ALICAT SCIENTIFIC

A **Halma** company

OPERATING MANUAL

FOR PRESSURE CONTROLLERS

Models PC · PCS · PC3 · PC3S · PCR · IVC · EXTSEN

Thank you for purchasing your pressure controller.

If you have any questions, or if something is not working as expected, please contact us. We are eager to help you in any way possible.

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Recalibrate your pressure controller every year.

Annual calibration is required to ensure the continued certainty of readings, and to extend the Limited Lifetime Warranty (page 48). Fill out the Service Request Form at alicat.com/service, or contact us directly when it is time to send in your device for recalibration.

Serial #: _____ Next Calibration: _____

NIST This device comes with a NIST-traceable calibration certificate.

RoHS This device conforms to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU.

CE This device complies with the requirements of the Low Voltage Directive 2014/35/EU and the EMC Directive 2014/30/EU and carries the CE Marking accordingly.

This device complies with the requirements of the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC

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Introduction

Your new pressure controller has a variety of innovative features:

- **1000 readings per second** ensures high resolution data.
- **Backlit display with adjustable contrast** is easy to read in direct sunlight. In dimly lit areas, press the bottom-center logo to turn on the backlight (see page 6).
- **Ability to control gases and liquids** to accommodate for a wide range of pressure control applications, when properly configured.
- **Data logging to your PC** over a serial data connection to capture all pressure data, for logging and analysis purposes (see page 32).

Please take the time to find and read the information for your specific device. This manual covers the following Alicat Scientific instruments:

- **PC**-Series absolute, gauge, and differential pressure controllers
- **PC3**-Series external-sensing pressure controllers
- **IVC**-Series integrated vacuum controllers

This includes devices configured with **corrosion-resistant materials** (PCS, PC3S), devices with a **remote-sensing line** (PC3, PC3S), a **remote sensor** (EXTSEN), **"hammerhead" dual valve** configurations (PCH, PCR, PCRH), **pneumatic valves** (PCP), and most combinations of these options.

This also includes devices labeled as approved for CSA Class 1 Div 2 and ATEX Class 1 Zone 2 hazardous environments. See page 47 for Special Conditions regarding the use of CSA/ATEX labeled devices.

Recalibration

Your pressure controller is a precision device, and an annual calibration is strongly recommended.

A yearly recalibration has several benefits:

- It ensures that your unit is functioning according to specification.
- Contamination may cause the instrument to measure improperly. Recalibration ensures the instrument is clean and free of debris.
- Recalibration maintains your LIFETIME WARRANTY (see page 48).

Sending your unit in for recalibration is quick, easy, and inexpensive.

Please keep the original box to return your Alicat instrument for recalibration. For more information regarding recalibration, see page 40.

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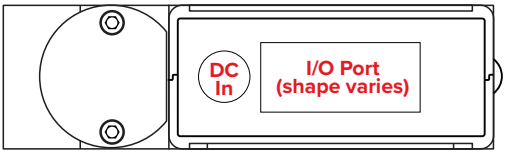
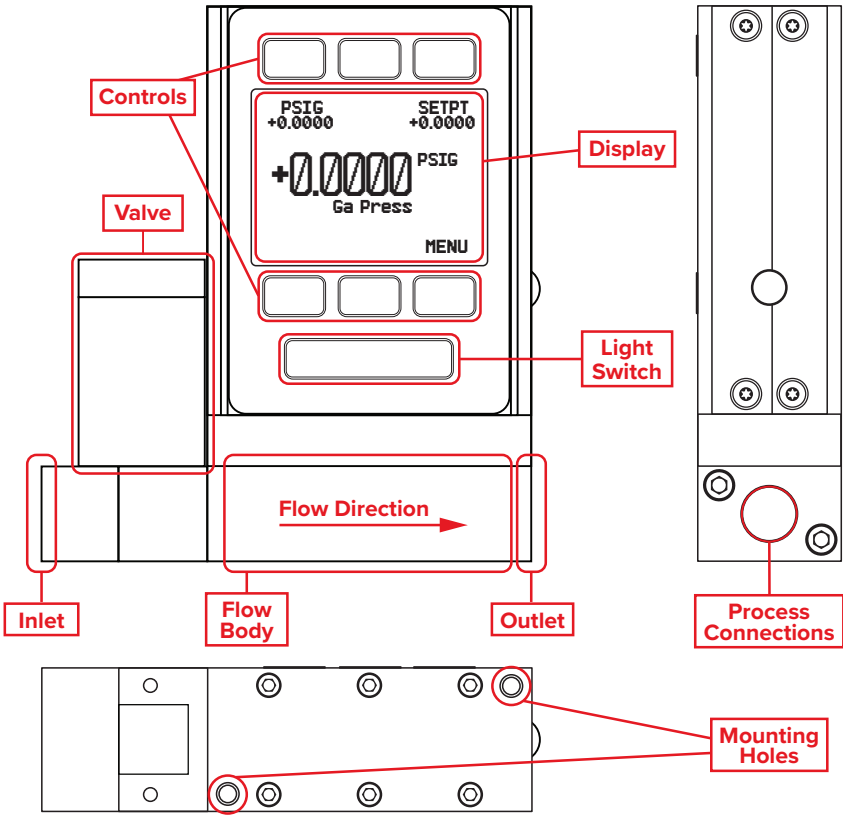
Getting Started

Getting to Know Your Pressure Controller

Connectors and Buttons

The drawings below represent a typical configuration of a pressure controller. **Your device's appearance and connections may differ.**





The Pressure Controller Display

The figure below identifies the various features of the main pressure controller display. **Press the button behind the Alicat logo to toggle the backlight** on and off.

Live data is measured 1000 times per second, and is typically displayed 10 times per second on the device's LCD screen.

Device engineering units are used by the controller in its serial communications and calculations. These can optionally be different from the **button engineering units**, which are the units being displayed. These can be individually configurable using the front display (page 28).

1. Chooses the pressure engineering units (page 28).
2. **TARE PRESS** tares the pressure reading on the device. Ensure the device is exposed to atmospheric pressure when this is performed. Tares are not available on absolute pressure (PSIA) devices.
3. **SETPT** sets the **pressure control setpoint** (page 20).
4. **MENU** enters the **menu system** (page 17).
5. The button under the Alicat logo **toggles the backlight** (see page 29 for more display options).

Status Messages

ADC Analog-digital converter error

EXH Exhaust mode active

HLD Valve hold active

LCK Front display is locked

POV Pressure over range of device

Mounting

All pressure controllers have mounting holes under the base for convenient attachment to flat panels. No straight runs of pipe are required upstream or downstream. Standard controllers are position insensitive and can be mounted in any orientation.

Caution: *Pressure controllers that use large Rolamite valves (PCR, PCR3, PCRS) should be mounted with their valve oriented vertically (right-side up). If another orientation is desired, please contact Alicat.*

Process Ports

Your pressure controller has been shipped with plastic plugs fitted into its ports. To lessen the chance of contaminating the stream, do not remove these plugs until you are ready to install the device.

Standard pressure controllers have female inlet and outlet ports. Welded VCR® and other specialty fittings may have male connections.

- For connections without face seal fittings, use thread-sealing Teflon tape to prevent leakage, but **do not wrap the first two threads**. This will help prevent tape getting into the stream.
- No tape is needed for face seal fittings.
- When changing fittings, carefully clean the port threads.

Warning: *Do not use pipe dopes or sealants on the process connections, as these compounds can cause permanent damage to the controller should they get into the stream.*

Filters

We recommend in-line sintered filters to prevent large particulates from entering the pressure controller, even though they may increase pressure drop. Suggested maximum particulate sizes are as follows:

PC/PCP/PCH/PC3: 20 microns **PCR/PCR3:** 40 microns

Operating Pressure

Controllable Pressure	Burst Pressure, ≤500 PSI devices*	Burst Pressure, >500 PSI devices*
102.4% of full scale pressure	300% of full scale pressure	150% of full scale pressure

* *Exceeding burst pressure will permanently damage the internal pressure sensor.*

Connecting Plumbing

Your pressure controller can regulate positive pressure and/or vacuum, depending on configuration. Connect the controller so that flow travels as indicated by the arrow, usually left to right, from the front of the device.

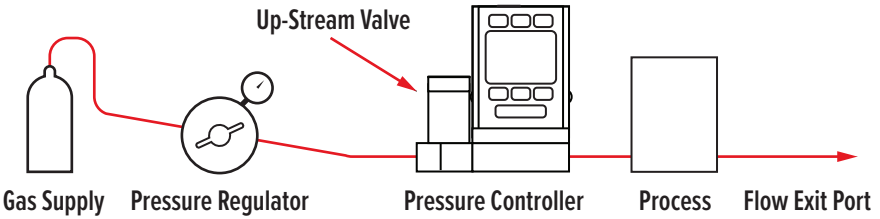
Applications

Valve Orientation

Your pressure controller will control process pressure to whatever side the pressure sensor is exposed to.

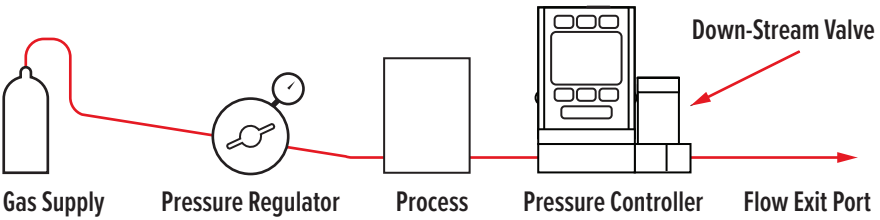
Pressure Control Application, Upstream Valve (downstream pressure control)

With the valve located on the upstream side, the sensor will be exposed downstream, therefore it will control pressure downstream. This configuration follows our standard pressure control algorithm (valve opens to increase pressure, closes to decrease pressure). For example:



Back Pressure Control Application, Downstream Valve (upstream pressure control)

A pressure controller with a downstream valve configuration will result in the sensor exposed to the upstream pressure. Due to this, the controller will be regulating the upstream pressure, and this configuration is known as a back pressure controller. This configuration follows our inverse pressure control algorithm (valve closes to increase pressure, opens to decrease pressure). For example:



Note: *Back pressure controlers include "DS," for downstream valve, in their part codes.*

Changing the Valve Orientation

The valve position on your Alicat pressure controller can be switched in the field. In addition to the valve switch, the controller must be configured for either forward pressure control (default control) or back pressure control (inverse control). If you need to switch from forward to back control, a video and explanation can be found at **alicat.com/valve-direction-change**.

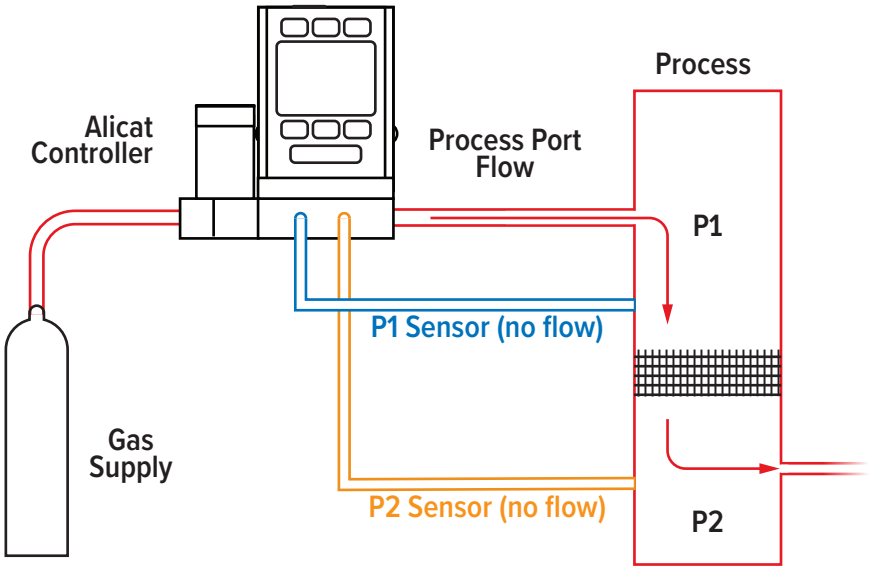
Special Configurations

PC-Series pressure controllers are occasionally ordered with special configurations to work in specialized ways:

Differential Pressure

PC-PSID Series pressure devices monitor and control the differential pressure between two points in the system. These devices have two ports located on the front face of the unit for connection to two points in the system where the differential pressure is measured from. The upstream port is for the higher of the two pressures, and the downstream port is for the lower pressure. In these devices, the flow path through the device is not connected to either leg of the differential pressure sensor.

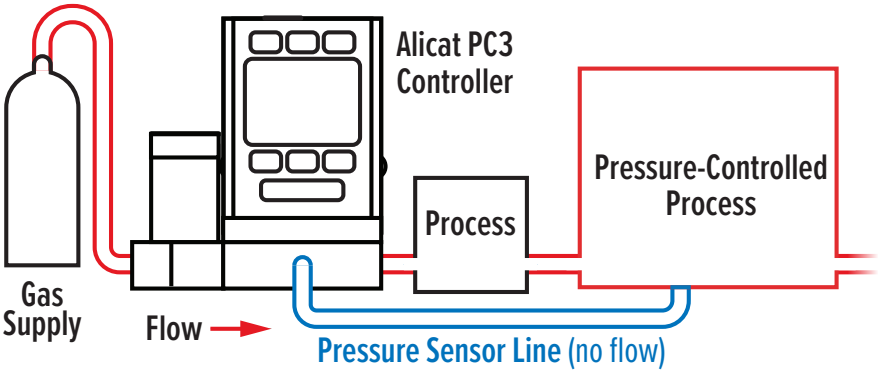
A 15 PSI pressure controller with differential pressure detector ports in front, and a DB9 serial data connection.



Remote-Sensing Controller

PC3-Series models sense and control the pressure at some point in the system outside the pressure controller itself. All PC-Series controllers can be ordered with an additional NPT port on the front, which is connected directly to the pressure sensor in the device. The pressure sensor is isolated from the flow path in this configuration.

A 100 PSI gauge pressure controller with a remote sensor port (in front), and an 8-pin mini-DIN serial data connection.



Using Alicat Pressure Instruments with Fluids

All of these pressure devices may be used with chemically-compatible liquids, but a few warnings must be taken into account:

1. Water is about 50 times more viscous than air. This is important when sizing a pressure controller, as this significant increase in viscosity requires a larger valve to reach expected flow rates. For example, a PC-series pressure controller sized to flow up to 20 SLPM of air will be limited to roughly 0.5 LPM of water (or similar fluid).
2. The factory PID tuning terms are established using air. It may be necessary to adjust the PID tuning parameters if you will be using a controller with liquid. Find more information at alicat.com/PID, or contact us (page 2) to help you through this tuning process.

Caution: *Please check with Alicat before using your pressure controller with liquids unless specifically ordered for this purpose.*

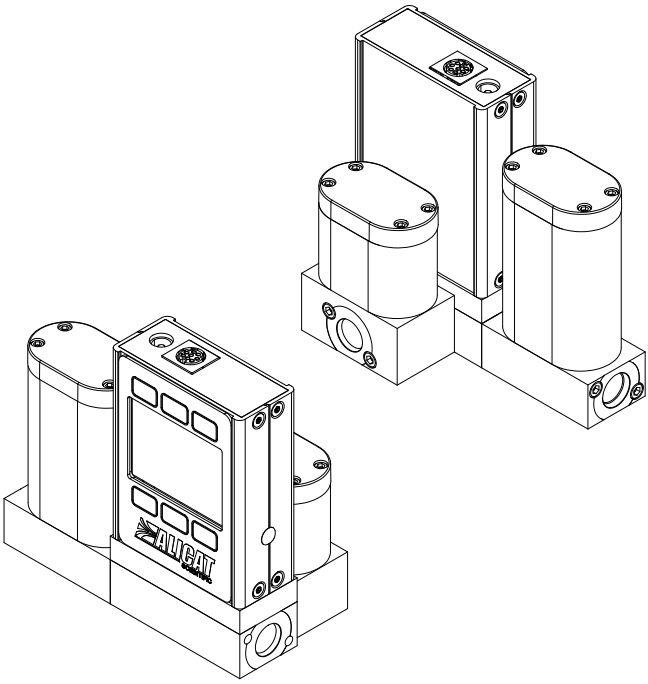
Integrated Vacuum Controllers (IVC)

IVCs are similar to our PC-Series absolute pressure controllers in functionality and in the navigation menu available on the screen. IVC devices are used in applications where precise control of vacuum is required, and are available with the following sensor packages:

- 10, 100, and 1000 TorrA
- Dual sensor package which integrates a 1000 Torr and 10 Torr sensor for increased turndown

A 10-torr integrated vacuum controller with its specialized vacuum sensor in the back.

Integration of the vacuum sensor, control valve, and PID algorithm in a single device eliminates the need for an external vacuum sensor and throttle valve in your system. These devices often come with 7/16"-20 SAE ports by default, but they can be ordered with welded VCR®, compression, or VCO® fittings if required. Process port sizes may change depending on the valve on your device.



Power and Signal Connections

Power can be supplied to your controller through either the power jack or the multi-pin connector on top of your device, depending on configuration.

Note: *Controller power jacks require a 12–30 Vdc power supply with a 2.1 mm female positive-center plug capable of supplying at least 250 mA, with an additional 40 mA for a color display. 4–20 mA analog outputs require at least 15 Vdc and 290 mA.*

Note: *Large valve controllers (PCR models) require a 24–30 Vdc power supply with a 2.1 mm female positive-center plug capable of supplying at least 750 mA.*

Standard 8-Pin Mini-DIN Pinout

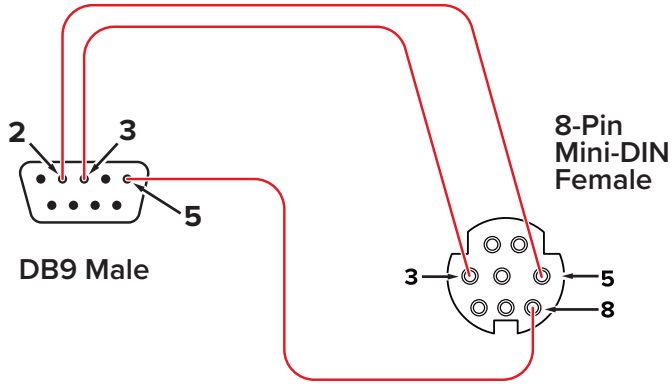
For 6-pin locking industrial connector, M12, DB9, and DB15 pinouts, see page 42 or visit alicat.com/pinouts.

Pin	Cable Color	Function
1	Black	Not connected *Optional: 4–20 mA primary output signal*
2	Brown	Static 5.12 Vdc *Optional: Secondary analog output (4–20 mA, 0–5 Vdc, 1–5 Vdc, 0–10 Vdc) or basic alarm*
3	Red	Serial RS-232RX input signal *Optional: RS-485 A*
4	Orange	Analog setpoint input
5	Yellow	Serial RS-232TX output signal *Optional: RS-485 B*
6	Green	0–5 Vdc *Optional: 1–5 Vdc or 0–10 Vdc) output signal*
7	Blue	Power in (as described above in the checked notes)
8	Purple	Ground (common for power, digital communications, analog signals, and alarms)

Caution: **Do not connect power to pins 1 through 6**. *Permanent damage can occur. Pin 2 (5.12 Vdc Output) is often mistaken for the standard 0–5 Vdc analog output signal. Pin 2 is normally a constant 5.12 Vdc that reflects system bus voltage.*

RS-232 or RS-485 Digital Signals

DB9 to 8-Pin Mini-DIN Connection for RS-232 or RS-485 Signals



9-Pin Serial Connection		8-Pin Mini-DIN Connection	
Pin	**Function**	**Pin**	**Function**
5	Ground	**8**	Ground
3	Transmit	**3**	Receive
2	Receive	**5**	Transmit

To use the RS-232 or RS-485 digital signal, connect the Output Signal (Pin 5), the Input Signal (Pin 3), and Ground (Pin 8) to your serial port as shown below. See page 32 for details on serial communication and how to use the data connection to issue commands.

Analog Signals

Primary Analog Output Signal

Most devices include a primary analog output signal, which is linear over its entire range. For ranges that start at 0 Vdc, a zero-pressure condition is indicated at approximately 0.010 Vdc. Full scale pressure is indicated by the top of the range: 5 Vdc for 0–5 Vdc, 20 mA for 4–20 mA signals, and so on. Communication protocols that eliminate analog outputs include DeviceNet, EtherCAT, EtherNet/IP, Modbus TCP/IP, and PROFIBUS.

Secondary Analog Output Signal

You may specify an optional second analog output at the time of order. This output may be 0–5 V, 1-5 V, 0–10 V, or 4–20 mA and can represent any measured parameter. Since pressure is the only measured parameter in the pressure series, this secondary analog output can be used as a comparison to the primary analog output.

Engineering Units

The device's units of measurement are handled in two ways:

Button engineering units are the units of measurement on the front display. For the standard pressure controller, the default units are PSIG (gauge), PSIA (absolute), or PSID (differential). Low pressure controllers may include default units of inH_2OG, inH_2OD, or torrA.

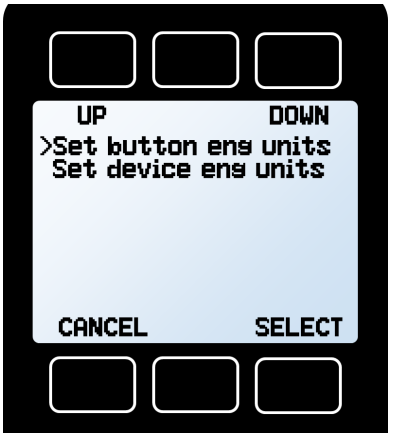
Device engineering units are the units of measurement used for calculation and sent through a serial data connection. **Optionally, these may be different from the displayed button engineering units**.

Selecting Engineering Units

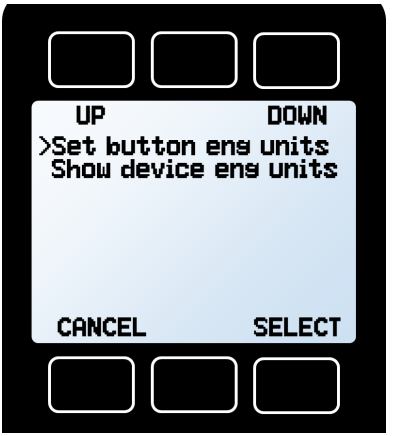
If a parameter is already highlighted in the center of the screen, pressing that measurement's button again will bring up a menu to modify either the button engineering units or the device engineering units.

If the device and button engineering units are the same (below left), the menu will offer to change button engineering units or device engineering units. Device engineering units can also be set in the Basic Configuration Menu (page 28).

If device and button engineering units differ (below right), the menu will offer to change button engineering units (**`Set button eng units`**), or to match button units to device engineering units (**`Show device eng units`**).



This will show if the front display units (button engineering units) are **the same** *as the serial data units (device engineering units).*



This will show if the front display units (button engineering units) are **different** *than the serial data units (device engineering units).*

Option: Color TFT Display

Multi-Color Display Indicators

- **GREEN**: Parameter labels and adjustments associated with the button directly above or below the label are presented in green.
- **WHITE**: Parameters operating under normal conditions.
- **RED**: Parameters with values exceeding 128% of the device's specifications.
- **YELLOW**: Menu items that are ready to be selected appear in yellow. This color replaces the > symbol in selections on monochrome display.

Press the Alicat logo button to turn off the color display backlight, located below the row of three buttons under the screen. The pressure controller remains in operation while the backlight is off.

LCD Contrast

LCD contrast is ranged from 0–11 on color displays, with 11 indicating the greatest contrast. See page 29 for information about display options.

Specifications for Instruments with Color Displays

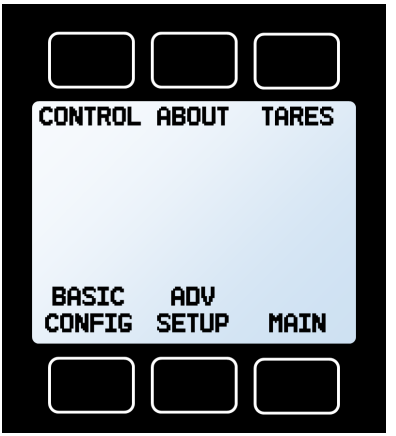
Color displays will require an additional 40 mA when using a 24 Vdc power supply. All other specifications from your device's specification sheet remain in effect.

Navigation & Customization

Main Menu

The Main Menu system is accessed by pressing the **MENU** button from the Main Display (page 7).

- **CONTROL** (page 18), **ABOUT** (page 27), **TARES** (below), **BASIC CONFIG** (page 28), and **ADV SETUP** (page 29) enter their menus.
- MAIN (page 7) exits to the main display.



Main Menu

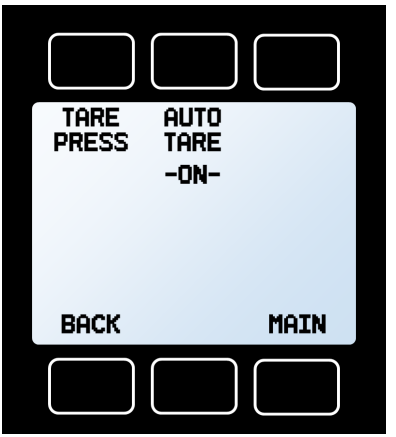
Taring

Taring ensures accurate measurements by giving the device a zero reference.

Auto-tare automatically tares when a zero setpoint is set for a short time, but **auto-tare is not recommended for pressure controllers** in most situations.

How to Manually Tare

1. Ensure that there is no flow, and that pressure is zero.
2. **MENU** → **TARE** → **TARE PRESS**, or via serial command (page 34). Gauge pressure tares must be done with the controller open to atmospheric pressure.



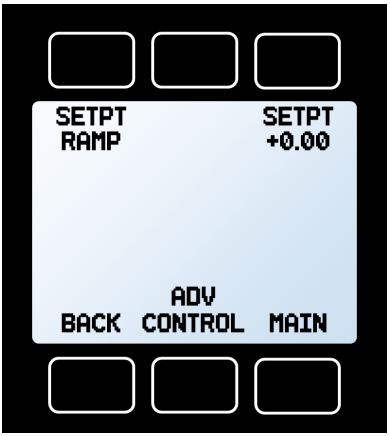
Tare Menu

When to Tare

- After significant changes in pressure
- After dropping or bumping the pressure controller
- After installing the controller in a different orientation

Control Menus

The **CONTROL** and **ADV CONTROL** menus allow you to command new setpoints, change the setpoint control loop, and adjust proportional, integral, and derivative (PID) control settings, among other options.



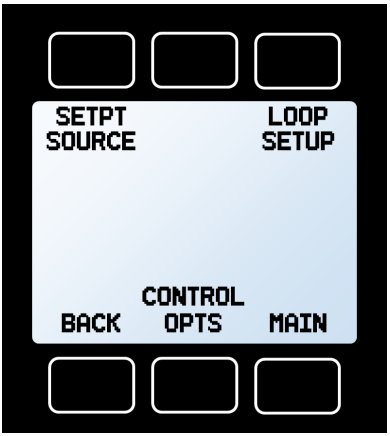
Control Menu

Menu → Control

- **SETPT RAMP** activates and sets the speed of setpoint ramping (page 22).
- **SETPT** displays the current setpoint. Press to command a new setpoint or clear the existing one. Setpoints are not editable via the front panel if the source is analog.
- **BACK** returns to the Main Menu selection (previous page).
- **ADV CONTROL** moves to the Advanced Control menu (below).
- **MAIN** exits to the Main Display (page 7).

Menu → Control → Advanced Control

- **SETPT SOURCE** selects setpoint input from either serial data and the front panel, or analog sources.
- **LOOP SETUP** selects the type of closed loop control and adjusts PID settings (page 24).
- **BACK** returns to the Control Menu (above).
- **CONTROL OPTS** sets options for setpoint ramping and limits for pressure control (starting page 19).
- **MAIN** exits to the Main Display (page 7).



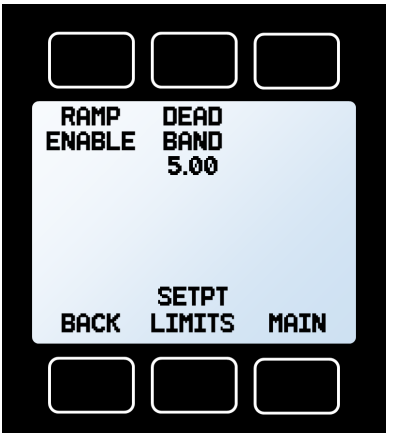
Advanced Control Menu

Control Options

The control options menu allows the user to enable ramping in either direction, establish a control deadband, or create setpoint limits.

Menu → Control → Advanced Control → Control Options

- **RAMP ENABLE** Defines the conditions when setpoint ramping will be active (page 22).
- **DEAD BAND** Sets the size of the control deadband (below).
- **BACK** Returns to the Advanced Control Menu (page 18).
- **SETPT LIMITS** Sets upper and lower setpoint limits (page 21).
- **MAIN** Exits to the Main Display (page 7).



Control Options Menu

Control Deadband

Menu → Control → Advanced Control → Control Options → Dead Band

The control deadband on the pressure controller allows the user to select upper and lower bounds around the setpoint. The controller will not adjust its valve position if the measured pressure is within these bounds. In this example, the controller will not adjust its valve position if the measured pressure is within 5 PSIG of the setpoint.

Control Deadband Menu

Changing the Setpoint

A setpoint is the amount of pressure the controller will attempt to match by opening or closing its valve.

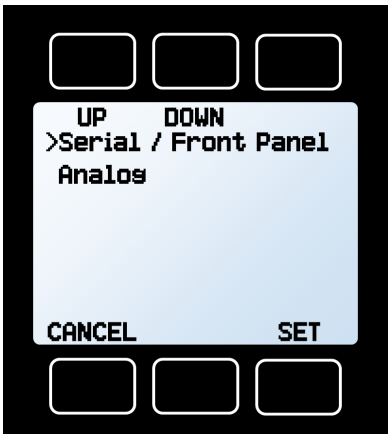
Press the **SETPT** button on the Main Display (page 7) or Control Menu (**MENU** → **CONTROL**, previous page) to choose a new setpoint. The setpoint selection screen indicates the engineering units and maximum allowable setpoint (e.g., **PSIG 10.00 Max**). To cancel a setpoint, press **CLEAR**, or give it a zero setpoint.

Changing Between Setpoint Sources

Menu → Control → Advanced Control → Setpoint Source

Pressure controllers accept setpoints from the front panel, a serial data connection, or an analog signal.

- When the source is set to **Serial/ Front Panel**, the controller will accept input from either the front panel, or an RS-232/ RS-485 connection. Neither source is a subordinate of the other, so the controller will accept the most recent command from either source.
- When the source is set to **Analog**, the controller will ignore serial setpoint commands and will prevent input from the front panel. Available analog inputs include: 0–5 Vdc, 1–5 Vdc, 0–10 Vdc, and 4–20 mA.



Setpoint Source Menu

Adjusting the setpoint with the optional IPC (Integrated Potentiometer Control)

If your controller has been ordered with a potentiometer control knob (IPC), then the setpoint source must be set to Analog for the controller to accept setpoint commands from the IPC.

When using a serial setpoint signal with a controller that has an IPC, leave the IPC knob at the midpoint when it is not in use.

Establishing Setpoint Limits

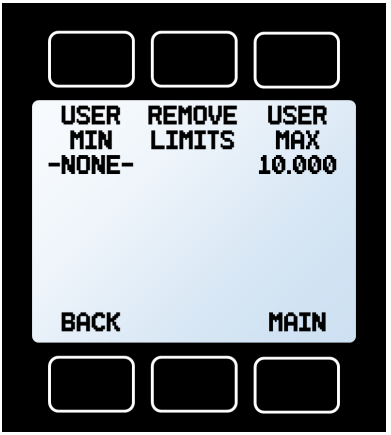
The Setpoint Limits Menu configures upper and lower limits (within the device's overall capabilities) for selecting a pressure control setpoint.

- When using the front panel, if you try to command a new setpoint that is outside of the upper and lower limits, the display notifies you that the requested setpoint is out of range.
- Over a serial connection, a setpoint outside the limit will be rejected with an error.
- When using an analog setpoint signal, setpoints that are outside of the setpoint limits are treated as if they were at the nearest limit. If you request a setpoint that is below the lower limit, the controller sets the setpoint at the lower limit. Likewise, a setpoint above the upper limit sets the setpoint at the upper limit.

Warning: *Pressure controllers that have non-zero lower setpoint limits cannot be set to stop flow until the lower limit has been cleared.*

Menu → Control → Advanced Control → Control Options → Setpoint Limits

- **USER MIN** sets the lower (minimum) setpoint limit.
- **REMOVE LIMITS** clears the minimum and maximum setpoint limits.
- **USER MAX** sets the upper (maximum) setpoint limit.
- **BACK** returns to the Control Options Menu (page 19).
- **MAIN** exits to the Main Display (page 7).



Setpoint Limits Menu

Setpoint Ramping

Setpoint ramping determines how quickly your pressure controller will reach the requested pressure setpoint. In practice, this might be used to prevent sudden bursts of pressure or flow from hitting delicate instruments when starting up a process.

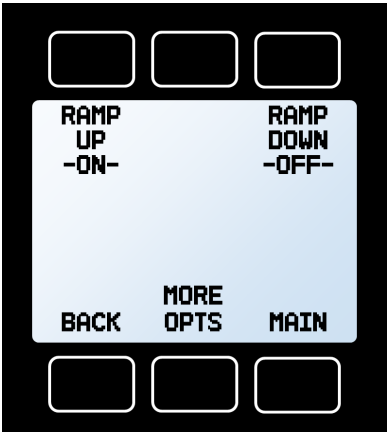
To activate setpoint ramping, set a maximum ramp rate and configure when to enable the ramping function.

Enabling Setpoint Ramping

Your pressure controller enables the ramping function independently for changes that require increases or decreases to achieve the new setpoint. For example, you can enable ramping up to a pressure setpoint to prevent pressure from building too quickly, but disable ramping down so that you can stop flow immediately. Each direction toggles on and off.

Menu → Control → Advanced Control → Control Options → Ramp Enable

- **RAMP UP** toggles ramping up to the pressure setpoint.
- **RAMP DOWN** toggles ramping down to the pressure setpoint.
- **BACK** returns to the Control Options Menu (page 19).
- **MORE OPTS** enables overrides for power on and zero setpoint scenarios (page 23).
- **MAIN** exits to the Main display (page 7).



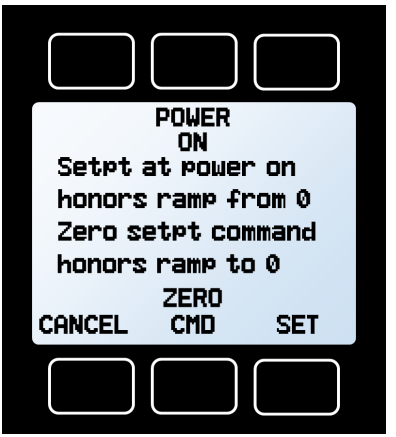
Setpoint Ramp Enable Menu

Enabling Setpoint Ramping Overrides

Menu → Control → Advanced Control → Control Options → Ramp Enable → More Options

The **MORE OPTS** button lets you configure overrides for the ramping function for two independent scenarios:

- **POWER ON** toggles whether the device should use the ramping setting that was last in use when it was turned off, when is turned back on again.
- **ZERO CMD** toggles whether the device should use ramping when the setpoint is set to zero.

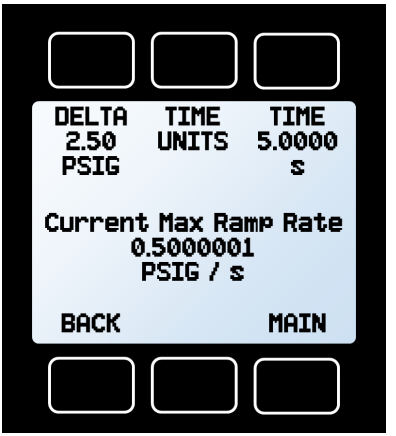


More Ramp Options Menu

Note: *If ramping is not enabled for either direction, these overrides have no effect.*

Menu → Control → Setpoint Ramp

- **DELTA** sets the change in pressure permitted in the time interval.
- **TIME UNITS** selects the unit of time for calculating the ramp rate.
- **TIME** sets the time over which the pressure can change by the delta.
- **BACK** returns to the Control Options Menu (page 19).
- **MAIN** exits to the Main Display (page 7).



Maximum Ramp Rate Menu

Setting a Maximum Ramp Rate

With ramping enabled in at least one direction, press **DELTA** to define the maximum allowable change in pressure. Press **TIME** to define the amount of time that change occurs within. The resulting maximum ramp rate will be shown in the center of the display.

Setpoint ramping in either direction can be toggled while keeping settings as configured above, see page 22.

Adjusting the Closed Loop Controller

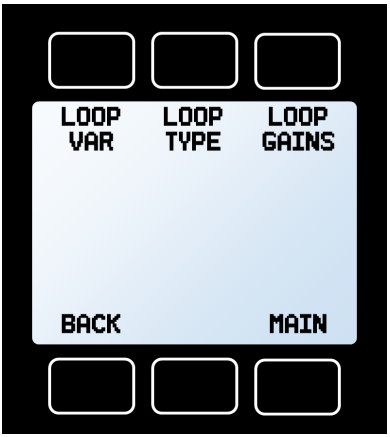
Your pressure controller uses an electronic closed loop algorithm to determine how to actuate its valve in order to achieve the commanded setpoint. We have tuned these settings for your specific operating conditions, but changes to your process sometimes require on-site adjustments to maintain optimal control performance. If you encounter issues with control stability, oscillation, or speed of response, fine-tuning your closed loop control may help.

The **LOOP SETUP** Menu lets you choose the closed loop control algorithm and adjust the gain settings for the proportional, integral, and derivative variables.

Note: *The D and P variables in the PD/PDF control algorithm are more typically referred to as P and I, respectively, in PDF controllers.*

Menu → Control → Advanced Control → Loop Setup

- **LOOP VAR** sets the controller's closed loop variable. By default, pressure controllers will only have their specific pressure parameter available (gauge, absolute, or differential).
- **LOOP TYPE** sets the control algorithm for PD/PDF or PD^2I.
- **LOOP GAINS** adjusts the gain settings for the proportional, integral, and derivative (PID) control functions.
- **BACK** returns to the Advanced Control Menu (page 18).
- **MAIN** exits to the Main Display (page 7).



Loop Setup Menu

Tuning the PD/PDF control algorithm

The controller's default control algorithm (PD) employs pseudo-derivative feedback (PDF) control, which uses two editable variables:

- The larger the **D** gain, the slower the controller will correct errors between the commanded setpoint and the measured process value. This is equivalent to the P variable in common PDF controllers.
- The larger the **P** gain, the faster the controller will correct for offsets based on the size of the errors and the amount of time they have occurred. This is equivalent to the I variable in common PDF controllers.

Tuning the PD^2I control algorithm

The controller's PD^2I control algorithm (also called PDDI) is used to provide faster response, most commonly in dual-valve flow and pressure controllers.

- The larger the **P** gain, the more aggressively the controller will correct errors between the commanded setpoint and the measured process value.
- The larger the **I** gain, the faster the controller will correct for offsets based on the size of the errors and the amount of time they have occurred.
- The larger the **D** gain, the faster the controller will predict needed future corrections based on the current rate of change in the system. This often results in slowing the system down to minimize overshoot and oscillations.

Troubleshooting valve performance with PID tuning

The following issues can often be resolved by adjusting the PID gain values for your pressure controller.

Fast oscillation around the setpoint

- **PD**: Reduce the P gain in decrements of 10%
- **PD²I**: Increase the P gain in increments of 10%, and then adjust the I gain to fine-tune.

Overshot setpoint

- **PD**: Reduce the P gain in decrements of 10%.
- **PD²I**: If D is not zero, increase the P gain in increments of 10%.

  In rare situations D may be zero; in that case, decrease the P gain in 10% increments to avoid overshoot.

Delayed or unattained setpoint

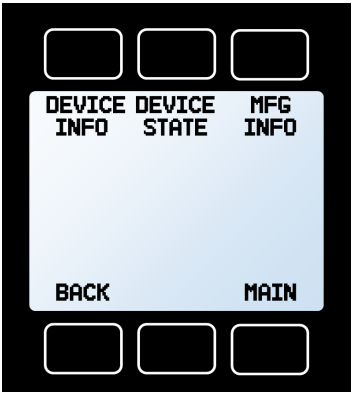
- **PD**: Increase the P gain in increments of 10%, and then decrease the D gain by small amounts to fine-tune.
- **PD²I**: Increase the P gain in increments of 10%, and then increase the I gain to fine-tune.

Valve tuning can be complex. If you have any trouble, please call support (page 2) to guide you through the process. Or, visit alicat.com/pid for more detailed instructions.

Device Information

Menu → About

- **DEVICE INFO** displays serial number, firmware, and calibration information.
- **DEVICE STATE** shows information for troubleshooting (see below).
- **MFG INFO** displays manufacturer contact information.
- **BACK** returns to the Main Menu (page 17).
- **MAIN** exits to the Main Display (page 7).

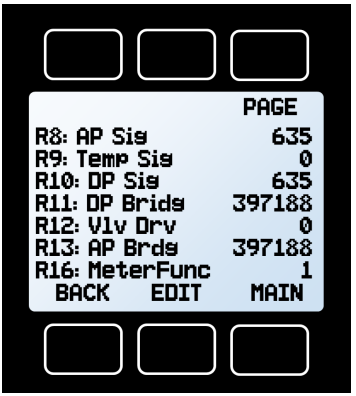


About Menu

Diagnostic Information

Menu → About → Device State

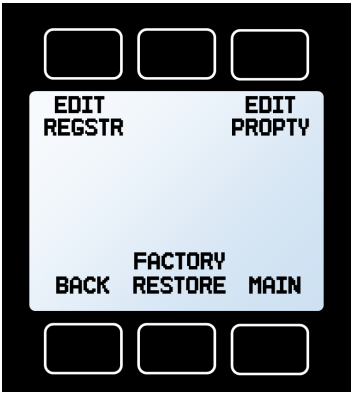
The **DEVICE STATE** screen displays live values for the internal device registers. Support engineers may need them to diagnose issues over the phone. **PAGE** displays the next page of register values.



Device State Information

Menu → About → Device State → EDIT

- **EDIT REGSTR** allows the user to edit any register values on the device. This can also be done via serial communication.
- **EDIT PROPTY** allows the user to send commands to adjust the device interface/serial data frame.
- **BACK** returns to the Device State page.
- **FACTORY RESTORE** resets settings to default (the last time it left the factory).
- **MAIN** exits to the Main Display (page 7).



Device State Information Editing Menu

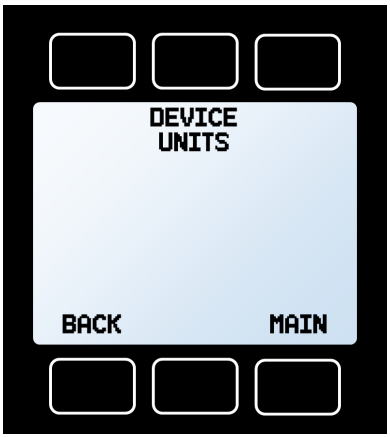
Do not change register values without help from an applications engineer. Incorrect settings can permanently damage to the device.

Basic Configuration Menu

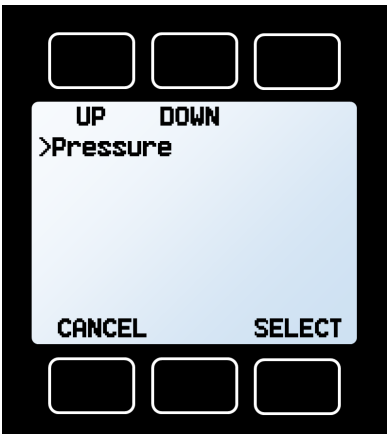
Engineering Units

There are two types of engineering units:

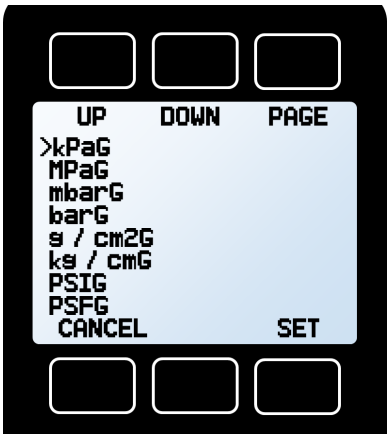
- **Button Engineering Units:** Changes the units on the front display only.
- **Device Engineering Units:** Changes the units on the front display and serial data frame.



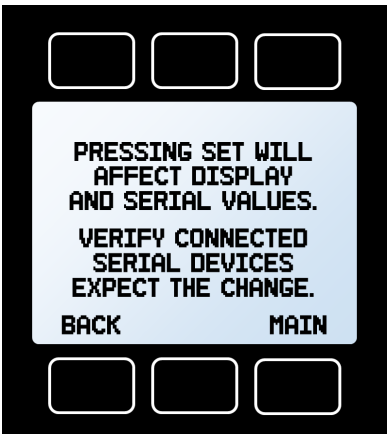
1: *Basic Configuration Menu*



2: *Parameters in Device Units Menu*



3: *Available Pressure Engineering Units*

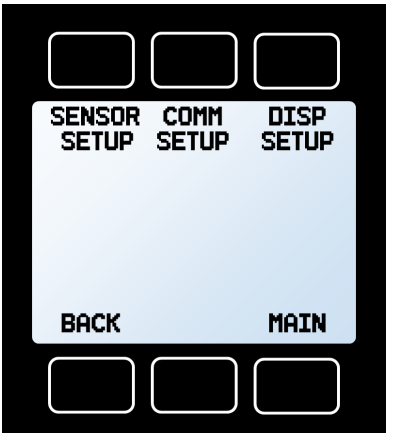


4: *Confirming Device Engineering Units*

Advanced Setup

Menu → Advanced Setup

- **SENSOR SETUP** (page 30), **COMM SETUP** (page 31), and **DISP SETUP** (below) enter their respective menus.
- **BACK** returns to the top-level Main Menu (page 17).
- **MAIN** exits to the Main Display (page 7).



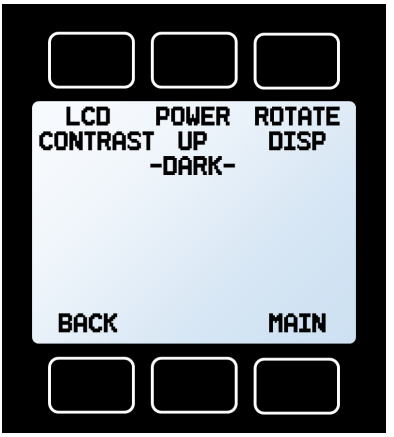
Advanced Setup Menu

Display Setup

Menu → Advanced Setup → Disp Setup

The options in the Display Setup menu adjust the contrast of the display and enable screen rotation.

- **LCD CONTRAST** sets the contrast level of the display, ranging from 0–31 on monochrome displays, and 0–11 on color displays. Press reset to revert to the default contrast level.
- **POWER UP –DARK– or –LIT–** toggles whether the back light of the unit will be on or off when the device powers on. This is not available on color displays.



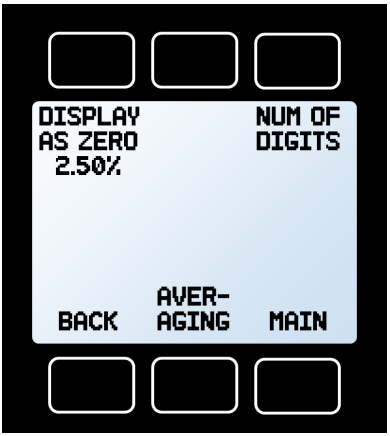
Display Setup Menu

- **ROTATE DISP** displays a sub-menu to change the screen orientation, by rotating it 180°.
- **BACK** returns to the Advanced Setup Menu (above).
- **MAIN** exits to the Main Display (page 7).

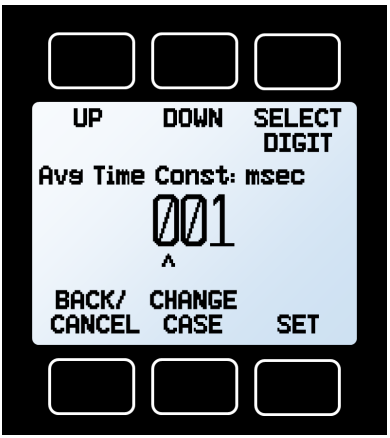
Sensor Setup

Menu → Advanced Setup → Sensor Setup

- **DISPLAY AS ZERO** (zero band) defines a pressure under which values are displayed as zero, and displays the current setting. The maximum zero band is 6.38%.
- **NUM OF DIGITS** sets the number of digits of pressure readings to display on-screen and in the serial data frame. Older devices typically had one less significant digit, and newer devices can be set to match.
- **BACK** returns to the Advanced Setup Menu (page 29).
- **AVERAGING** adjusts the time constant of the geometric running average for pressure. Values roughly correspond to the time constant (in ms) of the averaged values. Maximum averaging is 255 ms.
- **MAIN** exits to Main Display (page 7).



Sensor Setup Menu



Averaging Menu

Configuring Serial Communications

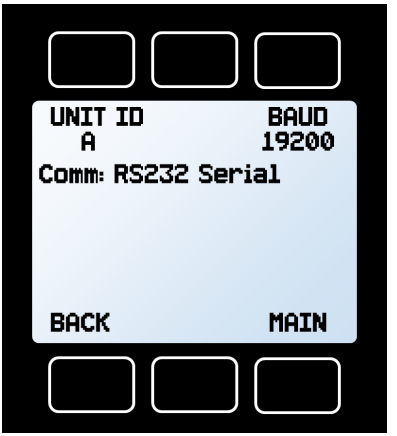
Menu → Advanced Setup → Comm Setup

Unit ID

The unit ID is the identifier that a computer uses to distinguish a controller from other devices when it is connected to a network. Using the unit ID letters **A–Z**, you can connect up to 26 devices to a computer at the same time via a single COM port. This is called polling mode (page 33). Unit ID changes take effect when **SET** is selected.

Selecting **@** as the Unit ID will set the controller to streaming mode when you exit the menu (page 33).

NOTE: *Devices equipped with Modbus RTU will also have a Modbus ID that can be set separately from the unit ID.*

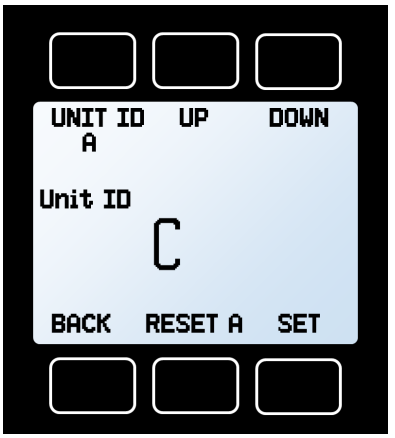


Comm Setup Menu

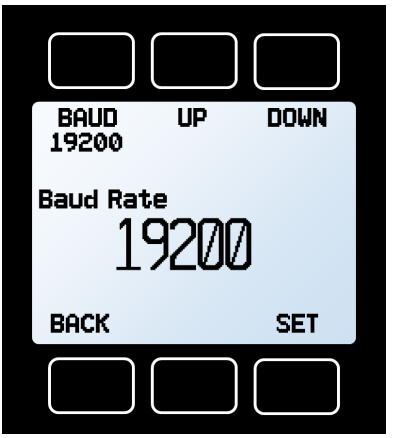
Baud Rate

Baud rate is the speed at which digital devices transfer information. The flow controller has a default baud rate of 19200 baud (bits per second). Baud rate changes take effect once you press **SET**. The computer, device, and software must all have the same baud rate.

Available baud rates include: 2400, 9600, 19200, 38400, 57600, and 115200.



Unit ID Menu



Baud Rate Setup Menu

Serial Communication

Connecting your device to a computer allows you to log the data that it generates. The pressure controller communicates digitally through its communications connector and cable using a real or virtual COM port on your computer. This section of the manual shows you how to operate the flow controller using ASCII commands.

Establishing Communication

After connecting your pressure controller using a communications cable, you will need to establish serial communications through a real or virtual COM port on your computer or programmable logic computer (PLC).

- If you have connected your device to a serial port, note its COM port number. This can be found in Windows® Device Manager.
- If you have used a USB cable to connect your device to your computer, then in most cases it will recognize your USB as a virtual COM port. If it does not, download the appropriate USB device driver at alicat.com/drivers and note the COM port number as found in Windows® Device Manager.

The controller will be configured with the following settings:

- **Baud:** 19200 (by default; others can be used if the computer, its software and the controller are all set to the same rate)
- **Data bits:** 8
- **Parity:** none
- **Stop bits:** 1
- **Flow control:** none

Alicat's Serial Terminal Application

Alicat's Serial Terminal is a preconfigured program for serial communications that functions much like the older Windows® HyperTerminal.

Download Serial Terminal for free at alicat.com/drivers. Once downloaded, simply run SerialTerminal.exe. Enter the COM port number to which your device is connected and the baud rate of the flow controller. The default baud rate is 19200, but this is adjustable by entering the **SERIAL COMM** Menu on your flow controller: **MENU → ADV SETUP → COMM SETUP → BAUD** (previous page).

Note: *In what follows, ↵ indicates an ASCII carriage return (decimal 13, hexadecimal D). For many devices, this is the same as hitting the Enter key. Serial commands are not case-sensitive.*

Polling Mode

Your controller is shipped in polling mode with a unit ID of **A**, unless requested otherwise. Each poll returns one line of data every time you request it. To poll, simply enter its unit ID.

Poll the device: `[unit ID]↵`
Example: `a↵` (polls unit A)

You can change the unit ID of a polling device by typing:

Change the unit ID: `[current unit ID]@=[desired unit ID]↵`
Example: `a@=b↵` (changes unit A to unit B)

The front panel menu can also be used to change the unit ID: **MENU** → **ADV SETUP** → **COMM SETUP** → **UNIT ID** (page 31). Valid IDs are letters A–Z, and up to 26 devices may be connected at a time, as long as each unit ID is unique.

Streaming Mode

In streaming mode, your device continuously and automatically sends a line of live data at regular intervals. Only one unit on a COM port may be in streaming mode at a time.

To put your flow controller into streaming mode, type:

Begin streaming: `[unit ID]@=@↵`
Example: `A@=@↵` (Begins streaming unit A)

This is equivalent to changing the unit ID to "@". To take the flow controller out of streaming mode, assign it a unit ID by typing:

Stop streaming: `@@=[desired unit ID]↵`
Example: `@@=a↵` (stops and assigns unit ID of A)

When sending a command in streaming mode, the flow of data will not stop while the user is typing. This may make the commands you type illegible. If the device does not receive a valid command, the command will be ignored. If in doubt, simply hit ↵ and start again.

Note: *The default streaming interval is 50 ms, but this can be modified by editing Register 91 while the device is in polling mode:*

Set streaming interval: `[unit ID]w91=[time in milliseconds]↵`
Example: `aw91=500↵` (streams data every 500 ms)

Taring

Be sure to tare your pressure controller before collecting data. If auto-tare is enabled, provide a zero setpoint until auto-tare activates, usually after a few seconds, depending on the device's full-scale pressure.

The controller can also be tared from the front panel. See page 17.

Serial commands can be used to manually tare the device:

Taring pressure aligns the internal gauge pressure sensor with the current barometric pressure, and must be done with the pressure controller open to atmosphere. Taring a differential pressure controller (page 10) zeros the differential pressure reading between the two measured points in the system as equal.

Tare gauge pressure: `[unit ID]p↵`
Example: `ap↵`

Absolute pressure devices cannot tare.

Collecting Pressure Data

Collect live pressure data by typing the `[unit ID]↵` command or by setting your pressure controller to streaming. Each line of data for live measurements appears in the format below, but Unit ID is not present in streaming mode.

```
A   20.00  +20.00
ID  Pressure  Setpoint
```

Single spaces separate each parameter, and each value is displayed in the chosen device engineering units, which may differ from the engineering units visible on the pressure controller display (see page 28). You can query the engineering units of the serial data frame by typing:

Query live data info: `[unit ID]??d*↵`
Example: `a??d*↵`
(returns the data frame descriptions)

Additional information, including status messages (page 7), may be present at the end of the line.

Commanding a New Setpoint

Before attempting to send setpoints to your pressure controller serially, confirm that its setpoint source is set to **Serial/Front Panel** by selecting **MENU** → **CONTROL** → **ADV CONTROL** → **SETPT SOURCE**.

There are two ways to command a new setpoint over a serial connection, as described below. In either of these methods, the data frame returns the new setpoint value when it has been accepted as a valid setpoint.

Sending Setpoints as Floating Point Numbers

This is how to send the desired setpoint value as a floating point number in the selected engineering units:

New setpoint: [unit ID]**s**[floating point number setpoint]↵
Example: **as5.44**↵
(setpoint of +5.44 PSIG)

New setpoint: [unit ID]**s**[floating point number setpoint]↵
Example: **as-15.00**↵
(setpoint of –15.00 PSIG)

Sending Setpoints as Integers

In this method, your controller's **full scale range (FS)** is represented by a value of 64000, and a zero setpoint is represented by 0. To calculate your intended setpoint, use the following formula:

Integer value = 64000 × [desired setpoint]/[device full scale]

Example: A desired setpoint of +6.00 PSIG on a 15 PSIG pressure controller is calculated as 64000 × 6.00/15.00 = **25600**. The command to assign the setpoint based on this integer value is:

New setpoint: [unit ID][setpoint as integer where 64000 is FS]↵
Example: **a25600**↵
(setpoint of +6.00 PSIG)

Quick Command Guide

Note: *Serial commands are not case-sensitive.*
In these examples, the unit ID of the controller is a.

Change unit ID:	[current unit ID]@=[desired unit ID]↵
Tare pressure:	ap↵
Poll the live data frame:	a↵
Begin streaming data:	a@=@↵
Stop streaming data:	@@=[desired unit ID]↵
Set streaming interval:	aw91=[number of milliseconds]↵
New setpoint:	as[setpoint as floating point #]↵
New setpoint:	a[setpoint as integer where 64000 is full scale]↵
Hold valve(s) at current position:	ahp↵
Hold valve(s) closed:	ahc↵
Cancel valve hold:	ac↵
Query live data info:	a??d*↵
Manufacturer info:	a??m*↵
Firmware version:	a??m9↵
Lock the front display:	al↵
Unlock front display:	au↵

More information can be found on our online Serial Primer document, at:
Alicat.com/drivers

If you have need of more advanced serial communication commands, please contact support (page 2).

Troubleshooting

If you run into trouble with your device's installation or operation, please get in touch with us (see page 2). You'll also find help on our website alicat.com and in the pages that follow.

General Use

Issue: *My controller does not turn on or has trouble staying on.*
Action: Check power and ground connections. Refer to the technical specifications to ensure you have the proper power for your model.

Issue: *The buttons do not work, and the screen shows* **LCK.**
Action: The pressure controller buttons were locked out via a serial command. Press and hold all four outer buttons to unlock the interface.

Issue: *I can't read the display easily.*
Action: During daytime, increase the visibility of the display by increasing the contrast (**MENU** → **ADV SETUP** → **DISP SETUP** → **LCD CONTRAST**) (page 29). For low-light conditions, push the logo button located below the display to turn on the backlight (see page 7).

Issue: *The analog output signal indicates values lower than what appears on my instrument's display.*
Action: Analog signal voltage degrades over long distances. You can minimize this effect by using wires with a heavier gauge, especially in the ground wire.

Issue: *How often do I need to calibrate my pressure controller?*
Action: Annual recalibrations are recommended. Check your pressure controller's last calibration date by selecting **MENU** → **ABOUT** → **DEVICE INFO**. If it is time to recalibrate, request a recalibration at alicat.com/service or get in touch with support (see page 2).

Issue: *I dropped my controller. Is it OK? Do I need to recalibrate?*
Action: If it turns on and appears to respond normally, then it is probably OK. It may or may not need a recalibration. Give it a tare, and compare it against a known good standard. If it checks out, keep using it, but tell us about the drop at your next annual recalibration so we can check it out for you.

Issue: *How can I see pressure in different units?*
Action: From the Main Menu, select **BASIC CONFIG** → **DEVICE UNITS**. From this menu, you can adjust pressure units. For more information, see page 28.

Pressure Readings

Issue: *My controller won't reach its setpoint.*
Action: You must ensure that there is enough supply pressure to reach the setpoint. If increasing the pressure doesn't help, check to see if there is a clog. Teflon tape can get stuck in the flow channel and block flow (see page 8). Make sure to clean out any loose Teflon tape and never tape the first two threads entering the device to help avoid this issue

Issue: *My pressure readings are negative.*
Action: If there is no flow or positive pressure, then a negative pressure reading can indicate a poor tare (see page 17). Ensure pressure is at zero, and tare.

Issue: *My pressure readings jump to zero when pressures are low.*
Action: Check the dead band (or "display as zero") settings, which will round down all values below a specified point to zero (see page 30).

Issue: *Does the controller work if it is laying down? Will it be accurate?*
Action: Yes to both for small valve controllers! The pressure controller is internally compensated for many situations, so you can use it sideways, on its back, or upside-down. For upside-down installations, you may want to rotate the display 180° (page 29). However, they should be tared again after changing their orientation. Large-valve controllers (PCR- and PCR3-Series) should be operated with the valve cylinder vertical and upright.

Issue: *Can I attach the controller to a vibrating device? Will it be accurate?*
Action: Yes, and yes! The pressure controller is internally compensated for any changes in orientation, including rapid vibrations. Noise will increase if the pressure controller is vibrating. Large-valve controllers are not recommended for use on vibrating surfaces.

Issue: *Can I use the controller with other gases or liquids?*
Action: Yes for gases, maybe for liquids. Your pressure controller is designed to operate independent of the media being used. One thing to check before changing gases or liquids is the chemical and material compatibility of the gas being used with the wetted materials inside the controller. We also recommend contacting support (page 2) before switching over to liquid pressure control.

Serial Communications

Issue: *My computer can't communicate with the controller.*

Action: **1.** Make sure the baud rate and other serial settings such as the COM port number are the same as your controller (see page 31).

2. Check the pressure controller unit's serial ID (also on page 31).

3. Check the pinout (see page 42, or online at alicat.com/pinouts).

4. Make sure the COM number matches the one your software is using to connect to the flow controller (page 32).

Still experiencing issues?

Issue: *None of the above helped.*

Action: See page 2 for contact information, or visit alicat.com/support.

Maintenance

Cleaning

This device requires minimal maintenance. If necessary, the outside of the device can be cleaned with a soft, dry cloth. Avoid excess moisture or solvents.

The primary cause of damage and/or long-term inaccuracy in these devices is contamination and/or corrosion damage. Gases and liquids should be filtered for particulates or biological materials that may grow in the device. When removing these units from the line for any extended period of time, make an effort to remove all of the gas or liquid from the device, as deposits of calcium, soluble minerals, or other particulates can affect the accuracy of the device.

If you suspect that debris or other foreign material has entered your device, do not take apart the flow body to clean it, as this will negate its NIST-traceable calibration. Please contact us (see page 2) for cleaning.

Recalibration

The recommended period for recalibration is once every year. A label located on the back of the device lists the most recent calibration date. This date is also stored by your pressure controller and is visible by selecting **MENU** → **ABOUT** → **DEVICE INFO** (page 27).

When it is time for your pressure controller's annual recalibration, contact us (see page 2) with your serial number.

Replacement Accessories

Accessories are available through support (see page 2), or visiting our website at alicat.com/accessories.

For repair, recalibration, or recycling of this product contact us (see page 2).

Technical Specifications and Dimensional Drawings

Please visit alicat.com/specs to find complete operating specifications and dimensional drawings.

Engineering Units

Pressure Units

Absolute	Gauge	Differential	Notes
PaA	PaG	PaD	pascal
hPaA	hPaG	hPaD	hectopascal
kPaA	kPaG	kPaD	kilopascal
MPaA	MPaG	MPaD	megapascal
mbarA	mbarG	mbarD	millibar
barA	barG	barD	bar
g/cm2A	g/cm2G	g/cm2D	gram force per square centimeter
kg/cmA	kg/cmG	kg/cmD	kilogram force per square centimeter
PSIA	PSIG	PSID	pound force per square inch
PSFA	PSFG	PSFD	pound force per square foot
mTorrA	mTorrG	mTorrD	millitorr
torrA	torrG	torrD	torr
mmHgA	mmHgG	mmHgD	millimeter of mercury at 0°C
inHgA	inHgG	inHgD	inch of mercury at 0°C
mmH_2OA	mmH_2OG	mmH_2OD	millimeter of water at 4 C (NIST conventional)
mmH_2OA	mmH_2OG	mmH_2OD	millimeter of water at 60°C
cmH_2OA	cmH_2OG	cmH_2OD	centimeter of water at 4°C (NIST conventional)
cmH_2OA	cmH_2OG	cmH_2OD	centimeter of water at 60°C
inH_2OA	inH_2OG	inH_2OD	inch of water at 4 °C (NIST conventional)
inH_2OA	inH_2OG	inH_2OD	inch of water at 60°C
atm			atmosphere
m asl			meter above sea level (only in /ALT builds)
ft asl			foot above sea level (only in /ALT builds)
V	volt; no conversions are performed to or from other units		
count	count	count	setpoint count, 0–64000
%	%	%	percent of full scale

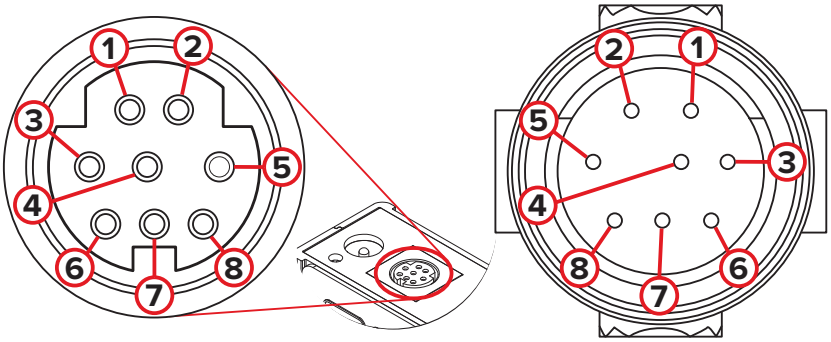
Time Units

Label	Notes
h:m:s	hours:minutes:seconds
ms	milliseconds
s	seconds
m	minutes
hour	hours
day	days

Pinouts

Check the calibration data sheet and pinout for your device.
See page 32 for additional important information about connecting your device to a computer for serial commands. Individual pinouts available at alicat.com/pinout.

8-Pin Mini-DIN (Default)

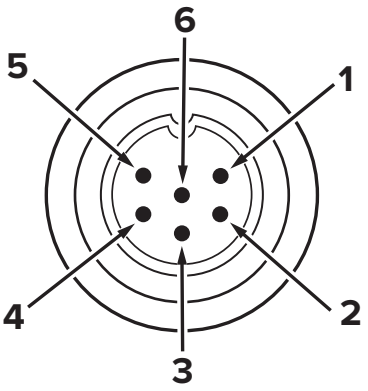


Female Connector: Device Male Connector: Cable

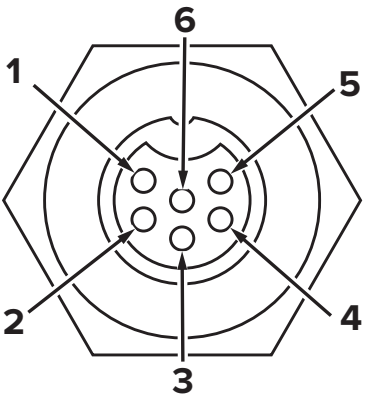
Pin	Cable Color	Function
1	Black	Not Connected *Optional: 4–20 mA primary output signal*
2	Brown	Static 5.12 Vdc Optional: Secondary analog output *(4–20 mA, 0–5 Vdc, 1–5 Vdc, 0–10 Vdc) or basic alarm*
3	Red	Serial RS-232RX Input Signal *Optional: RS-485 A*
4	Orange	Analog Setpoint Input
5	Yellow	Serial RS-232TX Output Signal *Optional: RS-485 B*
6	Green	0–5 Vdc Analog Out *Optional: 1–5 Vdc or 0–10 Vdc) output signal*
7	Blue	Power In
8	Purple	Ground (common for power, digital communications, analog signals, and alarms)

Caution: *Do not connect power to pins 1 through 6, as permanent damage can occur. It is common to mistake pin 2 (labeled 5.12 Vdc Output) as the standard 0–5 Vdc analog output signal. Pin 2 is normally a constant 5.12 Vdc that reflects the system bus voltage.*

Locking Industrial Connector Pinout



Male Connector: Cable

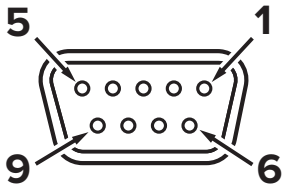


Female Connector: Device

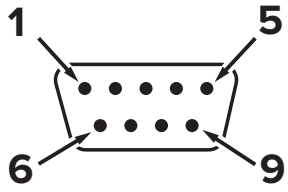
Pin	Function
1	Power In (+)
2	RS-232TX / RS-485 B
3	RS-232RX / RS-485 A
4	Analog Setpoint Input
5	Ground (common for power, communications, and signals)
6	Analog Out (voltage or current as ordered)

Note: *The availability of different output signals depend on the options ordered.*

9-pin D-Sub Connector Pinouts



Female Connector



Male Connector

Common 9-pin D-Sub Pinouts

Pin	DB9 (Female) DB9M (Male)	DB9A / DB9K	DB9R	DB9T	DB9U
1	Current Out	NC	TX or B	TX or B	RX or A
2	Analog Out 2	Analog Out	Analog Out	Analog Out	Analog Out
3	RX or A	Power In	Analog In	Power In	Power In
4	Analog In	Ground	Ground	Ground	Ground
5	TX or B	TX or B	NC	NC	NC
6	Analog Out	Analog In	RX or A	Analog In	Analog In
7	Power In	Ground	Power In	Ground	Ground
8	Ground	Ground	Ground	Ground	Ground
9	Ground	RX or A	Ground	RX or A	TX or B

Pin	DB9B	DB9G	DB9H	DB9I	DB9N
1	Analog Out 2	RX or A	TX or B	NC	Power In
2	Analog Out	Analog Out	Analog Out	Analog Out	Analog In
3	Power In	Ground	Analog In	Power In	Analog Out
4	Ground	Power In	RX or A	Ground	NC
5	Ground	Ground	Analog Out 2	NC	Ground
6	Analog In	TX or B	NC	Analog In	Ground
7	Ground	Analog In	Power In	Ground	RX or A
8	TX or B	Current Out	Ground	RX or A	TX or B
9	RX or A	Ground	Ground	TX or B	NC5

Key of Terms:

Analog In
Analog Setpoint Input

Analog Out
0–5 Vdc output signal (1–5, 0–10 Vdc optional)

Analog Out 2
5.12 Vdc or optional secondary analog output

Current Out
Not connected

NC Not connected

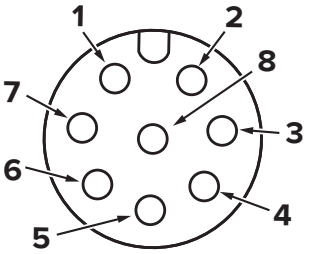
Power In (+Vdc)

RX or A
Serial RS-232RX or RS-485 A

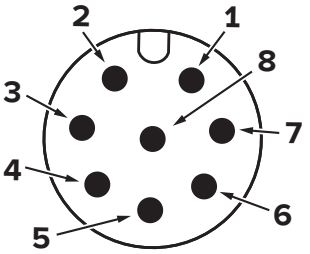
TX or B
Serial RS-232TX or RS-485 B

Ground
Common for power, digital communications, analog signals, alarms

M12 Connector Pinouts



Female Connector: Cable

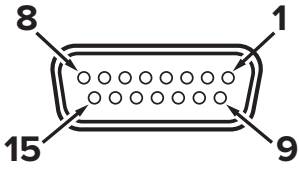


Male Connector: Device

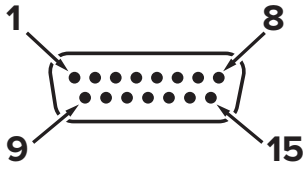
Common M12 Pinouts

Pin	M12	M12MD
1	**0–5 Vdc Output Signal** *Optional: 1–5 or 0–10 Vdc*	**Not Connected** *Optional: 4–20 mA primary output signal*
2	**Power In**	**Static 5.12 Vdc** *Optional: Secondary analog output (4–20 mA, 0–5 Vdc, 1–5 Vdc, 0–10 Vdc) or basic alarm*
3	**Serial RS-232 RX signal** *Optional: RS-485 A*	**Serial RS-232 RX Signal** *Optional: RS-485 A*
4	Analog Setpoint Input	Analog Setpoint Input
5	**Serial RS-232 TX signal** *Optional: RS-485 B*	**Serial RS-232 TX Signal** *Optional: RS-485 B*
6	**Static 5.12 Vdc** *Optional: Secondary analog output (4–20 mA, 0–5 Vdc, 1–5 Vdc, 0–10 Vdc) or basic alarm*	**0–5 Vdc Output Signal** *Optional: 1–5 or 0–10 Vdc*
7	**Ground** (common for power, digital communications, analog signals, and alarms)	**Power in**
8	**Inactive** *Optional: 4–20 mA primary output signal*	**Ground** (common for power, digital communications, analog signals, and alarms)

15-Pin D-Sub Connector Pinouts



Female Connector: Cable



Male Connector: Device

Common 15-pin D-Sub Pinouts

Pin	DB15	DB15A	DB15B	DB15H	DB15K	DB15O	DB15S
1	Ground	Ground	Ground	NC	NC	Ground	Ground
2	Analog Out	Analog Out	Analog Out	RX or A	Analog Out	NC	Analog Out
3	Ground	Analog In	NC	NC	NC	NC	NC
4	NC	Ground	NC	NC	NC	Analog Out	NC
5	Power In	Ground	Power In	Ground	Ground	Power In	Ground
6	NC	Ground	NC	Analog Out	NC	NC	NC
7	NC	Power In	NC	Ground	Power In	Analog In	NC
8	Analog In	TX or B	Analog In	NC	Analog In	NC5	Analog In
9	Ground	Ground	Ground	NC	Analog Out 2	Ground	Ground
10	Ground	NC	Ground	Analog Out 2	NC	Ground	Ground
11	Analog Out 2	NC	Analog Out 2	Power In	Ground	Analog Out 2	Analog Out 2
12	NC	Analog Out 2	NC	Ground	Ground	NC	RX or A
13	RX or A	NC	NC	NC	RX or A	NC	Power In
14	Ground	NC	RX or A	Analog In	TX or B	RX or A	TX or B
15	TX or B	RX or A	TX or B	TX or B	Ground	TX or B	Ground

Key of Terms:

Current Out
Not Connected

Analog In
Analog Setpoint Input

Analog Out
0–5 Vdc Output Signal
(1–5, 0–10 Vdc optional)

Analog Out 2
5.12 Vdc or Optional
Secondary Analog Output

TX or B
Serial RS-232TX or RS-485 B

RX or A
Serial RS-232RX or RS-485 A

NC Not Connected

Power In (+Vdc)

Ground
Common for power, digital communications, analog signals, and alarms

Additional Information for CSA and ATEX Approved Devices

II 3 G

Ex ec IIC T4 Gc
Sira 19ATEX4045X
Class I, Division 2, Group A, B, C and D, T4
24 Vdc, 0.800A maximum • T_{amb} –40°C to +60°C

Ex ec IIC T4 Gc
Class 1, Zone 2 AEx ec IIC T4 Gc
CSA 08CA2009485X

CSA and ATEX approved devices are equipped with a 6-pin locking industrial connector, but may be ordered with a different locking connector. Please see the pinouts (starting page 42) for your device's power and signal connections.

CSA certifies the use of this product for general use as well as use in hazardous locations as defined by Class 1 Division 2 Group A, B, C, and D, T4.

The examination certificate was issued by the CSA in accordance with accepted practices and procedures. This confirms compliance with the European ATEX Directive or Group II Category 3G equipment.

ATEX certification is indicated by the product label, and not by the statements in this, or any accompanying documentation. To comply with CSA and ATEX certification, devices have special required conditions to stay in compliance:

- When equipment is properly labeled, it is suitable in Class I, Division 2, Group A, B, C, and D, T4.
- Equipment is only certified for use in ambient temperatures from –40°C to +60°C.
- Electrical Rating 24 Vdc, 0.800A max.
- Instruments shall be powered by a CSA certified, UL listed, Class II external power supply suitable for the application.
- Instruments shall be housed in an enclosure with a minimum IP54 rating or location providing equivalent protection.
- Instrument's final approval shall be provided by the local authority having jurisdiction.

WARNINGS:

EXPLOSION HAZARD – *DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.*

EXPLOSION HAZARD – *SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.*

Limited Lifetime Warranty

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Note: Although we provide assistance on Alicat Scientific products both personally and through our literature, it is the complete responsibility of the user to determine the suitability of any product to their application.

Alicat Scientific, Inc. warrants to the original purchaser (hereinafter referred to as "Buyer") that instruments manufactured by Alicat Scientific (hereinafter referred to as "Product") shall be free from defects in materials and workmanship for the life of the Products.

Under this warranty, the Products will be repaired or replaced at manufacturer's option, without charge for parts or labor when the Product is carried or shipped prepaid to the factory together with proof of purchase.

The foregoing shall constitute the exclusive and sole remedy in lieu of other remedies of the Buyer for any breach by Alicat Scientific of this warranty to the maximum extent permitted by law.

This warranty does not apply to any Product which has not been installed or used in accordance with the Product operation and installation specifications provided to Buyer verbally or in writing by Alicat Scientific for the proper and normal use of the Product.

Buyer agrees hereunder that Alicat reserves the right to void any warranty, written or implied, if upon Alicat's examination of Product shall disclose to Alicat's satisfaction that the Product failure was due solely, or in part, to accident, misuse, neglect, abuse, alteration, improper installation, unauthorized repair or improper testing by Buyer or agent of Buyer.

Alicat Scientific shall not be liable under any circumstances for indirect, special, consequential, or incidental damages in connection with, or arising out of, the sale, performance, or use of the Products covered by this warranty.

Alicat Scientific does not recommend, warrant or assume responsibility for the use of the Products in life support applications or systems.

Alicat's warranties as herein above set forth shall not be enlarged, diminished or affected by, and no obligation or liability shall arise or grow out of Alicat's rendering of technical advice in connection with Buyer's order of the Products furnished hereunder.

If Product becomes obsolete, Alicat Scientific, at its own discretion, reserves the right to repair the Product with available replacement parts or upgrade the Product to a current, commercially available version of the original Product. Should upgrading the Product be deemed necessary by Alicat, Buyer hereby agrees to pay an upgrade fee equal to seventy percent of the retail value of the replacement Product. Alicat Scientific hereunder makes no claim that replacement Products will look, function or operate in the same or similar manner as the original product.

When a Product is returned to Alicat Scientific for recalibration this service is considered normal preventative maintenance. Recalibration of Product shall not be treated as a warranty service unless recalibration of Product is required as the result of repairs to Product pursuant to this Warranty. Failure of Buyer to send Product to Alicat Scientific for recalibration on a yearly basis after a period of 36 months from date of manufacture will remove any and all obligations regarding repair or replacement of Product as outlined by this Warranty to Buyer from Alicat Scientific.

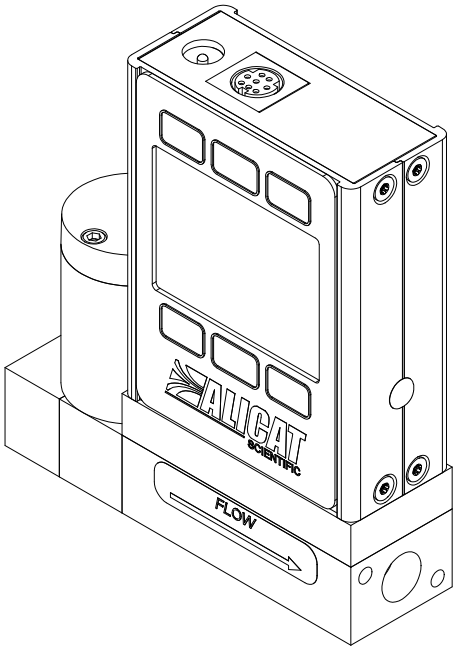
This Warranty is in lieu of all other relevant warranties, expressed or implied, including the implied warranty of merchantability and the implied warranty of fitness for a particular purpose, and any warranty against infringement of any patent.

Continued use or possession of Products after expiration of the applicable warranty period stated above shall be conclusive evidence that the warranty is fulfilled to the full satisfaction of Buyer.

Alicat makes no warranty as to experimental, non-standard or developmental Products.

Accessories purchased from Alicat are not covered by this warranty.

The product complies with the requirements of the Low Voltage Directive 2014/35/EU, the EMC Directive 2014/30/EU and the RoHS Directive 2011/65/EU and carries the CE Marking accordingly. Contact the manufacturer for more information.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FLOW

A **Halma** company

Main Menu

Accessible from **MENU** on the Main Display

- **Control (page 18)**
  - Setpoint ramping
  - Setpoint setting
  - Advanced Control
  - Setpoint source
  - Loop setup
  - Control options
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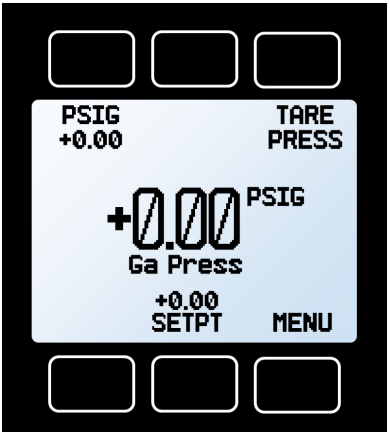
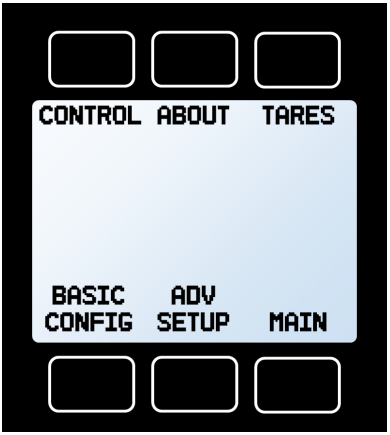
  - Manufacturer information
  - Device state
  - Diagnostic Information
- **Tares** (page 17)
  - How and when to tare
  - Tare pressure
- **Basic config** (page 28)
  - Device units
  - Pressure
- **Advanced setup** (page 29)
  - Sensor setup
  - Display as zero (dead band)
  - Number of digits
  - Pressure averaging
  - Communication setup
  - Unit ID
  - Baud
  - Display setup
  - LCD contrast
  - Power-up light
  - Display rotation
- **Main display** (page 7)



Main Display



Main Menu