarm indication)
  - Activated when the Float Switch in the system’s drip tray detects a raised liquid level. The system will go into an alarm state and the pump will not be allowed to run until the alarm is addressed and cleared.

**Note: Disposal of fuel and associated waste should be done in accordance with Federal, State and Local regulations.**

- Low/No Flow (system shutdown, alarm indication)
  - Activated when the Flow Switch on the pressure side of the pump detects a flow rate not adequate for the pump. Once the alarm debounce timer is expired, the system will go into an alarm state and the pump will not be allowed to run until the alarm is addressed and cleared.
- High Vacuum (system shutdown, alarm indication)
  - Activated when the Vacuum Switch, placed on the suction side of the pump set, detects a reading above the factory set point. The system will go into an alarm state and the pump will not be allowed to run until the alarm is addressed and reset.
- High Pressure (system shutdown, alarm indication)
  - Activated when a Pressure Switch, placed on the pressure side of the pump set, detects a reading above the factory set point. The system will go into an alarm state and the pump will not be allowed to run until the alarm is addressed and reset.
- High Water (system shutdown, alarm indication)
  - Activated when water level trips the Water Detection Alarm Module via the Water Detection Sensor Probes located on the mechanical water separator.
- Pump Overload (system shutdown, alarm indication) – *If Applicable*
  - Activated when the amperage draw from the pump-motor assembly exceeds the factory set point (determined by the pump’s FLA) on the pump overload relay module.
- Auto Water Drain Float Switch (halts auto water drain functionality, alarm indication) – *If Applicable*
  - Activated when the float switch on the Auto Water Drain’s Water Collection Drum is triggered due to a high water level.

**Note: If the Pump Overload Alarm triggers, please contact AXI International.**

Once triggered alarms are addressed, each alarm can be reset via the System Controller.

**Note: For information on factory set points or timer delays please refer to the “Accessories and Additional Configuration Parameters” subsection in the “Technical Assistance and Ordering” section.**



## Auto Water Drain (AWD) – *If Applicable*

1. When the Water Separator's High-Water Sensor is triggered, the system will shutdown
2. The system will remain shut down for 60 seconds, allowing water to be completely separated from the fuel
3. After 60 seconds, the Auto Water Drain Solenoid Drain Valve opens and the Auto Water Drain Accessory Pump turns on, draining the Water Separator bowl
4. Once the water level has dropped below the Water Separator's Low-Water Sensor, the system automatically turns back on and resumes normal operation

## Auto Filter Drain (AFD) – *If Applicable*

1. Before removing the system's fine filter for servicing, activate the Auto Filter Drain procedure via the TSC-7000 touchscreen controller (Please see Touchscreen Menu Structure Section).
2. Once the filter draining procedure is completed as indicated on the HMI, remove the filter and continue servicing the unit.

## Manual Additive Injection – *If Applicable*

**Note: Manual Additive Injection operation may vary depending on the vertical and horizontal distance between the additive holding container and fuel polishing system.**

1. With the system running, place flexible hose between the Additive Injection Port and Additive Container
2. Ensure sufficient additive is present in the container and that the flexible hose reaches the bottom
3. Open the Injection Port Ball Valve to begin injecting additive
4. To start or increase flow of additive into the system, slowly close the System Ball Valve to create a higher vacuum as indicated on the vacuum gauge
5. Monitor the system's vacuum gauge to avoid creating a vacuum higher than the system's set point

**Note: If a high vacuum alarm is triggered, return the System's Ball Valve to the fully open position and reset the alarm by pushing the Alarm Reset button on the SFC 50/55 control panel or via the TSC-7000 touchscreen controller**

6. Monitor the additive level in the holding container to gauge proper dosing
7. After injecting the desired amount of additive, close the Injection Port Ball Valve and return the System Ball Valve to the fully open position

## Auto Additive Injection – *If Applicable*

1. To start Auto Additive Injection, navigate from the Main Menu to the Additive Injection screen on the HMI.
2. On the screen there are two fields to input information, Gallons to Treat and Treatment Ratio.
3. There are two other non-editable fields that show the last treatment date and also the amount of additive that was added from the last treatment.
4. Enter the gallons of fuel to treat.
5. Then enter the treatment ratio (For example: 5 Gallon Jug of AFC treats 25,000 gallons of fuel, so enter 1:5000)
6. Once this information is entered, press the START button to begin the injection process.
7. There is a progress bar that will display the total amount of additive to be added (full red bar), and as the additive is injected the red bar will decrease.
8. Once the bar is depleted, the process will stop.
9. If at any point the process needs to be manually stopped, press STOP on the screen.
10. After the injection is completed, the data is stored in the log, which can be accessed by pressing LOG on the Additive Injection screen.
11. When the additive level reaches low, a "LOW ADDITIVE WARNING" will be displayed.
12. In order to run the process again, the additive must be refilled and the alarm reset by clearing all alarms.



## Primary Inspection

Upon arrival, the system and accessories must be visually inspected before installation. Improper handling during shipping may cause physical or electrical problems. Immediately report or note any damages to the shipper.

### Checklist

- If the packing crate shows signs of damage inspect the system for damage.
- Check the entire system for damage that could indicate internal mechanical or electrical problems.
- Check pump/motor hardware and all plumbing connections for tightness.
- Check all electrical terminals and connections for tightness.

# Installation

**Note:** It is recommended that only qualified, experienced personnel, familiar with this type of equipment, who have read and understood all the instructions in this manual should install, operate, and maintain the system.

## Mounting

The unit should be permanently wall mounted on a hard, level surface. Use provided mounting holes located on the back plate for proper fastening (Refer to mechanical drawing(s) for Mounting Hole Diameter). Ensure the system is level and secure, enabling water to be more accurately sensed in the primary filter's sump. Be sure to secure the system in a location that allows all piping and electrical wiring to be safely routed to the system. This unit is designed for well-ventilated indoor use within the specified temperature range and should be located as close to the tank as possible. **Allow enough room (approximately 7"-8") for changing primary filter(s) above the back plate of the system.**

## Electrical

**!WARNING!: To avoid the risk of electric shock, make sure that the power supply to the system is disconnected and ensure that the system is at zero volts, before working on any of the system's electrical parts.**

Make sure that the system's power requirements and rated voltage/frequency match your electrical system (see wiring diagram). The system may only be connected to properly grounded power sources for operator safety. Connect all components to the ground studs provided as shown on the provided drawings. After the initial wiring of the system, check operation to ensure that the motor is running in the correct direction. If the motor is running in the wrong direction, contact AXI International immediately.

**!WARNING!: The whole system (backplate, plumbing, motor, electric sub panel) must be properly grounded for operator safety.**

Depending on length of run, use wiring according to specification in wiring diagram and connect system to a separate UL listed breaker (not included) appropriate for branch circuit protection. Connect the System Controller to the filtration unit with the provided plugs and wiring harnesses.

**Note:** Wiring and electrical installation must be in accordance with all applicable federal, state, and local rules, laws, standards, and regulations.

## Field Connections – *If Applicable*

### Remote Monitoring – Dry Contacts:

The System Controller provides two Normally Open (N.O.) dry contacts for remote alarm monitoring. Please see wiring diagram for contact rating, connection, and location.

1. "Summary Alarm" – dry alarm contact for high vacuum, high pressure, no flow, or water detection
2. "Leak Detection" – dry alarm contact for leak detection


### Remote Shutdown – Interlocks:

The customer can provide interlocks connected to the System Controller in order to establish external shutdown capabilities of the system's pump.

**Note:** The 24 V DC provided by the power supply in the electrical box of the system must be used for remote shutdown

## Plumbing

**Note:** Please ensure to check all of the plumbing (joints, unions, miscellaneous fittings) for tightness prior to completion.



Use proper quality approved fuel line materials with similar inner diameter (ID) to the inlet/outlet of the system. For extended suction side plumbing runs, it is recommended to install oversized pipe, (1/4" to 1/2" increased ID) (Ref.: Page 4 – Suction Capability). **It is imperative that external, manual inlet and outlet ball valves be installed on each side of the filtration system. That will enable it to be isolated from the external piping apparatus, eliminating the possibility of the system to be damaged by over-pressurization of said plumbing during initial start-up testing (IST).**

**Note: Flexible plumbing is strongly recommended for system inlet and outlet connections to external plumbing in order to avoid issues with thermal expansion, prevent putting any stress on the internal fittings of the system, and enable ease of maintenance/installation. Install manual inlet and outlet ball valves prior inlet flexible plumbing and post outlet flexible plumbing respectively.**

The pick-up tube/line(s) should originate from the lowest point of the tank to ensure all water is removed. Also, it should be connected directly to the system's inlet port (located on the left-hand side of the system) and be kept as short as possible. It is recommended that an oversized, low restriction foot valve be installed to keep the system primed, especially if the inlet port of the system is located above the lowest possible level of fuel in the tank. Additionally, a priming tee should be installed at the highest point of the suction line to enable priming of the pipelines and system.

The return line(s) should be plumbed to the system's outlet port (located on the right-hand side of the system) and enter the tank as far as possible away from the pick-up tube, close to the tank bottom.

Multiple suction and/or return lines may be connected to a manifold outside the system.

**Note: Anti-Siphon or other external plumbing devices may be required by state and/or local regulations & code.**

Cumulatively, the system capabilities are 15 FT. (4.57 m) suction (vertical lift) or 100 FT. (30.48 m) horizontal run, when connected to the minimum recommended piping size (Ref.: Page 4 – Inlet/Outlet Port), or more, with no additional flow restrictions. That includes valves, 90-degree connectors, or other plumbing accessories. For continuous optimal performance, make sure suction and discharge lines are free of contamination, nothing is blocking the flow of fuel, and the suction line always stays primed.

**Note: Plumbing installation must be in accordance with all applicable federal, state, and local rules, laws, standards, and regulations.**

**Note: Additionally, if the system must share a fuel oil supply (FOS) line with a generator, we recommend check valves be installed after the split in the line, before the landing/entrance into the generator tank and the fuel polishing system. Also, it is highly recommended that the "External Shut Down" contacts on the PLC are utilized as well in this scenario.**

## Typical Plumbing Installation (Schematically)

See provided P&ID drawing(s).

## Important Installation Precautions

The suction line of the system should be independent and separate from the suction line of the engine. If that is not possible, appropriate valves must be installed to completely separate the system from the engine's fuel system to prevent any possible interference with safe engine operation (please see note above).

Also, it is highly recommended to plumb the discharge line independent and separate of the engine's fuel return line back to the tank. If the return line from the engine and the discharge of the system must be combined in any way, adequate valves should be installed to prevent any possible interference with safe engine operation.

# Controller

## Setting the Current Date and Time (SFC 50 or SFC-55)

1. Please make sure the selector switch is set to “OFF” and push the Alarm Reset button on the control panel.
2. When power is first applied to the system, the display of the PLC will show (blinking) the date and time.
3. Hit the “ESC” button.
4. Select ‘Stop’ and press “OK”.
5. Select ‘Yes’ (use down arrow key) and press “OK”.
6. Select ‘Setup’ (use down arrow key) and press “OK”.
7. Select ‘Clock’ and press “OK”.
8. Select ‘Set Clock’ and press “OK” (**must be in military format**).
9. Using the arrow keys, set the current day of the week, time and date as indicated in the display and press “OK”. Use the up and down arrow keys to change values, and use the left and right arrow keys to change between week, day, time, and date.
10. When finished entering press “OK” to confirm.
11. Press “ESC” until the base menu is displayed.
12. Select ‘Start’ and press “OK” – correct time and date should be displayed (when prompted, select “YES” to proceed).

## Programming the Timer (SFC-50 or SFC-55)

1. Hit the “ESC” button from the time and date display. If they are not shown, hit the down arrow button until they are displayed.
2. Select ‘Program’ and press “OK”.
3. Select ‘Set Param’ (use arrow keys) and press “OK”.
4. Use the arrow key to select the ‘Timer’ and Press “OK”.
5. Use the arrow keys to select the desired field and press “OK” to edit.
6. Use the left and right arrow keys to select the day/days of the week the system should automatically turn on, and the up or down arrow key to activate the selected day.
7. Use the arrow keys in same manner to program the ‘On’ time for when the system will switch on (on the selected day/days).
8. Use the arrow keys in same manner to program the ‘Off’ time – when the system will switch off.
9. Press “OK” to confirm the entry when finished setting all desired parameters.
10. If required, you can set up to 3 Timers by using the up and down arrow keys.
11. Press “ESC” until the time and date screen is displayed.

## Setting the Current Date and Time (TSC-7000) – *If Applicable*

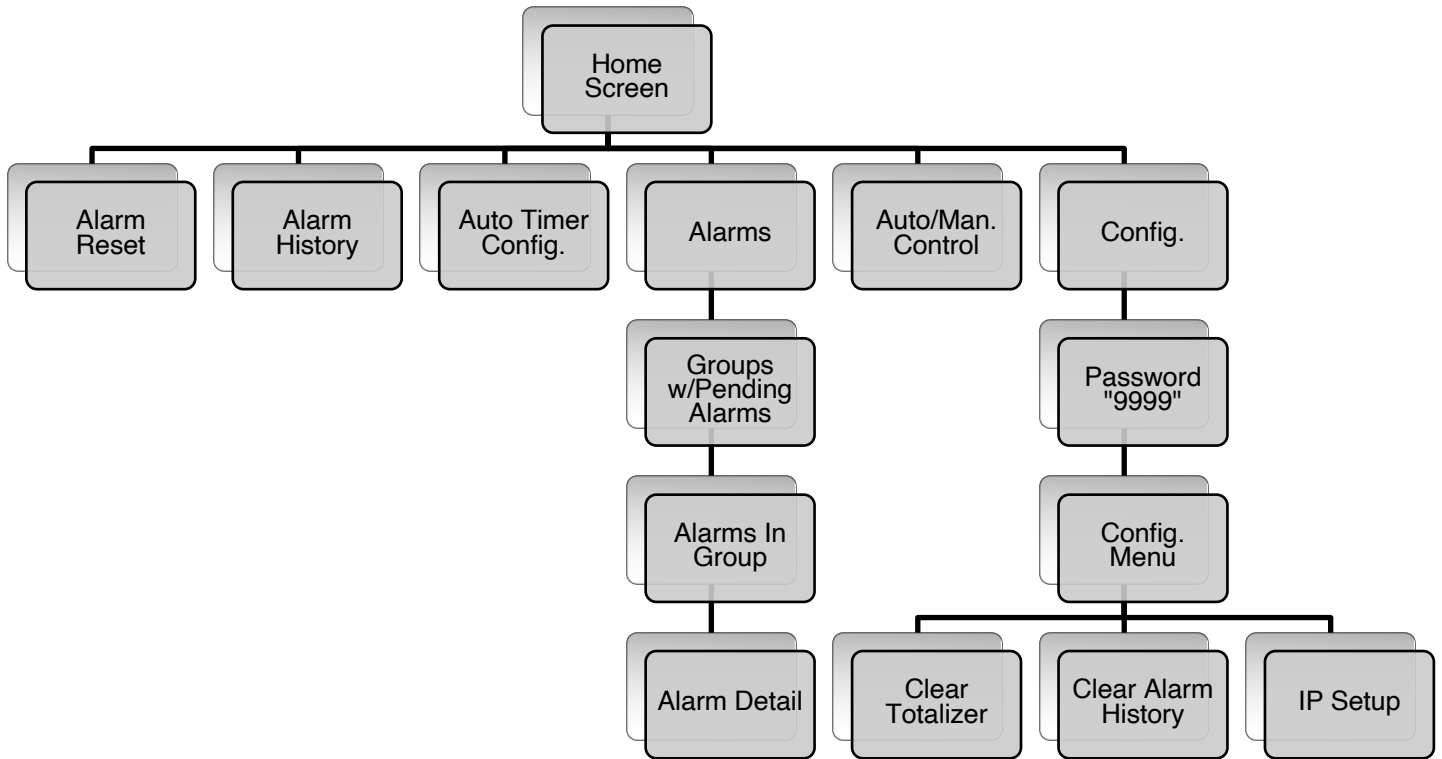
1. Please make sure the pump is set to “OFF”.
2. On the home screen, long-press (for a few seconds) to the right of the AXI logo until a new screen appears.
3. Select ‘Enter Info Mode’.
4. Once prompted, enter ‘1111’ for the password.
5. Select ‘Time and Date’.
6. Select and set the current time and date in military format.
7. Once finished, continually press ‘ESC’ until you are returned to the home screen. The updated information should be shown in the header of the touch screen pages.

## Programming the Timer (TSC-7000) – *If Applicable*

1. From the home screen, select ‘Timers’.
2. Once on the ‘Timers’ screen, you can set up to 3 run timers for each day of the week.
3. To set up a runtime simply enter a ‘Start’ and ‘Stop Time’ (using military format) in one of three timer boxes for the desired weekday.

- To toggle between weekdays, simply press the available buttons on the left or right of the screen labeled with the abbreviation for the previous or next day in the week (e.g. "MON", "WED").

## Touchscreen Menu Structure (TSC-7000) - *If Applicable*



## Modbus TCP/IP Communication (TSC-7000) - *If Applicable*

### Setting up the IP Address:

- From the Main Menu, press the "CONFIG" button.
- Input "9999" and press the enter key ("↵").
- Push "IP Config" and continue onto the next page.
- Enter the desired values for the PLC IP Address, PLC IP Mask, PLC IP Gateway, PLC Remote IP, and Network ID.
- Power cycle the touch screen HMI/PLC.

**Note:** When communicating via Modbus TCP/IP (Port 3 – Ethernet Cable Slot), the PLC Remote IP and Network ID do not need to be utilized for the proper functionality.



## Priming the System

The pump supplied with the system is NOT automatically self-priming and must not be run dry.

**!WARNING! If the pump is allowed to run without fuel, pump damage can occur.**

### Priming Procedure

The head of the pump on the system is shipped from the factory filled with No. 2 Diesel Fuel Oil in it to facilitate initial lubrication. This will not eliminate the necessity to prime completely the system. An externally installed priming tee (not provided) should be utilized to prime the system. Additionally, the lid of the primary filter can be removed, and the filter housing and suction plumbing can be filled through that method, as well. The primary filter along with the suction line(s) must be completely filled with fuel (no trapped air) prior to initial system start-up.

The system is equipped with a vacuum gauge on the input side of the pump. The gauge should read no more than 15" HG vacuum maximum under normal conditions. Vacuum gauge readings reaching 16" HG indicate excessive debris in the primary filter/water separator. Also, it could be derived from above average flow restriction or too high suction height. This will likely result in pump shutdown and activate the high vacuum alarm.

**Note: 16" HG vacuum = clogged primary filter or suction line flow restriction/excessive lift.**

The system's pressure gauge should show 22 PSI maximum pressure under normal conditions (.433 PSI = 1' vertical head pressure). Pressure gauge readings in excess of 22 PSI pressure indicate the need for filter replacement, or fuel line restrictions and/or friction.

System pressure over 22 PSI indicates a high-pressure alarm and will automatically shut down the pump.

The pump pressure relief valve has a 48-50 PSI set point. System pressure in excess of 48-50 PSI will cause the pressure relief valve to open and vent fuel back to the fuel transfer pump inlet side.

# Commissioning/Initial Start-Up

## Gauge Venting

After shipment, gauge pointers may not rest at zero due to internal case pressure build-up, which is caused by temperature and/or pressure variations. As a result, their accuracies may be significantly reduced. To restore the gauges to operating condition, move the yellow lever of the fill plug to the open position or remove the black rubber piece from top of gauge and leave it open to vent.

## Switch Adjustments

**Note:** Please contact AXI International before adjusting either the vacuum or the pressure switch to avoid voiding the system's warranty.

### Vacuum and Pressure Switches

When the value exceeds the set point of the switches' rating, the switch will change state. Ensure you are working with a normally closed position (leads on opposite sides of the switch – across from one another are connected to the wire spades). If the set point is incorrect, adjustments can be performed in the field as follows:

1. Remove the two wires connected to the normally closed spades on the top of switch.
2. Pop off the "Rubber Plug" in between the spades on top of the switch.
3. Insert a 5/64" Allen Wrench/Key into the slot.
4. For a vacuum switch, adjust the Wrench/Key  $\frac{1}{4}$  -  $\frac{1}{2}$  turn at a time CCW to increase the vacuum alarm's set point.
5. For a pressure switch, adjust the Wrench/Key  $\frac{1}{4}$  -  $\frac{1}{2}$  turn at a time CW to increase the pressure alarm's set point.
6. After adjusting the settings, perform the testing procedure(s) for the switch(es) as outlined in the commissioning section.

### Flow Switch

When the flow rate drops below the predetermined set point on the flow switch (i.e. 10 GPM), the switch will trigger a signal to shut down the pump. If the set point is incorrect, an adjustment can be performed in the field as follows:

1. Loosen the lock screw on the stem of the flow switch using the provided Hex Allen Key
2. Rotate the setting dial on the flow switch until the desired GPM flow range printed on the stem is reached.
  - a. If the Orange LED light on the Flow Switch's M12 Connector is not illuminated, a flow rate lower than its set point is being detected.
  - b. Turn the black neck of the Flow Switch CW. Once the point is reached where the Orange LED light turns on, turn the dial one more full turn CW.
3. Tighten the lock screw to secure the setting dial's placement
4. After adjustment, ensure to perform the relevant testing procedure outlined below


**Note:** For information on factory set points or timer delays please refer to the "Accessories and Additional Configuration Parameters" subsection in the "Technical Assistance and Ordering" section.

## Internal Pressure Relief Adjustment

**Note:** Please consult AXI International before performing any internal pressure relief settings to avoid warranty issues

The pump used on the FPS systems come from the factory with a pre-set internal pressure relief bypass. If the pressure on the discharge of the pump rises past this set point, the internal bypass will open and recirculate the fuel in the head of the pump to protect the itself and any downstream components. When this happens, the discharge branch of the system will not see the proper fuel flow, most likely causing the system to fail on a low flow alarm.





By adjusting this Internal Pressure Relief to a point past the set point on the Pressure Switch, the system will fail on a High-Pressure condition before the relief begins to open, allowing fuel to flow fully while within the acceptable pressure range. The desired set point for pump Internal Relief Valve is around 48-50 PSI, which is higher than the pressure switch setting, and lower than the operational pressure limit on the system fine filter.

#### **Tightening the Bypass Spring:**

1. To tighten the spring in the pump head, remove the blue cover nut located on the left side of the pump head
2. Loosen the secondary nut to allow for screw adjustment
3. Using a flathead screwdriver, tighten the screw two full turns (clockwise)
4. Restore the secondary nut and blue cover, tightening them down to their original positions

## **Initial Test Procedures**

**With breakers and power turned on, and pump running, check all alarms for proper operation:**

- **Leak Detection** - Manually raise the float switch located at the bottom of the leak-basin. The pump should immediately turn off, and the “Leak Detection” alarm should be indicated on the System Controller. Reset the alarm by lowering the float switch and pushing or selecting the Alarm Reset on the System Controller.
- **High Vacuum Alarm** - Slowly, partially close the inlet ball valve. At 16” HG, the pump should turn off and “PLS SERVICE PRIM. FILTER...” or “High Vacuum” alarm should be indicated on the System Controller. Open the inlet ball valve again. Reset the alarm by pushing or selecting the Alarm Reset on the System Controller.
- **High Pressure Alarm** - Slowly, partially close the outlet ball valve. At 22 PSI, the pump should turn off (after a delay of about 1 second) and “PLS SERVICE SEC. FILTER...” or “High Pressure” alarm should be indicated on the System Controller. Open the outlet ball valve again. Reset the alarm by pushing or selecting the Alarm Reset on the System Controller.
- **Water Sensor** - Jump the Water Detection Sensor Probes by placing a conductor across the two horizontal contacts. The pump should turn off after 10 seconds and “High Water Alarm” or “PLS. DRAIN WATER/BOWL...” should be indicated on the System Controller. Remove the metal and reset the alarm by pushing or selecting the Alarm Reset on the System Controller.

**Note: Systems with the Auto Water Drain (AWD) functionality have two sets of water sensing probes on the primary filter bowl. Please refer to the AWD section on for additional information.**

- **No Flow Alarm** – Ensure orange light indicator turns on when the system pump is on (moving fluid) and off when the system is not running. Disconnect the M12 connection on the back of the flow switch. The pump should turn off and the “No Flow Alarm” or “PLEASE PRIME SYSTEM / CHECK FLOW” should be indicated on the System Controller up to 15 seconds after disconnection. Use Flow Switch Setting & Adjustment instructions to return the switch to the proper setting. Reset the alarm by pushing or selecting the Alarm Reset on the System Controller.
- **Auto Water Drain Float Switch (If Applicable)** - Manually raise the “HIGH” float switch located on the Auto Water Drain’s Water Collection Drum. An alarm should be indicated on the System Controller. Reset the alarm by pushing the Alarm Reset on the System Controller.

**Note: If any of the above described alarm test procedures fail or if any alarm trip value deviates, immediately contact AXI International.**

# Maintenance

The system should be visually inspected and tested a minimum of every six (6) months according to the procedure below during light duty cycles. Monthly inspections are recommended for systems that are being used in excess of an average of eight (8) hours a day and five (5) days a week.

## Preventative Maintenance

**Prior to performing the maintenance procedure ensure that:**

1. The electrical sub-panel mounted main disconnect switch is operating properly.
2. The user supplied remote circuit breaker is in the "OFF" position.
3. All sources of power are isolated from the unit.

**Note: Proceed only after this has been verified and properly tagged.**

4. Drain visible water and sediment from the primary filter (see Servicing Primary Filter/Water Separator).
5. Check system and all parts for corrosion and rust.
6. Check mounting hardware – tighten as necessary.
7. Check bolts on the pump/motor hardware for tightness, as pump/motor hardware can loosen after normal operation for extended durations of time, due to vibration.
8. The hardware uses lock nuts – check all bolts for secure nuts.
9. Check all electrical terminals and connections for tightness.
10. All motors are permanently lubricated and do not require any lubrication.
11. Check all plumbing joints for leaks, tighten fittings and joints as necessary, and remove accumulated fuel in leak-basin as necessary.
12. Inspect all filter(s) and separator(s).

**Note: All filter elements should be replaced at least every six (6) months.**

## Servicing the Primary Filter/Water Separator

Clogged primary filter elements restrict the flow of fuel, resulting in the system's vacuum gauge indicating a pressure drop. The gauge reads the condition between the Primary Filter and the pump. At a pressure drop of 16" HG, the pump will automatically shut off and activate an alarm. This signal indicates that it is time to either back flush or change the filter element.

**Servicing and back-flushing Primary Filter:**

1. Turn the control panel selector switch to the "OFF" position – making sure the pump will not turn on.
  - a. TSC-7000 equipped models need to use the buttons on the "AUTO/MAN CONTROL" display.
2. Close the inlet and outlet ball valves.
3. Open the bleed screw at the top of the Primary Filter cover.
4. Place a fuel waste container below the yellow safety drain valve on the bottom of the filter bowl (unless system is equipped with the Automatic Water Drain option – OPT-AWD).
5. Open the yellow safety drain valve (push & turn counterclockwise).
6. Close after approximately 2 seconds.
7. After approximately 10 seconds, reopen the drain valve, allowing water to settle out of the fuel.
8. Close after visible sediment, particles, and water have been drained from the bowl.
9. If the filter requires changing, remove the filter from the housing by loosening the four bolts that hold the top plate in place. Remove the spring-loaded cartridge and replace the filter.
10. Prime the filter by following the instructions found in the Priming section of this manual and ensure that the fuel level is above the primary filter's outlet port.
11. Replace the lid and ensure to carefully and evenly re-tighten the four bolts of the top plate to avoid damaging it and to create a good seal.

12. Close bleed screw on the top of the lid.
13. Open the inlet and outlet ball valves on the system.
14. Press the Alarm Reset button on the control panel to acknowledge the alarm and reset it, if needed.
15. Return the selector switch to its original position and check for leaks when re-starting and pressurizing the system.

## Servicing the Fine Filter

Clogged filter elements restrict the flow of fuel, resulting in the system’s pressure gauge indicating a pressure spike. The gauge is mounted between the pump and the fine filter. At a pressure of 22 PSI, the pump will automatically shut off and generate a High Pressure Alarm. This signal indicates that it is time to change the filter element.

### Changing the fine filter(s):

1. Turn the control panel selector switch to the “OFF” position – making sure the pump will not turn on.
  - a. TSC-7000 equipped models need to use the buttons on the “AUTO/MAN CONTROL” display.
2. Close the inlet and outlet ball valves.
3. Place an appropriate container underneath the filter.
4. Remove the old spin-on filter with a filter wrench.
5. Apply a film of lubricating oil to the gasket of the new filter. Screw the new filter canister to the filter head until the gasket is tight and secure (rotate the element an additional 0.5-1.0 turn after the filter makes contact with the gasket).
6. Open the inlet and outlet ball valves.
7. Push or select Alarm Reset on the control panel to acknowledge the alarm and reset it.
8. Return the control panel selector switch to its original position.
9. Check for leaks when re-starting and pressurizing the system.

**Note:** Disposal of fuel, associated waste, and filters must be in accordance with all applicable federal, state, and local rules, laws, standards, and regulations.

**!WARNING!:** Some fuels may have been treated with biocides. Biocides are extremely toxic and may enter the body through the skin. It is recommended to use adequate protection and proper precautions if the fuel at-hand contains biocide type products.


## Replacement Filter Chart

FPS SERIES FILTERS							ALL FILTERS ARE ABSOLUTE, UNLESS OTHERWISE NOTED   WB: WATERBLOCK   SS: STAINLESS STEEL SCREEN					
CARTRIDGE FILTERS							SPIN-ON FILTERS					
	10µ	15µ WB	30µ	40µ SS	60µ SS	80µ SS	3µ	3µ WB	10µ	10µ WB	25µ	3µ X-GLASS
FPS SX-F	01010		01030		01060S		FF-3	WB-3	FF-10	WB-10	FF-25	FFZ-3
FPS MX-F	01810		01830		01860S		FF-3	WB-3	FF-10	WB-10	FF-25	FFZ-3
FPS LX-F	04010		04030		04060S		FF-3	WB-3	FF-10	WB-10	FF-25	FFZ-3

## Auto Water Drain (AWD) – *If Applicable*

### Servicing Auto Water Drain Strainer:

1. Turn the control panel selector switch to the “OFF” position – making sure the pump will not turn on.
  - a. TSC-7000 equipped models need to use the buttons on the “AUTO/MAN CONTROL” display.
2. Close the system’s Inlet and Outlet Isolation Ball Valves.
3. Place a fuel waste container below the strainer and Manual Drain Port.
4. Ensure the AWD’s Isolation Ball Valve is closed by opening the Manual Drain Port.
5. Open the bleed screw on top of the Water Separator to break vacuum.
6. Remove and clean the AWD’s strainer.

- 
7. Reattach and secure the strainer to the AWD assembly.
  8. Continue to “Servicing Water Collection Drum”.

**Servicing Water Collection Drum:**

9. Keep a fuel waste container below the Manual Drain Port (Please see Step 3).
10. Remove the Float Switch from the Water Collection Drum.
11. Properly dispose contents of the Water Collection Drum in accordance with the proper AHJ.
12. Replace the Float Switch to its original state on the Water Collection Drum.
13. Continue to “Manual Servicing of Water Separator”.

**Manual Servicing of Water Separator:**

14. Keep a fuel waste container under the Manual Drain Port.
15. Open the bleed screw on top of the Water Separator to break vacuum.
16. Open the AWD Isolation Ball Valve and Manual Drain Port.
  - a. See “Servicing the Primary Filter/Water Separator” for additional info.
17. Close the Manual Drain Port when all water has been drained from the Water Separator’s Sump.
18. Open the system’s Inlet and Outlet Isolation Ball Valves.
19. Confirm that the AWD Isolation Ball Valve and Manual Drain Ports are returned to their original positions.
20. Return the control panel selector switch to its original position.

**Auto Additive Injection – *If Applicable***

**Installing a New Additive Container:**

1. Turn key switch on external control panel to the “OFF” position - ensuring the system will not turn on.
2. Place diesel compatible absorbent pads next to the old additive container.
3. Wearing proper eye and hand protection gear, carefully remove the Float Switch/Container Port Assembly from the old additive container and secure over the adjacent pad to absorb any excess residue.
4. Exchange the old container for a new one by replacing the new container’s cap with the Float Switch/Container Port Assembly.
5. Use absorbent pads to clean up any spills and dispose in compliance with all relevant laws, regulations, and organizational policies and procedures.
6. Reset the Low Additive Warning Alarm via the TSC-7000 Touchscreen Controller to resume normal operation.

# Troubleshooting

## Symptom Troubleshooting Guide

### No fuel delivery

1. Pump does not run
2. Pump is not primed
3. Fuel supply line blocked
4. Excessive lift
5. Air leak in fuel supply to pump
6. Intake or outlet valve closed
7. Check valve installed backwards

### Insufficient fuel delivered

1. Air leak at inlet
2. Defective pressure relief valve or check valve
3. Excessive lift
4. Pump worn
5. Inoperative foot valve
6. Piping improperly installed or dimensioned
7. Primary filter/water separator plugged

### Rapid pump wear

1. Worn pump/motor coupler
2. Pump has been run dry or with insufficient fuel for extended periods of time
3. Plumbing on inlet side not appropriately dimensioned

### Alarm “HIGH VACUUM ALARM” comes on with clean or new filter element installed

1. Heavily contaminated fuel/excessive water in tank
2. Restriction in plumbing on inlet side too high
3. Excessive lift
4. Inoperative foot valve
5. Inlet ball valve not fully open
6. Suction line clogged

### Alarm “HIGH PRESSURE ALARM” comes on with clean or new filter element installed

1. Heavily contaminated fuel/excessive water in tank
2. Restriction in plumbing on discharge side too high
3. Head on discharge side too high
4. Check valve stuck or defective
5. Outlet ball valve not fully open
6. Discharge line clogged

### Pump requires too much power

1. Liquid too viscous
2. Bent pump shaft, binding rotor
3. Misalignment of pump/motor coupler

### Noisy operation

1. Insufficient fuel supply
2. Air leaks in the inlet pipe
3. Air in fuel on the suction side
4. Pump and motor out of alignment
5. Worn out spider coupling
6. Pump coupler out of balance

### Alarm “NO FLOW ALARM” comes on or pump requires frequent re-priming

1. Inoperative foot valve
2. Inoperative check valve
3. Inoperative solenoid valve (optional)
4. Pump cavitation
5. Plumbing air leaks
6. Lift too high
7. Leaking pump seal
8. Pump’s internal bypass/pressure relief valve cracking pressure is under 48-50 PSI.

### Motor does not turn or turns intermittently

1. Control power not available
2. Supply voltage is too low and/or incorrect
3. Motor thermal overload condition
4. Pump failed and seized
5. Motor failure

### Pump leaks fuel

1. Loose pump plumbing fittings
2. Worn pump shaft seal
3. Pump pressure relief valve failure
4. Fuel leak elsewhere and fuel dripping or running towards the pump
5. Excessive head from overhead storage tank
6. Worn pump O-rings or seals

# AXI International Limited Warranty

AXI International makes every effort to assure that its products meet high quality and durability standards and expressly warrants the products described herein against defects in material and workmanship for a period of one (1) year from the date of purchase. This warranty is not intended to supplant normal inspection, care and service of the products covered by the user, and shall not obligate AXI International to provide free service during the warranty period to correct breakage, maladjustment, or other difficulties arising out of abuse, misuse, or improper care and maintenance of such products. Our express warranty is subject to the following terms and conditions:


This warranty shall only extend to and is only for the benefit of original purchaser(s), or end customer(s) who use the products covered hereby and subject to the terms and conditions herein. This warranty is not an on-site warranty. Travel requests will be at the discretion of AXI International. Defective systems and ancillary products will require a return authorization number and shipping to AXI International's factory in Fort Myers, FL. Any warranty claim received by AXI International after one (1) year from the date of purchase will not be honored even if it is claimed that the defect occurred prior to one (1) year from the date of purchase. Claims outside of this one (1) year period, and for claims not listed within, payment, repair, or service will be awarded at the sole and exclusive discretion of AXI International.

## **This Warranty shall NOT apply to the following:**

1. Damage or deterioration caused by normal wear and tear.
2. Failures caused by any external cause or act of God, such as accident, collision, theft, vandalism, riots, wars, re, freezing, lightning, earthquakes, windstorms, hail, volcanic eruptions, floods, tornados or hurricanes.
3. Failures due to alterations, adjustments, unauthorized changes to the product(s), neglect or improper storage, repair and/or maintenance.
4. Failures due to abuse or application of the product(s) for uses other than for which it/they are designed or intended by AXI International, including but not limited to, improper installation or location in a harsh, corrosive or saltwater environment.
5. Failures resulting from attachments, accessory items, and parts not sold by AXI International.
6. Repairs by any party other than those authorized by AXI International.
7. Failures resulting from user's delay in making the product available for inspection by AXI International after notifying AXI International of a potential product problem.
8. Cosmetic damage, discoloration, rusting, corrosion or scratches from applied paint.
9. Replacement of consumables such as, but not limited to, fuses, lamps, filters, etc.
10. Additional expenses for repair after normal business hours, i.e., overtime or holiday labor rates.
11. Expenses for rental of equipment during downtime and/or performance of warranty repairs.
12. Expenses related to investigating performance complaints and/or troubleshooting where no manufacturing defect is found.

In addition to the limitations above, this warranty shall not apply to products (1) which have been tampered with, altered or repaired by anyone other than AXI International without the express prior written consent of AXI International (2) which have been installed improperly or subject to misuse, abuse, accident, negligence of others, improper operation or maintenance, neglect or modification, or (3) which have had the serial number altered, defaced or removed.

The liability of AXI International under this warranty is limited to the repair or replacement of the defective product. AXI International assumes NO LIABILITY for labor charges or other costs incurred by any purchaser incidental to the service, adjustment, repair, return, removal or replacement of products. AXI INTERNATIONAL ASSUMES NO LIABILITY FOR ANY GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, CONTINGENT OR OTHER DAMAGES UNDER ANY WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, WITH THE RESPECT TO THE PRODUCTS COVERED BY THIS WARRANTY POLICY, EXCEPT AS EXPRESSLY PROVIDED FOR HEREIN. AXI INTERNATIONAL ASSUMES NO LIABILITY FOR ANY GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, CONTINGENT OR OTHER DAMAGES EVEN IF SUCH DAMAGES ARE A DIRECT RESULT OF AXI INTERNATIONAL'S NEGLIGENCE. NO EMPLOYEE, AGENT, REPRESENTATIVE OR DISTRIBUTOR IS AUTHORIZED TO MAKE ANY WARRANTY ON BEHALF OF AXI INTERNATIONAL OTHER THAN THE EXPRESS WARRANTY PROVIDED FOR HEREIN.



AXI International reserves the right at any time to make changes in the design, material, function and specifications of its products. Any such changes shall not obligate AXI International to make similar changes in such products that were previously manufactured.

To the fullest extent permitted by law, any claims against AXI International are limited to the remedies as expressly set forth in this warranty and any other further claims, such as but not limited to, compensation for any damage incurred other than to the AXI International product, are hereby excluded.

## Warranty Claim Procedure

To make a claim under this warranty, please call AXI International at +1-239-690-9589 or 1-877-425-4239, and provide: Name and location where unit was purchased, the date and receipt of purchase, model number, serial number, and a detailed explanation of the problem you are experiencing. The Customer Service Representative may, at the discretion of AXI International, arrange for a Field Engineer to inspect your system. If the inspection reveals a defect covered by its limited warranty, AXI International will either repair or replace the defective parts or products. AXI International assumes no liability, if upon inspection, AXI International or its representative determines that there is no defect or that the damage to the system resulted from causes not within the scope of this limited warranty and customer shall be responsible standard rates incurred by AXI International, as established from time to time by AXI International.

For service and sales, please contact AXI International:

AXI International | 5400 Division Drive Fort Myers, FL 33905  
Tel: +1-239-690-9589 | Toll Free: +1-877-425-4239 | Fax: +1-239-690-1195  
Email: [info@axi-international.com](mailto:info@axi-international.com) | Internet: [www.axi-international.com](http://www.axi-international.com)

# Technical Assistance and Ordering

Please write, fax, email or call:

AXI International  
5400 Division Drive  
Fort Myers, FL 33905  
Tel: +1-239-690-9589  
Fax: +1-239-690-1195  
Email: info@axi-international.com Internet: www.axi-international.com

## Please provide the following information:

Serial Number of your system, the required part numbers and quantity. The drawings/parts list included in this manual are the most accurate source of part numbers.

## Accessories and Additional Configuration Parameters

### SYSTEM ALARMS

SWITCHES AND TIMER DELAYS			
TYPE	DEFAULT SET POINT	DEFAULT TIMER DELAY (SEC)	AXI INTERNATIONAL'S PART NUMBER
VACUUM SWITCH	16 IN. HG	5.0	AA-0528
PRESSURE SWITCH	22 PSI	0.0	AA-0526
FLOW SWITCH	3.5 GPM	10.0	AA-0576

## Replacement Filter Elements

### Primary Filter/Water Separator:

04060S - 60 $\mu$  Stainless Steel re-usable, cleanable filter element  
04030 - 30 $\mu$  replacement filter element  
04010 - 10 $\mu$  replacement filter element  
30440 Lid Gasket

### Fine Filter:

WB-3 - 3 $\mu$  Water Block Filter  
WB-10 - 10 $\mu$  Water Block Filter  
FFZ-3 - 3 $\mu$  Fine Filter  
FF-10 - 10 $\mu$  Fine Filter

## System Identification

Serial Number: \_\_\_\_\_ (e.g. B090010-MXF)

Inspected By: \_\_\_\_\_ Date: \_\_\_\_\_