PACE1000
PACE Tallis

Pressure Automated Calibration Equipment
Instruction Manual

Druck.com

Introduction

INFORMATION **Read this manual carefully before use. Keep for future reference.**

A PACE Indicator measures pneumatic and hydraulic pressures. It shows the measured pressure readings on a color touchscreen display that you can also use to change the operation modes of the Indicator. The Indicator can be operated remotely through communication interfaces.

Safety

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

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

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 more than the maximum working pressure of the Indicator.

This equipment is not rated for oxygen use.

This equipment is safe when you use the procedures in this manual. Do not use this equipment for any other purpose than shown, or it is possible that the protection given by the equipment will not work.

This manual has user instructions and safety information for the PACE Indicators. All personnel must be correctly trained and qualified before they use or do maintenance on the Indicator. The customer must make sure this occurs.
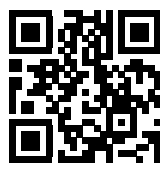
Maintenance

Maintain the equipment using procedures in this manual. The maintenance of parts not shown in this manual can only be done by approved service agents or the manufacturer's service departments.

Technical Advice

Contact the manufacturer for technical advice.

Symbols

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

General 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 meters (6560 ft)
EMC	EN 61326
Electrical Safety	EN 61010-1, UL 61010-1, CSA 22.2, No. 61010-1 and IEC 61010-1
Power Adapter	Input range: 100 - 240 V ac, 50 to 60 Hz, 600 - 300 mA, installation category II. Druck part number IS1000118M9922-12
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.

Glossary

This manual uses these terms. Abbreviations are the same in the singular and plural.

Term	Description	Term	Description
a	Absolute	max	Maximum
ac	Alternating Current	mbar	millibar
bar	Unit of pressure	min	Minute or minimum
bara	bar - absolute	MSDS	Material safety data sheet
barg	bar - gauge	MWP	Maximum working pressure
dc	Direct current	NPT	National Pipe Thread
DPI	Digital Pressure Instrument	Pa	Pascal
ft	Foot	PACE	Pressure Automated Calibration Equipment
g	Gauge	psi	Pounds per square inch
GPIB	General purpose interface bus	REF	Reference
H_2O	Water	RS-232	Serial communications standard
Hg	Mercury	Rx	Receive data

Term	Description	Term	Description
Hz	Hertz	SCPI	Standard Commands for Programmable Instruments
IDOS	Intelligent Digital Output Sensor (Druck product)	SELV	Separated (or Safety) Extra Low Voltage
IEEE 488	Institute of Electrical and Electronic Engineers standard 488 (for programmable devices with a digital interface)	Tx	Transmit data
in	Inch	UUT	Unit Under Test
kg	kilogram	V	Volts
m	Meter	°C	Degrees Celsius
mA	milliampere	°F	Degrees Fahrenheit

Associated Publications

This 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

Contents

1. Description

1.1 PACE1000 and PACE Tallis

Figure 1-1: PACE1000 Front View

This manual describes the PACE1000 and PACE Tallis Indicators. It shows the specific differences between the two Indicators where necessary.

The PACE Indicators measure pneumatic and hydraulic pressures. The front of each Indicator has a color touchscreen display that shows the measured pressure and Indicator status. You use the touchscreen to make selections and change settings.

The front panel includes a sounder which can 'beep' as you make selections on the touchscreen. It also works as an alarm sounder. You can set an alarm to trigger when the pressure is more than the high alarm or falls below the low alarm. The sounder beeps when the alarm triggers and the display shows an alarm symbol (bell).

The Indicator has two foldable legs at the bottom of the unit. The legs let you raise the front for easier use.

Note: An Indicator is a measuring instrument, so it can also be called an 'instrument'.

Figure 1-2: A Typical Rear View

The rear of the Indicators has all the pressure input and electrical connections. The electrical connections include sockets for the power supply and communication interfaces. Some connections give remote operation of the Indicator.

Note: The image shows a typical rear view. Your Indicator can have a different rear panel - determined by your choice of options.

You can use the Indicator in three ways:

• Free-standing on a horizontal surface.

- Rack-mounted in a standard 19 inch rack by the use of the rack-mount option kit.
- Panel-mounted by the use of the panel-mount option kit.

1.2 PACE Tallis

Figure 1-3: PACE Tallis Front View

PACE Tallis Indicators look the same as the PACE1000 and work in the same way, except for some small differences shown in this guide.

PACE Tallis Indicators use only Absolute Reference Standard Sensors. They are 'reference transfer standard calibrators'. They are enhanced versions of the standard PACE1000 Indicator with superior accuracy and stability due to the use of our TERPS (TRS) sensors and some changes to the options in the software.

PACE Tallis Indicators will only meet the stated accuracy and stability when used with the TRS sensors. If you use sensors that are not TRS, the PACE Tallis Indicator will show a warning when you first energize the Indicator.

1.3 Sensor Types

The PACE1000 Indicator can have IPS or IRS sensors. IPS sensors are piezo-resistive. IRS are resonant sensors. IPS sensor are gauge and IRS sensors are absolute.

We only supply TRS3 sensors with PACE Tallis. TRS3 sensors are absolute resonant sensors.

Important - IRS3 and TRS sensors of 8 bara and above must be regularly zeroed against the internal barometer. See "IRS and TRS (Tallis) Periodic Sensor Zeroing" on page 52.

1.4 More Information

Refer to the PACE1000 and PACE Tallis Datasheets for available options.

2. Installation

2.1 Unpacking

INFORMATION **After unpacking a cold Indicator, allow time for it's temperature to stabilize and any condensation to evaporate.**

Make sure the Indicator packaging includes these parts:

i. PACE Indicator.

ii. Power supply adapter.

iii. Safety instructions.

iv. Calibration certificate.

2.2 Placement

There are three possible ways to prepare the Indicator:

• Put it on a horizontal surface as a free-standing Indicator. You can use the feet underneath the Indicator to lift the front to a better viewing angle.

• Rack mount it in a standard 19 inch rack by the use of the rack-mount option kit. Refer to Section 2.5.1, "Rack-mount Option," on page 8.

• Panel mount it by the use of the panel-mount option kit. Refer to Section 2.5.2, "Panel-mount Option," on page 9.

CAUTION **In all installations, make sure air can flow freely around the Indicator.**

2.3 Pressure Connections

WARNING **Isolate the source pressure(s) and carefully release pressure from the pressure pipes before the disconnection or connection of the pressure pipes. Continue with care.**

Only use equipment with the correct pressure rating.

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

Do not apply more than the maximum working pressure of the Indicator.

This equipment is not rated for oxygen use.

2.3.1 Pressure Adapters

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

IO-SNUBBER-1

IO-DIFFUSER-1

IO-ADAPT-9/16AUTOC

IO-ADAPT-7/16UNF

IO-ADAPT-G1/4

IO-ADAPT-AN4

IO-ADAPT-1/8NPT

IO-ADAPT-AN6

IO-ADAPT-1/4NPT

IO-ADAPT-BARB
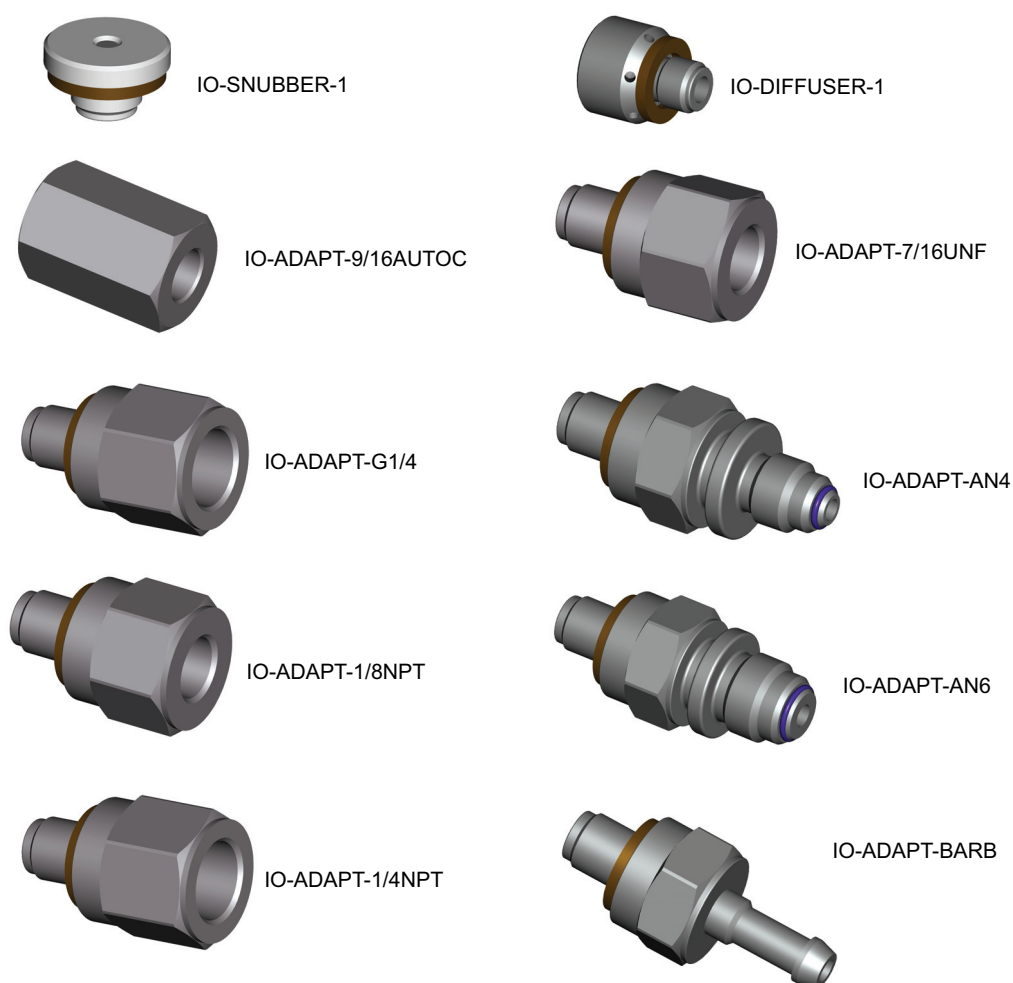
Figure 2-1: Pressure Adapters

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

Table 2-1: Pressure Adapter Specification

Adapter Part Number	Specification
IO-SNUBBER-1	Restricter/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.

2.3.2 Pressure Connection

⚠️ **WARNING** **Only use parallel threads. Female thread type is parallel thread to ISO228/1 (DIN ISO228/1, JIS B0202) G1/8.**

DO NOT CONNECT TAPERED THREADS DIRECTLY TO THE INDICATOR. Connect NPT tapered threads through a suitable pressure adapter.

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.
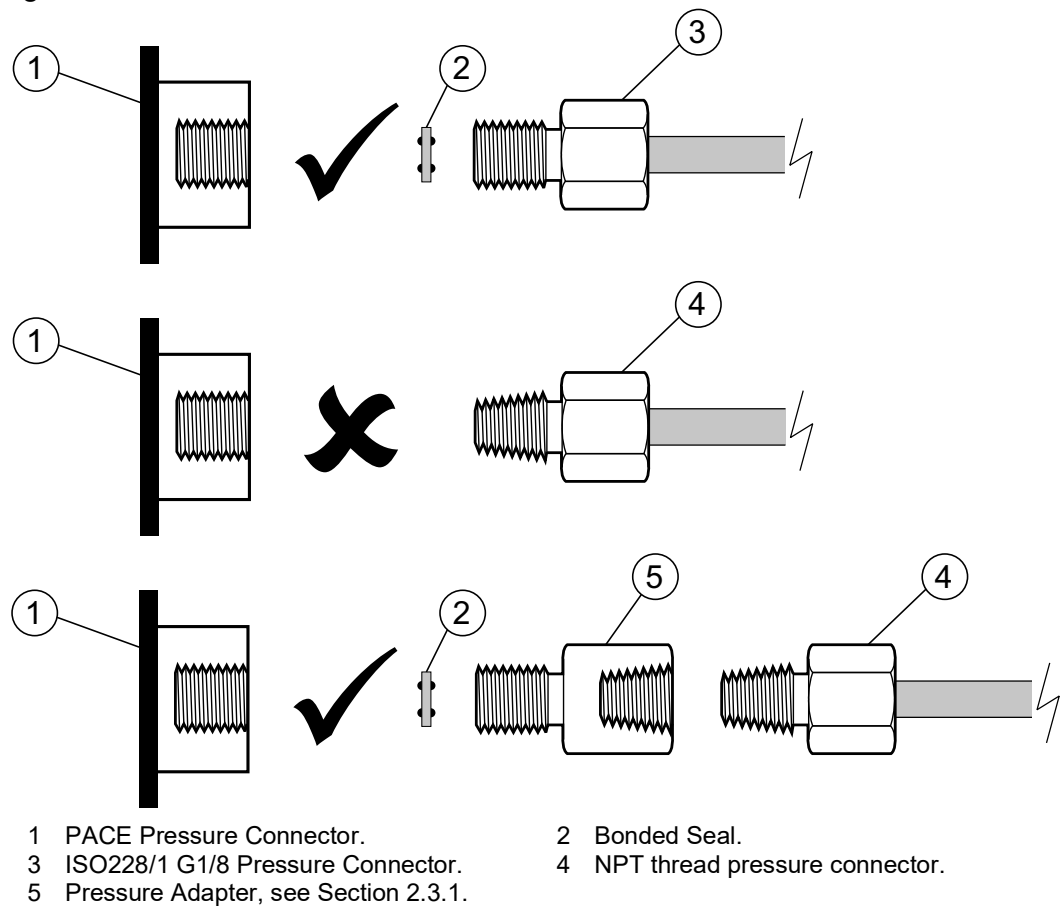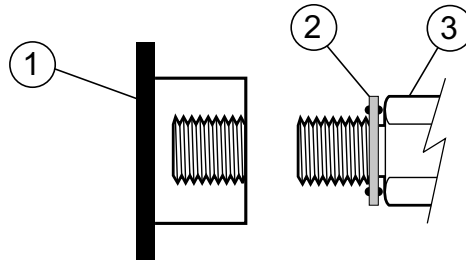

1	PACE Pressure Connector.	2	Bonded Seal.
3	ISO228/1 G1/8 Pressure Connector.	4	NPT thread pressure connector.
5	Pressure Adapter, see Section 2.3.1.		

Figure 2-2: PACE Pressure Connection

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

1   PACE pressure connector.
2   Bonded seal.
3   ISO228/1 G1/8 pressure connector or adapter. For
     adapters, see Section 2.3.1.

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

2.4 Connecting to UUT (Unit Under Test)

The pressure must not be more than 1.25 x full-scale or MWP stated on the rear panel of the Indicator.

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

2.4.1 Pneumatic Connection

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

CAUTION **Do not apply more than the maximum pressures for the unit under test.**

Reduce pressure at a controlled rate when releasing to atmosphere.

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

1. De-energize the power supply before connecting or disconnecting the Indicator.

2. Use the correct sealing method for all pressure connections. Refer to Section 2.3.2 on page 5.

3. Isolate the pneumatic pressures and de-pressurize the pipes (tubes) before connecting or disconnecting the Indicator.

4. Make sure the system that you connect to the Indicator can be isolated and opened to atmosphere.

5. The pneumatic gas must be clean and dry. Refer to specification in the Datasheet.

6. Connect the Unit Under Test (UUT) to the related connection port.

2.4.2 Hydraulic Connection

WARNING **Hydraulic liquid is dangerous. Obey applicable health and safety precautions. Use applicable protective barriers and eye protection.**

Before the application of pressure, examine all fittings and equipment for damage. All equipment must have the correct pressure rating.

Do not apply more than the maximum working pressure of the Indicator or the unit under test.

Remove all air from the hydraulic liquid.

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

CAUTION

Reduce pressure at a controlled rate when opening to atmosphere.

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

Make sure that there is absolute cleanliness for use of the Indicator.

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

Connect only clean equipment to the Indicator.

Use an external filter to avoid any contamination.

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

1. De-energize the power supply before the connection or disconnection of the Indicator.
2. Use the applicable sealing method for all pressure connections. Refer to Section 2.3.2 on page 5.
3. Isolate the hydraulic pressures and release the pressure in the pipes (tubes) before connection or disconnection of the Indicator.
4. Make sure the user systems can be isolated and opened to atmosphere.
5. The hydraulic liquid must be clean: refer to specification given in the Datasheet.
6. Connect the Unit Under Test (UUT) to the related connection port.
7. Fill and bleed the UUT and connection pipes (tubes).

2.5 Mounting Kits

2.5.1 Rack-mount Option

The length of the cables and pipes (tubes) must give enough room for the removal and installation of the Indicator. Make sure that there is a free flow of air through the equipment rack and around the Indicator.
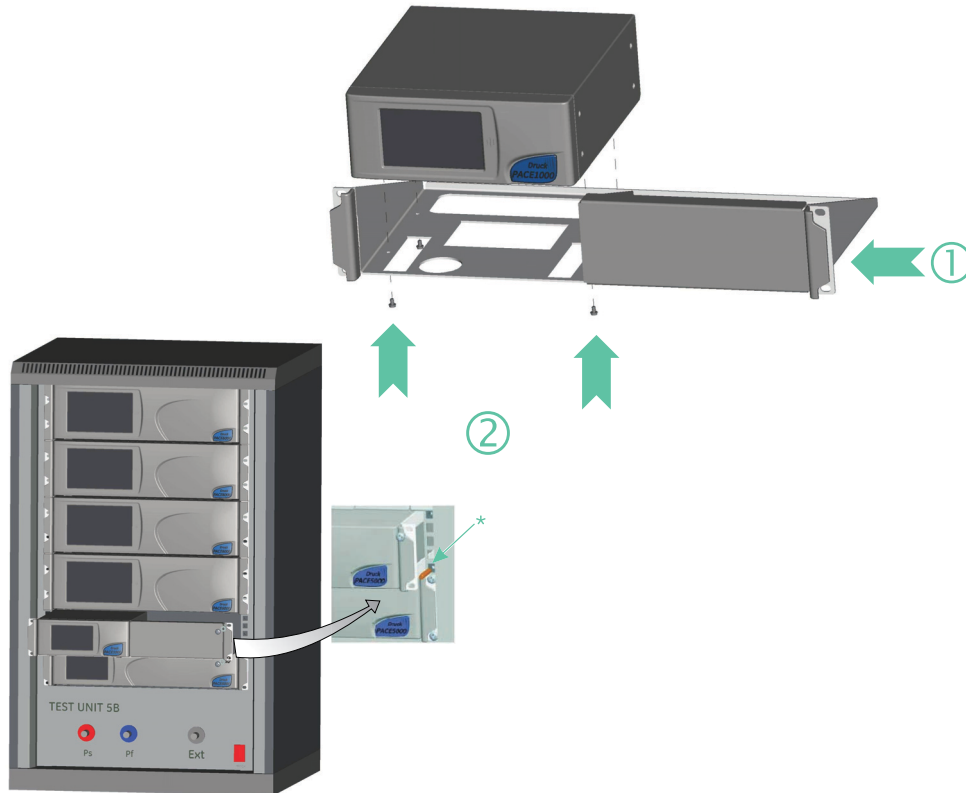

Figure 2-4: Rack-mounting

1. Put the Indicator in the rack mount assembly (1).
2. Use the four M3 x 6 screws (2), (maximum length M3 x 8) to set the Indicator in position.
3. Support the Indicator and connect the cables and pipes (tubes).
4. Refer to the electrical connections below before the Indicator goes into the equipment rack.
5. Temporarily locate the two spigots to each side of the equipment rack.
6. Engage and slide the Indicator into the rack.
7. Engage the Indicator on the spigots.
8. Secure the Indicator 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).

2.5.2 Panel-mount Option

There must be enough space at the rear of the Indicator for all the cables and pipes (tubes). The length of the cables and pipes (tubes) must allow for the removal and fitting of the Indicator. Allow a free flow of air through the equipment rack and around the Indicator.
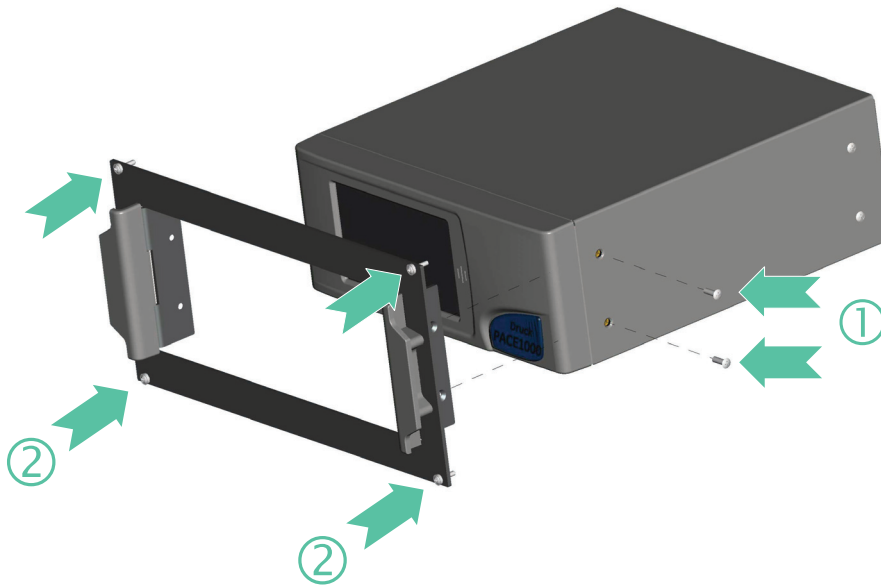

Figure 2-5: Panel-mounting

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

2.6 Communication Connection

Connect your connectors into the rear panel communications ports and secure with the captive screws if applicable.

Note: The RS-232 and IEEE 488 interfaces are enabled when the Indicator is energized. Set the parameters in the Supervisor Setup/communications menu. Refer to Section 6, "Communications," on page 39.

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

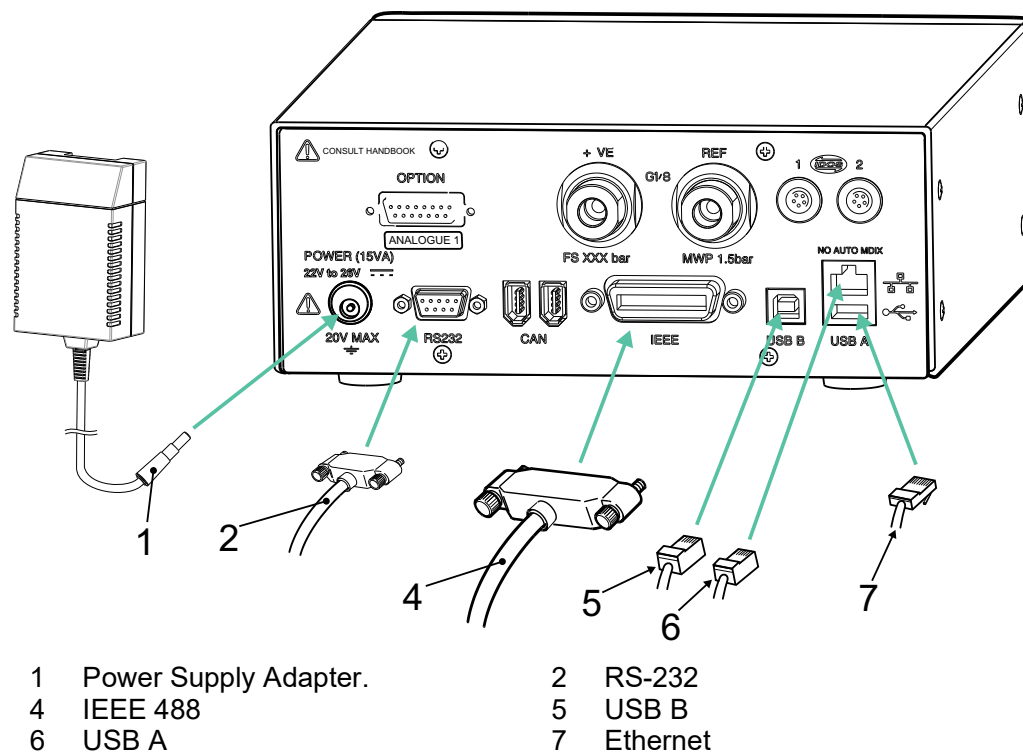| 1 | Power Supply Adapter. | 2 | RS-232 |
| 4 | IEEE 488 | 5 | USB B |
| 6 | USB A | 7 | Ethernet |

Figure 2-6: Communication Connectors

2.6.1 RS-232 Interface

When using the RS-232 Interface, connect a cable directly from the Indicator to a suitable port on the computer in a 'point to point' link.

Table 2-3 shows the pin connections for the 9-pin D-type, RS-232 connector and the way they connect between the Indicator and the RS-232 control signals, together with the device interconnection interface. The Indicator is set as a Data Circuit Terminating Equipment (DCE).

Table 2-3: RS-232 Connections

Indicator		Control Line		Computer	
Indicator 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

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

2.6.2 IEEE 488 Interface

The interface complies with IEEE 488 standard.

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

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

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

2.6.2.1 Single Unit Installation

1. Connect an IEEE 488 connector and cable assembly to the rear panel of the Indicator.
2. Connect the other end of the connector and cable assembly to the IEEE 488 connector on the controller or computer.
3. Change the IEEE 488 communication parameters. Refer to "IEEE 488" on page 39.

2.6.2.2 Multiple Unit Installation
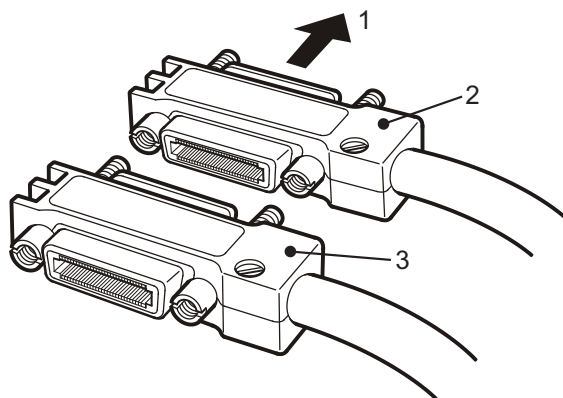
To install multiple units use stacking plugs to link the first Indicator and second Indicator as shown:

1. Connect to rear panel of first Indicator (1).
2. Connector from controller or computer (2).
3. Connector to rear panel of second Indicator (3).
4. Connect the IEEE 488 connector on the controller or computer and the other connector into the next Indicator.
5. Do again this procedure for all the Indicators in the system.
6. Use the **Supervisor** Menu > **Communications** on each Indicator to setup the necessary communication parameters. Refer to "IEEE 488" on page 39.
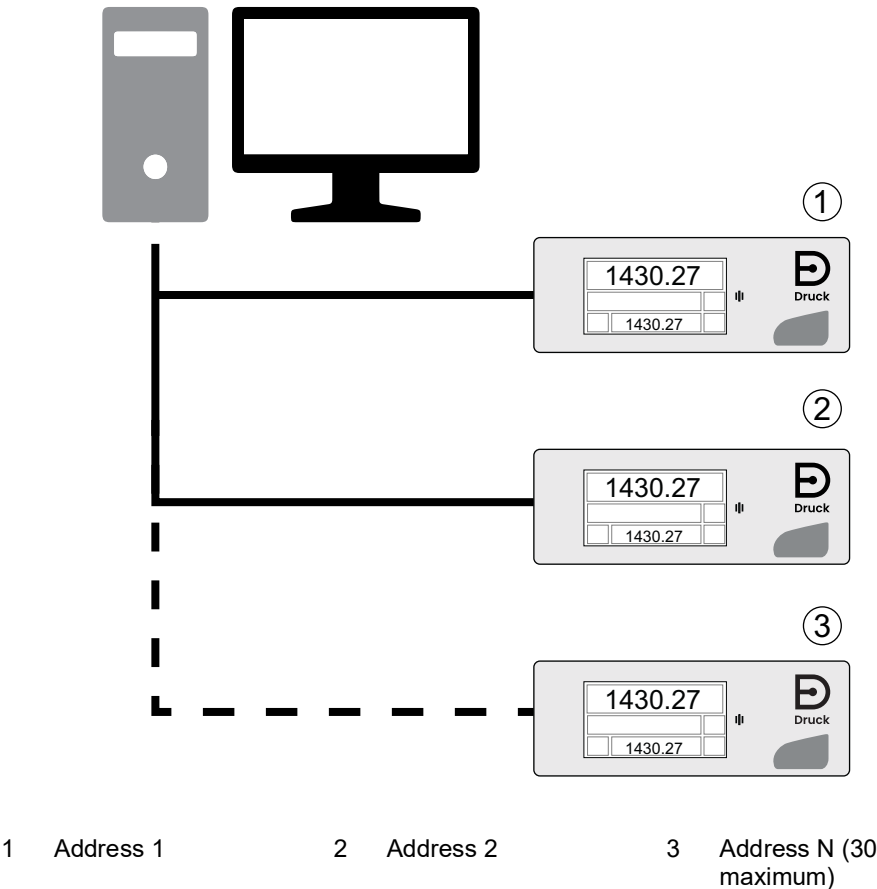
12 | PACE Indicators Instruction Manual–English

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

Figure 2-7: 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

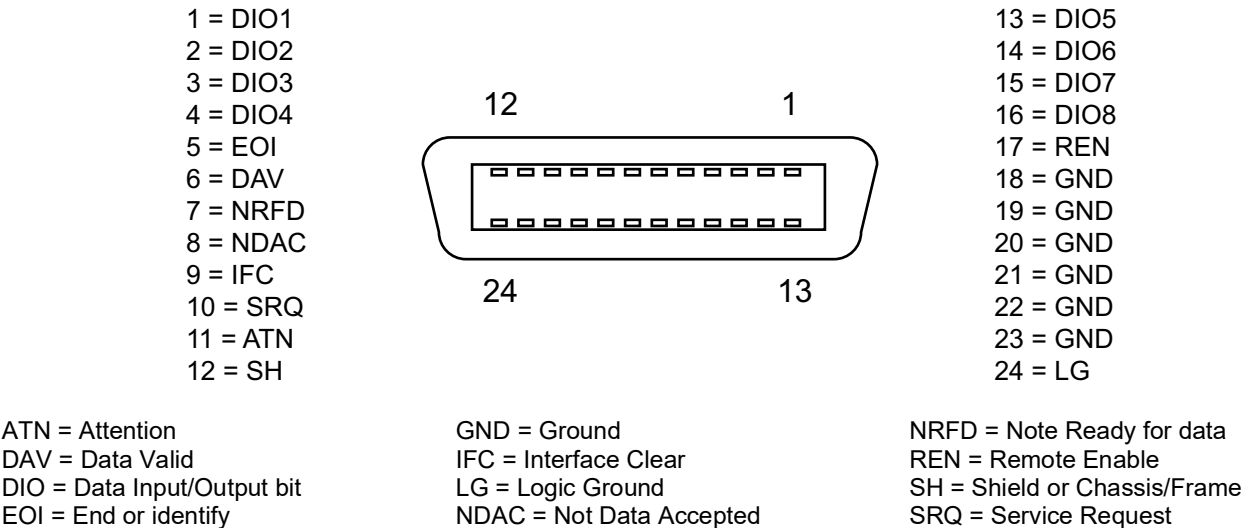| ATN = Attention | GND = Ground | NRFD = Note Ready for data |
DAV = Data Valid	IFC = Interface Clear	REN = Remote Enable
DIO = Data Input/Output bit	LG = Logic Ground	SH = Shield or Chassis/Frame
EOI = End or identify	NDAC = Not Data Accepted	SRQ = Service Request

Figure 2-8: GPIB IEEE 488 Connector Pinout

2.7 Power Connection and Power up Procedure

⚠ **CAUTION** Use only the power adapter supplied with the Indicator. Using other power adapters can cause over-heating, this can result in a fire.
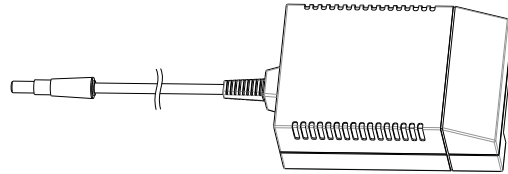Do not let the power adapter come into contact with any moisture or liquids.

Figure 2-9: Power Adapter

1. Use only the SELV power adapter supplied with the Indicator. See "General Specification" on page iii.
2. Install an accessible power isolator to use as the disconnecting device in the power adapter supply circuit.

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

3. Connect the power adapter to the Indicator.
4. Switch the power supply on.
5. Make sure the front panel display shows the power-up sequence. Refer to Section 3.2, "Typical Display Starting Sequence," on page 15.

2.7.0.1 Connection to Rack-mounted and Panel-mounted Indicators:

1. Install an accessible power isolator to use as the disconnecting device in the power adapter supply circuit.
2. Set the power supply isolator to OFF.
3. Connect the power adapter before sliding the Indicator into the rack.
4. Set the power supply isolator to ON.
5. Make sure that the front panel display shows the power-up sequence. Refer to Section 3.2, "Typical Display Starting Sequence," on page 15.

3. Operation

This section contains details of preparing the Indicator for measurement and its menus and options.

3.1 Preparation

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

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

Before use:

1. If necessary, do any relevant maintenance tasks. Refer to Section 4, "Maintenance and Software Update," on page 33.

2. For bench-top, single Indicator operation:

   a. Connect the Indicator to the electrical supply.

   b. Inspect the pneumatic hoses for damage, dirt and moisture.

3. Review and become familiar with the procedure before starting a process on a component or system.

3.2 Typical Display Starting Sequence

This sequence shows the typical Indicator display as you energize the Indicator.
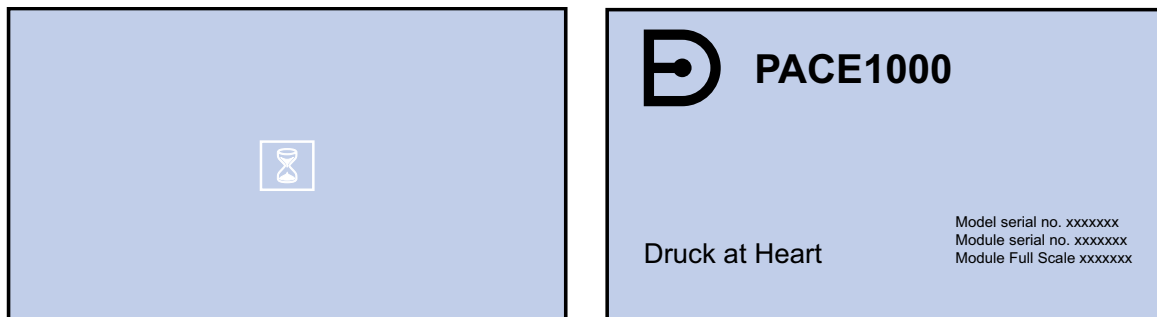
1. Energize the power supply.

Figure 3-1: Starting Sequence

2. The display shows the starting sequence as shown in the image. PACE Tallis is the same but the Indicator name will be different.

   Note: Do not touch the display screen during power-up.

3. The Indicator does a self-test. If the test finds a fault, the display shows an error, see Section 5, "Testing and Fault Finding," on page 35.

4. If the self-test works, the system enables the touchscreen and you will see the **Measure Mode** screen. It will show the measured pressure to the top of the display. The other areas of the display will show the parameters selected in the **Measure Setup** Menu.

5. The Indicator is now ready for use.

   Note: Do not use sharp objects to touch the screen. They can cause permanent damage to the touchscreen.

6. If necessary, do a test on the Indicator. See "Standard Serviceability Test" on page 35.
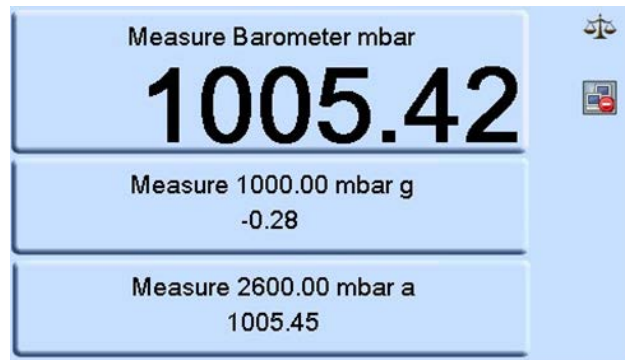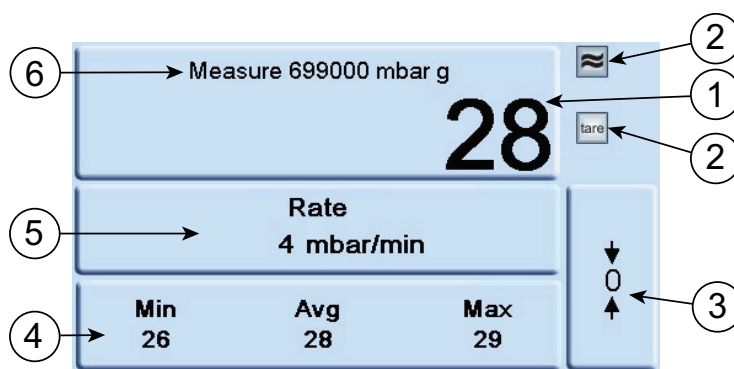
3.3 Measure Mode

Figure 3-2: Typical Measure Mode Screen

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

Figure 3-3: Touchscreen Areas in Measure Mode

The first image gives a typical view of the first screen that you see when the Indicator has started. The screen is in the **Measure Mode**, showing up to three readings from the sensors fitted in the Indicator or connected to the Indicator.

The second image shows a typical view where:

• The top section shows a pressure reading and a range for one sensor.

• The middle section shows a pressure change rate in the **Status Area**. But it can also show a pressure reading and a range for a selected sensor.

• The bottom section shows a minimum, average and maximum readings in the **Function Area**. But it can also show a pressure reading and a range for a selected sensor.

Refer to Appendix C for details of the icons used on the screen.

Touch the different sections of the screen to open menus that let you change how the Indicator is setup and what you see in the **Measure Mode**.

• Touching the top **Pressure Reading** opens the **Measure Setup** menu. See "Measure Setup Menu" on page 18.

• Touching the middle **Status Area** opens the **Status Area Setup** menu. See "Status Area and Function Area Menus" on page 19.

• Touching the bottom **Function Area** opens the **Function Area Setup** menu. See "Status Area and Function Area Menus" on page 19.

3.4 Changing and Saving the Menu Settings and Options

Select the **Escape** button on any screen to return to the **Measure Mode** or to move backwards in the menu structure.

Some menus will show the **Home** button. Use this to return to the **Measure Mode**.

Some menus will show the **More...** button. Use this to move to the next page of the menu and to loop between pages.
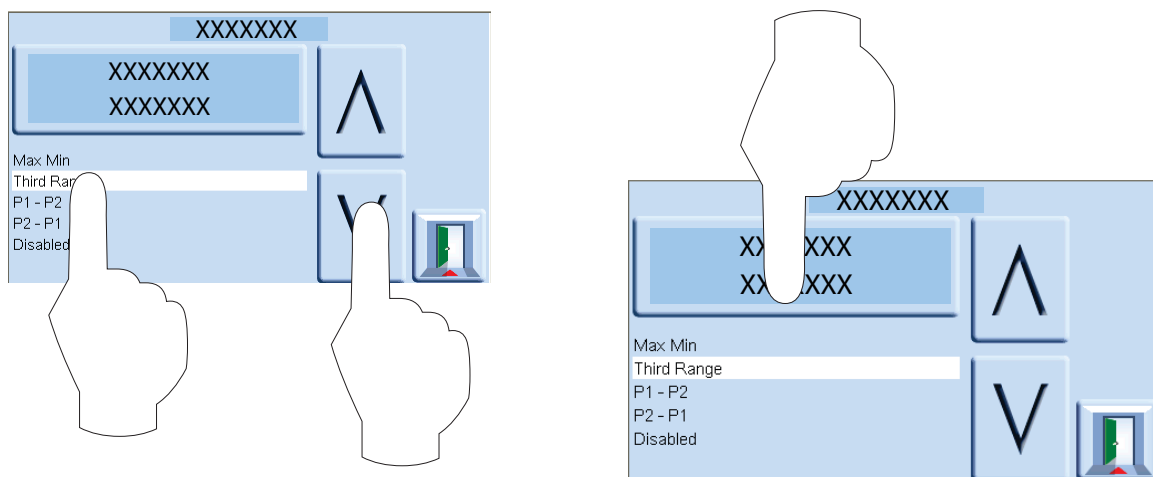

Figure 3-4: Changing and Saving the Menu Settings and Options

You can change settings in the many different menus that you can open. To do this, select a new setting by using the up and down arrows or touch the setting you want, then touch the top part of the screen to save your new settings and return to the menu.
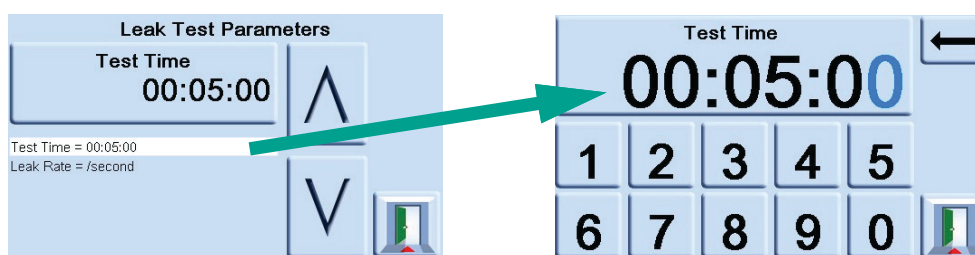

Figure 3-5: Editing Numbers or Letters

When you touch some selections, a numbered or lettered keyboard will open that lets you directly edit the numbers or letters of your selection. When you have done this, touch the top section of the screen to save your new values and return.

INFORMATION **The menus and options shown are typical. The different options for the Indicator will determine the menus and options shown. So some of the menus and options on your Indicator can be different.**

3.5 Measure Setup Menu

Figure 3-6: Measure Setup Menu

Navigation: Touch the top section in the **Measure Mode**.

This menu has these typical options:

- **Pressure Zero** - Sets the current pressure reading to zero. During use, the instrument pressure sensor can show small zero shifts caused by time and temperature changes. Regular "zeroing" increases measuring precision.
- **Range** - Selects the pressure range (sensor) that you see in the **Measure Mode** screen. This also gives an absolute range selection if the Indicator has a barometric option fitted.
- **Process** - See "Process Menu" on page 19.
- **Task** - See "Task Menu" on page 20.
- **Units** - Selects the range of available pressure units.
- **Global Setup** - See "Global Setup Menu" on page 24.
- **Datalog** - See "Datalog Menu" on page 26.
- **Status** - See "Status Menu" on page 28.
- **Barometer** - Sets the conditions for the barometer. This option is only available when the task has been set to **Airfield**. See "Task Menu" on page 20.
- **Range Alias** - Lets you add an alias to the name of the sensor and its range.

Note: Range Alias and **Instrument Alias** are different options.
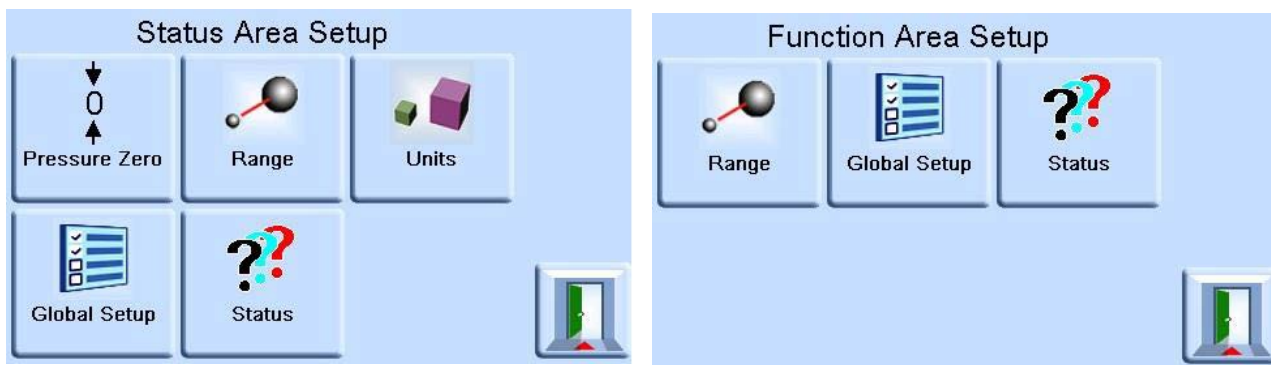
3.6 Status Area and Function Area Menus

Figure 3-7: Status Area and Function Area Menus

Navigation: **Measure Mode** > Touch the **Status Area** or the **Function Area**.

These menus have these typical options:

- **Pressure Zero** - Sets the current pressure range to zero.
- **Range** - Selects the pressure range (sensor) that you see in the **Measure Mode** screen. This also gives an absolute range selection if the Indicator has a barometric option fitted.
- **Units** - Selects the range of available pressure units. You can set special units by selecting a Pascal multiplier and assigning a five character name.
- **Global Setup** - See "Global Setup Menu" on page 24.
- **Status** - See "Status Menu" on page 28.
- **Range Alias** - Lets you add an alias to the name of the sensor and its range.

Note: Range Alias and **Instrument Alias** are different options.
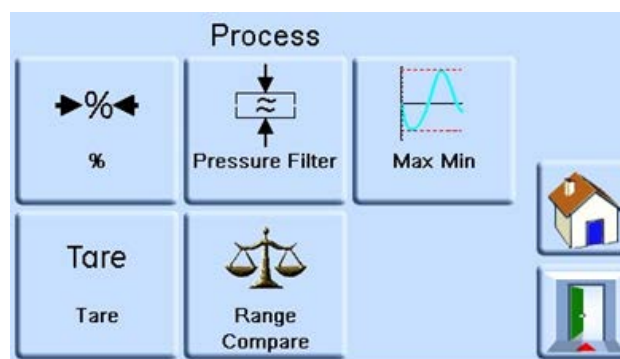
3.7 Process Menu

Figure 3-8: Process Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Process**

This menu has these typical options if you are in **Basic** Task Mode (see "Task Menu" on page 20):

- **%** - Sets the percentage condition on or off. Pressure can be shown as a percentage of full-scale or as a percentage of a specified span.

- **Pressure Filter** - Enables and disables the Pressure Filter function. The reading shown 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.
- **Max Min** - Adjusts the Time Constant for the Max/Min values.
- **Tare** - Enables and disables the Tare function. You can select a specific tare value or the current shown pressure reading can be "captured" as the tare value. The display shows the selected tare value in the pressure window.
- **Range Compare** - Enables and disables the **Range Compare** function. See "Range Compare" on page 50.

If you have selected the **Aeronautical** Task Mode (see "Task Menu" on page 20), the options change to:

- **Altitude Filter** - adds a filter with a time constant and band, where the filter resets if the measured value is out of the band.
- **Airspeed Filter** - adds a filter with a time constant and band, where the filter resets if the measured value is out of the band.
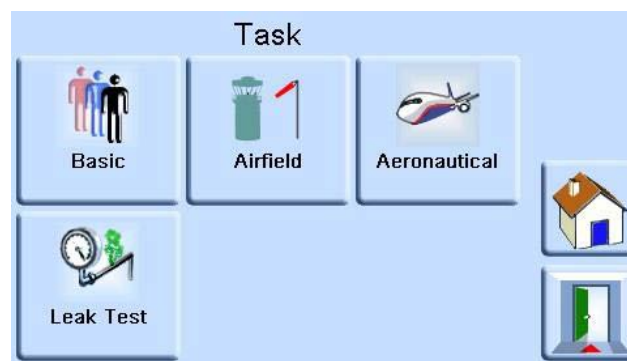- **Altitude Datum** - Offsets the altitude shown by the value you enter.

3.8 Task Menu

Figure 3-9: Task Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Task**

This menu has these typical options:

- **Basic** - Sets the **Measure Mode** screen to show basic measurement.
- **Airfield** - Optional (see Datasheet). Sets the **Measure Mode** Screen to show pressures and Q codes. These units are standardized three letter codes and are available in aeronautical units (feet and meters). Refer to Table 3-1. This also adds a **Barometer** option to the **Measure Setup** menu.
- **Aeronautical** - Opens the Aeronautical Menu. See "Aeronautical Menu" on page 22.
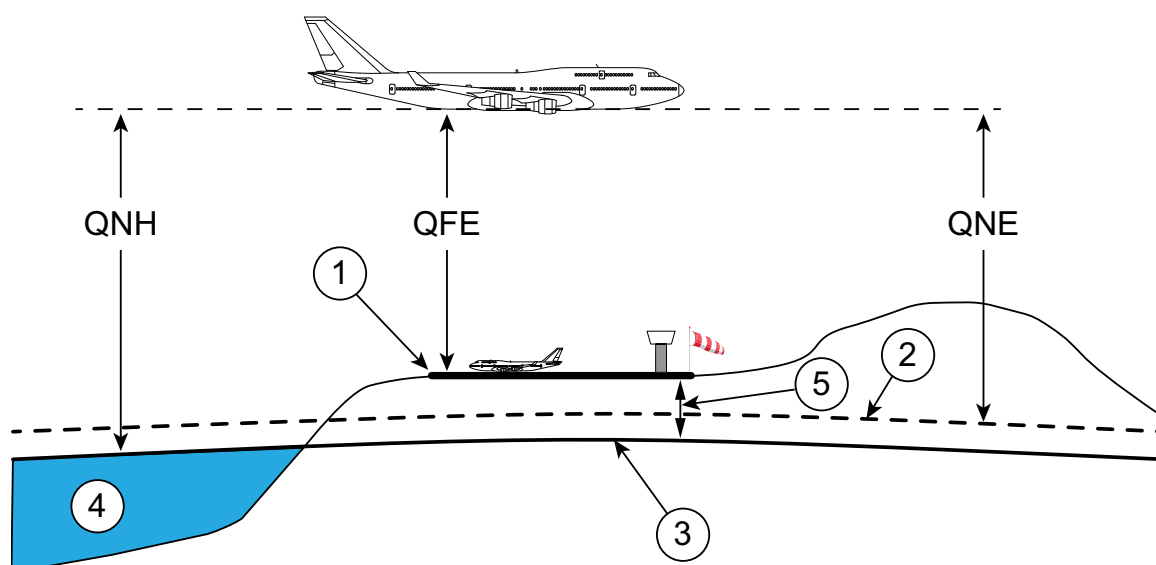- **Leak Test** - See "Leak Testing" on page 23.

Table 3-1: Airfield Task Q Codes

Q Code	Description
QFE	Query Field Elevation Atmospheric pressure at sea level, corrected for temperature and adjusted to airfield elevation (airfield atmospheric pressure at runway level). When set on the altimeter barometer scale the altimeter shows height above the runway.
QNE	Atmospheric pressure at Sea Level in International Standard Atmosphere (ISA) 1013.25 mbar. When set on the altimeter barometer scale the altimeter shows height according to international standard atmosphere.
QFF	Barometric pressure at a place, reduced to Mean Sea Level (MSL) using the actual temperature at time of observation as mean temperature.
QNH	Query Nautical Height Atmospheric pressure at Mean Sea Level (MSL) (can be local, measured pressure or a Regional Forecast Pressure (RFP). When set on the altimeter barometer scale the altimeter shows height above mean sea level. QNH can be above or below QNE depending on local conditions.

1	Runway on Earth's surface.	2	29.9212 inHg (1013.25 hPa) datum.
3	Sea level reference datum (adjusted).	4	Sea
5	Airfield Altitude		

Figure 3-10: Q Code Visualization

3.9 Aeronautical Menu

Figure 3-11: Aeronautical Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Task** > **Aeronautical**

This menu has these typical options:

- **Aeronautical** - Sets the **Measure Mode** screen to **Aeronautical**.

  In Aeronautical mode the Indicator can show aeronautical units as an alternative to normal pressure units on the **Measure Mode** screen. These units include Altitude (Alt), Calibrated Airspeed (CAS), Mach, Rate of climb (RoC), Rate of airspeed (RtCAS) and Rate of Mach (RtMach). The Indicator can also show Ps (static pressure), Pt (total pressure) and Qc.

  Select the **Measure Setup**, **Status Area Setup** or **Function Area Setup** menus to select which aeronautical units you need to see in the Measure Mode screen. See "Measure Setup Menu" on page 18 and "Status Area and Function Area Menus" on page 19.

  Select the **Units** option in the **Measure Setup** menu to change the units between imperial and metric. See "Measure Setup Menu" on page 18.

- **Airspeed Leak Test** - Sets the Indicator into an Airspeed Leak Test mode. See "Leak Testing" on page 23.
- **Altitude Leak Test** - Sets the Indicator into an Altitude Leak Test mode. See "Leak Testing" on page 23.

Note: After selecting the **Aeronautical** mode, the **Measure Mode** screen can show '**No Range**'. To correct this, touch the part of the display that shows **No Range**, then select the **Range** option to select a range.

Note: If you select the **Aeronautical** mode, the **Process** menu options change. See "Process Menu" on page 19.

Note: See "Supervisor Menu" on page 27 to select which sensor you use for the Altitude and Airspeed ranges.
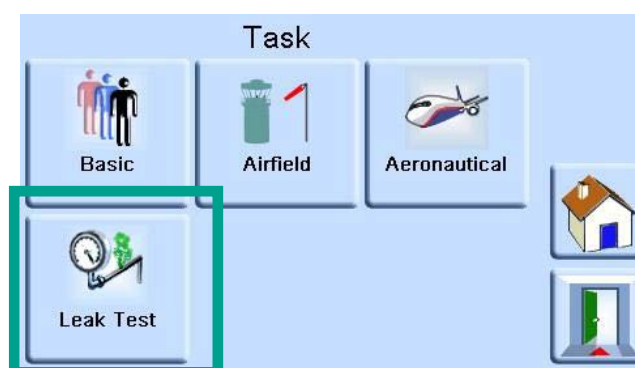
3.10 Leak Testing

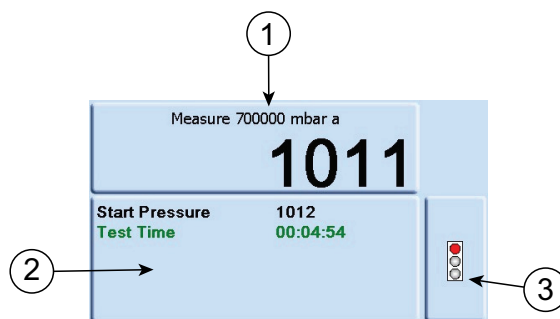**Figure 3-12: Leak Test Option**

Navigation:
Measure Mode top section > **Measure Setup** menu > **Task** > **Leak Test**
OR **Measure Mode** top section > **Measure Setup** menu > **Task** > **Aeronautical** > **Airspeed Leak Test**
OR **Measure Mode** top section > **Measure Setup** menu > **Task** > **Aeronautical** > **Altitude Leak Test**

Note: This is an optional function.

This task measures the leak rate over a measured time period. At the start of the test, the Indicator measures the test pressure of the user system. The Indicator then records the pressure change during the measured time period. On completion, the display shows the leak rate results.
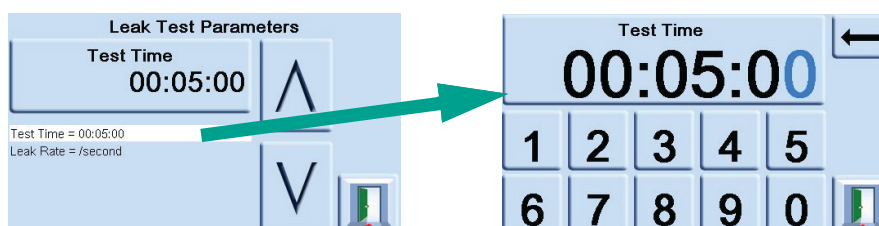

1	Pressure reading	3	Run button (Start and Stop)
2	Parameters		

Figure 3-13: Completed Leak Test Screen
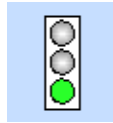
To do a leak test:

1. Connect your system to the Indicator.

2. Touch the bottom part of the screen to set the Leak Test Parameters. These include the test time period and the leak rate in /second or /minute. Touch the top part of the screen to save your settings and return to the leak test.

3. Touch the **Run** button to start the test. It will change from green to red.

4. The Indicator will run the test over the time period you set, then show the Leak Rate. Touching the **Run** button during the test will stop the test.

5. After the test, touch the top section of the screen. The screen will change to the **Measure Setup** menu. Change the **Task** back to **Basic** to return to normal operation.

3.11 Global Setup Menu

Figure 3-14: Global Setup Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Global Setup**

This menu gives access to the Indicator's settings for measure and control modes. It also gives PIN-protected access to the supervisor setup and calibration.

The menu has these options:

- **Supervisor Setup** - See "Supervisor Menu" on page 27.
- **Calibration** - See "Calibration Menu" on page 30.
- **Save/Recall User Setup** - Saves and Recalls the current User Setup
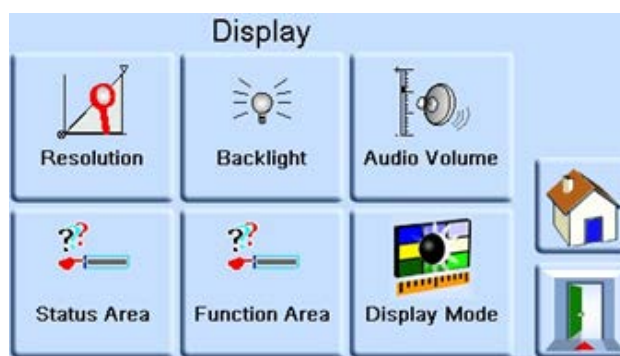- **Display** - "Display Menu" on page 25.

3.12 Display Menu

Figure 3-15: Display Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Global Setup > Display**

- **Resolution** - Adjusts the measurement resolution.
- **Backlight** - Adjusts the brightness and timer setting for the backlight.
- **Audio Volume** - Adjusts the volume of the sounder on the front panel of the Indicator.
- **Status Area** - Sets the condition of the **Status Area**.
- **Function Area** - Sets the condition of the **Function Area**.
- **Display Mode** - Sets the condition of the **Measure Mode** screen, giving a choice of a graph or a reading.
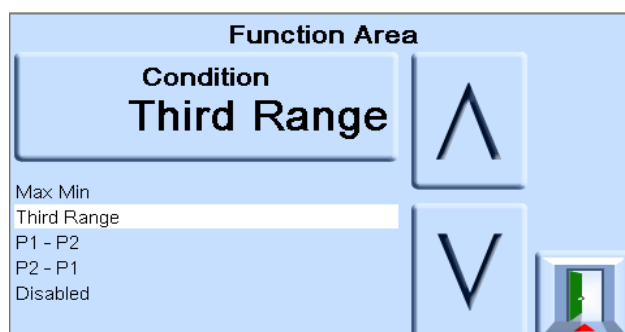

Figure 3-16: Display Mode Set to Graph

Figure 3-17: Function Area being Set to Show Third Range

You can use the **Function Area** option so the **Function Area** shows the 'Third Range' (sensor 3). Alternatively, you can set it to show mathematical operations on the three pressure ranges.

For example, pressure (P1) - pressure 2 (P2), where P1 is the top displayed pressure and P2 is the middle displayed pressure. You can also set the **Function Area** to show the maximum, minimum and average of the pressure value.
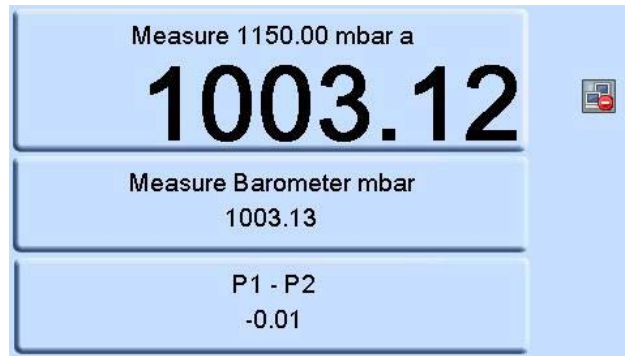

Figure 3-18: Function Area Set to Show P1-P2
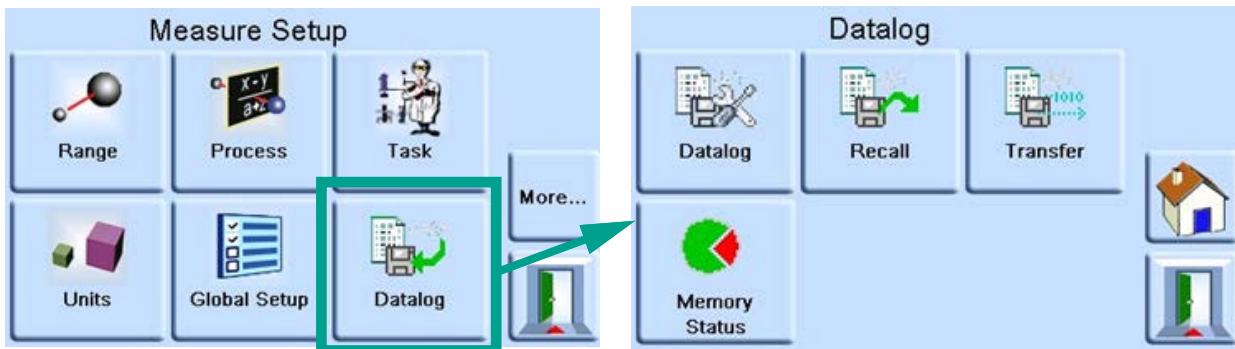
3.13 Datalog Menu

Figure 3-19: Datalog Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Datalog**

Note: You will only see the **Datalog** button when the Indicator has a memory card fitted. Touching this button opens the **Datalog** menu which as these options:

- **Datalog** - Sets the Filename, Mode, Period, Start and Stop events for the data logging and starts the data log.
- **Recall** - Recalls a previous Data Log file.
- **Transfer** - Transfers a Data Log file to USB. Refer to "USB" on page 41 for the USB options when storing and retrieving the Data Log files.
- **Memory Status** - Shows the size and status of the SD memory card.

Note: Number of data log points is limited by memory space, check the memory status for available space. Minimum periodic log period is 00:00:01 (1 second).
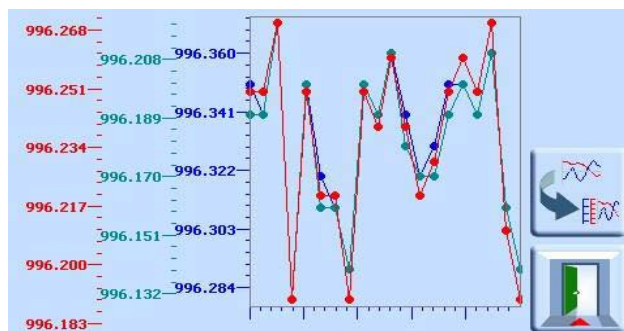
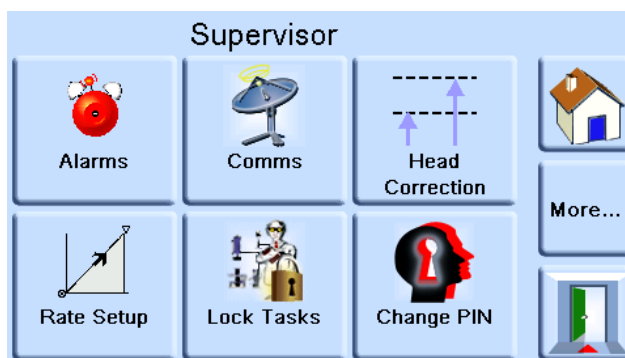**Figure 3-20: A Typical Data Logging Display**

3.14 Supervisor Menu

Figure 3-21: Supervisor Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Global Setup** > **Supervisor Setup**

This menu gives options for changing installation settings.

Note: You need a four-digit code to enter this menu. It protects against unauthorized use. The factory set Supervisor PIN is 0268. If you change the Supervisor PIN, keep the new PIN in a safe place. If the new PIN is lost, it can only be reset at a Druck Service Centre.

- **Alarms** - Enables and disables and sets the pressures for the High Alarm and Low Alarm.
- **Comms** - (Communications). See "Communications Menu" on page 28.
- **Head Correction** - Enables and disables the Gas Head Correction. See "Gas Head Correction" on page 51.
- **Firewall** - Enables and disables the Firewall. See "Ethernet" on page 41.
- **Rate Setup** - Sets the rate parameters in '/second' or '/minute'.
- **Lock Tasks** - Unlocks or locks the Task options. **Individual Tasks** locks or unlocks specific task. **All** unlocks or locks all tasks. See "Task Menu" on page 20.
- **Change PIN** - Sets a new Supervisor PIN.
- **User Defined Units** - Lets you choose your own set of units.
- **Instrument Alias Name** - Sets a 20 character name for the Indicator. The Indicator sends this name through the communications interfaces.
- **Language** - Sets the language used on the display. See "Languages" on page 55.
- **Area of Use** - Sets the area of use from around the Earth.
- **Restore Last Settings** - Restores the settings to the last power-up state.

- **Aeronautical Setup** - Opens a page with more options of:
  - **Altitude Range** - Sets the sensor used for the altitude range.
  - **Airspeed Range** - Sets the sensor used for the airspeed range.
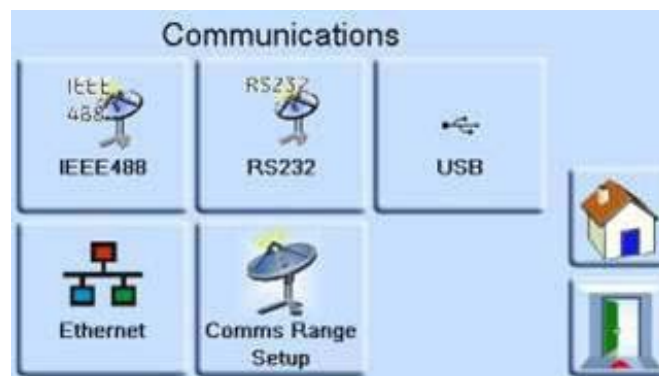
3.15 Communications Menu

Figure 3-22: Communications Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Global Setup** > **Supervisor Setup** > Enter PIN > **Comms**

This menu gives options for changing communications settings. See "Communications" on page 39 for more details.

- **IEEE488**
- **RS232**
- **USB**
- **Ethernet**
- **Comms Range Setup**

3.16 Status Menu

Figure 3-23: Status Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Status**

This menu gives options that let you see the status of the Indicator.

- **Instrument** - Opens an **Instrument Status** menu with more options of:

- • **Instrument** - Shows the Model, serial number, Alias name and MAC address of the Indicator.

- • **Sensor Status** - Opens a **Sensor Status** menu with information about each sensor fitted in the Indicator.

- • **Software Installed** - Shows the version numbers of the software installed in the Indicator.

- • **Hardware Build** - Shows information about any special hardware fitted in the Indicator.

- • **History** - Opens a **History** menu. See "History Menu" on page 29.

- • **Comms** - Opens a Communications Status menu with information about the communication ports. IEEE 488 and RS-232 are fitted as standard. Additional communication types are options - USB and Ethernet. See "Communications" on page 39.

- • **Current Set Up** - Shows information about the alarms.

- • **Software Options** - Shows which options are enabled, such as leak test.

- • **Summary** - Shows a summary of the software and hardware in the Indicator.

- • **Product Support** - Lets you save a link to our support channel to the USB port.
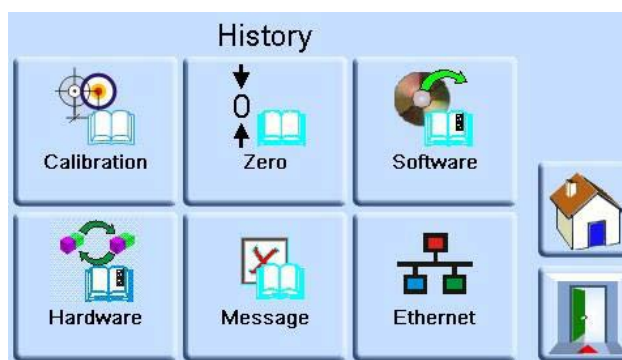
3.17 History Menu

Figure 3-24: History Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Status** > **History**

This menu gives options that let you see the history of the Indicator.

- • **Calibration** - Shows the history of the Indicator sensor calibrations.

- • **Zero** - Shows the history of when the Indicator sensors were set to zero.

- • **Software** - Shows when the software was installed.

- • **Hardware** - Shows when the Indicator sensors were fitted or removed.

- • **Message** - Shows any past messages.

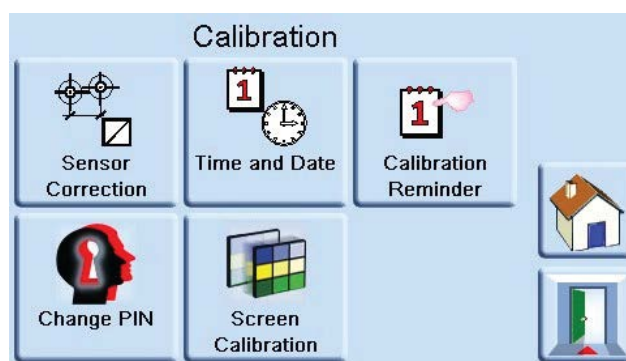- • **Ethernet** - Shows Ethernet connection history.

3.18 Calibration Menu

Figure 3-25: Calibration Menu

Navigation: **Measure Mode** top section > **Measure Setup** menu > **Global setup** > **Calibration**

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

For calibration, return the Indicator to the manufacturer or calibration facility. Refer to Section 7.9, "Packaging Procedure for Storage or Transportation," on page 57.

To find the date of the last calibration, see "History Menu" on page 29.

The calibration menu gives these options for programming settings for maintenance:

• **Sensor Correction** - Selects the range for a three-point calibration routine.

• **Time and Date** - Sets Indicator clock and date.

• **Calibration Reminder** - Sets a calibration period to remind you to calibrate the Indicator.

• **Screen Calibration** - Selects a touchscreen calibration routine.

• **Change PIN** - Changes the Calibration PIN. To do this:

    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 you lose the PIN you must return the Indicator to a Druck service center to reset it. See the PACE Calibration Manual K0450 for more information on calibration.

3.19 PACE Tallis Specific Operations

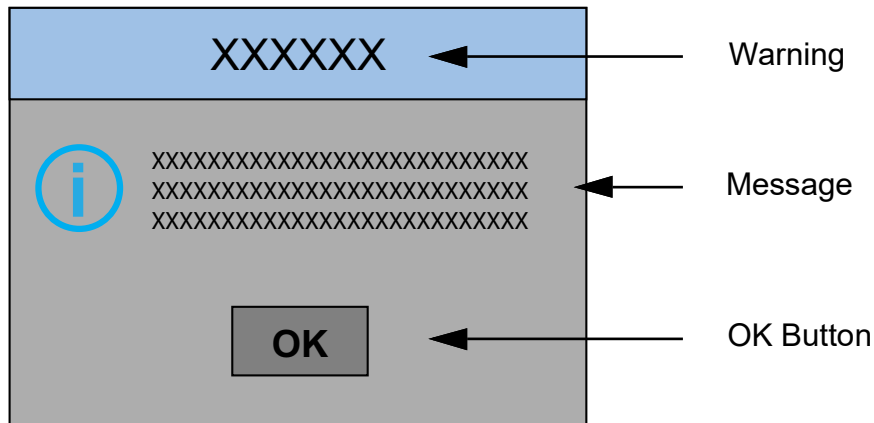### 3.19.1 Non TRS3 Sensor Warning

Figure 3-26: Typical Tallis Warning

The PACE Tallis Indicators show a warning on power up if the sensors fitted are not TRS3 sensors.

The warning message will say '**One or more non TRS3 sensors are fitted. Unit Datasheet accuracy may not be achieved**.' If you select the **OK** button, the Indicator will continue to work normally but it cannot be guaranteed to be as accurate as shown on the Datasheet.

3.19.2 Tallis Sensor Range

When you select **Range** from the **Measure Setup** menu (see "Measure Setup Menu" on page 18), the sensors will be listed as TRS3 for the PACE Tallis Indicators.

3.19.3 Differential Output Mode

Tallis Indicators use only absolute sensors, so note this when using Differential Output Mode. See "Differential Output Mode" on page 51.

3.19.4 Pseudo Gauge Mode

See "Pseudo Gauge Mode" on page 51.

3.19.5 Zero Against External Barometer

INFORMATION **The uncertainty of the external reference pressure directly affects the uncertainty budget of the Indicator. Using a non-approved barometric reference could negatively impact the uncertainty.**

To meet the annual Tallis accuracy specification, we recommend that you zero sensors in the 8-211 bara range against a barometric reference every 28 days.

Refer to "IRS and TRS (Tallis) Periodic Sensor Zeroing" on page 52 for more details.

4. Maintenance and Software Update

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.

4.1 Introduction

This section contains procedures for routine maintenance and the update of software.

Table 4-1: Maintenance Tasks

Task	Period
Visual Inspection	Before use
Test	Before use
Cleaning	Weekly
Calibration	12 months

Note: The cleaning period will depend on ambient conditions and usage - determined by whether the Indicator is stand-alone or rack-mounted. The calibration period will be determined by the accuracy you need.

4.2 Visual Inspection

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

a. External of the instrument.

b. Power supply adapter.

c. Associated equipment.

Replace parts that have damage. Contact Druck Service.

4.3 Test

Do a standard serviceability test. Refer to Section 5.2, "Standard Serviceability Test," on page 35.

4.4 Cleaning

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

4.5 Calibration

See"Calibration Menu" on page 30.

4.6 Software Update

To update the Indicator internal software:

Chapter 4. Maintenance and Software Update

1. Put a USB memory device into a PC that Internet connection.
2. Open Windows Explorer and select the USB memory device root folder. Delete these folders if you see them:
    i.   DPI
    ii. OS
3. Using a web browser go to the Druck PACE support page: **https://druck.com/software**
4. Select the most recent dated software and highest alphanumeric revision, unless an older revision of software is necessary.
5. Download the software file, which is a zip file.
6. 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. Make sure that these two folders have been created in the root folder of the USB memory device:
    i.   DPI
    ii. OS
7. Eject the USB memory device from the PC.
8. De-energize the Indicator.
9. Inset the USB memory device into the rear panel USB port of the Indicator.
10. Energize the Indicator.
11. Once the Indicator has energized, navigate through these 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
12. The Indicator 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.
13. Obey the on-screen prompts during the update process. Update the software in this order:
    a. OS software.

        Note: The Indicator must remain energized during the OS software update. Failure to do so will break the Indicator.
    b. Instrument software.
14. Once the software updates have been completed, de-energize the Indicator.
15. Energize the Indicator.
16. Wait until the Indicator shows the pressure measurement screen.
17. Verify the installed software version against the software history document.

5. Testing and Fault Finding

5.1 Introduction

This section details the standard serviceability test. Table 5-2 on page 37 lists possible faults, and the response.

The Indicator contains a self-test and diagnosis system that continuously monitors the performance of the instrument. As the Indicator energizes, it does a self-test.

5.2 Standard Serviceability Test

⚠️ **CAUTION** **Always release pressure before disconnecting pressure equipment.**

This procedure shows if the Indicator is serviceable and does tests on functions and facilities of the instrument.

1. Connect the instrument. Refer to Section 2, "Installation," on page 3.

2. After the Indicator has energized, select the **Measure Setup** menu.

    a. Select the necessary units of pressure measurement.

    b. Apply a known pressure to one of the sensors. Make sure the instrument pressure reading is in tolerance. Refer to Datasheet.

    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 the Indicator Ethernet port to a PC.

2. Make sure the Indicator Ethernet LAN indication turns green after a few seconds.

3. Set the Indicator Ethernet address to Auto IP.

4. Record the Indicator auto IP address.

5.3.1 Ethernet Ports

Table 5-1 details the Indicator's open Ethernet ports.
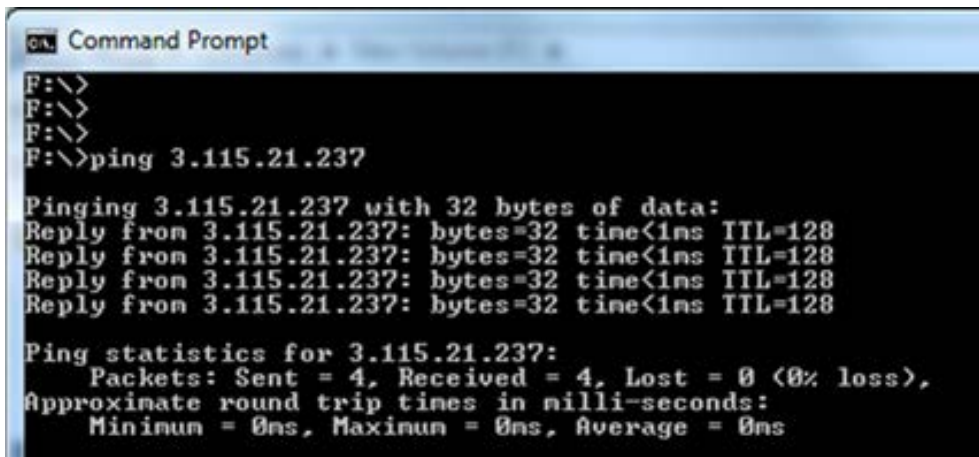
Table 5-1: Open Ethernet Ports

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.

2.   Using the "ping" command, ping the Indicator IP address. See the screen capture below. The Indicator will reply if operating correctly.

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

5.3.3 Web Browser Test

1.   Open the PC web browser.
2.   Enter the Indicator IP address. The PACE home page will open if operating correctly.
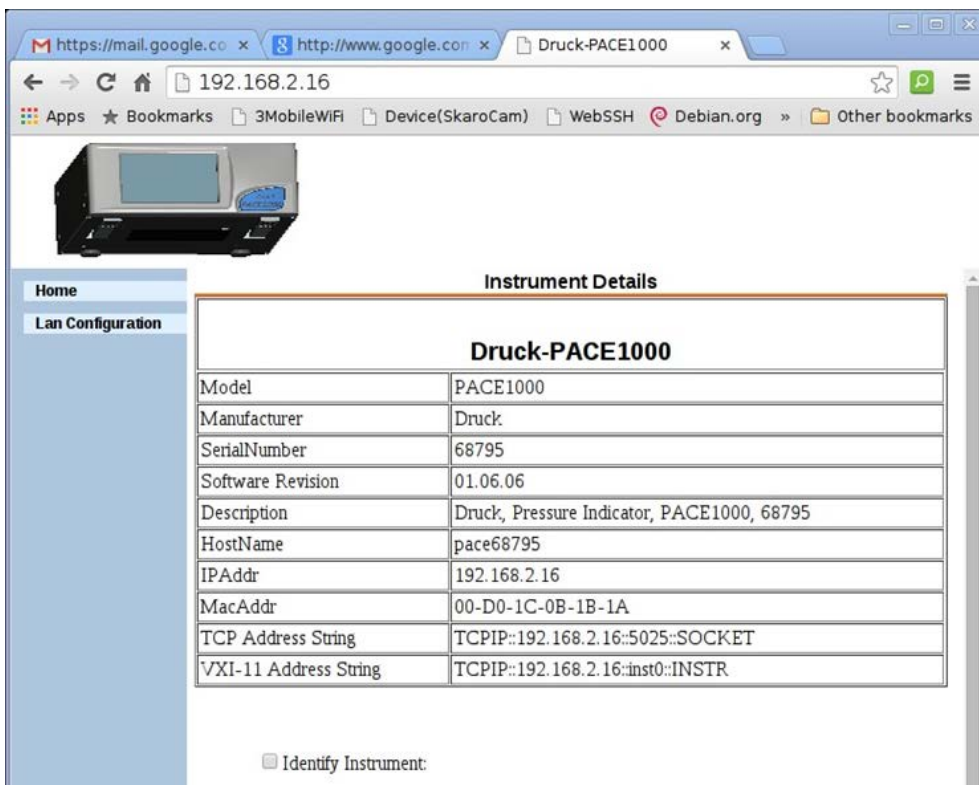
Note: The web browser example shows an IP address 192.168.2.16. The IP address of your Indicator can be different.

5.3.4 Measurement & Automation Explorer Test

The latest version of the National Instruments Measurement & Automation Explorer (NI MAX) can be downloaded from this link:

https://www.ni.com/en-us/support/downloads/drivers/download.system-configuration.html

1.   Open the National Instruments Measurement & Automation Explorer.

2.   In the explorer, navigate to **My System** > **Devices and Interfaces** > **Network Devices**

3.   Select the Indicator. The PACE home page will be shown if operating correctly.
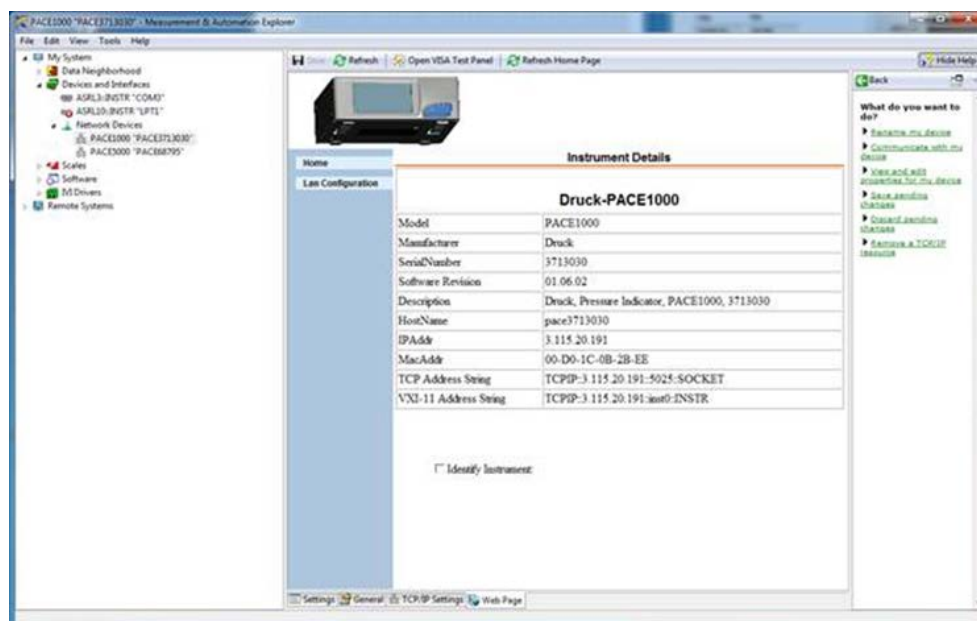
5.4 Fault Finding

Table 5-2 shows typical faults and responses. If the fault persists, refer to your service agent.

Table 5-2: Fault Diagnosis

Fault	Response
Power supply connected, display not working.	Check electrical power supply fuse or circuit breaker.
Pressure reading shown in red.	Out of limit for the Range Compare function. See "Range Compare" on page 50. OR Over-range pressure. Carefully de-pressurize.
Instrument will not zero.	Open system pressure to atmosphere. Check for blockage. Contact approved service agent for repair.
Warning: One or more non TRS3 sensors are fitted.	Accept or contact service agent for guidance. See "Non TRS3 Sensor Warning" on page 31.

5.5 Approved Service Agents

See the rear cover of this guide.

6. Communications

Simultaneous operation of the RS-232, IEEE 488 and Ethernet interfaces is fitted as standard.

Note: PACE LabVIEW drivers are available for download from:

http://sine.ni.com/apps/utf8/niid_web_display.download_page?p_id_guid=B6F9A6B06A EA01F1E0440021287E65E6

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

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

:INST:SENS[x]:READ? Where x = 1 to 8 set in the comms range menu.

:SENS:PRES?   Returns the top reading of the display window with display filtering (2 Hz update rate) applied.

:DISP[x]:WIND?   Where [x] = display (1 = top area, 2 = middle status area, 3 = bottom function area) window.

To obtain fastest readings you must use this 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.

6.0.1 Baud Rates

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.

6.1 IEEE 488

Located on the rear panel an external IEEE 488 connection has this 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. Refer to "Baud Rates" on page 39.

2. Navigate to the **Communications** menu. See "Communications Menu" on page 28.

3. Select option **IEEE488**.

4. On the **IEEE488 Parameters** screen, use the up and down arrows to select and edit the parameters.

6.2 RS-232

Located on the rear panel an external RS-232 connection has this 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.

To configure the RS-232 connection:

1. Refer to "Baud Rates" on page 39.

2. Navigate to the **Communications** menu. See "Communications Menu" on page 28.

3. Select **RS232**.

4. On the **RS232 Parameters** screen, use the up and down arrows to select and edit the parameters.

6.3 USB

The external USB 'B' connection on the rear panel has this 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 **Communications** menu. See "Communications Menu" on page 28.

2. Select **USB**.

3. On the **USB Parameters** screen, use the up and down arrows to select and edit the communications mode.

4. Select **Mass Storage Device** for an external memory device or the internal SD card memory. OR select **Communications** to give SCPI communications through USB port B.

6.4 Ethernet

The external Ethernet connection on the rear of the instrument has this configuration:

Table 6-4: Ethernet Configuration Options

Item	Description
Connector	Ethernet RJ45
Protocol	SCPI
Terminator	CR/LF

Table 6-4: Ethernet Configuration Options

Item	Description
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 35.

The Ethernet connection provides this functionality:

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

6.4.1 To Configure the Ethernet Connection

1. Navigate to the **Communications** menu. See "Communications Menu" on page 28.
2. Select the **Ethernet** option to open the **Ethernet Parameters**.
3. Use the Up and Down arrows to select the wanted parameter.
4. To change the **Address** parameter:
   a. Use the up and down arrows to select the **Address**.
   b. Touch the top section on the screen to enter the **IP Address** screen.

   c. Touch the top section on the screen to open the **Address Type** screen.

d. Use the up and Down arrows to select the wanted address type (either AUTO IP or STATIC).

e. Touch the top section on the screen to set the new address type.

f. Touch the **Escape** button to return to the **Ethernet Parameters** screen.

5. To change the host name:

a. On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Host Name**.
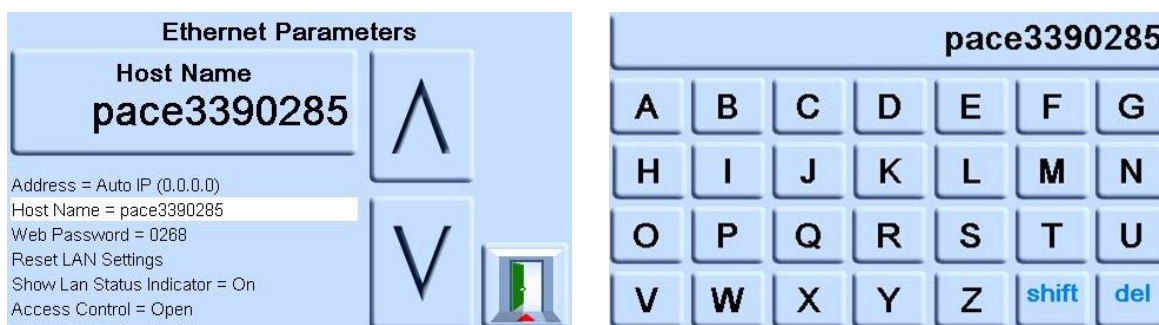

b. Touch the top section on the screen to enter the **Host Name** screen.

c. Use the keyboard to input the new host name and then touch the top button on the screen to set the host name.

d. Touch the **Escape** button to return to the **Ethernet Parameters** screen.

6. To change the web password:

a. On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Web Password**.
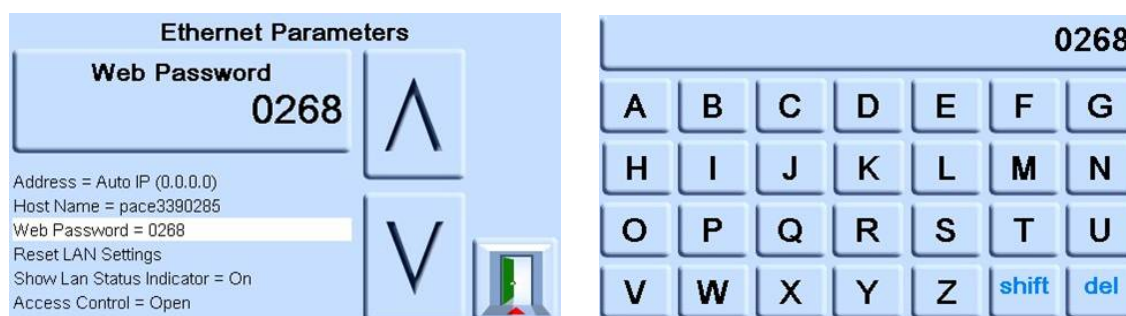
b. Touch the top section on the screen to enter the **Web Password** screen. The keyboard screen opens.

c. Use the keyboard to input the new web password and then touch the top button on the screen to set the new password.

d. Touch the **Escape** button to return to the **Ethernet Parameters** screen.

7. To reset the LAN settings:

a. On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Reset LAN Settings**.

b. Touch the top section of the screen.

c. The **Reset LAN Settings** pop-up box opens, asking for confirmation of the reset. Touch **Yes** to confirm reset of the LAN settings.
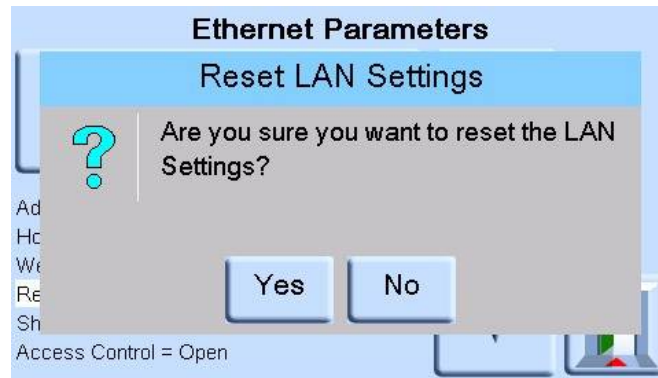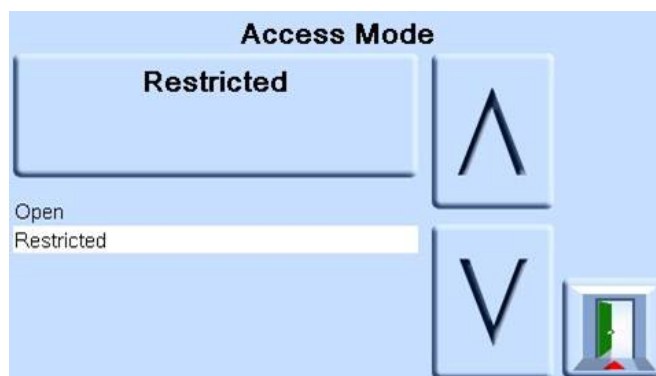
8. To turn the LAN status Indicator on or off:

   a. On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Show Lan Status Indicator**.
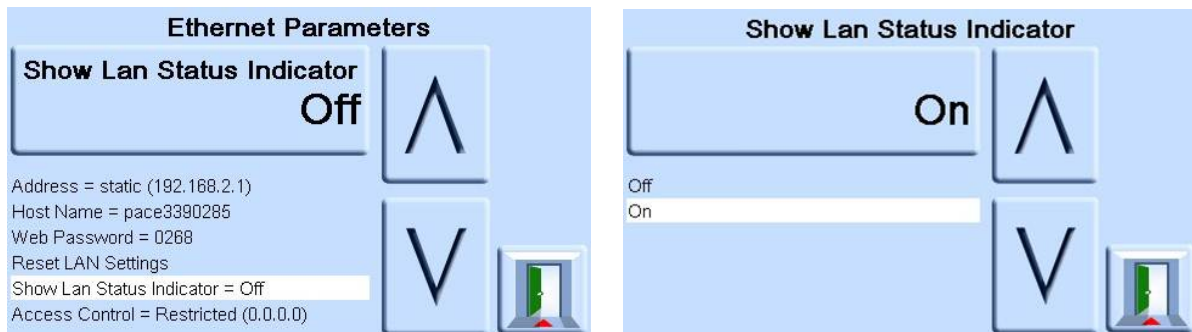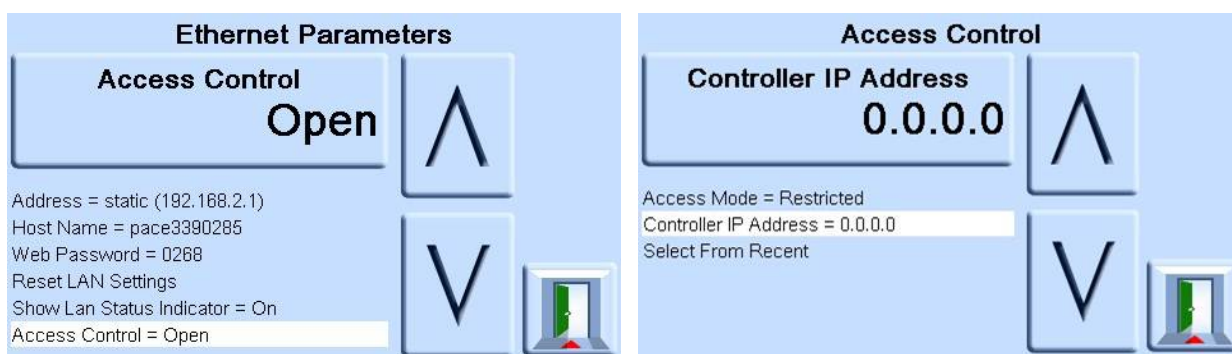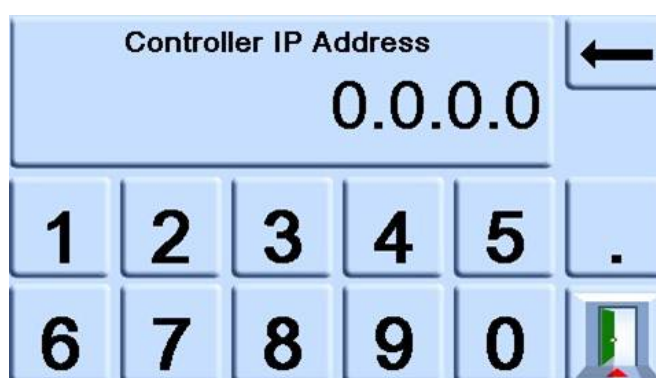

   b. Use the up and down arrows to select the wanted setting - either ON or OFF.

   c. Touch the top button on the screen to set the new setting.

9. To change ACCESS MODE:

   a. On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Access Control**.
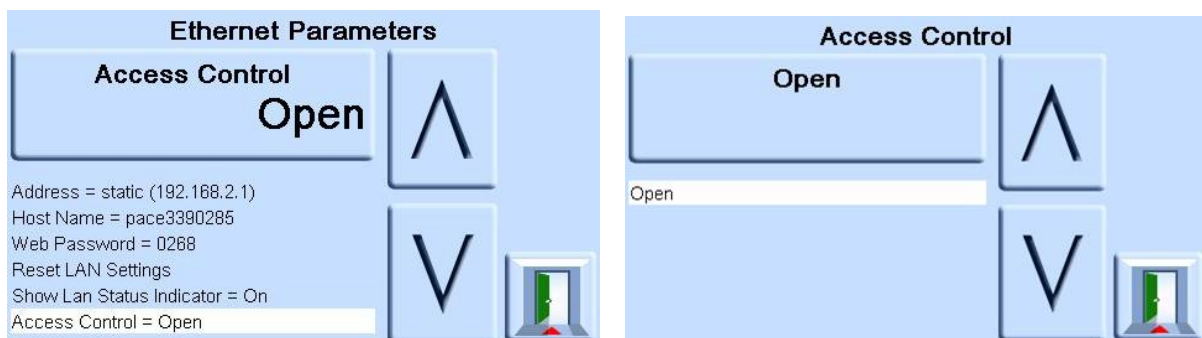
   b. Touch the **Open** box on the top of the screen to open the **Access Mode** screen.

   c. Use the up and down arrows to select the wanted parameter - either **Open** or **Restricted**.

    d.   Touch the **Open** or **Restricted** box at the top of the screen to set the mode.

10. To change controller IP address:

    a.   On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Access Control**.

    b.   Touch the **Access Control** box on the top of the screen.

    c.   Use the up and down arrows to select **Controller IP Address**.

    d.   Use the number touch pad at the bottom of the screen to input the new IP address and touch the **Controller IP Address** box at the top of the screen to set the new IP address.

11. To view the recent IP addresses:

    a.   On the **Ethernet Parameters** screen, use the up and down arrows on the right of the screen to select **Access Control**.

    b.   Touch the **Access Control** button on the top of the screen.

    c.   Use the up and down arrows to select **Select From Recent**.
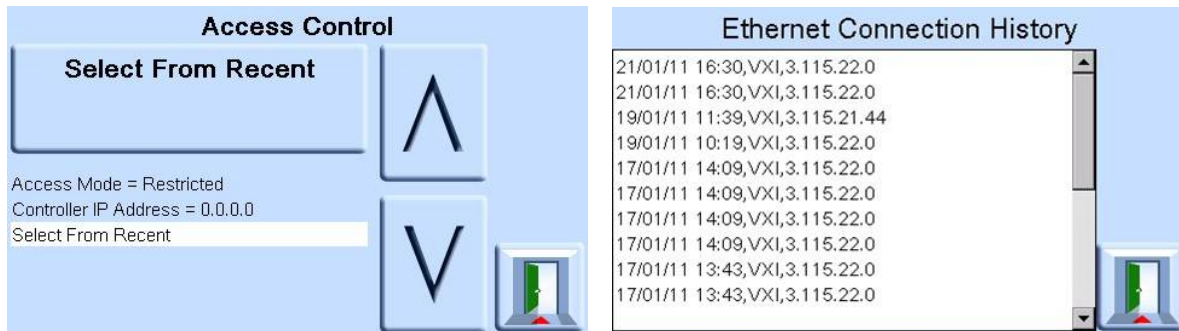
d. Select the **Select From Recent** button at the top of the screen to view the IP address history.

6.5 Comms Range Setup

A Comms Range value assigns a unique index number to a pressure sensor installed in the Indicator. This is used to identify the pressure sensor when communicating with the Indicator using SCPI.

In this typical example, the Indicator has three pressure sensors:

*   1150 mbar a
*   2 bar g
*   Barometric sensor

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

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

When communicating with the Indicator, 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.

Note: The next 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. Open the **Comms** menu. See "Communications Menu" on page 28.
2. Select **Comms Range Setup**.

Use the up and down arrows to select the wanted 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)… and so on.

3. Touch the top section on the screen to change the Range value.

4. Use the up and down arrow to highlight the new Range value.

5. Touch the top section on the screen to change the range value. The new range value is set and the screen returns to the **Comms Range Setup** screen.

6. If necessary, do again steps 3 to 6 to set up other range values.

7. Touch **Escape** to go back to the **Comms Range Setup** screen.

8. When complete, touch **Escape** to return to the **Measure Mode**.

6.6 IDOS Connectors

Your Indicator can have connectors to the rear, labeled 'IDOS'. These are for connection to external Druck Intelligent Digital Output Sensors.

7. Reference

7.1 Reference Port

The Indicator has pressure connectors for connection to your system. It also has a Reference Port connection. This reference connection gives a reference to atmosphere for gauge sensors and barometric sensors.

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".

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

The gas density and type does not affect the accuracy of pressure measurement, assuming that the UUT (Unit Under Test) is at the same level (height) as the Indicator, or gas head correction is accurately set. See "Gas Head Correction" on page 51.

For gauge sensors (without a barometric reference) small pressures can be applied. Refer to Datasheet. In all other pressure measurements, set 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 for IPS sensors, as there is no true differential calibration of the sensor.

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

Short term local atmospheric pressure changes cause the Indicator to adjust the pressure shown, which appears as instability. To keep a stable indicated pressure, you can use a reference port restricter (snubber) to restrict the reference port. This will prevent short term ambient pressure variations from affecting Indicator performance.

Connect the Indicator and UUT references together, using the optional differential connection kit (IO-DIFF-KIT-LP), to provide a common reference to atmosphere.
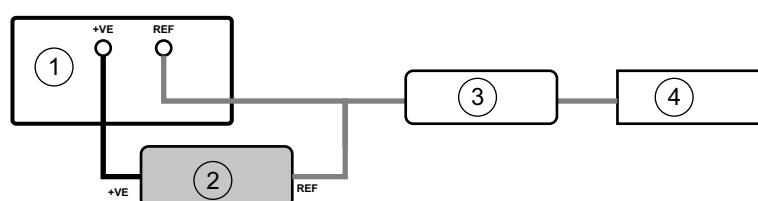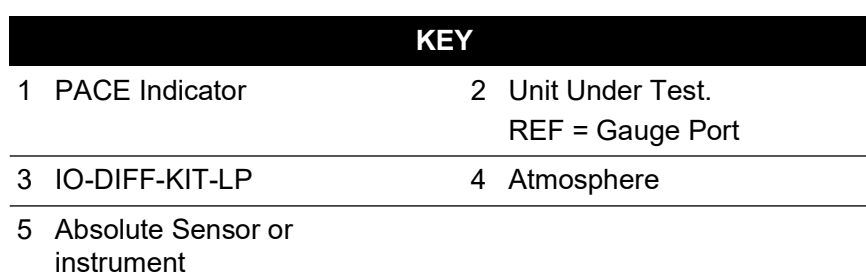
7.1.1 Connection Drawings

KEY		
1 PACE Indicator	2	Unit Under Test. REF = Gauge Port
3 IO-DIFF-KIT-LP	4	Atmosphere
5 Absolute Sensor or instrument		

Figure 7-1: Recommended Gauge Connections with No line Pressure

Figure 7-1 shows the recommended gauge connections with no line pressure. Use this for low pressure/low noise measurement in gauge or pseudo gauge mode.
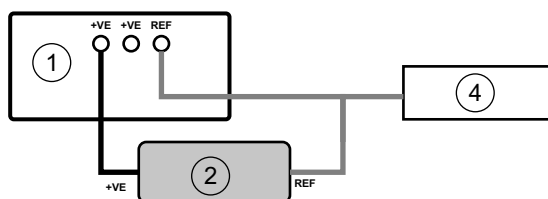

Figure 7-2: Standard Gauge Connection

Figure 7-2 shows the connections for standard gauge connection with no line pressure.

Figure 7-3: Barometric Measurement

Figure 7-3 shows the connections for barometric measurement, using the barometric option. You can add the IO-SNUBBER 1 to the REF port to reduce barometric noise.
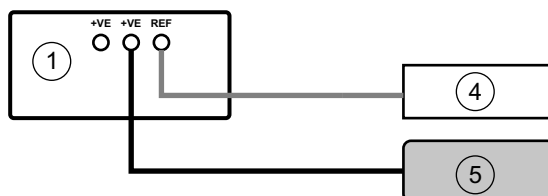

Figure 7-4: Absolute Measurement

Figure 7-4 shows the connections for absolute pressure measurement to IRS3, TRS3 or IPS pseudo sensors. With or without barometric option.

Note: the REF and +VE port must be opened to atmosphere during sensor periodic zeroing.

7.2 Range Compare

You can set the Indicator to use a **Compare Limit** to compare two or three sensors.

Note: The sensors must be of the same range. If the Indicator has two or three sensors of the same range fitted, the **Range Compare** option is set automatically to the **Disabled** condition.

When enabled, the **Measure Mode** screen shows the **Range Compare** symbol in the top right corner. If the measured reading of any sensor is out of the **Compare Limit** then it will also show the small yellow weighing scale symbol next to the range. The measured reading will also change to red.

7.2.1 Where the Indicator has two sensors of the same range

The Indicator compares the two sensors.

7.2.2 Where the Indicator has three sensors of the same range

• The Indicator compares sensor 1 to sensor 2 and 3.

• The Indicator compares sensor 2 to sensor 3.

• If sensor 1 and 2 are in the **Compare Limit** but sensor 2 to 3 are out of the **Compare Limit**, then sensor 3 will show as out of limit.

• If sensor 1 or 2 are out of the **Compare Limit** and sensors 2 to 3 are in the limit, then sensor 1 will show as out of limit, else sensor 2 will show as out of limit.

7.3 Differential Output Mode

You can use two of the same or different range sensors to provide a single differential pressure reading. This can be used in air data applications and gives a solution for often difficult-to-support differential 'at line' pressure calibrations.

Use the functions to set the differential mode, for example P1-P2 or P2-P1. See "Display Menu" on page 25.

To zero the difference, touch the **Function Area** to open the **Function Area Setup** menu, then select **Pressure Zero (P1-P2)** for example. The zero value will be in the user selected pressure units. The Indicator will use the zero value until the next power cycle.

7.4 Pseudo Gauge Mode

This mode is supported on units which have sensors in the 2-211 bara range, with an internal reference barometer or 2 bar grade zero sensor (TRS3 only). Current software will allow a barometric sensor to be used as the reference for Pseudo gauge. Future releases will allow the 2 bar absolute sensor to be used as a reference for Pseudo gauge. This is a factory configured option.

7.5 Gas Head Correction

This corrects the pressure reading for the height difference between the instrument reference level and the UUT (Unit Under Test). For accuracy, enable the head correction and set the parameters for each sensor.
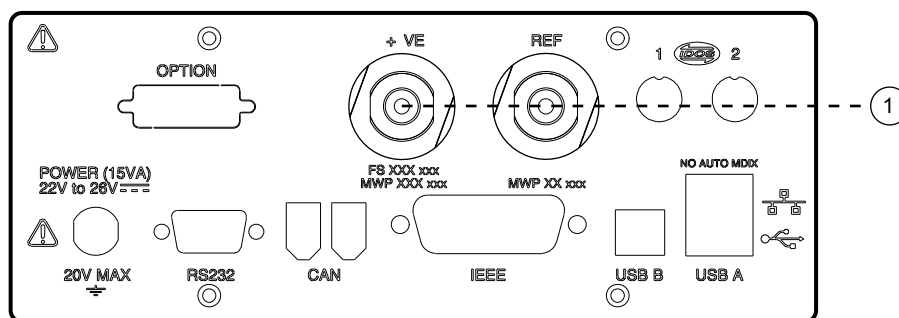
1 Reference level.

• For a UUT higher than the reference level of the Indicator, enter a **positive** height correction.

• For a UUT lower than the reference level of the Indicator, enter a **negative** height correction.

• When calibrating the Indicator, disable the gas head correction and correct the actual applied pressures for height.

7.6 IRS and TRS (Tallis) Periodic Sensor Zeroing

For 8 bar absolute and above IRS3 and TRS3 sensors, zeroing needs to be done against the internal barometer (Automatic Zero). It is also possible to use an external barometer if necessary (Manual Zero). Zeroing of the sensors can also be done over the SCPI interface. Refer to the communications manual.

To meet the annual IRS3/Tallis accuracy specification, we recommend that you zero sensors in the 8-211 bara range against the **internal** barometric reference every 28 days. The long-term stability specification is subject to the specification of the barometric reference that is used. The values quoted in the Tallis Datasheet are for a Tallis specification **internal** barometer.

Zeroing is not necessary for IRS3 and TRS sensors of 3.5 bar absolute and below.

7.6.1 Zeroing the Reference Sensor

If a IRS3 or TRS3 sensor is fitted, there is the option to zero the reference sensor using the internal barometer sensor reading.

To zero the reference sensor:

1. Make sure that both the IRS/TRS3 sensor +VE port and the REF port are open to atmosphere.

2. From the **Measure Setup** menu, select the **Global Setup** option.
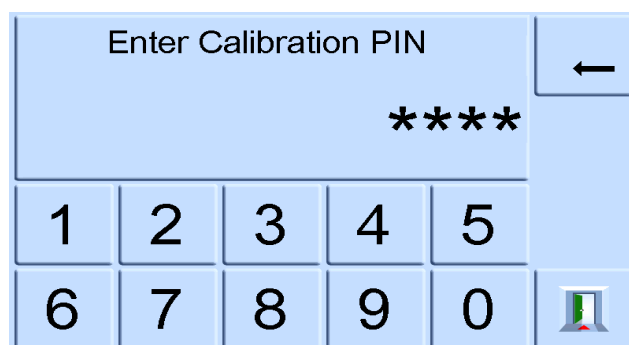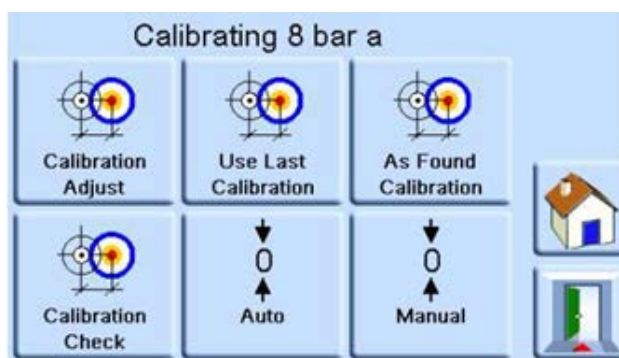
3. From the **Global Setup** menu, select **Calibration** and enter the PIN (default 4321).
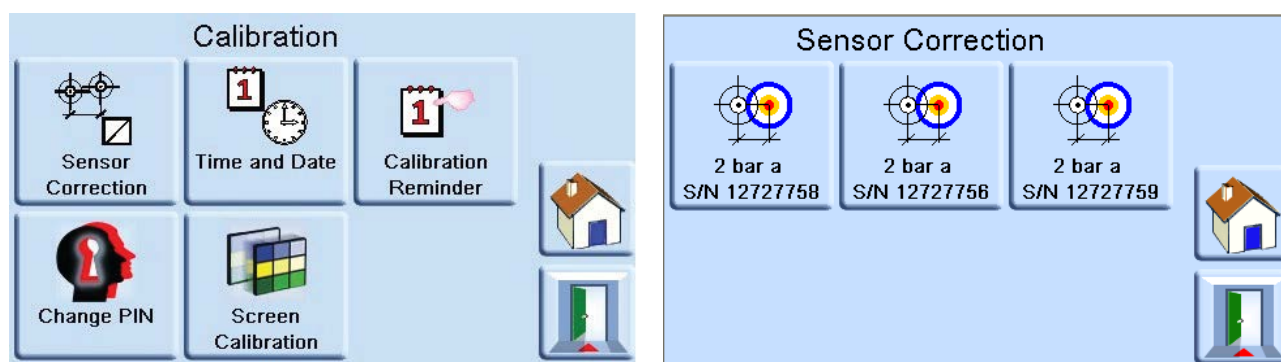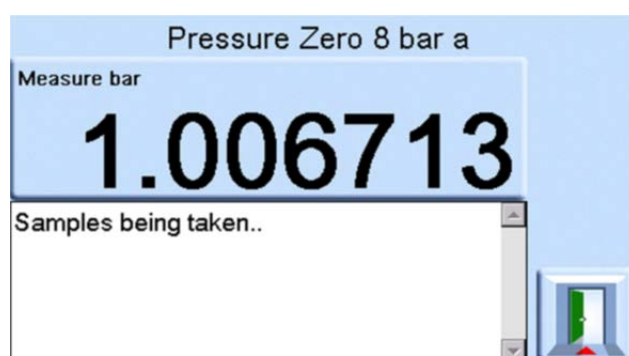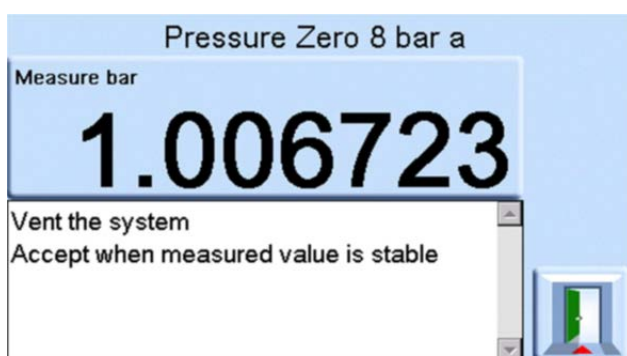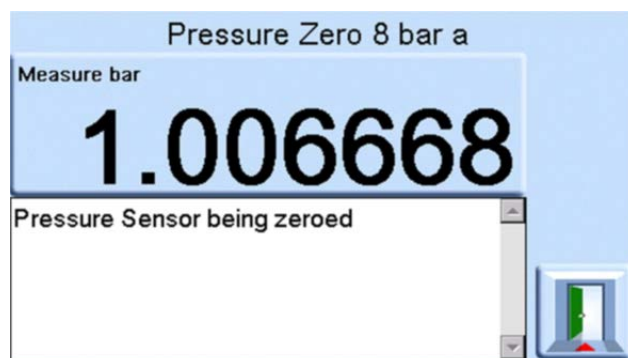

4. From the **Calibration** menu, select **Sensor Correction**, then select the sensor to be calibrated.

5. Now choose from Automatic Zero or Manual Zero as follows.
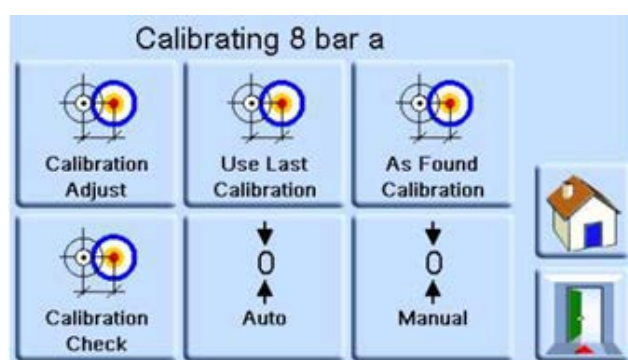
7.6.1.1 Automatic Zero

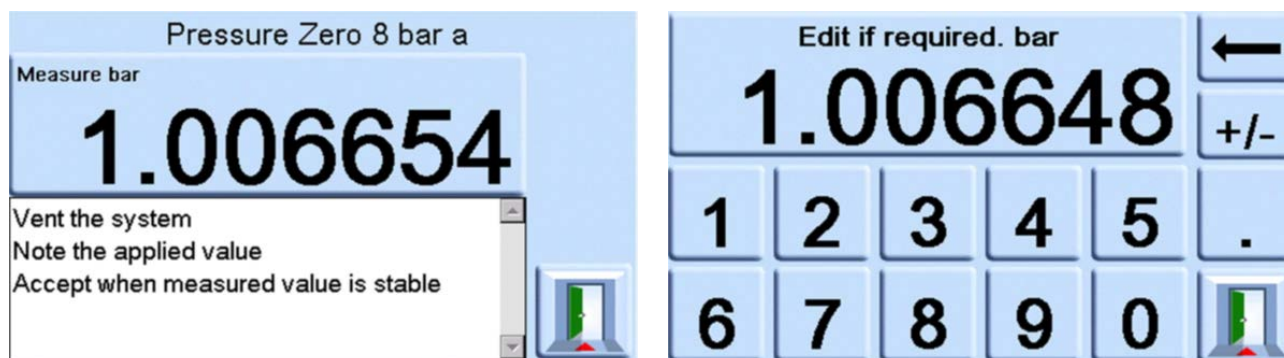

1. Select the **Auto** option.

2. The Indicator will now sample the pressure readings and automatically zero the sensor.
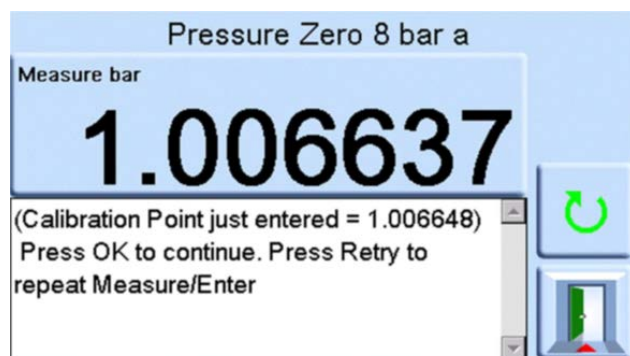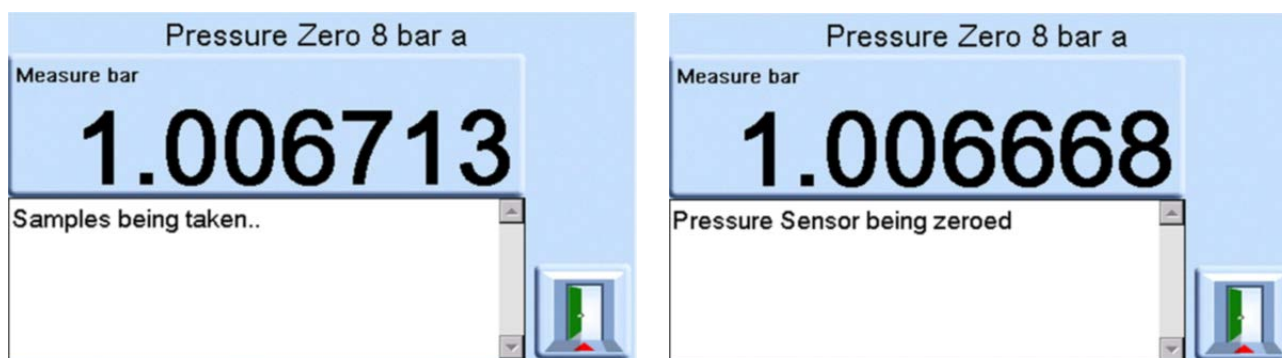
7.6.1.2 Manual Zero

1. Select the **Manual** option.

2. Enter the external reference barometer reading.

3. Check the reading and accept or select the **Retry** button to adjust the pressure.

4. On acceptance of the value, the Indicator will sample the sensor readings and apply the zero correction.

The Indicator uses the difference between the sensor and barometric readings to find a pressure zero value. It accepts a pressure zero when:

Reference Sensor reading (vented) - Barometric Sensor reading ≤ ±2000 ppm FS (0.2% FS)

If this condition is not met, the Indicator shows the **Zero Outside Limits** error.

A zero outside limits error may indicate that the reference sensor is faulty. Contact a Druck Service Centre for assistance.

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

7.7 Languages

Operation in any of these languages can be selected:

- English (default)
- French
- German
- Italian
- Portuguese
- Spanish
- Russian
- Chinese
- Japanese

More languages can be added.

7.7.1 Adding a Language

Languages can be added as shown next. Refer to Figure 7-5.

1. Create a language file by translating from the English language file.
2. Measure 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.

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.
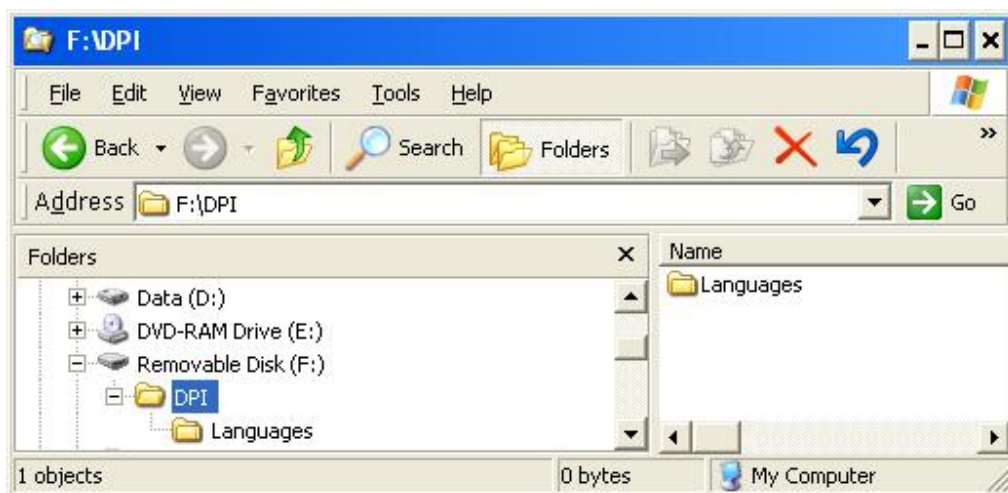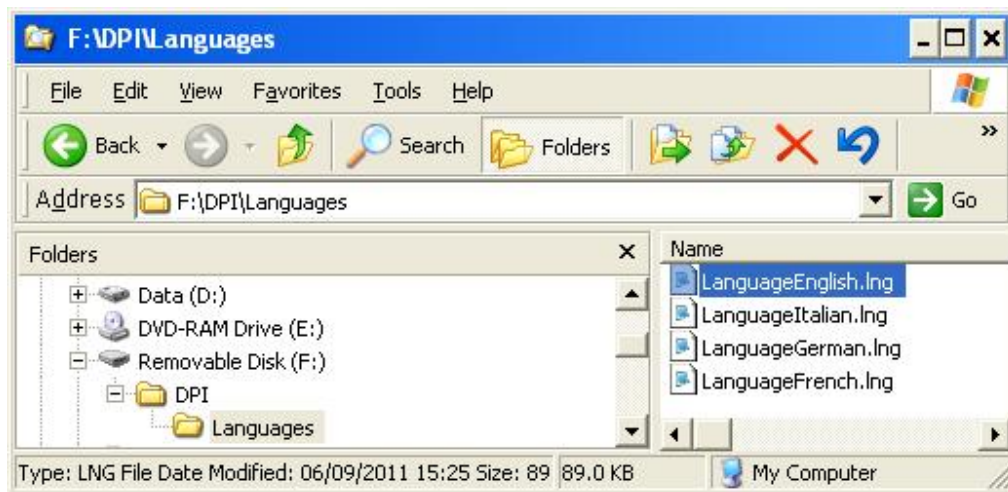

Figure 7-5: Language Setting

7.8 Return Goods/Material Procedure

If a calibration is necessary or the unit 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 this information for a RGA or RMA:

- Product (for example, PACE1000)

- Serial number.

- Details of defect/work to be undertaken.

- Calibration traceability requirements.

- Operating conditions.

7.8.1 Safety Precautions

INFORMATION **Service by unauthorized sources will affect the warranty and cannot guarantee continued 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.

7.9 Packaging Procedure for Storage or Transportation

To send the Indicator for calibration or repair, complete the return goods procedure. Refer to Section 7.8, "Return Goods/Material Procedure," on page 56.

To store or return the Indicator for calibration or repair:

1. The instrument must be at zero or 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. Put the power supply and cable in a safe place ready for packing.
7. Remove any pressure adapters, diffusers and restricters.

    If available, use the original packing material. When using packing materials other than the original:

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 the Indicator and power supply and cable in polyethylene sheeting.
10. Select a double-wall cardboard container.
    - Inner 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 in the container.
12. Seal carton with approved sealing tape.
13. Mark carton "FRAGILE" on all sides, top, and bottom of shipping container. See "General Specification" on page iii for shipping and storage conditions.

8. Options

8.1 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.

8.2 Soft Options

To enable soft options:

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

Note: Hardware options automatically enable when installed.

8.3 Analog Output and Volt-free Contact Options
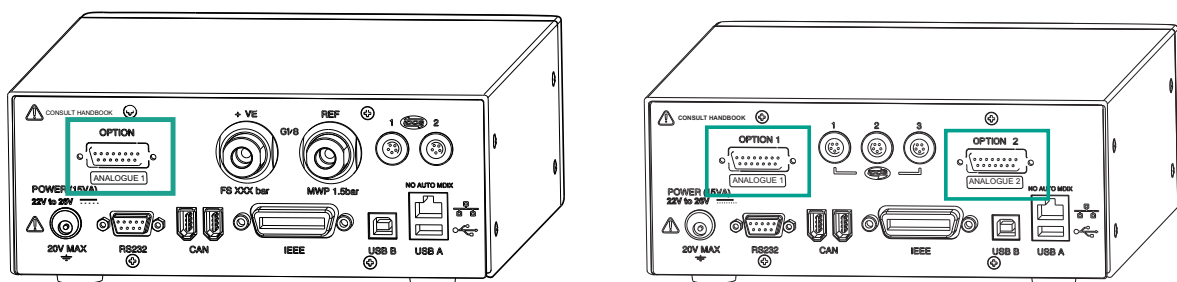

Figure 8-1: Typical Rear Panel with One or Two Analogue or Volt-free Connectors

The Indicator has a different rear panel for these options. It also has extra menu options to set the parameters for these options.

The analogue output option provides one or two connections to analogue outputs, proportional to measured pressure.

The volt-free option provides one or two connections to selectable relay contacts - operated by the conditions set in the Indicator menus.

The image shows that if you have the two connectors then there is no room for internal sensors, so it has three electrical sockets for external sensors instead.

⚠ **CAUTION** **To maintain product safety and compliance, external circuits connected to the instrument must meet Safety Extra-Low Voltage (SELV) requirements and shall not exceed 3 meters in length.**

Table 8-1: Analogue Connection Details

Item	Details
Voltages	24 V rated output
	30 V maximum with respect to chassis
Output Bandwidth	0.5 x update rate (Hz)
Connectors	15-way female D-type

Table 8-2: Volt-free Connection Details

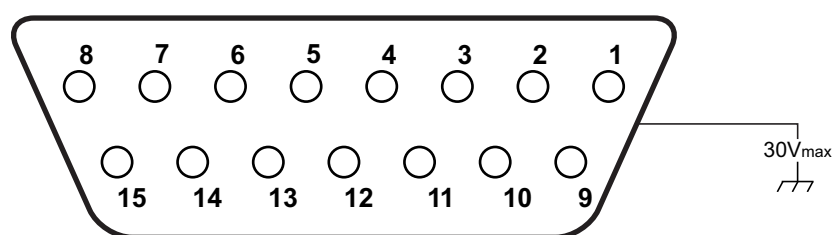| Item	Details
Voltages	24 V rated output
	30 V maximum with respect to chassis
Relay contacts	1 A resistive load 200 mA inductive load.
Connectors	15-way female D-type

Figure 8-2: Front View of Connectors

Table 8-3: Pin Number and Function - Analogue Output Option

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)		

Table 8-4: Pin Number and Function - Volt-free Option

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		
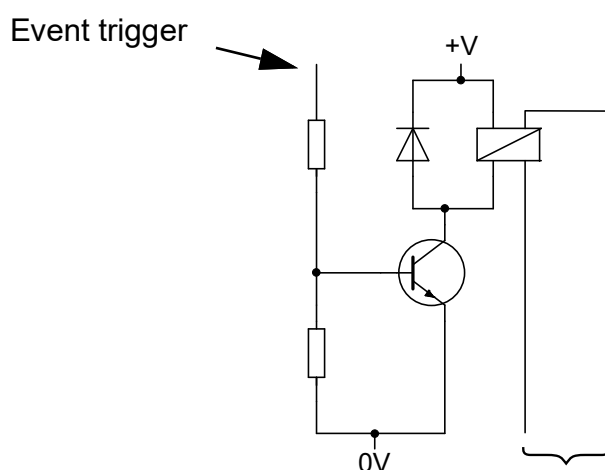
Figure 8-3: Typical Relay Circuit - Volt-free Option

To edit the parameters for the analogue output, select: **Measure Setup** > **Analogue O/P Setup**. If you have two analogue connectors, you will choose from 1 or 2. You will then have options to set for the analogue connections.

To edit the parameters for the volt-free contacts, select: **Measure Setup** > **VFC Setup**.

If you have two volt free connectors, you will choose from 1 or 2. You will then have options to set for the volt free contact connections.

8.4 Installation and Ancillary Equipment Kit

Refer to the Datasheet for details.

Chapter 8. Options

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 shown:

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

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.

Appendix B. Air Density

Appendix C. User Interface Icons

These 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

Appendix C. User Interface Icons

	Display Icons in Setup Menus				
Icon	**Function**	**Icon**	**Function**	**Icon**	**Function**
	Display		Divider		Error
	Escape		Ethernet		Ethernet not connected
	Ethernet connected		Exclamation		Fault history
	Filter pressure reading		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		More...		Nudge
	Passive mode		Percentage		Percentage
	PIN		Power-up		Preset
	Pressure		Pressure filter		Process

Display Icons in Setup Menus					
Icon	**Function**	**Icon**	**Function**	**Icon**	**Function**
	Protective vent		Question		Range
	Range compare		Recall user setup		Reset use log
	Resolution		Reference level difference (gas head correction)		Retry
	Roughing		RS-232		Restore to as shipped settings
	Restore settings 2		Run		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		Support		Task

Appendix C. User Interface Icons

	Display Icons in Setup Menus				
Icon	**Function**	**Icon**	**Function**	**Icon**	**Function**
	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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