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PACE Indicators

Pressure Automated Calibration Equipment

Instruction Manual

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Introduction

The PACE Pressure Indicator measures both pneumatic and hydraulic pressures. The color touch-screen displays the measured pressure and the status of the instrument. The touch-screen is used to change selections and settings. The instrument can be operated remotely through communication interfaces.

Safety

WARNING Do not apply pressure greater than the maximum safe working pressure.

The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual. Do not use this equipment for any other purpose than that stated, the protection provided by the equipment may be impaired.

This publication contains operating and safety instructions that must be followed to make sure of safe operation and to maintain the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage.

Use qualified technicians* and good engineering practice for all procedures in this publication.

Pressure

Do not apply pressures greater than the maximum working pressure to the equipment.

Toxic Materials

There are no known toxic materials used in construction of this equipment.

Maintenance

The equipment must be maintained using the procedures in this publication. Further manufacturer's procedures should be done by an authorized service agents or the manufacturer's service departments.

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Technical Advice

For technical advice contact the manufacturer.

* A qualified technician must have the necessary technical knowledge, documentation, special test equipment and tools to carry out the required work on this equipment.

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Symbols

Symbol	Description
	This equipment meets the requirements of all relevant European safety directives. The equipment carries the CE mark.
	This symbol, on the equipment, indicates that the user should read the user manual.
	This symbol, on the instrument, indicates that the user should refer to the user manual. This symbol, in this manual, indicates a hazardous operation. Ce symbole, sur l'instrument, indique que l'utilisateur doit consulter le manuel d'utilisation. Ce symbole, dans le manuel, indique une situation dangereuse.
	This symbol warns the user of the danger of electric shock. Ce symbole alerte l'utilisateur sur le danger de choc électrique.
	Do not dispose of this product as household waste. Use an approved organization that collects and/or recycles waste electrical and electronic equipment. For more information, contact one of these: - Our customer service department: **Druck.com** - Your local government office.

WARNING **Turn off the source pressure(s) and carefully vent 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 damaged fittings and equipment. Do not use any damaged fittings and equipment.

Do not exceed the maximum working pressure of the instrument.

This equipment is not rated for oxygen use.

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

Isolate the power supply before making any electrical connections to the rear panel.

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General Specification

Item	Description
Display	LCD: Color display with touch-screen.
Operating Temperature	10°C to 50°C (50°F to 122°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Ingress Protection	IP20 (EN 60529)
Operating Humidity	5% to 95% RH (non-condensing)
Vibration	MIL-PRF-28800 Type 2 class 5 style E/F
Operating Altitude	Maximum 2000 metres (6560 ft)
EMC	EN 61326
Electrical Safety	EN 61010-1, UL 61010-1, CSA 22.2, No. 61010-1 and IEC 61010-1
Power Adaptor	Input range: 100 - 240 V ac, 50 to 60 Hz, 600 - 300 mA, installation category II.
Pressure Safety	Pressure Equipment Directive - Class: Sound Engineering Practice (SEP) for group 2 fluids.
Pollution Degree	2
Operating Environment	Indoor use only. Do not use in potentially explosive environments.

Abbreviations

The following abbreviations are used in this manual. Abbreviations are the same in the singular and plural.

Abbreviation	Description
a	Absolute
ac	Alternating Current
dc	Direct current
DPI	Digital Pressure Instrument
etc.	And so on
e.g.	For example
ft	Foot
g	Gauge
GPIB	General purpose interface bus
H_2O	Water
Hg	Mercury
Hz	Hertz
IDOS	Intelligent Digital Output Sensor (Druck product)
i.e.	That is
IEEE 488	Institute of Electrical and Electronic Engineers standard 488 (for programmable devices with a digital interface)
in	Inch

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Abbreviation	Description
kg	kilogram
m	Metre
mA	milliampere
max	Maximum
mbar	millibar
min	Minute or minimum
MSDS	Material safety data sheet
MWP	Maximum working pressure
NPT	National Pipe Thread
Pa	Pascal
PACE	Pressure Automated Calibration Equipment
psi	Pounds per square inch
REF	Reference
RS-232	Serial communications standard
Rx	Receive data
SCPI	Standard Commands for Programmable Instruments
SELV	Separated (or Safety) Extra Low Voltage
Tx	Transmit data
UUT	Unit Under Test
V	Volts
°C	Degrees Celsius
°F	Degrees Fahrenheit

Associated Publications

The following table lists the Druck publications referenced in this manual:

Publication	Title
K0467	PACE Indicator User Guide and Safety Instructions
K0469	PACE Heritage Communications Manual
K0450	PACE Series Calibration Manual
K0472	PACE Series SCPI Manual

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1. Description

1.1 Introduction

The PACE Pressure Indicator measures both pneumatic and hydraulic pressures and displays, on a color touch-screen, the measured pressure and instrument status. The touch-screen enables selections and settings in measuring modes. The instrument can be operated remotely through communication interfaces.

Figure 1-1: PACE1000 Front View

The rear of the instrument houses all the electrical and pressure input connections. The electrical connections provide a power supply, serial and parallel communication interfaces, pressure ports and option ports.

The instrument can be used as follows:

- Free-standing instrument positioned on a horizontal surface.
- Rack-mounted in a standard 19 inch rack using the rack-mount option kit.
- Panel mount using the panel-mount option kit.

Figure 1-2: PACE1000 Rear View

Options available for the PACE1000 refer to the Data Sheet.

For information and notes on applications, refer to Section 6, “Reference,” on page 35 or **Druck.com**.

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2. Installation

2.1 Package Contents

INFORMATION After unpacking a cold instrument, allow time for it to stabilize and any condensation to evaporate.

Check that the PACE1000 packaging contains the following:

i. PACE1000 Pressure Indicator.

ii. Power supply adaptor.

iii. Safety instructions, instruction manual and CD-ROM containing the full documentation suite.

iv. Calibration certificate.

2.2 Packaging for Storage or Transportation

To store or return the instrument for calibration/repair:

1. Pack the instrument. Refer to Section 6.12, “Packaging Procedure,” on page 56.
2. Return the instrument for calibration/repair complete the return goods procedure. Refer to Section 6.11, “Return Goods/Material Procedure,” on page 56.

2.3 Preparation for Use

The instrument can be positioned in the following ways:

- Free-standing instrument positioned on a horizontal surface.
- Rack-mounted in a standard 19 inch rack using the rack-mount option kit. Refer to Section 2.6.1, “Rack-mount Option,” on page 7.
- Panel-mounted using the panel-mount option kit. Refer to Section 2.6.2, “Panel-mount Option,” on page 8.

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

Note: Allow a free flow of air around the instrument, especially at high ambient temperatures.

2.4 Connecting to PACE

WARNING Turn off the source pressure(s) and carefully vent 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 damaged fittings and equipment. Do not use any damaged fittings and equipment.

Do not exceed the maximum working pressure of the instrument.

This equipment is not rated for oxygen use.

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2.4.1 Pressure Adaptors

Figure 2-1 shows the available range of PACE pressure adaptors.

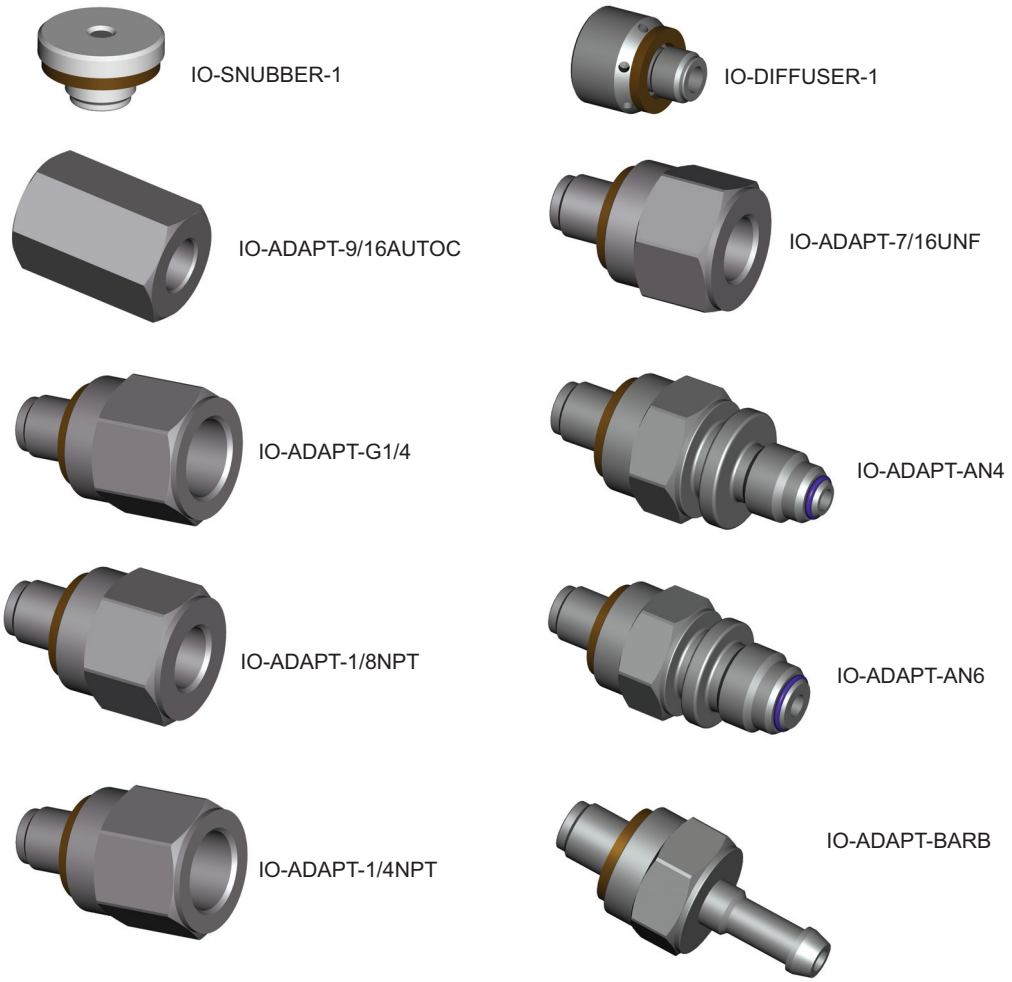

Figure 2-1: Pressure Adaptors

Refer to Table 2-1 and the Data Sheet for more information.

Table 2-1: Pressure Adaptor Specification

Adaptor Part Number	Specification
IO-SNUBBER-1	Restrictor/Snubber
IO-DIFFUSER-1	Diffuser
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.
IO-ADAPT-9/16AUTOC	1/8 NPT Female to 9/16-18 UNF Autoclave Female.

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2.4.2 Pressure Connection

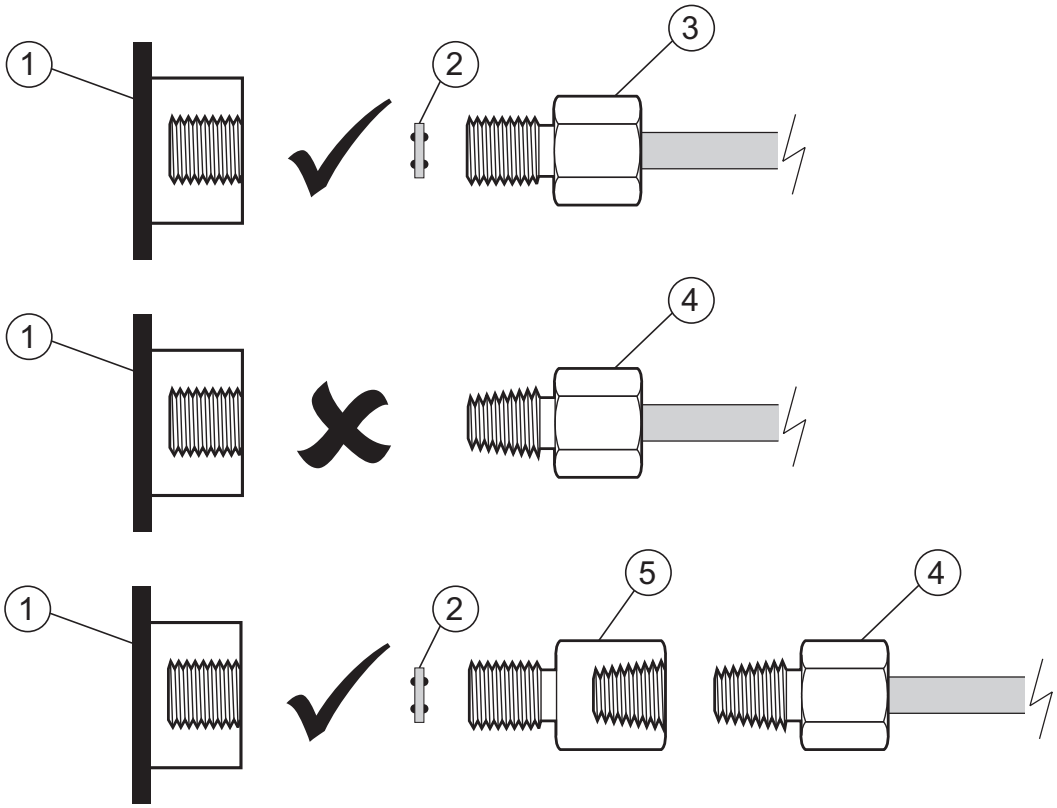
WARNING Parallel threads must be used. Female thread type is parallel thread to ISO228/1 (DIN ISO228/1, JIS B0202) G1/8.
Tapered threads not allowed.

The PACE has parallel thread pressure connectors. Use only the connector type specified in Table 2-2.

Table 2-2: PACE Pressure Connector Thread Specification

PACE Connector	Thread Specification
Input ≤ 210 bar (3000 psi)	ISO228/1 G1/8 Parallel Threads (DIN ISO228/1, JIS B0202)
Input ≥ 350 bar (5000 psi)	9/16-18 UNF Autoclave
Reference	ISO228/1 G1/8 Parallel Threads (DIN ISO228/1, JIS B0202)

Refer to Figure 2-2 for connection to the PACE pressure connectors.



1 PACE pressure connector.
2 Bonded seal.
3 ISO228/1 G1/8 pressure connector.
4 NPT thread pressure connector.
5 Pressure adaptor, see Section 2.4.1.

Figure 2-2: PACE Pressure Connection

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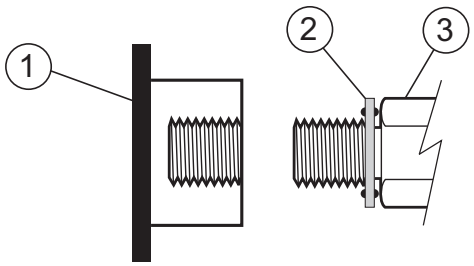
For pressures less than 100 bar (1450 psi), see alternative sealing method in Figure 2-3.



1 PACE pressure connector.
2 Bonded seal.
3 ISO228/1 G1/8 pressure connector or adaptor. For adaptors, see Section 2.4.1.

Figure 2-3: Alternative Sealing Method for < 100 bar (1450 psi)

2.5 Connecting to UUT

The pressure should not exceed 1.25 x full-scale or MWP stated on the rear panel of the instrument.

To protect the instrument from over-pressure, fit a suitable protection device such as a relief valve or bursting disc.

2.5.1 Pneumatic Connection

WARNING Pressure ranges > 210 bar (3000 psi) are only rated for hydraulic use.

CAUTION Do not exceed the maximum pressures stated in the appropriate component manual for the unit under test.

Reduce pressure at a controlled rate when venting to atmosphere.

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

1. Switch off the power supply before connecting or disconnecting the instrument.
2. Use the appropriate sealing method for all pressure connections. Refer to Section 2.4.2 on page 5.
3. Isolate the pneumatic pressures and de-pressurize the pipes (tubes) before connecting or disconnecting the instrument.
4. Make sure the user systems can be isolated and vented.
5. The pneumatic gas must be clean and dry. Refer to specification in the Data Sheet.
6. Connect the Unit Under Test (UUT) to the appropriate connection port.

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2.5.2 Hydraulic Connection

WARNING Hydraulic liquid is dangerous. Observe relevant health and safety precautions. Use appropriate protective barriers and eye protection.

Before applying pressure, examine all fittings and equipment for damage and ensure that all equipment is to the correct pressure rating.

Do not exceed the maximum working pressure of the instrument.

Purge all air from the hydraulic liquid.

Do not use a sensor for gas that has been used with hydraulic liquid.

CAUTION Do not exceed the maximum pressures stated in the appropriate component manual for the unit under test.

Reduce pressure at a controlled rate when venting to atmosphere.

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

Observe absolute cleanliness when using the instrument.

Severe damage can be caused if equipment connected to this instrument is contaminated.

Connect only clean equipment to the instrument.

To avoid any contamination, an external filter is recommended.

Note: Pressure connections greater than 210 bar (3000 psi) are 9/16-18 UNF male autoclave.

1. Switch off the power supply before connecting or disconnecting the instrument.
2. Use the applicable sealing method for all pressure connections. Refer to Section 2.4.2 on page 5.
3. Isolate the hydraulic pressures and de-pressurize the pipes (tubes) before connecting or disconnecting the instrument.
4. Make sure the user systems can be isolated and vented.
5. The hydraulic liquid must be clean, refer to specification given in the Data Sheet.
6. Connect the Unit Under Test (UUT) to the appropriate connection port.
7. Fill and bleed the UUT and connecting pipes (tubes).

2.6 Mounting Kits

2.6.1 Rack-mount Option

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

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instrument. The cooling air of the instrument must not be obstructed. Allow a free flow of air through the equipment rack and around the instrument, especially at high ambient temperatures.

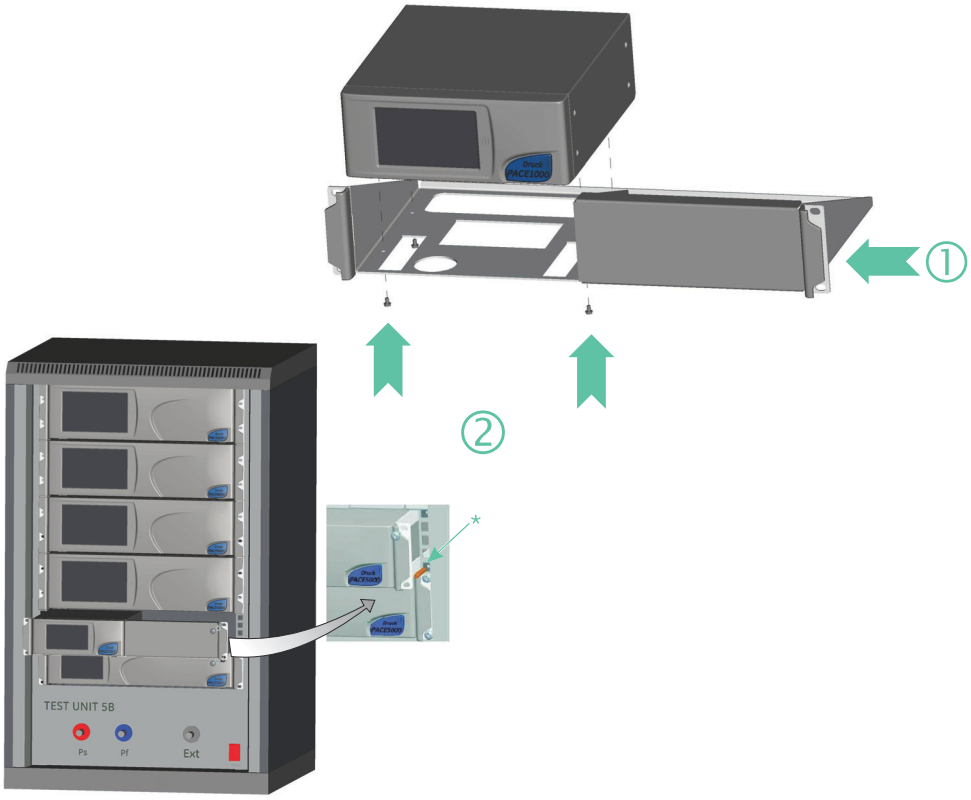

Figure 2-4: Rack-mounting

1. Locate instrument in rack mount assembly (1).
2. Secure with the four M3 x 6 screws (2), (maximum length M3 x 8).
3. Support the instrument and connect the cables and pipes (tubes).
4. Refer to the electrical connections below before fitting the instrument into the equipment rack.
5. Temporarily locate the two spigots* to each side of the equipment rack.
6. Locate and slide the instrument into the rack.
7. Locate the instrument on the spigots*.
8. Secure the instrument in the equipment rack with two of the screws and washers (supplied).
9. Remove the two spigots* and replace with the remaining two screws and washers (supplied).

2.6.2 Panel-mount Option

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 fitting of the instrument.

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The cooling air of the instrument must not be obstructed. Allow a free flow of air through the equipment rack and around the instrument, especially at high ambient temperatures.

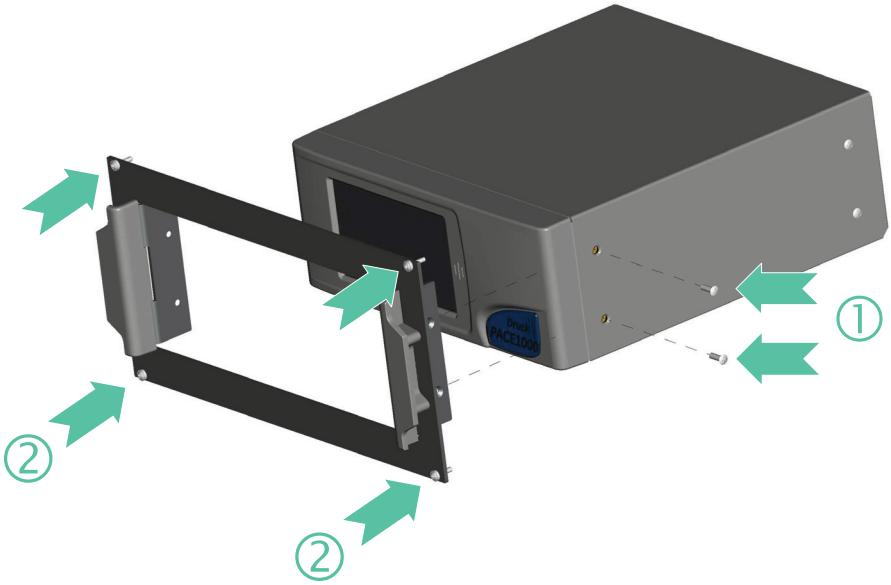

Figure 2-5: Panel-mounting

1. Remove the four screws (1) from the instrument.
2. Locate the instrument in panel mount assembly.
3. Secure with the four screws (2).
4. Support the instrument and connect the cables and pipes (tubes).
5. Refer to the electrical connections below before fitting the instrument into the panel.
6. Secure the instrument in the panel with four screws and washers (2).

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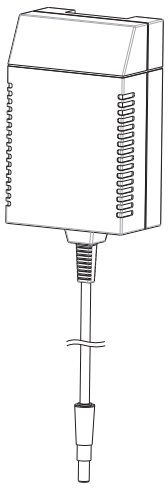
2.7 Power Connection

WARNING The ground lead of the instrument must be connected to the AC supply protective safety ground.

Isolate the power supply before making any electrical connections to the rear panel.

CAUTION Use the power adaptor supplied with the instrument (Druck part number IS1000118M9922-12). Using other power adaptors may cause over-heating, this can result in a fire.

Do not let the power adaptor come into contact with any moisture or liquids.



1. Before use, make sure the SELV power adaptor supplied with the instrument is used.
2. Install an accessible power isolator to use as the disconnecting device in the power adaptor supply circuit.
3. The power adaptor input power supply range: 100 - 240 VAC, 50 to 60 Hz, 600 - 300 mA, installation category II.

Note: The power adaptor must be supplied by a fused or overload-protected power supply.

4. Connect the power adaptor to the instrument.
5. Switch the power supply on.
6. Check that the front panel display shows the power-up sequence. Refer to Section 3.2, “Power-up Sequence,” on page 15.

Note: After the power-up sequence, the instrument shows the default display on the touch screen. The touch screen divides into a number of mimic keys.

Requirements for rack-mounted and panel-mounted instruments

1. Install an accessible power isolator to use as the disconnecting device in the power adaptor supply circuit.
2. Set the power supply isolator to OFF.
3. Connect the power adaptor before sliding the instrument into the rack.
4. Set the power supply isolator to ON.
5. Check that the front panel display shows the power-up sequence. Refer to Section 3.2, “Power-up Sequence,” on page 15.

2.8 Communication Connection

Connect the applicable connectors into the rear panel communications ports. If appropriate, secure with the captive screws.

Note: The RS-232 and IEEE 488 interfaces are both enabled at power-up. Set the required parameters in Supervisor Setup/communications menu. Refer to Section 6.6.2, “Communications,” on page 37.

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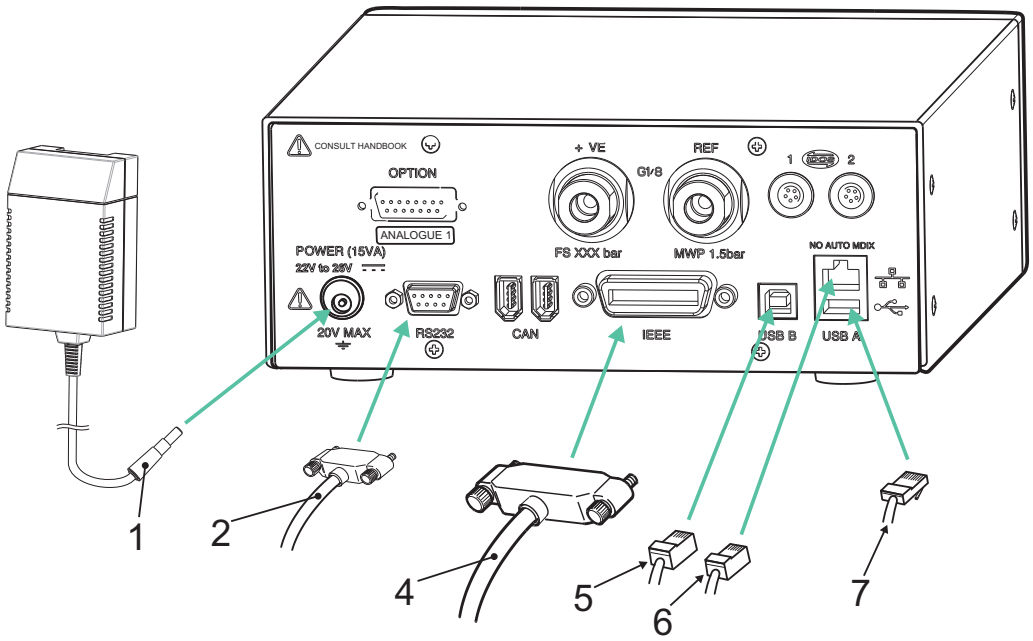
Note: Refer to the Data Sheet for a list of optional communication ports.



1	Power supply adaptor.	2	RS-232
4	IEEE 488	5	USB B
6	USB A	7	Ethernet

Figure 2-6: Communication Connectors

2.8.1 RS-232 Interface

When using the RS-232 interface, a cable must be connected directly from the instrument to a suitable port on the computer in a 'point to point' link.

The pin connections for the 9-pin D-type, RS-232 connector and the relationship between the instrument and the RS-232 control signals, together with device interconnection interface is shown in Table 2-3. The instrument is configured as Data Circuit Terminating Equipment (DCE).

Table 2-3: RS-232 Connections

Instrument		Control Line		Computer	
Instrument Function	9-way D-type Pin No.	Signal Direction	RS-232 Terminology	9-way D-type Pin No.	25-way D-type Pin No.
RxD (I/P)	3	←	TxD	3	2
TxD (O/P)	2	→	RxD	2	3
GND	5	←→	GND	5	7
CTS (I/P)	7	←	RTS	7	4
RTS (O/P)	8	→	CTS	8	5
Pulled high internally	1	→	RLSD (DCD)	1	8
Not connected	4	←	DTR	4	20
Pulled high internally	6	←→	DSR DCE Ready	6	6
Equipment chassis	Connector shell	←→	Cable Screen	-	1

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Note: For software handshaking use: TXD, RXD and GND. For hardware handshaking use: TXD, RXD, GND, CTS, RTS and DTR.

2.8.2 IEEE 488 Interface

The interface complies with IEEE 488 standard.

The IEEE 488 parallel interface connects a computer/controller to one or more PACE1000 instruments and other instruments.

Up to 30 instruments can be connected through a high-speed data bus to the computer/controller.

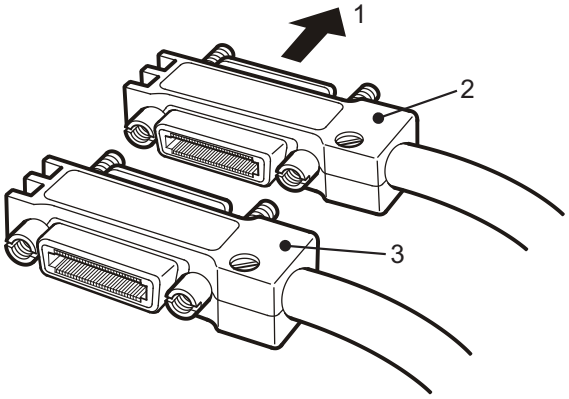
Note: The length of each IEEE 488 cable must be less than 3 metres to comply with the EMC requirements. Refer to Data Sheet.

2.8.2.1 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. Change the IEEE 488 communication parameters. Refer to Section 6.6.2.2, “IEEE 488,” on page 40.

2.8.2.2 Multiple Unit Installation

To install multiple units use stacking plugs to link the first instrument and second instrument as follows:



1. Connector to rear panel of first instrument. Refer to illustration.
2. Connector from controller/computer. Refer to illustration.
3. Connector to rear panel of second instrument. Refer to illustration.
4. Connect the IEEE 488 connector on the controller/computer and the other connector into the next instrument.
5. Repeat this procedure for all the instruments in the system.
6. Use the Supervisor setup (communications) menu on each instrument to setup the required communication parameters. Refer to Section 6.6.2.2, “IEEE 488,” on page 40.

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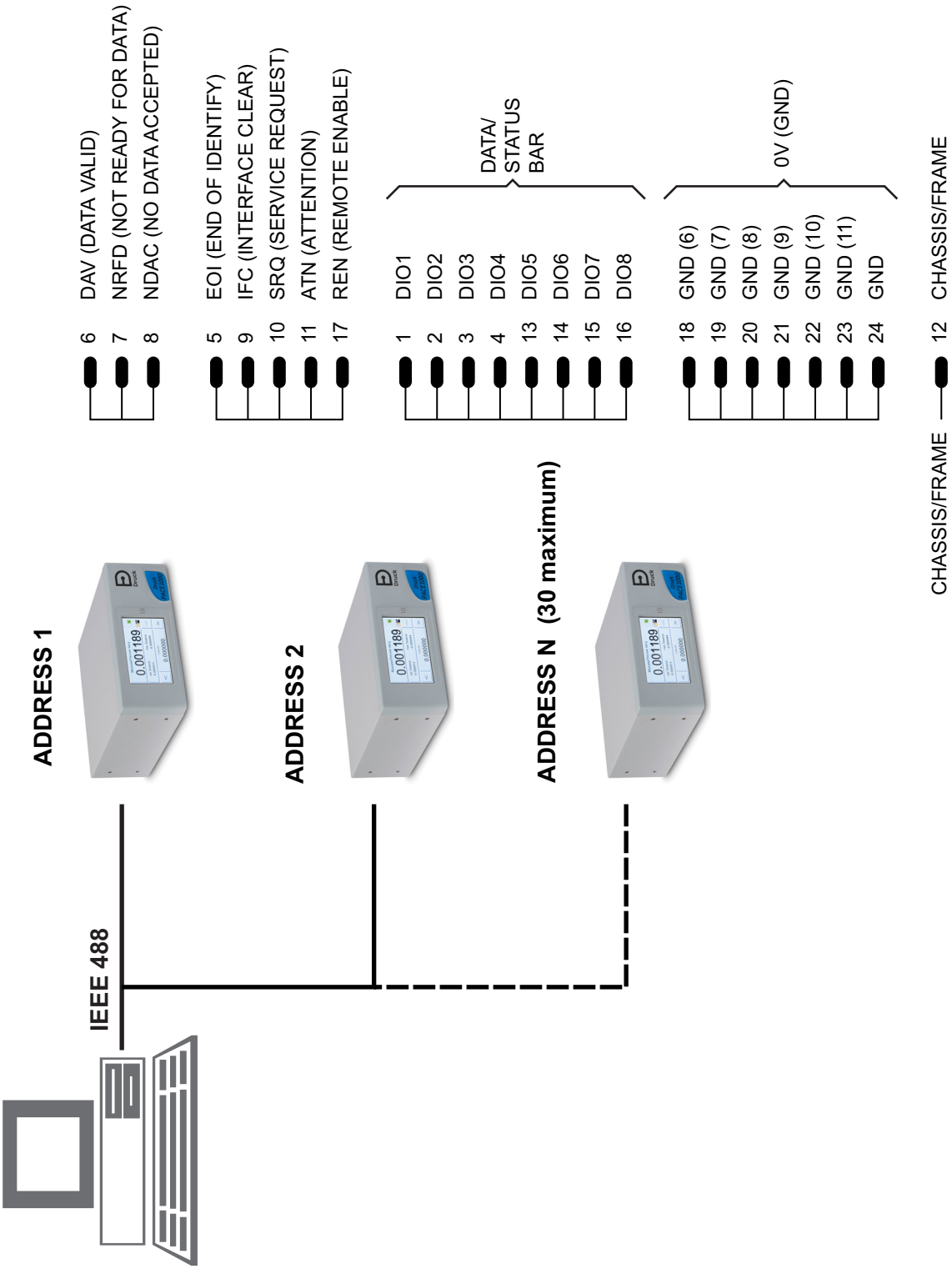

Figure 2-7: IEEE 488 Connection

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3. Operation

This section contains quick reference charts detailing all the available functions and the setup menu.

3.1 Preparation

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

Before use do the following:

1. If necessary, do the maintenance task. Refer to Section 4, “Maintenance,” on page 29.
2. For bench-top, single instrument operation do the following:
   a. Connect the instrument to the electrical supply.
   b. Inspect the pneumatic hoses for damage, ingress of dirt and moisture.
3. Before use, the instrument should be tested.
4. Review and become familiar with the procedure before starting a process on a component or system.

Note: The touch-screen can be permanently damaged by sharp objects.

3.2 Power-up Sequence

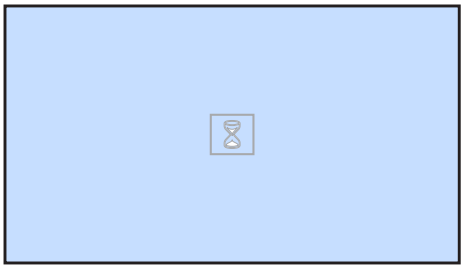
The following sequences of operation shows the instrument display.

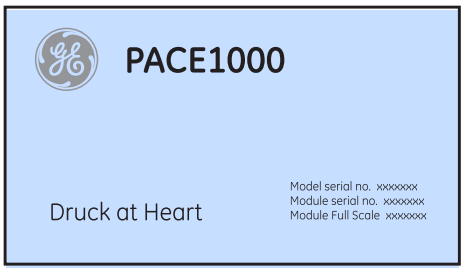
Note: The following sequence is an example, the values and selections displayed depend on the range(s) and options enabled in the instrument.

1. Set the power supply to ON.
2. The display shows the power-up sequence.

   Note: Do not touch the display screen during power-up.
3. The instrument carries out a self-test.

   Note: If the test finds a fault, the display shows an error, see Section 5, “Testing and Fault Finding,” on page 31.
4. If the self-test is successful the system enables the touch screen and changes to measure mode.
5. The touch screen shows the measured pressure in the parameters selected in setup.
6. The instrument is now ready for use.





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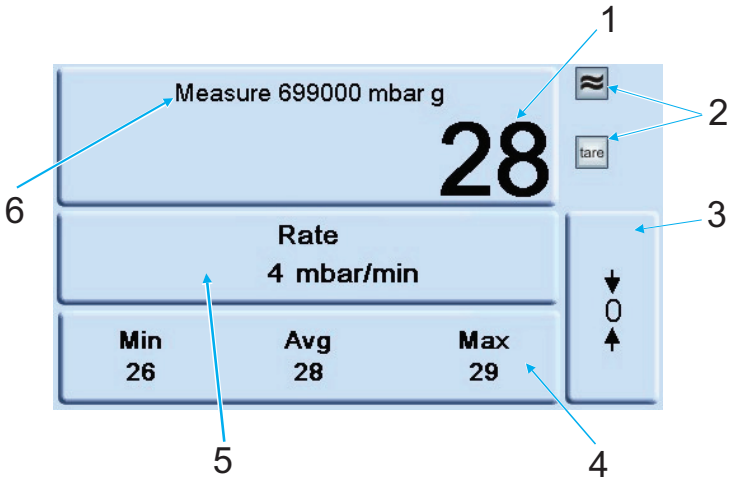
3.3 Measure Mode



1 Pressure reading
2 Functions enabled
3 Zero key (vent system before starting zero sequence)
4 Function area
5 Status area
6 Current pressure range

Figure 3-1: Touch Screen Areas

Table 3-1: Display Icons

Icon	Description	Icon	Description
Tare	Tare enabled	≈	Filter pressure reading
%	Percentage		Ethernet not connected
	Reference level difference (gas head correction)		Ethernet connected

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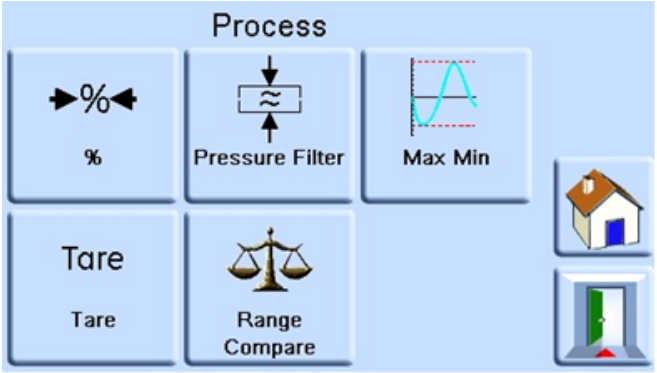
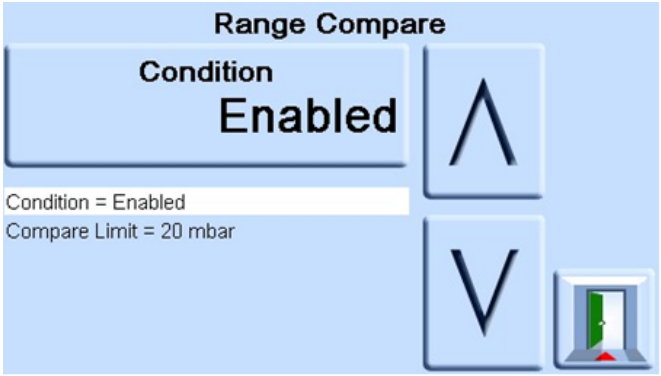
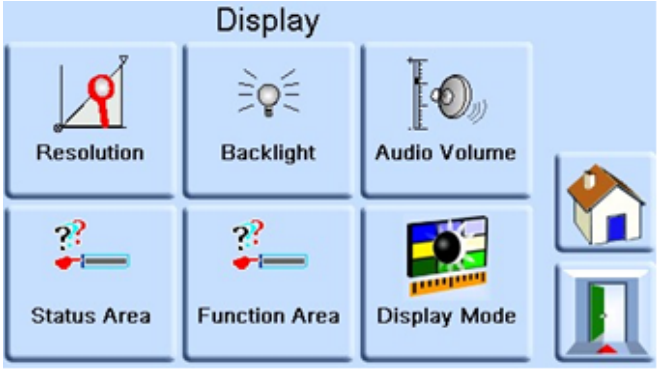
Function area Min/Avg/Max is performed on the reading selected for display in the top screen.

The Ethernet LAN Status indication (1) shows the following:

- Color red - not connected
- Color green - connected







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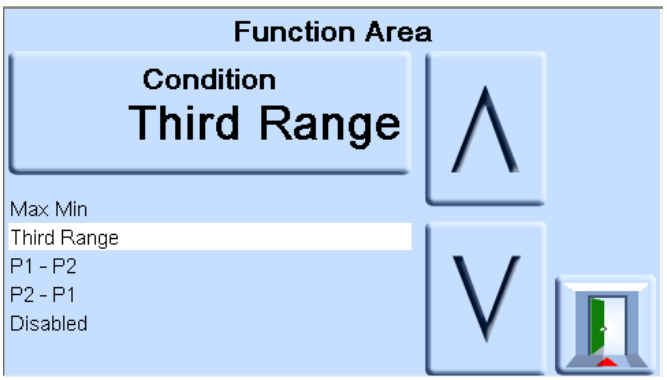
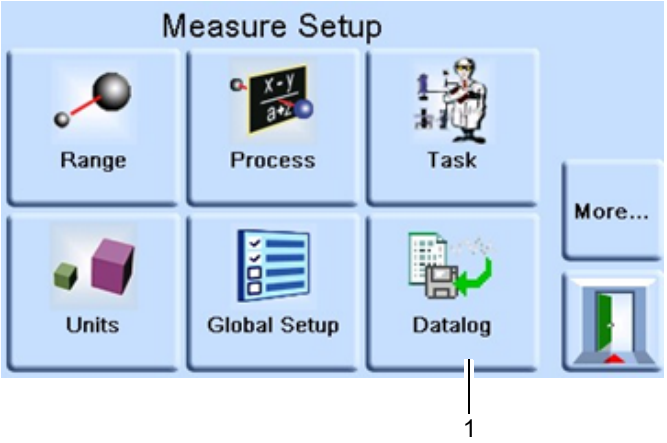
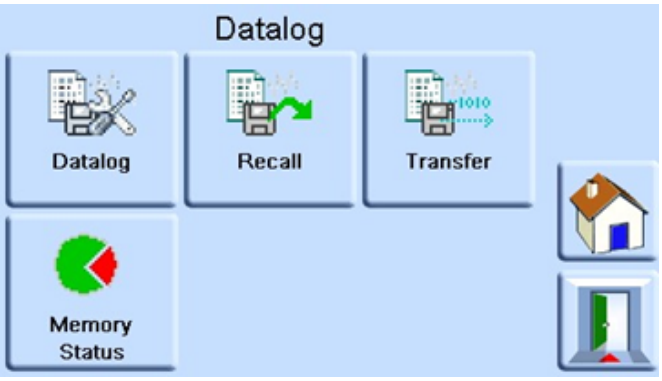


Selecting P1-P2 condition for display in the lower function area of the display allows the display of the subtraction of the middle status area displayed pressure P2 from upper most displayed pressure P1, or selecting P2-P1 condition for display in the lower function area of the display allows the display of the subtraction of the upper most displayed pressure P1 from the middle status area displayed pressure P2.

3.4 Data Logging

The “Datalog” icon (1) is present when a memory card is fitted:





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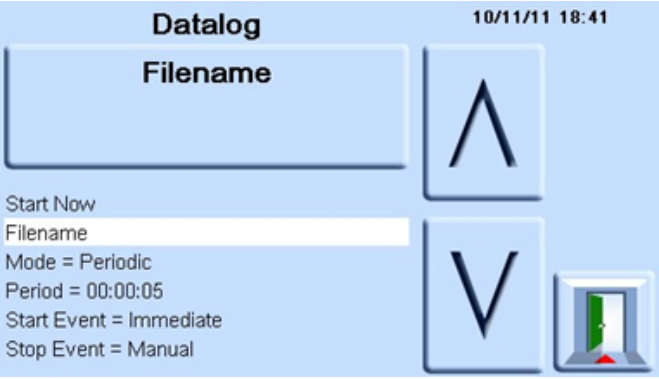

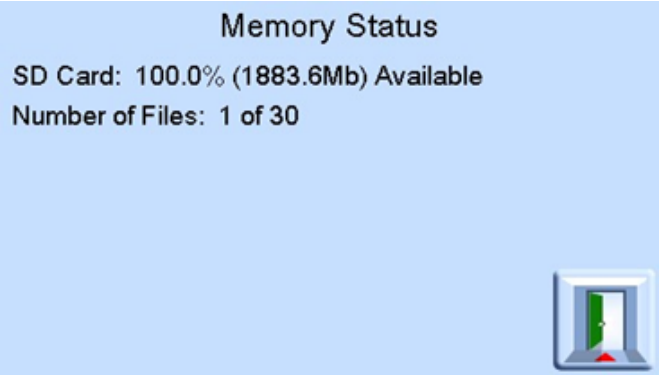

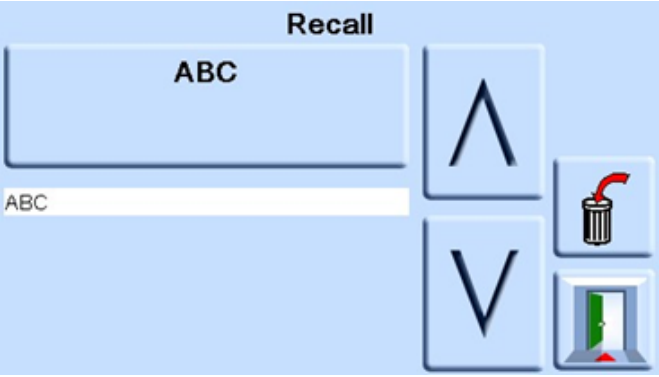

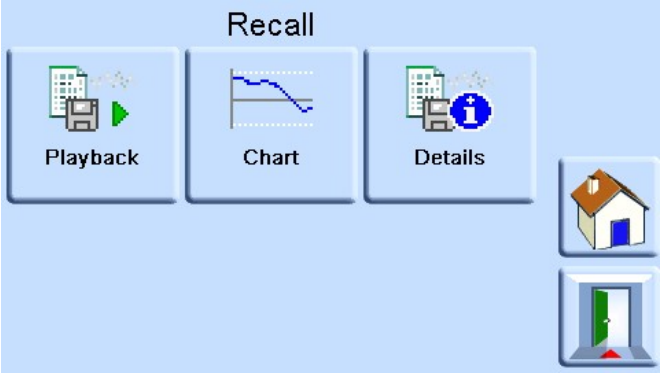

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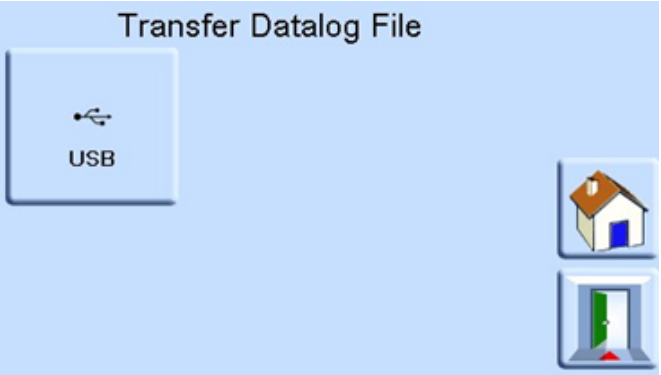

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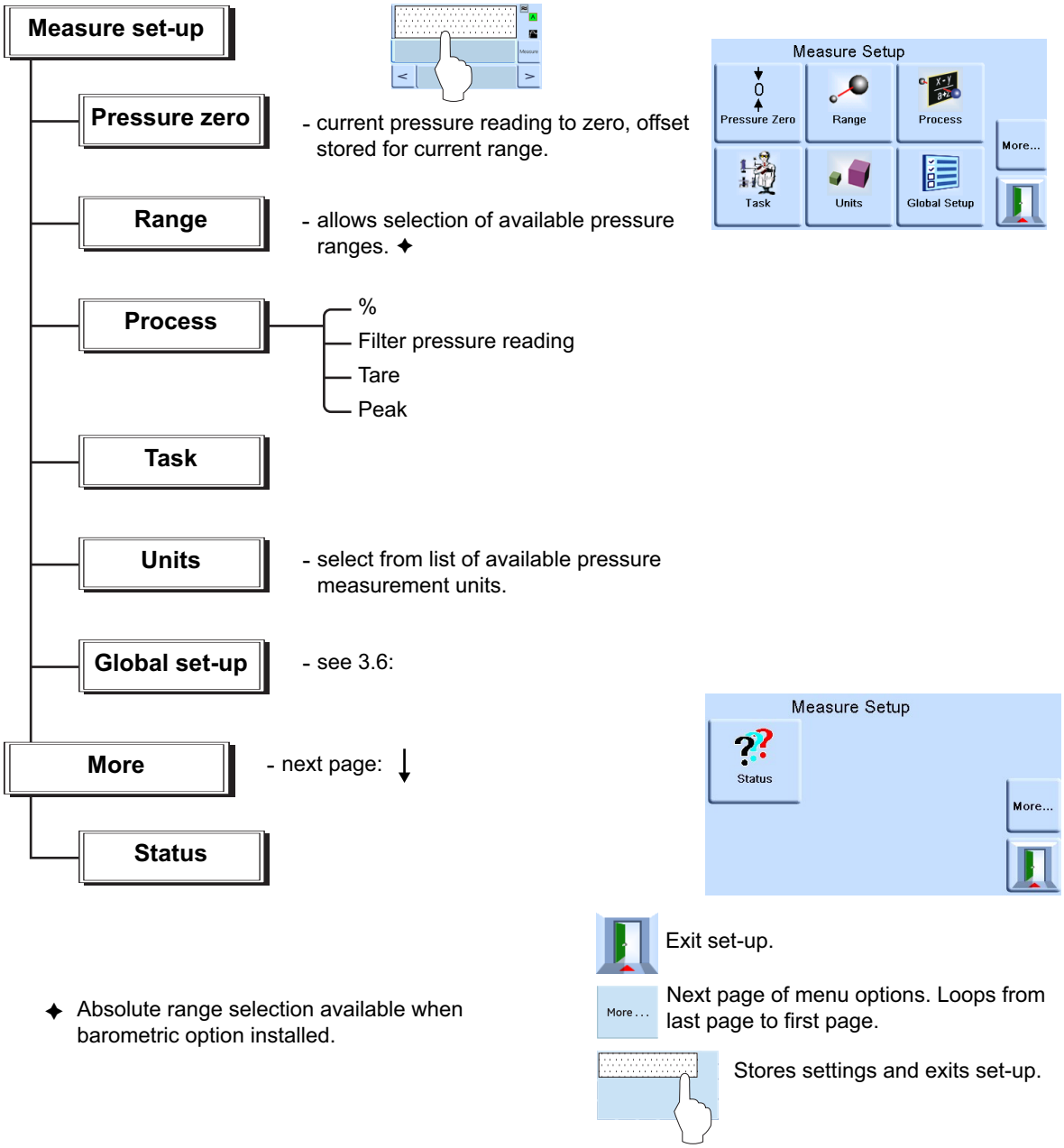
3.4.1 Measure Menu Setup



✦ Absolute range selection available when barometric option installed.

3.5 Operation and Example Procedures

3.5.1 Introduction

Before operation, the instrument must be connected to the correct electrical and pneumatic/hydraulic) supplies. Refer to Section 2, “Installation,” on page 3.

When the instrument is switched ON the display shows measured pressure mode and the task set before the power-off.

3.5.2 Measure Mode

The instrument works as a precision pressure indicator and shows the pressure measured at the output port.

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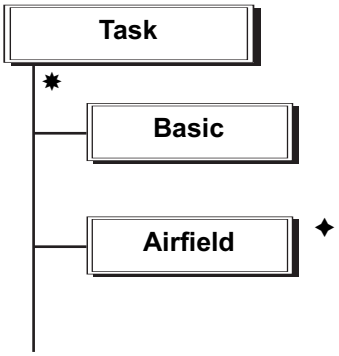
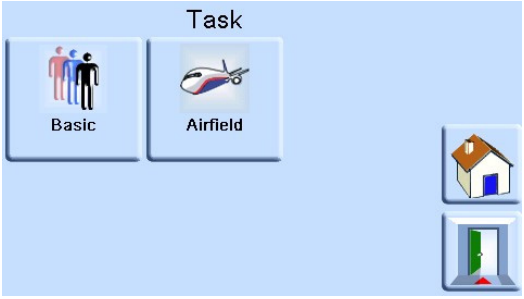
3.5.3 Task

Pressing **Task** enables pre-determined functions:





✦ Option refer to data sheet

✸ Selecting a task exits the menu and changes the display to the task selected.

Return to home.

Exit set-up.

The display shows the task screen, see illustration above.

When selected, e.g. Basic, the screen changes to show the selected task.

To measure pressure in the task proceed as follows:

1. Select the required units of pressure measurement from the measure setup menu.

   Note: In the Airfield Task Q codes can be used. These units are standardized three letter codes and are available in aeronautical units (feet and metres). Refer to Table 3-2.

Table 3-2: Airfield Task Q Codes

Q Code	Description
QFE	Atmospheric pressure at sea level, corrected for temperature and adjusted to airfield elevation. When set on the altimeter it reads height.
QNE	Atmospheric pressure at Sea level in International Standard Atmosphere (ISA) 1013.25 mbar.
QFF	Barometric pressure at a place, reduced to Mean Sea Level (MSL) using the actual temperature at time of observation as mean temperature.
QNH	Atmospheric pressure at Mean Sea Level (MSL) (may be local, measured pressure or a Regional Forecast Pressure (RFP). When set on altimeter it reads altitude.

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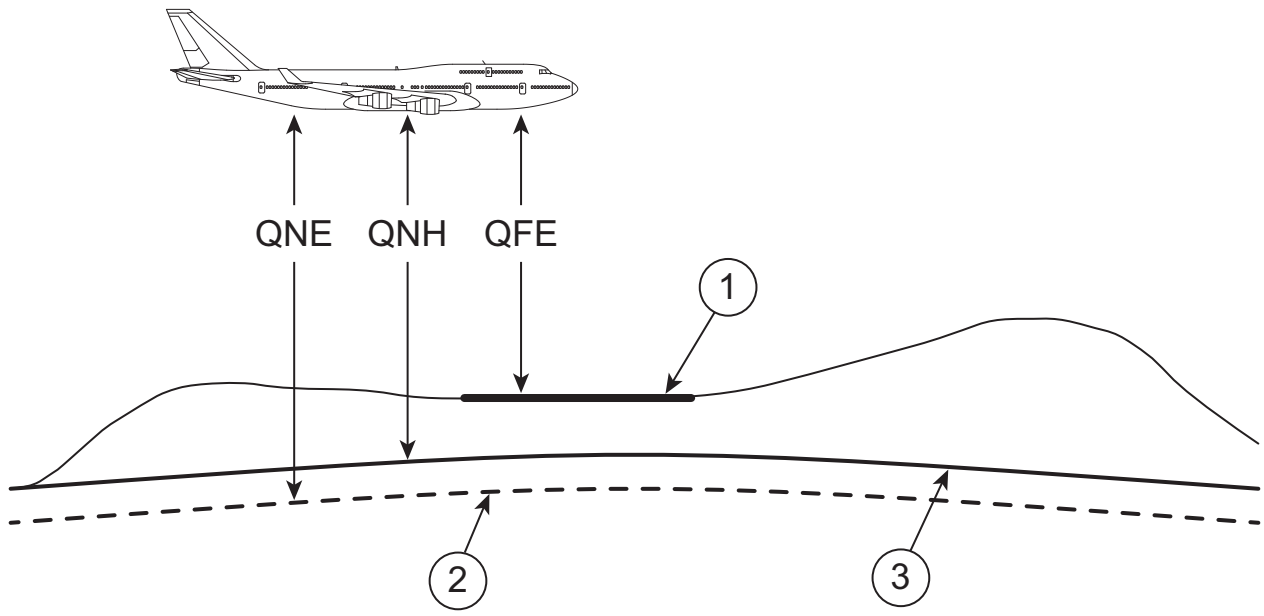

1 Runway on Earth's surface.
2 29.9212 inHg (1013.25 hPa) datum.
3 Sea level reference datum (adjusted).

Figure 3-2: Q Code Visualization

3.5.4 Leak Testing Option

This task, measures the leak rate over the measure dwell time.

At the start of the test, the instrument measures the test pressure of the user system. The instrument then records the pressure change during measure dwell time.

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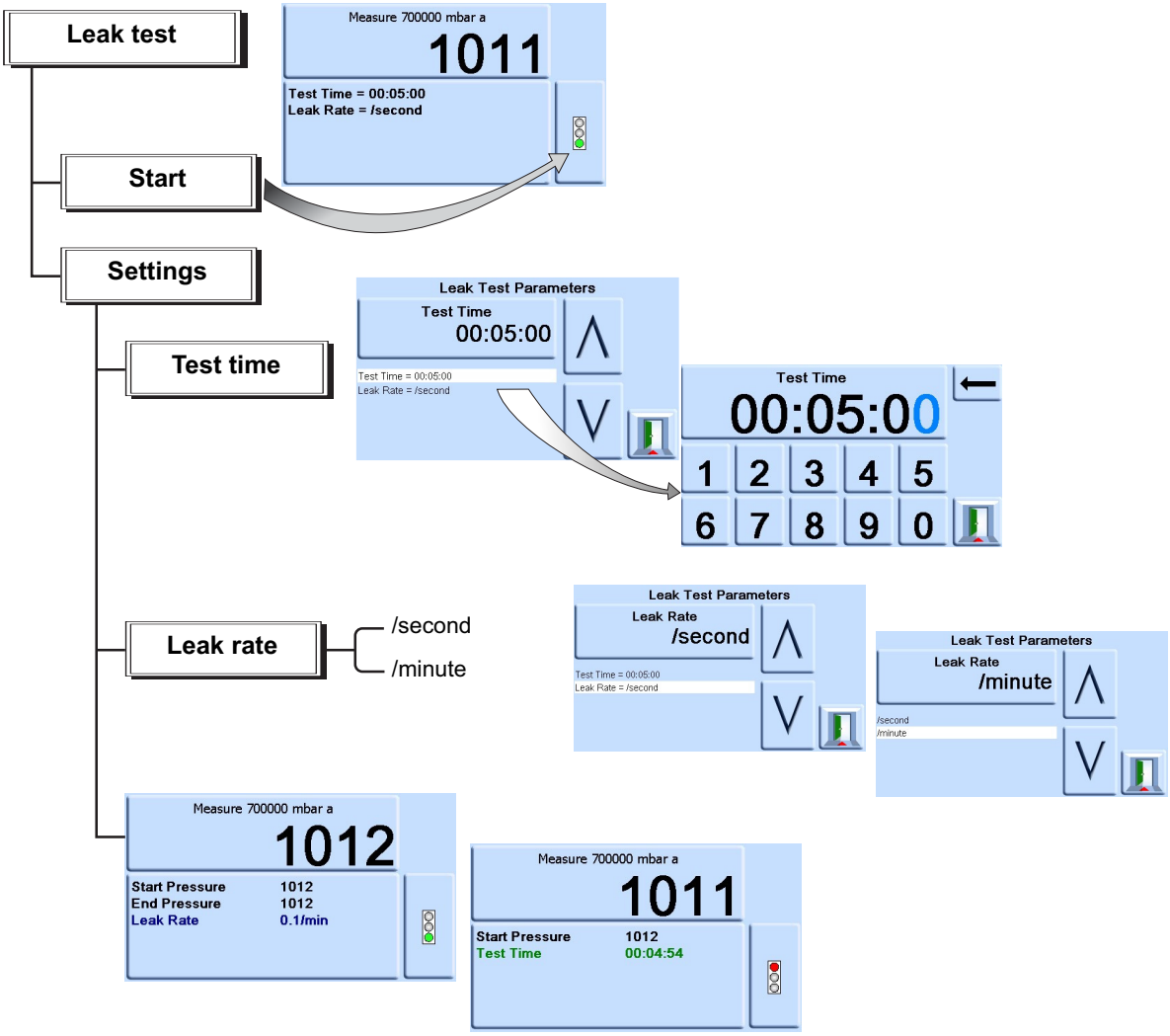
On completion, the display shows the leak rate results with leak rate per second or per minute in the current pressure units selected in measure setup.



3.6 Global Setup Selections

Global setup selections provide access to the instrument‘s settings for both measure and control modes.

This setup menu provides PIN-protected access to the supervisor setup and calibration.

Pressing Global Setup changes the touch-screen display to show available selections.

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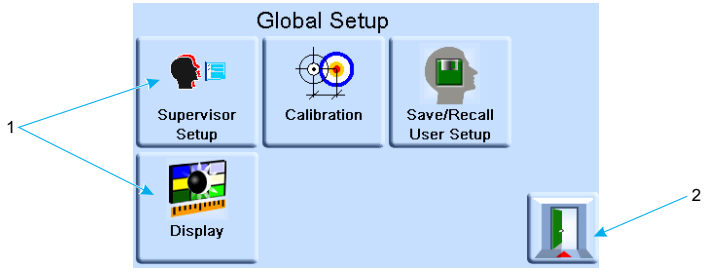
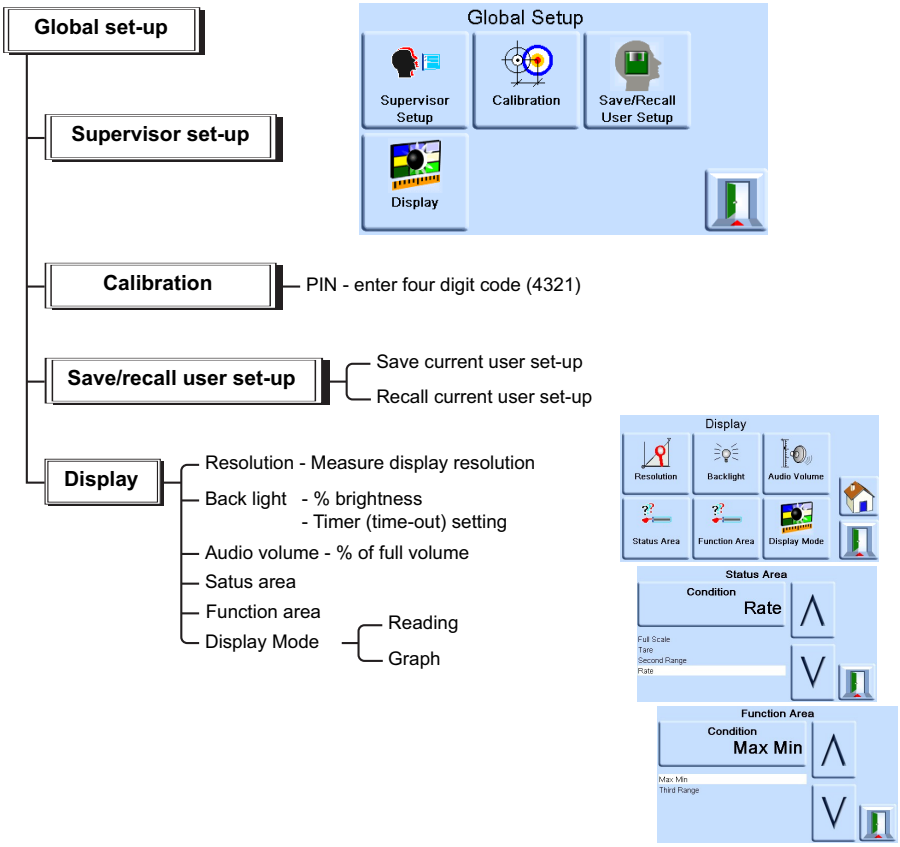
3.6.1 Supervisor Setup, Calibration, Save/Recall User Setup and Display



1 Selections 2 Escape Key



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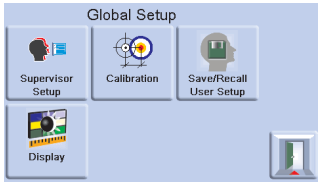
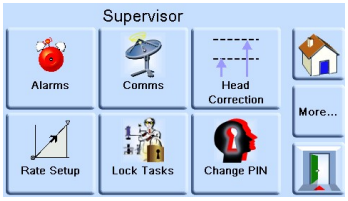
3.7 Supervisor Setup

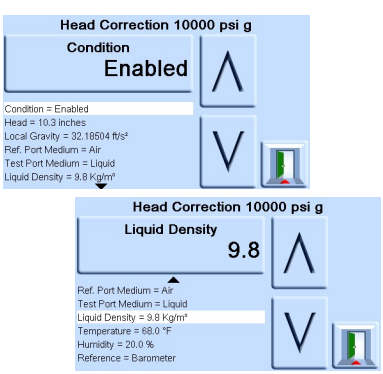
The supervisor setup menu provides facilities for changing settings. These are made during installation.



Pressing the escape key stores settings and returns to global set-up.



- **Supervisor**
  - **PIN** - enter four digit code (0268)
    - **Alarms**
      - Enable/disable high pressure
      - Enable/disable low pressure
    - **Communications**
      - IEEE488
      - RS232
      - USB
      - Ethernet
    - **Gas head correction** — Enable/ disable
      - Head - in or m
      - Local gravity - m/s²
      - Barometric - mbar
      - Reference port medium*
      - Test port medium*
      - Temperature (gas)
      - Humidity (gas)
      - *air or nitrogen
    - **Rate set-up**
      - /second
      - /minute
    - **Lock** — Lock tasks
      - Lock/unlock individual tasks
      - Lock/unlock all tasks
    - **Change PIN** — Enter new supervisor PIN
      - Enter new PIN
      - Re-enter new PIN



- **More** - next page: ↓
  - **User defined units** — User defined units - user unit 1
    - Enter the name of the defined units
    - Enter the equivalent value in Pascals
  - **Instrument alias name**
  - **Language**
  - **Area of Use**
    - Europe
    - North America
    - Japan
    - Asia
    - Rest of World
  - **Restore last settings** — Restore previous defaults Y/N?
  - Additional selections for options enabled: Aeronautical etc.

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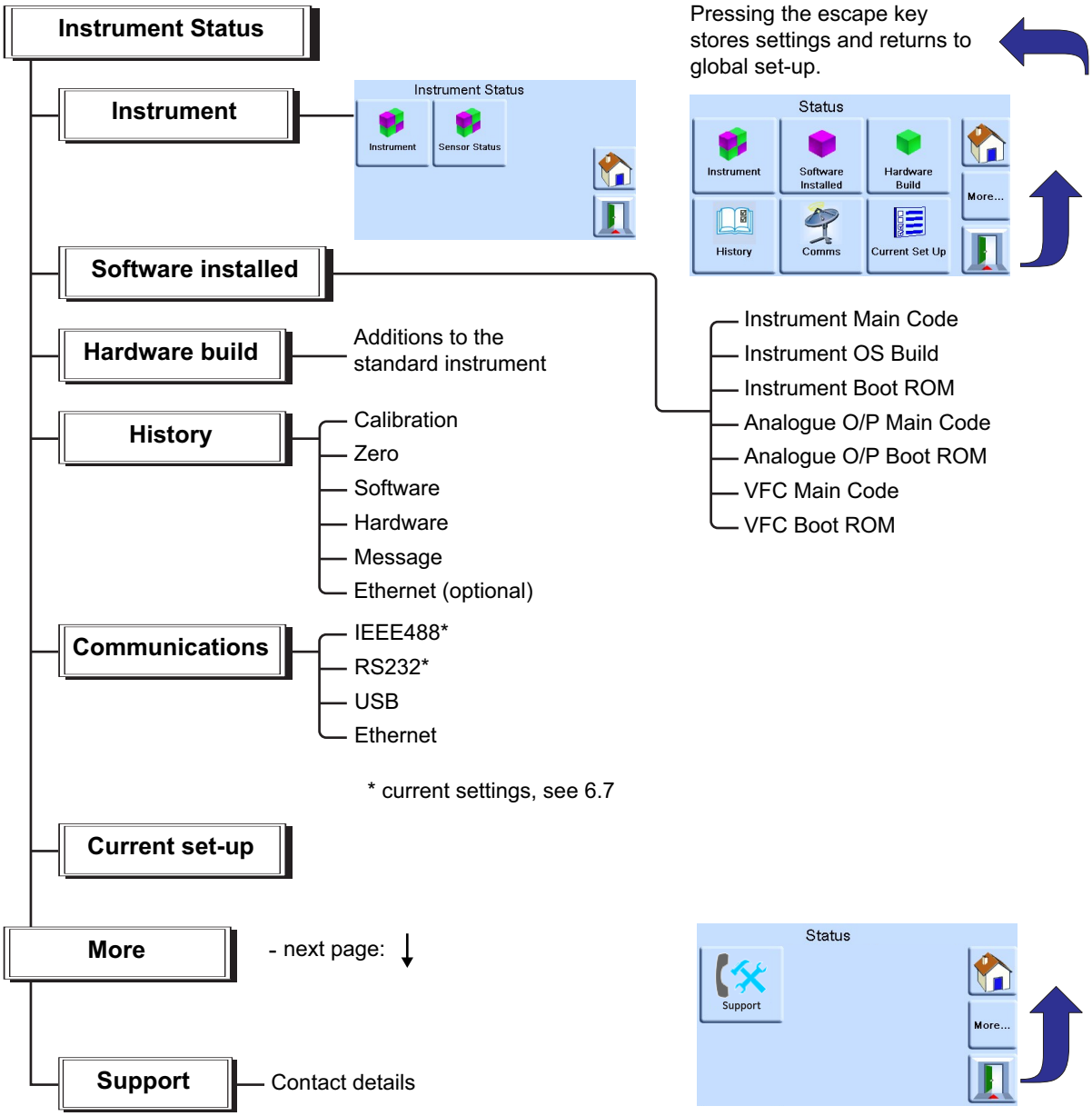
3.8 Instrument Status

The control setup menu provides access to the status of the instrument:



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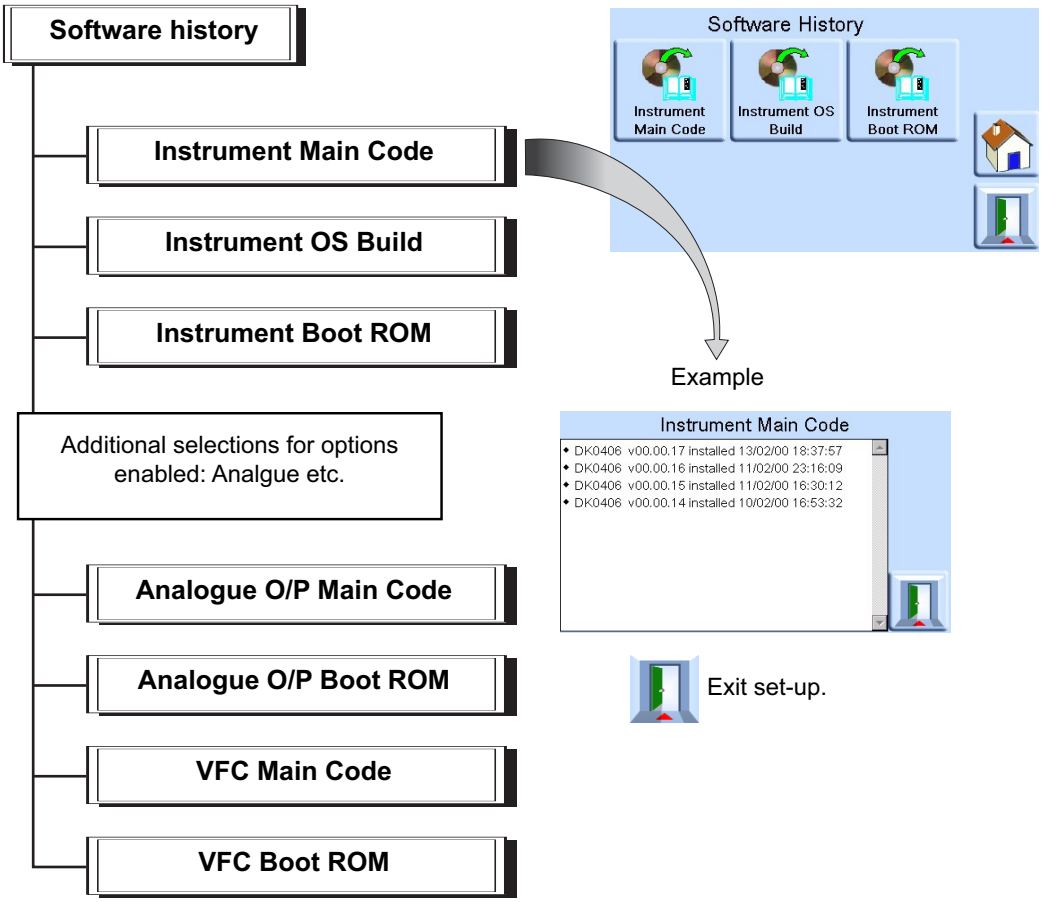
3.9 Software

Software history, in the status menu, provides read only information on the current software in the instrument.



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4. Maintenance

4.1 Introduction

This section contains procedures for routine maintenance and the replacement of components. Refer to Section 5, “Testing and Fault Finding,” on page 31.

Table 4-1: Maintenance Tasks

Task	Period
Visual Inspection	Before use
Test	Before use
Cleaning	Weekly[a]
Calibration	12 months[b]

a. May change; depends on usage (e.g. rack mounted, bench top) and environment (e.g. humidity, dust).
b. May change; depends on the required accuracy.

4.2 Visual Inspection

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

a. External of the instrument.
b. Power supply adaptor.
c. Associated equipment.

Damaged parts must be replaced, contact Druck Service.

4.3 Cleaning

Do not use solvents for cleaning. Clean the front panel with a damp lint-free cloth and mild detergent.

4.4 Test

Do a standard serviceability test. Refer to Section 5.2, “Standard Serviceability Test,” on page 31.

4.5 Software Update

To update the PACE1000 internal software, use the following procedure:

1. Insert a USB memory device into a web connected PC.
2. Open Windows Explorer and select the USB memory device root folder. Delete the following folders if they are present:
   i. DPI
   ii. OS
3. Using a web browser go to the following Druck PACE support page:

https://www.bakerhughesds.com/download-center?bh_ref=gemeasurement.com

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4. In the search window, select the following and hit Apply:

Search Term	Entry
Industry	(leave blank)
Category	Pressure Controllers - PACE
Product	Select PACE5000 or PACE6000
Name	(leave blank)

5. Select the software history file and open this file. Read this file to become aware of the latest and previous software version and any particular fixes needed.
6. Select the most recent dated software and highest alphanumeric revision, unless an older revision of software is required.
7. Download the software file, which is a zip file.
8. Once the zip file has completed download, save the zip file to the PC desktop. Unzip the contents of the zip file to the root folder of the USB memory device. Ensure that the following two folders have been created in the root folder of the USB memory device:
   i. DPI
   ii. OS
9. Eject the USB memory device from the PC.
10. Ensure that the PACE is powered off.
11. Inset the USB memory device into the rear panel USB port of the PACE.
12. Power-up the PACE.
13. Once the PACE has powered up, navigate through the following on-screen menus:
    a. Select the top measured pressure area of the display.
    b. Select the Global setup icon.
    c. Select the Calibration icon.
    d. Enter the PIN number: 5487
14. The PACE display now shows icons for each software component that can be updated. This depends on the current installed version compared to the software history document.
15. Update the software in the following order. Follow the on-screen prompts during the update process.
    a. OS software.

       Note: The PACE must remain powered-up during the OS software update. Failure to do so will result in non-recoverable damage to the PACE.
    b. Instrument software.
16. Once the software updates have been completed, turn off the PACE.
17. Turn the power back on to the PACE.
18. Wait until PACE displays the pressure measurement screen.
19. Verify the installed software version against the software history document.

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5. Testing and Fault Finding

5.1 Introduction

This section details the standard serviceability test. Table 5-2 on page 33 lists 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.

5.2 Standard Serviceability Test

CAUTION Always release pressure before disconnecting pressure equipment.

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

1. Connect the instrument. Refer to Section 2, “Installation,” on page 3.
2. After power-up, select measure setup.
   a. Select the required units of pressure measurement from the measure setup menu.
   b. Apply a known pressure to one of the sensors. Make sure the instrument pressure reading is within tolerance, stated in the specification. Refer to Data Sheet.
   c. Carefully release the applied pressure to atmospheric pressure.
   d. Make sure the instrument pressure reading shows atmospheric or ambient pressure.
   e. Test complete.

After a successful serviceability test the instrument is ready for use.

5.3 Ethernet Testing

1. Connect PACE Ethernet port to a PC.
2. Check the PACE Ethernet LAN indication turns green after a few seconds.
3. Set the PACE Ethernet address to Auto IP.
4. Record the PACE auto IP address.

5.3.1 Ethernet Ports

Table 5-1 details the PACE open Ethernet ports.

Table 5-1: Open Ethernet Ports

Ethernet Port	Use
80/tcp	PACE Web server (http).
111/tcp	rpcbind (RPC for VXI).
111/udp	rpcbind (RPC for VXI).
443/tcp	PACE Web server (https).
5025/tcp	PACE SCPI communication socket.
****/tcp	VXI-11 communication (dynamically allocated).

5.3.2 Ping Test

1. Open the PC command prompt screen.

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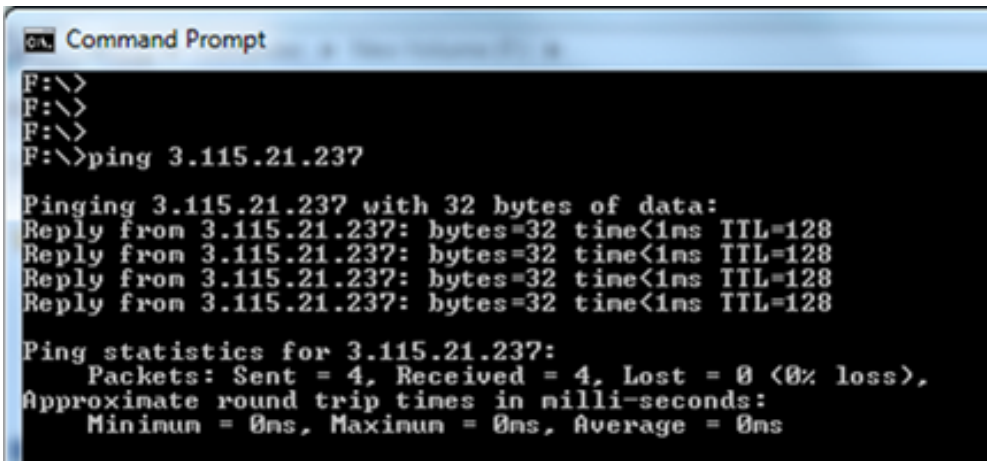
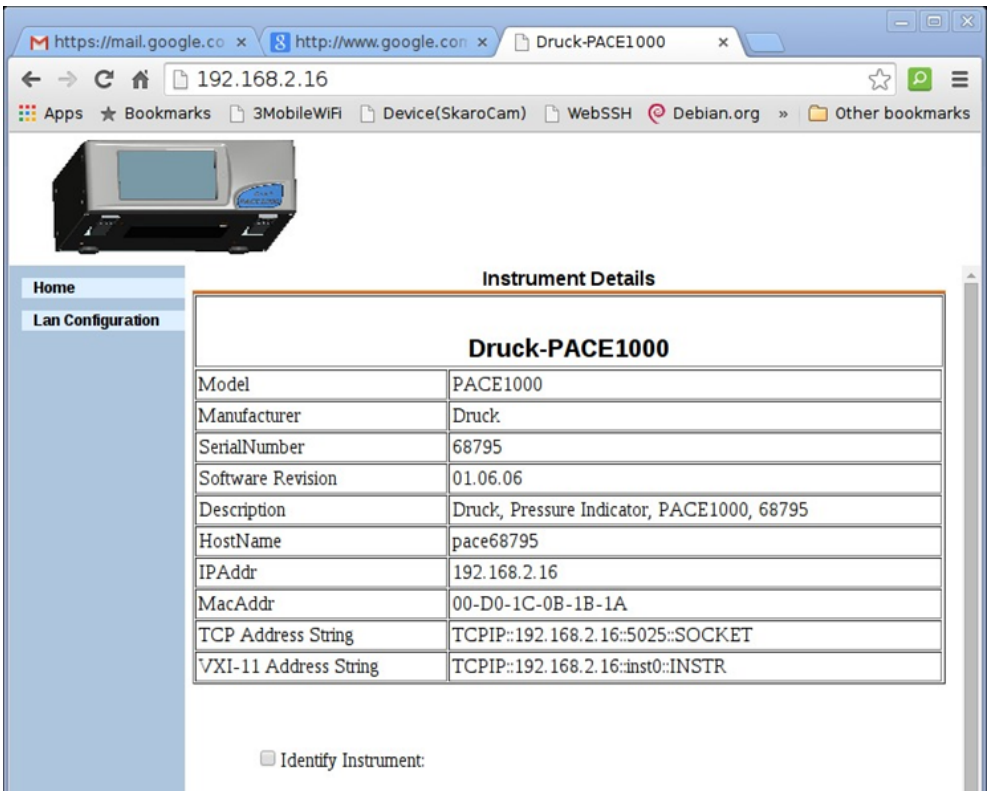
2. Using the “ping” command, ping the PACE IP address. See the screen capture below. The PACE will reply if operating correctly.



Note: The ping command example shows an IP address 3.115.21.237. The IP address of your PACE may be different.

5.3.3 Web Browser Test

1. Open the PC web browser.
2. Enter the PACE IP address. The PACE home page will be displayed if operating correctly.



Note: The web browser example shows an IP address 192.168.2.16. The IP address of your PACE may be different.

5.3.4 Measurement & Automation Explorer Test

The latest version of the Nation Instruments Measurement & Automation Explorer can be downloaded from the following link:

http://www.ni.com/download/ni-daqmx-14.1/4953/en/

1. Open the National Instruments Measurement & Automation Explorer.

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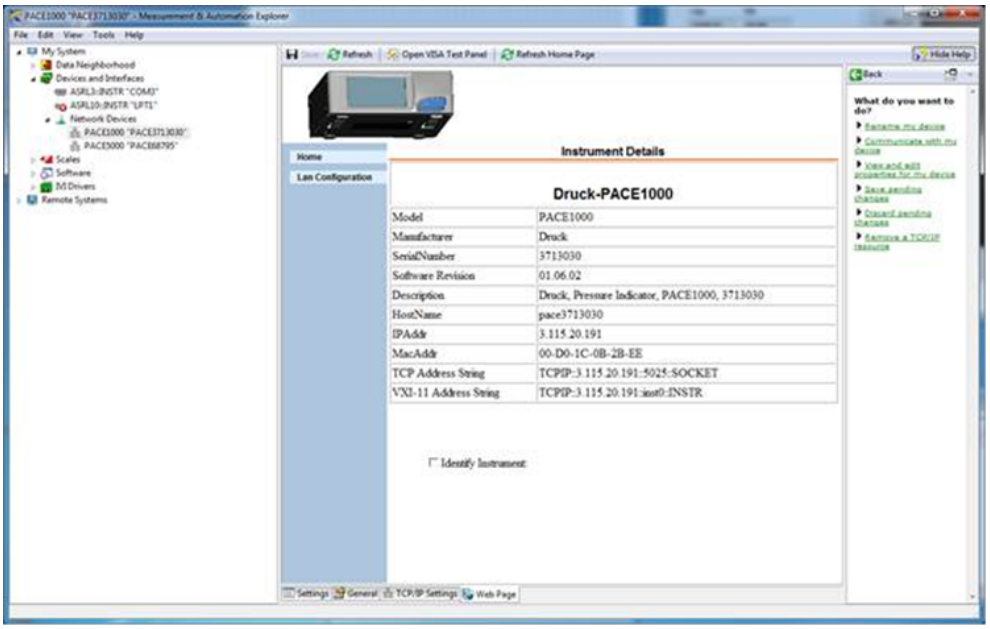
2. Navigate to My System > Devices and Interfaces > Network Devices
3. Select the PACE1000 device. The PACE home page will be displayed if operating correctly.



5.4 Fault Finding

Check the faults and responses, refer to Table 5-2. If the fault persists, refer to Section 5.5.

Table 5-2: Fault Diagnosis

Fault	Response
Power supply connected, display not lit.	Check electrical power supply fuse or circuit breaker.
Display pressure reading in red.	Over-range, carefully de-pressurize.
Instrument will not zero.	Vent system pressure. Check for blockage. Contact approved service agent for repair.

5.5 Approved Service Agents

For the list of service centers:

Druck.com

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6. Reference

6.1 Installation Notes

The PACE1000 pressure indicator requires a set of connections with the exception of the reference connection, this provides a reference to atmosphere for gauge sensors and barometric sensors.

The gas density and type does not affect the accuracy of pressure measurement, assuming that the UUT is at the same level (height) as the indicator or gas head correction is accurately set.

6.2 Reference Port

The reference port provides the negative pressure to the gauge sensor and to the barometric reference (option). Gauge sensors use this port identified as “REF”. For gauge sensors (without a barometric reference) small pressures can be applied. Refer to Data Sheet. All other pressure measurements require the port to be opened to atmosphere. When in gauge mode, the instrument shows the pressure difference between the reference port and the output port.

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

The transducer of the barometric reference option senses atmospheric pressure via the reference port. When enabled, the port must be open to atmosphere.

The reference connection should be actively used (differential connection option) for precision low pressure measurement. The instrument measures pressure relative to the pressure at the reference port.

An atmospheric pressure change causes the indicator to adjust the displayed pressure. This appears as instability. To keep a stable displayed pressure, the reference port should be restricted. Using a reference port restrictor (snubber), short term ambient pressure variations can be prevented from affecting indicator performance.

The indicator and UUT references should be connected together, using the optional differential connection kit, to provide a common reference to atmosphere.

6.3 Measure Setup

6.3.1 Pressure Zero

During use, the instrument pressure sensor can show small zero shifts caused by time and temperature changes. Regular “zeroing” increases measuring precision.

6.3.2 Process

Selects display processing features that change the reading, as follows:

Option	Description
%	Pressure can be displayed reading as a percentage of full-scale or as a percentage of a specified span.
Filter	The displayed reading can be filtered by a custom low pass filter or the filter can be disabled (default disabled). The indicator works at a speed independent of the filter time constant.
Tare	A specific tare value can be selected or the current displayed pressure reading can be “captured” as the tare value. The display shows the selected tare value in the pressure window.
Peak	Maximum, minimum and average display of pressure readings.

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6.3.3 Task

Selecting Task enables a set of pre-determined functions and software enabled optional functions.

6.3.4 Units

Select the new units from the list of pressure measurement units. Special units can also be defined. Refer to Section 6.6.6, “User Defined Units,” on page 50.

6.3.5 Global Setup

Refer to Section 6.5, “Global Setup,” on page 37.

6.3.6 Setup Zero

Zero from top level screen (main range only).

If other ranges are fitted these can be zeroed by selecting the displayed reading.

6.3.7 Barometric Reference Option

The barometric reference option measures the barometric pressure at the reference port.

Depending on the sensors fitted, it also permits the indicator to operate in either pseudo-gauge or pseudo-absolute mode by the addition of barometric pressure.

6.4 Status

The display shows the following:

a. Instrument status
   - Model
   - Serial number
   - MAC address sensor(s)
   - Range
   - Last calibration date*.
   - Software build - read only data.

b. Hardware build - read only data.

c. History - read only data
   - Calibration
   - Zero
   - Software
   - Hardware
   - Message
   - Ethernet connection

d. Communications, IEEE 488 and RS-232 are fitted as standard. Additional communication types are options - USB and Ethernet.

e. Current setup - read only data.

f. Support
   - List contact information for support and advice.

* The instrument date and time must have been set correctly.

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6.5 Global Setup

6.5.1 Supervisor Setup

PIN protected menu. Refer to Section 6.6, “Supervisor Setup,” on page 37.

6.5.2 Calibration

PIN protected menu. Refer to Section 6.7, “Calibration,” on page 52.

6.5.3 Save/Recall User Setup

The display shows the following:

a. Save user setup.

b. Recall user setup.

6.5.4 Display

The display shows the following:

a. Resolution

b. Backlight

c. Audio volume

d. Status area

e. Display Mode
   - Reading (default)
   - Graph

6.6 Supervisor Setup

INFORMATION A PIN protects the Supervisor menu against unauthorized use. Each instrument on delivery contains the factory set PIN (0268). To continue protecting the supervisor setup menu the PIN should be changed as soon as possible.

The Supervisor menu provides facilities for programming settings. These are usually made during installation as follows:

6.6.1 Alarms

An alarm can be set to trigger when the pressure exceeds the high alarm or falls below the low alarm. A buzzer sounds when the alarm triggers and the alarm symbol (bell) appears on the display.

6.6.2 Communications

Selects a communication port parameter. Simultaneous operation of the RS-232, IEEE 488 and Ethernet interfaces is fitted as standard.

Note: PACE1000 Lab view drivers are available for download from:

http://sine.ni.com/apps/utf8/niid_web_display.download_page?p_id_guid=B6F9A6B06AEA01F1E0440021287E65E6

The user can select appropriate settings for communicating with the control computer (PC) and the required command protocol. Refer to K0472, SCPI Remote Communications Manual or K0469 Heritage Communications Manual.

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Referring to the PACE SCPI communications user manual, there are three commands that can be used to retrieve pressure readings from the PACE100X:

:INST:SENS[x]:READ?	Where x = 1 to 8 set in the comms range menu.
:SENS:PRES?	Returns the reading top main display window with display filtering (2 Hz update rate) applied.
:DISP[x]:WIND?	Where [x] = display (1=top main, 2=middle status area, 3=bottom function area) window.

To obtain fastest readings you must use the following SCPI command:

:INST:SENS[x]:READ?

This command returns two readings, a filtered reading and a raw reading (unfiltered reading) from internal sensors, thus giving the user a choice of which reading to use which is most suitable for their application.

Example:

TX> :INST:SENS[x]:READ?

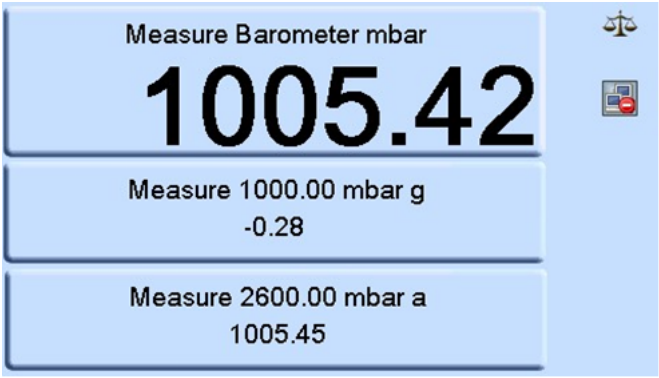
RX> :INST:SENS2:READ "993.539148733033 993.543837356372"

Note: Raw reading returned from IDOS sensors is “0” as a raw readings cannot be obtained from IDOS sensors.

Note: Baud rates slower than 115k2 baud will slow the new data update rate pro-rata. Even at a 115k2 baud rate the readings are slower than using IEEE 488. The IDOS sensor is a slower sensor than internal sensors.

6.6.2.1 Navigating to Communications Menu

1. On the main screen, touch any of the three horizontal touch areas on the screen.



2. On the MEASURE SETUP screen, select GLOBAL SETUP.

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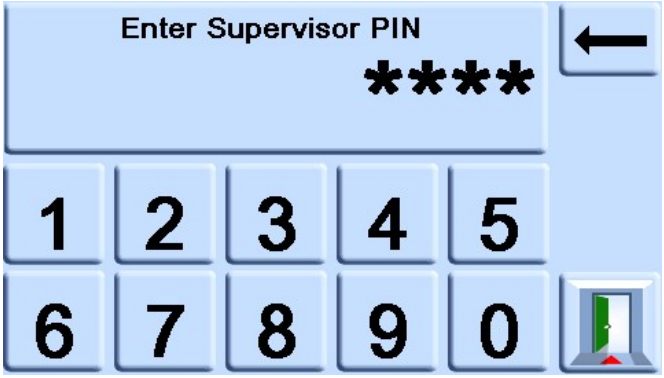
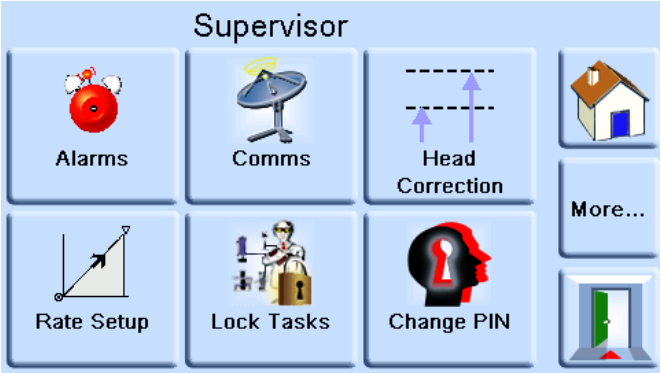
3. Select SUPERVISOR SETUP.

4. Enter the Supervisor PIN and press the top touch area. Use the back arrow in the top right corner of the screen to delete any incorrect data entries.



Note: The factory set Supervisor PIN is 0268. If the Supervisor PIN has been locally changed, make sure that the new PIN is kept in a safe place. If the new PIN is lost, it can only be reset at a Druck Service Centre.

5. On the SUPERVISOR screen, select COMMS.



6. The COMMUNICATIONS screen is shown.

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6.6.2.2 IEEE 488

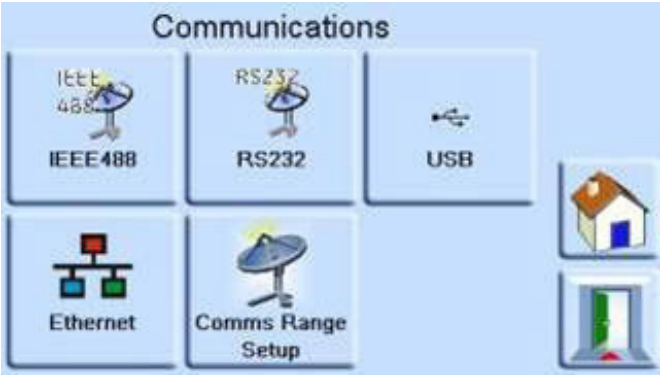
Located on the rear panel an external IEEE 488 connection has the following configuration:

Table 6-1: IEEE 488 Configuration Options

Item	Description
Connector	24-way ‘D’ female wired as IEEE 488 standard.
Communications	IEEE 488 GPIB
Default Address	16
Protocols	SCPI
Heritage Emulation	DPI 142/150, DPI 141

To configure the IEEE 488 connection:

1. Navigate to the supervisor communications configuration. Refer to Section 6.6.2.1, “Navigating to Communications Menu,” on page 38.
2. On the COMMUNICATIONS screen, select IEEE488.



3. On the IEEE488 PARAMETERS screen, use the Up and Down arrows to highlight and edit the desired parameter.

6.6.2.3 RS-232

Located on the rear panel an external RS-232 connection has the following configuration:

Table 6-2: RS-232 Configuration Options

Item	Description
Connector	9-way ‘D’ female. For pin connections, refer to Table 2-3 on page 11.
Communications	RS-232 point-to-point only. Daisy chain is not supported.
Baud Rate Power-up Default	9600, no parity, handshake = Xon/Xoff
Baud Rates Selectable[a]	2400, 4800, 9600, 19k2, 38k4, 57k6, 115k2
Parity	None, Odd, Even
Flow Control	None, Hardware, Xon/Xoff
Protocols	SCPI
Heritage Emulation	DPI 142/150, DPI 141
Terminator	CR or LF or CR/LF

a. Selectable through the user interface.

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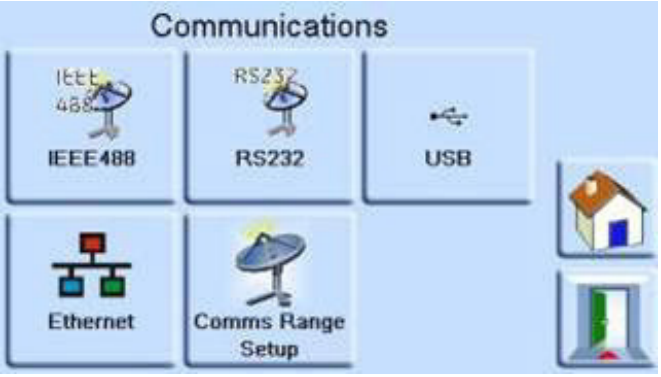
To configure the RS-232 connection:

1. Navigate to the supervisor communications configuration. Refer to Section 6.6.2.1, “Navigating to Communications Menu,” on page 38.
2. On the COMMUNICATIONS screen, select RS232.



3. On the RS232 PARAMETERS screen, use the Up and Down arrows to highlight and edit the desired parameter.

6.6.2.4 USB

Located on the rear panel an external USB ‘B’ connection has the following configuration:

Table 6-3: USB ‘B’ Configuration Options

Item	Description
Communications Mode	Mass Storage Device or Communications
Protocols	SCPI
Terminator	CR or LF or CR/LF

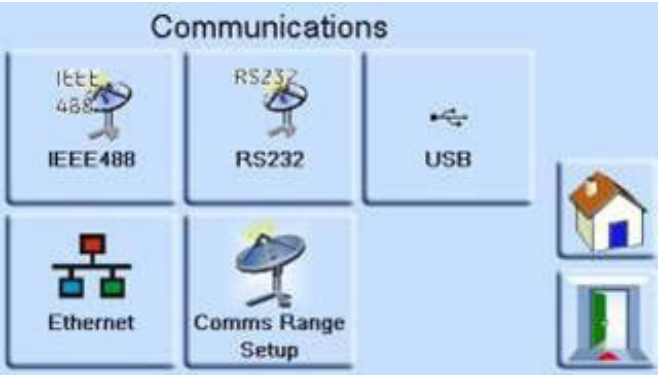
Communications mode is selected for serial communications using the SCPI protocol.

Mass storage device is selected to mount an external USB ‘A’ connected mass storage device or the internal memory SD card, from a PC connected to the USB ‘B’ port. When connecting a mass storage device into the USB ‘A’ connector, the internal memory SD card becomes unaccessible.

Note: When upgrading software, make sure that the USB ‘B’ connection is disconnected.

To configure the USB connection:

1. Navigate to the supervisor communications configuration. Refer to Section 6.6.2.1, “Navigating to Communications Menu,” on page 38.
2. On the COMMUNICATIONS screen, select USB.



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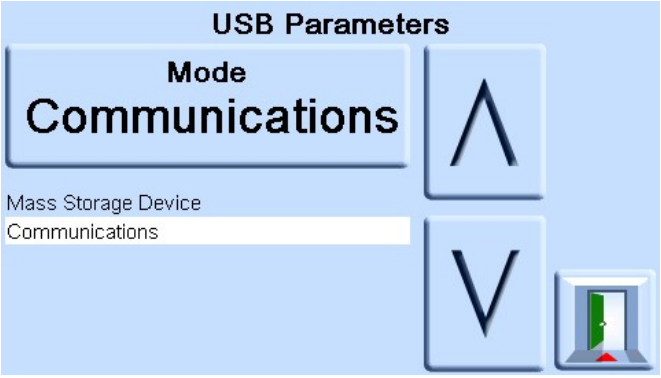
3. On the USB PARAMETERS, use the Up and Down arrows to highlight and edit the desired communications mode.



6.6.2.5 Ethernet

Located on the rear panel an external Ethernet connection has the following configuration:

Table 6-4: Ethernet Configuration Options

Item	Description
Connector	Ethernet RJ45
Protocol	SCPI
Terminator	CR/LF
Default Address	Auto IP (0.0.0.0)
Host name	PACExxxxxx (where xxxxxx = serial number)
Web Password	0268
Access Control	Open
Reset LAN Settings	Selected in Supervisor setup menu

A firewall protects the Ethernet connection. The firewall is always turned on. For a list of open ports, refer to Table 5-1 on page 31.

The Ethernet connection provides the following functionality:

- PACE Ethernet supports both VXI-II and Sockets automatically.
- Socket port address 5025.
- Internet protocol IP4.

To configure the Ethernet connection:

1. Navigate to the supervisor communications configuration. Refer to Section 6.6.2.1, “Navigating to Communications Menu,” on page 38.

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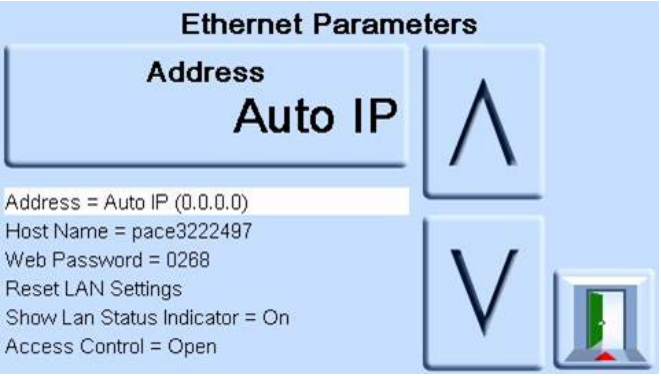
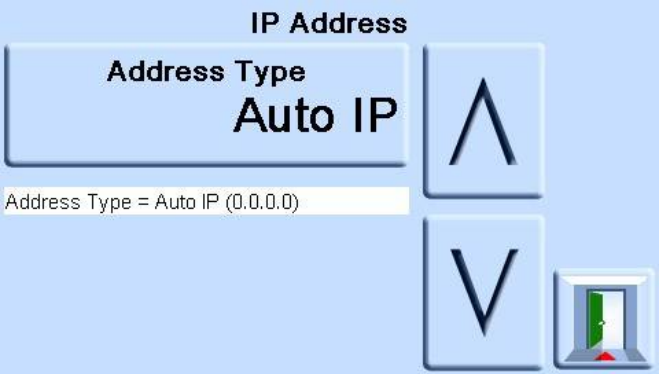
2. On the COMMUNICATIONS screen, select ETHERNET.

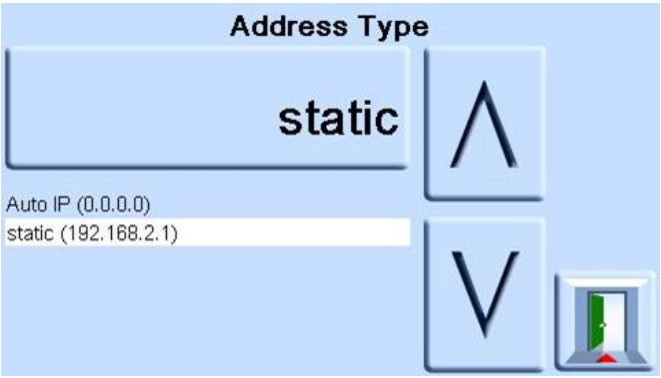
3. On the ETHERNET PARAMETERS, use the Up and Down arrows to highlight the desired parameter.



4. To change the ADDRESS parameter, complete the following:
   a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows to highlight the ADDRESS field.
   b. Press the top touch pad on the screen to enter the ADDRESS TYPE screen.



   c. Use the UP and Down arrows to highlight the desired address type (either AUTO IP or STATIC).



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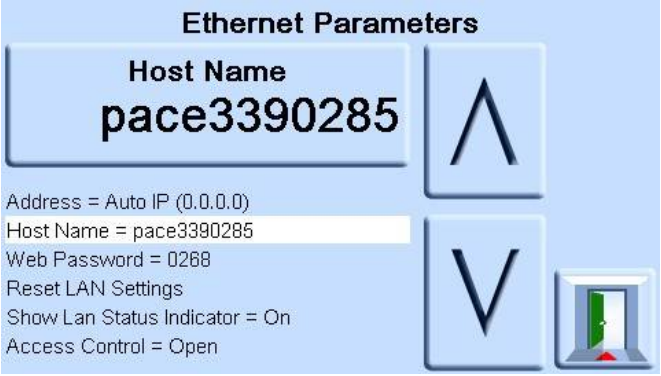
d. Press the top touch pad on the screen to set the new address type. The screen automatically returns to the ETHERNET PARAMETERS screen.

5. To change the host name, complete the following:

a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the HOST NAME field.

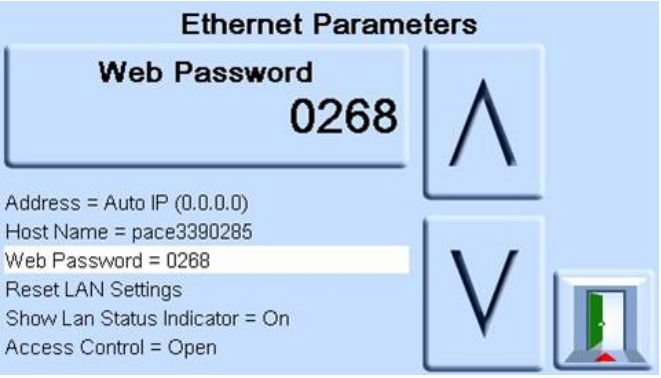


b. Press the top touch pad on the screen to enter the HOST NAME screen.

c. Use the keyboard to input the new host name and then press the top button on the screen to set the host name. The screen automatically returns to the ETHERNET PARAMETERS screen.

6. To change the web password, complete the following:

a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the WEB PASWORD field.



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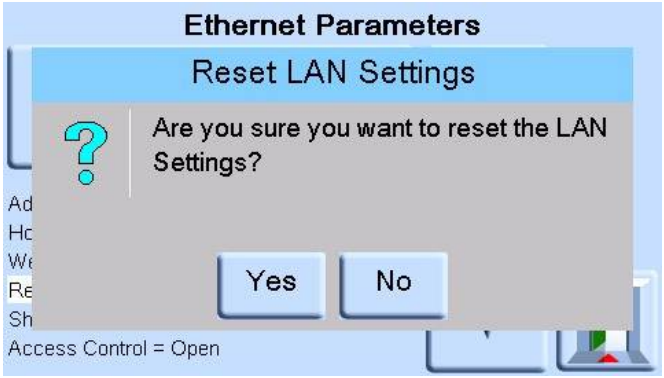
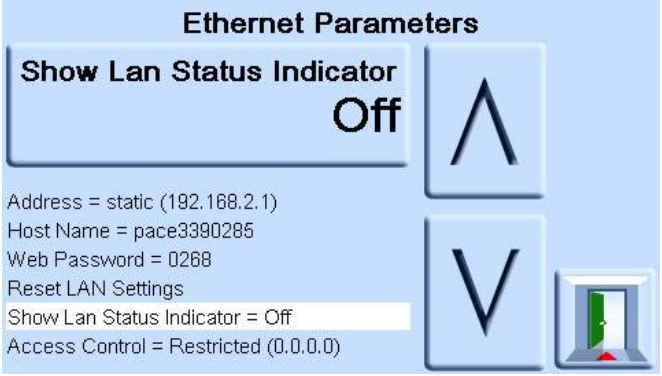
b. Press the top touch pad on the screen to enter the WEB PASSWORD screen. The keyboard screen opens.

c. Use the keyboard to input the new web password and then press the top touch area on the screen to set the new password. The screen automatically returns to the ETHERNET PARAMETERS screen.

7. To reset the LAN settings, complete the following:
   a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the RESET LAN SETTINGS field.
   b. Press the RESET THE LAN SETTINGS touch pad on the top touch pad of the screen.
   c. The RESET LAN SETTINGS sub-screen asking for confirmation of the reset. Press YES to confirm reset of the LAN settings.



8. To turn the LAN status indicator on or off, complete the following:
   a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the SHOW LAN STATUS field.



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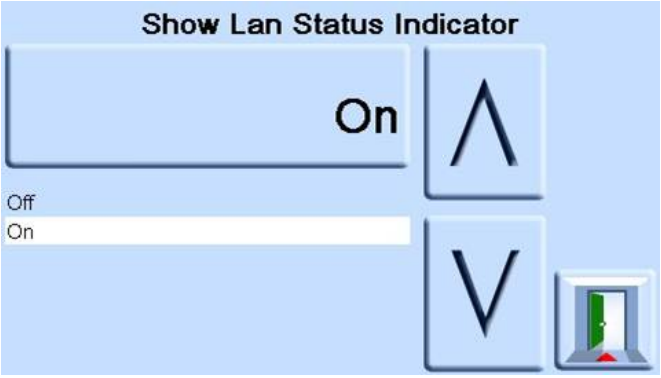
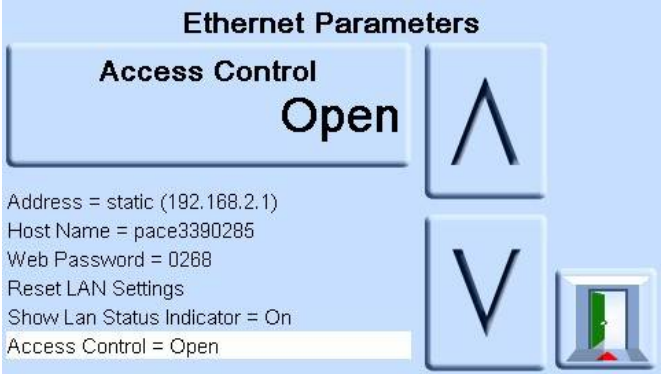
b. Use the UP and DOWN arrows to highlight the desired setting. The setting is either ON or OFF.



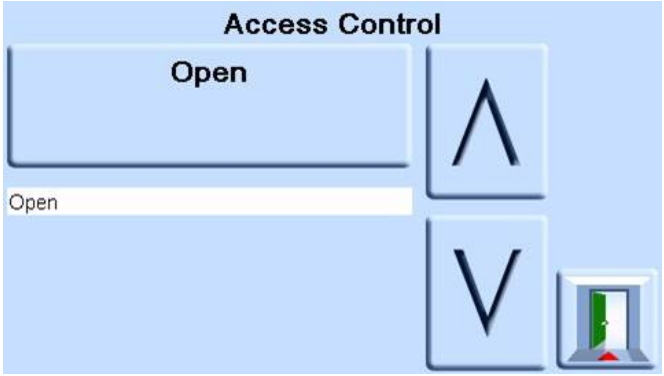
c. Press the top touch pad on the screen to set the new setting.

9. To change ACCESS MODE, complete the following:

a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the ACCESS CONTROL field.



b. Press the ACCESS CONTROL OPEN touch pad on the top of the screen to open the ACCESS MODE screen.



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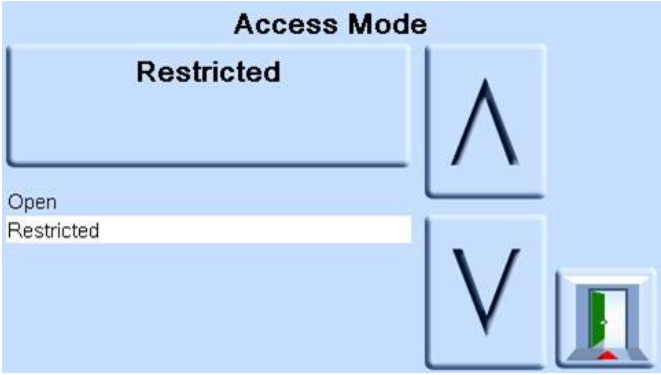
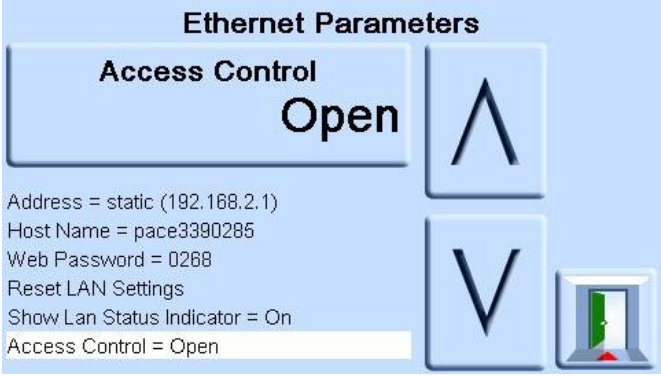
c. Use the UP and DOWN arrows to highlight the required parameter. The choices are OPEN or RESTRICTED.



d. Press the ACESS MODE OPEN or ACCESS MODE RESTRICTED touch pad at the top of the screen to set the required access mode.

10. To change CONTROLLER IP ADDRESS complete the following:

a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the ACCESS CONTROL field.



b. Press the ACCESS CONTROL touch pad on the top of the screen.

c. Use the UP and DOWN arrows to highlight the CONTROLLER IP ADDRESS field.

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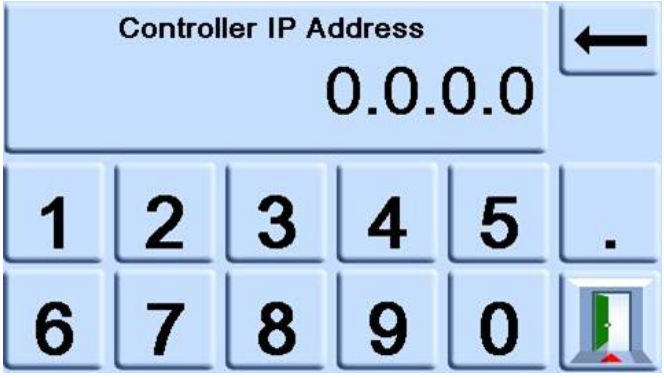
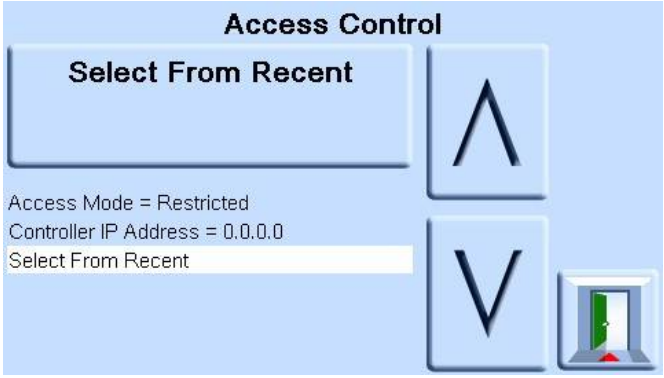
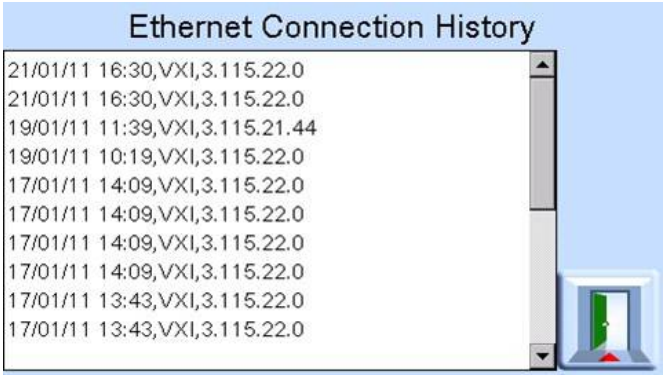
d. Use the number touch pad at the bottom of the screen to input the new IP address and press the CONTROLLER IP ADDRESS touch pad at the top of the screen to set the new IP address.



11. To view the recent IP addresses, complete the following:
    a. On the ETHERNET PARAMETER screen, use the UP and DOWN arrows on the right of the screen to highlight the ACCESS CONTROL field.
    b. Press the ACCESS CONTROL button on the top of the screen.
    c. Use the UP and DOWN arrows to highlight the SELECT FROM RECENT field.



    d. Press the SELECT FROM RECENT button at the top of the screen to view the IP address history.



6.6.2.6 Comms Range Setup

A Comms Range value assigns a unique index number to a pressure sensor installed in the PACE. This is used to identify the pressure sensor when communicating with the PACE using SCPI. For example, a PACE is installed with three pressure sensors:

- 1150 mbar a
- 2 bar g
- Barometric sensor

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In the Comms Range value configuration, they are assigned the following ranges:

- Range 1 = 1150 mbar a
- Range 2 = Barometric sensor
- Range 3 = 2 bar g

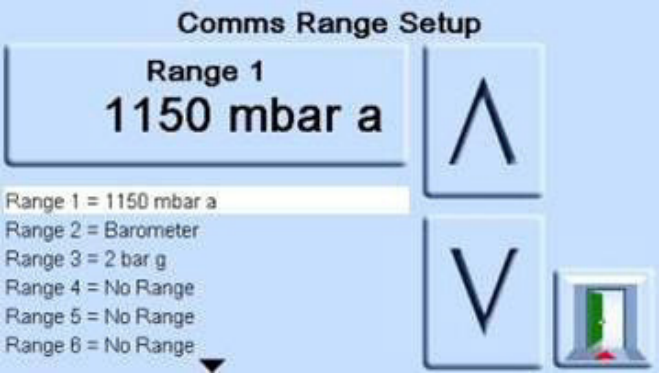
When communicating with the PACE, to request a pressure reading from the 1150 mbar a sensor, the SCPI command requests a reading from Index 1. To request a pressure reading from the Barometric sensor, the SCPI command requests a reading from Index 2. Etc.

Note: The following procedure only allows the supervisor to select these user pre-installed values. To initially define, change or delete the Comms Range values, refer to document K0472 PACE SCPI Remote Communications Manual.

To configure the Comms Range Setup:

1. Navigate to the supervisor communications configuration. Refer to Section 6.6.2.1, “Navigating to Communications Menu,” on page 38.
2. On the COMMUNICATIONS screen, select COMMS RANGE SETUP.

3. On the COMMS RANGE SETUP, use the Up and Down arrows to highlight the desired Range (Ranges 1 to 10).



   Comms Range Setup is used to align the SCPI index (x) to a pressure range.

   Where Range is index (1)… etc.

4. Press the top touch area on the screen to change the range value.
5. Use the Up and down arrow to highlight the new Range value.
6. Press the top Measure on the screen to change the range value. The new range value is set and the screen returns to the COMMS RANGE SETUP screen.
7. If necessary, repeat Steps 3 to 6 to set up other range values.
8. Press the Escape icon to go back to the COMMS RANGE SETUP screen.
9. When complete, press the Escape icon as necessary to return to the Measure screen.

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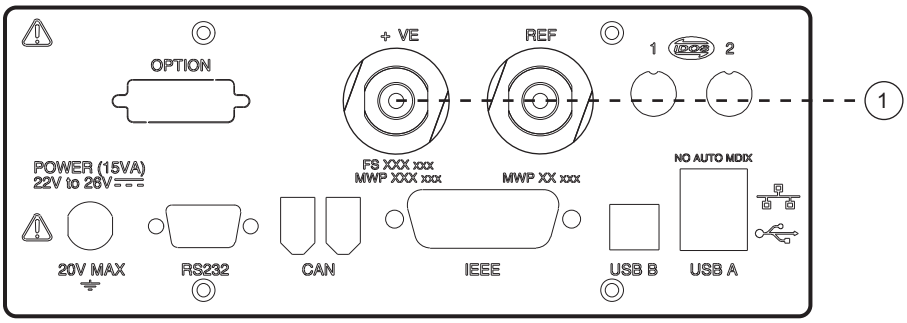
6.6.3 Gas Head Correction

Corrects pressure reading for the height difference between instrument reference level and UUT. For accuracy, head correction must be enabled and the parameters set for each sensor.



1 Reference level.

- For UUT positioned higher than the reference level of the PACE, enter a positive height correction.
- For UUT positioned lower than the reference level of the PACE, enter a negative height correction.
- When calibrating the PACE instrument disable the gas head correction and correct the actual applied pressures for height.

6.6.4 Lock Tasks

6.6.4.1 Individual Tasks

Allows any combination of individual tasks to be disabled.

Note: Restricts operation of the instrument to specific tasks or functions, recommended for production procedures.

6.6.4.2 All

Disables all tasks.

6.6.5 Change PIN

Changes the Supervisor PIN: enter the existing PIN, then the new PIN and confirmation of the new PIN.

Note: Confirmation of the new PIN permanently replaces the old PIN. Record this new PIN and keep in a safe place. If new PIN is lost it can only be reset by returning the instrument to a Druck service center.

6.6.6 User Defined Units

Permits the user to define a set of units. Following the on-screen prompts special units may be set by selecting a Pascal multiplier and assigning a five character name.

6.6.7 Instrument Alias Name

Permits the user to define a 20 character alias name for the instrument. The instrument returns this name through the communications interfaces.

6.6.8 Language

Operation in any of the following languages can be selected:

- English (default)
- French
- German
- Italian

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- Portuguese
- Spanish
- Russian
- Chinese
- Japanese

More languages can be added.

6.6.8.1 Adding a Language

Languages can be added as follows. Refer to Figure 6-1.

1. Create a language file by translating from the English language file.
2. Check the pixel width of each translated word by using the PACE language check file. This can be downloaded from the Druck Support Central.
3. Create an empty DPI folder on a USB stick.
4. Create an empty “LANGUAGES” sub-folder.
5. The language file naming conventions is “Language<<language name>>.lng”.
6. Save the language file into the languages sub-folder.
7. Use the PACE instrument software upgrade procedure to upload the language file from the USB stick into the PACE instrument.

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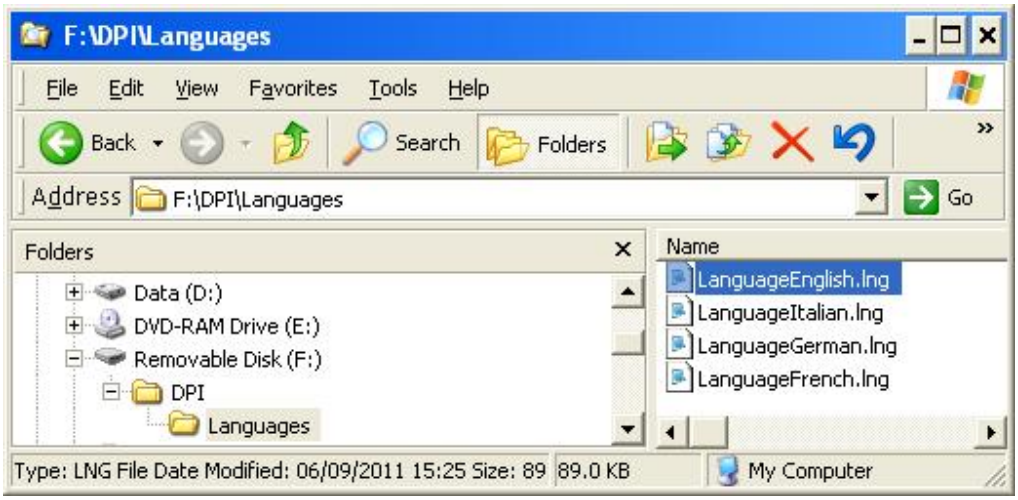
Note: An English and French language file name would be: LanguageEnglish.lng and LanguageFrench.lng. Language files named “Language.lng” or in any other format will be ignored by PACE.



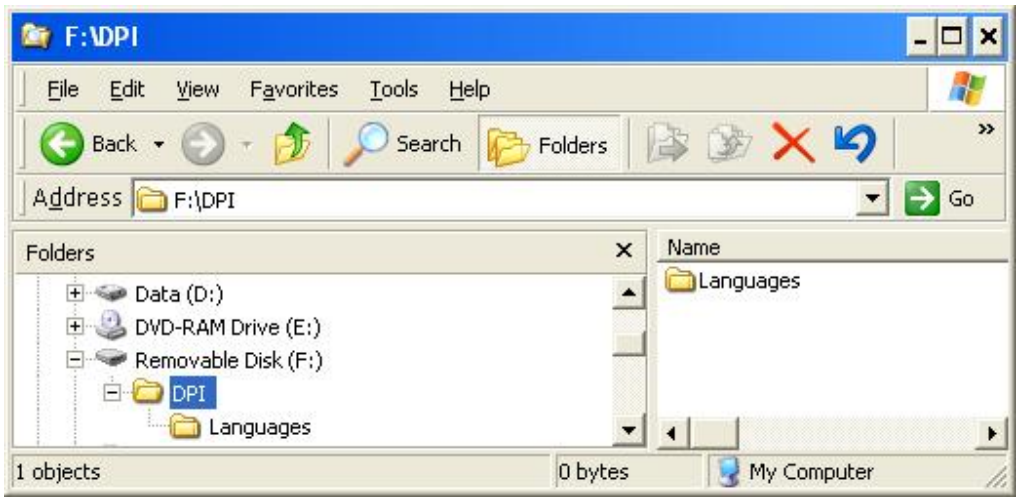


Figure 6-1: Language Setting

6.6.9 Restore as Shipped Settings

Restores instrument settings to factory default.

Note: Does not affect PIN settings.

6.7 Calibration

INFORMATION **A PIN protects the Calibration menu against unauthorized use. Each instrument, on delivery, contains the factory set PIN (4321). To continue protecting the supervisor setup menu, the PIN should be changed as soon as possible.**

The instrument should be returned to the manufacturer or calibration facility. Refer to Section 6.12, “Packaging Procedure,” on page 56.

To find the date of the last calibration, press Measure Setup > Status > Calibration history.

The calibration menu provides facilities for programming settings for maintenance as follows:

6.7.1 Sensor Correction

Selects the range for a three-point calibration routine.

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6.7.2 Screen Calibration

Selects touch screen calibration routine.

6.7.3 Time & Date

Sets instrument clock and date.

6.7.4 Change PIN

Changes the Calibration PIN.

a. Enter the existing PIN.

b. Enter the new PIN.

c. Confirm the new PIN.

Note: Confirmation of the new PIN permanently replaces the old PIN. Record this new PIN and keep in a safe place. If new PIN is lost it can only be reset by returning the instrument to a Druck service center. For more information regarding calibration, refer to PACE Calibration Manual K0450.

6.8 Specification

Refer to the PACE1000 Data Sheet for details.

Note: The Data Sheet is contained in the CD shipped with the product.

6.9 Options

6.9.1 Soft Options

To enable soft options on a PACE instrument, use the following:

1. Touch the top Measure area of the screen.
2. Select Global Setup.
3. Select Calibration.
4. Enter a Calibration PIN 1234.
5. Enter new option key xxxxxxxxxx (10 digits).
6. After entry of this key PACE confirms the options have been enabled.

Note: Hardware options automatically enable post installation.

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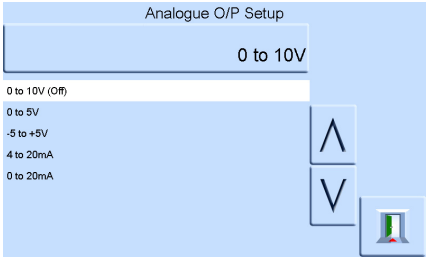
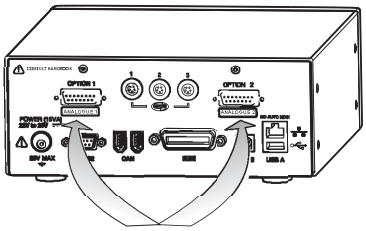
6.9.2 Analog Output Option

The Analog Output option provides an analog output that is proportional to measured pressure.

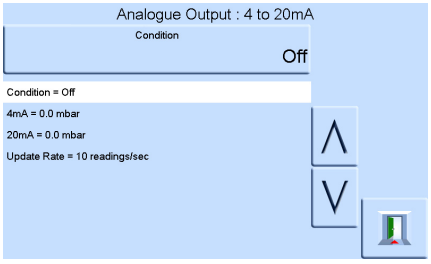
Selects Analogue Output Range





analogue connections

On/Off

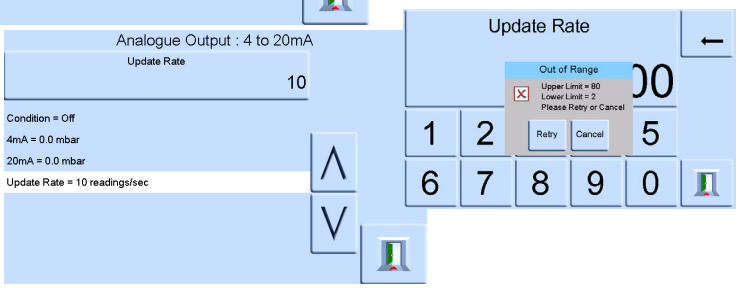


30Vmax

30V maximum with respect to chassis.
Rated output = 24V

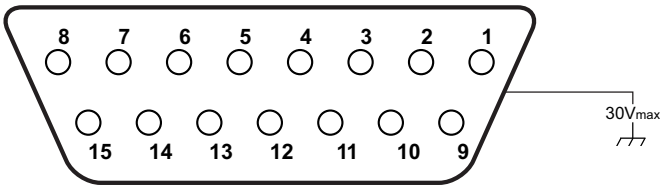
To maintain PACE product safety, external circuits connected to the instrument must meet Safety Extra-Low Voltage (SELV) requirements.

Update rate of Analogue Output option from the control module.



15-way female D connector

Front view of Analogue Option PCB connector



Analogue Output Bandwidth = 0.5 x Update Rate (Hz)

Table 6-5: Pin Number and Function

Pin Number	Function	Pin Number	Function
1	(not used)	9	(not used)
2	(not used)	10	0 V return
3	(not used)	11	+24 V dc output, 100 mA max
4	(not used)	12	Switch In 1
5	(not used)	13	Switch In 2
6	(not used)	14	Analog output +
7	(not used)	15	Analog output -
8	(not used)		

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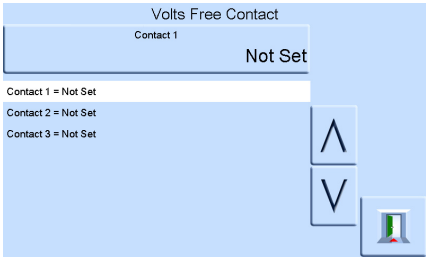
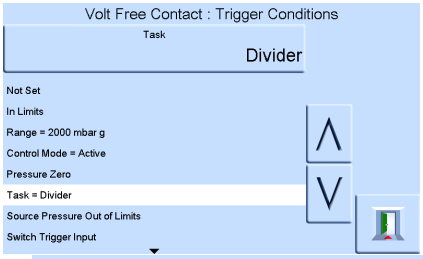
6.9.3 Volts-free Contact Option

The Volts-free Contact option provides a selectable relay contact toggle depending on conditions set in the PACE instrument.

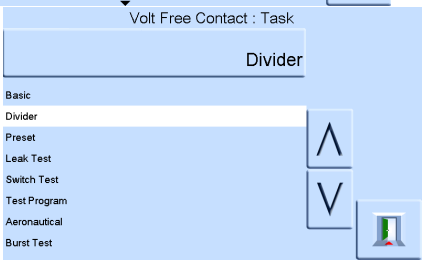
Each selection has three Volts-free Contacts.



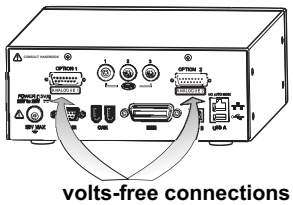
Selection of trigger conditions.



Selection of trigger conditions.



Relay contacts rated at 30 Vdc, 1 A resistive, 200 mA inductive.

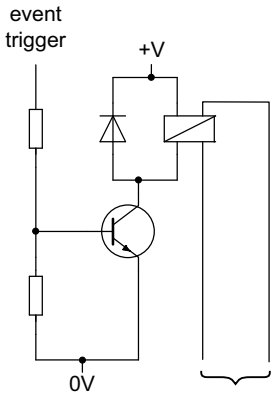


volts-free connections

30Vmax

30V maximum with respect to chassis.
Rated output = 24V

To maintain PACE product safety, external circuits connected to the instrument must meet Safety Extra-Low Voltage (SELV) requirements.



Typical Volts-free schematic

24 Vdc maximum
30 Vdc wrt chassis
1 A resistive maximum

Table 6-6: Pin Number and Function

Pin Number	Function	Pin Number	Function
1	Relay 1 normally CLOSED	9	Relay 3 common
2	Relay 1 normally OPEN	10	0V return
3	Relay 1 common	11	+24 V dc output, 100 mA max
4	Relay 2 normally CLOSED	12	Switch Input 1
5	Relay 2 normally OPEN	13	Switch Input 2
6	Relay 2 common	14	(not used)
7	Relay 3 normally CLOSED	15	(not used)
8	Relay 3 normally OPEN		

6.10 Installation and Ancillary Equipment Kit

Refer to the Data Sheet for details.

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6.11 Return Goods/Material Procedure

If the unit requires calibration or is unserviceable, return it to the nearest Druck Service Centre listed at: **Druck.com**

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

- Product (e.g. PACE1000).
- Serial number.
- Details of defect/work to be undertaken.
- Include any error code(s) if available.
- Operating conditions.

6.11.1 Safety Precautions

INFORMATION Service by unauthorized sources will affect the warranty and may not guarantee further performance.

You must inform Druck if the product has been in contact with any hazardous or toxic substance.

The relevant COSHH or in the USA, MSDS, references and precautions to be taken when handling.

6.12 Packaging Procedure

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

   If available, use the original packing material. When using packing materials other than the original, do the following:
8. 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.
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. Seal carton with approved sealing tape.
13. Mark carton “FRAGILE” on all sides, top, and bottom of shipping container.

The following conditions apply for both shipping and storage:

- Temperature range: -20° to +70°C (-4° to +158°F).

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Appendix A. Pressure Units and Conversion Factors

Pressure Units	Factor (hPa)	Pressure Units	Factor (hPa)
mbar	1.0	cmH_2O @ 20°C	0.978903642
bar	1000.0	mH_2O @ 20°C	97.8903642
Pa (N/m^2)	0.01	kg/m^2	0.0980665
hPa	1.0	kg/cm^2	980.665
kPa	10.0	torr	1.333223684
MPa	10000.0	atm	1013.25
mmHg @ 0°C	1.333223874	psi	68.94757293
cmHg @ 0°C	13.33223874	lb/ft^2	0.4788025898
mHg @ 0°C	1333.223874	inH_2O @ 4°C	2.4908891
inHg @ 0°C	33.86388640341	inH_2O @ 20°C	2.486413
mmH_2O @ 4°C	0.0980665	inH_2O @ 60°F	2.487641558
cmH_2O @ 4°C	0.980665	ftH_2O @ 4°C	29.8906692
mH_2O @ 4°C	98.0665	ftH_2O @ 20°C	29.836983
mmH_2O @ 20°C	0.097890364	ftH_2O @ 60°F	29.8516987

To convert from pressure VALUE 1 in pressure UNITS 1, to pressure VALUE 2 in pressure UNITS 2, calculate as follows:

$$\text{VALUE 2} = \text{VALUE 1} \times \frac{\text{FACTOR 1}}{\text{FACTOR 2}}$$

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Appendix B. 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.

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Appendix C. User Interface Icons

The following icons are used in the PACE series of instruments. Not all icons are used in every PACE instrument.

Display Icons in Setup Menus					
Icon	**Function**	**Icon**	**Function**	**Icon**	**Function**
	Active		Aero setup		Aeronautical
	Airspeed range		Alarm		Altitude range
	Area of use		Asterisk		Auto range
	Audio volume		Auto zero		Backlight
	Barometer		Basic		Burst pressure control mode
	Calibration		Calibration history		Change supervisor PIN
	Communications		Contrast		Control mode
	Copy		Correction analog output		Correction sensor
	Correction source sensor		Correction valve		Current setup
	Date & time		Delete		Diagnostic analog output
	Diagnostic barometric option		Diagnostic control sensor		Diagnostic controller
	Diagnostic general		Diagnostic RS-232		Diagnostic source sensor
	Diagnostic vacuum sensor		Diagnostic volt-free		Diagnostics
	Display		Divider		Error

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Appendix C. User Interface Icons

Display Icons in Setup Menus					
Icon	**Function**	**Icon**	**Function**	**Icon**	**Function**
	Escape		Ethernet		Ethernet not connected
	Ethernet connected		Exclamation		Fault history
	Gas head pressure		Gauge mode		Global setup
	Go-to-ground		Hardware build		Home
	Idle time-out		IEEE 488		Information
	In limits		Instrument		Instrument accuracy
	Instrument alias name		Language		Leak test
	Lock		Lock tasks		Logic output
	Max-min		Max peak		Min peak
	Nudge		Passive mode		Percentage
	PIN		Power-up		Preset
	Pressure		Pressure filter		Process
	Protective vent		Question		Range
	Recall user setup		Reset use log		Resolution
	Re-try		Roughing		RS-232
	Restore to as shipped settings		Restore settings 2		Run

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Display Icons in Setup Menus					
Icon	**Function**	**Icon**	**Function**	**Icon**	**Function**
	Save as shipped		Save recall user setup settings		Save user setup
	Screen mode		Screen saver		Select range
	Set-point disable/enable		Set-point limits		Set-point higher limit
	Set-point lower limit		Set date		Set serial number
	Set time		Setup zero		Slew rate linear
	Slew rate max rate		Software build		Software upgrade history
	Software upgrade		Status		Status area
	Step (single)		Stop		Supervisor setup
	Switch test	Tare	Tare		Support
	Task		Test program		Test program copy
	Test program delete		Timing		Time out
	Timed zero		Units		User defined units
	Use log		Use log history		Vent
	Vent time out		Vent Yes/No		Vent setup
	Warning		Zero analog output		Zero history
	Zero				

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