Advanced FPC Real Time Controller User Guide

Version 1.1
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for use with:

Control Software version 1.00.00
on
Advanced FPC Real Time Controller, PN 22991007

prepared by GPD Global® Documentation Department

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Front matter

Revision notes

Date	Version	Notes
03/06/20	1.0	Initial document.
09/25/20	1.1	• “Release notes” added. • “Communications: Input/Output signals” updated: function clarified for pins 2 & 10; pins 11 & 12 added. • Minor updates to format and terminology (press instead of touch; press and release instead of slide).

Contents

Legal

Trademarks

- GPD Global® is a registered trademark of GPD Global®, Inc.
- Taper-Lock™ is a trademark of GPD Global, Inc.

Throughout this manual, trademarks are used. Rather than put a trademark symbol in every occurrence of a trademarked name, we state that we are using the names in an editorial fashion only and to the benefit of the trademark owner with no intention of infringement of the trademark.

Disclaimers

GPD Global® devices are intended for the stated functions at the time of sale. GPD Global® is not liable for other uses.

IMPORTANT: Operation of a damaged device may cause personal injury and invalidate the warranty.			
IMPORTANT: L'utilisation d'une machine endommagée peut entraîner des blessures personnelles et invalider la garantie.	***WICHTIG*** Die Bedienung einer beschädigten Maschine kann zu Verletzungen des Bedieners sowie zur Ungültigkeit der Garantie führen.	***IMPORTANTE*** Il funzionamento di un'apparecchiatura danneggiata può causare lesioni personali e invalidare la garanzia.	***IMPORTANTE*** La utilización de una máquina averiada puede provocar lesiones e invalidar la garantía.

Safety notices

WARNING: **Appropriate use**

This equipment must be used in the manner indicated in these instructions. Use for any other purpose may cause damage to the equipment, injury, or death.

WARNING: **ELECTRIC SHOCK**

Equipment is electrical in nature and shock may occur if used improperly or opened while powered. Shock, injury, and death may occur. Unplug system before any maintenance or plugging or unplugging components.

Remove the electrical power cable from the AC outlet before the controller cover is opened. Only qualified personnel should remove the cover; there are no user-serviceable parts inside.

WARNING: **Final integration - moving parts**

The moving parts that require guarding are part of the end users integration and should be provided with guarding and enclosures. Failure to provide guarding may result in injury or death. Turn off system before touching moving parts.

WARNING: **Final integration - lock out tag procedure**

Lock out tag procedure for the final integrated system:

Injury may occur if you fail to perform these steps. Turn System off. Unplug system from power source, wait 30 minute for parts to cool. verify system is off by trying to restart system from control panel. if system does not start then place tag on the device from the Lock Out Tag out Standards. To return to service reverse this procedure omitting the 30 minute wait period.

CAUTION: **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.

CAUTION: **Qualifications of 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.

CAUTION: **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.

CAUTION: **System provides outputs for heaters**

Heaters must be protected from causing over heat. Integration in the final system must include a thermal snap switch or other fail safe over heat device. Heated devices must be guarded and labeled, Fire, burns, scalds, and other thermal injuries are possible. Unplug the system before servicing, and allow at least 30 minutes to cool down to room temperature before touching any heaters or similar device.

CAUTION: **Exhaust considerations**

No releases are generated during normal operations. End users should determine whether or not exhaust is required. Failure to provide exhaust may result in exposure to chemicals, resulting in illness injury and potentially death. When using hazardous materials, always provide enclosure with exhaust embedded and certified for use.

CAUTION: **Flammable and volatile compounds**

End users may select adhesives and compounds which are flammable and contain volatile organic compounds. End users must provide appropriate exhaust prevention of fire and other hazards in the final integration. Failure to provide such protection may result in fire resulting in damage to equipment the building in nearby environment, burns injuries and possibly death. End users must provide protection for fire risk generated by the chemicals of the use.

CAUTION: **Integration - power interrupt**

When integrating this controller, always provide a top level equipment EMO which interrupts power to the controller when activated.

CAUTION: **Integration - fire risk assessment**

The end user upon integration of this equipment should perform a fire risk assessment based on the quantity and flammability of chemicals that they intend to use with this system.

ALERT: **Integration - secondary containment of final integrated system**

The final integrated system must be provided with secondary containment. The volume of the secondary containment is 110% of the largest container.

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.

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.

About this manual

This document provides an overview of the Advanced FPC Real Time Controller plus setup and operating instructions, and details about communicating with the controller and programming it.

System overview

Use operator, remote, or external methods to control reservoir fluid pressure for automatically produced, consistent dispense results. This is the key advantage of using the self-regulated Advanced FPC Controller.

This advanced table top controller automatically manages a timed fluid pressure cycle for a wide range of material viscosities by applying a specified amount of air pressure to a reservoir for a specified period of time. It also provides operating control over auxiliary functions such as reservoir heat and/or needle heat.

A fluid dispense reservoir controlled by the Advanced FPC Controller can process any application for which that reservoir is compatible (e.g., patterns, dots, lines), in a wide range of material viscosities: cream solder, silver paste, epoxies, bond, oil, etc.

Theory of operation

General theory of operation

The Advanced FPC Controller may be connected to a robot or other control signal to start/stop the FPC (fluid pressure control) function applied to a reservoir. Alternatively, the start/stop button on the Advanced FPC Controller may be selected.

When the Advanced FPC Controller is in the Run state, fluid pressure achieves the Run mode set point dictated by the current recipe.

When using Continuous/Line mode, releasing the Run button deactivates the dispense operation.

The Advanced FPC Controller is simple to set up and use:

1. Position the Advanced FPC Controller on a level surface.
2. Install the provided Time Pressure Interface on your reservoir.
3. Mount your reservoir in the provided mount.
4. Connect the fluid pressure sensor cable (part of the Time Pressure Interface) to the Advanced FPC Controller.
5. Power on the Advanced FPC Controller and set it to online state.
6. Adjust controller recipe parameters as needed.
7. Start/Stop the FPC function - automatically or manually.

Online vs offline theory

The Online/Offline button on the front of the controller toggles the controller between online and offline states.

Numerous process settings can be edited regardless of Online/Offline status.

Offline

Offline status is the non-operational/power up condition when air output is at approximately atmospheric pressure.

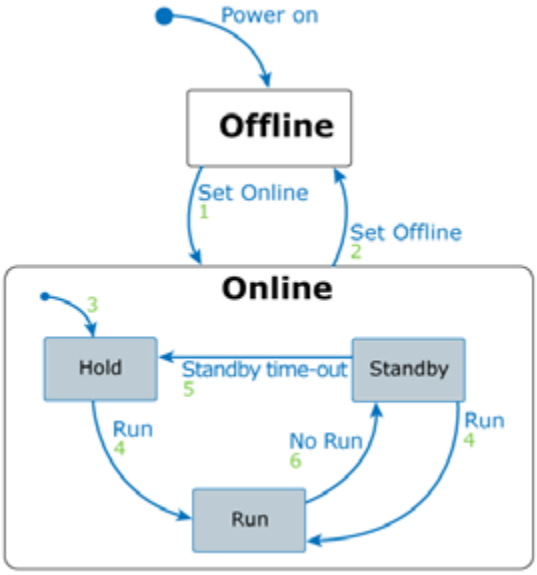
This is the safe/preferred state for any equipment change while the controller remains powered on.

Online

The controller must be Online for any activation method (operator/remote/external) to function.

Online status is either actively running a process (Run state) or waiting and immediately prepared to do so (Hold state/Standby state). While in any online state (Run/Hold/Standby), the controller actively controls pressure (air output is pressurizing or “pulling” vacuum) per user defined set point(s).

Figure 1: *Hold/Standby/Run states diagram and relationship to Online/Offline status*



Item	Description	Reference
1 - Online	Online is activated by operator or external/remote controller.	Set online/offline state (pg 16)
2 - Offline	Offline is activated by operator or external/remote controller. OR Error occurs.	Stop controller (pg 17) Troubleshooting (pg 33)
3 - Hold	Controller is enabled/set online. OR Standby state expires.	Set online/offline state (pg 16) Dot dispense window (pg 39) Continuous/Line dispense window (pg 40)

4 - Run	Run is activated by operator or external/remote controller.	Run controller (pg 16)
5 - Standby	Standby time-out expires.	Dot dispense window (pg 39) Continuous/Line dispense window (pg 40)
6 - No Run	Run is deactivated by operator or external/remote controller.	Run controller (pg 16)

Special features

- In addition to controlling all pneumatic aspects of a reservoir used for pattern dispense, dot dispense and/or continuous/line dispense, the Advanced FPC Controller also provides vacuum control to prevent the fluid reservoir from dripping.
- The pneumatic pressure control of a fluid reservoir for dispensing is either timed or externally activated.
- Control is activated via the front panel, a foot pedal, an external/remote controller.
- The controller stores 30 recipes which persist through a power cycle. Some remote programming and control functions are available.
- Temperature control of a heated needle and a heated reservoir are also available.

Specifications

Dimensions (W x D x H) . . . . . 247.65 mm x 279.4 mm x 101.6 mm (9.75” x 11” x 4”)
Weight. . . . . 4.25 kg (9.38 lb)

Power supply voltage . . . . . input: 120/240 V, 50/60 Hz, Single Phase
Consumption rating. . . . . 150 VA / 2.0 A

User interface . . . . . Touch Screen with Advanced FPC Real Time Controller software
Communication cables . . . . . controller to reservoir (standard): 2 meter, high flex.
Other lengths available.
External trigger signal . . . . . +5 to 24 V-Dry Contact

Air pressure:
Input . . . . . 0-6.9 bar (0-100 psi)
Output . . . . . 0-4.1 bar (0-60 psi)
Air tube diameter:
Input port. . . . . 6 mm
Output port . . . . . 6 mm

Heater . . . . . drives two 24VDC 23W heaters
External input . . . . . PLC, robotic controller, foot switch
Operating temperatures . . . . . +10° C to +40° C (50° F to 104° F)

System requirements

Hardware and software needed to control/run the Advanced FPC Controller:

Standard (included with controller):

Control Software (PN 2050-0098) - factory installed software; controls the controller.

Optional or provided by customer:

- Computer or controller - for external data acquisition/streaming.
- Robot with 24V output - for control by an external robot via digital signals.
- PLC or controller - for control by external inputs/outputs.
- Heater(s) - for heated reservoir material and/or needle.

Installation

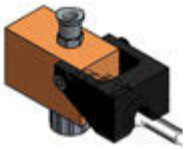
Inspect equipment

Inspect the equipment and note any damage or defects.

CAUTION: The system should not be used if damaged or defective.

Package contents

Your order includes these items:

Item	Part Number	Notes
Advanced FPC Controller	22991007	
Time Pressure Interface with Fluid Pressure Sensor	22893030	
Taper-Lock™ Mount	22893032	
Power Cable	10/1400	
Hose - Air In & Air Out	10/4622	
Reservoir Air Caps (3, 5, 10, and 30 cc)	10/3083, 10/1514, 10/1515, 10/1542	
Reservoir Air Cap Inserts	2675-0180	
User Guide	22940009	

Accessories

Your order may include these optional items:

- Fluid Pressure Sensor Calibration Kit
- Foot Pedal
- Power Extension Cord*
- Extension Cable* for Fluid Pressure Sensor
- Reservoir Heater
- Needle Heater

** Various lengths are available*

For part numbers, quotes, and further details, contact GPD Global.

Installation procedures

Physical installation

The Advanced FPC Controller is designed for bench top use. It can be stacked vertically with other control boxes from GPD Global.

Controller touchscreen

To change the viewing angle of the controller touch screen, adjust the bail that flips up/down (on bottom of the controller).

Controller foot pedal

A foot pedal can be used in place of the controller Run button.

To install a foot pedal to work with the controller:

1. Locate the Foot Pedal connection on the controller rear panel (refer to Connection locations (pg 7)).
2. Plug the foot pedal into the Foot Pedal connection.

Reservoir mount and interface

To assemble your reservoir (syringe) with the Time Pressure Interface and Taper-Lock Mount:

1. Screw a reservoir (syringe) and Luer-lock needle/nozzle onto the Time Pressure Interface per GPD Global *Time Pressure Interface User Guide* (PN 22800101).

   CAUTION: Do not grasp, twist, or rotate sensor spring relief or cable, or damage will occur.

2. Mount the Time Pressure Interface per *How to Use Taper-Lock Mount instructions* (PN 22200611).

Interconnections

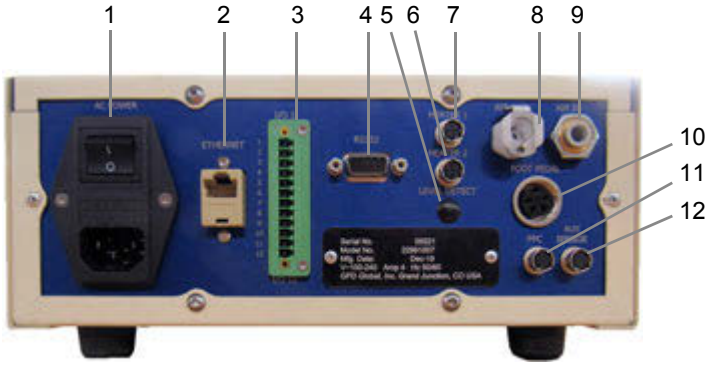
NOTE: Use Connection locations (pg 7) to identify the ports on the rear panel of the controller.

To connect the controller:

1. Connect air source to the Air In port. Refer to Specifications (pg 3).
2. Connect air hose to the Air Out port and to the reservoir cap.
3. Plug the fluid pressure sensor cable from the Time Pressure Interface (mounted to the reservoir) into the FPC port.
4. Plug the power cable into the AC power outlet and an appropriate power receptacle. Refer to Specifications (pg 3).

Connection locations

Figure 2: *Controller rear panel*



Item	Name	Description
1	AC Power	Turns on/off device power. Also acts as fuse holder and power cord connector.
2	Ethernet	Network connector for external data acquisition/streaming. Connect to external computer or controller. (RJ45)
3	I/O	Connector for external inputs/outputs. Connect to external PLC or controller.
4	RS232	Serial communication connector. Connect to external computer or controller. (D-sub 9)
5	Heater 1	Controls external heater 1. (5 Pin)
6	Heater 2	Controls external heater 2. (5 Pin)
7	Level Detect	Not currently available.
8	Air Out	Air to reservoir toggles on/off.
9	Air In	Connector for external air source regulated to meet air input Specifications (pg 3).
10	Foot Pedal	Foot pedal / reservoir on. (4 pin)
11	FPC	Connector for the fluid pressure sensor.
12	AUX Sensor	Reserved for servicing.

Also refer to rear panel details in Connector pin outs (pg 46).

Setup

Configuration

To configure the controller:

1. As needed, connect an external PLC, controller, or robot to the I/O port.

   An external robot can control the Advanced FPC Controller via digital signals. This enables the robot to have control over the controller and determine which recipe is selected. For details, refer to External robot control (pg 43).

2. As needed, connect optional devices. Refer to Customization (pg 8).

   CAUTION: Do not connect all optional items available into the controller at the same time or damage will occur and void the warranty.

3. Set initial air pressure setting per Optimization (pg 8).
4. Set values for Standby state and Hold state per Reservoir pressure and duration parameters (pg 18).

   For help identifying state icons, refer to Panes - dispense parameter areas (pg 11) and Windows and fields (pg 37).

Customization

As needed, any/all of the following optional devices may be connected to the controller; however, do not connect all available options to the controller at the same time. Contact GPD Global for details about approved combinations.

Item	Description
Ethernet	Connect an external computer or controller Ethernet cable to the Ethernet port.
Heater(s)	Connect an external heater(s) to the Heater 1 and/or Heater 2 port(s).
Extension Cable for Fluid Pressure Sensor	1 - Disconnect the *standard* Fluid Pressure Sensor cable from the controller FPC port. 2 - Connect the Fluid Pressure Sensor *Extension Cable* to the *standard* Fluid Pressure Sensor cable. 3 - Connect the other end of the Fluid Pressure Sensor *Extension Cable* to the FPC port on the controller.

Optimization

RECOMMENDATION: Start with an initial air pressure setting of 5.51 bar (80 psi) and, as needed, adjust for optimal operations for your process.

Startup

1. Turn on the power switch located on the rear panel.
2. Verify the fluid sensor is plugged into the controller.
3. Verify input air pressure supply meets Specifications (pg 3) and is connected to the controller.
4. Verify output air pressure is connected to fluid reservoir with fluid sensor.
5. Set the controller to online. Refer to Set online/offline state (pg 16) and Common indicators (pg 11).

Initial testing

To prepare the controller for operations:

1. Select a recipe per Select recipe (pg 17).
2. Select a dispense mode per Select dispense mode (pg 17).
3. Verify all equipment is connected properly.
4. **Function testing** - perform these tests to verify proper function:
   a. Set a positive Run set point pressure per Set parameters and settings (pg 18) and then run the controller by pressing and holding the Run button on the front panel.

      Air should be flowing out from the output air pressure line.

   b. Set a negative Hold set point pressure per Set parameters and settings (pg 18) and then set the controller to Online per Set online/offline state (pg 16).

      Output air pressure should exhibit vacuum/suction.

5. **Application testing** - perform application testing to determine specific fluid feed pressure ideal for the material to be dispensed.

Fixed Element	Process	Reference
Time	To obtain a dispense in *n* seconds, adjust pressure until desired dispense results occur in the desired amount of time.	Set parameters and settings (pg 18)
Pressure	To obtain a dispense at *n* pressure, adjust time until desired dispense results occur at the desired pressure.	

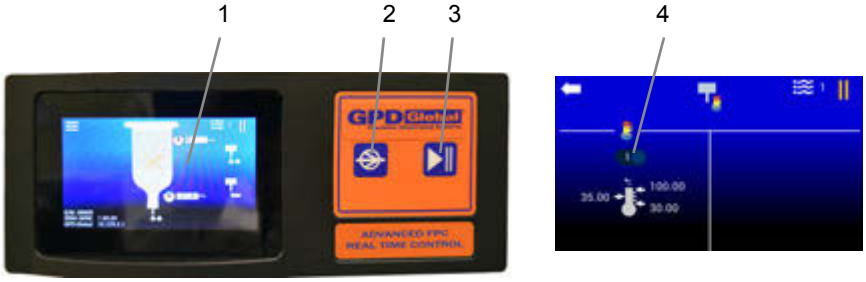
Power down procedure

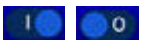
To turn off the controller, turn off the power switch located on the rear panel.

User interface

Description of controls

Figure 3: *Controller front panel and sample touch screen window*



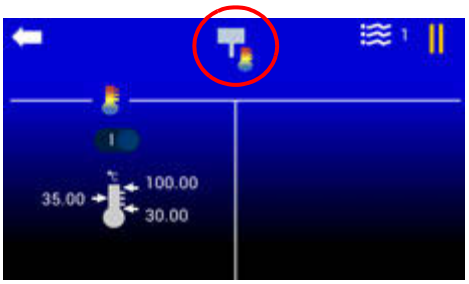
Item	Name	Description
1	Touch Screen	User interface.
2	Run button	Operator pushes button (or foot pedal) to run the controller, and releases button (or foot pedal) to stop the controller. OR Run function is activated and deactivated by external/remote controller.
3	Online/Offline button	• Toggles the controller between online and offline states. • The controller must be in Online state before any activation method (Run button, foot pedal, external/remote controller) will function.
4		On/Off toggle switch used in some touch screen windows. Press and release the icon to change its state.

Description of windows

Windows

Refer to Windows and fields (pg 37) for an example of each window and its field descriptions.

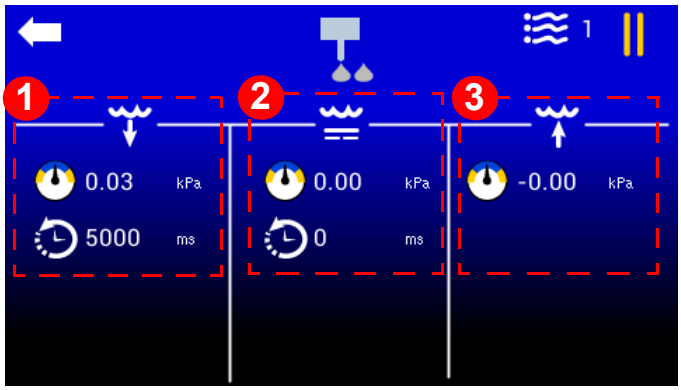
A unique icon in the center top of each window identifies the window displayed. An identifying icon is located on all windows *except* the Main window.



Panes - dispense parameter areas

The general process flow of a dispense is reflected in the layout of all dispense type windows.

Figure 4: *The Dot Dispense Parameters window is an example of a dispense type window.*



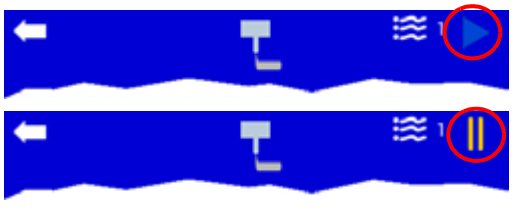
Item	Description
1	Parameters for the **Run dispense** portion of a dot dispense recipe.
2	Parameters for the **Standby state** of a dot dispense recipe.
3	Parameters for the **Hold dispense** portion of a dot dispense recipe.

System-wide command

The back arrow returns the display to the previous window. A back arrow is located on all windows *except* the Main window.

Common indicators

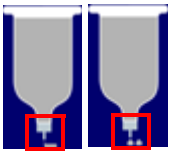
These status indicators are common to all windows:

Item	Name	Description
	Reservoir connection status	• online (arrow) • offline (double lines)
	Current recipe	Displayed value represents the current recipe number.
	Value state	The field background color indicates value state. • White = within set range • Amber = outside set range

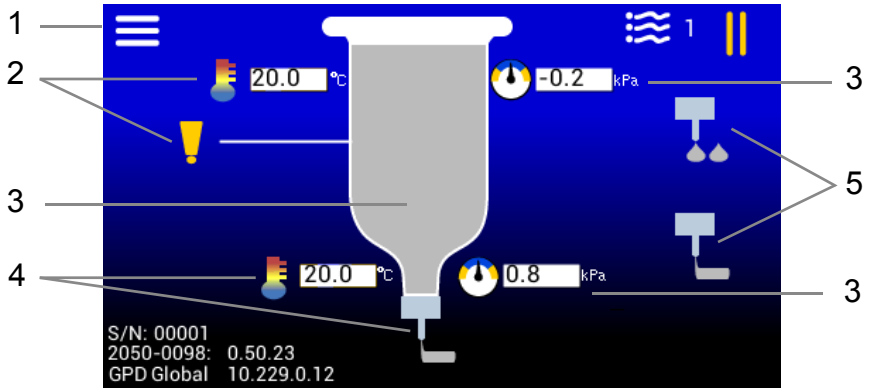
Main window

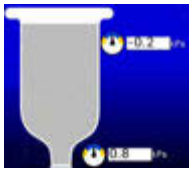
Indicators in Main window

These status indicators are used on the Main window:

Item	Name	Description
	Dispense mode	The nozzle image that matches the currently selected dispense mode (dot or line) displays at the base of the reservoir: • Dot dispense mode = nozzle dispensing dots • Continuous/line dispense mode = nozzle dispensing a line
	Reservoir status	(left to right) • Run command asserted, work-in-progress. • Controller is experiencing an error condition.
	State status	(left to right) • Run State - fluid pressure is controlled to user-specified run pressure. • Standby State - fluid pressure is controlled to user-specified standby pressure. • Hold State - fluid pressure is controlled to user-specified holding pressure.
	Level Detect Warning	This indicator displays if the level detect feature is enabled and a low level condition occurs in the reservoir.

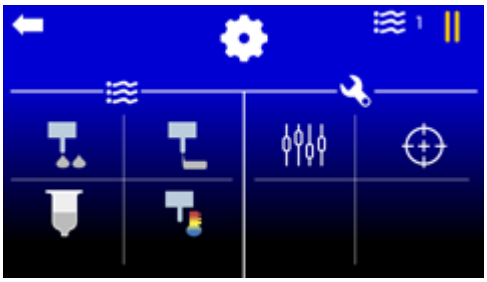
Navigating with Main window



Item		Name	Description
1		Menu	Opens Menu (pg 38) window.
2		Reservoir settings	Pressing icon/value opens Reservoir settings (pg 41). • Temperature value displays only when reservoir temperature is enabled. • Level Detect Warning displays only when level detection is enabled and fluid level is low. See more about value states at Common indicators (pg 11)
3		Dispense parameters	Pressing any of these icons or values opens a parameters window based on the selected dispense mode: • If Dot dispense mode is currently selected, pressing any of these areas opens Dot dispense window (pg 39). • If Continuous/Line mode is currently selected, pressing any of these areas opens Continuous/ Line dispense window (pg 40).
4		Needle settings	Pressing either of these icons or value opens Needle settings (pg 42). • Displays when needle temperature is enabled. Value state details here: Common indicators (pg 11)
5		Dispense mode	Pressing either of these icons toggles between the dispense modes. An image matching the currently selected dispense mode displays at the base of the reservoir.

Menu structure

The menu icon , located on the Main window, opens the Menu (pg 38) window.

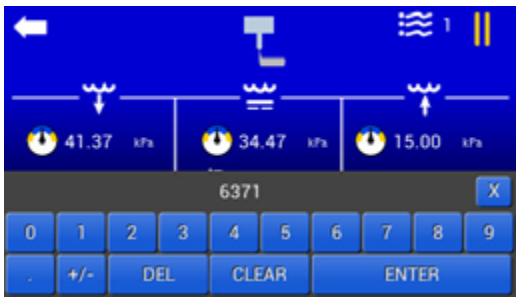


Use the Menu window to navigate to these destinations:

Icon	Description
	Dot dispense window (pg 39)
	Continuous/Line dispense window (pg 40)
	Reservoir settings (pg 41)
	Needle settings (pg 42)
	WARNING: *STOP! DO NOT USE - sensitive tuning settings for qualified GPD Global personnel only. Use of this feature by customer will void warranty. Improper settings can lead to poor controller performance.*
	Calibrate the fluid pressure sensor (pg 21)

Keypad for numeric input

Use the numeric keypad to change parameter values, setting values, and select a different recipe.



Display keypad

To display the keypad, press any icon associated with a value or any value associated wtih an icon.

Save

To save an entered value and close the keypad, press “ENTER” in the bottom right-hand corner of the keypad.

Cancel

To cancel an entered value and close the keypad, press “X” in the upper right-hand corner of the keypad.

Decimal places

Parameter and setting values display decimal places when appropriate. If you try to enter decimal places where they are not used/displayed, the decimal portion of your entry will be ignored.

Operating instructions

NOTE: If you use a glove or stylus to enter values on the touch screen, a capacitive type glove/stylus is required.

Power on/off

Advanced FPC Controller power

Power on

Turn on the power switch located on the rear panel.

Power off

To turn off the controller, turn off the power switch located on the rear panel.

Set online/offline state

Toggle the controller to an online or offline state using the Online/Offline button on the front panel of the controller.

The corresponding reservoir connection status,  online or  offline, displays in the upper right corner of the screen.

The controller starts up in the offline state. It must be set online in order to run the controller (control fluid pressure).

Run controller

Run the controller, i.e., control reservoir fluid pressure, via any of these methods:

- Run button - on controller front panel
- Foot pedal - connected to controller
- Signal - via an external controller connected to controller
- RS232 - use force run command (**frun**). Refer to ASCII command set (pg 52).
- Modbus TCP/IP - set force run register (**ForceRun**). Refer to Process image (pg 62).

To run controller:

1. Perform Startup (pg 9).
2. Perform Initial testing (pg 9).
3. Run the controller/controlled fluid pressure:
   a. Verify the correct holding pressure value is set for the current recipe.

      Holding set point fluid pressure will be achieved when the controller is set to Online.

   b. To start Run:
      - Press and hold the Run button, or
      - Depress and hold the foot pedal, or
      - External controller sends a signal.

      Run set point fluid pressure is achieved.

4. To stop asserting fluid pressure:
   - Release the Run button, or
   - Release the foot pedal, or
   - External controller sends a signal.

   Holding set point fluid pressure is achieved.

Stop controller

To stop fluid pressure control, set the controller to Offline using the Online/Offline button.

The ||| indicator displays when the controller is set to Offline.

Change Equipment

Prior to making any equipment changes (replacing reservoir/needle/syringe, etc.), power off the controller or set it to Offline state.

CAUTION: All hardware setup must be complete prior to setting the controller Online (i.e., air output in line with the fluid pressure sensor).

Select recipe

Recipes can be assigned using a value from 1-30. Current recipe details are retained through a power cycle.

To change to a different recipe:

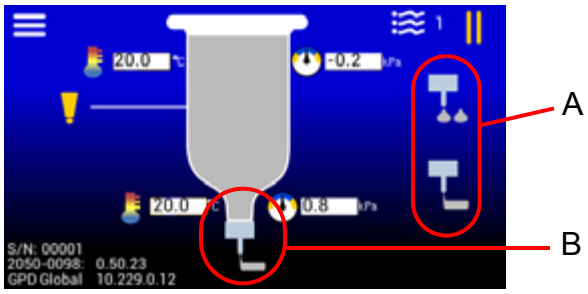
1. Touch the icon. A keypad displays.
2. Enter a different recipe number.

Select dispense mode

The currently selected dispense mode is indicated by an image at the base of the reservoir on the Main window.

Toggle to a different dispense mode:

Touch the desired dispense mode icon (Item A). The image at the base of the reservoir (Item B) changes to indicate the newly selected dispense mode.



Select units of measure

If you prefer to use a a unit of measure other than the default, touch the pressure or temperature symbol to select a different unit of measure option. For details, refer to Units of measure defaults (pg 36).

Set parameters and settings

How to:	Reference
Edit parameters	Dot dispense parameters (pg 18) Continuous/line dispense parameters (pg 18)
Edit run pressure set point	
Edit standby pressure set point	
Edit hold pressure set point	
Zero pressure in reservoir	Reservoir pressure and duration parameters (pg 18)
Turn heater on/off	Reservoir temperature settings (pg 19) Needle temperature settings (pg 19)
Edit temperature set point	
Edit temperature limits	

Reservoir pressure and duration parameters

NOTE: The value for the reservoir pressure set point and state duration can be set regardless of controller Online/Offline status.

Dot dispense parameters

1. In the Main window, touch the  icon. Refer to Menu (pg 38).
2. Touch the  icon. Refer to Dot dispense window (pg 39).
3. Set values for the Run, Standby, and Hold states:
   a. In the state/panel area to be updated, touch the  or  icon. A keypad displays.
   b. Enter a new value.
   c. Touch ENTER to save change or X to cancel change.
4. As needed, repeat prior step for additional parameters and/or states.

Continuous/line dispense parameters

1. In the Main window, touch the  icon. Refer to Menu (pg 38).
2. Touch the  icon. Refer to Continuous/Line dispense window (pg 40).
   a. In the state/panel area to be updated, touch the  or  icon. A keypad displays.
   b. Enter a new value.
   c. Touch ENTER to save change or X to cancel change.
3. As needed, repeat prior step for additional parameters and/or states.

Temperature settings

NOTE: Settings can be changed regardless of controller Online/Offline status.

Reservoir temperature settings

To edit the reservoir temperature settings:

1. In the Main window, touch the icon. Refer to Menu (pg 38).
2. Touch the icon. The reservoir settings window displays. Refer to Reservoir settings (pg 41).
3. **Reservoir heater power** - To change the on/off state of the reservoir heater, touch the heater On/Off control to toggle between on and off.
4. **Temperature set point** - To change the value:
   a. Touch the *left arrow* in the icon. A keypad displays.
   b. Enter new value.
   c. Touch ENTER to save change or X to cancel change.
5. **Temperature upper limit** - To change the value:
   a. Touch the *top right arrow* in the icon. A keypad displays.
   b. Enter new value.
   c. Touch ENTER to save change or X to cancel change.
6. **Temperature lower limit** - To change the value:
   a. Touch the *bottom right arrow* in the icon. A keypad displays.
   b. Enter new value.
   c. Touch ENTER to save change or X to cancel change.

Needle temperature settings

To edit the needle temperature settings:

1. In the Main window, touch the icon. Refer to Menu (pg 38).
2. Touch the icon. The needle settings window displays. Refer to Needle settings (pg 42).
3. **Needle heater power** - To change the on/off state of the reservoir heater, touch the heater On/Off control to toggle between on and off.
4. **Temperature set point** - To change the value:
   a. Touch the *left arrow* in the icon. A keypad displays.
   b. Enter new value.
   c. Touch ENTER to save change or X to cancel change.
5. **Temperature upper limit** - To change the value:
   a. Touch the *top right arrow* in the icon. A keypad displays.
   b. Enter new value.
   c. Touch ENTER to save change or X to cancel change.

6. **Temperature lower limit** - To change the value:
   a. Touch the *bottom right arrow* in the  icon. A keypad displays.
   b. Enter new value.
   c. Touch ENTER to save change or X to cancel change.

Adjustments

NOTE: If you use a glove or stylus to enter values on the touch screen, a capacitive type glove/stylus is required.

Reset fluid pressure to zero

To reset fluid pressure to zero (0):

1. In the Main window, touch the  icon. Refer to Menu (pg 38).
2. Touch the  icon. The reservoir settings window displays. Refer to Reservoir settings (pg 41).

Touch the 

icon. The currently measured fluid pressure will be adjusted to zero and the displayed pressure value will change to 0.0.

Calibrate the fluid pressure sensor

The calibration process is performed by calibrating against 2 points:

- Calibration point atmospheric pressure - the 0 pressure point
- Calibration point at maximum pressure - the maximum input supply pressure to the system per Specifications (pg 3)

Equipment/Tools required:

- Fluid Pressure Sensor Calibration Kit, PN 22893033

OR

- High precision pressure gauge with kPa output display
- Syringe (empty)
- Tubing
- Air fittings
- Valve or cap (to seal end of Time Pressure Interface)

Prerequisite:

System should be “dry” (free of fluids/material) to perform the calibration procedure, so replace reservoir/syringe with an clean, dry, empty one.

To calibrate the fluid pressure sensor (located on the Time Pressure Interface):

1. Prepare the system for calibration by temporarily sealing the system at the point where dispense fluid is output so the pneumatic system can easily be both (1) exhausted to atmospheric pressure, and (2) is capable of being completely sealed.

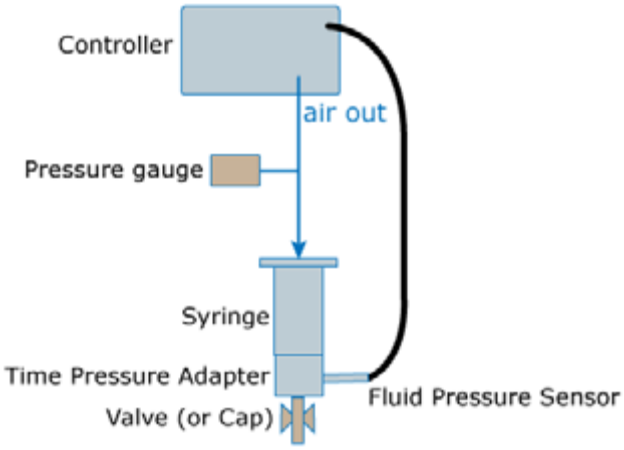
   CAUTION: **Seal the output pressure system**. If the pressure system is not properly sealed, loose system fittings can be propelled from the system at high speed when the air output pressure fully pressurizes during the calibration process.

   
   Wear approved safety eye protection when operating or working near the system.

   a. Seal the **output** pressure system by replacing the needle with a manual valve (Figure 5).

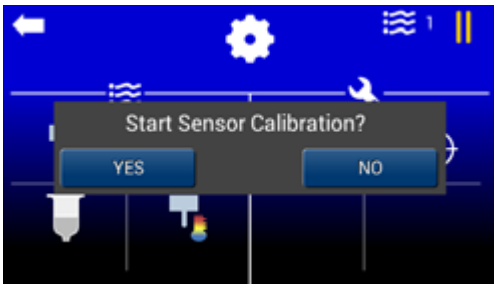
b. Attach a pressure gauge on the output pressure source (Figure 5).

Figure 5: *Pneumatic system temporarily sealed for sensor calibration procedure.*



2. In the Main window, touch the icon. Refer to Menu (pg 38).

3. Touch the icon. A prompt displays.



4. Choose one:
   – Touch NO to cancel/abort calibration.

     NOTE: The sensor calibration process can be safely aborted at any time by shutting off power to the controller.

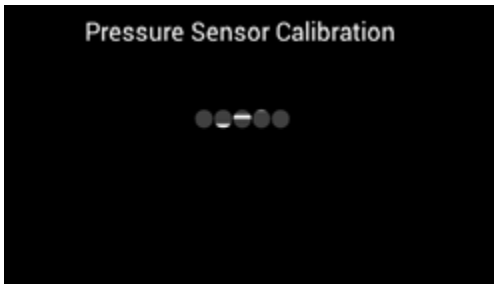
   – Touch YES to start sensor calibration, and continue with the following step.

5. Choose one:
   – Touch START to start the calibration process.
   – Touch EXIT to abort the calibration process and restart the controller.

6. To purge air pressure:
   a. To expose the sensor to atmospheric pressure, gently grip only the hex fitting portion with a wrench and then gently remove the fluid pressure sensor from the Time Pressure Interface.

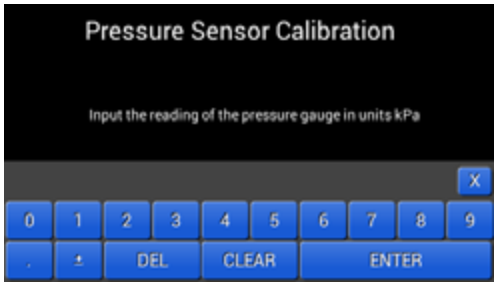
      CAUTION: Do not grasp, twist, or rotate sensor spring relief or cable, or damage will occur.

   b. Manually open the valve or unscrew cap (refer to Figure 5)
   c. Wait for air pressure to be purged.



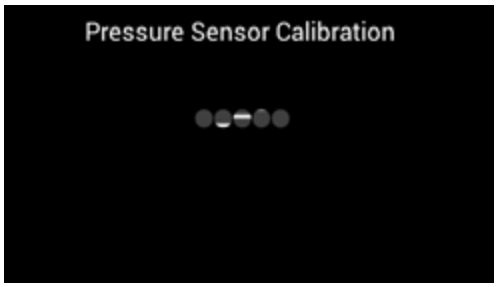
7. When the keyboard displays:
   a. Note the value displayed on the calibration pressure gauge.
   b. Close the manual valve.
   c. Using units kPa, input the value from the calibration pressure gauge.
   d. Touch ENTER.

   The system will pressurize.

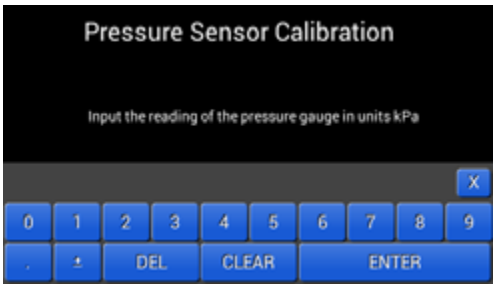


8. Wait for the system to pressurize.

   The system must be completely sealed; leaks will prevent the system from pressurizing completely.



9. When pressure is stable:
   a. Note the pressure gauge reading
   b. Enter the pressure gauge reading on the controller in units kPa.
   c. Touch ENTER.

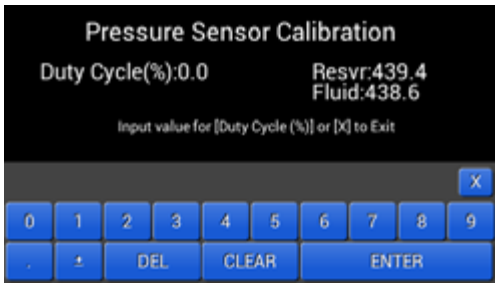


10. To verify calibration:
    a. Compare the value displayed by the pressure gauge to the values displayed for **Resvr** and **Fluid**. Values should be within ±0.5 PSI of each other.
    b. As needed, adjust air flow and pressure by entering a value in **Duty Cycle(%)**.

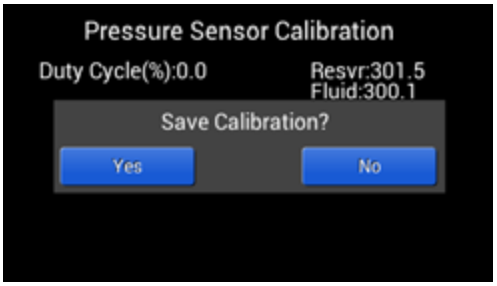
Table 1: *Control the flow rate of pressurization with Duty Cycle(%)*

Duty Cycle(%)	Notes
0%	Valve is closed. System exhausts to atmosphere.
0.1%	minimum flow
100%	maximum flow

c. Choose one:
   - Exit the calibration process by pressing X.
   - Abort the calibration process by powering off the controller.
   - Accept calibration results by pressing ENTER and continuing with the following step.



11. Choose one:
   – To exit without saving calibration results, touch NO.
   – To save calibration results, touch YES.



The controller reboots and returns to the Main window.

NOTE: If the sensor does not operate as expected, perform theTesting procedures (pg 34). If testing does not resolve the problem, the sensor may need to be replaced. Contact GPD Global to verify whether or not the problem requires sensor replacement.

IMPORTANT: If the sensor needs to be replaced, calibrate the new sensor prior to returning the controller to operation.

Programming instructions

NOTE: "Pump" is used herein as a generic term to represent *a head that moves fluid*; e.g., reservoir, syringe, needle, nozzle, or valve.

Interfacing with controller

Program via RS232 interface

To use the RS232 interface to program the controller:

1. Power off the controller.
2. Plug an RS232 connector into the controller.
3. For programming, use the ASCII Commands and ASCII Command Set reference material provided in the RS232 programming (pg 50)

Program via Ethernet

To use the Ethernet interface to program the controller:

1. Power off the controller.
2. Plug an Ethernet connector into the controller.
3. For programming, use the Process Image Data and Process Image Type reference material provided in the Modbus TCP/IP programming (pg 56).

Basic interface operations

Examples of usage for the programmer/integrator interfacing with the controller.

Set offline - disable controller operations

Setting the controller Offline will disable the controller such that no valves are in operation. This can be done in the following:

Process Image

```
OnlineState=0
```

ASCII Command

```
onst=0
```

Set online - enable controller operations

Setting the controller Online enables the controller and immediately begins controlling pressure at the holding pressure set point; therefore, the holding pressure set point should be set before setting the controller Online.

Recommended steps (initialization)

- Set dispense mode

There are two dispense modes: continuous and dot. Each mode has a holding pressure set point; therefore, it is recommended you set this prior to use.

- Set holding pressure set point

  This depends on the dispense mode selected.

- Set online

Set continuous dispense mode

Process Image

```
DispenseMode=1
```

ASCII Command

```
dmod=1
```

Set holding pressure set point

For example, set holding pressure set point to 0.0 kPa for continuous dispense mode.

Process Image

```
ContHoldSetpoint=0.0
```

ASCII Command

```
cths=0.0
```

Set online

If set online, the holding pressure set point will be achieved.

Process Image

```
OnlineState=1
```

ASCII Command

```
onst=1
```

Run (Dispense)

When a run command is asserted (i.e., digital input signal) the controller will achieve the Run set point pressure. This requires the controller to be Online (see Set online (pg 28). The Run set point pressure should be set prior to running. Like the holding pressure set point (see Set holding pressure set point (pg 28), the Run set point has a separate value when in dot mode and when in continuous mode.

Continuous mode

If Continuous mode, set Run set point (ex. 50 kPa)

Process Image

```
ContRunSetpoint=50.0
```

ASCII Command

```
ctrs=50.0
```

Dot mode

If Dot mode, set Run set point (i.e. 50 kPa)

Process Image

```
DotRunSetpoint=50.0
```

ASCII Command

```
dtrs=50.0
```

Differences between Dot mode and Continuous mode

Dot and Continuous dispense modes differ during the Run state.

- Continuous - achieves Run set point pressure until the run command is no longer asserted.
- Dot - achieves Run set point pressure for a predetermined period of time.

NOTE: The run activation signal must be deactivated before another run cycle can occur.

Setting Dot mode time (ex. 250ms)

Process Image

```
DotRunDuration=250
```

ASCII Command

```
dtrs=250
```

Determine when Dot completed

Monitor the pump busy signal or register to determine when a Dot activation has completed.

```
0 = not busy (completed)
1 = busy
```

Process Image

```
PumpBusy
```

ASCII Command

```
pbsy
```

Error Handling

There are multiple ways to detect and determine if an error has unexpectedly occurred while the controller is in operation.

Detect faults

- Check for fault condition
  - monitor PumpFault digital output
  - read PumpFault register

Process Image Read

```
PumpFault
```

ASCII Command

```
pflt
v 1
```

Determine error source

When a fault condition occurs, the following can be done to determine what the error is:

- Check the error code
  - Read Error register
- Check the error message
  - Read ErrorMsg register(s)

Error code

Process Image Read

```
Error
```

ASCII Command

```
errn
```

Error Message

Process Image Read

```
ErrorMsg
```

ASCII Command

```
errm
```

Routine maintenance

Cleaning

Periodically wipe the external surfaces of the controller with a clean, dry, soft cloth.

Troubleshooting

Symptom

This reservoir status indicator displays on the Main window.

Problem: An error condition has occurred for the reservoir. The fluid sensor may not be functioning correctly or is disconnected.

Action: To clear an error condition, set the controller to Online using the Online/Offline button. To detect and determine error source, refer to Error Handling (pg 31).

Symptom

This low level warning indicator displays on the Main window.

Problem: A low fluid level condition has occurred in the reservoir.

Action: Either refill the reservoir or replace it with a full reservoir.

Symptom

The controller will not enter Run mode.

Problem: The temperature of the fluid or needle may be outside specified temperature range.

Action: Inspect the Main window for temperature warning indicators. Refer to Common indicators (pg 11).

Symptom

This temperature warning indicator (amber background) displays on the Main window. Value may vary.

Problem: Temperature is outside of specified temperature range or heater is malfunctioning.

Action:

- If temperature is below set point, wait until set point has been achieved. The controller will not function when temperature is outside set point range. If two heaters are in use, the temperature for both heaters must be within set point range before controller will function.

- If temperature significantly exceeds set point, turn off the controller and call support.

- Inspect heaters and replace as needed.

Symptom

Problem: The pressure value reported by the fluid pressure sensor (located on the Time Pressure Interface) is noticeably different than expected. For example, when the fluid pressure sensor is exposed to atmosphere pressure, the reading is not close to zero (0).

Action:

Determine whether or not the sensor responds to the controller by comparing readings per Compare pressure readings (pg 34). If the problem is not resolved, perform the Test controller function (pg 34) procedure.

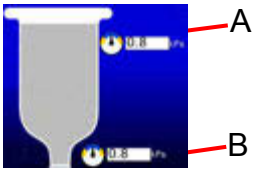
Testing procedures

Compare pressure readings

To compare the pressure reading reported by the fluid pressure sensor to that of another pressure gauge:

1. Set up the hardware in the same dry pneumatic configuration as described in Calibrate the fluid pressure sensor (pg 21).
2. Compare the fluid pressure readings to the external pressure gauge.
3. Also compare the fluid pressure readings to the reservoir pressure (Figure 6, Item A) reading displayed on the main screen.

Figure 6: *Reservoir pressure reading (A) and fluid pressure reading (B) on Main window.*



NOTE: Because this test is performed with a dry pneumatic system, the two pressure readings (Figure 6, Items A and B) on the main screen should be the same value consistently.

NOTE: If pressure readings differ significantly, perform the Calibrate the fluid pressure sensor (pg 21) procedure.

Test controller function

To test the fluid pressure sensor for proper function:

1. Disconnect the air cap from the reservoir (syringe).
2. Gripping only the hex fitting portion with a wrench, gently remove the fluid pressure sensor from the Time Pressure Interface.

   CAUTION: Do not grasp, twist, or rotate sensor spring relief or cable, or damage will occur.

3. Set air pressure to a low setting (5 psi). Air should flow from the air cap.
4. **Gently** cover the fluid pressure sensor with a finger tip and **slowly** increase finger tip pressure.

   CAUTION: DO NOT exert more pressure on the sensor after air flow has ceased as this will damage the sensor. Pressing harder on the sensor will not produce better results.

Air flow from the air cap should cease when the process value is equal to the set point.

NOTE: If air flow continues without interruption, the sensor may need to be calibrated per Calibrate the fluid pressure sensor (pg 21).

Removal & replacement of components

Fuses

To replace a fuse:

1. Using the tip of a small screwdriver, pry the fuse holder from the center of the AC power connector located on the rear panel.

2. Remove and replace one or both fuses.
3. Slide fuse holder into AC power connector.

Suggested spare parts

Description	Part No.	Qty
Coupling Insert for Reservoir Air Cap	2675-0180	4
Reservoir Air Cap, 3 cc	10/3083	2
Reservoir Air Cap, 5 cc	10/1514	2
Reservoir Air Cap, 10 cc	10/1515	2
Reservoir Air Cap, 30 cc	10/1542	2
Temperature Fuse, 2A	4300-0118	2

Appendices

Units of measure defaults

The currently selected units of measure display on the screen next to its corresponding value.

Values with multiple units (e.g., kPa | PSI) can be selected by the user.

Figure 7: *Available units of measure*

Time	Milliseconds
Pressure	kPa (default) | PSI
Temperature	Celsius (default) | Fahrenheit

To change units of measure:

1. Locate a value with units of measure next to it that you want to change.

2. Touch the units of measure to cycle through the available measurement units.

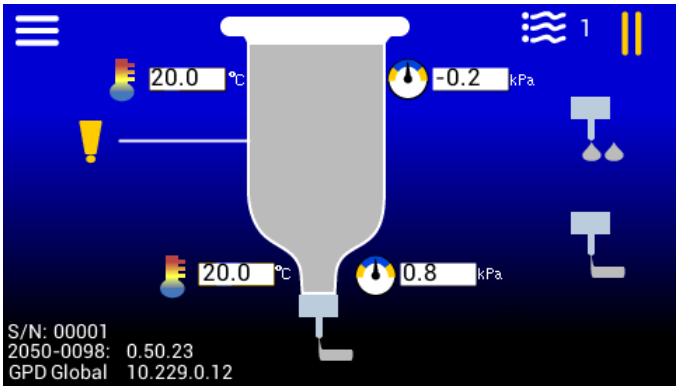
Windows and fields

Main

Use the Main window to:

- access the menu window
- select a dispense mode or a recipe
- access dispense mode settings for the currently selected dispense mode
- monitor reservoir and fluid pressure
- monitor reservoir and needle temperature (if heaters enabled)
- monitor for current dispense mode, reservoir connection status,, and active status.

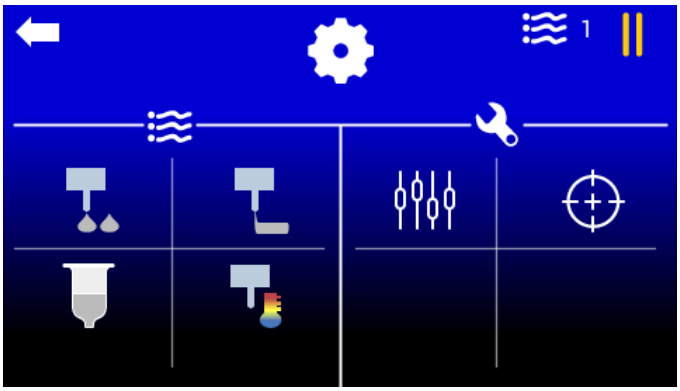
For additional details about the Main window, refer to Indicators in Main window (pg 12) and Navigating with Main window (pg 13).



Item	Name	Description
	Reservoir temperature	• Current temperature of reservoir (if enabled) • Touching this value navigates to Reservoir settings (pg 41).
	Needle temperature	• Current temperature of needle (if enabled) • Touching this value navigates to Needle settings (pg 42).
	Reservoir pressure	• Current reservoir air pressure • Touching this value navigates to Dot dispense window (pg 39) or Continuous/Line dispense window (pg 40).
	Fluid pressure	• Current fluid pressure near the needle tip • Touching this value navigates to Dot dispense window (pg 39) or Continuous/Line dispense window (pg 40).
 	Dispense mode	Selects either dot dispense mode or continuous/line dispense mode. • Touch a dispense mode icon to select that mode. • The mode icon will display at the base of the reservoir, and when a recipe is selected, it will dispense in the selected dispense mode. The currently selected dispense mode is indicated at the base of the reservoir. For example, the reservoir shown at left indicates continuous/line dispense mode.

Menu

Use the Menu window to navigate to parameters and settings windows.



	Settings window.
	Menu choices.
	Opens Dot dispense window (pg 39).
	Opens Continuous/Line dispense window (pg 40).
	Opens Reservoir settings (pg 41) window.
	Opens Needle settings (pg 42)window.
	Hardware parameters categories.
	 ***WARNING:*** *STOP! DO NOT USE - sensitive tuning settings for qualified GPD Global personnel only. Use of this feature by customer will void warranty. Improper settings can lead to poor controller performance.*
	Opens the Calibrate the fluid pressure sensor (pg 21) prompt.

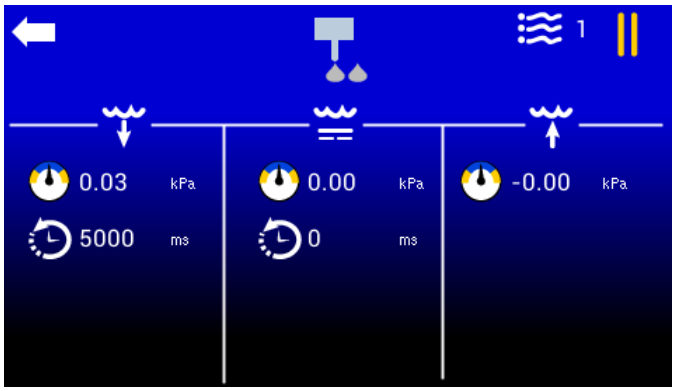
Parameters

Dot dispense window

Use this window to edit dot mode parameter values.

The Advanced FPC Controller can be in one of three states at any given time when online: Run, Standby, or Hold. The active state is displayed on the Main (pg 37) screen.

Each state has a pressure set point that becomes the controlled pressure when that state is active.



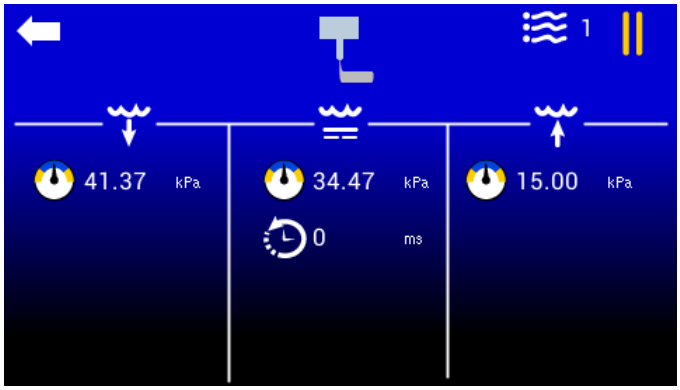
	Dot dispense parameters window.	
	Run state	Occurs when a run command/signal is sent to the controller. Remains active for the amount of time (milliseconds) displayed in Run time parameter.
	Pressure set point	Active when the Run state is active.
	Run time	The amount of time (milliseconds) the controller remains in Run state when the Run state is active.
	Standby state	• Occurs after deactivation of a run command/signal. • Remains active for the period of time (milliseconds) displayed in the "Standby time-out" parameter.
	Pressure set point	Active when the Standby state is active.
	Standby time-out	The amount of time (milliseconds) the controller remains in Standby state when the Standby state is active.
	Hold state	• Initial and idle states • Occurs when the Standby state expires.
	Pressure set point	Active when the Hold state is active.

Continuous/Line dispense window

Use this window to edit line dispense (i.e., continuous dispense) parameter values.

The Advanced FPC Controller can be in one of three states at any given time when online: Run, Standby, or Hold. The active state is displayed on the Main (pg 37) screen.

Each state has a pressure set point that becomes the controlled pressure when that state is active.

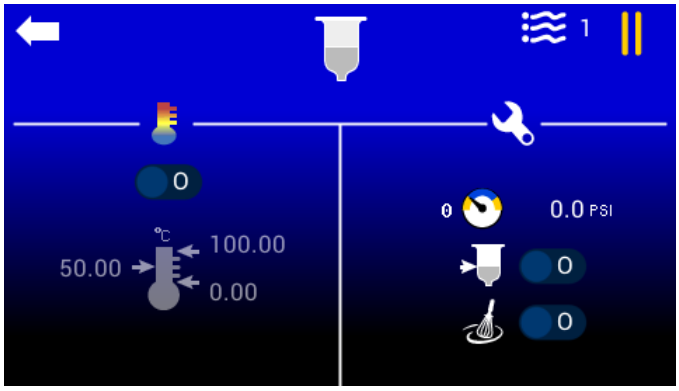


	Continuous/Line dispense parameters window.	
	Run state	Occurs when a run command/signal is sent to the controller.
	Pressure set point	Active when the Run state is active.
	Standby state	• Occurs after deactivation of a run command/signal. • Remains active for the period of time (milliseconds) displayed in the Standby time-out parameter.
	Pressure set point	Active when the Standby state is active.
	Standby time-out	The amount of time (milliseconds) the controller remains in Standby state when the Standby state is active.
	Hold state	• Initial and idle states • Occurs when the Standby state expires.
	Pressure set point	Active when the Hold state is active.

Settings

Reservoir settings

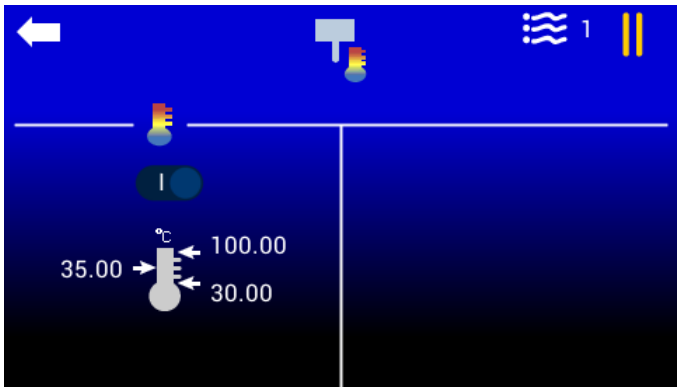
Use this window to edit reservoir settings.



	Reservoir settings window.	
	Temperature	Current temperature settings for temperature control.
 	Heater control	Toggles heater on/off. Heater is turned on. Heater is turned off.
	Reservoir temperature settings	Enter values for temperature (Celsius) settings here: • Set point value = arrow on left • Upper limit value = arrow at top right • Lower limit value = arrow at bottom right Temperature values and icon appear gray when this option is turned off.
	Hardware settings	Controls for optional hardware.
	Zeroing pressure	When this icon is touched, the currently measured pressure is adjusted to zero.
	Current pressure	Displays the currently measured pressure.
	Level detect	Not currently functional. Toggles the reservoir level detect on/off.
	Reservoir mixer	Not currently functional. Toggles the reservoir mixer on/off.

Needle settings

Use this window to edit needle settings.



	Needle settings window.	
	Temperature	Current temperature settings for temperature control.
	Heater control	Toggles heater on/off. Heater is turned on. Heater is turned off.
	Needle temperature settings	Enter values for temperature (Celsius) settings here: • Set point value = arrow on left • Upper limit value = arrow at top right • Lower limit value = arrow at bottom right Temperature values and icon appear gray when this option is turned off.

External robot control

An external robot can control the Advanced FPC Controller via digital signals. Doing so makes the following functions available:

- Run - puts the controller into the Run state to start dispensing.
- Profile Select (1-3) - the combined state of these 3 signals determines which recipe is selected via a user-supplied cable and foot pedal, a 24V signal, and a solid state relay (or dry contact).

The following state of the controller can be monitored via digital output signals:

- Ready - the controller is capable of being put into the Run state.
- Busy - the controller is currently dispensing.
- Fault - the controller is in an error condition.

I/O polarity choices

To use an external robot, select from the following instructions that applies to the type of I/O polarity used by your robot.

REQUIRED: External robot must have 24V output

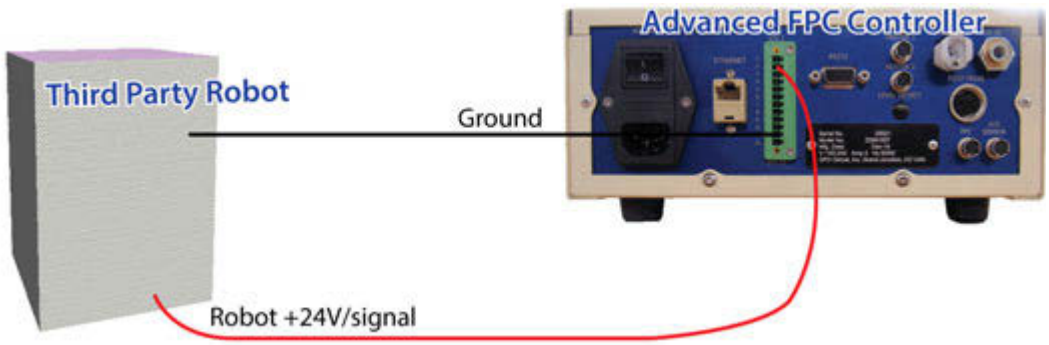
TIP:

PNP = sourcing; high side switching.

NPN = sinking; low side switching.

PNP start/stop only

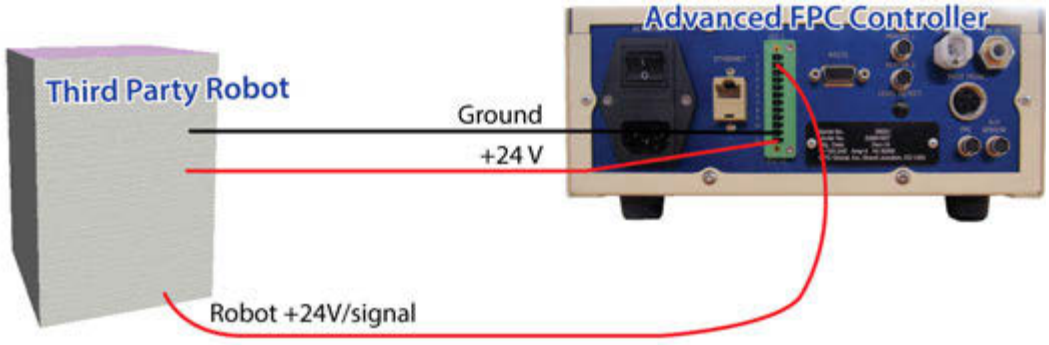
To use an external robot to start/stop the controller:



1. Route ground from controller I/O 11 to robot ground.
2. Route 24V trigger signal from controller I/O 2 to robot signal.

PNP start/stop with optional outputs

To use an external robot to start/stop the controller and to monitor available output signals:

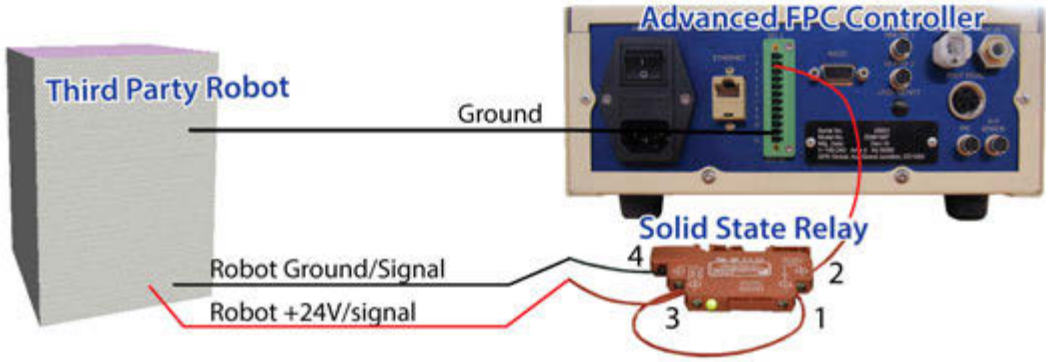


1. Route ground from controller I/O 11 to robot ground.
2. Route 24V trigger signal from controller I/O 2 to robot signal.
3. Route 24V from controller I/O 12 to robot source.
4. To monitor controller reservoir signals, connect robot to controller output pins 6 (Ready), 7 (Busy), and 8 (Fault). Output voltage for pins 6, 7, 8 is equal to voltage on pin 12.

NPN start/stop only

To use an external robot to start/stop the controller:

REQUIRED: Customer-supplied Relay (solid state preferred) and Wiring



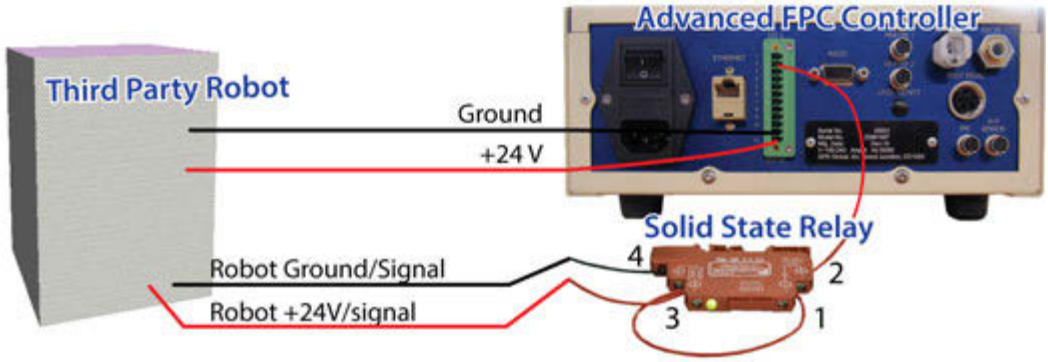
1. Route ground from controller I/O 11 to robot ground.
2. Jumper relay 3 to 1.
3. Route relay 2 to controller I/O 2.
4. Route robot ground/signal to relay 4.
5. Route robot 24V trigger signal to relay 3.

NPN start/stop with optional outputs

To use an external robot to start/stop the controller and to monitor available output signals:

REQUIRED: Customer-supplied Relay (solid state preferred) and Wiring

NOTE: Additional relays may be necessary to convert for NPN input.



1. Route ground from controller I/O 11 to robot ground.
2. Jumper relay 3 to 1.
3. Route relay 2 to controller I/O 2.
4. Route robot ground/signal to relay 4.
5. Route robot 24V trigger signal to relay 3.
6. Route 24V from controller I/O 12 to robot source.

To monitor controller reservoir signals, connect robot to controller output pins 6 (Ready), 7 (Busy), and 8 (Fault). Output voltage for pins 6, 7, 8 is equal to voltage on pin 12.

Communications

Input/Output signals

Figure 8: *IO is Opto-couple isolated.*

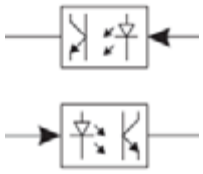
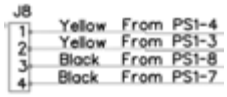


Table 2: *External Input/Output Connector Pin Descriptions*

Pin	I/O Description	I/O Function	I/O State
1	Digital Input	Reserved	Active: High (+24V) Inactive: Open circuit
2	Digital Input	Pump On (Start/Stop)	
3	Digital Input	Profile Select 1	
4	Digital Input	Profile Select 2	
5	Digital Input	Profile Select 3	
6	Digital Output	Pump Ready	
7	Digital Output	Pump Busy	
8	Digital Output	Pump Fault	
9	Reserved	Reserved	0-10 VDC
10	Reserved	Reserved	0-10 VDC Return
11	Ground	Ground/24V Com	Ground/+5-28 VDC Common
12	Voltage supply for output signals	Customer input	+5-28 VDC

Connector pin outs

Figure 9: *Jumpers*



NOTE: Jumpers are required on all header pins.

Figure 10: *AMS (voltage feedback)*

Figure 11: *Ethernet*

Figure 12: *External I/O*

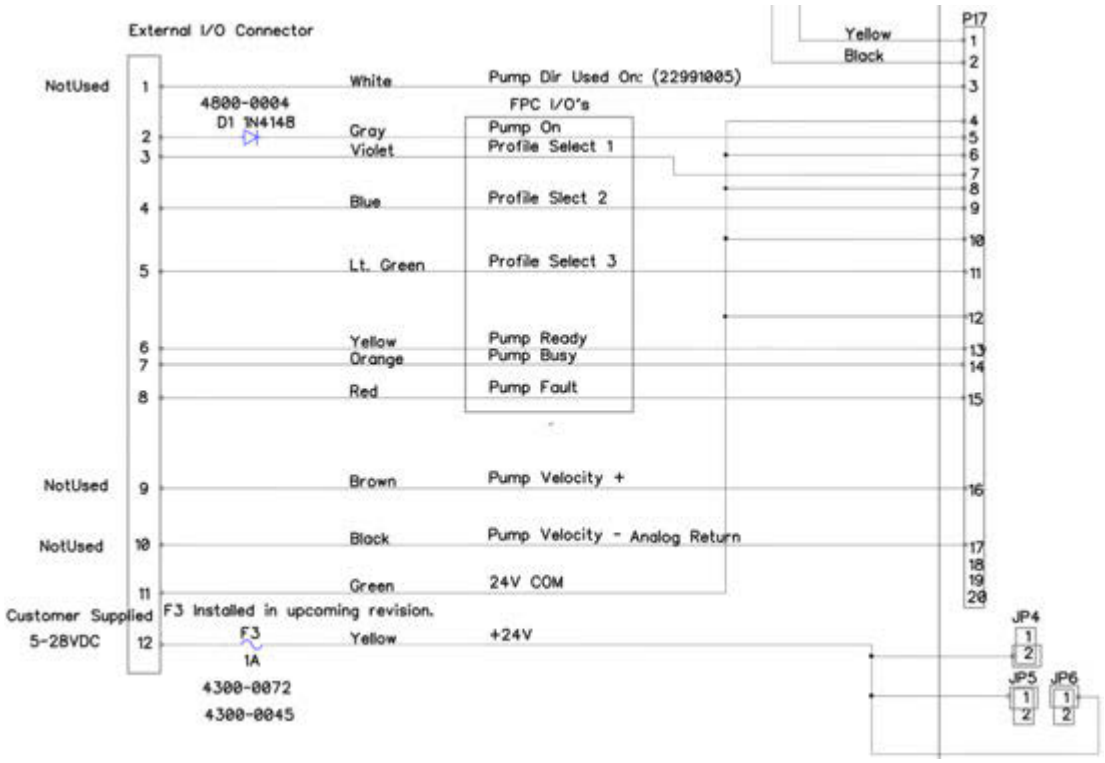


Figure 13: *RS232*

Figure 14: *Pumps*

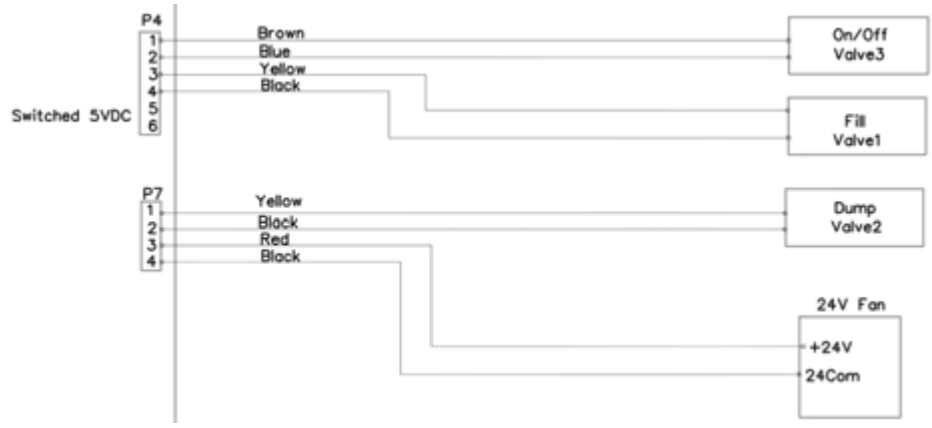


Figure 15: *FPC & AUX*

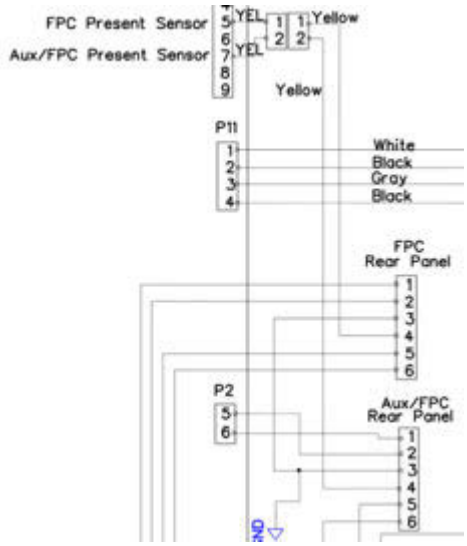


Figure 16: *Foot Pedal*

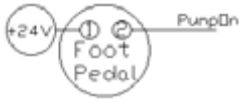
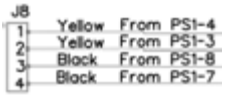


Figure 17: *Heater(s)*



Ethernet TCP/IP

The Ethernet TCP/IP communication port provides an additional means beyond the touch screen for reading and writing controller parameters.

This method uses:

- Default IPv4 Address: 10.229.0.1
- Subnet Mask: 255.0.0.0
- Gateway: 10.0.0.1
- Log Destination IPv4 Address: 10.254.254.254

Network configurations

The user's PC can allow communication with the Advanced FPC Controller with either a switch (recommended) or by direct connection (alternative).

Sample TPC/IP configuration:

- IPv4 Address: 10.229.0.10
- Subnet Mask: 255.0.0.0
- Gateway: 10.0.0.1

Figure 18: *Recommended: network configuration using a switch to communicate with controller*

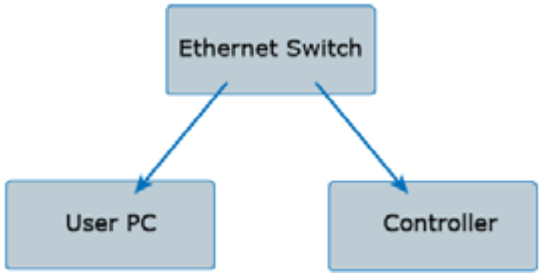


Figure 19: *Alternative: network configuration using direct connection to communicate with controller*

Log message output

The controller emits log messages in Syslog protocol format to the log destination address specified, i.e., Log Destination IPv4 Address noted here: Ethernet TCP/IP (pg 49).

Logging can be enabled by:

- Setting the LogEnable register in the process image
- Setting ASCII command: `loge=1`

Logging level can be set by:

- Setting the LogLevel register in the process image
- Setting ASCII command: `logl={level}`
  - Example of setting log level to Informational: `logl=6`

RS232 programming

The RS232 communication port provides an additional means beyond the touch screen for reading and writing controller parameters. This method of communication uses a text based (ASCII character set) command and response protocol.

RS232 settings

Baud	115200
Data Bits	8
Stop Bits	1
Parity	None

ASCII commands

Command Structure

The actual ASCII string for the commands / responses are shown in the tables below.
NOTE: - `\n` refers to a single newline character (ASCII character 10).

Writing a variable value

`var=val\n`

ex. writing a variable value

Command	Response
dfsp=100.0\n	`v\n`

Reading a variable value

`var\n`

ex. reading a variable value

Command	Response
dfsp\n	`v 100.0\n`

Bad command / response

ex. bad command

Command	Response
badcmd\n	`e 1\n`

Responses

Success Responses

Always begins with a **v** character.

`v\n`	the command succeeded
`v xxx\n`	the command succeeded and returned a value - value format is defined by the command

Error Response

`e x\n`	the command failed with error code x

Error Codes

Error Code	Description	Example
1	Unknown command	`badcmd\n`
2	Malformed command	`dfsp=\n`
3	Value out of range	`dfsp=-2.0\n`
4	Write-only, value of variable cannot be read	`abcd\n`
5	Read-only, value of variable cannot be changed	`pbsy=1\n`

ASCII command set

KEY for Table 3

Column	Code	Description
R/W	R	Read
	W	Write
Controller	F	Advanced FPC Controller
	S	Servo Controller
	(blank)	Reserved

Table 3: *ASCII Command Set*

Command	Description	R/W	Notes	Controller
		General		
prdy	Pump ready	R	0=pump is not ready, 1=pump ready	F,S
pbsy	Pump busy	R	0=pump is not busy, 1=pump is busy	F,S
pflt	Pump fault	R	0=pump not in a fault state, 1=pump is in a fault state	F,S
pprs	Pump present	R	0=pump is not present/connected,1=pump is present/connected	S
pion	Pump on	R	0=pump signal not active, 1=pump signal activated	F,S
prf1	Profile Select 1 signal	R	0=inactive,1=active	F,S
prf2	Profile Select 2 signal	R	0=inactive,1=active	F,S
prf3	Profile Select 3 signal	R	0=inactive,1=active	F,S
unit	Unit Select signal	R	0=inactive,1=active	
pdir	Pump Direction signal	R	0=inactive,1=active	S
pval	Pump valid and compatible with controller	R	0=pump invalid,1=pump valid	
pcnf	The currently active pump configuration	R/W		F,S
dmod	The dispense mode	R/W	0=dot,1=continuous,65535=auto/wire mode	F,S
onst	Online state of the controller (online or offline)	R/W	1=Online, 0=Offline, transitions to Online clear faults	F,S
frun	Forces the pump to run with the current parameters	R/W	1=Run, 0=Idle	F,S
recp	The currently selected recipe	R/W	Zero based index, recp=0 is the first recipe	F,S
loge	Log enable	R/W	0=disable,1=enabled	F,S
logl	The logging level	R/W		F,S
wnvr	Writes current configuration parameters to non volatile ram	R/W	0=no action, non-zero=performs write	F,S

Table 3: *ASCII Command Set (cont'd)*

Command	Description	R/W	Notes	Controller
Servo Controller Parameters				
dfsp	Dot Forward Speed (°/s)	R/W	Positive non-zero number	S
dfac	Dot Forward Acceleration (°/s²)	R/W	Positive non-zero number	S
dfdc	Dot Forward Deceleration (°/s²)	R/W	Positive non-zero number	S
dfrt	Dot Forward Rotation (°)	R/W	Positive non-zero number	S
drsp	Dot Reverse Speed (°/s)	R/W	Positive non-zero number	S
drac	Dot Reverse Acceleration (°/s²)	R/W	Positive non-zero number	S
drdc	Dot Reverse Deceleration (°/s²)	R/W	Positive non-zero number	S
drrt	Dot Reverse Rotation (°)	R/W	Positive number	S
drdl	Dot Reverse Delay (ms)	R/W	Non-negative number	S
cfsp	Continuous Forward Speed (°/s)	R/W	Positive non-zero number	S
cfac	Continuous Forward Acceleration (°/s²)	R/W	Positive non-zero number	S
cfdc	Continuous Forward Deceleration (°/s²)	R/W	Positive non-zero number	S
crsp	Continuous Reverse Speed (°/s)	R/W	Positive non-zero number	S
crac	Continuous Reverse Acceleration (°/s²)	R/W	Positive non-zero number	S
crdc	Continuous Reverse Deceleration (°/s²)	R/W	Positive non-zero number	S
crrt	Continuous Reverse Rotation (°)	R/W	Positive number	S
crdl	Continuous Reverse Delay (ms)	R/W	Non-negative number	S
prvs	Servo pump total revolutions	R	Valid only with EEPROM pumps	
FPC / Time Pressure Controller Parameters				
cths	The hold mode set point while in continuous mode	R/W		F
ctrs	The run mode set point for a continuous dispense	R/W		F
ctss	The standby mode set point while in continuous mode	R/W		F
ctst	The standby mode timeout period (ms) while in continuous mode	R/W	Non-negative number	F
dths	The hold mode set point (kPa) while in dot mode	R/W		F
dtrs	The run mode set point (kPa) for a dot dispense	R/W		F
dtrt	The amount of time (ms) that the dispense will run for in dot mode	R/W	Non-negative number	F
dtss	The standby mode set point (kPa) while in dot mode	R/W		F
dtst	The standby mode timeout period (ms) while in dot mode	R/W	Non-negative number	F
faps	The current fluid pressure (kPa)	R		F
zfp	Zeroes the fluid pressure sensor to the current pressure	R/W	Write Non-zero	F

Table 3: *ASCII Command Set (cont'd)*

Command	Description	R/W	Notes	Controller
zrp	Zeroes the reservoir pressure sensor to the current pressure	R/W	Write Non-zero	F
Body/Needle Temperature				
btrd	Body/Needle Temperature Ready	R	0=not ready, 1=ready	F,S
bten	Body/Needle Temperature Enable	R/W	0=disable,non-zero=enabled	F,S
btrx	Body/Needle RTD Present	R	0=no rtd, 1=rtd detected	F,S
btmp	Body/Needle Temperature (°C)	R	Positive Number	F,S
btsp	Body/Needle Temperature Setpoint (°C)	R/W	Positive Number	F,S
btlo	Body/Needle Temperature Minimum (°C)	R/W	Positive Number	F,S
bthi	Body/Needle Temperature Maximum (°C)	R/W	Positive Number	F,S
btpp	Body/Needle Temperature, PID Proportional Gain	R/W		F,S
btpi	Body/Needle Temperature, PID Integral Gain	R/W		F,S
btpd	Body/Needle Temperature, PID Derivative Gain	R/W		F,S
btpe	Body/Needle Temperature, PID Integral Error Rate	R/W		F,S
btpm	Body/Needle Temperature, PID Integral Maximum	R/W		F,S
btpt	Body/Needle Temperature, PID Time base (ms)	R/W	non-zero	FS,
btpw	Body/Needle Temperature, PWM Period (ms)	R/W	non-zero	F,S
btpr	Body/Needle Temperature, sample rate (ms)	R/W	non-zero	F,S
btfb	Body/Needle Temperature, filter band	R/W		F,S
btfl	Body/Needle Temperature, filter length	R/W		F,S
Reservoir				
rlvd	Reservoir Level Detect Enable	R/W	0=disable,non-zero=enabled	F,S
rlvs	Reservoir Level Detect Status	R	0=not active,1=active	F,S
rmix	Reservoir Mixer Enable	R/W	0=disable,non-zero=enabled	F,S
Reservoir Temperature				
rtrd	Reservoir Temperature Ready	R	0=not ready, 1=ready	F,S
rten	Reservoir Temperature Enable	R/W	0=disable,non-zero=enabled	F,S
rtrx	Reservoir RTD Present	R	0=no rtd, 1=rtd detected	F,S
rtmp	Reservoir Temperature (°C)	R	Positive Number	F,S
rtsp	Reservoir Temperature Setpoint (°C)	R/W	Positive Number	F,S
rtlo	Reservoir Temperature Minimum (°C)	R/W	Positive Number	F,S
rthi	Reservoir Temperature Maximum (°C)	R/W	Positive Number	F,S
rtpp	Reservoir Temperature, PID Proportional Gain	R/W		F,S
rtpi	Reservoir Temperature, PID Integral Gain	R/W		F,S
rtpd	Reservoir Temperature, PID Derivative Gain	R/W		F,S
rtpe	Reservoir Temperature, PID Integral Error Rate	R/W		F,S

Table 3: *ASCII Command Set (cont'd)*

Command	Description	R/W	Notes	Controller
rtpm	Reservoir Temperature, PID Integral Maximum	R/W		F,S
rtpt	Reservoir Temperature, PID Period (ms)	R/W	non-zero	F,S
rtpw	Reservoir Temperature, PWM Period (ms)	R/W	non-zero	F,S
rtpr	Reservoir Temperature, sample rate (ms)	R/W	non-zero	F,S
rtfb	Reservoir Temperature, filter band	R/W		F,S
rtfl	Reservoir Temperature, filter length	R/W		F,S
Reservoir Pressure				
rard	Reservoir Air Ready	R	0=not ready, 1=ready	S
raps	Reservoir Air Pressure (kPa)	R	Positive Number	F,S
rast	Reservoir Air Set Point (kPa)	R/W	Positive Number	S
rhip	Reservoir Max Air Pressure (kPa)	R/W	Positive Number	S
rlop	Reservoir Min Air Pressure (kPa)	R/W	Positive Number	S
dadl	Disable Air Delay (ms)	R/W	Non-negative number	S

Modbus TCP/IP programming

This device implements the Modbus® TCP/IP protocol which provides an additional communication interface to the Advanced FPC Real Time Controller through the Ethernet connection.

The process image can be accessed via Modbus® TCP/IP using the following address scheme:

- 00000 to 09999 : Coil addressing
- 10000 to 19999 : Discrete input addressing
- 30000 to 39999 : Input register addressing
- 40000 to 49999 : Holding register addressing

Process image data

Use this process image data when communicating with the Advanced FPC Controller via its Ethernet connection. Refer to Common process image (pg 57).

Process image types

Content in the Process image types (pg 64) file provides reference information for data in the Common process image (pg 57) file. Also refer to Process image (pg 62).

Common Process Image

As of 12/18/2019

Name	Description	Address	Type
PartNumber	The GPD part number of the device	400000	GPDPartNumber
SerialNumber	The unique serial number of the device	400010	GPDSerialNumber
DeviceName	A name describing the device	400020	ZString
Manufacturer	The manufacturer of the device	400030	ZString
ModelId	The model identifier of the device	400040	ZString
FirmwareVersion	Firmware version of the device	400050	ZString
DeviceFunction	The overall function (or purpose) of the device	400060	ZString
NetIPAddr	The IP address of the device	400070	IPv4Address
NetSubnet	The subnet mask of the device	400080	IPv4Address
NetGateway	The network gateway for the device	400090	IPv4Address
NetDNS	The network DNS for the device	400100	IPv4Address
LogDest	The network destination for log messages	400110	IPv4Address
BoardTemp	The board temperature, from temperature sensor on device circuit board	400120	Temperature
ScriptSize	The size of the PAWN script currently loaded on the device	400122	UInt16
ScriptVersion	The version of the script currently loaded, should be set in the application script	400123	ZString
ReadNVRAM	Reads configuration data from non-volatile random access memory into memory	400133	UInt16
ScriptId	The script identifier of the currently loaded script, this should be used to uniquely identify a compiled script	400143	ZString
ScriptPartNumber	The part number of the currently loaded application script.	400170	ZString
LibVersion	The library version of the firmware	400180	ZString
ErrorMsg	A description of the last error condition as indicated in Error	400200	ZString
TRISA	PORTA pin directions	400293	UInt16
TRISB	PORTB pin directions	400294	UInt16
TRISC	PORTC pin directions	400295	UInt16
TRISD	PORTD pin directions	400296	UInt16
TRISE	PORTE pin directions	400297	UInt16
TRISF	PORTF pin directions	400298	UInt16
TRISG	PORTG pin directions	400299	UInt16
RA0	The state of PORT RA0	400300	Boolean
RA1	The state of PORT RA1	400301	Boolean
RA2	The state of PORT RA2	400302	Boolean
RA3	The state of PORT RA3	400303	Boolean
RA4	The state of PORT RA4	400304	Boolean
RA5	The state of PORT RA5	400305	Boolean
RA6	The state of PORT RA6	400306	Boolean
RA7	The state of PORT RA7	400307	Boolean
RA8	The state of PORT RA8	400308	Boolean
RA9	The state of PORT RA9	400309	Boolean
RA10	The state of PORT RA10	400310	Boolean
RA11	The state of PORT RA11	400311	Boolean

Name	Description	Address	Type
RA12	The state of PORT RA12	400312	Boolean
RA13	The state of PORT RA13	400313	Boolean
RA14	The state of PORT RA14	400314	Boolean
RA15	The state of PORT RA15	400315	Boolean
RB0	The state of PORT RB0	400316	Boolean
RB1	The state of PORT RB1	400317	Boolean
RB2	The state of PORT RB2	400318	Boolean
RB3	The state of PORT RB3	400319	Boolean
RB4	The state of PORT RB4	400320	Boolean
RB5	The state of PORT RB5	400321	Boolean
RB6	The state of PORT RB6	400322	Boolean
RB7	The state of PORT RB7	400323	Boolean
RB8	The state of PORT RB8	400324	Boolean
RB9	The state of PORT RB9	400325	Boolean
RB10	The state of PORT RB10	400326	Boolean
RB11	The state of PORT RB11	400327	Boolean
RB12	The state of PORT RB12	400328	Boolean
RB13	The state of PORT RB13	400329	Boolean
RB14	The state of PORT RB14	400330	Boolean
RB15	The state of PORT RB15	400331	Boolean
RC0	The state of PORT RC0	400332	Boolean
RC1	The state of PORT RC1	400333	Boolean
RC2	The state of PORT RC2	400334	Boolean
RC3	The state of PORT RC3	400335	Boolean
RC4	The state of PORT RC4	400336	Boolean
RC5	The state of PORT RC5	400337	Boolean
RC6	The state of PORT RC6	400338	Boolean
RC7	The state of PORT RC7	400339	Boolean
RC8	The state of PORT RC8	400340	Boolean
RC9	The state of PORT RC9	400341	Boolean
RC10	The state of PORT RC10	400342	Boolean
RC11	The state of PORT RC11	400343	Boolean
RC12	The state of PORT RC12	400344	Boolean
RC13	The state of PORT RC13	400345	Boolean
RC14	The state of PORT RC14	400346	Boolean
RC15	The state of PORT RC15	400347	Boolean
RD0	The state of PORT RD0	400348	Boolean
RD1	The state of PORT RD1	400349	Boolean
RD2	The state of PORT RD2	400350	Boolean
RD3	The state of PORT RD3	400351	Boolean
RD4	The state of PORT RD4	400352	Boolean
RD5	The state of PORT RD5	400353	Boolean
RD6	The state of PORT RD6	400354	Boolean
RD7	The state of PORT RD7	400355	Boolean
RD8	The state of PORT RD8	400356	Boolean
RD9	The state of PORT RD9	400357	Boolean
RD10	The state of PORT RD10	400358	Boolean
RD11	The state of PORT RD11	400359	Boolean

Name	Description	Address	Type
RD12	The state of PORT RD12	400360	Boolean
RD13	The state of PORT RD13	400361	Boolean
RD14	The state of PORT RD14	400362	Boolean
RD15	The state of PORT RD15	400363	Boolean
RE0	The state of PORT RE0	400364	Boolean
RE1	The state of PORT RE1	400365	Boolean
RE2	The state of PORT RE2	400366	Boolean
RE3	The state of PORT RE3	400367	Boolean
RE4	The state of PORT RE4	400368	Boolean
RE5	The state of PORT RE5	400369	Boolean
RE6	The state of PORT RE6	400370	Boolean
RE7	The state of PORT RE7	400371	Boolean
RE8	The state of PORT RE8	400372	Boolean
RE9	The state of PORT RE9	400373	Boolean
RE10	The state of PORT RE10	400374	Boolean
RE11	The state of PORT RE11	400375	Boolean
RE12	The state of PORT RE12	400376	Boolean
RE13	The state of PORT RE13	400377	Boolean
RE14	The state of PORT RE14	400378	Boolean
RE15	The state of PORT RE15	400379	Boolean
RF0	The state of PORT RF0	400380	Boolean
RF1	The state of PORT RF1	400381	Boolean
RF2	The state of PORT RF2	400382	Boolean
RF3	The state of PORT RF3	400383	Boolean
RF4	The state of PORT RF4	400384	Boolean
RF5	The state of PORT RF5	400385	Boolean
RF6	The state of PORT RF6	400386	Boolean
RF7	The state of PORT RF7	400387	Boolean
RF8	The state of PORT RF8	400388	Boolean
RF9	The state of PORT RF9	400389	Boolean
RF10	The state of PORT RF10	400390	Boolean
RF11	The state of PORT RF11	400391	Boolean
RF12	The state of PORT RF12	400392	Boolean
RF13	The state of PORT RF13	400393	Boolean
RF14	The state of PORT RF14	400394	Boolean
RF15	The state of PORT RF15	400395	Boolean
RG0	The state of PORT RG0	400396	Boolean
RG1	The state of PORT RG1	400397	Boolean
RG2	The state of PORT RG2	400398	Boolean
RG3	The state of PORT RG3	400399	Boolean
RG4	The state of PORT RG4	400400	Boolean
RG5	The state of PORT RG5	400401	Boolean
RG6	The state of PORT RG6	400402	Boolean
RG7	The state of PORT RG7	400403	Boolean
RG8	The state of PORT RG8	400404	Boolean
RG9	The state of PORT RG9	400405	Boolean
RG10	The state of PORT RG10	400406	Boolean
RG11	The state of PORT RG11	400407	Boolean

Name	Description	Address	Type
RG12	The state of PORT RG12	400408	Boolean
RG13	The state of PORT RG13	400409	Boolean
RG14	The state of PORT RG14	400410	Boolean
RG15	The state of PORT RG15	400411	Boolean
AnalogInCh0	The normalized value of the analog input channel 0	400412	Float
AnalogInCh1	The normalized value of the analog input channel 1	400414	Float
AnalogInCh2	The normalized value of the analog input channel 2	400416	Float
AnalogInCh3	The normalized value of the analog input channel 3	400418	Float
AnalogInCh4	The normalized value of the analog input channel 4	400420	Float
AnalogInCh5	The normalized value of the analog input channel 5	400422	Float
AnalogInCh6	The normalized value of the analog input channel 6	400424	Float
AnalogInCh7	The normalized value of the analog input channel 7	400426	Float
AnalogOutCh0	The normalized value of the analog output channel 0	400428	Float
AnalogOutCh1	The normalized value of the analog output channel 1	400430	Float
AnalogOutCh2	The normalized value of the analog output channel 2	400432	Float
AnalogOutCh3	The normalized value of the analog output channel 3	400434	Float
AnalogOutCh4	The normalized value of the analog output channel 4	400436	Float
AnalogOutCh5	The normalized value of the analog output channel 5	400438	Float
AnalogOutCh6	The normalized value of the analog output channel 6	400440	Float
AnalogOutCh7	The normalized value of the analog output channel 7	400442	Float
AnalogInCh8	The normalized value of the analog input channel 8	400444	Float
AnalogInCh9	The normalized value of the analog input channel 9	400446	Float
AnalogInCh10	The normalized value of the analog input channel 10	400448	Float
AnalogInCh11	The normalized value of the analog input channel 11	400450	Float
AnalogInCh12	The normalized value of the analog input channel 12	400452	Float
AnalogInCh13	The normalized value of the analog input channel 13	400454	Float
AnalogInCh14	The normalized value of the analog input channel 14	400456	Float
AnalogInCh15	The normalized value of the analog input channel 15	400458	Float
LogEnable	Enables or disables log messages, 0 = disabled, non-zero = enabled	400500	Boolean
LogLevel	The log level threshold for log messages	400501	LogLevel
Reset	Resets/Restarts the device when value 0xA55A is written	400502	UInt16
BootloaderStart	Restarts the device in bootloader mode when value 0xA55A is written, enabling the device to have it's firmware updated	400503	UInt16
WriteNVRAM	Writes data to non-volatile memory where: 0xA55A=saves all, alternatively as a bitmask: 0x1=saves all, 0x2=saves configuration, 0x4=saves all recipes, 0x8=saves current recipe, 0x10=saves provisioning data	400504	UInt16
Safe	Forces the system/hardware to go to a safe state	400505	Boolean
Error	The error code of the system/device (0 = no error)	400506	Int16
AInSlopeCh0	The slope in the linear equation for analog input channel 0	400507	Float
AInOffsetCh0	The offset in the linear equation fo analog input channel 0	400509	Float
AInSlopeCh1	The slope in the linear equation for analog input channel 1	400511	Float
AInOffsetCh1	The offset in the linear equation fo analog input channel 1	400513	Float
AInSlopeCh2	The slope in the linear equation for analog input channel 2	400515	Float
AInOffsetCh2	The offset in the linear equation fo analog input channel 2	400517	Float
AInSlopeCh3	The slope in the linear equation for analog input channel 3	400519	Float
AInOffsetCh3	The offset in the linear equation fo analog input channel 3	400521	Float

Name	Description	Address	Type
AInSlopeCh4	The slope in the linear equation for analog input channel 4	400523	Float
AInOffsetCh4	The offset in the linear equation fo analog input channel 4	400525	Float
AInSlopeCh5	The slope in the linear equation for analog input channel 5	400527	Float
AInOffsetCh5	The offset in the linear equation fo analog input channel 5	400529	Float
AInSlopeCh6	The slope in the linear equation for analog input channel 6	400531	Float
AInOffsetCh6	The offset in the linear equation fo analog input channel 6	400533	Float
AInSlopeCh7	The slope in the linear equation for analog input channel 7	400535	Float
AInOffsetCh7	The offset in the linear equation fo analog input channel 7	400537	Float
AOutSlopeCh0	The slope in the linear equation for analog output channel 0	400539	Float
AOutOffsetCh0	The offset in the linear equation fo analog output channel 0	400541	Float
AOutSlopeCh1	The slope in the linear equation for analog output channel 1	400543	Float
AOutOffsetCh1	The offset in the linear equation fo analog output channel 1	400545	Float
AOutSlopeCh2	The slope in the linear equation for analog output channel 2	400547	Float
AOutOffsetCh2	The offset in the linear equation fo analog output channel 2	400549	Float
AOutSlopeCh3	The slope in the linear equation for analog output channel 3	400551	Float
AOutOffsetCh3	The offset in the linear equation fo analog output channel 3	400553	Float
AOutSlopeCh4	The slope in the linear equation for analog output channel 4	400555	Float
AOutOffsetCh4	The offset in the linear equation fo analog output channel 4	400557	Float
AOutSlopeCh5	The slope in the linear equation for analog output channel 5	400559	Float
AOutOffsetCh5	The offset in the linear equation fo analog output channel 5	400561	Float
AOutSlopeCh6	The slope in the linear equation for analog output channel 6	400563	Float
AOutOffsetCh6	The offset in the linear equation fo analog output channel 6	400565	Float
AOutSlopeCh7	The slope in the linear equation for analog output channel 7	400567	Float
AOutOffsetCh7	The offset in the linear equation fo analog output channel 7	400569	Float

Process Image

As of 12/18/2019

Name	Description	Address	Type
PumpConfig	The currently active pump configuration	400800	ZString
PresCtrlEnable	Enables the pressure controller	400832	Boolean
PresCtrlUpdateRate	The update rate of the pressure controller (ms)	400833	UInt16
PresCtrlSetpoint	The current set point for the pressure controller	400834	Float
PresCtrlPropGain	The proportional gain for the pressure controller	400836	Float
PresCtrlDerivGain	The derivative gain for the pressure controller	400838	Float
PresCtrlExDutyCycle	The valve duty cycle for the dump valve when exhausting	400840	Float
PresCtrlPwmPeriod	The PWM period for the valve controller	400842	UInt16
PresCtrlDumpDutyCycle	The valve duty cycle for the dump valve when holding pressure	400843	Float
ProcCtrlEnable	Enables the process controller	400900	Boolean
ProcCtrlUpdateRate	The update rate of the process controller (ms)	400901	UInt16
ProcCtrlSetpoint	The current set point for the process controller	400902	Float
ProcCtrlPropGain	The proportional gain for the process controller	400904	Float
ProcCtrlIntGain	The integral gain for the process controller	400906	Float
ProcCtrlDerivGain	The derivative gain for the process controller	400908	Float
ProcCtrlIntMax	The maximum amount of integral for the process controller	400910	Float
ProcCtrlIntRate	The maximum amount of integral added per update of the process controller	400912	Float
ProcErrorSensor	Sets the current pressure control point (0=fluid,1=reservoir)	400947	UInt16
ProcError	The current amount of process error	400948	Float
ProcErrorDetected	Determines if a process error has been detected	400950	UInt16
ProcErrorWindow	The maximum allowable process error	400951	Float
ProcErrorTimeWindow	The maximum allowable time to exceed the maximum allowable process error	400953	UInt16
ProcExhaustThreshold	The amount of pressure differential that will cause the system to perform maximum exhaust	400954	Float
FluidSensorPresent	Determines if a fluid sensor is present	400989	UInt16
ZeroRsrvrPressure	Zeroes the reservoir pressure sensor to the current pressure	400990	UInt16
ZeroFluidPressure	Zeroes the fluid pressure sensor to the current pressure	400991	UInt16
ScreenshotEnable	Creates a screenshot of the HMI saved to SD card	400970	UInt16
ScreenshotFile	The filename on SD card where the screenshot will be saved.	400980	ZString
NeedleTempIntgMax	The maximum integral value for the PID controller for the needle temperature controller	400992	Float
NeedleTempIntgRate	The maximum amount of integral per update for the PID controller for the needle temperature controller	400994	Float
RsrvrTempIntgMax	The maximum integral value for the PID controller for the reservoir temperature controller	400996	Float
RsrvrTempIntgRate	The maximum amount of integral per update for the PID controller for the reservoir temperature controller	400998	Float
RsrvrTempRTDPresent	Indicates if an RTD is currently connected to the controller for the reservoir	401004	Boolean
NeedleTempRTDPresent	Indicates if an RTD is currently connected to the controller for the needle heater	401005	Boolean
RsrvrTemp	The current temperature of the reservoir the RTD value	401006	Temperature
NeedleTemp	The current temperature of the needle temperature	401008	Temperature
NeedleTempReady	The needle temperature is within specifications	401010	Boolean
ForceRun	Forces the pump to run with the current parameters	401011	Boolean
PumpOn	Signals the controller to begin running the pump	401012	Boolean
PumpProfileSelect1	Pump control profile select #1, the profile is selected by the three profile select inputs (8 possible profiles)	401014	Boolean
PumpProfileSelect2	Pump control profile select #2, the profile is selected by the three profile select inputs (8 possible profiles)	401015	Boolean
PumpProfileSelect3	Pump control profile select #3, the profile is selected by the three profile select inputs (8 possible profiles)	401016	Boolean
LvlDtct	The status of the level detect sensor	401019	Boolean
RsrvrTempReady	The reservoir temperature is within specifications	401020	Boolean
OnlineState	Online state of the controller (online or offline)	401021	Boolean
RsrvrAirPressure	The current air pressure of the reservoir	401025	Pressure
PumpReady	Indicates if the pump is ready to be driven	401027	Boolean
PumpBusy	Indicates if the pump is busy performing an operation	401028	Boolean
PumpFault	Indicates if the pump is in a fault state	401029	Boolean
RsrvrHeaterOn	Controls the reservoir heater	401030	Boolean
NeedleHeaterOn	Controls the needle heater	401031	Boolean
RsrvrTempProp	Reservoir Temperature, Proportional Gain	401033	Float
RsrvrTempIntg	Reservoir Temperature, Integral Gain	401035	Float
RsrvrTempDeriv	Reservoir Temperature, Derivative Gain	401037	Float
RsrvrTempPIDPeriod	Reservoir Temperature, PID Period (ms)	401039	UInt16
RsrvrTempPWMPeriod	Reservoir Temperature, PWM Period (ms)	401040	UInt16
RsrvrTempSampleRate	Reservoir Temperature, sample rate (ms)	401041	UInt16
NeedleTempProp	Needle Temperature, Proportional Gain	401042	Float
NeedleTempIntg	Needle Temperature, Integral Gain	401044	Float
NeedleTempDeriv	Needle Temperature, Derivative Gain	401046	Float
NeedleTempPIDPeriod	Needle Temperature, PID Period (ms)	401048	UInt16
NeedleTempPWMPeriod	Needle Temperature, PWM Period (ms)	401049	UInt16
NeedleTempSampleRate	Needle Temperature, sample rate (ms)	401050	UInt16
RsrvrTempDutyCycle	Reservoir Temperature, current heater output duty cycle	401051	Float
NeedleTempDutyCycle	Needle Temperature, current heater output duty cycle	401053	Float
RsrvrTempPowerGain	Reservoir Temperature, gain for the PID control output	401055	Float
NeedleTempPowerGain	Needle Temperature, gain for the PID control output	401057	Float
SelectedRecipe	The currently selected recipe	401069	UInt16
NeedleTempOffset	Offset applied to the needle temperature value	401074	Float
RsrvrTempOffset	Offset applied to the reservoir temperature value	401078	Float
NeedleTempFilterBand	The band width of the software filter for the needle temperature	401080	Float
NeedleTempFilterLength	The sample length of the software filter for the needle temperature	401082	UInt16
RsrvrTempFilterBand	The band width of the software filter for the reservoir temperature	401083	Float
RsrvrTempFilterLength	The sample length of the software filter for the reservoir temperature	401085	UInt16

Name	Description	Address	Type
PrevDispenseType	The dispense mode used in the previous dispense cycle	401086	UInt16
RsrvrAirOffset	Offset applied to the reservoir air pressure value	401087	Float
FluidPressure	The current fluid pressure	401092	Pressure
DotRunDuration	The amount of time (ms) that the dispense will run for in dot mode	401100	UInt16
DotRunSetpoint	The run mode setpoint for a dot dispense	401101	Pressure
DotStandbySetpoint	The standby mode setpoint while in dot mode	401103	Pressure
DotHoldSetpoint	The hold mode setpoint while in dot mode	401105	Pressure
DotStandbyTimeout	The standby mode timeout period (ms) while in dot mode	401117	UInt16
ContRunSetpoint	The run mode setpoint for a continuous dispense	401118	Pressure
ContStandbySetpoint	The standby mode setpoint while in continuous mode	401120	Pressure
ContHoldSetpoint	The hold mode setpoint while in continuous mode	401122	Pressure
ContStandbyTimeout	The standby mode timeout period (ms) while in continuous mode	401132	UInt16
NeedleTempEnable	Enables the needle temperature control	401134	Boolean
NeedleTempSetpoint	The current setpoint for the needle temperature	401135	Temperature
RsrvrTempEnable	Enables the reservoir temperature control	401137	Boolean
RsrvrTempSetpoint	The current setpoint for the reservoir temperature	401138	Temperature
RsrvrAirMaxPressure	The maximum allowable air pressure for the reservoir	401140	Pressure
RsrvrAirMinPressure	The minimum allowable air pressure for the reservoir	401142	Pressure
RsrvrLvlDtctEnable	Enables the level detection for the reservoir	401144	Boolean
RsrvrMixerEnable	Enables the reservoir mixer	401145	Boolean
DispenseMode	Indicates the dispense mode type to use	401146	UInt16
RsrvrTempMin	The minimum temperature value of the reservoir to be considered within 'tolerance'	401147	Temperature
RsrvrTempMax	The maximum temperature value of the reservoir to be considered within 'tolerance'	401149	Temperature
NeedleTempMin	The minimum temperature value of the needle to be considered within 'tolerance'	401151	Temperature
NeedleTempMax	The maximum temperature value of the needle to be considered within 'tolerance'	401153	Temperature
TuningProfile	The tuning profile number used with the currently selected recipe	401163	UInt16

Process Image Types

As of 04/06/2016

PI Type	OPC Type	Unit	Range	Description	Notes
UInt16	Word		0 ≤ N ≤ 65535	16 bit unsigned integer	
Int16	Short		-32768 ≤ N ≤ 32767	16 bit signed integer	
UInt32	DWord		0 ≤ N ≤ 4294967295	32 bit unsigned integer	
Int32	Long		-2147483648 ≤ N ≤ 2147483647	32 bit signed integer	
Float	DWord		2E-38≤ N ≤ 2E38	single precision floating point	
Count	DWord		0 ≤ N ≤ 4294967295	32 bit signed number	
Name(N)	String.N		[A-Za-z\b]	A string of characters of max length N, null terminated ASCII string	
Boolean	Short		true|false		
ZString(N)	String.N	byte	^ .{0,N}$		Note that the zero terminator may not be present at MODBUS/OPC protocol levels.
GPD Part Number	String.10		^[0-9]{4}-[0-9]{4}(-[0-9]+)?$		
GPD Serial Number	String.10		^[0-9]{7,9}$	NNN = product code, nnnn = sequential machine id e.g. 2220281 222=uMAX 0281=machine #281	
IPv4 Address	String.16		^(?:[0-9]{1,3}\.){3}[0-9]{1,3}$ [1]	standard octet dotted notation	e.g. 192.18.0.1
Distance	Float	mm	±10E38		
Duration	DWord	ms	0 ≤ N ≤ 4294967295]	a span of time (ms)	
Angle	Float	°	±360°		
Speed	float	mm/s	±10E38		
Acceleration	Float	mm/s²	±10E38		
RotationalSpeed	Float	° n/s	±10E38		
RotationalAcceleration	Float	° n/s²	±10E38		
Temperature	Float	°C	±10E38		
Pressure	Float	kPa	±10E38		
LogLevel	Word		0-8	Log message levels	0=emergency, 1=alert, 2=critical, 3=error, 4=warning, 5=notice, 6=info, 7=debug, 8=trace
CultureInfo	String.6	https://msdn.microsoft.com/en-us/library/ee825488(v=cs.20).aspx	^[a-z]{2}-[A-Z]{2}$	Cultural information for localization, the two character language code followed by the two character country code	example. 'en-US'

1 the given regex is a simplistic match - it does not enforce ranges on the octets. A more accurate version is this: ^(?:(?:25[0-5]|2[0-4][0-9]|[01]?[0-9][0-9]?)\.){3}(?:25[0-5]|2[0-4][0-9]|[01]?[0-9][0-9]?)$