

# *FPC Controller User Guide*

*with FPC HMI v1.0.3*

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prepared by GPD Global® Documentation Dept.

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## Safety Notices

### **Appropriate use, warranty**

Any of the following that are done without the explicit and written approval of the manufacturer:

- conversions or additions,
- the use of non-original spare parts,
- repairs carried out by companies or persons that have not been authorized by the manufacturer

can lead to the warranty being rendered null and void. The manufacturer shall have no liability whatsoever for damage resulting from failure to follow the operation and maintenance instructions.

### **Qualifications of the operating and maintenance personnel**

The owner bears the responsibility for ensuring that operating and maintenance personnel have the required qualifications. The operation and maintenance instructions must be read and understood. Comply with the relevant applicable technical and safety regulations.

### **Organizational measures**

The owner is to provide any personal protective equipment that is required. All the safety devices are to be checked regularly. Wear protective glasses and a protective suit for operation and cleaning to protect against any chemicals that may be sprayed out.

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## Warranty

**General Warranty.** Subject to the remedy limitation and procedures set forth in the Section “Warranty Procedures and Remedy Limitations,” GPD Global warrants that the system will conform to the written description and specifications furnished to Buyer in GPD Global’s proposal and specified in the Buyer’s purchase order, and that it will be free from defects in materials and workmanship for a period of one (1) year. GPD Global will repair, or, at its option, replace any part which proves defective in the sole judgment of GPD Global within one (1) year of date of shipment/invoice. Separate manufacturers’ warranties may apply to components or subassemblies purchased from others and incorporated into the system. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

**Limitations.** GPD Global reserves the right to refuse warranty replacement, where, in the sole opinion of GPD Global the defect is due to the use of incompatible materials or other damages from the result of improper use or neglect.

This warranty does not apply if the GPD Global product has been damaged by accident, abuse, or has been modified without the written permission of GPD Global.

Items considered replaceable or rendered unusable under normal wear and tear are not covered under the terms of this warranty. Such items include fuses, lights, filters, belts, etc.

**Warranty Procedures and Remedy Limitations.** The sole and exclusive remedy of the buyer in the event that the system or any components of the system do not conform to the express warranties stated in the Section “Warranties” shall be the replacement of the component or part. If on-site labor of GPD Global personnel is required to replace the non-warranted defective component, GPD Global reserves the right to invoice the Buyer for component cost, personnel compensation, travel expenses and all subsistence costs. GPD Global’s liability for a software error will be limited to the cost of correcting the software error and the replacement of any system components damaged as a result of the software error. In no event and under no circumstances shall GPD Global be liable for any incidental or consequential damages; its liability is limited to the cost of the defective part or parts, regardless of the legal theory of any such claim. As to any part claimed to be defective within one (1) year of date of shipment/invoice, Buyer will order a replacement part which will be invoiced in ordinary fashion. If the replaced part is returned to GPD Global by Buyer and found by GPD Global in its sole judgment to be defective, GPD Global will issue to Buyer a credit in the amount of the price of the replacement part. GPD Global’s acceptance of any parts so shipped to it shall not be deemed an admission that such parts are defective.

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Specifications, descriptions, and all information contained in this manual are subject to change and/or correction without notice.

Although reasonable care has been exercised in the preparation of this manual to make it complete and accurate, this manual does not purport to cover all conceivable problems or applications pertaining to this machine.

## Overview

The FPC Controller is an off-line control system for the FPC Pump Interface. The controller and its HMI control software are available to interface the FPC Pump Interface with your existing dispense pump.

### Models

22891003  
22391004



### FPC Controller shown with FPC Pump Interface, HyFlo Pump, and Stand



## Scope of Supply

The FPC system includes an FPC Controller with HMI control software, a power cord, and a user guide.

## Theory of Operation

The FPC (pump inlet pressure control) system is simple to use:

1. Install an FPC Pump Interface with FPC sensor on a dispense pump.
2. Attach a fluid reservoir to the pump.
3. Plug the FPC Sensor into the FPC Controller and adjust the controller parameters accordingly.
4. The FPC Controller may be connected to a GPD Island Series or other control signal to start/stop the FPC function. Alternatively, the Start/Stop button may be selected from the HMI touch screen on the FPC Controller.

## Features

### Run mode

Pump inlet pressure is controlled to match the pump inlet pressure set point.

### Standby mode

Pump inlet pressure is controlled to match the standby set point.

### Offline mode

Reservoir pressure is set to zero (0).

### Manual mode

Pump inlet pressure control is disabled and a constant air pressure is exerted.

### Set Point

Establishes desired air pressure. The set point can be specified through either the touch screen set point parameter or the external set point analog input channel. Only a single source is active at any given time.

**Sensor Adjustment**

Establishes a 'zero offset' for the pressure sensor.

**At Pressure**

The ready state for the FPC Controller is based on actual pressure at the pump inlet. The ready state requires this pressure be within a specified range centered on the Run set point.

**Maximum pressure**

At no time will the FPC Controller adjustment pressure exceed a configurable, maximum pressure value.

## Controller Operation

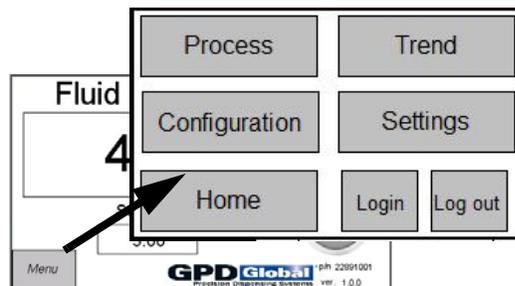
- [User Interface](#) (pg 3)
- [Set Up](#) (pg 3)
- [Operations](#) (pg 4)
- [Data Trend Graph](#) (pg 7)
- [Set Parameters](#) (pg 8)
- [Set Options](#) (pg 8)

## User Interface

### Navigation

Use the Menu window to navigate to all windows: Process, Trend, Configuration, Settings, Home, Login, and Log out.

To close the Menu window, either press the MENU button again or select a menu item. Selecting a menu item automatically closes the Menu window while opening the window for the selected menu item.



### Enter Value

A numeric keypad will display whenever you press a value field. The keypad closes automatically when you press the keypad ENTER or ESC button.

**NOTE:** All input takes effect immediately.



## Set Up

To set up the FPC Controller:

1. Plug the power cord into an appropriate power outlet. Refer to [Specifications](#) (pg 12).
2. Connect air to the AIR IN port on the rear panel. Refer to [Specifications](#) (pg 12).
3. Connect air hose from the syringe cap on the pump to AIR OUT port on front panel.
4. Plug the sensor cable from the FPC Pump Interface (mounted to pump) into the SENSOR port on the front panel.
5. As needed, enter or edit appropriate parameters. Refer to [Set Parameters](#) (pg 8).

The FPC Controller is now ready for operations.

## Operations

### Power On/Off

To power the FPC Controller on/off, press the Power switch on the back of the unit.

### Online

When the RUN button is pressed:

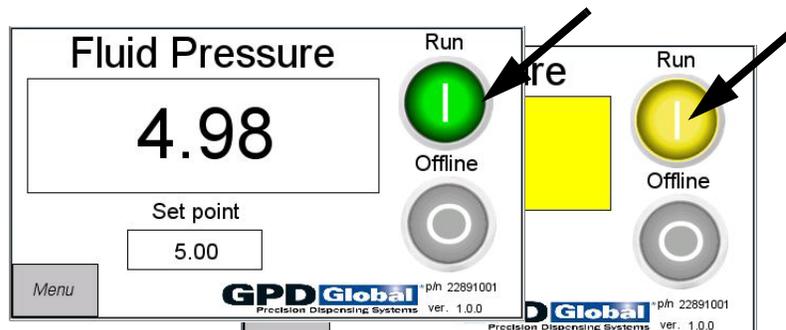
- the controller will go online, and
- the RUN button will turn green if the RunMode digital input is asserted, or
- the RUN button will turn yellow if the RunMode digital input is not asserted.

**Table 1: Run Button States**

| Color  | State  |
|--------|--|
| Yellow | Standby Mode: pressure comes from idle Pressure.       |
| Green  | Run Mode: pressure comes from Set Point.               |
| Blue   | Idle Time: pressure remains at Set Point for “x” time. |

*For further details, refer to [Operation Modes](#) (pg 5).*

1. Before turning on the FPC Controller, make sure the pump FPC Sensor is connected to the controller.
2. Press the RUN button on the Home window to bring the controller online.



### Run FPC Pump Interface

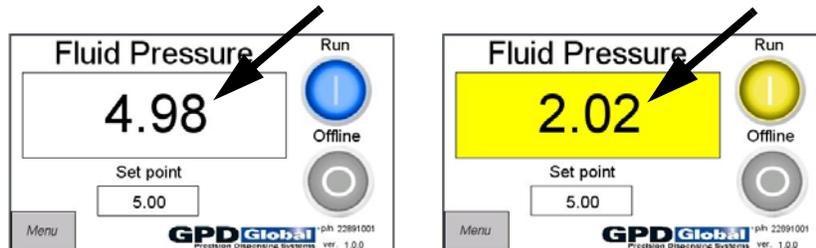
To run the FPC Pump Interface using the FPC Controller:

1. Verify [Set Up](#) (pg 3) has been performed.
2. Press the RUN button. When the RUN button turns green, the system is in Run mode.

## View Current Pressure

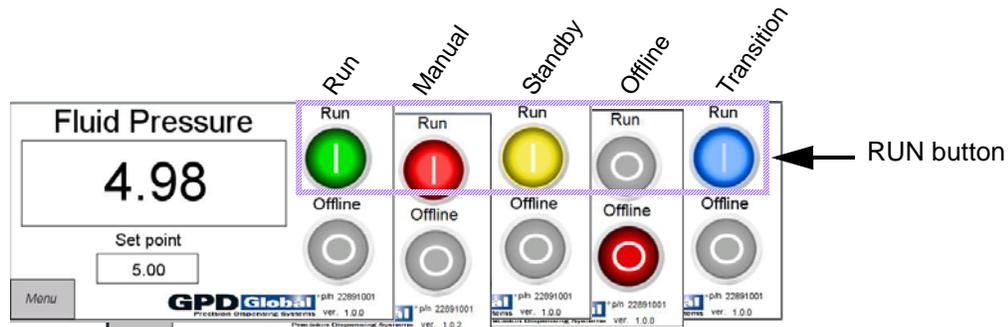
The current pump inlet pressure is always displayed in the Home window. The background color of reading indicates the state of the pump inlet pressure:

- White background - pump inlet pressure is within set point tolerance (requires Run mode to be active).
- Yellow background - pump inlet pressure is outside set point tolerance.



## Operation Modes

**Figure 1:** FPC Controller mode is indicated by color of RUN button.



## Run Mode

Press the RUN button on the Home window. The FPC Controller is active when the RUN button is Yellow, Green, or Blue.

**NOTE:** For RUN mode to be active, it must be selected from the Home screen.

If external hardware interfacing with the FPC Controller is present and an Emergency Stop condition (Emergency Stop digital input) is enabled, the FPC Controller is forced offline (OFFLINE button on Home screen). The FPC Controller cannot be active with the emergency condition active.

When the FPC Controller is in Run mode, the reservoir pressure is being controlled to match the set point (pump inlet pressure). The set point can be specified through two sources, only one of which will be active at any given time:

- The set point parameter input via the touch screen. Refer to [Process](#) (pg 19).
- The external set point analog input channel (if external hardware interfacing with the FPC Controller is present). Refer to [Settings \[4\]](#) (pg 27).

## Standby Mode

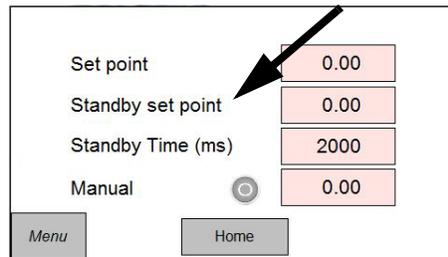
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Standby mode is indicated by a Yellow RUN button. The FPC Controller is in Standby mode when  $n$  milliseconds (specified by Standby Time) have elapsed since dispensing stopped.

These conditions will exist during Standby mode:

- Reservoir pressure is controlled to match the Standby set point.
- RunMode digital input is not asserted.
- Standby or RUN Mode cannot be active if an Emergency Stop condition is present on an externally connected machine.

The Standby set point is located in the [Process](#) (pg 19) window.



## Offline Mode

---

When the FPC Controller is in the Offline mode, the OFFLINE button appears red and zero (0) reservoir pressure is forced.

The FPC Controller is in Offline mode when the FPC Controller is forced Offline through the touch screen or an externally connected machine (via the Emergency Stop digital input) is in an Emergency Stop condition.

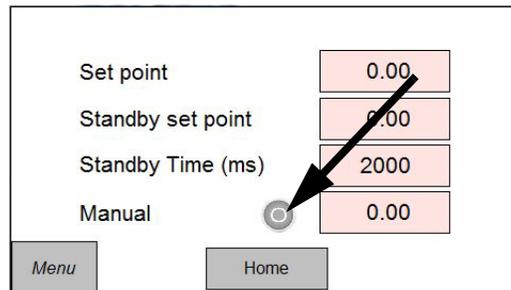


## Manual Mode

The MANUAL button is available when the FPC Controller is in Standby mode (RUN button is Yellow).

When the FPC Controller is in Manual mode, inlet pressure control is disabled and a constant reservoir pressure is commanded.

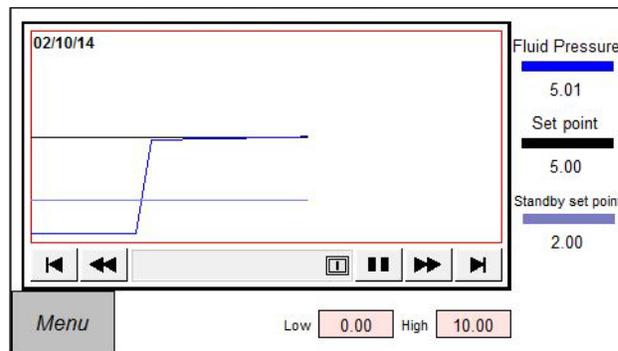
To activate Manual mode, press the MANUAL button in the [Process](#) (pg 19) window.



## Data Trend Graph

To generate a trend line graph for pump inlet pressure, set point, and standby set point:

1. From the Home window, press MENU > TREND. The Trend window displays.



2. To zoom in/out on the vertical pressure line, enter a value in Low and High.
3. Navigate the horizontal time line using the controls at the bottom of the graph.

## Set Parameters

**NOTE:** The controller retains some of the current set up parameters when power is cycled. Most settings remain unchanged until you enter new selections and values even if the FPC Controller power is cycled; however, manual (air pressure) parameters will be set to a value of 0.0 when power is cycled.

**SUGGESTION:** Record your settings by material. Previous settings are not retrievable after new selections and values are entered.

Below are some of the various parameters available for user modification:

| To edit:                      | Refer to:                                 |
|-------------------------------|---|
| Set point                     | <a href="#">Process</a> (pg 19)           |
| Standby set point             |   |
| Manual (air pressure)         |   |
| Standby time                  | <a href="#">Configuration [1]</a> (pg 21) |
| Ramp up time                  |   |
| Standby ramp up time          |   |
| Pressure settings *           | <a href="#">Settings [3]</a> (pg 26)      |
| External set point settings * | <a href="#">Settings [4]</a> (pg 27)      |

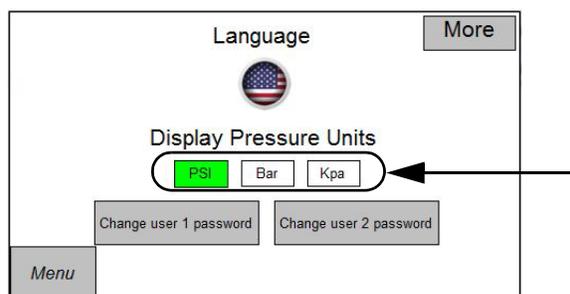
\*for use when external hardware is interfaced with the FPC Controller

## Set Options

### Units of Measure

To change the unit of measure for all pressure displays:

1. From the Home window, press MENU > SETTINGS. The initial Settings window displays.
2. Press the desired choice of units: PSI, Bar, or Kpa. The selected units will display with a green background.



### Localization

Currently, window text displays in English. Refer to [Settings \[1\]](#) (pg 24).

## Configuring Controller

- [Configuration Parameters](#) (pg 9)
- [Sensor Adjustment](#) (pg 9)
- [Tuning Parameters](#) (pg 10)
- [Noise Suppression](#) (pg 10)

Various configuration settings for the FPC Controller may be changed by the user:

- maximum pressure
- pump inlet pressure range
- ramp values
- sensor offset value
- tuning parameters
- noise suppression values

**NOTE:** A top level password is required to access configuration settings.

## Configuration Parameters

To change various configuration parameters, from the Home window press MENU > CONFIGURATION to open the initial Configuration window.

For further details about each parameter, refer to [Configuration \[1\]](#) (pg 21).

|                      |                      |
|----------------------|----------------------|
|                      | <a href="#">More</a> |
| Max Pressure         | 100.00               |
| Tolerance            | 0.20                 |
| Run Ramp (ms)        | 0                    |
| Standby Ramp (ms)    | 0                    |
| <a href="#">Menu</a> |                      |

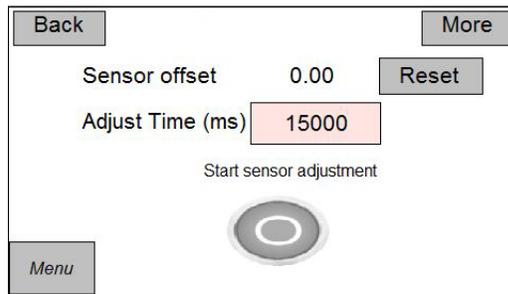
## Sensor Adjustment

To perform the sensor adjustment procedure:

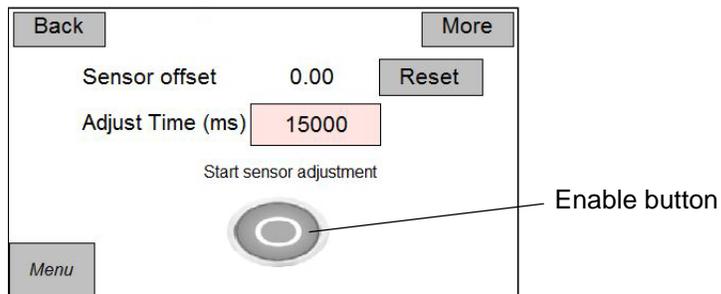
1. If external hardware interfacing with the FPC Controller is present:
  - a. Verify that the EStop digital input channel to the FPC Controller is not being asserted (typically by releasing the Emergency Stop button on the interfacing hardware).
  - b. Verify that the RunMode digital input channel to the FPC Controller is not being asserted.
2. From the Home window, press the RUN button. The RUN button will turn yellow to indicate the controller is in Standby mode.

**IMPORTANT:** Do not press the OFFLINE button during this procedure.

3. Press MENU > CONFIGURATION, and then press MORE to open the second Configuration window. For details about each parameter, refer to [Configuration \[2\]](#) (pg 22).



4. Enter a value in Adjust Time (ms).
5. To start the sensor adjustment procedure, press the grey ENABLE button. The button is green while the adjustment procedure is active and returns to grey when the procedure has been completed.

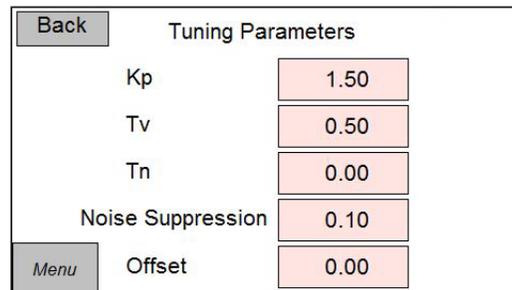


The Sensor offset value is updated upon procedure completion.

## Tuning Parameters Noise Suppression

To change tuning or noise suppression parameters, from the Home window press MENU > CONFIGURATION, and then press MORE > MORE to open the third Configuration window.

For further details about each parameter, refer to [Configuration \[3\]](#) (pg 23).



# Security

## Access Levels

The FPC Controller has two passworded access levels. The first (user 1) – a limited access level – enables the user to access the Home, Login, and Process windows. The second level (user 2) – the unlimited access level – enables the user to access all aspects.

## Login

**NOTE:** As a security measure, the user is logged off automatically after a period of inactivity; the login screen is reset.

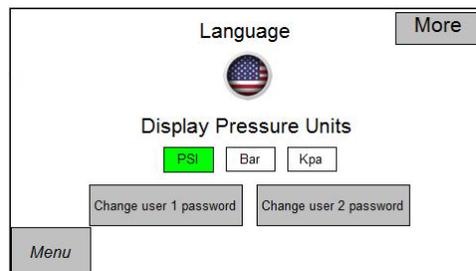
To log into the FPC Controller:

1. From the Home window, press MENU > LOGIN. The Login window displays. Close the Menu window.
2. Press the USER field. Enter a user name (1 or 2) for the appropriate level of access, and then press ENTER.
3. Press the PASSWORD field. Enter the appropriate password and then press ENTER. If the password is input incorrectly, an Invalid Password prompt will display; otherwise, the login will have been successful.
4. Press MENU to exit this window and select a different window.

## Change Password

To change a password:

1. From the Home window, press MENU > SETTINGS. The Settings window displays. Close the Menu window.



2. To change the password for user 1, press CHANGE USER 1 PASSWORD. To change the password for user 2, press CHANGE USER 2 PASSWORD instead. A prompt for the appropriate user displays.



3. Press the \*\*\*\*\* button and input the desired password. Pressing the SAVE button confirms and changes the password for the applicable user.

**NOTE:** Make note of the new password. Passwords cannot be recovered if lost.

4. Press the X icon to exit.

## Specifications

| Specification                                | Model<br>22891003                | Model<br>22891004 |
|--|----------------------------------|-------------------|
| Input air pressure, max.<br>(clean, dry air) | 6.9 bar (100 psi)                | 8.3 bar (120 psi) |
| Output pressure, max.                        | 6.9 bar (100 psi)                | 20 bar (290 psi)  |
| Input power                                  | 100-240 VAC, 50/60 Hz            |                   |
| Controller interface                         | HMI with FPC Controller software |                   |
| Air input port tube diameter                 | 6 mm                             | 6 mm              |
| Air output port tube diameter                | 6 mm                             | 6 mm              |
| External input/output                        | 9 pin DB                         |                   |

## Spare Parts

Applicable to all models:

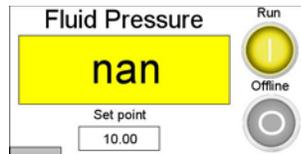
| Description                            | Part No.  | Qty |
|--|-----------|-----|
| Potentiometer Trim Pot Adjustment Tool | 4750-0052 | 1   |
| Fuse F1 and F2, 2A                     | 4300-0118 | 1   |

## Troubleshooting

This section is intended for use by those with access to configuration settings.

### Symptom

A Fluid Pressure value of “nan” displays in the Home window:



### Possible Problem

The system is configured incorrectly. Each set of Low and High fields in all Settings windows must define a range; if they are equal to each other, an error occurs.

#### Example - CORRECT

Each set of Low and High fields defines a range.

In this example, correct settings reflect the electrical signal of the sensor. The sensor has a VDC output range of 0-10 VDC for 0-72.0 PSI.

|       | LOW  | HIGH  | SAMPLE SETTING WINDOW |
|-------|------|-------|-----------------------|
| Units | 0.00 | 72.00 |                       |
| VDC   | 0.00 | 10.00 |                       |

#### Example - INCORRECT

One or more sets of Low and High fields do NOT define a range; they are equal to each other.

In this example, Low and High values for Units are both 0.00. For VDC, values are both 10.00.

|       | LOW   | HIGH  | SAMPLE SETTING WINDOW |
|-------|-------|-------|-----------------------|
| Units | 0.00  | 0.00  |                       |
| VDC   | 10.00 | 10.00 |                       |

### Action

Inspect and edit, as needed, the values for each set of Low and High fields located here:

- Sensor - refer to [Settings \[2\]](#) (pg 25).
- Regulator - refer to [Settings \[3\]](#) (pg 26).
- Pressure - refer to [Settings \[3\]](#) (pg 26).
- External Set Point - refer to [Settings \[4\]](#) (pg 27).

## References

- [FPC Controller Interface IO](#) (pg 14)
- [Controls and Connections](#) (pg 15)
- [Fuses](#) (pg 15)
- [Windows](#) (pg 16)

## FPC Controller Interface IO

### Analog IO

#### Analog Inputs to the FPC Controller

External set point - this channel is used to control the pump inlet pressure set point when the FPC Controller is in Run mode.

To enable this feature, the scaling settings must be configured properly and use of the external set point must be enabled via [Settings \[4\]](#) (pg 27).

#### Analog Outputs from the FPC Controller

Current Pressure - this channel can be used to monitor the current pump inlet pressure.

The scaling settings, which specify the voltage range and its representation in units of pressure, are configurable in [Settings \[4\]](#) (pg 27).

### Digital IO

#### Digital Inputs to the FPC Controller

RunMode - while this channel is asserted, the FPC Controller will be forced into Run mode unless the FPC Controller is in an emergency stop condition or the FPC Controller is being forced offline.

EStop - while this channel is asserted, the FPC Controller disables air pressure on the system.

#### Digital Outputs from the FPC Controller

Ready - this channel is asserted under the following conditions:

- the controller is in Run mode.
- the pump inlet pressure is within tolerance of the specified set point.
- the Enabled channel is asserted when the controller is not in Offline mode.

## Controls and Connections



**Table 2: Control & Connection Identification**

| Item | Description   |
|------|---|
| 1    | Air Out<br>Air to syringe   |
| 2    | HMI<br>Human machine interface  |
| 3    | Sensor<br>Connector for reservoir sensor cable                                      |
| 4    | Air In<br>Connector for external air source   |
| 5    | Power Switch<br>Powers the controller box   |
| 6    | USB<br>Connector for upgrading HMI control software.<br>Location may vary by model. |
| 7    | Ethernet<br>Network connector for external data acquisition/streaming               |
| 8    | External I/O<br>Connector for external inputs / outputs                             |

**Table 3: External I/O Connector Pin Descriptions**

| Pin | I/O Description | I/O Function               | I/O State   |
|-----|-----------------|----------------------------|---|
| 1   | Digital Input   | Enable run mode            | <ul style="list-style-type: none"> <li>Open = Air off</li> <li>Closed = Air on</li> </ul>                   |
| 2   | Digital Input   | Emergency stop             | <ul style="list-style-type: none"> <li>Closed = E-Stop asserted</li> <li>Open = Run</li> </ul>              |
| 3   | Digital Output  | Ready                      | <ul style="list-style-type: none"> <li>24VDC = FPC ready</li> <li>0V = FPC busy</li> </ul>                  |
| 4   | Digital Output  | Error                      | <ul style="list-style-type: none"> <li>24VDC = FPC in error state</li> <li>0V = FPC normal state</li> </ul> |
| 5   | Ground, Digital |                            |   |
| 6   | Analog Input    | Set point for FPC pressure | 0-10VDC   |
| 7   | Analog Output   | Current pressure out       | 0-10VDC   |
| 8   | Ground, Analog  |                            |   |
| 9   | +24VDC          |                            |   |

## Fuses

Refer to [Spare Parts](#) (pg 12) for replacement part numbers.

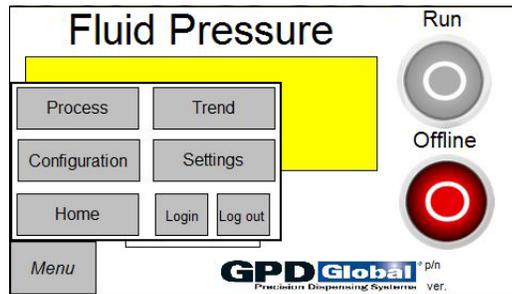
| Location        | Fuse I.D. | Items Affected            |
|-----------------|-----------|---------------------------|
| AC Inlet Module | F1, F2    | Main system power         |
| Power Supply    | FS1       | 24V system supply voltage |

## Windows

- [Menu](#) (pg 16)
- [Home](#) (pg 17)
- [Login](#) (pg 18)
- [Process](#) (pg 19)
- [Trend](#) (pg 20)
- [Configuration](#) (pg 21)
- [Settings](#) (pg 24)

## Menu

Use the Menu window to navigate to any of these windows: Process, Trend, Configuration, Settings, Home, Login, and Log out.



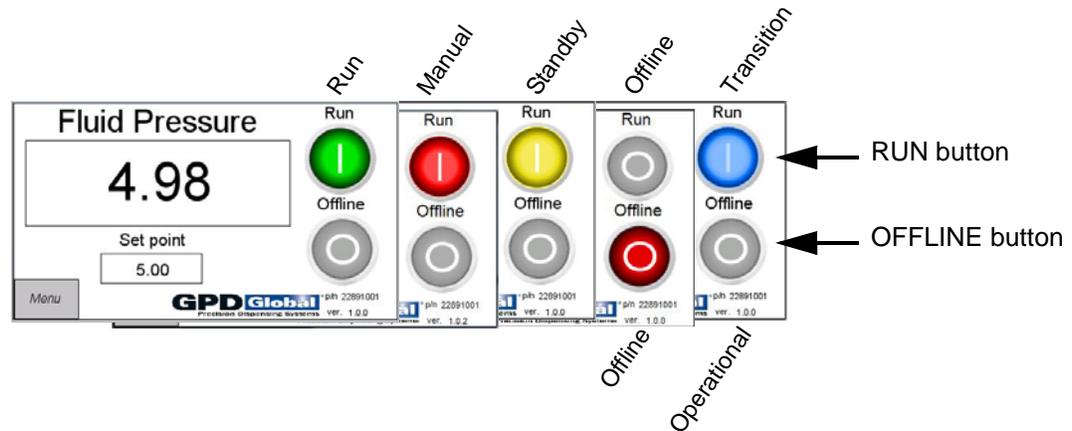
| Component     | Description   |
|---------------|---|
| Menu button   | Always present in lower left corner of Home window. Press the MENU button once to display the Menu window, and again to close the Menu window.                          |
| Process       | Opens the process parameters window. Requires access level 1 or 2.  |
| Trend         | Opens the trend line graph display window.  |
| Configuration | Opens the first configuration settings window. Requires access level 2.   |
| Settings      | Opens the first system settings window. Requires access level 2.  |
| Home          | Opens the Home window.  |
| Login         | Opens the Login window.   |
| Log out       | Logs out the current user. Additionally, an automatic log out of the current user occurs if there is no user interaction with the touch screen for more than 5 minutes. |

Home

Use this window to determine:

- the current fluid pressure (pump inlet pressure),
- if the fluid pressure is within set point tolerance,
- the current state of the FPC Controller.

Figure 2: Button color indicates mode of RUN button & state of OFFLINE button.



| Component      | Description  |
|----------------|--|
| Fluid Pressure | Current reading of the pressure sensor. Two possible states: <ul style="list-style-type: none"> <li>• White background - pump inlet pressure is currently within set point tolerance (requires Run mode to be active).</li> <li>• Yellow background - pump inlet pressure is outside set point tolerance.</li> </ul>   |
| Set point      | The targeted amount of pump inlet pressure which will be achieved when the FPC Controller is in Run mode (indicated when the RUN button is green).   |
| Run            | The RUN button has four different visual states: <ul style="list-style-type: none"> <li>• <b>Green</b> - FPC Controller is currently in Run mode and is set to achieve pump inlet pressure at the targeted set point.</li> <li>• <b>Red</b> - The air regulator is commanding a user specified constant air pressure, and pump inlet pressure control is not in effect.</li> <li>• <b>Yellow</b> - FPC Controller is in Standby mode and the pump inlet pressure will be achieved at the specified standby set point.</li> <li>• <b>Grey</b> - FPC Controller is currently in Offline mode; the air regulator will command zero (0) pressure in this state.</li> <li>• <b>Blue</b> - FPC Controller is in the process of leaving Run mode. The amount of time this takes depends on the Standby time setting, and will enter Standby mode (if enabled) or will go into Offline mode if the Run command is not re-enabled.</li> </ul> |
| Offline        | The OFFLINE button has two different visual states: <ul style="list-style-type: none"> <li>• <b>Red</b> - FPC Controller is currently Offline. The air regulator will command zero (0) pressure in this state.</li> <li>• <b>Grey</b> - FPC Controller is currently operational.</li> </ul>  |

## Login

Use this window to log in and gain access to additional secure areas.

The screenshot shows a simple login interface. At the top center, the word "Login" is displayed. Below it, there are two input fields. The first is labeled "User" and contains the number "1". The second is labeled "Password" and contains a single asterisk "\*". In the bottom-left corner of the window, there is a button labeled "Menu".

| Component | Description   |
|-----------|---|
| User      | Used to select the user login access level:<br>Access levels: <ul style="list-style-type: none"> <li>• user 1 = access limited to Home, Login, and Process windows.</li> <li>• user 2 = unlimited access</li> </ul>   |
| Password  | Used to enter the security access code for the currently selected user. An invalid password message will display if an incorrect password is entered. Passwords can be changed in <a href="#">Settings</a> (pg 24).<br><b>NOTE:</b> Changed passwords cannot be recovered.<br>Default passwords: <ul style="list-style-type: none"> <li>• user 1 = 111111</li> <li>• user 2 = 222222</li> </ul> |

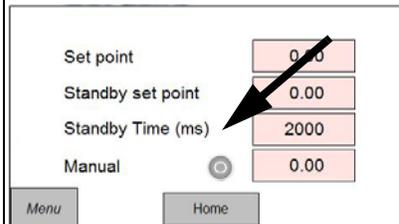
## Process

Use this window to set the set point and standby set point, and to enable/disable the Standby and Manual modes.

To open the Process window from Home, press MENU > PROCESS.

The screenshot shows a control interface with four input fields and two buttons. The fields are labeled 'Set point', 'Standby set point', 'Standby Time (ms)', and 'Manual'. Each field contains a numerical value: 0.00, 0.00, 2000, and 0.00 respectively. Below the fields are two buttons labeled 'Menu' and 'Home'. A small circular icon with a dot is positioned between the 'Manual' label and its value field.

| Component         | Description  |
|-------------------|--|
| Set Point         | The value of the current set point is entered/changed here.<br>Indicates the desired amount of pump inlet pressure to be exerted when the FPC Controller is in Run mode.   |
| Standby set point | The current Standby set point value. Indicates the desired amount of pump inlet pressure to be exerted when the FPC Controller is in Standby mode.   |
| Standby Time (ms) | Amount of time (in milliseconds) that the FPC Controller will wait before transitioning out of run mode if run mode has been disabled.   |
| Manual            | The amount of constant air pressure the air regulator will supply when Manual mode is enabled.   |
| Manual button     | When this button is visible, the FPC Controller can be put in Manual mode. Manual mode forces the air regulator to maintain a constant air pressure.<br><b>NOTE:</b> Pump inlet pressure control is not active in Manual mode. |



## Trend

This window displays a real time, trend line graph of the following data: pump inlet pressure, set point, and standby set point.



| Component     | Description   |
|---------------|---|
| Time line     | The horizontal axis represents time. The time line can be navigated using the controls at the bottom of the graph.  |
| Pressure line | The vertical axis represents pressure (in units set in <a href="#">Settings</a> (pg 24)). The vertical view can be scaled (zoomed in/out) using the Low and High boxes. |
| Low           | The lower range of the vertical axis on the displayed line graph.   |
| High          | The upper range of the vertical axis on the displayed line graph.   |

## Configuration

- [Configuration \[1\]](#) (pg 21)
- [Configuration \[2\]](#) (pg 22)
- [Configuration \[3\]](#) (pg 23)

### Configuration [1]

Use this window to set maximum pressure, pump inlet pressure range, and ramp values.

|                   |             |
|-------------------|-------------|
|                   | <b>More</b> |
| Max Pressure      | 100.00      |
| Tolerance         | 0.20        |
| Run Ramp (ms)     | 0           |
| Standby Ramp (ms) | 0           |
| <b>Menu</b>       |             |

| Component         | Description  |
|-------------------|--|
| Max Pressure      | The maximum amount of air pressure allowed through the air regulator.  |
| Tolerance         | The range of tolerated pump inlet pressure; the range centered on the current set point in which the controller will consider the current pump inlet pressure within acceptable range. This is calculated as follows:<br><br>Tolerance range = [ SP - T/2, SP + T/2 ]<br><br><b>Example:</b><br>Tolerance = 0.20<br>Set point = 5.0<br>Tolerance range = [4.9,5.1]   |
| Standby Time (ms) | Amount of time (in milliseconds) that the FPC Controller will wait before transitioning out of run mode if run mode has been disabled.   |
| Run Ramp (ms)     | Amount of time (in milliseconds) that the FPC Controller will ramp up to the current set point when the controller enters run mode.<br><br><b>Example:</b><br>Run ramp (ms) = 2000<br>Set point = 10.0<br><br>If the controller goes from an Offline state (with a current pump inlet pressure of 0.0) into the Run mode state, the controller will take at least 2000 milliseconds to achieve the set point of 10.0 |
| Standby Ramp (ms) | Amount of time (in milliseconds) that the FPC Controller will ramp up to the Standby set point when the FPC Controller enters Standby mode.  |
| MORE              | Opens the next window - <a href="#">Configuration [2]</a> (pg 22).   |

## Configuration [2]

Use this window to adjust the sensor offset value.

| Component        | Description  |
|------------------|--|
| Sensor offset    | <p>The currently adjusted sensor offset.</p> <p>The FPC Controller internally adds this value to the current set point and subtracts this value from the actual pressure sensor value for display purposes.</p> <p>NOTE: The value remains unchanged if the sensor pressure reading is beyond its limit of 10% of the sensor range.</p>  |
| RESET            | When the RESET button is clicked, the sensor offset will be reset to a value of 0.0.   |
| Adjust Time (ms) | Amount of time the sensor adjustment process takes when enabled.   |
| Enable button    | <p>Starts the sensor adjustment process. When the adjustment has been completed, the ENABLE button is automatically disabled and the sensor offset value is updated.</p> <p>To perform the adjustment, the FPC Controller must be in Standby mode (refer to <a href="#">Standby Mode</a> (pg 6)).</p> <p>If the ENABLE button remains green (fails to disable after N milliseconds, where N = Adjust Time parameter), step through the <a href="#">Sensor Adjustment</a> (pg 9) procedure.</p> |
| MORE             | Opens the next window - <a href="#">Configuration [3]</a> (pg 23).   |
| BACK             | Opens the previous window - <a href="#">Configuration [1]</a> (pg 21).   |

### Configuration [3]

**CAUTION:** The content in this section is NOT recommended for use by anyone besides GPD Global personnel or those working under the direct guidance of GPD Global personnel.

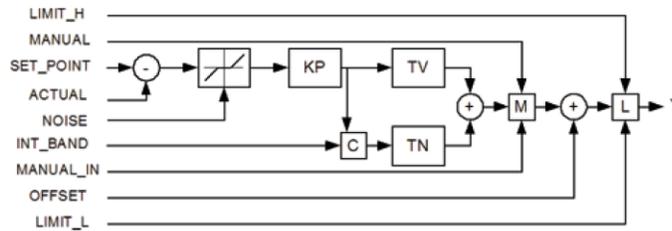
**IMPORTANT:** Before changing parameter values, write down the original parameters because they will not be retained.

Use this window to tune parameters (PID controller settings) and set noise suppression set point and offset values.

|             |                   |      |
|-------------|-------------------|------|
| <b>Back</b> | Tuning Parameters |      |
|             | Kp                | 1.50 |
|             | Tv                | 0.50 |
|             | Tn                | 0.00 |
|             | Noise Suppression | 0.10 |
| <b>Menu</b> | Offset            | 0.00 |

| Component         | Description   |
|-------------------|---|
| Tuning Parameters | PID controller settings. The PID controller calculates output with the following equation:<br>$Y = KP * (DIFF + 1/Tn * INTEG (DIFF) + TV *DERIV (DIFF)) + OFFSET$ |
| Noise Suppression | The PID controller will only be active when the deviation between the set point and the actual sensor value is greater than this value (PSI).                     |
| BACK              | Opens the previous window - <a href="#">Configuration [2]</a> (pg 22).  |

**Figure 3: PID Schematic**

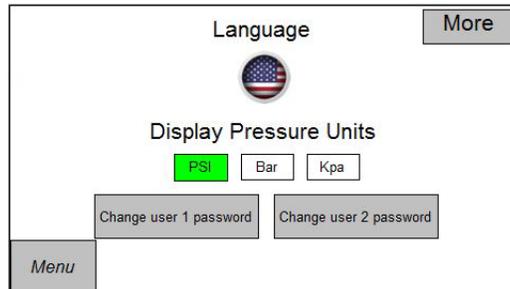


## Settings

- [Settings \[1\]](#) (pg 24)
- [Settings \[2\]](#) (pg 25)
- [Settings \[3\]](#) (pg 26)
- [Settings \[4\]](#) (pg 27)

### Settings [1]

Use this window to select a language, select the desired units of pressure, and change passwords.



| Component              | Description  |
|------------------------|--|
| Language               | This button will cycle through the available languages the system supports. Selecting a language will change the displayed system text to the selected language.       |
| Display Pressure Units | Use this button series to select the units of pressure on the controller. The available units of pressure are PSI (pounds per square inch), Bar, and kPa (kilopascal). |
| Change user n password | Pressing a "Change user n password" button will open a popup window allowing you to change the login password for that user.   |

## Settings [2]

Use this window to set linear scaling settings for the analog input of the sensor to the PLC.

|      |        |       |        |      |      |
|------|--------|-------|--------|------|------|
| Back | Sensor |       | Low    | High | More |
|      | Units  | 0.00  | 72.52  |      |      |
|      | VDC    | 0.000 | 10.000 |      |      |
| Menu |        |       |        |      |      |

### Example settings:

Units Low = 0.0  
 Units High = 72.52  
 VDC Low = 0.0  
 VDC High = 10.0

### Interpreting Example Settings:

- When measured voltage of sensor is 0.0, this amount of pressure is equal to 0.0 PSI.
- When measured voltage of sensor is 10.0, this amount of pressure is equal to 72.52 PSI.
- When measured voltage of sensor is 5.0, this amount of pressure is equal to 36.26.

| Component | Description   |
|-----------|---|
| Units     | <ul style="list-style-type: none"> <li>• Units Low - minimum value in PSI for which the sensor is capable of producing output.</li> <li>• Units High - maximum value in PSI for which the sensor is capable of producing output.</li> </ul> |
| VDC       | <ul style="list-style-type: none"> <li>• VDC Low - voltage output when sensor is reading zero (0) pressure.</li> <li>• VDC High - maximum voltage of which the sensor is capable.</li> </ul>  |

### Settings [3]

---

Use this window to set linear scaling settings for the analog output for controlling the air regulator and the analog output for reading the current pump inlet pressure.

|      |           |       |        |      |
|------|-----------|-------|--------|------|
| Back | Regulator | Low   | High   | More |
|      | Units     | 0.00  | 100.00 |      |
|      | VDC       | 0.000 | 10.000 |      |
|      | Pressure  | Low   | High   |      |
|      | Units     | 0.00  | 145.00 |      |
| Menu | VDC       | 0.000 | 10.000 |      |

**NOTE:** All unit parameters (low and high) are in PSI.

| Component | Description  |
|-----------|--|
| Regulator | The linear scaling settings for the analog output for controlling the air regulator.           |
| Pressure  | The linear scaling settings for the analog output to indicate the current pump inlet pressure. |

## Settings [4]

Use this window to set the linear scaling settings for the analog input for controlling the set point, specify the voltage range in which the external set point should be considered zero, and set the external set point to be used.

**NOTE:** All unit parameters (low and high) are in PSI.

| Component            | Description  |
|----------------------|--|
| External set point   | The linear scaling settings for the analog input for controlling the set point.  |
| Zero Threshold (VDC) | Specifies the voltage range in which the external set point should be considered at 0. The set point will be considered at 0.0 when the measured voltage of the external set point is within the following range: [VDCLow,VDCLow+ZT) |
| Enable               | Button enables the external set point to be used. When enabled, the set point is completely controlled by this analog input channel; the set point settings available through the touch screen will no longer be in effect.          |