Druck
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PACE5000 E
PACE6000 E

Pressure Automated Calibration Equipment

Instruction Manual

Druck.com

General Information and Safety Warnings

WARNING **Do not use the equipment with media that has an oxygen concentration > 21 % or other strong oxidizing agents.**

This equipment is not rated for oxygen use.

This equipment contains materials or fluids that can degrade or combust in the presence of strong oxidizing agents.

This equipment does not have a Safety Integrity Level (SIL) rating and is only for use in non-safety critical systems.

This equipment is not rated for use in hazardous or potentially explosive atmosphere. Using this equipment in a hazardous or potentially explosive atmosphere could lead to serious injury or death.

Turn off the source pressure(s) and carefully release pressure from the pressure lines before disconnecting or connecting the pressure lines. Proceed with care.

Only use equipment with the correct pressure rating.

Before applying pressure, examine all fittings and equipment for damage. Replace all fittings and equipment that have damage. Do not use any fittings and equipment that have damage.

The equipment is safe when operated as described by the procedures in this manual. Do not ignore the warnings. Do not use this instrument for other purposes than those given in this manual. The ability of the instrument to give protection can decrease if it is not used correctly.

Do not apply pressures greater than the Maximum Working Pressure (MWP) stated on the rear panel of the Pneumatic Control Module or Modules.

Do not apply electrical power greater than the maximum values stated on the rear panel of the instrument.

Operating the equipment with the cover removed allows access to hazardous live parts. Do not energize with covers removed.

The system assembler is responsible for the safety of the system.

All users must be suitably trained in pressure safety.

RISK OF ELECTRIC SHOCK **The ground lead of the instrument must be connected to the AC supply protective safety ground.**

INFORMATION **This equipment does not contain consumable materials.**

Technical Advice

Contact the manufacturer for technical advice. Refer to the rear page for details.

Symbols

Symbol	Description
	This equipment meets the requirements of all relevant European safety directives. The equipment carries the CE mark.
	This equipment meets the requirements of all relevant UK Statutory Instruments. The equipment carries the UKCA mark.
	This symbol on the equipment indicates that the user should read the user manual.
	This symbol on the equipment indicates a warning and that the user should refer to the user manual. Ce symbole, sur l'instrument, indique que l'utilisateur doit consulter le manuel d'utilisation. Ce symbole, dans le manuel, indique une situation dangereuse.
	This symbol warns the user of the danger of electric shock. Ce symbole alerte l'utilisateur sur le danger de choc électrique.
	Environmentally Friendly Use Period (EFUP).
	Druck is an active participant in the UK and EU Waste Electrical and Electronic Equipment (WEEE) take-back initiative (UK SI 2013/3113, EU directive 2012/19/EU). The equipment that you bought has required the extraction and use of natural resources for its production. It can contain hazardous substances that could impact health and the environment. In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way. The crossed-out wheeled bin symbol invites you to use those systems. If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. Please visit the link below for take-back instructions and more information about this initiative.  **https://druck.com/weee**

General Specifications

Item	Description
Display	LCD: Color display with touchscreen.
Operating Temperature	0°C to 55°C (32°F to 131°F)
Shipping and Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Product weights PACE5000 E	5.55 kg (12.2 lbs) chassis only. 8.87 kg (19.6 lbs) chassis and low pressure Pneumatic Control Module. 10.99 kg (24.2 lbs) chassis and high pressure Pneumatic Control Module.
Product weights PACE6000 E	7.26 kg (16 lbs) chassis only. 13.90 kg (30.6 lbs) chassis and two low pressure Pneumatic Control Modules. 16.02 kg (35.3 lbs) chassis and one low pressure and one high pressure Pneumatic Control Modules. 18.14 kg (40 lbs) chassis and two high pressure Pneumatic Control Modules.
Product dimensions PACE5000 E	88 mm (2U) (3.47”) high 320 mm (12.6”) deep 440 mm (17.3”) wide
Product dimensions PACE6000 E	132 mm (3U) (5.2”) high 320 mm (12.6”) deep 440 mm (17.3”) wide
Maximum Working Pressure (MWP)	Refer to rear of the Pneumatic Control Modules.
Ingress Protection	IP20 (EN 60529)
Operating Humidity	5% to 95% RH (non-condensing)
Vibration	MIL-PRF-28800 Def.Stan.66-31 8.4 Cat 3
Operating Altitude	Maximum 2000 meters (6560 ft)
EMC	EN 61326-1
Electrical Safety	EN 61010-1, UL 61010-1, CSA 22.2
Power Supply	Input range: 100-120/200-240 VAC, (50/60 Hz) PACE5000 E: 2 A PACE6000 E: 3 A
Fuse	T4AH250V
Pollution Degree	2
Overvoltage Category	II
Pressure Safety	Pressure Equipment Directive - class: sound engineering practice (SEP) for group 2 gases
Operating Environment	Indoor use only. Do not use in potentially explosive environments.
Pressure media	Clean, dry, nitrogen or air.

Glossary

Term	Description	Term	Description
a	Absolute	MWP	Maximum Working Pressure
ac	Alternating Current	NAMUR	User Association of Automation Technology in Process Industries
bar	Unit of pressure	NPT	National Pipe Thread
bara	Bar - absolute	OD	Outer Diameter
barg	Bar - gauge	Pa	Pascal
dc	Direct Current	PACE	Pressure Automated Calibration Equipment
DPI	Digital Pressure Instrument	ppm	Parts per million
ft	Foot	psi	Pounds per square inch
g	Gauge	QR	Quick-response
GPIB	General Purpose Interface Bus	REF	Reference
H_2O	Water	ROC	Rate of change
HDMI	High Definition Media Interface	RS-232	Serial communications standard
Hg	Mercury	Rx	Receive data
HiSLIP	High Speed LAN Instrument Protocol	SCPI	Standard Commands for Programmable Instruments
HTTP and HTTPS	Hypertext Transfer Protocol and Hypertext Transfer Protocol secure	SELV	Separated (or Safety) Extra Low Voltage
Hz	Hertz	TLS	Transport Layer Security
IEEE 488	Institute of Electrical and Electronic Engineers standard 488 (for programmable devices with a digital interface)	TMC	Test and Measurement Class
in	Inch	Tx	Transmit data
kg	Kilogram	URL	Uniform Resource Location
LXI	LAN-based eXtension for Instrumentation	USB	Universal Serial Bus
m	Meter	UUT	Unit Under Test
mA	Milliampere	VCP	Virtual Communications Port
max	Maximum	Vent	To release pressure to atmosphere
mbar	Millibar	VXI-11	A communication protocol developed by the VXIbus consortium
min	Minute or minimum	V	Volts
MNPT	Male National Pipe Thread	°C	Degrees Celsius
MSD	Mass Storage Device	°F	Degrees Fahrenheit
MSDS	Material Safety Datasheet		

Associated Documents

Refer to the Druck website for associated documents for this equipment:

https://druck.com

Contents

1. Introduction and Description

1.1 Introduction

This document gives user instructions for the PACE5000 E and 6000 E Modular Pressure Controllers. A separate document gives Quick Start and Safety instructions, which you must read before using the products.

1.2 Description

The PACE5000 E and 6000 E Modular Pressure Controllers support our removable Pneumatic Pressure Control Modules, so they can control pressure or pressures supplied from an external source or sources. The PACE5000 E supports one Pneumatic Control Module. The PACE6000 E supports one or two independent Pneumatic Control Modules. Each controller has a color touchscreen display that shows the measured pressure and the status of the controller. You can use the touchscreen to make selections and changes to settings. Icons and buttons on the touchscreen include selectable help text in the selected language.

Note: The Modular Pressure Controllers can also be called ‘instruments’.

Figure 1-1: PACE5000 E - Front View

Figure 1-2: PACE6000 E - Front View

The front panel of each instrument has a power button, the touchscreen, a sounder and a USB type A socket. Pressing the power button brings the instrument out of Standby mode when you energize the instrument. It also sets the instrument to Standby mode to save energy. The sounder can emit a sound as you make selections on the touchscreen. It also works as an alarm sounder. It will sound if the pressure is more than the high alarm level or falls below the low alarm level. A red bell symbol will also show above the measured pressure reading during the alarm condition. The USB socket is the same as the USB Type A socket on the rear, but for easier access.

You can use the instruments as free-standing on a horizontal surface, or rack-mounted in a standard 19 inch rack using the rack mount option kit. See Section 2 for more details.

The instruments each have two foldable legs at their bottom. The legs let you raise the front for easier use if you are to use the instruments on a horizontal surface.

Refer to Appendix D, “Typical Accessories,” on page 83 for some typical accessories. Refer to the product Datasheet to see the complete list of available options and accessories.

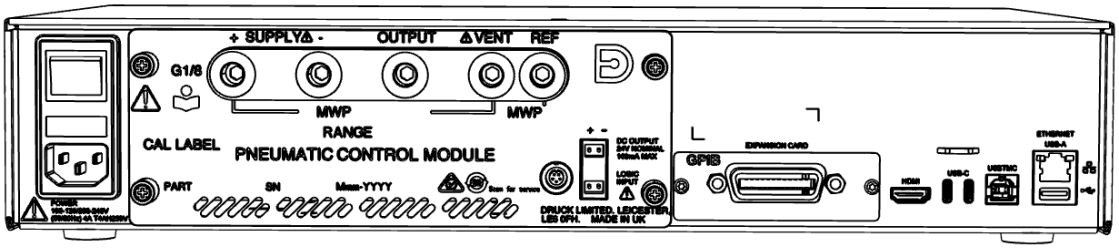


Figure 1-3: PACE5000 E Rear View (GPIB Fitted)

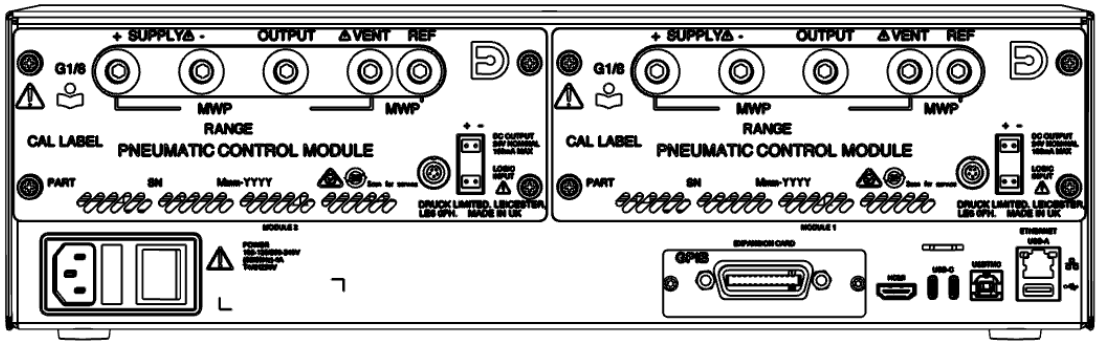


Figure 1-4: PACE6000 E Rear View (GPIB Fitted)

The rear of each instrument has most of the electrical connections and the removable Pneumatic Control Module (or modules). The electrical connections include an AC power supply input and communication interfaces including Ethernet, HDMI and USB sockets. We also offer the option of an IEEE488 GPIB Expansion Card. The communication interfaces can give remote display and operation of the instruments - see Chapter 5.9 on page 48 for Communication Settings.

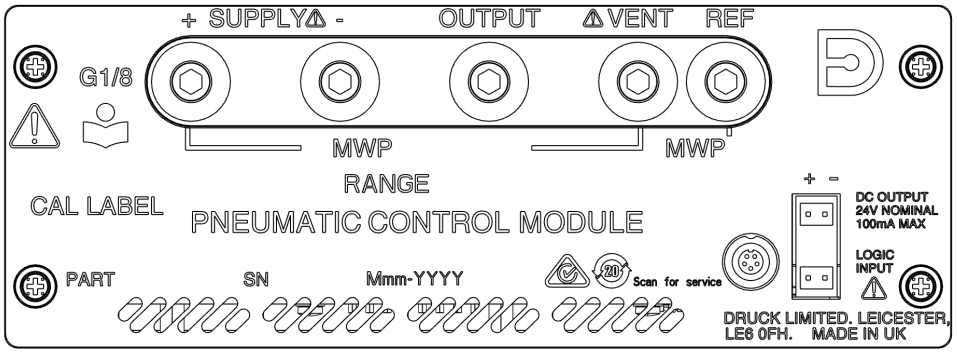


Figure 1-5: Pneumatic Control Module

Each removable Pneumatic Control Module contains:

- Pressure ports with built-in filters
- Internal pressure sensors and software-controlled valves
- DC Output and Logic Input connections

2. Installation

This section gives details for connecting the equipment to pneumatic and electrical supplies and to other equipment for tests.

Refer to the separate guide supplied with each Pneumatic Control Module to install the module into the instrument.

2.1 Lifting and Handling

WARNING Heavy equipment up to 18 kg. Use assistance when necessary. Refer to the "General Specifications" on page iii for weights.

2.2 Unpacking

INFORMATION After unpacking an instrument that has been in a cold environment, allow time for it to stabilize and for any condensation to evaporate.

Keep the original packing in case you need to return the equipment for calibration or any other reason.

Check that the packaging contains:

1. The instrument.
2. A power supply cable.
3. Safety instructions.
4. A Pneumatic Control Module blanking plate (PACE6000 E only). Keep this plate for future use. It protects the rear of the instrument if you remove a Pneumatic Control Module.

2.3 Preparation for Use

Install the Pneumatic Control Module or modules into the instrument as shown in the separate guide supplied with each module.

Either put the instrument on a horizontal surface, or fit it to a standard 19 inch rack using the rack-mount option kit. Refer to Section 2.9, "Rack Mount Option," on page 14.

For free-standing instruments, you can use the feet on the front of the base to elevate the instrument to a better viewing angle.

Note: Do not obstruct air vents around and below the instrument. Allow a free flow of air around the instrument.

2.4 Instrument Pressure Connections

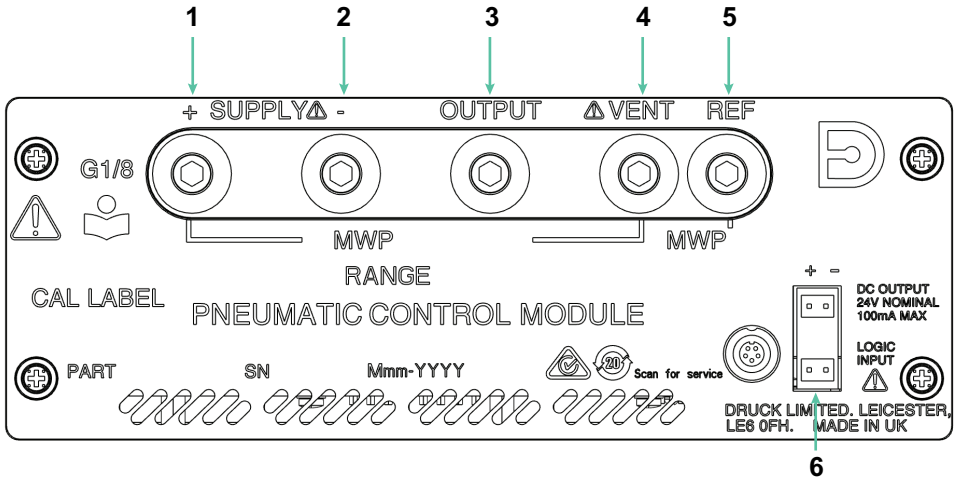
WARNING **Turn off the source pressure(s) and carefully release pressure from the pressure lines before disconnecting or connecting the pressure lines. Proceed with care.**

Only use equipment with the correct pressure rating.

Before applying pressure, examine all fittings and equipment for damage. Replace all fittings and equipment that have damage. Do not use any fittings and equipment that have damage.

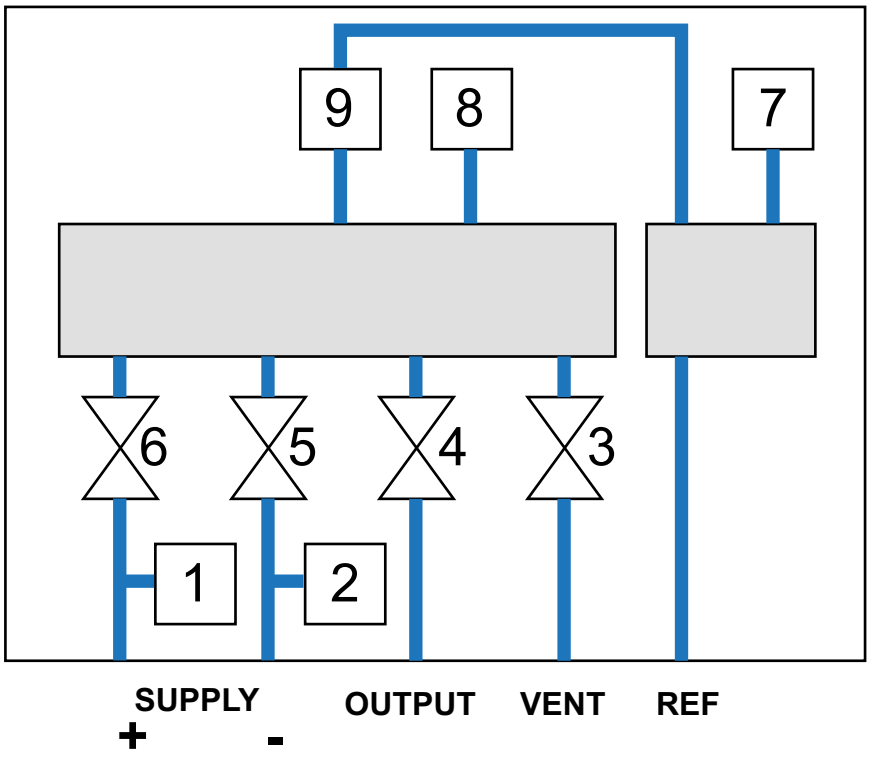
Do not apply pressures greater than the Maximum Working Pressure (MWP) stated on the rear panel of the Pneumatic Control Module or Modules.

The system assembler is responsible for the safety of the system.



1 Supply +
2 Supply -
3 Output
4 Vent
5 REF (Reference)
6 24 V DC output and logic input

Figure 2-1: Pneumatic Control Module Connections



1 + source sensor
2 - source sensor
3 Vent valve
4 Isolation valve
5 Release valve
6 Apply valve
7 Barometric sensor (option)
8 Reference sensor (option)
9 Control (gauge) sensor

Figure 2-2: Schematic of Pneumatic Control Module

Figure 2-2 shows a simplified schematic of the internal electronic valves and sensors in a Pneumatic Control Module, and how they connect to the ports.

2.4.1 SUPPLY Ports

These connect to your positive and vacuum supply.

2.4.2 OUTPUT Port

This port supplies the controlled test pressure to the UUT.

2.4.3 VENT Port

This port releases system gas. It can be at output pressure and unrestricted. Do not obstruct the VENT port. Fit a diffuser to diffuse gas exhaust at the VENT port. Refer to the Datasheet for suitable diffusers.

2.4.4 Reference Port (REF)

This port connects to the negative side of the control (gauge) sensor and the optional barometric sensor. See “Barometric Reference Option” on page 67.

If no barometric sensor is fitted, you can apply small pressures to the REF port, up to the limits of the control (gauge) sensor. Refer to Datasheet. Unless stated otherwise, leave the REF port opened to atmosphere. When in gauge mode, the instrument shows the pressure difference between the REF port and the OUTPUT port.

Note: This is not a true differential operation as there is no true differential calibration of the sensor.

Use the REF port (with the differential connection option) for precision low pressure measurement. The instrument measures pressure relative to the pressure at the REF port.

Short term atmospheric pressure changes will affect the pressure shown. This can seem like instability. To stabilize the shown pressure, you can restrict the reference port using a reference port restricter (snubber). This will prevent short term ambient pressure variations from affecting indicator performance. See the Datasheet for suitable restricters.

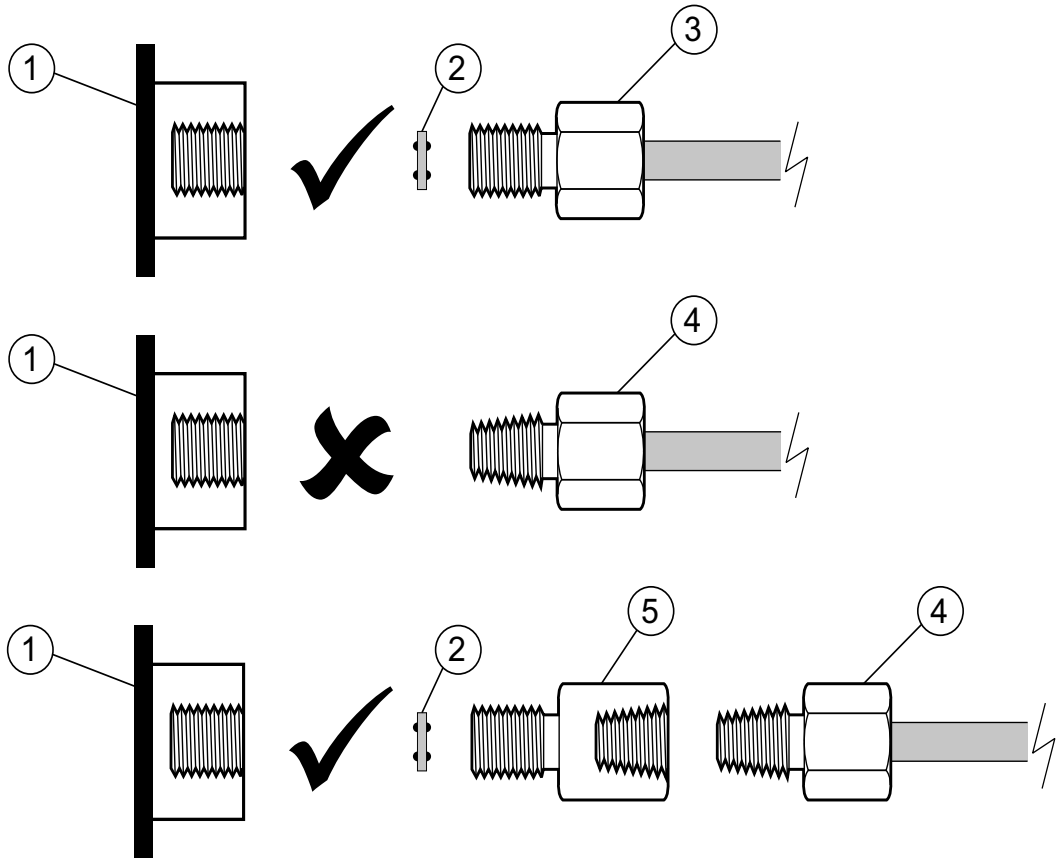
We recommend that you connect the instrument and UUT references together using the optional differential connection kit. This gives a common reference to atmosphere.

2.4.5 Pressure Port Connections

The Pneumatic Control Modules have parallel thread pressure connectors to ISO228/1 G1/8 Parallel Threads (DIN ISO228/1, JIS B0202). Use only connectors of that type. Refer to Appendix D on page 83 for details of suitable adapters.

WARNING Use only parallel threads to connect to the PACE instruments. Do not use tapered threads.

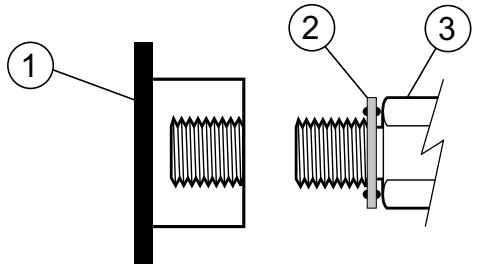
Figure 2-3 shows good and bad examples of connections to the PACE pressure connectors.



1 PACE pressure connector.
2 Bonded seal.
3 ISO228/1 G1/8 pressure connector.
4 NPT thread pressure connector.
5 Pressure adapter, see “Typical Accessories” on page 83.

Figure 2-3: PACE Pressure Port Connections

Figure 2-4 shows an alternative sealing method for pressures less than 100 bar (1450 psi).



1 PACE pressure connector.
2 Bonded seal.
3 ISO228/1 G1/8 pressure connector or adapter. For adapters, see “Typical Accessories” on page 83.

Figure 2-4: Alternative Sealing Method for < 100 bar (1450 psi)

2.5 Connecting to UUT

CAUTION Do not apply pressures greater than the maximum pressures stated in the appropriate component manual for the unit under test (UUT).

Reduce pressure at a controlled rate when releasing to atmosphere.

Carefully de-pressurize all pipes (tubes) to atmospheric pressure before disconnecting and connecting to the unit under test.

If testing a contaminated UUT, you must use additional in-line filters connected between the PACE OUTPUT port and the UUT to prevent contamination of the PACE instrument.

The pressure should not be more than the maximum working pressure or 1.25 x full scale.

To protect the instrument from over-pressure, fit a suitable protection device such as a relief valve or bursting disc. Refer to Appendix D on page 83 for details of suitable relief valves.

1. Use the appropriate sealing method for all pressure connections. Refer to Section 2.4.
2. Isolate the pneumatic pressures and de-pressurize the pipes (tubes) before connecting or disconnecting the instrument.
3. Make sure the user systems can be isolated and opened to atmosphere.
4. The pneumatic gas must be clean and dry, nitrogen or air. Refer to the specification in the Datasheet.
5. Connect pressure and vacuum supplies to the SUPPLY + and SUPPLY - connection ports.
6. Connect the Unit Under Test (UUT). See “Pneumatic Connection Examples” on page 11.

2.6 Dual Channel Operation (PACE6000 E only)

For dual channel operation, two independent pressure and vacuum supplies can be used.

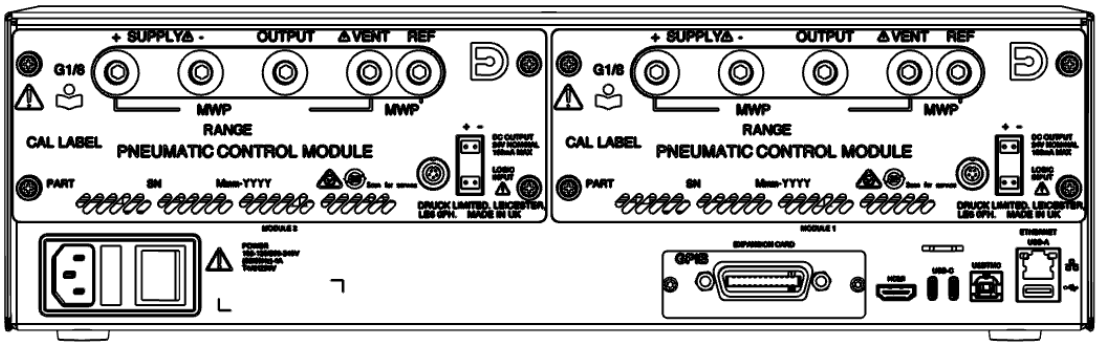


Figure 2-5: Control Module Rear View

When using two Pneumatic Control Modules, there are no restrictions on which module fits in which position.

All pneumatic connections must be rated appropriately for the pressure range of the controller and comply with the Pressure Equipment Directive (refer to “General Specifications” on page iii) or equivalent regional pressure standard.

When connecting the output ports of two Pneumatic Control Modules together (for example: “Auto Range Function (PACE6000 E only)” on page 33), connecting controller outputs together creates a pressure system. The system designer must make sure that all system components meet the local and regional pressure safety requirements.

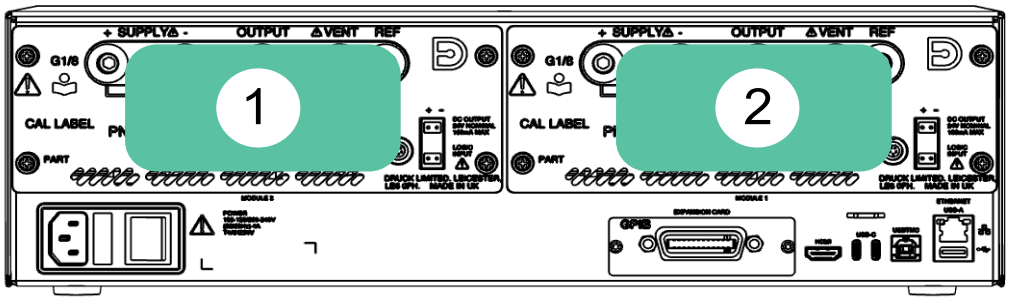
The Control Modules for the PACE controller have two specific mechanical constructions depending on their full-scale pressure range.

Table 2-1: Control Module Constructions

Full-scale Pressure		Construction
GAUGE	70 bar and below 1000 psi and below	LOW PRESSURE
ABSOLUTE	71 bar and below 1015 psi and below	
ALL STYLES	100 bar and above	HIGH PRESSURE

WARNING DO NOT connect the output of a Control Module with HIGH PRESSURE construction to one of LOW PRESSURE.

DO NOT mix Control Modules with HIGH PRESSURE and LOW PRESSURE construction in a system using the Auto Range function.



1	2	
HIGH PRESSURE	LOW PRESSURE	✗
LOW PRESSURE	HIGH PRESSURE	✗
LOW PRESSURE	LOW PRESSURE	✓
HIGH PRESSURE	HIGH PRESSURE	✓

Figure 2-6: Mixing Control Modules when using the Auto Range Function

2.7 Supply Equipment

The instrument must have the correct supply pressure and a suitable supply medium. Refer to the Datasheet.

A positive pressure supply is necessary for the instruments. A vacuum supply is necessary for instruments operating in an absolute range or negative pressure range.

Supplies must include an isolation valve and any other necessary conditioning equipment.

Supply pressure must be at least 110% of range full scale. When operating at positive or negative full-scale, there must be a pressure difference between supply and output to cause a gas flow.

The controller maintains performance during slow variations in source pressure down to a source pressure of 20% full-scale range.

The type and density of the supply gas does not affect the accuracy of pressure measurement, if the Unit Under Test (UUT) is at the same height as the controller, or the Gas Head Correction is accurately set. See “Remote Mode” on page 61.

To protect the instrument from over-pressure, fit a suitable protection device (such as a relief valve or bursting disc) to limit the supply pressure to below the MWP of the instrument. Refer to the Datasheet for details of suitable relief valves.

On instruments without a negative supply, the positive pressure discharges from the system to atmosphere through the negative supply port. Pipe the negative port to a safe discharge area, or fit a diffuser to the negative port.

2.7.1 Vacuum Pump

Use a vacuum supply when you have absolute or negative gauge ranges.

A vacuum supply improves:

- Time to reduce system pressure at pressures below 2 bar (30 psi), full-scale.
- Control stability near atmospheric pressure.
- Overshoot at low pressures.
- Performance at or near gauge zero.

For recommended configurations see Figure 2-9, Figure 2-10 & Figure 2-11. Refer to the Datasheet for details of suitable pumps and compressors.

The higher the flow rate of the vacuum pump the better the PACE control performance. Low pressure ranges < 700 mbarg must have vacuum regulation or the use of the negative gauge pressure generator IO-NEG-G-GEN-1 option. Refer to the Datasheet.

We recommend that you connect a normally-open venting solenoid to atmosphere and the pump. When the pump supply stops, the valve opens to allow atmospheric pressure to enter the pump directly rather than through the pipe (tube) to the instrument. If this does not happen, oil can progressively move up the supply pipe (tube) and into the instrument.

The negative supply for absolute control does not need regulating. Any variation between this and absolute zero will affect instrument operation if controlling at low absolute pressures.

When installing a vacuum supply, protect the vacuum pump against the discharge of positive pressure by the controller into the vacuum pump. This can result in reducing vacuum pump performance.

Use a check valve in the negative supply to vent excess pressure to atmosphere if the vacuum pressure rises above atmospheric pressure. Install the check valve on the instrument side of a volume which is approximately equal to the system volume. The volume slows any rapid pressure rise giving the vacuum pump time to reduce the pressure. When used with a check valve, a wide-bore vacuum pipe or tube can have enough volume to give the necessary overpressure protection.

2.7.2 Maximum and Minimum Working Pressure Warning

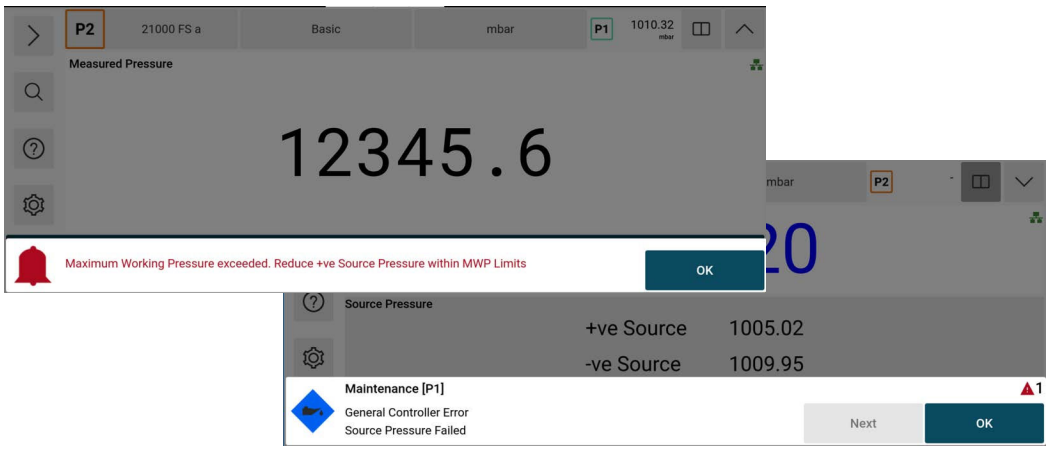


Figure 2-7: Maximum and Minimum Pressure Warnings

If the measured +ve source pressure is more than maximum working pressure (see the rear of the Pneumatic Control Modules) then the instrument will show a warning.

The instrument will show a similar warning if the measured source pressure falls below the minimum working pressure (less than 110% of the selected range full scale).

Select **OK** to clear this message.

2.7.3 Supply Contamination

Water, oil or particulate contamination must be removed from the compressed gas supply. Any water in the compressed gas supply will be in vapor form, i.e. non-condensing. Use a mist filter to remove them. Make sure the supply contains no oil as this causes a rapid deterioration of the control valve performance.

The compressed gas supply must not contain particulates. Use a particulate filter to remove them. Do not use a compressed gas supply containing corrosive material.

Refer to the Datasheet for suitable oil and mist filters.

2.7.4 Operating Near Atmospheric Pressure or Below

Any controller operating near atmospheric pressure or below must have a vacuum pump or other negative supply connected to the negative supply port for optimum performance. Without a vacuum supply, as the output pressure approaches atmospheric pressure, the differential pressure approaches zero resulting in a reduced flow to the output.

Reduced flow causes an increase in the time to control to atmosphere. This is especially true with large user volumes, and an increased overshoot at low pressures. Refer to Figure 2-9, Figure 2-10 and Figure 2-11.

2.8 Pneumatic Connection Examples

Refer to the Datasheet for optional kits, parts and accessories.

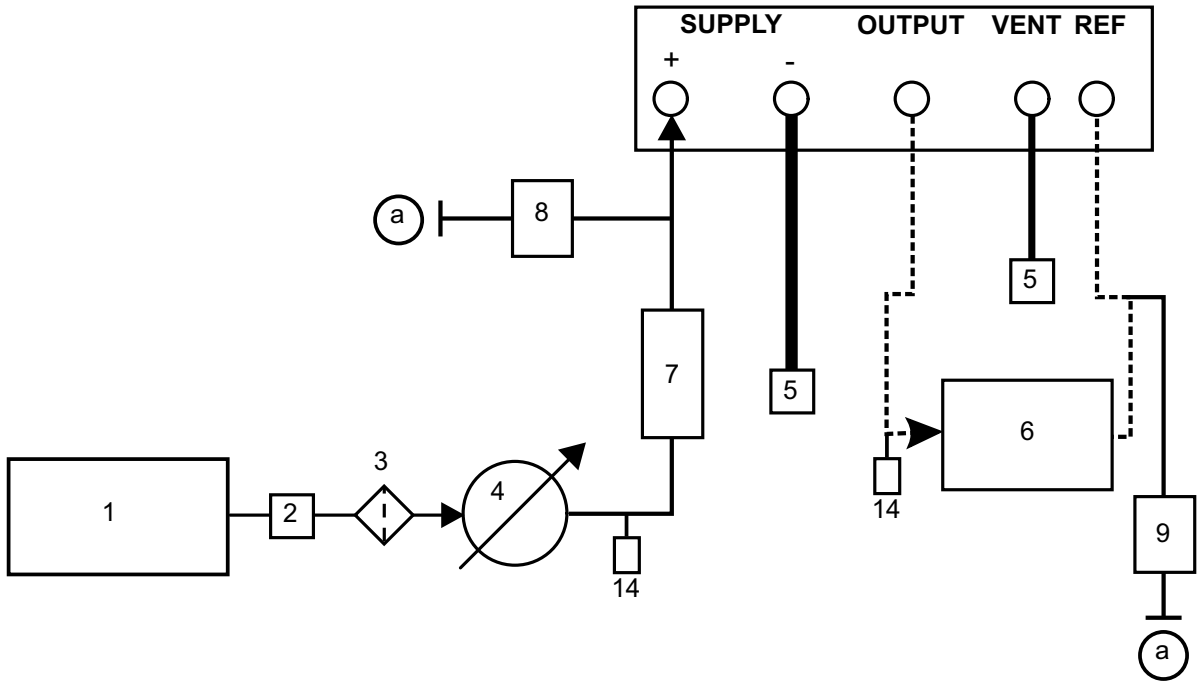
The following notes apply to the connection examples that follow:

Table 2-2: Notes for Connection Examples

Note	Description
*	High pressure gas exhaust - depending on pressure range.
**	Optional vacuum system kit, allows the -ve port gas to directly discharge to atmosphere, by-passing the vacuum pump.
†	Optimum controller transient response and minimum time to setpoint can degrade if either the pneumatic supply or vacuum system has restricted flow. Installing a reservoir volume, which has a larger capacity than the load volume, located in close proximity to the controller supply ports can improve the controller response.
‡	Optional negative gauge pressure generator kit.
★	For ranges of 70 bar (1000 psi) and above, fit a suitable protection device to prevent overpressure. For example, fit a relief valve or bursting disc. The protection device must limit the applied pressure to below the MWP.
◊	Optional differential connection kit.

2.8.1 Pneumatic Connections without Vacuum Supply

The examples below show a single channel connection detail, using supply equipment described above.

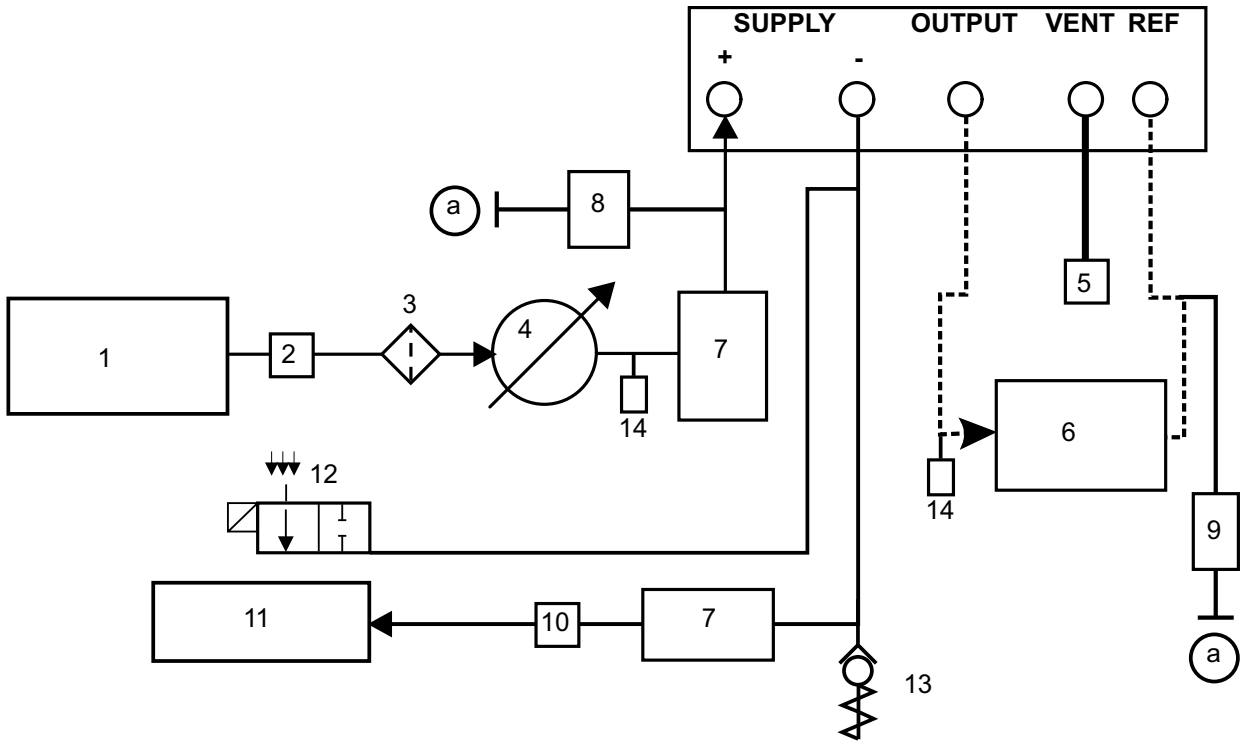


1	Pressure source	2	Supply Isolation Valve
3	Filter	4	Regulate to between 110% full-scale and MWP
5	Optional Diffuser*	6	Unit under test
7	Optional reservoir †	8	Protection device ★
9	Optional differential connection ◊	14	Manual external vent valves
a	Atmosphere		

Figure 2-8: Pneumatic Connections without Vacuum Supply

Note: See Table 2-2 for more notes.

2.8.2 Pneumatic Connections with Vacuum Supply



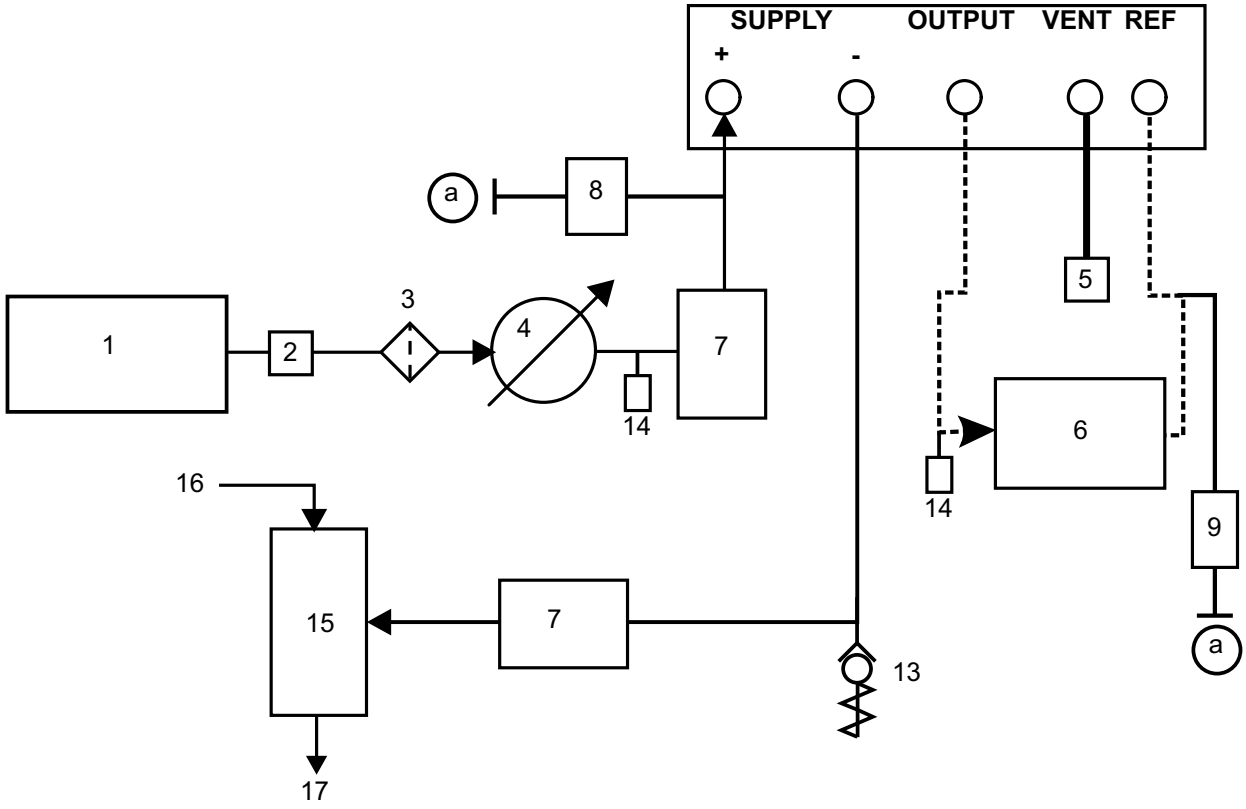
1	Pressure source	2	Supply Isolation Valve
3	Filter	4	Regulate to between 110% full-scale and MWP
5	Optional Diffuser*	6	Unit under test
7	Optional reservoir †	8	Protection device ★
9	Optional differential connection ◊	10	Oil mist trap
11	Vacuum source	12	Normally open electrical release valve
13	Check valve **	14	Manual external vent valves
a	Atmosphere		

Figure 2-9: Pneumatic Connections with Vacuum Supply

Notes:

- See Table 2-2 for more notes.
- We recommend you use PACE option IO-VAC-SYS Vacuum System Check Valve Kit in the vacuum line. Mount near to the Supply -ve port to exhaust most of the high pressure directly to atmosphere. The vacuum buffer volume must be rated to at least the highest system pressure.

2.8.3 Pneumatic Connections with Negative Gauge Pressure Generator



1	Pressure source	2	Supply Isolation Valve
3	Filter	4	Regulate to between 110% full-scale and MWP
5	Optional Diffuser*	6	Unit under test
7	Optional reservoir †	8	Protection device ★
9	Optional differential connection ◊	13	Check valve **
14	Manual external vent valves	15	Vacuum generator‡
16	Source pressure (regulated compressed air supply)	17	Exhaust to atmosphere
a	Atmosphere		

Figure 2-10: Pneumatic Connections with Negative Gauge Pressure Generator

Note: See Table 2-2 for more notes.

2.9 Rack Mount Option

We offer brackets that mount each side of the instrument so that you can fit the instrument to a standard 19 inch rack. We also offer a trolley as an accessory. Refer to the Datasheet.

When fitted in a rack or trolley, there must be enough space at the rear of the instrument for all the cables and pipes (tubes). The length of the cables and pipes (tubes) must allow for the removal and installation of the instrument. Do not block the flow of cooling air around the instrument. Allow a free flow of air through the equipment rack and around the instrument.

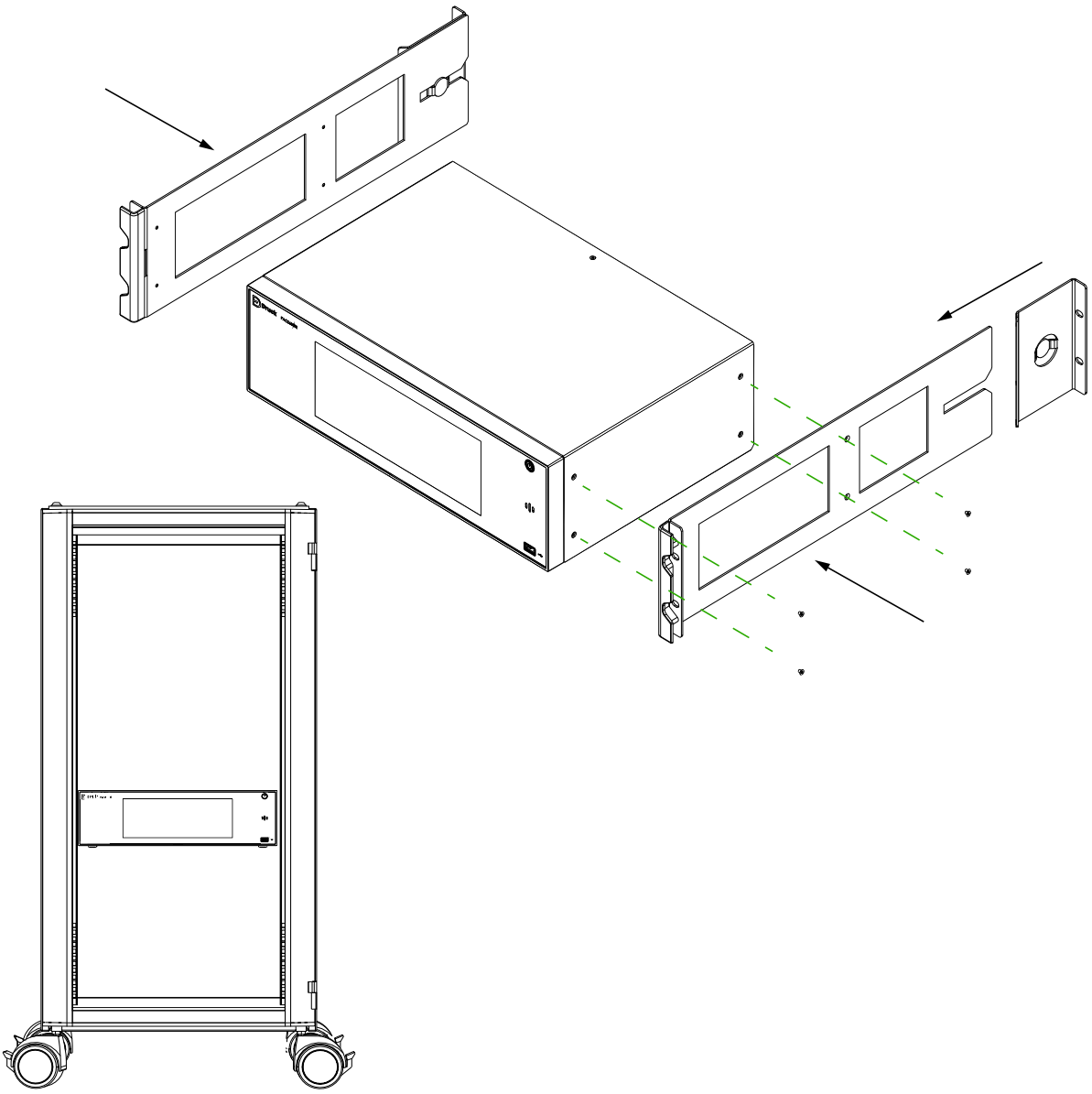


Figure 2-11: Rack-mounting

To fit the instrument to a rack:

1. Remove the four countersunk screws each side of the instrument.
2. Re-use the screws to fit the brackets to the sides of the instrument.
3. Each bracket has second part which is a slide-on attachment. Slide this on to the rear end of each bracket.
4. Support the instrument and connect the cables and pipes (tubes).
5. Refer to the electrical connections shown in Section 2.10 and Section 2.11 before fitting the instrument into the rack.
6. Locate and slide the instrument into the rack.
7. Secure the instrument in the equipment rack with the screws and washers (supplied with the brackets).

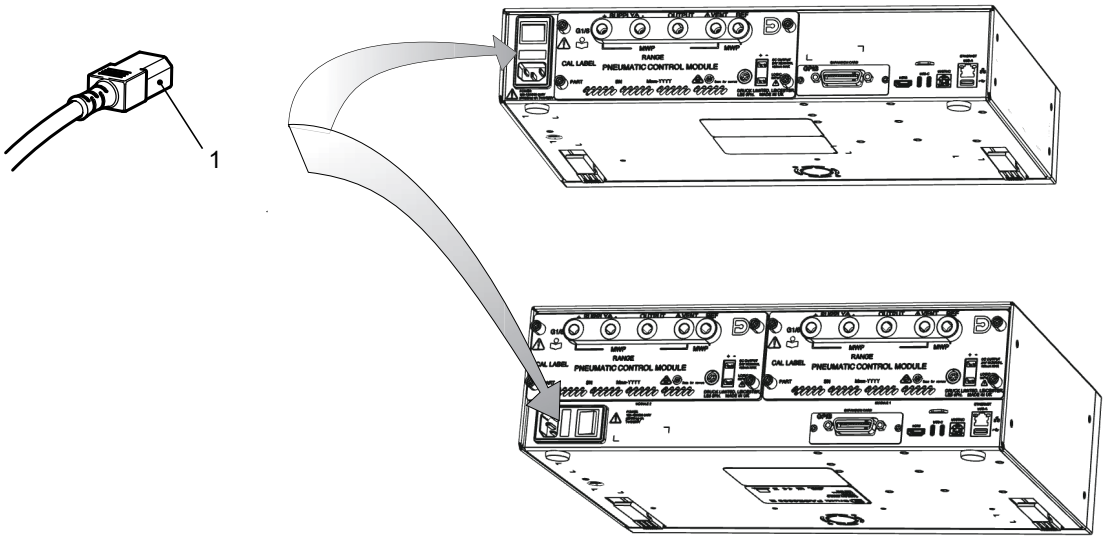
2.10 Power Connection

RISK OF ELECTRIC SHOCK **The ground lead of the instrument must be connected to the AC supply protective safety ground.**

1. We supply an IEC cable with the instrument for connecting to the mains supply. This cable gives the protective safety earth to the equipment. The IEC connector is the disconnection device for the equipment. Make sure that you can easily reach the connector after installation.
2. For power supply range, power rating and installation category, refer to “General Specifications” on page iii.
3. Connect the electrical power supply to the instrument.
4. Energize the power supply.
5. Set the power switch on the rear of the instrument to on.
6. The button to the front of the instrument will glow orange. The instrument is in **Standby Mode**.
7. Briefly press the front button. It will change to glowing white. The internal fans of the instrument will start, and the instrument will start its power-up sequence.

Note: If you need to set the instrument back to **Standby Mode**, press and hold the front button for longer than five seconds.

8. Check that the display shows the power-up sequence. Refer to Section 3.2, “Typical Display Starting Sequence,” on page 21.

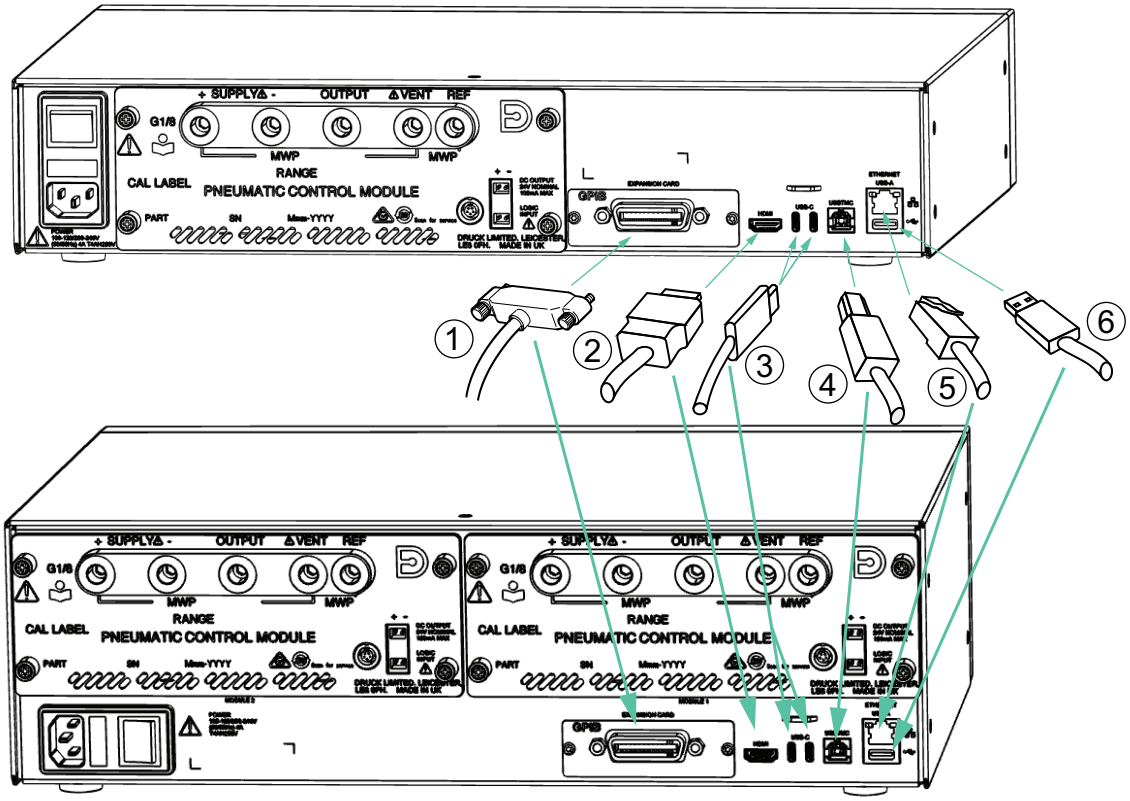


1 IEC connector

Figure 2-12: Electrical Connections

2.11 Communication Connections

Connect the applicable connectors into the rear panel communications ports. Secure the GPIB IEEE connector (optional) using captive screws.



1	GPIB IEEE488 (optional)	3	USB Type C	5	Ethernet
2	HDMI	4	USB Type B/USB TMC	6	USB Type A

Figure 2-13: Communication Connectors

2.11.1 Tether

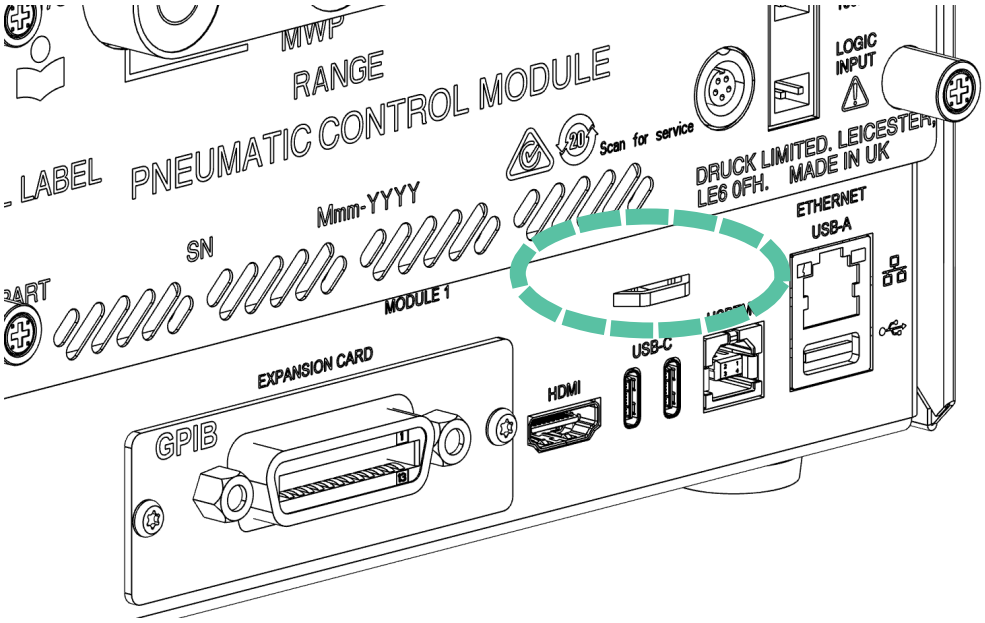


Figure 2-14: Tether to Rear of Instrument

The instruments each have a small punched-out metal ‘tether’ above the communication connectors at the rear of the instrument. You can use this with a suitable cable tie to help support the communication cables.

Note: Do not use the tether to support pressure pipes.

2.11.2 USB Type A - Front and Rear

These sockets support connection for USB Flash drives for software updates.

2.11.3 Ethernet Socket

This sockets supports connection to the instrument from a PC on the same local area network for remote communications.

2.11.4 RS232 Converter (optional)

We can supply a USB-A to RS232 converter for use in the USB-A socket if you need RS232 connection.

2.11.5 USB TMC

The USB B type socket, labeled ‘USB TMC’ supports test and measurement class communication protocol and VCP.

2.11.6 HDMI

This socket supports connection of a remote display, which can work with a USB mouse and keyboard.

2.11.7 USB Type C

These sockets can support an external mouse, keyboard, mass storage device and serial or virtual communication port (VCP).

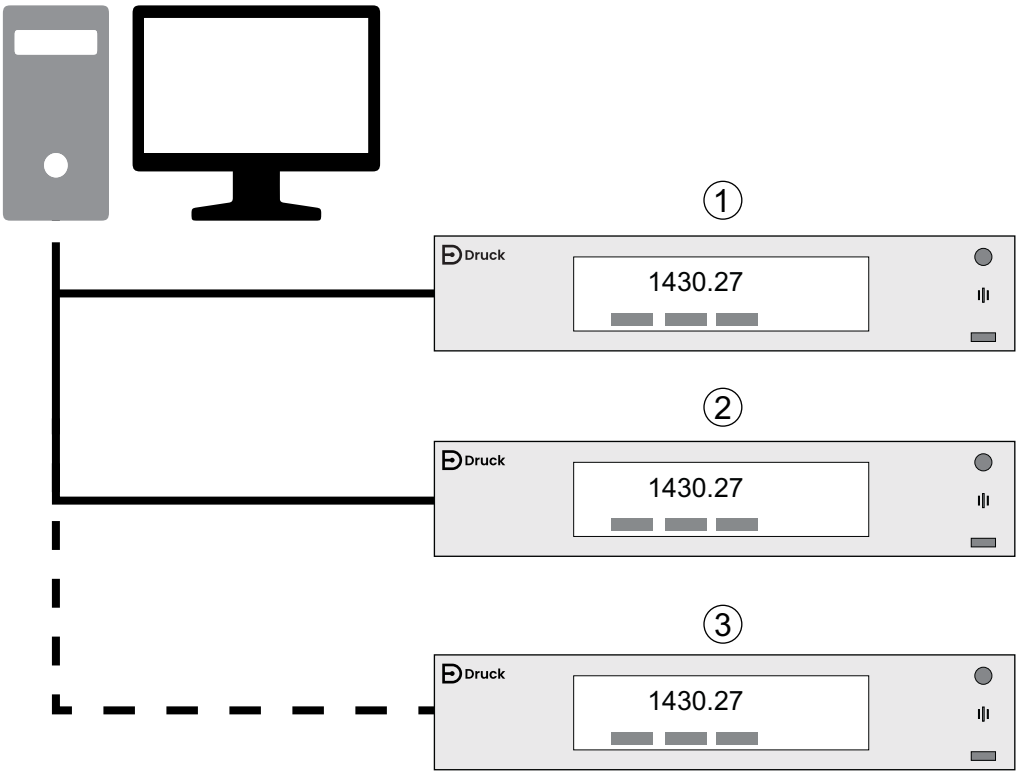
2.11.8 GPIB IEEE 488 Interface (optional)

Also see “GPIB IEEE_4888 Expansion Card” on page 68.

The GPIB interface is to the IEEE 488 standard. It connects a computer/controller to one or more PACE instruments and other instruments. Up to 30 instruments can connect through a high-speed data bus to the computer/controller.

Note: EMC requirements state that the length of each IEEE 488 cable must be less than 3 meters. Refer to Datasheet.

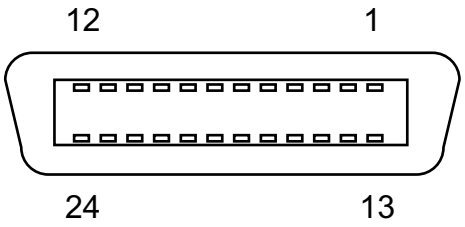
If fitted, the optional GPIB IEEE 488 is enabled at power-up. Set the necessary parameters in the settings. Refer to “Settings” on page 43



1 Address 1 2 Address 2 3 Address N (30 maximum)

Figure 2-15: IEEE 488 Connection

1 = DIO1
2 = DIO2
3 = DIO3
4 = DIO4
5 = EOI
6 = DAV
7 = NRFD
8 = NDAC
9 = IFC
10 = SRQ
11 = ATN
12 = SH



13 = DIO5
14 = DIO6
15 = DIO7
16 = DIO8
17 = REN
18 = GND
19 = GND
20 = GND
21 = GND
22 = GND
23 = GND
24 = LG

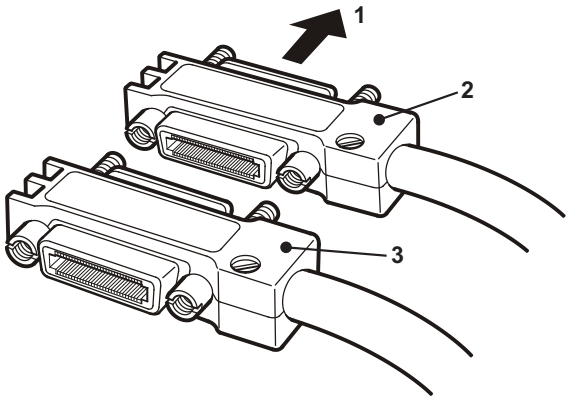
ATN = Attention
DAV = Data Valid
DIO = Data Input/Output bit
EOI = End or identify
GND = Ground
IFC = Interface Clear
LG = Logic Ground
NDAC = Not Data Accepted
NRFD = Note Ready for data
REN = Remote Enable
SH = Shield or Chassis/Frame
SRQ = Service Request

Figure 2-16: GPIB IEEE 488 Connector Pinout

2.11.8.1 IEEE 488 Single Unit Installation

1. Connect an IEEE 488 connector/cable assembly to the rear panel of the instrument.
2. Connect the other end of the connector/cable assembly to the IEEE 488 connector on the controller/computer.
3. Check the IEEE 488 communication parameters. Refer to “Communications Screen” on page 48.

2.11.8.2 IEEE 488 Multiple Unit Installation



1 Connect to first instrument
2 Connector from controller/computer
3 Connector from second instrument

Use stacking GPIB IEEE_488 plugs to link the first instrument and second instrument to a controller or computer.

1. Connect a cable between from the computer/controller and the first instrument.
2. Connect a second cable between the first instrument and the second instrument.
3. Repeat this procedure for all the instruments in the system.

Use the **Settings** options on each instrument to setup the necessary communication parameters. Refer to “Communications Screen” on page 48.

3. Operation

This section contains details of preparing the instruments for measurement and normal operation of their screens.

3.1 Preparation

Make sure the electrical cables and pneumatic pipes (tubes) are as described in the installation requirements. Refer to Section 2, “Installation,” on page 3.

INFORMATION **Keep any connected pressure pipes stable during measurements. Moving or compressing the connected pipes can affect the pressure reading.**

If the instrument has been stored outside of the operating temperature range, before use, let the instrument equalize to room temperature for one hour, not energized.

Before use:

1. If necessary, do any relevant maintenance tasks. Refer to Section 6, “Maintenance and Calibration,” on page 51.
2. Inspect the pneumatic hoses for damage.
3. Review and understand the procedure before starting a process on a component or system.

3.2 Typical Display Starting Sequence

This sequence shows the typical display as you energize the instrument.

Note: Do not use sharp objects on the touchscreen. They can cause damage.

1. Energize the power supply to the instrument as described in “Power Connection” on page 16.

Figure 3-1: Opening (Splash) Screen

2. The display shows an opening (splash) screen as shown in the image.

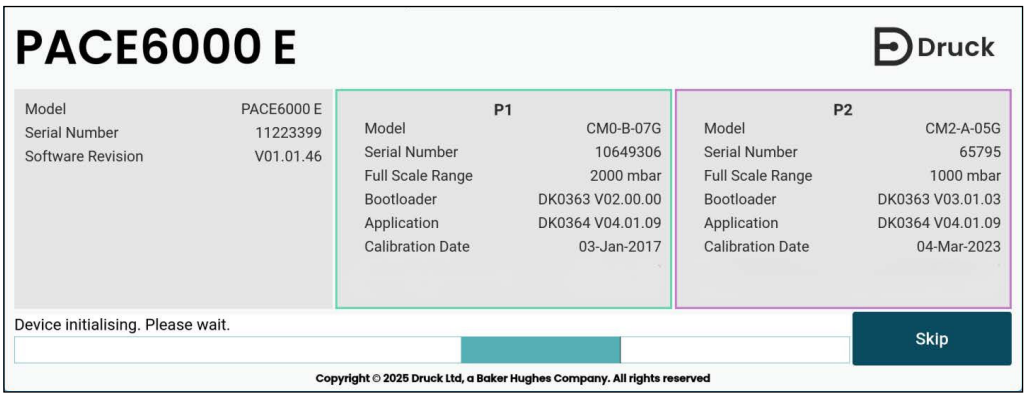


Figure 3-2: Power-up Sequence

3. The instrument does a power-up sequence with a self-test while showing an information page. The page shows information about the instrument and its Pneumatic Control Module or Modules. If the test finds a fault, the display shows an error. Refer to Section 7.3, “Fault Finding,” on page 60. The instrument will also check the firmware of any fitted Pneumatic Control Modules. See “Updating Pneumatic Control Module Firmware” on page 53. We do not recommend that you select the **Skip** button. It is for advanced users.
4. If the self-test completes with no faults, the system enables the touchscreen and you will see a typical **Home** screen.

Notes:

- If this is the first time you have energized a new instrument, the power-up sequence will also ask you to set the date and time and language used in the instrument screens.
- If you have selected the **Skip** button earlier, then the **Home** screen will be shown with some parts not enabled until the instrument can communicate with the Pneumatic Control Module or modules.

5. The instrument is now ready for use.
6. Let the energized instrument stabilize at ambient temperature for a minimum of 30 minutes for optimum datasheet accuracy.
7. If necessary, do a serviceability test to check the instrument. See “Standard Serviceability Test” on page 59.

3.2.1 Standby Mode

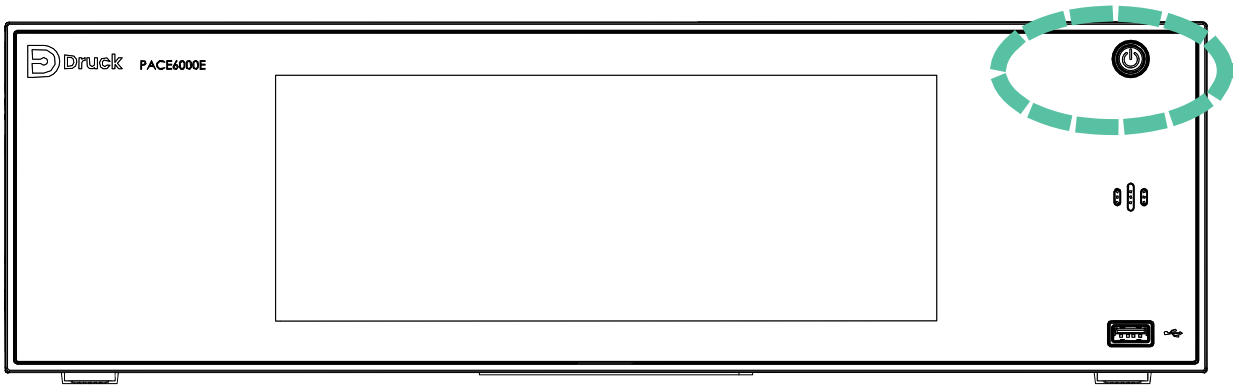
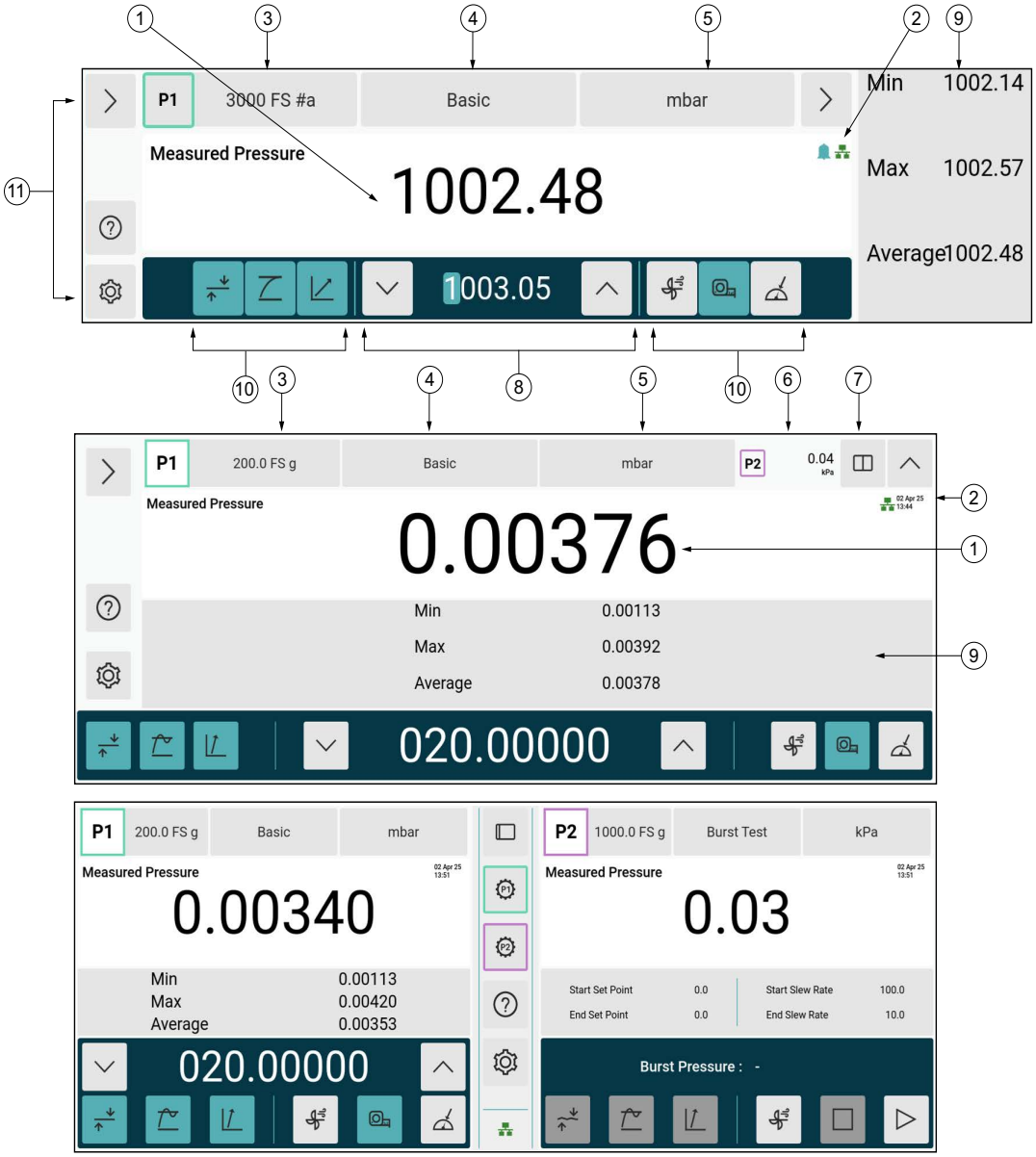


Figure 3-3: Push the Power Button

The instruments have a standby mode that helps to save energy when the instruments are not in use. When the instrument is energized and working, push and hold the power button at the front of the instrument for longer than five seconds to put the instrument into standby mode. The button will change to an orange color. Press the button again to bring the instrument out of standby mode and into normal operation mode. The button will change to a white color.

As you enter standby mode, the instrument display will open a dialogue box that asks if you are sure that you want to shut the system down and will ask you to vent the system to leave it in safe state before shutting down.

3.3 Typical Home Screens



1 Pressure measurement of selected sensor in selected pressure measurement units.
2 Enabled function symbols and LAN connection status.
3 Measurement Range button for the sensor in Pneumatic Control Module 1.
4 Task button.
5 Measurement Units button.
6 P2 (Pneumatic Control Module 2) pressure measurement. PACE6000 E only.
7 One and two channel screen select.
8 Setpoint area with Nudge buttons.
9 Status area.
10 Icons
11 Icons in the Side Bar

Figure 3-4: Areas of the Home Screen

The PACE5000 E and PACE6000 E screens have different sizes but they work in the same way and look almost the same and use the same icons, buttons and enabled function symbols. The top and middle images give typical views of a One Channel **Home** screen on the PACE5000 E and 6000 E. The bottom image gives a typical view of a Two Channel **Home** screen on the PACE6000 E with two Pneumatic Control Modules fitted. The screens show the pressure

setpoint and the readings from the sensors in the Pneumatic Control Module or modules. The **Setpoint** area changes to show other parameters when you use the instrument for other tasks.

Note: The PACE6000 E shows a One Channel **Home** screen by default, so you must select to view both channels if you need to see them together. See “Two Channel Home Screen (PACE6000 E only)” on page 31.

The pressure measurement digits in the middle of the **Home** screen have different colors determined by how the instrument is working:

- In **Measure Mode**, the digits are normally black if no alarms have been set.
- In **Control Mode** the digits are green when pressure is inside the values set in the **In Limits Meter** and blue when pressure is outside the values set in the **In Limits Meter**. See “In Limits Meter” on page 62.
- In **Measure Mode** or **Control Mode**, the digits are red when the alarm has operated.

Refer to Appendix C on page 79 for details of the icons and functions used on the screens.

3.4 Using the Screens

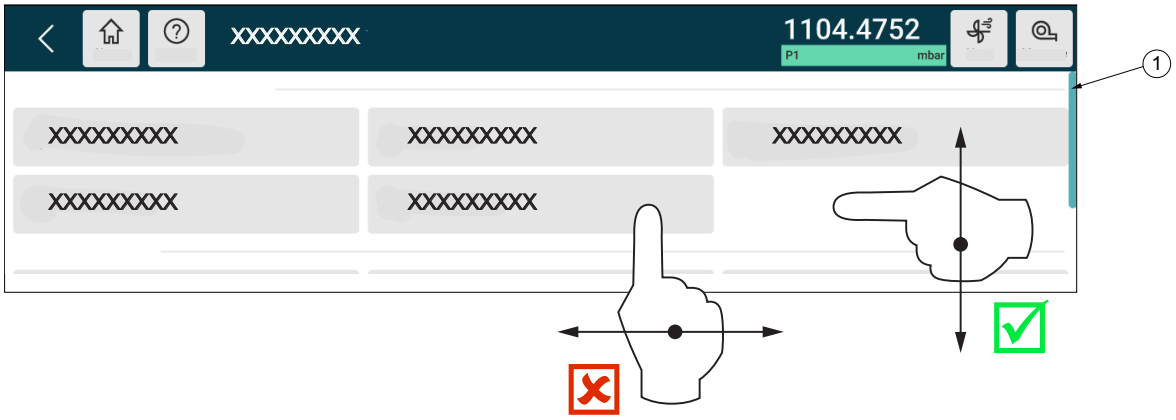


Figure 3-5: Screen with a Scroll Bar

To use the screens, select the icon, button or area on the screen that you need to change or see more information for. This is also true if you are using a separate mouse or touchscreen display connected to the communication connections on the rear of the instrument.

Some screens have more information than they can show. In this condition, you will normally see a vertical scroll bar (1) to the right-hand side of the screen. Select to scroll the screen up or down. There is no sideways scrolling on the screens.

Select the **Back** icon to return to a previous screen. Select the **Home** button to return to the **Home** screen. Select the **Help** icon to show helpful text in your selected language in the icons, buttons and options around the screens.

Icons and buttons with the color light gray are selectable. If they are colored blue/green, they are already active. If they are colored dark gray, they are not available.

Figure 3-6: Selectable and Active Icon colors

Refer to Appendix C, “Touchscreen Icons and Symbols,” on page 79 for details of the typical icons, functions and other symbols that you see on the screens.

3.5 Reduce Screen Clutter

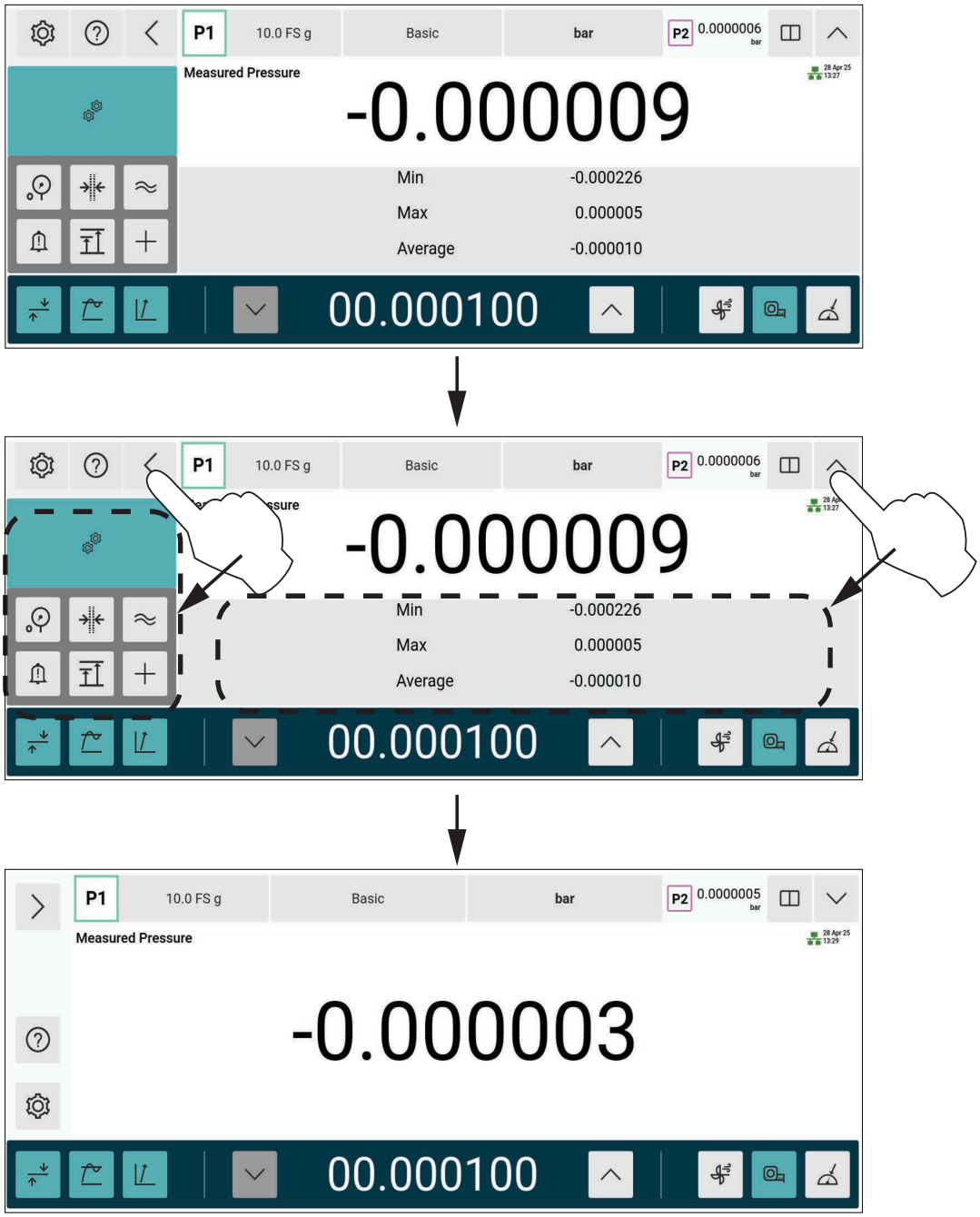


Figure 3-7: Reducing Screen Clutter

To reduce ‘clutter’ on the screen and see only the measured values and setpoint, use the **Status Area** button to hide the **Status Area.** Use the **Collapse** button to hide the left-hand side icons in the **Side Bar**. Also see “Active Settings” on page 50. If using the PACE 6000 E in Two Channel Home Screen mode (see “Two Channel Home Screen (PACE6000 E only)” on page 31), select the **P1** or **P2 Setting** icons to set the **Status Area** and **Side Bar** on or off for each channel.

3.6 Measure and Control Modes

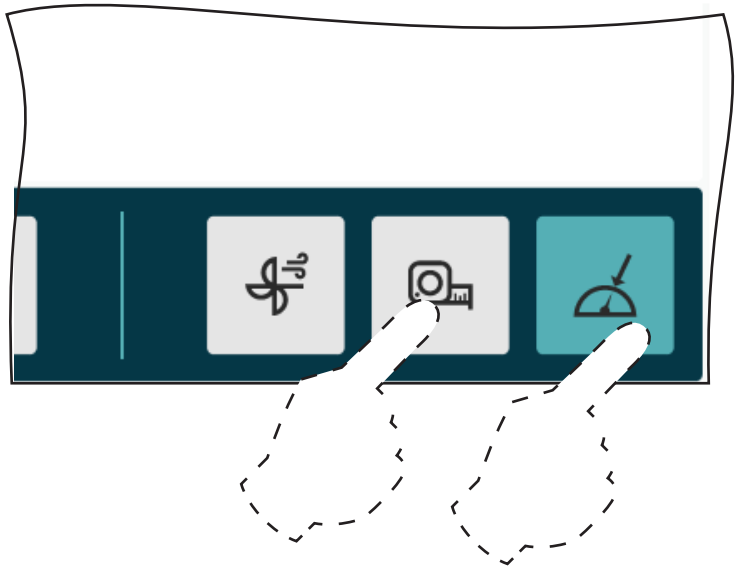


Figure 3-8: Selecting Measure and Control Modes

The instrument operates in two modes:

1. **Measure Mode -** where the instrument works as a precision pressure indicator and shows the pressure measured at the output port without controlling.
2. **Control Mode -** where the instrument works as a precision pressure controller and shows the controlled pressure measured at the output port.

Select the **Control** and **Measure** icons to change between **Measure Mode** and **Control Mode**. The icon changes from gray to blue/green as you select it.

Control Mode has three options that you can change in the **Settings** or by directly selecting the icons in the **Home** screen.

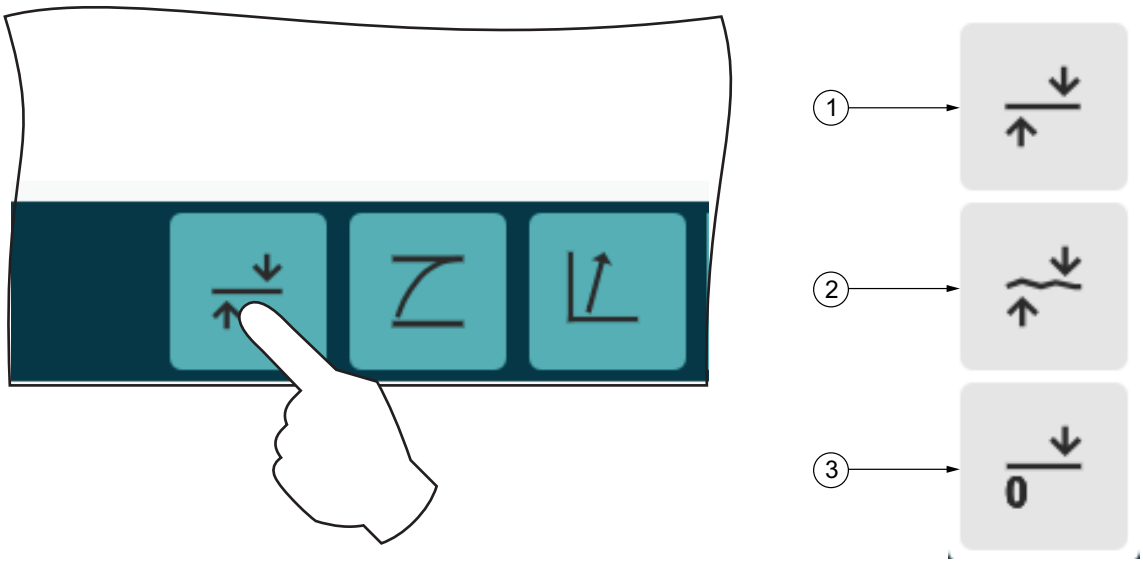


Figure 3-9: Selecting the Control Mode Option

3.6.1 Active Control (1)

In this mode, the controller continuously maintains the setpoint, compensating for small pressure leaks and thermal affects.

3.6.2 Passive Control (2)

In this mode, you can define a band either side of the setpoint, the default band equals the instrument's precision. When the controlled pressure enters this band, the controller automatically shuts off. If the measured pressure exits the band, the controller automatically re-establishes the pressure, without instability, the controlled pressure re-enters the band.

Note: If passive mode is in use with a leak free and thermally stable system, then the control stability contribution can be discounted from the uncertainty calculation.

3.6.3 Zero Gauge Control (3)

The controller switches off once stable at zero gauge and the vent opened. Entering a new setpoint causes the vent to shut and the controller starts to control to the new setpoint.

3.7 Changing the Setpoint

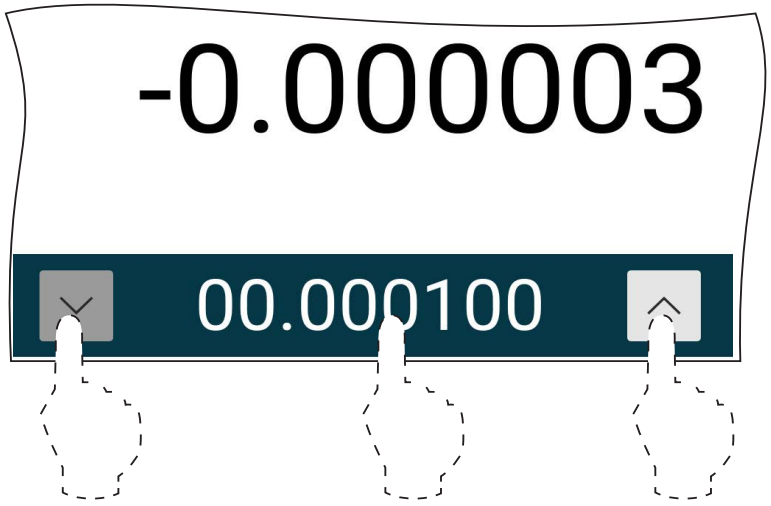


Figure 3-10: Changing the Setpoint

To change the setpoint, make sure you have the **Home** screen selected, showing the setpoint. The instrument then gives you choices:

- Directly enter a completely new setpoint value.
- Use the **Nudge** up and down buttons to increase or decrease the value, set by the nudge resolution.

To directly enter a new setpoint or change the nudge resolution, select the setpoint number. A dialog box opens with a selector for you to choose to change the Nudge resolution or Setpoint value using a number keypad, then select **OK**. Next to the selector, the dialog box also shows the minimum and maximum setpoint values and nudge resolutions that you can enter. See Figure 3-11.

Notes:

- See "General Settings Screen" on page 45 to change the number resolution.
- Select the **Help** icon to show the nudge resolution under the setpoint value in the Setpoint area.

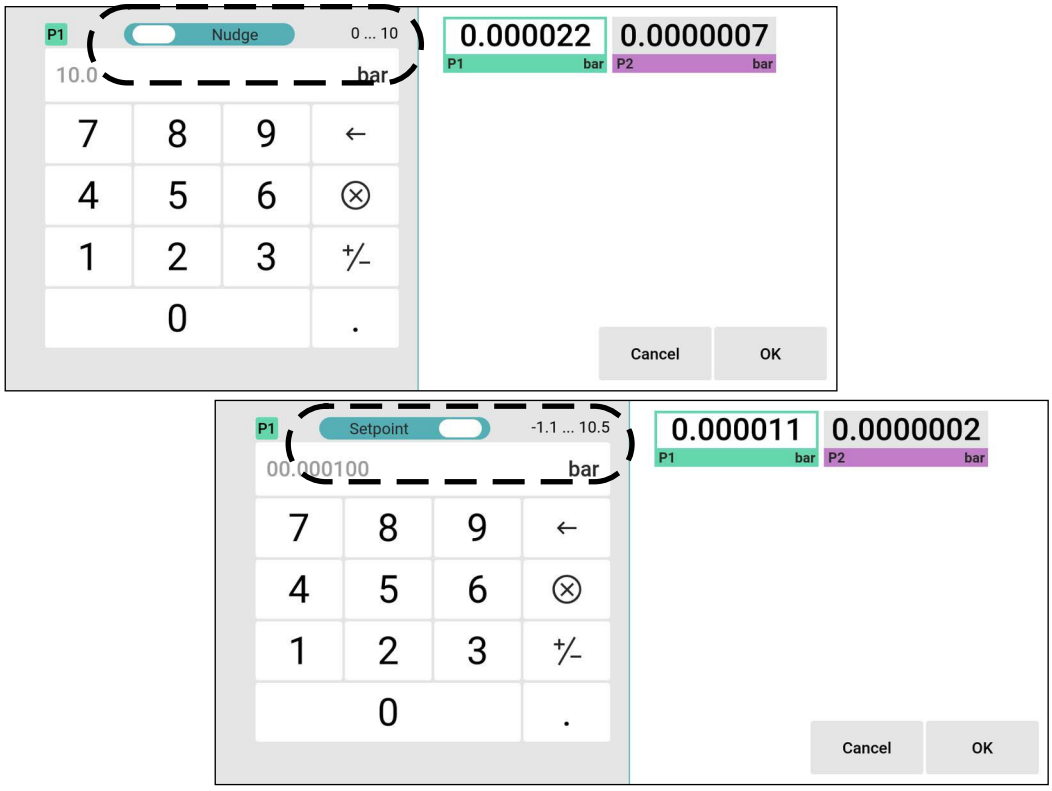


Figure 3-11: Nudge Resolution and Setpoint Values

3.8 Status Area Parameters

Figure 3-12: Selecting the Status Area

From the **Home** screen, if you select any part of the **Status Area**, a new screen opens where you can choose up to 5 parameters to be shown in the **Status Area**. Select each parameter as necessary, then select the **Save** button. This area shows pressures in the selected pressure units.

- **Full Scale** - shows the full scale (FS) values of the select range.
- **Min Max Average** - shows the live values of minimum, maximum and average of the selected pressure value.
- **P2-P1** and **P1-P2** - shows calculations based on the two pressure readings (PACE 6000 E only).
- **Reference** - shows the reference pressure.

- **Source Pressure** - shows the live values of the source pressures.
- **Tare** - sets and shows the tare value.
- **Pseudo** - (only available if the Pneumatic Control Module has a barometer fitted). This option makes the barometer work with the main sensor to give a pseudo range. See “Pseudo” on page 61.
- **Barometer** - (only available if the Pneumatic Control Module has a barometer fitted). This option shows the barometer value.
- **Time To In Limits** - time to the In Limits condition. See “In Limits Meter” on page 62.
- **Effort Meter -** shows the effort the controller exerts to reach the setpoint. In **Measure** mode the meter does not operate. In normal controlled pressure conditions, the meter indicator stays within the band. If the indicator moves outside the band this can mean that there is a leak into or out of the system, or that the controller is controlling to a new setpoint.
- **In Limits Meter -** shows the In Limits condition. See “In Limits Meter” on page 62.
- **Slew Rate** - shows the slew rate aim (AIM) and activity (ACT) in rate of change (or ROC in aeronautical tasks) per second. See “Slew Rate” on page 62.

Notes:

- Select the **Status Area** button  at the top right of the screen to open the **Status Area** if necessary.
- If using the PACE 6000 E in Two Channel Home Screen mode (see “Two Channel Home Screen (PACE6000 E only)” on page 31), select the **P1** or **P2 Setting** icons to set the **Status Area** on or off for each channel.

3.9 Measurement Range, Auto Range and Measurement Units

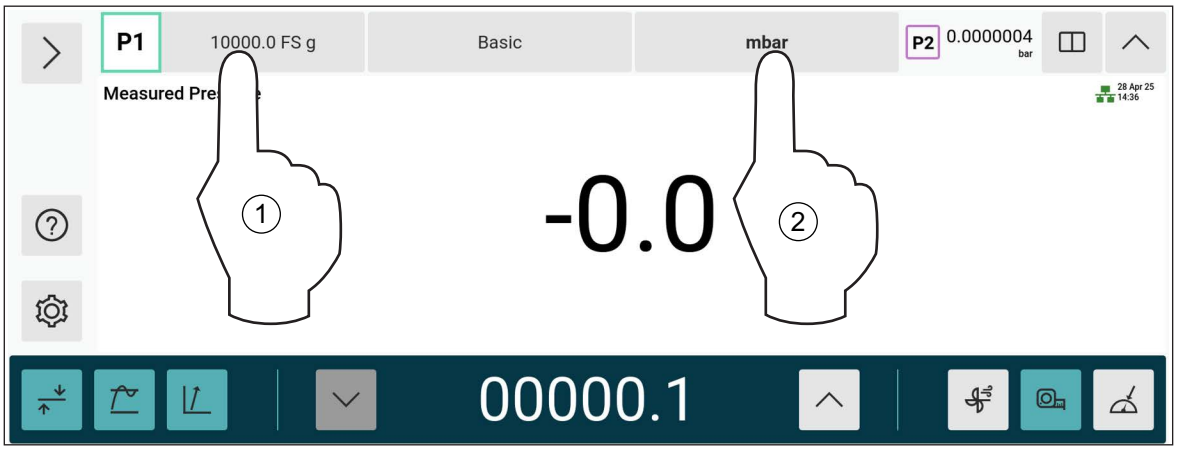


Figure 3-13: Selecting Measurement Range and Units

These options let you change the pressure measurement range and change the measurement units of pressure shown on the screen.

3.9.1 Measurement Range button (1)

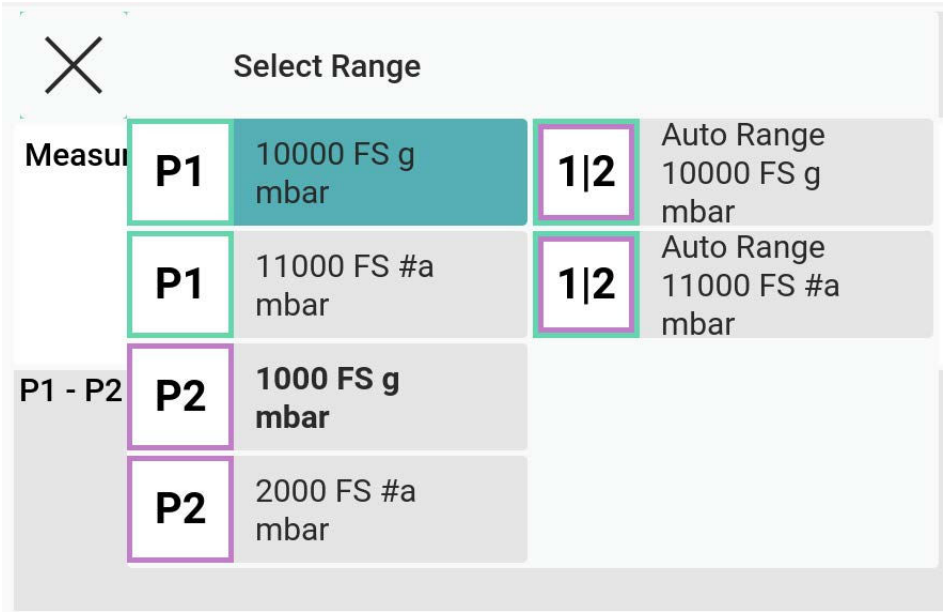


Figure 3-14: Typical Measurement Range Button Options

Select to open options of other ranges or select to open the Auto Range option. See “Auto Range Function (PACE6000 E only)” on page 33 for more details.

3.9.2 Measurement Units button (2)

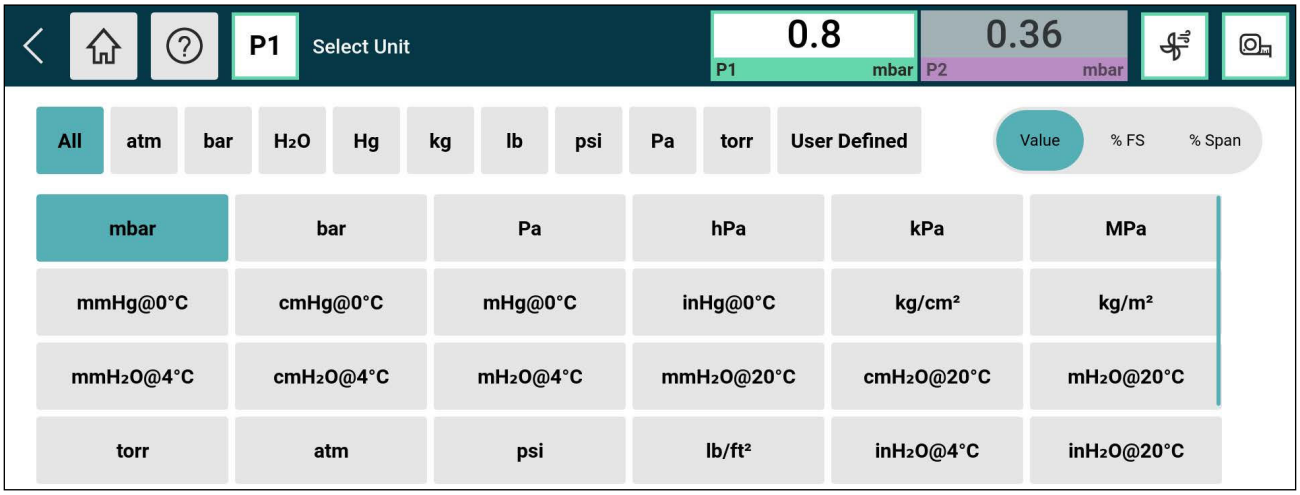


Figure 3-15: Typical Select Unit Screen

Select to open the **Select Unit** screen that gives options of other pressure units, or select **User Defined** units. You can also select the **User Defined** units in the **Settings**. See “Supervisor Setup Screen” on page 46. You can also select to show pressure as a percentage of full scale (% FS) or percentage of span (% span).

Note: In the Two Channel **Home** screen mode, the **Measurement Range** button will not give the full choice of ranges. Switch back to One Channel **Home** screen to get the full choice.

3.10 Two Channel Home Screen (PACE6000 E only)

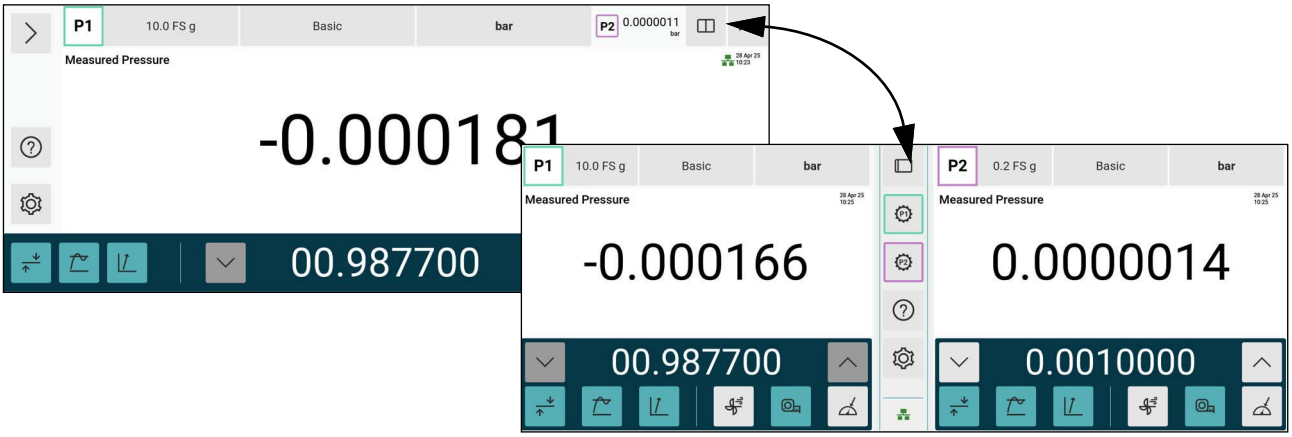


Figure 3-16: Selecting the Two Channel Home Screen

You can split the PACE6000 E **Home** Screen so that you can see the measured values and parameters of the two Pneumatic Control Modules at the same time (P1 and P2).

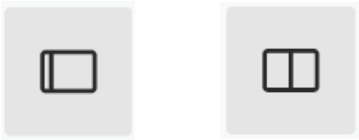


Figure 3-17: One and Two Channel Icons

Select the **One Channel** icon to split the **Home** screen into two channels. The icon changes to a **Two Channel** icon. Select the **Two Channel** icon again to return to a one channel **Home** screen.

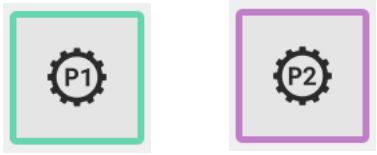


Figure 3-18: P1 and P2 Settings Icons

The central area of the Two Channel Home screen includes the **P1** and **P2 Settings** icons that let you set the **Side Bar** and **Status Area** on or off for each channel. To reduce screen clutter when you have a Two Channel Home screen, select these two icons to turn off the **Status Area** and **Side Bar**.

3.11 Good Practice: Zero Function

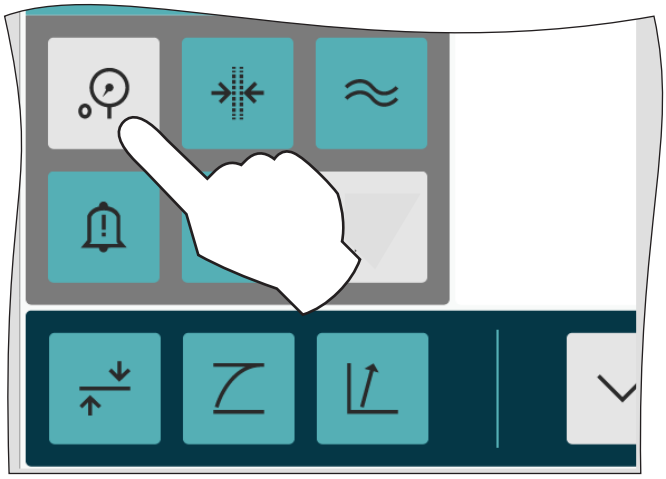


Figure 3-19: Selecting the Zero Icon

During use, the instrument pressure sensors can show small zero shifts caused by time and temperature changes. Regular use of the zero function improves measuring precision for gauge pressure sensors.

To zero a sensor:

1. Expand the left-hand side of the screen (**Side Bar**) if necessary and select the **Zero** icon.
2. The instrument will show a message asking you to confirm that you are about to trigger a Zero operation.
3. If you select **OK**, the instrument will show a note that it is zeroing the channel, then eventually a note saying ‘Zero complete’.
4. Select the **OK** button to accept.

See “Zero Settings Screen” on page 45 for more details about setting up automatic zeroing.

Note: During a zero operation, only the internal volume of the instrument vents to atmosphere.

3.12 Good Practice: Vent Function

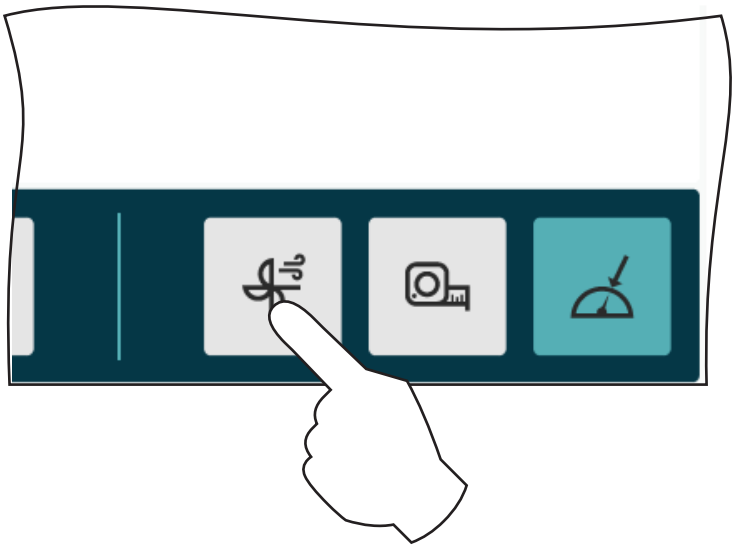
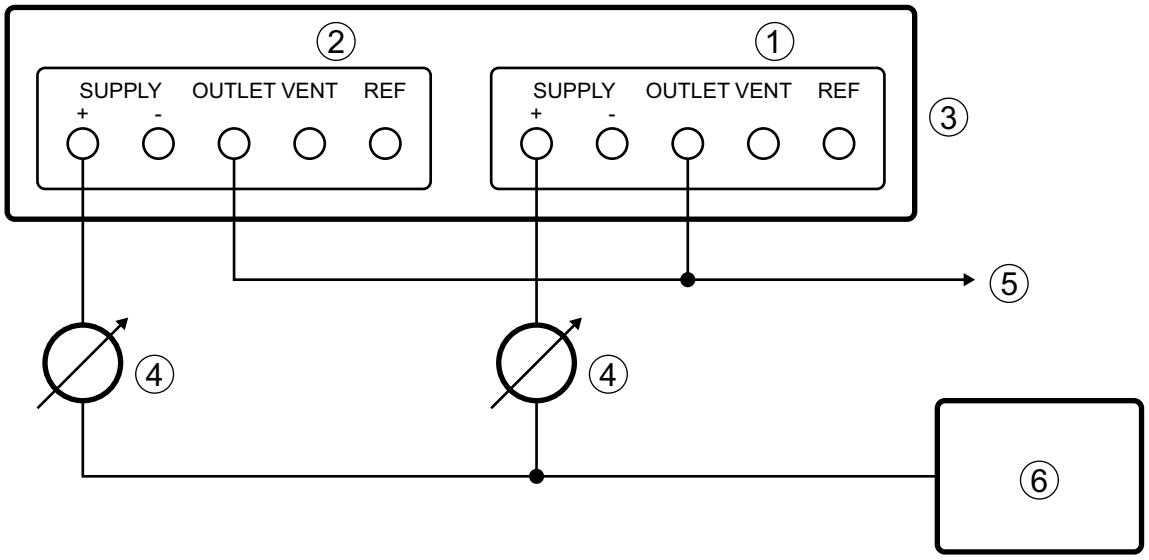


Figure 3-20: Selecting the Vent Function

You will see the **Vent** icon on all screens. This function reduces the system pressure to atmospheric pressure. Reduce the system pressure at a controlled rate to near atmospheric pressure, then use this function to reduce system pressure to atmospheric before disconnecting the UUT. You can change vent rate - see Section 5.4, “General Settings Screen,” on page 45.

3.13 Auto Range Function (PACE6000 E only)



1	Module 1	2	Module 2
3	Rear of PACE6000 E	4	Pressure Regulator
5	Pressure Output	6	Pressure Source

Figure 3-21: Pneumatic Control Modules Connected together to a Pressure Source

This function applies where the pneumatic connections of the PACE6000 E Pneumatic Control Modules are connected together.

It allows two separate Pneumatic Control Modules to work as a single control module with a single output. This optimizes the accuracy of the sensor reading across the full range of controlled pressure.

Notes:

- When using remote communications, you cannot change Auto Range function.

The Auto Range function is **not** available if:

- The Pneumatic Control Module combination is not correct. See “Dual Channel Operation (PACE6000 E only)” on page 8 for connecting the output ports of two Pneumatic Control Modules together.
- The instrument in Two Channel Home screen mode.

3.13.1 Isolation Valves and Auto Range (PACE6000 E only)

The isolation valves of each Pneumatic Control Module work in different ways, determined by whether you use the PACE6000 E in one or two channel mode. See “Two Channel Home Screen (PACE6000 E only)” on page 31. This also affects the Auto Range selection.

- In **one** channel mode, only the isolation valve for the currently selected channel is open at any time. The isolation valve for the other channel will remain shut. Auto Range can be selected.
- In **two** channel mode, both isolation valves are open at any time and Auto Range **cannot** be selected.
- Changing from **one** to **two** channel mode while the system is in **Control** mode will change both channels to **Measure** mode and both isolation valves will open.
- Changing from **two** to **one** channel mode while the system is in **Control** mode will change both channels to **Measure** mode and the instrument will shut the isolation valve of the non-active channel.

4. Tasks

CAUTION In all tasks, do not apply more than the maximum pressures stated in the maintenance manual for the unit under test.

Carefully de-pressurize all pipes (tubes) to atmospheric pressure before disconnecting and connecting to the unit under test.

INFORMATION Some tasks are optional, so although you can see them, you cannot select them unless you have bought that option. See “Software Options - Task Options” on page 69.

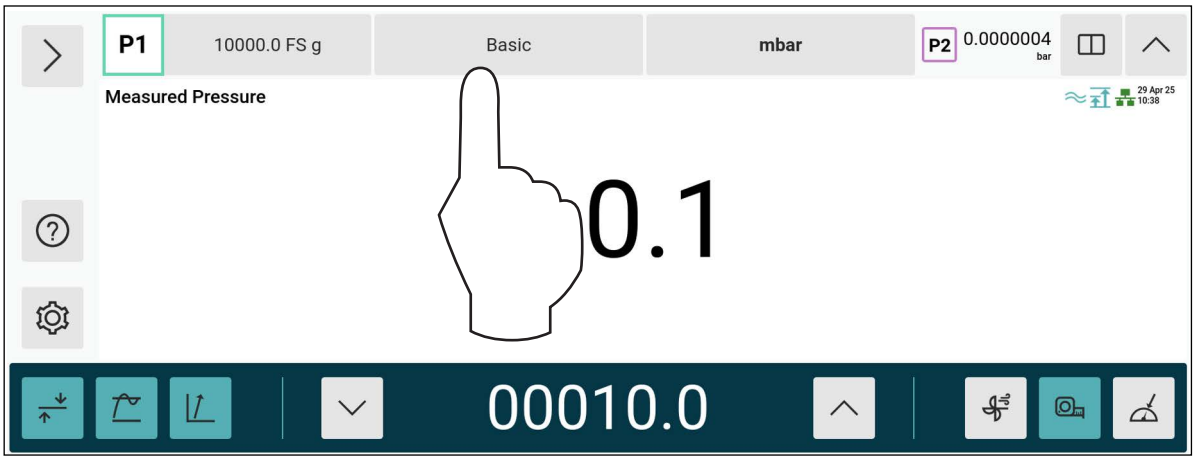
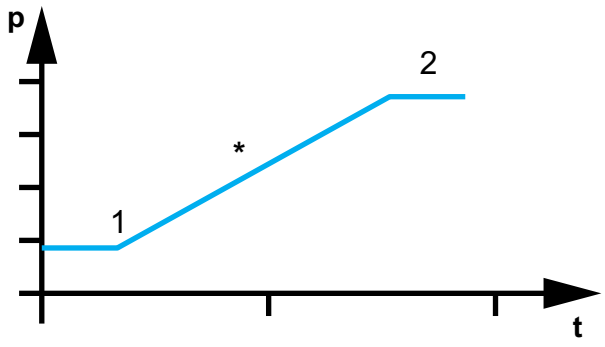


Figure 4-1: Selecting a Task

This option lets you set the instrument to work in unique ways, to help you do a selected ‘task’.

4.1 Basic Task - Controlling to a Pressure



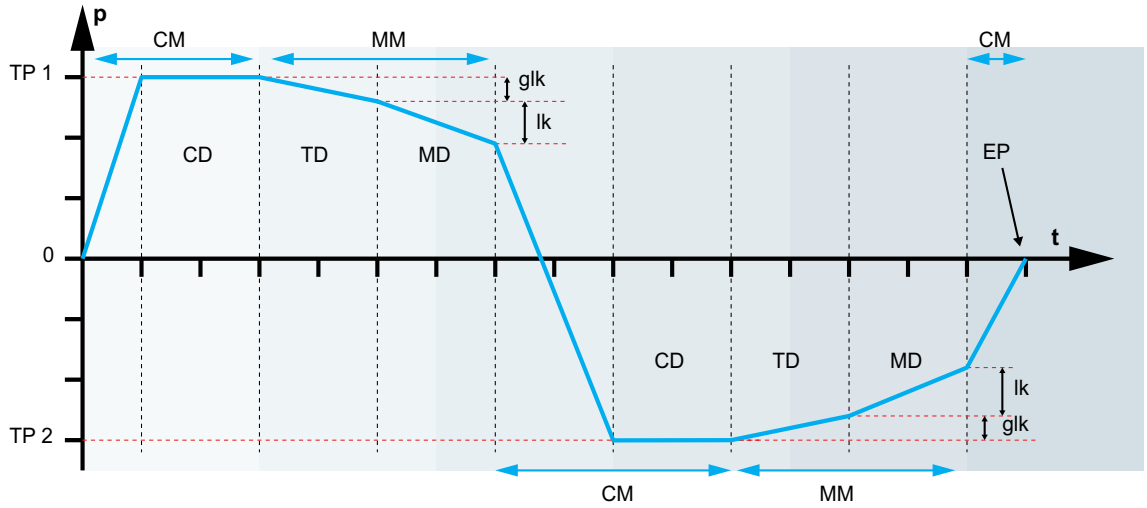
p	Pressure	t	Time
1	Control mode enabled	2	Setpoint reached
*	Controlled pressure to the setpoint		

Figure 4-2: Typical Pressure Control task

This task sets the instrument to work normally as an Indicator and Controller using standard pressure units.

1. In the **Home** screen, make sure the **Task** button shows **Basic**.
2. In **Measure Mode**, set the new setpoint value to the necessary pressure or ambient or zero gauge pressure.
3. Select the **Control Mode**.
4. The display shows the pressure value changing as the instrument controls to the new setpoint, at the set rate of change.
5. When the display shows the necessary pressure, select the **Measure Mode**.
6. Note the changing text colors of the measured pressure value as you change between **Measure** and **Control Mode** and as the measured value reaches the setpoint. See “Typical Home Screens” on page 23.

4.2 Leak Test Task



lk	Leak	p	Pressure
glk	Gross Leak	t	Time (seconds)
TP	Test Point	EP	End Point
CD	Control Dwell	MD	Measure Dwell
MM	Measure Mode	CM	Control Mode
TD	Thermal Dwell		

Figure 4-3: Example Leak Test

This task applies one or two test pressures to either an external system to find any leaks in a system connected to the instrument or an internal leak check. This task sets the test pressure (or pressures), control dwell time at the test pressure, the thermal dwell time and the leak test time (measure dwell time).

At the start of the test, the instrument applies a test pressure to the user system. A control dwell time allows the system to thermally stabilize. The instrument changes to **Measure** mode and then

records the pressure change during measure dwell time. On completion, the display shows the leak rate results with leak rates per second or per minute in the current pressure units selected.

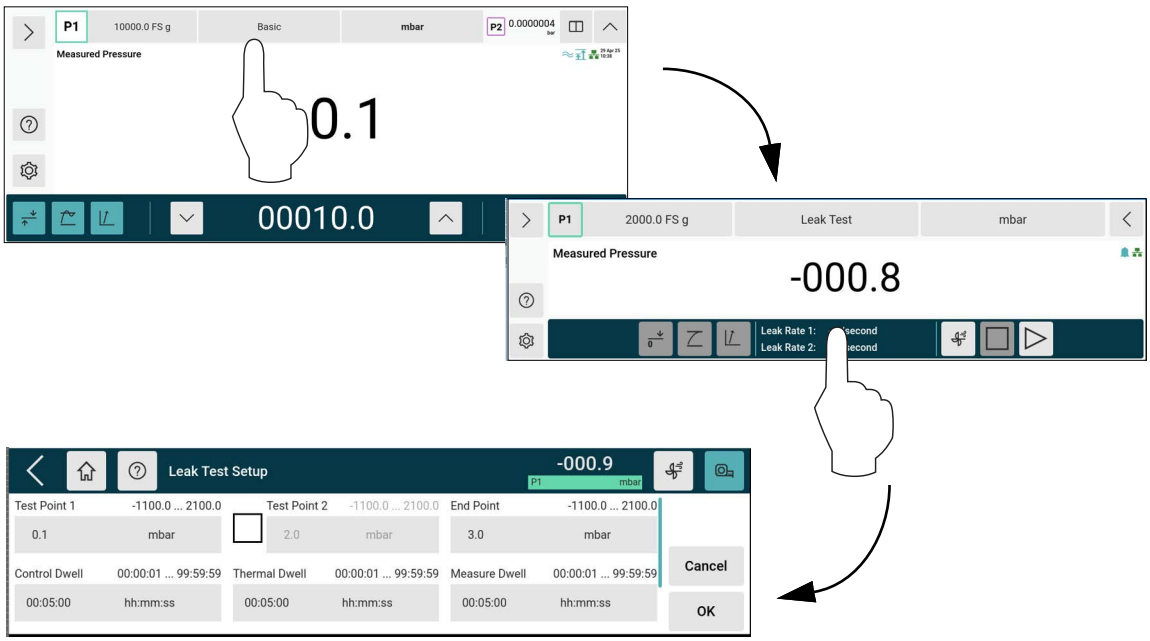


Figure 4-4: Selecting and Setting Up the Leak Test

To select and do this task:

1. From the **Home** screen, select the **Task** button and select the **Leak Test** option. The **Home** screen changes to the **Leak Test** screen with **Stop** and **Start** icons. The **Setpoint** area changes to show leak test values.
2. Select the leak test values area. A new **Leak Test Setup** screen opens for you to setup the leak test parameters.

The parameters include:

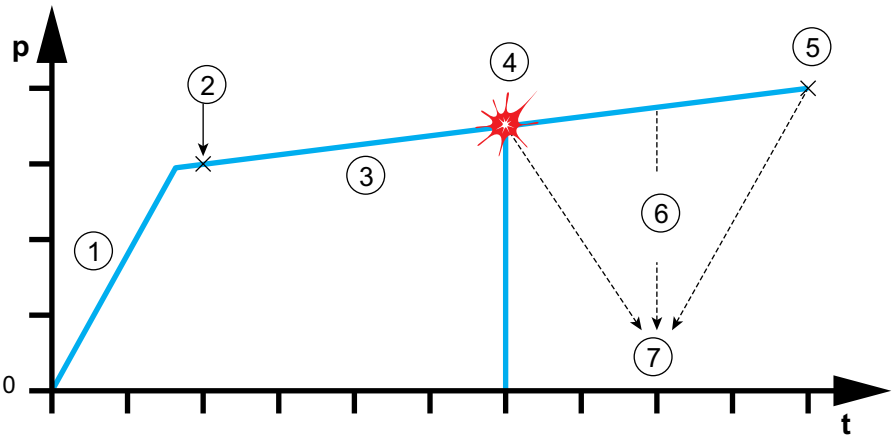
- **Test Point 1** and **2** - the two test point pressures. You can enable or disable the second test point.
- **End Point** - the end setpoint controlled pressure value at the end of the test.
- **Control Dwell** - the settling time over which the instrument is in **Control** mode and the pressure equals the test pressure.
- **Thermal Dwell** - the time over which gross leak is calculated and the instrument is in **Measure** mode.
- **Measure Dwell** - the actual leak test time while the instrument is in **Measure** mode.
- **Leak Rate** - select to show leak rate in rate per second or rate per minute.
- **Gross Leak Threshold Rate** - the threshold at which leakage is considered too large. Default 5% per minute. The instrument calculates the gross leak during the thermal stability dwell time.

3. Set your parameters as necessary, select the **OK** button and select the **Start** icon to start the test.
4. The instrument will apply pressure and measure the leak (if any) and show the results on the **Leak Test** screen after the measure dwell is complete.
5. After the leak test completes, the **Stop** icon will be unavailable and the **Start** icon will be available again.

Notes:

- Press the **Stop** icon to stop the test at any time.
- If the Test Point 2 is enabled, then the instrument does a second leak test at test point 2 and shows a second leak rate result.

4.3 Burst Test Task



1 Start slew rate
2 Start setpoint
3 End slew rate
4 Burst Point
5 End setpoint
6 Stop test
7 Measure mode
p Pressure
t Time

Figure 4-5: Typical Burst Test

This task can be used to test sudden rupture devices, such as a bursting disc device. It is done using a predefined test where you enter pressure values below and above the expected burst disc rupture pressure and set slew rates to set the speed of the test and allow for accurate capture of the burst disc rupture pressure.

The test continues until:

1. A burst is detected.
2. The test is stopped by the user.
3. The pressure reaches the end setpoint.

If a burst has been detected, the instrument shows the burst pressure value.

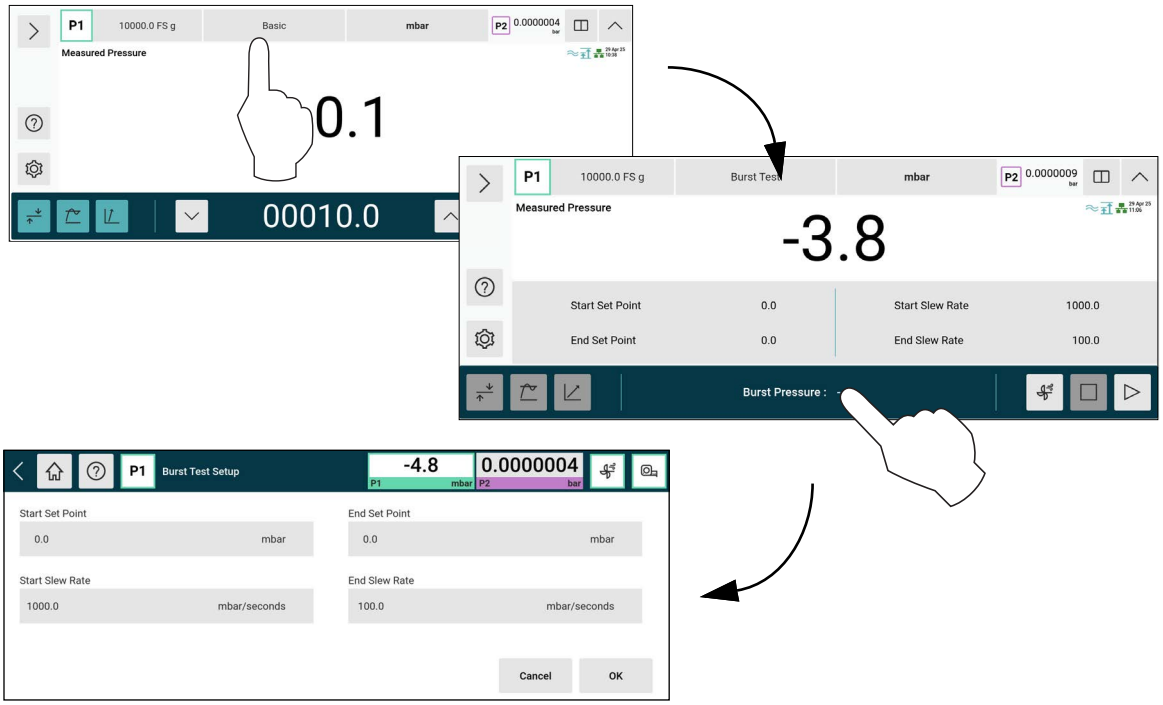


Figure 4-6: Selecting and Setting up the Burst Test Task

To select and do the task:

1. From the **Home** screen, select the **Task** button and select the **Burst Test** option. The **Home** screen changes to the **Burst Test** screen with **Stop** and **Start** icons. The **Setpoint** area changes to show burst test values.
2. Select the burst test values area. A new **Burst Test Setup** screen opens for you to setup the burst test parameters.

The parameters include:

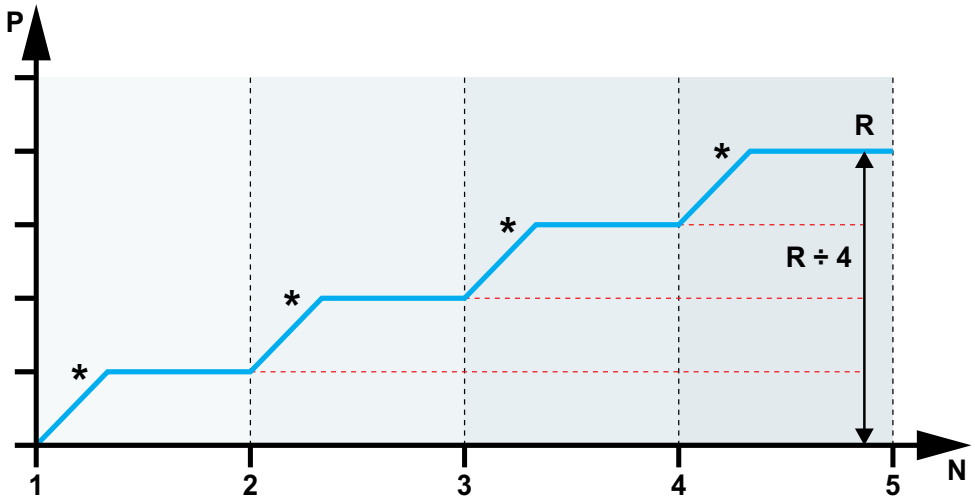
- **Start Setpoint** - to increase the pressure near the expected burst point.
- **Start Slew Rate** - the default value can be changed to another value suitable for the device under test.
- **End Setpoint** - to take the pressure past the expected burst point.
- **End Slew Rate** - the default value can be changed to another value suitable for the device under test. The slower the slew rate, the more accurate the burst point detection pressure.

3. On completion of the test, the instrument will automatically change to **Measure** mode.
4. Set your parameters as necessary, select the **OK** button and select the **Start** icon to start the test.

Note: Press the **Stop** icon to stop the test at any time.

5. The instrument will apply pressure and show the results.

4.4 Divider Task



P Pressure
N Number of setpoints (five in this example)
R Range between start setpoint (1) and end setpoint (5).
* Controlled pressure to each setpoint.

Figure 4-7: Example Divider Task

This task divides the start and end setpoint values into a set number of calculated equal divisions of setpoints. You select the start and end setpoint values and the number of setpoints. The software calculates the divisions, showing a table of the calculated setpoints.

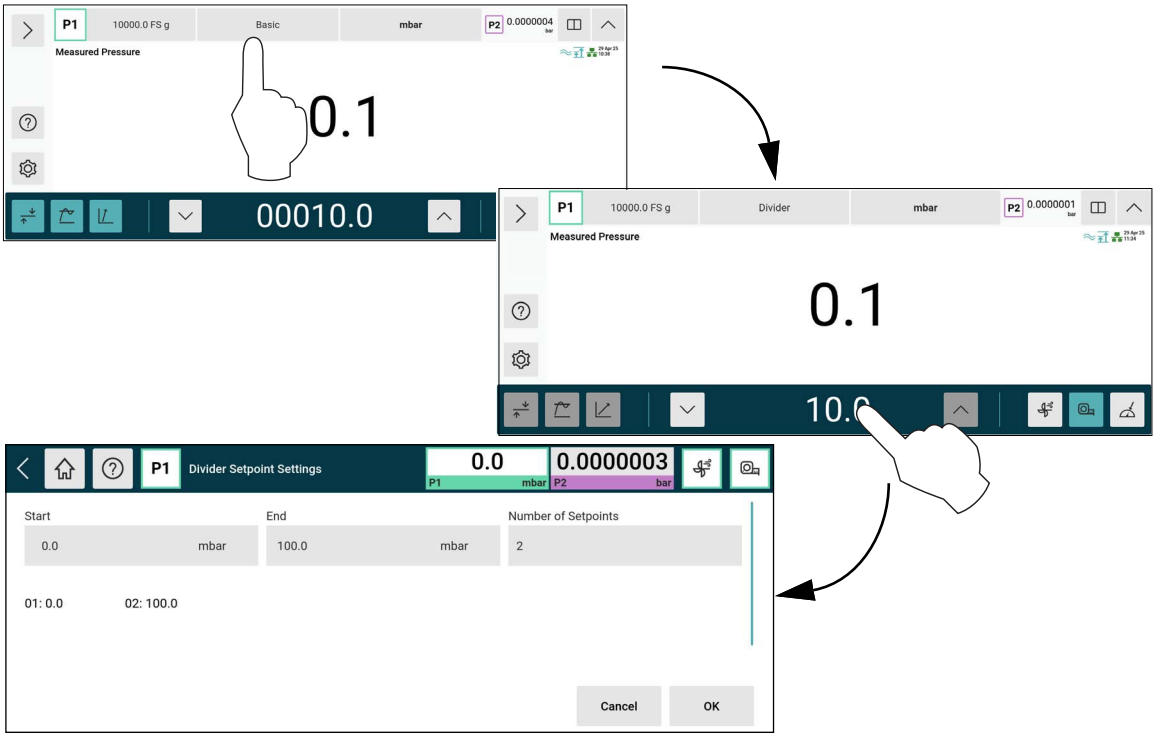


Figure 4-8: Setting up the Divider Task

To select and do the task:

1. From the **Home** screen, select the **Task** button and select the **Divider** option. The **Home** screen changes to the **Divider** screen. The **Setpoint** area changes to show divider values.

2. Select the divider values area. A new **Divider Setpoint Settings** screen opens for you to setup the divider parameters.

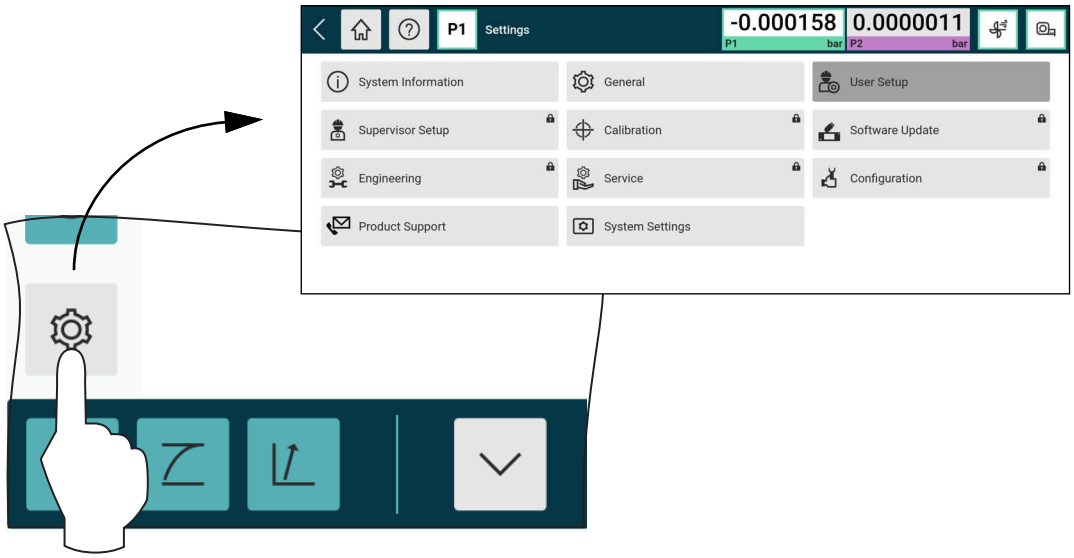
The parameters include:

- **Start** - the starting setpoint.
- **End** - the end setpoint.
- **Number of Setpoints** - the number of setpoints.

3. Set your parameters as necessary. The screen will show a table of the calculated setpoints. Select the **OK** button and select **Control** mode to start the test.
4. Use the **Setpoint** area Nudge buttons to step between setpoints. The instrument will control pressure to reach the setpoints.

Chapter 4. Tasks

5. Settings



The **Home** screen shows the **Settings** icon. Select the icon to open the **Settings** screen that has options to see and change the settings of the instrument and its Pneumatic Control Module or Modules.

- **System Information** - see “System Information Screen” on page 44.
- **General** - see “General Settings Screen” on page 45.
- **User Setup** - for future use.
- **Supervisor Setup -** see “Supervisor Setup Screen” on page 46.
- **Calibration** - see “Calibration” on page 58.
- **Software Update** - gives options for updating the software of the instrument and the Pneumatic Control Module or Modules. See “Software Update Screen” on page 52.
- **Engineering, Service and Configuration** - for advanced users only, such as Service Engineers.
- **Product Support -** QR codes and URLs of Druck Product Support.
- **System Settings** - lets you change the system settings such as language and date and time. Select the language option then select any of the languages and the text on all screens will immediately change to your selected language. **Backlight** and **Volume** options are for future use.

5.1 Selecting P1 or P2 in the Settings Screens (PACE6000 E only)

The settings screens for the PACE5000 E and PACE6000 E are almost the same, except that the PACE6000_E screens will show the buttons and pressures at the top for both channels P1 and P2. Figure 5-1 shows the Alarm Settings screen as an example. Select the P1 or P2 channel button to see or change the settings for each channel.

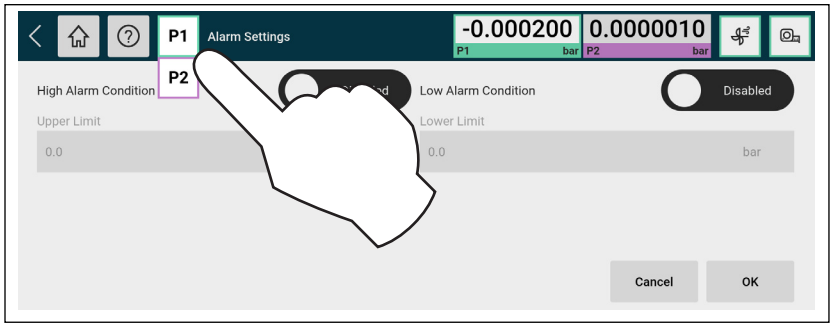
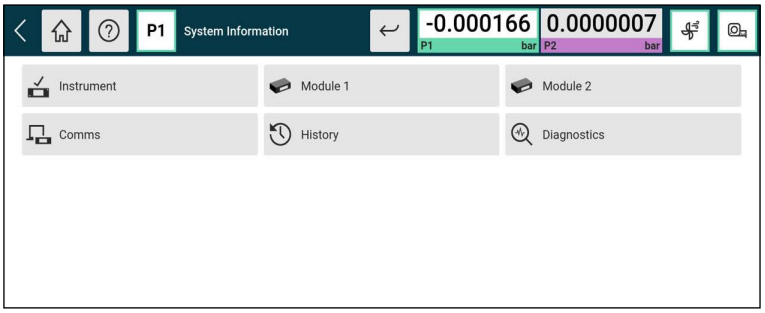


Figure 5-1: Selecting P1 or P2 in the Settings Screens

5.2 PIN-Protected Option Screens

Some **Settings** options show a small padlock, which means you will need to use a PIN to open the option. Refer to “Personal Identification Numbers (PINs)” on page 61. When you open a PIN-protected option, it’s screen will auto logout after approximately three minutes. You can manually logout using the **Logout** icon shown at the top of the screen.

5.3 System Information Screen



Navigation: **Settings** > **System Information**

This screen gives options to see information about the instrument and its Pneumatic Control Modules.

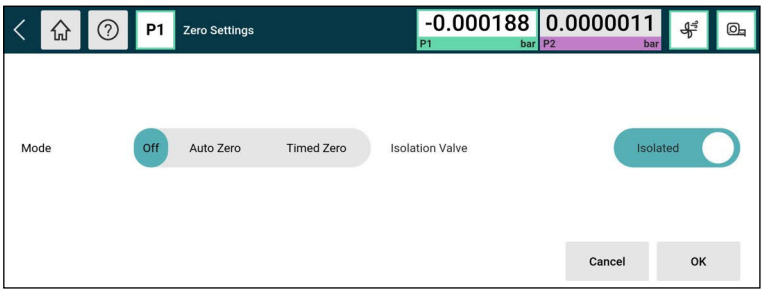
- **Instrument** - information about the instrument and what options are enabled.
- **Module** or **Module 1** and **Module 2** - information about the Pneumatic Control Module (or Modules for PACE6000 E).
- **Comms** - current information about the communications connection settings such as the Ethernet and USB ports.
- **History** - historical information about Ethernet, Hardware, Messages and Valve Correction.
- **Diagnostics** - diagnostic information including temperatures.

5.4 General Settings Screen

Navigation: **Settings** > **General**

- **Control Settings** - selects the control mode. See “Measure and Control Modes” on page 26.
- **Filter** - enables or disables the filter (disabled by default). The displayed reading for the channel can be filtered by a custom low pass filter. The instrument works at a speed independent of the filter time constant.
- **Min Max Average** - resets and adjusts the time constant for the maximum, minimum and average display of pressure readings. See “Status Area Parameters” on page 28.
- **Setpoint Limit** - enables, disables and sets the upper and lower limits of the setpoint. This is useful for protecting sensitive equipment under test.
- **Slew Rate** - adjusts the slew rate and its units. See “Slew Rate” on page 62.
- **Tare** - enables or disables the manual tare function. A specific tare value can be selected or the current displayed pressure reading can be “captured” as the tare value.
- **Vent** - sets the rate at which the vent works and gives more options such as the vent state after venting. Use the vent setup to prevent damage to rate-sensitive equipment connected to this controller. The vent rate setting is independent of the controller slew rate settings.
- **Zero** - sets the zero mode. See “Zero Settings Screen” on page 45.
- **Number Resolution** - sets the resolution of the measurement units.

5.5 Zero Settings Screen



Navigation: **Settings** > **General** > **Zero**

This screen lets you set up automatic zeroing.

- **Modes** - **Off, Auto Zero** or **Timed Zero**

Selecting **Auto Zero** sets the instrument to automatically zero the sensor. When the setpoint is set to 0 bar and the measured pressure reaches <3 bar, the instrument opens its vent valve to allow the internal pressure manifold to reach atmospheric pressure. If the pressure is >3 bar, the instrument will control the pressure to <3 bar before opening the vent valve. Once the pressure

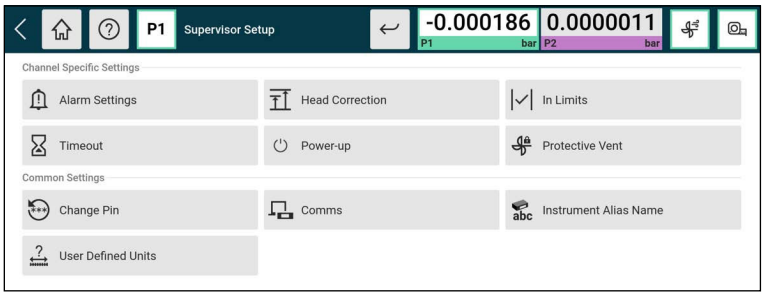
stabilizes, the instrument uses this new pressure as the zero reference and sets the sensor to zero. Default setting is **off**.

Selecting **Timed Zero** lets you set intervals at which the instrument will zero the sensor.

- **Isolation Valve** - **Non-Isolated** or **Isolated**

The Pneumatic Control Modules have a software-controlled internal Isolation Valve at the OUTPUT port, which isolates the module from the external equipment if necessary. For example, when zeroing a sensor. Selecting **Isolated** means that the instrument will automatically shut the isolation valve before it does the zero operation. The valve will re-open after the operation. Default setting is **Isolated**.

5.6 Supervisor Setup Screen



Navigation: **Settings** > **Supervisor Setup**

Note: This is a PIN secured screen.

5.6.1 Channel Specific Settings

- **Alarm Settings** - see “Alarm Settings Screen” on page 47.
- **Head Correction** - enables and sets the values for gas head height correction. See “Head Height Correction Screen” on page 47.
- **In Limits** - sets the In Limits values and time. See “In Limits Meter” on page 62. Default settings are 0.001% FS and 1 second.
- **Timeout** - sets the idle time. This is the time that starts when the controller reaches the setpoint in **Control** mode. If new setpoints are not entered the timer will time-out and return the instrument to **Measure** mode. Default setting is **Disabled**.

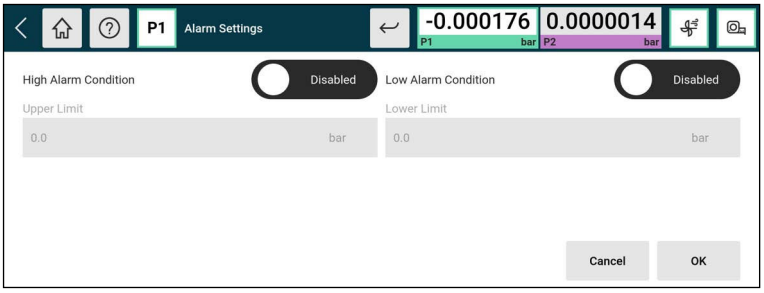
Note: Controller timeouts can save supply gas, extending control valve life and minimizing acoustic noise.

- **Power-up** - see “Power-up Options Screen” on page 49.
- **Protective Vent** - enables or disables the protective vent. You can set the vent to release trapped pressure on power-up if the trapped pressure is greater than or equal to 3 bar gauge. The over range protective vent discharges pressure at a controlled rate if measured pressure is more than 110% full-scale. Default settings are **Enabled**.
- **User Defined Units Settings** - lets you set user defined units of pressure. See “User Defined Units” on page 62.

5.6.2 Common Settings

- **Change PIN** - see “Personal Identification Numbers (PINs)” on page 61.
- **Comms** (Communications) - see “Communications Screen” on page 48.
- **Instrument Alias Name** - lets you create an alias for the instrument. The instrument shows this name when you communicate through the communication interfaces.

5.7 Alarm Settings Screen



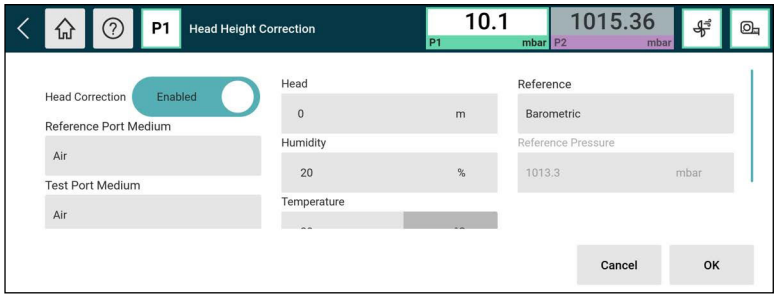
Navigation: **Settings** > **Supervisor Setup,** enter PIN > **Alarm Settings**

This screen lets you enable or disable and set the value of the high and low alarms for each channel of the PACE6000 E or the single channel of the PACE5000 E.

The alarms trigger when the pressure is more than the high alarm value or falls below the low alarm value. A buzzer sounds when the alarm triggers and the alarm symbol (bell) changes color to red. The screen will also show a message.

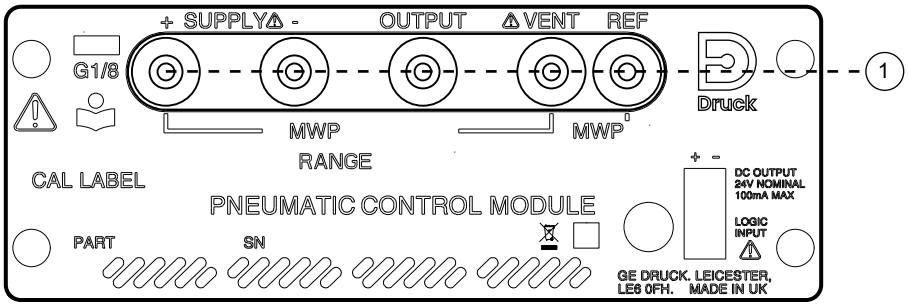
Default settings are both **Disabled**.

5.8 Head Height Correction Screen



Navigation: **Settings** > **Supervisor Setup,** enter PIN > **Head Correction**

This screen makes changes to the Gas Head Correction. This corrects pressure reading for the head (height difference) between the Instrument Reference Level and the UUT. For accuracy, enable head correction and set the parameters for each sensor.



1 Instrument Reference Level.

Figure 5-2: Gas Head Correction

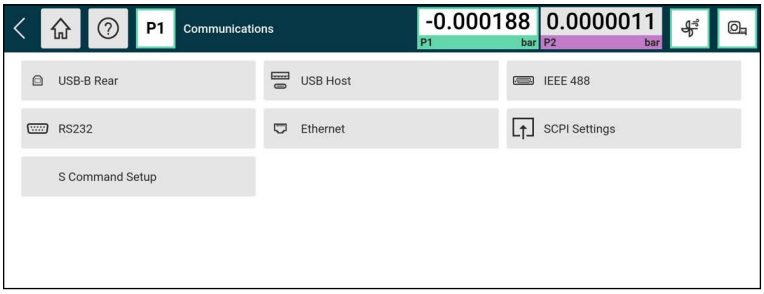
- Where the UUT is higher than the reference level of the PACE, enter a positive height correction.

- Where the UUT is lower than the reference level of the PACE, enter a negative height correction.

Note: When calibrating the PACE instrument, disable the Gas Head Correction and correct the actual applied pressures for height.

Head Correction is **Disabled** by default.

5.9 Communications Screen



Navigation: **Settings** > **Supervisor Setup,** enter PIN > **Comms**

These settings are for the communication connections on the instrument.

INFORMATION

When connecting to the instrument by remote communications, the touchscreen will show the Remote mode message. See “Remote Mode” on page 61.

- **USB-B Rear** - sets the Mode: MSD (Mass Storage Device), VCP (Virtual Com Port) or TMC, Terminator: CR, LF or CR/LF, Protocol: SCPI, DPI500 or DPI520 and Check Sum status for the rear USB type B socket. Default setting is **Mode** TMC.
- **USB Host** - sets the USB Host List.
- **IEEE 488** (option) - disables or enables and sets the Address, Terminator CR or LF, Protocol: SCPI, DPI500 or DPI520 and Check Sum status for the optional IEEE 488 connection. Default setting is **Disabled**.
- **RS232** - disables or enables and sets the RS232 communications options for when you have connected the optional USB to RS232 adapter. Default setting is **Enabled** with **Baud Rate** 115200, **Terminator** CR, **Parity** and **Flow Control** NONE, **Stop Bits** 1 and **Protocol** SCPI.
- **Ethernet** - gives options to configure the ethernet socket communications.
  - **General Settings**
    - **Network Settings** - lets you set the parameters of a static IP, or simply leave the parameters set to Auto IP, with a choice of IPv4 or IPv6. Default setting is **Auto IP**.
    - **Access Control** - a firewall mechanism. The device can be in either of two states: Open or Restricted. In the Open state any user (client) can connect to the instrument through any LAN based protocols (Normal behavior). In the Restricted state, no devices other than the whitelisted IP address can connect to the instrument using any LAN based protocols. The user can whitelist the IP address either by manually typing the IP address, or by selecting the IP address from the recently connected client list. Default setting is **Access mode** Open.
    - **LAN Reset** - resets the LAN configuration to default values. It will first open a message telling you what it will reset to default values.
    - **Webpage access** - use this to change the LXI web page password.

- **Ethernet Protocols**

  These options allow you to enable or disable the protocols.
  - **Raw Socket** - (default port address 5025).
  - **HiSLIP** - (default port address 4880).
  - **TLS Socket (SCPU TLS)** - (default port address 5027).
  - **VXI-11** - sets the TCP and UDP Port (default port address 111).
  - **HTTP** - (default port address 80).
  - **HTTPS** - (default port address 443).
- **SCPI Settings** - lets you change the SCPI mode from **Standard** (default) to **Legacy**.
- **S Command Setup** - lets you set the pressure units for the S Commands S0 to S3. Default is **SO** bar, **S1** psi, **S2** kPa and **S3** mbar.

INFORMATION

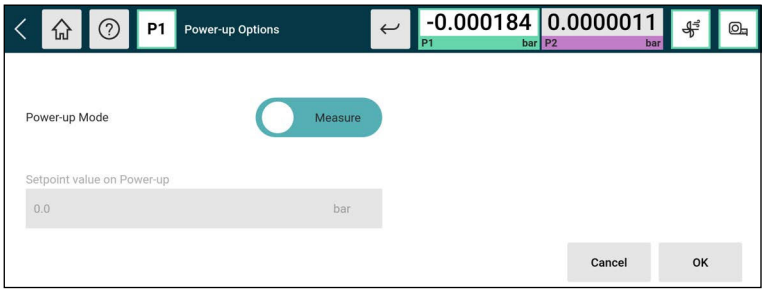
The Standard SCPI-99 mode is selected by default.

You can change SCPI communications from **Standard** SCPI-99 mode (default) to **Legacy** PACE Mode. The difference is that in **Legacy** Mode, the SCPI command is echoed back, followed by the response.

To run any existing scripts of SCPI commands developed for **Legacy** PACE, select **Legacy** mode before running them and after selecting the **Restore Factory** setting - restricted to advanced users only.

You can select **Standard** SCPI-99 mode by sending SCPI command :SYSTem:ECHO 0 and Legacy mode by sending SCPI command :SYSTem:ECHO 1.

5.10 Power-up Options Screen



Navigation: **Settings** > **Supervisor Setup,** enter PIN > **Power-up**

This screen lets you set up the way the instrument is set on power-up.

- **Power-up Mode** - a selector that lets you choose to set the instrument into **Measure** mode or **Control** mode on power-up. Default is **Measure**.
- **Setpoint value on Power-up** - the value of the setpoint when the instrument energizes and is in **Control** mode. Select this area to open a dialogue box for you to enter the setpoint value. Default is 0.0.

5.11 Active Settings

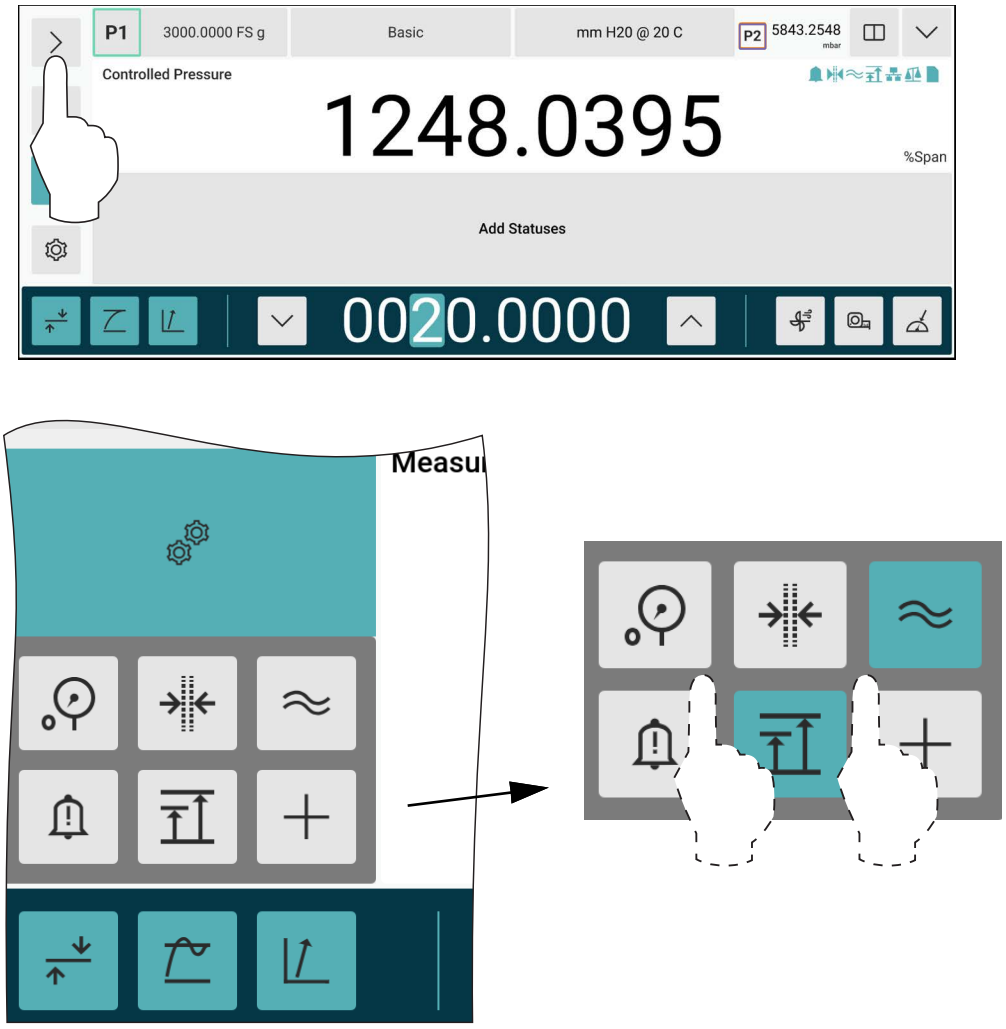


Figure 5-3: Selecting the Active Settings

This area of the **Home** screen lets you easily see and disable any settings which are in use (active). To see them:

1. On the **Home** screen, select the **Expand** icon to expand the options to the left of the screen in the **Side Bar**.
2. The active settings show in green underneath the **Active Settings** (two gear wheels) icon.
3. You can now select the settings in this area of the **Home** screen to disable or make them active.

Note: When using the Two Channel **Home** Screen (PACE6000 E Only), select the **P1** and **P2 Settings** icons to see the **Side Bar** containing the **Active Settings**.

6. Maintenance and Calibration

THE EQUIPMENT CONTAINS NO USER SERVICEABLE PARTS. INTERNAL COMPONENTS MAY BE UNDER PRESSURE OR PRESENT OTHER HAZARDS. SERVICING, MAINTAINING, OR REPAIRING THE EQUIPMENT MAY RESULT IN DAMAGE TO PROPERTY AND SERIOUS PERSONAL INJURY (INCLUDING DEATH). THEREFORE IT IS PARAMOUNT THAT SERVICE ACTIVITIES ARE UNDERTAKEN ONLY BY A DRUCK AUTHORIZED SERVICE PROVIDER.

REPAIR ACTIVITIES UNDERTAKEN BY UNAUTHORIZED PERSONNEL MAY INVALIDATE THE EQUIPMENT WARRANTY, SAFETY APPROVALS AND DESIGN CONDITION. DRUCK CANNOT BE HELD LIABLE FOR ANY DAMAGES (INCLUDING DAMAGE TO THE EQUIPMENT), MONETARY FINES, PROPERTY DAMAGE OR PERSONAL INJURY (INCLUDING DEATH) THAT MAY OCCUR DURING OR AS A RESULT OF SERVICE MAINTENANCE OR REPAIR WORK UNDERTAKEN BY AN UNAUTHORIZED SERVICE PROVIDER.

CAUTION **After any maintenance or service, inspect the equipment to make sure all covers are securely fitted.**

6.1 Introduction

All personnel must be correctly trained and qualified before they use or do maintenance on the product.

This section contains procedures for routine maintenance and the replacement of components.

Table 6-1: Maintenance Tasks

Task	Period
Visual Inspection	Before use
Testing	Before use
Cleaning	Weekly - Can change; depends on usage (for example, rack mounted or bench top) and environment (for example. humidity and dust).
Calibration	12 months - Can change; depends on the necessary accuracy.
Replace Pneumatic Control Module Filters	Determined by usage, but typically after 8500 hours of control.
Service Pneumatic Control Module	Three years or after 8500 hours of control. Whichever comes sooner.

6.2 Visual Inspection

Inspect for obvious signs of damage and dirt on the following:

1. External of the instrument.
2. Power supply connector and power lead.
3. Associated equipment.

Replace any parts that have damage. Contact Druck Service.

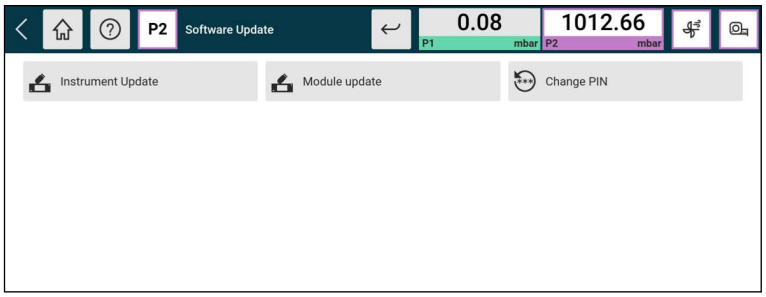
6.3 Testing

Do a standard serviceability test Section 7.2, “Standard Serviceability Test,” on page 59.

6.4 Cleaning

Do not use solvents for cleaning. When necessary, clean externally using a damp lint-free cloth and mild liquid detergent.

6.5 Software Update Screen



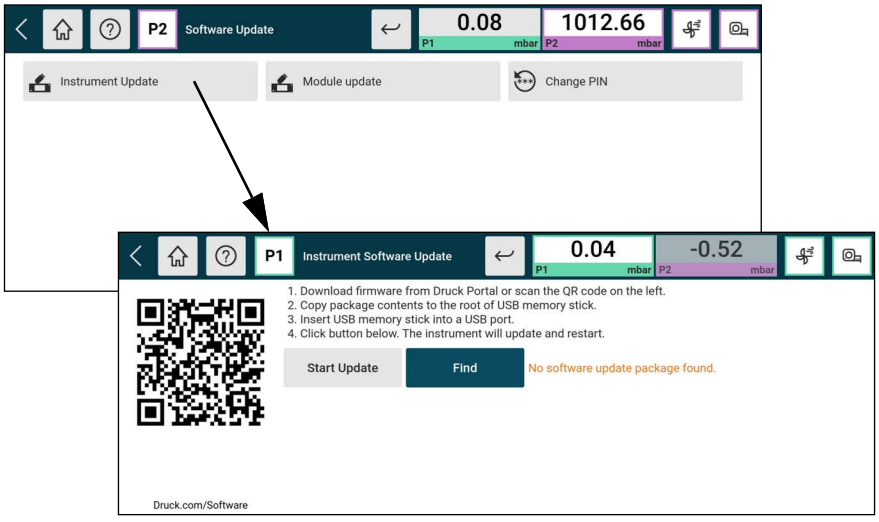
Navigation: **Settings** > **Software Update >** Enter PIN

Note: This is a PIN secured screen.

This screen gives you options of updating the software in the instrument and the separate Pneumatic Control Module or modules (PACE6000 E), or to change the PIN. See “Personal Identification Numbers (PINs)” on page 61. It also uses a different PIN to let you add task options. See “Software Options - Task Options” on page 69.

When updating the instrument software, you download a complete ‘package’ of software that also includes the software for Pneumatic Control Modules, for later installation to the module (or modules) if necessary.

6.5.1 Updating the Instrument Software



1. On the instrument, select the **Software Update** screen. Enter the PIN for Software Update.
2. Insert a USB type A or C Flash Drive of minimum 4 GB and maximum 32 GB formatted to FAT32 into an internet-connected PC.
3. Check that the Flash Drive is empty by deleting any files that are on it.
4. On the PC, use a web browser to open the Druck Download Portal here: **https://druck.com/software**

You can alternatively use a mobile device and scan the QR code on the **Instrument Software Update** screen to go to the Druck Download Portal to see what software is available.

5. Read the EUSR (End User Software Release) document on the portal to make sure you are selecting the correct and latest software package for the instrument (PACE5000 E or PACE6000 E).
6. Download the software package file, which is a zip file.
7. Make a note of the software revision so that you can check it is correctly installed later.
8. Once the zip file has completed download, save the zip file to the PC. Unzip the contents of the zip file to the root folder of the USB Flash Drive.
9. Eject the USB Flash Drive from the PC.
10. Insert the USB Flash Drive into the front or rear panel USB type A port or the rear USB type C port of the instrument.
11. On the **Instrument Software Update** screen, select the **Find** button. The instrument will search the USB drive to find the correct files for the update. The **Instrument Update** screen will show the details of the software update that it has found.
12. Select the **Start Update** button to make the instrument start the Software Update procedure. The update screen will show and the system will reboot several times.
13. Once the software updates have been completed, make sure that the software in the instrument has the new revision number. To do this, select the **Settings** > **System Information** screen.
14. You can now remove the USB Flash Drive from the instrument.

INFORMATION **You can also use the LXI Interface to update the software package in the instrument. See Appendix A on page 71.**

6.5.2 Updating Pneumatic Control Module Firmware

WARNING **Using out-of-date versions of software and firmware in the instrument or its control modules carries a risk. If you decline any updates recommended by Druck, then you do so at your own risk.**

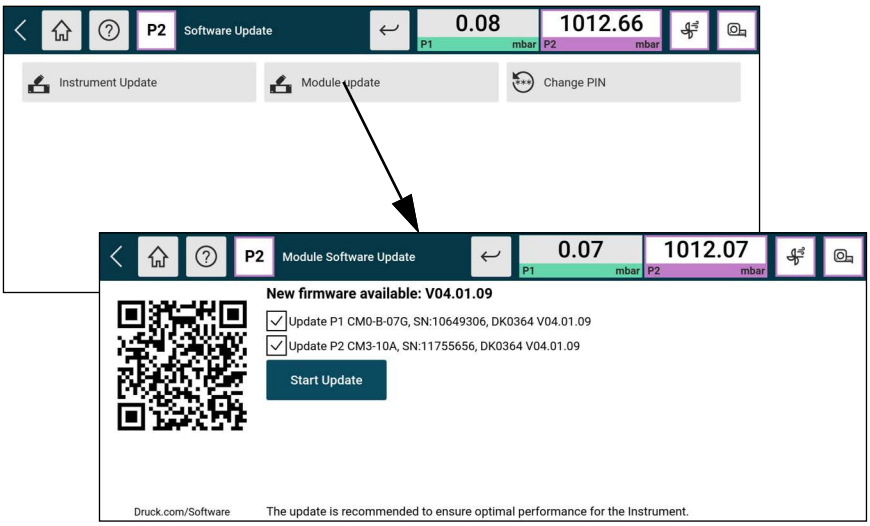
The firmware in the Pneumatic Control Modules must be correct for the PACE5000 E and PACE6000 E instruments that hold them.

The instrument will examine the Pneumatic Control Module firmware each time it energizes, as part of the Power-up Sequence. If the instrument detects out of date firmware (for example, if you fit an older Pneumatic Control Module to the instrument), it will give you the option to update the firmware from the ‘package’ of software present in the instrument. Alternatively, you may select to continue using the out-of-date firmware at your own risk.

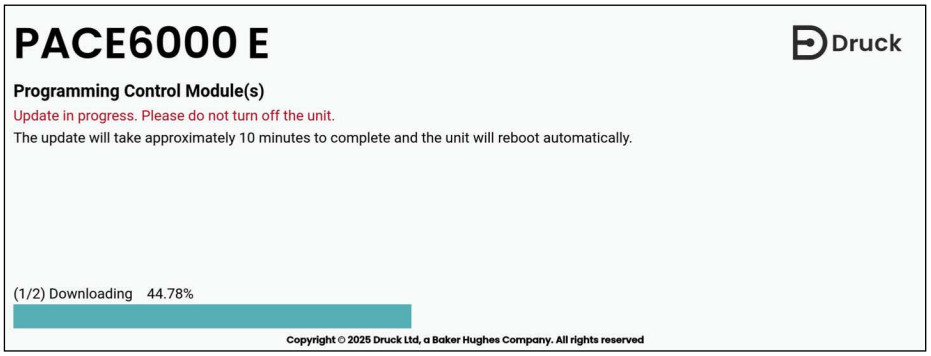
You may also manually update the Pneumatic Control Module firmware using the Software Update screen. To do this:

1. Update the Instrument Software as described in “Updating the Instrument Software” on page 52.

2. Select **Settings** > **Software Update** and enter the PIN for Software Update. Then select the **Module update** option.



3. The **Module Software Update** screen opens. It will show you any new available firmware for the Pneumatic Control Modules. Select to update the module or modules (PACE 6000E only).
4. Select the **Start Update** button to start the software download from the software package in the instrument to the Pneumatic Control Module.



5. This procedure will automatically update the firmware in the Pneumatic Control Modules and then restart the instrument.

6.6 Replacement Parts

WARNING Turn off the source pressure and carefully vent the pressure lines (tubes) before disconnecting the pressure lines (tubes) for maintenance. Proceed with care.

Isolate the instrument power supply before replacing parts. The instrument contains hazardous voltages when power is applied.

Isolate the power supply before removing or fitting a Pneumatic Control Module or blanking plate.

If replacing the mains fuses, use only the type shown in "General Specifications".

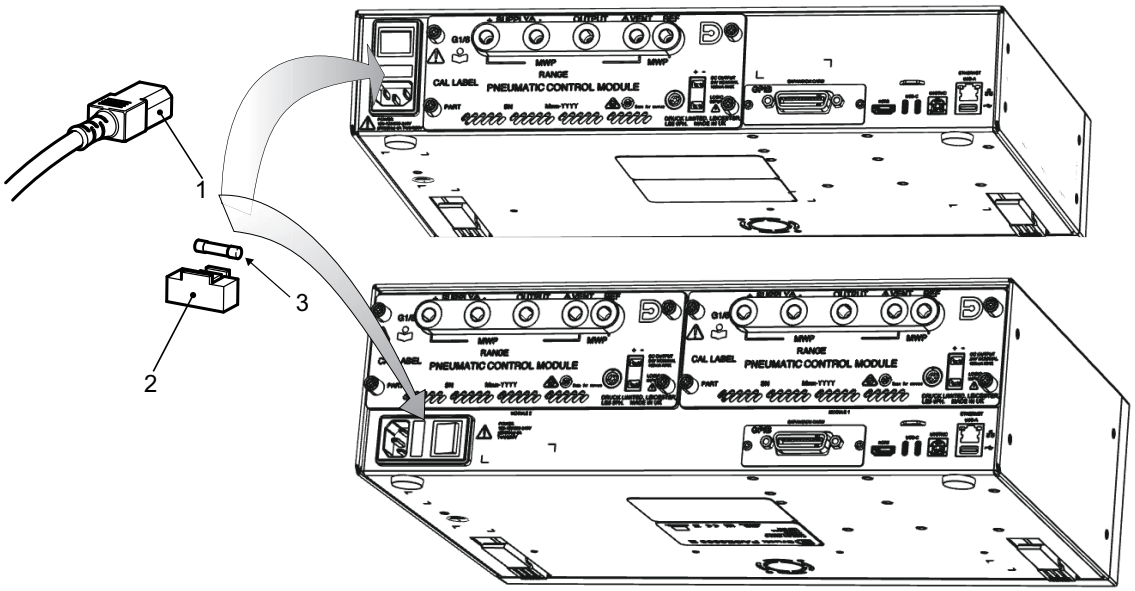
If replacing the mains cable, use cable identical to the cable supplied with the instrument, rated to at least 5 A and containing a protective earth conductor.

Use only these replacement parts:

- Fuse - see "General Specifications" on page iii.
- Filter Kit - (IO-FILTER-KIT).
- Pneumatic Control Module - see Sales Datasheet.

6.6.1 Fuse Replacement

Refer to Section 7, "Testing and Fault Finding," on page 59 when to replace the fuse.



1 IEC connector
2 Fuse carrier
3 Fuse

Figure 6-1: Fuse Replacement

6.6.1.1 Remove Fuse

Refer to Figure 6-1.

1. Set the power switch to OFF. If the PACE is not rack-mounted, got to step 3.
2. For access to rack-mounted instruments, the following actions may be necessary:
   a. Isolate pneumatic supplies.

b. De-pressurize all pressure supply inlet and output lines.
c. Partially or completely withdraw the instrument.

3. Isolate the power supply to the instrument and disconnect the IEC power supply connector (1).
4. Remove the fuse carrier (2) from the power supply input socket assembly.
5. Remove the fuse cartridge (3).

6.6.1.2 Replace Fuse

Refer to Figure 6-1.

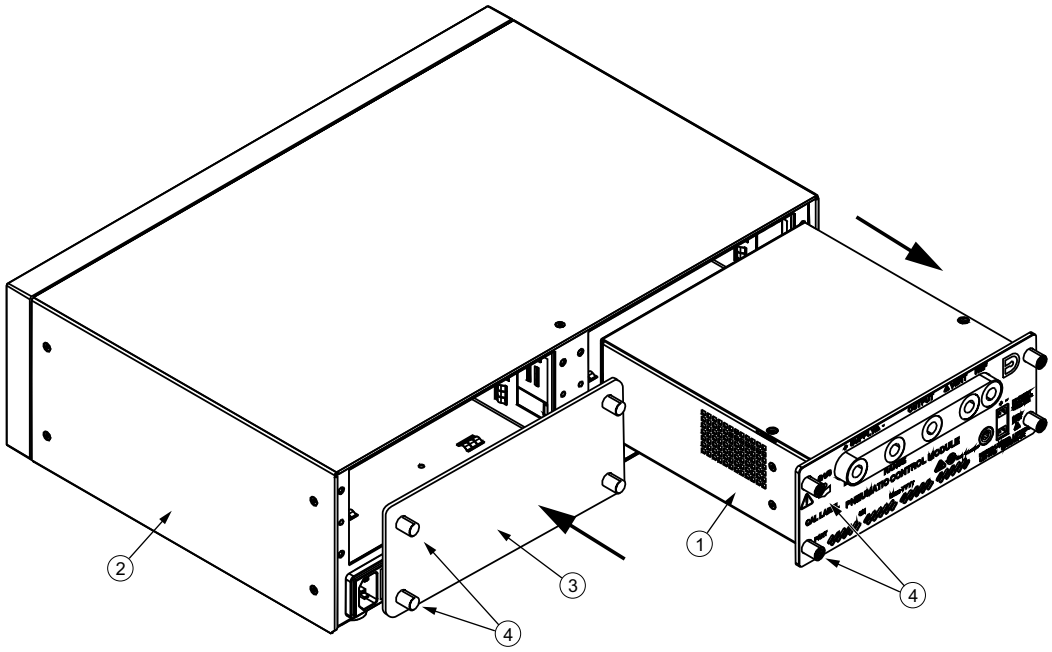
Check for the correct type of fuse. See “General Specifications” on page iii.

6. Replace the fuse.
7. Refit the fuse carrier (2) in the power supply inlet socket assembly.
8. Refit and reconnect rack-mounted units. Refer to Section 2, “Installation,” on page 3.
9. Switch on the power supply and set the power supply switch to ON.
10. If the fuse breaks immediately on power-on, contact the manufacturer or Service Agent.

6.6.2 Pneumatic Control Module Replacement

WARNING Turn off the source pressure and vent the pressure lines before disconnecting or connecting the pressure lines. Proceed with care.

Isolate the power supply before removing or fitting a Pneumatic Control Module or blanking plate.



1 Pneumatic Control Module
2 Instrument Chassis
3 Blanking Plate
4 Screws

Figure 6-2: Pneumatic Control Module Replacement

Refer to Figure 6-2 when removing and replacing the Control Modules.

6.6.2.1 Remove Control Module

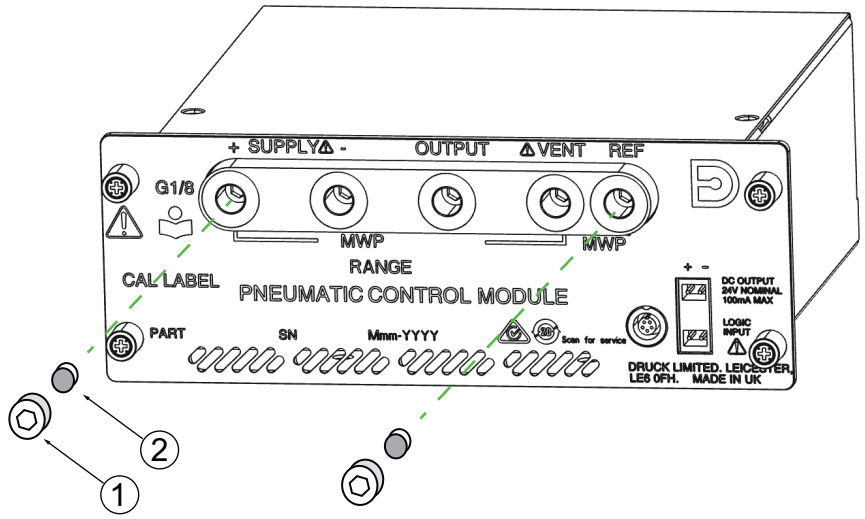
1. Release the four crosshead screws (drive size 2) that secure the Control Module in the instrument chassis.

2. Remove the Control Module from the chassis.
3. Fit the blanking plate (3) (supplied).

6.6.2.2 Replace Control Module

1. Fit a fully compatible Control Module (1) into the instrument chassis (2).
2. Secure the four crosshead screws to hold the Control Module in the instrument chassis.

6.6.3 Pneumatic Control Module Filters



1 Retainer 2 Filter

Figure 6-3: Pneumatic Control Module Filter Replacement

6.6.3.1 Remove Filter

Refer to Figure 6-3.

1. Set the power switch to OFF. If the PACE is not rack-mounted, got to step 3.
2. For rack-mounted instruments:
   a. Isolate pneumatic supplies.
   b. De-pressurize all pressure supply inlet and output lines.
   c. Partially or completely withdraw the instrument from the rack if necessary to get access.
3. Isolate the power supply to the instrument and disconnect the IEC power supply connector.
4. Disconnect the pneumatic pipes from the Control Module.

Note: It is not necessary to remove the Control Module to access the filters, but it will make access easier.

5. Release the four crosshead screws (drive size 2) securing the Control Module in the instrument case.
6. Remove the Control Module.
7. Use a 5 mm hexagonal key to release the filter retainer (1).
8. Remove the five filters (2). If necessary, invert the Control Module to help removal.

6.6.3.2 Replace Filter

Refer to Figure 6-3.

1. Insert a new filter into each of the five pressure connections.

2. Use a 5 mm hexagonal key, to secure each filter retainer and tighten to 1 to 1.5 Nm.
3. Reconnect the pressure pipes. Refer to Section 2, “Installation,” on page 3.

6.7 Calibration

This section is for future releases only.

7. Testing and Fault Finding

7.1 Introduction

This section details the standard serviceability test. Table 7-1 for possible faults, and the response.

The PACE contains a self-test and diagnosis system that continuously monitors the performance of the instrument. At power-up, the system performs a self-test.

7.2 Standard Serviceability Test

CAUTION Always release pressure before disconnecting pressure equipment.

The following procedure shows if the instrument is serviceable and checks some functions and facilities of the instrument.

1. Connect the instrument. Refer to Section 2, “Installation,” on page 3.
2. Connect a pressure measurement device to the output port.
3. After power-up, make sure the **Home** screen is set for **Basic** task and **Measure** mode is selected.
   a. Select the necessary units of pressure measurement. See “Measurement Range, Auto Range and Measurement Units” on page 29.
   b. Select the **Status Area** and select to show the **Effort Meter** and **Slew Rate**. See “Status Area Parameters” on page 28.
   c. From the **Settings** > **General** Screen, select the necessary slew rate and vent rate.
   d. Return to the **Home** screen.
   e. Select the setpoint and set it to a value within the pressure range of the instrument.
   f. Select **Control** mode.
4. The screen display changes as follows:
   a. The measured pressure digits change from black to blue and indicates the pressure value changing towards the setpoint.
   b. The **Effort Meter** shows the work effort of the controller.
5. When the instrument controller reaches the selected pressure setpoint, the screen display changes as follows:
   a. The color of the pressure digits change from blue to green indicating that the controller is within the in-limits tolerance.
   b. The **Effort Meter** shows the controller effort to keep the pressure at the setpoint. It should remain within the normal band.
   c. Check the pressure measurement device shows the approximate pressures output from the instrument.
6. Select the **Vent** icon. The pressure reduces to atmospheric pressure at a controlled rate (vent rate).
7. The test is complete when the pressure reaches atmospheric.

Note:

- The vent valve opens and remains open until you select **OK** - determined by how you have set the **Vent** option. See “General Settings Screen” on page 45.
- Always use the vent function before disconnecting pressure equipment from the output port.

- The instrument automatically returns to **Measure** mode after a vent.
- The color of the pressure digits changes to black.

If this test is successful, the instrument is ready for use.

7.3 Fault Finding

Check the faults and responses, refer to Table 7-1. If the fault persists, refer to Section 7.4.

Table 7-1: Fault Diagnosis

Fault	Response
Power supply connected, display not lit.	Check front power button is glowing orange. If not: • Check rear panel switch set to on. • Check fuse and, if necessary, replace • Check electrical power supply fuse or circuit breaker.
Instrument functions, but does not reach all setpoints.	Check pneumatic supplies for correct pressures. Check system for leaks.
In measure mode with output port sealed, the pressure continues to increase or decrease.	Increasing pressure, leaking Apply control valve. Decreasing pressure, leaking Release control valve. Make sure by isolating pressure supplies. Contact Druck approved service agent.
Display pressure reading in red	Over-range, use vent de-pressurize or vent manually. If this keeps occurring, enable the over-range protective vent
Instrument enters measure mode without user request or command.	Idle time-out enabled but timeout period setting too short.
Instrument will not zero.	Blocked vent port. Check for blockage. Contact approved service agent for repair.
Instrument controlling to setpoint, no pneumatic output	Blocked isolation valve. Contact approved service agent for repair.
Erratic or inaccurate zero	Leaking isolation valve. Reference port restricter not fitted. Contact approved service agent for repair.
Increased gas consumption. Unstable control at setpoint or does not achieve setpoint.	System leak. Do a leak test. Contact approved service agent for repair. Reference port restricter not fitted.
If the controlled pressure stays within the tolerance band and the pressure at the output is within limits. If the controller status indicator is outside the tolerance band.	Leak in the system or the supply pressure differs from the pressure for which the control valves have been characterized.
Existing SCPI scripts developed for Legacy PACE do not run correctly.	Check communication settings - see Chapter 5.9, “Communications Screen,” on page 48.

7.4 Approved Service Agents

Refer to the rear page for details.

8. Reference

8.1 Personal Identification Numbers (PINs)

These are the default Personal Identification Numbers to give access to the different PIN-protected options on the normal PACE screens.

Table 8-1: Default PINs

PIN	Access
026805	Supervisor
654321	Calibration
548704	Software Update
123456	Options Enable

8.1.1 Changing PINs

If the PIN for an option (such as **Software Update**) is changeable, it will include a **Change PIN** option button on the relative screen. Entering a new PIN permanently replaces the old PIN. Record this new PIN and keep in a safe place.

8.2 Pseudo

This is a **Status Area** parameter which is only available if the Pneumatic Control Module has a barometer fitted. The barometer works with the main sensor to provide a ‘pseudo’ range.

The instrument uses the reference barometer to calculate pseudo absolute (gauge + atmospheric pressure) or pseudo gauge (absolute – atmospheric pressure) values.

So for example, if the Control Module has a -1 bar to 2 bar gauge sensor and barometer, the following ranges will be available for selection:

- 2000 FS g
- 3000 FS a (pseudo)

Or when a 0 to 2 bar absolute sensor and barometer is fitted, the following ranges will be available for selection:

- 2000 FS a
- 1000 FS g (pseudo)

8.3 Remote Mode

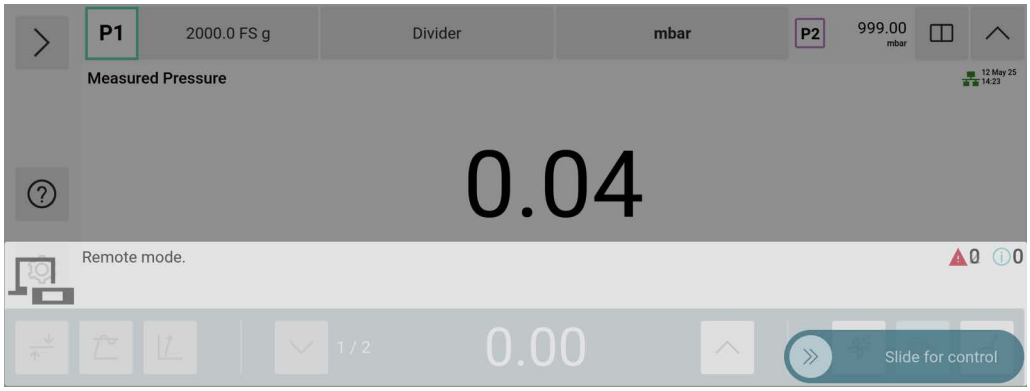


Figure 8-1: Remote Mode Enabled

When using remote communications to the instrument, the touchscreen will darken and show the **Remote mode** message. This means that the remote user has full control of the instrument. You cannot control the instrument locally using the touchscreen unless you manually select the '**Slide for control**' slider. Control then returns to the touchscreen.

8.4 In Limits Meter

Figure 8-2: Typical In Limits Meter

In limits is a tolerance applied to the measured value and compared with the setpoint. When the controller reaches the setpoint, the instrument controls within this set tolerance value. It does not affect controller stability or precision. The instrument uses the 'in-limits' flag when doing a control task such as a Leak Test. The measured value digits change color determined by whether it is inside or outside the In Limits range. See "Typical Home Screens" on page 23.

In remote control, the control computer can be used to interrogate the 'in-limits' register to make sure the controller has reached setpoint.

You can select to show an **In Limits Meter** in the **Status Area** of the **Home Screen**.

8.5 Slew Rate

Also 'Rate of Change'. Sets how the controller reaches a setpoint.

- **Max Rate** - sets the controller to change to a new setpoint at its maximum rate (a step change).
- **Linear** - sets the controller to change to a new setpoint at a linear rate that you can set. You can set the rate per minute or per second.

8.6 Overshoot

Sets how the controller responds to the new setpoint.

Overshoot - a fast change in controlled pressure can cause the measured pressure to go beyond the setpoint.

No overshoot - the controlled pressure will change but remain within the setpoint. This is useful when the unit under test has hysteresis errors.

8.7 User Defined Units

To create user defined units:

1. Select **Settings** > **Supervisor Setup** option and enter the PIN.
2. Select the **User Defined Units** option.

3. Select one of the four available slots.
4. Select the **Name** box and give your units a name using the keyboard that will open.
5. Select the scale for the unit. The **Current measured pressure** box will show how your units will be viewed.

8.8 Heritage Communications

The PACE5000 E and 6000 E instruments can support heritage SCPI commands and communication methods used on older products such as the DPI500 or DPI520, but you must use the correct connections and settings.

8.8.1 Connections for heritage communications

- Rear USB TMC type B socket
- GPIB IEEE488 (option)
- Front or rear USB type A sockets with USB to RS232 adapter

8.8.2 Settings for heritage communications

See “Communications Screen” on page 48 for communication settings options.

- **USB-B Rear** > Set **Mode** to **VCP** and **Protocol** to **DPI500** or **DPI520**
- **IEEE 488** > Set **Protocol** to **DPI500** or **DPI520**
- **RS232** > Set **Protocol** to **DPI500** or **DPI520**

Use a suitable terminal program on your PC to send the heritage commands to the instrument.

8.9 LabVIEW™ Instrument Drivers

For those who need to use LabVIEW with the PACE instruments, we have worked with National Instruments to provide downloadable drivers that will give full control and data acquisition from the PACE instruments.

An instrument driver is a set of high-level functions that control and communicate with instrument hardware in a system. In LabVIEW, an instrument driver is a set of VIs that communicate with an instrument using LabVIEW built-in VISA I/O functions. Each VI (virtual instrument) corresponds to a programmatic operation, such as configuring, reading from, writing to, and triggering an instrument.

Serial Driver Link:

Druck PACE Series Calibrator - USB, Ethernet, IEEE 488.2 (GPIB), Serial Driver for LabVIEW - National Instruments

CVI IVI Instrument Driver:

Druck Pace Series Calibrator - Certified LabWindows/CVI IVI Instrument Driver

The locations will give answers to your questions and explain how to use instrument drivers.

8.9.1 Connections for LabVIEW communications

- Rear USB TMC type B socket
- GPIB IEEE488 (option)
- Front or rear USB type A sockets with USB to RS232 adapter

8.9.2 Settings for LabVIEW communications

See “Communications Screen” on page 48 for communication settings options.

- **USB-B Rear** > Set **Mode** to **VCP** and **Protocol** to **SCPI**

- **IEEE 488** > Set **Protocol** to **SCPI** (default)
- **RS232** > Set **Protocol** to **SCPI** (default)

Note: The LabVIEW driver will work with both **Standard** and **Legacy** SCPI mode.

8.10 Return Goods/Material Procedure

If the unit must be calibrated or is unserviceable, return it to the nearest Druck Service Centre listed at: **https://druck.com/service**.

Contact the Service Department to obtain a Return Goods/Material Authorization (RGA or RMA). Provide the following information for a RGA or RMA:

- Product (for example PACE5000 E)
- Serial number.
- Details of defect/work to be undertaken.
- Calibration traceability requirements.
- Operating conditions.

INFORMATION **Service by unauthorized sources will affect the warranty and further performance.**

You must inform Druck if the product has been in contact with any hazardous or toxic substance. Refer to the relevant COSHH or Material Safety Datasheets for references and precautions that you must take when handling.

8.11 Packaging for Storage or Transportation

To store or return the instrument for calibration/repair:

1. Pack the instrument. Refer to Section 8.12, “Packaging Procedure,” on page 64.
2. Return the instrument for calibration/repair complete the return goods procedure. Refer to Section 8.10, “Return Goods/Material Procedure,” on page 64.

The procedure above applies to the Pneumatic Control Module as a separate item.

8.12 Packaging Procedure

1. The instrument should be at zero/ambient pressure.
2. Switch off and isolate the electrical power supply to the instrument.
3. Shut off the pneumatic pressure and vacuum supplies to the instrument.
4. Remove the instrument from the equipment rack to access the rear panel.
5. Disconnect the power supply cable and the pneumatic supply hose assemblies.
6. Remove any pressure adapters, diffusers and restricters.

   If available, use the original packing material. When using packing materials other than the original, do the following:
7. Fit protection to all the ports to prevent ingress of moisture and dirt.

   Note: Use the original red plastic plugs or low tack masking tape.
8. Fit protection for the front screen to prevent damage.
9. Wrap unit in polyethylene sheeting.
10. Select a double-wall cardboard container.
    - Inside dimensions must be at least 15 cm (6”) greater than the equipment
    - The carton must meet test strength requirements of ≥ 125 kg (275 lbs).

11. Protect all sides with shock-absorbing material to prevent equipment movement within the container.
12. Put the power supply cable in the packaging.
13. Seal carton with approved sealing tape.
14. Mark carton “FRAGILE” on all sides, top, and bottom of shipping container.

Refer to the “General Specifications” on page iii for shipping and storage conditions.

8.13 Cyber Security Concern

If you have a concern about cyber security while using our product or services, please contact us here:

https://www.bakerhughes.com/contact-us

Chapter 8. Reference

9. Options

9.1 Barometric Reference Option

The barometric reference option for CM1 and CM2 Pneumatic Control Modules measures the barometric pressure at the reference port of the Pneumatic Control Module or modules. CM3 modules use Pseudo gauge. This option allows absolute or gauge pressure range selection. To get absolute pressure, the instrument uses a summation of gauge pressure and barometric pressure (measured by the barometric sensor). This gives a pseudo absolute range. See “Pseudo” on page 61 for an explanation and see Figure 9-1 for examples.

Refer to the Datasheet for the performance of barometric reference and precision of absolute ranges.

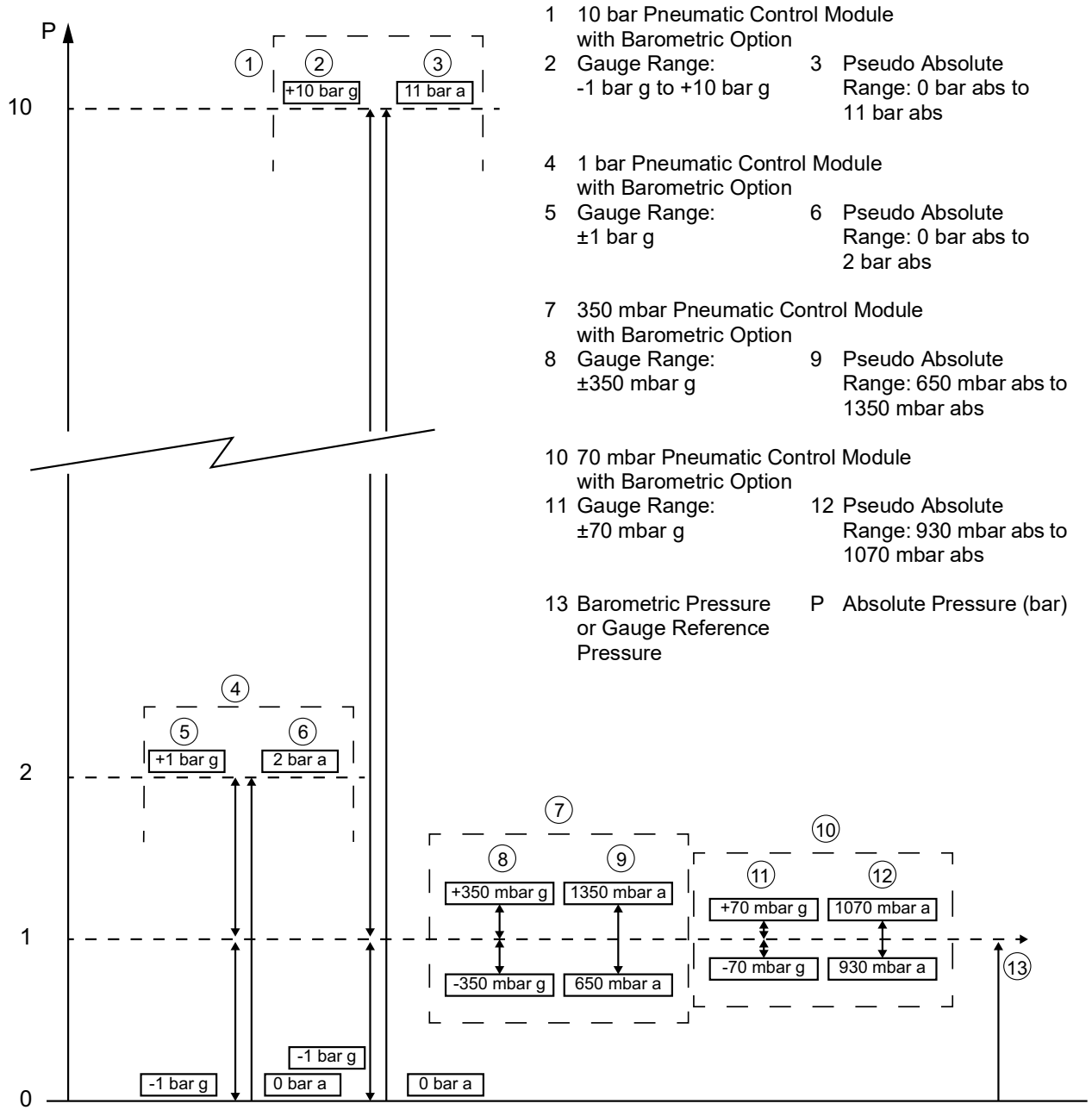


Figure 9-1: Typical Examples of Barometric Options

9.2 GPIB IEEE_4888 Expansion Card

See “GPIB IEEE 488 Interface (optional)” on page 18.

If you have bought this option, we fit the GPIB card before shipping the PACE unit to you. If you have bought the GPIB card separately and need to fit yourself, follow this procedure:

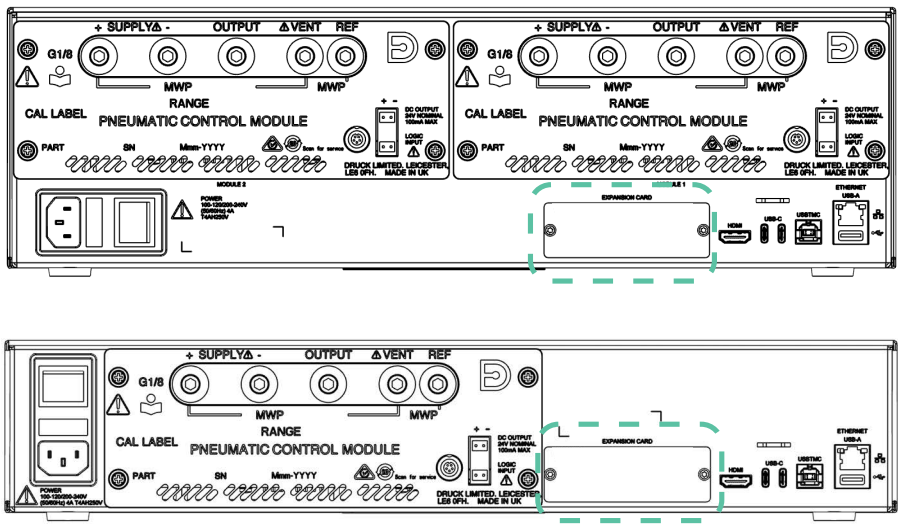


Figure 9-2: PACE5000 E and 6000 E Expansion Card Blanking Plates

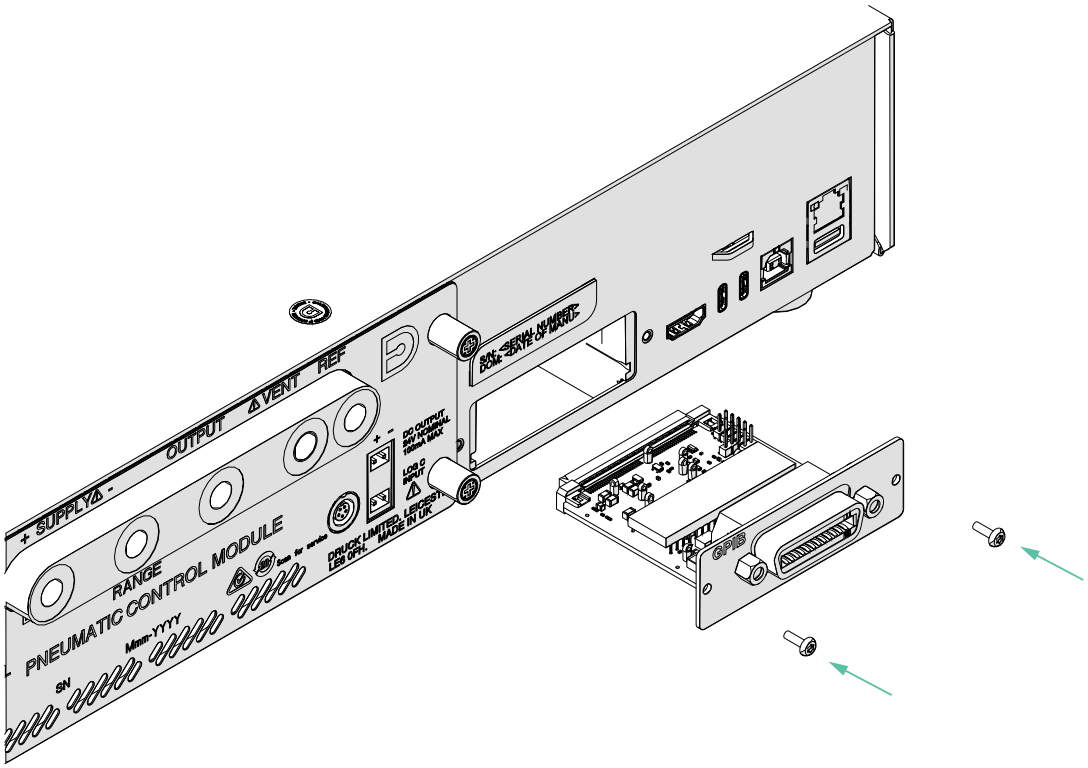


Figure 9-3: Fitting the GPIB Card into a PACE5000 E (PACE6000 E is almost the same)

1. Disconnect the instrument from the mains power supply.

2. Undo the two fixing screws securing the GPIB card blanking plate at the rear of the instrument - labeled ‘Expansion Card’. Store the Blanking Plate safely in case you need to re-use it.
3. Using anti-static precautions, remove the GPIB card from its packaging and insert it into its socket at the rear of the instrument.
4. Secure the GPIB card in the instrument using the fixing screws.
5. Connect the instrument to the electrical supply and energize it.
6. Check that the instrument passes the Power-up sequence without errors. See “Typical Display Starting Sequence” on page 21.
7. Select the **Settings** > **System Information** > **Comms** screen and check that the IEEE 488 communications section shows all its details correctly.

9.3 Software Options - Task Options

To enable any additional optional tasks, you must contact our customer service (see rear page) for a unique 10 Digit Number, called an ‘Option Key’.

Notes:

- You need to know the serial number of the instrument before contacting us.
- Additional task options may be chargeable.

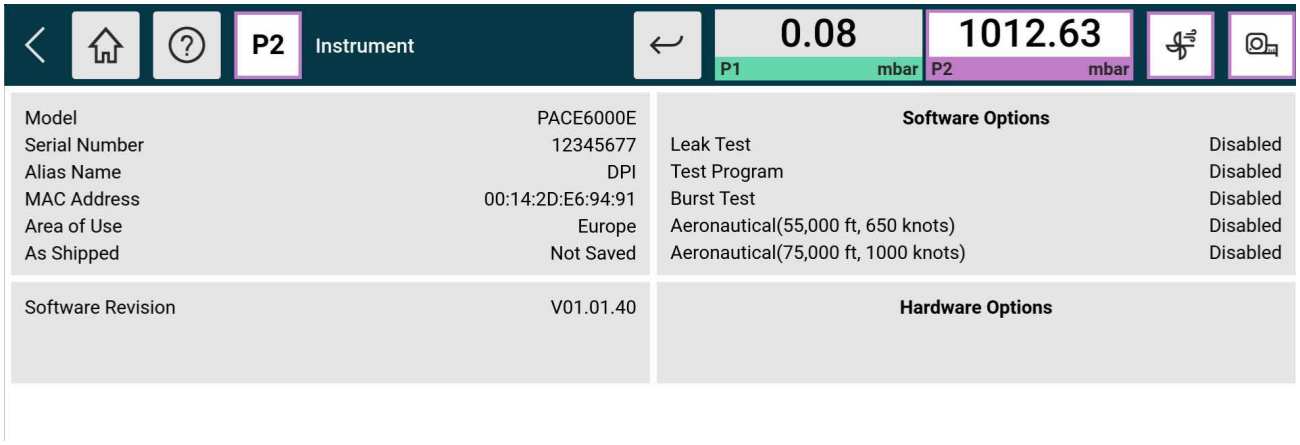


Figure 9-4: Settings > System Information > Instrument Screen

To see the optional tasks available for your instrument, select the **Settings** > **System Information** > **Instrument** Screen**.** See “System Information Screen” on page 44. This area will show you the Serial Number of the instrument. It also shows the Task Options listed under ‘**Software Options**’, for example ‘Leak Test’. The list will show you whether the option is enabled or disabled.

To enable an option:

1. Contact customer service with the serial number of the instrument. They will send you a unique 10 Digit Number that will enable the option or options that you have asked for. Keep a safe record of this number.
2. Select **Settings** > **Software Update** screen. See “Software Update Screen” on page 52.
3. Enter the Options Enable PIN. See “Personal Identification Numbers (PINs)” on page 61.
4. Now enter the 10 Digit Option Key supplied to you and select **OK**.
5. Your task option or options will be enabled. Do a check to make sure that the option has been enabled by selecting the **Settings** > **System Information** > **Instrument** Screen.

Chapter 9. Options

Appendix A. LXI (LAN-based eXtension for Instrumentation)

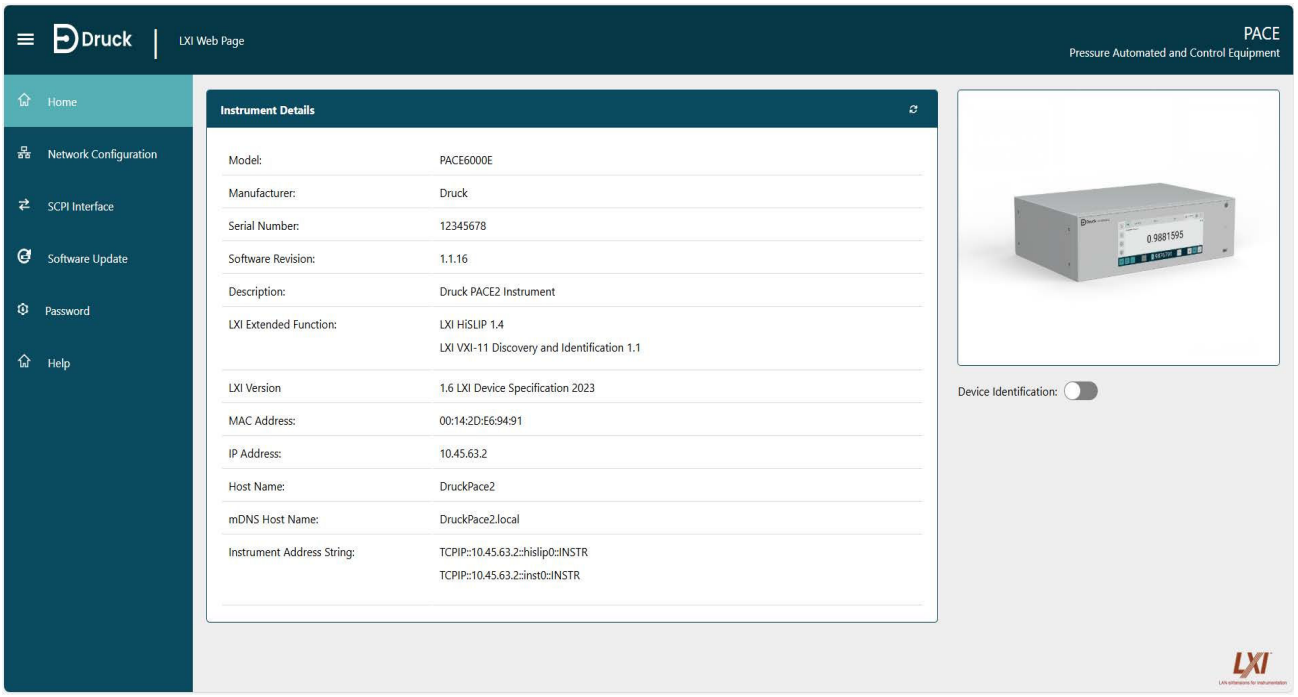


Figure A-1: Typical LXI Welcome Page

The PACE5000 E and PACE6000 E instruments include LXI standard communications through the ethernet connection and a **local network only**. To use the LXI communications you must first find the local IP address of the instrument. See “Communications Screen” on page 48.

Select the local IP address of the instrument from a suitable browser application on a local network-connected computer to open the LXI Web Pages for the instrument.

The LXI Web Pages show communication settings and other details for the instrument. They also include a SCPI Interface for remote communications.

Notes:

- The LXI Web Pages use the word ‘device’ for the LXI interface and software components used in the PACE instrument.
- Your browser should translate most of the LXI Web Pages text into the preferred language set in your browser.

A.1 Secure and Unsecure Connection

The LXI Web Pages will work in secure and unsecure connection, determined by how you enter the IP address in your browser. Some options are only available to view and change when in secure connection.

For example:

- **https**://192.168.1.x opens the instrument LXI web home page in **Secure** connection, where you can view **and change** settings.
- **http**://192.168.1.x opens the instrument LXI web home page in **Unsecure** connection, where you can **only view some** settings.

A.2 Using the LXI Web Pages

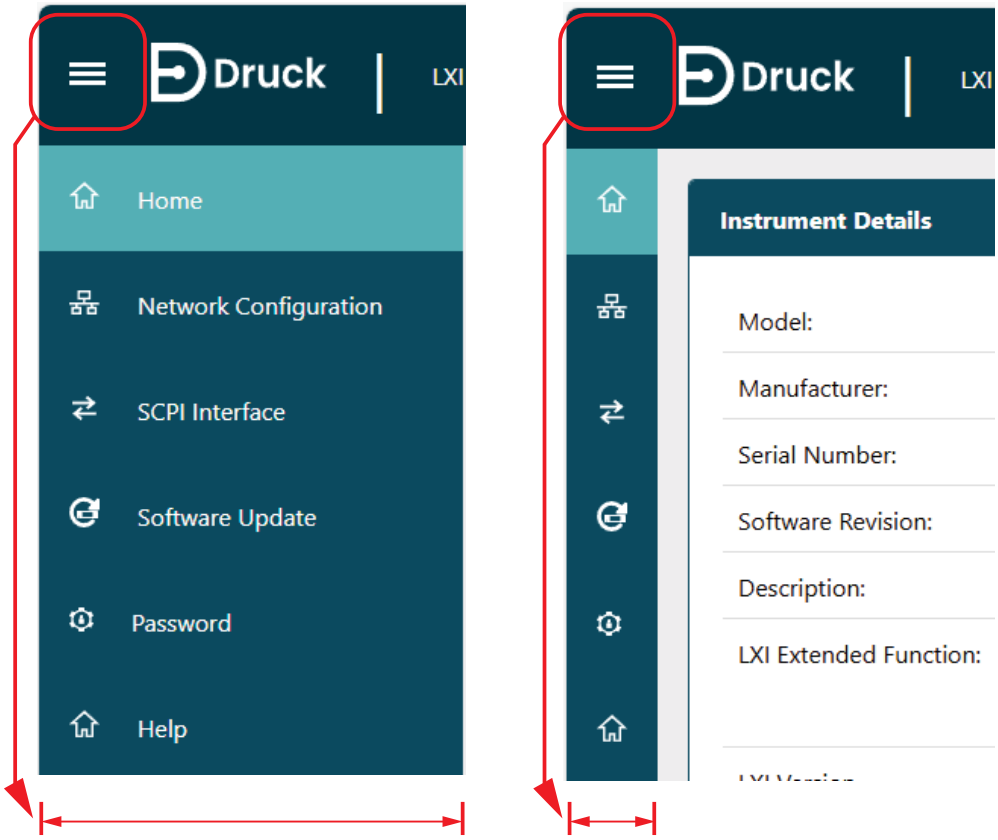
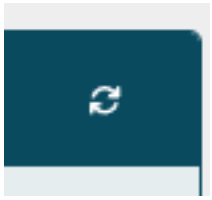
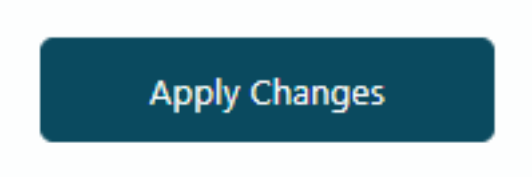


Figure A-2: Expand or Collapse the Sidebar Menu

The LXI Web Pages have items on the left-hand Sidebar Menu. The amount of items can change, determined by whether you are using **secured** or **unsecured** connection. Select the three horizontal lines at the top left of the page to expand or collapse the Sidebar Menu.



Some pages have a **Refresh** button to the top right. This will refresh the information on the page if you make any changes to the settings.



When you are in **secure** connection, some pages will show an **Apply Changes** button to the bottom right. You will use this with the password to save any changes that you make.

A.3 Home (or Welcome) Page

This page shows the **Instrument Details**, an image of the instrument and a **Device Identification** selector.

If you set the selector to **ON**, the Ethernet symbol on the instrument display flashes. This is helpful when you have more than one instrument, so that you see which instrument you are communicating with.

Notes:

- You may use the **Device Identification** selector in either secure or unsecure connection.
- Set the selector to off when it is not necessary to identify the instrument.

A.4 Network Configuration Page

This page shows the **Network Configuration** of the device. You can only change options if you are in the **secure** connection.

- **General** - shows the device **Host Name**, **Description/Service Name** and **mDNS Host Name**. It also lets you **Factory Reset** the device when in **secure** connection.

Note: The **Factory Reset** will completely reset the instrument, not just the LXI components. It works in the same way as the **Restore Factory** option in the instrument settings - restricted to advanced users.

- **IP Configurations** - shows options for the IP address, Subnet Mask and Gateway for the device.
- **Advanced Configurations** - shows options for **Auto-negotiation**, **ICMP Ping** and **mDNS and DNS-SD**.
- **Interface Settings** - shows options for:
    - **HiSLIP** protocol with Port number (default 4880).

- **VXI-11** protocol with Port number (default 111) and shows the LXI Conformance standard.
- The unsecure **HTTP** LXI Web Server with Port number (default 80).
- the secure **HTTPS** LXI Web Server with Port number (default 443).

A.5 SCPI Interface Page

This page has three sections and two buttons:

- **SCPI Input** - use this section to enter the SCPI commands.
- **Write** and **Read** buttons - use these to write the command to the device and read the response from the device.
- **SCPI Response** - shows the SCPI response from the device.
- **Console** - shows the complete record of the commands used.

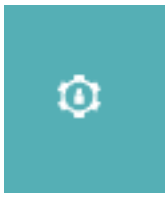
Note: Refer to the Druck PACE SCPI User Guide for more information on the SCPI commands.

A.6 Software Update Page

This page is only available when in **secure** connection. It gives instructions of how to update the software in the device using the LXI interface. The page gives full instructions showing how to install the latest software package after you have downloaded it from the Druck Download Portal: **https://druck.com/software**

This works in a similar way to the software update using the touchscreen as described in Appendix 6.5, “Software Update Screen,” on page 52.

A.7 Password Page



This page is only available when in **secure** connection. It lets you change the LXI Web Page password for the device. You can use letters, numbers or symbols for the password.

The default password is 1234. Also see “Communications Screen” on page 48.

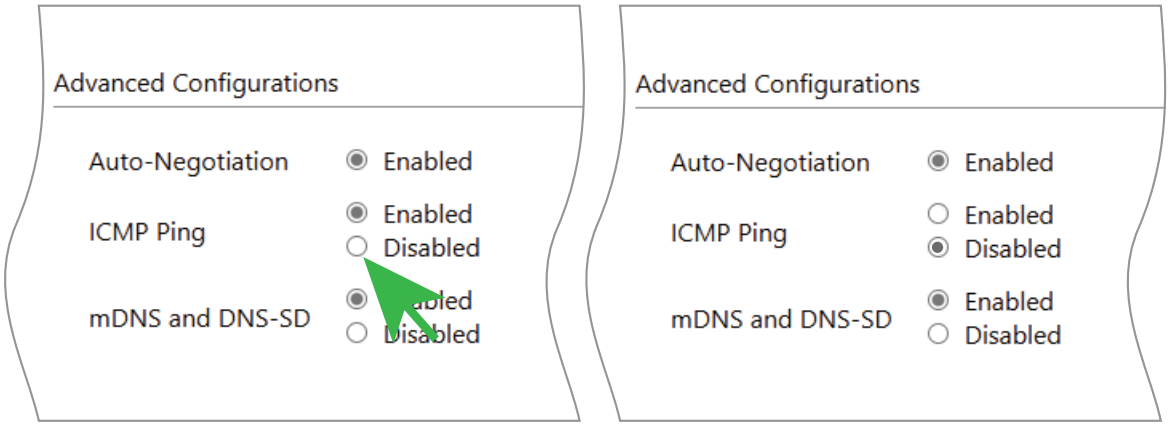
Note: Take care to remember the password. If you forget it, you must contact our service department to reset it. See rear pages for contact details.

A.8 Help Page

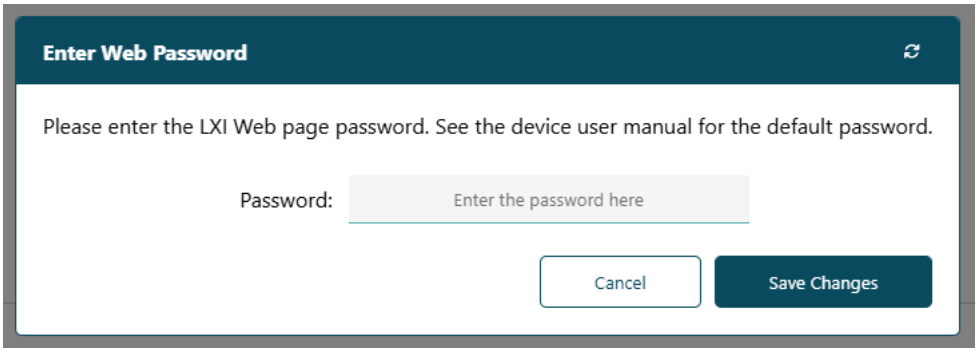
This page shows the LXI version installed on the instrument and the Privacy, Terms and Contact information for the Druck LXI software.

A.9 To Change Settings

To change any settings, you must first open the LXI Web Pages using the **secured** connection and you must know the password. The default LXI Web Page password is 1234.



1. Select the setting you wish to change, for example, the **ICMP Ping Enabled** setting.
2. To the bottom right of the page, select the **Apply Changes** button. An **Enter Web Password** dialogue will open.



3. In this dialogue box, enter the password and select **Save Changes**.

Appendix A. LXI (LAN-based eXtension for Instrumentation)

Appendix B. Air Density and Pressure Conversion Factors

B.1 Air Density

Values of air density (kgm^{-3}) for air of relative humidity 50% and containing 0.04% carbon dioxide by volume.

Table B-1: Air Density Values

Air Pressure (kPa)[a]	Air Temperature (°C)						
	14	16	18	20	22	24	26
87	1.052	1.045	1.037	1.029	1.021	1.014	1.006
88	1.064	1.057	1.049	1.041	1.033	1.025	1.018
89	1.077	1.069	1.061	1.053	1.045	1.037	1.029
90	1.089	1.081	1.073	1.065	1.057	1.049	1.041
91	1.101	1.093	1.085	1.077	1.069	1.061	1.053
92	1.113	1.105	1.097	1.089	1.080	1.072	1.064
93	1.125	1.117	1.109	1.100	1.092	1.084	1.076
94	1.137	1.129	1.121	1.112	1.104	1.096	1.088
95	1.149	1.141	1.133	1.124	1.116	1.108	1.099
96	1.162	1.153	1.145	1.136	1.128	1.119	1.111
97	1.174	1.165	1.156	1.148	1.139	1.131	1.123
98	1.186	1.177	1.168	1.160	1.151	1.143	1.134
99	1.198	1.189	1.180	1.172	1.163	1.154	1.146
100	1.210	1.201	1.192	1.184	1.175	1.166	1.158
101	1.222	1.213	1.204	1.196	1.187	1.178	1.169
102	1.234	1.225	1.216	1.207	1.199	1.190	1.181
103	1.247	1.237	1.228	1.219	1.210	1.201	1.193
104	1.259	1.249	1.240	1.231	1.222	1.213	1.204
105	1.271	1.261	1.252	1.243	1.234	1.225	1.216
106	1.283	1.274	1.264	1.255	1.246	1.237	1.228

a. 100 kPa = 1 bar.

B.2 Pressure Conversion

Pressure Units	Factor (hPa)	Pressure Units	Factor (hPa)
mbar	1.0	cmH_2O @ 20°C	0.978902756
bar	1000.0	mH_2O @ 20°C	97.8902756
Pa (N/m^2)	0.01	kg/m^2	0.0980665
hPa	1.0	kg/cm^2	980.665

Appendix B. Air Density and Pressure Conversion Factors

Pressure Units	Factor (hPa)	Pressure Units	Factor (hPa)
kPa	10.0	torr	1.3332240
MPa	10000.0	atm	1013.25
mmHg @ 0°C	1.333224	psi	68.94757
cmHg @ 0°C	13.33224	lb/ft^2	0.4788026
mHg @ 0°C	1333.223874	inH_2O @ 4°C	2.4908205
inHg @ 0°C	33.86388640341	inH_2O @ 20°C	2.486413
mmH_2O @ 4°C	0.0980638	inH_2O @ 60°F	2.488432
cmH_2O @ 4°C	0.980638	ftH_2O @ 4°C	29.889846
mH_2O @ 4°C	98.0638	ftH_2O @ 20°C	29.836956
mmH_2O @ 20°C	0.0978902756	ftH_2O @ 60°F	29.861188

Appendix C. Touchscreen Icons and Symbols

We have made the icons, buttons and symbols on the PACE5000 E and PACE6000 E screens easy to understand. But if you need help to understand what they do, select the **Help** icon. It will enable some text in most of the icons and buttons on the screen. The text will show what the icon or button does and will be in the language selected for the screens.

The following tables show some typical examples of the icons, functions and symbols.

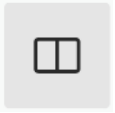
Note: Most icons and buttons are light gray when not selected and change to blue/green when selected (active).

C.1 Touchscreen Icons

Table C-1: Touchscreen Icons

Icon	Description	Icon	Description
 OR 	**Help** - select to show text on other icons.	 OR 	**Overshoot** - select to set overshoot on or off.
	**Settings** - opens the **Settings** screen.	 OR 	**Slew Rate** - select maximum or linear.
	**Vent** - select to release pressure to atmosphere.		**Measure** - enables the **Measure Mode**.
	Setpoint Nudge down - decreases the selected digit in the setpoint value.		Setpoint Nudge up - increases the selected digit in the setpoint value.
	**Control** - enables the **Control Mode**.		
 OR 	**Expand** and **Collapse** - shows or hides extra icons to the left of the screen.	 	**Stop** and **Start**.

Table C-1: Touchscreen Icons

Icon	Description	Icon	Description
 OR 	**Status Area** - shows or hides the **Status Area**.	 OR 	Two Channel or One Channel - changes the **Home** screen to show one or two channels. PACE6000 E only.
 OR  OR 	**Controller Active** - select to choose active, passive or gauge controller modes.		**P1 and P2 Settings**. Select to view the **Side Bar** or **Status Area** for P1 or P2. PACE 6000 E only.
	**Home** - returns the current screen to the **Home** screen.		**Head Height** - enables the Head Height correction function.
	**Back** - returns the current screen to the previous screen.		**Enter Label** - select to add options to the **Side Bar**.
	**Zero** - sets the selected gauge sensor to zero.		**Filter** - enables the filter.
	**Logout** - enabled when you use a PIN-protected screen. It manually logs you out of the screen, so you will need to re-enter the PIN to use the screen again.		**Alarm** - enables the alarm.

C.2 Functions

Table C-2: Functions

Function	Description	Function	Description
 OR 	Shows that the **Alarm** function has been enabled. It changes to red when the alarm has activated. The measured value also shows in red. The alarm icon will show constantly in red for as long as the alarm condition is present, even if pop-ups have been acknowledged.		**Head Height** enabled.
	**Tare** function enabled.		**Filter** function enabled.
	**Range Compare** function enabled.		**Log** function enabled.

C.3 LAN Connection Status

Table C-3: LAN Connection Status

Function	Description
	Flashing green = **Device Identification** selected in the LXI Interface. Solid green = connection in use. Solid red = connection fault. Blue = not connected.

C.4 Status Symbols

Table C-4: Status Symbols

Function	Description	Function	Description
	Maintenance is necessary. Low severity. Function will drop or cease soon.		Out of specification. Medium severity. Device is running beyond permissible range.
	Check function. Low severity. Signal is temporarily invalid.		Failure. High severity. Signal is invalid.

Appendix D. Typical Accessories

Figure D-1 and the following table shows some of the PACE pressure adapters and other parts. Refer to the Druck sales Datasheet or the manufacturers Datasheet for the fitting for more information.

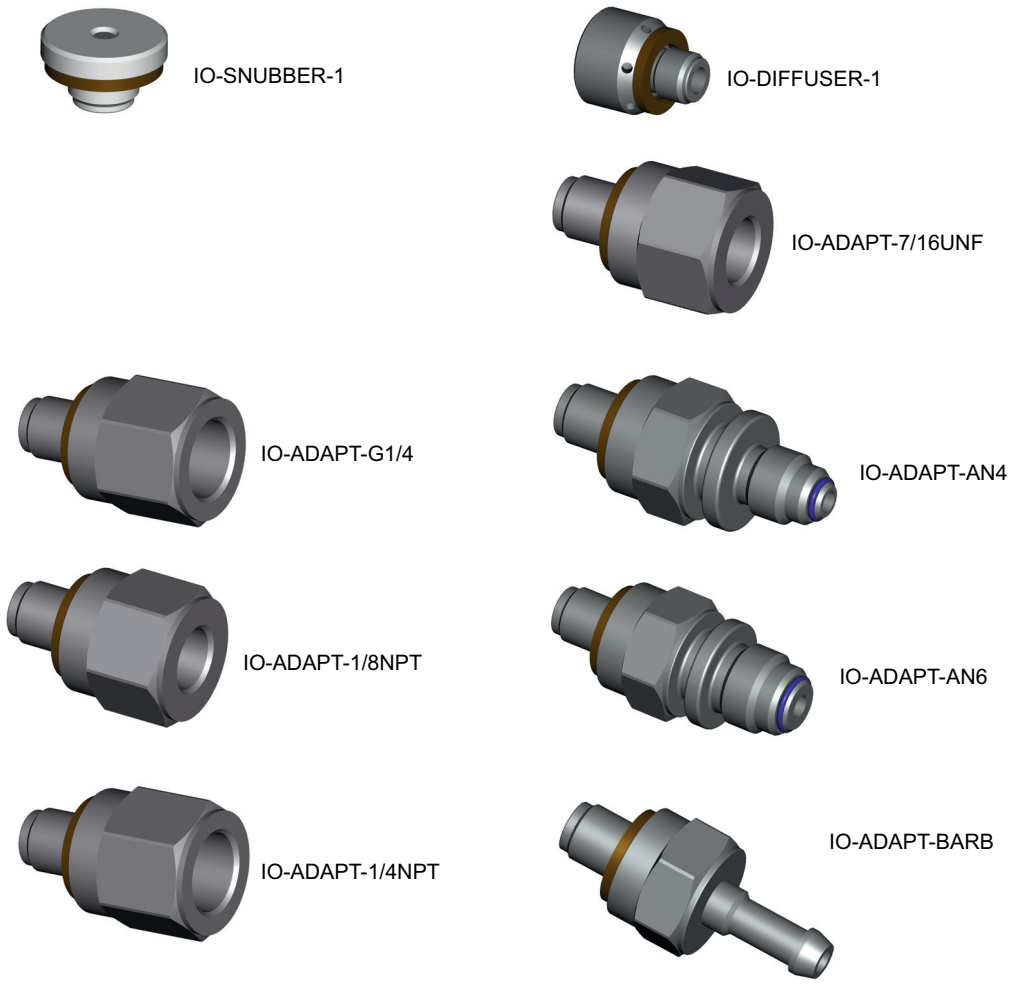


Figure D-1: Pressure Adapters and Other Parts

Table D-1: Details of Adapters and Other Parts

Part Number	Details
IO-SNUBBER-1	Restricter/Snubber
IO-DIFFUSER-1	Diffuser Gas Exhaust
IO-ADAPT-1/4NPT	ISO 228 G1/8 Male to 1/4 NPT Female.
IO-ADAPT-1/8NPT	ISO 228 G1/8 Male to 1/8 NPT Female.
IO-ADAPT-7/16UNF	ISO 228 G1/8 Male to 7/16-20 UNF Female.
IO-ADAPT-AN4	ISO 228 G1/8 Male to AN4 37° Male.
IO-ADAPT-AN6	ISO 228 G1/8 Male to AN6 37° Male.
IO-ADAPT-BARB	ISO 228 G1/8 Male to 1/4 Hose.
IO-ADAPT-G1/4	ISO 228 G1/8 Male to ISO 228 G1/4 Female.

Appendix D. Typical Accessories

Office Locations

https://druck.com/contact

Services and Support Locations

https://druck.com/service