ALICAT SCIENTIFIC

A **Halma** company

OPERATING MANUAL

PRESSURE GAUGES

Models P · PB · PS · PBS

Thank you for purchasing your pressure gauge.

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Recalibrate your pressure gauge every year.

Annual calibration is required to ensure the continued certainty of readings and to extend the Limited Lifetime Warranty. Fill out the Service Request Form at alicat.com/service, or contact us directly.

Serial #: _____ Next Calibration: _____

NIST This device comes with a NIST traceable calibration certificate.

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 gauge 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 7).
- **Log data to your PC**. Talk to the pressure gauge over a serial data connection to capture all pressure data, for logging and analysis purposes (see page 19).

This manual covers the following instruments:

- Pressure gauges (P-Series)
- Portable pressure gauges (PB-Series)
- Pressure gauges for aggressive fluids (PS-Series)
- Portable pressure gauges for aggressive fluids (PBS-Series)
- Devices labeled as approved for CSA Class 1 Div 2 and ATEX Class 1 Zone 2 hazardous environments. See page 34 for Special Conditions regarding the use of CSA/ATEX labeled devices.

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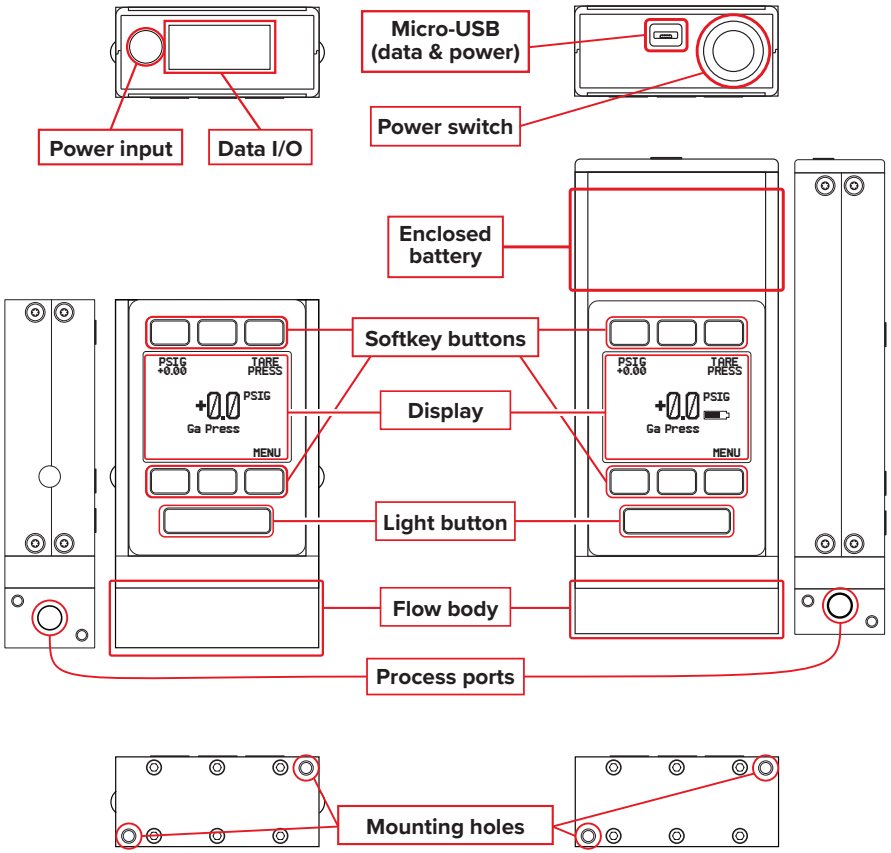
Getting Started

Getting to Know Your Pressure Gauge

Connectors and Buttons

The drawings below represent a typical configuration of a standard pressure gauge, and a standard battery-powered pressure gauge. **Your pressure gauge's appearance and connections may differ.**



The Pressure Gauge Display

The figure below identifies the various features of the pressure gauge display. **Press the button behind the Alicat logo to toggle the backlight** on and off (see page 18 for more details).

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

Engineering units are used by the pressure gauge in its serial communications and calculations. These can be different from **button units**, which are the units being displayed. These are individually configurable (see page 16).

1. Highlights **pressure** in the center of the display. Push a second time to choose the pressure parameter, or to select pressure engineering units (see page 16).

3. **TARE PRESS** **tare the pressure** (see page 22).

6. **MENU** enters the Menu system (see page 14).

7. Toggles the backlight (see more display options on page 18).

The Main Display

Note: *Buttons 2, 4, and 5 do not have functions on the main display for pressure devices.*

Status Messages

ADC Analog-digital converter error

LCK Front display is locked

POV Pressure over range of device

Mounting

All pressure gauges have mounting holes for convenient attachment to flat panels. Gauges are position insensitive and can be mounted in any orientation.

Process Ports

Your pressure gauge has been shipped with plastic and/or stainless-steel plugs fitted into its ports. To lessen the chance of contaminating the flow stream, do not remove these plugs until you are ready to install the device.

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

Absolute and gauge pressure devices may be connected into your system with the flow going in either direction for ease of viewing the display. These units are shipped with a plug for dead-end applications. This plug should be removed for flow through applications with a 3⁄16″ Hex Wrench.

Differential pressure devices have two ports for connection to the points in the system where the differential pressure is to be measured. The upstream port is for the higher pressure 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.

- If you are using a fitting that does not have a face seal, use thread-sealing Teflon tape to prevent leakage around the port threads, but **do not wrap the first two threads**. This will minimize the possibility of getting tape into the flow stream.
- If you are using a fitting that has a face seal, there is no need to apply Teflon tape to the threads.
- 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 gauge should they get into the flow stream.*

Filters

When pressure drop is not an issue, use in-line sintered filters to prevent large particulates from entering the pressure gauge.

Recommended filter size for pressure gauges: **40 microns**

Power and Signal Connections

Power can be supplied to your pressure gauge through either the power jack or the multi-pin connector on top of your device.

Power jacks require a 9–24 Vdc power supply with a 2.1 mm female positive center plug capable of supplying at least 40 mA, with an additional 40 mA for a color display. 4–20 mA analog signal outputs require at least 12 Vdc and 80 mA, and 0–10 Vdc outputs require at least 12 Vdc.

Standard 8-Pin Mini-DIN Pinout

For 6-pin locking industrial connector, M12, DB9, and DB15 pinouts, see page 29 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	Remote tare (ground to tare)
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)
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 (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.*

RS-232 or RS-485 Digital Signals

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 19 for details on how to use the data connection to issue commands.

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

Analog Signals

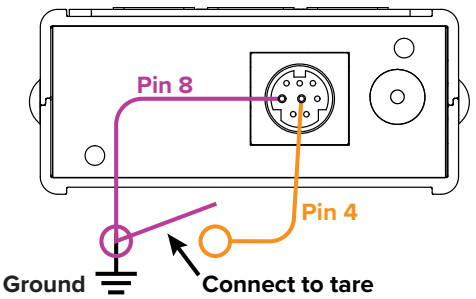
Primary Analog Output Signal

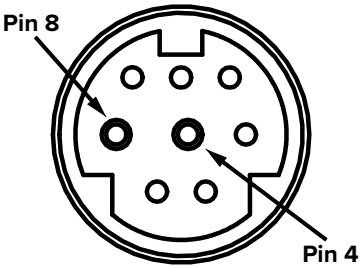
Most devices include a primary analog output signal, which is linear over its entire range. For ranges that start at 0 Vdc, a zero-pressure condition is indicated at approximately 0.010 Vdc. Full scale pressure is indicated by the top of the range: 5 Vdc for 0–5 Vdc, 20 mA for 4–20 mA signals, and so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

Using Ground to Tare

You can tare your pressure gauge remotely by momentarily grounding Pin 4, as shown below. When the switch is closed, the device will tare, and resume operation once the switch has been released. You can also tare with the front controls (page 14) or serial commands (page 22).

DB9 and other pinouts can be found on page 29.



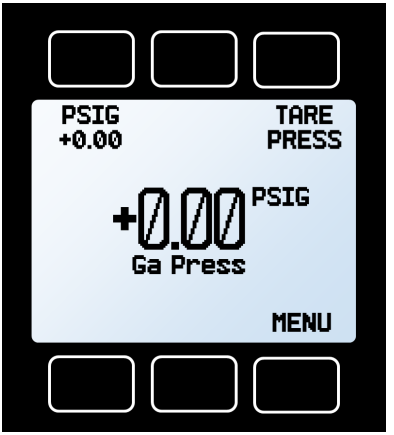


Engineering Units

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

Button engineering units are the units of measurement shown in all places on the front display.

Device engineering units are the units of measurement used for calculation and sent through a serial data connection. **These may be different from the displayed button engineering units**, if the user so chooses.



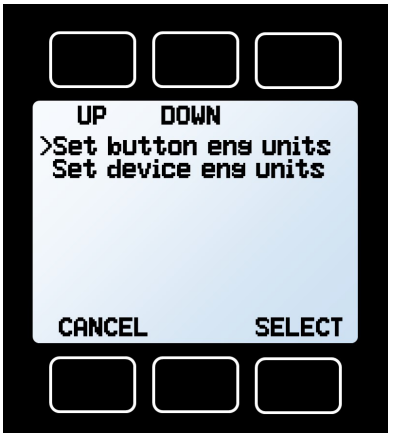
Main Display

Selecting Engineering Units

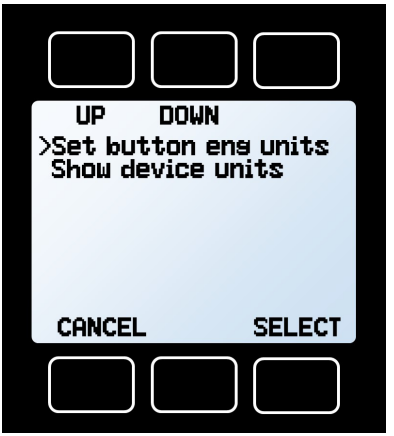
Press the button above **PSIG** to modify either the button engineering units or the device engineering units.

If the device and button engineering units are the same (below left) when entering the Engineering Units menu, it will offer to change button engineering units or device engineering units. Device engineering units can also be set in the Basic Configuration menu (page 16).

If the device and button engineering units are different (below right) when entering the menu, it will offer to change the button engineering units (**Set button eng units**), or to change the button units to match the device engineering units (**Show device units**).



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

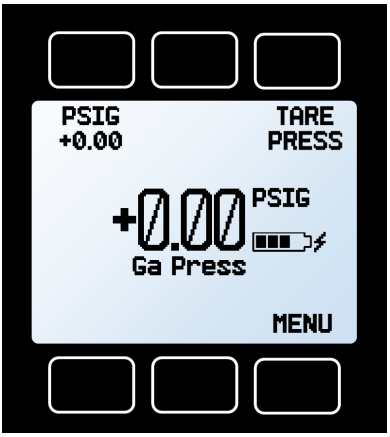


This will show if the button engineering units are the different than the device engineering units.

Option: Charging Your Portable Pressure Gauge

Portable gauges' batteries are partially charged before shipping. When fully charged, and with the backlight set to 10, typical battery life is 18 hours with a monochrome display, or 8 hours with a TFT color display. Dimming the backlight will increase battery life.

When the battery indicator displays as being completely empty, about 15 minutes of battery life remains.



Main Display for MB devices

Charge the pressure gauge using the supplied USB cable (micro-B to type A) or a similar cable. You may charge the pressure gauge using any USB outlet on a computer or portable power supply, but charging will be fastest (approximately 3.5 hours) when connected to the supplied 2.0A power supply.

The red indicator LED on top of the device lights up red to indicate that the unit is charging. The red LED turns off when the battery is charged.

Your pressure gauge may be used while it is charging. If the battery has been fully depleted, you may need to charge the pressure gauge for a full minute before the device can be turned on.

Warning: *The safe charging temperature range is 0–45°C (32–113°F). If internal sensors detect temperatures outside of this range, the battery will not charge.*

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 are indicated in white.
- **RED**: Parameters with values exceeding 128% of the device's specifications show in red.
- **YELLOW**: Menu items that are ready to be selected appear in yellow. This color replaces the symbol (>) in selections on monochrome display.

Main Display for TFT screen devices

Press the bottom-central button to turn off the color display backlight, located below the row of three buttons under the screen. The pressure gauge remains in operation while the backlight is off.

LCD Contrast

LCD contrast is ranged from 0 to 11 on color displays, with 11 indicating the greatest contrast. See page 18.

Specifications for Instruments with Color Displays

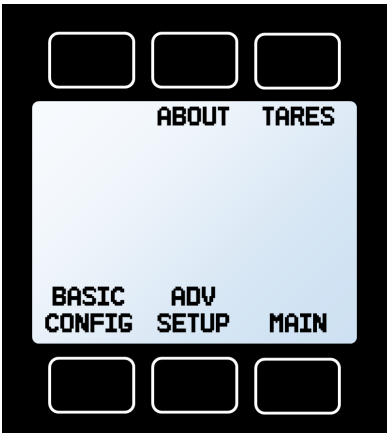
Color displays will require an additional 40 mA when using a 24 Vdc power supply. All other specifications from your device's specification sheet remain in effect.

Navigation & Customization

Main Menu

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

- **ABOUT** (page 15), **TARES** (see below), **BASIC CONFIG** (page 16), and **ADV SETUP** (page 17) enter their respective menus.
- **MAIN** exits to the Main Display (page 7).



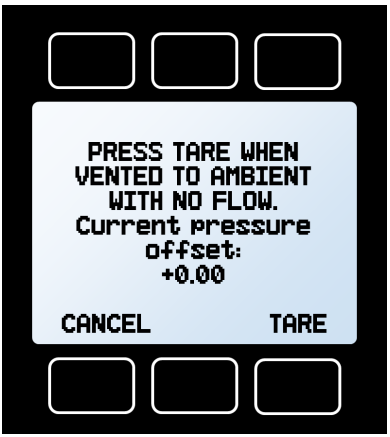
Main Menu

Taring Your Pressure Gauge

Taring ensures that your pressure gauge is providing the most accurate measurements possible by giving it a good zero reference.

How to Tare

1. From the Main Display, select **MENU** → **TARES** → **TARE PRESS**.
2. Gauge pressure device tares must be done with the pressure gauge open to atmosphere with no flow.
3. Absolute pressure devices can be tared if purchased with the operational internal barometer, and then open to atmosphere and no flow.



Tare warning and pressure offset

4. Differential pressure devices require zero differential pressure between the P1 and P2 ports. They must be either open to atmosphere on both ports, or tied to the same pressure source.

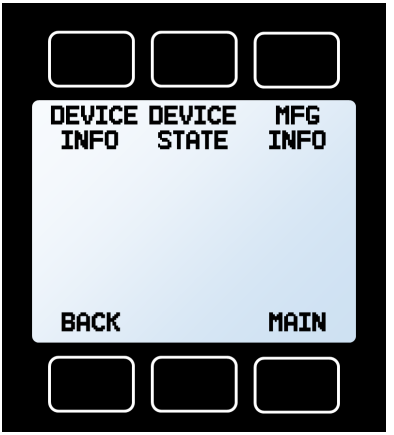
When to Tare

- Before every new pressure measurement cycle
- After significant changes in temperature or pressure
- After dropping or bumping the pressure gauge
- After installing the gauge in a different orientation

Device Information

Menu → About

- **DEVICE INFO** displays serial number, firmware revision, and calibration information.
- **DEVICE STATE** displays information for troubleshooting (see below).
- **MFG INFO** shows contact information.
- **BACK** returns to the main menu (page 14).
- **MAIN** exits to the Main Display (page 7).



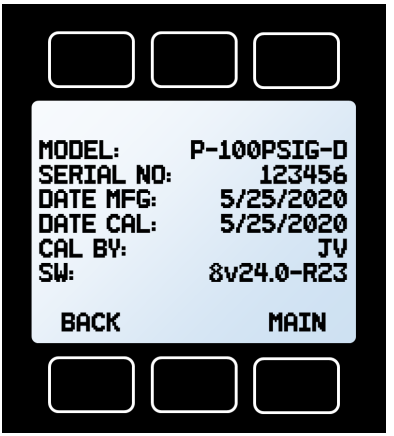
About Menu

Menu → About → Device State

Diagnostic Information

The **DEVICE INFO** screen displays information about that particular device: The model, serial number, manufacturing and calibration dates, the initials of the calibrating technician, and the firmware's revision number.

The **DEVICE STATE** screen displays live values for the internal device registers. Many of these values can help support engineers diagnose operational issues over the phone. On the **DEVICE STATE** screen, **PAGE** displays the next page of register values.

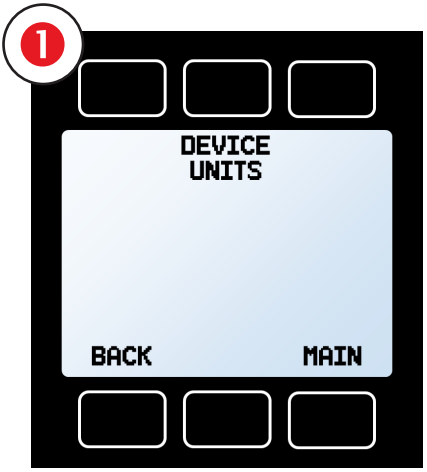


Device Information screen

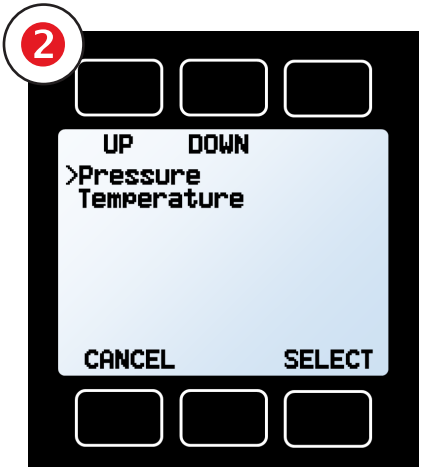
Basic Configuration Menu

Engineering Units

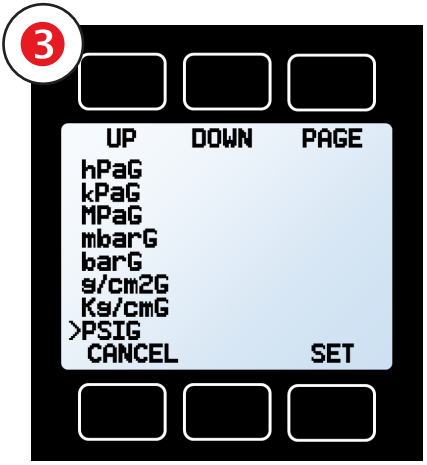
Changing device engineering units alters both the display and the serial data frame. First, choose **Device Units**, then select an engineering unit, and lastly confirm the change. Some units will only have **Pressure** listed, unless it was purchased with an optional temperature gauge.



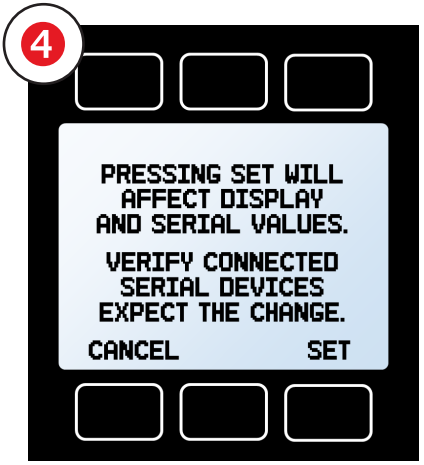
Basic Configuration Menu



Parameters in Device Units Menu



Available engineering units

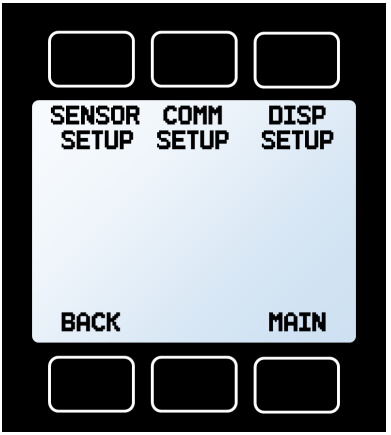


Confirming device engineering units

Advanced Setup

Menu → Advanced Setup

- **SENSOR SETUP** (see below), **COMM SETUP** (page 19), and **DISP SETUP** (page 18) enter their respective menus.
- **BACK** returns to the top-level main menu (page 14).
- **MAIN** exits to the Main Display (page 7).

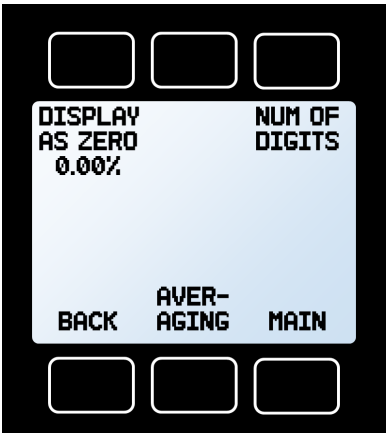


Advanced Setup Menu

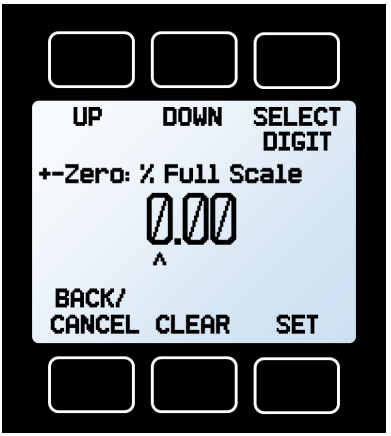
Menu → Advanced Setup → Sensor Setup

- **DISPLAY AS ZERO** defines a pressure under which values are displayed as zero. The maximum zero band is 6.38%. **Example:** A 100 PSIG pressure gauge with a 0.25% zero band would display 0 PSIG for all readings below 0.25 PSIG.
- **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.
- **CANCEL** returns to the advanced setup menu.
- **AVERAGING** adjusts the time constants of the geometric running averages for pressure. Values roughly correspond to the time constant (in ms) of the averaged values. Higher numbers have a greater smoothing effect on fluctuating readings (255 ms max).

MAIN exits to Main Display (page 7).



Sensor Setup Menu



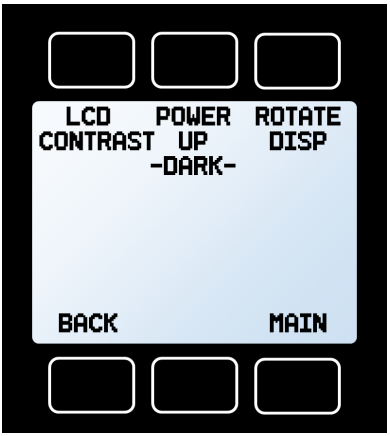
Display as Zero Menu

Display Setup

Menu → Advanced Setup → Disp Setup

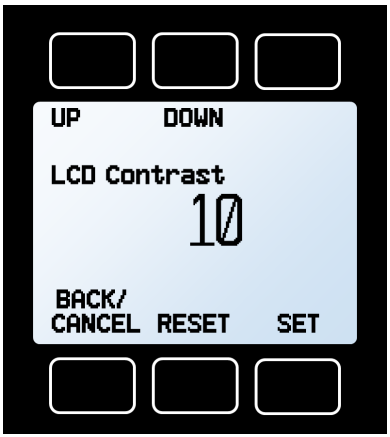
The options in the Display Setup Menu adjust the contrast of the display and enable screen rotation.

- **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.
- **ROTATE DISP** displays a sub-menu to change the screen orientation, by rotating it 180°.

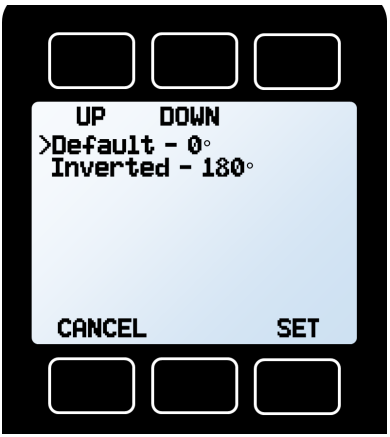


Display Setup Menu

- **BACK** returns to the Advanced Setup menu (page 17).
- **MAIN** exits to the Main Display (page 7).



LCD Contrast Menu



Rotate Display Menu

Serial Communication

Connecting your device to a computer allows you to log the data that it generates. The device 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 device using ASCII commands.

Configuring Serial Communications

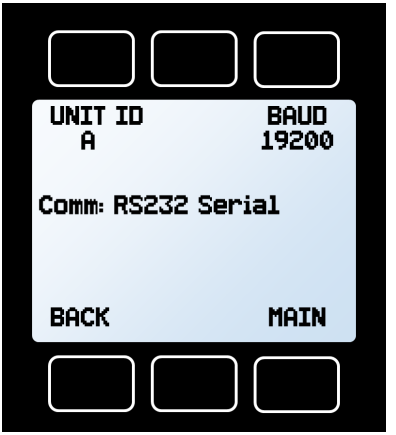
Menu → Advanced Setup → Comm Setup

Unit ID

The unit ID is the identifier that a computer uses to distinguish one device 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 21). Unit ID changes take effect when you select **SET**.

If you select @ as the Unit ID, the pressure gauge enters streaming mode when you exit the menu (page 21).

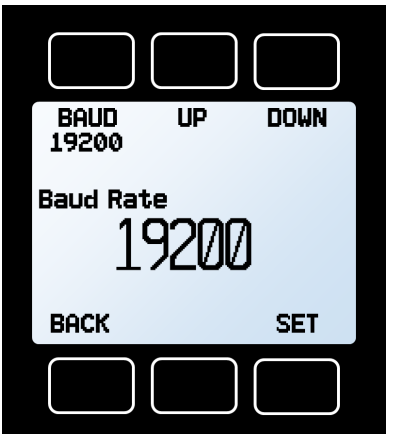
NOTE: *Devices equipped with Modbus RTU will also have a Modbus ID that can be set separately from the unit ID.*



Communications Setup Menu

Baud Rate

Baud rate is the speed at which digital devices transfer information. The pressure gauge 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.



Baud Rate Menu

Establishing Communication

After connecting your device 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, the computer in most cases will recognize your device 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 device will be configured with the following settings:

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

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 device. The default baud rate is 19200, but this is adjustable by entering the **SERIAL COMM** menu on your device: **MENU** → **ADV SETUP** → **COMM SETUP** → **BAUD** (page 19).

Note: *In what follows, ↵ indicates an ASCII carriage return (decimal 13, hexadecimal D). Serial commands are not case-sensitive.*

Polling Mode

Devices are shipped in polling mode with a unit ID of A, unless requested otherwise. Each poll returns one line of data. 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 19). Valid IDs are letters A–Z. 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 device 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 device 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 unreadable. If the device does not receive a valid command, it will ignore it. If in doubt, simply hit ↵ and start again.

The default streaming interval is 50 ms, but this can be increased by changing Register 91 while the device is in polling mode:

Set streaming interval: `[unit ID]w91=[time in milliseconds]↵`

Example: `aw91=500↵` (streams new data every 0.5 s)

Taring

Taring pressure aligns the sensor with the current barometric pressure, and must be done with the gauge open to atmosphere and no flow (or the same pressure source for differential pressure devices). Absolute pressure devices will return a **?** if the device is not configured with an internal barometer:

Tare pressure: [unit ID]**p**↵
Example: **ap**↵

To tare an absolute pressure device configured with an internal barometer use this command:

Tare pressure: [unit ID]**pc**↵
Example: **apc**↵

Collecting Data

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

Examples:

Unit A at 15 PSIG: **A +15.00**
Streaming at 0.01 PSIG: **+.01**

Single spaces separate each parameter, and each value is displayed in the chosen device engineering units. This may differ from the engineering units visible on the pressure gauge display (see page 16). 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 columns, including status messages (page 7), may be present after the pressure reading.

Quick Command Guide

Note: *Serial commands are not case-sensitive.*

In these examples, the unit ID of the pressure gauge is a.

Change unit ID:	[current unit ID]@=[desired unit ID]↵
Tare gauge or differential pressure:	ap↵
Tare absolute pressure:	apc↵ (with an optional barometer)
Poll the live data frame:	a↵
Begin streaming data:	[unit ID]@=@↵
Stop streaming data:	@@=[desired unit ID]↵
Set streaming interval:	aw91=[number of milliseconds]↵
Query live data info:	a??d*↵
Manufacturer info:	a??m*↵
Firmware version:	a??m9↵
Lock the front display:	al↵
Unlock front display:	au↵

Additional 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 by phone, chat, or email (see page 2). You'll also find help on our website, alicat.com, and in the pages that follow.

General Use

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

Portable devices run on a rechargeable battery, but you can also connect to a wall outlet or computer using a micro-USB cable. If the battery has been fully depleted, it may take a minute or so to acquire enough charge to turn back on. If your device will not power on after being plugged in for at least 5 minutes, contact support (page 2).

Issue: ***The buttons do not work, and the screen shows*** **LCK.**
Action: The device 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 the day, you can increase the visibility of the display by increasing the contrast (**MENU → ADV SETUP → DISP SETUP → LCD CONTRAST**). If you are working under low-light conditions, push the logo button located below the display to turn on the backlight (see page 18).

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 device?***
Action: Annual recalibrations are recommended. Check your device'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 device. 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 pressure standard you know is accurate. 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 11.

Pressure Readings

Issue: *The live pressure readings won't settle down.*
Action: The device is very fast, so it can detect subtle variations in pressure that may go unnoticed by your other devices. This sensitivity can help detect problems with pumps or other devices. You can lessen this sensitivity by increasing the averaging. Select **MENU → ADV SETUP → SENSOR SETUP → PRESS AVG**. See page 17.

Issue: *My pressure readings are negative.*
Action: Under conditions open to atmosphere, a negative pressure reading can indicate a poor tare. Ensure that the device is open to atmosphere and select **TARE PRESS** from the Main Display to give it a fresh tare (page 14).

Issue: *My pressure readings jump to zero when pressure is low.*
Action: Your device is equipped with a programmable zero band that is preset at the factory. Reduce your deadband threshold by selecting **MENU → ADV SETUP → SENSOR SETUP → DISPLAY AS ZERO**. Note: The zero band threshold has no effect upon the serial data.

Issue: *Does the device work if it is laying down? Will it be accurate?*
Action: Yes, but it should be tared after changing its orientation. See page 14 for more on how to tare your device.

Issue: *Can I put the device on top of a vibrating device? Will it be accurate?*
Action: Yes, and yes! The pressure gauge is internally compensated for any changes in orientation, including rapid vibrations. Noise will increase if the device is vibrating.

Issue: *My pressure gauge disagrees with another device I have in line.*
Action: Pressure devices can normally be compared against one another provided there are no leaks between the two devices. Another possibility is an improper tare error (see page 14).

Issue: *My pressure readings won't change when pressure changes.*
Action: If your pressure readings won't change regardless of actual pressure, check that the tare pin hasn't been accidentally grounded (page 10). If not, your pressure sensor may be damaged. Please contact support (page 2) to troubleshoot.

Serial Communications

Issue: *My device isn't communicating with the computer while connected.*
Action: **1.** Make sure the baud rate and other serial settings such as the COM port number is the same one your device is using (see page 19).
2. Check the device's unit ID (also page 19).
3. Check the pinout (see page 29 or alicat.com/pinouts).
4. Make sure the COM number matches the one your software is using to connect to the device (page 20).

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 causes of damage and/or long-term inaccuracy in these devices are contamination and/or corrosion damage. Fluid should be filtered for particulates or biological materials that may grow in the device.

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 inside your device and is visible by selecting **MENU** → **ABOUT** → **DEVICE INFO**.

When it is time for your device'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/cm^{2}A	g/cm^{2}G	g/cm^{2}D	gram force per square centimeter*
kg/cm^{2}A	kg/cm^{2}G	kg/cm^{2}D	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
count	count	count	setpoint count, 0–64000
%	%	%	percent of full scale

Temperature Units

Label	Notes	Label	Notes
°C	degrees Celsius	K	kelvin
°F	degrees Fahrenheit	°R	degrees Rankine

† *Displayed as kg/cmG*

* *Instances of* **µ** *are displayed as a lower-case* **u**;
superscript and subscript numerals are displayed as lining (normal) numerals.

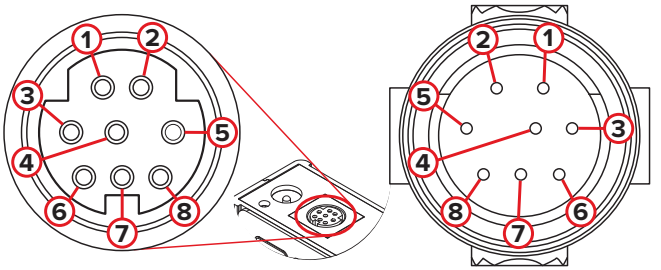
Note: *Not all units are available on all devices*

Pinouts

Check the calibration data sheet and pinout for your device.
Individual pinouts available at alicat.com/pinout.

See page 19 for additional important information about connecting your device to a computer for serial commands.

8-Pin Mini-DIN (Default)

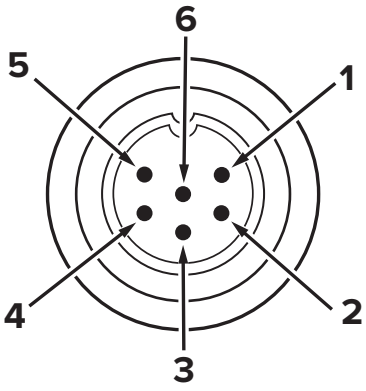


Female Connector: Device Male Connector: Cable

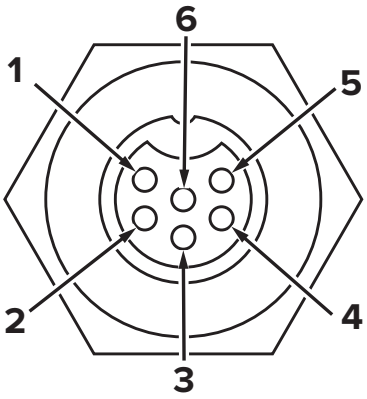
Pin	Cable Color	Function
1	Black	Not connected *Optional: 4–20 mA primary output signal*
2	Brown	Static 5.12 Vdc Optional: Secondary analog output *(4–20 mA, 0–5 Vdc, 1–5 Vdc, 0–10 Vdc) or basic alarm*
3	Red	Serial RS-232RX input signal *Optional: RS-485 A*
4	Orange	Remote tare (ground to tare)
5	Yellow	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)
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. Pin 2 (labeled 5.12 Vdc Output) is commonly mistaken for 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



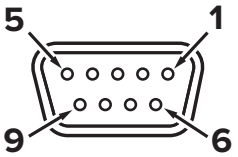
Female Connector: Device

Pin	Function
1	Power in (+)
2	RS-232TX / RS-485 B
3	RS-232RX / RS-485 A
4	Remote tare (ground to tare)
5	Ground (common for power, communications, and signals)
6	Signal out (Voltage or Current as ordered)

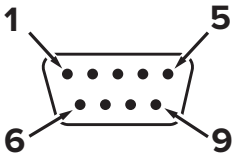
The availability of different output signals depend on the options ordered.

9-pin D-Sub Connector Pinouts

Common 9-pin D-Sub Pinouts



Female Connector



Male Connector

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
Remote tare function for pressure gauges

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

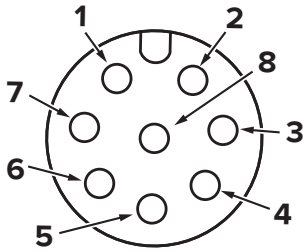
Power In (+Vdc)

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

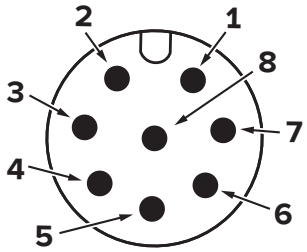
TX or B
Serial RS-232TX or RS-485 B

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

M12 Connector Pinouts



Female Connector: Cable

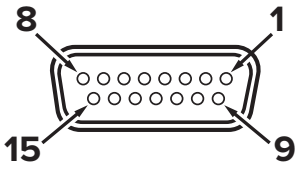


Male Connector: Device

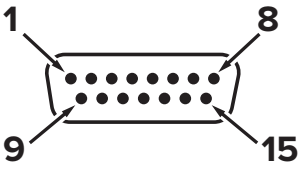
Common M12 Pinouts

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	**Remote tare (ground to tare)**	**Remote tare (ground to tare)**
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** Optionally 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:

Analog In
Remote tare function for pressure gauges

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

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 • Tamb −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 29) 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

Notice: Alicat Scientific, Inc. reserves the right to make any changes and improvements to the products described in this manual at any time and without notice. This manual is copyrighted. This document may not, in whole or in part, be copied, reproduced, translated, or converted to any electronic medium or machine readable form, for commercial purposes, without prior written consent from the copyright holder.

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.

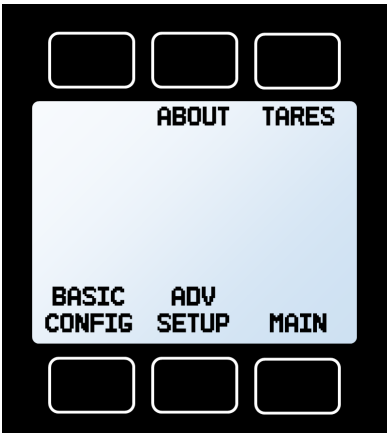
The product complies with the requirements of the Low Voltage Directive 2014/35/EU, the EMC Directive 2014/30/EU and the RoHS Directive 2011/65/EU and carries the CE Marking accordingly. Contact the manufacturer for more information.

Main Menu

Accessible from MENU on the Main Display

- **About** (page 15)
  - Device information
  - Manufacturer information
  - Device state
  - Diagnostic Information
- **Tares** (page 22)
  - How and when to tare
  - Tare pressure
- **Basic config** (page 16)
  - Device units
  - Pressure
- **Advanced setup** (page 17)
  - Sensor setup
    - Display as zero (zero 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

Contact Information

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C/O Avire India Pvt. Ltd.
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