

PACE5000 E

PACE6000 E

Pressure Automated Calibration Equipment Instruction Manual



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.

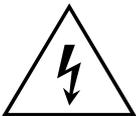
Do not apply pressures greater than the Maximum Working Pressure (MWP) stated on the rear panel of the Pneumatic Control Module or Modules.

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.
	<p>This symbol on the equipment indicates a warning and that the user should refer to the user manual.</p> <p>Ce symbole, sur l'instrument, indique que l'utilisateur doit consulter le manuel d'utilisation. Ce symbole, dans le manuel, indique une situation dangereuse.</p>
	<p>This symbol warns the user of the danger of electric shock.</p> <p>Ce symbole alerte l'utilisateur sur le danger de choc électrique.</p>
	Environmentally Friendly Use Period (EFUP).
	<p>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).</p> <p>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.</p> <p>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 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.</p> <p>If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.</p> <p>Please visit the link below for take-back instructions and more information about this initiative.</p>
 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 2014/68/EU (SEP), Group 2 Gases Article 4 paragraph 1, point (a) (i).
Operating Environment	Indoor use only. Do not use in potentially explosive environments.
Pressure media	Clean, dry, nitrogen or air.

*See Section 2.6 for high and low pressure module definition.

Glossary

Term	Description	Term	Description
a	Absolute	NAMUR	User Association of Automation Technology in Process Industries
ac	Alternating Current	NPT	National Pipe Thread
bar	Unit of pressure	OD	Outer Diameter
bara	Bar - absolute	Pa	Pascal
barg	Bar - gauge	PACE	Pressure Automated Calibration Equipment
dc	Direct Current	ppm	Parts per million
DPI	Digital Pressure Instrument	Ps	Pitot static
ft	Foot	psi	Pounds per square inch
g	Gauge	QR	Quick-response
GPIB	General Purpose Interface Bus	REF	Reference
H ₂ O	Water	ROC	Rate of change or rate of climb
HDMI	High Definition Media Interface	RS-232	Serial communications standard
Hg	Mercury	RtCAS	Rate of Airspeed
HiSLIP	High Speed LAN Instrument Protocol	Rx	Receive data
HTTP and HTTPS	Hypertext Transfer Protocol and Hypertext Transfer Protocol secure	SCPI	Standard Commands for Programmable Instruments
IEEE 488	Institute of Electrical and Electronic Engineers standard 488 (for programmable devices with a digital interface)	SELV	Separated (or Safety) Extra Low Voltage
in	Inch	TLS	Transport Layer Security
kg	Kilogram	TMC	Test and Measurement Class
LXI	LAN-based eXtension for Instrumentation	Tx	Transmit data
m	Meter	URL	Uniform Resource Location
mA	Milliampere	USB	Universal Serial Bus
max	Maximum	UUT	Unit Under Test
mbar	Millibar	VCP	Virtual Communications Port
min	Minute or minimum	Vent	To release pressure to atmosphere
MNPT	Male National Pipe Thread	VXI-11	A communication protocol developed by the VXIbus consortium
MSD	Mass Storage Device	V	Volts
MSDS	Material Safety Datasheet	°C	Degrees Celsius
MWP	Maximum Working Pressure	°F	Degrees Fahrenheit

Associated Documents

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



<https://druck.com>

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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 operates if the pressure is more than the high alarm level or falls below the low alarm level. A red bell symbol shows 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.

Chapter 1. Introduction and Description

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, “Accessories,” on page 113 for some typical accessories. Refer to the product Datasheet to see the complete list of available options and accessories.

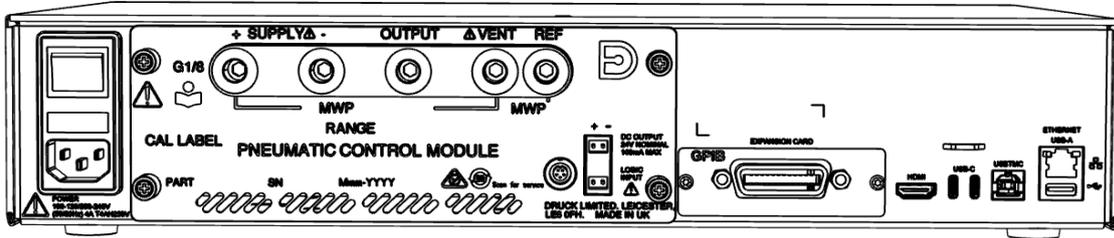


Figure 1-3: PACE5000 E Rear View (GPIB Fitted)

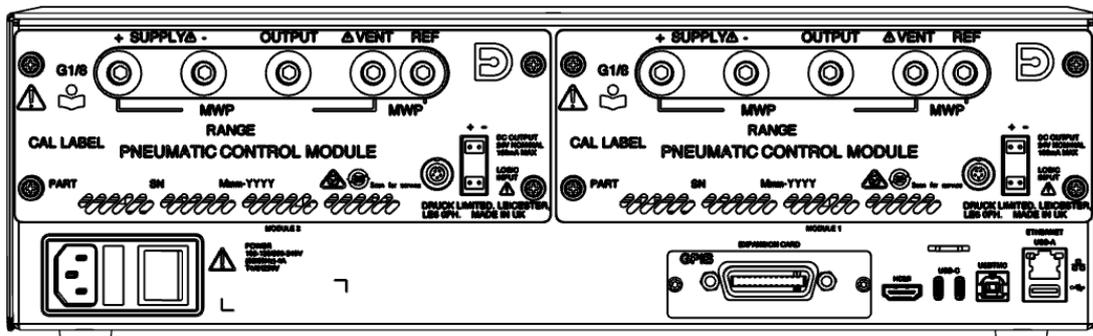


Figure 1-4: PACE6000 E Rear View (GPIB Fitted)

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 5.10 on page 64 for Communication Settings.

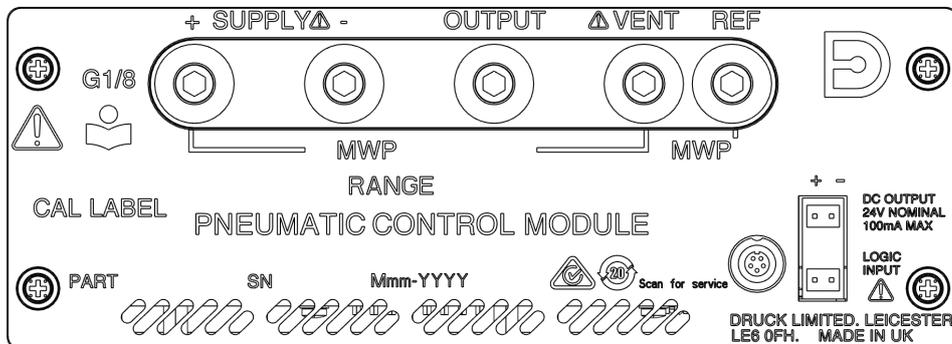


Figure 1-5: Pneumatic Control Module

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

Chapter 1. Introduction and Description

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 16.

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



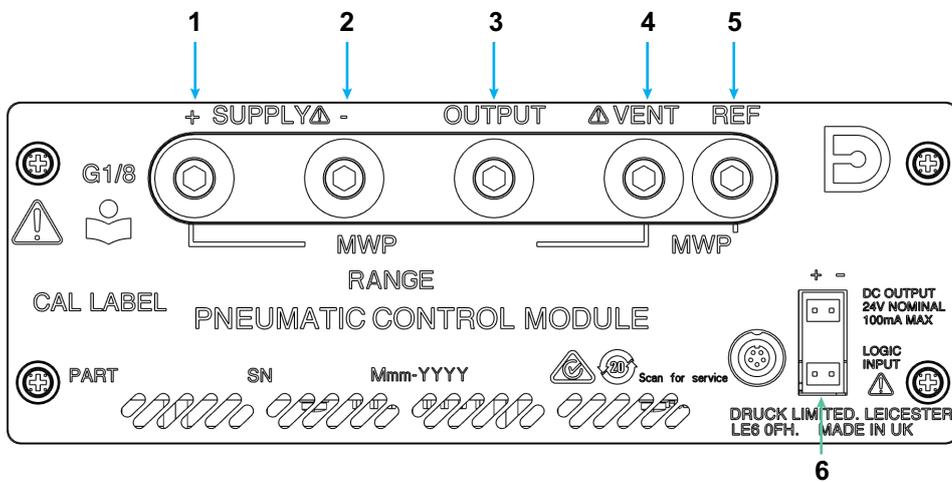
WARNING Turn off the source pressure(s) and carefully release pressure from the pressure lines before disconnecting or connecting the pressure lines. Proceed with care.

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.

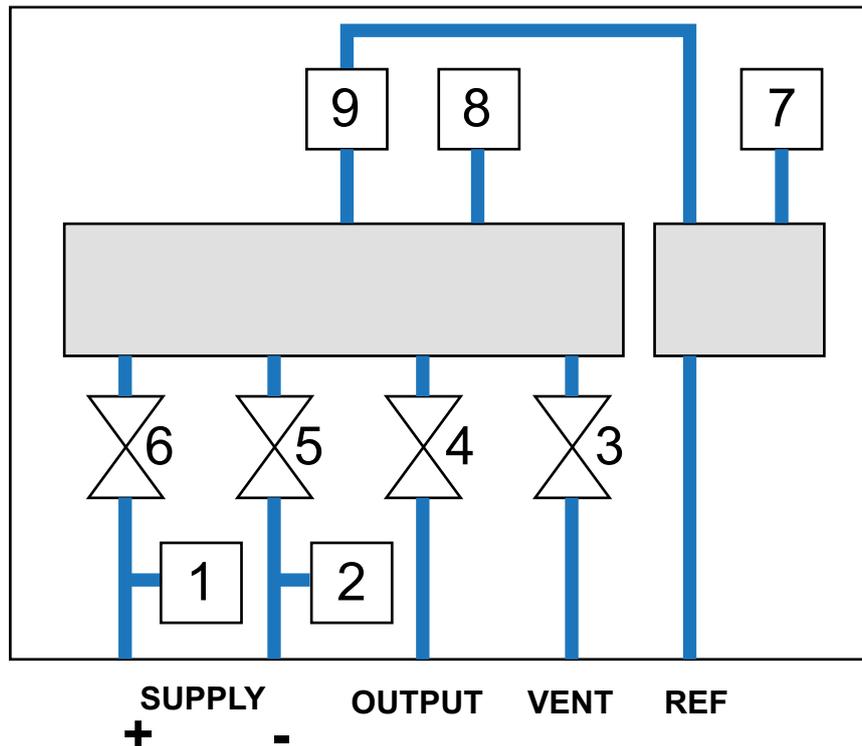
Do not apply pressures greater than the Maximum Working Pressure (MWP) stated on the rear panel of the Pneumatic Control Module or Modules.

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 95.

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.

Chapter 2. Installation

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 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 prevents 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 113 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.

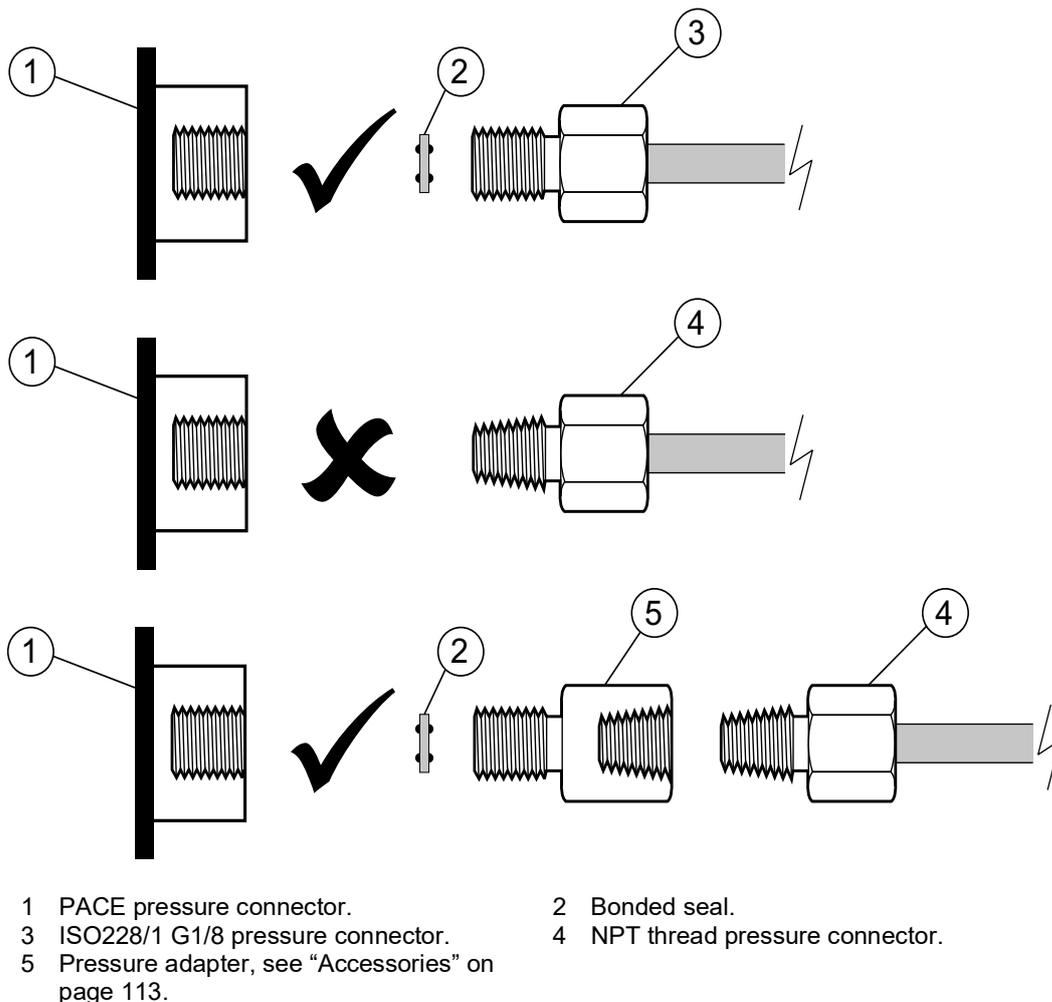


Figure 2-3: PACE Pressure Port Connections

2.6 Dual Channel Operation (PACE6000 E only)

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

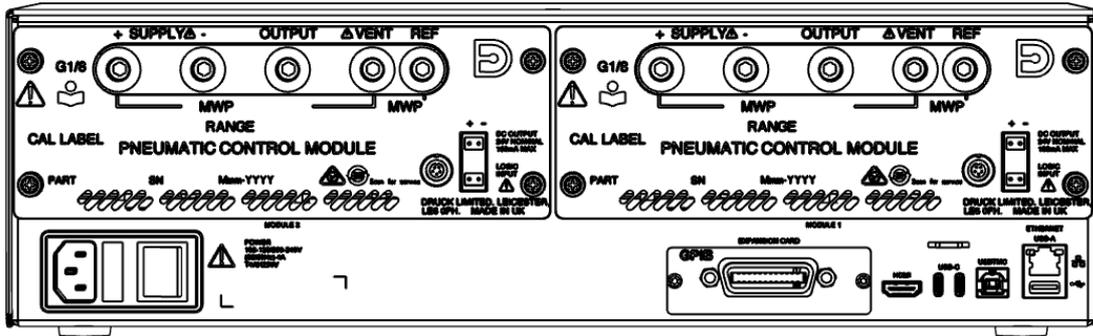


Figure 2-5: Control Module Rear View

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 36), 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.

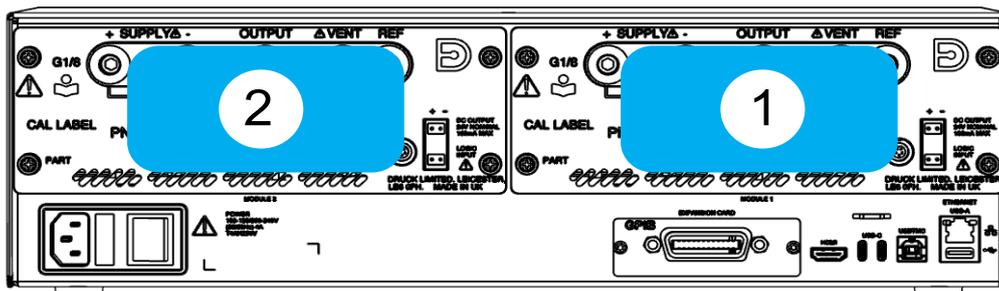
Table 2-1: Control Module Constructions

	Full-scale Pressure	Construction
GAUGE	70 bar and below 1000 psi and below	LOW PRESSURE
ABSOLUTE	71 bar and below 1015 psi and below	
GAUGE	100 bar and above 1500 psi and above	HIGH PRESSURE
ABSOLUTE	101 bar and above 1465 psi and above	



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

See Table 2-1 for definitions of high and low pressure. Note that module 1 and module 2 as shown in Figure 2-6 are also as shown in the User Interface of the instrument.

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 91.

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.

Chapter 2. Installation

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 connections 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 mbar 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 affects 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

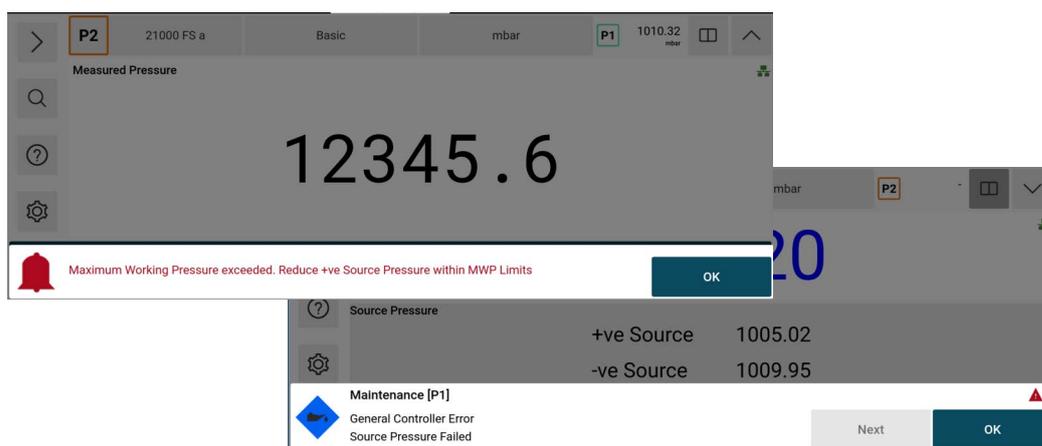


Figure 2-7: Maximum and Minimum Pressure Warnings

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

The instrument shows 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 is 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:

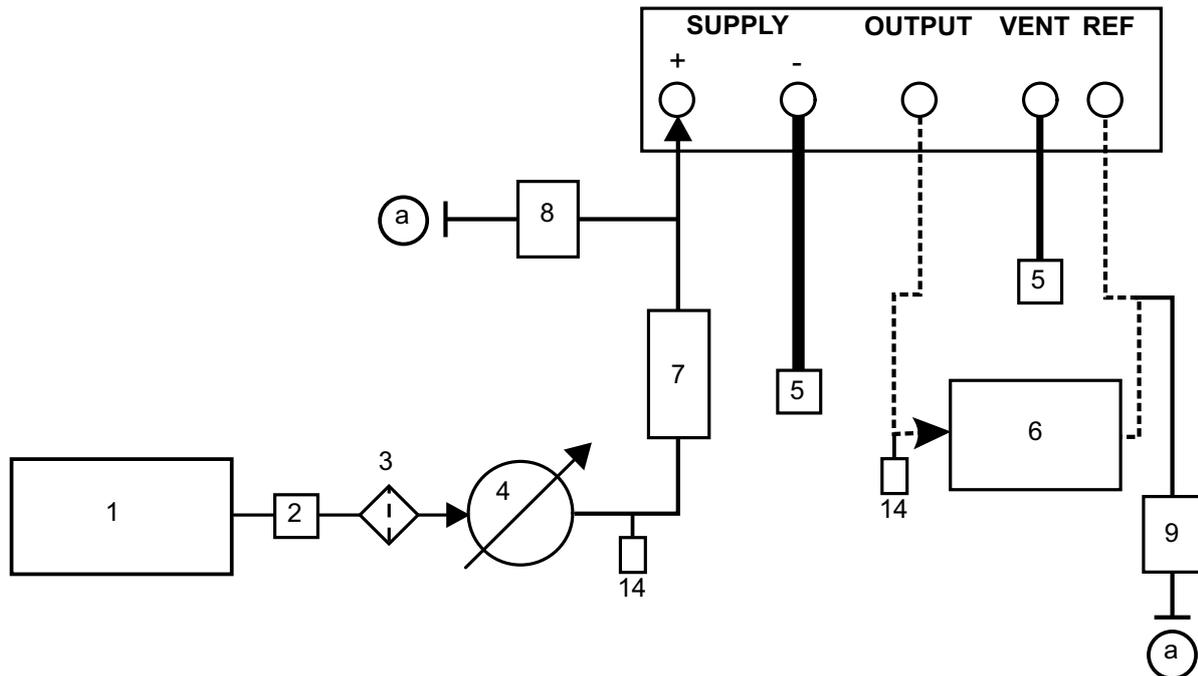
Table 2-2: Notes for Connection Examples

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.

Chapter 2. Installation

2.8.1 Pneumatic Connections without Vacuum Supply

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

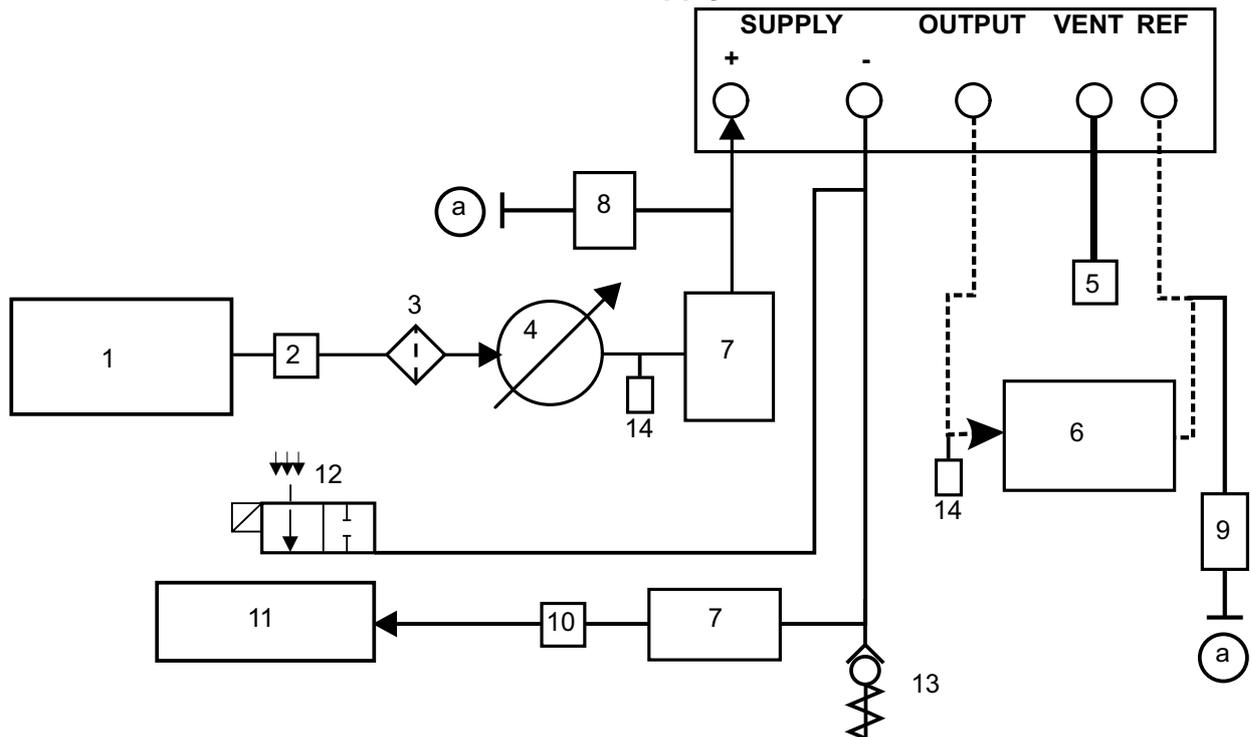


- | | | | |
|---|------------------------------------|----|---|
| 1 | Pressure source | 2 | Supply Isolation Valve |
| 3 | Filter | 4 | Regulate to between 110% full-scale and MWP |
| 5 | Optional Diffuser* | 6 | Unit under test |
| 7 | Optional reservoir † | 8 | Protection device ★ |
| 9 | Optional 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



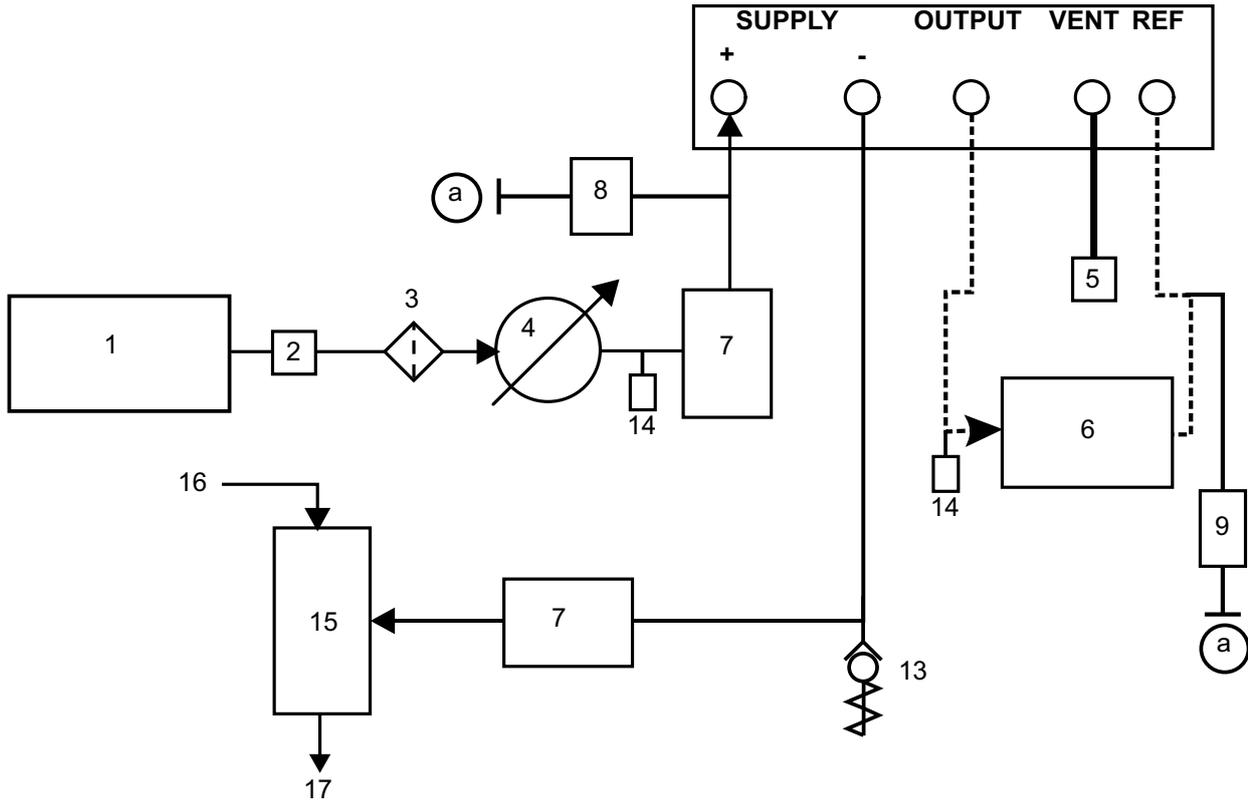
- | | | | |
|----|------------------------------------|----|---|
| 1 | Pressure source | 2 | Supply Isolation Valve |
| 3 | Filter | 4 | Regulate to between 110% full-scale and MWP |
| 5 | Optional Diffuser* | 6 | Unit under test |
| 7 | Optional reservoir † | 8 | Protection device ★ |
| 9 | Optional 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.

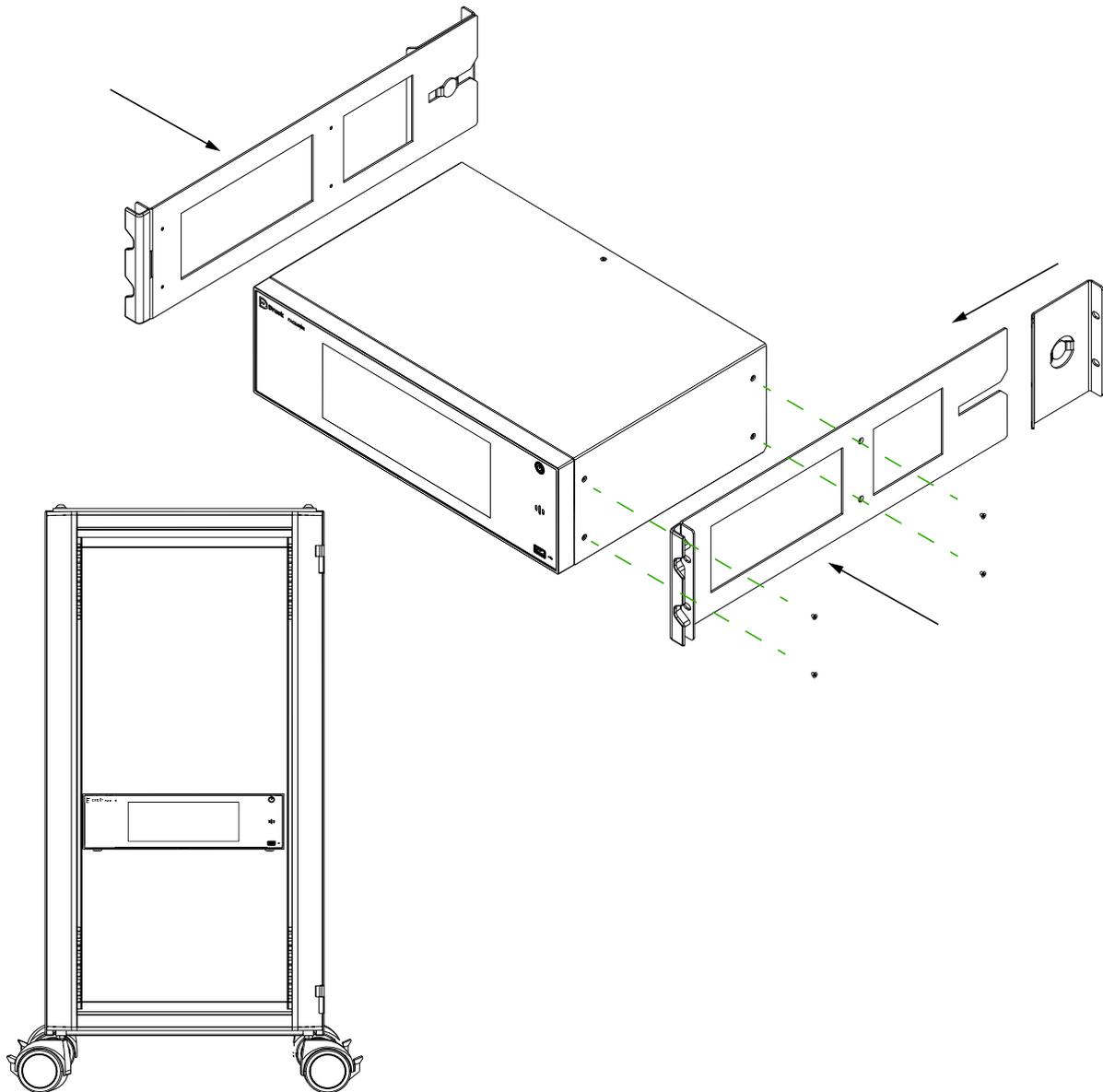
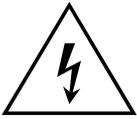


Figure 2-11: Rack-mounting

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

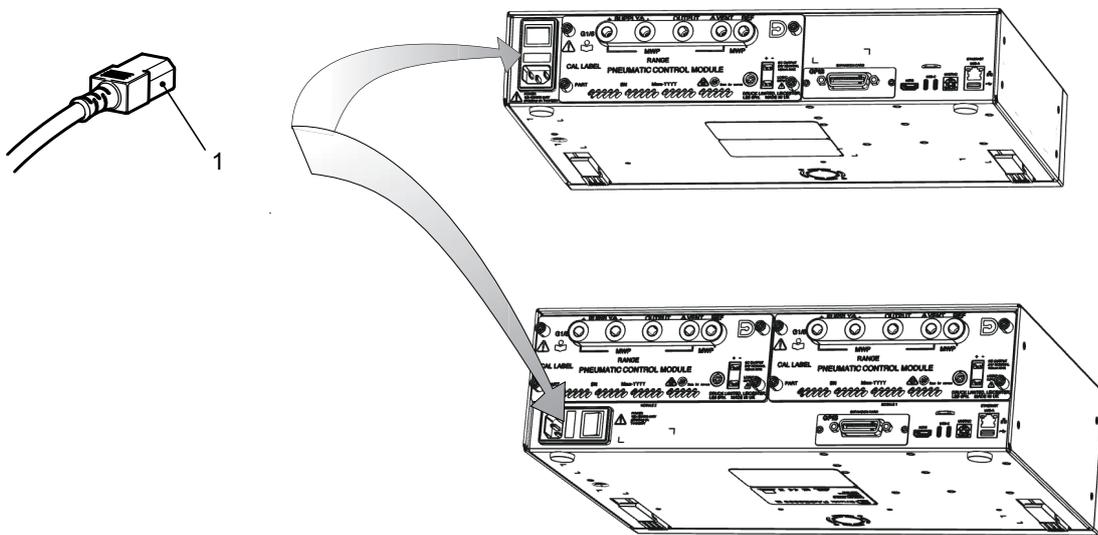


RISK OF ELECTRIC SHOCK The ground lead of the instrument must be connected to the AC supply protective safety ground.

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 glows orange. The instrument is in **Standby Mode**.
7. Briefly press the front button. It changes to glowing white. The internal fans of the instrument start working, and the instrument starts 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 23.

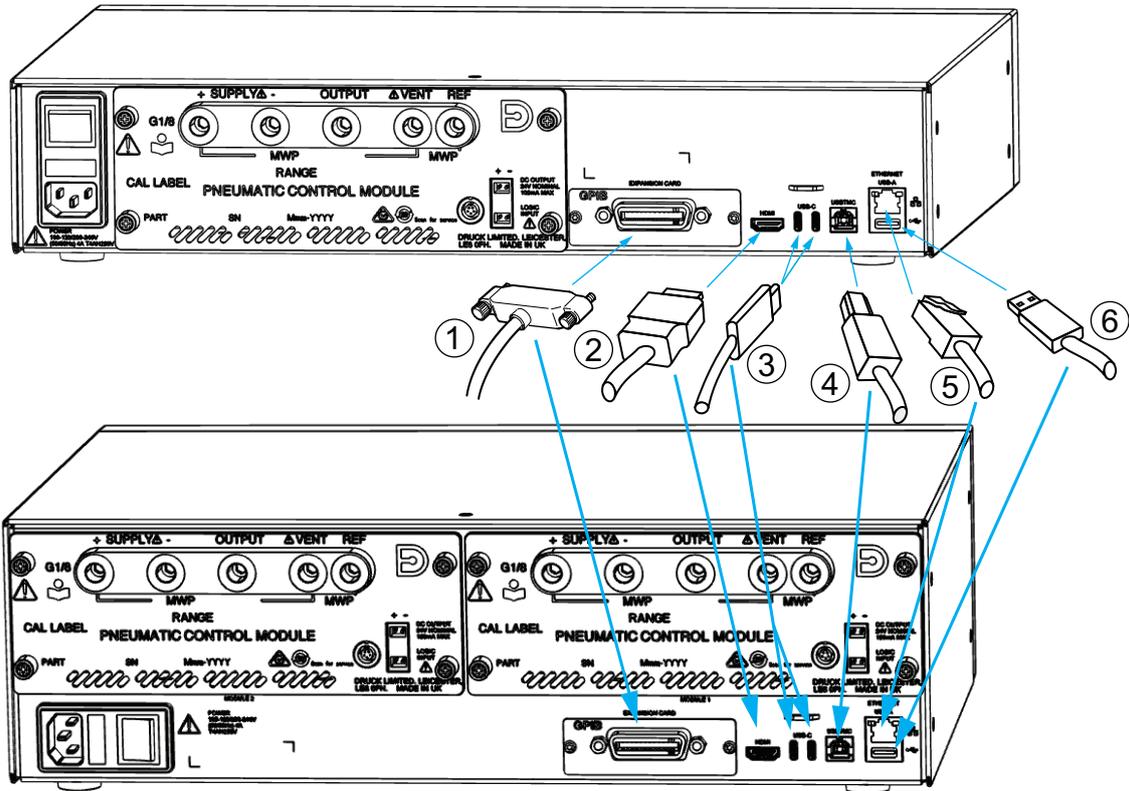


1 IEC connector

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

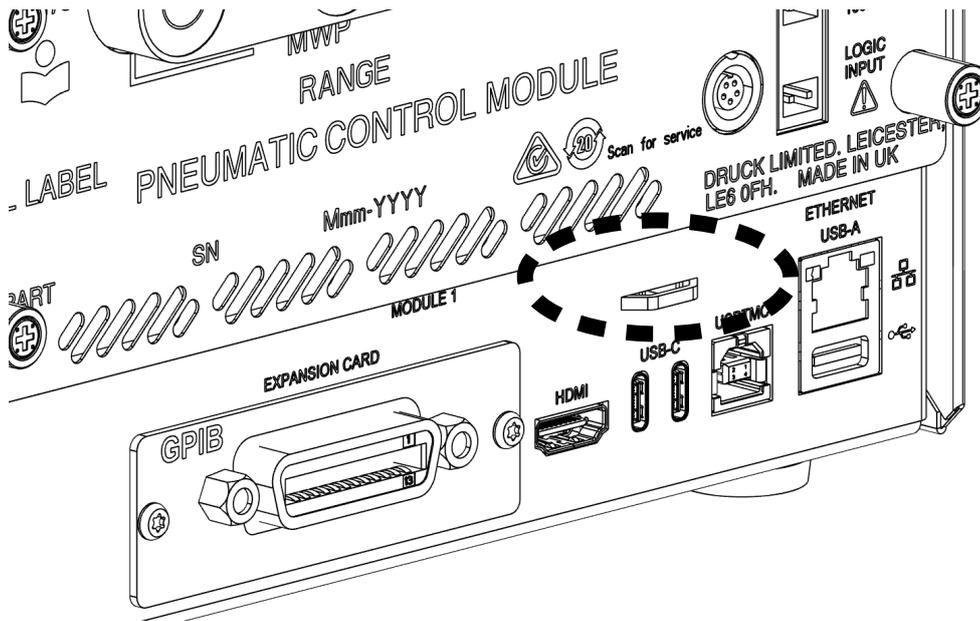


Figure 2-14: Tether to Rear of Instrument

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 sockets if you need RS232 connection.

Note: To make sure the instrument operating system loads the RS232 driver, de-energize the instrument power, connect the converter, then energize the instrument. Also, make sure the RS232 option is set to **Enabled**. See Section 5.10 on page 64.

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 96.

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 connects at power-up. Set the necessary parameters in the settings. Refer to “Settings” on page 57

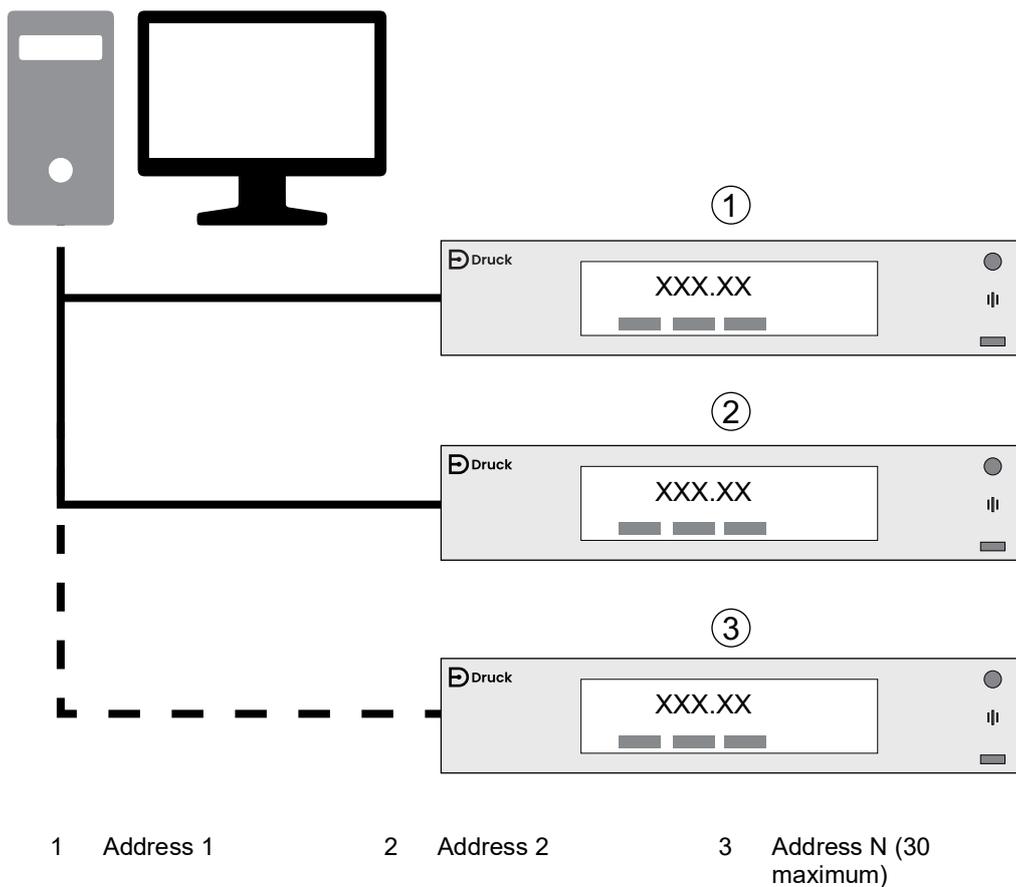
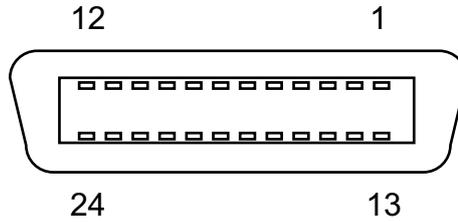


Figure 2-15: IEEE 488 Connection

- 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

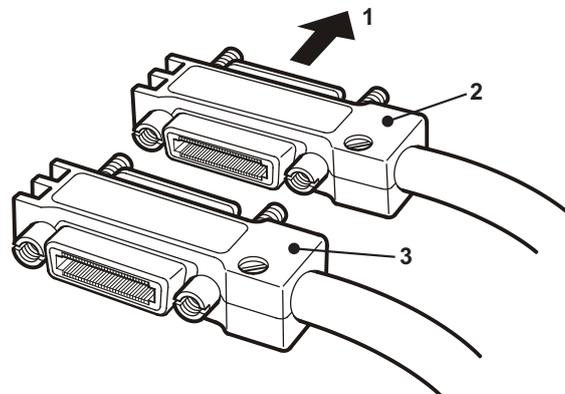
NRFD = Note Ready for data
 REN = Remote Enable
 SH = Shield or Chassis/Frame
 SRQ = Service Request

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 64.

2.11.8.2 IEEE 488 Multiple Unit Installation



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

Figure 2-17: Stacking GPIB IEEE_488 plugs

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 64.

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 5.



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 69.
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 18.



Figure 3-1: Opening (Splash) Screen

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

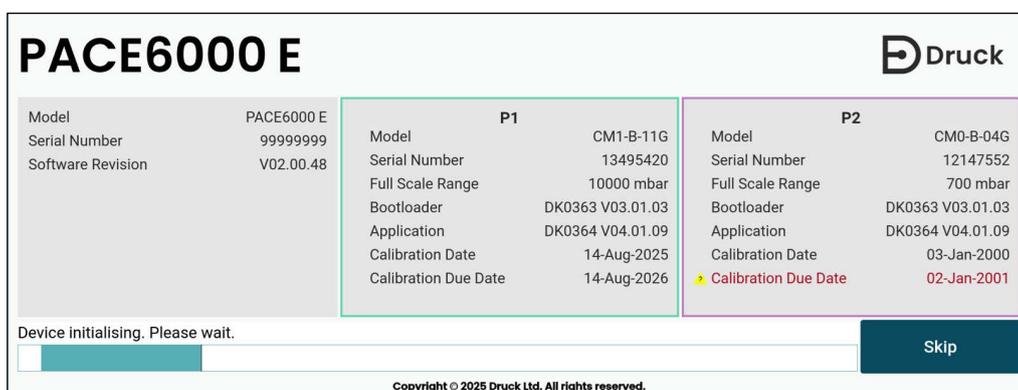


Figure 3-2: Power-up Sequence

Chapter 3. Operation

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 78. The instrument also checks the firmware of any fitted Pneumatic Control Modules. See “Updating Pneumatic Control Module Firmware” on page 71. 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 shows a typical **Home** screen.

Notes:

- If this is the first time you have energized a new instrument, the power-up sequence also asks 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 shows 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 77.

3.2.1 Standby Mode

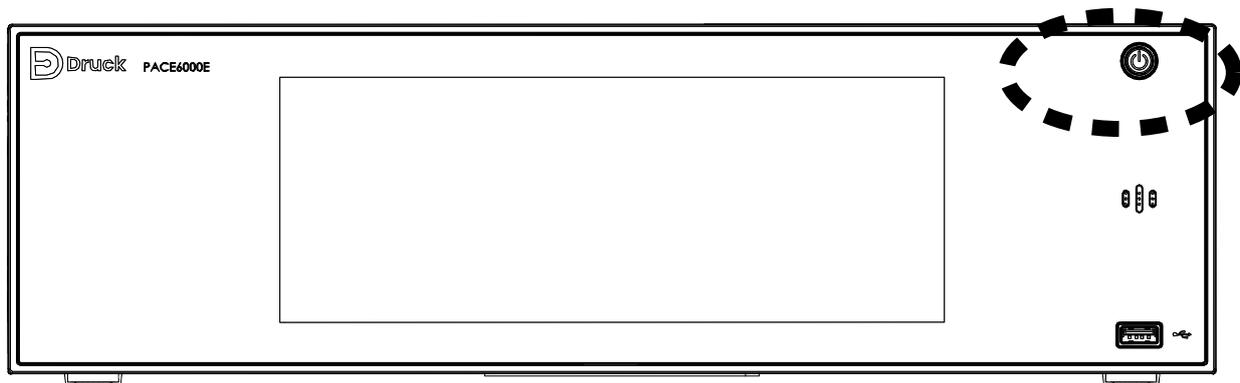
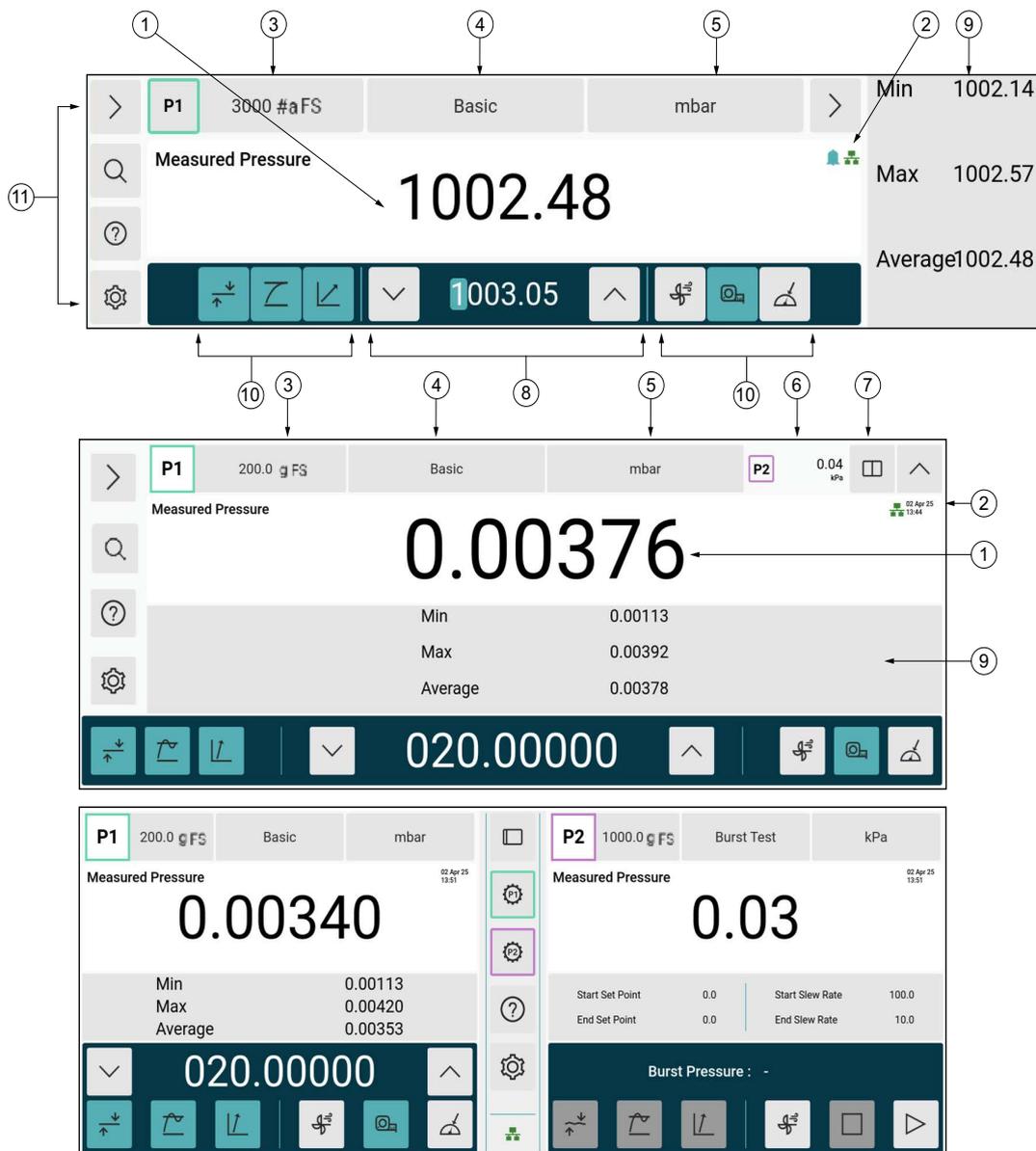


Figure 3-3: Push the Power Button

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 changes to an orange color. Press the button again to bring the instrument out of standby mode and into normal operation mode. The button changes to a white color.

As you enter standby mode, the instrument display opens a dialog box that asks if you are sure that you want to shut the system down and asks 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. | 7 One and two channel screen select. |
| 2 Enabled function symbols and LAN connection status. | 8 Setpoint area with Nudge buttons. |
| 3 Measurement Range button for the sensor in Pneumatic Control Module 1. | 9 Status Area. |
| 4 Task button. | 10 Icons |
| 5 Measurement Units button. | 11 Icons in the Side Bar |
| 6 P2 (Pneumatic Control Module 2) pressure measurement. PACE6000 E only. | |

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

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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 34.

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 91.
- In **Measure Mode** or **Control Mode**, the digits are **red** when the alarm operates.
- Some digits are **blue** if you have the **Aeronautical** Task option and select the **Mach** range, to show that the values are dynamic (for example Mach full scale).

Refer to Appendix C on page 107 for details of the icons and functions used on the screens.

3.4 Using the Screens

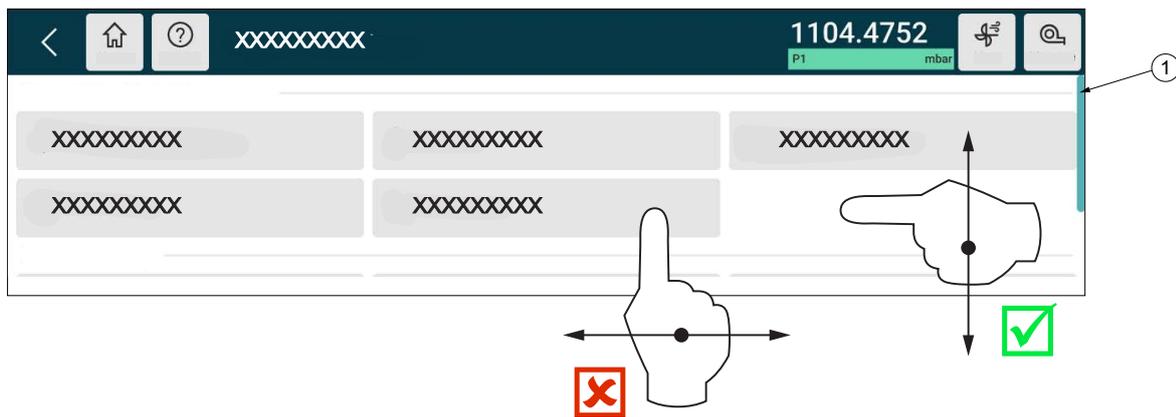


Figure 3-5: Screen with a Scroll Bar

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 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 107 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 “Process Settings” on page 66. If using the PACE6000 E in Two Channel Home Screen mode (see “Two Channel Home Screen (PACE6000 E only)” on page 34), 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

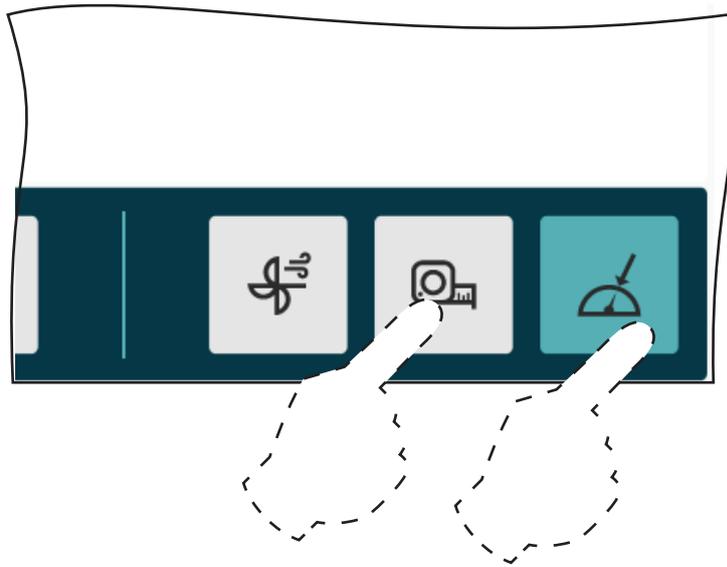


Figure 3-8: Selecting Measure and Control Modes

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.

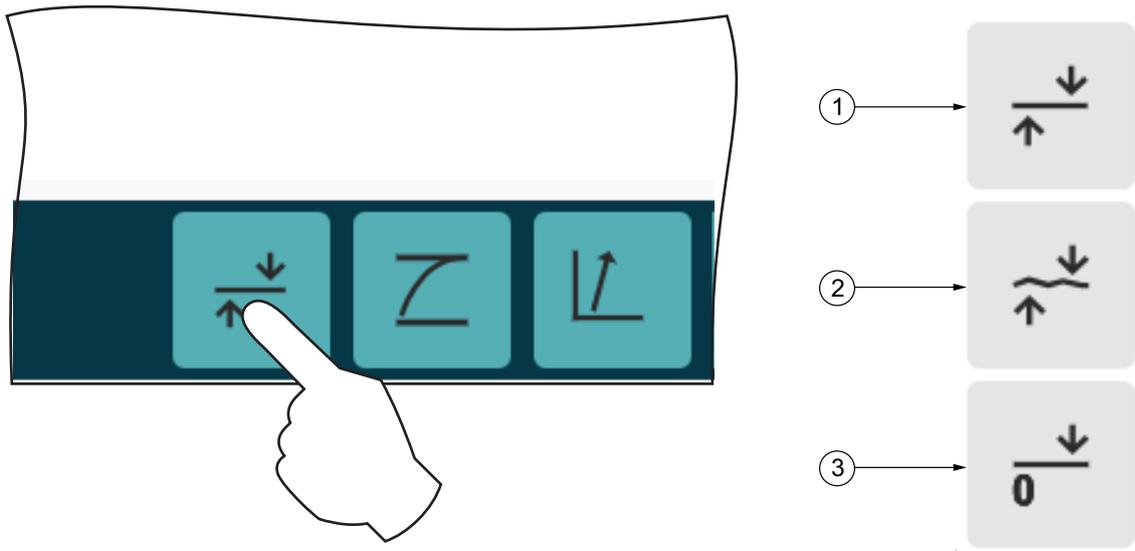


Figure 3-9: Selecting the Control Mode Option

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

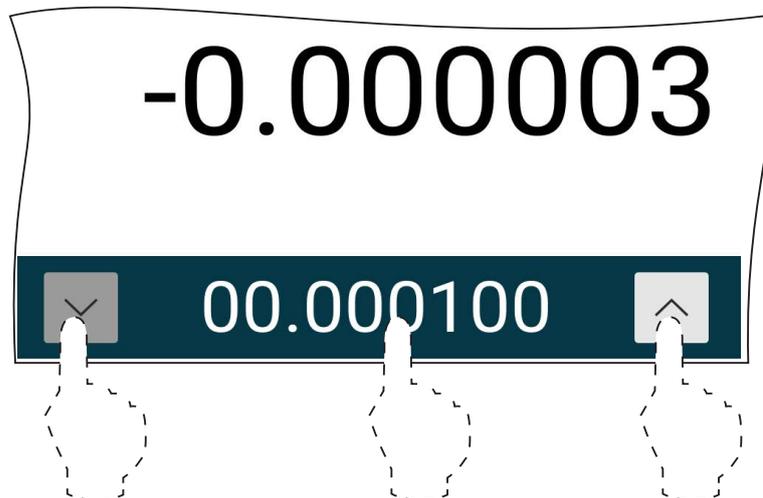


Figure 3-10: Changing the Setpoint

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 59 to change the number resolution.
- Select the **Help** icon to show the nudge resolution under the setpoint value in the Setpoint area.

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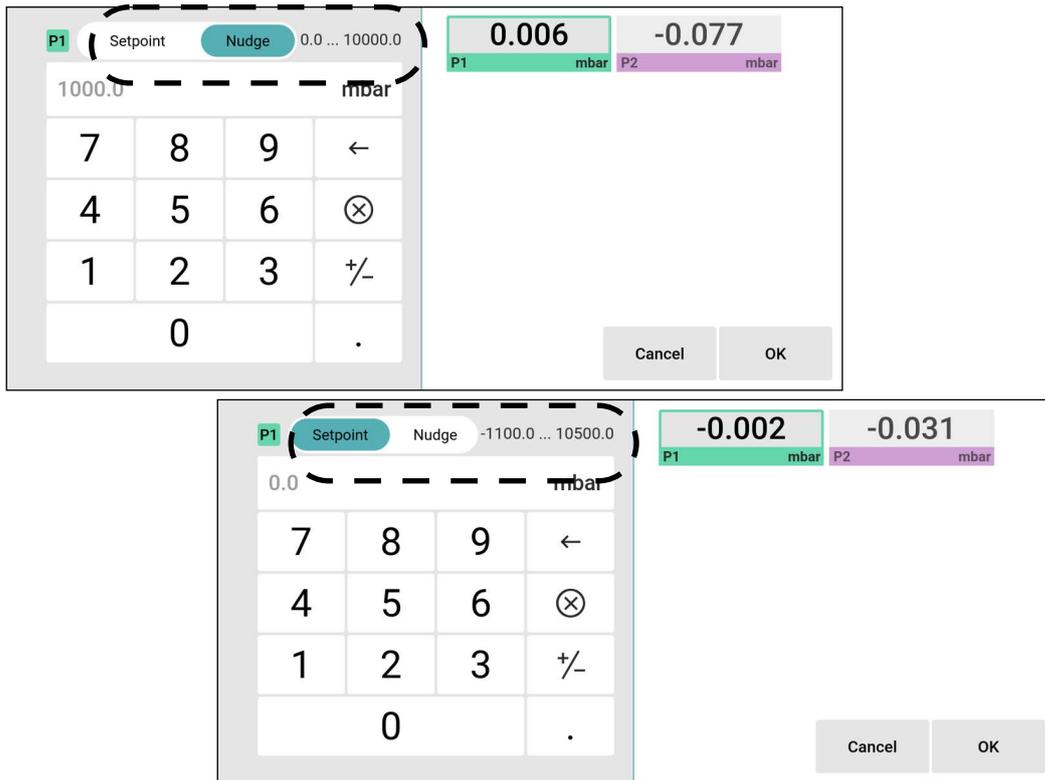


Figure 3-11: Nudge Resolution and Setpoint Values

3.8 Status Area Parameters

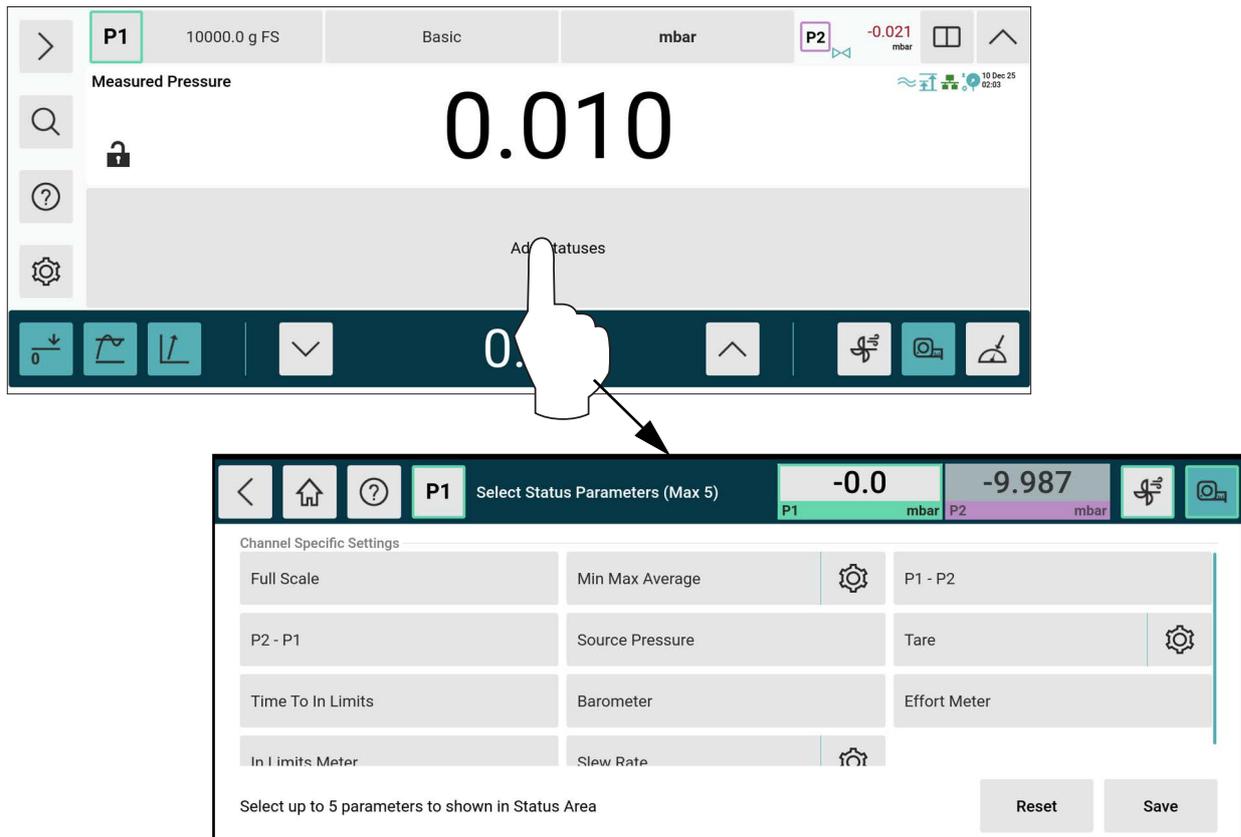


Figure 3-12: Selecting the Status Area Parameters

From the **Home** screen, if you select any part of the **Status Area**, a new screen opens where you can choose parameters to be shown in the **Status Area**. The PACE5000_E allows up to 3 parameters and the PACE6000_E allows up to 5 parameters. Select each parameter as necessary, then select the **Save** button. This area shows pressures in the selected pressure units.

Note: These parameters can be different for some tasks other than the **Basic** task. See other Tasks for more details.

- **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 (PACE6000 E only).

Note: This is only available if your Control Module has a reference sensor.

- **Source Pressure** - shows the live values of the source pressures.
- **Tare** - sets and shows the tare value.
- **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 91.
- **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

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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 91.
- **Slew Rate** - shows the slew rate aim (AIM) and activity (ACT) in rate of change per second. See “Slew Rate” on page 91. In aeronautical tasks, this can become ROC (Rate of Climb) in altitude mode. In airspeed mode it can become RtCAS (Rate of Calibrated Air Speed). For Mach it is RtMach (Rate of Mach).

Notes:



- Select the **Status Area** button at the top right of the screen to open the **Status Area** if necessary.
- If using the PACE6000 E in Two Channel Home Screen mode (see “Two Channel Home Screen (PACE6000 E only)” on page 34), 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

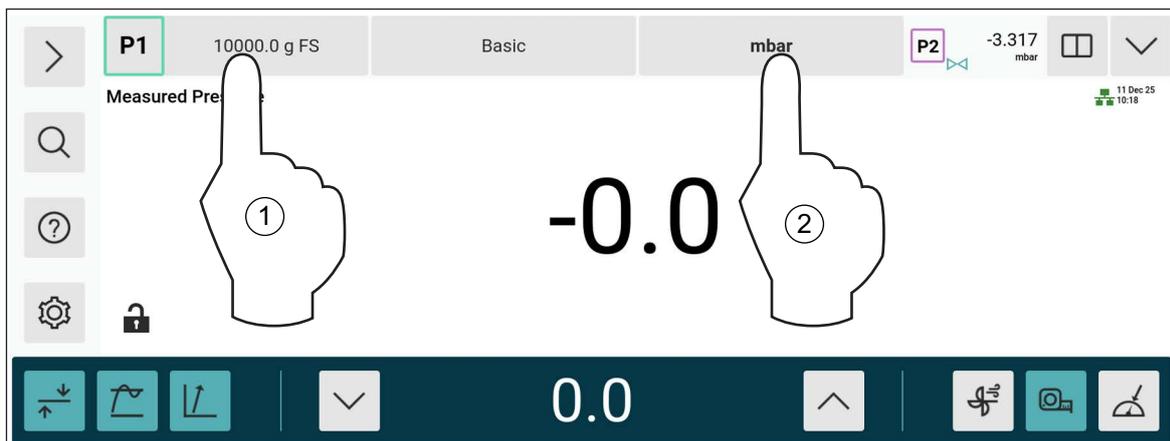


Figure 3-13: Selecting Measurement Range and Units

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)

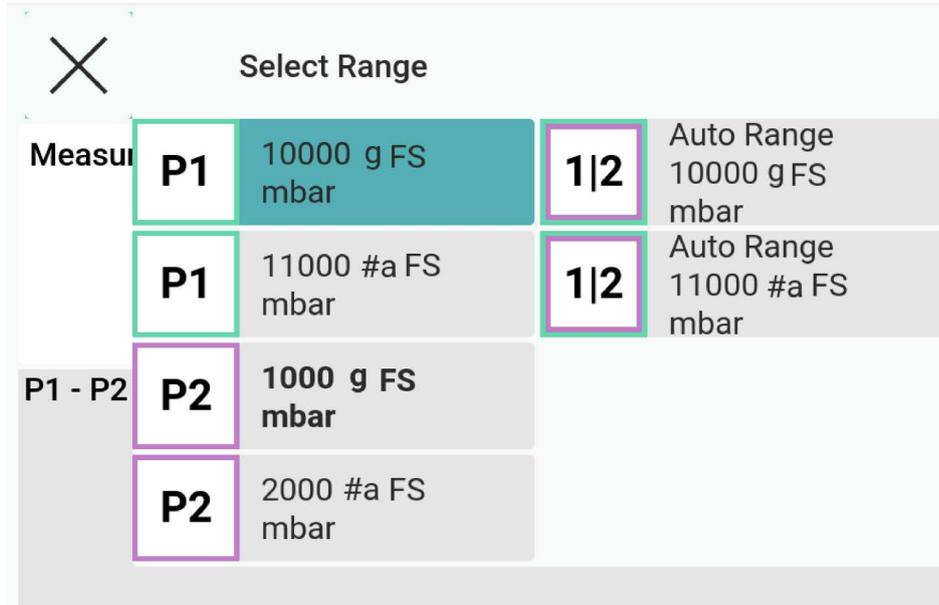


Figure 3-14: Typical Measurement Range Button Options

Select to open options of other ranges or select to open the Auto Range option. See “Auto Range Function (PACE6000 E only)” on page 36 for more details.

The range shown in green is the active **and** selected range for that channel. The range shown in **bold** is the active range of the other channel.

3.9.2 Measurement Units button (2)

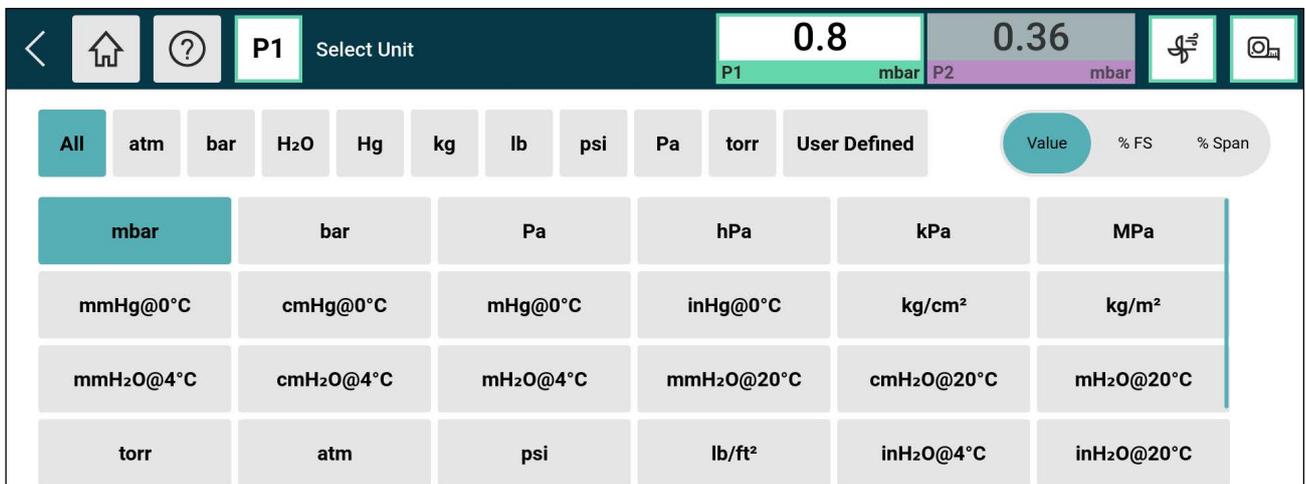


Figure 3-15: Typical Select Unit Screen

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 61. You can also select to show pressure as a percentage of full scale (% FS) or percentage of span (% span).

Notes:

- Your region of use determines the available units.
- In the Two Channel **Home** screen mode, the **Measurement Range** button does 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)

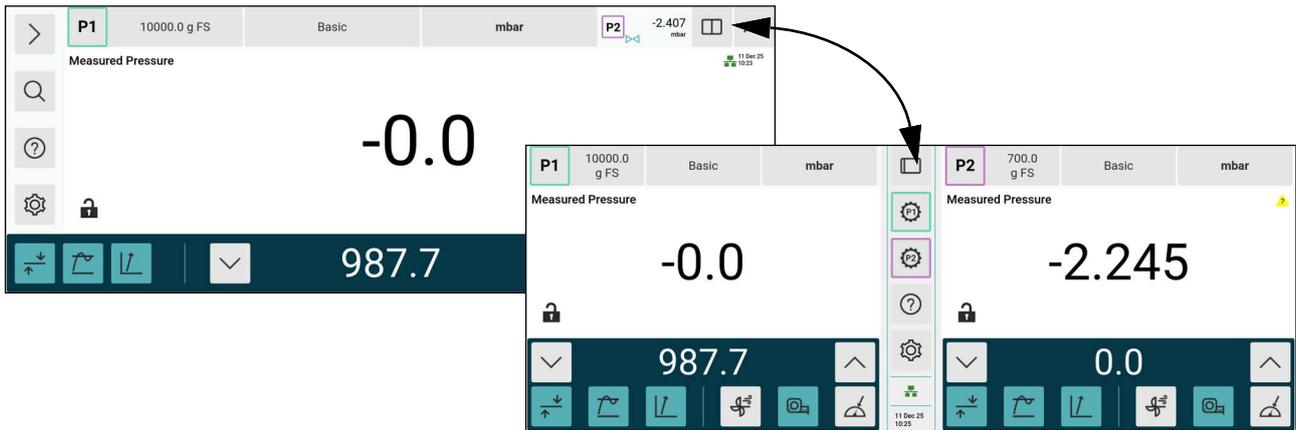


Figure 3-16: Selecting the Two Channel Home Screen

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.

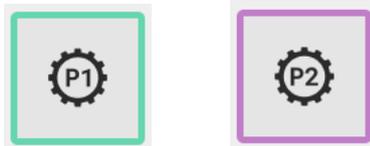


Figure 3-18: P1 and P2 Settings Icons

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

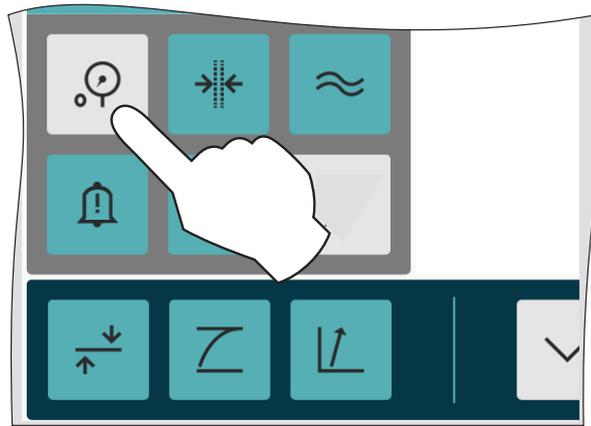


Figure 3-19: Selecting the Zero Icon

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.

The sensors for Pneumatic Control Modules can be different, so this affects the zero function. If your instrument has a CM3 Pneumatic Control Module, this module includes an added TERPS Reference Sensor. For these modules, the zero function will only zero the control sensor. It will not zero the added TERPS Reference Sensor.

3.11.1 To Zero a Control Sensor (all modules)

1. Expand the left-hand side of the screen (**Side Bar**) if necessary and select the **Zero** icon.
2. The instrument shows a message asking you to confirm that you are about to trigger a Zero operation.
3. If you select **OK**, the instrument shows 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 60 for more details about setting up automatic zeroing.

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

3.11.2 CM3 Modules of 3.5 bar and Below

For these modules, use the Tare function to temporarily offset any zero shifts in the TERPS Reference Sensor. See "General Settings Screen" on page 59. A permanent zero of the Reference Sensor is not necessary as per the datasheet accuracy specification.

3.11.3 CM3 Modules of 8 bar and Above

For these modules, the instrument will remind you to zero the TERPS Reference Sensor every 28 days. If you ignore the reminder, it will repeat every 8 hours. You must use the **Sensor Correction** screen to zero the TERPS Reference Sensor against atmospheric pressure. To do this:

1. Select **Settings > Calibration** (Enter PIN) > **Sensor Correction**
2. Select the **Reference Sensor**
3. Select **Auto Zero**

3.12 Good Practice: Vent Function

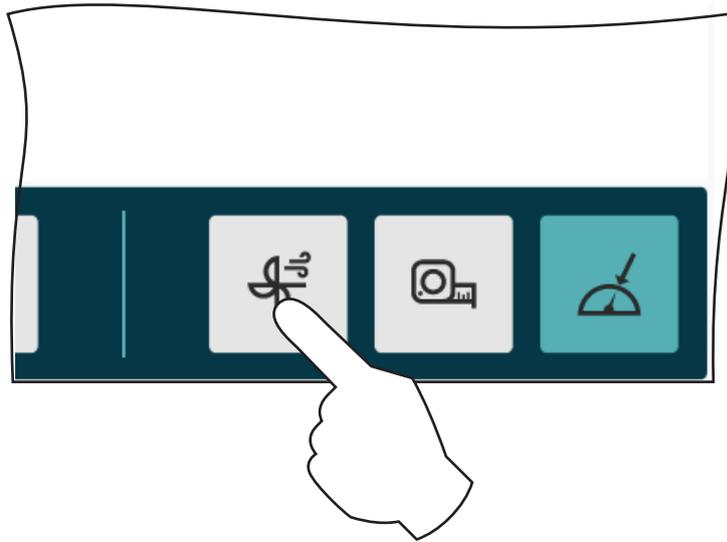
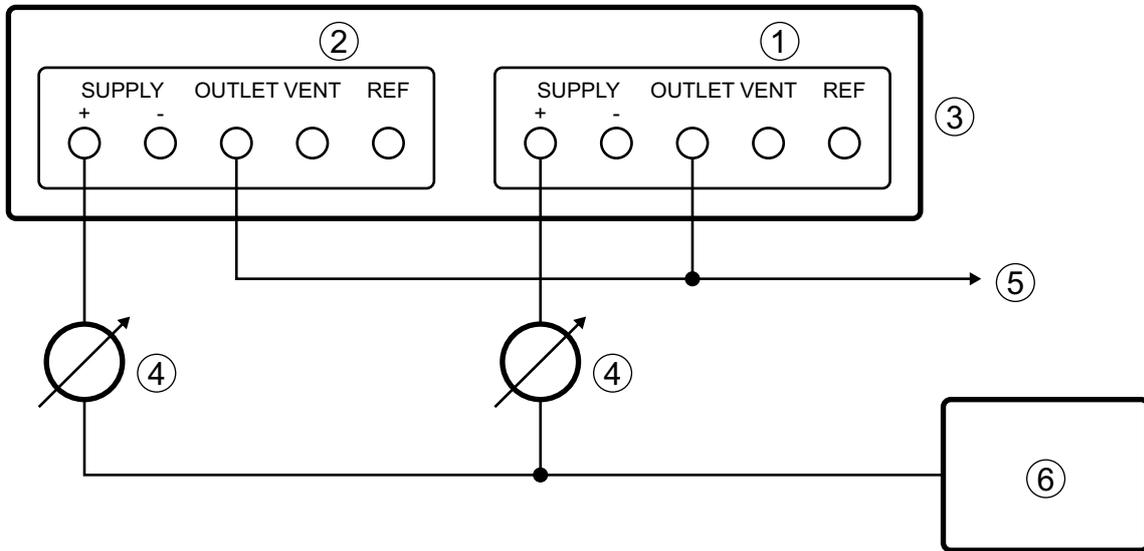


Figure 3-20: Selecting the Vent Function

The **Vent** icon shows 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 59.

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 10 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 34. 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 remains 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** changes both channels to **Measure Mode**. Both isolation valves open.
- Changing from **two** to **one** channel mode while the system is in **Control Mode** changes both channels to **Measure Mode**. The instrument shuts the isolation valve of the non-active channel.

Note: If the instrument is configured in single channel mode then it operates with a single isolation valve open at any one time. In this setting the dual display mode is disabled. If necessary, select **Settings > Supervisor Setup > (Enter PIN) > Channel Mode** and change the setting to **Dual**. The dual display opens and the unit operates with both isolation valves open.

3.14 Lock Controls



Figure 3-22: Lock Controls

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Available when in **Basic** Task only for both single and dual display (PACE6000 E), these controls let the Supervisor partially or fully lock the **Home** screen controls. They stop a user from seeing and changing some settings in the **Home** screen.

Select the icon to change its condition. A keypad dialog screen opens to enter the Supervisor PIN. When you have entered the correct PIN, the icon changes from locked to unlocked or unlocked to locked as necessary. You may also select **Lock Partially**.

Icon	Meaning	What it does
	Locked	The user cannot see or operate the Setpoint area, or Control mode icons.
	Unlocked	The user can see and operate all controls.
	Lock Partially	The user can see and operate the Setpoint area, Control and Measure Mode icons. The user cannot see or operate the icons to the left of the Setpoint area, or the icons in the Side Bar .

3.15 Search

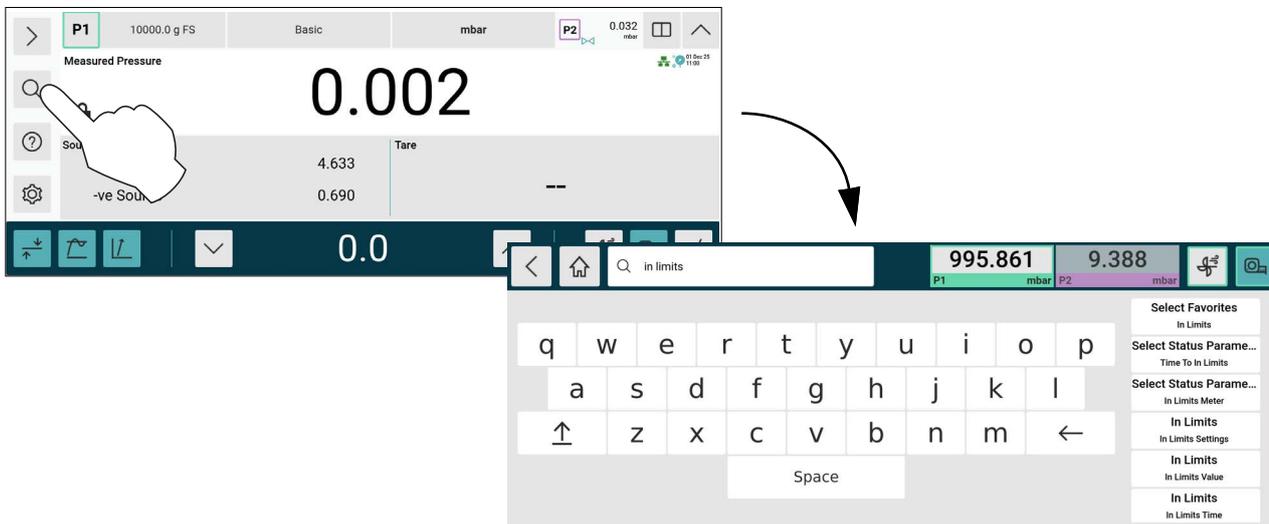


Figure 3-23: The Search Screen

Selecting the **Search** icon opens a Search Screen with a keyboard. Use the keyboard to enter the word or phrase that you need to search for in the user interface. The result screen shows the results of the search to the right-hand side. Select the results to open the screen that contains the word or phrase that you have searched for.

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 paid for that option. See “Software Options - Task Options” on page 97.

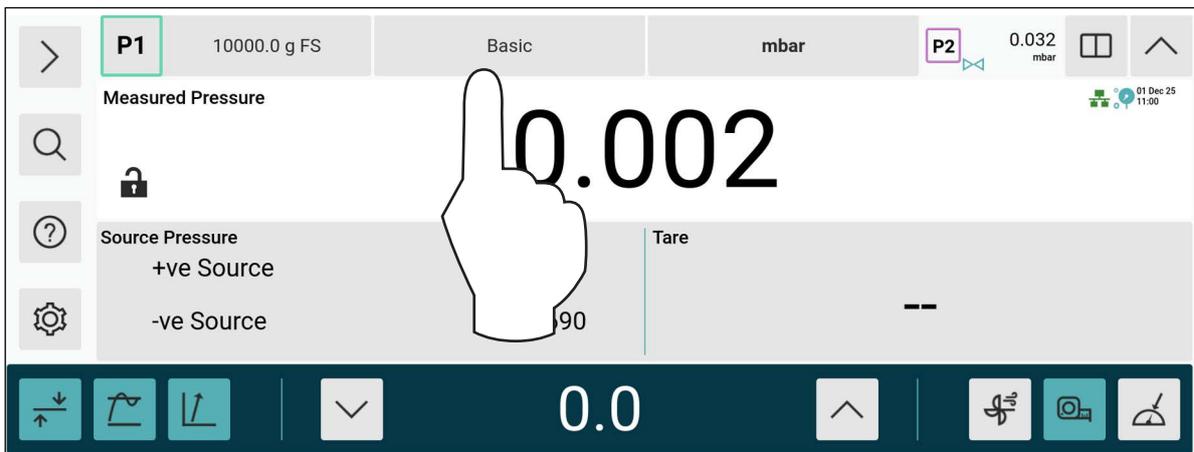
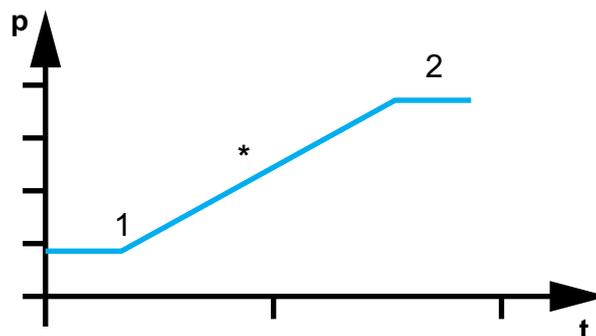


Figure 4-1: Selecting a Task

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.

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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 25.

4.2 Leak Test Task

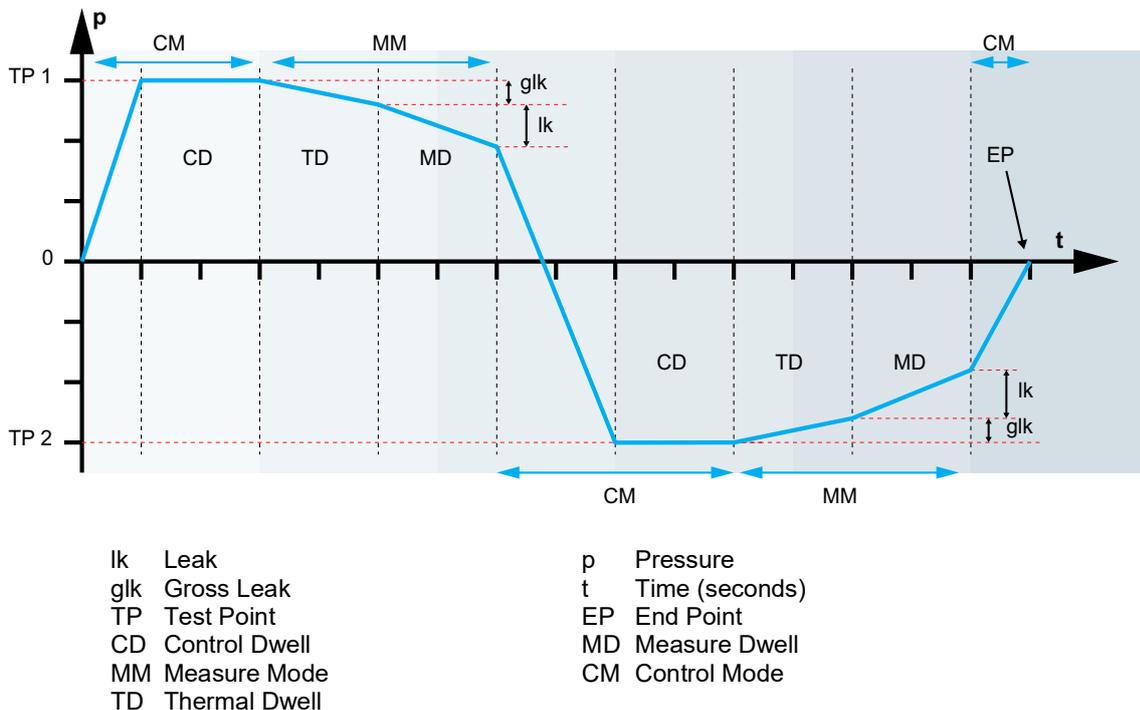


Figure 4-3: Example Leak Test

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.

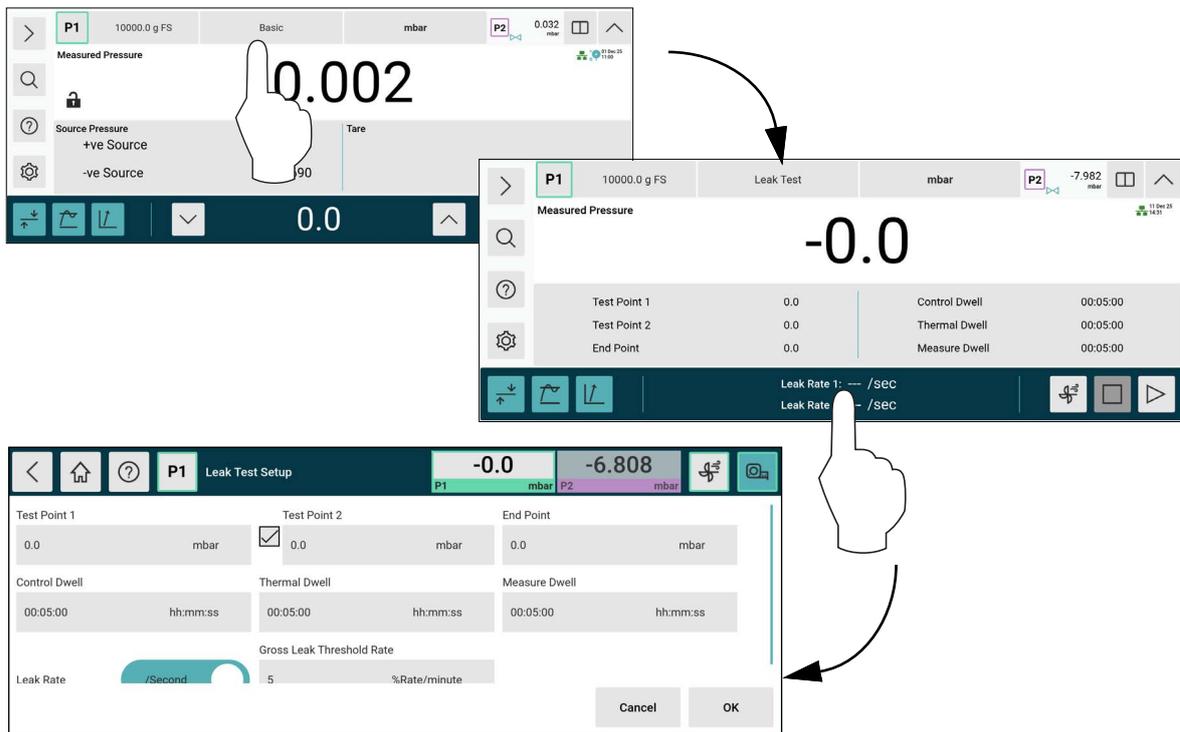


Figure 4-4: Selecting and Setting Up the Leak Test Task

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 applies pressure and measures the leak (if any), showing the results on the **Leak Test** screen after the measure dwell completes.

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- After the leak test completes, the **Stop** icon is not available, but the **Start** icon is available again.

Notes:

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

4.3 Burst Test Task

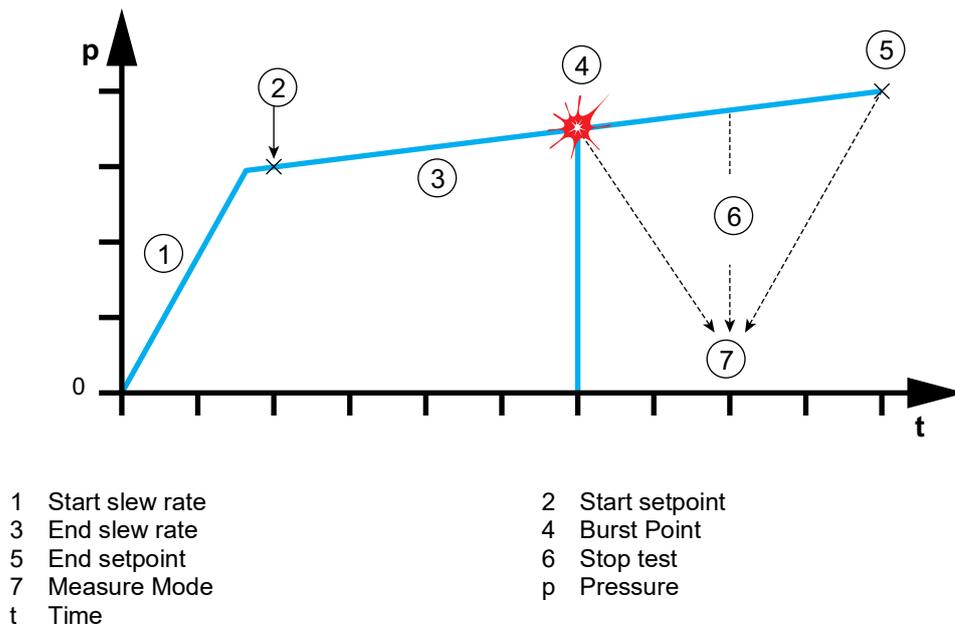


Figure 4-5: Typical Burst Test

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:

- A burst is detected.
- The test is stopped by the user.
- The pressure reaches the end setpoint.

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

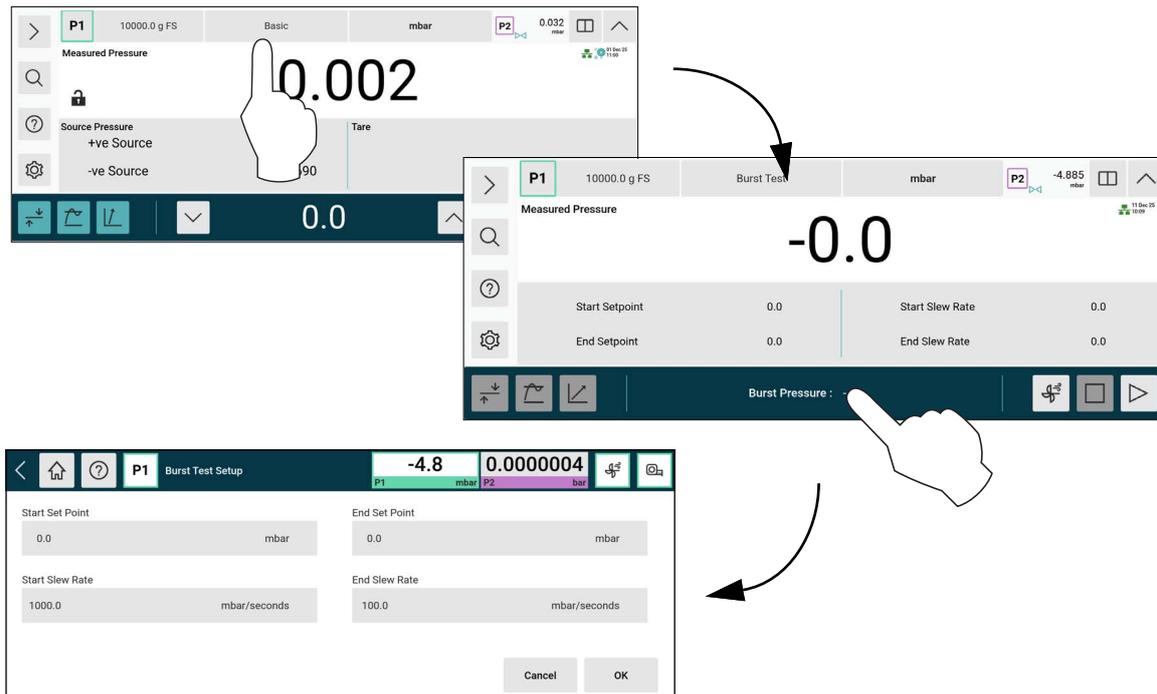


Figure 4-6: Selecting and Setting up the Burst Test Task

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.

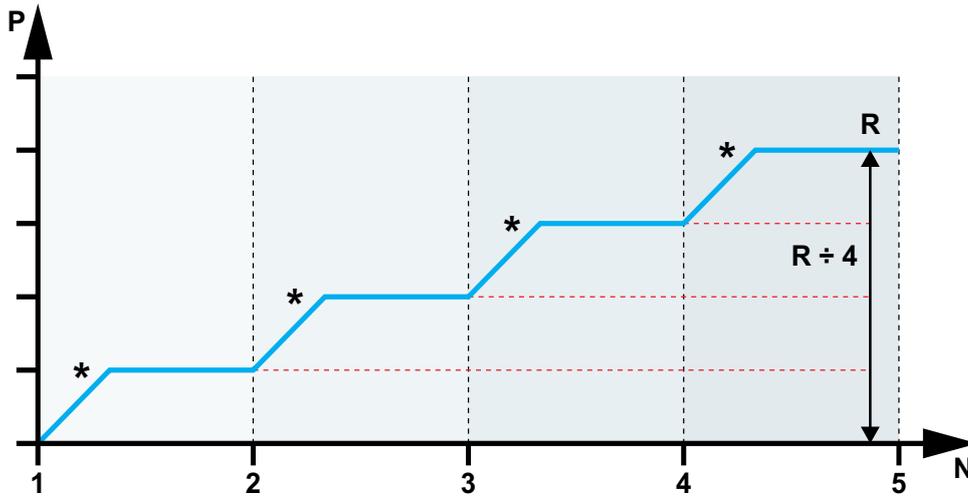
The parameters include:

- **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 automatically changes 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 applies pressure and shows 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.

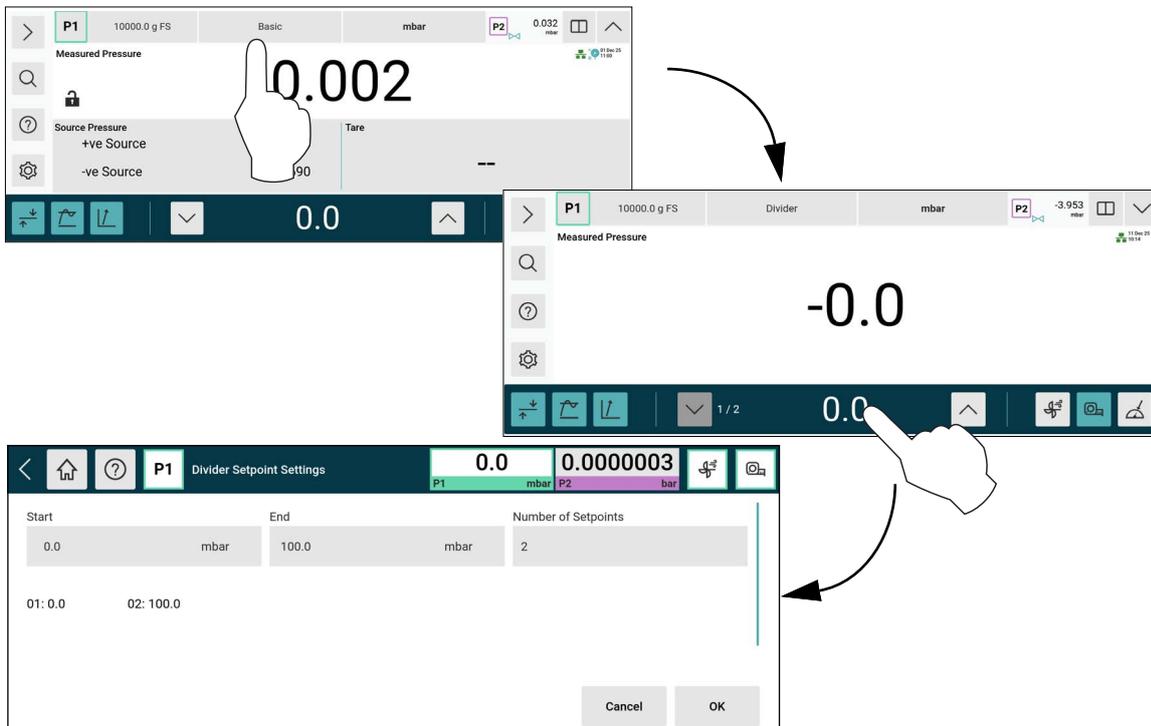


Figure 4-8: Setting up the Divider Task

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 shows 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 controls pressure to reach the setpoints.

4.5 Preset Task

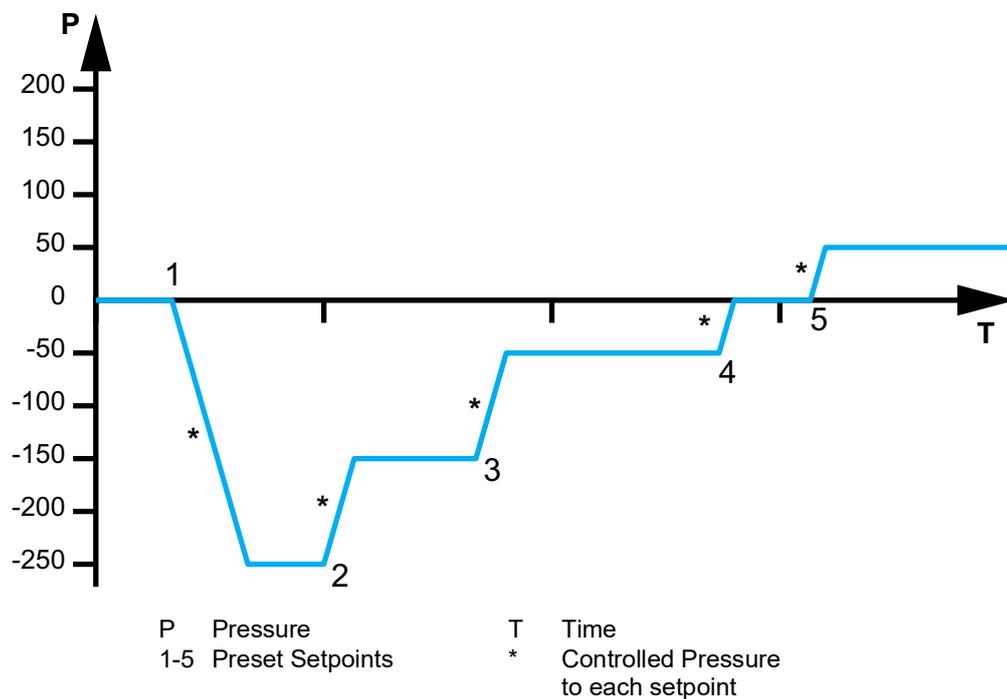


Figure 4-9: Typical Preset Setpoints

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This task lets you choose from up to 8 Preset Groups, each with up to 35 setpoint values that you set before running the task. The instrument controls the pressure as you select each pre-defined preset value by selecting the Nudge up and down buttons.



Figure 4-10: Setting up the Preset Task

To select and do the task:

1. From the **Home** screen, select the **Task** button and select the **Preset** option. The **Home** screen changes to the **Preset** screen. The **Setpoint** area changes to show preset values.
2. Select the **Setpoint** area. A new **Select Preset Group** screen opens for you to setup the Preset Groups and their preset setpoint values.
3. Select the **View/Edit** button to view and edit the setpoints in each group. As you select each setpoint, a numerical entry dialog box opens to let you enter the setpoint value.
4. Select the **Rename** button to rename the group. A keyboard opens to let you rename the group. The maximum character limit is 10.

Notes:

- You cannot rename the 'Original Preset Group', but you can view or edit its setpoints.
- You need the supervisor PIN to edit setpoints or rename a group, but you may change the PIN for this Preset Task feature using the Change PIN option.

5. Set your Preset Group and its setpoints as necessary, then select the **OK** button. The **Setpoint** area shows the Group you have selected and the first of the 35 setpoints (shown as 1/35).
6. Select **Control Mode** to start the task. The instrument applies pressure and moves through the setpoints you have set in the group as you select the **Nudge** up and down buttons. The **Setpoint** area shows the number of the active setpoint in the group as 'XX/35'.

4.6 Test Program



Figure 4-11: Setting up the Test Program

This task lets you create, save, import, export and run sequences of commands on the instrument.

Notes:

- Running Test Programs disables the SCPI communications.
- Changes made to the instrument settings during the Test Program remain when you exit the Test Program. For example if your Test Program includes the command to change to **Control Mode**, the instrument will remain in **Control Mode** if you select to go back to the Basic Task.

To select the Test Program task:

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1. From the **Home** screen, select the **Task** button and select the **Test Program** option. The **Home** screen changes to the **Test Program** screen. The **Setpoint** area changes to show program **Time Elapsed**, which **Line** of the program is active, program **Status** and lets you choose **Stepped Execution**. It also has the **Stop** and **Start** buttons that let you stop and start your program. **Stepped Execution** lets you step through each line of you program using the **Start** button.

Note: You must stop any running program before you can select **Stepped Execution**.

2. The **Status Area** shows the name of the selected Test Program. Select the **Status** area. A new **Select Test Program** screen opens for you to select, duplicate or view/edit your Test Programs.
3. If necessary, select the **Duplicate** button to duplicate an existing Test Program. The instrument duplicates the Test Program and adds the number 1 to the end of the new Test Program name.
4. Select the **View/Edit** button adjacent to the selected test program to open the **Edit Test Program** screen. This screen lets you change the name of the program. Select the **Test Program Sequence** button to open the screen for the Test Program. This lets you edit the commands and sequence of the Test Program.

Note: When you select more than one item in the list of Test Programs, the **View/Edit** and **Duplicate** buttons disappear, because you cannot duplicate, view or edit more than one Test Program at a time. Note this if your list of Test Programs is long and you select a program and scroll down. Select an already selected Test Program to deselect it.

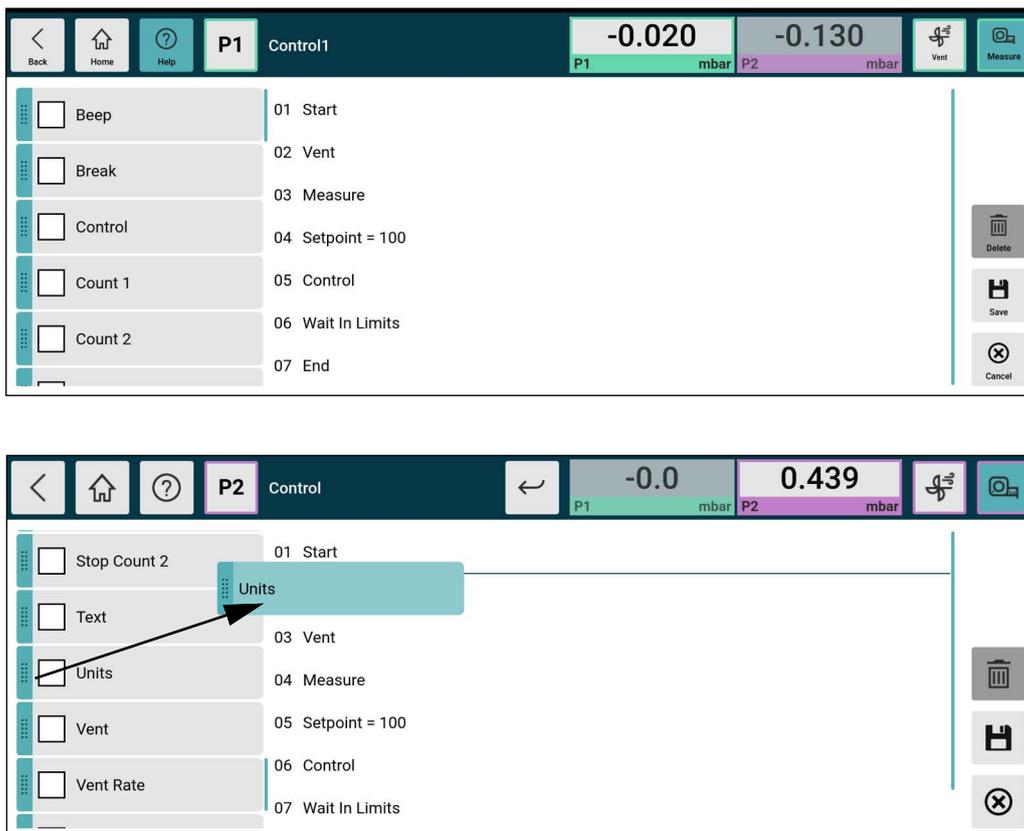


Figure 4-12: A Typical Test Program Edit Screen

5. In the selected **Test Program Edit** screen, you can select from the list of **Commands** on the left and add them to the program on the right. You can also use the buttons to the right of the screen to delete a line of the program and save the program.
6. See Table 4-1 for a list of the **Commands** and what they do.

7. Select and drag a Command from the left and drag it to the program on the right. If you make a mistake, select and delete the program line and try again. Use the small check boxes in each command to let you select multiple commands if necessary.

Note: We recommend that for most Test Programs, step 2 should be the UNITS command to set the measured units.

03 Setpoint = 0.0



Figure 4-13: Command Edit Option

8. Some commands such as **Setpoint**, **Text** and **In Limits Timer** have an **Edit** option, so you can change the value or argument for that command. See Figure 4-13.
9. Save your Test Program, then go back to the **Select Test Program** Screen to select it, then select **OK**.
10. The **Status** area shows the name of your program. Select the **Start** button and the **Stop** buttons to start and stop your program. The **Status** area shows important information about your program as it runs.

Table 4-1: Test Program Commands

Command	Description
BEEP	Sounds a beep (on/off).
BREAK	Breaks to this point when stop count command or STOP icon is selected, then executes the code from the break statement to the end statement.
CONTROL	Selects Control Mode .
COUNT 1	Counter 1 - Used in a loop to count the number of loop cycles.
COUNT 2	Counter 2 - Used in a loop to count the number of loop cycles.
DWELL	Sets dwell time (seconds) within the test program.
END	Program end.
GOTO	Sets up a loop. Enter program line number to go to.
IF	If statement allows for a decision. For instance, if count 1 = 5 then GOTO xx
IN LIMITS	In-Limits band setting (% full-scale).
IN LIMITS TIMER	Waits, within In-limits for this time period, before setting a valid In-limits condition and continuing the Test program sequence.
ISOLATION VALVE	Control of output isolation valve: Isolated (closed) or Non-isolated (open).
MEASURE	Selects Measure Mode .
PAUSE	Pauses test program and waits for user input (Resume).
RANGE	Specifies instrument range. Test program can only run within one control module.
RATE MAX	Sets controller rate to maximum.
RATE VALUE	Sets controller linear rate entered. Per minute or second
RESOLUTION	Sets display resolution.
SET COUNT 1	Sets the counter 1 internal value.
SET COUNT 2	Sets the counter 2 internal value.

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Table 4-1: Test Program Commands

Command	Description
SETPOINT	Used to enter setpoint.
SETTLING FAST	Sets controller fastest response, may overshoot.
SETTLING NO OVERSHOOT	Sets controller response without overshoot.
START	Program start.
STOP COUNT	Stops Counter 1.
STOP COUNT 2	Stops Counter 2.
TEXT	Sets screen message.
UNITS	Select the necessary display units.
VENT	Instructs the module to vent.
WAIT IN-LIMITS	Waits until pressure is within the limits.
ZERO	Output zeroed

4.6.1 Example Program

Table 4-2: Example Program

Step	Command	Argument	Action
1	START		Program start
2	UNITS	mbar	Set units to mbar
3	RATE	100	Set rate to 100 mbar/min
4	IN LIMITS TIME		10 (00:00:10) seconds
5	IN LIMITS		Set In-Limits band
6	RESOLUTION	5	Set display resolution to 5 digits
7	SETTLING		No overshoot
8	TEXT		Operator instruction, e.g. "Connect UUT"
9	ZERO		
10	SET POINT	400	Setpoint to 400 mbar
11	CONTROL		Controller ON
12	WAIT IN LIMITS		Wait for In-Limits condition
13	BEEP		Beep on, approximately 1 second, Beep off
14	MEASURE		Set to Measure Mode (controller off)
15	DWELL	30	Wait for 30 seconds (00:00:30)
16	SET POINT	800	Setpoint to 800 mbar
17	CONTROL		Controller on
18	WAIT IN LIMITS		Wait for In-Limits condition
19	BEEP ON		Beep on, approximately 1 second, Beep off
20	MEASURE		Set to Measure Mode (controller off)
21	TEXT		Operator instruction, e.g. (Wait for beep, record pressure)
22	DWELL	30	Wait for 30 seconds
23	BEEP		Beep on, approximately 1 second, Beep off
24	TEXT		Operator instruction, e.g. "Min pressure allowed 785 mbar"
25	PAUSE		WAIT (for operator input to touch single step)
26	VENT		Vent
27	END		Program end

4.6.2 Programming Loops

To program a loop, use the GOTO command.

Include the COUNT command in the loop for counting the number of loop cycles.

To stop a test program from looping, select the **Stop** button.

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Note: The test program commands do not include tests for conditional jumps.

Table 4-3: Example of Programming a Loop

Step	Command	Argument	Action
1	START		Program start
2	UNITS	mbar	Set units to mbar
3	RATE VALUE	100	Set rate to 100 mbar/min
4	RESOLUTION	5	Set display resolution to 5 digits
5	IN LIMITS		Sets the In-Limits band
6	IN LIMITS TIME		10 (00:00:10) seconds
7	SETTLING NO OVERSHOOT		No overshoot
8	TEXT		Operator instruction, e.g. "Connect UUT"
9	ZERO		Zeros a sensor
10	SET POINT	400	Setpoint to 400 mbar
11	CONTROL		Controller ON
12	WAIT IN LIMITS		Wait for In-Limits condition
13	BEEP ON		Beep on, approximately 1 second, Beep off
14	MEASURE		Set to Measure Mode , controller off
15	DWELL	30	Wait, 30 seconds
16	SET POINT	800	Setpoint to 800 mbar
17	CONTROL		Controller on
18	WAIT IN LIMITS		Wait for In-limits condition
19	BEEP ON		Beep on, approximately 1 second, Beep off
20	MEASURE		Set to Measure Mode , controller off
21	COUNT 1		Increment loop counter
22	VENT		Vent
23	GOTO	9	Loop back to program line 9
24	BREAK		
25	SET POINT	0	
26	WAIT IN LIMITS		
27	MEASURE		
28	END		Program end

4.7 Aeronautical Task



Figure 4-14: Setting up the Aeronautical Task - One Channel Shown for Clarity

The aeronautical task sets the instrument to control and measure using values and rates in aeronautical units. This is a specialized task and only available for the PACE6000 E because it has two Pneumatic Control Modules to control and measure altitude and airspeed at the same time for most tests.

You can select the aeronautical task on the PACE6000 E with a single control module, but it is limited to either altitude or airspeed and Mach (not both).

- Channel **one** measures and controls **altitude** with units of feet or meters.
- Channel **two** measures and controls **airspeed** with units of knots, mph, km/h or Mach.

There are two versions of this task. Each version works in the same way, but have different maximum airspeed and altitude ranges. See the sales datasheet for details.



INFORMATION Before testing an aeronautical device, do a leak test. See “Leak Test Task”.

When selected, the Aeronautical Task disables some features used by service personnel, including: Sensor correction, Valve correction, Module diagnostics and Service leak test.



CAUTION Take extra care setting up the instrument for the Aeronautical Task so that the aeronautical pressures applied do not exceed maximum pressure values and rates of change for the unit under test.

To select the Aeronautical task:

1. From the **Home** screen, select the **Task** button and select the **Aeronautical** option. The **Home** screen changes to the **Aeronautical** task screen.

Chapter 4. Tasks

2. If measuring and controlling airspeed and altitude at the same time, you can select the dual display mode to show both modules. The **Measure Mode**, **Control Mode** and **Go to ground** icons move to the central area of the screen to show that they operate for both channels.
3. In the **Aeronautical** task screen, select the **Status Area** for each channel. This opens the **Aeronautical Setup (Airspeed)** screen or **Aeronautical Setup (Altitude)** screen or **Aeronautical Setup (Mach)** screen to let you select the aeronautical values and rates to use on the **Aeronautical** task screen.

The **altitude** parameters include:

- **ROC** - rate of climb.
- **Timed ROC** - a calculation of the average rate of climb over the defined time period. This calculation is completely independent and works in either **Measure** or **Control Mode**. Select the **Timed ROC** icon to stop and start the calculation, shown in the **Status Area**.
- **Ps** - Static pressure. Only available when both control modules are fitted.

The **airspeed** parameters include:

- **RtCAS** - rate of airspeed.
- **Mach** - ratio of airspeed against speed of sound.

Note: Mach is a dynamic value - so the instrument shows its measured and range values in blue.

- **Pt** - Pitot total pressure. Only available when both control modules are fitted.
- **Qc** - Differential pressure (Pt - Ps). Only available when both control modules are fitted.

The **Mach** parameters include:

- **Rt Mach** - Rate of Mach.
- **Airspeed** - Aircraft speed relative to the surrounding air.
- **Reference Pressure**.

4. Select your parameters, then select the **Save** button.



Note that the slew rate button (or buttons) used in other tasks on the lower part of the screen change to aeronautical rate buttons, that let you change the aeronautical rate settings - for example Rate of Climb, Rate of Calibrated Airspeed or Rate of Mach.

5. Change the instrument from **Measure** to **Control Mode**, then set the setpoint to the necessary value. The instrument controls the values.
6. Use the **Hold** and **Resume** buttons if necessary during the task.

4.7.1 Examples of Aeronautical Tests

These two examples show typical connections for Aeronautical Tests.

4.7.1.1 Altitude and Airspeed Tests

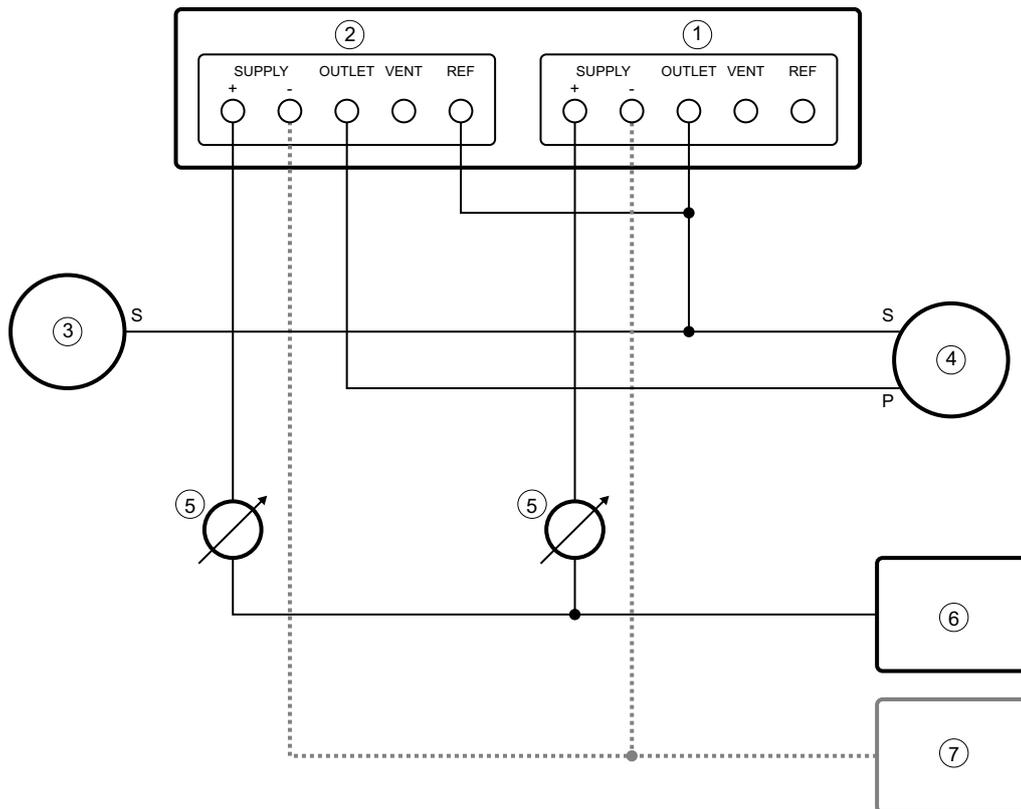


Figure 4-15: Altitude and Airspeed Test

- | | |
|---|--|
| 1 Module 1 rear view - measuring Static (altitude) pressure | 2 Module 2 rear view - measuring Pitot (airspeed) pressure |
| 3 Altimeter | 4 Airspeed Indicator |
| 5 Pressure Regulator | 6 Pressure Source |
| 7 Vacuum Source | |
| S Static | P Pitot |



CAUTION Before testing, set the rates of change for both pitot and static to a safe value. A high rate of change can damage sensitive aeronautical components. Refer to the maintenance manual for the unit under test.

In this example, negative airspeed can be generated. This can damage an airspeed indicator. To stop negative airspeed, apply the static pressure before the pitot pressure for increasing and decreasing airspeed values.

This example shows both control modules connected so that the instrument controls both altitude and airspeed at the same time.

Chapter 4. Tasks

4.7.1.2 Single Control Module Aeronautical Tests

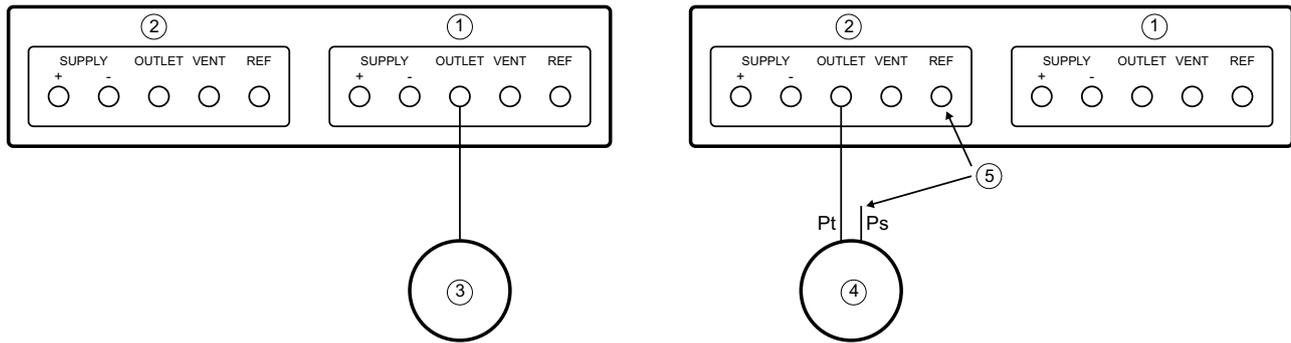


Figure 4-16: Single Control Module Aeronautical Test

- | | |
|----------------------|----------------------|
| 1 Module 1 Rear View | 2 Module 2 Rear View |
| 3 Altimeter | 4 Airspeed Indicator |
| 5 Open to atmosphere | |
| Pt Pitot | Ps Pitot-static |

If you are to use only one module at a time, you must change the connections when changing from Altitude to Airspeed.

5. Settings

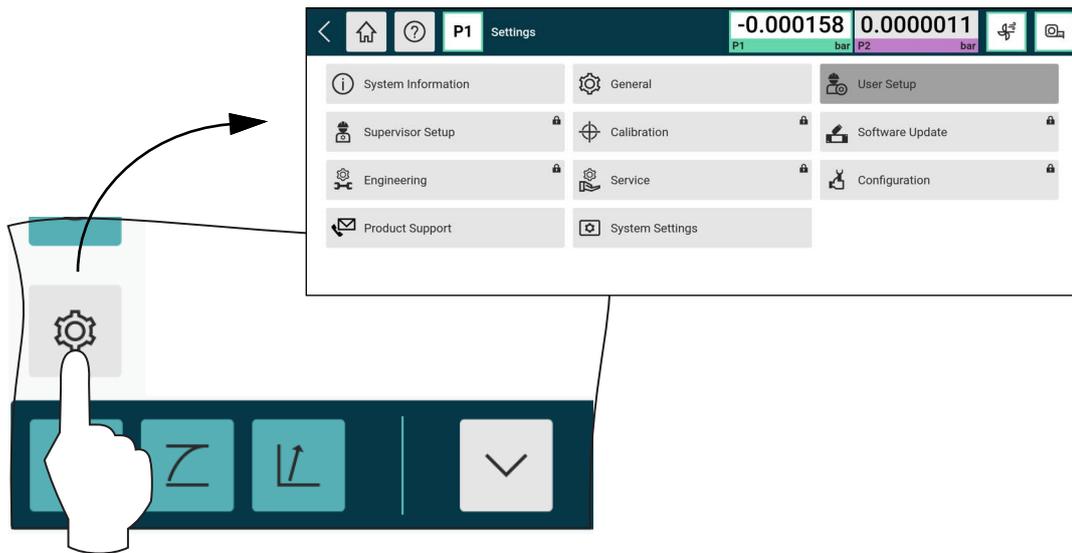


Figure 5-1: Selecting the Settings Screen

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 58.
- **General** - see “General Settings Screen” on page 59.
- **User Setup** - see “User Settings Screen” on page 60.
- **Supervisor Setup** - see “Supervisor Setup Screen” on page 61.
- **Calibration** - see “Calibration” on page 76.
- **Software Update** - gives options for updating the software of the instrument and the Pneumatic Control Module or Modules. See “Software Update Screen” on page 70.
- **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 immediately changes to your selected language. You can also change the **Backlight** and **Volume** levels.

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

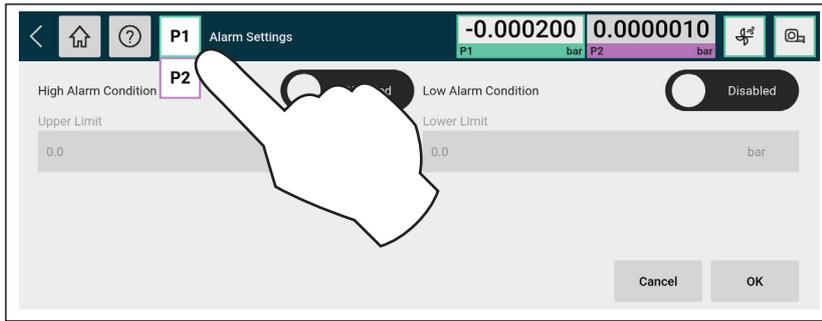


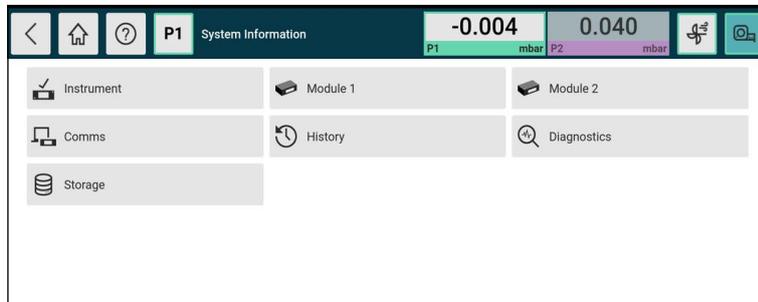
Figure 5-2: Selecting P1 or P2 in the Settings Screens

The settings screens for the PACE5000 E and PACE6000 E are almost the same, except that the PACE6000_E screens show the buttons and pressures at the top for both channels P1 and P2. Figure 5-2 shows the Alarm Settings screen as an example. Select the P1 or P2 channel button to see or change the settings for each channel.

5.2 PIN-Protected Option Screens

Some **Settings** options show a small padlock,  which means a PIN is necessary to open the option. Refer to “Personal Identification Numbers (PINs)” on page 89. When you open a PIN-protected option, it’s screen auto logs out after approximately three minutes. You can manually logout using the **Logout** icon shown at the top of the screen.

5.3 System Information Screen



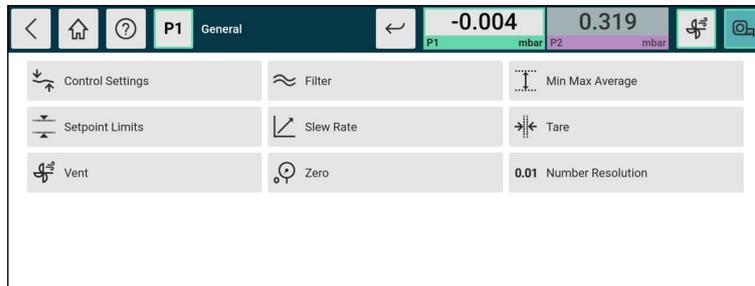
Navigation: Settings > System Information

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 Calibration, Ethernet, Hardware, Messages, Valve Correction and Zero adjustment.
- **Diagnostics** - diagnostic information including temperatures.

- **Storage** - shows how much of the internal storage memory has been used and how much is available. See “Internal Memory Devices and Storage” on page 89.

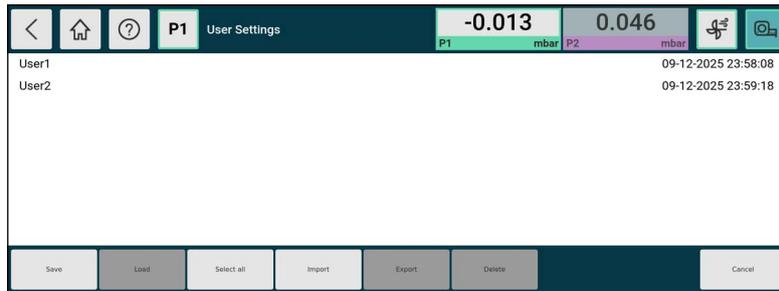
5.4 General Settings Screen



Navigation: Settings > General

- **Control Settings** - selects the way the **Control Mode** works. See “Measure and Control Modes” on page 28.
 - **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 31.
 - **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 91.
 - **Tare** - enables or disables the manual tare function. Select a specific tare value or capture (Take Snapshot) a current 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 60.
- Note:** This option is hidden if you are using tasks which do not support it.
- **Number Resolution** - sets the resolution of the measurement units.

5.5 User Settings Screen

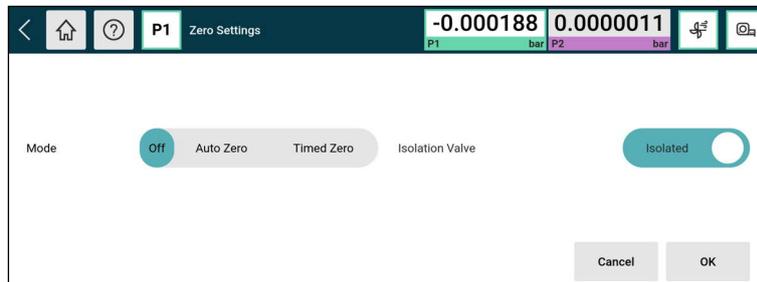


Navigation: Settings > User Setup

Use this screen to save your settings to the internal storage of the instrument you are using, or to export your settings for use on another instrument or the same instrument at a later date. The screen shows any current user settings files and the date they were created.

- **Save** - saves your setting to the internal storage of the instrument you are using.
- **Load** - loads the selected setting into the instrument.
- **Select all** - selects all the user settings in the screen.
- **Import** - imports user settings from a USB storage device connected to the instrument.
- **Export** - exports your user settings to a USB storage device connected to the instrument.
- **Delete** - deletes all selected user settings.

5.6 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 controls 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**.

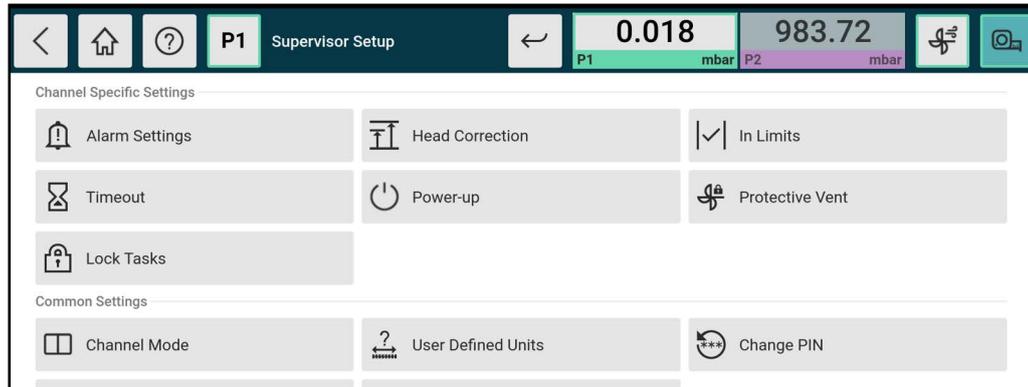
Selecting **Timed Zero** lets you set intervals at which the instrument zeros the sensor.

- **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. Select **Isolated** to automatically shut the isolation valve before it does the zero operation. The valve re-opens after the operation. Default setting is **Isolated**.

5.7 Supervisor Setup Screen



Navigation: Settings > Supervisor Setup

Note: This is a PIN secured screen.

5.7.1 Channel Specific Settings

- **Alarm Settings** - see “Alarm Settings Screen” on page 62.
- **Head Correction** - enables and sets the values for gas head height correction. See “Head Height Correction Screen” on page 63.
- **In Limits** - sets the In Limits values and time. See “In Limits Meter” on page 91. Default settings are 0.001% FS and 1 second.

Note: If using an In Limits value of <1.0, then if using SCPI commands to query the value (:SOUR:PRES:INL:TIME or equivalent aeronautical commands), commands are provided for higher precision (:SOUR:PRES:INL:TIME:PREC or equivalent aeronautical commands). Otherwise a minimum value of 1 will be returned.

- **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 65.
- **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**.
- **Lock Tasks** - lets the supervisor lock or unlock Tasks (that have been purchased) available to the user. See “Lock Tasks Screen” on page 66.

5.7.2 Common Settings

- **Channel Mode** - sets the instrument to work in **Single** or **Dual** Channel Mode (PACE6000 E only).

The **Dual** Channel Mode setting forces both isolation valves to remain open when the display is in single mode. This means that both Pneumatic Control Modules can be used independently. For example, when a Leak Test runs on module 2 and a Basic Task runs on module 1.

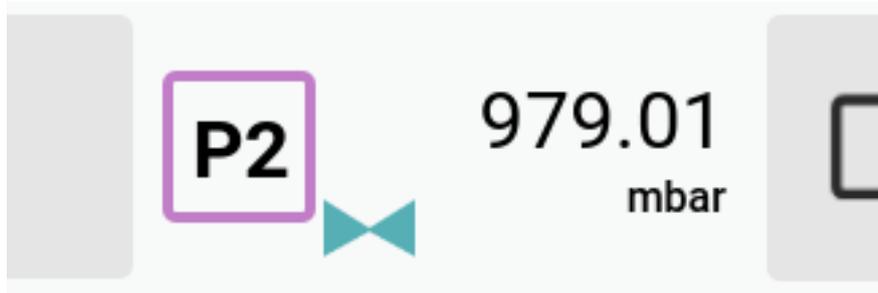
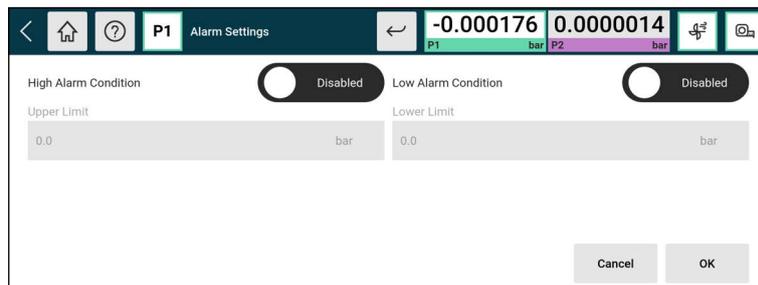


Figure 5-3: Typical Home Screen Valve Icon (PACE6000 E only)

The PACE6000 E home screen has an icon to show the status of the isolation valve of the channel not being shown. See “Touchscreen Icons”.

- **User Defined Units Settings** - lets you set user defined units of pressure. See “User Defined Units” on page 92.
- **Change PIN** - see “Personal Identification Numbers (PINs)” on page 89.
- **Comms (Communications)** - see “Communications Screen” on page 64.
- **Instrument Alias Name** - lets you create an alias for the instrument. The instrument shows this name when you communicate through the communication interfaces.

5.8 Alarm Settings Screen



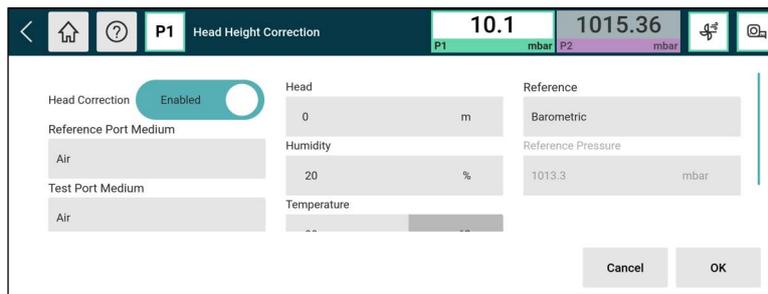
Navigation: Settings > Supervisor Setup, enter PIN > Alarm Settings

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 also shows a message.

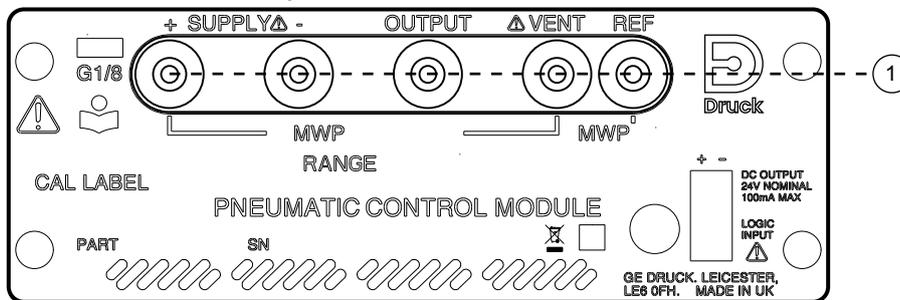
Default settings are both **Disabled**.

5.9 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.

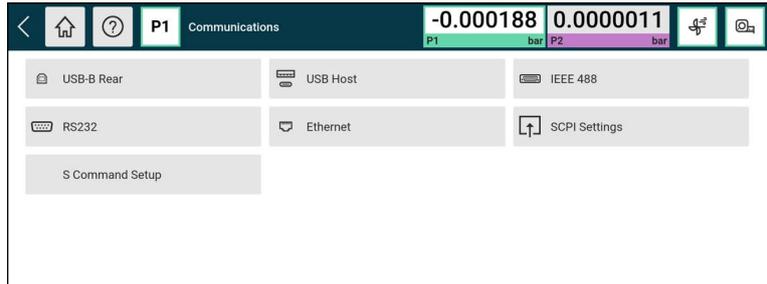
Figure 5-4: Gas Head Correction

- 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.

5.10 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 shows the Remote mode message. See “Remote Mode” on page 91.

- **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**. Also see Section 2.11.4 on page 20.
- **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**.



INFORMATION The instrument has support for IPv4 link local addresses enabled by default, as do all modern computer operating systems. A ‘link local’ address is an automatic IP address that both endpoints assign to themselves when no DHCP server is available, such as when a crossover cable is used instead for direct point-to-point link. The addresses usually fall within the range 169.254.x.x, which allows devices on the same network segment to communicate without manual configuration. Therefore, you do not need to set a static IP address in such cases and you should use the Auto IP setting.

- **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 settings to default values. It first opens a message telling you that it will reset to default values.
- Web page 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 S0 bar, S1 psi, S2 kPa and S3 mbar.



INFORMATION

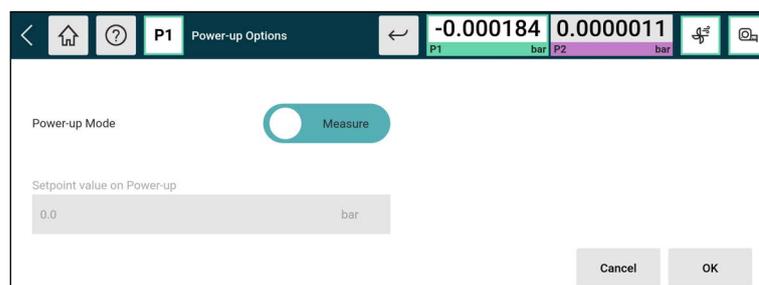
The Standard SCPI-99 mode is selected by default.

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.

5.11 Power-up Options Screen

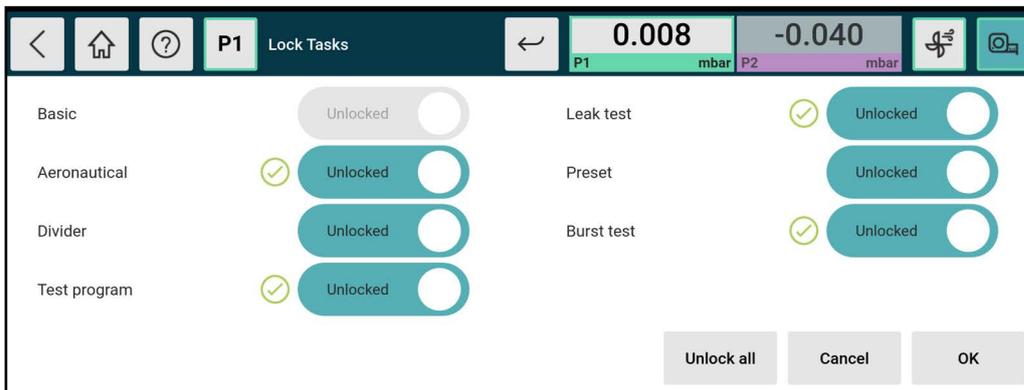


Navigation: Settings > Supervisor Setup, enter PIN > Power-up

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 dialog box for you to enter the setpoint value. Default is 0.0.

5.12 Lock Tasks Screen



Navigation: Settings > Supervisor Setup, enter PIN > Lock Tasks

This screen shows which Tasks are locked and unlocked. The currently selected Task shows as light gray. The green tick mark shows that the Task is a paid option.

5.13 Process Settings

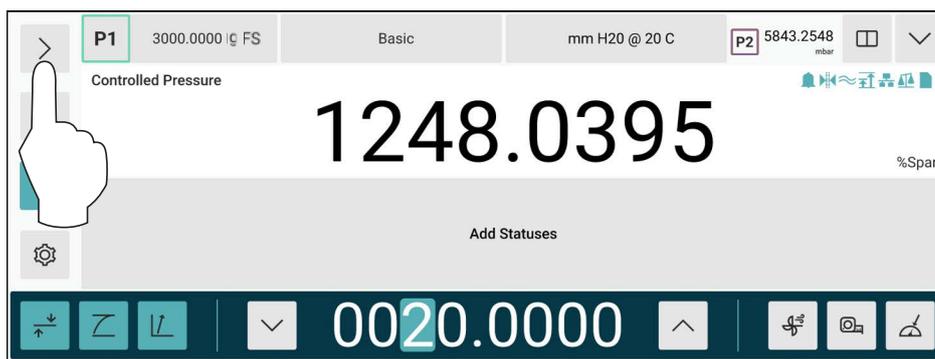


Figure 5-5: Selecting the Process Settings

This area of the **Home** screen lets you easily see and select any of the five process settings. You cannot add or change icons on this menu.

1. On the **Home** screen, select the **Expand** icon to expand the options to the left of the screen in the **Side Bar**.
2. Select the **Process Settings** icon. You can now see and select the Process Settings under the icon. The icons change to green when you select them and they become 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 **Process Settings**.

5.14 Favorites

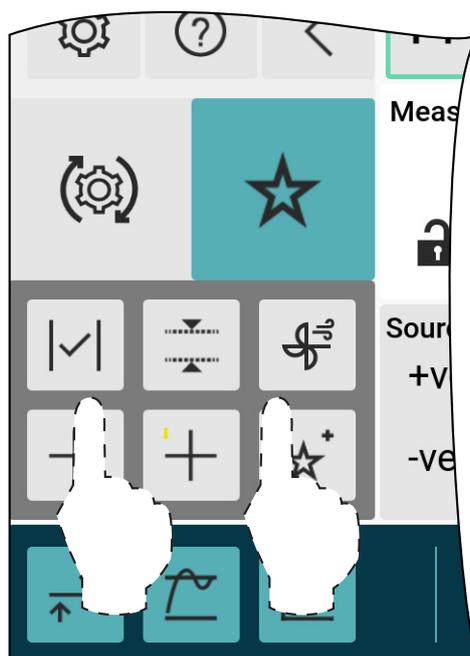
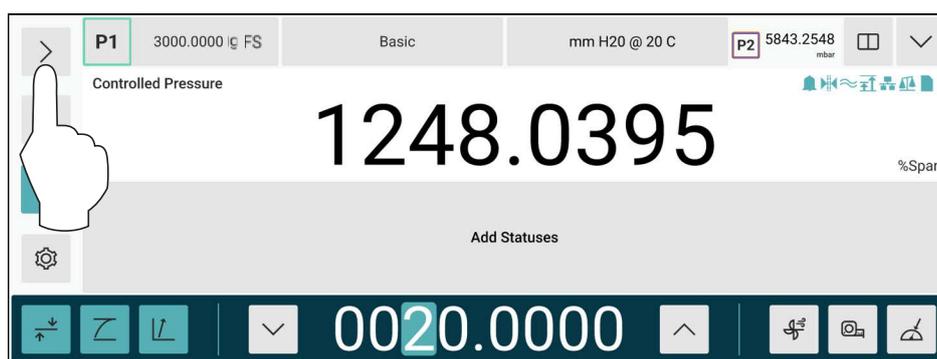


Figure 5-6: Selecting Favorites

This area of the **Home** screen lets you easily see and select your most often used (Favorite) options. 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. Select the **Favorites** icon. You can now see and select the **Favorites** menu under the icon.

Chapter 5. Settings

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

To change or add icons on the Favorites menu, select a button with the '+' mark or the 'star+' mark. The **Select Favorites** screen opens, to let you select up to five Favorite icons to be shown on the **Favorites** menu.

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.

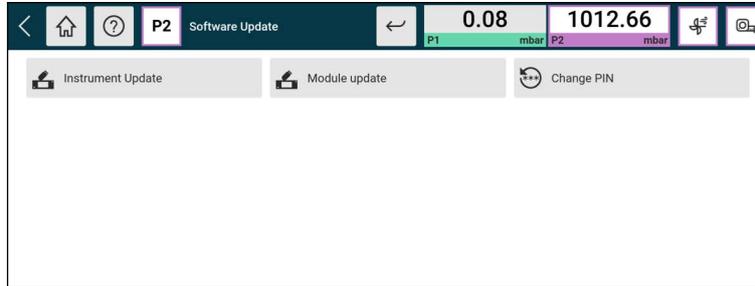
6.3 Testing

Do a standard serviceability test Section 7.2, "Standard Serviceability Test," on page 77.

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



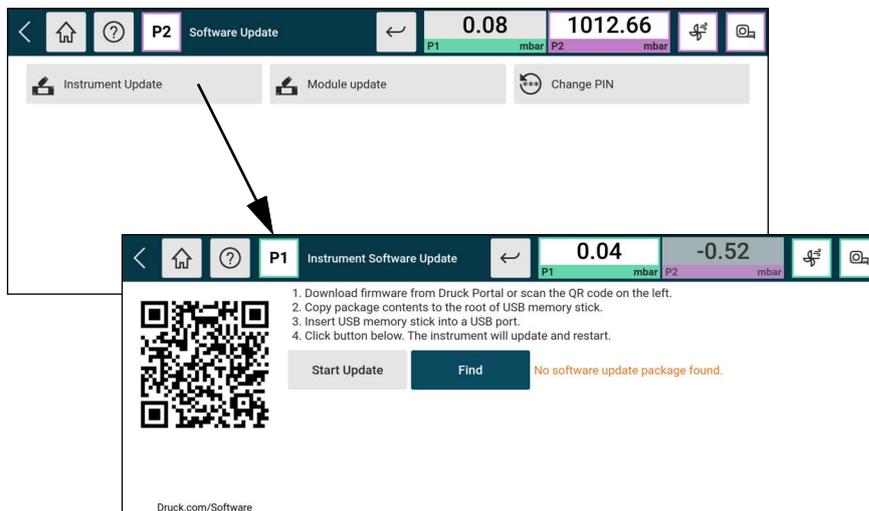
Navigation: Settings > Software Update > Enter PIN

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 89. It also uses a different PIN to let you add task options. See “Software Options - Task Options” on page 97.

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



INFORMATION You can also use the LXI Interface to update the software package in the instrument. See Appendix A on page 99.

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 searches the USB drive to find the correct files for the update. The **Instrument Update** screen shows 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 shows and the system reboots 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.

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.

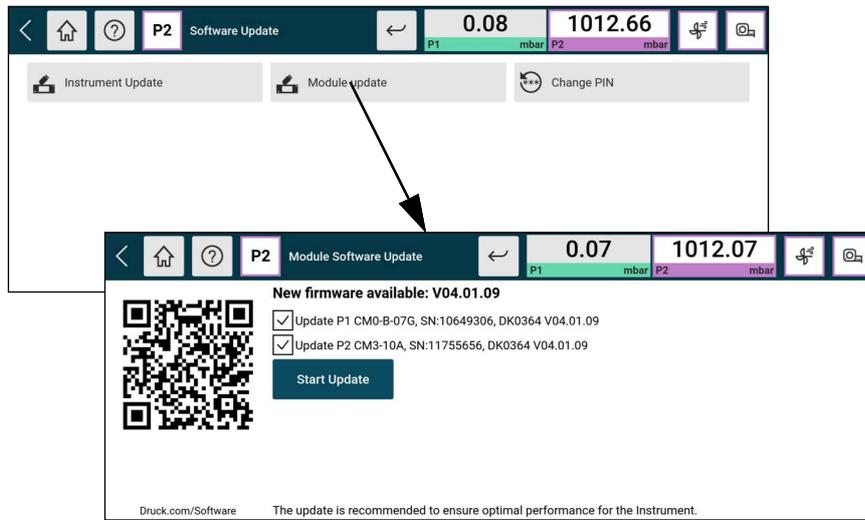
The instrument examines the Pneumatic Control Module firmware each time it energizes, as part of the Power-up Sequence. If the instrument detects out of date firmware (for example, if you fit an older Pneumatic Control Module to the instrument), it gives you the option to update the firmware from the '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:

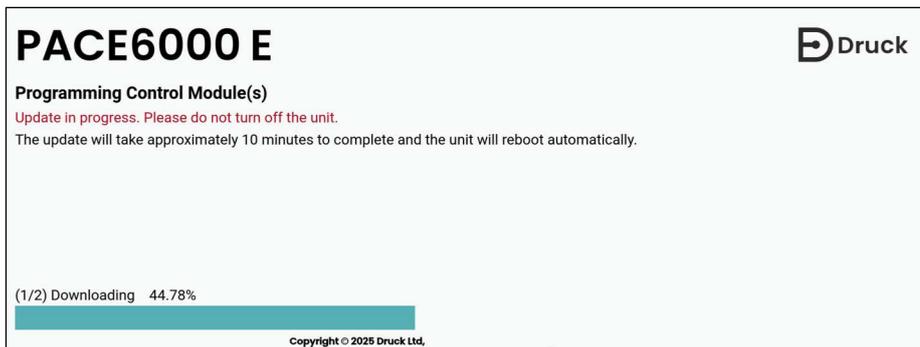
1. Update the Instrument Software as described in "Updating the Instrument Software" on page 70.

Chapter 6. Maintenance and Calibration

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 shows any new available firmware for the Pneumatic Control Modules. Select to update the module or modules (PACE6000E 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 automatically updates the firmware in the Pneumatic Control Modules and then restarts 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 77 when to replace the fuse.

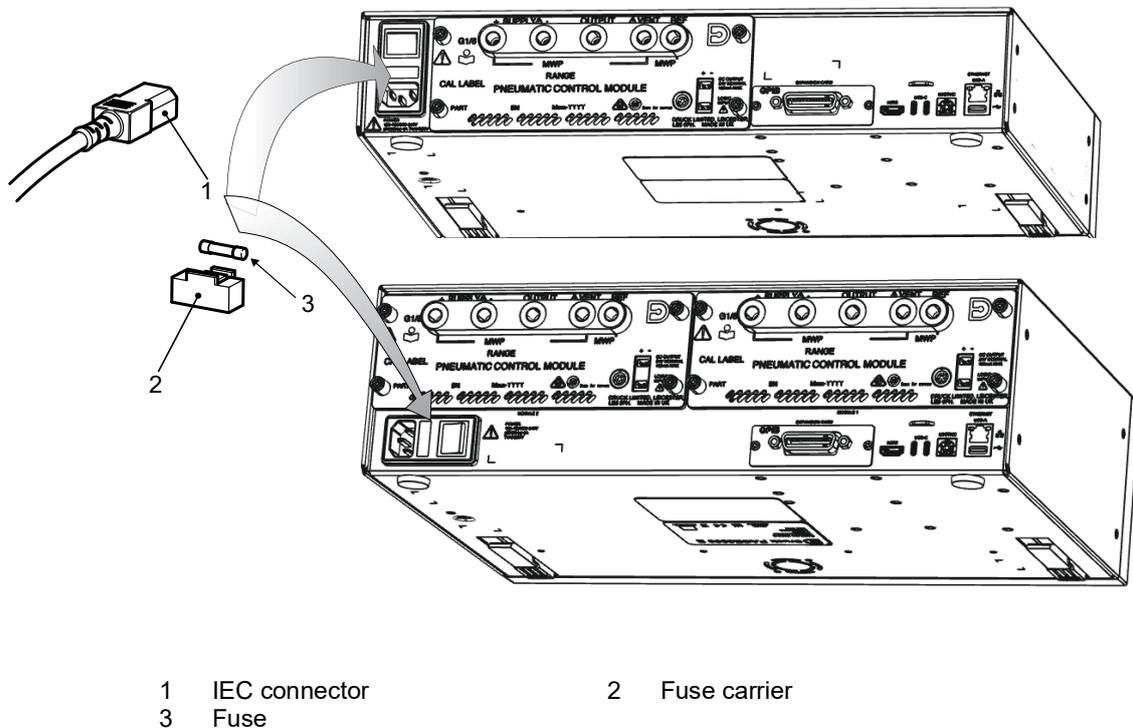


Figure 6-1: Fuse Replacement

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 5.

Chapter 6. Maintenance and Calibration

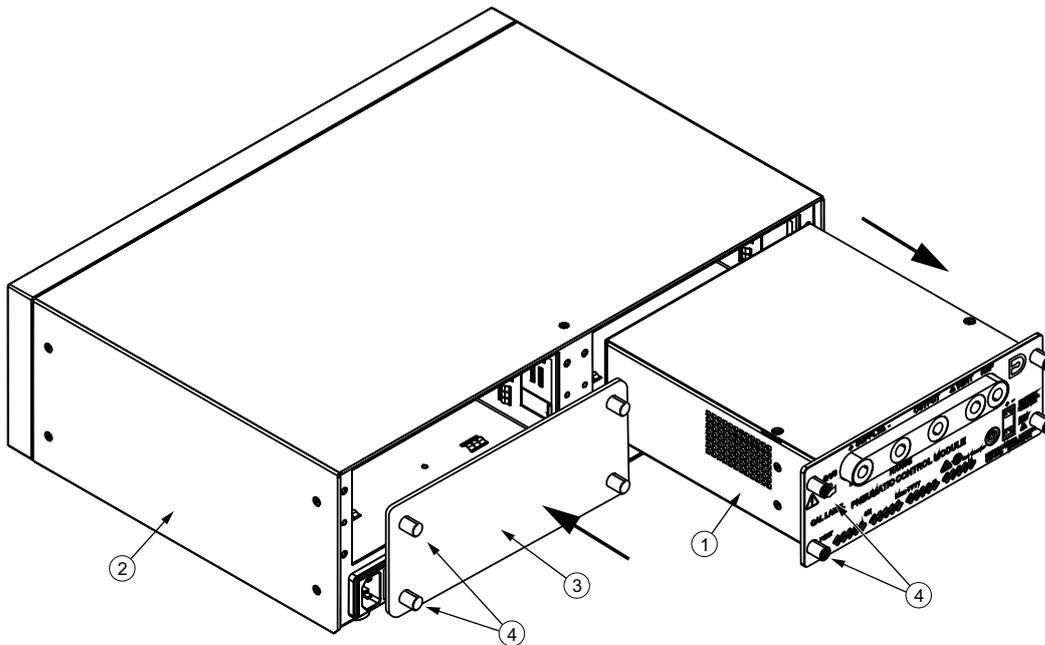
9. Switch on the power supply and set the power supply switch to ON.
10. If the fuse breaks immediately on power-on, contact the manufacturer or Service Agent.

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

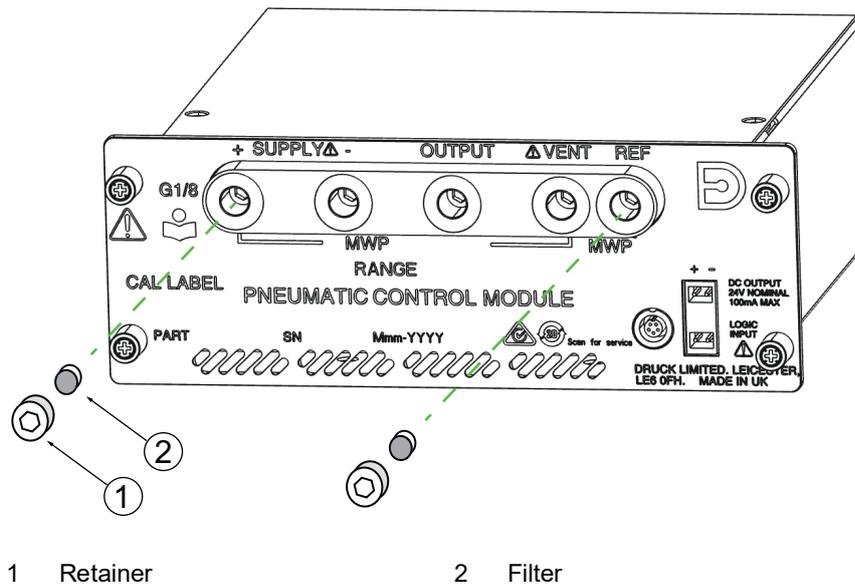


Figure 6-3: Pneumatic Control Module Filter Replacement

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 makes 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 5.

6.7 Calibration

Refer to the separate PACE E series calibration manual for full calibration details.



CAUTION Do not adjust any calibration settings unless authorized by an approved Druck calibration service.

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 5.
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 32.
 - b. Select the **Status Area** and select to show the **Effort Meter** and **Slew Rate**. See "Status Area Parameters" on page 31.
 - 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 59.
- Always use the vent function before disconnecting pressure equipment from the output port.

Chapter 7. Testing and Fault Finding

- 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 7.5.

Table 7-1: Fault Diagnosis

Fault	Response
Power supply connected, display not lit.	Check front power button is glowing orange. If not: <ul style="list-style-type: none">• 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.

Table 7-1: Fault Diagnosis

Fault	Response
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 5.10, "Communications Screen," on page 64.
Unable to connect to instrument over network.	Check Ethernet cable is connected; Check if instrument can be reached using a 'ping'. Check if you have a VPN connected. Check settings. See Chapter 5.10, "Communications Screen," on page 64.

7.4 Error Codes

This is a list of the typical error codes that the PACE E series instruments can show in the event of a problem, and corrective action needed.

Table 7-2: Error Codes

Description	NAMUR Category	Action
Aeronautical Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Aeronautical Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Control Modules not compatible for Aeronautical task.	Function check	Action: No action required
Control Modules are busy running a task.	Function check	Action: No action required
Aeronautical task is not valid in Single Channel Mode.	Function check	Action: No action required
Apply valve bias error	Failure	Action: Service required for Control Module, see druck.com/service
Apply valve characterisation error	Failure	Action: Service required for Control Module, see druck.com/service
Basic Task Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Basic Task Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
The board temperature has exceeded the maximum operating temperature. Preparing to shut down. The device will automatically vent the pressure unit(s).	Failure	Action: Contact Service Center at druck.com/service
Burst Test Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required

Chapter 7. Testing and Fault Finding

Table 7-2: Error Codes

Description	NAMUR Category	Action
Burst Test Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
CAN data error: no reply	Failure	Action: Reboot system
Certificates are corrupted. Initialized with default values	Function check	Action: No action required
Certificates are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Channel index out of range	Failure	Action: Contact Service Center at druck.com/service
Failed to change control module ON/OFF state	Function check	Action: No action required
CM Records are corrupted. Initialized with default values	Function check	Action: No action required
CM Records are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Controller Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Controller Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Controller has disconnected. Please restart the system	Failure	Action: Contact Service Center at druck.com/service
Controller EEPROM 1 failed	Failure	Action: Service required for Control Module, see druck.com/service
Controller EEPROM 2 failed	Failure	Action: Service required for Control Module, see druck.com/service
Controller not detected	Failure	Action: Contact Service Center at druck.com/service
Control pressure over range	Failure	Action: Service required for Control Module, see druck.com/service
Control pressure under range	Failure	Action: Service required for Control Module, see druck.com/service
Control sensor calibration data checksum error	Failure	Action: Service required for Control Module, see druck.com/service
Control sensor header checksum error	Failure	Action: Service required for Control Module, see druck.com/service
Control Setpoint Configuration corrupted. Initialized with default values	Function check	Action: No action required
Control Setpoint Configuration corrupted Failed to reinitialize with default values	Function check	Action: No action required
Control temperature over range	Failure	Action: Service required for Control Module, see druck.com/service
Control temperature under range	Failure	Action: Service required for Control Module, see druck.com/service

Table 7-2: Error Codes

Description	NAMUR Category	Action
System will restart	Failure	Action: If problem persists, please contact druck.com/contact
Divider Task Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Divider Task Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
DPI Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
DPI Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
External Communication Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
External Communication Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Failed to change isolation valve state	Function check	Action: No action required
FPGA programming failed	Failure	Action: Service required for Control Module, see druck.com/service
Full-scale less than zero	Failure	Action: Contact Service Center at druck.com/service
Function Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Function Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
GPIB expansion card not found	Function check	Action: No action required
GPIB programming failed	Failure	Action: Contact Service Center at druck.com/service
Gross leak detected	Failure	Action: Contact Service Center at druck.com/service
Head Correction Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Head Correction Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Hardware Manager Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Hardware Manager Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Index out of range	Failure	Action: Contact Service Center at druck.com/service
Instrument Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required

Chapter 7. Testing and Fault Finding

Table 7-2: Error Codes

Description	NAMUR Category	Action
Instrument Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Invalid Factory Settings detected. Please contact Service Center and also provide instrument version and serial number	Maintenance	Action: Contact Service Center at druck.com/service
Power up setpoint value is out of range. Enter a new valid power up setpoint	Function check	Action: No action required
Item index out of range	Failure	Action: Contact Service Center at druck.com/service
LAN Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
LAN Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Leak Test Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Leak Test Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Database file corrupted. Please refer system log for corrupted file details	Failure	Action: Contact Service Center at druck.com/service
Failed to read/write data from the database.	Failure	Action: Contact Service Center at druck.com/service
Lock Tasks Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Lock Tasks Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Maximum source pressure exceeded	Out of spec	Action: Contact Service Center at druck.com/service
Maximum source pressure in range	Function check	Action: No action required
Internal Memory is full.	Maintenance	Action: Contact Service Center at druck.com/service
Internal Memory is almost full.	Maintenance	Action: Contact Service Center at druck.com/service
User memory is full.	Maintenance	Action: Free up space to continue. Older files will be removed automatically if needed.
User memory is almost full.	Maintenance	Action: Free up space to continue. Older files will be removed automatically if needed.
Message buffer full	Failure	Action: Contact Service Center at druck.com/service
MinAvgMax Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required

Table 7-2: Error Codes

Description	NAMUR Category	Action
MinAvgMax Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Mode index out of range	Failure	Action: Contact Service Center at druck.com/service
Network Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Network Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Not in calibration mode	Function check	Action: No action required
Device not in preferred task.	Out of spec	Action: Contact Service Center at druck.com/service
No bias run completed	Failure	Action: Service required for Control Module, see druck.com/service
Option Enable Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Option Enable Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Current pressure exceeds 5% of full scale range	Failure	Action: Contact Service Center at druck.com/service
PIN Access Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
PIN Access Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Preset Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Preset Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Pressure Alarm Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Pressure Alarm Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Pressure Filter Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Pressure Filter Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Cannot zero system because it is pressurised.	Function check	Action: Vent system before performing zero.
Pressure Zero Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Pressure Zero Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required

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Table 7-2: Error Codes

Description	NAMUR Category	Action
Release valve bias error	Failure	Action: Service required for Control Module, see druck.com/service
Release valve characterisation error	Failure	Action: Service required for Control Module, see druck.com/service
The SD card is already in correct format	Function check	Action: No action required
SD card is not correctly formatted	Failure	Action: Contact Service Center at druck.com/service
Failed to detect SD card	Failure	Action: Contact Service Center at druck.com/service
Sensor Calibration Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Sensor Calibration Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Sensor index out of range	Failure	Action: Contact Service Center at druck.com/service
Sent value out of limits	Maintenance	Action: No action required
Sequence Arbiter Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Sequence Arbiter Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Setpoint invalid for current source pressure	Function check	Action: No action required
Settings not allowed.	Function check	Action: No action required
Sensors in CM are modified.	Function check	Action: No action required
Control module software not found	Function check	Action: Contact Service Center at druck.com/service
Incompatible control module software version	Function check	Action: No action required
Control module software version is older than the latest version. Please upgrade	Function check	Action: No action required
CM slot was previously populated and now became empty.	Function check	Action: No action required
Control sensor range not compatible with control module type	Failure	Action: Contact Service Center at druck.com/service
CM slot was previously populated and now has a different CM.	Function check	Action: No action required
CM sensor with invalid full scale value detected.	Failure	Action: Contact Service Center at druck.com/service
CM slot was previously empty and now loaded with CM.	Function check	Action: No action required

Table 7-2: Error Codes

Description	NAMUR Category	Action
SCPI for HTTP(S) communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI GPIB communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI HiSLIP communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
HTTPS communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
HTTP communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI Raw communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI TLS communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI USB device service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI USB serial communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
SCPI VXI11 communication service failed	Failure	Action: If problem persists, please contact druck.com/contact
Source sensor FS less than control sensor FS	Failure	Action: Service required for Control Module, see druck.com/service
Source pressure failed	Maintenance	Action: Check Source Pressure.
Source pressure measurement unavailable	Failure	Action: Service required for Control Module, see druck.com/service
Source sensor calibration temperatures in descending order	Failure	Action: Contact Service Center at druck.com/service
Source pressure should be greater than 110% FS full scale	Failure	Action: No action required
Span outside limits	Maintenance	Action: Recalibrate or contact Service Center at druck.com/service
Supervisor software version is not upto date. Please upgrade	Function check	Action: No action required
System Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
System Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Tare Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Tare Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required

Chapter 7. Testing and Fault Finding

Table 7-2: Error Codes

Description	NAMUR Category	Action
Requested Task is Locked or Disabled.	Function check	Action: No action required
Testpoint are outside setpoint limits	Function check	Action: No action required
Units Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Units Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Current pressure exceeded user defined high alarm threshold	Function check	Action: No action required
Current pressure exceeds CM positive full scale value	Out of spec	Action: Contact Service Center at druck.com/service
Current pressure is below user defined low alarm threshold	Function check	Action: No action required
Current pressure is below CM negative full scale value	Out of spec	Action: Contact Service Center at druck.com/service
Vacuum pressure failed	Failure	Action: Contact Service Center at druck.com/service
Vacuum pressure measurement unavailable	Failure	Action: Service required for Control Module, see druck.com/service
Vacuum sensor calibration temperatures in descending order	Failure	Action: Contact Service Center at druck.com/service
Vacuum pressure should be full vacuum or else 110% of FS for sensor ranges less than 700 mbar	Failure	Action: No action required
Valve index out of range	Failure	Action: Contact Service Center at druck.com/service
Vent Configuration Parameters are corrupted. Initialized with default values	Function check	Action: No action required
Vent Configuration Parameters are corrupted. Failed to reinitialize with default values	Function check	Action: No action required
Vent range index out of range	Failure	Action: Contact Service Center at druck.com/service
Vent timed out	Failure	Action: Contact Service Center at druck.com/service
Zero outside limits	Maintenance	Action: Recalibrate or contact Service Center at druck.com/service
Zero range index out of range	Function check	Action: No action required
Zero timed out	Maintenance	Action: Contact Service Center at druck.com/service

7.5 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 includes 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 Internal Memory Devices and Storage

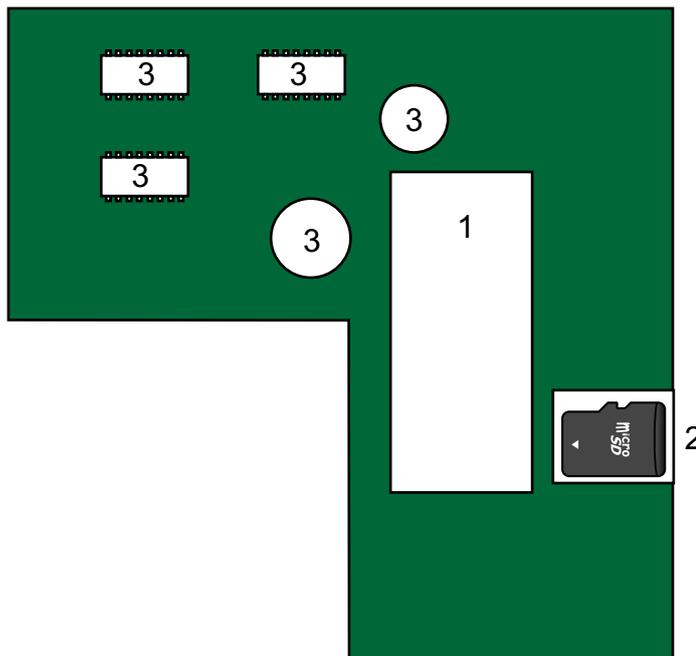


Figure 8-1: Generic View of the PACE E Series Main PCB

- 1 Processor and EMMC
- 2 Micro SD Card
- 3 Peripheral Components

The instruments each have a main PCB (Printed Circuit Board). This PCB carries a single module with the processor and an EMMC (Embedded MultiMedia Card), surrounded by peripheral components and an additional micro SD card. Each Pneumatic Control Module also has its own internal memory device. Table 8-2 shows what is stored on each memory device.

Table 8-2: What Each Device Stores

Memory Device	What it stores
EMMC	Operating System Only
Micro SD	User Data: -All User Settings -Data Logs -Snapshots -Test Programs
Pneumatic Control Module	Sensor Calibration

Table 8-3:

The Micro SD card is a high-specification, long-lasting device. But in the unlikely situation that it becomes corrupted, the instrument shows a warning and automatically backup the contents of the SD card to the EMMC, if it has enough remaining space. You must then contact our service department as soon as possible to arrange repair of the instrument in order to keep your original settings and restore the instrument to full operation.



INFORMATION If the Micro SD card memory (User Data) reaches 90% usage, the instrument shows a warning. It automatically overwrites older data, so it is not recoverable.

8.2.1 Storage Screen

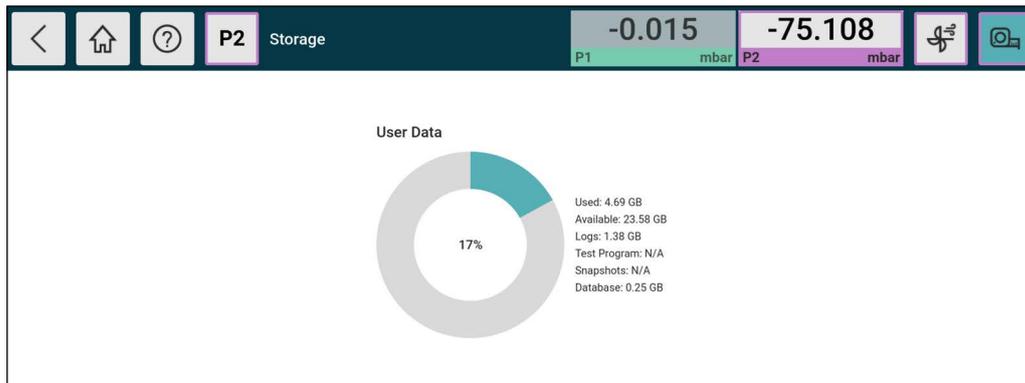


Figure 8-2: Storage Screen

Navigation: Settings > System Information > Storage

The **Storage** screen shows a circular chart of the User Data memory use on the Micro SD card. If the memory used for any item is less than 10 MB, it will show as ‘N/A’.

8.3 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 are available for selection:

- 2000 g FS

- 3000 a FS (pseudo)

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

- 2000 a FS
- 1000 g FS (pseudo)

Note: The User Interface uses the symbol '#' to show pseudo.

8.4 Remote Mode

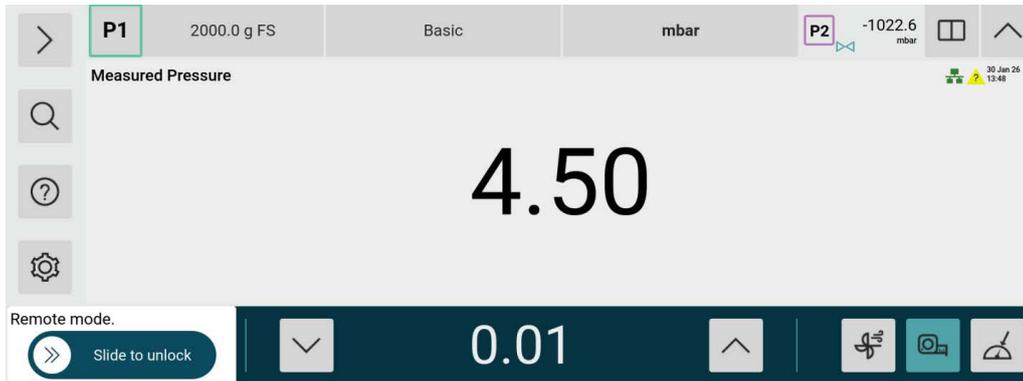


Figure 8-3: Remote Mode Enabled

When using remote communications to the instrument, the touchscreen darkens and shows 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 to unlock**' slider. Control then returns to the touchscreen.

8.5 In Limits Meter



Figure 8-4: 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 25.

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**.

8.6 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.

8.7 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 changes but remains within the setpoint. This is useful when the unit under test has hysteresis errors.

8.8 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 opens.
5. Select the scale for the unit. The **Current measured pressure** box shows how your units are to be viewed.

8.9 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.

8.9.1 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

8.9.2 Settings for heritage communications

See “Communications Screen” on page 64 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.

8.10 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 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 give answers to your questions and explain how to use instrument drivers.

8.10.1 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

8.10.2 Settings for LabVIEW communications

See “Communications Screen” on page 64 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 works with both **Standard** and **Legacy** SCPI mode.

8.11 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.

8.12 Packaging for Storage or Transportation

To store or return the instrument for calibration/repair:

1. Pack the instrument. Refer to Section 8.13, “Packaging Procedure,” on page 94.
2. Return the instrument for calibration/repair complete the return goods procedure. Refer to Section 8.11, “Return Goods/Material Procedure,” on page 93.

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

8.13 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.

8.14 Cyber Security Concern

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

<https://druck.com/contact-us>

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 90 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.

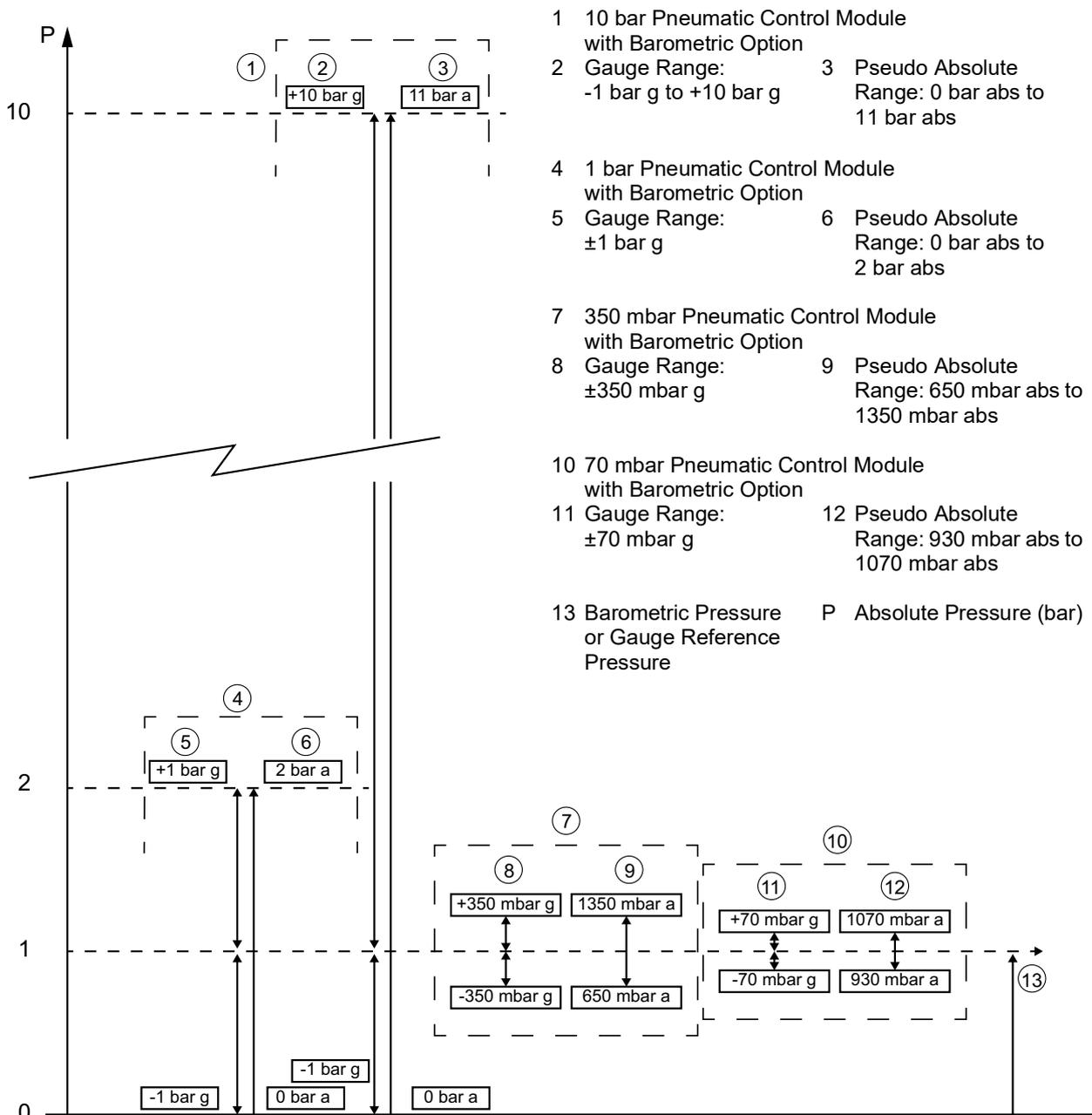


Figure 9-1: Typical Examples of Barometric Options

9.2 GPIB IEEE_4888 Expansion Card

See “GPIB IEEE 488 Interface (optional)” on page 21.

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:

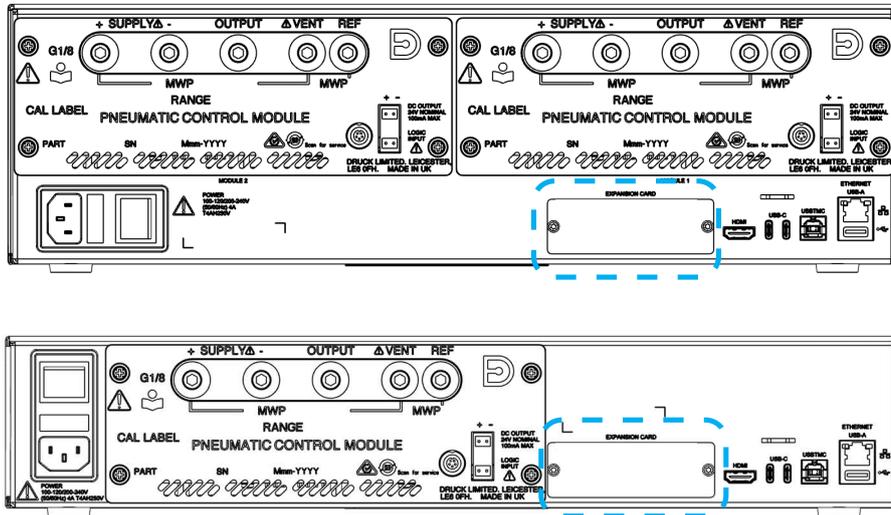


Figure 9-2: PACE5000 E and 6000 E Expansion Card Blanking Plates

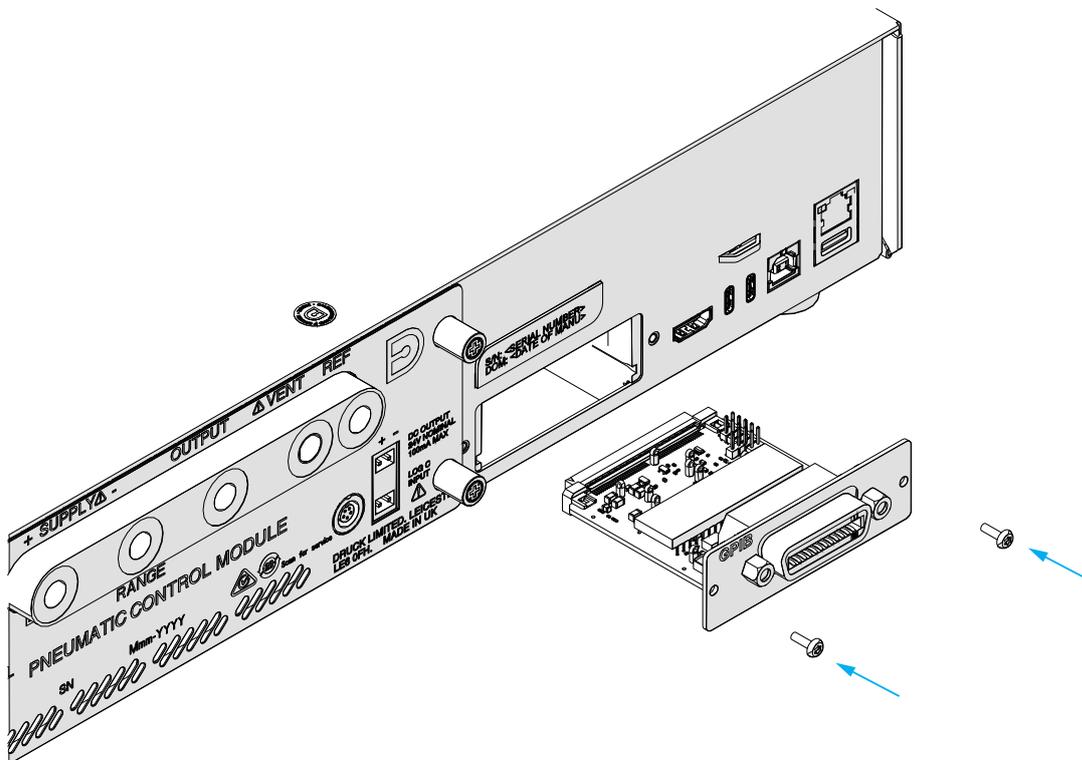


Figure 9-3: Fitting the GPIB Card into a PACE5000 E (PACE6000 E is almost the same)

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 23.
7. Select the **Settings > System Information > Instrument** screen shows the GPIB **Expansion Card Slot** in the **Hardware Options**.
8. 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.

Instrument Information		Software Options	
Model	PACE6000E	Leak Test	Disabled
Serial Number	99999999	Test Program	Disabled
Alias Name	DPI	Burst Test	Disabled
MAC Address	00:14:2D:E5:65:CC	Aeronautical (55,000 ft, 650 knots)	Disabled
Area of Use	Europe	Aeronautical (75,000 ft, 1000 knots)	Disabled
As Shipped	Not Saved		
Software Revision	V02.00.51	Hardware Options	
		Expansion Card Slot	GPIB,1A

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 58. This area shows the Serial Number of the instrument. It also shows the Task Options listed under '**Software Options**', for example 'Leak Test'. The list shows whether the option is enabled or disabled.

To enable an option:

1. Contact customer service with the serial number of the instrument. They then send you a unique 10 Digit Number for 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 70.
3. Enter the Options Enable PIN. See "Personal Identification Numbers (PINs)" on page 89.
4. Now enter the 10 Digit Option Key supplied to you and select **OK**.
5. Your task option or options are enabled. Do a check to make sure that the option has been enabled by selecting the **Settings > System Information > Instrument** Screen.

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

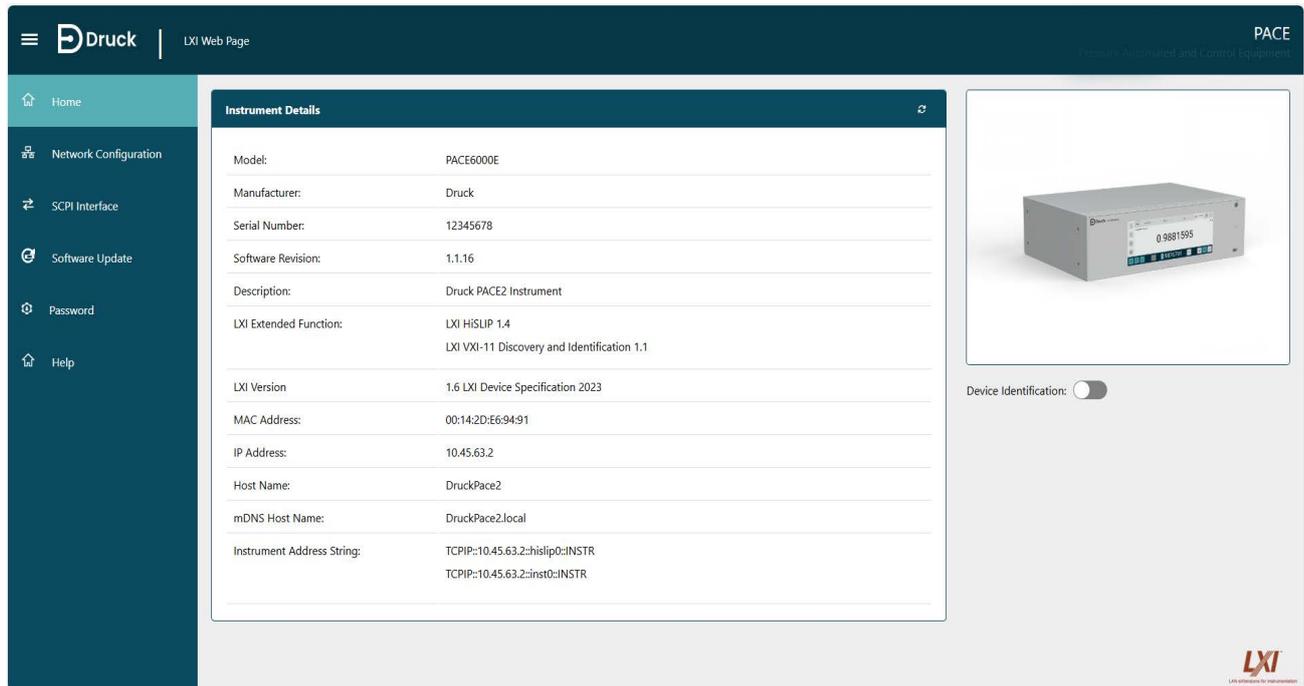


Figure A-1: Typical LXI Welcome Page

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 64.

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 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.

Your browser can initially show warnings such as ‘Your connection is not private’ with “net::ERR_CERT_AUTHORITY_INVALID”. These are expected and you may continue. If you

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

use just **http**, a banner shows in the browser 'You're viewing the read-only interface. To edit settings or update software, please switch to the secure version of the web interface'.

A.2 Using the LXI Web Pages

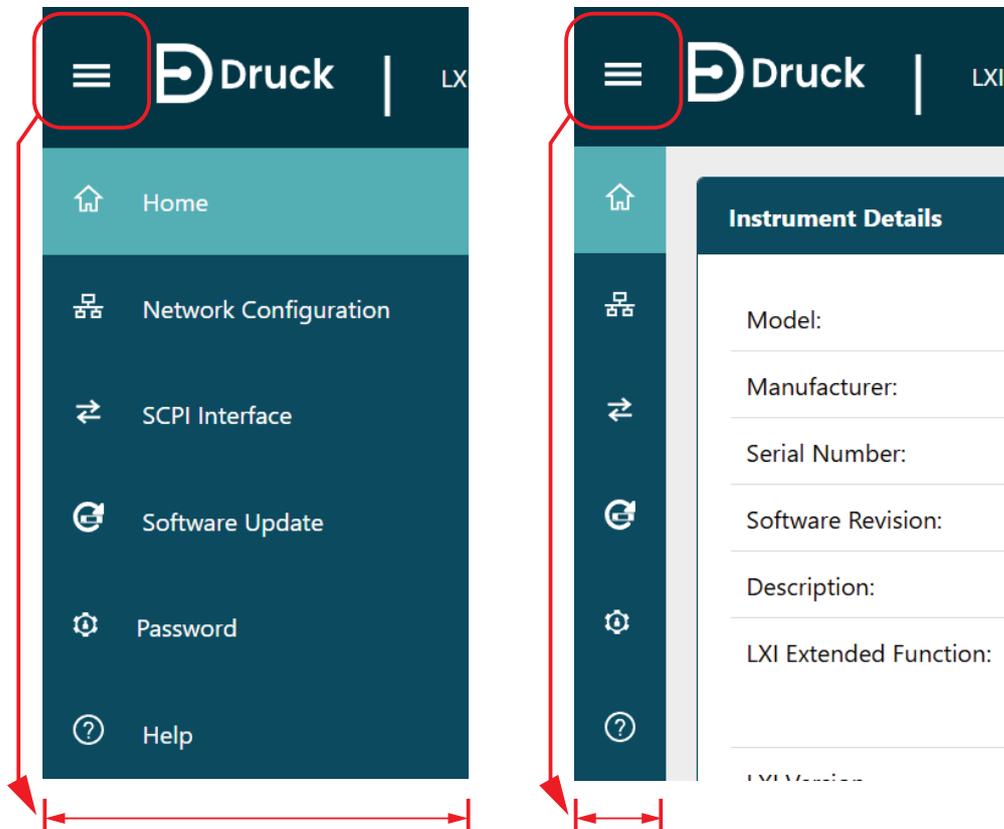
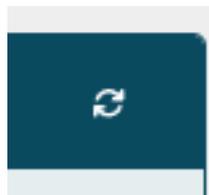
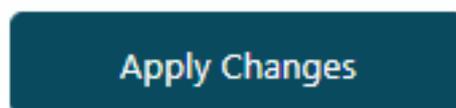


Figure A-2: Expand or Collapse the Sidebar Menu

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 refreshes the information on the page if you make any changes to the settings.



When you are in **secure** connection, some pages show an **Apply Changes** button to the bottom right. You 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.

Device Identification



Device Identification



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** completely resets 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).

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

- **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.
- **Query** - does the equivalent of Write then Read.
- **SCPI Response** - shows the SCPI response from the device.
- **Console** - shows the complete record of the commands used.

Note: Refer to the Druck PACE E Series SCPI Remote Communication Manual 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 70.

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 64.

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. This page also has links to the User Manual, API Documentation, Support and Download Portal.

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.

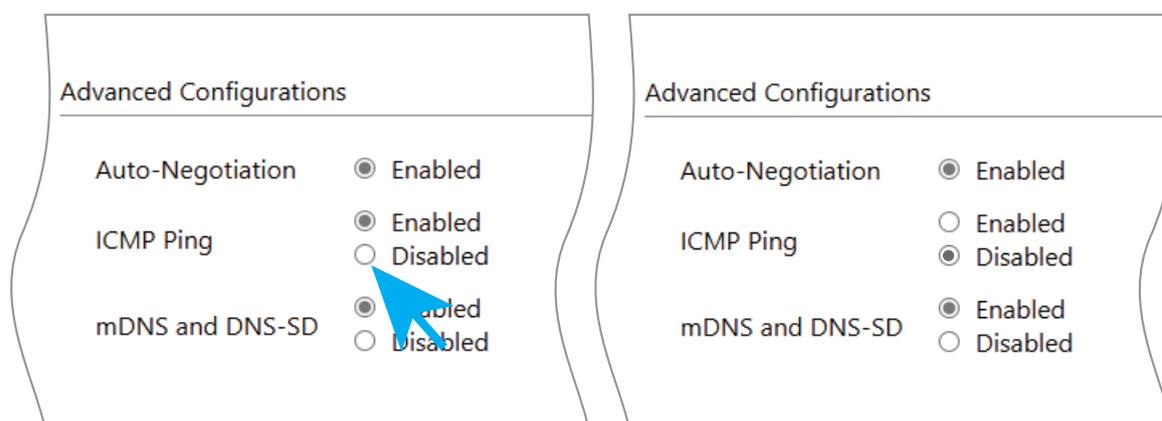


Figure A-3: Changing Settings

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** dialog opens.

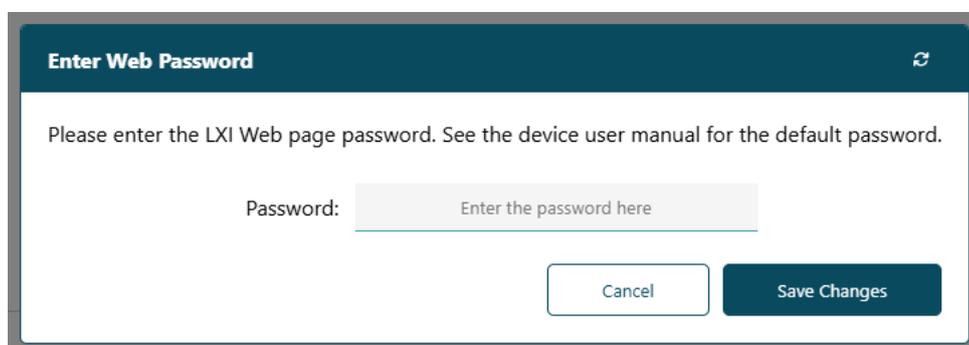


Figure A-4: Enter Web Password Dialog

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

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	mH ₂ O @ 4°C	98.0638
bar	1000.0	mmH ₂ O @ 20°C	0.097890276
Pa (N/m ²)	0.01	cmH ₂ O @ 20°C	0.978902756
hPa	1.0	mH ₂ O @ 20°C	97.8902756

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	1333.224	inH ₂ O @ 4°C	2.4908205
inHg @ 0°C	33.863890	inH ₂ O @ 20°C	2.486413
kg/cm ²	980.665	inH ₂ O @ 60°F	2.488432
kg/m ²	0.0980665	ftH ₂ O @ 4°C	29.889846
mmH ₂ O @ 4°C	0.0980638	ftH ₂ O @ 20°C	29.836956
cmH ₂ O @ 4°C	0.980638	ftH ₂ O @ 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 enables some text in most of the icons and buttons on the screen. The text shows what the icon or button does and is 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:

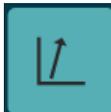
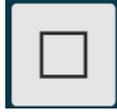
Icon	Description	Icon	Description
 OR 	Expand and Collapse - shows or hides extra icons to the left of the screen.	 OR 	Help - select to show text on other icons.
	Search - opens a screen to let you search for a word or phrase in the user interface.		Settings - opens the Settings screen.
 OR  OR 	Controller Active OR Controller Passive OR Controller Gauge.	 OR 	Overshoot Disabled OR Overshoot Enabled.
 OR 	Slew Rate Maximum OR Slew Rate Linear. In the Aeronautical task, these are different and let you select aeronautical rates.	 OR 	Setpoint Nudge down OR Setpoint Nudge up These controls decrease or increase the selected digit in the setpoint value.
	Vent - select to release pressure to atmosphere.		Measure - selects the Measure Mode .

Table C-1:

Icon	Description	Icon	Description
	Control - selects the Control Mode .		
 OR 	Expand and Collapse - shows or hides extra icons to the left of the screen.	 	Stop and Start.
 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  OR OR 	Controller Active OR Controller Passive OR Controller Gauge These controls set the controller mode.	 	P1 and P2 Settings - select to view the Side Bar or Status Area for P1 or P2. PACE6000 E only.
	Home - returns the current screen to the Home screen.		Head Height - selects the Head Height correction function.
	Back - returns the current screen to the previous screen.		Enter Label - select to add options to the Side Bar .

Appendix C. Touchscreen Icons and Symbols

Table C-1:

Icon	Description	Icon	Description
	Zero - sets the selected gauge sensor to zero.		Filter - enables the filter.
	Logout - shown when you use a PIN-protected screen. It manually logs you out of the screen, so you must re-enter the PIN to use the screen again.		Alarm - selects the alarm.
	View/Edit - select to view and edit the adjacent option.		Rename - select to rename the adjacent option.
	Duplicate - select to duplicate the adjacent option.		Delete - deletes the selected settings. Shown in Test Program screens.
	Save - saves the selected settings. Shown in Test Program screens.		Cancel - cancels the changes you have made to the settings. Shown in Test Program screens.
	Go to ground - returns the instrument and any UUT connected to it, safely to ground pressure at a controlled rate. Similar to the vent function but shown in the Aeronautical task only.		Hold and Resume - holds and resumes the control of airspeed, Mach or altitude modes. Shown in the Aeronautical task only.
 OR 	Timed ROC Start OR Timed ROC Stop These controls start and stop the timed rate of climb. Shown in the Aeronautical task only.	 OR  OR 	Lock OR Unlock OR Lock Partially These controls let a supervisor lock some Home screen controls from use. Shown in the Basic task only.

C.2 Functions and Status Indicators

Table C-2: Functions

Function	Description	Function	Description
 OR 	<p>Shows that the Alarm function has been enabled. It changes to red when the alarm has activated. The measured value also shows in red.</p> <p>The alarm icon shows constantly in red for as long as the alarm condition is present, even if pop-ups have been acknowledged.</p>		<p>Head Height enabled.</p>
	<p>Tare function enabled.</p>		<p>Filter function enabled.</p>
	<p>Range Compare function enabled.</p>		<p>Log function enabled.</p>
	<p>Isolation Valve status - open. This icon is shown on the upper part of the screen next to the Measurement Range button for each channel.</p>		<p>Isolation Valve status - shut.</p>
	<p>LAN Connection Status Flashing green = Device Identification selected in the LXI Interface. Solid green = connection in use. Solid red = connection fault. Blue = not connected.</p>		

C.3 Status Symbols

Table C-3: Status Symbols

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

Appendix C. Touchscreen Icons and Symbols

Appendix D. Accessories

D.1 Typical Adapters and Other Parts

Figure D-1 and the following table shows some of the PACE pressure adapters and other parts. For more information, see the sales Datasheet from Druck or the manufacturer's Datasheet.

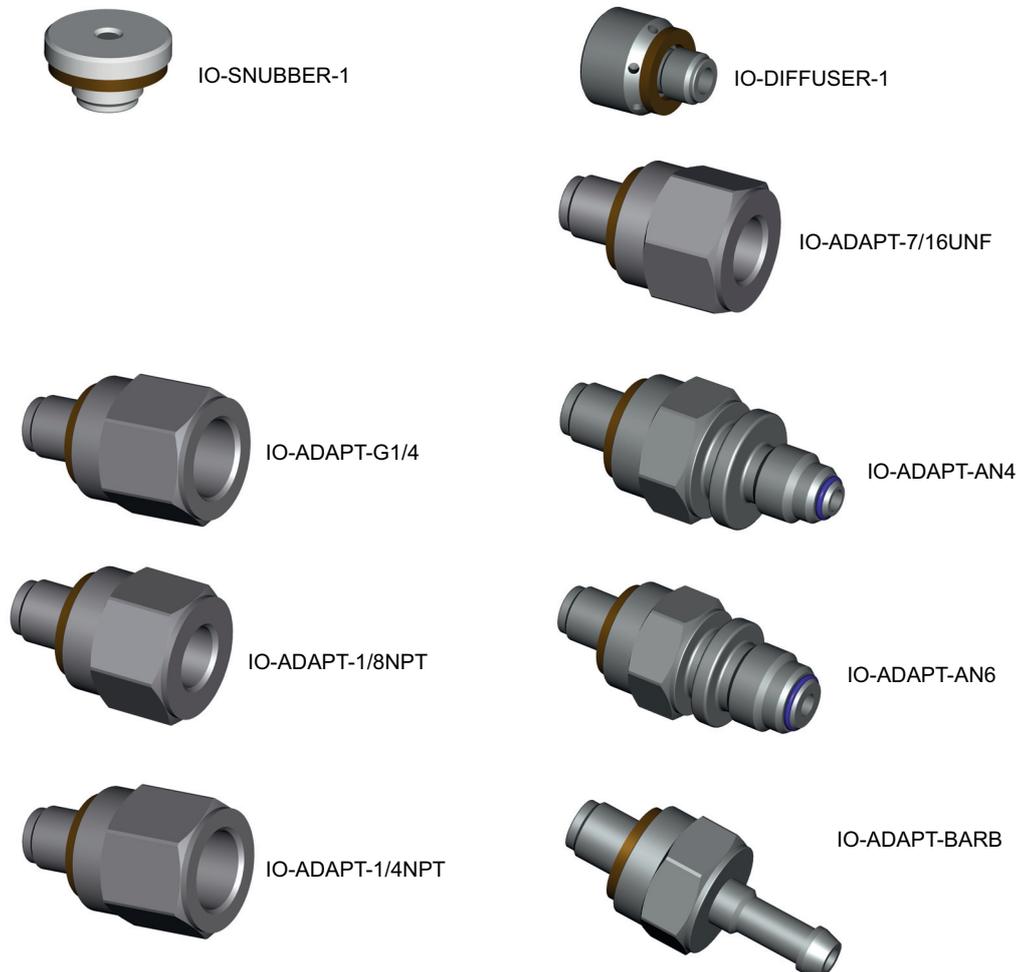


Figure D-1: Pressure Adapters and Other Parts

Table D-1: Details of Adapters and Other Parts

Part Number	Details
IO-SNUBBER-1	Restrictor/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.

D.2 IOPACE-IDT, IOPACE-IDT-HP and IOPACE-IDT-RM

We offer an IDT (Instrument Dirt Trap) as an accessory for several of our products. The IDT protects pneumatic systems from unwanted material. It traps dirt and prevents it from entering and causing damage to pneumatic equipment. It has no diaphragm or other internal components that could create a pressure drop and does not affect calibration accuracy.

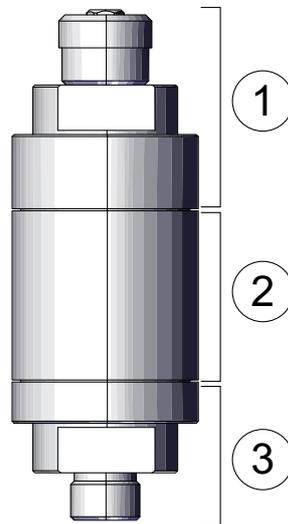


Figure D-2: IDT

The IDT has three primary sections. The Top Section (1) connects to the unit under test (UUT) using a quick-fit adapter. The Chamber (2) contains the dirt trap. The Bottom Section (3) connects to the PACE instrument. O-ring seals sit between each section.

Note: Do not use tools on the quick-fit connectors. Hand-tighten only.

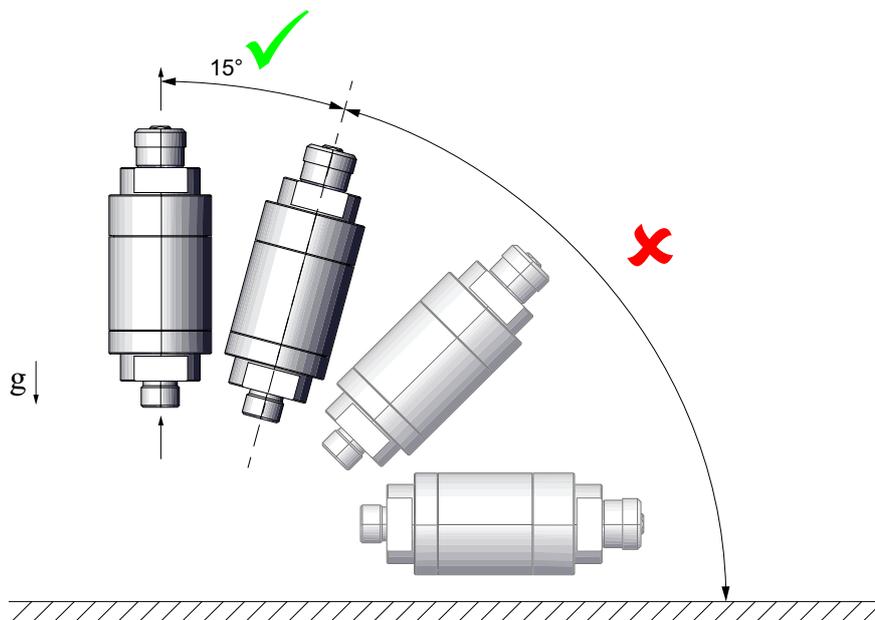


Figure D-3: Fit and Use the IDT Near to Vertical

The IDT uses gravity to trap the dirt. Fit and use the IDT as near to vertical as possible.

D.2.1 Cleaning the IDT



CAUTION Do not use solvents to clean this equipment. Solvents can cause damage to the seals.

1. Release the pressure from the system.
2. Remove the IDT from the system.
3. Unscrew the Top Section to release the Chamber.
4. Wipe the components with a soft lint-free cloth or tissue paper.
5. Re-assemble by screwing the Top Section (hand-tight) onto the chamber. Make sure that the two o-ring seals are correctly located.

D.2.2 Repairing the IDT

Do not do repairs to this equipment. Return the equipment to the manufacturer or an approved service agent.

D.2.3 IOPACE-IDT and IOPACE-IDT-HP

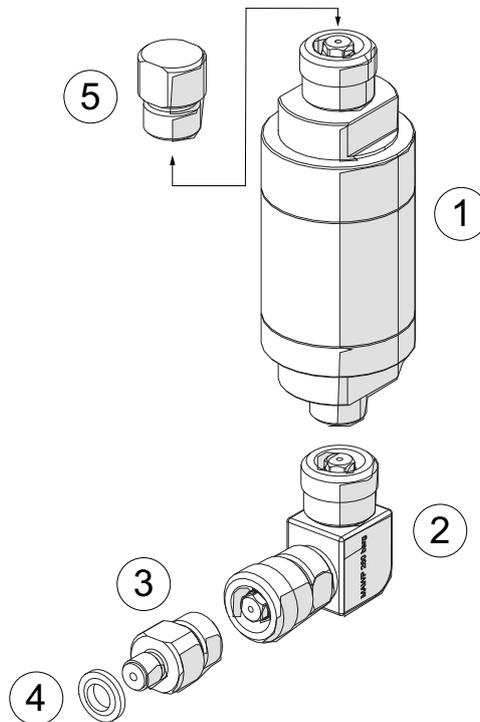


Figure D-4: IOPACE-IDT and IOPACE-IDT-HP Parts

- | | |
|----------------------------|-----------------------------------|
| 1 IDT | 2 Elbow with quick-fit connectors |
| 3 G1/8 Male to AMC Adapter | 4 Washer |
| 5 Blanking Plug | |

- The IOPACE-IDT has a maximum working pressure (MWP) of 100 barg.
- The IOPACE-IDT-HP looks the same as the IOPACE-IDT but we test and rate it for higher pressures up to a MWP of 260 barg.

Both are suitable to work with Gases compatible with 316L and 303 stainless steel, 6082 aluminum, nitrile and PTFE.

Appendix D. Accessories

The IOPACE-IDT and IOPACE-IDT-HP accessories each include an IDT with a blanking plug, an elbow and adapter to fit the IDT to the OUTPUT port of the PACE Pneumatic Control Modules at the rear of the PACE5000 E or PACE6000 E instruments.

The blanking plug helps to cover outlet ports when not in use and when doing leak tests. You must use suitable pressure hoses to connect the IDT to your unit under test (UUT). You can also fit the UUT directly to the top of the IDT if necessary.

D.2.4 Installation



CAUTION Disconnect the IDT from the PACE instrument after use and before transit.

1. Fit the parts together as shown in Figure D-4. Hand-tighten the quick-fit adapter and use spanners to tighten the G1/8 male to AMC adapter with bonded washer.
2. Fit the assembly to the OUTPUT port of the PACE instrument as shown in Figure D-5.

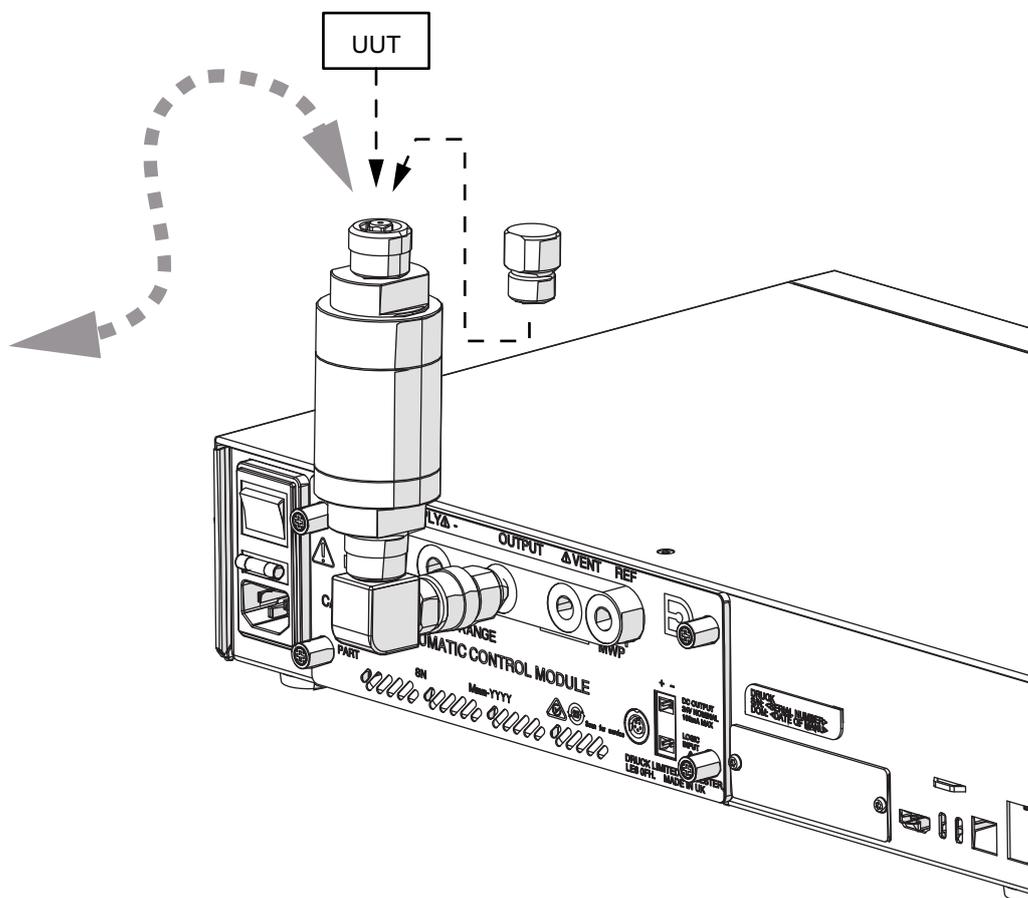


Figure D-5: Fitted to PACE5000 E Instrument

D.2.5 IOPACE-IDT-RM

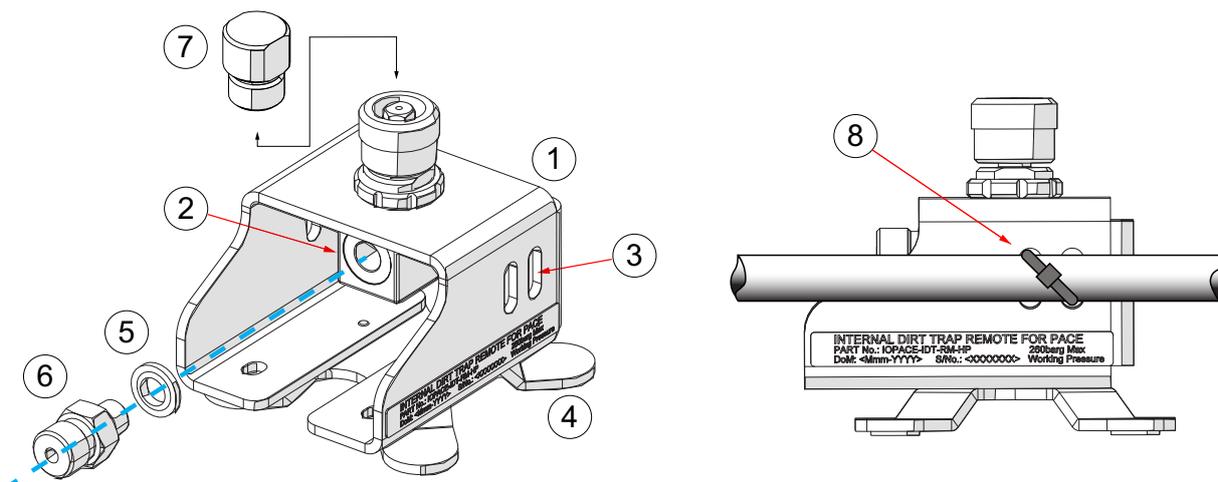


Figure D-6: IOPACE-IDT-RM Parts

- | | |
|-----------------|----------------------------------|
| 1 Bracket | 2 Elbow |
| 3 Tether Slots | 4 Stand with four feet |
| 5 Washer | 6 G1/8 male to 1/4 VCO Adapter |
| 7 Blanking Plug | 8 Hose with strap (not supplied) |

The IOPACE-IDT-RM (remote mounting kit) is an accessory to the IOPACE-IDT and IOPACE-IDT-HP. It includes a bracket with a removable stand and an elbow connector with quick-fit connector and adapter. It does **not** include an IDT. You attach the IDT at the top of the bracket. The bracket includes Tether Slots so that you can fix pneumatic hoses to the bracket using straps (not supplied).

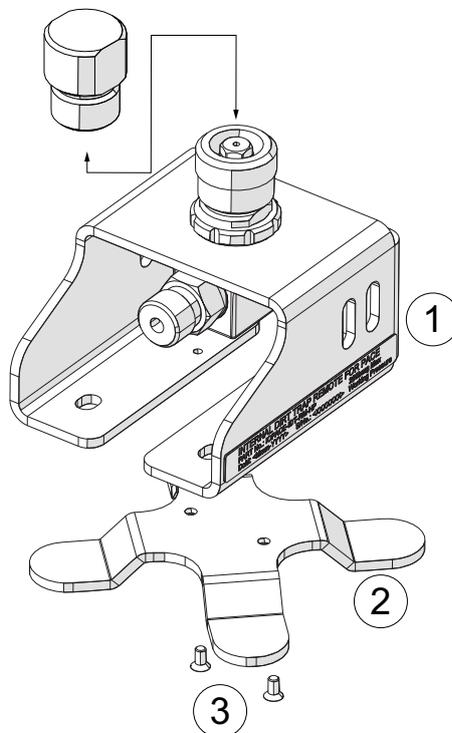


Figure D-7: Fitting or Removing The Stand from the Bracket

- | | |
|-------------|---------|
| 1 Bracket | 2 Stand |
| 3 M3 Screws | |

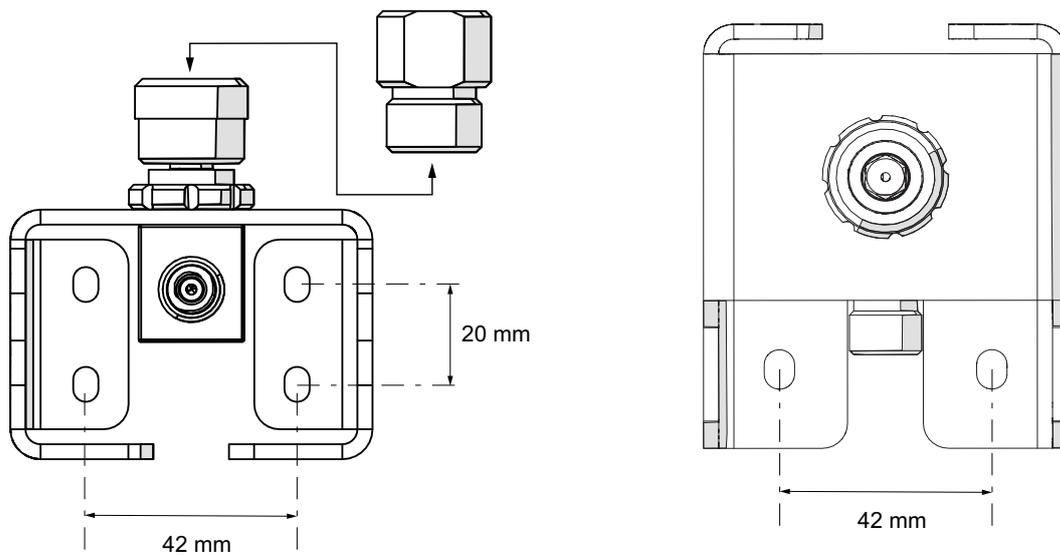


Figure D-8: Slots at Rear of Bracket

Use the M3 screws to fix the stand to the bracket. Remove or do not fit the stand if necessary to screw the bracket down to a surface, using the two 6 mm holes in the bottom of the bracket. In this case you must find suitable screws. You can also use the 6 mm holes at the rear of the bracket to fix it to a wall or inside a cabinet.

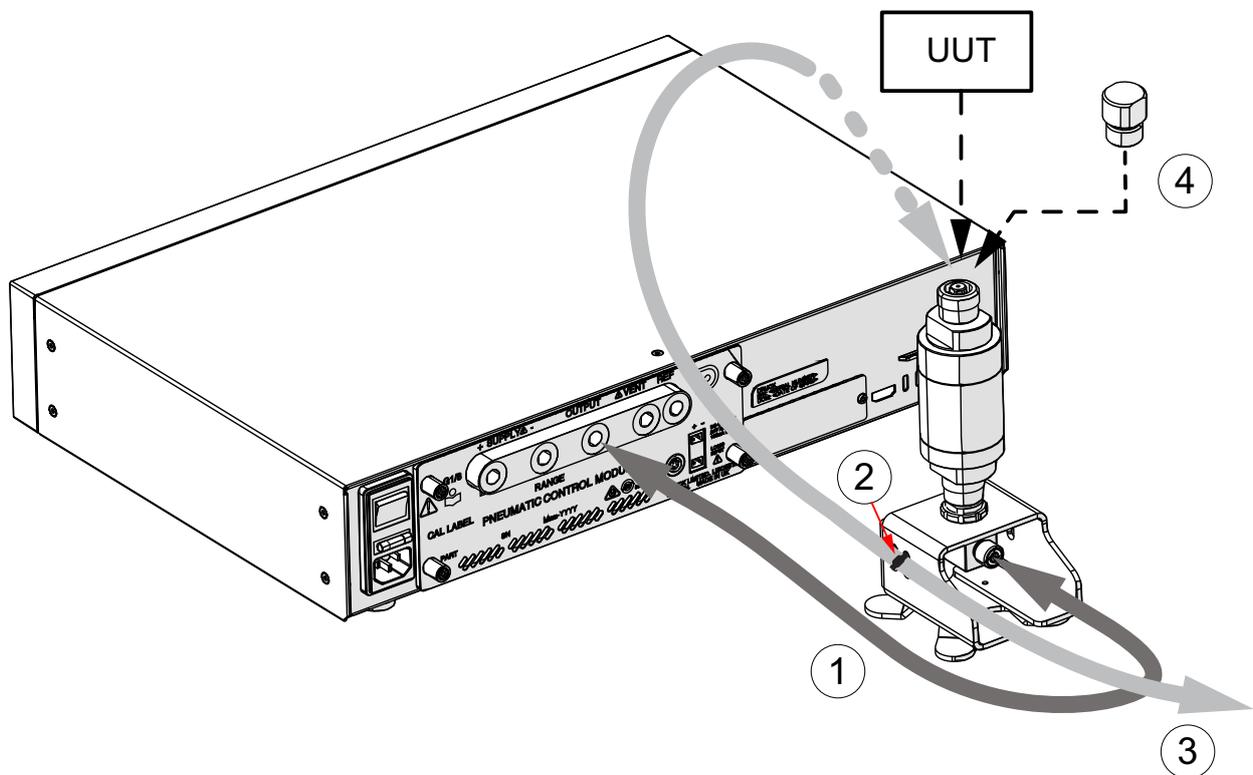


Figure D-9: Connecting the IOPACE-IDT-RM to an Instrument

- | | |
|------------------------|-----------------|
| 1 Pressure Hose | 2 Strap |
| 3 Pressure Hose to UUT | 4 Blanking Plug |

IOPACE-IDT, IOPACE-IDT-HP and IOPACE-IDT-RM

Release pressure from the system and use suitable pressure hoses to connect between this accessory and the OUTPUT port of the PACE Instrument, and from the IDT to your unit under test (UUT). You can also fit the UUT directly to the top of the IDT if necessary.

Office Locations



<https://druck.com/contact>

Services and Support Locations



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