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a Baker Hughes business

DPI610E
DPI610E-IS

Portable Pressure Calibrator
Instruction Manual



DPI610E-PC



DPI610E-SPC



DPI610E-HC



DPI610E-SHC

Druck.com

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Appendix A. COMPLIANCE STATEMENTS i
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1. Overview

The DPI610E series instrument comprises a portable pressure calibrator with an in-built pressure generation manual pump, with pressure measurement and simulation capability. It is to be used to calibrate pressure sensors and transmitters. It has a smart and simple user interface allowing it to be operated by any technician, service or maintenance engineer.

The DPI610E series combines a practical and robust design with reliable and accurate measurements. It is battery-powered and features highly reliable pneumatic and hydraulic assemblies for continuous and reliable performance for field calibration, even in harsh environmental conditions.

A flexible hose is supplied with the instrument to enable connection to other equipment.

This calibrator is enhanced with data logging functionality with internal memory for secure file storage.

The analysis feature includes field error calculations with PASS/FAIL status with the ability to create or download procedures which can be run on multiple devices, providing calibration certification for asset management and maintenance purposes.

The DPI610E can have Bluetooth hardware, to transmit data between other Bluetooth equipped devices. The DPI610E supports the HART (Highway Addressable Remote Transducer) communication protocol and allows basic HART operation and configuration on HART supported devices.

1.1 DPI610E Series

1.1.1 Firmware Versions

This manual is based on the use of application firmware DK0492 version 02.00.03 and 02.00.04. For further details see End User Software Release Note document **169M2231** available at **Druck.com/DPI610E**.

Table 1-1: DPI610E Series

Product Name	Case Color	Pressure Range	Calibrator Type
DPI610E-PC	Blue	0.35 bar - 35 bar (5 - 500 psi) (0.035 MPa - 3.5 MPa)	Pneumatic
DPI610E-SPC	Yellow	0.35 bar - 35 bar (5 - 500 psi) (0.035 MPa - 3.5 MPa	Pneumatic - Intrinsically Safe
DPI610E-HC	Blue	70 bar - 1000 bar (1000 psi - 15000 psi) (7 MPa - 100 MPa)	Hydraulic
DPI610E-SHC	Yellow	70 bar - 1000 bar (1000 psi - 15000 psi) (7 MPa - 100 MPa)	Hydraulic- Intrinsically Safe

Photographs of these Calibrator types are on the next page.

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Model: DPI610E-PC
Type: Pneumatic
Pressure Range: 0.35 - 35 bar,
5 - 500 psi, 0.035 - 3.5 MPa



Model: DPI610E-SPC
Type: Pneumatic - Intrinsically Safe
Pressure Range: 0.35 - 35 bar,
5 - 500 psi, 0.035 - 3.5 MPa



Model: DPI610E-HC
Type: Hydraulic
Pressure Range: 70 - 1000 bar,
1000 - 15000 psi, 7 - 1000 MPa



Model: DPI610E-SHC
Type: Hydraulic - Intrinsically Safe
Pressure Range: 70 - 1000 bar,
1000 - 15000 psi, 7 - 1000 MPa

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1.2 Equipment in the Box

The following items are supplied with the instruments in the DPI610E series. When unpacking the instrument, make sure that there are no missing items.

Note: When the hydraulic instrument is delivered there is a protective cap in the reservoir socket. Keep this cap for future use: this is for sealing the socket when no reservoir is attached.

1.2.1 Pneumatic Units

1. DC Power Supply (IO610E-PSU)
2. BSP Swivel Adapter (184-203)
3. NPT Swivel Adapter (184-226)
4. Blanking Plug (111M7272-1)
5. (IDT) Instrument Dirt Trap (IO620-IDT621-NEW) - packed separately, OR
   (IDT) Instrument Dirt Trap (IO620-IDT621-IS) - packed separately
6. Hose sets: 1m (IOHOSE-P1) or Intrinsically Safe (IOHOSE-P1-IS)
7. Electrical Test Lead Set (I06X-LEAD)
8. 2m USB Cable (IO610E-USB-CABLE)
9. DPI610E Quick Start and Safety Manual (165M0437)
10. Certificates Document Pack (IS product only)
11. Factory Calibration Certificate.

1.2.2 Hydraulic Units

1. DC Power Supply (I0610E-PSU)
2. BSP Swivel Adapter (184-203)
3. NPT Swivel Adapter (184-226)
4. Blanking Plug (111M7272-1)
5. Hose sets: 1m long (IO620-HOSE-H1) or Intrinsically Safe (IO620-HOSE-H1-IS)
6. Reservoir (PV411-115 or Intrinsically Safe PV411-115-IS) - packed separately
7. 250 mL Reservoir Filler Bottle (1S-11-0085)
8. Electrical Test Lead Set (I06X-LEAD)
9. 2m USB Cable (IO610E-USB-CABLE)
10. DPI610E Quick Start and Safety Manual (165M0437)
11. Certificates Document Pack (IS product only)
12. Factory Calibration Certificate.

1.3 Specifications for DPI610E

Refer to **www.druck.com/dpi610e** for the Data sheet that gives the technical specifications for the DPI610E.

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1.4 Accessories

Table 1-2 shows common accessories for the DPI610E series. See Data sheet (BHCS39207) for a full list of accessories.

Table 1-2: Common accessories

Part Code	Description
RTD-INTERFACE-485	RTD Interface only (non-IS area)
RTD-INTERFACE-IS	RTD IS Interface (IS area)
RTD-PROBE-485	RTD Interface with PT100 Probe (non-IS area)
RTD-PROBE-IS	RTD Interface with PT100 Probe (IS area)
IO-RTD-M12CON	M12 Field Wireable Connector to fit RTD Interface (IS and non-IS area)
IO-RTD-M12EXT	RTD M12 male to female extension lead 2 m (6.5 ft) 4-wire
IO-RTD-PRB150	150 mm length 6 mm diameter PT100 steel RTD probe, Class A
PM700E	Remote Pressure Sensor (non-IS area)
PM700E-IS	Remote Pressure Sensor (IS area)
PM700E-CABLE	Remote Sensor Extension Cable 2.9 m (9.5 ft)
IO620-IDT621-NEW	Bar Dirt and Moisture Trap (non-IS area)
IO620-IDT621-IS	Bar Dirt and Moisture (IS area)
IO610E-CASE	Carrying Case (suitable for IS and non-IS use)

1.5 Observance of Manual

INFORMATION **This manual contains operating procedures and safety information for the DPI610E series. It is the responsibility of the customer to make sure that all personnel operating and maintaining the equipment are correctly trained and qualified.**

Note: Before operating or using the equipment, read and obey all warnings and cautions given in the Quick Start and Safety Manual.

1.6 Safety

INFORMATION **The manufacturer has designed this equipment to be safe when used as detailed in this manual. Operators should read and obey all local Health and Safety regulations and Safe Working Procedures or Practices.**

When performing a procedure or task:

1. Do not use this instrument for any other purpose than stated in this manual. Incorrect use may reduce safety.
2. Follow all operating and safety instructions in the Quick Start and Safety Manual.
3. Use suitably qualified Technicians and good engineering practice for all procedures in this documentation.

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1.6.1 General Safety Precautions

- Use only the approved tools, consumable materials and spares to operate and maintain the equipment.
- Make sure all work areas are clean and clear of unwanted tools, equipment and materials.
- Make sure all unwanted consumable materials are discarded in accordance with local health and safety and environmental regulations.

1.6.2 Software Configuration and Security

Before use, make sure the relevant instrument settings are as expected. Other personnel that have access to the instrument, can have made unknown changes. Visually inspect the instrument for this type of change, before measurements are taken and calibrations done with the instrument.

1.6.3 Operation in a Hazardous Environment



WARNING Do not use the DPI610E-HC or DPI610E-PC in locations where explosive gas, vapor or dust are present. There is a risk of an explosion.

Refer to the Quick Start and Safety Manual provided with the instrument.

1.6.4 General Warnings



Make sure that the instrument is safe to use with the proposed media. Some liquid and gas mixtures are dangerous. This includes mixtures that result from contamination.

Do not use in an enriched oxygen environment or with other strong oxidizers - this can cause an explosion.

Do not use tools on the instrument that might cause incendive sparks - this can cause an explosion.

It is dangerous to ignore the specified limits (refer to data sheet) for the DPI610E series or to use the instrument when it is not in its normal condition. Use the applicable protection and obey all safety precautions.

1.6.5 Electrical Warning



RISK OF ELECTRIC SHOCK To prevent electrical shocks or damage to the instrument, do not connect more than 30 V CAT I between the terminals, or between the terminals and the ground (earth). Any connection must be compliant with the terminal input/output parameters.

External circuits should have appropriate insulation to the mains.



WARNING This instrument uses a Lithium-Ion (Li-Ion) battery pack. To prevent an explosion or fire, do not short circuit and do not disassemble. Keep the battery safe from damage.

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WARNING To prevent an explosion or fire, only use the Druck specified battery (150M8295-1) and power supply (149M4334-1) rated for this instrument.

To prevent battery leakage/damage or excess heat generation, only use the mains power supply in the ambient temperature range 0 to 40°C (32 to 104°F). The power supply input range is 90 – 264 VAC, 50 to 60 Hz, 300 mA, installation category CAT II.

Note: Battery temperature. Long time exposure to temperature extremes can decrease battery life. For maximum life, do not expose the battery to temperatures outside the range -20°C to +40°C for long periods. The recommended storage temperature range is -20°C to 25°C.

Note: Position the power supply without obstructing the supply disconnecting device.

Note: The instrument is suitable for short-term and long-term temporary over-voltage that may occur between the line conductor and earth in electrical installations.

Note: Keep all leads free from contaminants.

1.6.6 Pressure Warnings

INFORMATION The instrument contains an internal over-pressure vent mechanism to protect the internal pressure sensor and pump mechanism from damage.

Note: Maximum Operating Pressure (MWP) is stated on the label on the underside of the instrument. Over pressure should be limited to 1.5 × MWP (MWP is based on unit pressure range).

WARNING Always wear appropriate eye protection when working with pressure.

To prevent a dangerous release of pressure, make sure that all the related pipes, hoses and other accessories have the correct pressure rating, are safe to use and are correctly attached. Isolate and bleed the system before you disconnect a pressure connection.

It is dangerous to attach an external source of pressure to the instrument. Use only the internal mechanisms to set and control pressure in the pressure station.

1.6.7 Over-voltage Categories

The following summary of installation and measurement over-voltage categories is derived from IEC610101. The over-voltage categories indicate the severity of over-voltage transients.

Table 1-3: Over-voltage Categories

Category	Description
CAT I	This is the least severe over-voltage transient. CAT I equipment cannot be directly connected to the mains power. E.g a process loop powered device.
CAT II	This is for single phase electrical installation. E.g appliances and portable tools.

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1.7 Maintenance

Maintain the instrument using the procedures outlined in this User Manual. For information relating to maintenance issues please contact: www.bakerhughesds.com/druck/global-service-support

Table 1-4 summarizes manufacturer recommended maintenance tasks for the DPI610E series.

Table 1-4: Maintenance Tasks

Task	Period
Visual Inspection	Before Use
Cleaning	Determined by usage
Calibration	12 months (recommended)

1.7.1 Visual Inspection

Inspect the instrument before use, checking for signs of damage (e.g case cracking, pressure connector damage or pressure leakage), to ensure continued safe working.

1.7.2 Cleaning

Clean the surface of the instrument should using a damp cloth with water and mild detergent. Do not submerge the instrument in water.

1.7.3 Calibration

To calibrate the instrument, please contact www.bakerhughesds.com/druck/global-service-support

1.8 Service and Repair

WARNING Servicing or repairing the equipment may result in damage to property and serious personal injury (including death). It is important that service and repair are only done by a Druck authorized service provider.

Repair activities undertaken by unauthorized personnel may invalidate the equipment warranty. Druck cannot be held liable for any damage (including damage to the equipment), monetary fine 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.

Internal components, such as the Lithium battery pack, may be under pressure or create other hazards if abused.

For more details, please see www.bakerhughesds.com/druck/global-service-support

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1.9 Spares

For advice or technical support relating to spare parts, please contact: drucktechsupport@BakerHughes.com

1.10 Instrument Return

1.10.1 Returned Goods Procedure

If the unit requires calibration or is unserviceable, please return it to the nearest Druck Service Centre listed at: https://www.bakerhughes.com/druck

Contact the Service Centre to obtain a Return Goods Authorization (RGA). If you are in the USA, obtain a Return Material Authorization (RMA).

Provide the following information on either a RGA or RMA:

- Product code
- Serial number
- Details of defect/work to be undertaken
- Error code(s) if applicable
- Operating conditions.

1.10.2 Instrument Disposal

Do not dispose of this product as household waste. Use a Recycling Passport for the product. This can be downloaded from the product web page: https://www.Druck.com/expert. Use an approved organization that collects and/or recycles redundant electrical and electronic equipment.

For more information contact either our Customer Service Department (https://www.bakerhughes.com/druck) or your local government office.

1.11 Packaging For Storage or Transportation

1.11.1 Environment

The equipment must be maintained in the conditions shown in Table 1-5. This applies for both shipping and storage.

Table 1-5: Conditions for Storage and Transportation

Condition	DPI610-E	Mains Plug 149M43341
Outdoor use	Not for permanent installation outdoors	For indoor use only
IP rating	IP54	IP20
Operating temperature	-10 to 50°C	-10 to 50°C
Storage and shipping temperature	-20 to 70°C	-20 to 70°C
Altitude	-300 to 2000m	-300 to 2000m
Operating humidity	0 to 95% relative humidity (RH) non-condensing	0 to 95% relative humidity (RH) non-condensing
Pollution degree	1	1

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1.12 Preparing the Instrument

INFORMATION When you receive the instrument, check the that the box contains the items listed in Section 1.2, “Equipment in the Box,” on page 3. It is recommended that you retain the box and packaging for future use.

1.12.1 Initial Checks

- Visual check (for cracks/defects)
- Do not use any equipment that you know is damaged or faulty
- Ensure the battery is charged (see Section 1.13).

1.13 Battery and Charging

The instrument contains a rechargeable Li-ion battery. To charge the battery, plug the power supply into the DC charging port located under the protection flap, in the head of the instrument.

The instrument can also be charged from any vehicle with a standard 12 V accessory socket with an IO610E-CAR CHARGER (optional accessory).

The instrument can be charged while switched on and also when powered off. Battery charge time is approximately two hours from empty to fully charged.

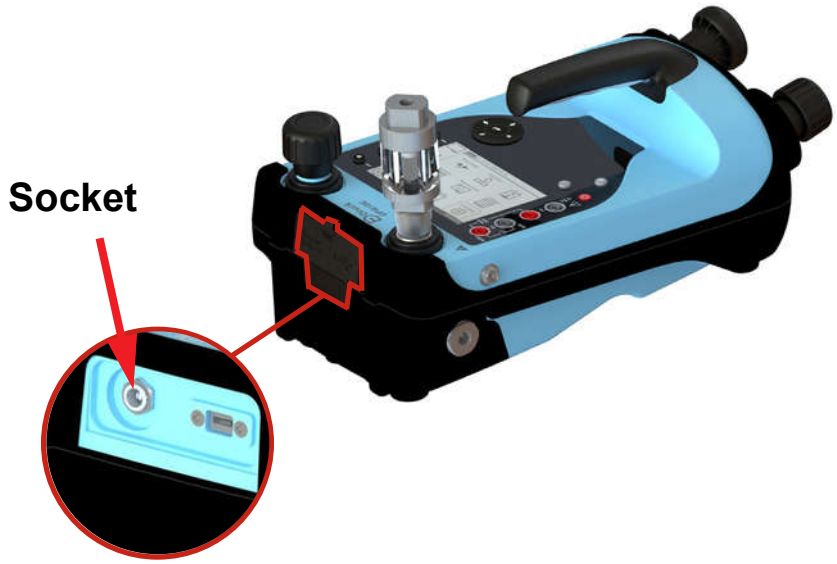

Figure 1-1: Battery Charging Socket

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1.13.1 Battery Status Indicator

	The battery status indicator (located at the right hand side of instrument) provides a visual indication of the battery level, even when the instrument is off. Push the circular button on the right of the display to temporarily show the charge: the display will automatically close down. Each LED represents approximately 25% battery capacity.

1.14 Power ON/OFF

1.14.1 Power ON

To switch the instrument ON, hold down the power button for about 2 seconds, until the Druck Logo splash screen appears.

1.14.2 Power OFF

To switch the instrument OFF, hold down the power button for about 4 seconds until the closing screen appears.

1.14.3 Auto Power Down

The instrument has an Auto Power Down feature that can be enabled/deactivated as required. See General Settings Section 4 on page 36: (on the instrument it can be found under the **General Settings** screen on the Dashboard).

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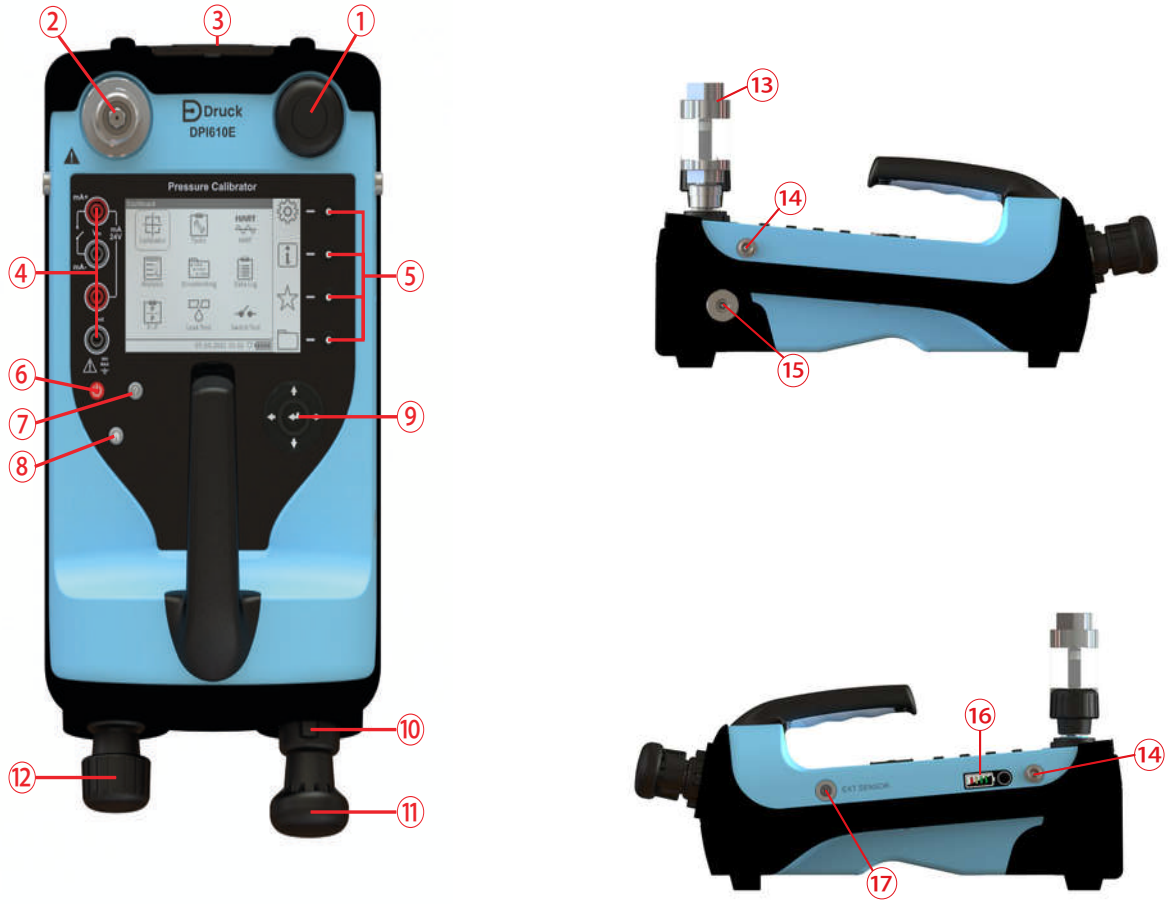
1.15 Parts



Pneumatic version

Number	Item	Number	Item
1	Pressure Release Valve	10	Pressure/Vacuum Selector
2	Test Port (including Swivel Connector)	11	Pressure/Vacuum Hand Pump
3	Auxiliary Ports (DC power supply port Battery Charging, USB micro port.	12	Volume Adjuster (Fine control of pressure)
4	Electrical 4mm sockets	13	Instrument Dirt (& Fluid) Trap (IDT)
5	Screen Selection softkeys	14	Clip Fastener for Carrying Strap
6	Power ON/OFF button	15	Barometer Port
7	Help Button	16	Battery Level Indicator (One bar equals 25% charge)
8	Home Button	17	External Sensor Port
9	Navigation Pad		

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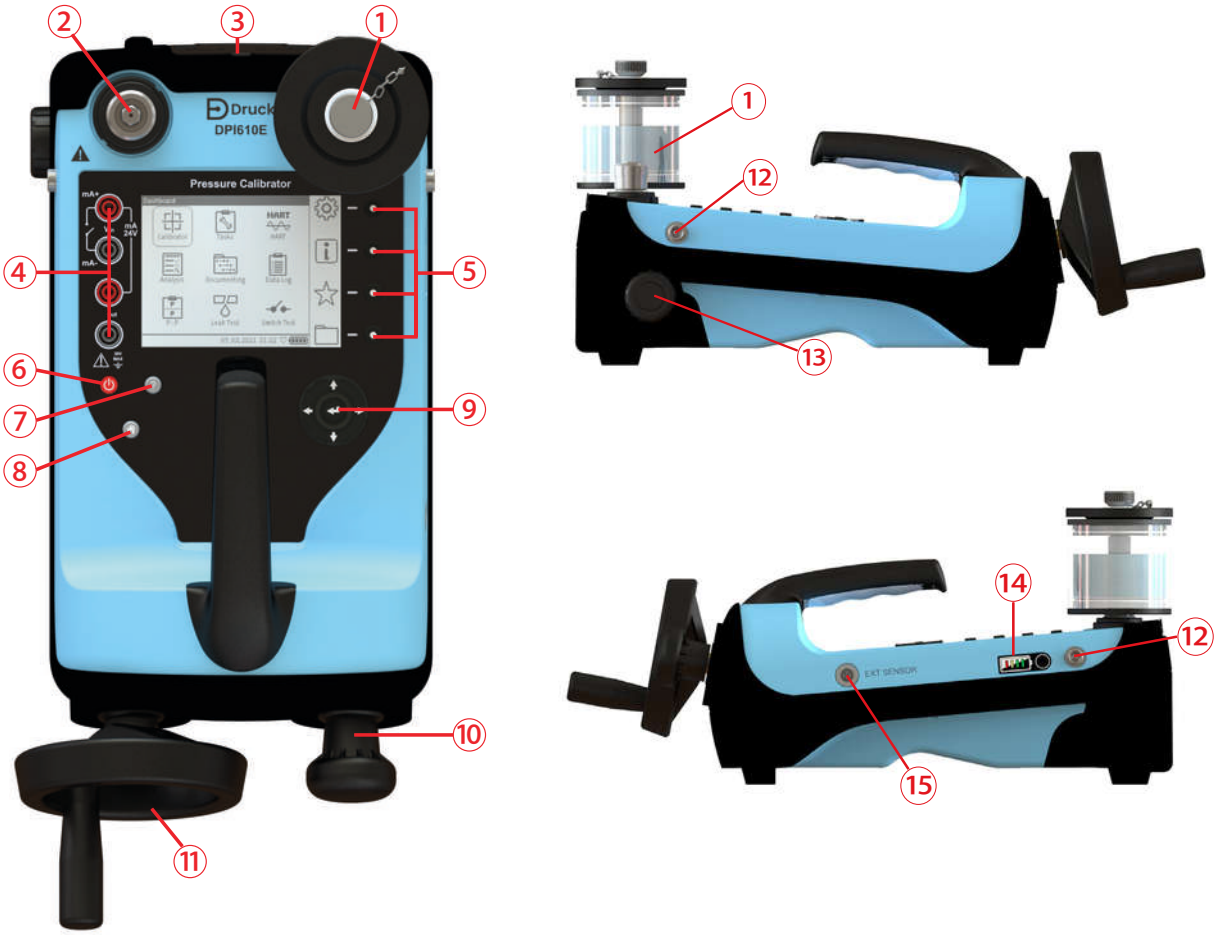

Hydraulic version

Number	Item	Number	Item
1	Hydraulic Reservoir	9	Navigation pad
2	Test Port (including swivel connector)	10	Pressure Hand Pump
3	Auxiliary Ports (DC power supply port Battery Charging, USB micro port.	11	Volume Adjuster Wheel (Fine control of pressure)
4	Electrical 4mm Sockets	12	Clip Fastener for Carrying Strap
5	Screen Selection softkeys	13	Pressure Release Valve
6	Power ON/OFF button	14	Battery Level Indicator (One bar equals 25% charge)
7	Help button	15	External Sensor Port
8	Home button		

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1.15.1 Test Port

The Test Port is at the top left corner of the instrument. Pressure can be generated and supplied to pressure devices that are connected either directly or by the use of compatible hose fittings.

1.15.2 Reservoir (Hydraulic Version)

Make sure the Reservoir is filled with the correct hydraulic fluid before use. Recommended fluid ISO viscosity grade ≤ 22, such as demineralized water or mineral oil.

1.15.3 Pressure Release Valve

The Pressure Release valve is on the top right of the instrument for the Pneumatic version and on the left side for the Hydraulic version. To release all pressure within the instrument, slowly open the pressure release valve by turning it counter-clockwise. Make sure the system is sealed before pressure generation by completely closing the pressure release valve in the clockwise direction.

1.15.4 Electrical Connections

Four electrical 4mm sockets are on the left side of the instrument glass face. These are labeled for different electrical measurement or source functions.

1.15.5 Handle and Shoulder Strap

The DPI610E has a carry handle to allow for a steady grip on the instrument, while the shoulder strap can be used for more comfortable use.

1.15.6 Pump (Pneumatic Version)

When the pump selector is in the (+) orientation the hand pump generates pressure by a forward-backward stroke action. When the pump selector is in the (-) orientation the pump creates a vacuum by a backward-forward stroke action. To prevent damage to the device the system must be fully vented before switching between vacuum and pressure.

1.15.7 Priming Pump (Hydraulic Version)

The priming pump is used to draw hydraulic fluid from the reservoir and force air, gas or vapor present, out of the system.

1.15.8 Volume Adjuster (Pneumatic Version)

The volume adjuster is used to control the pressure for fine adjustments.

1.15.9 Volume Adjuster Wheel (Hydraulic Version)

The volume adjuster wheel is used to adjust the pressure in the range of 20 - 1000 bar. To increase the pressure, turn the wheel clockwise. To decrease the pressure, turn the wheel counter-clockwise.

1.15.10 Pressure/ Vacuum Selector (Pneumatic Version)

The pressure/vacuum selector can be set to generate a pressure or a vacuum. To prevent damage to the unit the system must be fully vented before switching between vacuum and pressure.

1.15.11 Auxiliary Ports

The auxiliary ports are at the top of the instrument and enclosed within the rubberized flap. It accommodates a DC power supply port and a Micro USB port.

1.15.12 External Sensor Port

On the right side of the instrument is the RS485 communications port to enable connection of external remote sensors such as the PM700E pressure sensor and the RTD-Interface.

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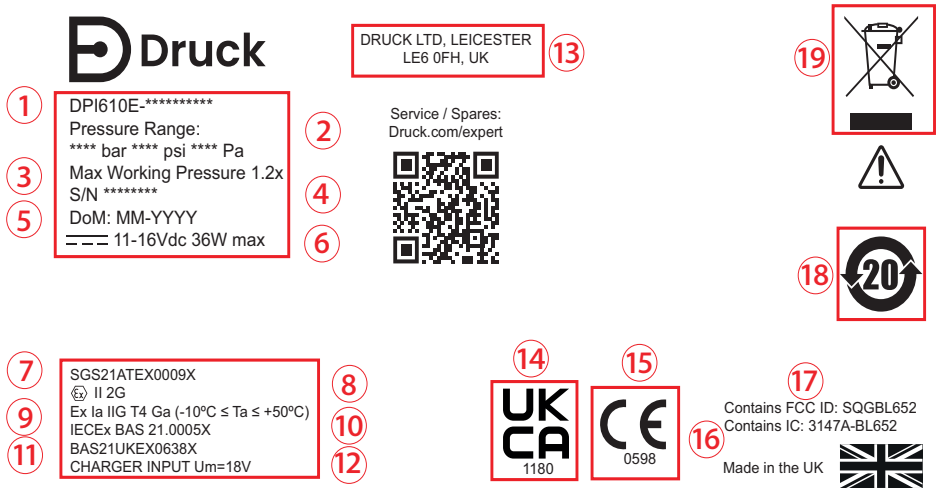
1.15.13 Barometric Port (Pneumatic Version only)

The left side has a Barometer port that provides a static pressure inlet for the internal barometric pressure sensor.

1.16 Label on Instrument Base.



Note: Certification markings might be different on instrument, depending on model purchased.

Number	Item
1	Full code Identification of instrument.
2	Pressure range of instrument.
3	Maximum Working Pressure is 1.2 x value of top value of pressure range
4	Serial number of the instrument
5	Date of Manufacture: Month, Year
6	Current and Voltage rating for the instrument
7	ATEX Certificate Number
8	EU Directive 2014/34/EU Marking
9	EU Hazardous Area Marking
10	IECEx Certificate Number
11	UKEX Certificate Number
12	Current output of Charger
13	Full address of manufacturer of instrument
14	This mark indicates that this product complies with the Great Britain standard for the safety of products
15	This mark indicates that this product complies with the European standard for the safety of products.
16	Canada ISED Radio Approval ID (Bluetooth)
17	US FCC Radio Approval ID (Bluetooth)
18	China RoHS
19	WEEE (Recycling) Marking. Do not dispose of as normal refuse - take to an authorized disposal facility.

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1.17 User Interface



Figure 1-2: Instrument User interface

The user interface (Figure 1-2) can be operated using the touchscreen, buttons or softkeys.

1.17.1 Buttons and softkeys

1.17.1.1 Power Button

The power button is used to switch the instrument on and off. See Section 1.14, “Power ON/OFF,” on page 10.

1.17.1.2 Help Button

The Help button provides relevant information on how to use the instrument. It is context-sensitive which means the information provided when the help button is pressed will be related to the specific screen or task in use at that moment in time. The Help button also provides a link and QR code to access the full user manual online through a smart device or PC.

1.17.1.3 Home Button

The **Home** button acts as a shortcut key which enables quick navigation to the Dashboard home screen from anywhere in the user menu.

1.17.1.4 Enter button

An **Enter** button is in the middle of the Navigation Pad.

1.17.1.5 Navigation Pad

	The Navigation Pad consists of Up, Down, Left, Right and Enter buttons which allow quick and easy navigation when using the user interface.

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1.17.1.6 Softkeys



There are four softkeys on the right side of the LCD display. These softkeys are context-sensitive and their use varies from screen to screen depending on the menu or task being accessed. Each softkey has a corresponding on-screen icon which provides a visual display of the purpose of that specific button as shown in Figure 1-2. The on-screen icons also act as touch-screen buttons for the same purpose as the corresponding softkey.

1.18 First Use

Check that the default settings for the instrument are correct before the first use of the instrument: refer to Section 4 on page 36 for how to set its default values. For example, it might be necessary to change the language for the user interface or the time and date.

1.19 Dashboard

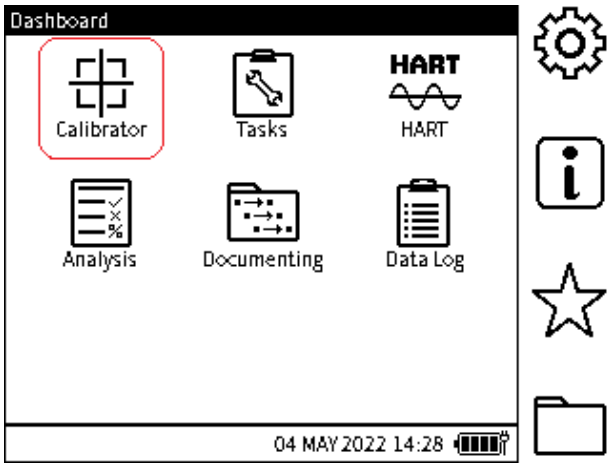

Figure 1-3: Instrument Dashboard

On power up, the instrument displays the Dashboard. The Dashboard is the home screen through which all functions, tasks and settings can be accessed. The Dashboard has icons which represent different applications. The Calibrator, Tasks, HART, Analysis, Documenting, and Data Log icons are fixed and always present.

Note: If additional applications are configured on the instrument license, their respective icons will also be present and fixed on the Dashboard (See Chapter 4 on page 36).

1.19.1 Dashboard Softkeys

The dashboard softkey icons are on the right of the dashboard screen. The icons are ⚙ General Settings, ⓘ Status, ☆ Favorites and 🗀 File System. An icon is activated by either tapping the screen where it is or by pushing the softkey on the right of the icon.

Note: The icons on the sidebar are fixed on the Dashboard.

Be careful to avoid accidentally touching the display screen when using the instrument. This can make the system execute unintended actions. This can happen, for example, when pushing cables into the sockets in the face of the instrument or by letting cables touch the screen.

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1.19.2 Dashboard Navigation

To access an application, the user should select the relevant icon on the touch screen. The user can also use the navigation buttons to navigate between icons on the dashboard as described in Section 1.17.1.5.

To access the icons on the side bar, select the relevant icon on the touch screen, or push the corresponding softkey.

Note: To return to the Dashboard, the user can select the home button **<HOME>**.

1.19.3 Set Date, Time and Language

1.19.3.1 Date and Time

To access the **Date/Time** menu screen (Figure 1-4), select:

Dashboard >> ⚙ General Settings >>TIME/DATE

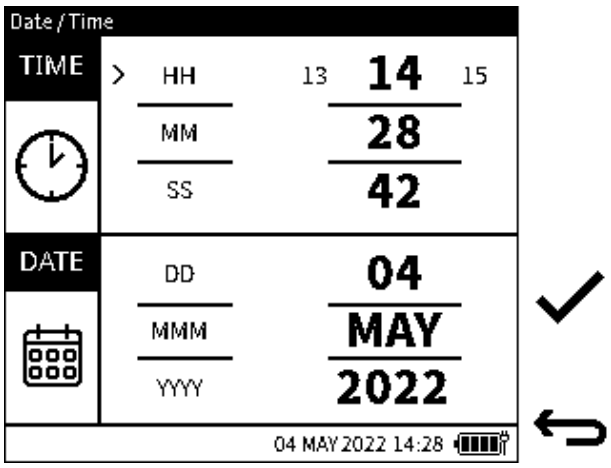

Figure 1-4: Time/Date Menu Screen

On the Navigation Pad, use the **UP/DOWN** navigation buttons to select the time and date parameters to be changed, then use the **LEFT/RIGHT** buttons to increase or decrease the values. If using the touchscreen, tap the required time or date parameter to be changed and then tap on the right side of the set value (in bold font) to increment or on the left side to decrement the value as required.

When all parameters have been selected push the **Tick** ✓ softkey to accept the **Date/Time** changes or tap the **Back** ⮌ button to exit without saving the changes.

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1.19.3.2 Language

To access the **Language** menu (Figure 1-5), select:

Dashboard >> ⚙ General Settings >>Language

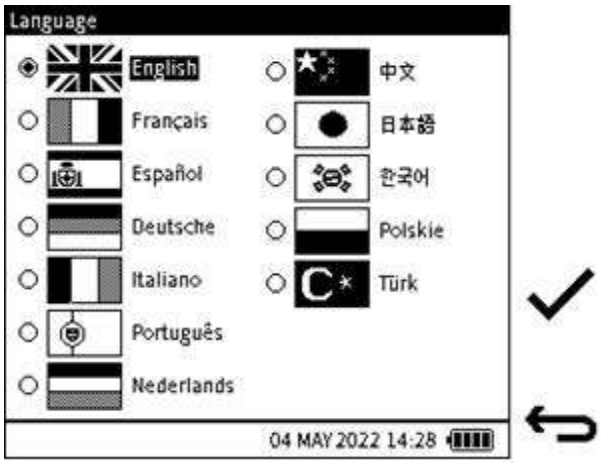

Figure 1-5: Language Menu Screen

Use the navigation buttons to select the desired language. If using the touchscreen, tap on the desired language option. Push the **Tick** ✓ softkey to accept the changes or select the **Back** ⮌ softkey to exit without saving any changes.

1.19.3.3 Open Source Licenses

There are two files that relate to the software for upgrading the firmware for this instrument:

1568-notices-report-08_08_2022_17_04.txt covers DK0491 DPI610E Bootloader

1563-notices-report-08_08_2022_16_01.txt covers DK0492 DPI610E Main Application.

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2. Pump Operations

2.1 Pneumatic System

2.1.1 Use of Blanking Plug

	A Blanking Plug seals the test port and stops foreign matter getting into the port. It is good practice to attach the Blanking Plug when the test port is not in use. To attach the Blanking Plug to the test port: put the plug into the swivel connector and hold in position while turning the swivel connector fully counter-clockwise until it is hand tight. To release the plug, hold the plug in position while turning the swivel connector clockwise until the plug can be removed.

2.1.2 Flexible hose

A flexible hose is delivered with the DPI610E, to enable connection to other equipment. Two types of hose are available: one for Safe area use and the other for Intrinsically Safe (IS) environments.

Before use always visually check the hose for faults, such as splits or cuts in the hose.

Always make sure the instrument is safe to use.

2.1.3 Venting to atmosphere

A rapid drop in pressure can damage the instrument. Open the pressure release valve slowly and monitor the pressure reading until you reach the desired pressure.

	To vent the system to atmospheric pressure, slowly turn the pressure release valve fully counter-clockwise until the sensor returns to zero (gauge sensor) or 1 bar (absolute sensor).

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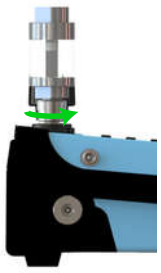
2.1.4 Attach Instrument Dirt (and Water) Trap to Test Port

INFORMATION **It is recommended that a dirt trap is always used.**

CAUTION **To avoid damage to the dirt trap, hold it firmly while screwing it into the test port.**

	To attach the Instrument Dirt (and Water) Trap (IDT) to the test port, first remove the Blanking Plug if it is in the test socket: turn the swivel connector clockwise to release the plug. Put the trap into the socket while turning the swivel connector fully counter-clockwise until it is hand tight.

2.1.5 Attach/Remove Device Under Test

2.1.5.1 Attach Device Under Test

To avoid damage to the device under test, hold it firmly while screwing it into the test port/dirt trap.

	To attach the device under test to the test port or dirt trap, put the trap into the thread of the swivel connector, then turn the swivel connector fully counter-clockwise until it is hand tight. **Note:** Make sure that the device under test has a male G ⅜ Quickfit adapter thread or use a suitable adapter rated to 35 bar. **If in doubt, please contact** www.bakerhughesds.com/druck/global-service-support

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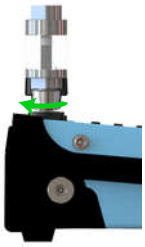
2.1.5.2 Remove Device Under Test

A rapid drop in pressure can damage the instrument. Open the pressure release valve slowly and monitor the pressure reading until you reach the desired pressure

Step 1		Release all of the pressure in the instrument by opening the pressure release knob fully counter-clockwise.
Step 2		To remove the device under test, hold it firmly while turning the swivel connector it fully clockwise. Attach the Blanking Plug to seal and protect the socket if the instrument will not be in immediate use, see “Use of Blanking Plug” on page 19.

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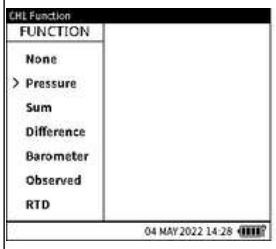
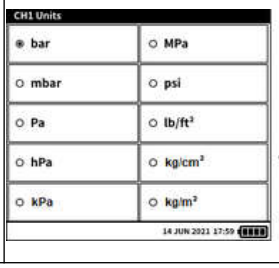
2.1.6 Preparing the instrument for Pressure/Vacuum operation

Make sure the instrument is safe to use: refer to the instructions on page 19.

Step 1		To power ON the instrument, push down the power button for 2 seconds until the Druck splash screen appears.
Step 2		Select the required pressure function from the Channel Function screen. **Note:** From the dashboard select: CALIBRATOR >> CH1 or CH2 >> FUNCTION >> Pressure> INT>>Normal Select the **Tick** ✓ softkey and tap the **Back** ⮌ icon.
Step 3		Select the required units. **Note:** From the dashboard select: CALIBRATOR >> CH1 or CH2 >> UNITS >> either tap the unit required on the screen or use the Navigation key pad arrow keys to select the unit. Select the **Tick** ✓ softkey and tap the **Back** ⮌ icon.

CAUTION To avoid damage to the device under test, hold it firmly while screwing it into the test port/dirt trap.

Step 4		To attach the device under test to the test port or dirt trap: hold the device in the socket, then turn the swivel connector at the base of the connector fully counter-clockwise until it is hand tight. **Note:** Make sure that the device under test has a male G ⅜ Quickfit adapter thread or use a suitable adapter rated to 35 bar. **If in doubt, please contact** www.bakerhughesds.com/druck/global-service-support

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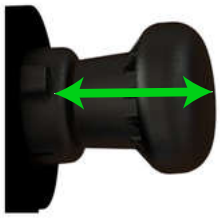
2.1.7 Generating Pressure/Vacuum

Step 1		Seal the system by turning the pressure release valve fully clockwise.

CAUTION **Do not submerge the instrument in the pressure medium. If fluid enters any part of the electrical connection panel, allow the instrument to dry out thoroughly before use.**

Step 2		Adjust the pressure-vacuum selector to pressure mode (+) or vacuum mode (-) depending on the desired operation. **Note:** To adjust the selector from pressure mode to vacuum mode, turn it clockwise. To adjust the selector from vacuum mode to pressure mode, turn it counter-clockwise.

CAUTION **To prevent the instrument from sliding, make sure that either the slip prevention feet are engaged or the instrument is secured against a flat surface.**

Step 3		Use the pump to achieve the desired pressure/vacuum.
Step 4		Turn the volume adjuster to make fine adjustments to the pressure/vacuum.

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A rapid change in pressure/vacuum can damage the instrument. Open the pressure release valve slowly and monitor the reading on the screen until you reach the desired pressure/vacuum.

Optional		To decrease pressure/vacuum, open and close the pressure release valve slowly.

The above procedure is applicable for general use, but a different procedure is necessary for low pressure (350 mbarg) or high vacuum (-950 mbarg).

2.1.7.1 How to make Low Pressure (350 mbarg Full Scale)

Follow these instructions to get a low pressure:

1. Correctly connect the device under test to the test port. Make sure that the DPI610E release valve is also fully open (turn counter-clockwise).
2. Move the pressure-vacuum selector to the '+' position to select the pressure mode.
3. Turn the fine adjustment knob counter-clockwise until about 2 inches/5 cm of thread can be seen (this will take around 15 full rotations from the "fully in" position).
4. Seal the system: close the release valve (turn clockwise) firmly to hand-tight.
5. Make sure that the device screen shows the internal pressure.
6. Push the pump handle slowly and gently and at the same time look at the display for the increase of pressure. Stop when the necessary pressure value is shown.

   Note: Frequently less than one full pump stroke can supply the necessary pressure. More than one pump stroke can be necessary because of the type of connected device under test.
7. If the pressure is below the necessary value, go back to step 5.
8. If the pressure is too high or if the display shows **> > > >** (the pressure is above the internal sensor full-scale limit), slowly turn the fine adjustment knob counter-clockwise to move the pressure down to the necessary value.

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2.1.7.2 How to make a High Vacuum (-950 mbarg)

Follow these instructions to make a high vacuum:

1. Turn the pressure/vacuum selector collar to the vacuum '-' position. Note that as the vacuum increases, it is only the last part of the pump travel (i.e. fully pulled-out) that actually increases the vacuum. This is exactly similar to pumping positive pressure, where it is only the last part of the inward travel that pushes air past the non-return valve as pressure rises. Therefore, for effective use, the pump must be fully pulled out (until the end stop is felt) to effectively generate vacuum.
2. It is much more effective to pull the pump knob out quite quickly (until end stop is hit) because this keeps the non-return valve fully open.
3. To try to get to -950 mbar is similar to trying to remove 95% of the air from the system: this requires approximately 15-20 (fast) strokes to achieve.
4. If difficulty is still encountered getting to low vacuum then stop pumping and use the volume adjuster – unscrewing this will draw further vacuum and reduce the pressure.
5. If -950 mbar is achieved but then the pressure slowly increases (i.e. system appears to be leaking) then check that the release valve is tightly shut and that the IDT (Instrument Dirt Trap) top/bottom seals are not leaking.

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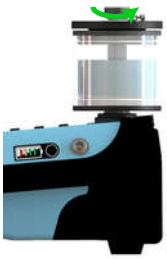
2.2 Hydraulic System

2.2.1 Filing the reservoir

Make sure the instrument is not pressurized: refer to Section 2.2.2 on page 27 for instructions. The instrument is supplied with a 100 cc (3 oz) reservoir tank. The pressure reservoir can be filled attached or detached from the instrument. When the reservoir is removed, seal the socket with the protective cap delivered with the instrument to prevent entry of foreign matter. Make sure that the pressure medium is compatible with your test device.

Note: The recommended pressure medium is demineralized water or mineral oil.

CAUTION **Do not submerge the instrument in the pressure medium. If fluid enters any part of the electrical connection panel, allow the instrument to dry out thoroughly before use.**

Step 1		Turn the reservoir into the reservoir port. Turn the reservoir clockwise, until it is hand tight.
Step 2		Turn the reservoir locknut counter-clockwise and remove the reservoir cover.

INFORMATION **The pressure medium level must stay above the horizontal pin in the reservoir at all times when the instrument is in use. The volume of pressure medium in the reservoir shall not exceed 75cc when the instrument is in use. To avoid contamination, use only one type of pressure media in the instrument. If you wish to change the pressure medium after first use, please contact the Service Department.**

The pressure medium level must always stay above the horizontal pin in the reservoir when the instrument is in use.

The volume of pressure medium in the reservoir must not exceed 75cc when the instrument is in use. The reservoir can be unscrewed from the instrument and filled. To avoid contamination, use only one type of pressure media in the instrument. If you wish to change the pressure medium after first use, please contact the Service Department.

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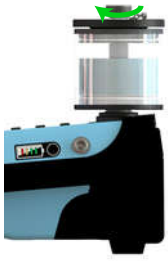
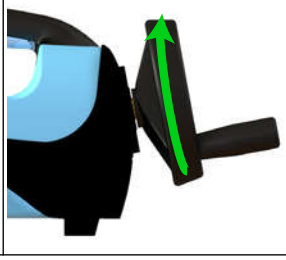
Step 3		Use the squeeze bottle to fill the reservoir with pressure medium to approximately 75% capacity of the reservoir.
Step 4		Push the reservoir cover into position and turn the locknut clockwise until the reservoir cover just seals the reservoir, leaving a small amount of play, (finger tight and back off a quarter turn).

2.2.2 Priming the Instrument

CAUTION Before operating the priming pump, always make sure that the test port is sealed beforehand. Priming the instrument when the test port is unsealed could cause the pressure medium to spray from the test port into the electrical ports.

INFORMATION A blanking plug has been provided by the manufacturer and shipped with the instrument.

Step 1		Make sure the test port is sealed by the Blanking Plug. To attach the Blanking Plug to the test port: put the plug into the thread of the swivel connector and hold in position while turning the swivel connector fully counter-clockwise until it is hand tight. **Note**: It is easier to bleed the system if a hose is attached after air has already been removed from the instrument. Go to step 16 for more information.
Step 2		Turn the volume adjuster wheel clockwise until it stops: this can be up to 30 turns. **Note:** This is the zero point.

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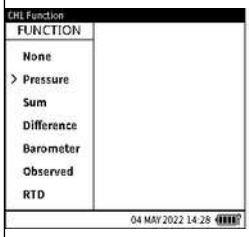
Step 3		Make sure that the pressure release knob is at its fully closed position (hand tight): turn the knob in a clockwise direction.
Step 4		The reservoir must be connected the reservoir port and filled to the required level. See Section 2.2.1 on page 26.
Step 5		To power ON the instrument, push down the power button for 2 seconds until the Druck splash screen appears.
Step 6		Select the required pressure function from the Channel Function screen. **Note:** From the Dashboard select: CALIBRATOR >> CH1 or CH2 >> FUNCTION >> Pressure> INT>>Normal Push the **Tick** ✓ softkey and push the **Back** ⮌ icon to show the previous screen.
Step 7		Select the required units. **Note:** From the Dashboard select: CALIBRATOR >> CH1 or CH2 >> UNITS >> either tap the unit required on the screen or use the Navigation key pad arrow keys to select the unit. Push the **Tick** ✓ softkey and push the **Back** ⮌ button to show the previous screen.
Step 8		Slowly operate the priming pump until the pressure reaches 5-10 bar.

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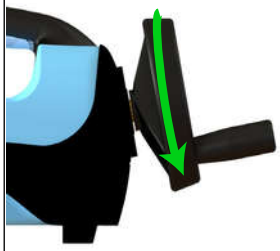
Step 9		Turn the volume adjuster wheel fully counter-clockwise until it stops (this could need at least 29 turns). The indicated pressure reading will decrease.
Step 10		Slowly operate the priming pump until the pressure reaches 5-10 bar.
Step 11		Turn the pressure release knob a quarter of a turn counter-clockwise to release the pressure.
Step 12		Slowly operate the priming pump until no air bubbles come out of the hole in the reservoir center stem. **Note:** It should take 10-15 strokes to remove trapped air from the system.

CAUTION **Do not continue to operate the pump after air bubbles stop coming out of the central reservoir stem hole.**

CAUTION **Do not remove the blanking plug when the instrument is under pressure. Before removing the blanking plug, check the instrument pressure display for pressure. If pressure is observed, turn the pressure release knob fully counter-clockwise until the pressure display reads zero (gauge sensor) or atmospheric pressure (absolute sensor).**

Step 13		Remove the blanking plug from the test port.

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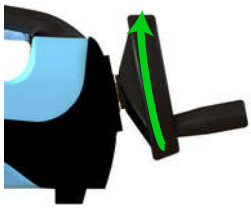
Step 14		Turn the pressure release knob fully clockwise, hand tight.

CAUTION **Do not operate the priming pump. Only use the volume adjuster wheel.**

Step 15		Slowly turn the volume adjuster wheel 2-5 turns clockwise to remove any trapped air.[If mineral oil is used as the pressure media, operate the pump gently to avoid creating a mess.] **Note:** The user may notice air bubbles at the opening of the test port.
Step 16	The instructions in this Step 16 relate only to the connection of a hose to the test port and removal of air from this hose. If a test device is to be connected directly to the instrument (or to the hose after air has been removed), go to Step 17. Connect the hose to the test port and use the Step 10 to Step 15 procedures to remove air from the hose. Use Steps 10 and 11. Ignore Step 12. Use Steps 13 and 14. Step 15: Use the pump to move fluid into the hose. Stop using the pump when air bubbles do not appear at the hose outlet.	

CAUTION **Do not allow movement of the hose to rotate the adapter as this may cause internal damage to the instrument.**

Step 17	Hold the test device in position in the test socket while fully turning the swivel connector counter-clockwise until it is hand tight. A blanking plug can be attached to the hose end instead of a test device. **Note:** As required, use adapters provided with the instrument or an AMC adapter(s) and the corresponding seal(s).	
Step 17		Use the priming pump to prime the system to a maximum of 10-20 bar.

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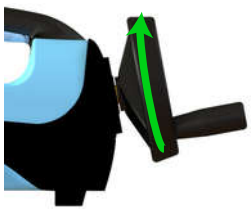
2.2.3 Generating Pressure

INFORMATION **Make sure the instrument is primed before attempting to generate pressure. Check the instrument pressure range on rear label before attempting to generate pressure.**

Step 1		After priming the instrument as described in Section 2.2.2, turn the volume adjuster wheel clockwise until the required pressure is achieved. **Note:** If the required pressure is not achieved or not stable, release the pressure in the instrument and repeat the priming sequence.

2.2.4 Releasing Pressure

Step 1		To release pressure, open the pressure release knob by turning it counter-clockwise.

2.2.5 How to achieve 400 bar

For applications where pressures above 400 bar are required to be generated it is recommended that the system is primed to around 25 bar using the priming pump and that a hydraulic hose of no more than 1m length is used to connect to the device under test.

Note: Using long (or wide-bore) hoses may prevent the required pressure from being reached within the limits of the screw pump mechanism.

2.2.6 How to replace the fluid in the Hydraulic System

The hydraulic system can either use ionized water or hydraulic fluid. The following instructions are for how to remove old fluid and replace with new fluid of the same type. Contact the Services Department for guidance about how to change the type of fluid medium in the device.

Wear the appropriate personal protection equipment when following these procedures e.g., eye protection glasses.

1. Remove old fluid in the Reservoir (if necessary clean the reservoir) and then fill the Reservoir with fresh fluid (to 75% reservoir capacity). Dispose of this old fluid in accordance with your company's procedures.
2. Attach this Reservoir to the DPI610E Reservoir port.
3. Close the Pressure Release Valve (Hand tight).
4. Remove the DUT or (blanking plug if attached) and then attach the supplied hose (or compatible hose) to the test port with the open end of the hose in an empty container.

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5. Turn the Volume adjustment wheel counter-clockwise until it stops.
6. Move the Priming pump handle seven strokes to move hydraulic fluid into the container.
7. Turn the Volume adjustment wheel clockwise until it stops.
8. Move the Priming pump handle seven strokes again.
9. Remove the hose from the test port and then make sure the fluid drains into the container.
10. Dispose of the old fluid collected in the container in accordance with the local regulations.
11. Use the blanking plug to seal the test port.
12. Make sure that Pressure Release Valve is closed (Hand tight), Power on the DPI610E.
13. Operate the Priming pump until the indicated pressure is at 20bar.
14. Open the Pressure release valve.
15. Operate the Priming pump seven strokes.
16. Remove the reservoir and empty the hydraulic fluid (if necessary clean the reservoir again) and then fill the Reservoir with fresh fluid to the recommended level (75% full).
17. Attach the Reservoir filled with new fluid to the DPI610E Reservoir port.

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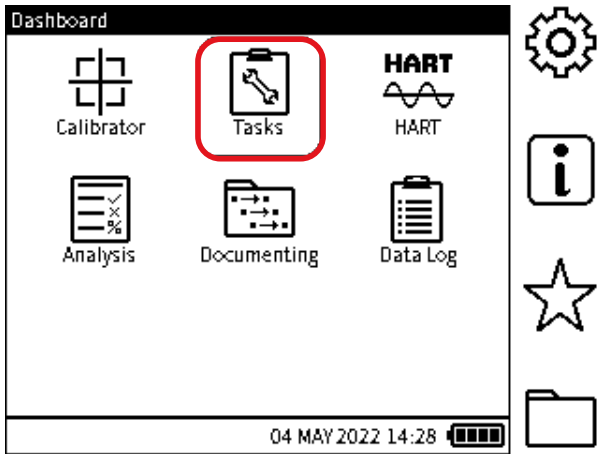
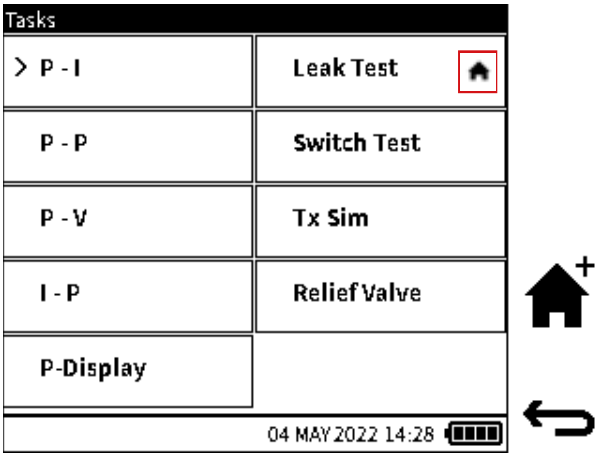
3. Basic Tasks

3.1 Tasks

Use the Dashboard to access the **Tasks** application. The **Tasks** menu has a list of tests that automatically configure the instrument when selected. The following options are available on the **Tasks** screen:

Step 1	 	Select the **Tasks** icon on the Dashboard to show a list of available tasks. Tap on the task to select it. **Note**: Any **Task** option added to the Dashboard screen will be identified by a mini **Home** icon next to the option text. (As shown in the second screen).

3.1.1 P-I (Pressure to Current measure)

This configures channel **CH1** to measure pressure, which can be internal (**INT**) or external (**EXT**). If external pressure is detected on **CH1**, it will retain this function, otherwise it defaults to internal pressure.

Channel **CH2** is configured to measure Current.

This task is typically for calibrating Current Output Pressure transmitters.

3.1.2 P-P (Pressure to Pressure)

This configures **CH1** to internal (**INT**) pressure measurement and **CH2** to external (**EXT**) pressure measurement.

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3.1.3 P-V (Pressure to Voltage)

This configures **CH1** to measure pressure, that can be internal (**INT**) or external (**EXT**). If external pressure is detected on **CH1**, it will retain this function, otherwise it defaults to internal pressure.

CH2 is configured to measure Voltage.

This task is typically for calibrating Voltage Output Pressure transmitters.

3.1.4 I-P (Pressure to Current source)

This configures **CH1** to measure pressure, that can be internal (**INT**) or external (**EXT**). If external pressure is detected on **CH1**, it will retain this function otherwise, it defaults to internal pressure.

CH2 is configured to Current source.

This task is typically used for calibrating I/P pressure converters.

3.1.5 P-Display (Pressure to Display)

This configures **CH1** to measure pressure that can be internal (**INT**) or external (**EXT**). If external pressure is detected on **CH1**, it will keep this function otherwise, it defaults to internal pressure.

CH2 is configured to Observed function.

This task is typically used for calibrating pressure devices with no electrical output but which have a visual indication of measured pressure.

3.1.6 Leak Test

This configures **CH1** to pressure measure that can be internal (**INT**) or external (**EXT**) with the **Leak Test** utility. If external pressure is detected on **CH1**, then the external pressure configuration is kept, otherwise **CH1** defaults to internal pressure configuration.

CH2 configuration remains unchanged.

For more details on the **Leak Test**, refer to Section 7.1 on page 120.

3.1.7 Switch Test

This configures **CH1** to measure pressure, that can be internal (**INT**) or external (**EXT**) while the **Switch Test** utility details are displayed on **CH2**. If external pressure is detected on **CH1**, it keeps this function, otherwise it defaults to internal pressure.

For more details on the **Switch Test**, refer to Section 7.2 on page 125.

3.1.8 TX SIM (Transmitter Simulation)

This configures **CH1** to measure pressure, that can be internal (**INT**) or external (**EXT**). If external pressure is detected on **CH1**, it will retain this function otherwise, it defaults to internal pressure.

CH2 is configured with Current source (in transmitter simulation mode).

For more details on the **TX SIM** task, refer to Section 7.3 on page 128.

3.1.9 Relief Valve Test

This configures **CH1** to measure pressure, that can be internal (**INT**) or external (**EXT**), with the **Relief Valve Test** utility. If external pressure is detected on **CH1**, it will retain this function otherwise, it defaults to internal pressure.

CH2 configuration remains unchanged.

For more details on the **Relief Valve Test**, refer to Section 7.4 on page 130.

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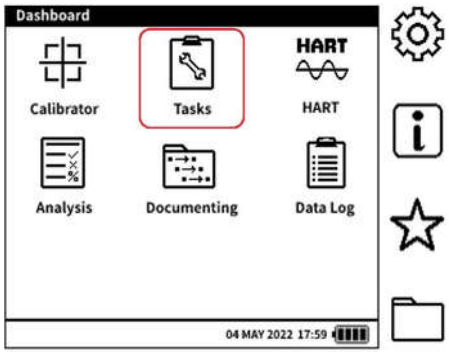
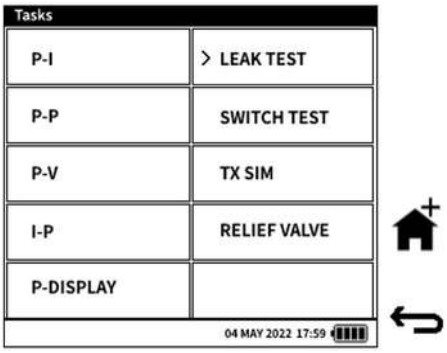
3.2 Tasks Selection

To select any of the options on the **Tasks** menu for automatic configuration, first tap the desired option to select it, then tap again to initiate the configuration of the selected task. This is effectively a two-tap action that can be done in quick succession. If using the navigation buttons, use the UP/DOWN/LEFT/RIGHT buttons to select the desired task and press the Navigation Pad **Enter** button to initiate configuration of the selected task.

3.3 Adding Tasks to the Dashboard

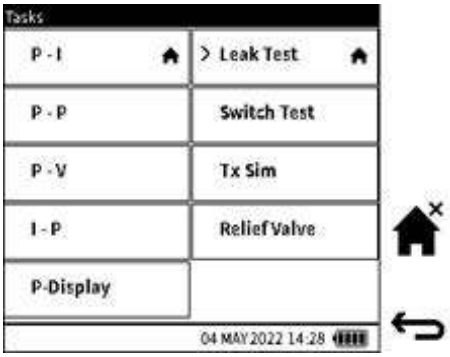
Up to three commonly used tasks from the Tasks menu can be added to the Dashboard (Home) screen as a shortcut. To add a **Task** option to the Dashboard, tap to select the desired Task, then select the (**HOME+**) softkey to add the selected option to the Dashboard. If using the navigation buttons, use the UP/DOWN/LEFT/RIGHT buttons to select the desired task and press the (**HOME+**) icon to add the selected option to the Dashboard. Any **Task** option added to the Dashboard screen will be identified by a mini Home icon next to the option text.





3.4 Removing Tasks from the Dashboard

Only Tasks added through the **Tasks** menu can be removed from the Dashboard. To remove a Task option from the Dashboard: from the **Tasks** menu tap to select the desired Task, then select the (**HOMEx**) icon to remove the selected option. If using the navigation buttons, use the **UP**/**DOWN**/**LEFT**/**RIGHT** buttons to select the desired task and press the (**HOMEx**) softkey to remove the selected option. Once removed, the mini **HOME** icon next to the option text will disappear.



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4. General Settings

Select the **General Settings** icon to show the following DPI610E settings:

Setting	Description
DATE/TIME	Set the date/time.
LANGUAGE	Set the language.
BACKLIGHT	Turn the back light on/off.
COMMUNICATIONS	Select one of the USB communication modes or the Bluetooth mode.
AUTO POWER DOWN	Enable/disable Auto Power Down.
TOUCHSCREEN LOCK	Enable/disable Touchscreen Lock.
ENABLE HOLD	Enable/disable Hold.
ADVANCED	Access the Advanced Menu.

Note: To access the **General Settings** menu from the Dashboard, tap the icon on the touchscreen or press the corresponding softkey as shown below:

Option 1		Tap the icon on the touchscreen.
Option 2		Press the softkey corresponding to the **General Settings** icon.

4.1 DATE, TIME and LANGUAGE

To change the Date, Time and Language settings, see “Set Date, Time and Language” on page 17 and page 18.

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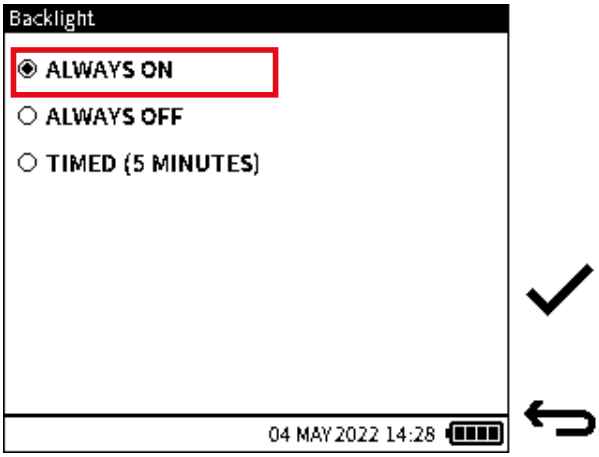
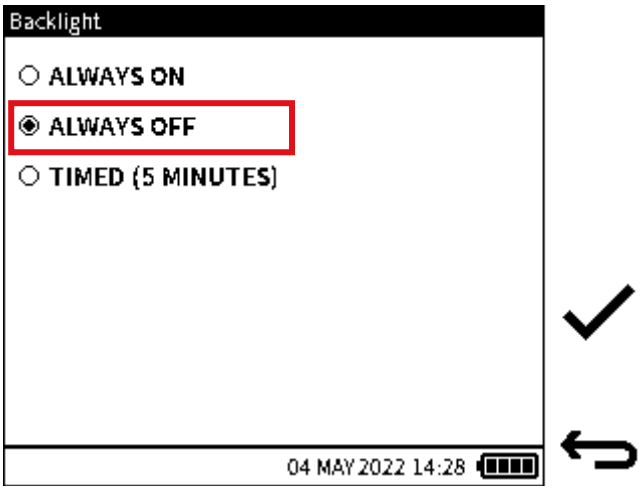
4.2 BACKLIGHT

This feature controls the instrument backlight. By default, the DPI610E is configured to **Timed (5 Minutes)**.

To change this setting:

1. Select **Backlight** from the **General Settings** menu.
2. Select the required mode (described below).
3. Select ✓ to confirm.

	If **ALWAYS ON** is selected, the backlight will remain on when the instrument is on, except when the battery is at a critically low level.
	If **ALWAYS OFF** is selected, the backlight will remain off at all times when the instrument is on.

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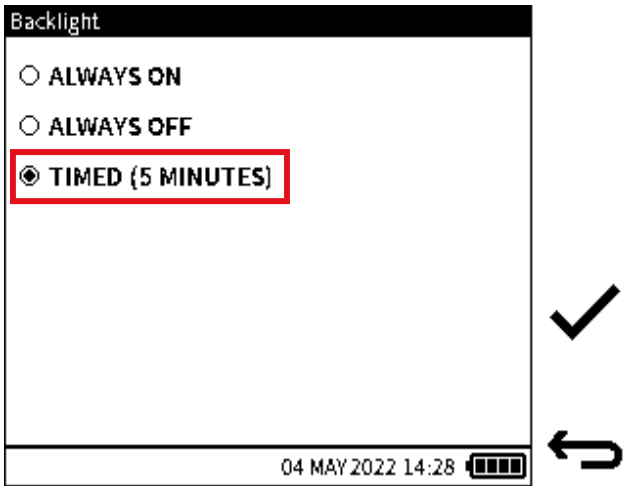
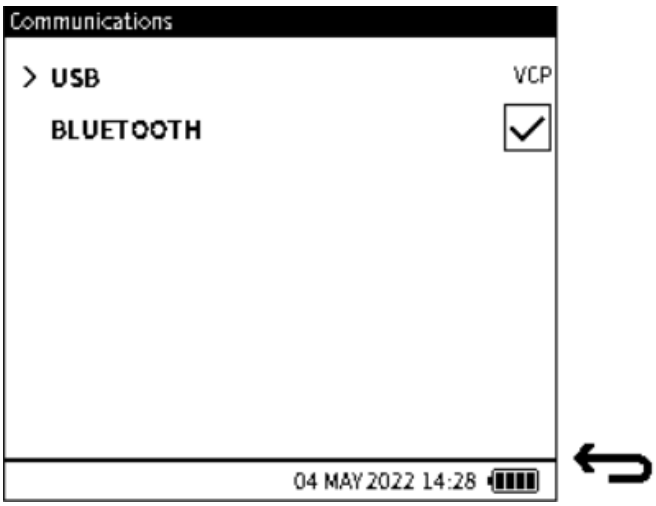


If **TIMED (5 MINUTES)** is selected, the backlight will remain on and automatically switch off after a period of 5 minutes of inactivity.

4.3 COMMUNICATIONS

The **COMMUNICATIONS** screen has two communication options:



Select the **USB** option to show two USB modes:
USB - MASS STORAGE mode for the transfer of files/folders between the instrument and a PC.
USB - VIRTUAL COMMS PORT (**VCP**) Communications mode.

Push the ✓ icon on the USB screen to select one of these modes.
BLUETOOTH - To select this mode, tap on this checkbox if it does not have a tick mark.

The **MASS STORAGE** mode is the default USB setting when the DPI610E is energized.

BLUETOOTH is a wireless technology standard for the transfer of data between devices over short distances. The DPI610E transmits a signal when the Bluetooth mode is selected. Another device, that also has Bluetooth energized, senses this signal and makes a Bluetooth connection with the DPI610E. This device can then communicate with the DPI610E by transmission of DUCI commands through the Bluetooth connection.

A device with a Bluetooth capability can receive data at a distance of up to 5m from the DPI610E. Bluetooth devices can read the DPI610E channel configuration and its measurements.

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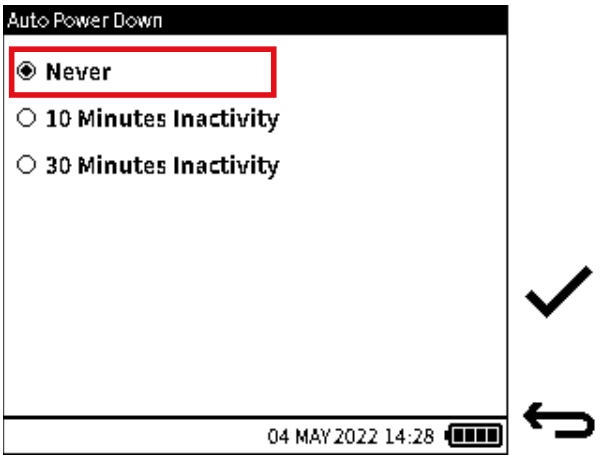
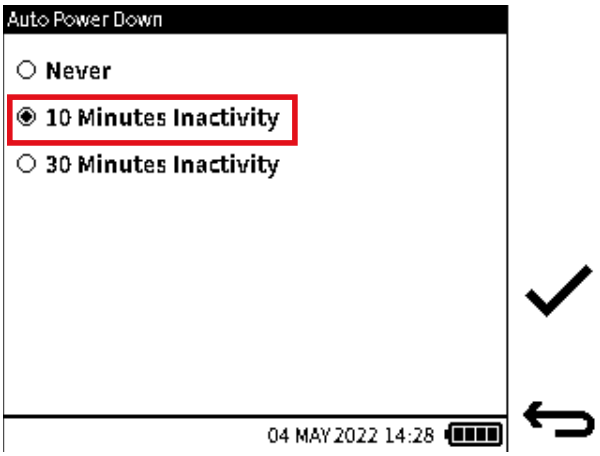
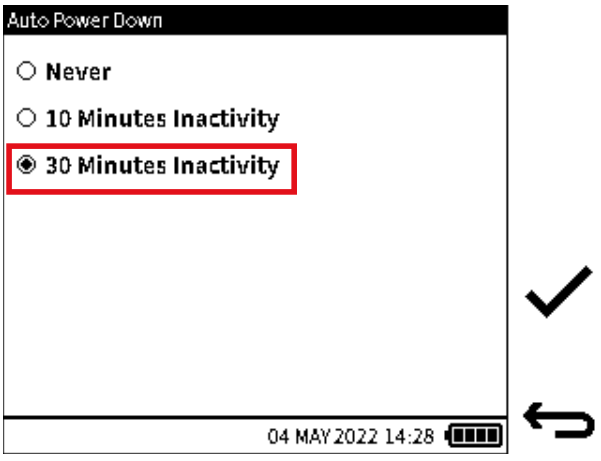
4.4 AUTO POWER DOWN

This feature controls the auto power down behavior of the instrument. By default, the DPI610E is configured to remain on until powered down by the user.

To change this setting:

1. Select **Auto Power Down**.
2. Select the required mode (described below).
3. Select ✓ to confirm.

	If **Never** is selected, the instrument will remain on until powered down by the user.
	If **10 Minutes Inactivity** is selected, the instrument will automatically switch off after 10 minutes of inactivity. **Note: Auto Power Down** will not come into effect until all tests running have been completed.
	If **30 Minutes Inactivity** is selected, the instrument will automatically switch off after 30 minutes of inactivity. **Note: Auto Power Down** will not come into effect until all tests running have been completed.

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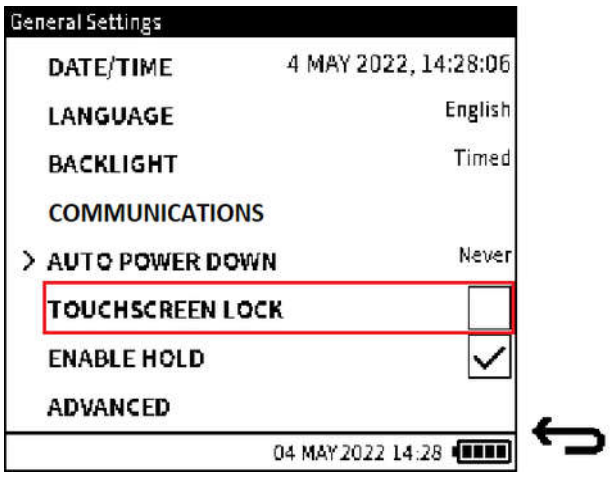
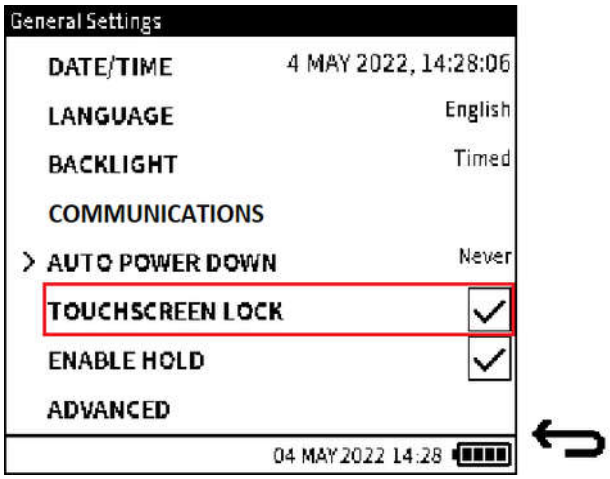
4.5 TOUCHSCREEN LOCK

This feature allows the user to lock the touchscreen and navigate using the navigation keypad and softkeys only. By default, the DPI610E is configured with **Touchscreen Lock** disabled.

To change this setting:

Step 1		Check that the **TOUCHSCREEN LOCK** box is unchecked (it has no Tick mark).
Step 2		Select **OK**.
Step 3		Ensure that **TOUCHSCREEN LOCK** is checked (has a tick mark.) **Note: TOUCHSCREEN LOCK** can be disabled by tapping anywhere on the touch-screen 3 times within 5 seconds.

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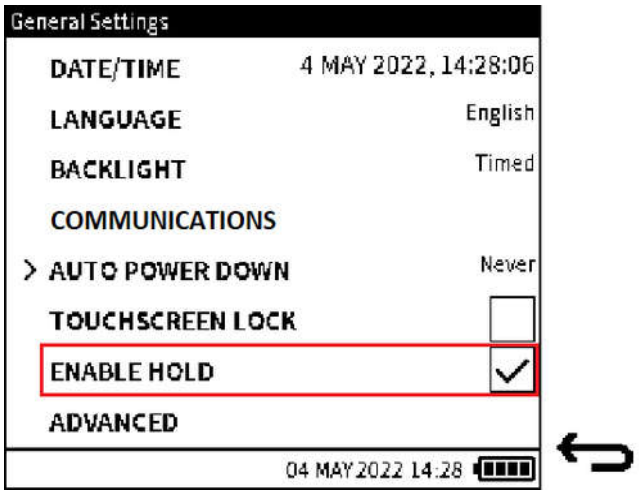
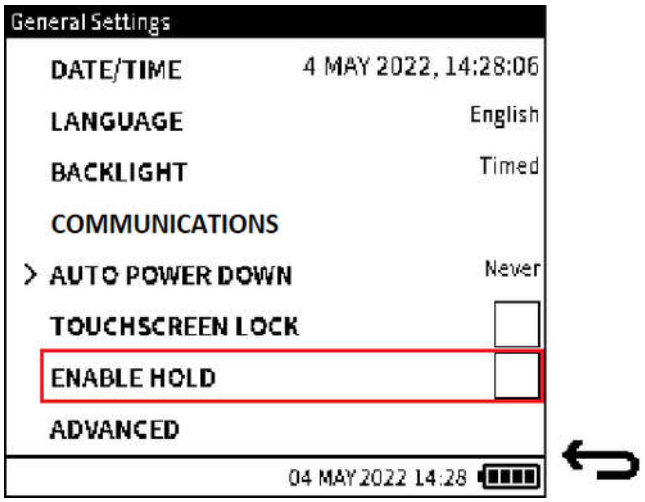
4.6 ENABLE HOLD

This feature allows the user to enable/disable the **Hold** icon on the main reading screen. By default the DPI610E is configured with **Enable Hold** enabled.

To change this setting:

Step 1		To disable the **Hold** icon if necessary, tap on the **ENABLE HOLD** checkbox to remove the tick mark.
Step 2		Select **OK**.
Step 3		Confirm that the **ENABLE HOLD** checkbox does not have a **Tick** mark.

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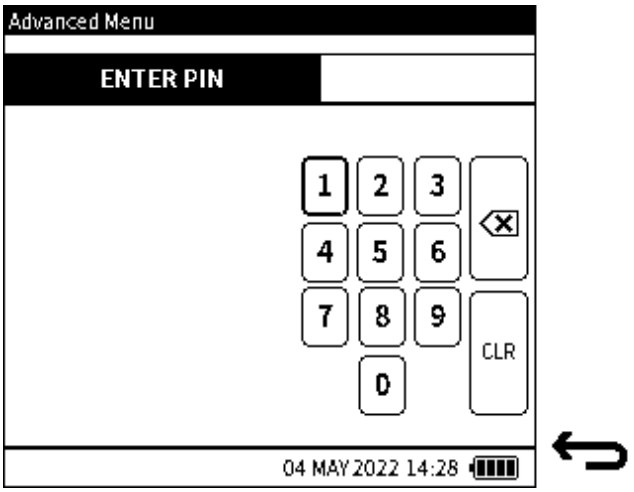
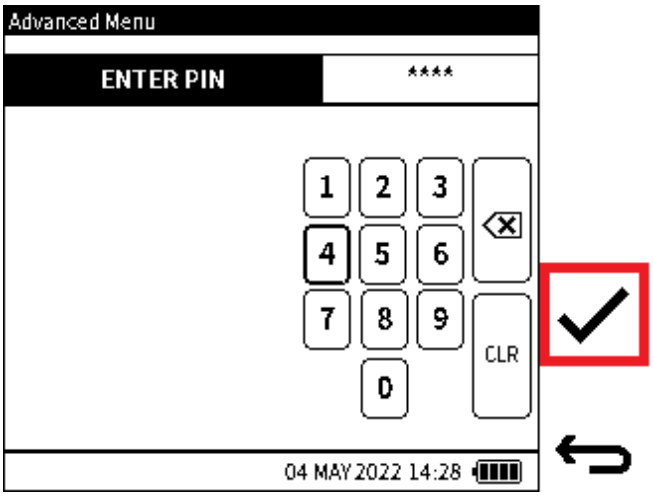
4.7 ADVANCED

This feature provides access to the **Advanced Menu,** which has the following options:

Option	Description
CALIBRATION*	Calibration options.
CHANGE PIN	Change the Advanced menu PIN.
SOFTWARE UPGRADE	Upgrade system software.
FACTORY RESET	Set the instrument back to default settings
FORMAT FILE SYSTEM	Erases all content on mass storage and creates factory default folders
SERVICE/ ENGINEERING	Reserved for internal use

* The CALIBRATION options are dealt with by Chapter 13, “Instrument Calibration,” on page 255 and the other options from Section 5.2 on page 46 forwards.

To access the **Advanced Menu**:

Step 1		Enter the PIN. The default PIN is **4321** and it can be changed by the user at any time. See Section 5.2 on page 46.
Step 2		Select ✓ to confirm.

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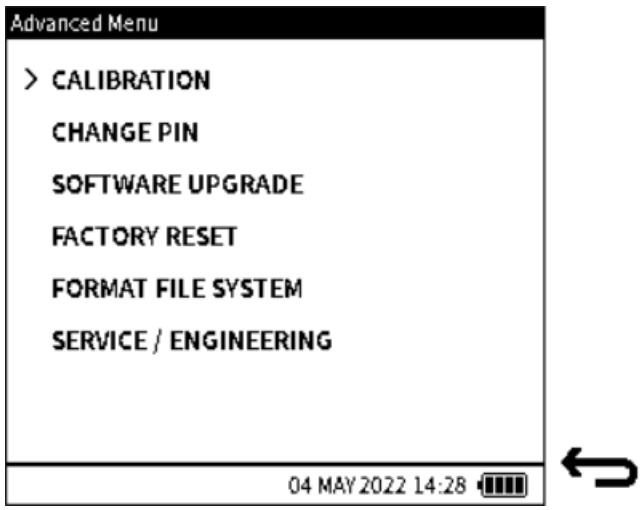
Step 3		The **Advanced Menu** screen is now unlocked and its options available (see Chapter 5, “Advanced Menu,” on page 44).

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5. Advanced Menu

The following options are available in the **Advanced** menu:

Option	Description
*CALIBRATION	Calibration options
CHANGE PIN	Change the PIN
SOFTWARE UPGRADE	Start software upgrade
FACTORY RESET	Set the instrument back to default settings
FORMAT FILE SYSTEM	Erases all content on mass storage and creates factory default folders
SERVICE / ENGINEERING	Reserved for internal use

***** A separate chapter describes the **Instrument Calibration** options that become available when CALIBRATION is selected. (See Chapter 13, “Instrument Calibration,” on page 255).

Note: To access the Advanced menu, select **ADVANCED** from the **General Settings** menu (see Chapter 4.7, “ADVANCED,” on page 42).

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5.1 CALIBRATION Menu

The **INSTRUMENT** option is available in the **Calibration** screen (Figure 5-1):

Option	Description
INSTRUMENT	Perform calibration activities on the instrument

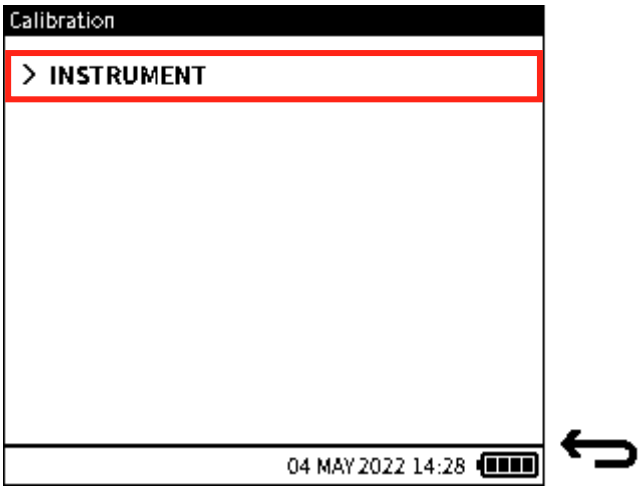
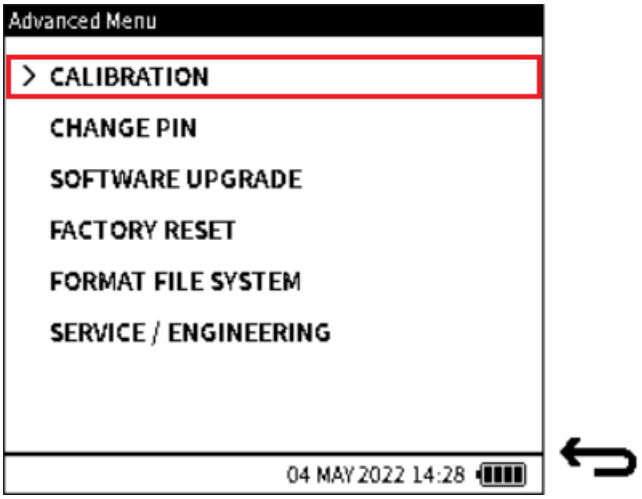


Figure 5-1: Calibration Menu

Note: To access the **CALIBRATION** menu (Figure 5-1), select **CALIBRATION** from the **Advanced Menu** screen as shown below:

Step 1		Select **CALIBRATION** from the **Advanced Menu**.

Refer to Chapter 13, “Instrument Calibration,” on page 255 that describes the options available when this CALIBRATION menu becomes active.

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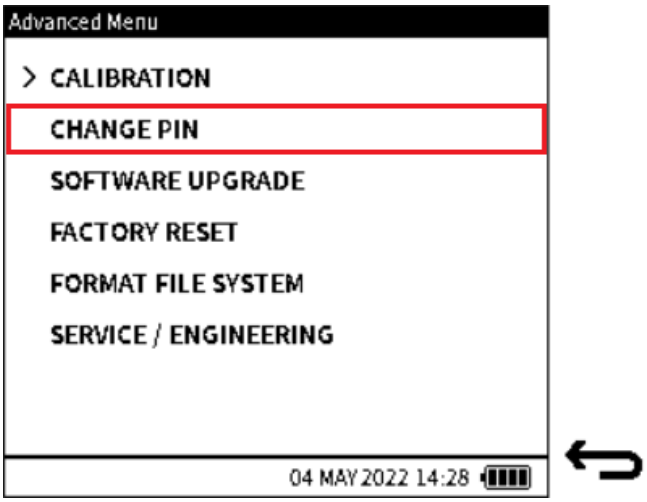
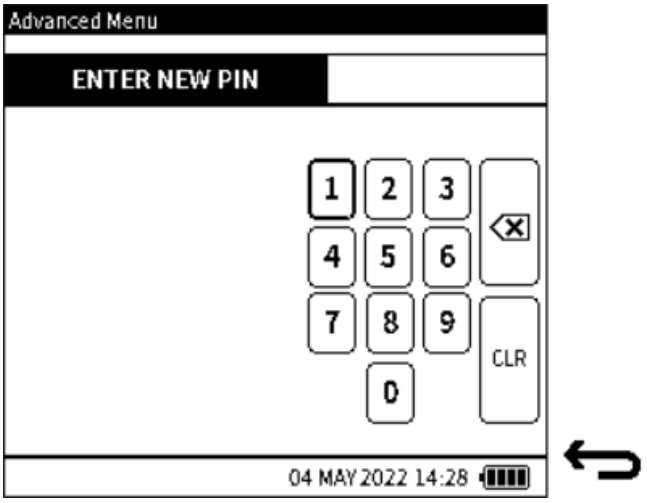
5.2 CHANGE PIN

This option allows the user to change the instrument PIN number.

Step 1		Select **CHANGE PIN** from the **Advanced** menu.
Step 2		To change the PIN to a new number, use the onscreen keypad to enter the new number. Select ✓, enter the new PIN again and select ✓ to confirm the selection.

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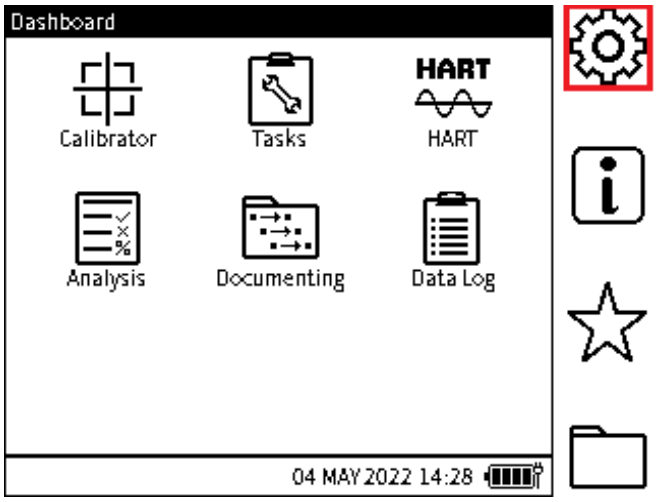
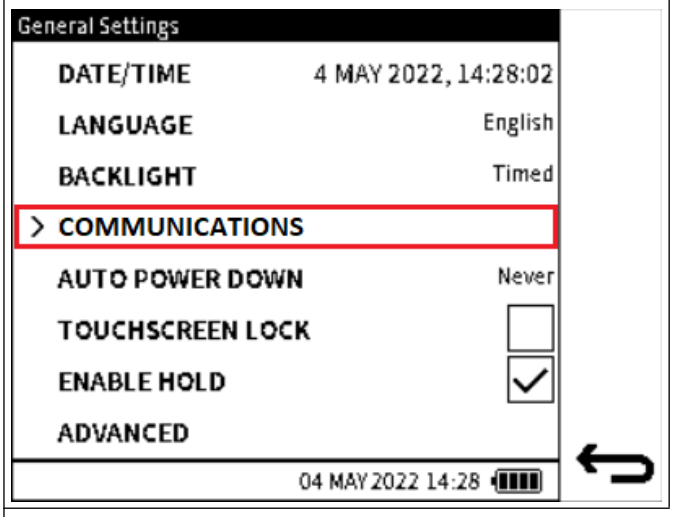
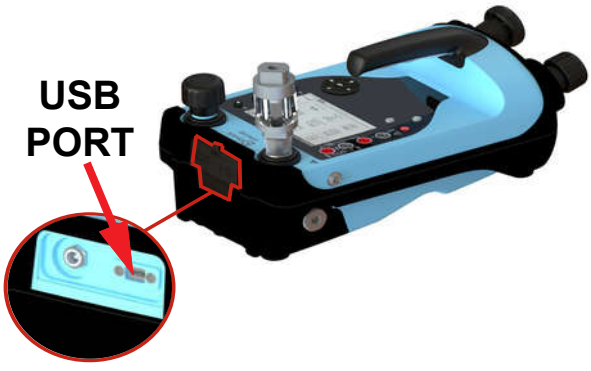
5.3 SOFTWARE UPGRADE

This option allows the user to upgrade the firmware software of the instrument. Before this can be done, a software upgrade file must first be transferred into the instrument.

5.3.1 How to load a Software Upgrade File

Step 1	Download the “DK0492.raw” application image from https://inspectionworks.com/druck-portal/#/store/public on to the PC that is to connect to the DPI610E. Make sure the file name is not renamed.	
Step 2		Select the **Settings** icon on the Dashboard. Press the **Home** button if necessary, to show the Dashboard. To select, tap on the icon or press the softkey on the right of icon.
Step 3		The **General Settings** screen appears. Select the **COMMUNICATIONS** option.
		

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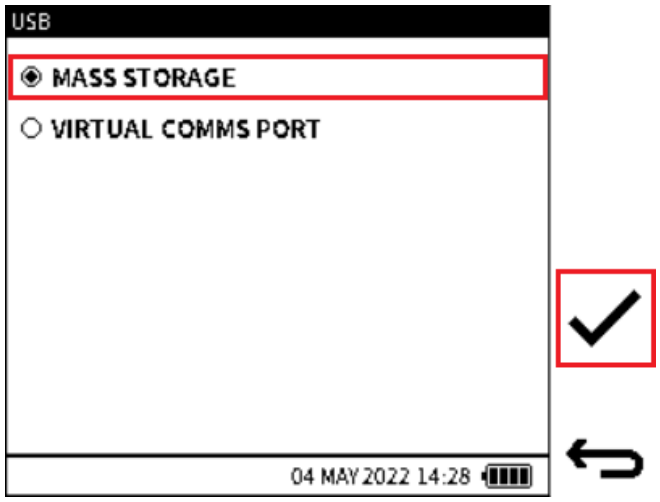
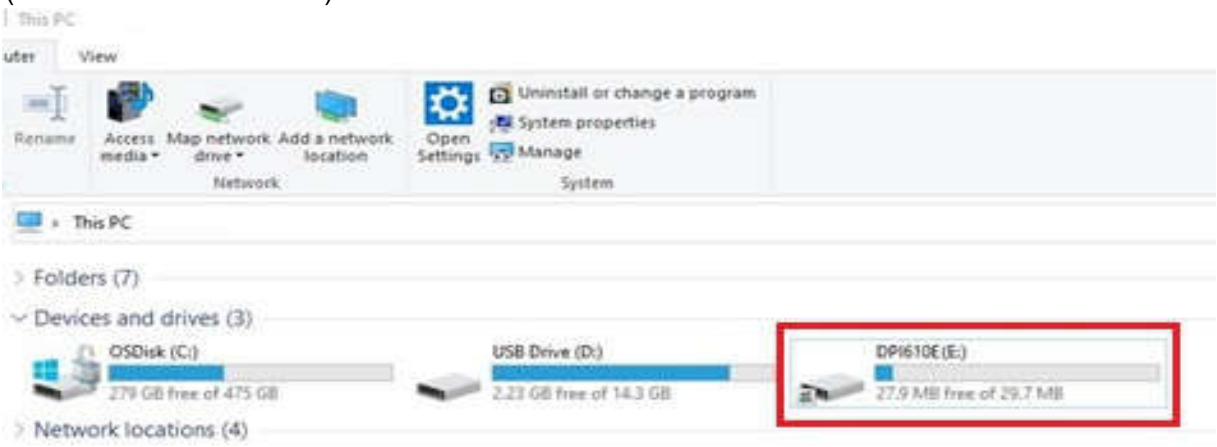
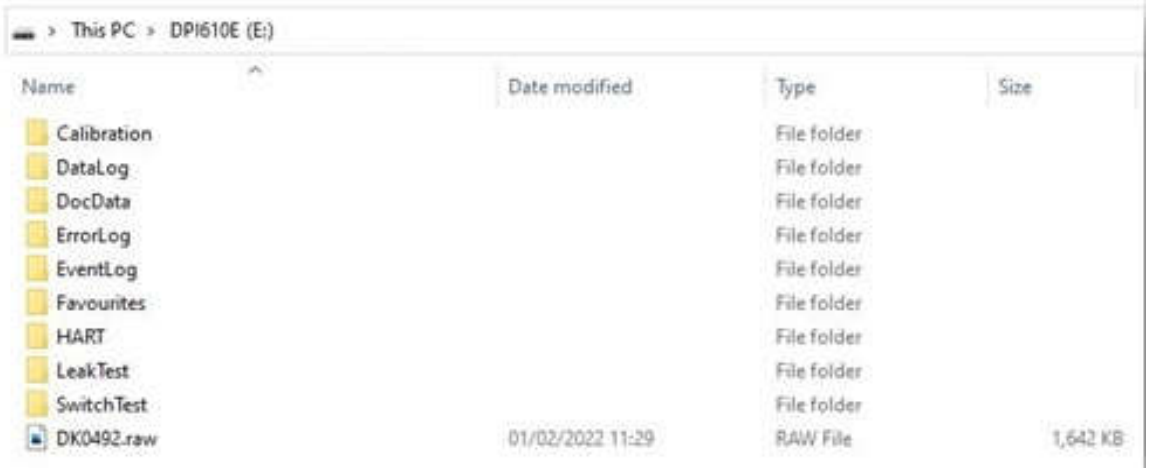
Step 4		Tap on **MASS STORAGE** to select the option. Select ✓ to confirm the selection.
Step 5	Connect the DPI610E to the PC using a micro-USB data cable. The PC should automatically detect the DPI610E which should appear as a Mass Storage drive (default name is DPI610E). 	
Step 6	Copy the DK0492.raw file from the PC file system location and paste it into the root directory of the DPI610E mass storage drive.  If a previously existing DK0492.raw file is present, a popup window will indicate this. Select **Overwrite** to replace the old file.	

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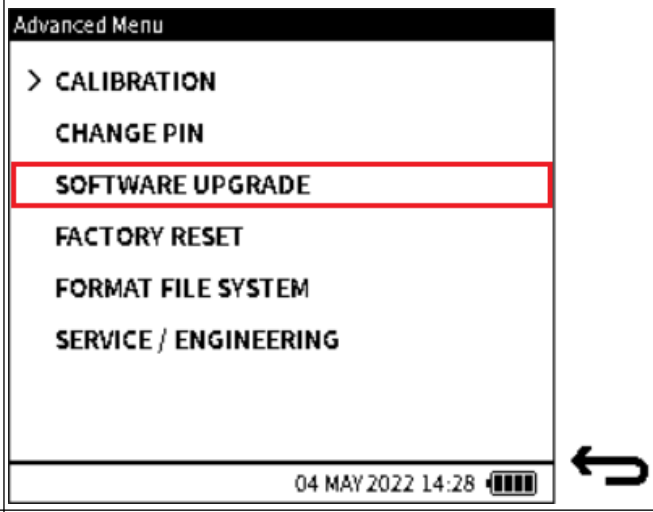
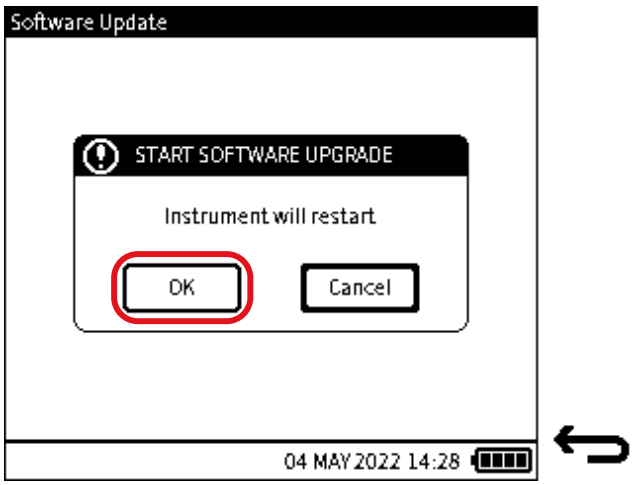
Step 7	Remove the USB cable from the DPI610E when the successful transfer of the DK0492.raw file from the PC to the memory of the DPI610E is confirmed. The next heading describes the procedure for how to upgrade the software firmware.

5.3.2 How to upgrade the Firmware

Use the following procedure to upgrade the firmware (software embedded in hardware):

Step 1		Select **SOFTWARE UPGRADE** from the **Advanced Menu** screen. Refer to Section 5.3.1 on page 47 for how to show this screen.
Step 2		Press the **OK** button to start the upgrade process. Be aware that this will reboot the DPI610E.

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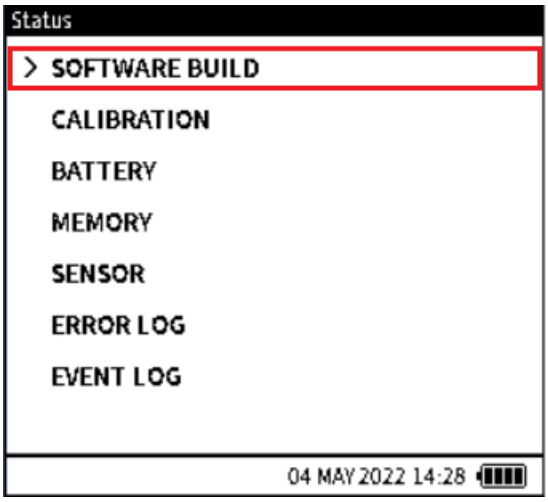
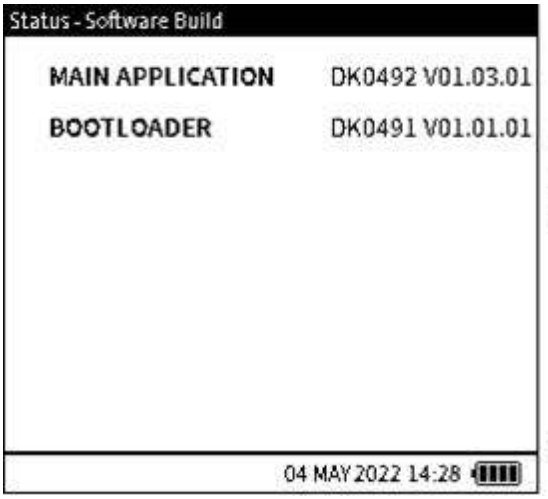
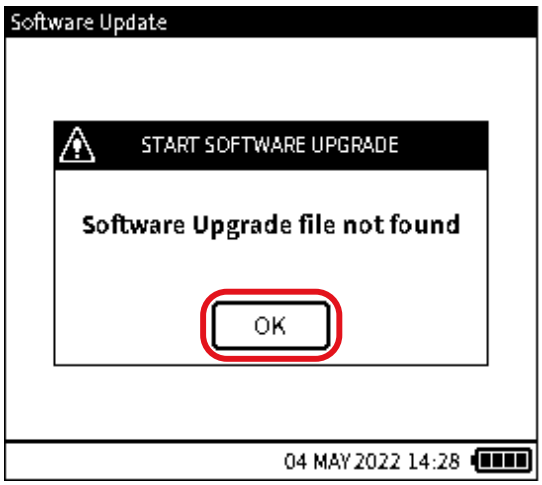
Step 3	 	The DPI610E starts again and shows the Dashboard screen. Press the **Information** (**Status**) icon then select **SOFTWARE BUILD** on the **Status** screen that appears. The versions of the DK0491 Boot-loader and DK0492 Application software will be shown. Check that these are correct. The icon shows a QR image that can be scanned using a mobile phone. This will take you to a website that describes how to upgrade your application. Select to return to the **Status** screen.
Step 4		If the '**Software Upgrade file not found**' notification appears. Make sure that the upgrade file "DK0492.raw" has been copied into the instrument's root directory, as stated in the previous steps. Select the **OK** button to close this screen message. Contact the Technical Support Dept using the links given in Chapter 1 of this manual if you are unable to upgrade the software.

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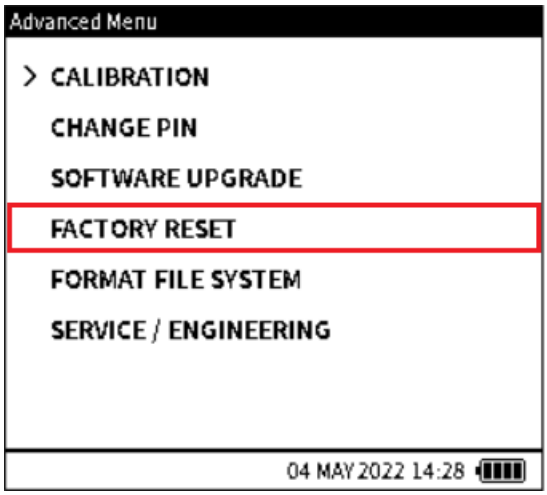
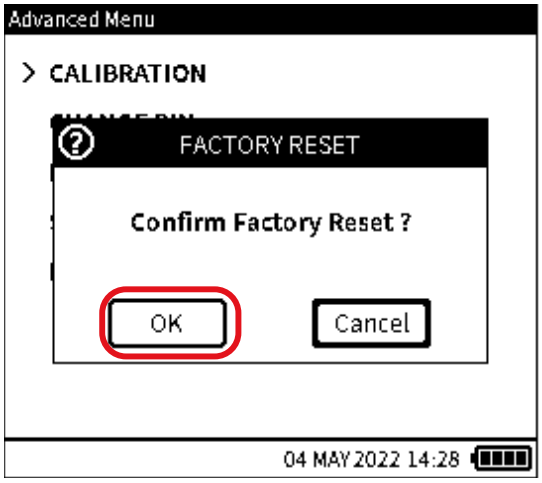
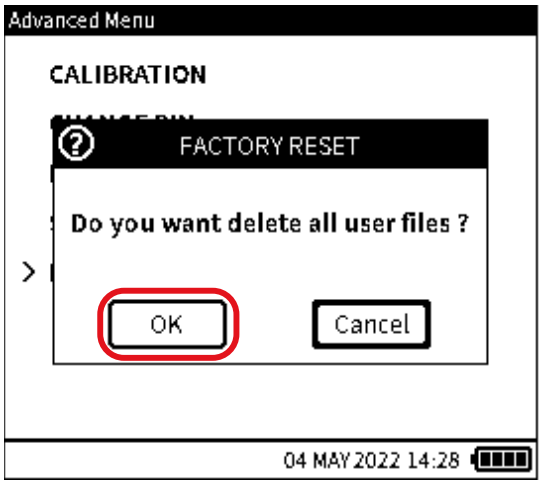
5.4 FACTORY RESET

This option allows the user to reset the instrument to factory settings. There is the option to remove all previous user files by this operation (Step 3 below).

Step 1		Select **FACTORY RESET** from the **Advanced Menu** screen.
Step 2		Select the **OK** button to confirm the selection of **Factory Reset**.
Step 3		Select the **OK** button to confirm deletion of all user files.

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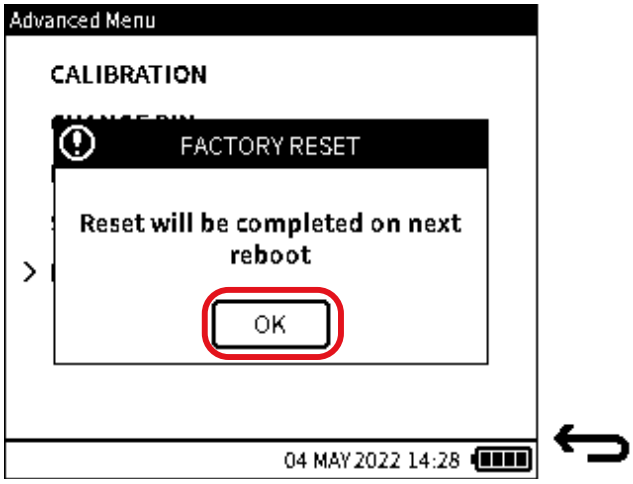
Step 4		Select the **OK** button to confirm the restart of instrument.
Option		If **Cancel** is selected in Step 4, reset will be completed on next boot. Select the **OK** button to confirm selection.

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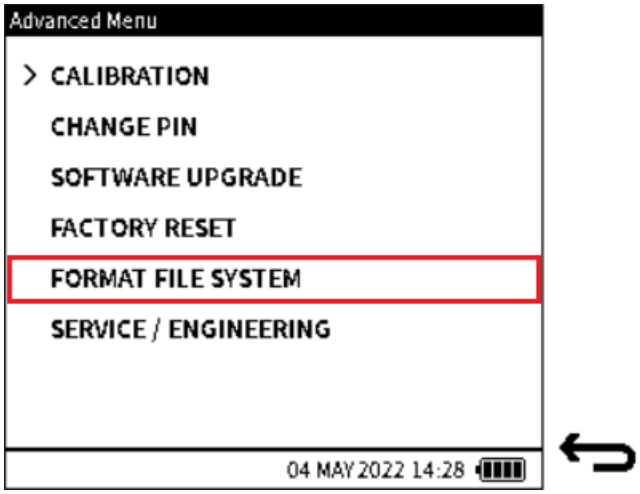
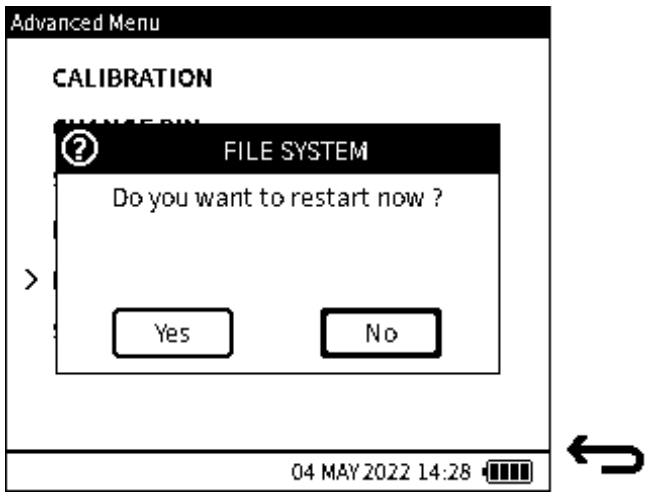
5.5 FORMAT FILE SYSTEM

The file system can be formatted if the instrument is out of storage space and a one-step clear-out is desired. It is important to save any important files as well as the files available in the HART folder before formatting. (Use the Step 5 to 6 procedures in Section 5.3.1 on page 47 to copy files).

Step 1		Select **FORMAT FILE SYSTEM** from the **Advanced Menu** screen.
Step 2		A popup window appears. All user files must be deleted, to enable formatting of the file system operation to occur. Press the **OK** button to proceed.
Step 3		To restart the instrument and complete the format operation, select **Yes** in the popup message window. If **No** is selected, a popup message appears "Formatting will be completed on next reboot". Tap **OK** to close this message window. After the instrument is restarted, copy any backup files back into their respective folders.

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5.6 SERVICE / ENGINEERING

This Advanced **SERVICE/ENGINEERING** function is not for operator use and requires a PIN for use only by specialist users.

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6. Calibrator Tasks

6.1 Calibrator Task Screen

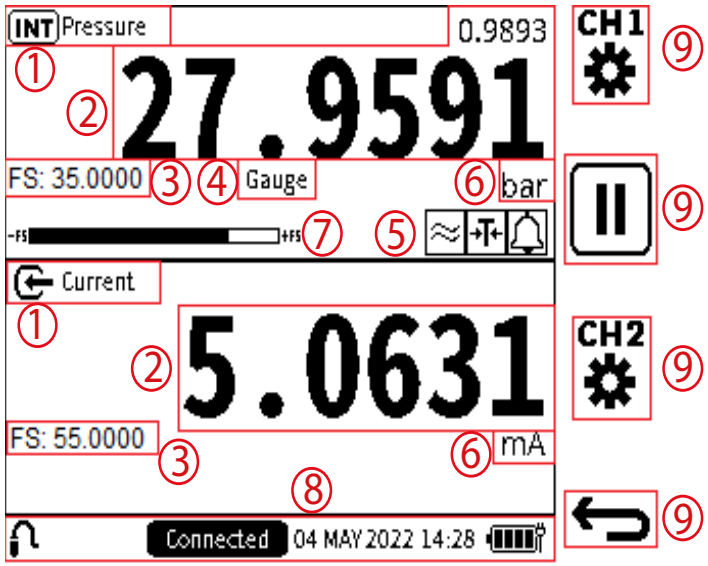

Figure 6-1: Calibrator Task Screen

1. **Function Name** – name of the currently selected function on the channel.
2. **Primary reading** – measured values that directly represent the channel function description and displayed in large digits within the channel windows. A secondary reading can appear in either channel window. This reading is in smaller digits just above the primary reading and shows the measured values associated with the primary reading of the channel function.
3. **Full-scale value** – each function selected has a maximum measurement capability which is captured by the positive full-scale value. It is always displayed in the channel window (with a prefix **FS:**).
4. **Sensor Type** – this applies to pressure or temperature sensors. The pressure sensor type (Gauge, Sealed Gauge or Absolute) or RTD sensor being used by the channel function will be displayed in this field.
5. **Process Options** – any Process options that are currently active for each channel is indicated by process icons in this area of the channel window.
6. **Units** – measurement units of the primary (and secondary reading where applicable) are displayed in the units field on the right hand side of the channel window below the primary reading.
7. **Full Scale Bar** – this bar gives a visual indication of the proportion of generated and measured pressure from the internal sensor of the full-scale range.
8. **Status bar** – the status bar area is present throughout the user interface and provides date and time information, battery level indication on the bottom right hand side of the screen. On the left side of the status bar, additional information about remote or external sensor connection status is provided. Critical information such as calibration overdue or an alarm condition also appear in this status bar.
9. **Softkey** – up to four softkeys are available throughout the menu screens giving touchscreen and button options for operating different aspects of the user interface.

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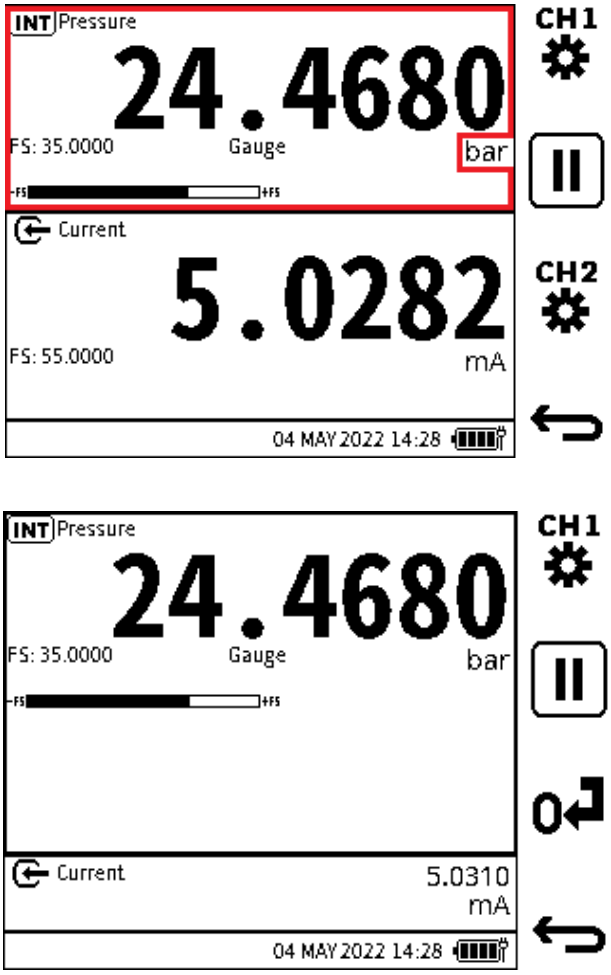
6.1.1 Calibrator Tasks Screen Shortcuts

6.1.1.1 Maximize and Minimize Channel Window

Using the Touchscreen

Step 1		When in the default 50:50 channel window layout, tap on any blank area on the desired channel window (except the Units area) to maximize the window area. This will minimize the other channel window.

INFORMATION **When in maximized/minimized layout, the 50:50 layout can be restored by tapping on any area of the channel windows with the exception of the Units area.**

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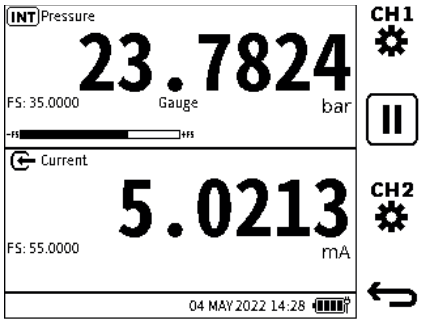
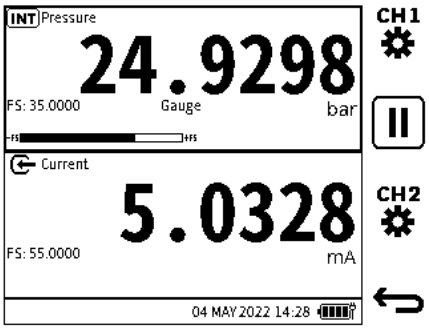
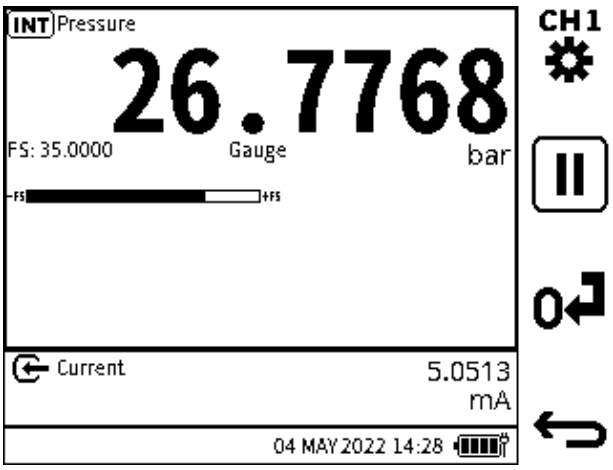
Using Navigation Buttons

Step 1	 	When in the default 50:50 channel window layout, press the **UP** button to select the Channel 1 (**CH1**) window area.
Step 2	  	Press the **Enter** button to maximize the Channel window.

INFORMATION **Press the DOWN button to select the Channel 2 (CH2) window area.**

INFORMATION **When in a maximized/minimized layout, the 50:50 layout can be restored by pressing the ENTER button.**

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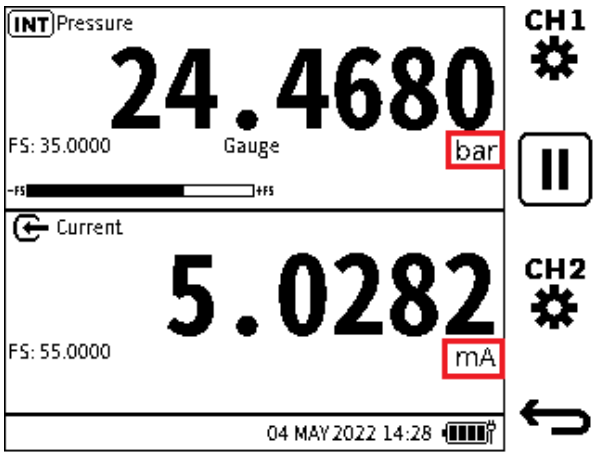
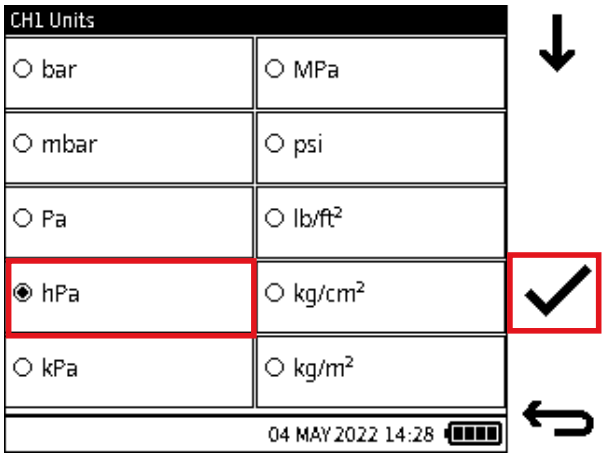
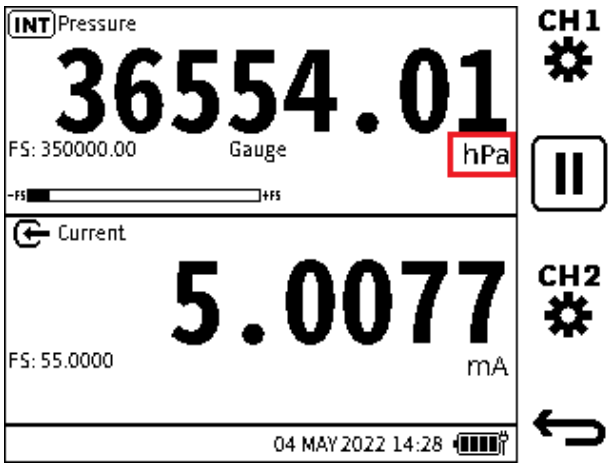
6.1.1.2 Change Measurement Units

To change the measurement units on each channel on the calibrator task screen:

Step 1		Select the units text on the relevant channel window. From the dashboard select: CALIBRATOR >> CH1 or CH2 >> UNITS.
Step 2		Select the desired unit from the **CH Units** screen. Either tap the unit required on the screen or use the Navigation key pad arrow keys to select the unit. Select ✓ to confirm the selection. **Note**: A DPI610E can be ordered as either SI only or use both SI and Non-SI units. An SI model will only show SI units on this screen.
Step 3		The desired unit appears on the configured channel window.

Note: An alternative method to select units of measurement is given in Step 3 of Section 2.1.6 on page 22.

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6.1.1.3 10 V/24 V Loop Power Enable/Disable

The Loop Drive is the internal power supplied by the DPI610E. It is available to use with any of the electrical functions listed in the **CH2 Setup** screen (to enable the Loop Power, see Section 6.2.9 on page 80).

When 10 V or 24 V Loop Power is enabled, it is displayed at the top of the **CH2** channel window (see Figure 6-2).

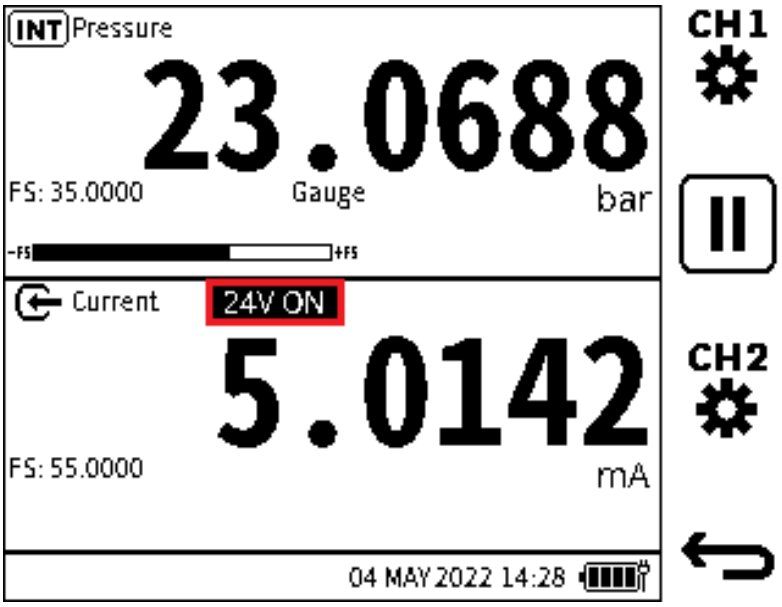

Figure 6-2: 24 V Loop Power Enabled

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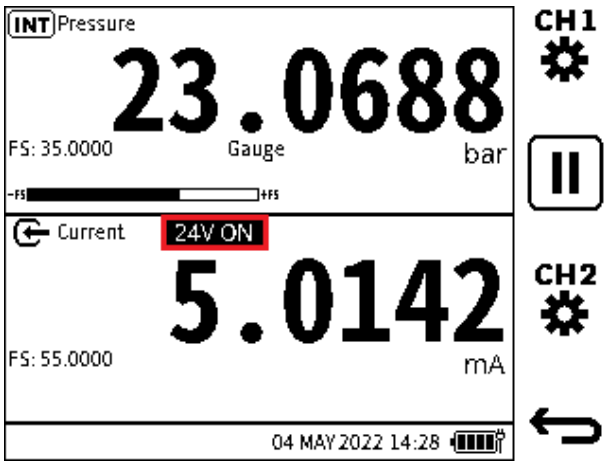
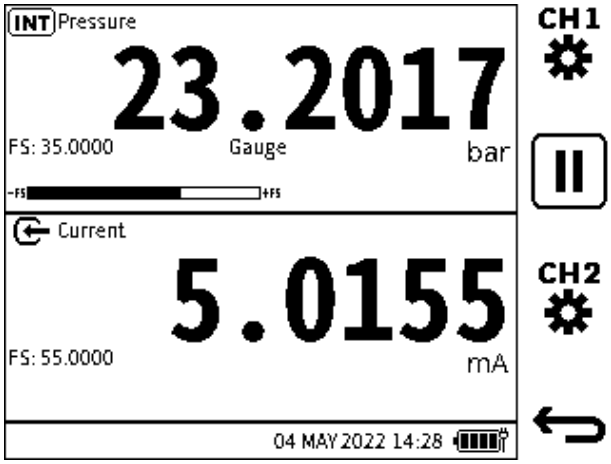
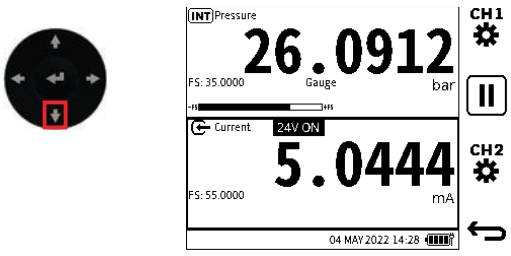
The **Loop Power** function can be disabled quickly without leaving the Calibrator screen:

Using the Touchscreen

Step 1		Tap on the 10 V/ 24 V text field in the Calibrator screen.
		Check that the 10 V/ 24 V function has been disabled: as shown by the removal of the voltage text field (e.g. **24V ON**).

Using Navigation Buttons

Step 1		Press the **DOWN** button to select the channel 2 window area.

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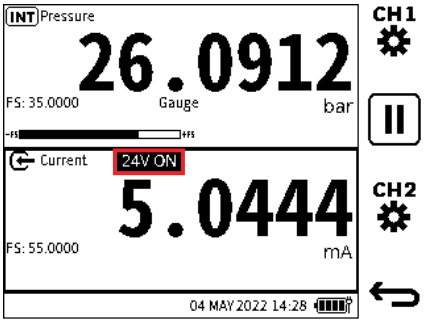
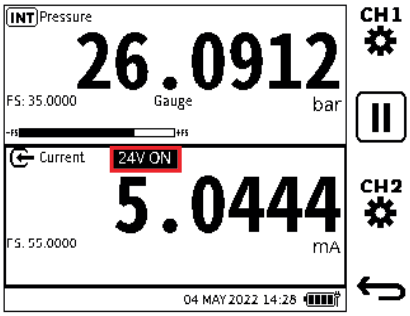
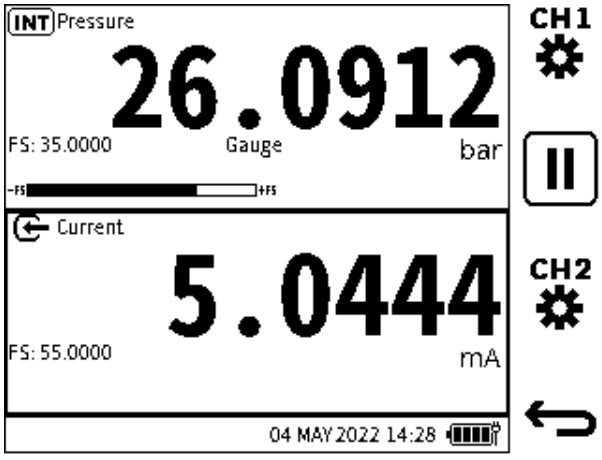
Step 2	 	Press the **RIGHT** button until the 10V/24V text area is highlighted.
Step 3	 	Press the **Enter** Key to cancel the **24V ON** function.
Step 4		Check that the 10 V/24 V function is not in the display after the function has been disabled.

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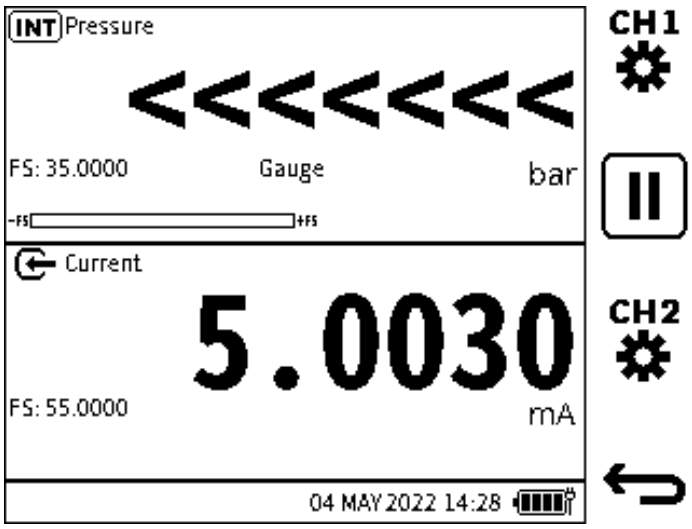
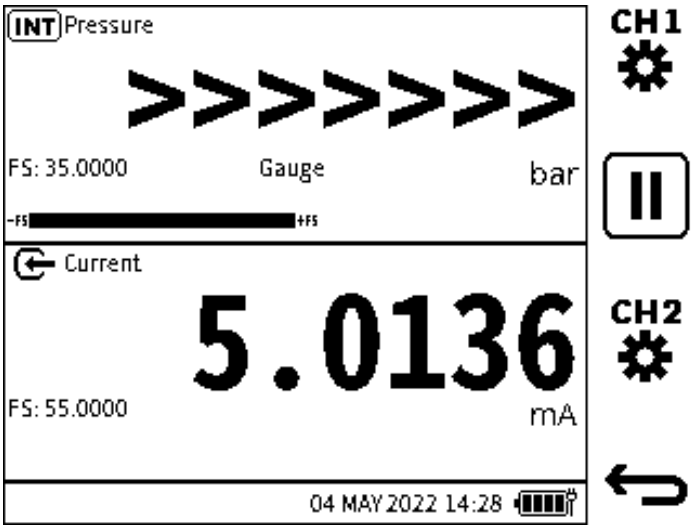
6.1.2 Error Indications

An out-of-range error message occurs when the values of the primary reading measure are more than the full-scale value of the function range.

Table 6-1: Error Indicators

Condition	Description	Depiction
Under-range	Measured reading<110% of the negative full-scale value.	
Over-range	Measured reading>110% positive full scale.	INT Pressure >>

6.2 Functions

6.2.1 Functions available by channel

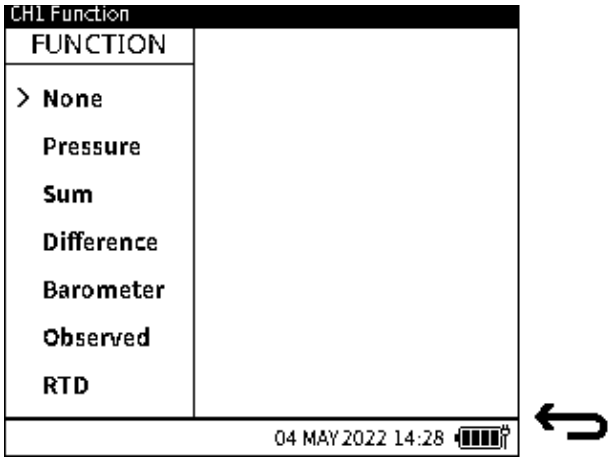


Figure 6-3: Channel 1 Functions

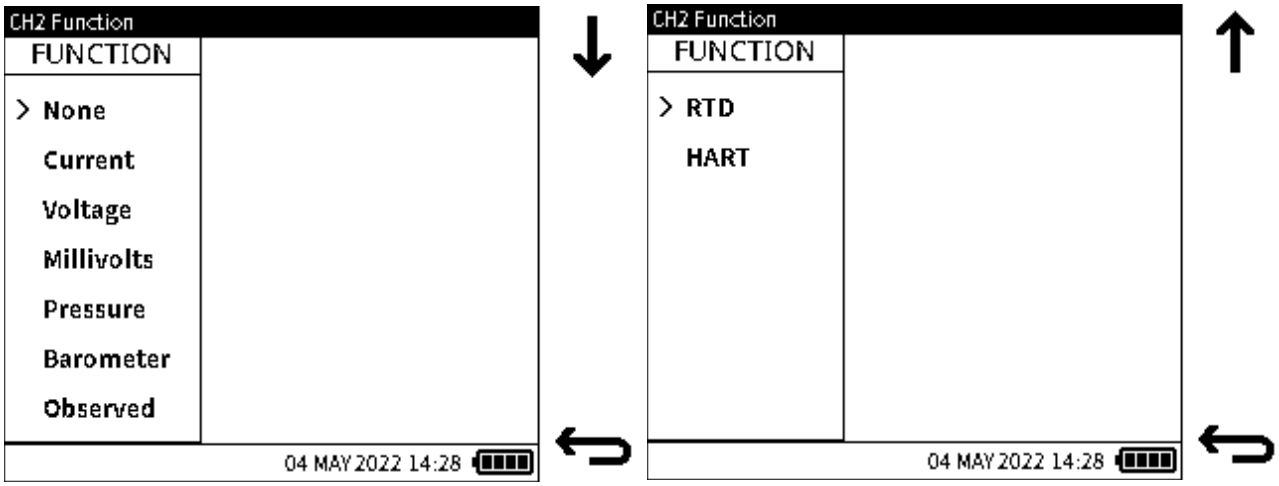


Figure 6-4: Channel 2 Functions

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Figure 6-5 is a channel function combination matrix. It shows the combinations of channel selections that are supported in the DPI610E product range.

Figure 6-5: Channel Function Combination Matrix

				Channel 2									
				None	Electrical	Pressure				Barometer	Observed	RTD	HART
						INT		Ext					
						Normal	Pseudo	Normal	Pseudo				
Channel 1	None			o	o	o	o	o	o	o	o	o	o
	Pressure	INT	Normal	o	o	x	x	o	o	o	o	o	o
			Pseudo	o	o	x	x	o	x	x	o	o	o
		EXT	Normal	o	o	o	o	x	x	o	o	x	o
			Pseudo	o	o	o	x	x	x	x	o	x	o
	Sum			o	o	x	x	x	x	o	o	o	o
	Difference			o	o	x	x	x	x	o	o	o	o
	Barometer			o	o	o	x	o	x	x	o	o	o
	Observed			o	o	o	o	o	o	o	o	o	o
	RTD			o	o	o	o	x	x	o	o	x	o

INFORMATION **‘Electrical’ includes Current, Voltage and Millivolt functions.**

Note: ‘**o**’ denotes a supported combination of functions.

Note: ‘**x**’ denotes that a combination of functions is not supported.

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6.2.2 None

Users can select this function option if they do not wish to display any function or readings on the channel being setup. On the Calibrator main reading screen, the channel window will be cleared of all readings and information with only the function name present.

6.2.3 Pressure

6.2.3.1 Internal Pressure

Pneumatic units contain internal pressure sensors which range from 350 mbarg to 35barg.

Hydraulic units contain internal pressure sensors which range from 70 bara/g to 1000bara.

Available internal pressure sensors are listed in Table 6-2.

Table 6-2: Internal Pressure Sensors in DPI610E Range

Pressure	Pressure Range Code	Pneumatic	Hydraulic
350 mbar / 5 psi / 35 kPa	03	G	-
1 bar / 15 psi / 100 kPa	05	G	-
2 bar / 30 psi / 200 kPa	07	G	-
3.5 bar / 50 psi / 350 kPa	08	G	-
7 bar / 100 psi / 700 kPa	10	G	-
10 bar / 150 psi / 1000 kPa	11	G	-
20 bar / 300 psi / 2 MPa	13	G	-
35 bar / 500 psi / 3.5 MPa	14	G	-
70 bar / 1000 psi / 7 MPa	16	-	G or A
100 bar / 1500 psi / 10 MPa	165	-	G or A
135 bar / 2000 psi / 13.5 MPa	17	-	G or A
200 bar / 3000 psi / 20 MPa	18	-	G or A
350 bar / 5000 psi / 35 MPa	20	-	A
700 bar / 10000 psi / 70 MPa	22	-	A
1000 bar / 15000 psi / 100 MPa	23	-	A

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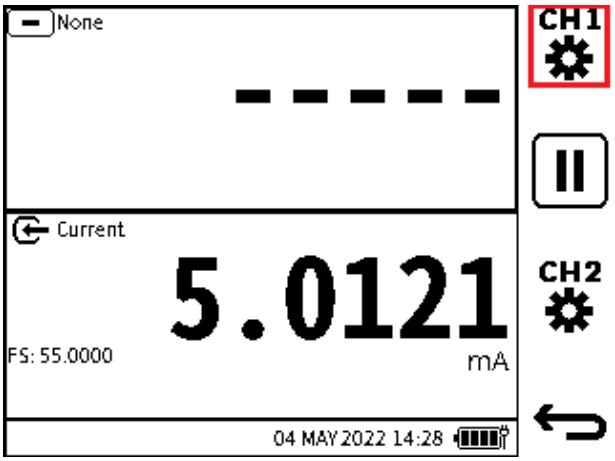
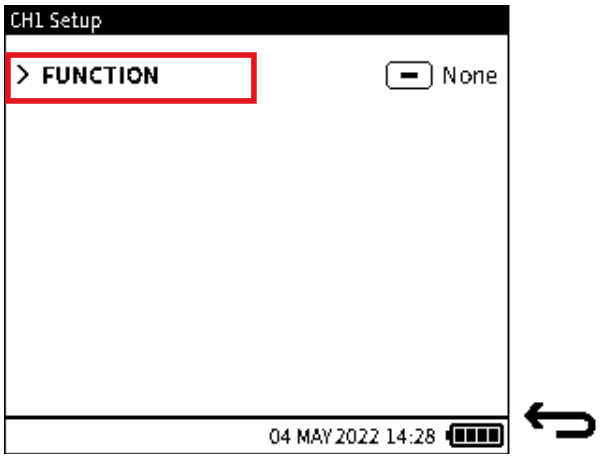
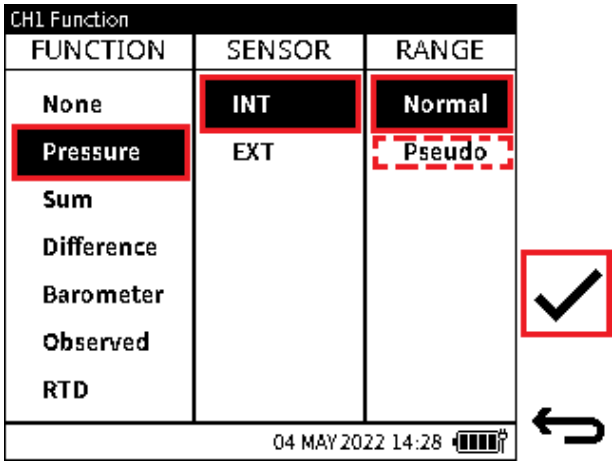
To configure a pressure measurement reading from an internal sensor

Step 1		Select the desired channel (Channel 1 in this example).
Step 2		Select **FUNCTION** in the **Channel Setup** screen.
Step 3		Select **Pressure** in the **Channel Function** screen. Select **INT** (for **Internal**). Select **Normal** or **Pseudo**. Select ✓ to confirm the selections.

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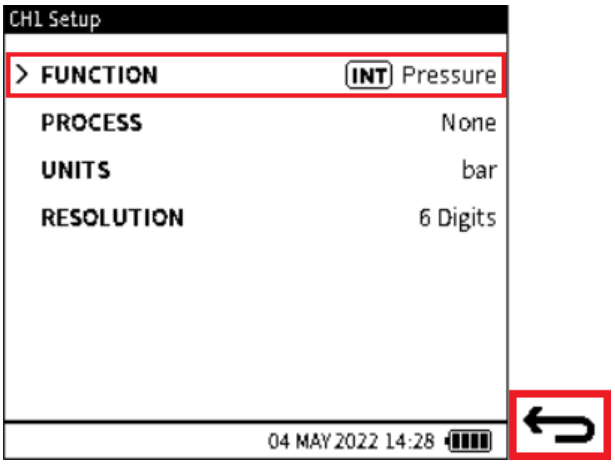
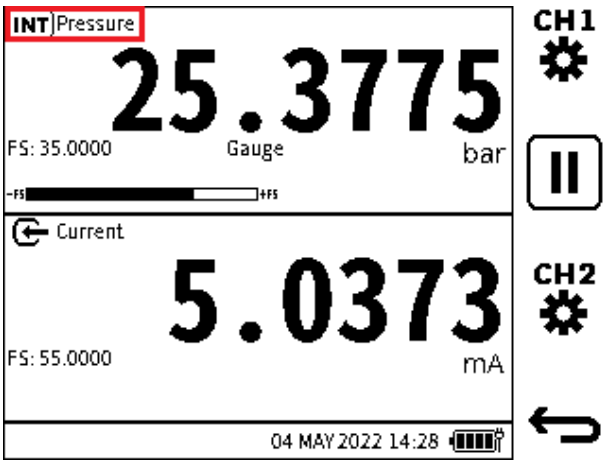
INFORMATION **See Chapter 6.2.3.4, "Normal and Pseudo Pressure Range," on page 69.**

Step 4		Check that the desired configuration appears in the **Channel Setup** screen. Select ⮌ to return to the **Calibrator Main** screen.
Step 5		Check that **INT Pressure** appears on top left corner of the desired channel screen.

6.2.3.2 External Pressure

External pressure sensors (PM700E) are available in the range 25 mbarg/d to 1400 bara.

Refer to "External Sensors" on page 133 for a list of available sensors, and information about how to configure the DPI610E to recognize and use external sensors and RTD probes.

6.2.3.3 The Zero Function

The **Zero** function is used on gauge sensors to remove offset drifts and therefore maintain the highest accuracy.

INFORMATION **The Zero function is only available on gauge sensors. It is not possible to apply total vacuum to absolute sensors, as they are designed to measure atmospheric pressure.**

Note: It is recommended that all gauge sensors are zeroed at the beginning of each day before use.

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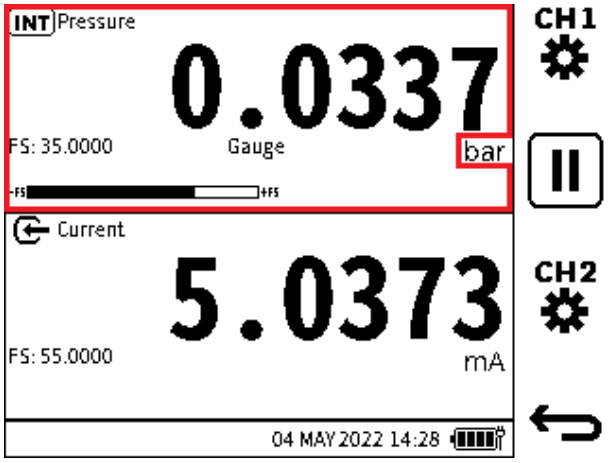
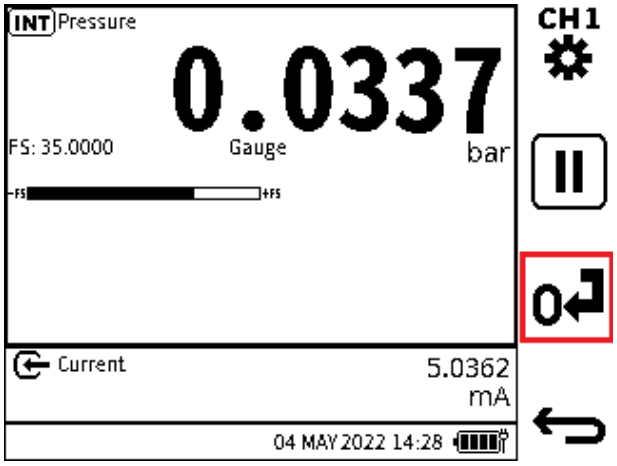
To zero a gauge sensor

Step 1	See Chapter 2.1.3 on page 19 for pneumatic units or Chapter 2.2.4 on page 31 for hydraulic units.	Make sure that the sensor is open to atmosphere. **Example**: For the DPI610E internal sensor, open the pressure release knob fully or make sure that the test port is open to atmosphere.
Step 2	See Chapter 6.2.3.1 (INT) or Chapter 6.2.3.2 (EXT).	Select the desired pressure function (**INT** or **EXT**) from the **CH Setup** menu on **CH1** or **CH2**.
Step 3		Expand the pressure channel by tapping anywhere in the channel window (except the Units area) (See Chapter 6.1.1.1, “Maximize and Minimize Channel Window,” on page 56).
Step 4		Select 0 to set the pressure sensor to zero.

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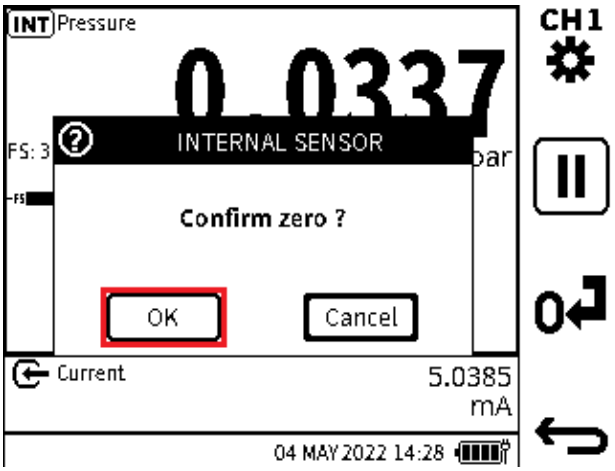
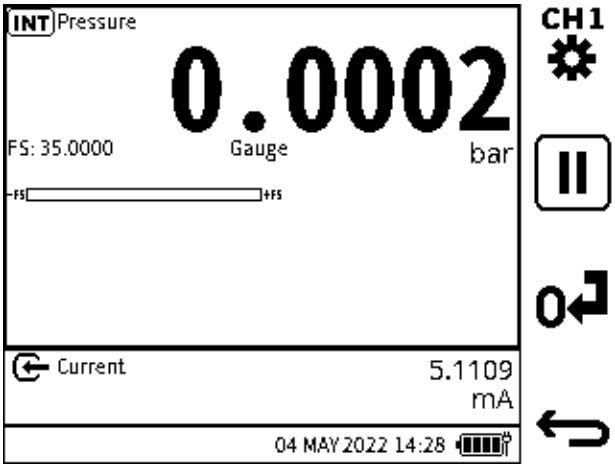
Step 5		Select **OK** to confirm.
Step 6		Check that the desired pressure channel has been zeroed. **Note:** A Zero Error can occur if the pressure reading, measured from the sensor, is outside 1% of the full scale value when the instrument pressure port is opened to atmosphere.

6.2.3.4 Normal and Pseudo Pressure Range

Internal and external pressure sensors are either gauge (measuring with respect to atmospheric pressure) or absolute (measuring with respect to vacuum). The measured readings from these sensors in their native form are referred to as ‘Normal’.

The sensors in pneumatic variants contain an accurate barometer which continuously measures the atmospheric pressure. This measured reading can be used to convert the internal (or external if present) pressure sensor reading from natively absolute to gauge or natively gauge to absolute. These pressure sensor modes are referred to as ‘Pseudo-gauge’ (natively absolute sensor to a gauge indication) and ‘Pseudo-abs’ (natively gauge sensor to absolute indication) respectively.

The hydraulic variants do not contain the barometer as it is not usual to require gauge readings at the higher pressure at which these hydraulic variants operate. Therefore, the hydraulic variants do not support ‘Pseudo-gauge’ or ‘Pseudo-abs’ ranges.

6.2.3.5 Sealed Gauge Pressure Range

Hydraulic variants with internal or external absolute pressure sensors up to 10 bar and above, can use an atmospheric reading to convert the sensor reading to gauge by taring the atmospheric pressure value. This sensor mode is referred to as ‘Sealed Gauge’. When a supported absolute pressure sensor is connected and detected and the pressure function is configured on either channel, a pop-up window is displayed giving the option to use the sensor in absolute or sealed gauge mode.

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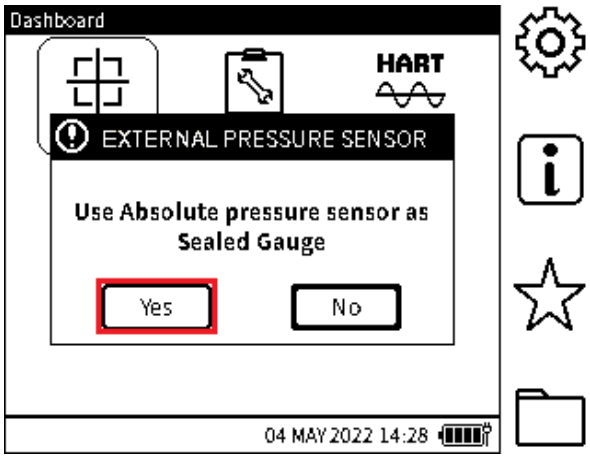
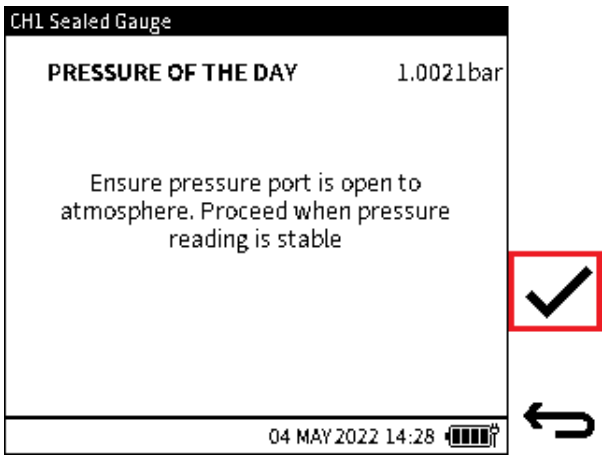
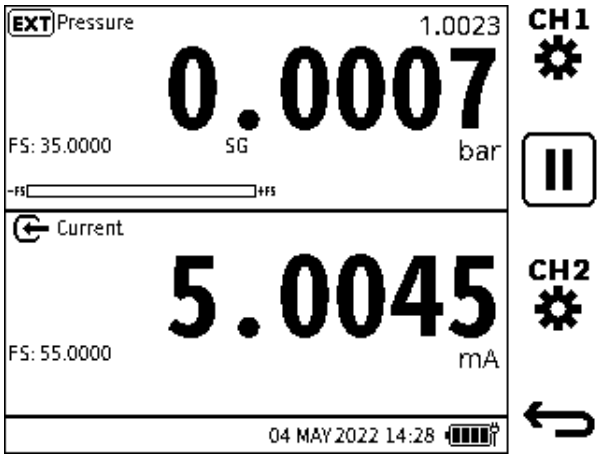
How to configure an External Sensor as a Sealed Gauge

The **EXT** Pressure function must be configured in one of the channels and you need to go into Calibrator to trigger this popup message.

Step 1		Switch on the instrument and select the **Calibrator** icon and when the popup window appears select **YES**. If the instrument is already switched on select the **CH1** or **CH2** channel.

INFORMATION **If NO is selected, the sensor will be used in its native form - as an Absolute pressure sensor.**

Step 2		Make sure that the pressure port is open to atmosphere and proceed when the pressure reading is stable. Select ✓ to confirm.
Step 3		Make sure that **Sealed Gauge** is correctly configured on the desired channel.

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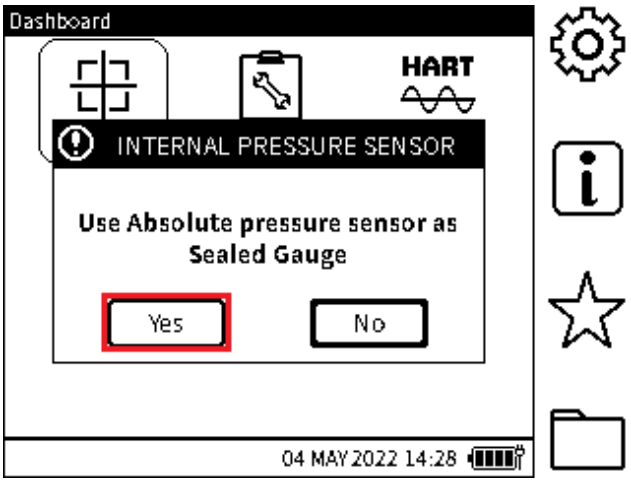
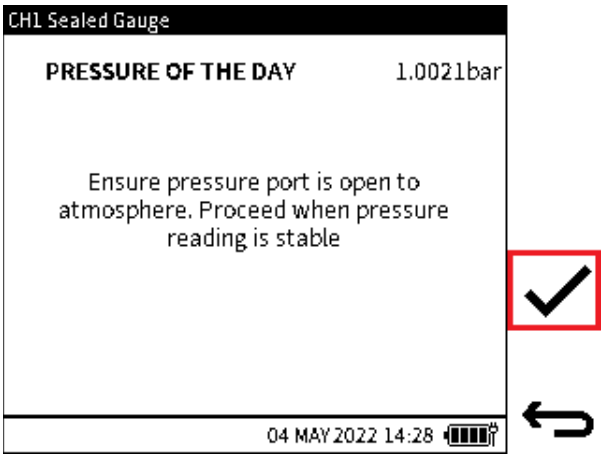
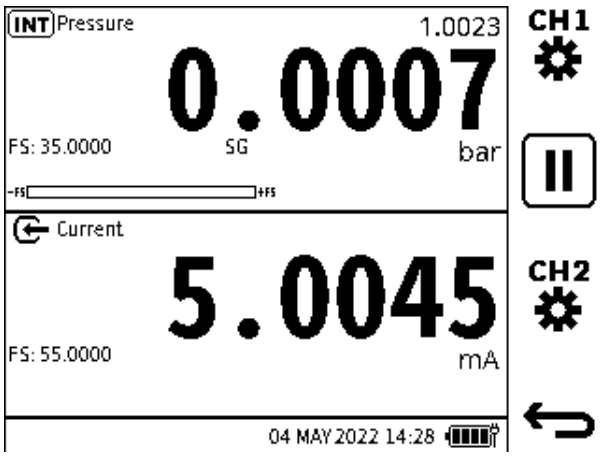
How to configure an Internal Sensor as a Sealed Gauge

INFORMATION **The INT Pressure function must be configured in one of the channels and you need to go into Calibrator to trigger this popup message.**

Step 1		Select **YES**.

INFORMATION **If NO is selected the sensor will be used in its native form - an Absolute pressure sensor.**

Step 2		Make sure that the pressure port is open to atmosphere. When the pressure reading is stable, select the ✓ icon.
Step 3		Make sure that **Sealed Gauge** is correctly configured on the desired channel.

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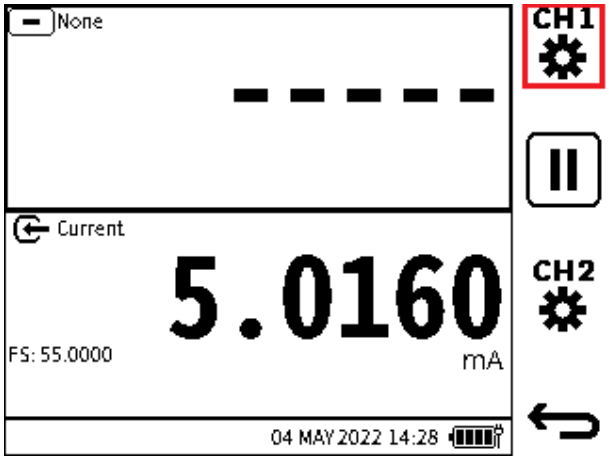
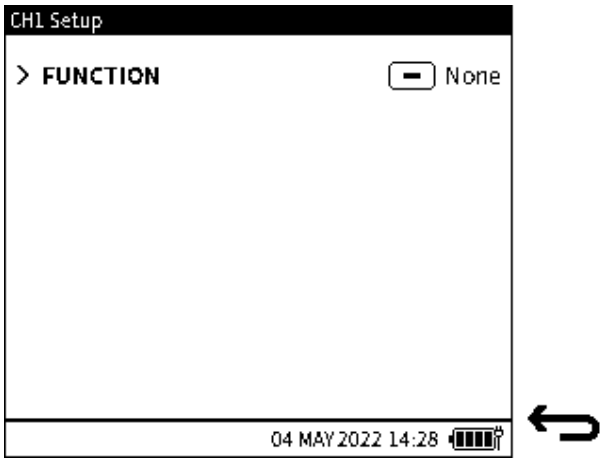
6.2.4 Sum

Sum is a pressure related function which allows the internal pressure reading from the instrument to be combined with the pressure reading from an external sensor. An external pressure sensor must be connected to see the resulting reading on the **Calibrator Main** screen.

The **SUM** function is only available on **CH1**. If the **SUM** function is selected on **CH1**, the **INT** Pressure function or **EXT** Pressure function cannot be configured on **CH2**.

Note: Care should be taken, when both sensors are not gauge, to make sure the contribution from atmospheric pressure has been considered.

To configure a pressure measurement reading using the **Sum** function:

Step 1		Tap the CH1 icon to select Channel 1 or push the related softkey.
Step 2		Select **FUNCTION** from the **Channel Setup** menu.

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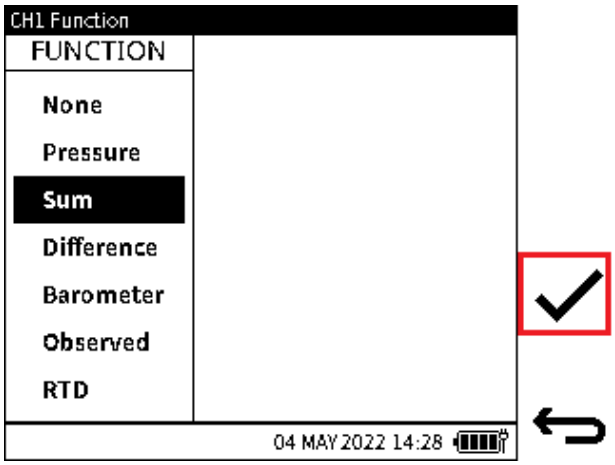
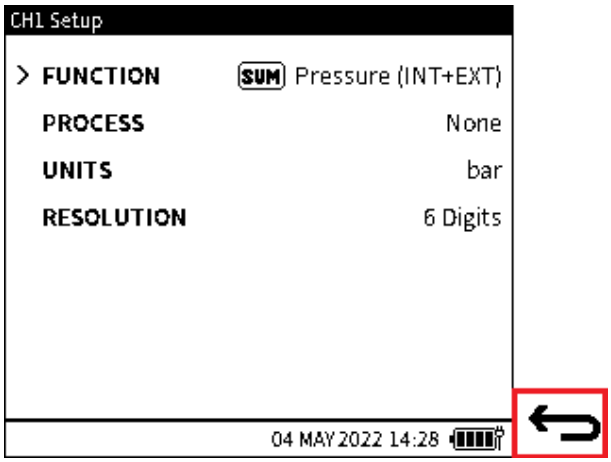
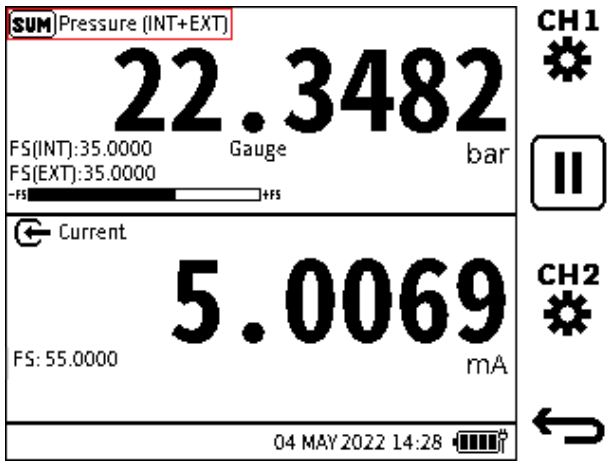
Step 3		Select **Sum** from the channel **FUNCTION** menu. Select ✓ to confirm. The **CH Setup** screen will appear again.
Step 4	 	Check that the desired configuration appears in the **CH Setup** menu. Select ⮌ to go back to the **Calibrator Main** screen.

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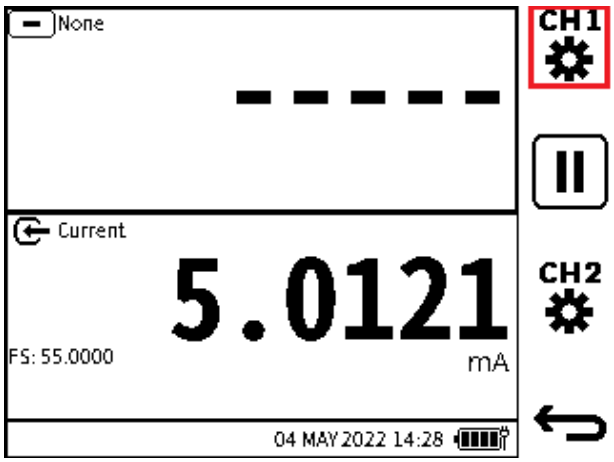
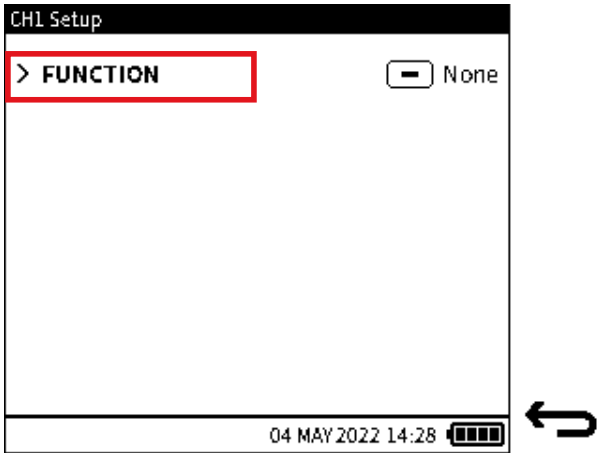
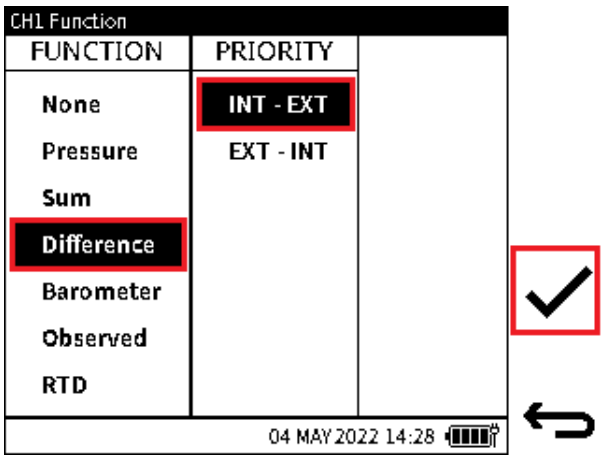
6.2.5 Difference

Difference is a pressure related function: this allows the difference between the internal pressure sensor reading and the external pressure sensor reading to appear on the calibrator task screen. An external pressure sensor must be connected to see the resulting pressure reading.

Note: Be careful when both sensors are not the same type (absolute/gauge), to make sure to compensate for the contribution from atmospheric pressure.

To configure a pressure measurement reading using the **Difference** function:

Step 1		Tap the CH1 icon to select Channel 1 or push the related softkey.
Step 2		Select **FUNCTION** from the **Channel Setup** menu.
Step 3		Select **Difference** from the **FUNCTION** menu. Select **INT-EXT** or **EXT- INT** as desired. Select ✓ to confirm.

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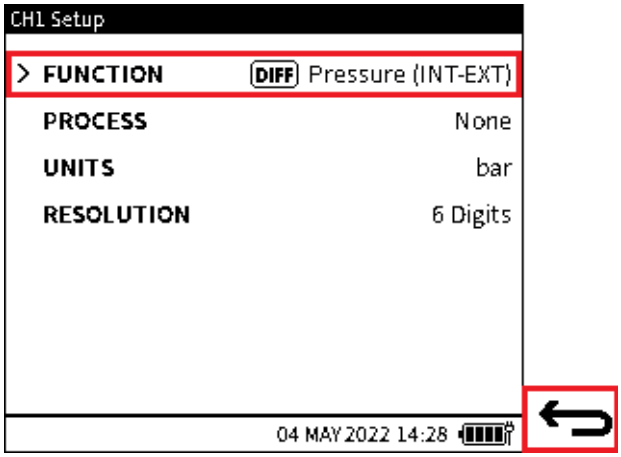
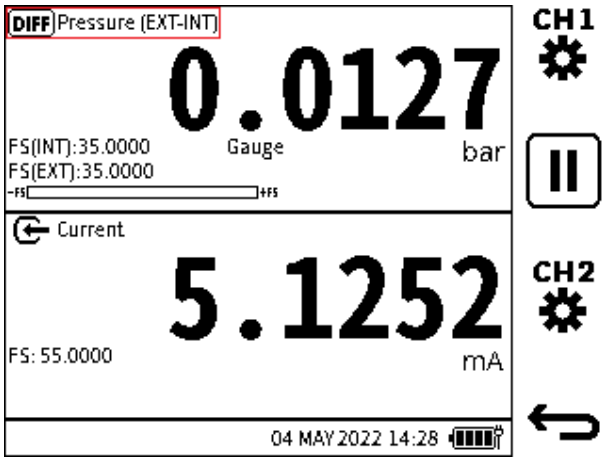
Step 4		Check that the desired configuration appears in the **CH Setup** menu. Select ⮌ to return to the **Calibrator Main** screen.
Step 5		Confirm that the **Difference** function is correctly configured on the desired channel. The **Difference** DIFF icon together with the function name, will be Pressure (**INT-EXT**) or (**EXT-INT**) depending on the priority chosen. The **FS** values of both the internal sensor and the external sensor will also be displayed. The sensor type field will also be updated where required.

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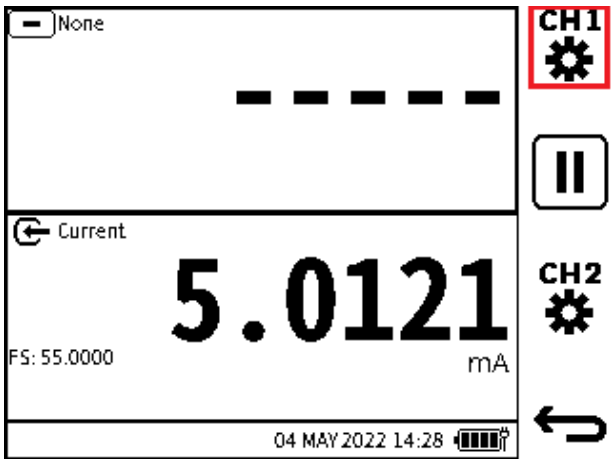
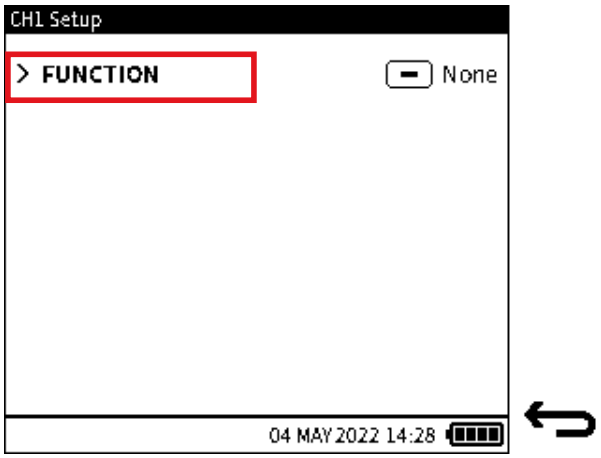
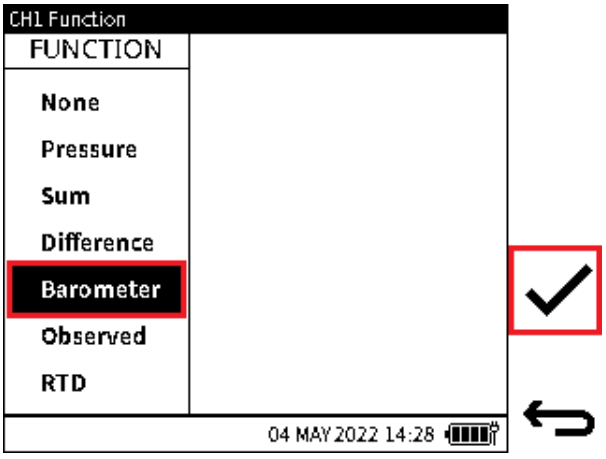
6.2.6 Barometer

The internal Barometer can measure a range of 750 to 1150 mbar. The **Barometer** function allows the measured atmospheric pressure to be displayed on the **Calibrator Main** reading screen as a primary reading. The internal barometer is only available in the pneumatic variant.

To configure a pressure measurement reading using the Barometer function:

Step 1		Select the CH1 or CH2 icon as desired.
Step 2		Select **FUNCTION** from the **Channel Setup** menu to show the **CHL Function** screen.
Step 3		Select **Barometer** in the channel **FUNCTION** menu. Select the Tick ✓ button to confirm the selection.

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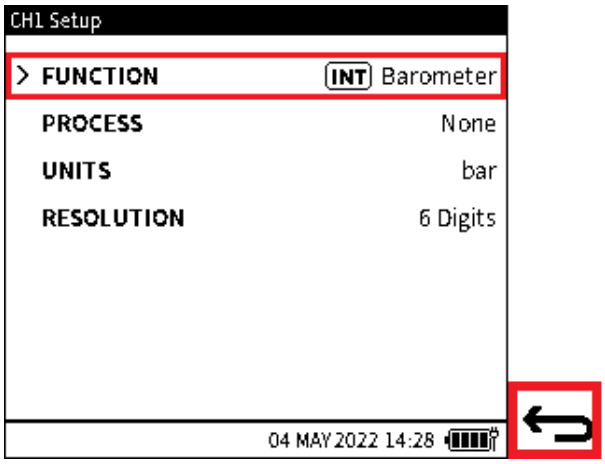
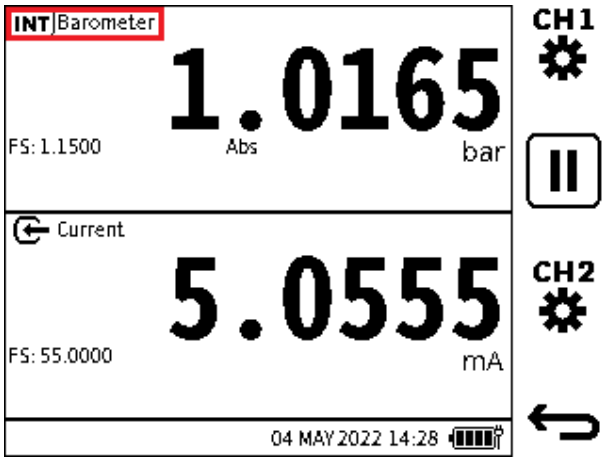
Step 4		Confirm that the **INT Barometer** function appears in the **CH Setup** menu. Select the **Back** ⮌ icon to go to the **Calibrator Main** Screen.
Step 5		Check that the **Barometer** function is correctly configured in the desired channel window.

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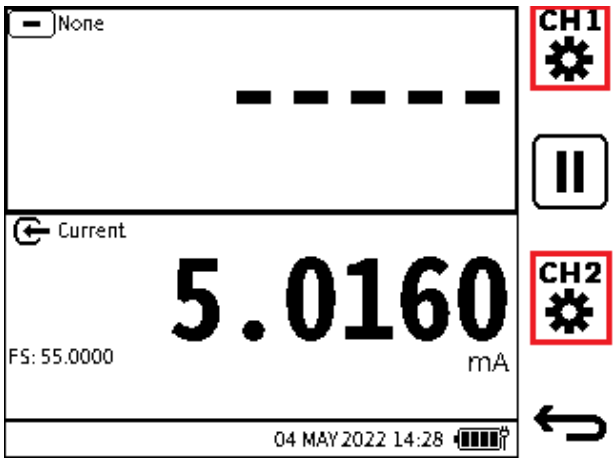
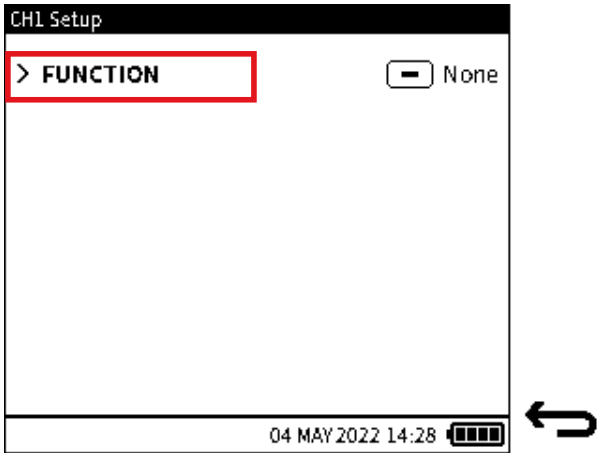
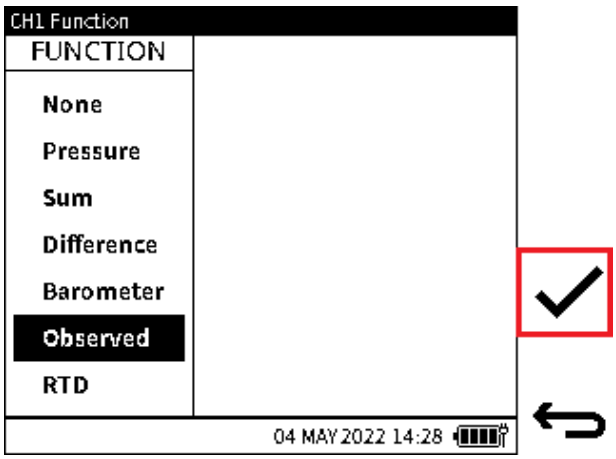
6.2.7 Observed

The **Observed** function is a non-measured function and has a range of +/- 999999.9. It allows manual entry of an observed reading from an external measuring and indicating device. It is often used in conjunction with a second measured function on another channel to record the relationship between the two readings.

To configure a channel using the **Observed** function:

Step 1		Select the CH1 or CH2 as desired.
Step 2		Select **FUNCTION** from the **Channel Setup** menu.
Step 3		Select **Observed** from the channel **FUNCTION** menu. Select the Tick ✓ button to confirm the selection.

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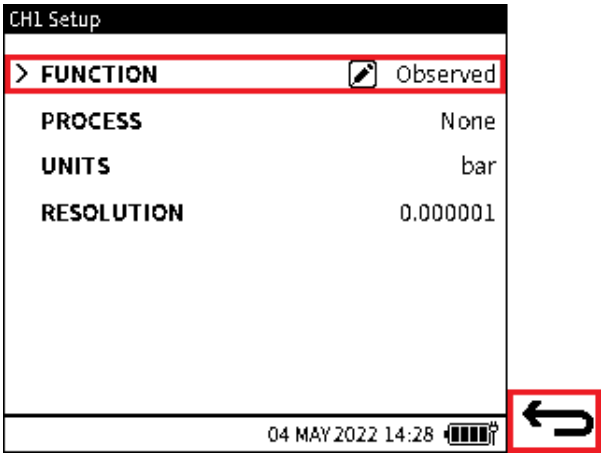
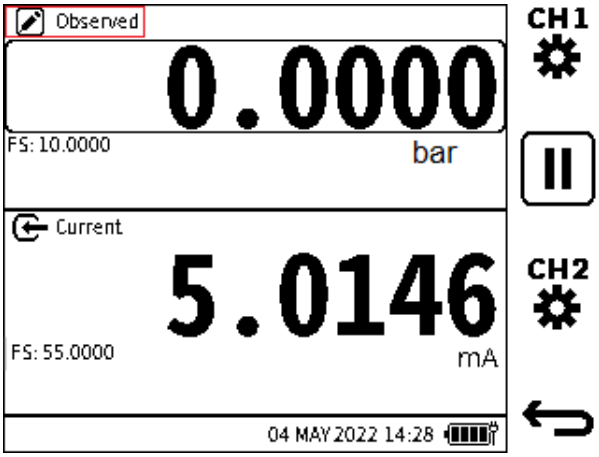
Step 4		Check that the **Observed** function appears in the **CH Setup** menu. Select ⮌ to return to the **Calibrator Main** screen.
Step 5		The **Observed** message will appear in the top left corner of the screen display. To select a different unit of measurement, refer to Section 6.1.1.2 on page 58 for instructions.

6.2.8 RTD

The RTD function enables temperature or resistance measurements to be shown on the **Calibrator** main reading screen as a primary reading when the RTD-Probe is connected to the DPI610E via the RTD-Interface (or RTD-Interface-IS).

When the RTD-Interface connection is detected, the sensor icon is shown in the status bar and the “Connected” text briefly appears, to confirm successful connection. Upon disconnection, the sensor icon will disappear and the “Disconnected” text briefly appears, to confirm the connection has been lost.

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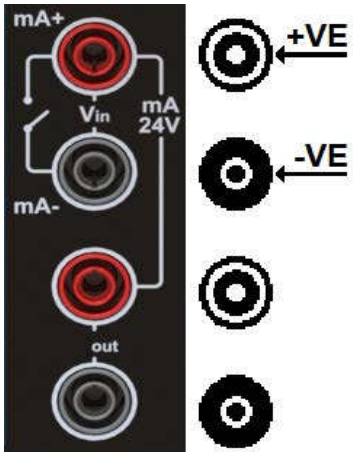
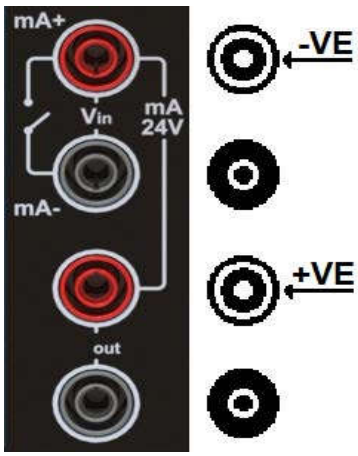
6.2.9 Current

The current measurement range: +/- 55 mA.
The DPI610E can measure or source electrical current expressed in milliamps (mA). Only **CH2** can do this. When using the **CH2 Current** function, there is the additional option to use the internal 10 V (non-IS instruments only) or 24 V power supply provided by DPI610E or to use an external power supply for the device under test.

6.2.9.1 Current Measure

It is necessary to use the correct terminals to configure the **Current Measure** function:

Step 1		Use the diagram on the left to make the necessary connections for Current Measure when the 24V internal power supply is not used (the **Off** option is selected in Step 4).
		Use the diagram on the left to make the necessary connections for Current Measure using the internal 24 V supply.

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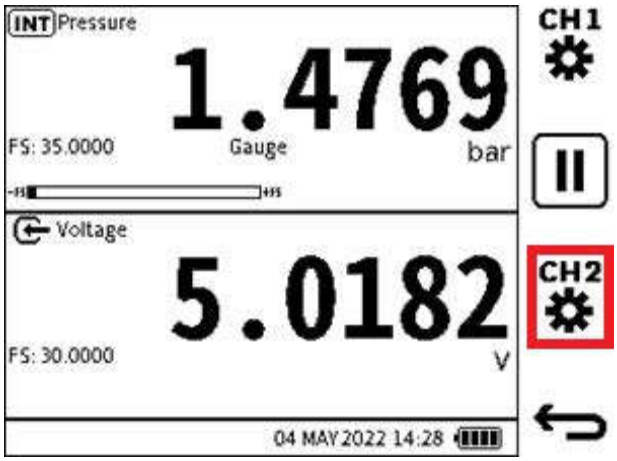
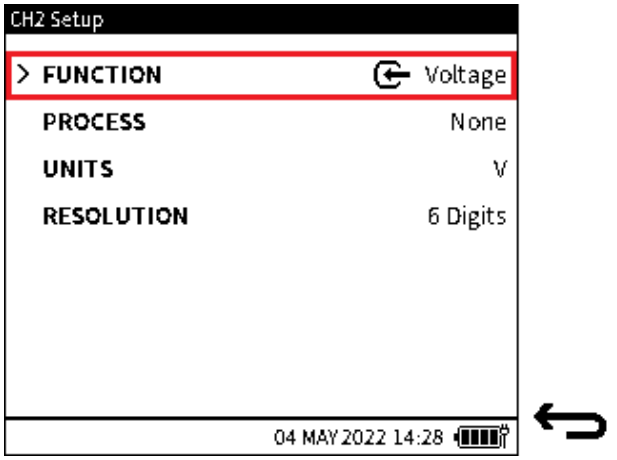
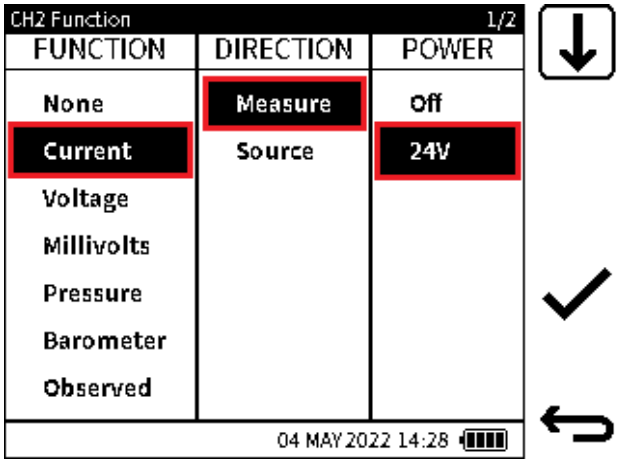
Step 2		Select the CH2 channel.
Step 3		Select **FUNCTION** from the **CH2 Setup** screen.
Step 4		Select **Current** > **Measure** > then select one of the following: **10 V** for measure with internal 10 V Loop Power supply (only for non-IS units) OR **24 V** for measure with internal 24 V Loop Power supply. Select ✓ to confirm the selection. If **Off** is selected the electrical connections will not be the same as for when 24 V or 10 V is selected (see Step 1).

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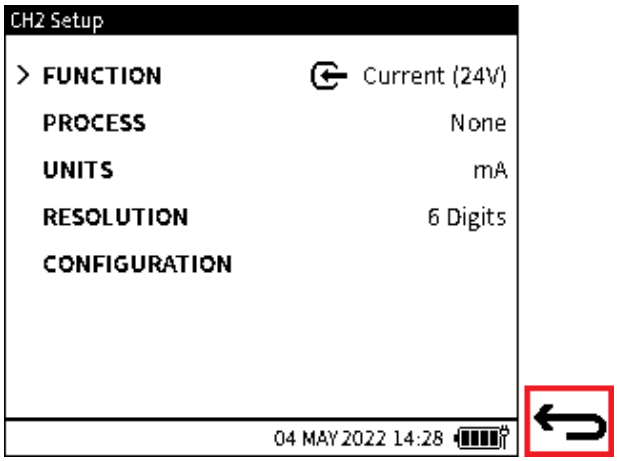
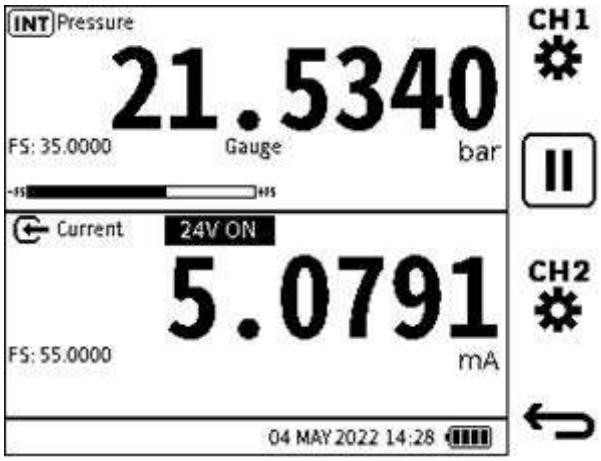
Step 5	 	This screen will have only “Current” as the Function when **Off** is selected. When **24V** is selected, “Current (24V)” will appear. Select the **Back** icon to go to the **Calibrator Main** Screen. The **Calibration** screen will show “24V ON” in the **CH2** screen area. If **Off** has been selected, only “Current” will be in the top of this area.

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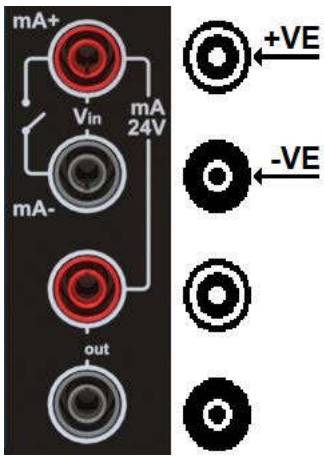
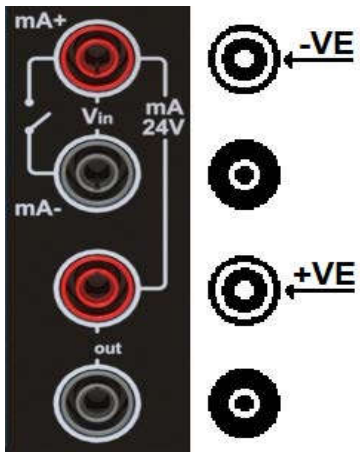
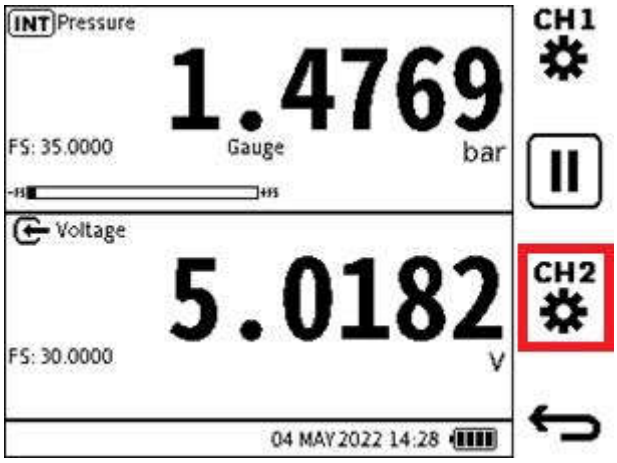
6.2.9.2 Current Source

To configure the **Current Source** function:

Step 1		Use the diagram on the left to make the necessary connections for Current Source when the 10V/24V internal power supply is not used (when the **Off** option is selected in Step 4).
		Use the diagram on the left to make the necessary connections for Current Source using the internal 10 V or 24 V supply.
Step 2		Select the CH2 channel.

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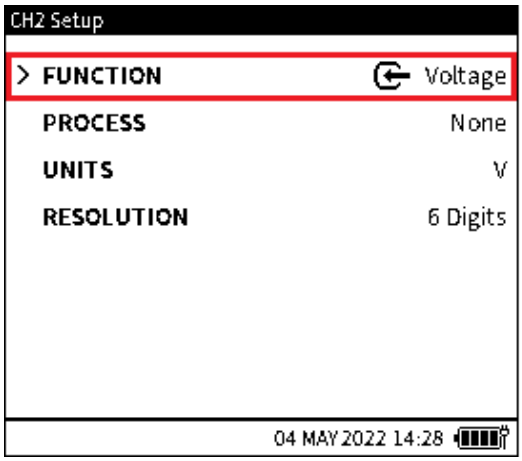
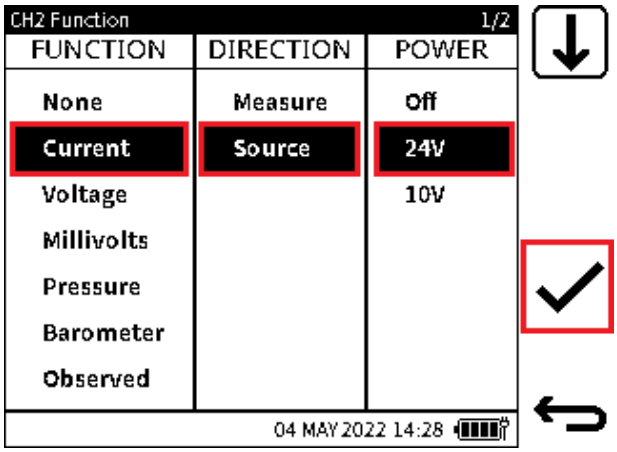
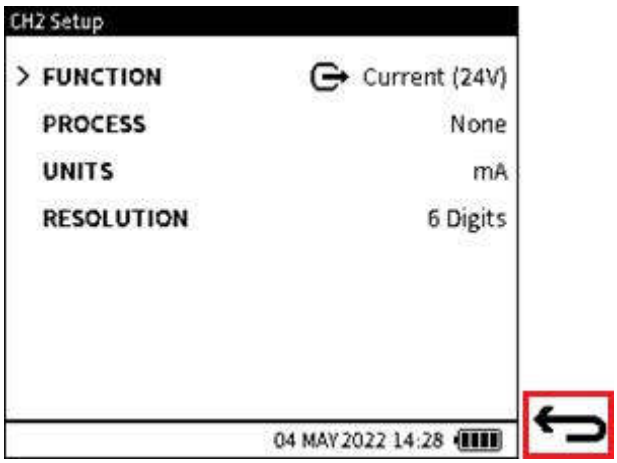
Step 3		Select **FUNCTION** from the **Channel Setup** menu.
Step 4	 	Select **Current** > **Source** > then select one of the following: **10 V** for measure with internal 10 V Loop Power supply (only for non-IS units) OR **24 V** for measure with internal 24 V Loop Power supply. Select ✓ to confirm the selection. If **Off** is selected the electrical connections will not be the same as for when 24 V or 10 V is selected (see Step 1). This screen will have only “Current” as the Function when **Off** is selected. When **24V** is selected, “Current (24V)” will appear. When **10V** is selected, “Current (10V)” will appear. Select the **Back** ⮌ icon to go to the **Calibrator Main** screen

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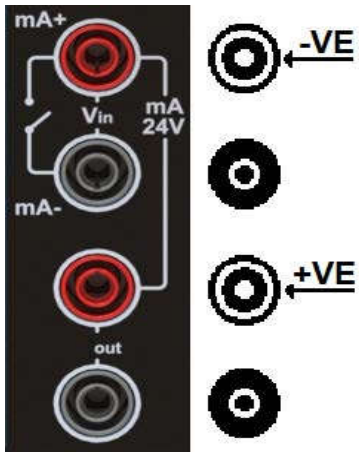
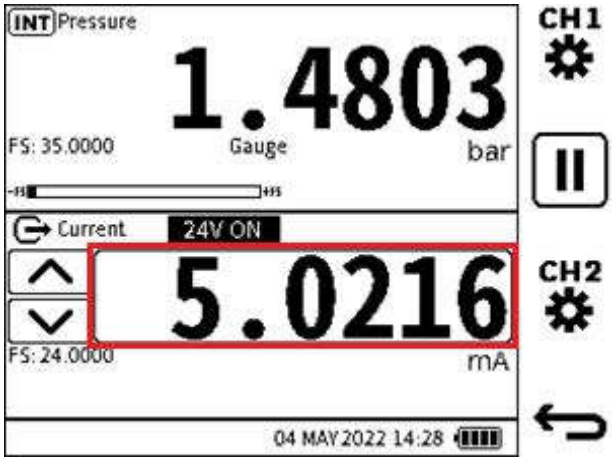
Direct Input of Current Value



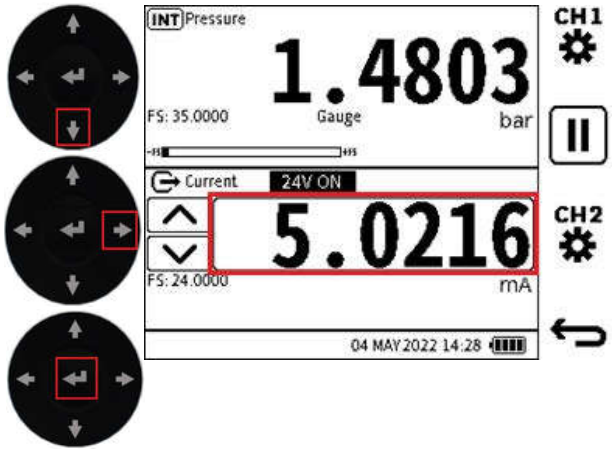
The DPI610E can provide electrical current accurately within the 0 to 24 mA range.
The diagram on the left shows the terminal connections for this configuration.

You can directly input the current value to be sourced. The Touchscreen or the Navigation Pad can then be used to input this current value:



Use the Touchscreen to set the source current

Tap in the **Current Value** field. Enter the required current source value using the **UP**/**DOWN** arrow icons on the left of the field.



Use the Navigation Pad to set the source current

Press the **DOWN** button to select the **CH2** window area.
Press the **RIGHT** button until the source value is outlined in bold.

Press the **OK** (**Enter**) button to show the source value entry screen. Enter the new value using the onscreen keyboard, and press the **Tick** ✓ softkey to confirm.

INFORMATION **Once a target current source value is set, the displayed value will start to flash on the main reading screen. Once the setpoint has been reached, the source value will stop flashing and remain steady.**

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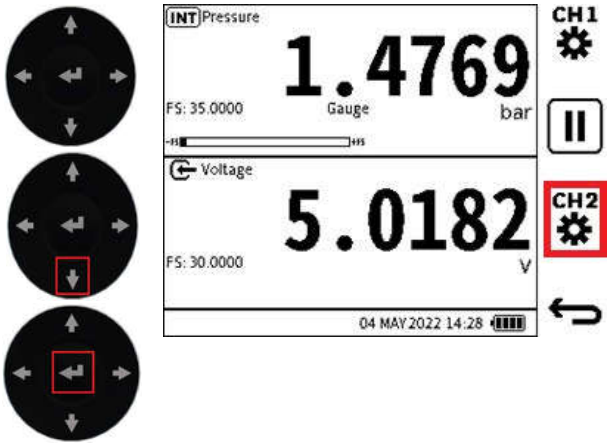
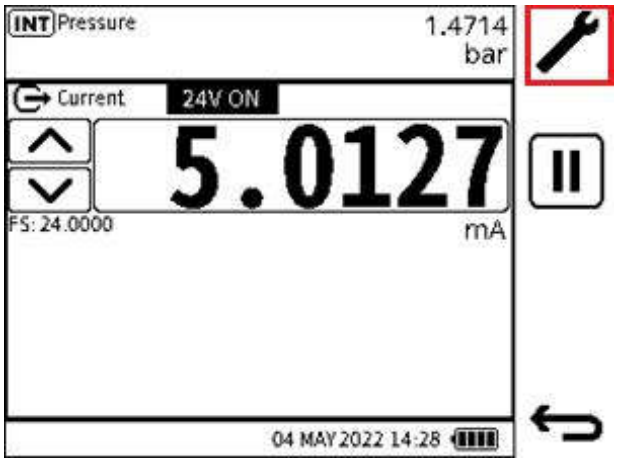
Source Automation Options

The other methods to set the Current source output are:

1. Nudge (manual)
2. Span Check (manual or automated)
3. Percent Step (manual or automated)
4. Defined Step (manual or automated)
5. Ramp (automated).

Use the **Current Source** function to make available the above options.

To access the Current Source automation options:

Step 1		Tap on the **CH2** window (anywhere, but not in the Units area) to expand the **CH2** window. An alternative method is to use the Navigation keypad: push the **DOWN** button to select **CH2**, then push the **OK** button to expand the channel window.
Step 2		Select the **Setup** options icon to show the **Source Automation** screen.

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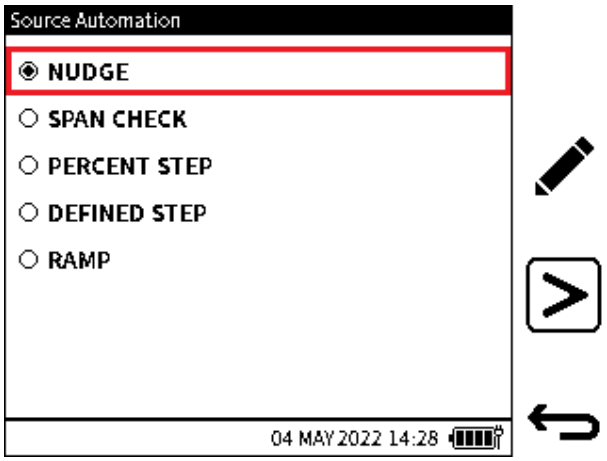
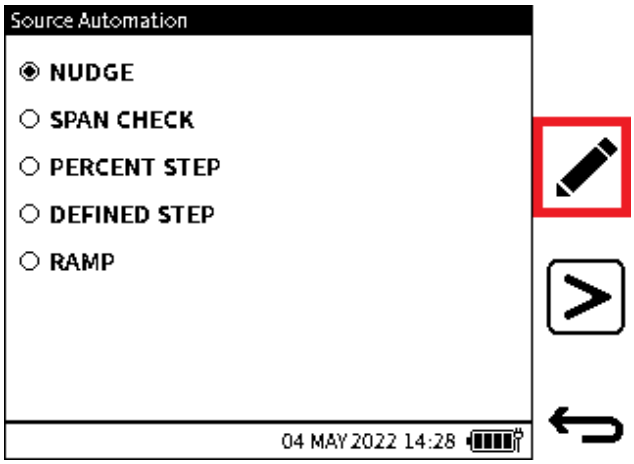
Step 3		Select the option from the **Source Automation** screen: the default option is **NUDGE**.
Step 4		If necessary, select the **Edit** softkey and then set the parameters for the selected automation. **Note**: Different automation options will have different parameters.

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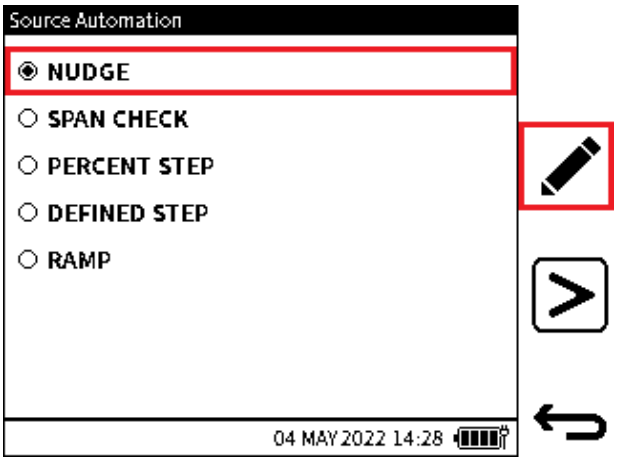
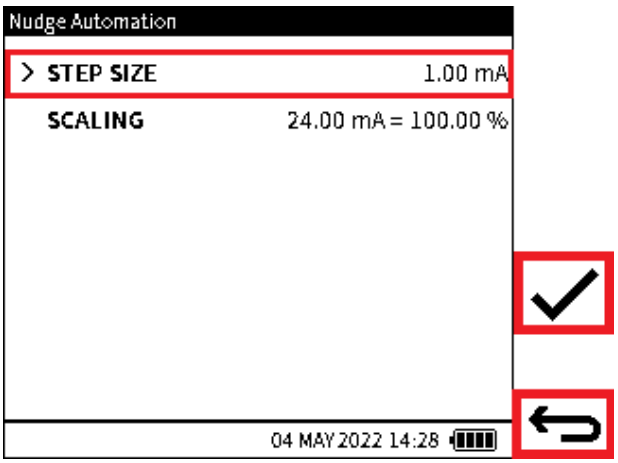
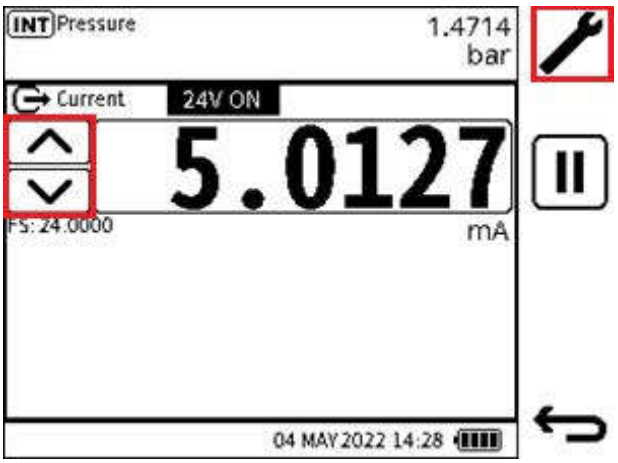
1. NUDGE

This is the default **Source Automation** option. This option lets the source value be increased or decreased by a set step size value.

Step 1		Select the **NUDGE** radio button. Push the **Edit** softkey to show the **Nudge Automation** menu. The display will show the **Nudge Automation** settings. Go to Step 2 to change the settings if necessary.
Step 2		To change the step size, select the **STEP SIZE** row to show an on-screen keypad. Use the on-screen or Navigation buttons to enter the new value. For a description of **SCALING** refer to Section 6.3.6 on page 114. Select the **Tick** icon/softkey to save the new values or the **Back** icon if the new values are not to be saved. Select the **Proceed** softkey to use the selected automation option and its automation settings.
Step 3		**Nudge Automation** **To use the Navigation Pad (Manual):** To use the keypad, push the **DOWN** button to select the **CH2** window and the **Enter** button to enlarge the window. Push the **RIGHT** navigation button to make available the **UP**/**DOWN** buttons. If necessary, tap the Up or Down screen buttons to increase or decrease the Current value. Push the **Setup** icon to show the **Source Automation** menu.

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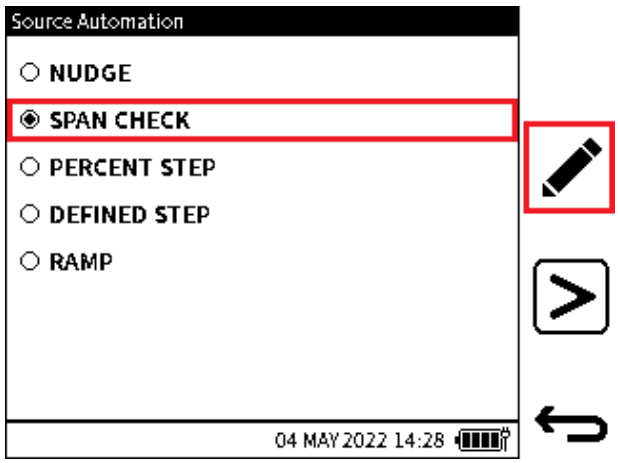
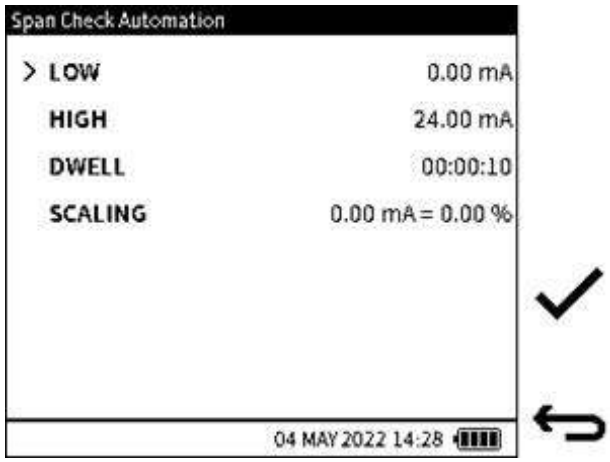
2. SPAN CHECK

Use Span Check to check the span of a device under test. Set the minimum current output that relates to the device's zero or negative full-scale, and the maximum current output that relates to the positive full-scale of the device under test. For most Current output devices, the minimum and maximum values are 4 and 20 mA. These are the default values for the Span Check automation.

The **SPAN CHECK** function gives a 2-point span check. **LOW** (minimum) and **HIGH** (maximum) span values can be set. The **DWELL** time is the interval to wait at each Span Point before the change to the other span point.

To change the **LOW** or **HIGH** span values or the **DWELL** time:

Step 1		Tap the **SPAN CHECK** radio button on the **Source Automation** screen to show the **Span Check Automation** screen. Push the **Edit** softkey to show the **Span Check Automation** screen that has the **Span Check** settings. Go to Step 2 to change the settings if necessary.
Step 2		**LOW** value - this is the first current source value to be set by this option. **HIGH** value - this is the maximum current source value set-point set by this option. **DWELL** - this is the time period to wait at the low value, before a change to the high value (or from a high value down to a low value.) For a description of **SCALING** refer to Section 6.3.6 on page 114. Select the parameter value to be changed. Enter the new value using the on-screen or Navigator keys. Select the **Tick** icon/softkey to save the new values or the **Back** icon to not save the new values. Select the **Proceed** softkey to use the automation option and its automation settings.

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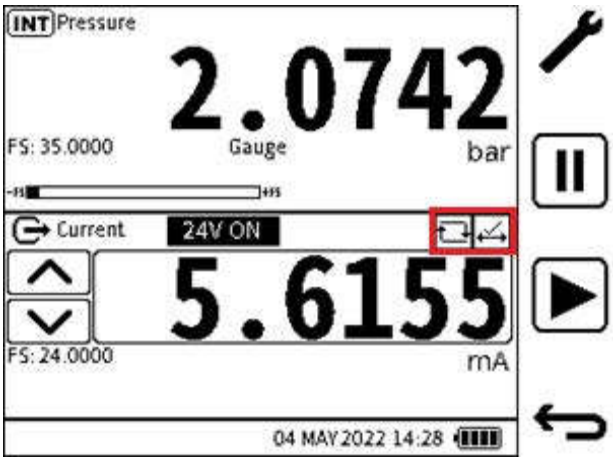
Step 3		After selection of **Span Check** automation, the display will show the **Span Check** icon at the top right of the **CH2** window. The **Span Check** can be done manually. Use the **UP** and **DOWN** nudge buttons to switch between the **LOW** and **HIGH** source values. An option is available to automate the **Span Check**: push the automation **Play** softkey. **To use the Navigation Pad (Manual)** Push the **DOWN** button to select the **CH2** window and the **Enter** button to enlarge the window. Push the **RIGHT** navigation button to make available the **UP**/**DOWN** buttons. If necessary tap the up or down screen keys to increase or decrease the Current value. **To use the Touchscreen (Manual)** Tap on the Nudge **UP** and Nudge **DOWN** buttons to increase or decrease the Current value. The **Auto-repeat** icon is next to the **Span Check** automation icon when the **Span Check** cycle is automatically repeated. This happens when the automation **Play** softkey is used, until manually stopped. To stop the automation at any time, push the **Cancel** softkey.

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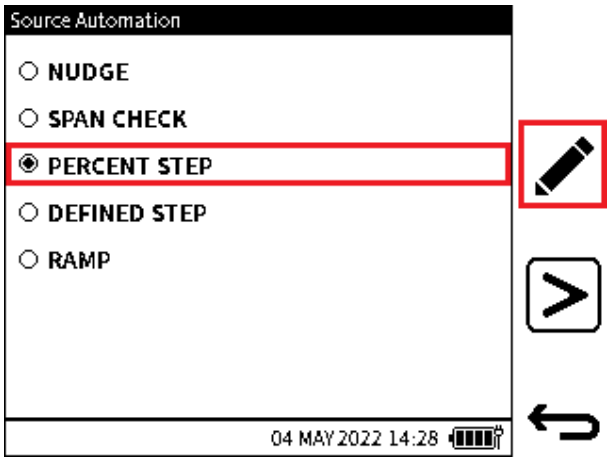
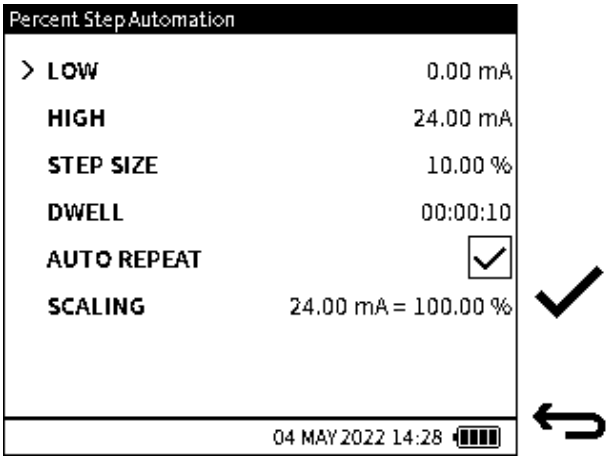
3. PERCENT STEP

The **PERCENT STEP** function lets the source value be increased in steps that are related to a set percentage of the span. To set up and use the Percent Step automation:

Step 1		Tap the **PERCENT STEP** radio button on the **Source Automation** screen. Push the **Edit** softkey to show the **Percent Step Automation** screen. Go to Step 2 to change the settings if necessary.
Step 2		**LOW** value - this is the first current source value to be set by this option. **HIGH** value - this is the maximum current source value set-point set by this option. **STEP SIZE** - this is the value for each step increase or decrease. This option shows the Step Size as a percentage. The calculated mA step size will be related to the step size percentage of the **LOW** and **HIGH** value. **DWELL** - the time interval that can be set for the wait period at each set-point value, before the change to the next value. **AUTO-REPEAT** - this tick box option lets the automation cycle be repeated continuously until manually stopped. Select the parameter value to be changed. Enter the new value using the on-screen or Navigator keys. For a description of **Scaling** refer to Section 6.3.6 on page 114. Select the **Tick** icon/softkey to save the new values or the **Back** icon to not save the new values. Select the **Proceed** softkey to use the selected automation option and its automation settings.

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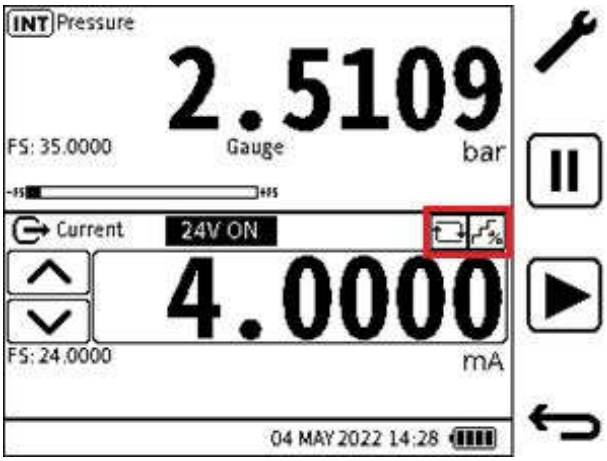
Step 3		When the **Percent Step** function is selected, the display will show the **Percent Step** icon in the top right corner of the **CH2** window in the calibrator screen. The **Percent Step** sequence can be done manually: use the **UP** and **DOWN** nudge buttons to increase or decrease the source values. An option is to push the automation **Play** softkey to automate the process. **How to use the Navigation Pad (Manual)** Push the **DOWN** button to select the **CH2** window and the **Enter** button to enlarge the window. Push the **RIGHT** navigation button to make available the **UP**/**DOWN** buttons. If necessary tap the **UP** or **DOWN** screen keys to increase or decrease the Current value. **How to use the Touch screen (Manual)** Tap on the Nudge **UP** and Nudge **DOWN** buttons to increase or decrease the Current value. If the **Auto-repeat** function is selected its icon will be next to the **Percent Step** automation icon. The automation cycle is automatically repeated until manually stopped. To stop the automation at any time, push the **Cancel** softkey.

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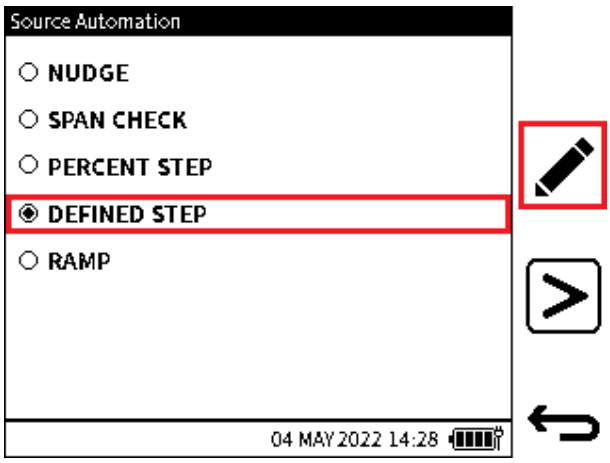
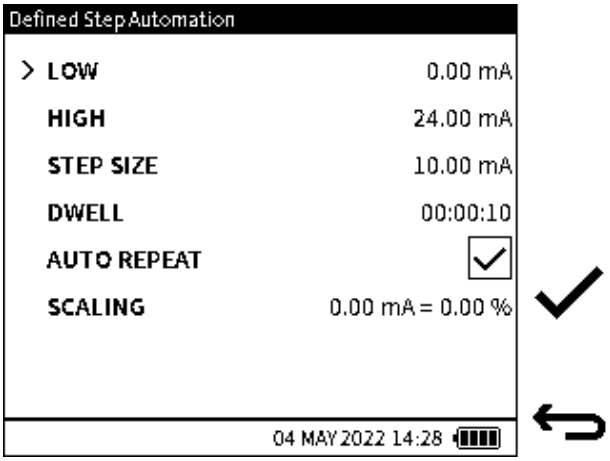
4. DEFINED STEP

The **DEFINED STEP** automation lets a defined step size within the span limits be set.The **LOW**, **HIGH** and **STEP SIZE** value set the spam limits. There is the option to auto-repeat the automation process.

To set up and use the Defined Step automation:

Step 1		On the **Source Automation** screen tap the **DEFINED STEP** radio button to show the **Defined Step Automation** screen. If you want to view or edit the **DEFINED STEP** automation settings, go to Step 2.
Step 2		**STEP SIZE** value - this is the value of each step increase or decrease. The values of this option are measured in mA. **DWELL** - this is the time interval that can be set to pause or wait at each set-point value before the change to the next value. **AUTO-REPEAT** - this tickbox option lets the automation cycle repeat continuously until manually stopped. Tap or select the parameter value to be changed. Use the on-screen or Navigator buttons to enter the new value. For a description of **Scaling** refer to Section 6.3.6 on page 114. Select the **Tick** ✓ icon/softkey to save the new values or the **Back** ⮌ icon to not save the new values. Select the **Proceed** > softkey to use the selected automation option and its automation settings.

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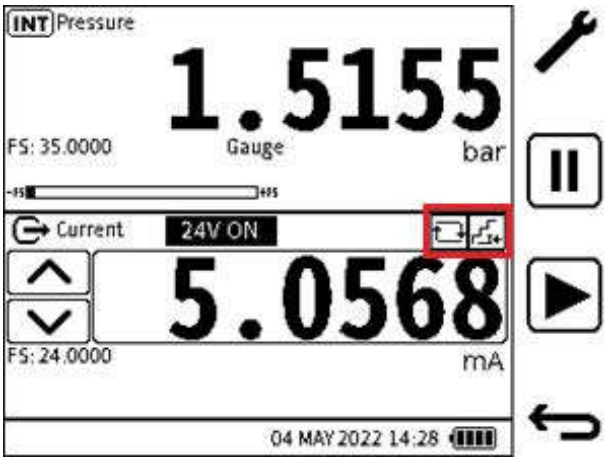
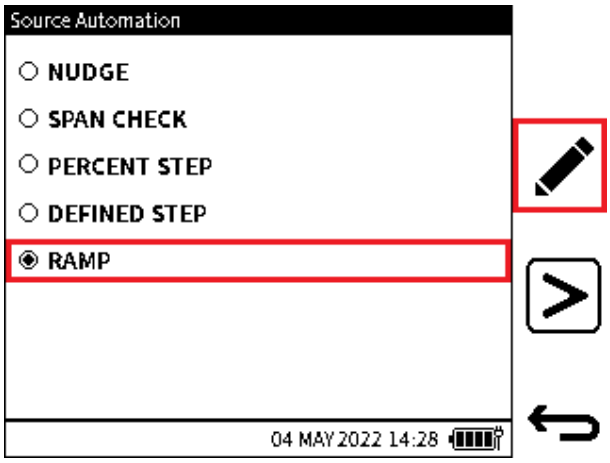
Step 3		When the **Defined Step** function is selected, the display shows its icon in the top right of the **CH2** window in the Calibrator screen. The **Defined Step** sequence can be done manually by the use of the **UP** and **DOWN** nudge buttons, to increase and decrease the source values. An option is to push the automation **Play** softkey to automate the process. If the **Auto-repeat** function is selected its icon will be next to the **Defined Step** icon. The automation cycle is automatically repeats until manually stopped. To stop the automation at any time, push the **Cancel** softkey.

5. RAMP

The **RAMP** function lets the source value automatically change from a defined **START** value to a defined **END** value. This is done in a specified time: the value can increase or decrease.

The **TRAVEL** time can be set to define the time for the value to go from **START** to **END** or from **END** to **START**.

Step 1		On the **Source Automation** screen tap the **RAMP** radio button. Select the **Edit** softkey to show the **Ramp Automation** menu screen.

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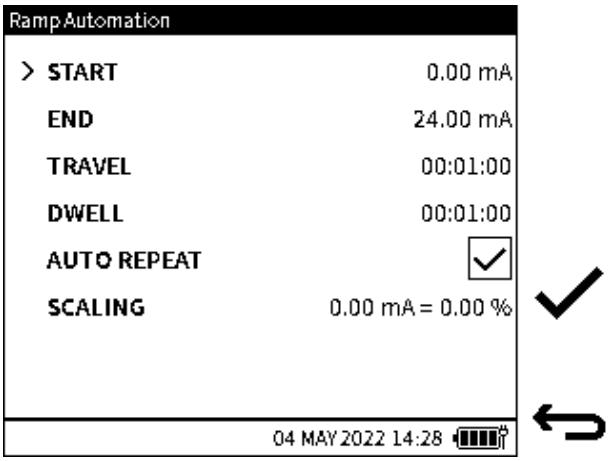
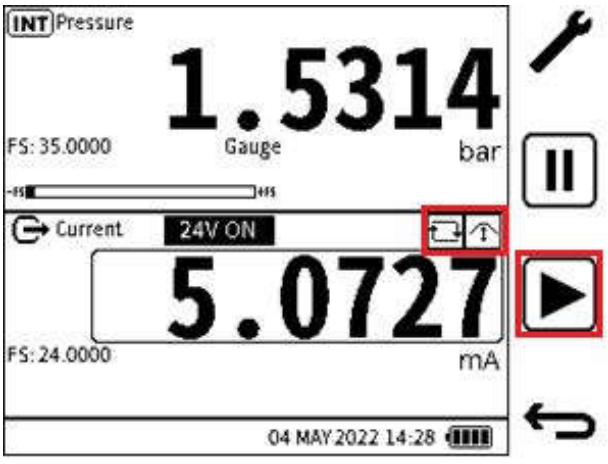
Step 2		**START** value - this is the first Current source value to be set by this option. **END** value - this is the maximum set-point of the Current source value, to be set by this option. **TRAVEL** - this is the time for the Current source value to Change (ramp) from the **START** value to the **END** value. This automatically calculates the step size to be used, to agree with the travel time. **DWELL** - this is the time that can be set to pause or wait at the end of each direction or travel before a change to the opposite direction of travel. **AUTO-REPEAT** - the tick box option that lets the automation cycle be repeated continuously until manually stopped. Tap or select the parameter value to be changed. Use the on-screen keypad to change the value. For a description of **Scaling** refer to Section 6.3.6 on page 114. Select the **Tick** icon ✓ to set the new values. Select the **Proceed** icon to operate the option and go back to the **Calibrator** screen.
Step 3		The **Calibrator** screen will show the **Ramp** icon and the **Auto-repeat** icon (if selected). The **Ramp** sequence is not manual and as a result the **UP** and **DOWN** nudge buttons are not usable with this option. Push the **Play** softkey to select automation. The automation cycle continuously repeats until manually stopped. To stop the automation at any time, press the **Cancel** softkey.

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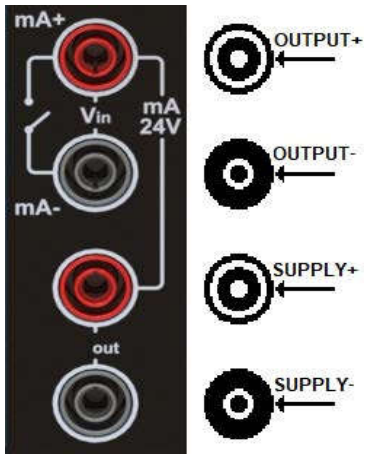
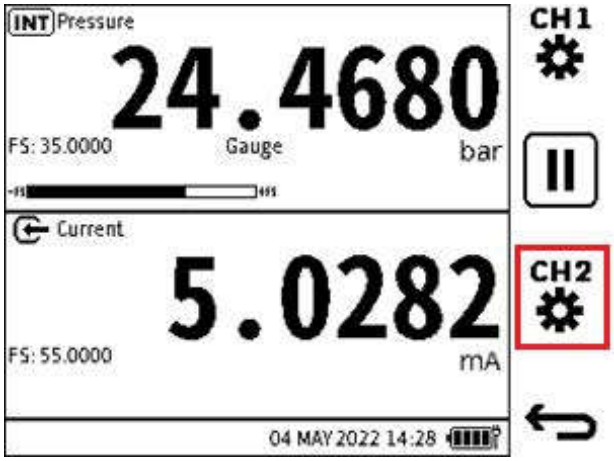
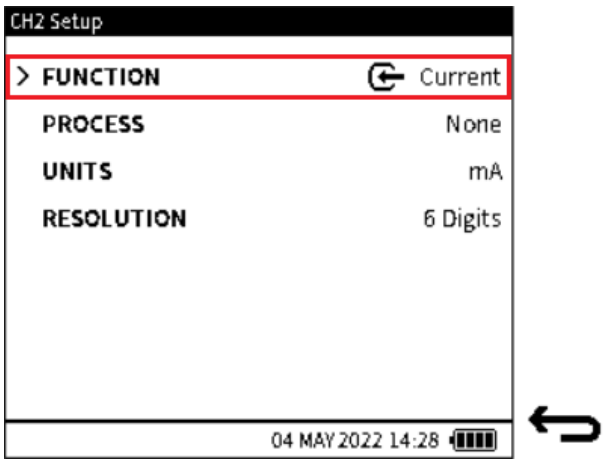
6.2.10 Voltage

	For the DPI610E instrument voltage is measured in Volts (V) or milliVolts (mV) and is a function of **CH2** only. When the **Voltage** function is selected, the **Direction** is automatically set to **Measure**, as the Source option is not supported by the DPI610E. The supported voltage range is -30 V to 30 V. When using the **Voltage** function, there is the additional option to use the internal 10 V (non-IS units only) or 24 V power supply provided by DPI610E or to measurement of the voltage input from a source that is powered external to the unit. Terminal connections for measurement of voltage are shown in the diagram on the left.

6.2.10.1 Voltage Measure - Configuration

Step 1		From the **Calibrator** screen, select the channel 2 CH2 **Setup** screen (either press the screen icon or press the softkey.)
Step 2		Select **FUNCTION** from the **CH2 Setup** screen.

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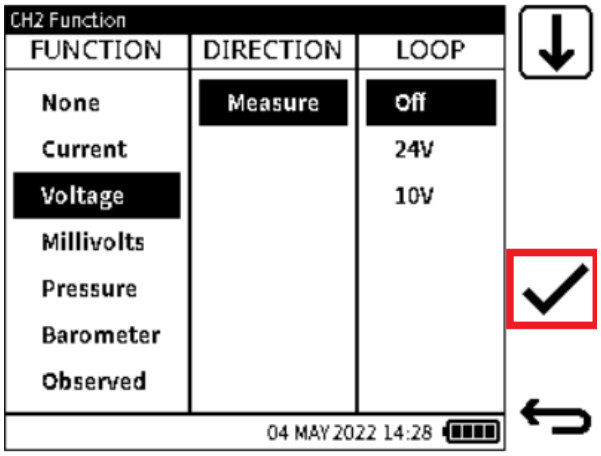
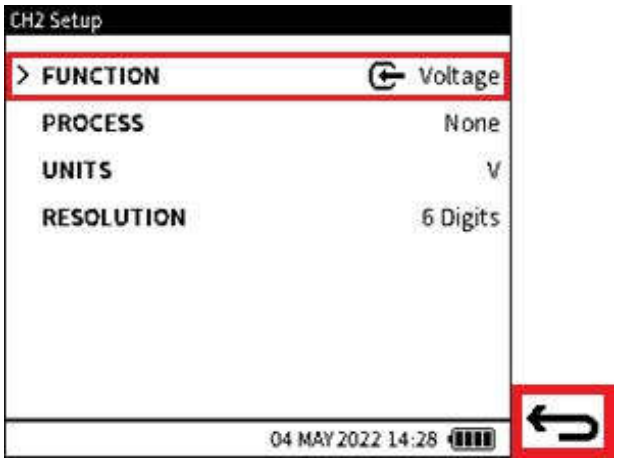
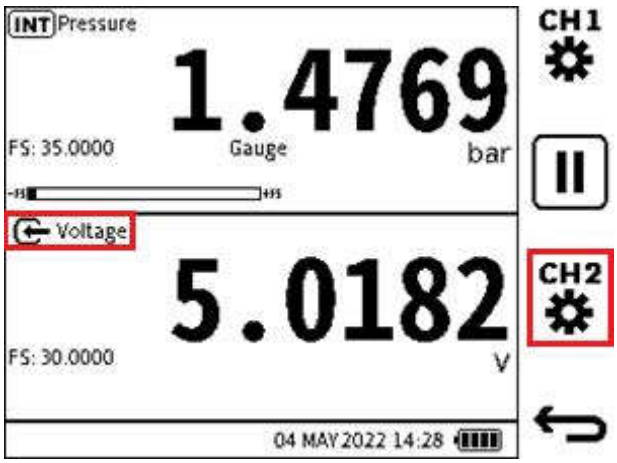
Step 3	  	Select **Voltage** > **Measure** then select one of the following: **Off** for measurement without internal loop power supply OR **10 V** for measure with internal 10 V loop power supply (only for non-IS units) OR **24 V** for measure with internal 24 V loop power supply. Select the Tick ✓ icon to confirm the selection and configure the instrument. Check that Voltage mode is active. Select the **Back** ⮌ icon to show the **Calibration** screen. Check that Voltage is shown in screen.

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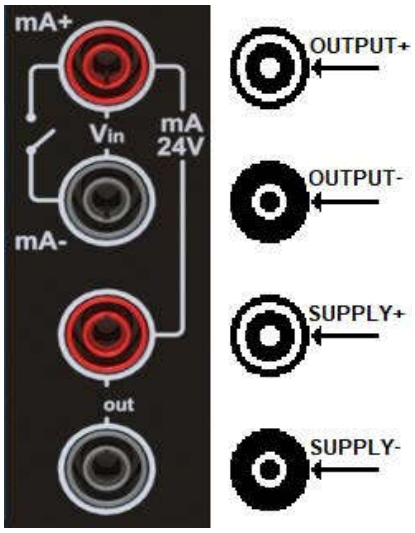
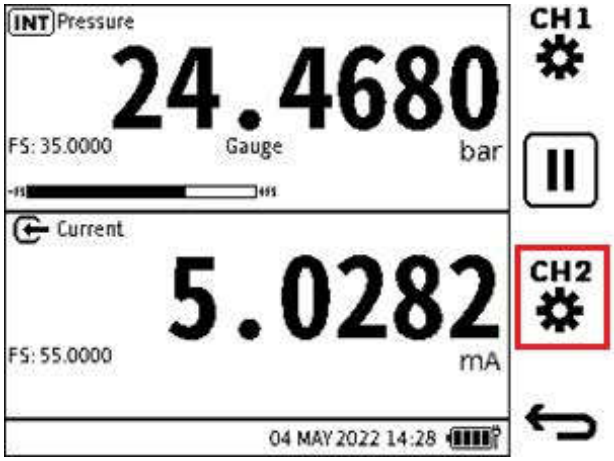
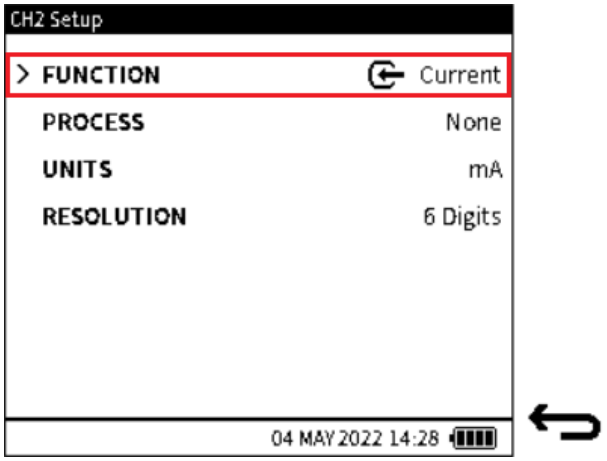
6.2.11 Millivolts Measure - Configuration

	Voltage can also be measured in millivolts (mV) and is a function of **CH2** only. When the **Millivolts** function is selected, the **Direction** is automatically set to **Measure** as the Source option is not supported by the DPI610E. The supported millivolts range is -2000 mV to 2000 mV. When using the **Millivolts** function, there is the additional option to use the internal 10 V (non-IS units only) or 24 V power supply provided by DPI610E or to measure the millivolts input from a source that is powered external to the unit. Terminal connections for measurement of millivolts are shown in the diagram on the left.

Step 1		From the **Calibrator** screen, select the Channel 2 CH2 **Setup** (either press the screen icon or press the softkey.)
Step 2		Select **FUNCTION** from the **CH2** setup screen.

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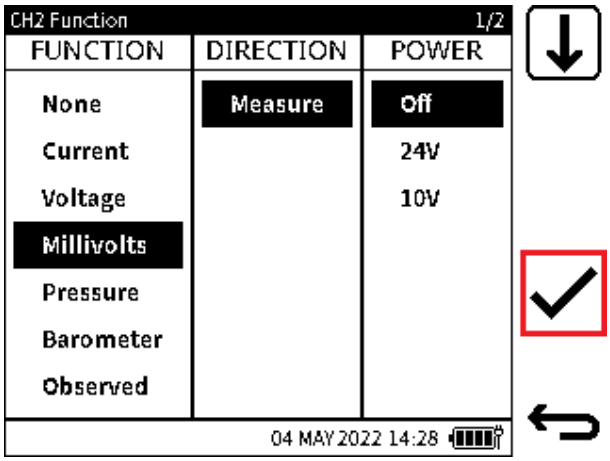
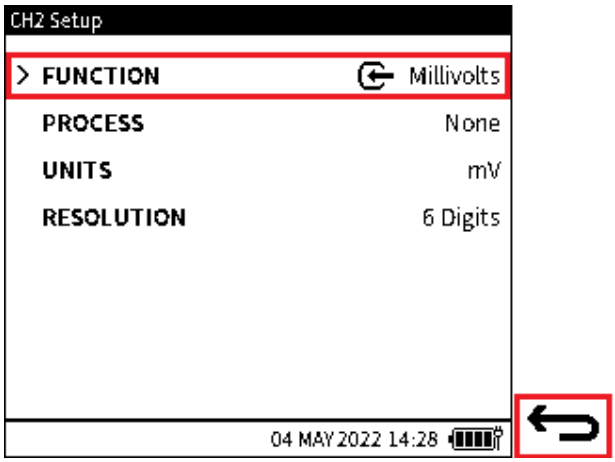
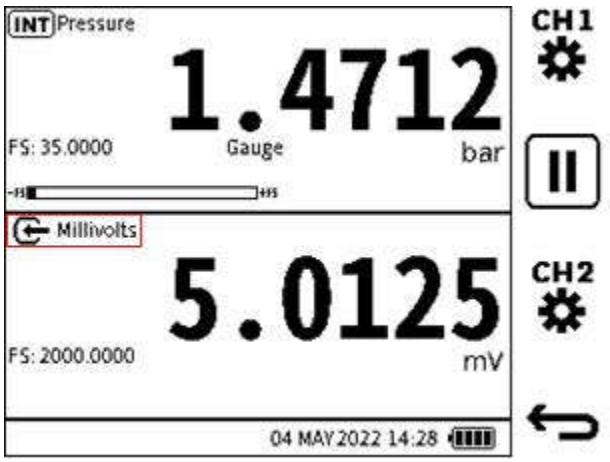
Step 3	  	Select **Millivolts** > **Measure** then select one of the following: **Off** for measurement without internal loop power supply OR **10 V** for measure with internal 10 V loop power supply (only for non-IS units) OR **24 V** for measure with internal 24 V loop power supply. Select the Tick ✓ icon to confirm the selection and configure the instrument. Check that Voltage mode is selected. Select the **Back** ⮌ icon to show the **Calibrator** screen. Check that Millivolts appears on the screen.

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6.2.12 HART

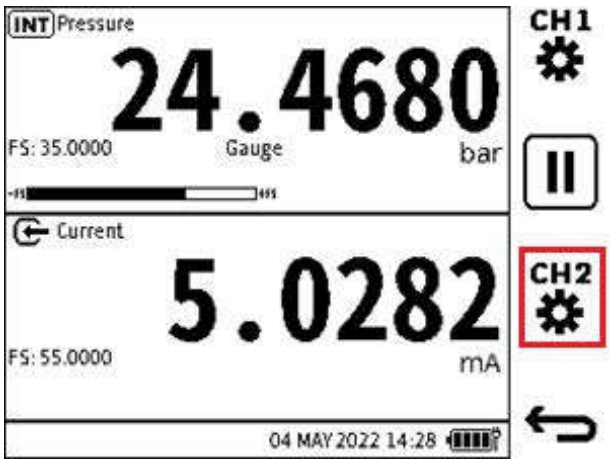
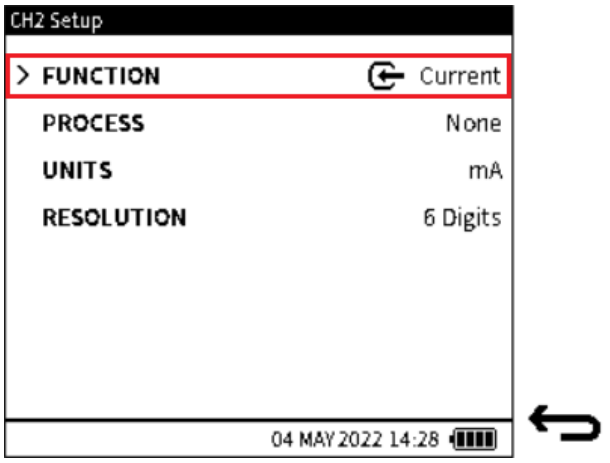
The DPI610E can use the **HART** (Highway Addressable Remote Transducer) communication protocol and allows basic HART operation and configuration on HART supported devices. The HART bi-directional communications technology works as a master/slave protocol. When the DPI610E connects to the HART device, the DPI610E acts as the master and the HART device, the slave. The DPI610E supports commonly used functions from the Universal and Common Practice commands specified in HART revision 5, 6 and 7. (See more about HART in Chapter 12 on page 233).

The HART function is only available on **CH2**. As it utilizes the current loop signal for its communication, the DPI610E can provide 10 V/24 V loop power supply to the HART device if required.

The DPI610E also offers an optional 250-ohm resistor that provides the voltage drop required for the HART communication when an external HART resistor is not available.

The HART resistor can be enabled (and disabled) from the **CH2 Setup** window.

To select the **HART** function:

Step 1		From the Calibrator screen, select the channel 2 **CH2 Setup** icon (either tap the screen icon or press the softkey.)
Step 2		Select **FUNCTION** from the **CH2 Setup** screen.

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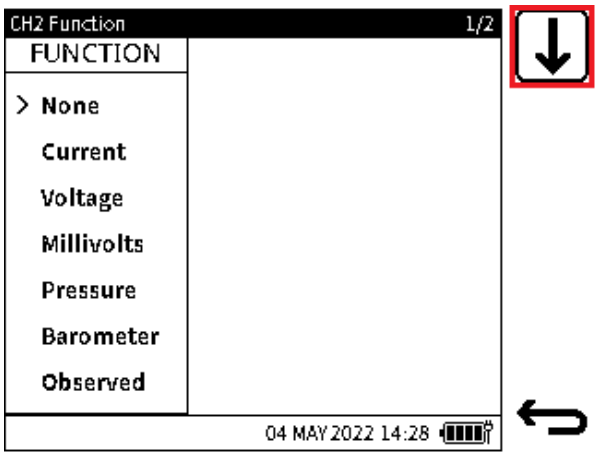
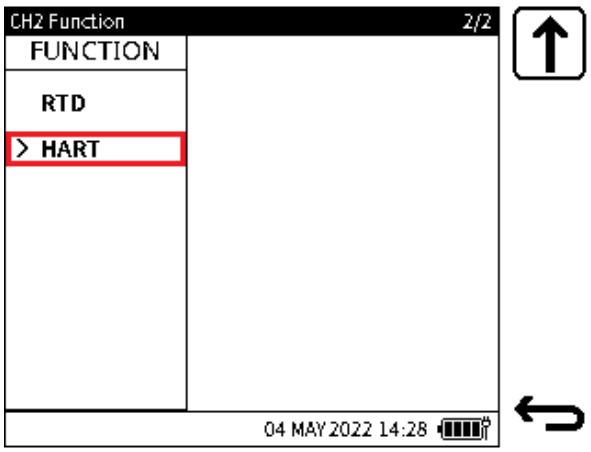
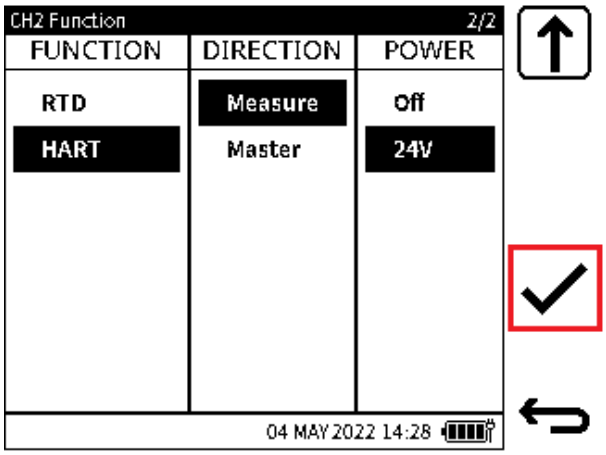
Step 3	  	Select **None** in the **FUNCTION** column and tap the page down softkey to view the second page of **CH2** functions. Tap **HART** on the second screen to view two more selection columns. Select the required options in the columns and then select the Tick ✓ icon to confirm the selection and configure the instrument. The **CH2 Setup** (**HART**) configuration screen will appear. Make more selections on this screen or select the **Back** icon to show the **Calibration Main** screen. For more details on how to set up the **HART** application and the **HART** device, see Chapter 12 on page 233. To cancel the **HART** function, to enable the selection of another function, use the procedure given in Section 12.2 on page 237 to return to the **Configuration** screen.

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6.3 Process Options

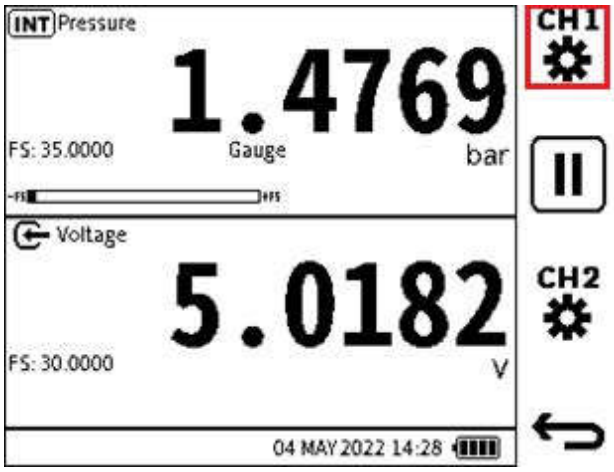
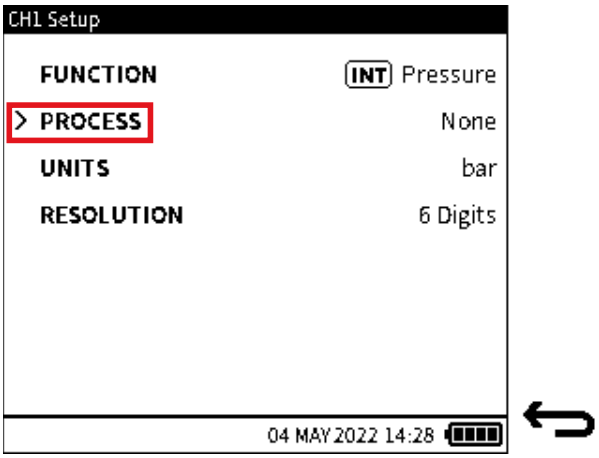
6.3.1 Tare

The Tare function is used to set the channel readings to a temporary zero. When Tare is active, the primary reading value is deducted from subsequent reading values until Tare is disabled. The initial reading will be approximately zero. The use of the Tare function therefore makes clear any difference in new measured values.

For example, if the reading from the internal pressure sensor is 21.4985 bar at the time Tare is enabled, the reading becomes approximately 0.000 as the value 21.4985 is captured and subtracted from true reading and the resulting value is then displayed. Whenever Tare is active, the Tare symbol  will appear in the relevant channel window to indicate it is in operation.

Note: **Tare** is only available for **Measure** functions except for **Barometer** and **HART**.

To enable the Tare function:

Step 1		Select the desired channel.
Step 2		Select **PROCESS**.

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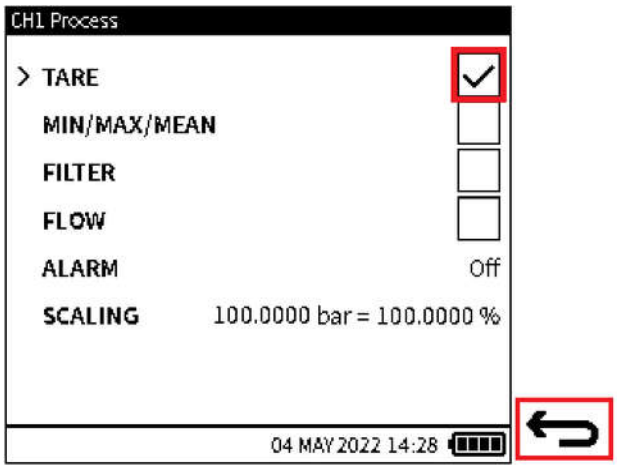
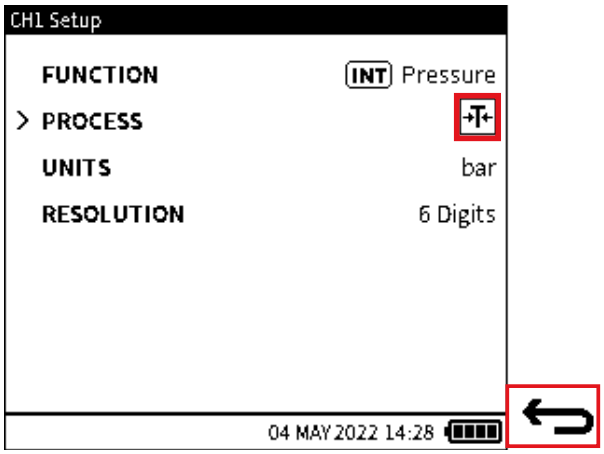
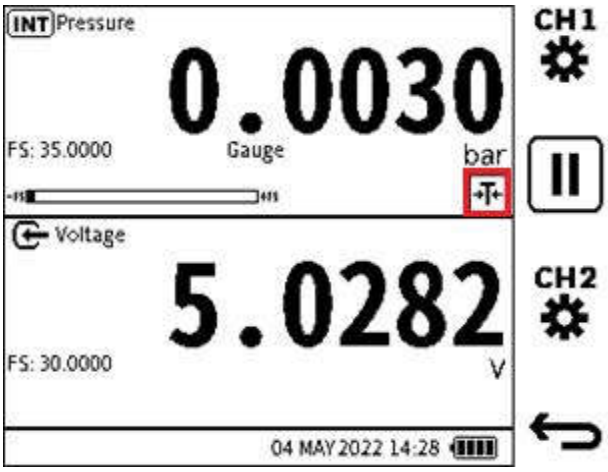
Step 3		Select the **TARE** Checkbox. Tap on the Checkbox or use the Navigation Pad buttons to move to the **TARE** row and press the Pad's **Enter** button. Select the **Back** icon to go back to the **Channel Setup** screen.
Step 4		Check that the **TARE** icon is in the **CH Setup** screen, to confirm that **Tare** is enabled. Select the **Back** icon.
Step 5		Check that the **TARE** icon appears in the relevant channel window and the channel reading is zero or close to zero.

INFORMATION **When Tare is disabled, the primary reading returns to displaying the true measured value.**

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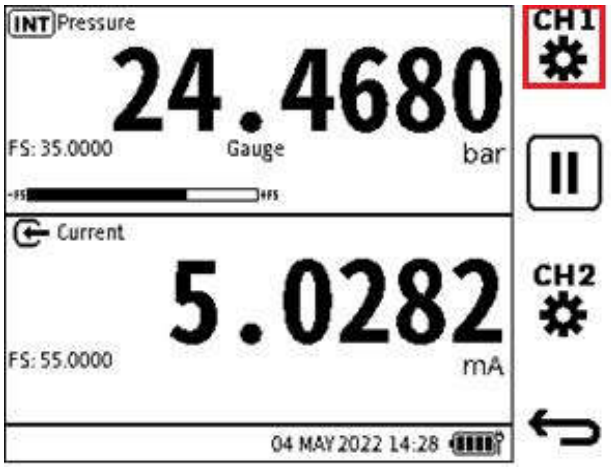
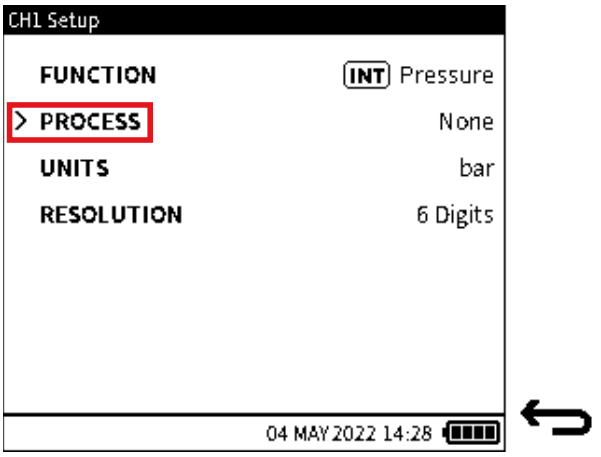
6.3.2 Min/Max/Mean

The **Min**/**Max**/**Mean** function provides the minimum, maximum and average of the primary reading from the time it is enabled. It is continuously updated as the reading values change and is displayed in addition to the live primary reading. When enabled, the **Min**/**Max**/**Mean** status icon is displayed. The relevant channel will need to be expanded to view the additional information (refer to “Maximize and Minimize Channel Window” on page 56 for how to expand the window).

INFORMATION **The Min/Max/Mean function is only applicable to Measure functions with the exception of HART.**

To enable the **Min**/**Max**/**Mean** function:

Step 1		Select the desired channel.
Step 2		Select **PROCESS**.

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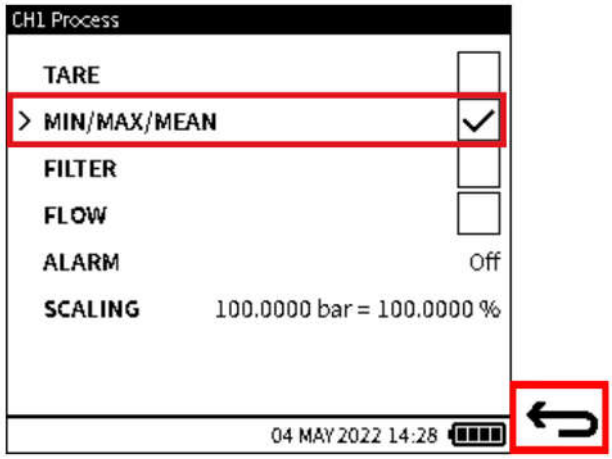
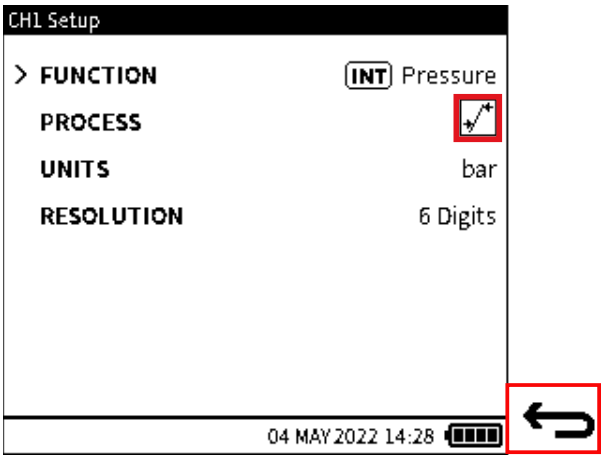
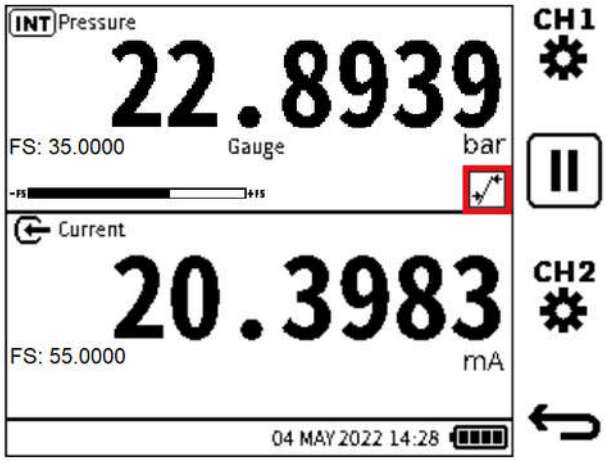
Step 3		Select the **MIN/MAX/MEAN** Checkbox and then select the **Back** icon.
Step 4		Check that Min/Max/Mean is enabled in the **Channel Setup** screen. (The **Min/Max/Mean** icon will appear as the **PROCESS** option). Select the **Back** icon.
Step 5		Check that the **Min/Max/Mean** icon appears on the relevant channel window. **INFORMATION To view Min/Max/Mean information maximize the relevant channel window. See "Maximize and Minimize Channel Window" on page 56 for details.**

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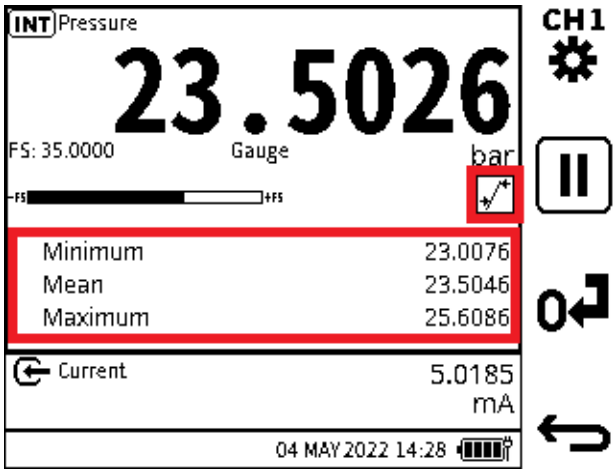
Step 6		**Min**/**Max**/**Mean** information appears in the maximized channel window.

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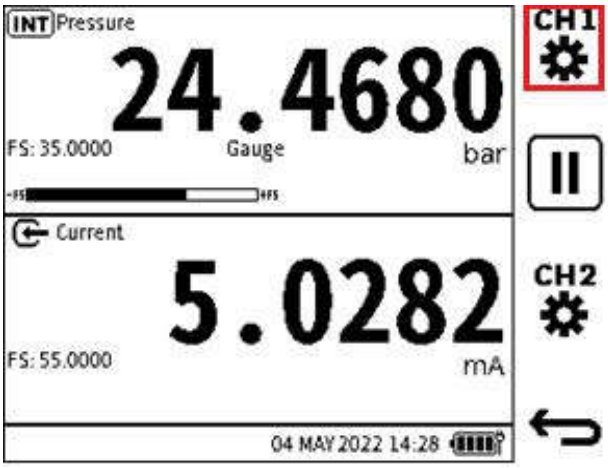
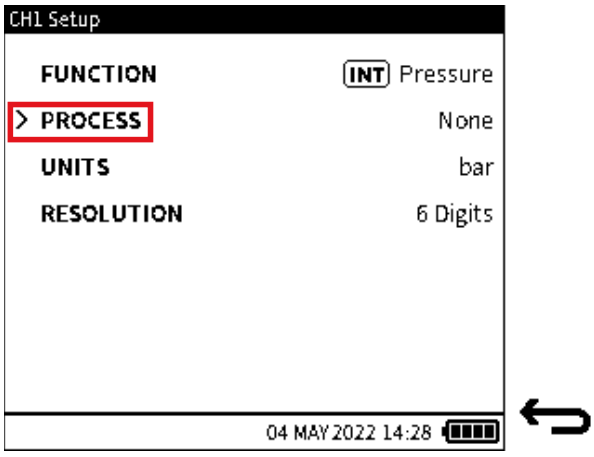
6.3.3 Filter

The **Filter** function lets a low pass band filter be applied to the channel readings. This filter gives a more stable measurement reading over a noisy signal.

INFORMATION **The Filter function can be applied on all functions except HART.**

When the **Filter** process option is enabled, the **Filter** status icon is shown in the relevant channel.

To enable the **Filter** function:

Step 1		Select the desired channel.
Step 2		Select **PROCESS**.

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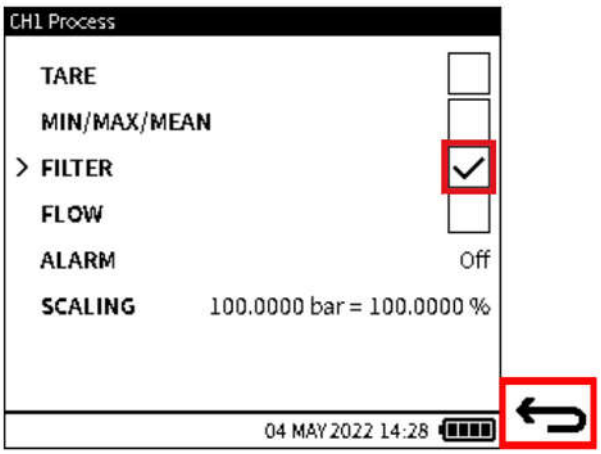
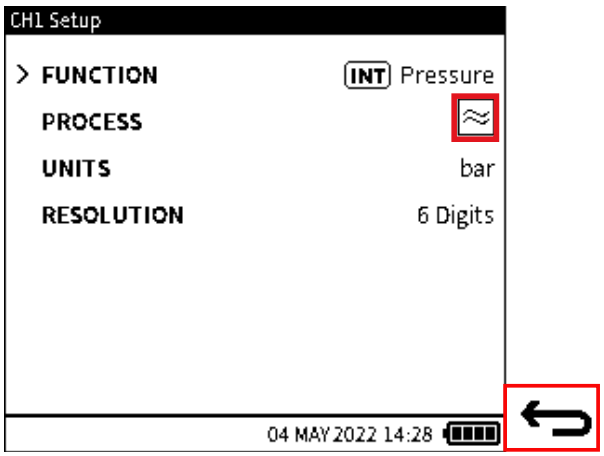
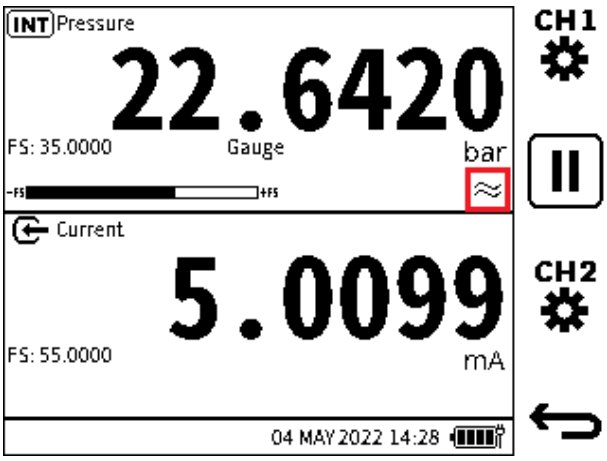
Step 3		Tap the **FILTER** Checkbox (put a tick mark in it) and then select the **Back** icon.
Step 4		The **FILTER** icon should appear in the **PROCESS** row, to show that **FILTER** is enabled in the **Channel Setup** menu (as the **PROCESS** Option.) Select the **Back** icon to go back to the **Calibration Main** screen.
Step 5		Check that the **FILTER** icon appears on the relevant channel window. (The **FILTER** icon will appear as the **PROCESS** option).

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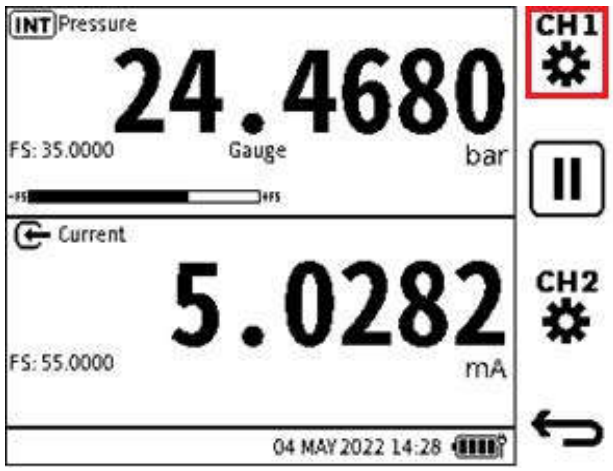
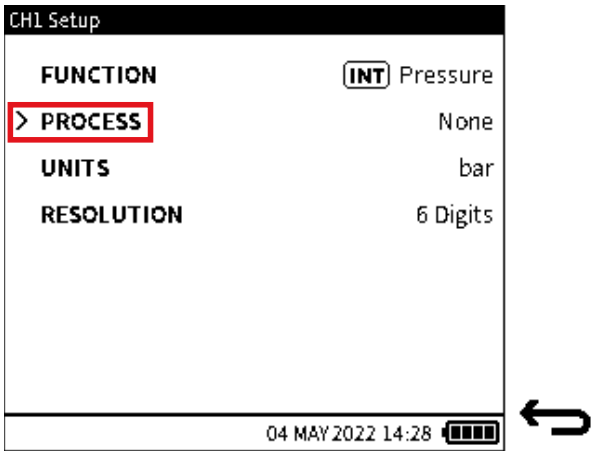
6.3.4 Flow

The **Flow** function enables the square root of the measured pressure value to appear as the primary reading.

INFORMATION **The Flow process option is only supported by pressure functions i.e. Internal Pressure, External Pressure, Sum and Difference.**

When enabled the **Flow** status icon appears.

To enable the Flow function:

Step 1		Select the desired channel.
Step 2		Select **PROCESS**.

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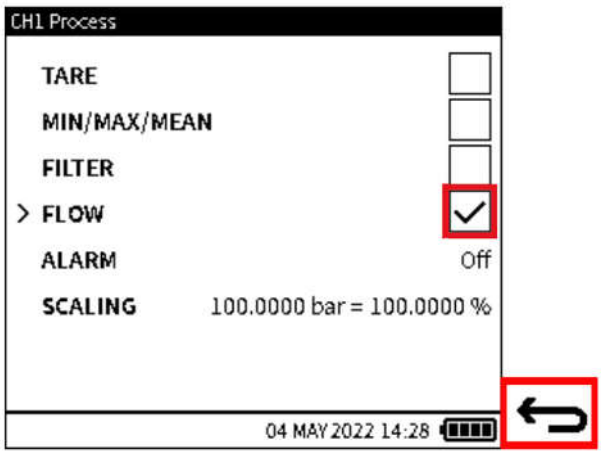
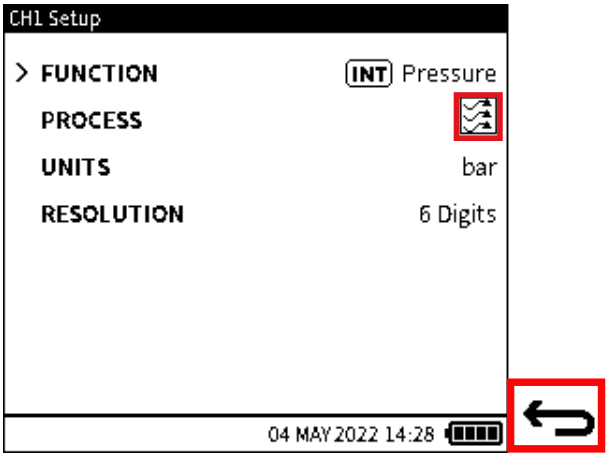
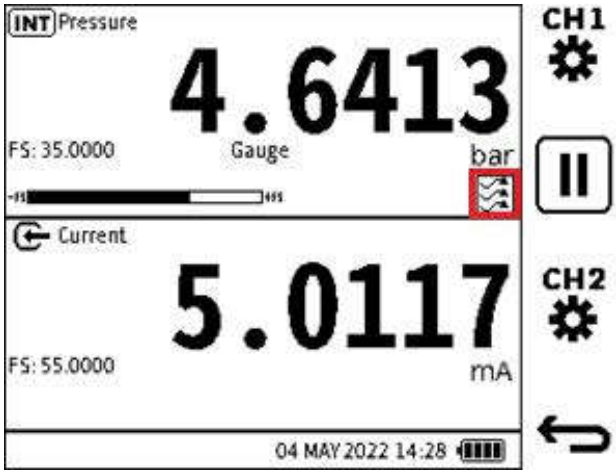
Step 3		Tap the **FLOW** Checkbox (put a tick mark in it) and then select the **Back** icon.
Step 4		The **FLOW** icon should appear in the **PROCESS** row, to show that **FLOW** is enabled in the **Channel Setup** menu (as the **PROCESS Option**.) Select the **Back** icon to go back to the **Calibration Main** screen.
Step 5		Check that the **FLOW** icon appears in the relevant channel window.

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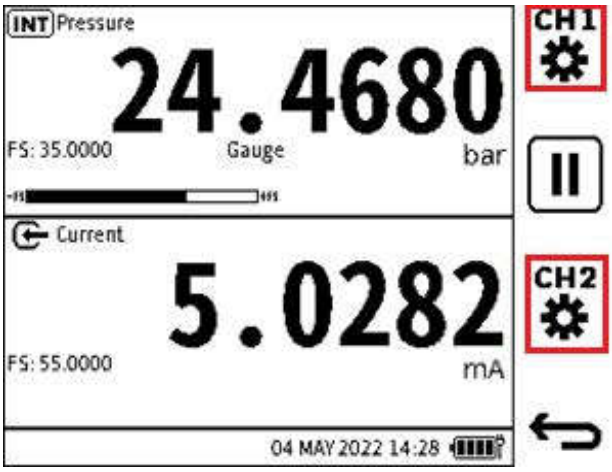
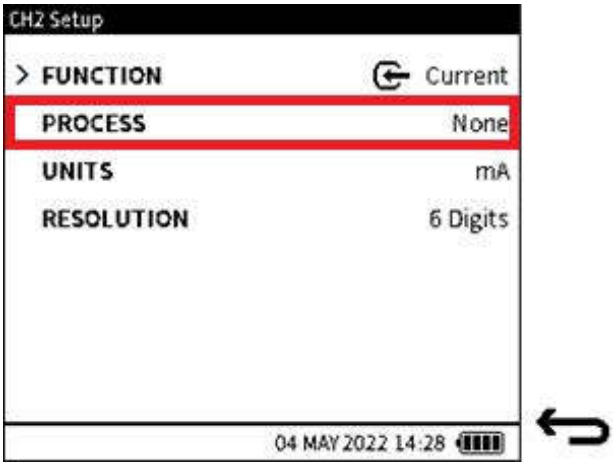
6.3.5 Alarm

This process option provides a visual indication of when a user-set alarm limit is exceeded.

INFORMATION **The user Alarm option is available with all Measure functions except for Barometer and HART.**

To enable and configure the user Alarm option:

Step 1		Select the CH1 or CH2 icon as the desired channel.
Step 2		Select **PROCESS**.

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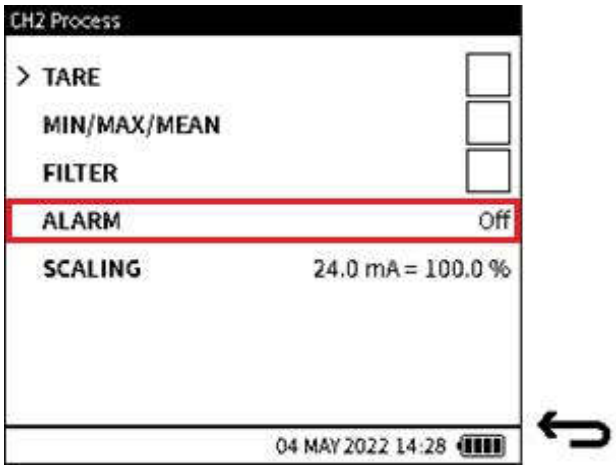
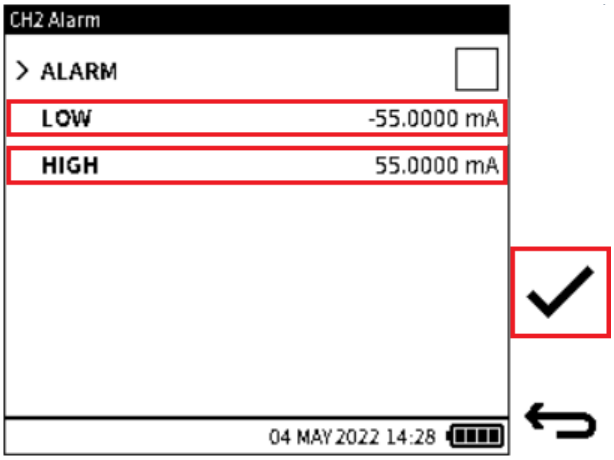
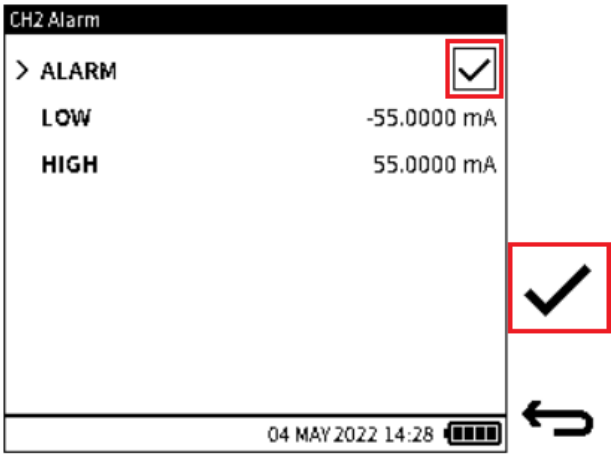
Step 3		Tap the **ALARM** area or use the Navigation Pad buttons to select it. The **Alarm** screen appears.
Step 4	 	Use the procedures given below to set the **LOW** and **HIGH** values for alarm activation. Use the Navigation button to move to the **LOW** option, press the Navigation **Enter** button to show an onscreen keypad. Use the keypad to enter the value for the lower end of normal range condition. Select the **Tick** softkey to confirm the value. **Note**: By default, the **LOW** (zero or negative full-scale) range value of the selected measure function is populated. Select the **HIGH** option and enter the value for the highest end of normal range condition. Select the **Tick** softkey to confirm the value. **Note**: by default, the **HIGH** (positive full-scale) range value of the selected measure function is populated. Use the Navigation Pad to select the **ALARM** row. Press the **Enter** button in the pad to insert a tick into its checkbox or tap in the checkbox. Press the **Tick** softkey to confirm the alarm settings and return to the **PROCESS** options screen. **Note**: To disable the Alarm, select the **ALARM** Checkbox to remove the **Tick** mark.

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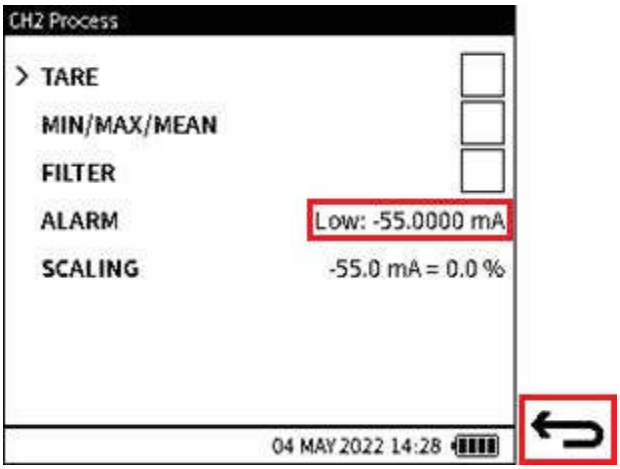
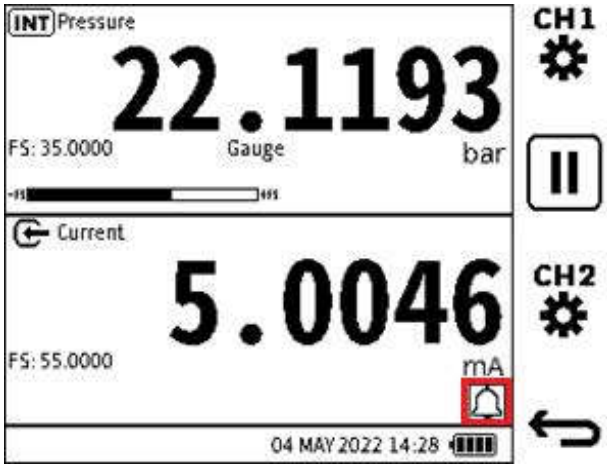
Step 5	 	The values displayed in the **ALARM** row, switch between the **LOW** and **HIGH** values. Press the **Back** softkey to return to the **Channel Setup** screen. The **ALARM** icon appears, to show that the **PROCESS** option is enabled.
Step 6		When the Alarm is enabled, the **ALARM** icon appears in the relevant channel window. If the measured value falls outside the normal range condition, the alarm will be triggered. An alarm condition is indicated by both the **ALARM** icon and the measured reading flashing within the relevant channel. When the measured value falls within the normal specified range condition, the icon and measured value will stop flashing.

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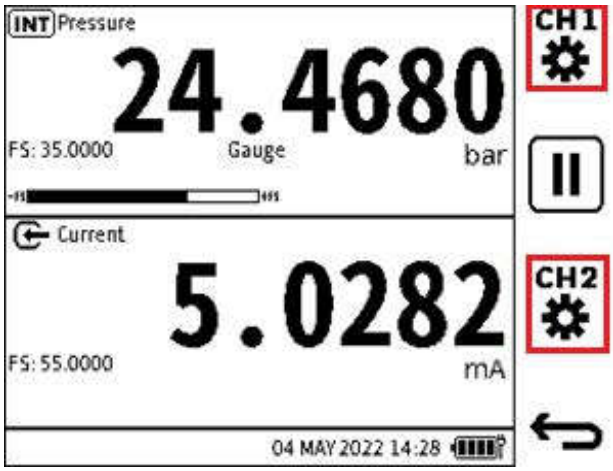
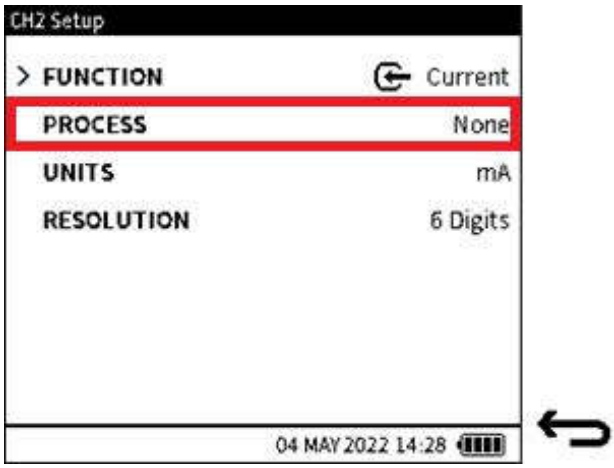
6.3.6 Scaling

This process option provides a method of configuring custom measurement units, by the use of the original units of the Functions. Scaling provides two pairs of values that define the linear relationship between the original measurement unit and the configured custom unit.

INFORMATION The Scaling option is available with all measure and source functions except for Observed and HART.

There are two methods to activate and configure the Scaling option.

6.3.6.1 First Scaling Method

Step 1		Select the CH1 or CH2 icon for the desired channel.
Step 2		Select **PROCESS**.

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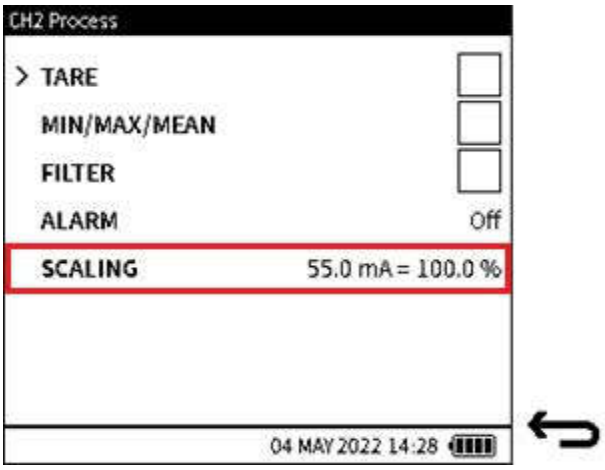
Step 3		Tap the **SCALING** area or use the Navigation pad buttons to select it. The **Scaling** screen appears for the selected channel.

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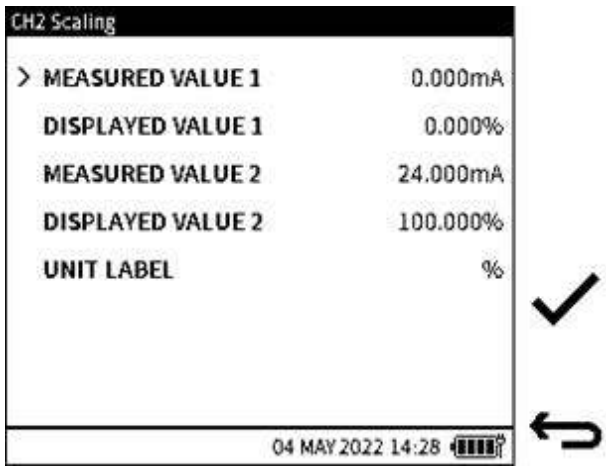
<table>
<tr>
<td>Step 4</td>
<td>


The custom label uses this relationship formula:
$$Displayed\ value_x = \frac{Displayed\ Value_2 - Displayed\ Value_1}{Measured\ Value_2 - Measured\ Value_1} \times Measured\ Value_x$$

Note: The measured values are in the original units e.g. mA and displayed values are in the custom label units e.g. “%”.
When the scaling parameters have been configured, select the Tick softkey to confirm the changes and return to the PROCESS screen. The updated Channel Scaling parameters appear in the Scaling fields.
</td>
<td>
Use the buttons on the Navigation Pad to move to the required row and press the Enter button to show a screen keypad. Tap or use the Navigation buttons (press the Enter button to enter each number) to select each keypad number. To confirm the complete number, press the Tick softkey.
MEASURED VALUE 1: a minimum value within the measurement/source range of the selected function. By default, this is populated as the zero or negative full-scale value of the measurement/source function.
DISPLAYED VALUE 1: a minimum value equivalent to the minimum measured value expressed as the custom unit. By default, the value populated is 0(%).
MEASURED VALUE 2: a maximum value within the measurement/source range of the selected function. By default, this is populated as the positive full-scale value of the measurement/source function.
DISPLAYED VALUE 2: a maximum value equivalent to the maximum measured value expressed as the custom unit. By default, the value populated is 100(%).
UNIT LABEL: this is a free text field where the custom unit can be named. It is limited to a maximum of six characters. The default custom unit label is “%”.
</td>
</tr>
<tr>
<td>Step 5</td>
<td>Press the Back button in the Channel Process screen to show the Channel Setup screen.</td>
<td></td>
</tr>
</table>

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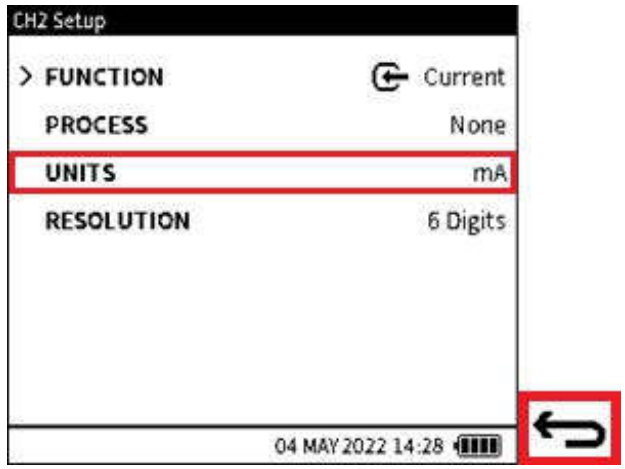
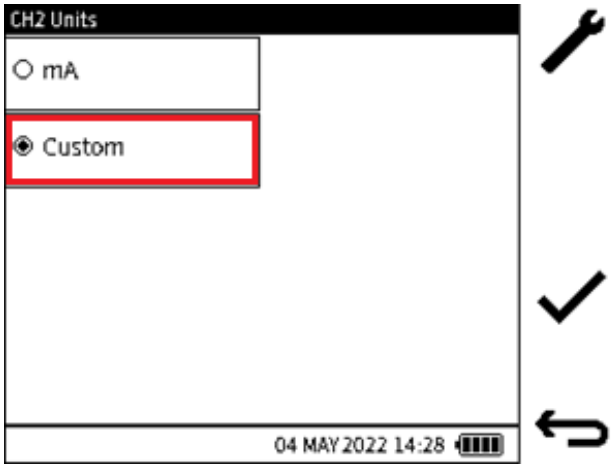
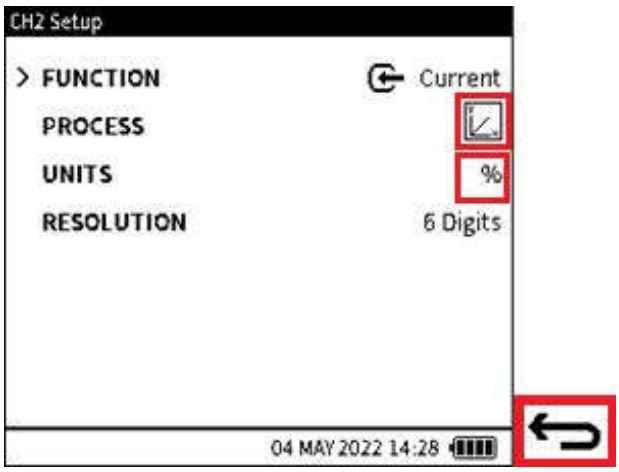
Step 6	 	To enable or use the custom units: select **UNITS** to show the channel **Units** screen. Tap or select the **Custom** radio button**.** Select the **Tick** softkey to confirm the selection and return to the **Channel Setup** screen.
Step 7		The **Scaling** icon will appear in the **PROCESS** field and the custom unit label will appear in the **UNITS** field. Select the **Back** softkey to return to the **Calibrator** screen.

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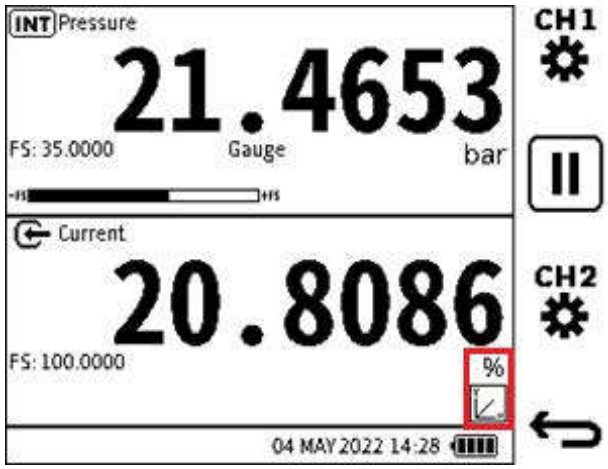
Step 8		The **Scaling** icon will be in the relevant channel window and the **UNITS** field will show the configured custom label. In addition, the full-scale value will be expressed as its equivalent in the custom unit. Check that the minimum and maximum displayed values correspond with the minimum and maximum measured values.

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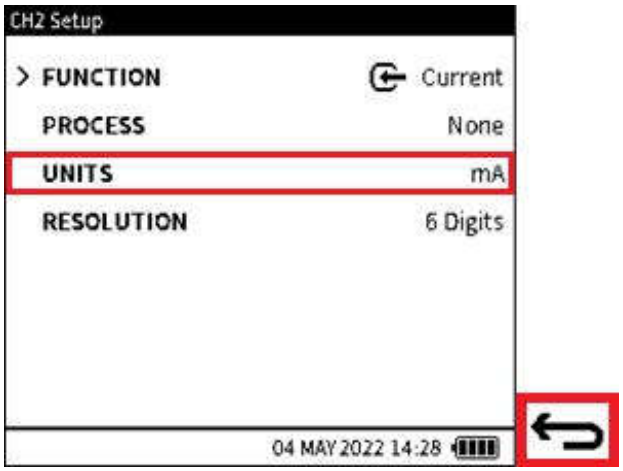
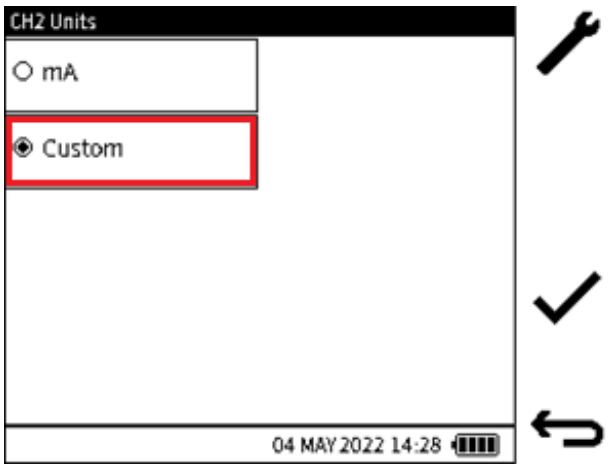
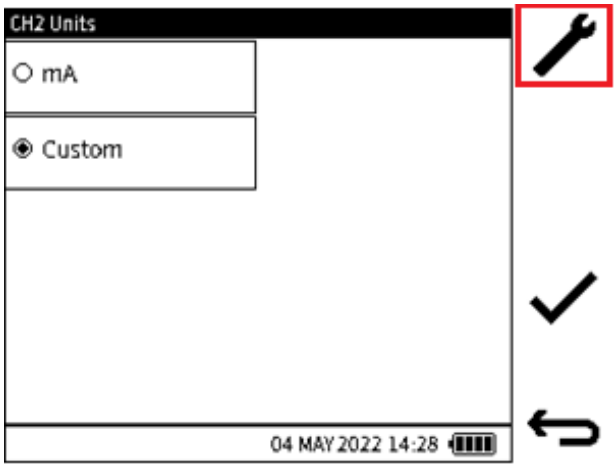
6.3.6.2 Second Scaling Method

Step 1		Select the CH1 or CH2 icon for the desired **Setup** channel. Select the **UNITS** field in the channel **Setup** screen (Refer to steps 1 to 4 in Section 6.3.6.1).
Step 2		Select the **Custom** option.
Step 3		Select the **Setup** softkey to view and/or change the **Scaling** parameters which configure the custom unit. For details on how to configure the parameters, see Section 6.3.6.1 for Method 1.

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7. Utilities

Pressure functions provide utilities or tests, which are:

- Leak Test
- Switch Test
- TX Simulator
- Relief Valve Test.

The **Tasks** menu gives access to these utilities. Only pressure measure functions are supported with a utility function.

When the Leak Test, Switch Test and Relief Valve Tests are done, there is the option to save the test results in the DPI610E. These result files are in the CSV format and can be viewed when transferred to a PC (See Section 5.3.1 on page 47). As a result, the Data logging application does not support these tests.

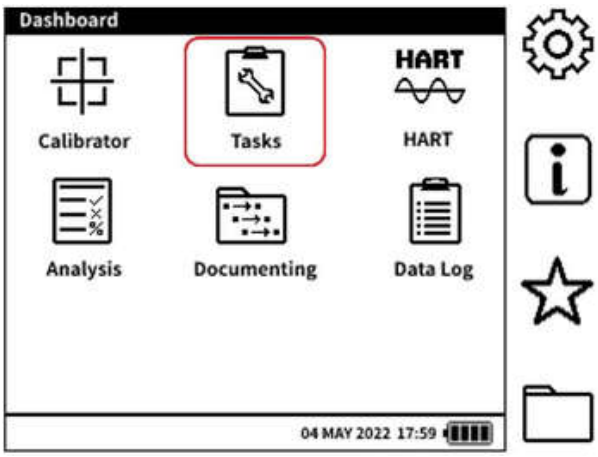
The Transmitter Simulation (TX SIM) utility is supported by Data logging.

7.1 Leak Test

Leak Testing is usually done to make sure that the pressurised equipment or system and its associated components do not leak. When a Device Under Test (DUT) is connected to the DPI610E pressure test port either directly or using hoses and auxiliary connections, it is good practice to check for any possible leaks before commencing calibration or any other tests.

In a Leak Test, pressure (or vacuum) is applied to the system (typically not exceeding 10% of the sensor working pressure) and any change in this pressure is recorded over the duration of the test.

To configure and run a Leak Test:

Step 1		Tap on the **Tasks** icon on the Dashboard to select the menu.

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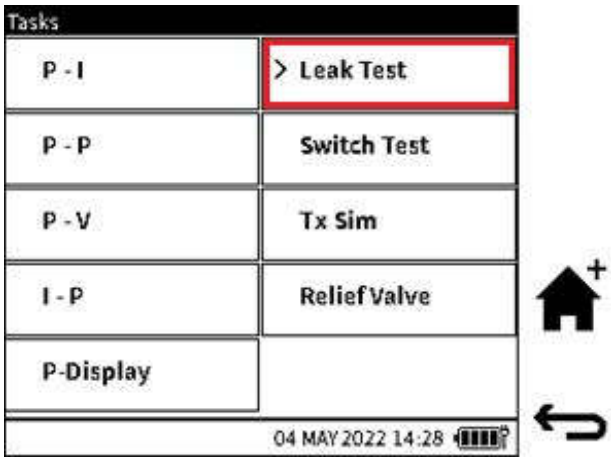
Step 2		From the **Tasks** menu, select **Leak Test** from the Task list. Tap the **Leak Test** option again if using the touchscreen or press the Navigation pad **OK** button to launch the **Leak Test** utility. **Note**: If no compatible function is configured on **CH1**, the **Internal Pressure** function will be used automatically to run the Leak Test.

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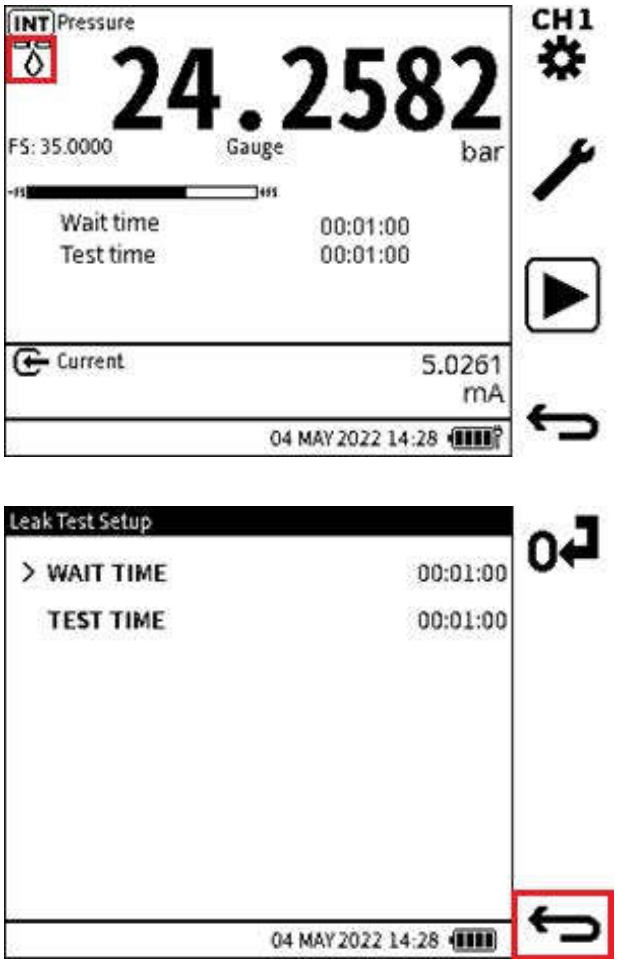
<table>
<tr>
<td>Step 3</td>
<td>


</td>
<td>On the Leak test screen, CH1 will automatically be maximized to show the relevant test details. The Leak icon will appear below the Function name field. The WAIT TIME and TEST TIME are the two parameters for setting up the Leak test and these are in the channel window. They use the HH:MM:SS format.
To enter a value into either of the parameters, tap the WAIT TIME or TEST TIME text to show an on screen keypad. Use this keypad to enter the required value.
WAIT TIME - Before starting a Leak test a period of time may be required to allow the pressurized system to settle before the actual test is started. This time is referred to as WAIT TIME on the DPI610E and the default WAIT TIME is 1 minute (00:01:00). This time value can be changed to any value between 0 seconds (00:00:00) up to 60 minutes (01:00:00).
TEST TIME - This is the period over which the DPI610E is testing for change in pressure i.e., leaks. The default TEST TIME is 1 minute (00:01:00) and this time value can be changed to any value between 1 second (00:00:01) and 480 minutes (08:00:00).
These time settings can be quickly accessed if using the touchscreen, by tapping the relevant fields on the channel window. Another way to access these settings is by pressing the Setup softkey.
The Leak Test Setup screen will provide the options for both the WAIT TIME and the TEST TIME.
Press the Back softkey to return to the Leak Test screen.</td>
</tr>
<tr>
<td>Step 4</td>
<td colspan="2">After the Leak Test times have been set, pressurize the system to the desired pressure using the DPI610E pump.</td>
</tr>
</table>

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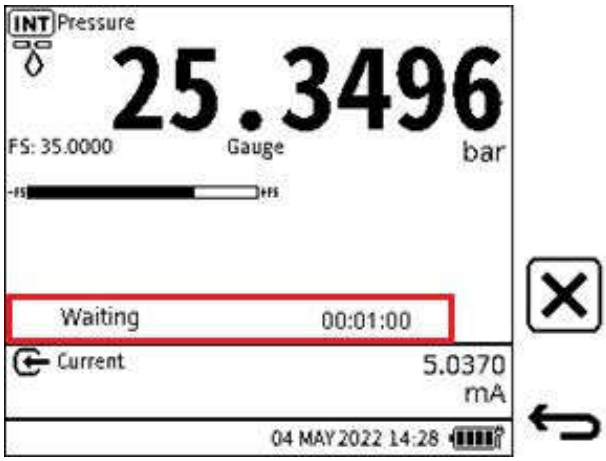
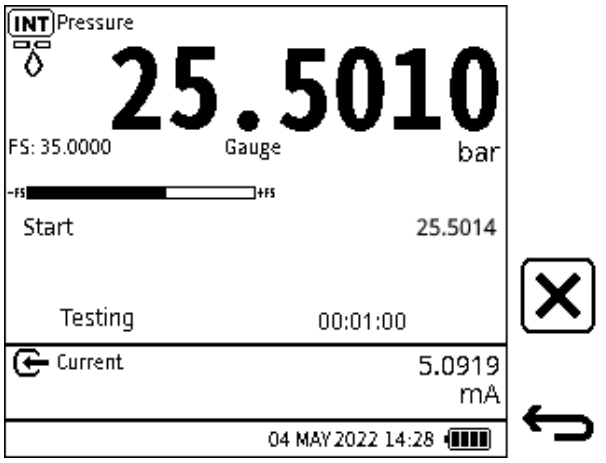
<table>
<tr>
<td rowspan="2">Step 5</td>
<td>
</td>
<td rowspan="2">Select the PLAY ▶ softkey to begin the task. (This icon will change to a STOP ✕ icon after selection).
Note: the displayed WAIT TIME and TEST TIME settings will be cleared.
Note: If a WAIT TIME has been set, a “Waiting” countdown begins from the WAIT TIME value down to zero. This potentially gives enough time for the pressure to stabilize.
After the WAIT time has elapsed, the test begins. The Start pressure value is recorded on the screen at the start of the test. A “Testing” countdown begins from the TEST TIME value down to zero.

When the TEST TIME has elapsed, the End pressure value is also recorded and the Leak Rate per minute is calculated and appears as the Leak Rate test result.</td>
</tr>
<tr>
<td>
</td>
</tr>
</table>

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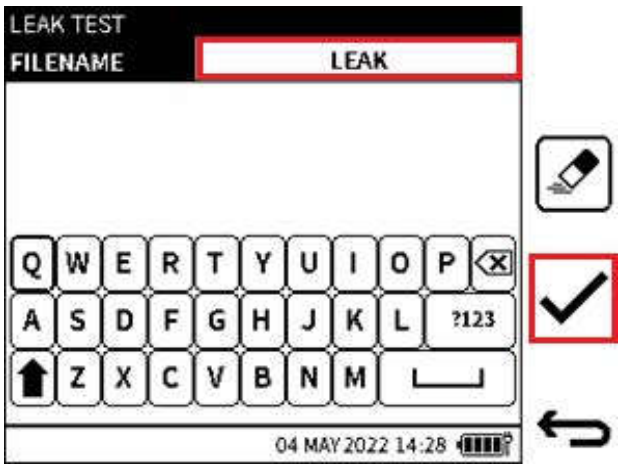
Step 6	 	If required, the test result can be saved by selecting the **Save** softkey before exiting the test screen. A keypad appears on the screen. Use this keypad if you want to enter a new name for the results file. The default result filename will be the DPI610E date and time stamp. Select the **Tick** softkey to confirm a different filename and complete the save process.

Note: Section 9.6.2, “How to use a PC to view Data Log files in the DPI610E,” on page 172. Result files are stored within the internal memory of the DPI610E. (See Chapter 14, “Files System,” on page 293.) Only the list of test result files can be viewed on the device. Details of the files can only be accessed when the files are opened on a PC.

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7.2 Switch Test

The DPI610E can test pressure switches or pressure devices with switch contacts.

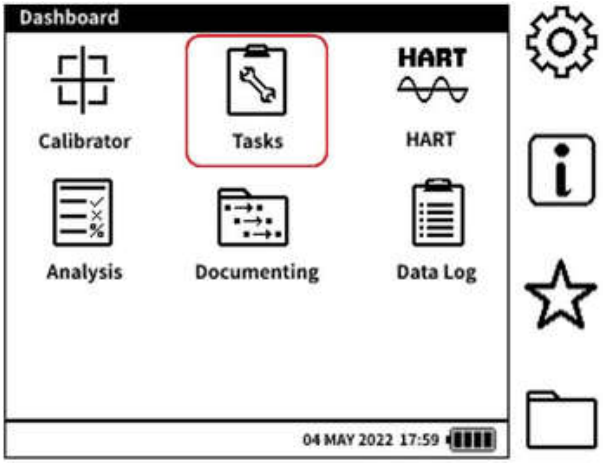
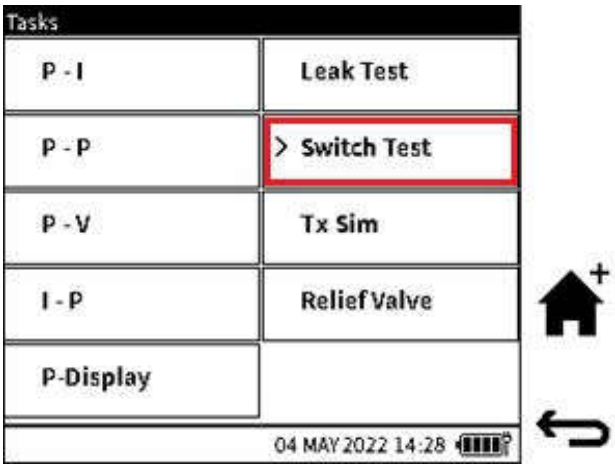
Pressure switches open or close an electrical circuit when a configured setpoint pressure level is reached and/or exceeded.

Pressure switches commonly have two types of contact which are: normally open or normally closed. When a pressure switch is normally open, it means that the state of the switch contacts, when pressurised within normal operating limits, is Open. When the pre-set setpoint pressure is reached, the micro-switch is triggered (Actuation) and the contacts change state from open to closed. When the pressure returns within normal operating limits, the switch contacts are reset (De-actuation) i.e., change back to the normal open state.

For a normally closed switch the reverse is the case. At the switch point (Actuation), the state changes from Closed to Open and at the reset point (De-actuation), it returns to the closed state.

The difference between the switch point and reset point is called Hysteresis.

To configure and do a Switch test:

Step 1		Tap on the **Tasks** icon on the Dashboard to select the menu.
Step 2		Tap the **Switch Test** two times if using the touchscreen or press the **OK** button to launch the utility.

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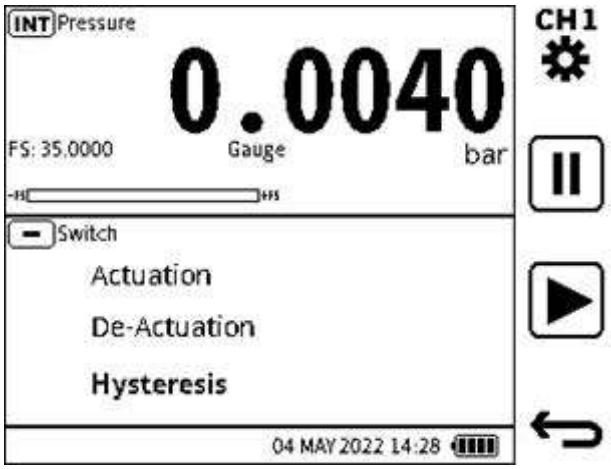
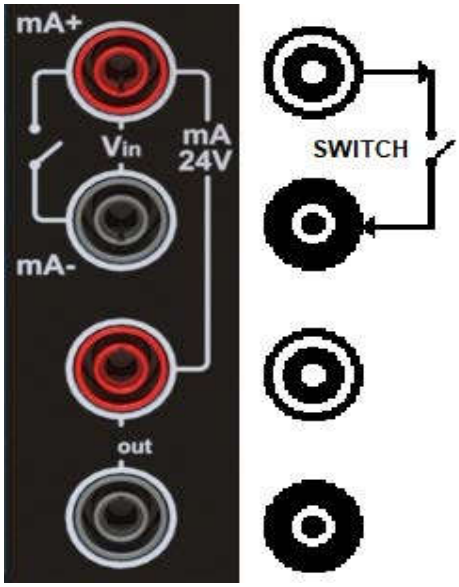
Step 2 Cont'd		The **Calibrator** screen will be configured with the **Switch Test** data. The Pressure related function is configured on **CH1** while the **Switch Test** data are in the **CH2** window. **Note**: if no compatible function is configured on **CH1**, the **Internal Pressure** function will be used automatically to run the Switch Test.
Step 3	Open the DPI610E pressure line by loosening the pressure release knob. Check that the pressure indicates a value around zero if using a gauge sensor or around 1 bar if using an absolute sensor.	
Step 4	Connect the pressure switch or device to the test port securely.	
Step 5	Connect test leads from the pressure switch contacts to the ± mA/Vin ports on the DPI610E as shown in the connection diagram below. 	
Step 6	Select the **PLAY** ▶ softkey to begin the Switch Test. (This icon will change to a **STOP** ✕ icon after selection). At this point the normal state is detected i.e. If open, it is identified as Normally open (NO) in the test window. Vice versa, if a closed circuit is detected, the switch will be identified as Normally closed (NC) for the duration of the test.	

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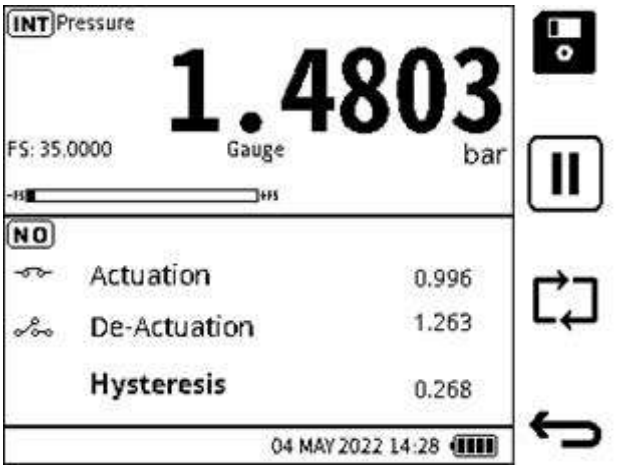
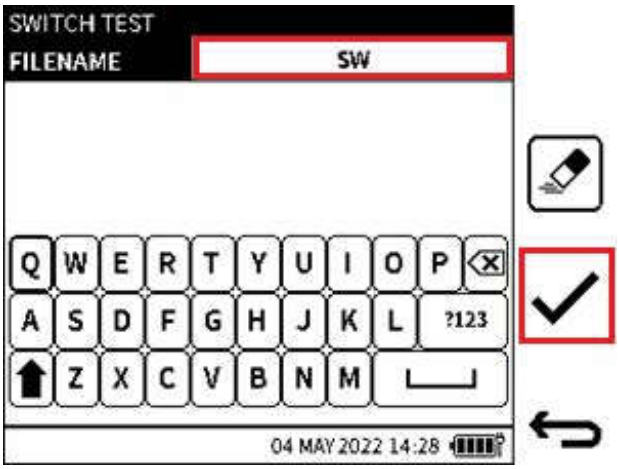
Step 7	Close the pressure line by fully closing the pressure release knob. Check there are no leaks.	
Step 8	 	Slowly start to pressurize the system. If the trip or actuation point is known and it is safe to do so, the pump may be used to quickly ramp up the pressure close to the setpoint and then the volume adjuster can be used to slowly increase the pressure closer to the setpoint. Once the switch is actuated, the actuation pressure is recorded in the switch test channel window. The state icon for the actuation is also displayed i.e. icon of a switch open or a switch closed. Increase the pressure a little more and allow to settle. Gradually start to reduce the pressure using the volume adjuster. At the switch reset (De-actuation) point, the pressure is recorded and the switch state icon at this point is displayed. The test is concluded with the Hysteresis value calculated and displayed. This completes the switch test cycle. If required, the test result can be saved by selecting the **Save** softkey before exiting the test screen. A keypad appears on the screen. Use this keypad to enter a new name for the results file if necessary. If the results are saved, the test details will be cleared, and the test will be restarted. If the results are not saved, a new switch test cycle can be set up, ready to be run. To do this, carefully vent the system (open the pressure release knob) and then select the **Restart** softkey.

Note: Result files are stored within the internal memory of the DPI610E. See Chapter 14 (File System). Only the list of test result files can be viewed on the device. Details of the files can only be accessed when the files are opened on a PC (See Section 9.6.2, “How to use a PC to view Data Log files in the DPI610E,” on page 172).

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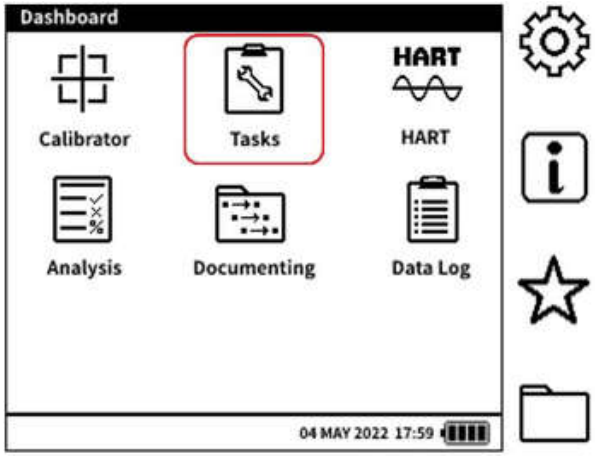
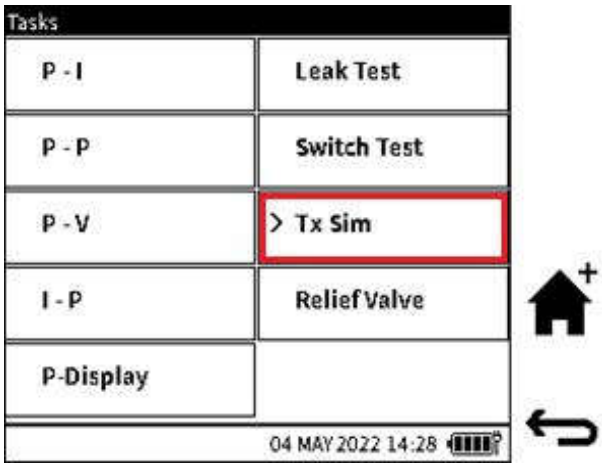
7.3 TX (Transmitter Simulation) Simulator

The DPI610E provides a current output (current source) which is proportional to the pressure measured and indicated by the DPI610E. This utility is normally used by the DPI610E to simulate a pressure transmitter. It is configured by specifying the transfer function parameters of the current output transmitter to be simulated.

To configure and run the Transmitter Simulation mode:

Step 1		Tap on the **Tasks** icon on the Dashboard to select the menu.
Step 2		From the **Tasks** menu, select **Tx Sim** from the **Task** list. Tap the **Tx Sim** option again if using the touchscreen or press the Navigation pad **OK** button to start the utility.

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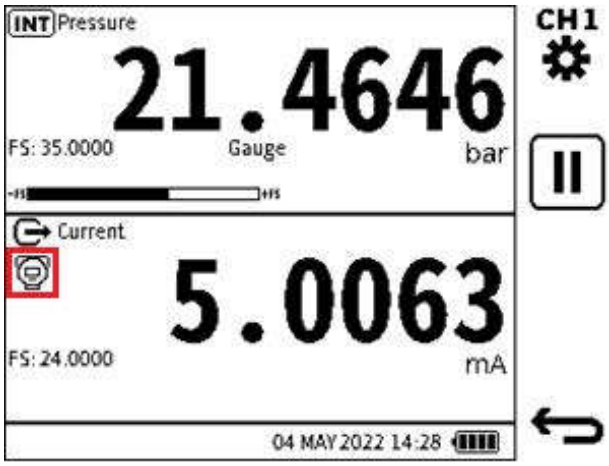
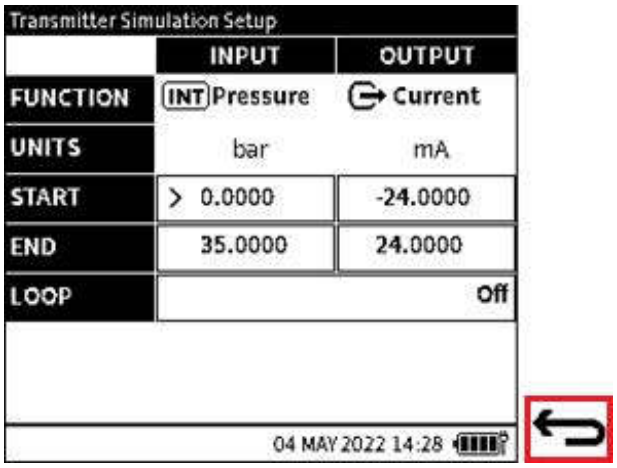
Step 3		The **Calibrator** screen will be configured with the transmitter simulation details. **CH1** will be configured with the internal pressure function while **CH2** will be configured with **Current** source in simulation mode. The **TX Sim** icon will be displayed within the **CH2** window under the **Function** name field. **Note**: In **TX Sim** mode, the current output is automatically determined, and source based on the transfer function characteristic configured.
Step 4		To configure the simulated transmitter: Tap in the **CH2** area to maximize the **CH2** window and select the **Setup** softkey. Select and edit the **START** and **END** values of the Input channel i.e., the **Pressure** channel. Default values are the zero (or Negative full-scale) and the Positive full-scale of the internal pressure sensor respectively. Select and edit the **Start** and **End** values of the **OUTPUT** channel i.e., the current source channel. Default values are 0 and 24 mA. There is also the option for the DPI610E to provide power i.e., 10V or 24V. The default setting is **Off** (no power provided by the DPI610E). Press the **Back** softkey.

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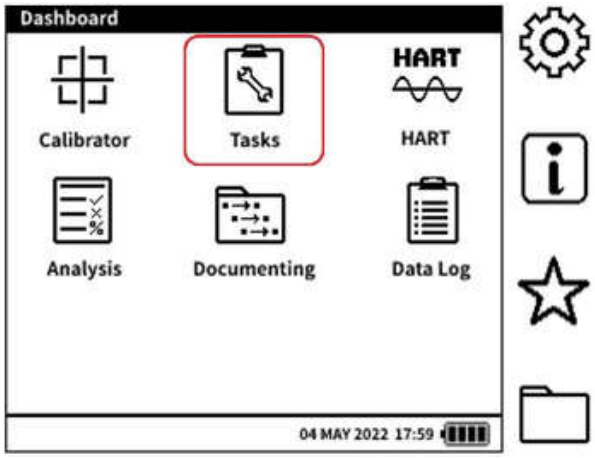
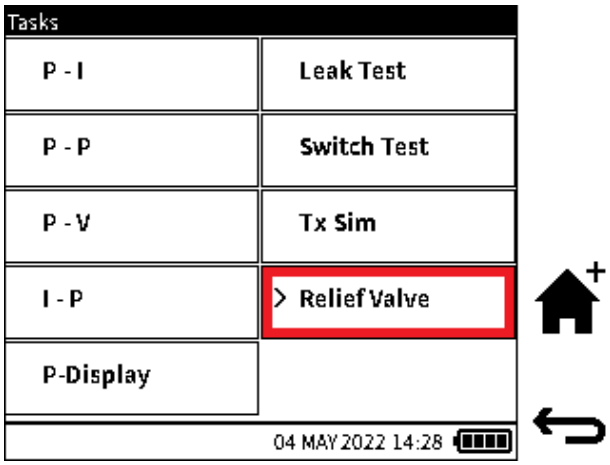
7.4 Relief Valve Test

Pressure relief valves control or make limits for the pressure in a system. Too much pressure (overpressure or vacuum) can make equipment malfunction. Use the Relief Valve utility to do tests on pressure or vacuum relief valves. Pressure relief valves open at a set pressure to release pressure that is too high, and close when the system goes to its correct pressure limit. Vacuum relief valves open to prevent a too high internal vacuum pressure and close when the system goes to the correct pressure. The internal memory of the DPI610E holds the Relief Valve Test result files: (See Section 14.8 on page 297.) Only the list of test result files can be seen on the device. Data about the files can only be accessed when the files are opened on a PC (See Section 9.6.2, “How to use a PC to view Data Log files in the DPI610E,” on page 172).

To configure and run a Relief Valve test:

Step 1		Tap on the **Tasks** icon on the Dashboard to select the menu.
Step 2		From the **Tasks** menu, select **Relief Valve** from the **Task** list. Tap the **Relief Valve** option again if using the touchscreen or press the Navigation pad **OK** button to launch the utility.

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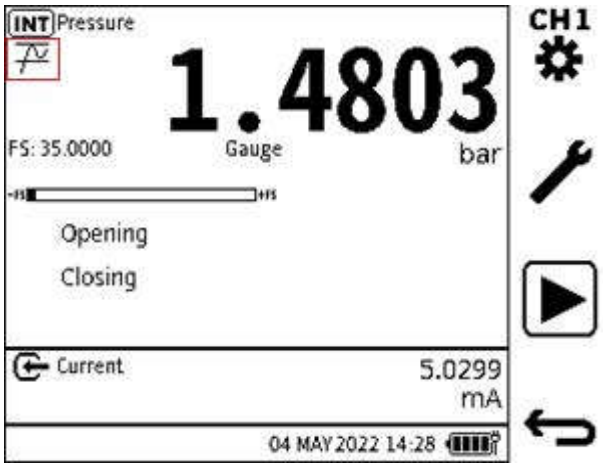
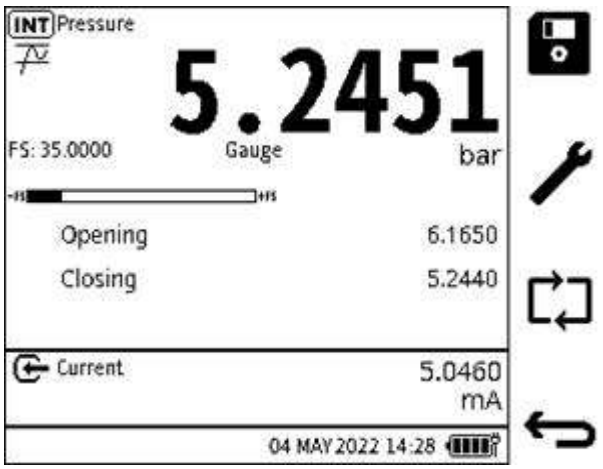
Step 3		The Calibrator screen will be configured with the **Relief Valve** Test details. The **CH1** window will automatically become larger to display the test details. **Note**: the default **Relief Valve** mode is Rising. To change the Relief Valve type, select the **Setup** softkey and select the required type. Select the **Tick** softkey to confirm and return to the **Calibrator** screen. The relevant Relief Valve type icon will be displayed in the channel window under the Function name field.
Step 4	Vent the pressure on the DPI610E by opening the pressure release knob fully.	
Step 5	Connect the Device Under Test (DUT) securely to the pressure test port of the DPI610E. Refer to “Attach Device Under Test” on page 20 for instructions.	
Step 6	Seal the pressure system by closing the pressure release valve securely. For location of this valve refer to “Parts” on page 11.	
Step 7	Select the **PLAY** softkey to start the Relief Valve test. The display will start to show the **Opening** and **Closing** values. If in **Rising Relief Valve** mode, the **Opening** pressure is continually updated as the maximum pressure detected once the test has started. The closing pressure is continually updated as the minimum pressure detected each time a new maximum pressure is recorded. If in **Falling Relief Valve** mode, the reverse is the case i.e., the Opening pressure is continually updated as the minimum pressure detected once the test has started. The Closing pressure is continually updated as the maximum pressure detected each time a new minimum pressure is recorded. Assuming the **Rising Relief Valve** mode is used, gradually increase the pressure using the pump or the volume adjuster towards the Relief valve setpoint or blow down pressure. Around the setpoint mark, observe the pressure reading when it stops increasing with any further generated pressure. The **Opening** pressure value should not increase any further and will remain unchanged. This is recorded as the final opening pressure. Stop generating pressure at this stage and allow the pressure to settle. When the pressure settles below the setpoint mark, the valve will close, and the pressure reading will settle at minimum value which is recorded as the final closing pressure.	
Step 8		When the **Open** and **Close** pressures are stable, select the **Stop** icon softkey to end the test. The results of the Relief Valve test can be saved by selecting the **Save** softkey.

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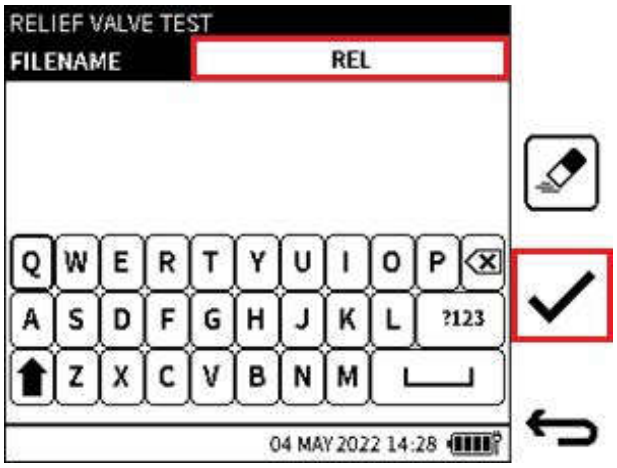
Step 9		The default result file name will be the DPI610E current date and time stamp. This can be renamed if necessary. Select the **Tick** softkey to confirm the Result file name and complete the save operation. If the results are saved, the test details will be cleared, and the test will be restarted. If the results are not saved, a new test cycle can be set up ready to be run. To do this, carefully vent the system (open the pressure release knob) and then select the **Restart** softkey.

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8. External Sensors

8.1 PM700E

8.1.1 Overview

The PM700E external remote sensors extend the pressure measurement capability of a DPI610E unit. These sensors provide pressure measuring capability from 25 mbar up to 1400 bar, with ranges available in absolute, gauge and differential models. PM700E sensors are available for both commercial and hazardous area environments. Any number of remote sensors can be individually used with a single DPI610E, because all sensors hold their own calibration data.



PM700E (Gauge, Absolute)



PM700E (Differential)

8.1.2 Media Compatibility

Care must be taken to observe media compatibility when using the PM700E. Sensor variants up to and including 3.5 bar, have exposed sensors, while 7 to 1400 bar variants are diaphragm isolated.

Table 8-1: Pressure and Media Compatibilities

Pressure FS	Media Compatibility
0 to 3.5 bar	Non-condensing dry gases with 316L Stainless Steel, Pyrex, Silicon, Gold, Aluminium, Glass, Silicon Dioxide and RTV Adhesive
Differential sensor reference port	Non-condensing dry gases with 316L and 304 Stainless Steel, Pyrex, Silicon, Glass, Silicon Dioxide and RTV Adhesive
7 to 200 bar	316L Stainless Steel and Hastelloy C276
350 to 1400 bar	Inconel 625 and 17-4PH Stainless Steel

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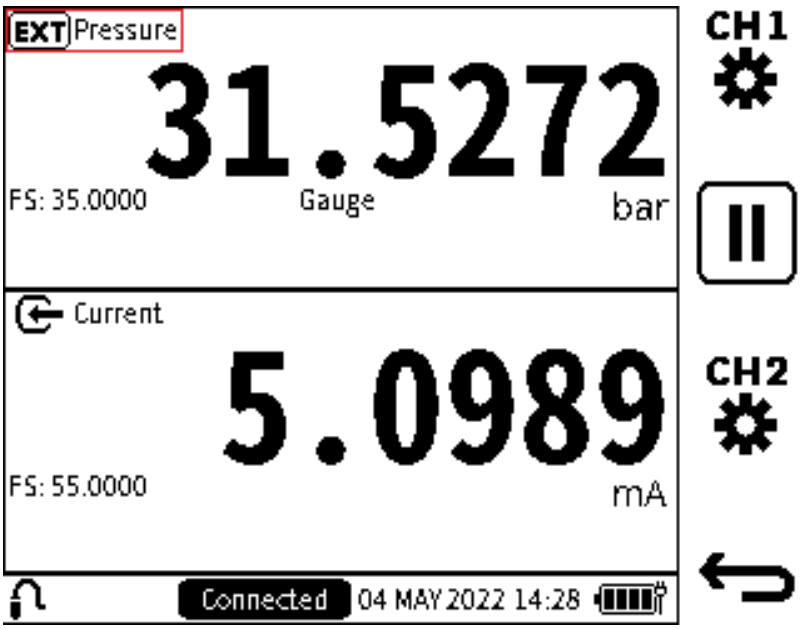
8.1.3 Setup

Each PM700E sensor is supplied with a 2.9m (9.5 feet) PM700E-CABLE. This cable is for connection of the sensor to the “EXT SENSOR” port on the side of the DPI610E. Align the pin/slot arrangement at the female end of the cable connector with the male connector end of the sensor. The cable connector should push in with little force when it is correctly aligned. Proceed to complete the connection by rotating the locking collar until hand tight. Similarly, align the male end of the cable to the port on the DPI610E and tighten in the same way.



The DPI610E automatically detects any connection to a PM700E sensor. Upon successful connection of a recognised and supported sensor, a “Connected” status indication will appear for a few seconds in the status bar. Also, the screen will show an **External Sensor** icon until the sensor is disconnected (see bottom left of screen image below). When the sensor is disconnected, a “Disconnected” status indication appears for a few seconds in the status bar and then the external sensor icon disappears.



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8.1.4 The Zero Function

Note: It is recommended that all gauge sensors are zeroed at the beginning of each day before use.

INFORMATION **The Zero function is only available on gauge sensors. Absolute sensors can only measure atmospheric pressure. Refer to "The Zero Function" on page 67 for more information about the use of this function.**

8.1.5 Available External Pressure Sensors

Only the external pressure sensors in Table 8-2 are compatible with the DPI610E type of instrument.

Table 8-2: External Pressure Sensors for DPI610E Range

Pressure Range	Gauge	Absolute	Differential	Barometric
25 mbar / 10 in H20/ 2.5 kPa	008G	-	008L	-
70 mbar / 1 psi / 7 kPa	01G	-	01L	-
200 m bar / 3 psi / 20 kPa	02G	-	02L	-
350 m bar / 5 psi / 35 kPa	03G	03A	03L	-
700 m bar / 10 psi / 70 kPa	04G	04A	04L	-
1 bar / 15 psi / 100 kPa	05G	05A	05L	
750 - 1150 m bar / 11 - 17 psi / 75 - 115 kPa (Barometric)	-	-	-	05B
2 bar / 30 psi / 200 kPa	07G	07A	07L	-
3.5 bar / 50 psi / 350 kPa	08G	08A	-	-
7 bar / 100 psi / 700 kPa	10G	10A	-	-
10 bar / 150 psi / 1000 kPa	11G	11A	-	-
20 bar / 300 psi / 20 MPa	13G	13A	-	-
35 bar / 500 psi / 2 MPa	14G	14A	-	-
70 bar / 1000 psi / 7 MPa	16G	16A	-	-
100 bar / 1500 psi / 10 MPa	165G	165A	-	-
135 bar / 2000 psi / 13.5 MPa	17G	17A	-	-
200 bar / 3000 psi / 20 MPa	18G	18A	-	-
350 bar / 5000 psi / 35 MPa	-	20A	-	-
700 bar / 10 000 psi / 70 MPa	-	22A	-	-
1000 bar / 15 000 psi / 100 MPa	-	23A	-	-
1400 bar / 20 000 psi / 140 MPa	-	24A	-	-

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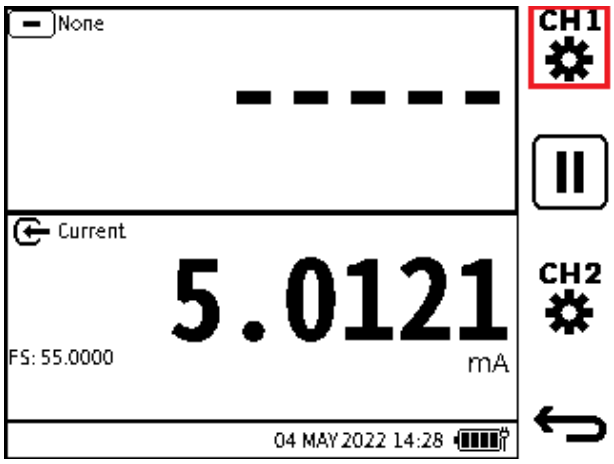
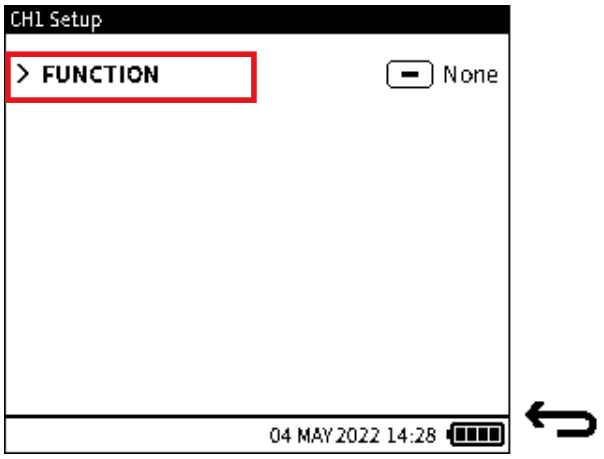
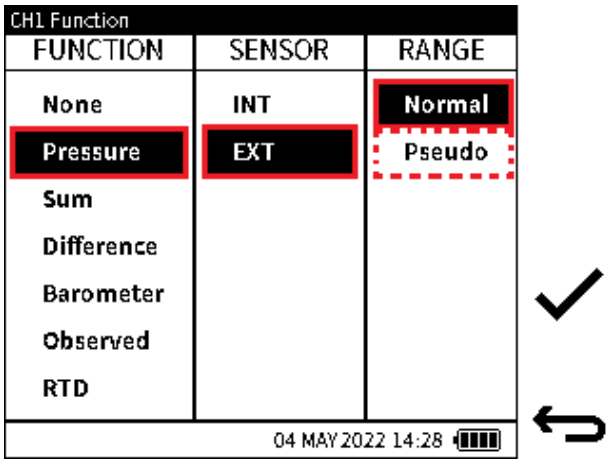
8.1.6 Configuration of an External Pressure Sensor

To configure a channel with the external remote pressure reading:

Step 1		Select the desired channel (channel 1 in this example).
Step 2		Select **FUNCTION** from the Channel **Setup** screen.
Step 3		Select **Pressure** > **EXT**> **Normal** or **Pseudo**. Select the **Tick** icon to confirm the selections and show the **Channel Setup** screen. Refer to “Normal and Pseudo Pressure Range” on page 69 for more information about the use of Normal and Pseudo sensor values.

The **EXT**ernal pressure function is similar to that of the **INT**ernal pressure function because it supports all the Calibrator task features associated with that of the internal pressure e.g., sensor zero, pseudo-range, leak test, switch test, relief valve etc.

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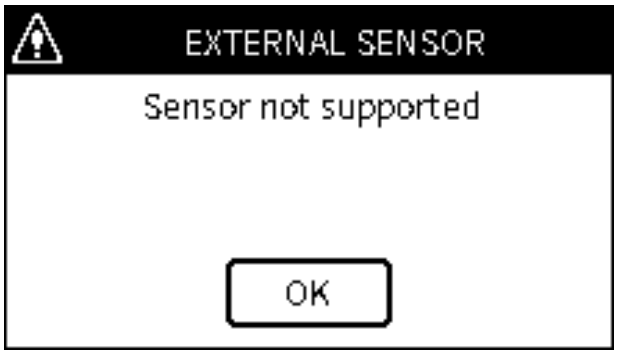
If a channel is configured with the **External Pressure** function without a sensor connected, the primary reading in that channel window will be appear as "**- - - - -**".

If the external sensor is disconnected while the function is in use an error message may appear.

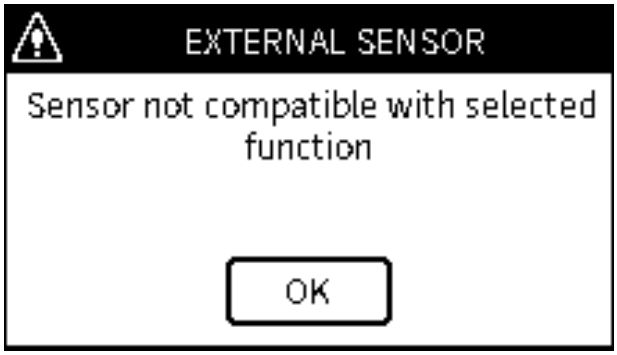
PM 700E External Remote sensors with DK481 firmware version 2.00.00 and above are fully supported for use with the DPI610E. Sensor validation is done each time a connection is detected.

If a channel is configured for External Pressure and an unsupported sensor is detected (for example a PM 700E sensor with firmware older than 2.00.00), a warning message appears stating the sensor is not supported and the status bar will have the sensor icon in it.



The readings from the sensor will appear as normal when configured on the Calibrator screen however, sensor calibration will not be supported using the DPI610E. All PM700E sensors etched with a part number ending in "-3" have the correct firmware installed.

If a channel is configured for External Pressure and an unrecognised sensor is detected, a warning message appears stating the connected sensor is not compatible and the sensor icon will appear in the status bar.



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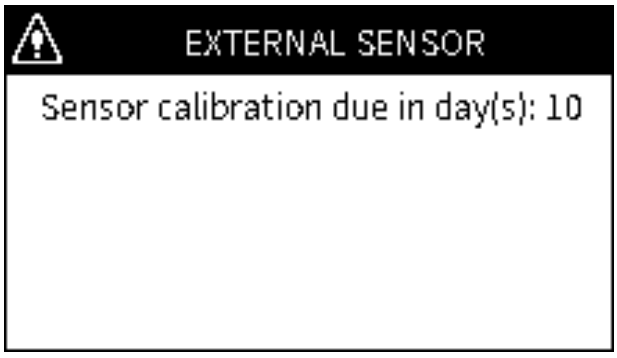
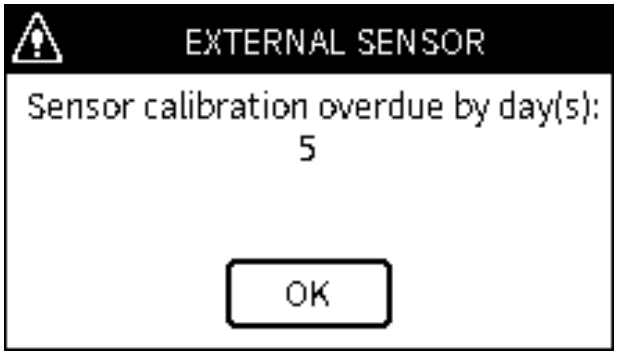
Each time a PM 700E sensor is connected or when the DPI610E is powered on with the sensor connected, the calibration status is checked. If the days remaining from the current DPI610E system date to the calibration-due date of the sensor is less than 30 days, an on-screen message appears, to inform the user.



If the days remaining is 0 or less, an on-screen message appears, stating calibration is due when the sensor is detected either at power up or when the DPI610E is already in operation. In addition, a message text “CAL DUE” will permanently be on the status bar until the sensor is disconnected or the sensor has been calibrated.



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8.2 RTD Probe and Interface

8.2.1 Overview

The DPI610E can be configured to display readings from the RTD-INTERFACE, which is a remote adapter interface and the RTD-PROBE (or any other compatible probe). Temperature measurements can be displayed as resistance or temperature units. The RTD-PROBE and RTD-INTERFACE are available in both safe and hazardous area models. The RTD-PROBE is fitted with a 15 cm (6”) class-A PT100 probe. The model names are as follows:

Table 8-3: RTD- Model Names

	Safe Area	Hazardous
RTD Interface	RTD-INTERFACE-485	RTD-INTERFACE-IS
RTD Interface with probe	RTD-PROBE-485	RTD-PROBE-IS

The RTD-PROBE/RTD-INTERFACE connects to the DPI610E with the supplied 2.9m (9.5 feet) cable. The RTD-INTERFACE is supplied with a field-rewireable M12 connector to allow for connection by user 2,3 or 4-wire RTDs.



8.2.2 Temperature Considerations

Careful consideration must be taken when using the RTD-INTERFACE and the RTD-PROBE, or any specialist RTD probes, that the environment and process temperatures do not exceed the specified limits for each RT component as detailed in the table below.

Table 8-4: RTD-Temperature Specifications

	Item	Temperature Range
Measuring temperatures	IO-RTD-PRB150 (Supplied Probe)	-5ºC to 200ºC (when used with appropriate extension cable)
	RTD-INTERFACE (BODY)	-10ºC TO 50ºC
	RTD-PROBE	-10ºC TO 50ºC when directly plugged in to RTD-INTERFACE -10ºC TO 50ºC when using supplied cable
	SPECIALIST RTD PROBE (Not supplied by Druck)	The capability of the RTD-INTERFACE (resistance range) with a suitable extension cable and suitable probe is 0 to 400Ω which equates to -250ºC to +650ºC for a PT100 probe.

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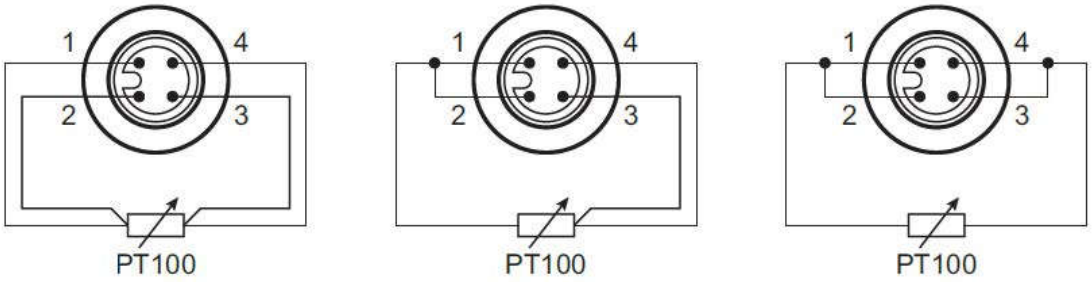
8.2.3 Setup

Connect the RTD-PROBE to the RTD-INTERFACE by screwing the probe end into the connection on the RTD-INTERFACE, if a direct connection is required. The 2 m (6.6 feet) M12 extension cable (IO-RTD-M12EXT) can be used to extend the connection between the RTD-INTERFACE and the RTD-PROBE. If using a compatible RTD not supplied by Druck, use the M12 field wireable connector (IO-RTD-M12CON) to connect the RTD probe to the RTD-INTERFACE.

Note: The pin numbering is printed on the rear of the connector body.



RTD M12 Connector Pinout

With the supplied RS485 sensor cable, align the pin/slot arrangement at the female end of the cable connector with the male connector end of the sensor. The cable connector should push in slightly with little force when it is correctly aligned. Proceed to complete the connection by rotating the swivel connector fully until hand tight. Similarly, align the male end of the cable to the port on the DPI610E and tighten in the same way.



The DPI610E automatically detects any connection to the RTD-INTERFACE. Upon successful connection of a recognised and supported sensor, a “Connected” status indication appears for a few seconds in the status bar. Also, the external sensor icon will be permanently displayed until the sensor is disconnected. When the sensor is disconnected, a “Disconnected” status indication appear for a few seconds in the status bar and the external sensor icon will disappear.

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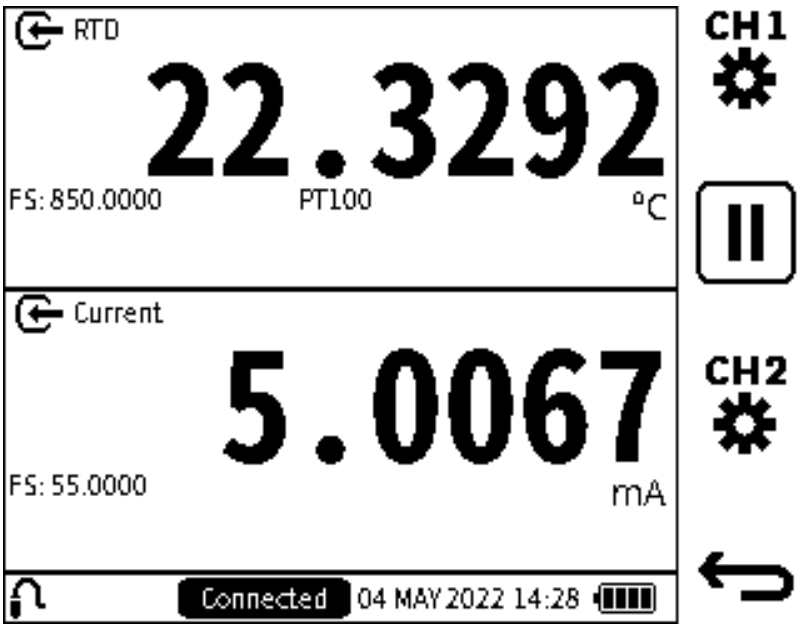
If a channel is configured with a RTD function without a sensor connected, the primary reading in that channel window will be displayed as "**- - - - -**". If the external sensor is disconnected while the function is in use an error message may appear. The full-scale value of the RTD probe is displayed as well as the RTD probe type.



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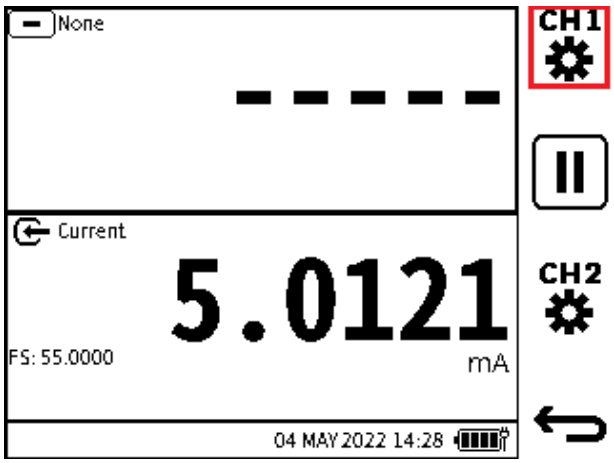
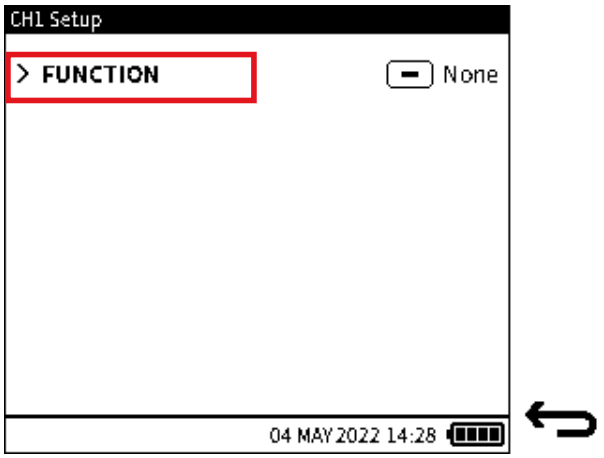
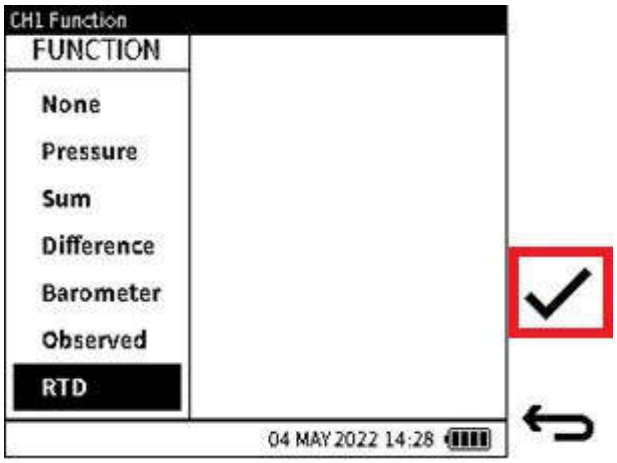
8.2.4 Configuration of a channel for a RTD sensor

Step 1		Select the desired channel (channel 1 in this example).
Step 2		Select **FUNCTION** from the Channel **Setup** screen.
Step 3		Select **RTD** and select the **Tick** icon to confirm the selections and show the **Channel Setup** screen.

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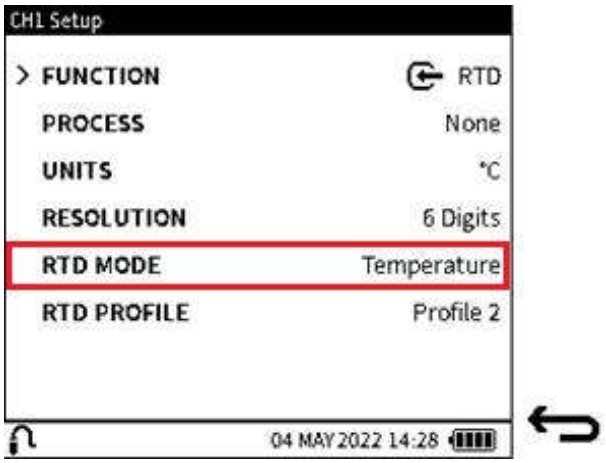
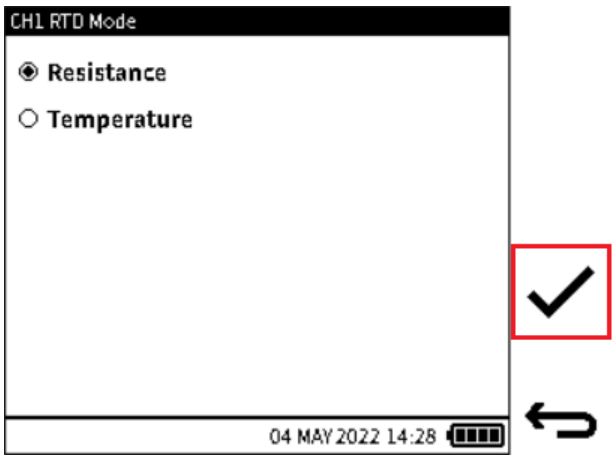
Step 4		To configure the RTD measurement as resistance or temperature, select the **RTD Mode** option from the **CH Setup** screen and press the **Enter** key in the Navigation Pad.
Step 5		Tap in the radio button for Resistance or Temperature. Select the **Tick** icon to confirm the selected **RTD MODE** and to go back to the channel **Setup** screen. The **RTD Profile** can now be selected if necessary.

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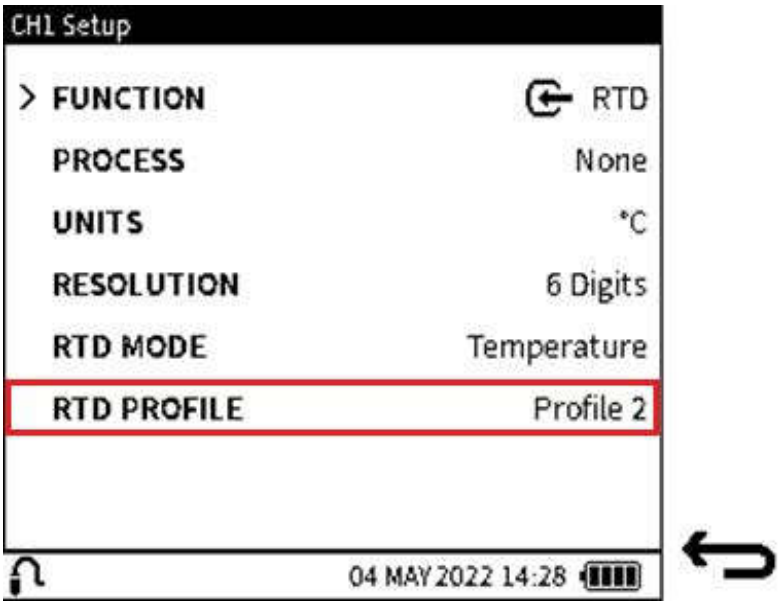
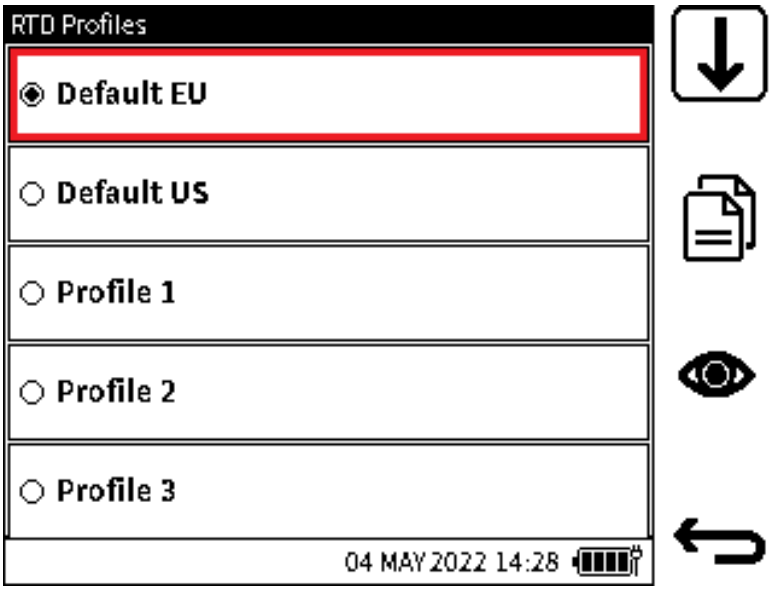
8.2.5 RTD Profiles

The full-scale value of the RTD probe is displayed as well as the RTD probe type. When the RTD function is selected, the desired RTD profile might need to be configured by:

- Tapping on the currently saved RTD profile field in the **Channel Setup** screen.



- Using the keypad to move the selector icon to the **RTD Profile** row and pressing the **ENTER** button to show a list of the available profiles.



The default profile set is the “Default EU” option or PT100-PA-392, which is based on the European standard (DIN/IEC 60751) for Class A Platinum RTDs. There is also a “Default US” or PT100-PD-385, which is based on the American standard. The Default EU and Default US profile options are pre-defined and cannot be edited or deleted.

However, up to eight Custom profiles can be created by populating the user profile files available with the required coefficients, temperature range and label.

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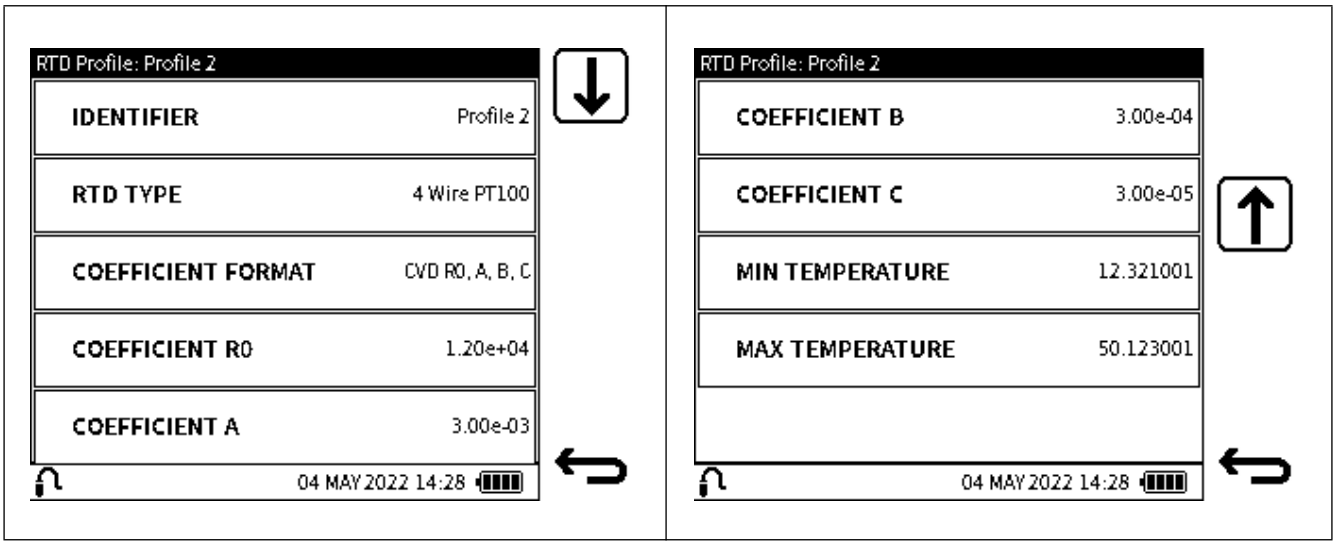
Tap on the desired profile to select it. Tap on the **View** icon softkey to view or/and edit the coefficients and parameters within the profile. Alternatively, use the **UP**/**DOWN** Navigation Pad buttons to select the required profile and press the **View** softkey to view or/and edit the coefficients and parameters within the profile.



To edit any of the parameters:

- Tap on the value field of the desired parameter:
  - Use the **UP**/**DOWN** buttons to move the selector icon to the required parameter to change. Press the **Enter** button to enter the edit screen of the parameter. Press or tap the **Tick** icon softkey to accept and save the new values.

It is possible to copy the parameters saved in any of the profiles to a custom profile. Note the Default EU and Default US profiles cannot be overwritten but can be copied into any of the custom profiles. Custom profiles are saved in the RTD-INTERFACE not on the DPI610E.

Table 8-5: RTD Profile parameters

Parameter	Description
Identifier	Give the custom profile a unique label
RTD Type	Select from 2, 3, 4 wire RTD configuration. 4-wire is default.
Coefficient Format	Select from Callendar-Van Dusen equation formats or use the ITS90 equation format.
Coefficient R0	Resistance at 0°C
Coefficient 1 (a, A, Alpha)	First coefficient value
Coefficient 2 (b, B, Beta)	Second coefficient value
Coefficient 3 (c, C, Delta)	Third coefficient value
Min. Temperature	Minimum temperature
Max. Temperature	Maximum temperature

When all parameter fields are filled, use the **Back** softkey to go back to the **RTD Profile** screen.

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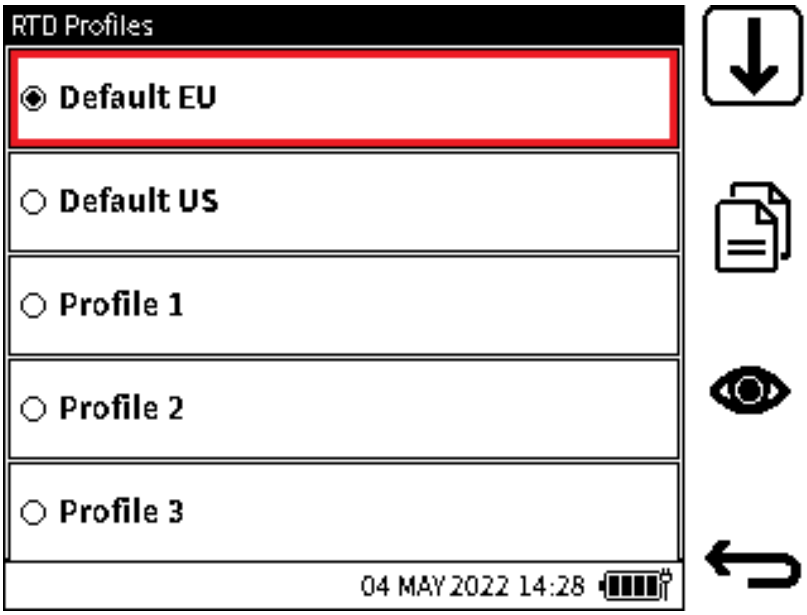
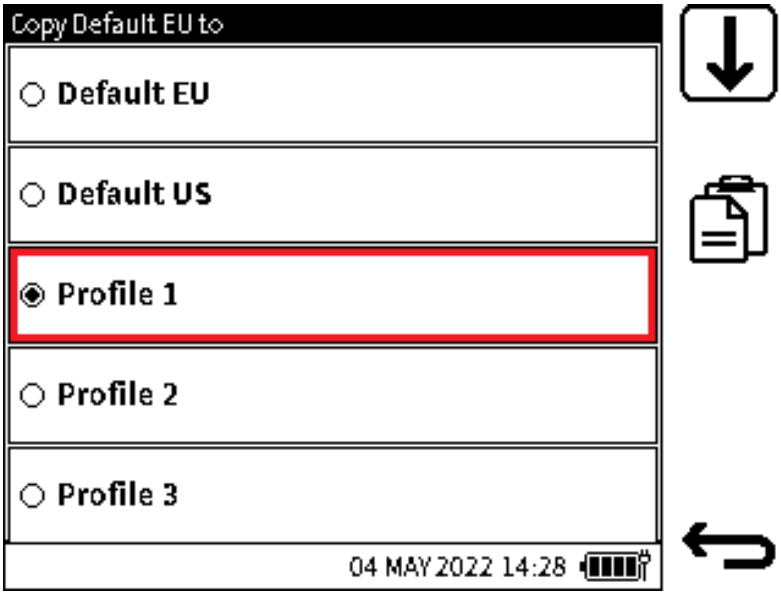
8.2.5.1 To copy a RTD profile

Select the desired profile:



Once selected, tap, or press the **Copy** icon softkey and then select the desired destination profile, for example: Profile 1.



8.2.5.2 RTD Units

When in Resistance mode, the only units available to select are Ohms (Ω) and Custom units. In Temperature mode, select from °C, °F or Custom units. Refer to Section 6.3.6 on page 114 for information about Custom units.

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8.3 The ADROIT sensor

8.3.1 Overview

The Druck ADROIT 6000 Series is a family of high performance, digitally-compensated industrial pressure sensors that can put in spaces that are as small as 19 mm wide. ADROIT sensors can measure pressure ranges from 70 mbar to 350 bar (1 to 5,000 psi), with electrical output options of either Voltage or Current (4 to 20 mA).



To calibrate ADROIT sensors without the DPI610E, it is necessary to use the Druck ADROIT PC application, together with the ADROIT interface box and an applicable calibrated pressure source.

The DPI610E is an all-in-one solution for the calibration of ADROIT sensors: thus, a PC, interface device, and a pressure source are not necessary. The DPI610E with its One-Wire Interface technology, can communicate with ADROIT sensors.

8.3.2 Configuration of ADROIT Sensor

You must select a communication channel for the DPI610E and ADROIT sensor to work with each other. It is necessary to have the following information, which a label on the sensor must supply:

Sensor pressure range. For example: 0 to 10 bar g.

Electrical Output option. For example: 0 to 10 V.

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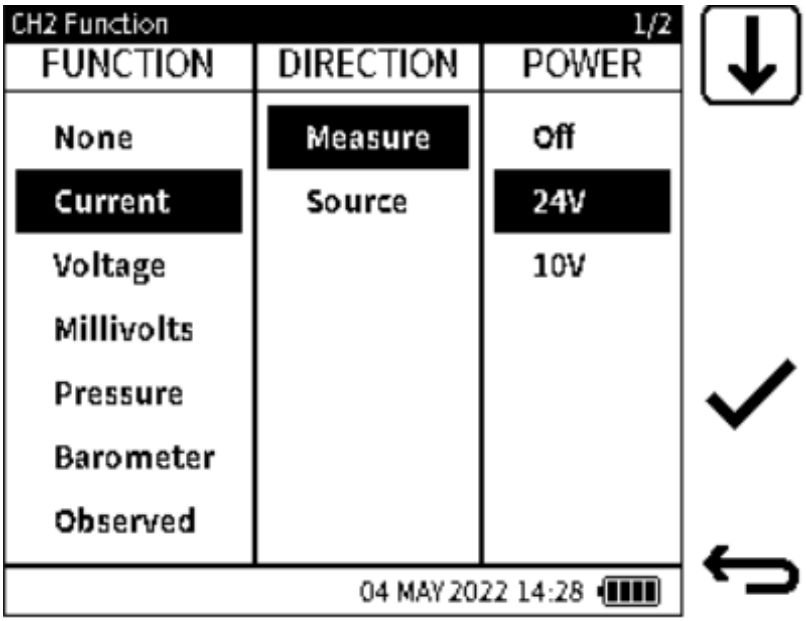
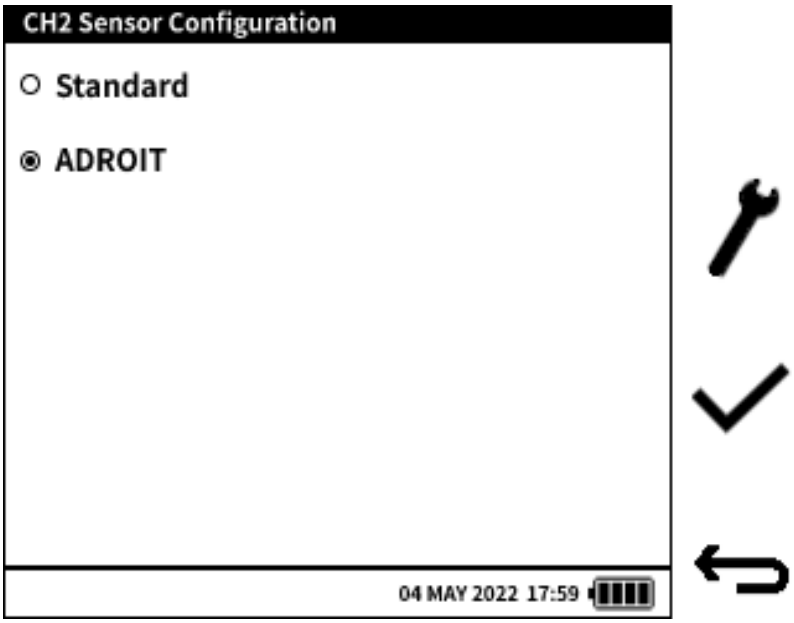
CH2 is the primary electrical channel on the DPI610E and thus the channel that controls **ADROIT** functionality.

In the **CH2** setup screen, select either the **Current** or **Voltage** function, based on the electrical output function of the sensor. Then select the **Measure** Direction and **24V** Loop options. Select ✓ to save and show the **CH2** setup menu.



Wait until the display shows the **CONFIGURATION** option on the **CH2 Setup** screen. Select this option to show the **CH2 Sensor Configuration** screen: the default Configuration option is **Standard**.



The display will show the **Configuration** setup softkey after you select the **ADROIT** configuration option. Select this softkey to look at or change the configuration parameters.

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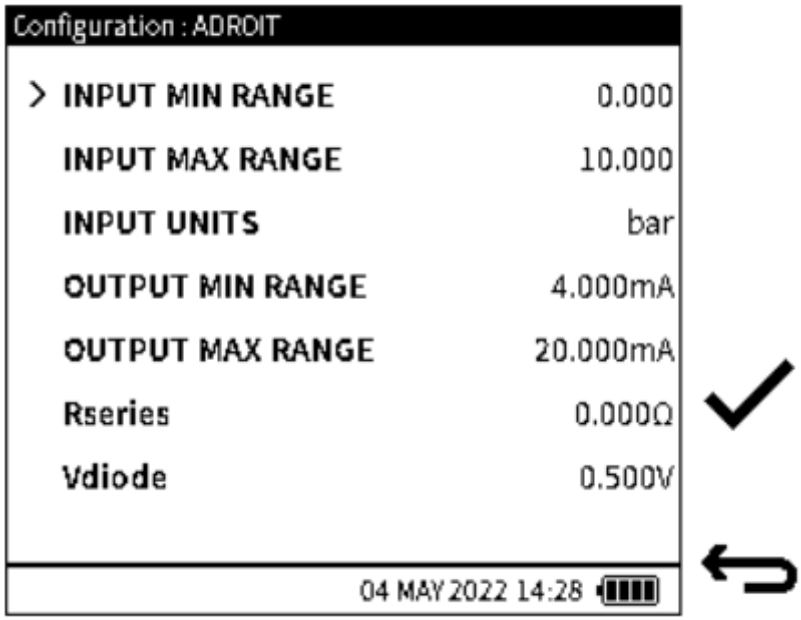
After you select the icon you will have to wait while the system updates, then the display shows the **Configuration: ADROIT** screen.



INPUT MIN RANGE - the minimum pressure range value of the ADROIT sensor. Default value is 0 bar (or equivalent in other user-selected pressure measurement unit).

INPUT MAX RANGE - the maximum pressure range value of the ADROIT sensor. Default value is 10 bar (or equivalent in other user selected pressure measurement unit).

INPUT UNITS - measurement unit of input.

OUTPUT MIN RANGE - the minimum electrical output range value of the ADROIT sensor. Default value for current output sensors is 4 mA and the default value for 3-wire voltage output is 0 V.

OUTPUT MAX RANGE - the maximum electrical output range value of the ADROIT sensor. Default value for current output sensors is 20 mA and the default value for 3-wire voltage output is 5 V.

Rseries - the series resistance made from the wiring (cable) length between the ADROIT sensor and the electrical ports where it stops. Default value is 0 ohm.

Vdiode - the voltage-drop through the resistor or resistance in the circuit. Default value is 0.5 V.

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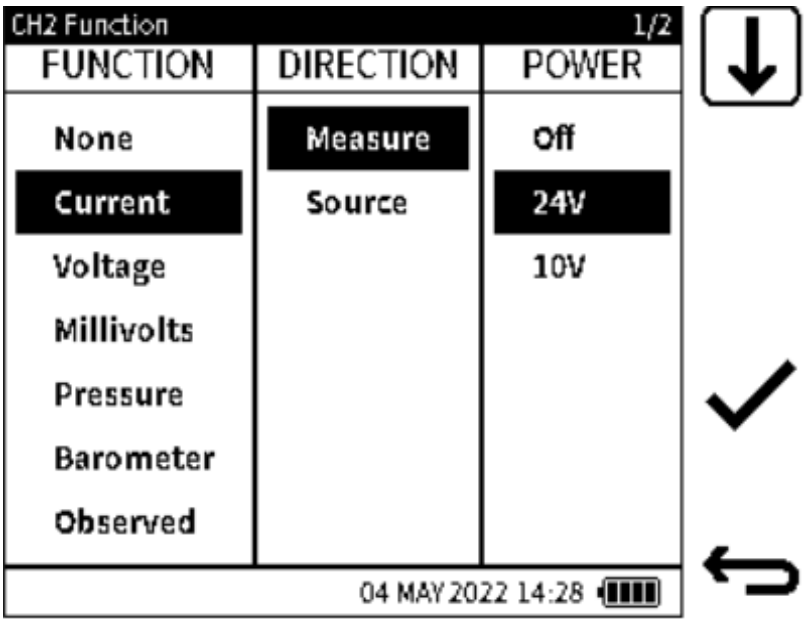
Change the sensor input and output parameters so that they are the same as on the sensor label.

Select the **Tick** ✓ softkey to save and show the sensor configuration menu. The display shows a screen message that asks you to wait while the system updates.



Select the **Back** ↩ button on the **CH2 Setup** screen to show the Calibrator screen.

Make sure that the ADROIT sensor is correctly connected to the pressure port on the DPI610E.



Make sure that the device is not pressurized before the removal of a Blanking Plug if it is in the Test Socket. Refer to Section 2.1.1 and Section 2.1.3 on page 19 for the necessary procedures.

Use applicable adapter fittings if the pressure connector thread does not match the DPI610E test port quick-fit connector. The adapter fittings must be rated to 35 bar g. Use the procedure in Section 2.1.5, “Attach/Remove Device Under Test,” on page 20 to attach the ADROIT sensor to the test port.

Push the plugs of the electrical leads from the ADROIT sensor into the correct electrical sockets on the DPI610E (See **Current Measure** with 24V page 80 or **Voltage Measure** with 24V electrical connection diagrams on page 96).

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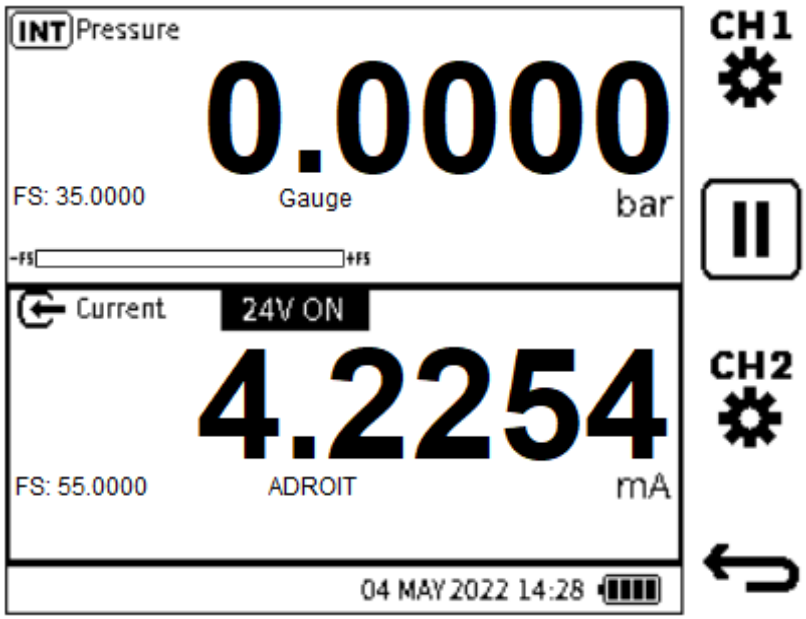

Make sure that the electrical reading and details in the **CH2** are correct: the measured value will be the minimum range value when the pressure is open to atmosphere. Make sure that the full-scale value agrees with the sensor details set in the ADROIT configuration menu.

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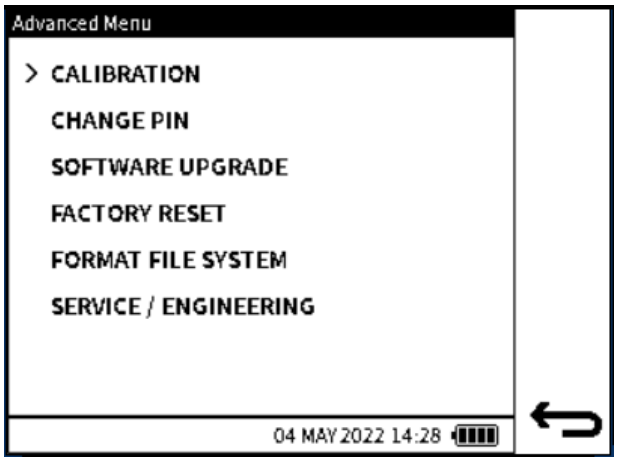
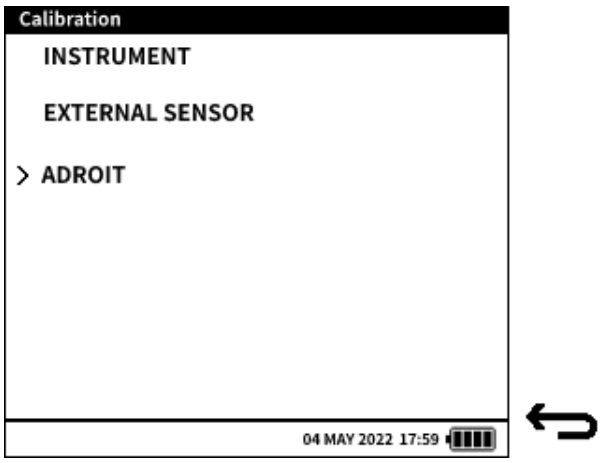
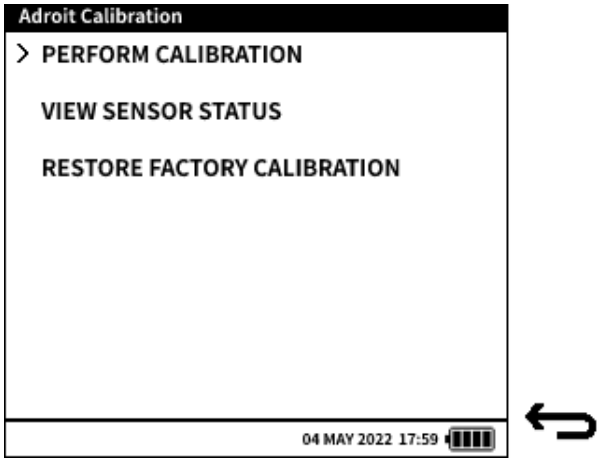
8.3.3 ADROIT CALIBRATION

On the Dashboard push the **Settings** softkey and then select the **ADVANCED** menu option. Enter the correct PIN to access the **ADVANCED** menu (for more information, refer to “ADVANCED” on page 42).

Step 1		Select **CALIBRATION** on the **Advanced Menu** screen.
Step 2		Select **ADROIT** on the **Calibration Menu** screen. Wait for the display to show the **Adroit Calibration** screen. **Note**: The display will only show the **EXTERNAL SENSOR** option when an external sensor is attached to the EXT.SENSOR socket on the side of the DPI610E.
Step 3		There are three calibration options for an ADROIT sensor: **PERFORM CALIBRATION** - Calibrate the sensor. **VIEW SENSOR STATUS** - Look at ADROIT pressure sensor data. **RESTORE FACTORY CALIBRATION** - Use the factory (default) calibration values.

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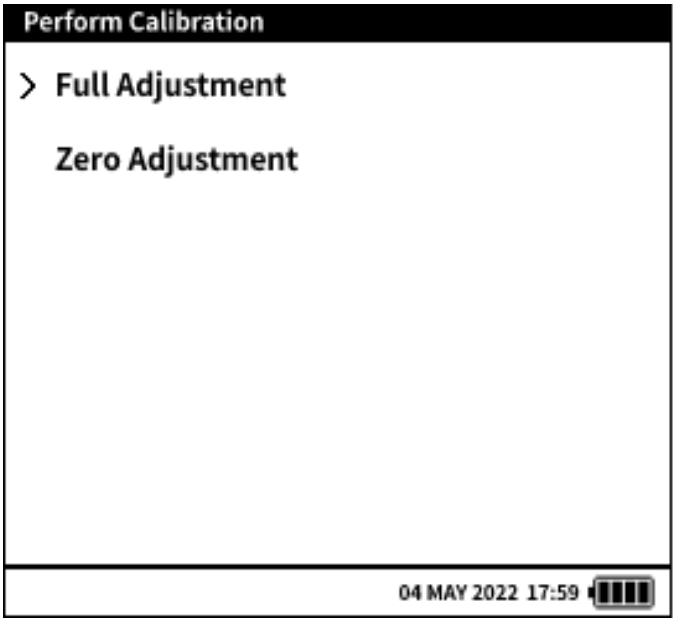
8.3.4 PERFORM CALIBRATION

Select the **PERFORM CALIBRATION** option to access the calibration options. There are two types of adjustments available:

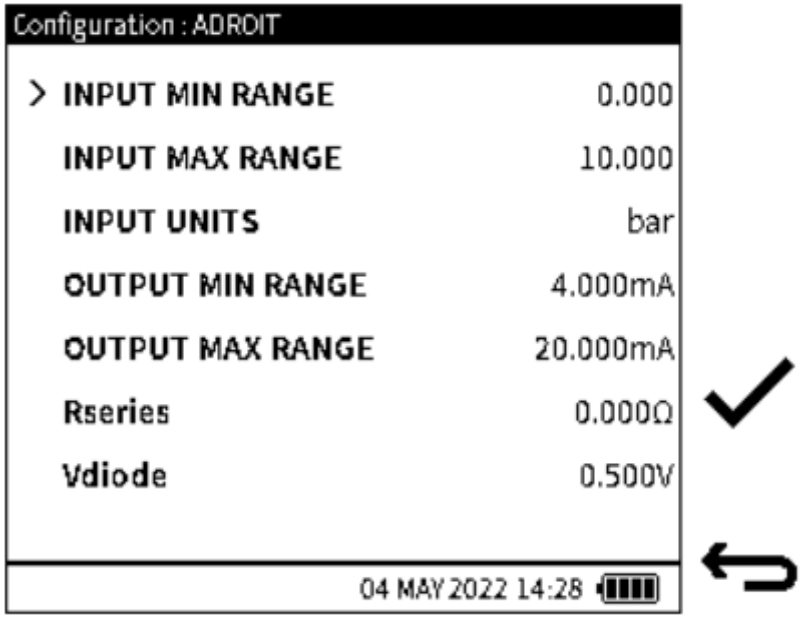


Full Adjustment - this is a 2-point calibration adjustment of the sensor over the zero (or minimum full-scale) and the positive full-scale pressure range.

Zero Adjustment - this is a 1-point calibration adjustment of the sensor at zero pressure.

8.3.5 FULL ADJUSTMENT CALIBRATION

Select **Full Adjustment** from the **Perform Calibration** menu screen, make sure that the sensor data on the **Configuration: Adroit** screen are the same as that of the sensor to calibrate. Refer to page 149 for a description of the contents of this screen.



Change the sensor data on the screen if necessary.

Select the **Tick** ✓ icon to go to the next step of the calibration procedure.

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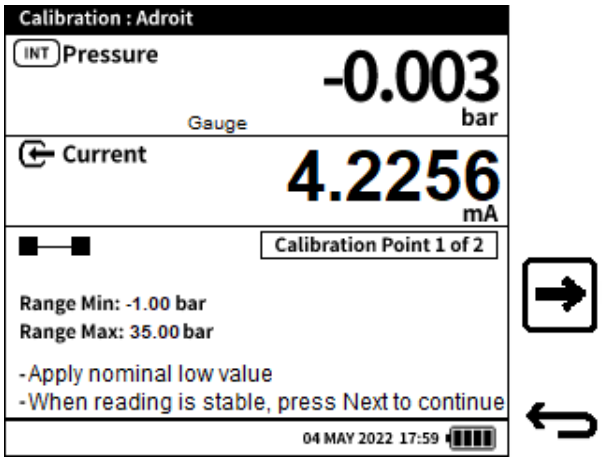
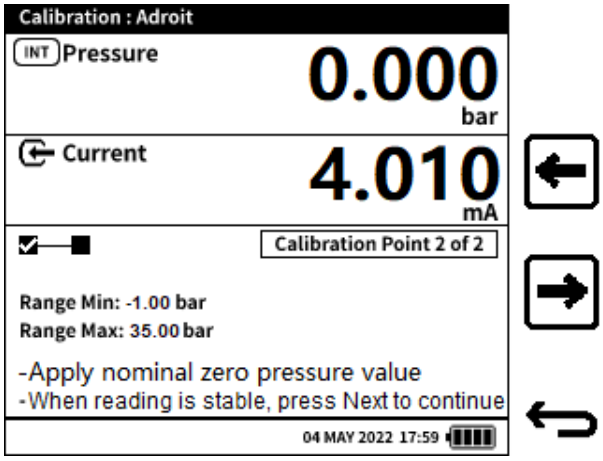
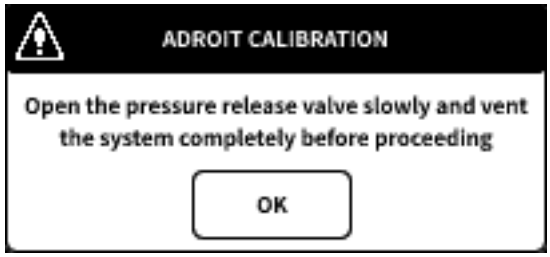
Step 1		To start the full calibration adjustment apply a nominal zero or low pressure to the sensor. Use the DPI610E pump and/or volume adjuster to do this. When the pressure value is stable, push the **Next** softkey to move to Calibration Point 2.
Step 2		At Calibration point 2, apply the full-scale pressure of the sensor using the DPI610E pump and/or volume adjuster. When the pressure reading is stable, push the **Next** softkey to continue. **Do not use this step 2 for the calibration of Voltage Output sensors.**
Step 3		**For Current Output sensors only (Ignore this step for Voltage Output sensors).** The screen will show a pop up window that tells you to vent the system to atmosphere. Open the pressure release valve slowly until the system is fully vented before you select the **OK** button

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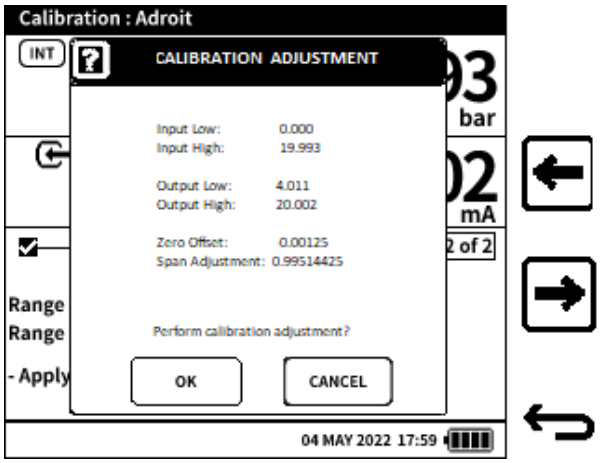
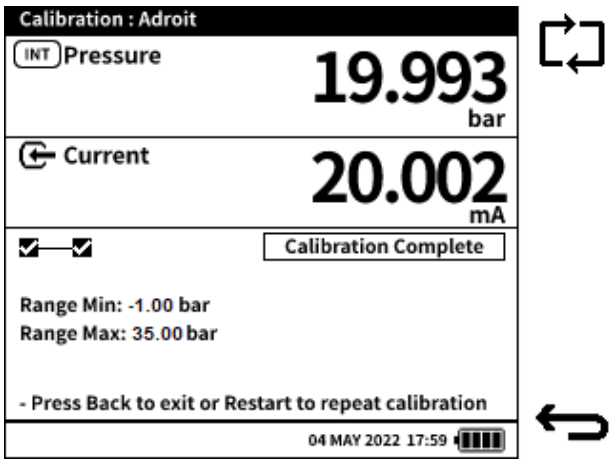
Step 3		The display shows the **CALIBRATION ADJUSTMENT** window. Make sure that the values shown are correct before you select the **OK** button. The functions of the parameters are: **Input Low** - the Input low pressure applied by the DPI610E to the sensor at Calibration Point 1. **Input High** - the Input high (or positive full-scale) pressure applied by the DPI610E to the sensor at Calibration Point 2. **Output Low** - the electrical output value from the sensor that the DPI610E measured at Calibration Point 1. **Output High** - the electrical output value from the sensor that the DPI610E at Calibration Point 2. The system calculates the **Zero Offset** and **Span Adjustment** values from these shown values. If these values are not acceptable, select **Cancel** to go back to the calibration procedure.
Step 4		When **OK** is selected after the display shows the calibration results, the status box shows the **Calibration Complete** message. There are three selections available: **VERIFICATION** softkey takes you to the **Verification** screen (see **Verification** screen page 263). **RESTART** softkey lets the calibration procedure be restarted if a repeat calibration is necessary. **BACK** softkey exits the calibration procedure and takes the user to the **Perform Calibration** menu screen.

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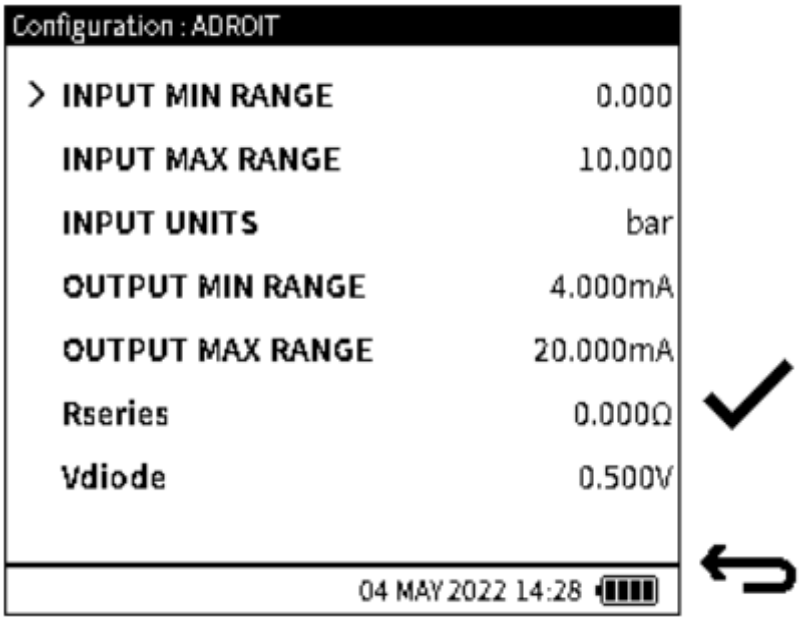
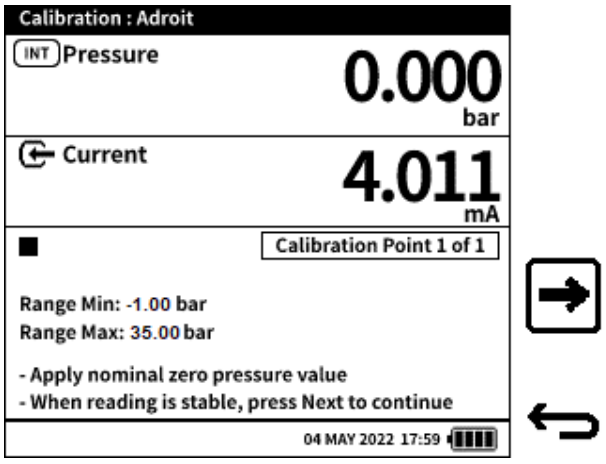
8.3.6 ZERO ADJUSTMENT

When you select **Zero Adjustment** from the **Perform Calibration** menu screen (see page 153), make sure that the sensor data on the **Configuration: Adroit screen** are the same as that of the sensor to calibrate. Refer to page 157 for a description of the contents of this screen.



Change the sensor data on the screen if necessary.

Select the **Tick** ✓ icon to go to the next step of the calibration procedure.

Step 1		To start the zero calibration adjustment apply a nominal zero or low pressure to the sensor. Use the DPI610E pump and/or volume adjuster to do this. When the pressure value is stable, push the **Next** → softkey to continue.

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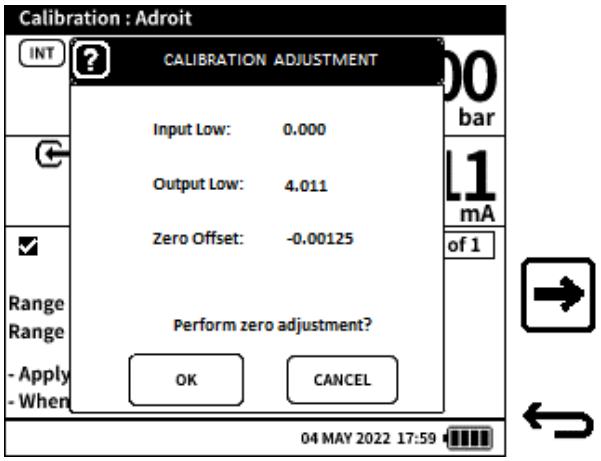
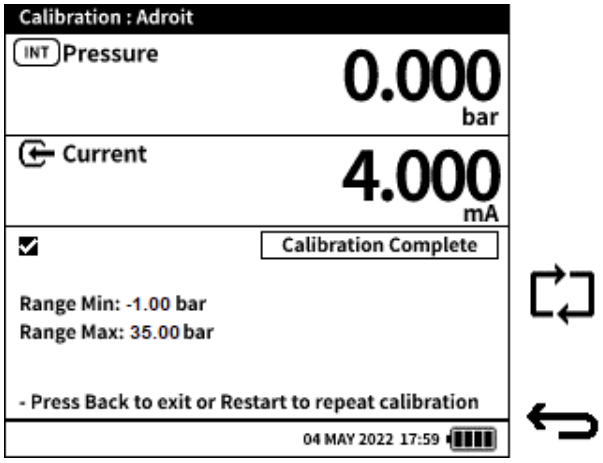
Step 2		The display shows the **CALIBRATION ADJUSTMENT** window. Make sure that the values shown are correct before you select the **OK** button. The functions of the parameters are: **Output Low** - the electrical output value from the sensor that the DPI610E measured at Calibration Point 1. From these two values the system calculates the Zero Offset value. If these values are not acceptable select the **CANCEL** button, and do the calibration procedure again.
Step 3		When **OK** is selected after the display shows the calibration results, the status box shows the **Calibration Complete** message. There are three selections available: **VERIFICATION** softkey takes you to the **Verification** screen (see **Verification** screen page 263). **RESTART** softkey lets the calibration procedure be restarted if a repeat calibration is necessary. **BACK** softkey exits the calibration procedure and takes the user to the **Perform Calibration** menu screen.

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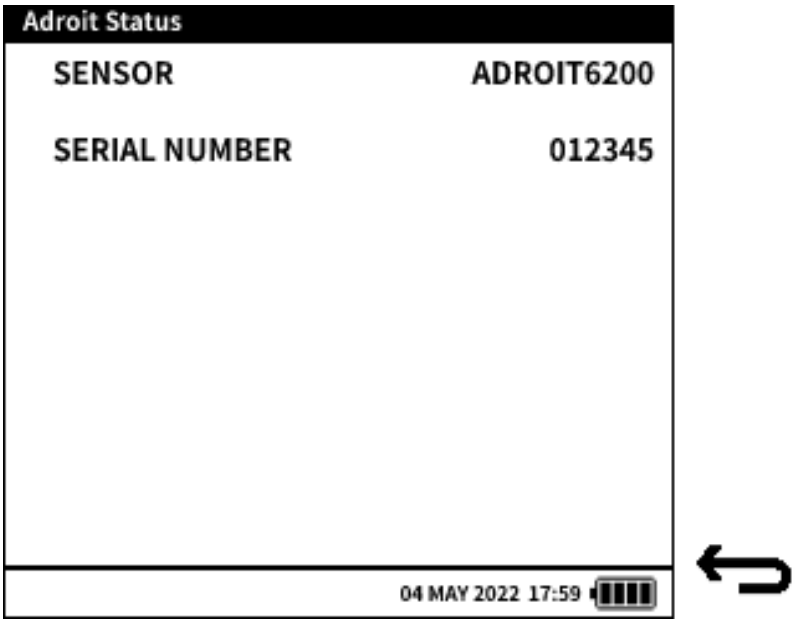
8.3.7 VIEW SENSOR STATUS

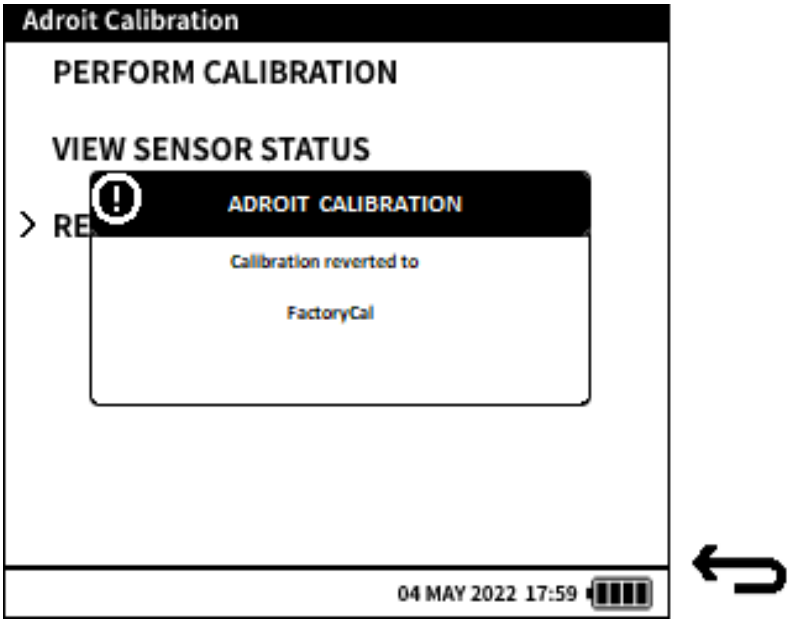
This menu gives information about the ADROIT sensor model and serial number.



Before delivery the sensor has its factory calibration values saved internally. If it is necessary, the sensor can have these factory settings made active again. You use the **RESTORE FACTORY CALIBRATION** function to do this.

Select **RESTORE FACTORY CALIBRATION** from the **Adroit Calibration** screen.

Select **OK** on the pop-up window to confirm restore: this operation may take several seconds.



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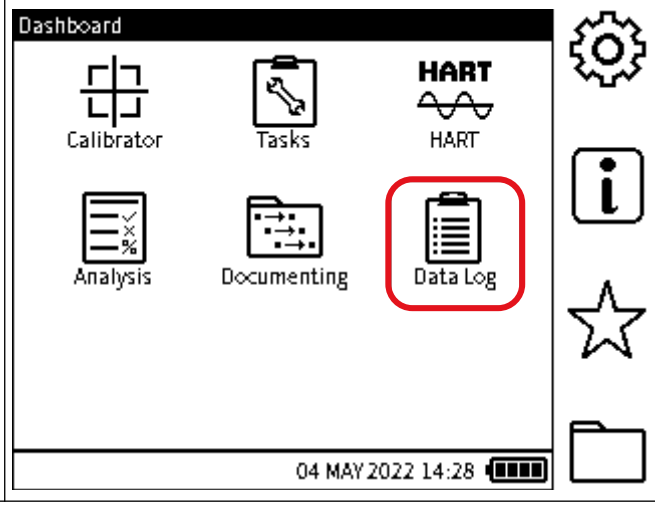
9. Data Log

The **Data Log** function records instrument readings (measured or sourced) so that they can be reviewed or analyzed. The following options are available under the **Data Log** menu:

Option	Description
Setup	Set up data log
Files	View and delete data log files

To access Data Log:

Step 1		Select **Data Log** from the Dashboard.

9.1 Data Log Setup Menu

The following options are available under the **Setup** menu:

Option	Description
FILENAME	Change file name
TRIGGER	Set Data Log trigger
TIME INTERVAL	Set Data Log time interval
LOG DURATION	Set Log duration
DATA POINTS	Set Data Log points

Note: Select the **TRIGGER** mode first (See Section 9.2, “TRIGGER Menu,” on page 162) before setting the filename of the data log.

TIME INTERVAL, **LOG DURATION** and **DATA POINTS** are only listed in the **Data Log Setup** menu when **TRIGGER** is set to **PERIODIC** (See Section 9.2 on page 162).

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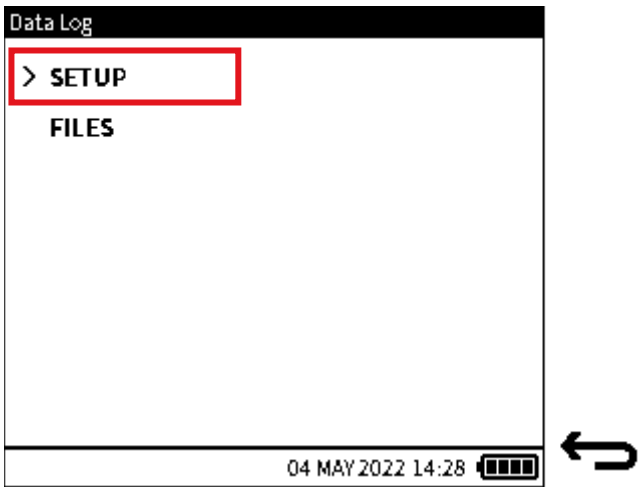
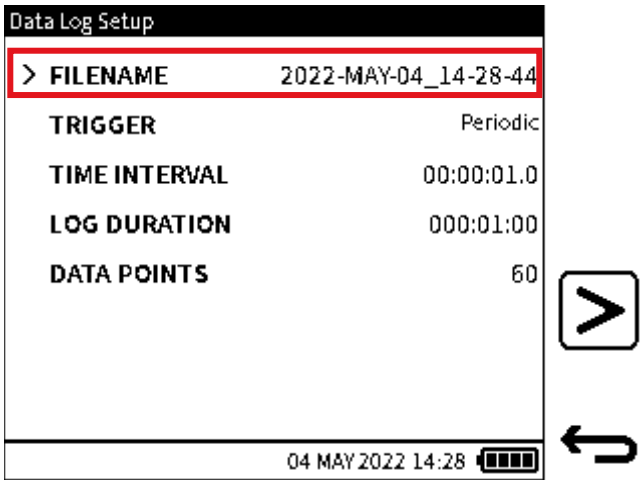
9.1.1 How to set the Data Log Filename

To set the Data Log filename:

Step 1		Select **SETUP** from the **Data Log** screen.
Step 2		Select **FILENAME** from the **Data Log Setup** screen. **Note**: **TIME INTERVAL**, **LOG DURATION** and **DATA POINTS** are only listed on the **Data Log Setup** screen when **TRIGGER** is set to periodic.
Step 3		Select the **Eraser** to delete the default data log file name. **Note**: The default data log file name format is: [YYYY-MMM-DD_HH-MM-SS].

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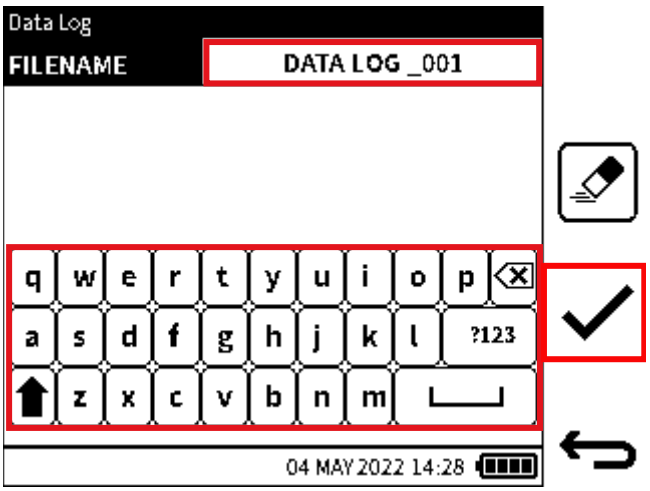
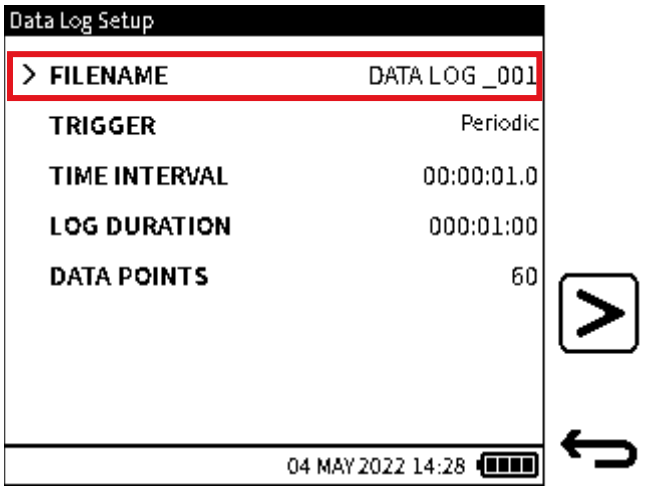
Step 4		Use the keypad to enter the new **Data Log** filename. **Note**: Only a maximum of 20 characters and symbols is available. Select ✓ to confirm the new file name.
Step 5		Check that the new filename appears in the **Data Log Setup** screen. **Note**: **TIME INTERVAL**, **LOG DURATION** and **DATA POINTS** are only listed on the **Data Log Setup** screen when **TRIGGER** is set to Periodic.

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9.2 TRIGGER Menu

The **TRIGGER** menu allows the user to select the type **Data Log Trigger** requirement. The following options are available under the **TRIGGER** menu:

Option	Description
KEY PRESS	Data Log triggered by a key press
PERIODIC	Periodic Data Log

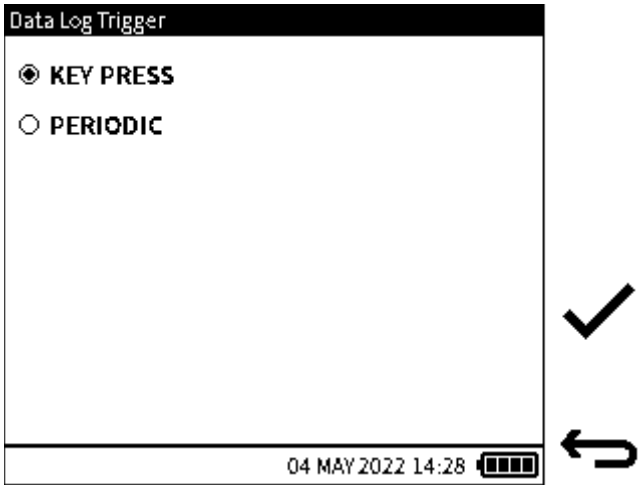

Figure 9-1: Data Log Trigger Menu

When **KEY PRESS** is selected, no more settings will be required to set up the data log. Tap the

Tick ✓ icon to return to the **Data Log Setup** screen: select **FILENAME** if a new name for the data log file is needed (See Section 9.1.1 on page 160 for the procedure). Refer to Section 9.4 on page 168, to continue the instructions for **KEY PRESS** data logging.

When the **PERIODIC** trigger is selected, more recording options become available for configuration.

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9.3 Periodic Trigger Options

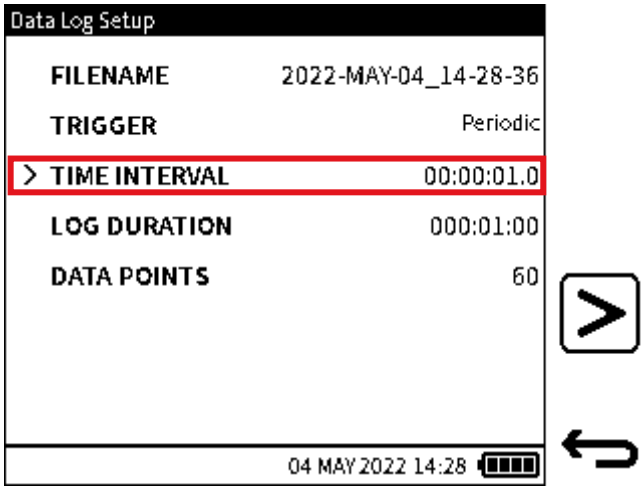
The options **TIME INTERVAL**, **LOG DURATION** and **DATA POINTS** are only available for use when **PERIODIC** is the trigger mode for recording data results.

9.3.1 TIME INTERVAL

When a Periodic trigger is selected, the option to set the Periodic interval is available from the **Data Log Setup** screen. The interval determines how long each data point is logged and it is expressed as HH:MM:SS.S. The supported time interval range is between 00:00:00.2 to 23:59:59.9. The minimum interval supported is dependent on the functions configured in the Calibrator channels. See table below.

Function	Minimum Interval (HH:MM:SS.S)
Internal Barometer	00:00:05.0
Internal Pressure	00:00:00.2
External Sensor (Pressure and RTD)	00:00:00.2
Current / Voltage / Millivolt Measure	00:00:00.5
Current Source	00:00:01.0
HART	00:00:00.5

9.3.1.1 How to set the TIME INTERVAL

Step 1		Select **TIME INTERVAL** from the **Data Log Setup** screen.

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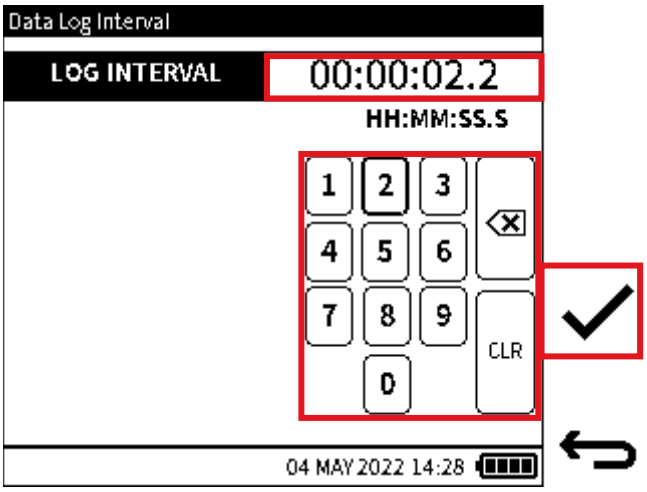
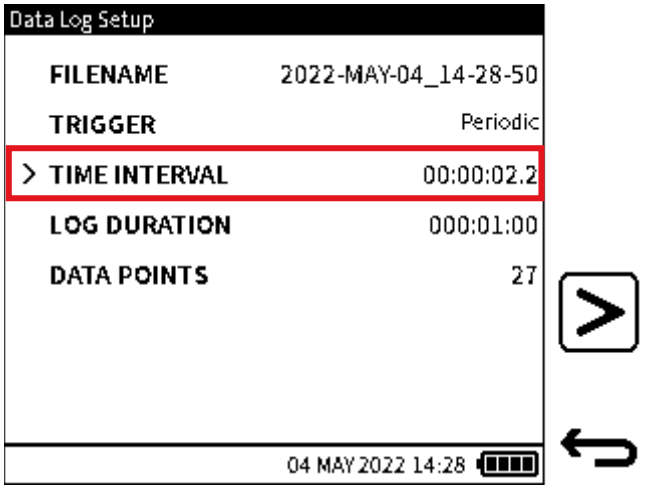
Step 2		Use the keypad to set the **LOG INTERVAL**. Select ✓ to confirm. **Note**: The time interval must be entered in the [HH:MM:SS.S] format in the range [00:00:01] to [23.59.9].
Step 3		Check that required interval appears in the **TIME INTERVAL** row of the **Data Log Setup** screen.

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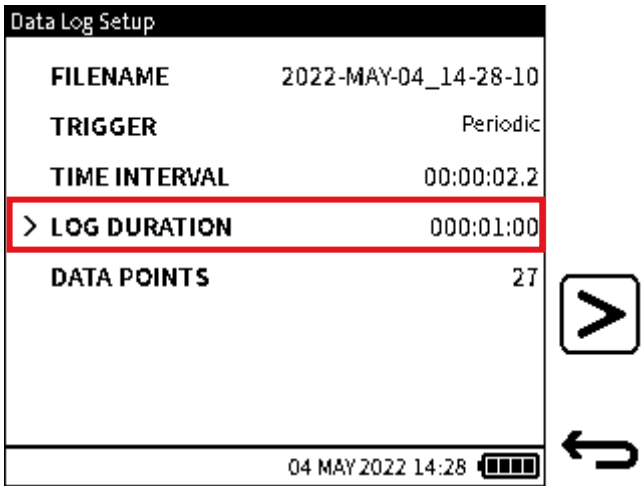
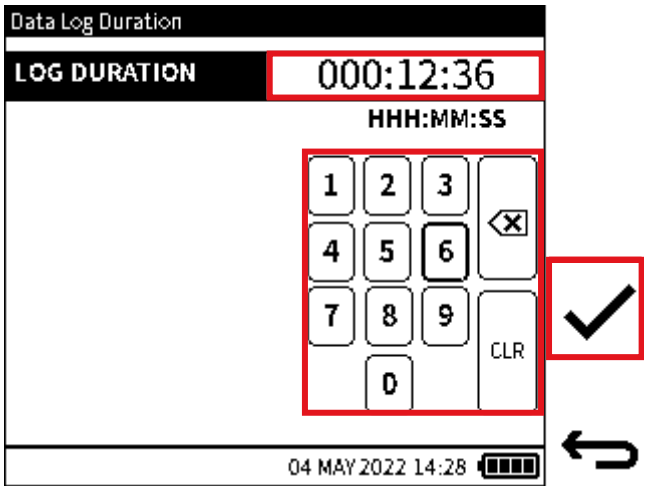
9.3.2 LOG DURATION

When a Periodic trigger is selected, the option to set the Data Log Duration is available from the **Data Log Setup** screen. The log duration determines the period over which the logging will take place i.e., start to end. It is expressed as HH:MM:SS. The supported time interval range is between 00:00:01 to 999:59:59.

Note: The time interval value must always be less than the **LOG DURATION** value.

9.3.2.1 How to set the LOG DURATION

Step 1		Select **LOG DURATION** from the **Data Log Setup** screen.
Step 2		Use the onscreen keypad to set the **LOG DURATION** value. Select ✓ to confirm. **Note**: The time interval must be entered in the [HHH:MM:SS] format in the range [000:00:01] to [999.59.59].

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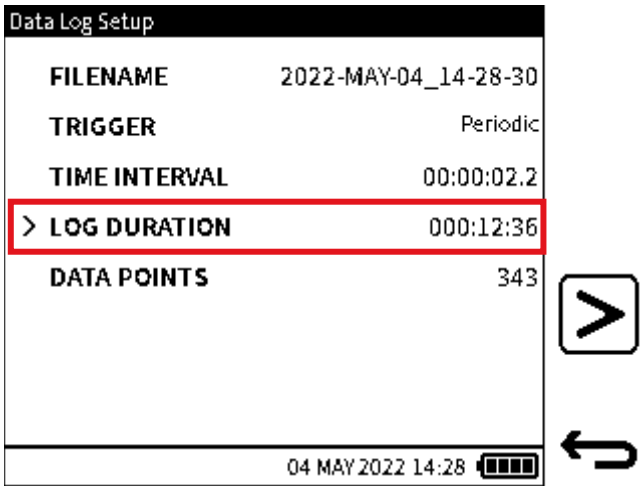
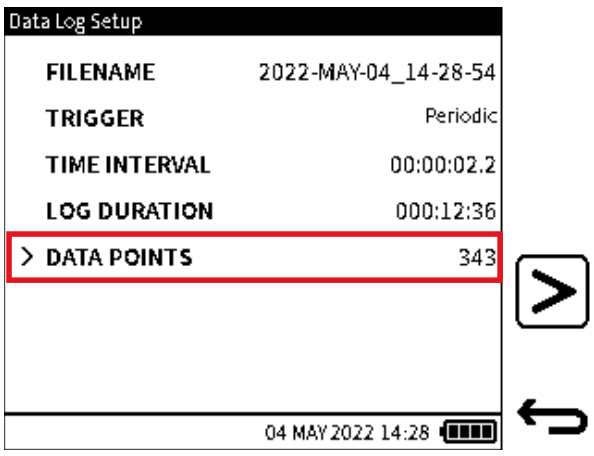
Step 3		Check that required duration appears in the **LOG DURATION** section of the **Data Log Setup** screen.

9.3.3 DATA POINTS

When a Periodic trigger is selected, the **Data Log Setup** screen shows the number of configured data points. The number of data points is directly linked to the time interval and the log duration configured. For example, if a time interval of 10 seconds (00:00:10.0) and log duration of 1 minute (000:01:00) is configured, the number of data points displayed in the setup menu will be 6. Each time the time interval or log duration value is changed, the number of data points is automatically adjusted. Alternatively, the periodic data log can be configured by specifying the number of data points required and the time interval or sampling frequency. From the previous example, if the number of data points is changed from 6 to 5, the log duration will automatically adjust to 50 seconds (000:00:50) based on the unchanged time interval of 10 seconds and the new number of required data points.

9.3.3.1 How to set the DATA POINTS

Step 1		Select **DATA POINTS** from the **Data Log Setup** screen

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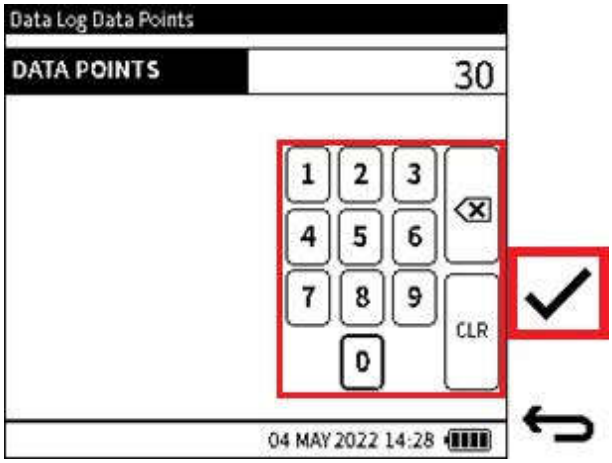
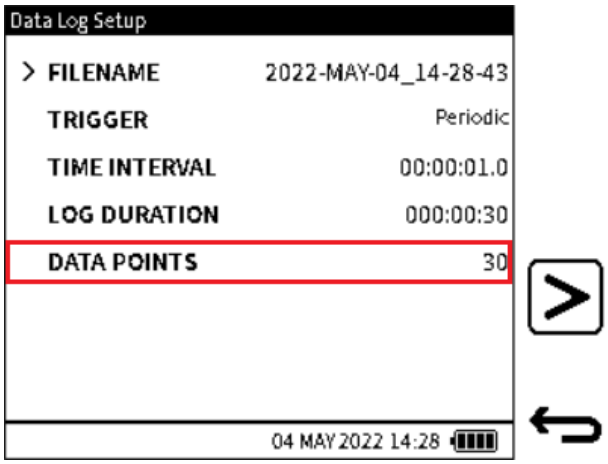
Step 2		Use the keypad to set the number of data points. Select ✓ to confirm.
Step 3		Check that required number of data points appears in the **DATA POINTS** field of the **Data Log Setup** screen.

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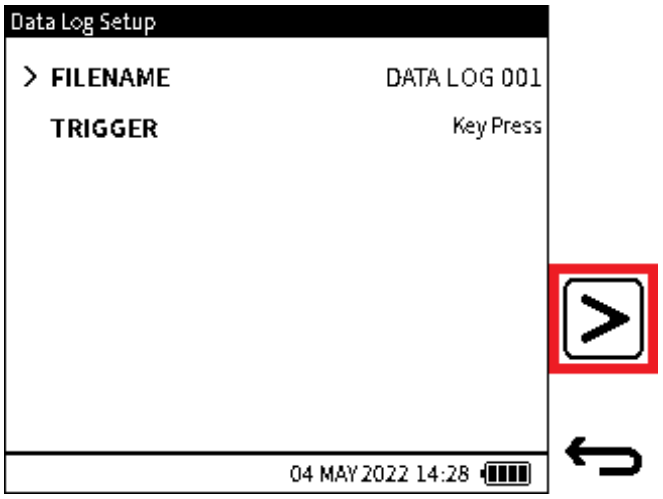
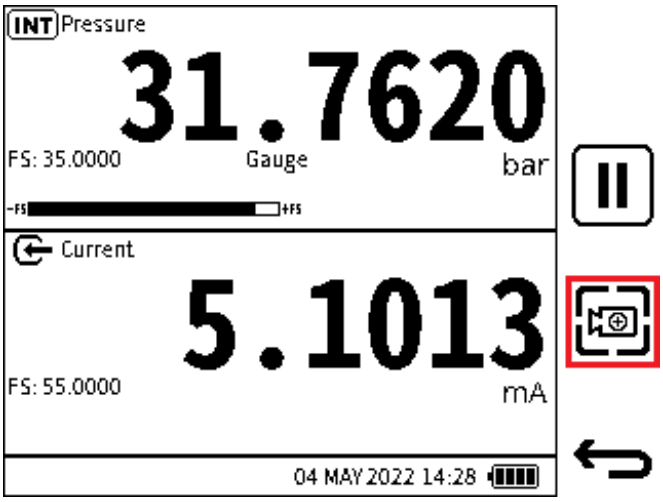
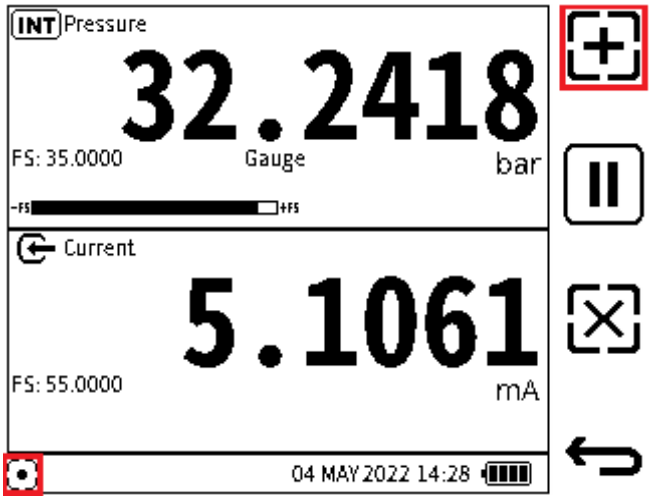
9.4 Setting up Manual Data Logging

The **KEY PRESS** option (see Section 9.2 on page 162) is a manual data trigger. Use the following steps to continue with a **KEY PRESS** triggered Data Log session:

Step 1		Select the **Proceed** icon in the **Data Log Setup** screen.
Step 2		The **Calibration** main screen appears. Press the **KEY PRESS RECORD** icon to start the data logging session.
Step 3		The **Data Log Status** icon will appear in the status bar until the logging is complete. Press the **Start Logging Data** icon to log data when wanted. To temporarily stop the testing press the **Hold** icon. To restart the testing press the **Hold** icon again.

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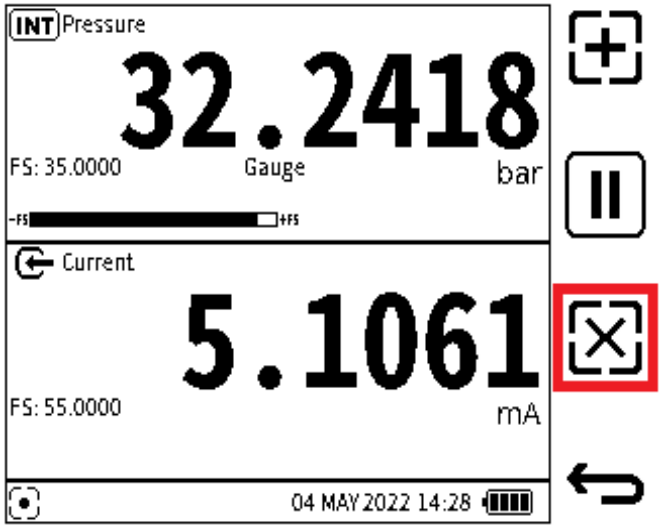
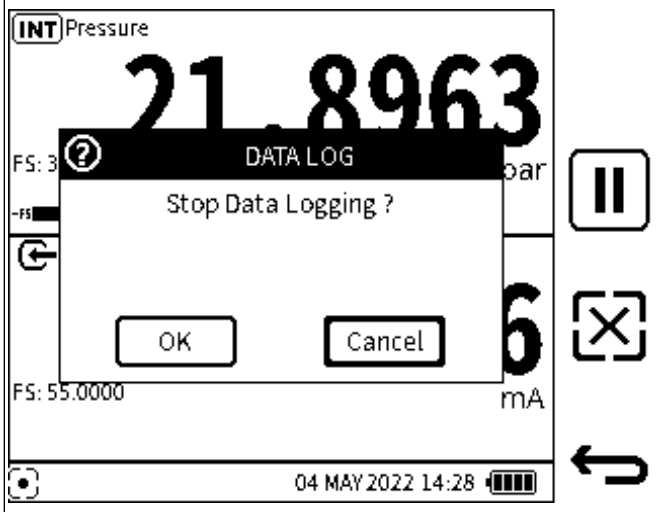
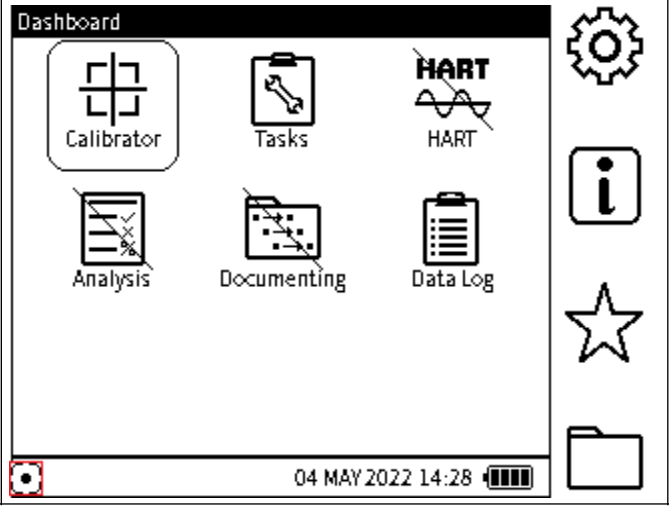
Step 4		To stop data logging completely press the **Stop** icon.
Step 5		A popup message appears that requests confirmation that the data log session is to end. Select **OK** to end the session or **CANCEL** to continue. If you select **OK**, another popup message will appear to confirm the data log file has been saved.
		It is not possible to change the channel configuration once data logging has begun. If at any point during data logging, the user selects the Dashboard, some applications that may interfere with the logging, will be disabled. Such applications will have a slash across the icon on the Dashboard.

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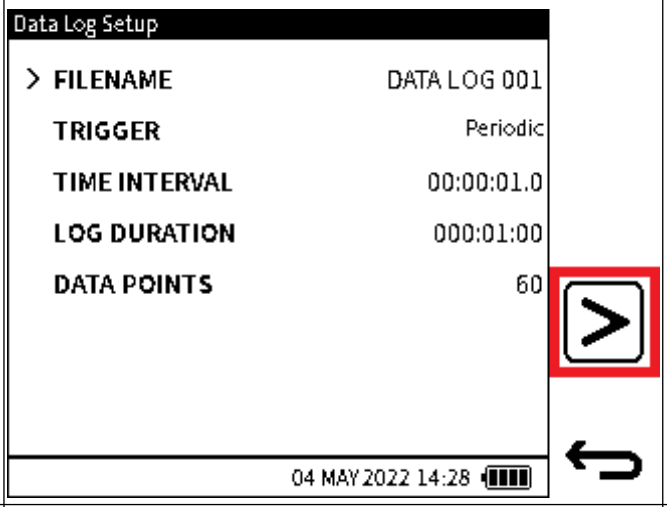
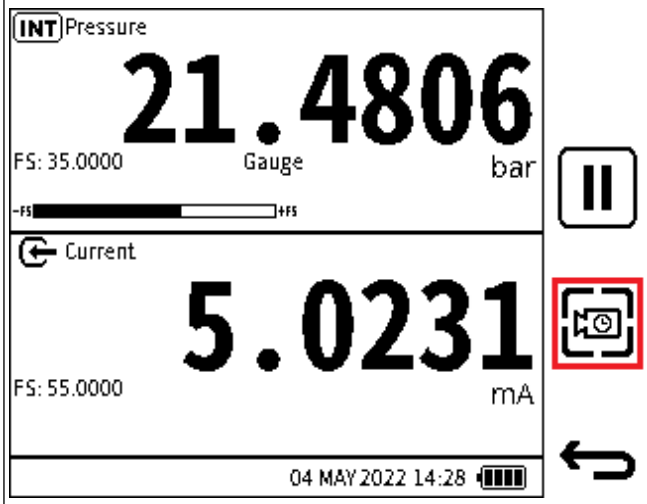
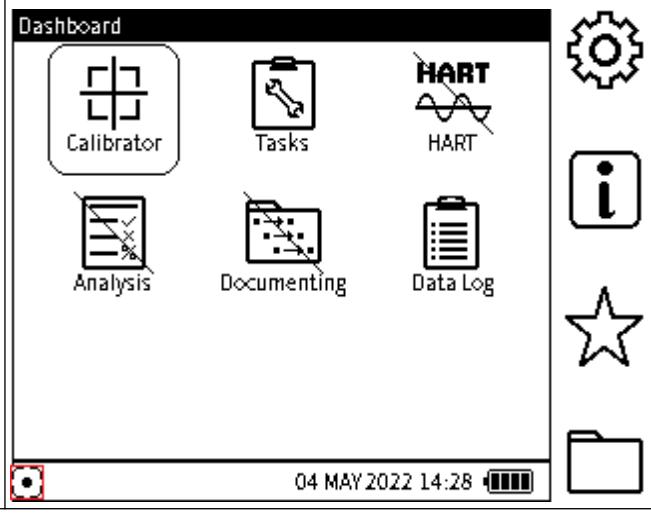
9.5 Setting up Periodic Data Logging

The **PERIODIC** option is a time-based data trigger (see Section 9 on page 159, Section 9.2 on page 162 and Section 9.3 on page 163). Use the following steps to continue with a **PERIODIC** triggered Data Log session:

<table>
<tr>
<td>Step 1</td>
<td>
</td>
<td>After selecting the PERIODIC Data Log mode and the values of the PERIODIC options, select the Proceed icon in the Data Log Setup screen.
The Calibrator main screen appears.</td>
</tr>
<tr>
<td>Step 2</td>
<td>
</td>
<td>To start the periodic logging, select the Periodic Data Log softkey. This is similar to the icon for the Key Press Data Log icon except it has a clock in its center rather than an addition sign.
At this point, the Data Log Status icon appears in the status bar until the logging is complete. Periodic logging is automatic, based on the configurations in the Setup menu. At the end of the session, a popup message appears, to confirm that data logging is complete. The file is saved automatically.</td>
</tr>
<tr>
<td></td>
<td>
</td>
<td>It is not possible to change the channel configuration once data logging has begun. If at any point during data logging, the user selects the Dashboard, some applications that may interfere with the logging, will be disabled. Such applications will have a slash across the icon on the Dashboard.</td>
</tr>
</table>

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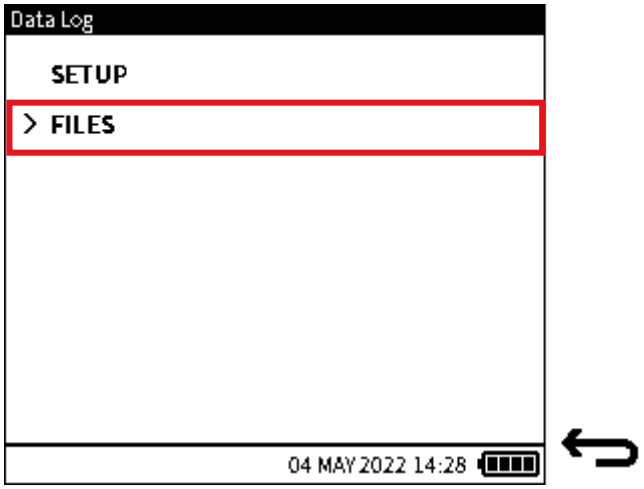
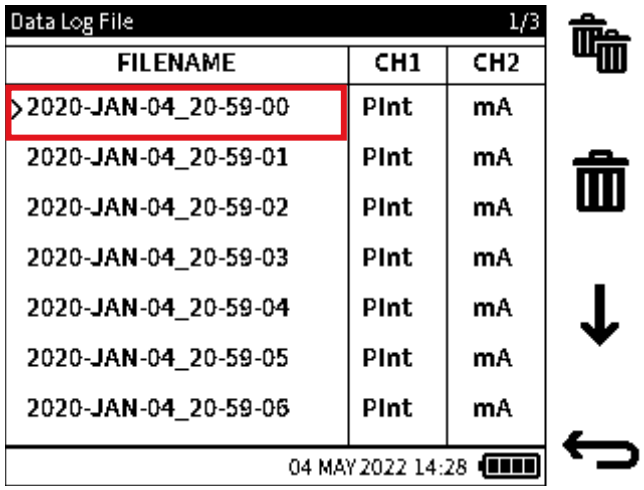
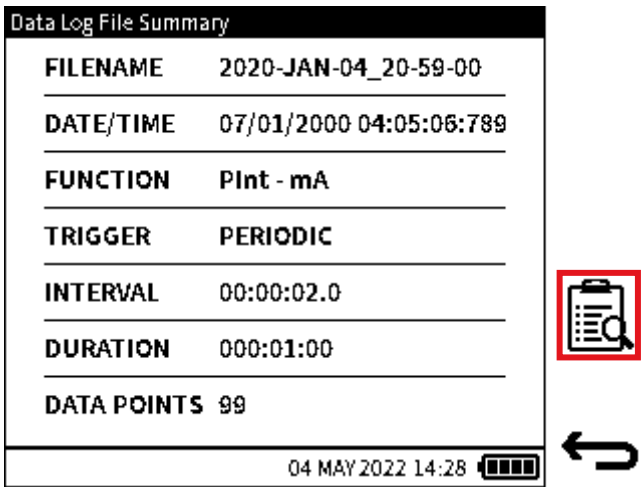
9.6 Viewing & Deleting Data Log files

9.6.1 Viewing Data Log Files

To view the **Data Log** files:

Step 1		Select **FILES** in the **Data Log** screen.
Step 2		Tap on (or use the Navigation Pad) to select the required **Data Log** file.
Step 3		Select the **Clipboard** icon on the **Data Log File Summary**.

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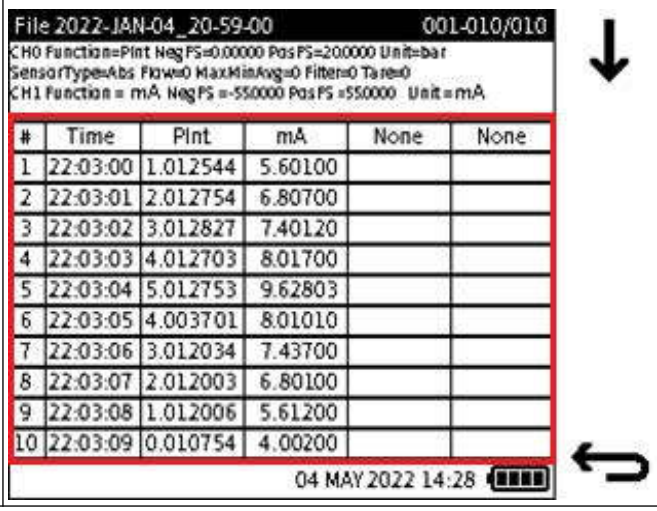
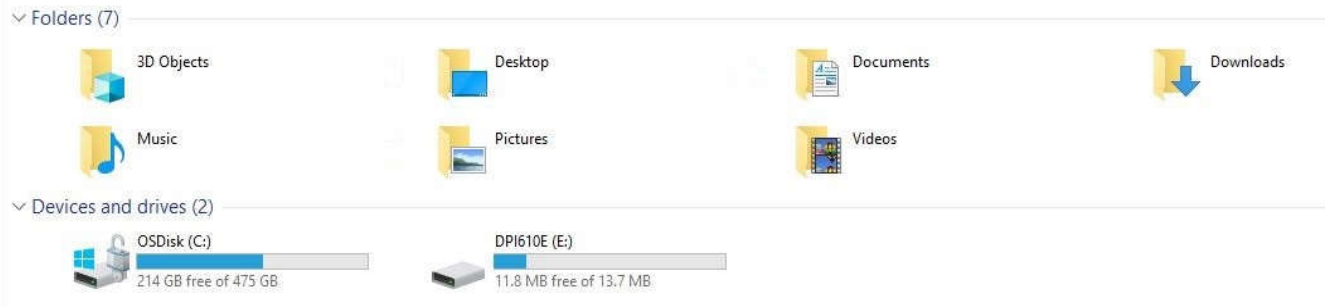
Step 4



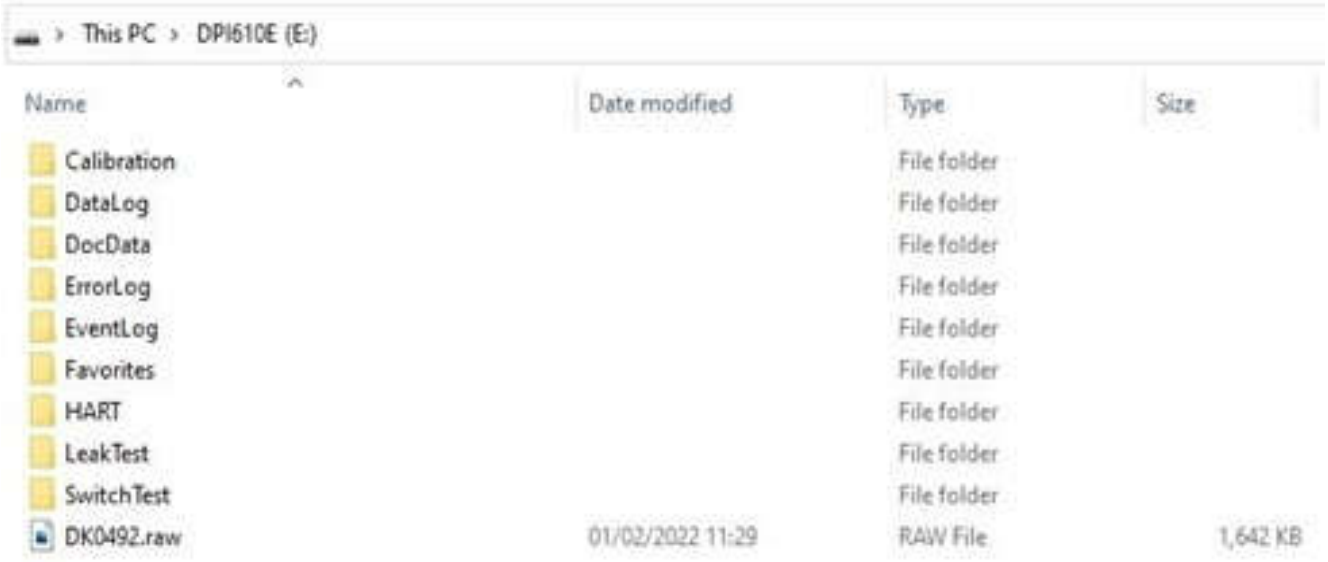
View **Data Log** file.

9.6.2 How to use a PC to view Data Log files in the DPI610E

Data log files are saved in CSV format in the DPI610E internal memory. Use a micro-USB data cable to connect the DPI610E device to the PC (See Section 9.7 on page 176). On the PC, the DPI610E memory appears as a mass storage device or drive within Windows File Explorer.



Double-tap on the DPI610E drive and select the **DataLog** folder from the root directory.



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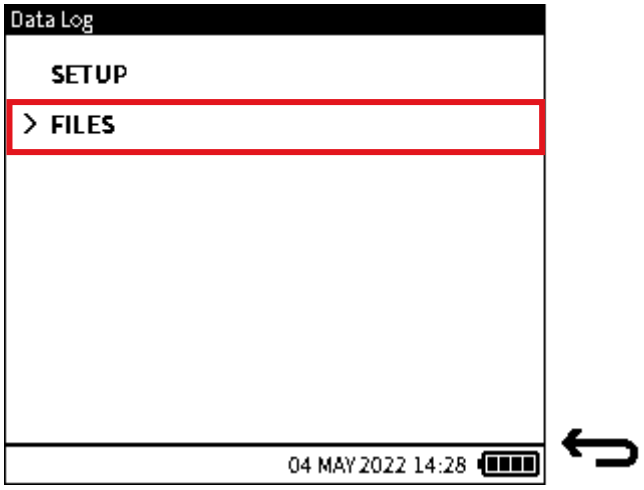
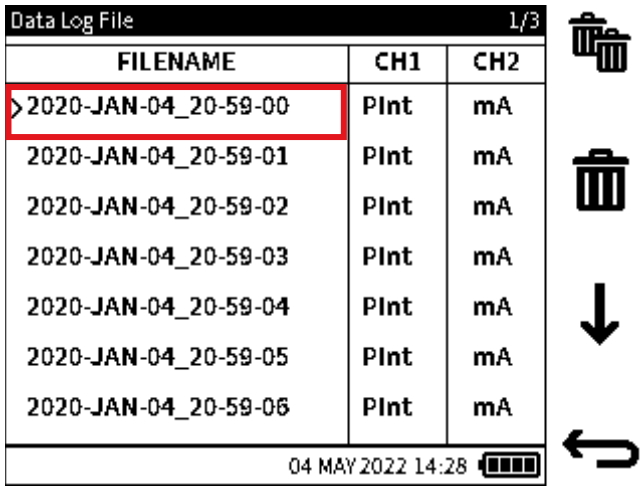
Right-click on the desired log file and choose a supported application to open the file and view the contents: Microsoft Excel is recommended.



9.6.3 Deleting Data Log Files

9.6.3.1 To delete a single Data Log file

Step 1		Select **FILES** from the **Data Log** screen.
Step 2		Tap on (or use the Navigation Pad) to select the required **Data Log** file.

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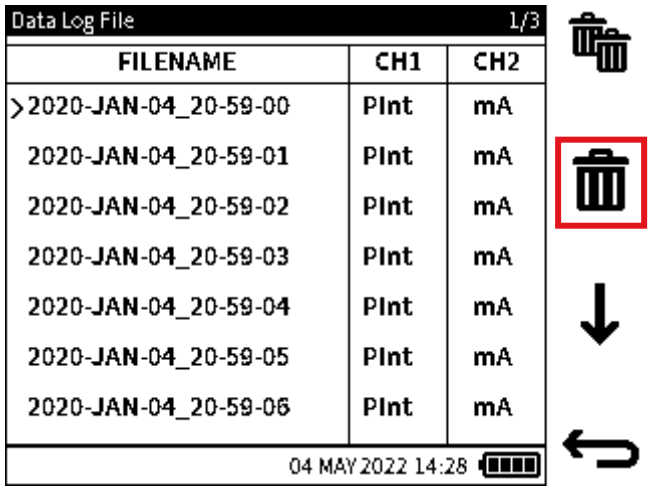
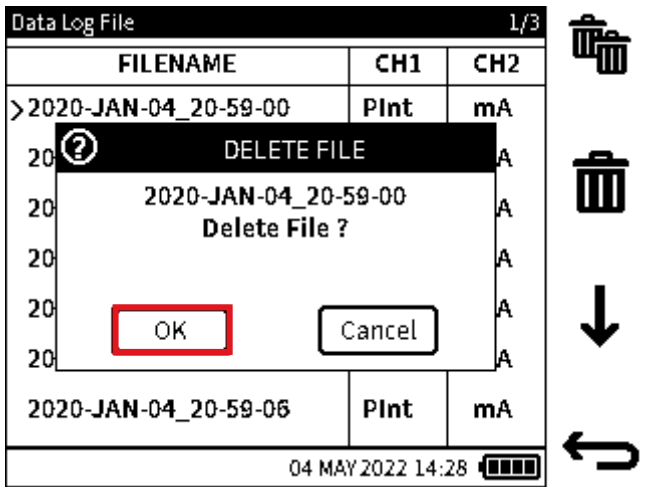
Step 3		Select the ‘single’ trash icon on the **Data Log File** screen.
Step 4		Select **OK** to confirm.

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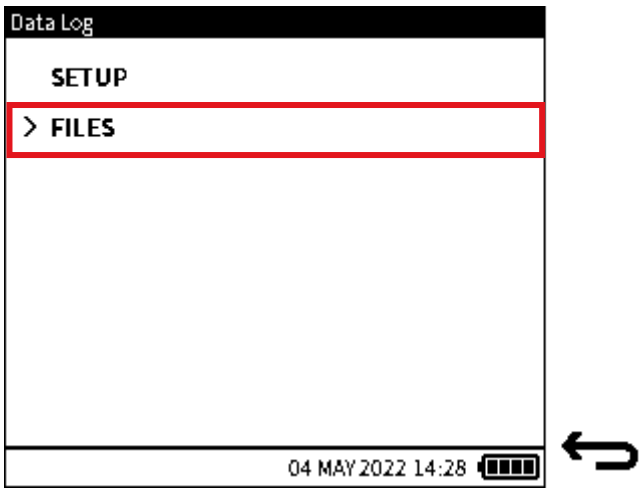
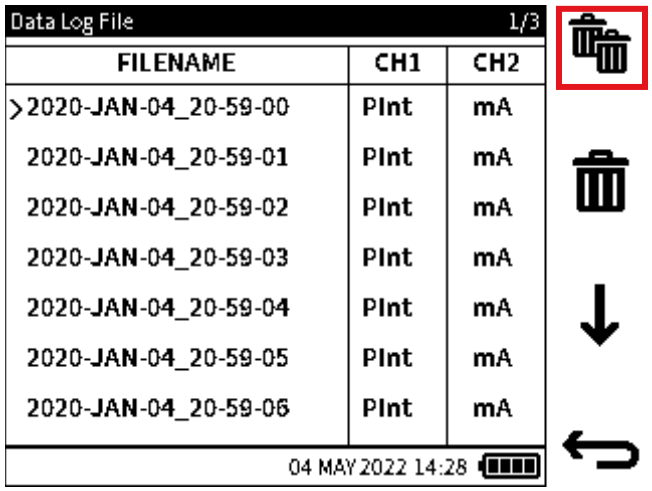
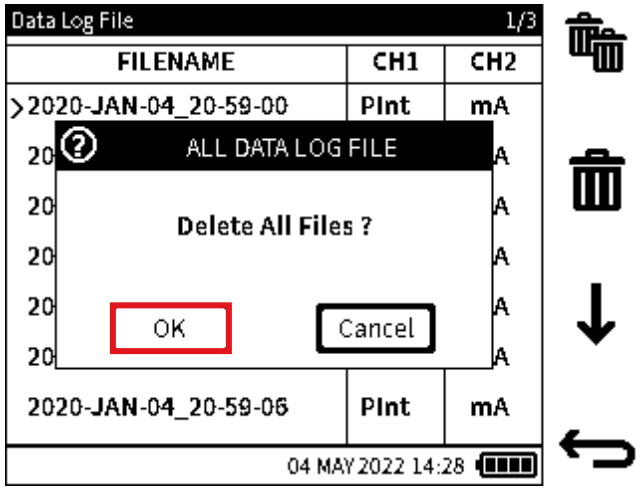
9.6.3.2 To delete all Data Log files

Step 1		Select **FILES** from the **Data Log** screen.
Step 2		Select the 'double' trash icon on the **Data Log** summary screen.
Step 3		Select **OK** to confirm.

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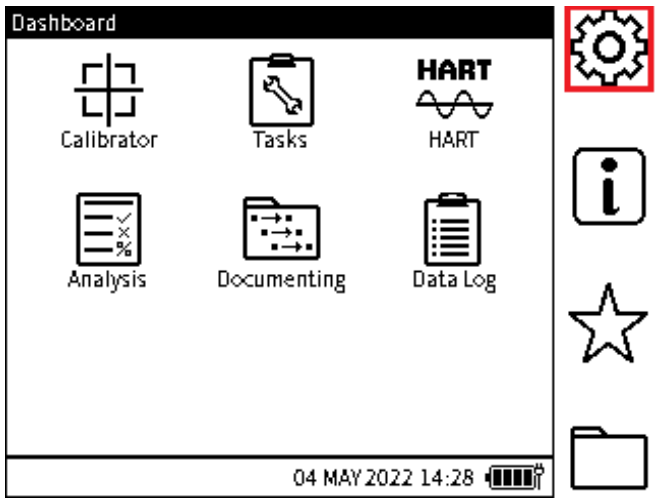
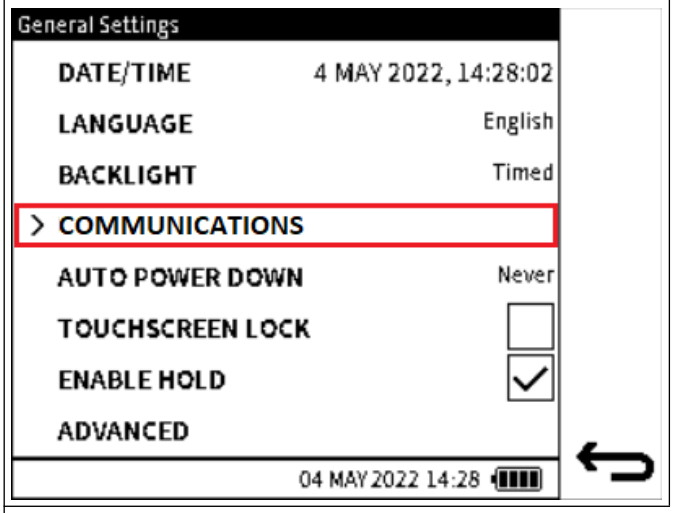
9.7 How to transfer a Data Log file

Data Log files can be copied from the DPI610E internal memory to an external device. This device can either be a micro-USB memory stick or an external PC.

Step 1		Select the **Settings** icon on the Dashboard. Press the **Home** button if necessary, to show the Dashboard. To select, tap on the icon or press the softkey on the right of icon.
Step 2	 	The **General Settings** screen appears. Select the **USB** option. Push a micro-USB memory stick into the USB port located behind a rubber flap at the end of the instrument. Use a USB port converter if only a standard USB memory stick is available. If the Data Log file is to be copied to the memory of an external PC, connect a micro-USB data cable to the USB port.

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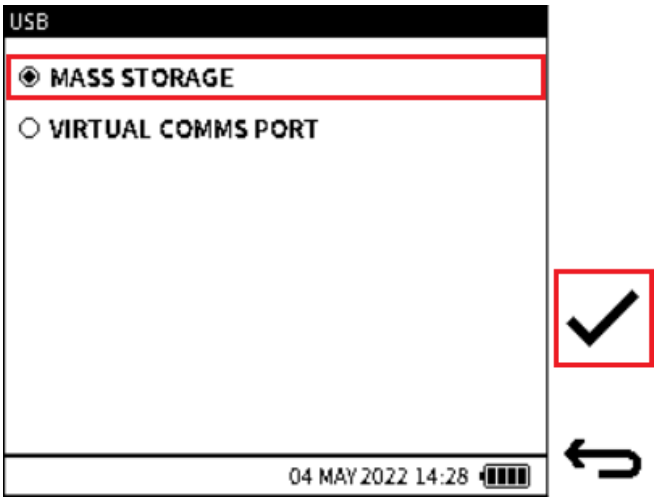
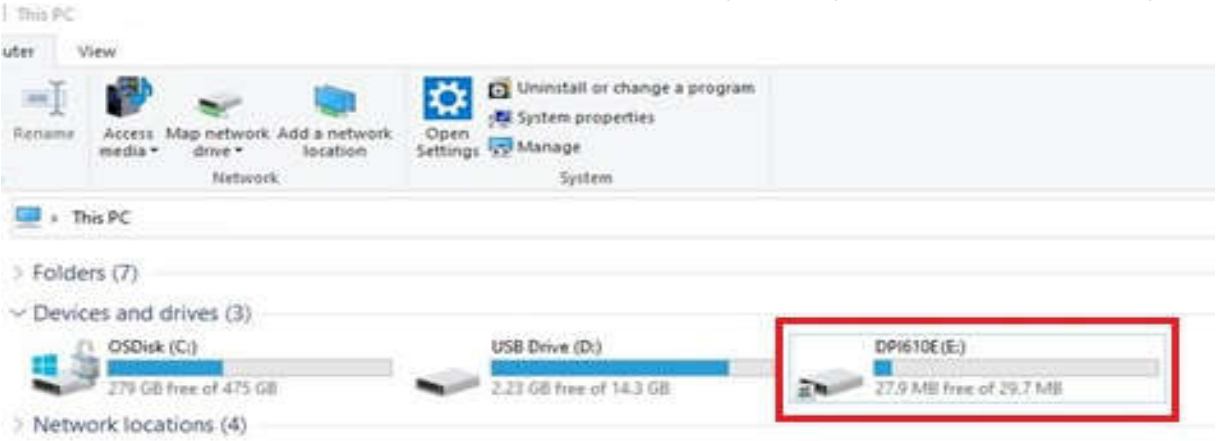
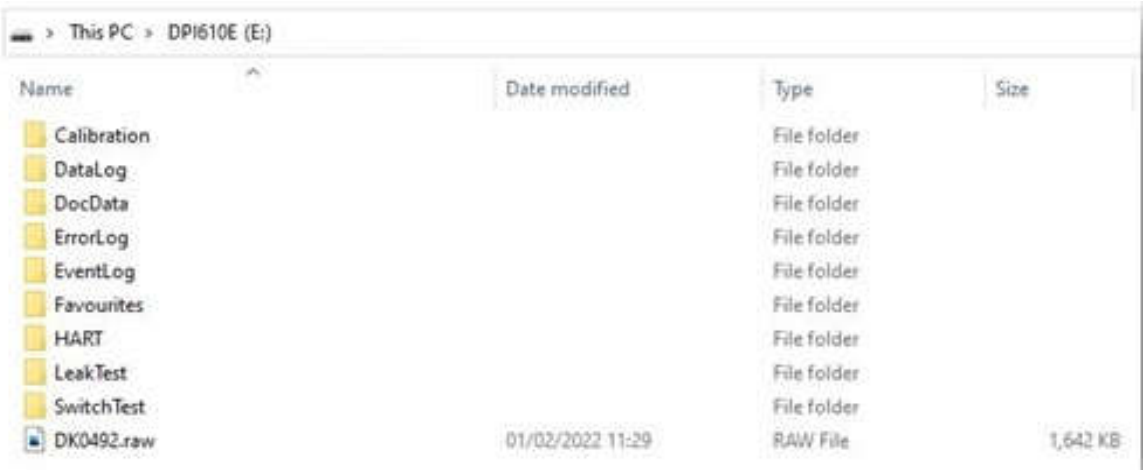
Step 4		Tap on **MASS STORAGE** to select the option. Select ✓ to confirm the selection.
Step 5	Connect the DPI610E to the PC using the micro-USB data cable. The PC should automatically detect the DPI610E which should appear as a Mass Storage drive (default name is DPI610E)..  **Note**: You may need to have USB access enabled on your PC to use this feature.	
Step 6	When the copy process is confirmed, remove the cable from the DPI610E. . 	

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10. Analysis

10.1 Overview

The **Analysis** application calibrates the transfer characteristic of a device under test. This is done by using readings from the two channels. One channel acts as the Input channel and the other channel as the Output channel.

The Input channel provides a measure of the input signal to the device under test (DUT). For example, if calibrating a pressure transmitter, the Input channel could be the DPI610E Internal Pressure which measures the supplied pressure to the DUT.

The Output channel measures the output signal from the DUT. If calibrating a 4 to 20 mA process transmitter, the output channel would be the Current Measure.

By default, the Analysis application uses the functions and measurement units set up in CH1 as the Input and the function set up in CH2 as the output. This means that the required functions for analysis must be selected in the Calibrator screen before starting the Analysis application (Refer to “Calibrator Tasks” on page 55 for more details.)

There is however the option to toggle between Input and Output selection for both functions.

For the Analysis application to run, both channels must be enabled with a valid function i.e., any function option except “None”.

At each test point value, the Analysis function calculates the difference of each Output channel to the ideal transfer characteristic and compares this to a user specified tolerance limit. This deviation is calculated and can be displayed in different user defined formats. In addition, the tolerance test result is shown as a **Pass** or **Fail**.

10.2 Analysis Application

Select the **Analysis** icon on the Dashboard to start the Analysis application.

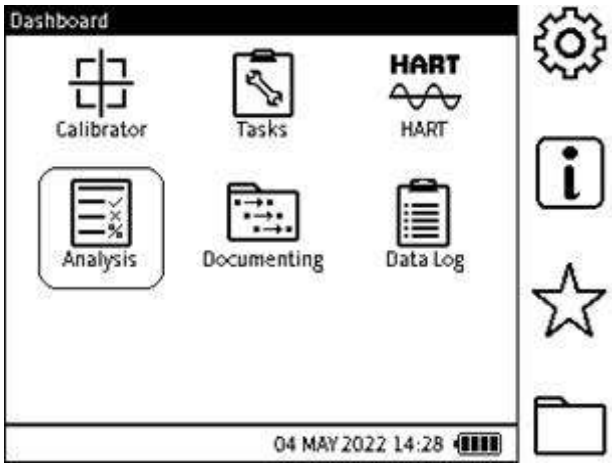

Figure 10-1: Instrument Dashboard

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10.3 Setup

The **Analysis Setup** screen shows the selected **CH1** and **CH2** calibrator functions and units. The required functions needed in the Analysis application, need to be selected in the Calibrator application prior to running Analysis. For example, to run analysis on a pressure transmitter with a 4 to 20 mA output, **CH1** can be configured to **INT** Pressure and **CH2** to **Current Measure** (with 10/24 V power if required). Select the required types of measurement units.

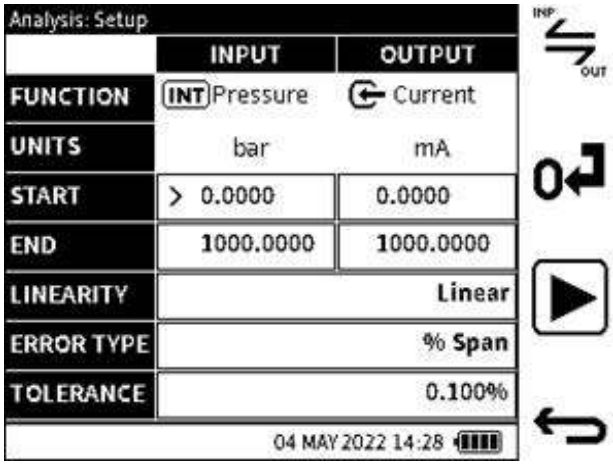

Figure 10-2: Analysis Function screen

The **INPUT** and **OUTPUT** functions can be interchanged using the toggle softkey.

10.3.1 START/END Values

The measurement range for the input and output channels is defined by setting a **START** (Low) and **END** (High) value for each channel. The default values displayed are usually the negative and positive full-scale values of the related function. When Current Measure is selected, the default **START** and **END** values, are 4 and 20 mA. When entering **START** and **END** values, any value entered which falls outside the full-scale limits of the selected function will be rejected.

10.3.2 LINEARITY

The transfer characteristic from **INPUT** signal to the **OUTPUT** signal can be either:

Linear	- when the transfer characteristic is a directly proportional relationship.
Square Root	- when the transfer characteristic has a square-root relationship. This is commonly found in flow sensors.

The default Linearity option is Linear.

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10.3.3 ERROR TYPE

The error or deviation from the transfer characteristic can be calculated and expressed in any of the following options:

% Span	- a percentage of the Output signal span.
% Full Scale	- a percentage of the Output signal full-scale.
% Reading	- a percentage of the Output signal reading.
Fixed	- absolute measurement units of the Output signal.

The default option is % Span.

10.3.4 TOLERANCE

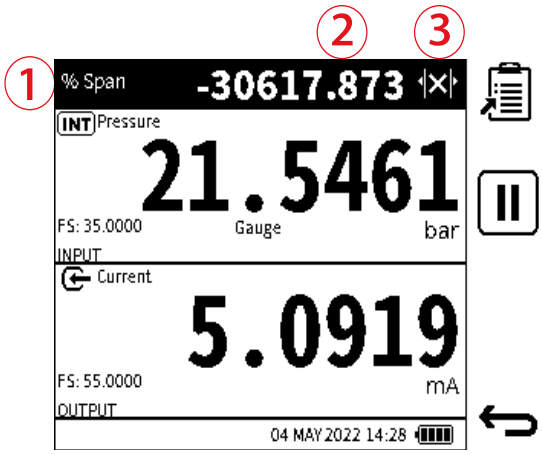
Use this option to define the tolerance or test limit values for the calculated result error or deviation from the transfer characteristic. The tolerance value is expressed either as a percentage (%) or as an absolute or fixed measurement unit e.g., mA. This is reliant on the Error type selected.

The default tolerance value is 0.1%.

10.4 Analysis Function

Set the **Input** and **Output** channel and error analysis parameters as described in “Analysis Application” on page 178.

Select the **Play** button to start.



The **Analysis** main screen window displays the following:

1. The deviation tolerance type.
2. The error/deviation value of the output channel from the ideal transfer characteristic.
3. A live indication of the tolerance result status icon which is one of the following:

PASS - the currently measured output value lies within the specified tolerance limits.

FAIL - the currently measured output value lies outside the specified tolerance limits.

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The screen is in two sections. Each section displays information for a channel and is either the **Input** or **Output** channel.

To test the full range of the Device Under Test (DUT):

- Step the input signal value through its range. In the example screen shot, step the internal pressure generated by using the DPI610E pump from the lower range of the DUT to the full-scale pressure value.
- At each setpoint step, check the Analysis status at the top of the screen for the deviation.
- When the test is complete, exit the Analysis screen using the **Back** button.

10.4.1 DATA LOGGING within Analysis

Checking a DUT in the Analysis application can be documented using the Datalog. To use this feature, select the **Data Log**  icon. For more information on **Data Log**, see Chapter 9 on page 159. When using **Data Log** in the Analysis application, only the **Key Press** trigger mode is available.

- Enter the required **Data Log** file name.
- Select the **Play**  softkey to proceed.
- At each **Setpoint** step (or when desired), press the “Add Datapoint”  softkey to capture the current analysis data displayed by the screen.
- When the testing is complete, press the **Back** icon to exit the Datalog and Analysis application.

Datalog files can be accessed via the **Data Log** application (Refer to “Data Log” on page 159).

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11. Documenting

11.1 Overview

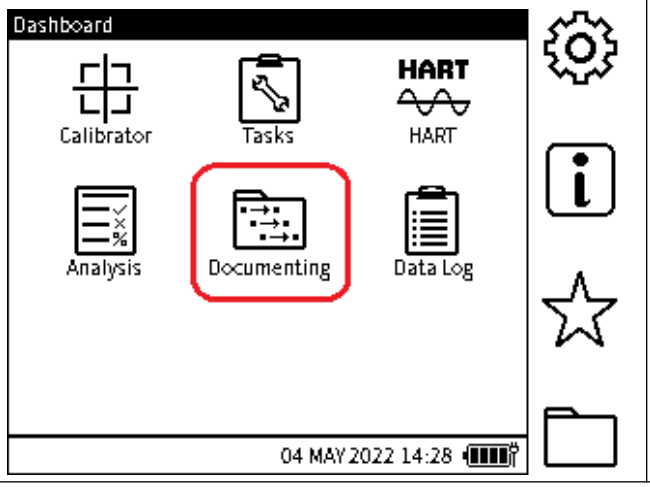
Use the Documenting application to do documented calibration of Device Under Test (DUT) equipment or of assets using defined test procedures.

Test procedures can be created within the Documenting application and stored for future use.

When test procedures are used to calibrate DUTs, the test details and results of the calibration are saved in DPI610E memory. This data can also be transferred to a PC for further analysis or post calibration tasks.

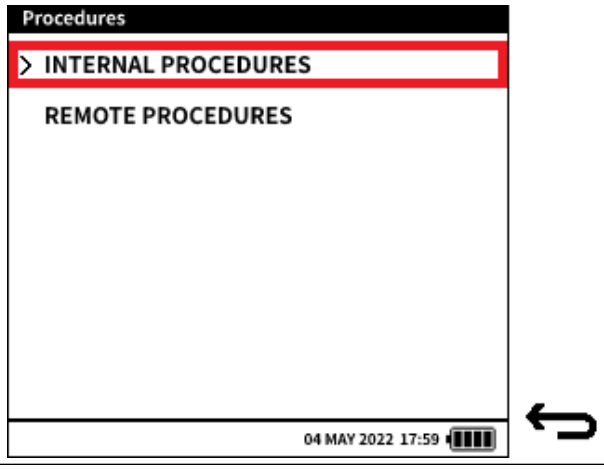
A calibration certificate template wizard is provided by Druck to transform the data into a professional looking format for printing or filing purposes. The related Excel Macro file is available on: Druck.com/DPI610E as “Druck DPI610E Calibration Template”.

11.1.1 How to start the Documenting application

	Select the **Documenting** softkey from the Dashboard. This will show the **Procedures** screen.

11.2 Internal Procedures

11.2.1 How to select the INTERNAL PROCEDURES mode.

Step 1		To view, create or run internal procedures, select the **INTERNAL PROCEDURES** softkey from the **Procedures** screen. This will show a list of available internal procedure files.

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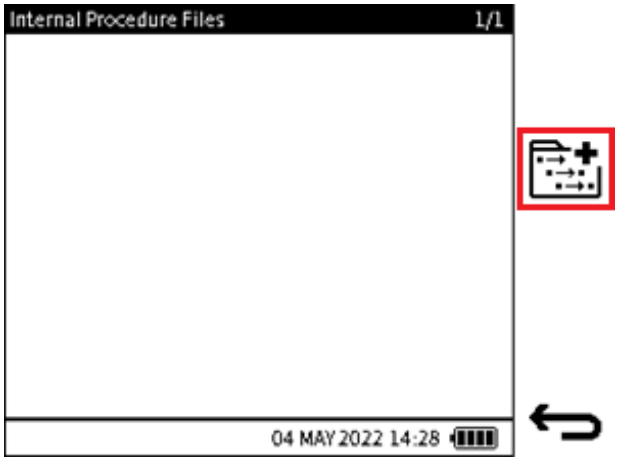
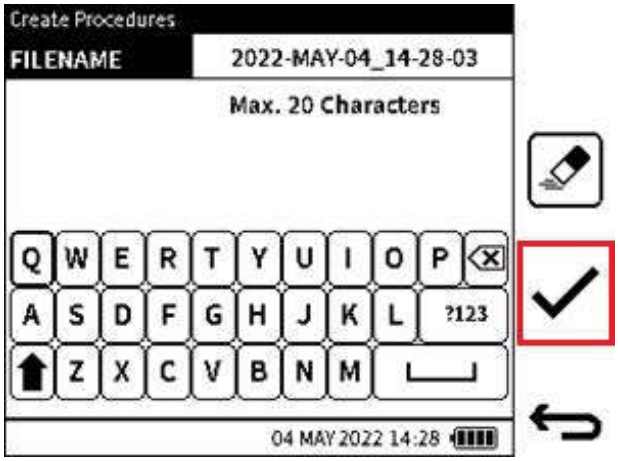
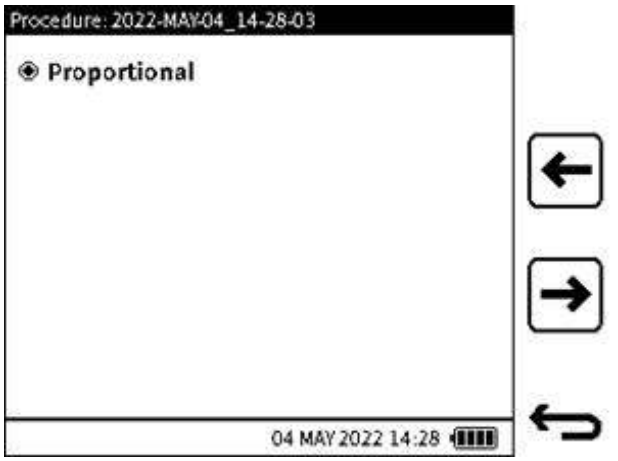
11.2.2 How to create an Internal Procedure

Step 1		This screen appears after **INTERNAL PROCEDURES** has been selected from the **Procedures** screen (see Section 11.2.1 on page 182). The **Internal Procedure Files** screen shows the list of available internal procedure files. The number of Assets on which each procedure has been run and calibration results saved will also be shown alongside the Procedure file name. See Section 11.2.3 on page 191 on how to run a test procedure. If no procedures have been created or saved, the **Internal Procedures** screen will be blank. Select the **New Procedure** Softkey to start the Procedure Creation wizard. **Note**: Functions on **CH1** and **CH2** configured in Calibrator, will be used as the input and output functions when creating an internal procedure.
Step 2		Enter a filename for the test procedure or use the default filename which is based on the system date and time stamp. **Note**: A maximum of 20 characters is supported for the filename. Select the **Tick** softkey to confirm and show the **Create Procedure** screen.
Step 3		Select the type of calibration required. **Proportional** is the default option. Press the **Next** softkey to proceed or the **Previous** softkey to go back one step.

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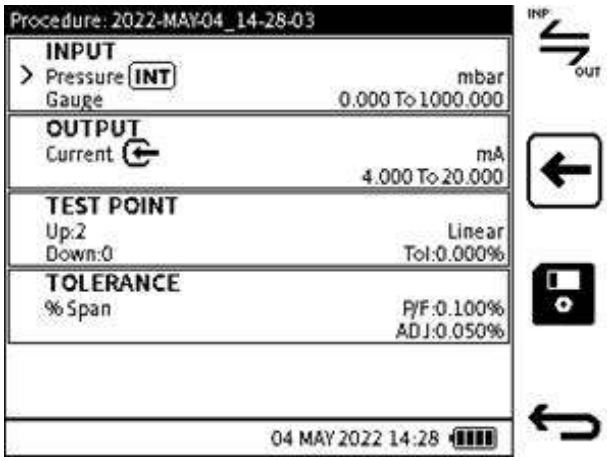
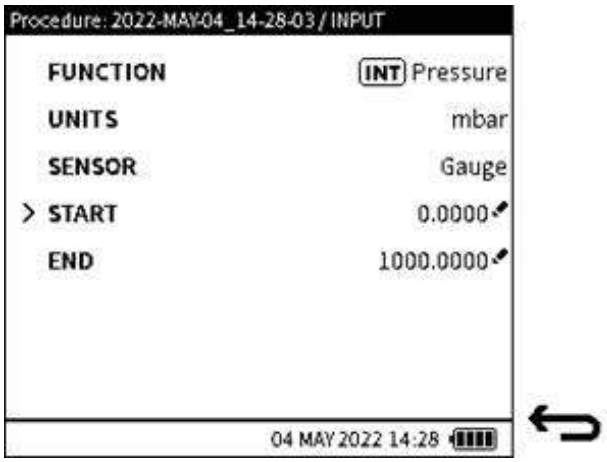
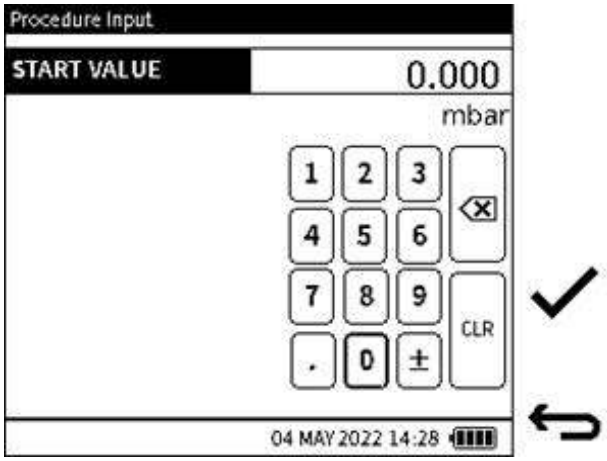
<table>
<tr>
<td rowspan="3">Step 4</td>
<td>
</td>
<td>This is the test procedure setup screen that has the following sections that are critical to the procedure:
1. Input
2. Output
3. Test Points
4. Tolerance.
These details are auto populated based on the current Calibrator configuration, parameters configured in the Analysis application setup and other default settings. Details of each section is given in the following steps.</td>
</tr>
<tr>
<td>
</td>
<td rowspan="2">INPUT: The input refers to the test input signal to the Device Under Test (DUT). The input function type, the sensor type (where applicable), the range, and the measurement units all appear in this section.
By default, the Function (and hence Sensor type) set up in CH1 is configured as the input with the selected Units. These are read-only and not editable in the procedure creation wizard. If any changes are required, these must be done in Calibrator prior to the use of the Documenting application.
The input range is auto populated by default with the full sensor range related to the Function. Only the range can be edited and must be within the full sensor range. Set the START and END values of the input range if different to the values displayed.
Note: It is possible using the Toggle softkey to swap the Input and Output functions i.e., use the original Input function as the Output function and vice versa.</td>
</tr>
<tr>
<td>
</td>
</tr>
</table>

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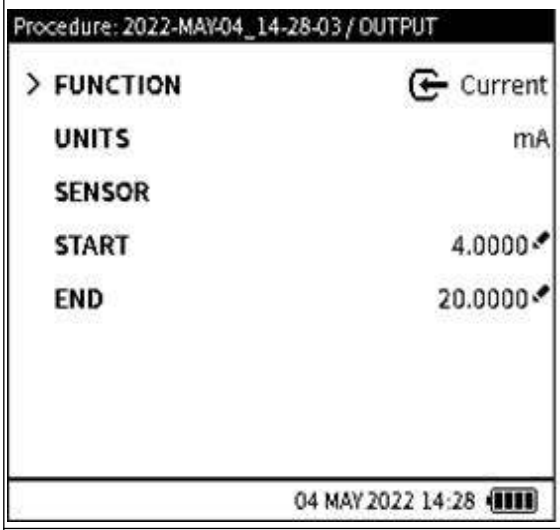
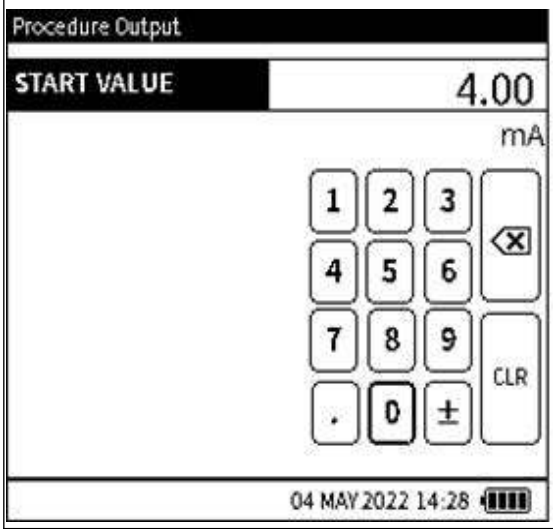
Step 4 Cont'd



OUTPUT: The Output refers to the output signal from the Device Under Test (DUT). By default, the **FUNCTION** (and hence **SENSOR** type) set up in **CH2** is configured as the output with the selected **UNITS**. These are read-only and not editable in the procedure creation wizard. If any changes are required, these must be done in Calibrator prior to using the Documenting application.
The output range is auto populated by default with the full sensor range related to the Function. Only the range can be edited and must be within the full sensor range. Set the **START** and **END** values of the input range if different to the values displayed.



Note: It is possible using the **Toggle** softkey to swap the Input and Output functions i.e., use the original Input function as the Output function and vice versa.



TEST POINT: This refers to input points at which the device under test (DUT) is tested and its calibration data recorded.
POINTS UP & **POINTS DOWN**
The number of calibration points must be specified within the specified Input range. This can be specified as **POINTS UP** i.e. direction from **START** range value to **END** range value or/and **POINTS DOWN** i.e. direction from **END** range value to **START** range value.
The default setting is 2 POINTS UP and 0 POINTS DOWN. This means there will be two test points - the first test point will be the Input Start value and the second will be the Input End value.

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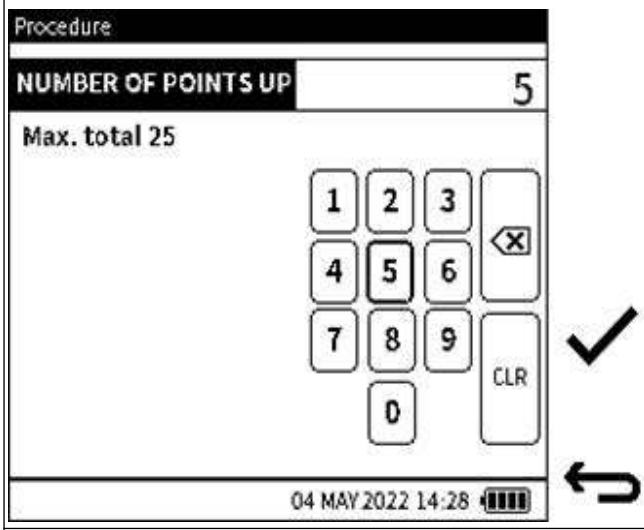
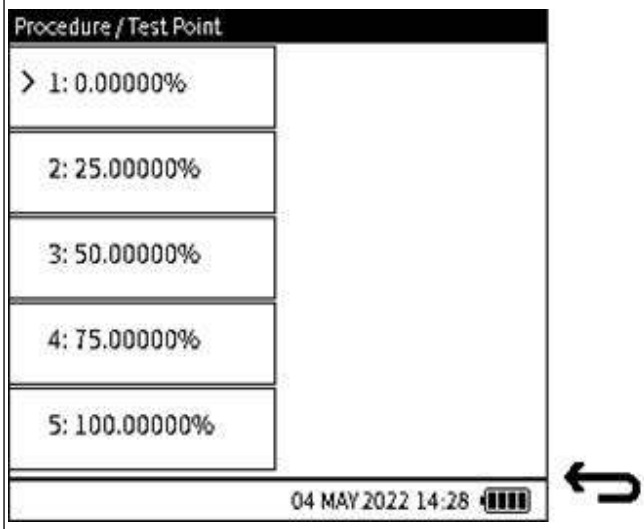
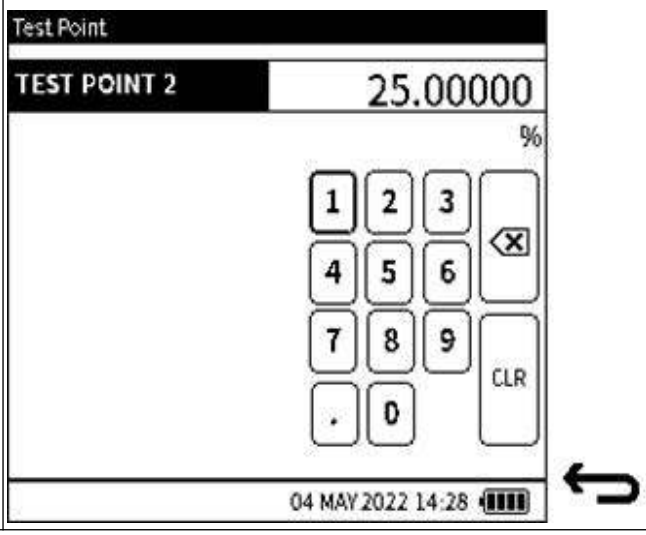
<table>
<tr>
<td rowspan="2">Step 4
Cont'd</td>
<td>
</td>
<td>Set the desired number of points UP and DOWN if different from that displayed. Either UP or DOWN values must be between 0 and 25.
Note: There must be a minimum of 2 points UP and maximum of 25 test points in total (i.e., UP and DOWN combined).
For each Points UP and DOWN setting, the resulting test point values are calculated and can be viewed by selecting the View softkey.</td>
</tr>
<tr>
<td>


</td>
<td>In the Test Point screen, it is possible to manually adjust each test point if required by selecting the relevant test point box and changing the value. As shown in the screen below.</td>
</tr>
</table>

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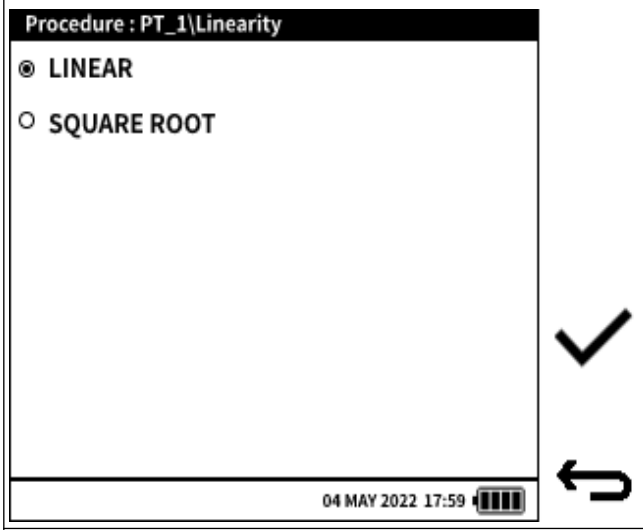
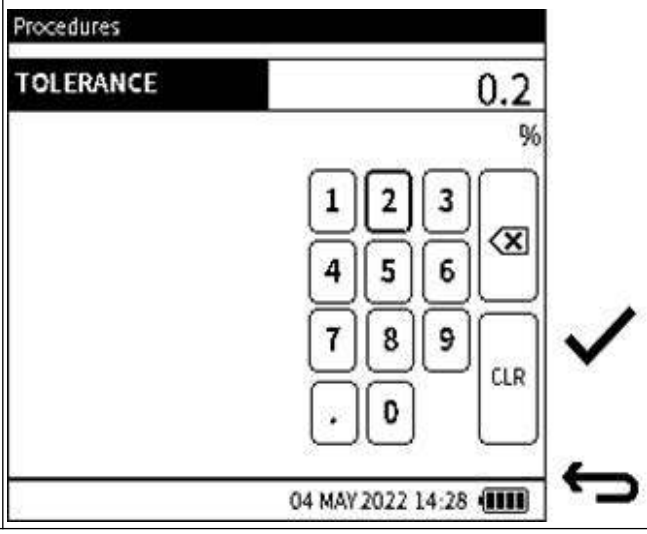
Step 4 Cont'd		**Linearity** – the relationship between the input and output can also be specified i.e., either Linear or Square Root transfer function. The default is Linear. The use of a square root function is necessary for pressure transmitters that measure fluid flow. This fluid flow produces pressure readings that do not follow a linear relationship.
		**TOLERANCE** – this is the maximum deviation or permissible error margin for each input test point in the calibration. It is specified as a percentage of the Input range. The default test point tolerance value is 5% and can be changed if required.

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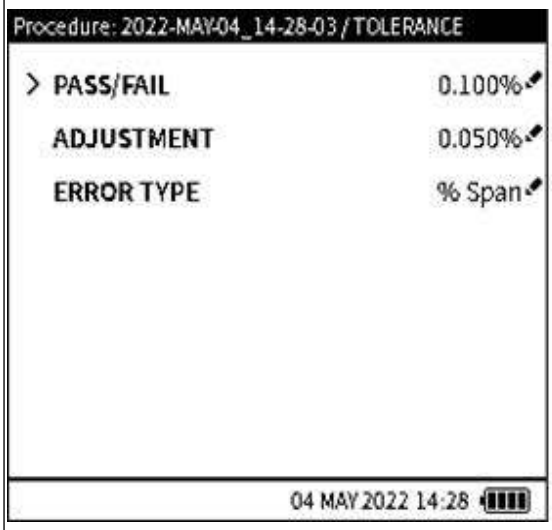
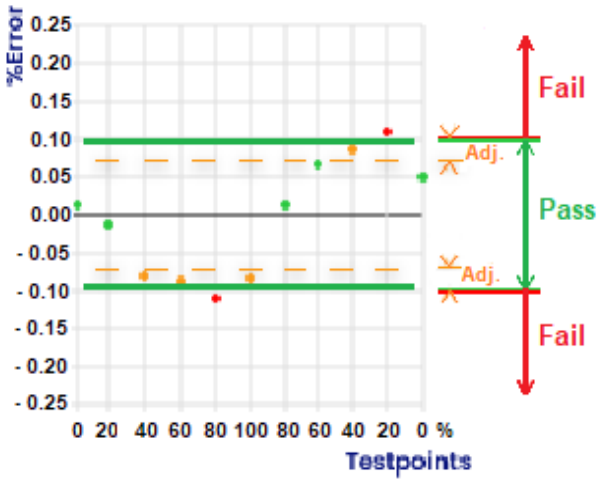
Step 5	 	**TOLERANCE**: This section refers to the deviation on the output signal or result with respect to each input signal setpoint applied.

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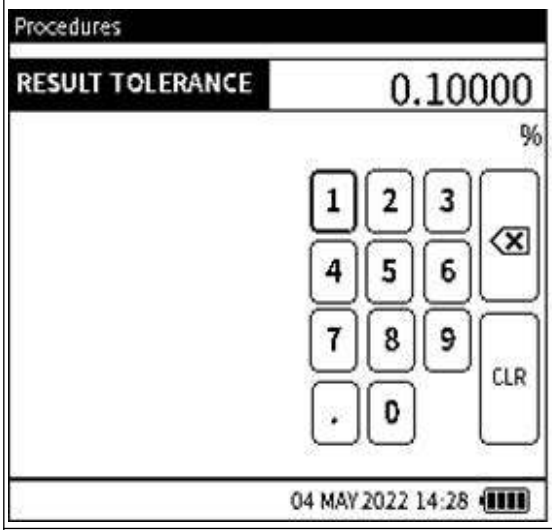
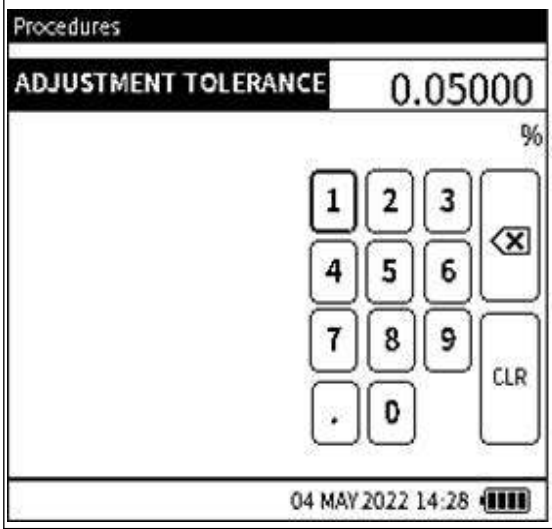
Step 5 Cont'd		**PASS/FAIL** (or **Result Tolerance**) (**P/F**): This sets the maximum deviation that determines if the result (output) at each test point is within specification (**PASS**) or out of specification (**FAIL**). It is expressed as a percentage of the output or in fixed measurement units depending on the tolerance type. The default value is 0.1% (based on % FS).
		This screen is for the **ADJUSTMENT** value in the **Procedure: PT_1/Tolerance** screen on the previous page. **ADJUSTMENT** (**Tolerance**)**:** This sets the maximum deviation within the **PASS/FAIL** tolerance which indicates that the Device Under Test (DUT) is close to out of specification limits. Hence the **ADJUSTMENT** tolerance value must be less than the **PASS/FAIL** tolerance value to be captured. If an **ADJUSTMENT** tolerance is not required, the adjustment tolerance value can be equal to the **PASS/FAIL** tolerance. The default value is 0.07% (based on% FS).
		Use this screen to set the way the maximum deviation is calculated. The four options for this calculation are given by the graph in the next row. **ERROR TYPE** (**Tolerance**)**:** this specifies the way the maximum deviation is calculated and expressed. Options include: • %FS (Percent of Full-scale) • %Span (Percent of Span) • %Percent of reading) • %Fixed (Measurement units). See Section 10.3.3 on page 180 for more details. The default is % Full-scale (%FS).

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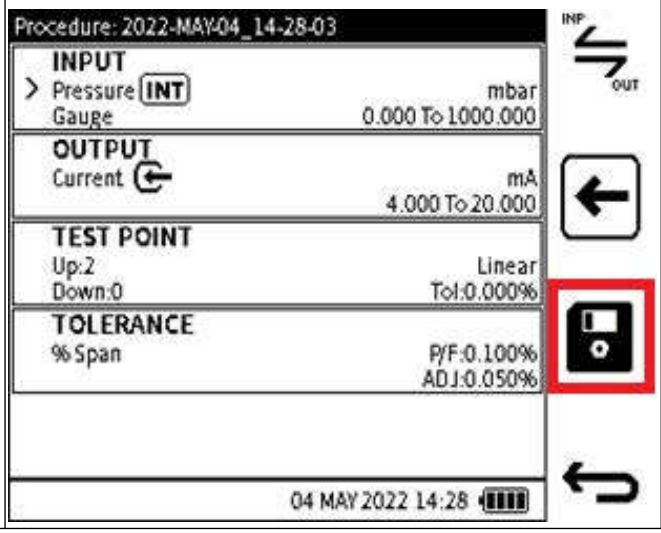
Step 6		When the details of the test are completed, press the **Save** softkey to save the procedure. The test procedure after being saved, becomes immediately available for use.

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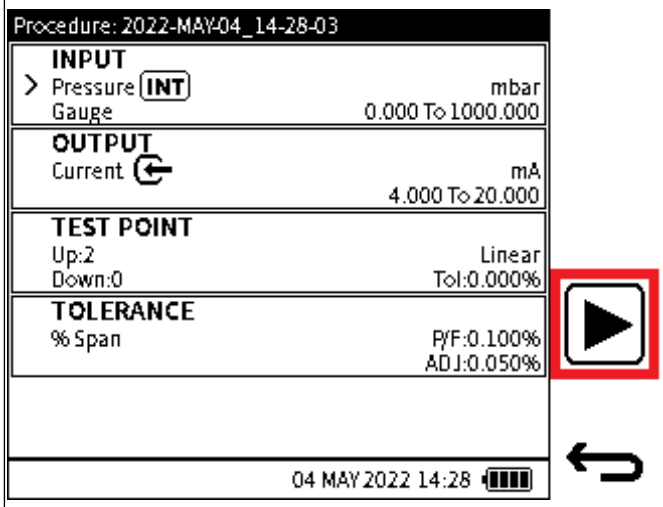
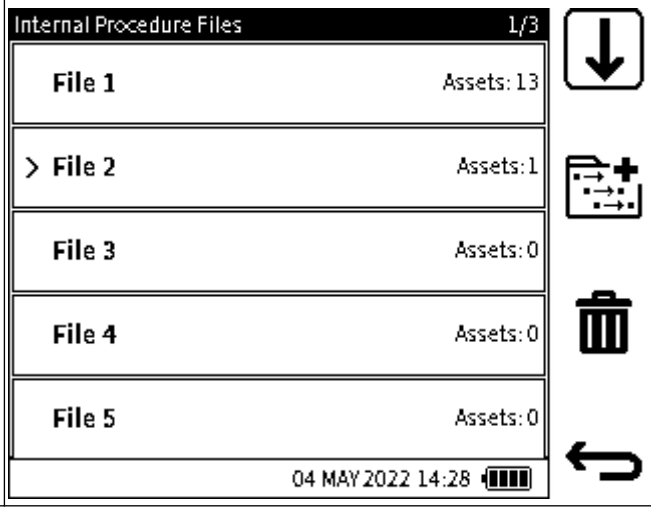
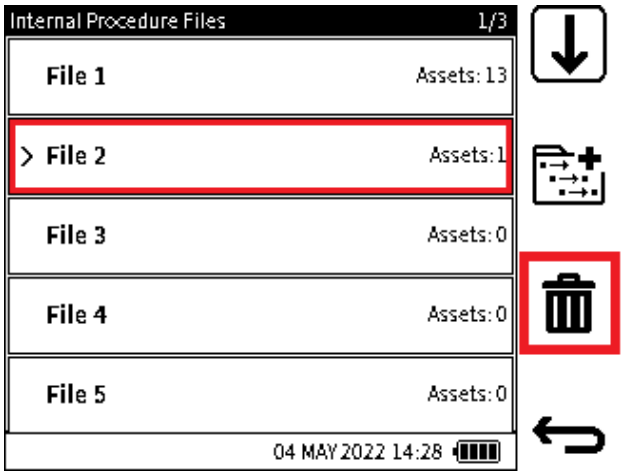
11.2.3 How to start a Test Procedure

Step 1		Once the test procedure has been saved successfully, it is available to be used immediately by selecting the **Play** softkey.
Step 2		The test procedure can also be selected from the **Internal Procedure Files** screen. Select a test procedure, for example, **File 2**, by tapping in the row or using the Navigation pad.

11.2.4 How to delete a Test Procedure

	Tap or use the Navigation pad buttons to select the row that has the test procedure file name: in this example, **File 2**. Tap or use the softkey to select the **Delete** icon, to delete the file name from the list. **Note**: When a Test Procedure is deleted, any asset data saved as part of the procedure file will also be deleted.

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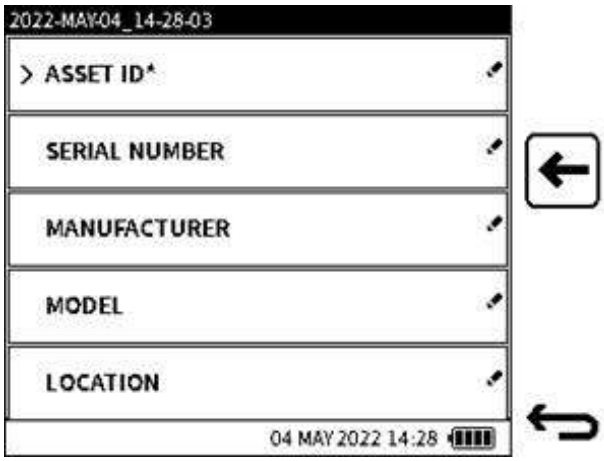
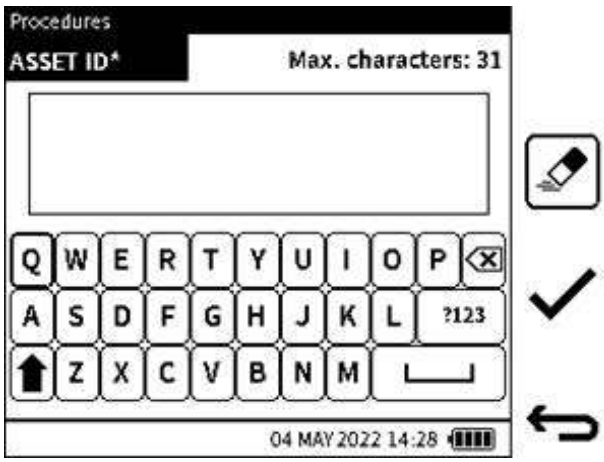
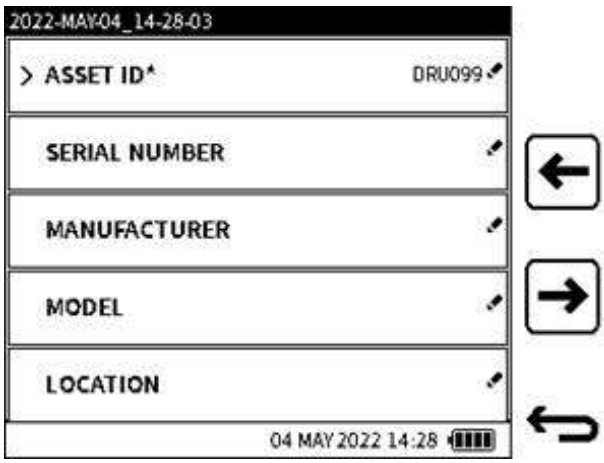
11.2.5 Starting a Test Procedure

When a test procedure has been created and saved in DPI610E memory, it can be run by selecting the **Play** softkey. Additional data about the DUT, Environment and User is required each time the test procedure is run.

11.2.5.1 DUT data

<table>
<tr>
<td rowspan="3">Step 1</td>
<td>
</td>
<td rowspan="2">Enter the following data about the Device Under Test:

ASSET ID (Mandatory) – This is a unique tag or device reference that is given to the asset or DUT. This ID will be used as the default result filename when the calibration is completed. Maximum number of characters: 31.
SERIAL NUMBER (Optional) – the serial number of the asset or DUT. Leave blank if not known. Maximum number of characters: 50.
MANUFACTURER (Optional) – the manufacturer of the asset or DUT. Maximum number of characters: 30.
MODEL (Optional) – the model's name or number of the asset or DUT. Maximum number of characters: 30.
LOCATION (Optional) – the physical location of the asset or DUT. Maximum number of characters: 50.</td>
</tr>
<tr>
<td>
</td>
</tr>
<tr>
<td>
</td>
<td>When the required fields have data in them select the Next screen icon to go to the next step.</td>
</tr>
</table>

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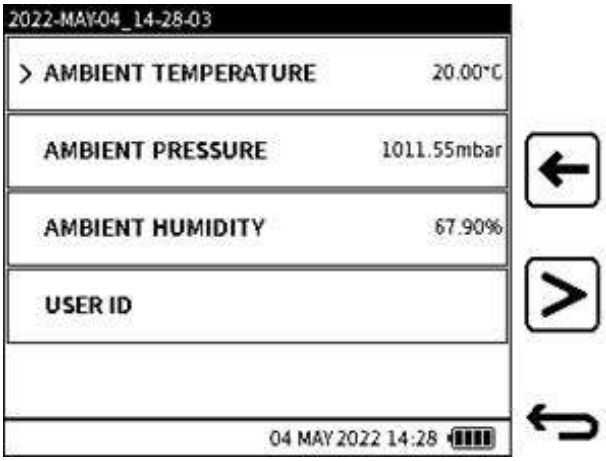
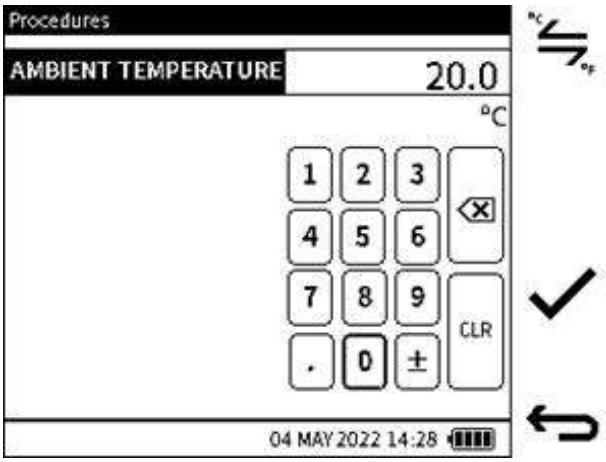
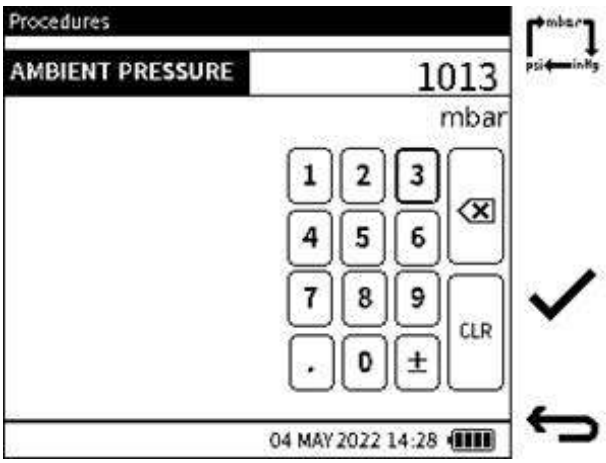
11.2.5.2 Environment and User ID data

Step 1	  	If required, enter the following ambient environment and user details. **AMBIENT TEMPTERATURE** – Enter the ambient temperature value where the test is being done. Temperature units available are °C or °F. Use the **Toggle** softkey to switch between these units. The unit conversion will be done automatically: 20°C is the default ambient temperature value. Any value entered must be between -100 to +100 °C (-148 to 212 °F). **AMBIENT PRESSURE** – Enter the ambient pressure value (or pressure of the day) where the test is being done. Pressure units available are mbar, psi or in Hg. Use the **Toggle** softkey to switch between these units. The unit conversion will be done automatically. For DPI610E pneumatic variants, the default ambient pressure value is obtained from the internal barometer sensor. On hydraulic variants, the default ambient pressure value is 1013 mbar. Any value entered must be between 800 to 1200 mbar (11 to 18 psi or 23 to 36 in Hg). **AMBIENT HUMIDITY** – Enter the ambient humidity value where the test is being done. The default value is 70%. Any value entered must be between 0 and 100%.

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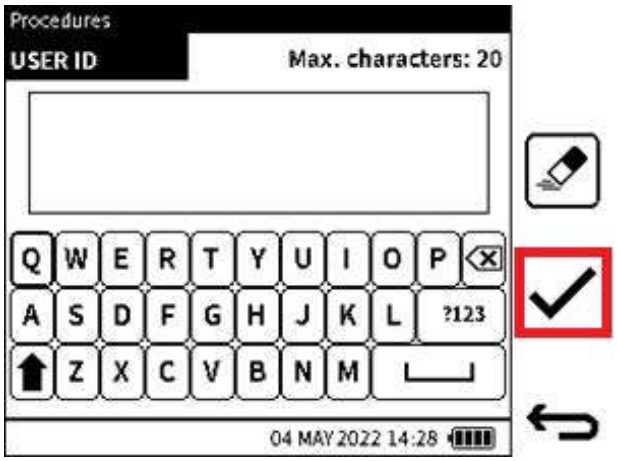
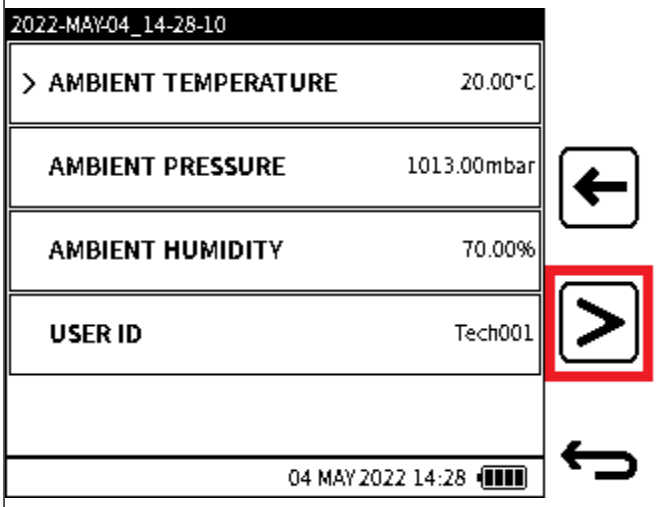
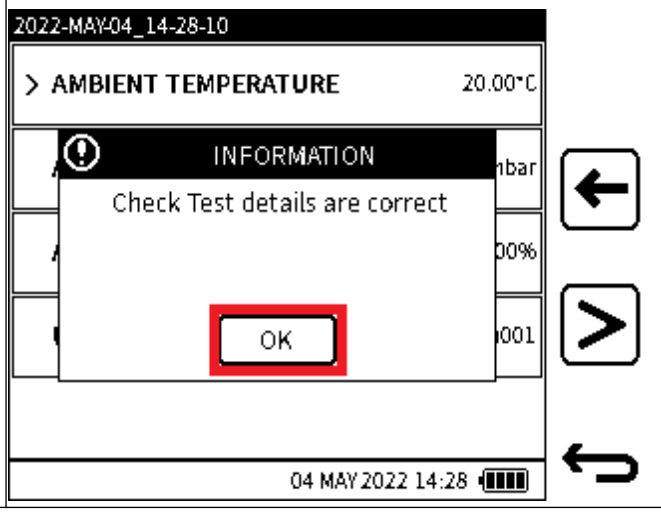
<table>
<tr>
<td>Step 1
Cont'd</td>
<td>
</td>
<td>USER ID – enter the User ID of the person doing the test procedure. Maximum number of characters: 20.

Select the Tick ✓ softkey to save the User ID entry or select the Back ⮌ softkey to return to the previous screen without saving.</td>
</tr>
<tr>
<td rowspan="2">Step 2</td>
<td>
</td>
<td>After the Environment and User ID data have been entered, select the Proceed > softkey to continue.</td>
</tr>
<tr>
<td>
</td>
<td>A popup message will appear to prompt the user to check all the details are correct. Select the OK button to clear the message. This provides a checkpoint where the user may go back and check all the details of the test procedure are correct.</td>
</tr>
</table>

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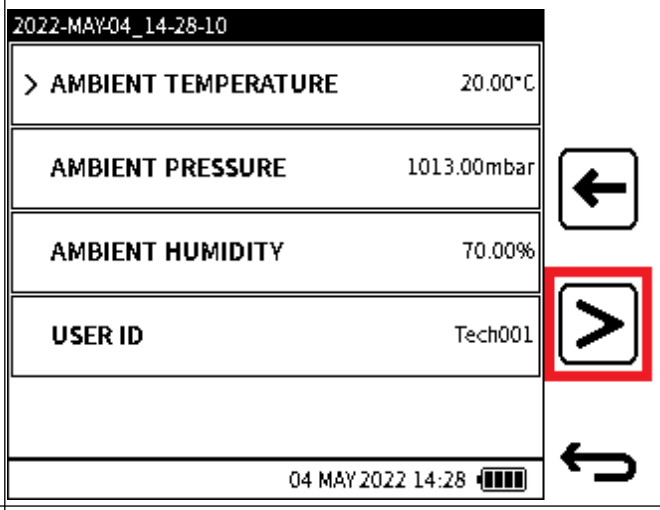
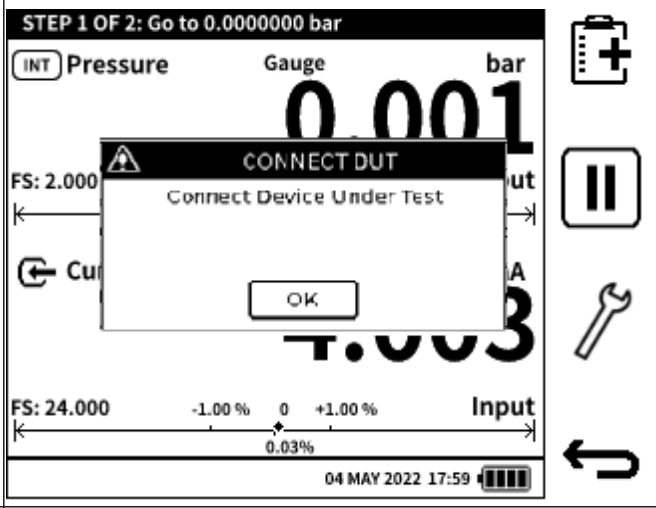
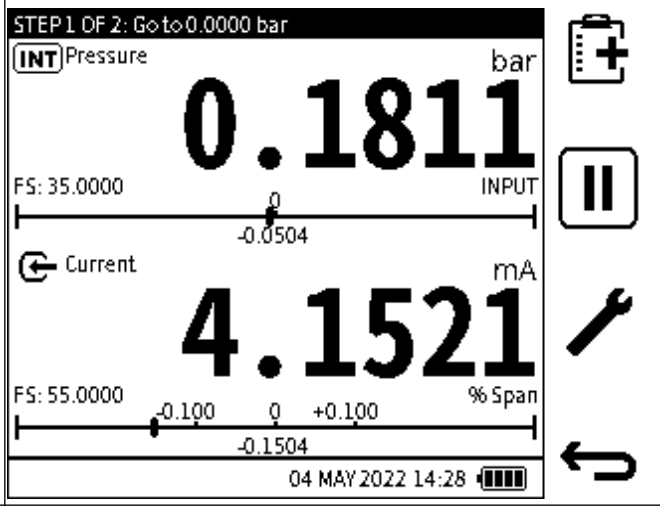
Step 2 Cont'd		When ready to start the test, press the **Proceed** softkey to continue.
Step 3		When the test configuration is complete, connect the Device Under Test (DUT) if not done already. A popup message will appear, to prompt the user to make this connection. Select **OK** only when the DUT has been connected successfully. The screen in Step 5 will appear.
Step 4		The DPI610E does a verification check to make sure the test requirements and the DUT connected match. At this stage any discrepancies will be identified, and the relevant popup message appears. For example, if a pressure sensor (DUT) is connected that is a different sensor type to that which the test specifies. Another example is if the DUT connected has an incompatible pressure range to that which is specified for the test.

The next section describes the components of the **Documenting Main** screen.

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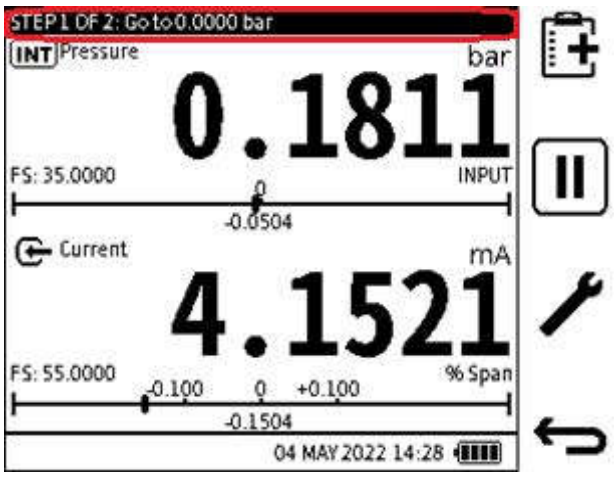
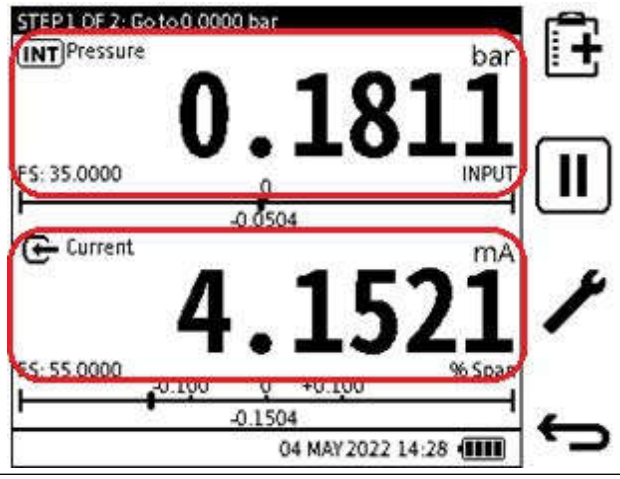
11.3 The Documenting Main Screen

This section describes the different elements of the **Documenting Main** screen.

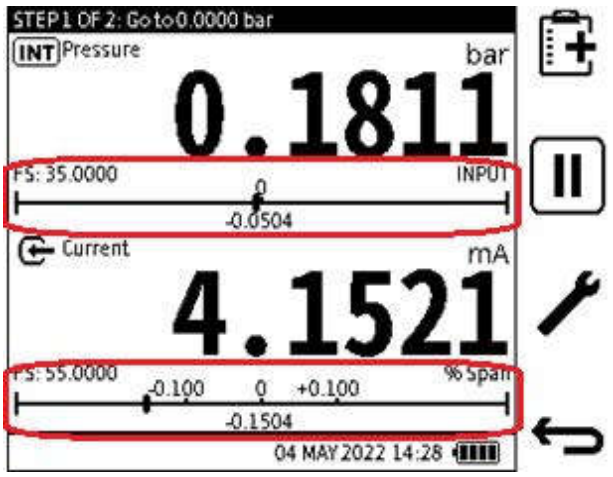


The title bar contains information about:

- Number of steps the test requires and what the current step is e.g., Step 1 of 2.
- The input test point value to apply e.g., Go to 0.000 bar.
- Completion status at the end of the test.



This screen shows the sensor information and readings for Input and Output. The top channel displays the Input information and the bottom channel, the Output.
In the output section, the Error Type appears below the reading on the right side of the window e.g.,% Span in the example screen.



The error and tolerance indicator is for both the input and the output.
The specified tolerance value is on either side of the zero mark. This value is based on the Error Type and hence is expressed as a % unless the Fixed units Error type is selected, which in this case is expressed as the Output measurement units.
The calculated live error is displayed below the zero mark in both input and output channels. A marker is also displayed to indicate the approximate error value point with respect to the specified tolerance and tolerance line.
Note: if the marker is not visible, check the error value as it most likely means the error is too large to be visible on the error and tolerance indicator.

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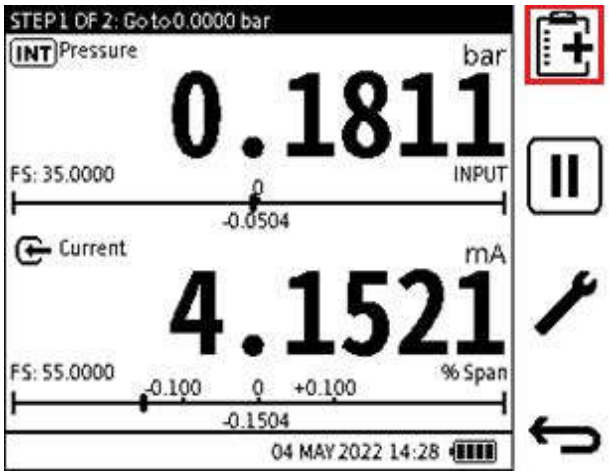	Select the **Add Test Point** softkey to capture the datapoint.

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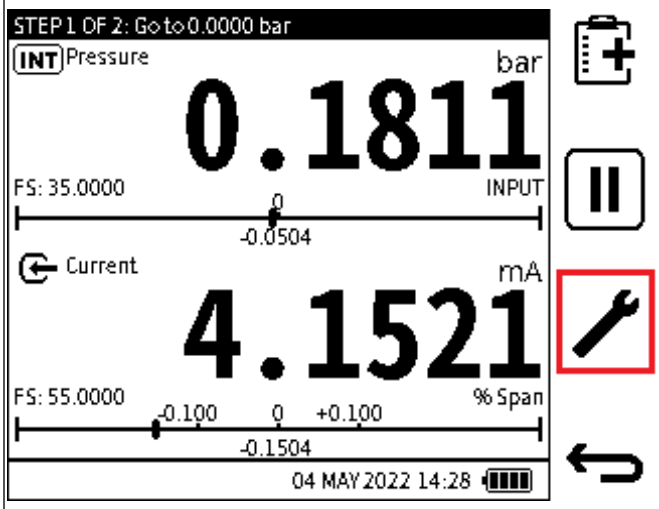
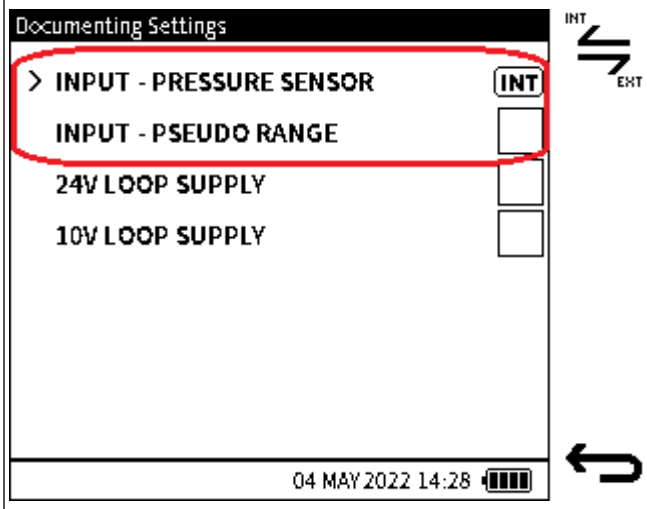
11.4 Documenting Settings

Step 1		If additional test procedure setup is required before documenting begins, select the **Setup** softkey.
Step 2		**Pressure Sensor Type** For pressure calibrations, if a different pressure sensor type is to be used from that which was used to create the test procedure, it is possible to change the sensor configuration to match. **Note**: This applies to the **INT** and **EXT** Pressure functions used as the Input or/and Output only. For example, if a gauge pressure sensor is specified in the test procedure and the available pressure sensor is an absolute pressure sensor, the absolute pressure sensor can be configured to pseudo gauge (pneumatic variants only) or sealed gauge (hydraulic variants only). To use **PSEUDO RANGE**, select the relevant pseudo-range option from the settings screen. The tick-box is ticked when enabled and unticked when disabled.

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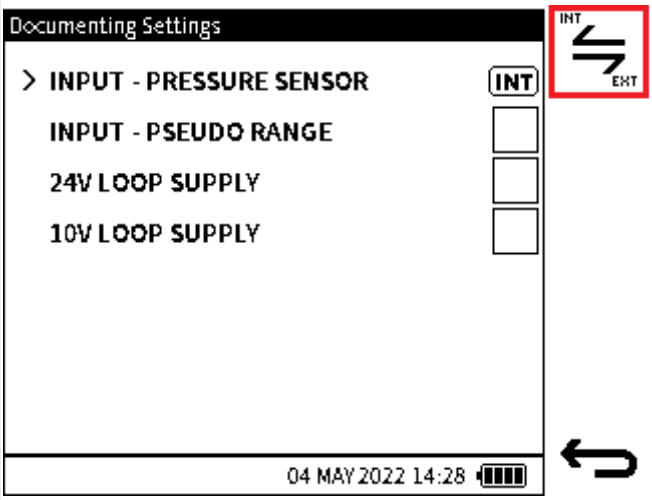
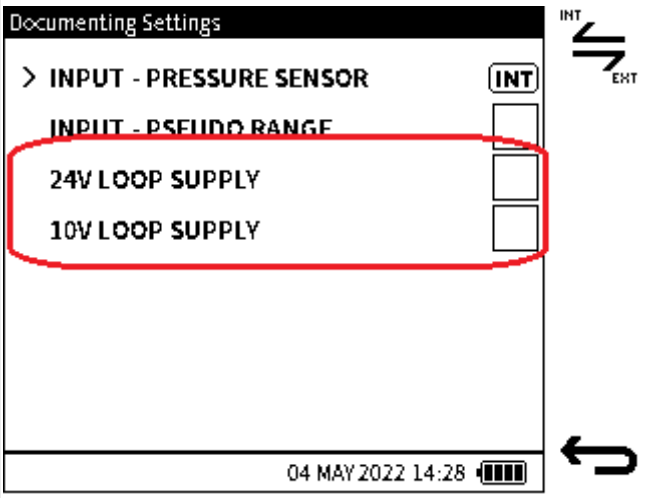
Step 3



Pressure Sensor Function
For pressure-to-pressure calibrations i.e., **INT** pressure and **EXT** pressure, it is possible to swap the assignments of the sensors as Input and Output by the use of the **Toggle** softkey.
Care must be taken to make sure the sensor type and range are compatible with that specified in the test.



10 V/24 V Power
Select the required option from the settings screen.
The tick-box is enabled when it has a tick mark and disabled when it does not have a tick mark.
Note: These options are only available when electrical functions are used in the test procedure.

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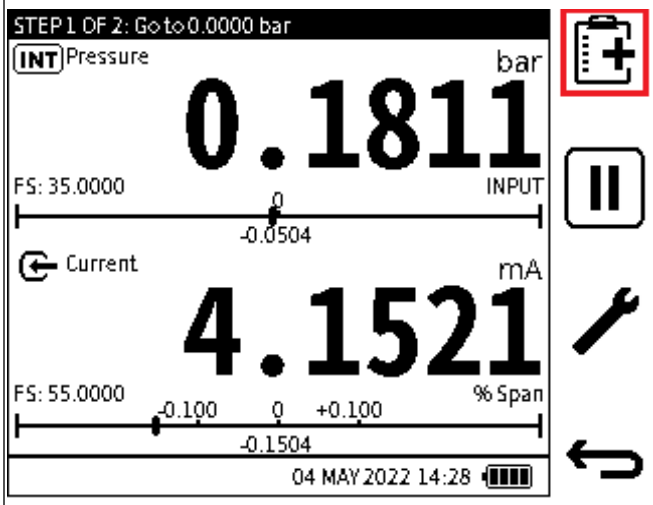
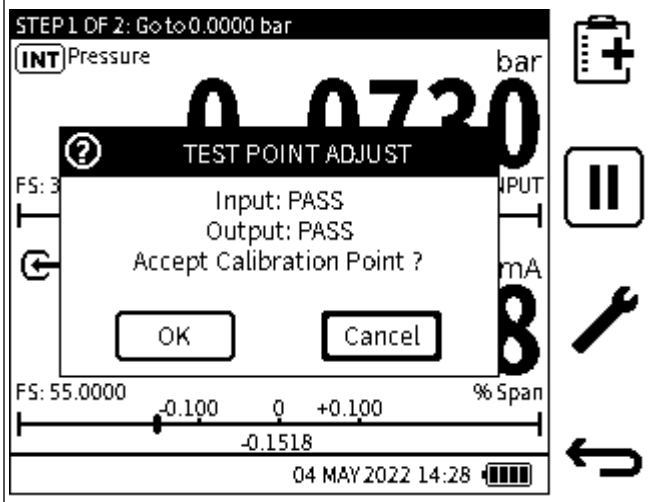
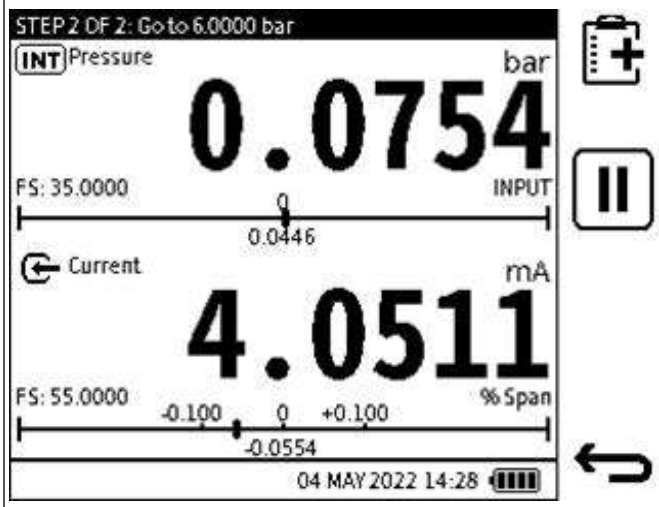
11.5 Running a Test Procedure

Step 1		Using the step instructions in the title bar, go to (or input) the Step 1 setpoint value displayed. In this example, apply 0.0000 bar using the DPI610E pump and/or volume adjuster. When the value is within the test point tolerance limits, select the **Add Test Point**  softkey to capture the datapoint.
Step 2		A popup message window appears that shows the **Pass/Fail** status of both the input (test point) and the output (result) and requires confirmation to log the calibration data point. Select **OK** to accept and log the reading or **Cancel** to abort.
Step 3		Go to the next step setpoint as shown in the title bar and repeat the previous step. Repeat until all steps have been completed and logged.

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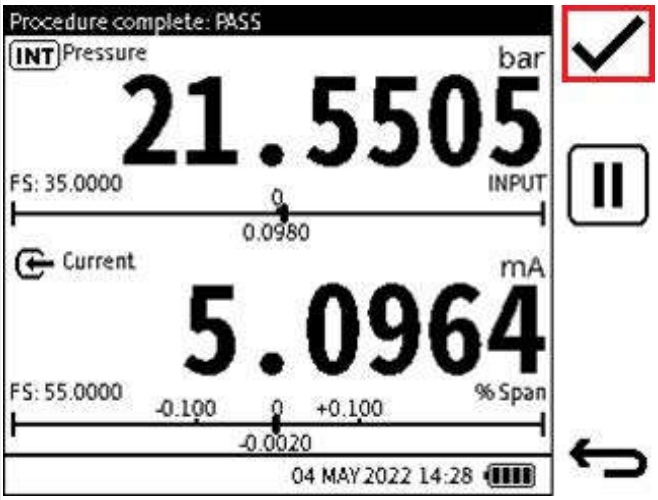
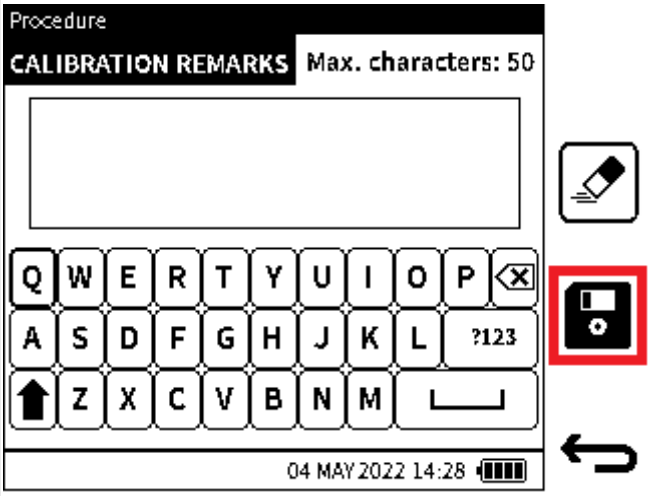
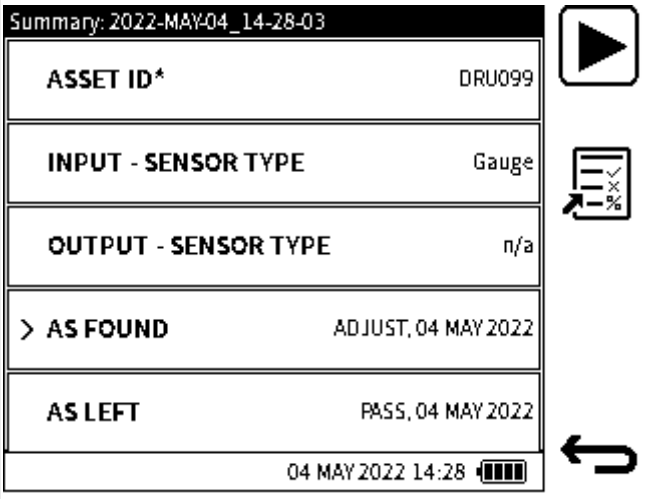
Step 4		After the last calibration data point has been logged, the **Tick** softkey will replace the **Add Test point** softkey. The title bar will show **Procedure complete**, together with a **PASS**/**FAIL**. Select the **Tick** ✓ softkey to confirm completion of the calibration.
Step 5		The following screen is the **CALIBRATION REMARKS** screen. Enter any comments worth noting relating to the calibration procedure just completed. This step is optional, and the **CALIBRATION REMARKS** field can be left blank. Maximum number of characters: 50. Select the **Save** softkey to save the **CALIBRATION REMARKS** and continue.
Step 6		The next screen is the Procedure result summary screen. This screen gives details of the test procedure just completed.

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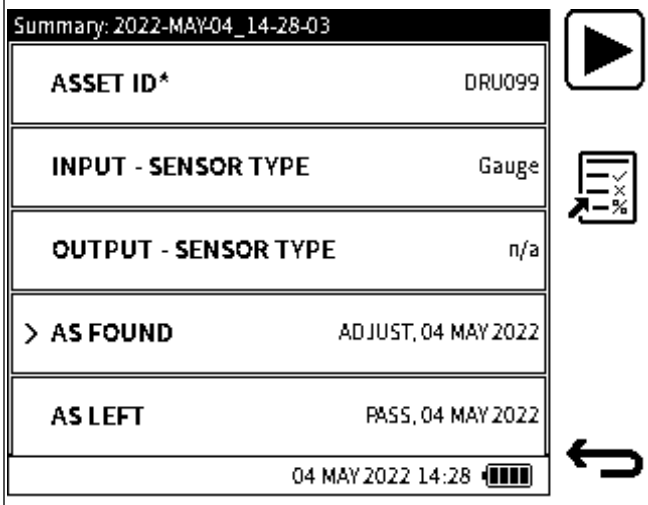
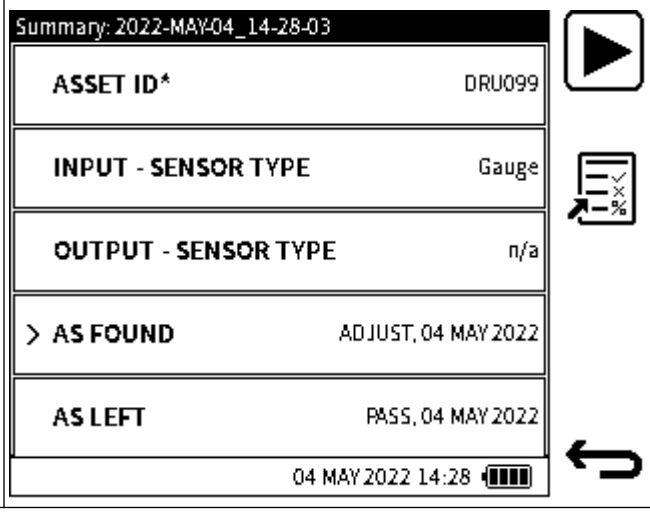
11.6 Post Examination of Test Procedure Results

Step 1		**Note**: When a test procedure is done on a new Asset for the first time, there will be no **As-Found** or **As-Left** results. When no **As-Found** or **As-Left** results are detected for a particular asset, the calibration data will be automatically saved as **As-Found**. If **As-Found** or **As-Left** results file is detected, then at the end of the test procedure there is the option to save the results as **As-Found** or **As-Left**. Selecting **As-Found** will overwrite any existing **As-Found** data. If no **As-Left** data is detected, and save as **As-Left** is selected, then a new **As-Left** results file is saved. If **As-Left** data file exists already, then the file is overwritten if **As-Left** option is selected.
Step 2		On the **Test Procedure Summary** screen, the option to re-run the test procedure using the same test details and device under test (DUT) details is provided by using the **Play** softkey. If you wish to exit, use the **Back** softkey to return to the **Internal Files Procedure** menu.

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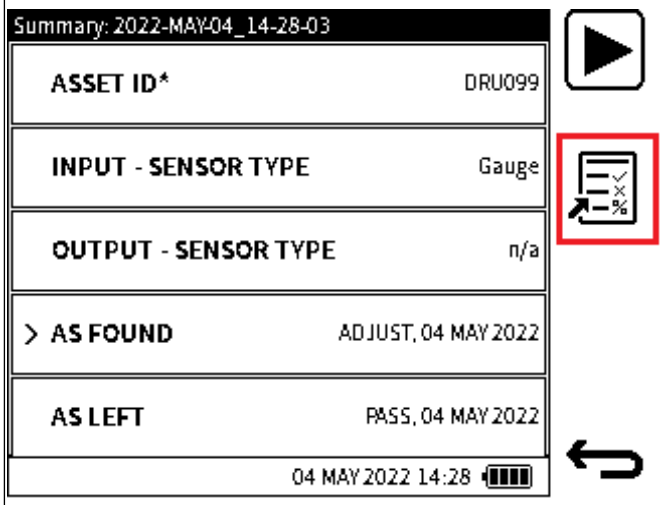
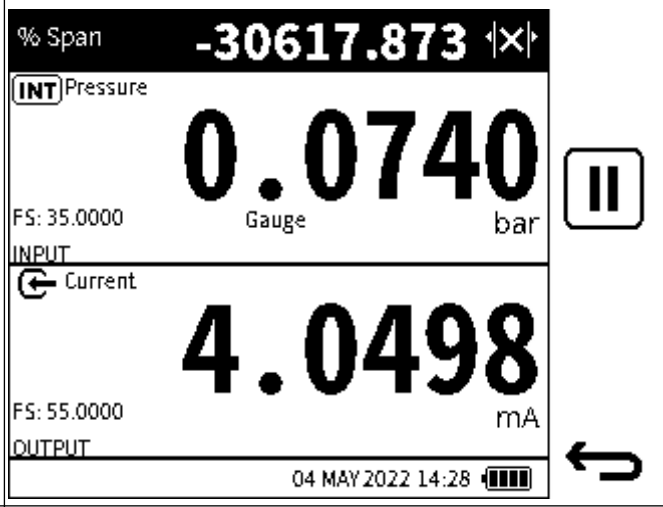
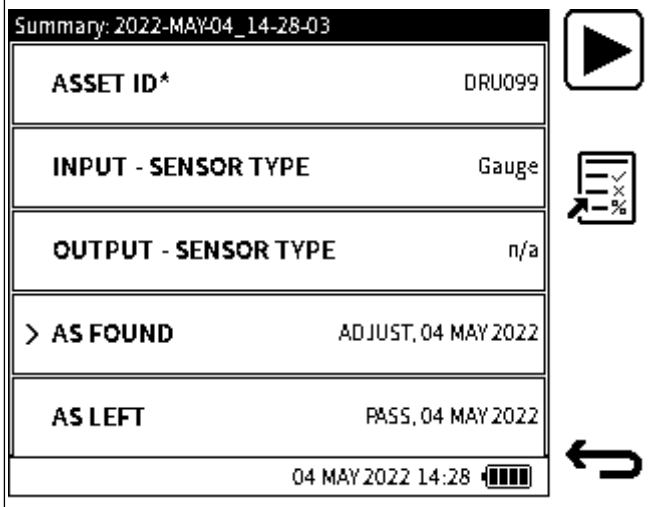
11.7 Making an adjustment on the Device Under Test (DUT)

Step 1		If at the end of the test procedure, an adjustment is required. For example, if the end result of the test procedure is a **Fail**. Then it is possible to perform and verify an adjustment using the **Analysis** softkey.
Step 2		Make the necessary adjustment to the DEVICE UNDER TEST (DUT) and check the output signal through its entire calibration range to ensure it is within spec before repeating the calibration test procedure. When the adjustment is complete, select the **Back** softkey to return to the **Procedure Summary** screen.
Step 3		The test procedure may now be done again after adjustment. Select the **Play** softkey or icon to do this.

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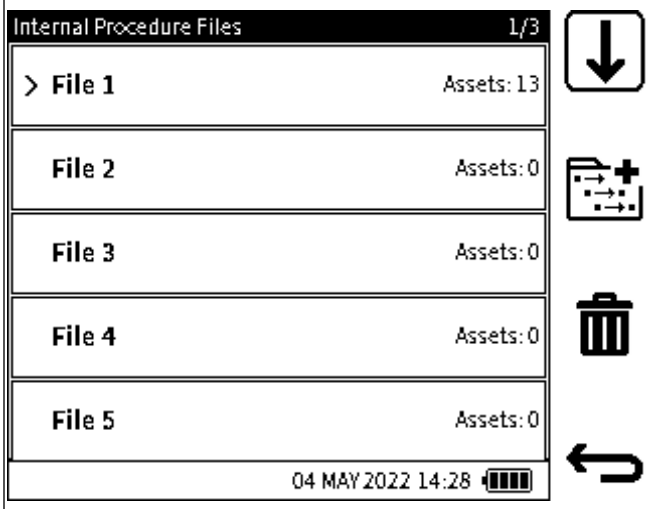
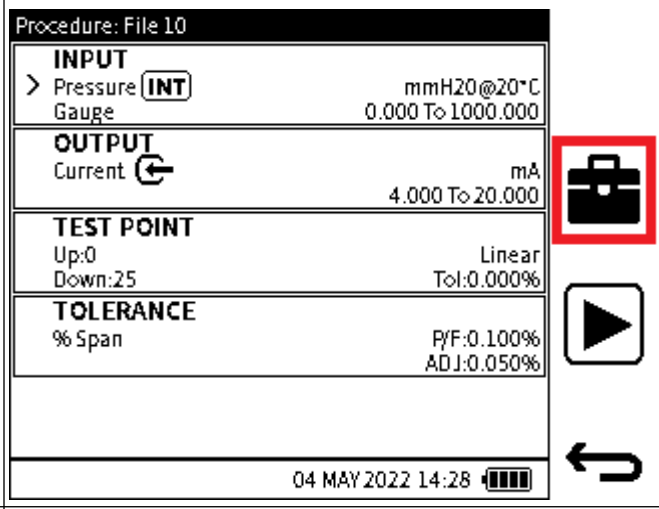
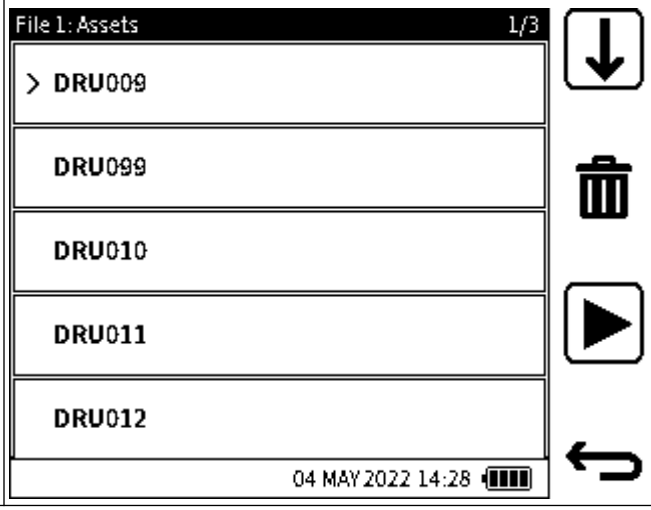
11.8 How to redo a Test Procedure

The instructions in this section relate to doing a Test Procedure again for an existing asset or Device Under Test (DUT).

Step 1		Select the desired test procedure file from the list in the **Internal Procedures Files** screen.
Step 2		Select the **Briefcase** (Assets) softkey to view the asset details which the test procedure has been done on.
Step 3		On the **Assets** screen, view all assets that this specific test procedure has been done on and logged. **Note**: Up to 25 Assets and results can be saved for each calibration test procedure. To redo the test procedure on the selected asset or Device Under Test (DUT). Select the **Play** softkey from this menu screen.

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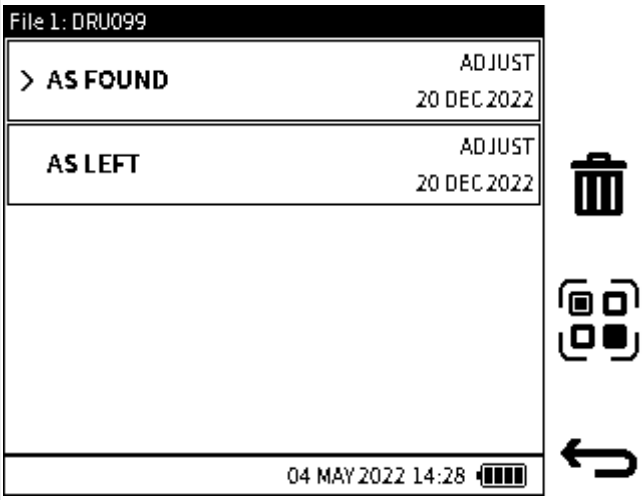
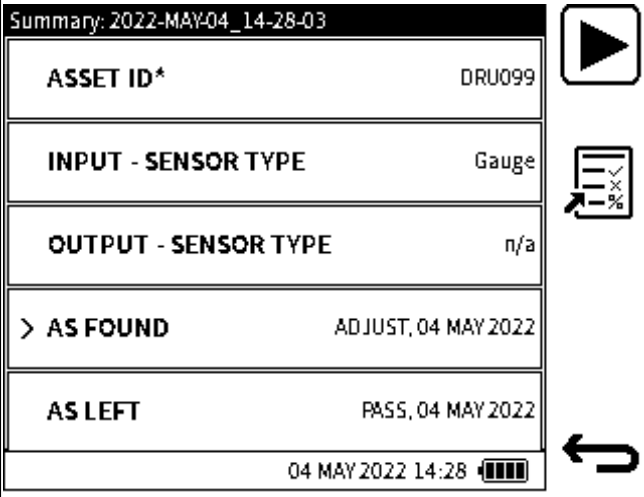
Step 4		To view **As-Found** or/and **As-Left** calibration results, select the desired Asset filename by tapping once to select and a second time to open. Any available results associated with that test procedure and asset will appear on the screen.

11.9 How to View Test Results.

Step 1		Results can be viewed immediately after the test procedure is complete, by tapping on the required result (i.e., **As-Found** or **As-Left**) from the procedure **SUMMARY** screen. The results can also be viewed by selecting the relevant Test Procedure file and required asset file.

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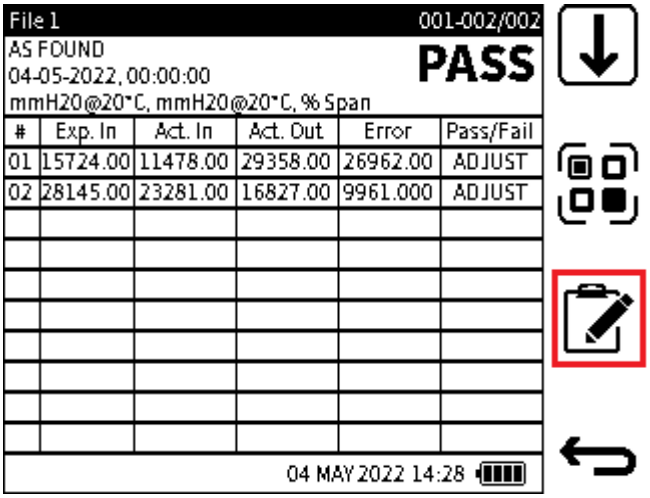
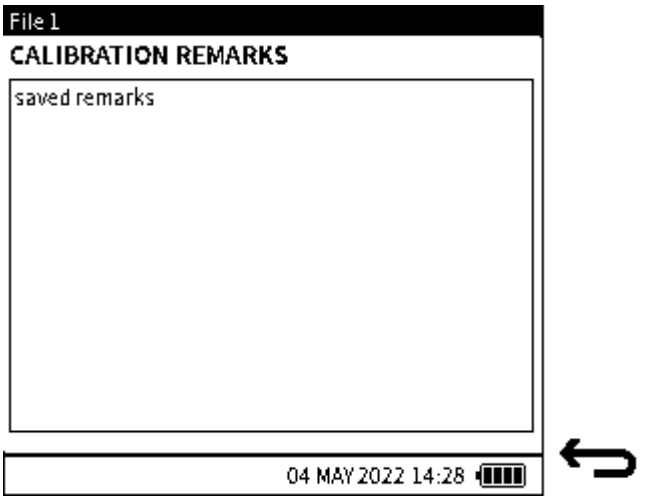
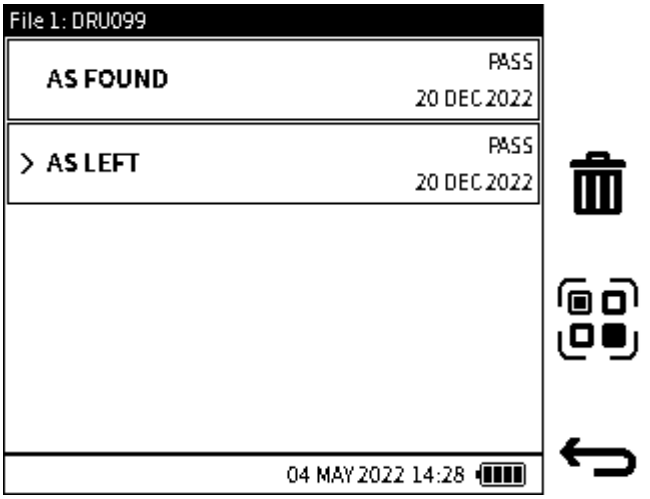
<table>
<tr>
<td>Step 2</td>
<td>




</td>
<td>The calibration test procedure results show the following:
• Result type – As-Found or As-Left
• Date/Time – the date and time stamp the calibration procedure was completed
• Details of the input and output function i.e., Function name and measurement units
• Data details including:
• Input Expected
• Input (Actual)
• Output
• Calculated Error
• Pass or Fail status for each test point
• Pass or Fail Status overall.
To view Calibration remarks relating to the test, select the Clipboard softkey.</td>
</tr>
<tr>
<td>Step 3</td>
<td>


</td>
<td>Results can also be viewed when the test procedure is selected, the device under test is selected and then the relevant test result i.e., As-Found or As-Left.</td>
</tr>
</table>

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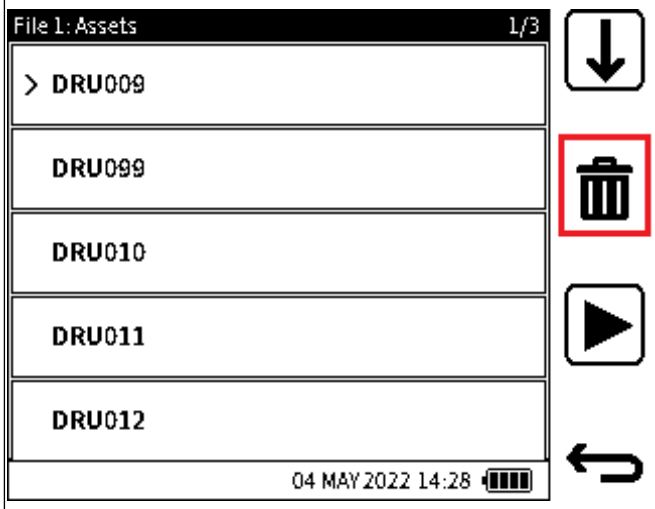
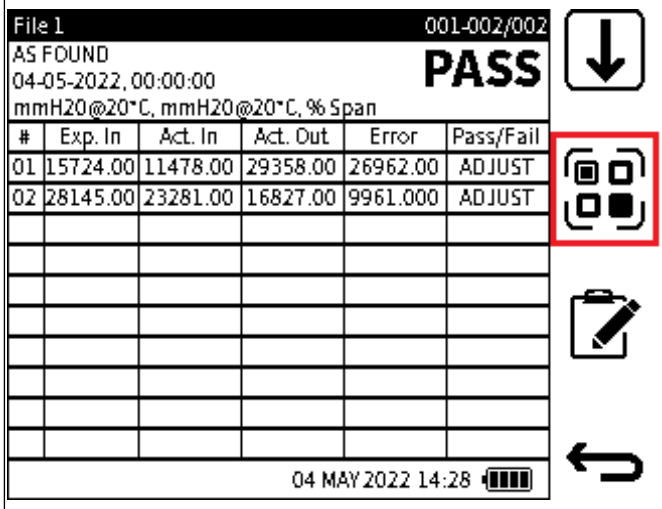
11.10 Deleting Asset Data

Step 1		Select the required test procedure. Select the required asset to be deleted. Select the **Delete** softkey. **Note**: All asset data will be deleted.

11.11 How to use the Calibration Certificate Wizard

Step 1		When an **As-Found** or **As-Left** asset or Device Under Test (DUT) result is viewed, it is possible to create a certificate document, using the calibration and test procedure details. Select the **QR** code softkey to access the QR code for the calibration certificate template. This template transforms the raw calibration procedure result data to a formatted calibration certificate document.
Step 2		Download the certificate template either using the URL or QR code provided.

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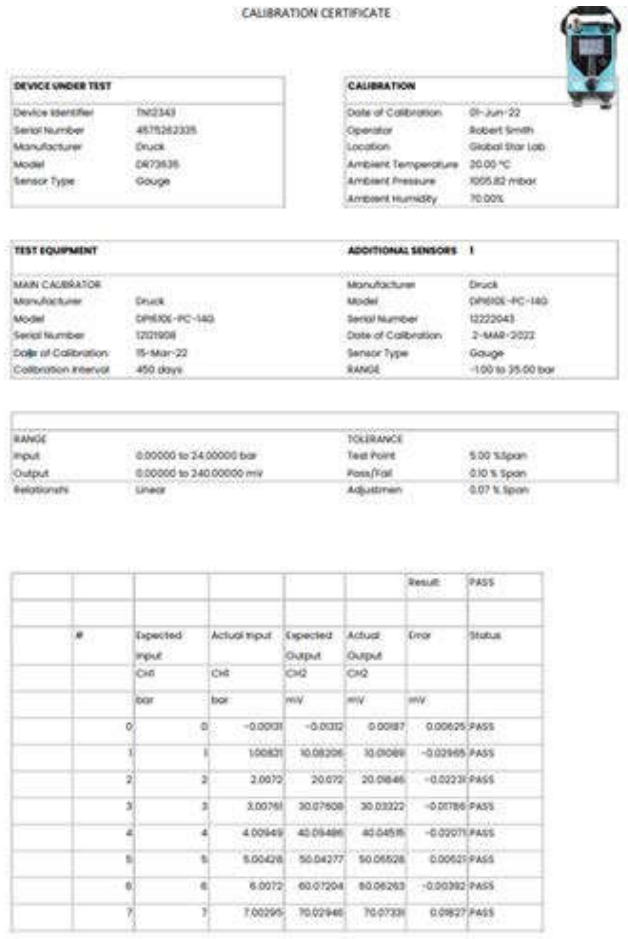
Step 3		Connect the DPI610E to a PC using a compatible data micro-USB cable. **Note**: Make sure the USB setting is in Storage mode (See Section 4.3 on page 38). Open the Calibration Certificate Template file and tap on the **Select CSV** cell. Select the required asset result file from the DocData folder in the DPI610E mass storage drive in File Explorer and select **Open**. The calibration data and test procedure data will be populated in the template format. To add a logo, select the **Add Logo** cell, and select the desired logo image and select **OK** to use.
Step 4		When the calibration certificate document has been formatted and edited to suit the user requirements, it can then be exported as a PDF file using the **Export** button on the template CSV and selecting a destination file path for it to be saved.

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11.12 Remote Documenting

Remote documenting is a documenting feature that allows test procedures created in our 4Sight2 software to be downloaded and run on the DPI610E to calibrate devices under test.

4Sight2 offers easy-to-use, cost effective and scalable calibration management with full integration with Druck Calibrators, to provide seamless communication, end-to-end automation, paperless calibration process and increased efficiency.

The 4Sight2 software is available on the Druck website www.druck.com/4sight2 and is free to download and use (trial or Freemium version).

To download test procedures from 4Sight2 on to the DPI610E, connect the instrument to the PC using the USB data cable supplied.

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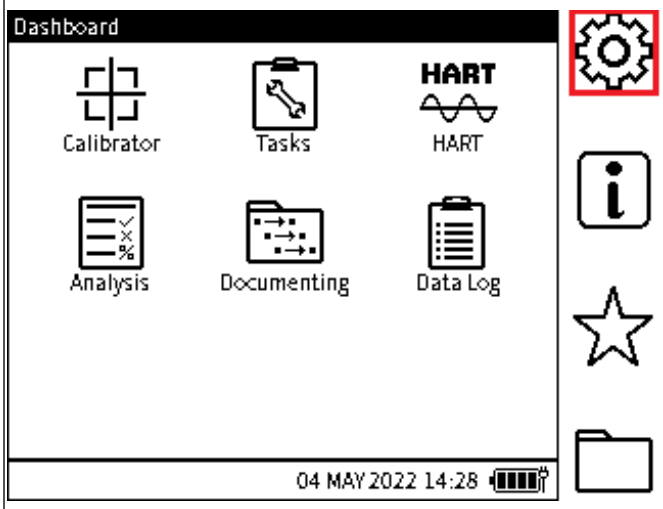
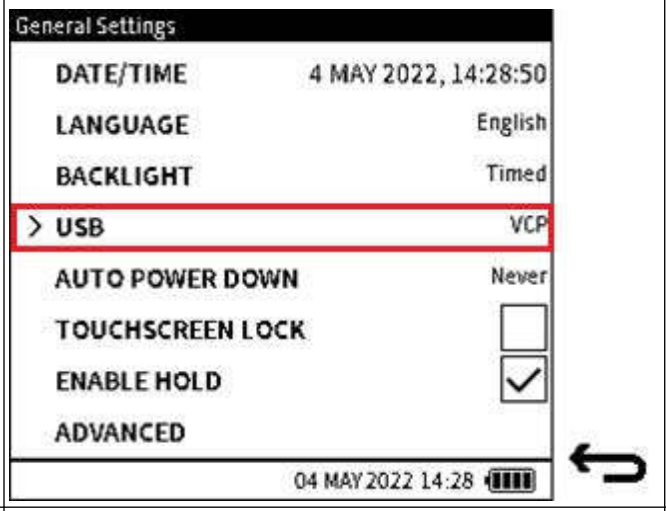
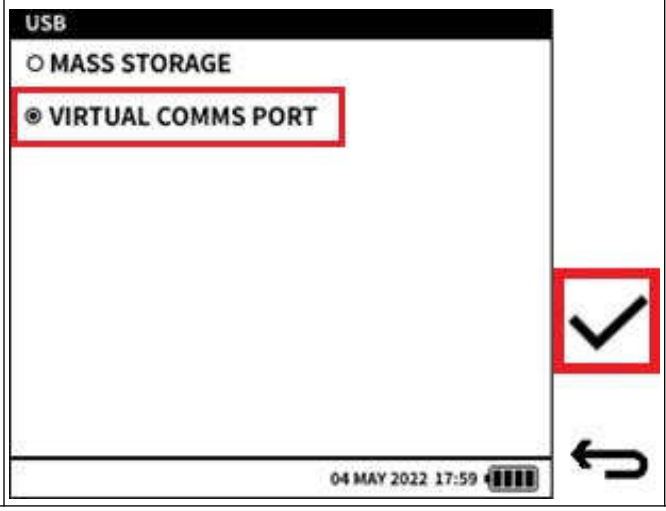
11.12.1 Setup and Connection.

Step 1		Select the **Settings** softkey on the Dashboard.
Step 2		Select the **USB** option.
Step 3		Select the **VIRTUAL COMMS PORT** radio button if it is not already selected. Select the **Tick** ✓ softkey to confirm completion of the selection.

The 4Sight2 software and the Druck CommServer must install correctly for the DPI610E to successfully connect to the 4Sight2 software.

Start the 4Sight2 application on your system.

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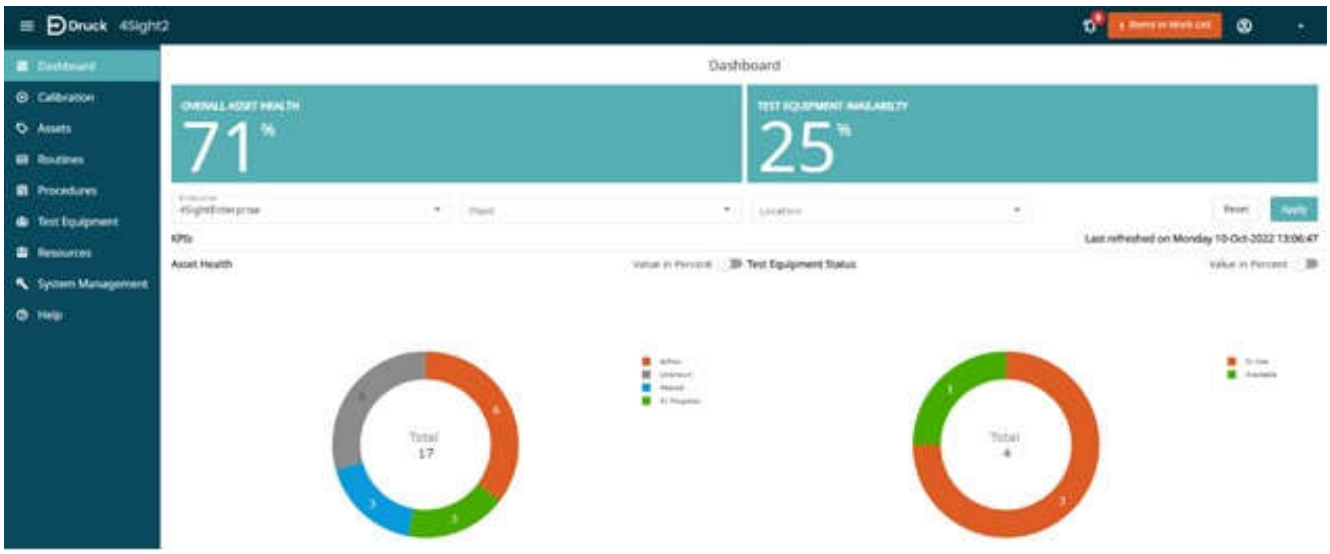
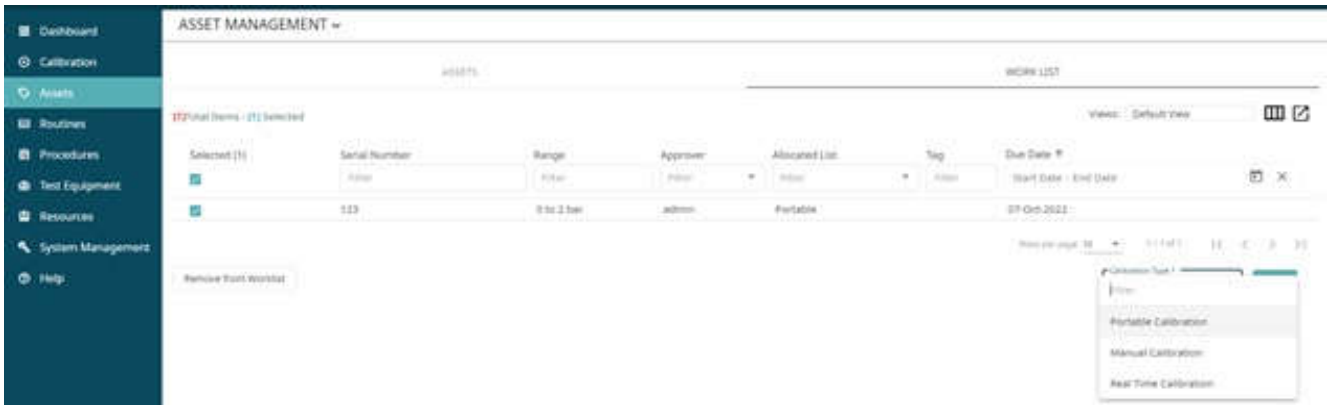
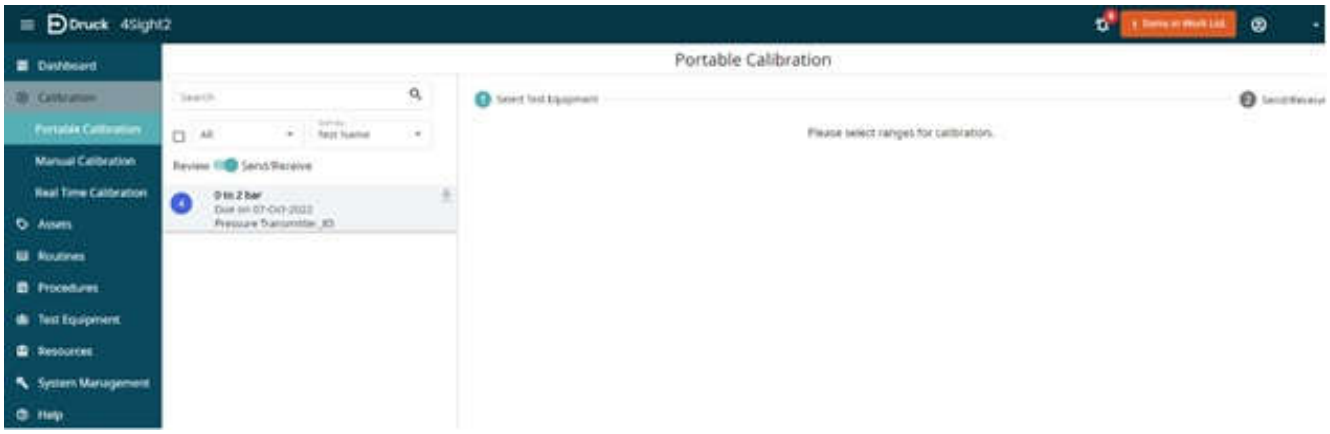
From the 4Sight2 Dashboard, select the **Assets** tab to access **Asset and Work List** information. Select the **Work List** tab to view the calibrations required to be completed. (For more information on how to create Assets or Work List items, please refer to the 4Sight2 Calibration Management Software User Manual 123M3138).



From the 4Sight2 work list, select calibration procedure(s) to be done. Select the **Portables** calibration type option and press the **Send** button.



Next, navigate to the **Calibration** tab and tap **Portable Calibration**. The calibration procedure(s) selected in the previous step should be listed in the Portable Calibration list.



Select the desired procedure to proceed. Ensure the Port is set to **USB**. If the **Test Equipment** drop-down box is empty, select **Get Connected Test Equipment**. This will start the connection to the DPI610E.

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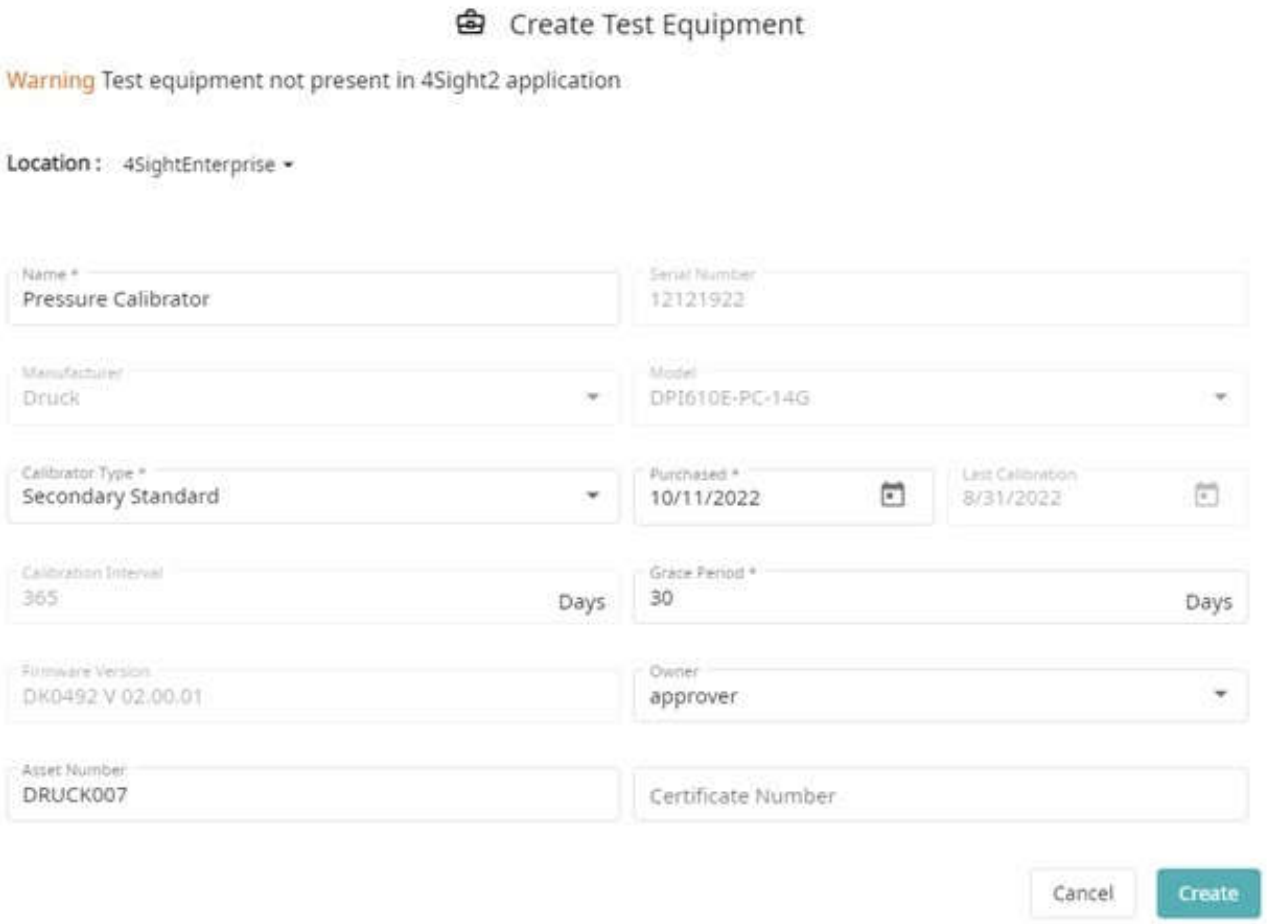
Note: If any errors connecting to the DPI610E come up during this process, ensure the DPI610E is plugged in and in (VCP) Virtual Communications Port mode. If the Druck Comms Server is not installed and running, the connection cannot be established.

Upon successful connection to the DPI610E test equipment, select the **Test Equipment** drop down box to select the detected device denoted by its model and serial number.

Create the Test Equipment profile by filling the resulting popup screen and tap **Create** to complete.



Select the **Continue** button to proceed.

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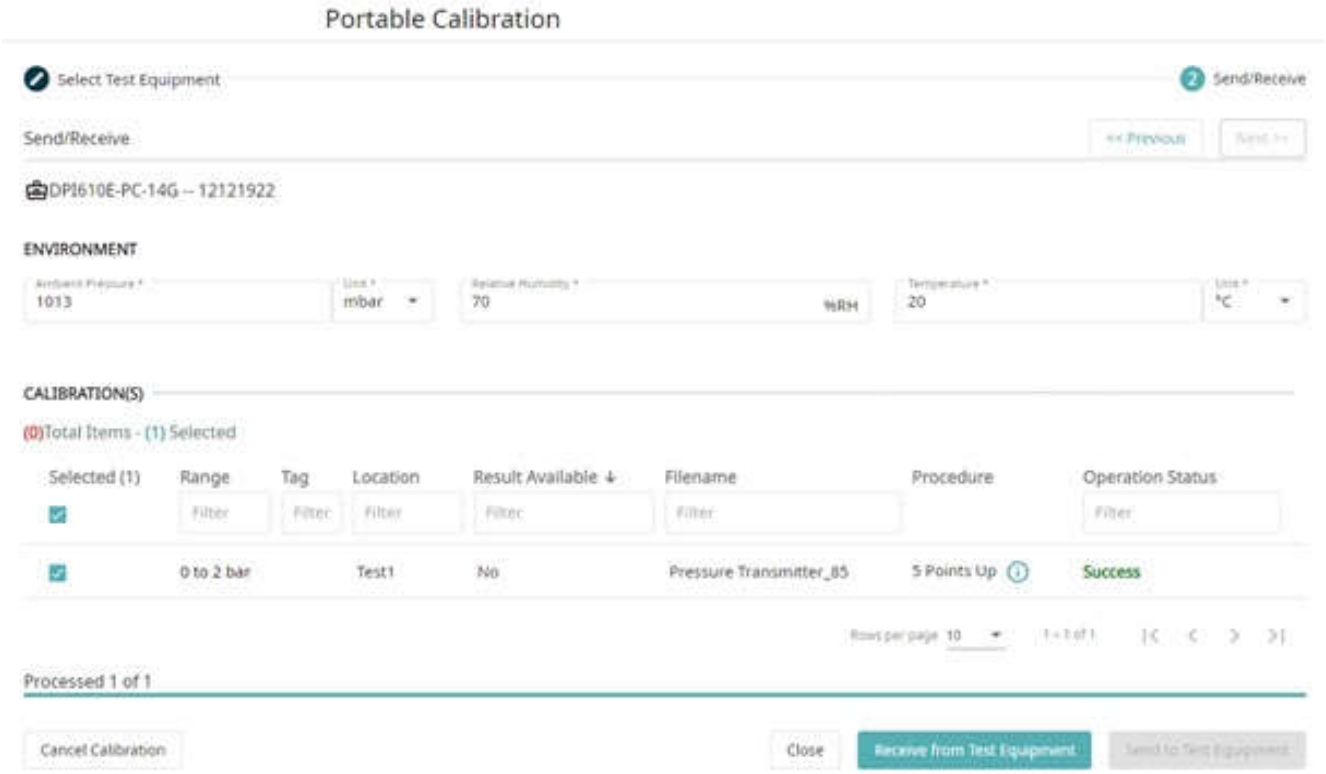
Next, set the Ambient / Environmental parameters where the calibration will be done. This can still be modified on the DPI610E at the start of the actual calibration.

Select the Calibration Test Procedure(s) to be sent to the DPI610E and tap **Send to Test Equipment**.

The process is completed with a "**Success**" indication under the **Operation Status** tab.



Note: tests that have special or Asian characters in the file name and notes cannot be uploaded to the DPI610E. Accented characters in the file name may be replaced by alternative characters without the accent symbols.

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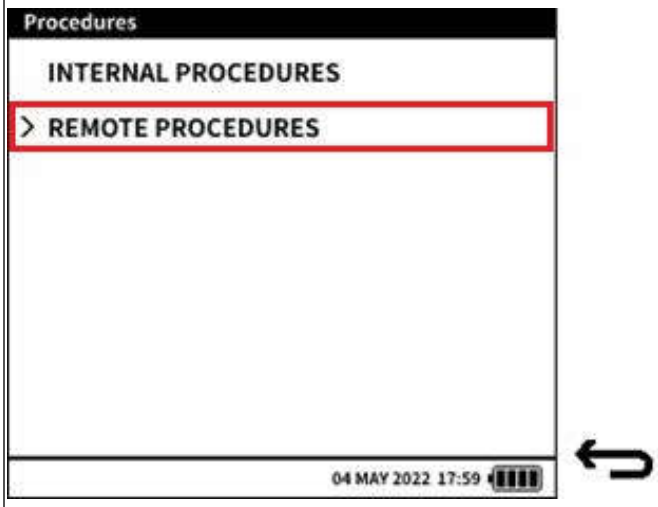
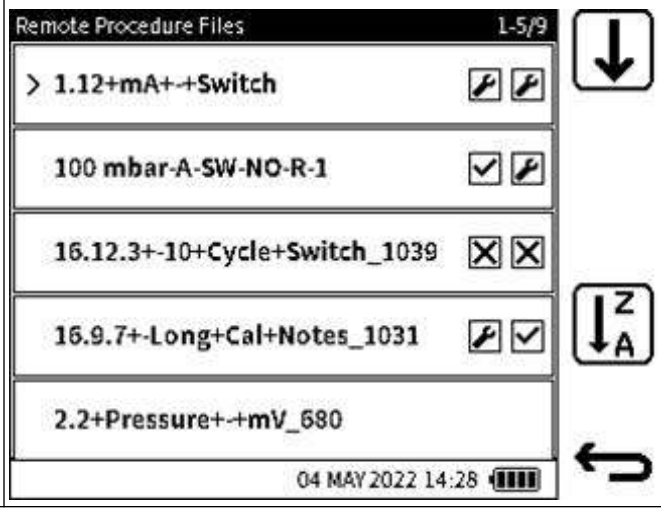
11.12.2 Running 4sight (Remote) Calibration Test Procedures

On the DPI610E, select **REMOTE PROCEDURES** from the Procedures menu and tap again (or press the Enter button if using the navigation keypad) to open.

Step 1		On the DPI610E, select **REMOTE PROCEDURES** from the **Procedures** menu.
Step 2		Select the desired Remote test procedures from the **Remote Procedure Files** screen. Use the icon to show the next page of files. Use the icon to set the order in which the files are listed. Tap on the row to open the procedure (or use the **Enter** button in the Navigation pad).

There are two types of remote test procedures supported by the DPI610E:

1. Linear or Proportional Test Procedure.
2. Switch Test Procedure.

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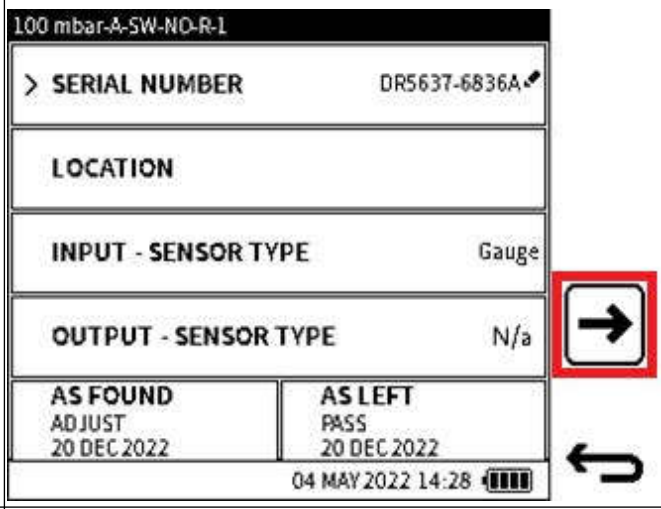
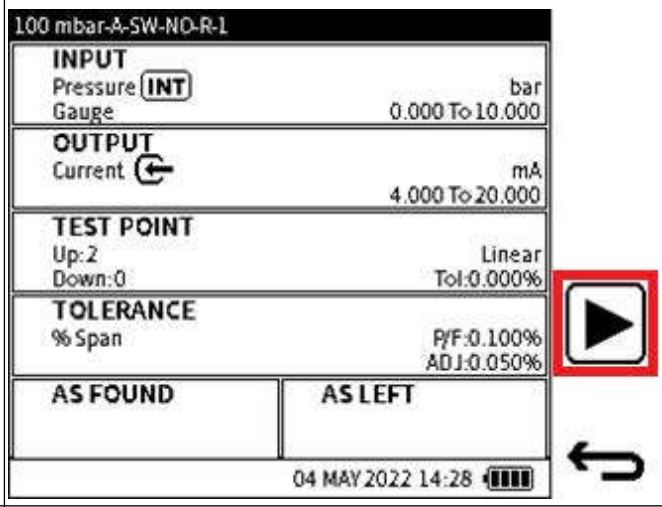
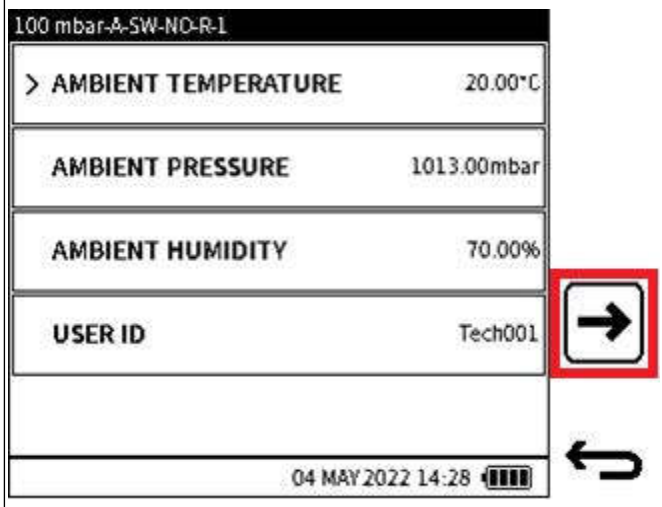
11.13 Linear / Proportional Test Procedure

Step 1		When a proportional test procedure is selected from the **Remote Procedures** menu, the test procedure file details are displayed as shown in the figure. At this point, only the Device Under Test (DUT) serial number information can be modified. Make sure that the details are correct, then select the **Next** softkey to view the test information
Step 2		Make sure that all the test information is correct, then press the **Play** softkey to start the calibration procedure. See Section 11.2.2, “How to create an Internal Procedure,” on page 183.
Step 3		Examine and change, if necessary, the environment details and user ID. Press the **Next** softkey to go to the next step.

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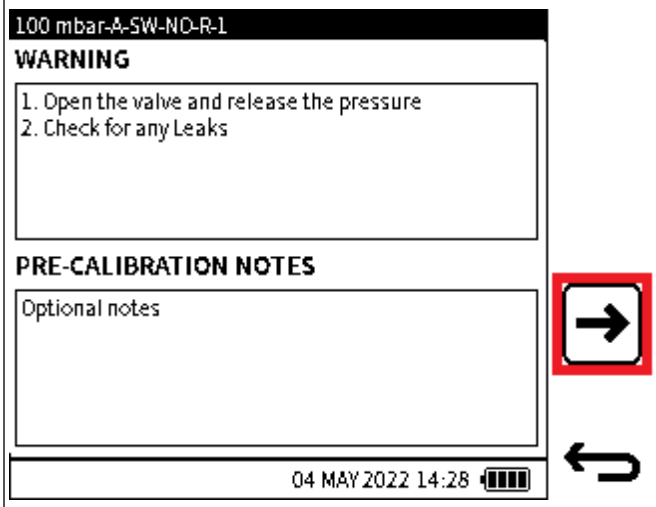
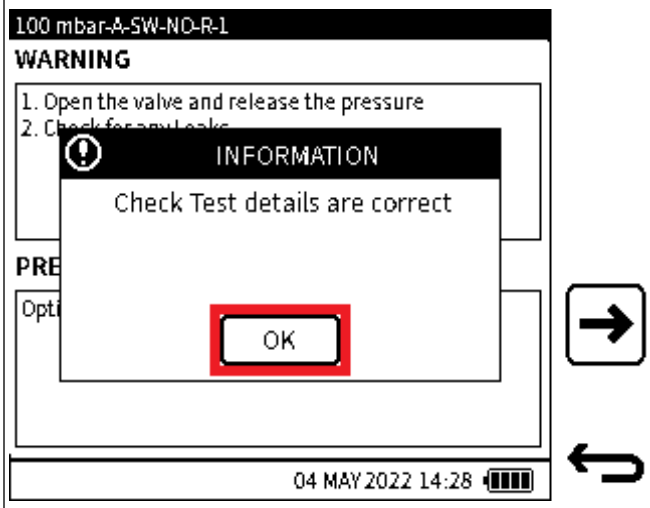
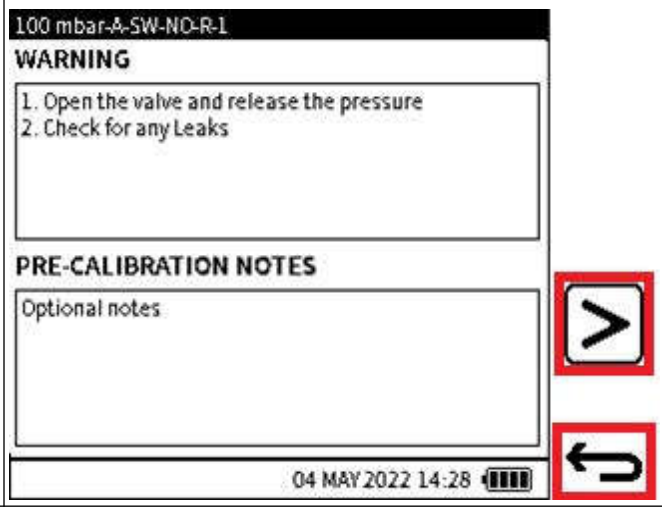
<table>
<tr>
<td>Step 4</td>
<td>


</td>
<td>The next screen that appears shows WARNING NOTES and the PRE-CALIBRATION NOTES as configured in 4Sight2.
This screen shows read-only information for the user doing the test.
Select the Next softkey.

A popup message appears and requests confirmation that the Test details are correct. Select the OK button to remove this popup.</td>
</tr>
<tr>
<td>Step 5</td>
<td>
</td>
<td>The choice available now is either to go back to the test information by the use of the Back softkey, or if the test details are acceptable, select the Proceed softkey to show the test screen.</td>
</tr>
</table>

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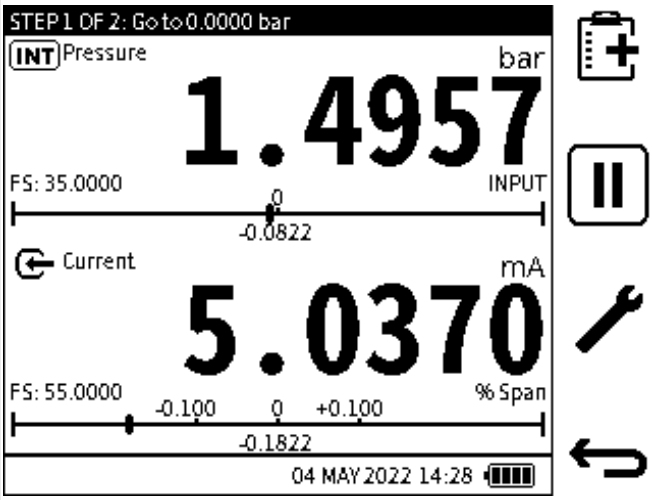
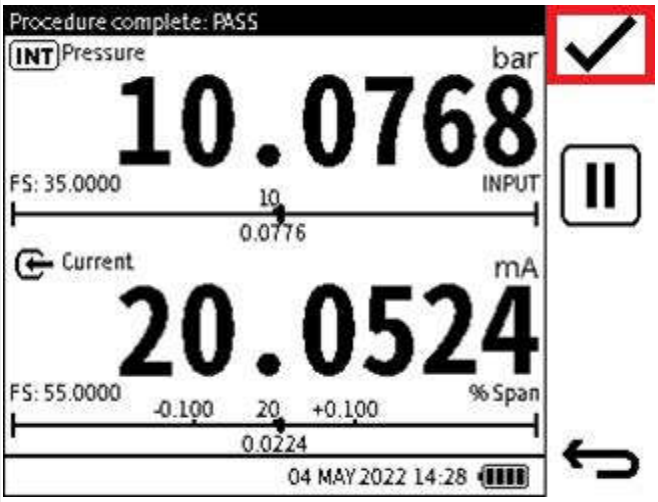
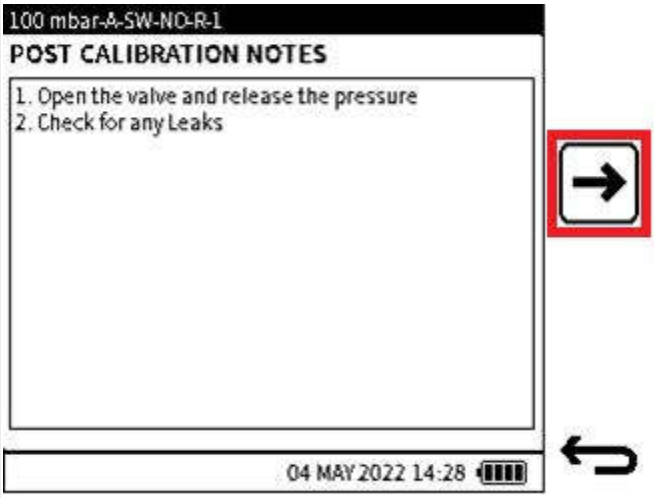
Step 6		On the test screen, follow the instructions on the top bar, to complete the calibration test procedure. Refer to Section 11.5 on page 200 for an example of how to run a test procedure. **Note**: See Section 11.3, “The Documenting Main Screen,” on page 196 for more information about the test screen and Section 11.4, “Documenting Settings,” on page 198 for more information about the additional settings available.
Step 7		After the last calibration data point has been logged, the **Tick** ✓ softkey replaces the **Add Test Point** softkey. The title bar will show Procedure complete with the overall test result status. Select the **Tick** ✓ softkey to confirm completion of the calibration.
Step 8		This is the POST CALIBRATION screen that gives the necessary information to know after the calibration ends. This information is read-only and configured with 4Sight2. Select the **Next** softkey to show the **CALIBRATION REMARKS** screen.

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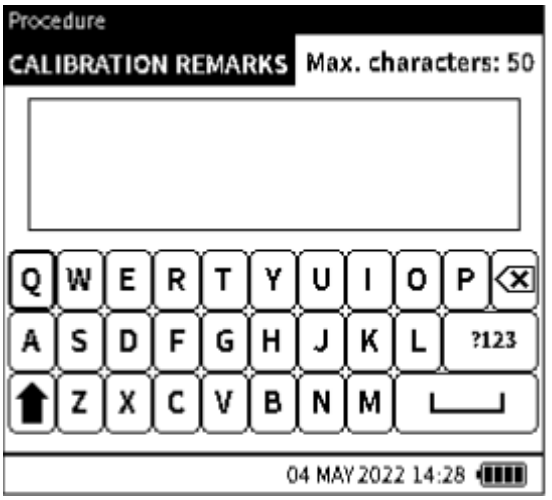
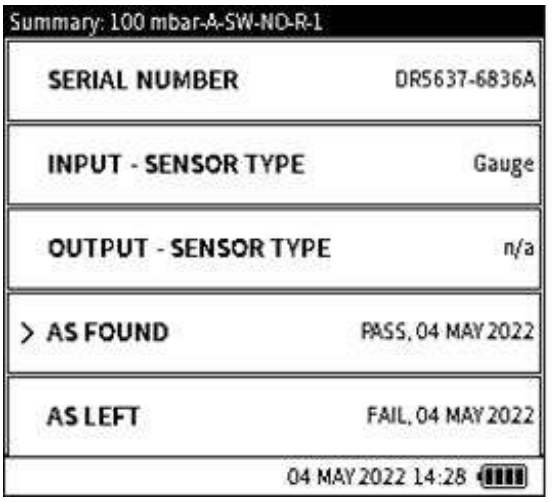
Step 9		Enter comments that relate to the calibration procedure just completed. This step is optional, and the **CALIBRATION REMARKS** field can be left blank. Maximum number of characters: 50. Select the **Save** softkey to save the **CALIBRATION REMARKS** and continue.
Step 10		**Note**: When a test procedure is done on a new Asset for the first time, there will be no **As-Found** or **As-Left** results. When no **As-Found** or **As-Left** results are detected for a particular asset, the calibration data will be automatically saved as **As-Found**. If only an **As-Found** results file is detected, then at the end of the test procedure, the results will be automatically saved as **As-Left**. If both **As-Found** and **As-Left** results files already exist when the test procedure is run again, then the **As-Left** results file is overwritten. On the **Test Procedure SUMMARY** screen, the option to re-run the test procedure using the same test details and device under test (DUT) details is provided by using the **Play** softkey. If you wish to exit, use the **Back** softkey to return to the **Remote Procedure** menu.

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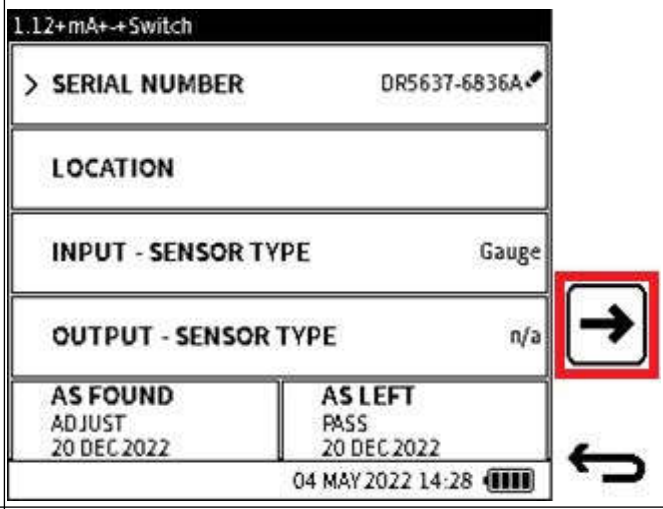
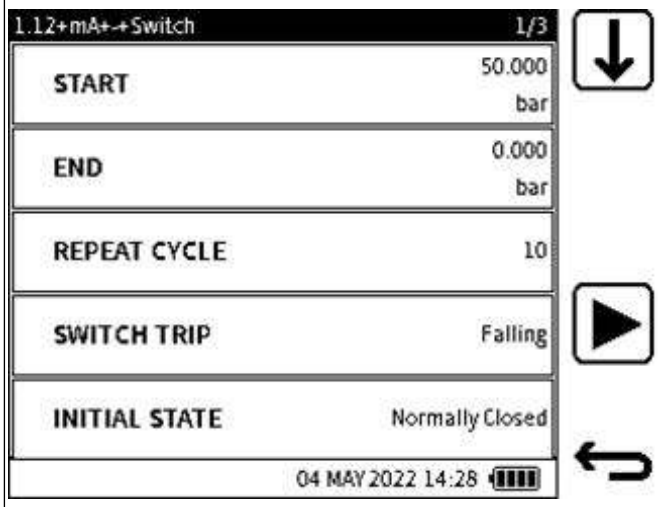
11.14 Switch Test Procedure

Step 1		When a **Switch Test** procedure is selected from the **Remote Procedures** menu, the test procedure file details are displayed as shown in the figure. At this point, only the Device Under Test (DUT) **SERIAL NUMBER** information can be modified. Make sure that the details are correct, then select the **Next** softkey to view the test information.
Step 2	 *Step 2 procedure continues on next page*	The Switch Test information is given by three screen pages that detail the following settings as configured in 4Sight2: **START** - required start-pressure value for the switch test before pressure ramp. **END** - required end-pressure value for the switch test. **REPEAT CYCLE** - number of consecutive switch test cycles required to be completed in the test procedure. **SWITCH TRIP** - the direction of pressure designed to cause a trip of the pressure switch. **INITIAL STATE** - the initial or normal state of the pressure switch in its normal operating pressure condition (deactuated state). This is either **Normally Open** or **Normally Closed**.

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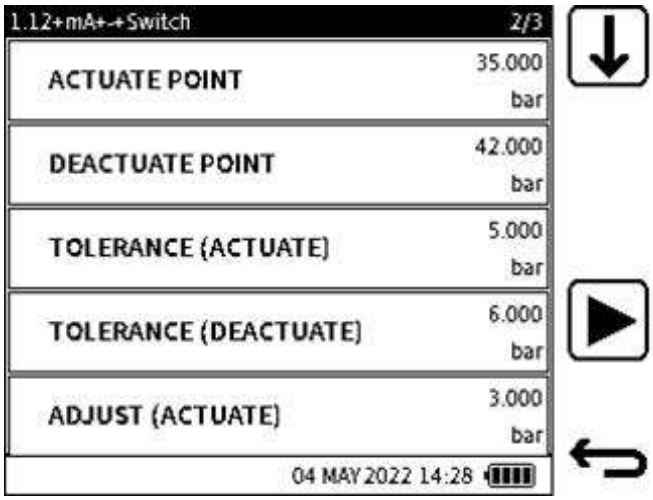
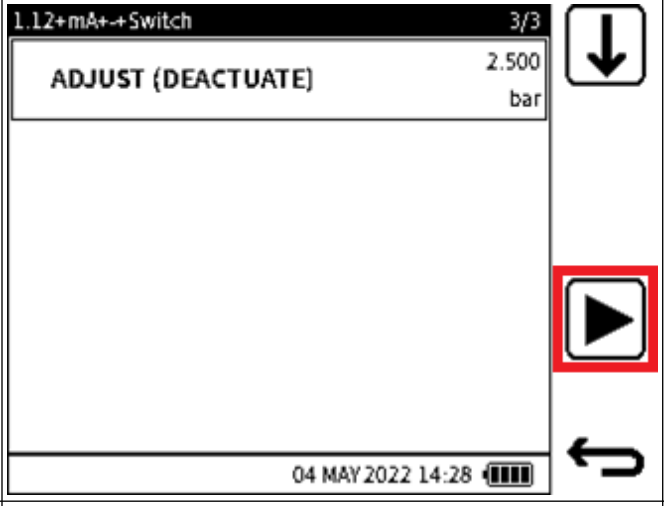
Step 2 Cont'd



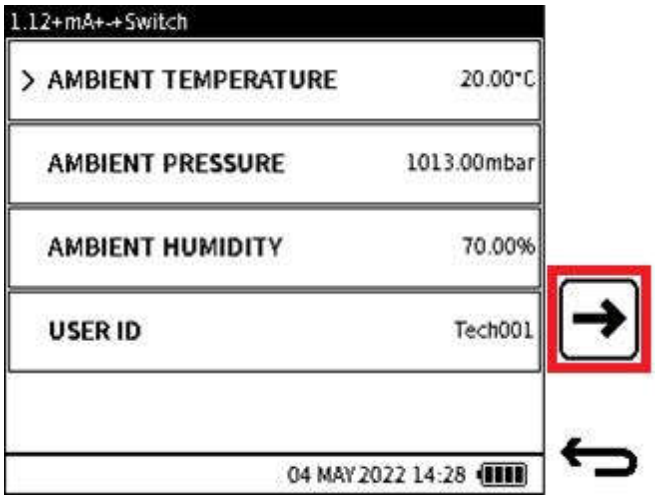
ACTUATE POINT - expected actuating or trip point of the pressure switch DUT.
DEACTUATE POINT - Expected deactuating or reset point of the pressure switch DUT.
TOLERANCE (ACTUATE) - maximum deviation that determines if the actuating or trip pressure value of the pressure switch DUT is within specification (PASS) or out of specification (FAIL).
TOLERANCE (DEACTUATE) - maximum deviation that determines if the deactuating or reset pressure value of the pressure switch DUT is within specification (PASS) or out of specification (FAIL).
ADJUST (ACTUATE) - maximum deviation of the actuating or trip point pressure value within the PASS/FAIL tolerance which indicates that the pressure switch DUT is close to out of specification limits.



ADJUST (DEACTUATE) - maximum deviation of the deactuating or reset point pressure value within the PASS/FAIL tolerance which indicates that the pressure switch DUT is close to out-of-specification limits.

Check that all the test information is correct, then press the **Play** softkey to start the calibration procedure. See Section 11.2.2, "How to create an Internal Procedure," on page 183.

Step 3



Examine and change, if necessary, the environment details and **USER ID**.

Press the **Next** softkey to go to the next step.

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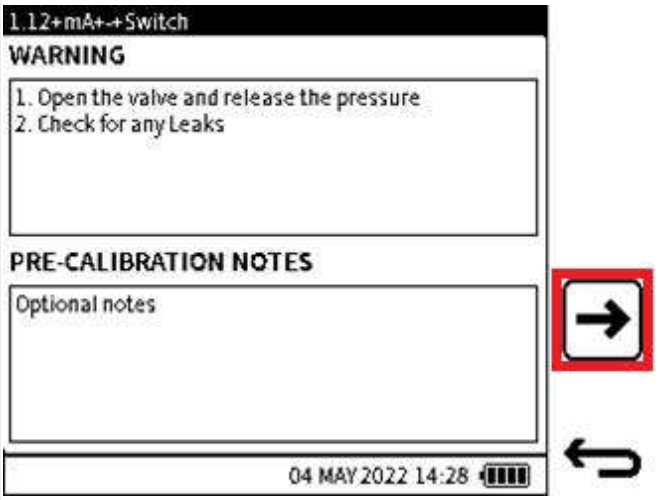
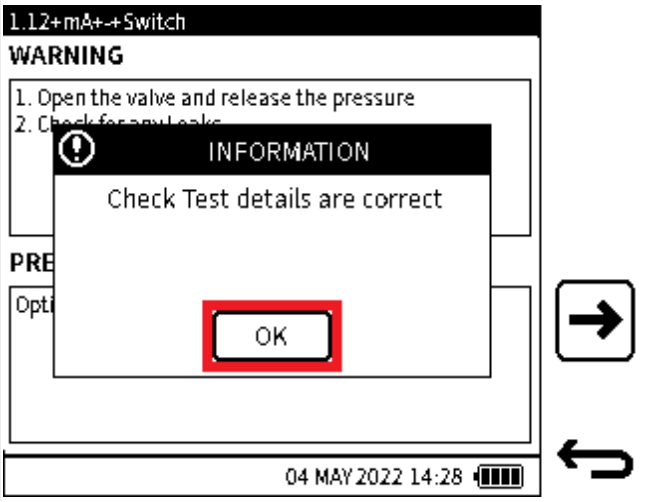
Step 4



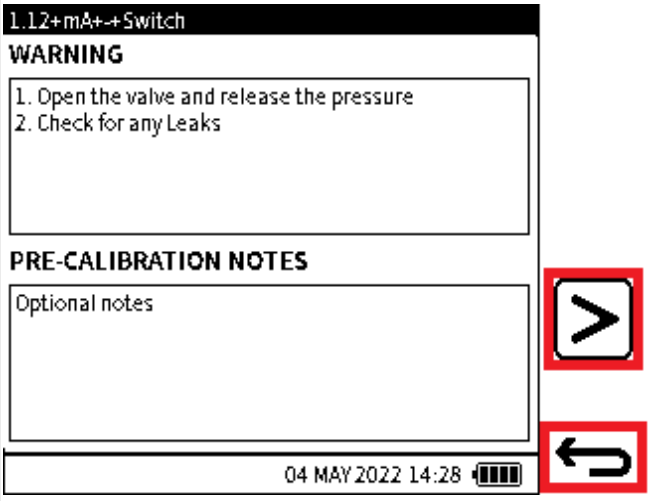
??The next screen that appears shows **WARNING NOTES** and the **PRE-CALIBRATION NOTES** as configured in 4Sight2.
This screen shows read-only information for the user doing the test.

Select the **Next** softkey to show the test screen.



A popup message appears and requests confirmation that the Test details are correct. Select the **OK** button to remove this popup.

Step 5



The choice available now is either to go back to the test information by using the **Back** softkey or the **Proceed** softkey to show the test screen.

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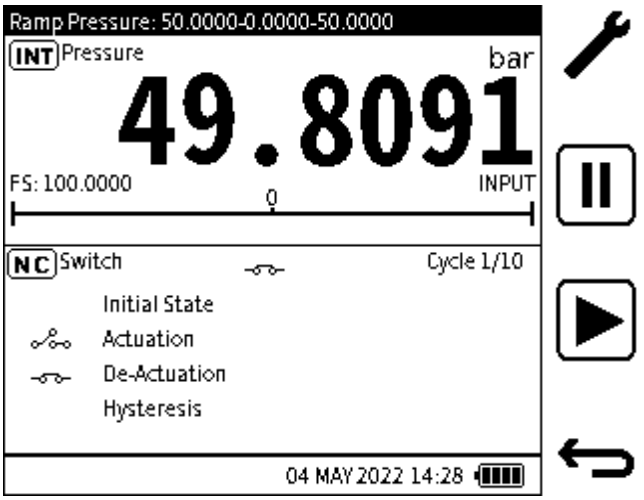
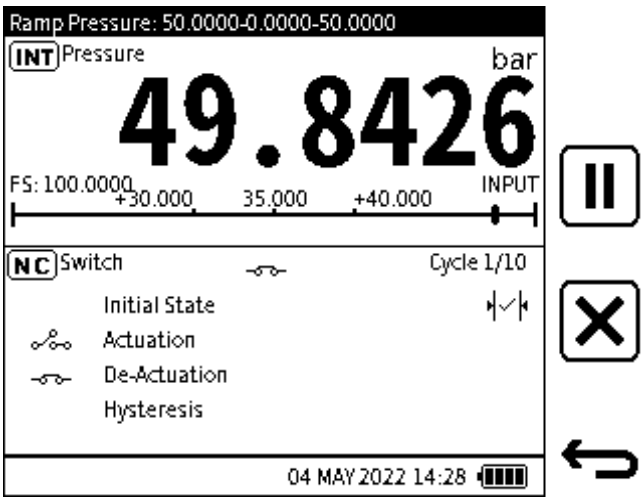
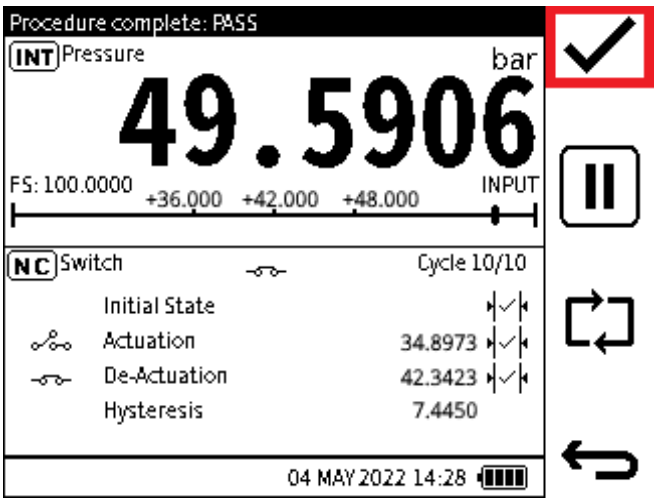
Step 6	 	On the test screen, follow the instructions on the top bar to complete the calibration test procedure. For a Switch Test procedure, the Ramp start and end pressure value will be displayed in the top bar. The top channel displays the Input pressure applied to the switch DUT and the bottom channel, displays the switch information. The live switch state is always displayed at the top of the switch channel. The switch test cycle status is shown at the top right corner of the switch channel. The switch test results show the following information for each test cycle: • Actuation pressure value with PASS/FAIL status. • Deactuation pressure value with PASS/FAIL status. • Hysteresis value. **NOTE:** See Section 11.3, “The Documenting Main Screen,” on page 196 for more information about the test screen and Section 11.4, “Documenting Settings,” on page 198 for more information about the additional settings available. To begin the Switch Test, make sure that the applied pressure is at the Ramp start value before selecting the **Play** softkey.
Step 7		After the last switch test cycle has been completed, the **Tick** softkey will replace the **Add Test Point** softkey. The title bar will show Procedure complete with the overall test result status. Select the **Tick** softkey to confirm completion of the calibration.

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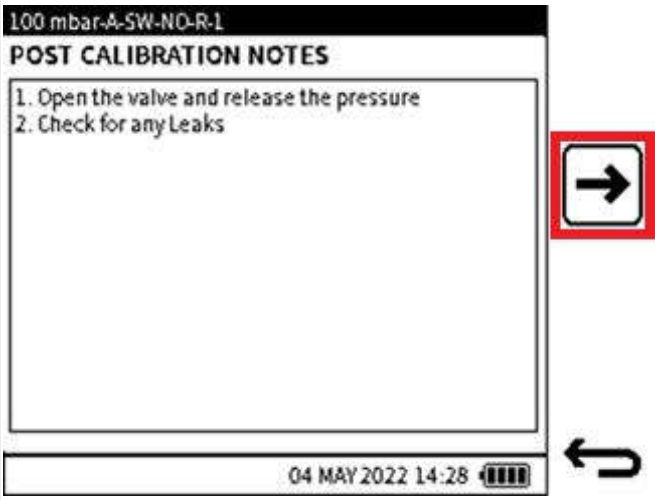
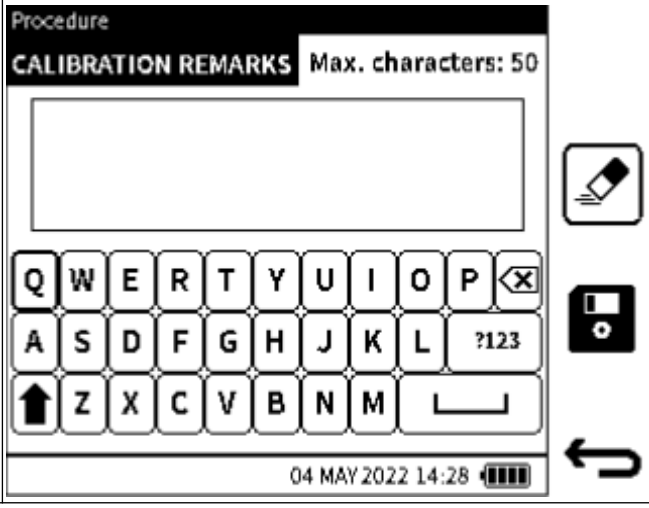
Step 8		The **POST CALIBRATION** screen gives necessary information to know about after the calibration has been done. This information is read-only and configured within 4Sight2. Press the **Next** softkey to go to the next screen.
Step 9		Enter required comments relating to the calibration procedure just completed into this screen. This step is optional: the **CALIBRATION REMARKS** field can be left blank. Maximum number of characters: 50. Select the **Save** softkey to save the CALIBRATION REMARKS and continue

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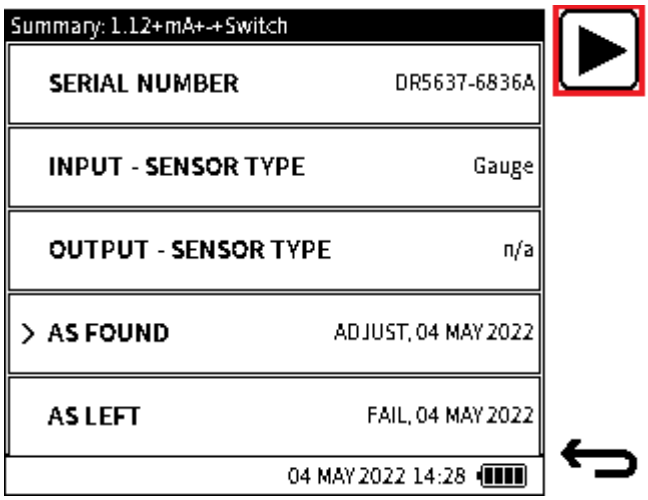
Step 10		The Procedure result **SUMMARY** screen. This screen shows details of the test procedure just completed. **Note**: When a test procedure is done on a new Asset for the first time, there will be no **As-Found** or **As-Left** results. When no **As-Found** or **As-Left** results are detected for a particular asset, the calibration data will be automatically saved as **As-Found**. If only an **As-Found** results file is detected, then at the end of the test procedure, the results will be automatically saved as **As-Left**. If both **As-Found** and **As-Left** results files already exist when the test procedure is run again, then the **As-Left** results file is overwritten. On the Test Procedure **SUMMARY** screen, use the **Play** softkey to do the test procedure again, using the same test details and device under test (DUT) details. To exit, select the **Back** softkey to return to the **Remote Procedure** menu.

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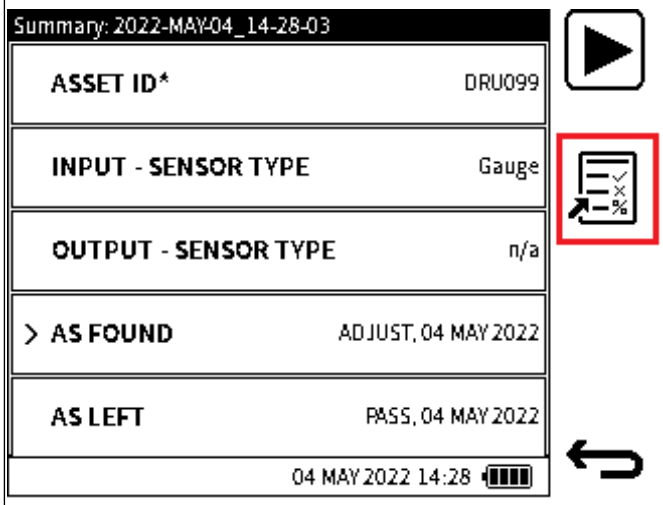
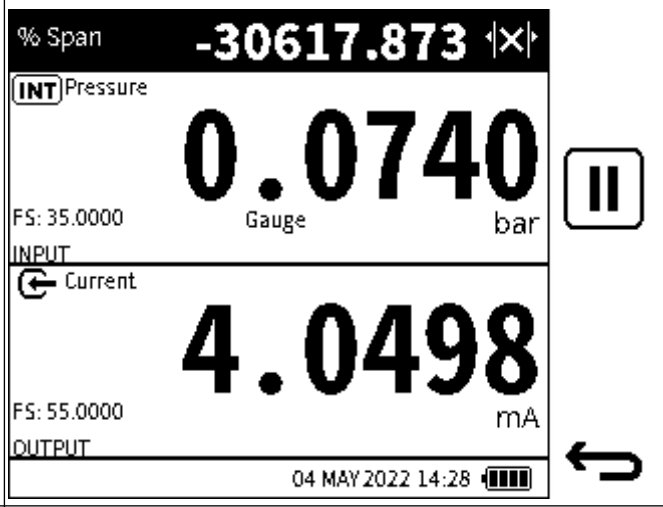
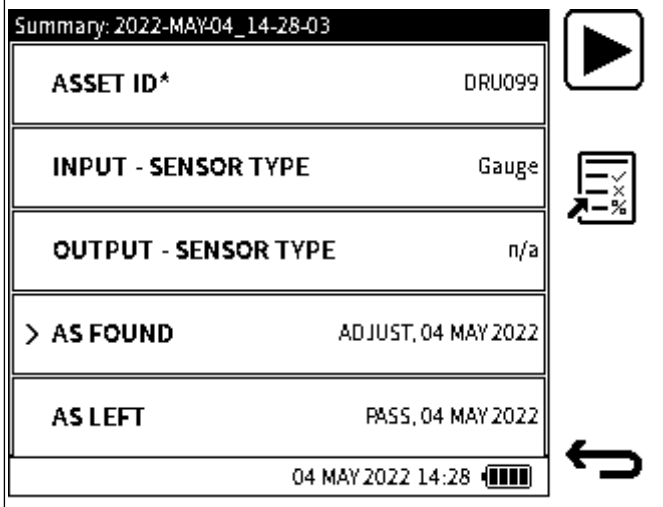
11.15 Making an adjustment on the Device Under Test (DUT)

Step 1		If at the end of the test procedure, an adjustment is required. For example, if the end result of the test procedure is a **Fail**. Then it is possible to perform and verify an adjustment using the **Analysis** softkey.
Step 2		Make the necessary adjustment to the DEVICE UNDER TEST (DUT) and check the output signal through its entire calibration range to ensure it is within spec before repeating the calibration test procedure. When the adjustment is complete, select the **Back** softkey to return to the **Procedure Summary** screen.
Step 3		The test procedure may now be done again after adjustment. Select the **Play** softkey or icon to do this.

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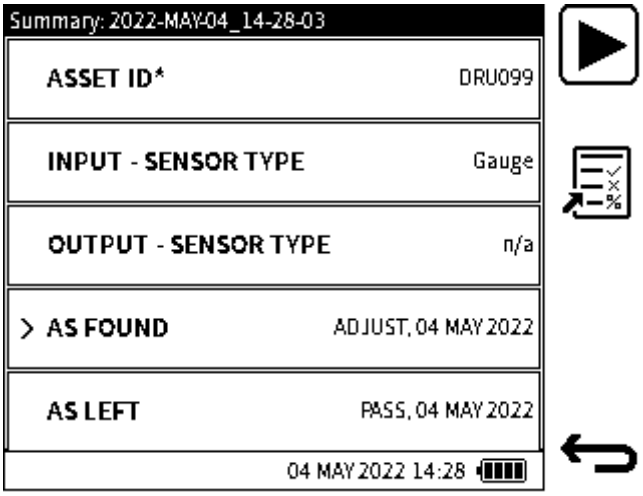
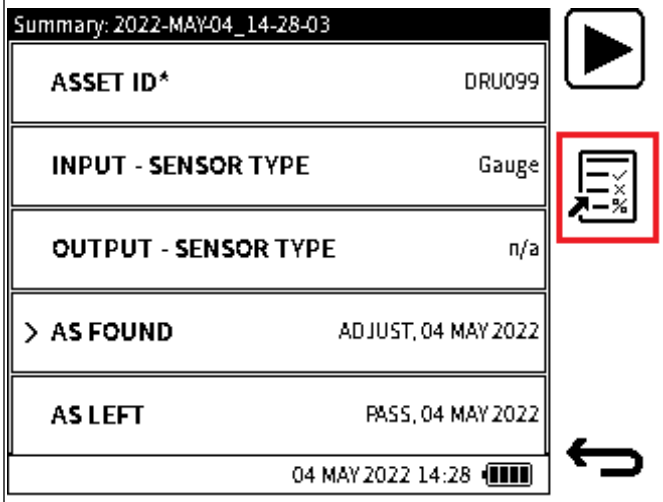
11.16 How to View Test Results

Tap on the required result row (e.g., **As-found** or **As-Left**) to see a screen of results immediately after the test procedure is finished.



Results can also be viewed when the test procedure is selected and then the relevant test result i.e. As-Found or As-Left.

Step 1		If at the end of the test procedure, an adjustment is required. For example, if the result of the test procedure is a **Fail**. Then it is possible to perform and verify an adjustment using the **Analysis** softkey.

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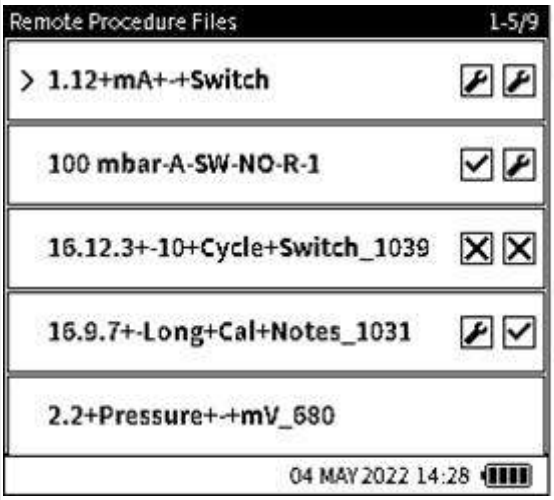
<table>
<tr>
<td>Step 2</td>
<td>


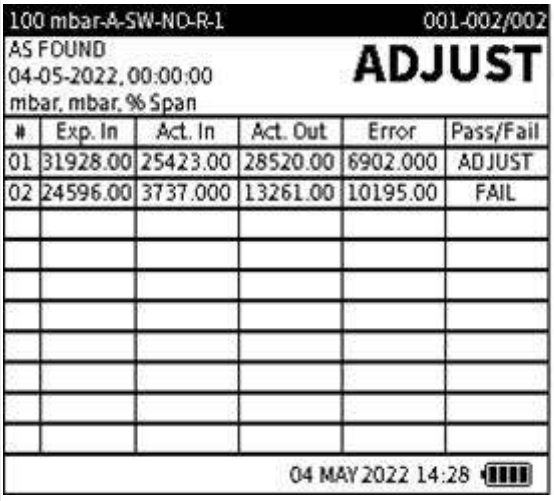


</td>
<td>Use the  icon to show the next page of files.
Use the  icon to set the order in which the files are listed.

NOTE: Visual indication of test results are presented in the Remote Procedures menu next to each procedure filename. If no icons are present, it means no results are present for that test procedure. The first icon represents the As-Found result while second icon represents the As-Left result.

✓ - PASS INDICATION

✗ - FAIL INDICATION

 - ADJUST INDICATION</td>
</tr>
<tr>
<td>Step 3</td>
<td>


</td>
<td>The calibration test procedure results for Proportional Test Procedure show the following:
• Test Procedure/Asset ID
• Result type - As-Found or As-Left
• Date/Time - the date and time stamp the calibration procedure was completed
• Input and Output measurement units
• Error type
• Test point #
• Expected input of each test point
• Actual input of each test point
• Calculated error or deviation
• Pass or Fail result status.</td>
</tr>
</table>

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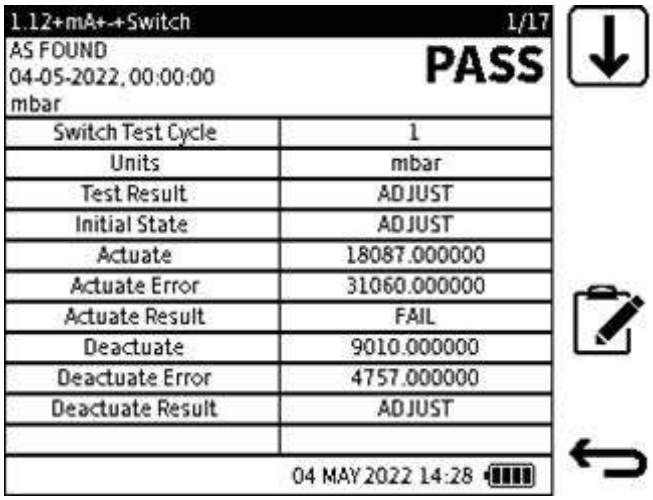
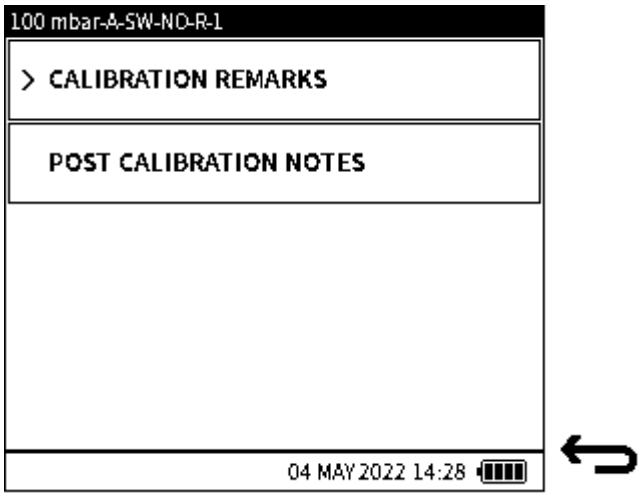
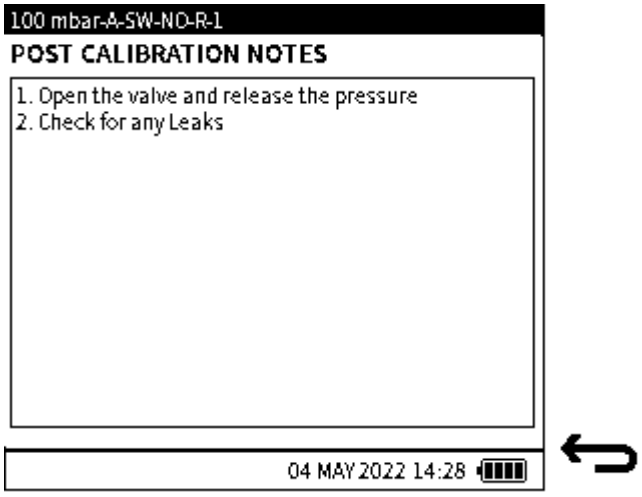
<table>
<tr>
<td>Step 4</td>
<td>


</td>
<td>The calibration test procedure results for Switch Test Procedure show the following:
• Test Procedure/Asset ID
• Result type - As-Found or As-Left
• Date/Time - the date and time stamp the calibration procedure was completed
• Switch Test Cycle number
• Pressure measurement units
• Initial Switch State
• Actuation and Deactuation Pressure
• Actuation and Deactuation Error
• Actuation and Deactuation Result
• Pass or Fail status for each test cycle.
NOTE: For Switch Test with multiple switch cycles, use the Page Down softkey to view the test results of each cycle.</td>
</tr>
<tr>
<td>Step 5</td>
<td>




Step 5 continues on next page
</td>
<td>To see CALIBRATION REMARKS or POST CALIBRATION NOTES that relate to the test, select the Clipboard softkey from the results screen and select the desired option.
Use the Page Down softkey and Back softkey to move between screen pages.</td>
</tr>
</table>

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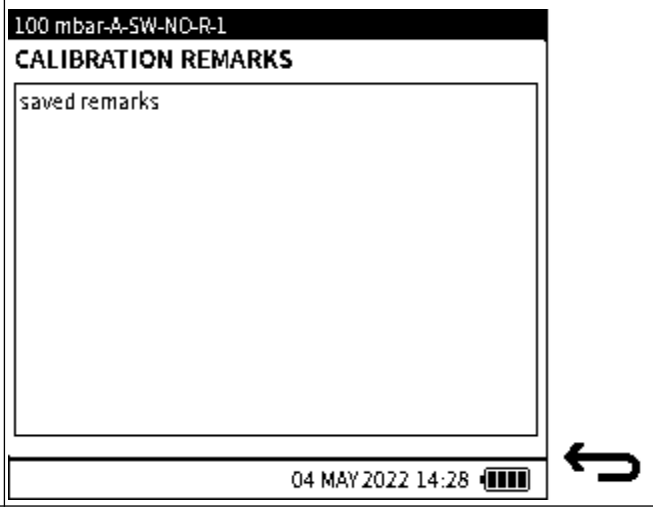
Step 5 Cont'd		

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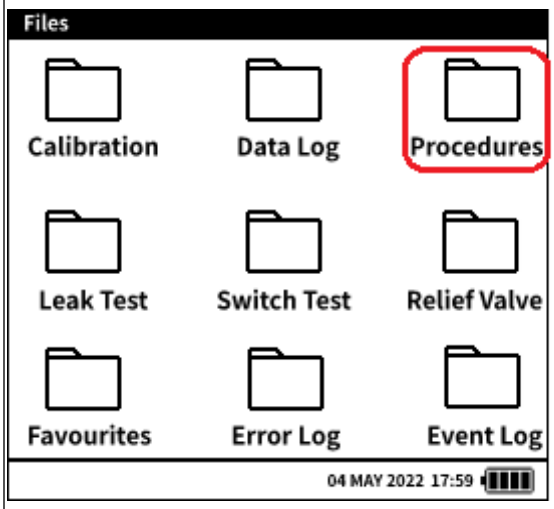
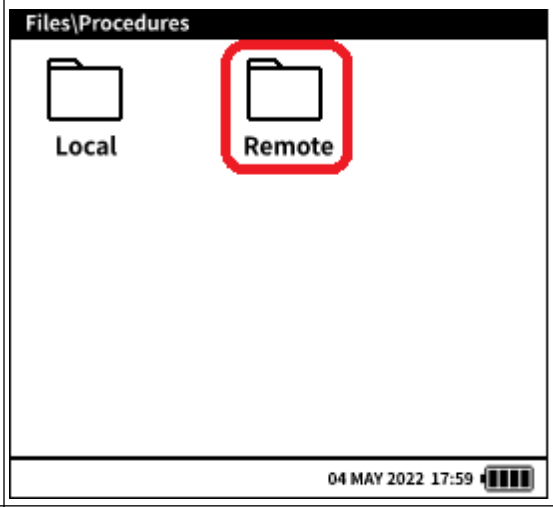
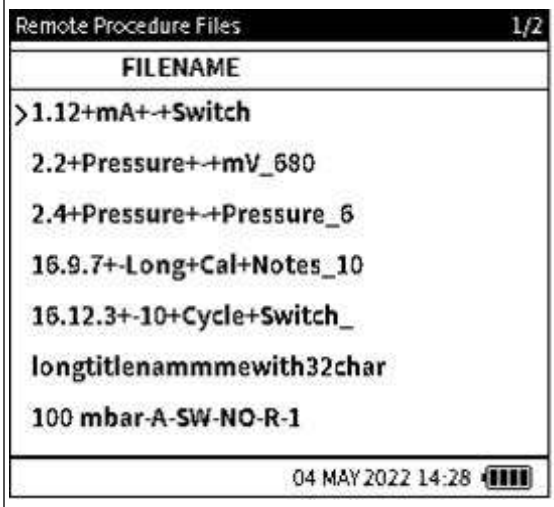
11.17 Deleting Remote Procedure Files

Step 1	 	To delete **Remote Procedure** files, use the **File System** softkey via the Dashboard. Select the **Procedures** folder and then the **Remote** sub-folder.
Step 2		From the list of procedure files, tap on the desired file to delete and select the **Single Delete** softkey to delete this file. To delete all files present, select the **Delete All** softkey.

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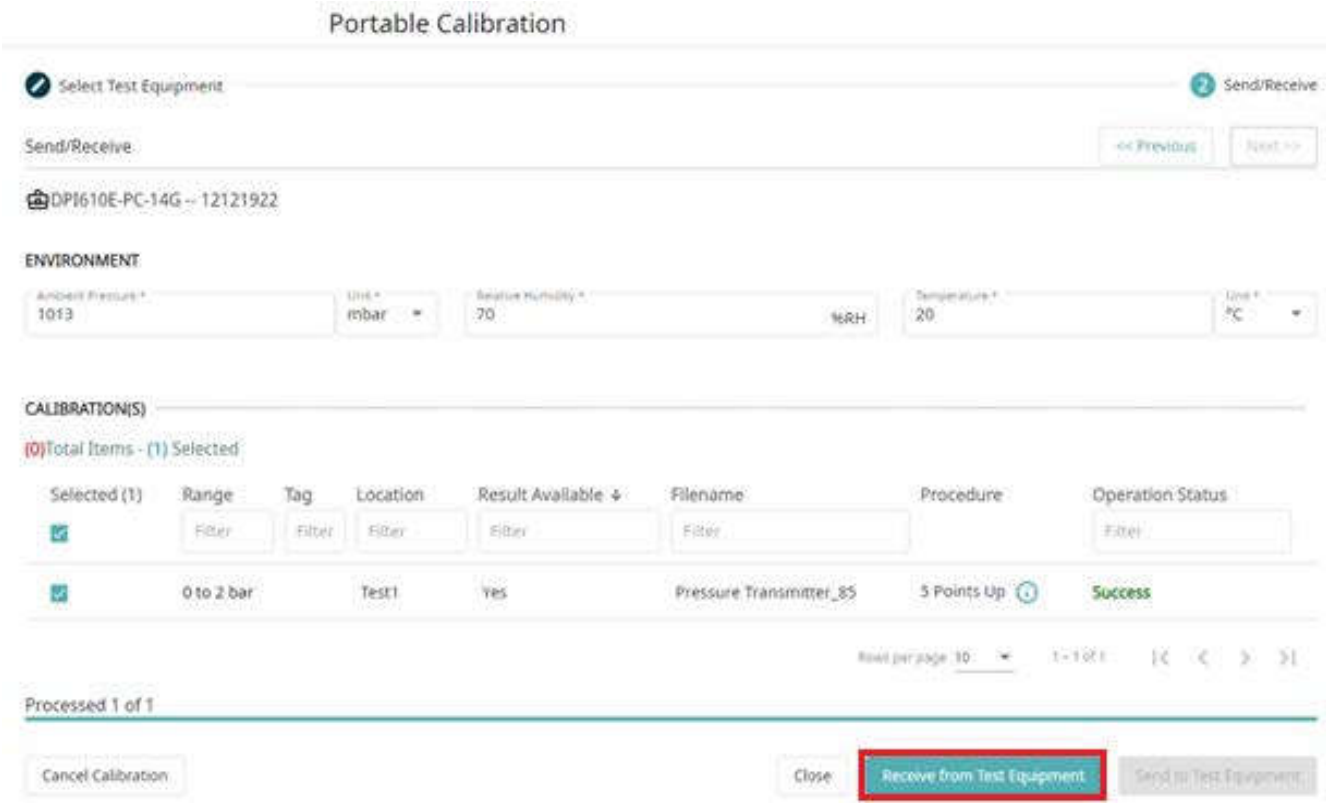
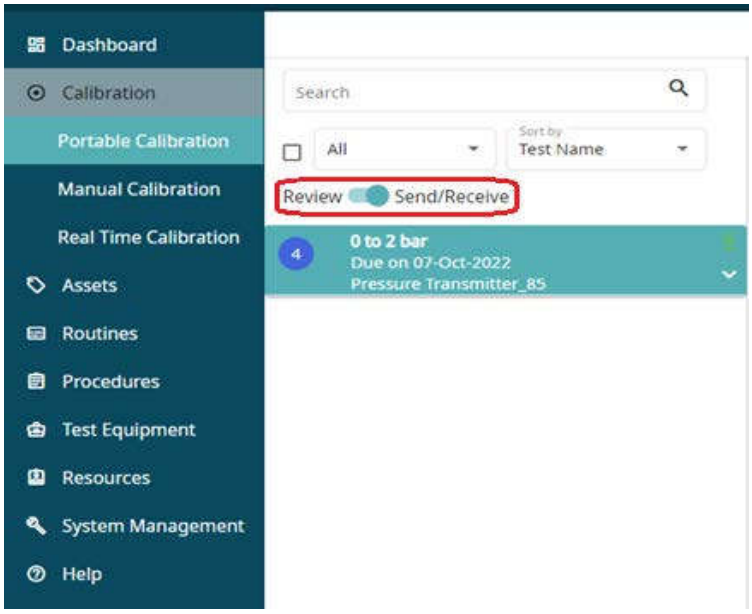
11.18 Uploading Test Results To 4Sight2

To upload test results back to 4Sight2:

From the relevant Calibration screen in 4Sight2, select the desired calibration and tap **Receive from Test Equipment**. Successful upload of results will be indicated with the Success text in the Operation Status area.



To review results, tap on the toggle icon in the left-hand section of the screen to change from **Send/Receive** to **Review** mode.



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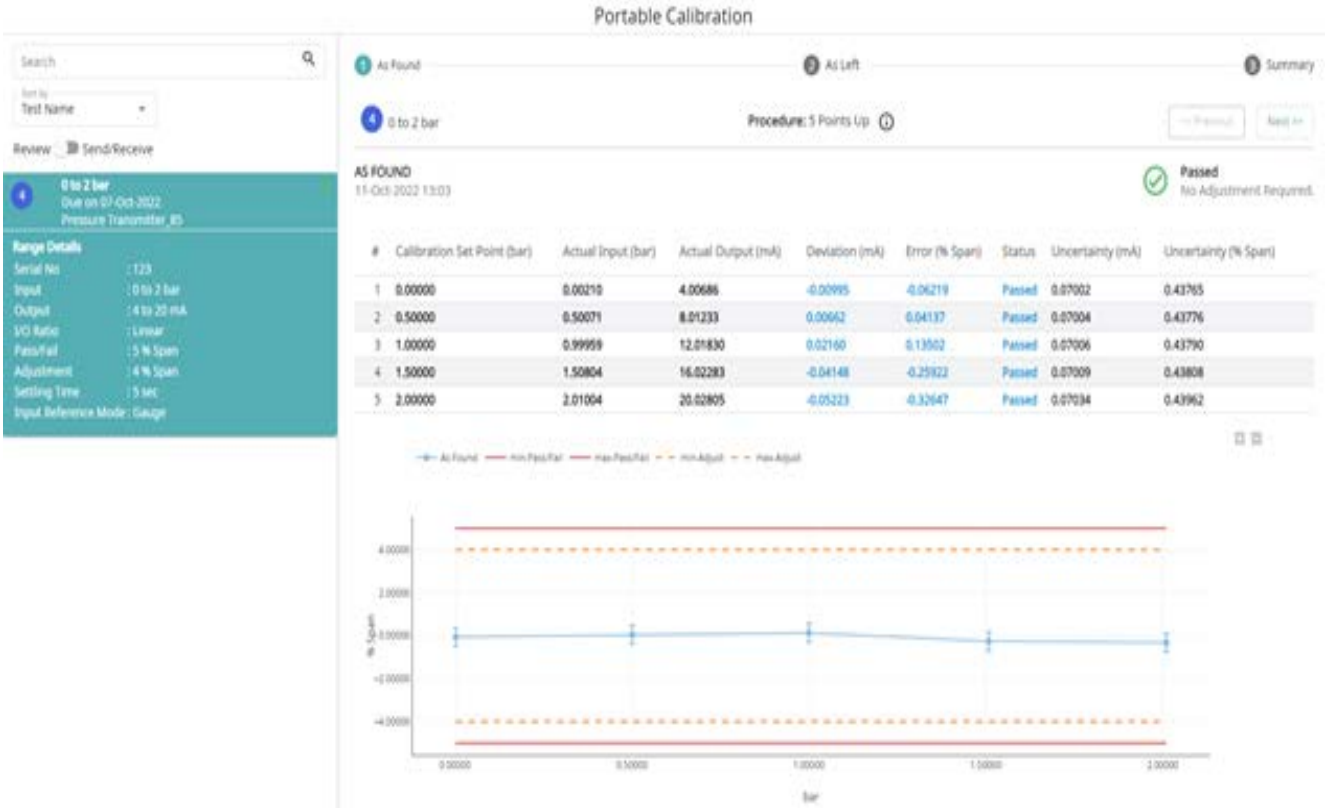
Select the calibration file to reveal details of the test and its results.



For additional information on how to analyse or process test data within 4Sight2, please refer to the 4Sight2 User Manual **123M3138**.

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12. HART

12.1 HART® Application

The DPI610E supports the HART® (Highway Addressable Remote Transducer) communication protocol and allows basic HART operation and configuration on HART supported devices. The HART bi-directional communications technology works as a master/slave protocol and when connecting the DPI610E to the HART device, the DPI610E acts as the master and the HART device, the slave. The DPI610E supports commonly used functions from the Universal and Common Practice commands specified in HART revision 5, 6 and 7.

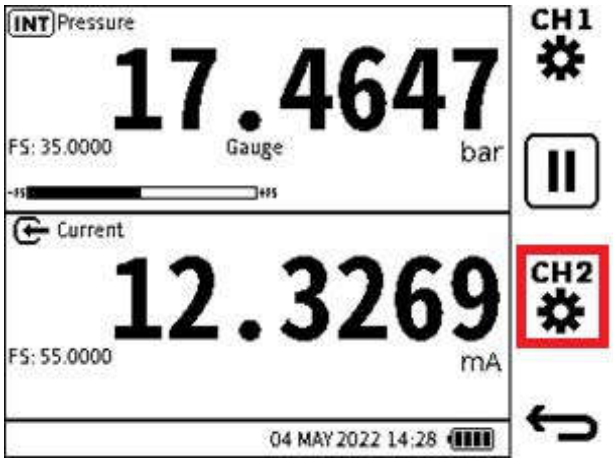
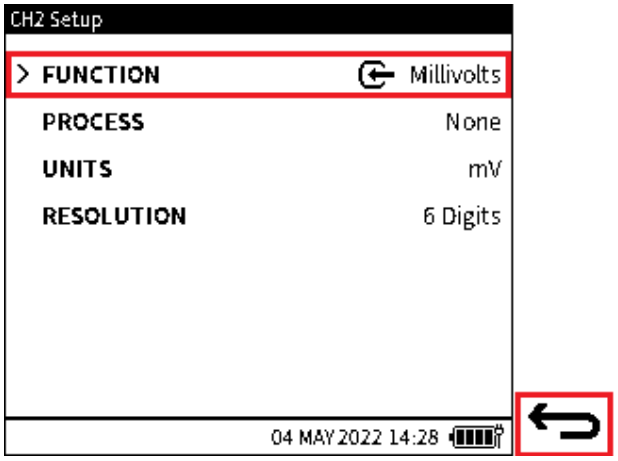
The HART function is only available on **CH2**. The function uses the current loop signal for its communication: the DPI610E can provide a 24 V loop power supply to the HART Device if required. The DPI610E also offers a 250-ohm HART resistor that provides the voltage drop required for the HART communication.

The DPI610E can be used to communicate with HART devices as a:

Primary Master - the DPI610E starts and controls all communications. The field device (slave) uses each command from the master device to make a change and/or send data back.

Secondary Master - the DPI610E connects to an existing HART communications network. The Secondary Master communicates with the field device between Primary Master messages.

12.1.1 Starting the HART application (1st Method)

Step 1		From the **Calibrator** screen: select the channel 2 CH2 **Setup** (either tap the screen icon or press the softkey.) **Note**: The **HART** function is only available on **CH2**.
Step 2		Select **FUNCTION** from the **CH2 Setup** screen.

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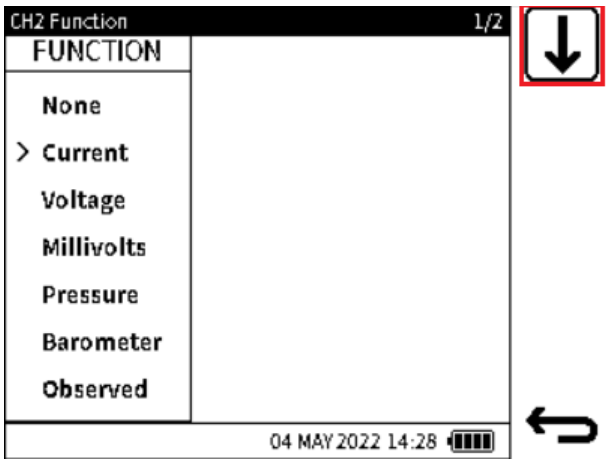
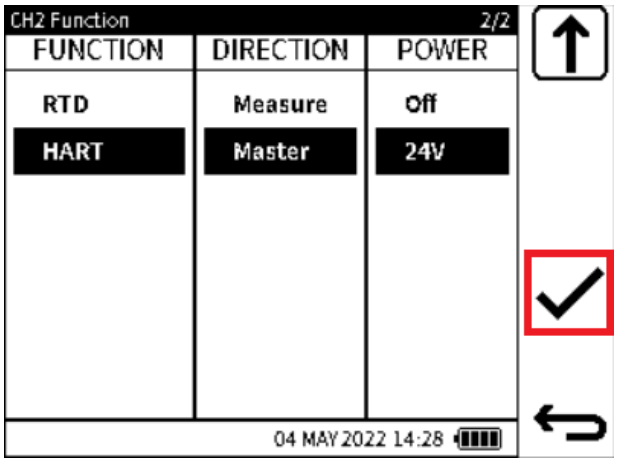
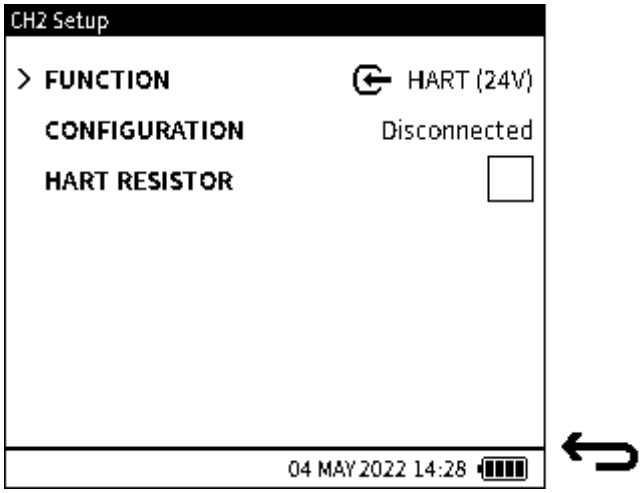
.

Step 3		Select the **Page Down** softkey to view the second page of **CH2** functions.
Step 4		Select **HART** in the **FUNCTION** column. Choose the desired **DIRECTION** (**Measure** or **Master**). Select the loop **POWER** option (**Off** to use an external power supply or **24V** to use the DPI610E internal power supply). Select the **Tick** ✓ icon to confirm the selection and configure the instrument.
Step 5		In the **CH2 Setup** screen, the **HART** function is displayed. The configuration status is also shown (i.e. **HART** device connected or disconnected). See Section 12.2 on page 237 for Configuration details. The 250-ohm HART resistor option allows the DPI610E to provide the resistor internally when enabled (checkbox ticked). If the instrument is connected directly to a network, there must be a 250-ohm resistor connected in series with the loop power supply and the **HART** device. Here the **HART** resistor should be disabled in the setup (checkbox unticked).

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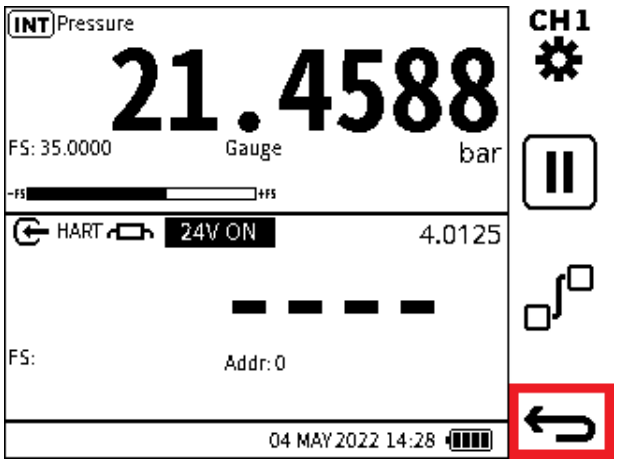
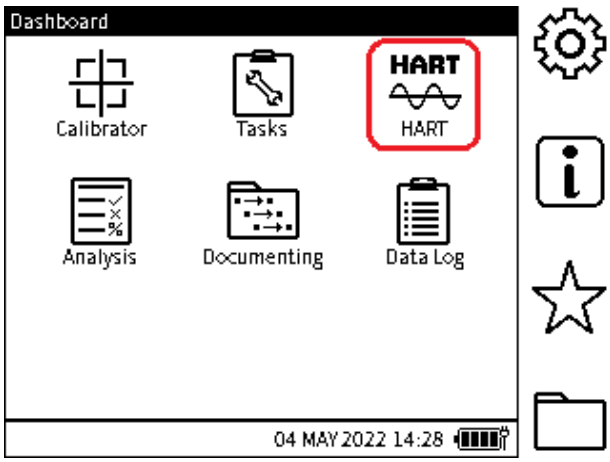
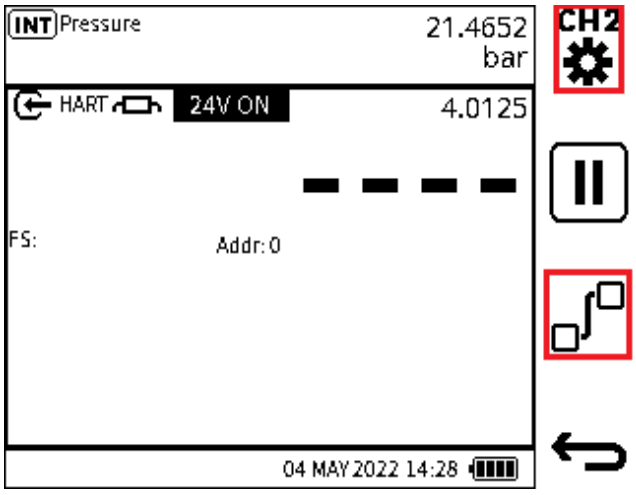
Step 6		**Note**: the 250-ohm HART resistor is important in allowing communication with the HART device, as it provides enough impedance in the signal loop for the HART signal to develop. Select the **Back** softkey to return to the Calibrator screen. **HART** is configured in **CH2**.

12.1.2 Starting the HART application (2nd Method)

Step 1		From the **Dashboard** select the **HART** icon by tapping on the HART icon or using the keypad to select the icon and the OK button to launch the application. This second method is a quicker way to configure the channel with HART. However, the HART application will use the default or last saved configuration. If different settings are required, then use Method 1 to change as desired.
Step 2		Tap in the **HART** bottom screen area to enlarge the window and show the **CH2** icon. Select this CH2 icon to show the **CH2 Setup** screen. You can follow the procedure in Section 12.1.1 on page 233 from step 2 forward to configure the HART function. Select the **Configuration** softkey to establish communication between the instrument and the **HART** device.

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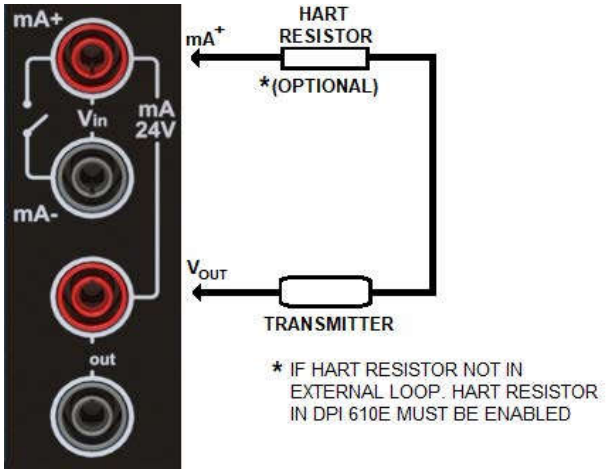
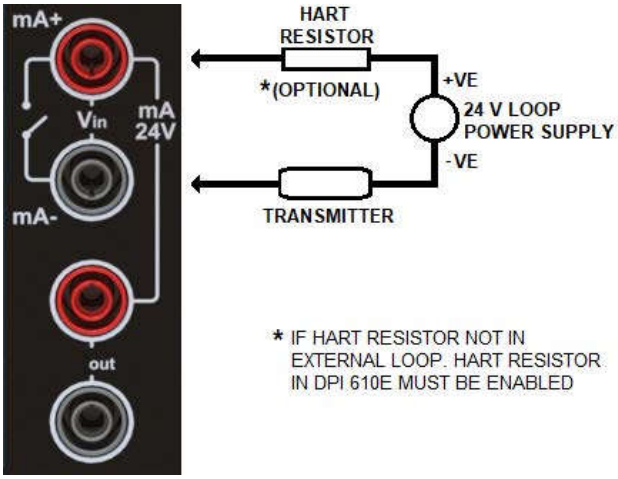
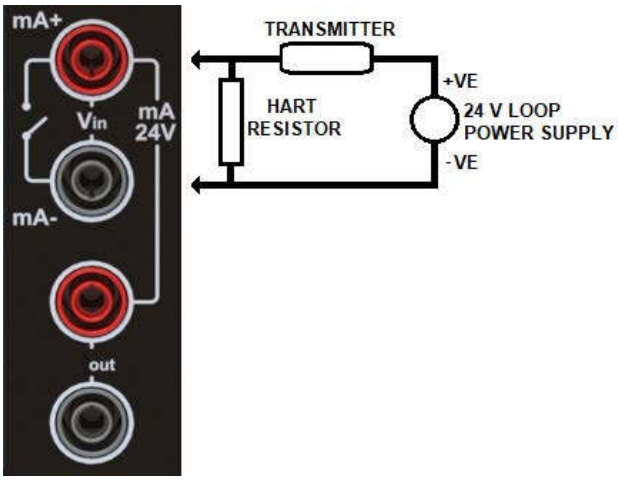
12.1.3 HART device electrical connection

Use the **Help** button on the DPI610E, to show information about the different electrical connections shown below. It could be necessary to use this button if this manual is not available.

	HART with internal 24 V loop power enabled. This is when the menu selection is: **HART** > **Measure** > **24V** (see Step 4 page 234).
	HART with external loop power (internal loop power disabled).This is when the menu selection is: **HART** > **DIRECTION** > **Measure** > **Off** (see Step 4 page 234).
	HART when connected to an external current loop. This is when the menu selection is: **HART** > **DIRECTION** > **Master** (see Step 4 page 234).

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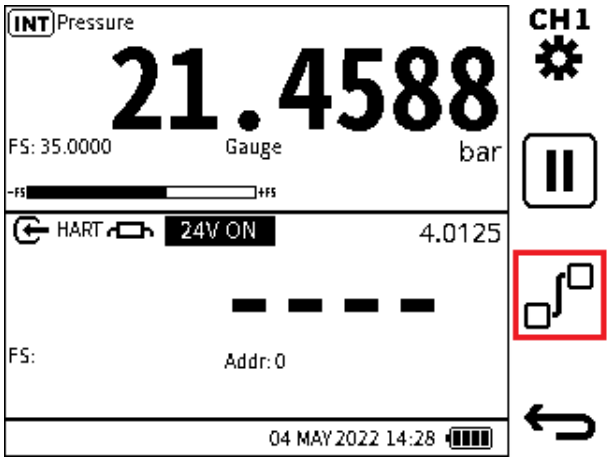
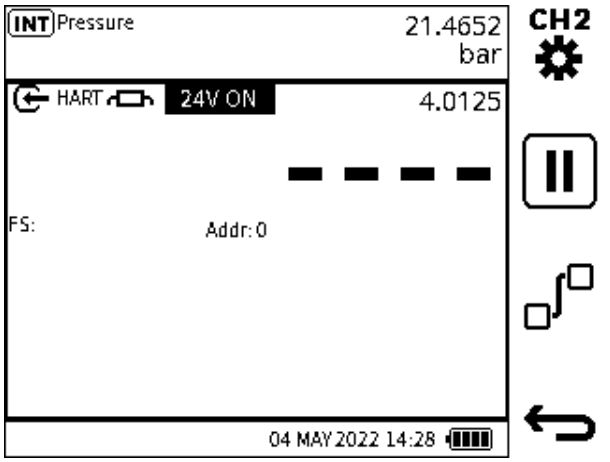
12.2 HART Device Configuration

Step 1		When the **HART** device has been physically connected to the DPI610E (electrical connection), the loop current measured (Measure mode) or "secondary reading" of the connected HART device (Master mode), which will normally be the demanded current by the DPI610E, is displayed as the secondary reading in the **CH2** window. To establish communication between the instrument and the **HART** device, select the **Configuration** softkey. **Note**: When the **HART** device has no communication with the DPI610E, an animated set of dashed lines (-----) appears in the primary reading area.
Step 2		Alternatively, the **Configuration** menu can be accessed from the **CH2 Setup** screen. **Note**: If the **HART** application is already running, maximize the **CH2** window to access the **CH2 Setup** softkey.
Procedure continues with Step 3 on next page		

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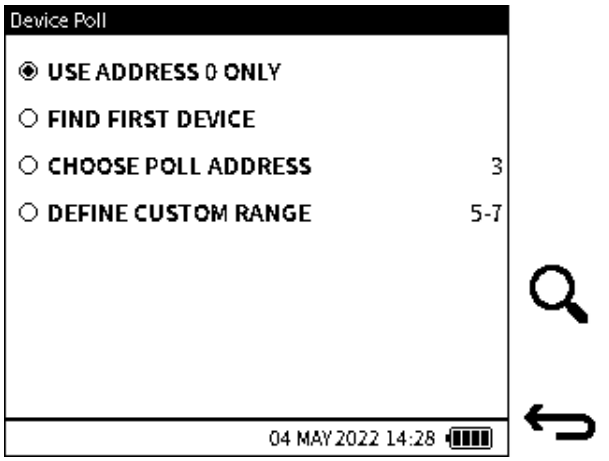
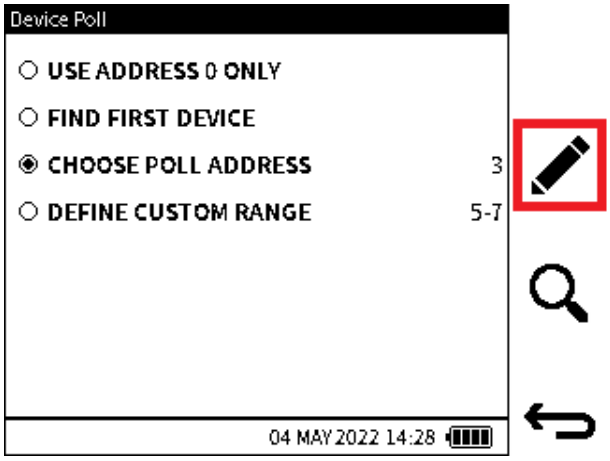
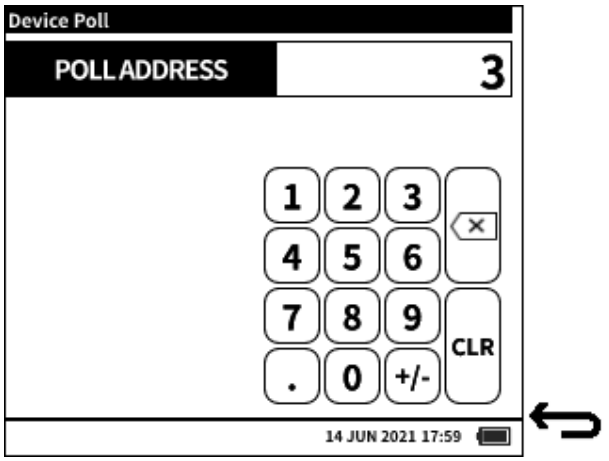
Step 3







The connected **HART** device can be configured with its unique Poll Address. The configuration screen provides options for the **HART** device polling. Select one of the following Device Poll methods to use:

1. **USE ADDRESS 0 ONLY** - Searches for any connected devices with Poll Address 0 only.
2. **FIND FIRST DEVICE** – Searches the full Poll Address range (0 to 63) and identifies the first device found.
3. **CHOOSE POLL ADDRESS** – Searches a single user specified Poll Address.
4. **DEFINE CUSTOM RANGE** – Searches a user specified Poll Address range.

When the **CHOOSE POLL ADDRESS** is selected, the Poll Address number to search must be entered.

The default is 0.
To edit the Address value, select the **Edit** softkey and enter the desired value. Press the **Tick** softkey to accept and the **Back** softkey to return to the **Device Poll** screen.
Note: A valid Poll Address value must be between 0 and 63).

Step 3 procedure continues on next page

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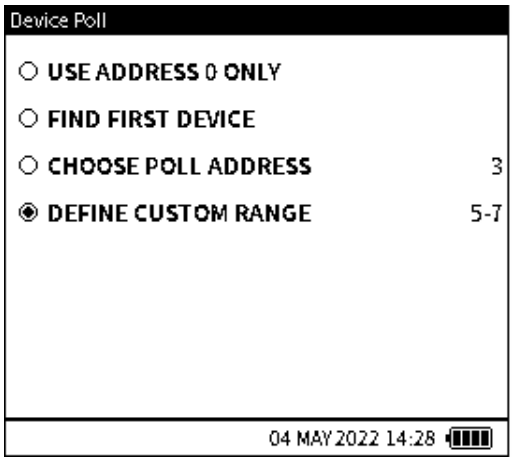
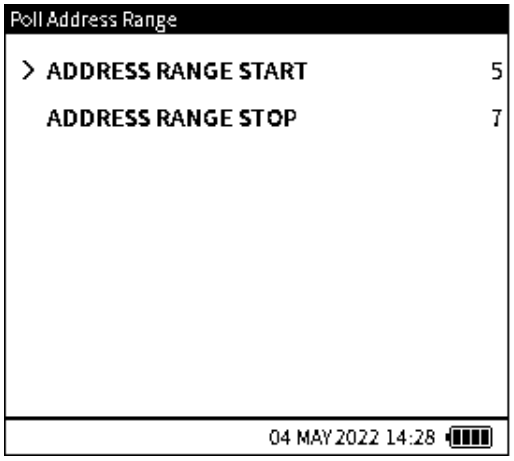
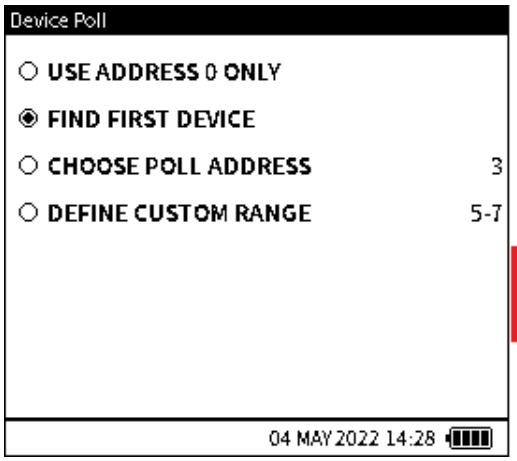
Step 3 Cont'd



When the **DEFINE CUSTOM RANGE** option is selected, the Poll Address range must be specified.
The default is 0 to 63.



To edit the Address range, select the **Edit** softkey and enter the desired **START** and **END** value. Press the **Tick** softkey to accept and the **Back** softkey to return to the **Device Poll** menu.
Note: A valid Poll Address range must be between 0 and 63.



Once the desired Poll method has been set up, select the **Search** softkey to begin.

Step 3 procedure continues on next page

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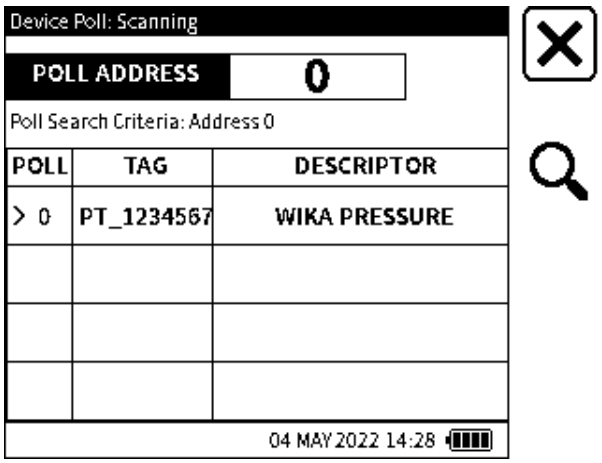
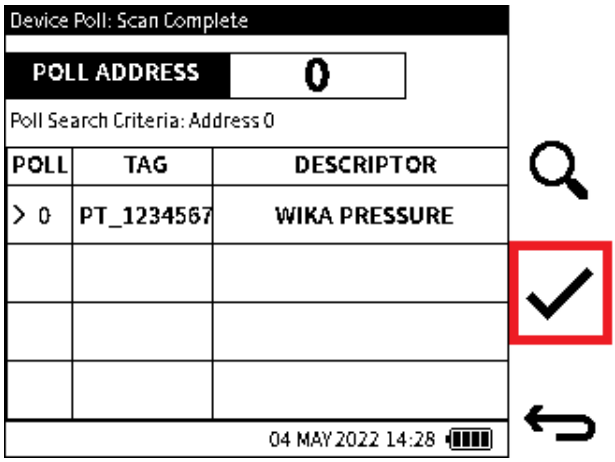
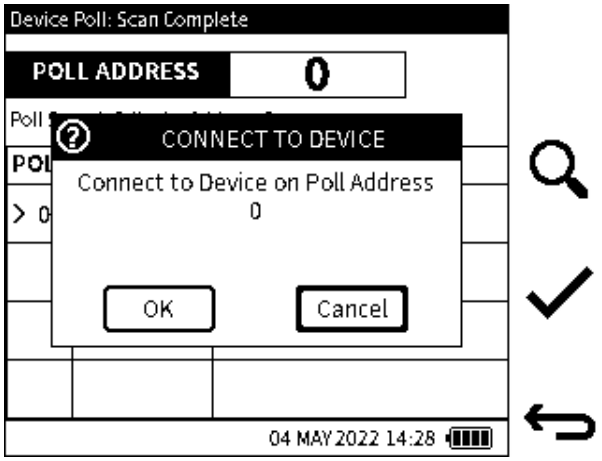
<table>
<tr>
<td>Step 3
Cont'd</td>
<td>
</td>
<td>In the Device Poll screen the following information is available:
1. In the Title bar, the Device Poll status is provided i.e., Scanning or Scan Complete.
2. Poll Address being currently searched.
3. Poll Search method or criteria.
4. Search result table which displays the Poll Address, Tag and Descriptor of the device when successfully found. It can display up to four found devices.
The scan can be aborted at any time if necessary, by using the Stop softkey.
Restart the scan by selecting the Search softkey.</td>
</tr>
<tr>
<td>Step 4</td>
<td>


</td>
<td>When the scan is complete or when the scan is aborted, any detected HART device(s) will be displayed in the table. If more than one device is displayed, select the desired device to connect to, by tapping the device details or using the navigation keypad.
Select the Tick softkey to connect to the selected device.
Select OK to connect to the selected device and return to the Calibrator screen or CANCEL to return to the Device Poll configuration screen.</td>
</tr>
</table>

Step 4 continues on next page

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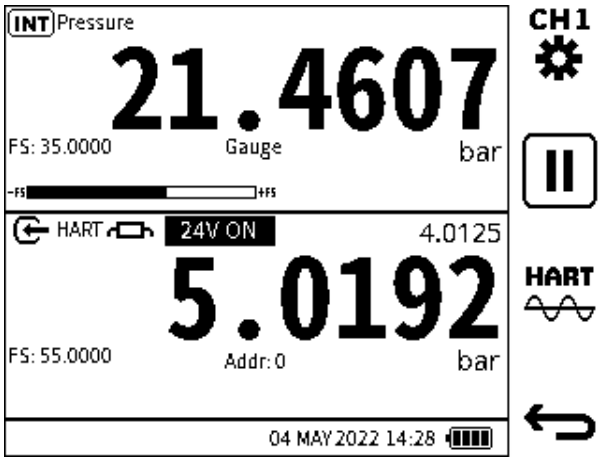
Step 4 Cont'd		The **HART** device is now connected, and the Primary reading displays the Primary Variable reading from the **HART** device. The device Poll Address is displayed as well as its full-scale value.

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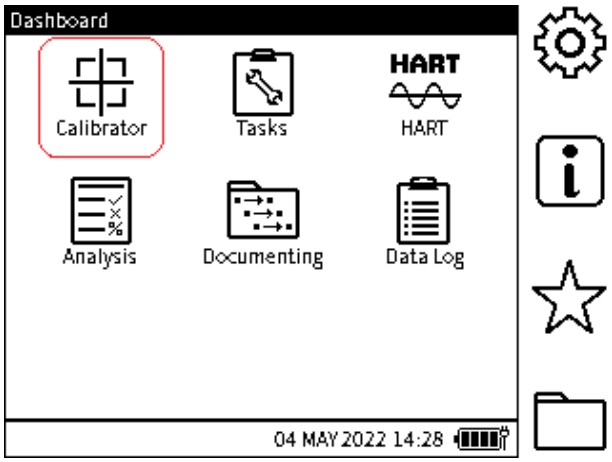
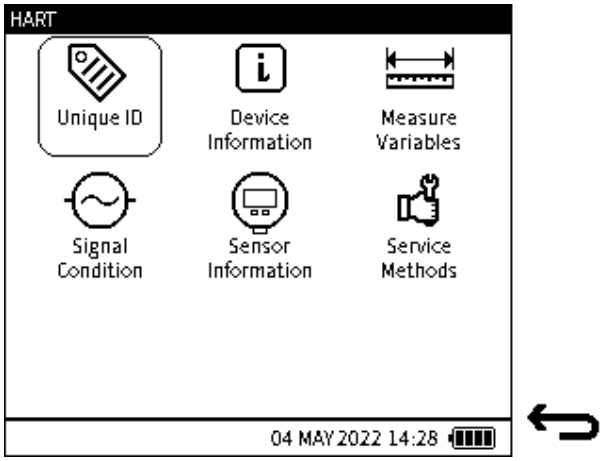
12.3 HART Dashboard

Step 1		From the **Dashboard**: select the **Calibrator** icon. The **Calibration** screen will appear: the **CH2** is replaced by the **HART** icon. **Note**: for the **HART** softkey to appear in the next screen, the **HART** device must be connected successfully to the DPI610E. See previous section.
Step 2		From the **Calibrator** screen: select the **HART** channel HART icon (either tap the screen icon or press the softkey.)
Step 3		A screen of **HART** options appears. These options are described in the rest of this chapter.

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12.3.1 Unique ID

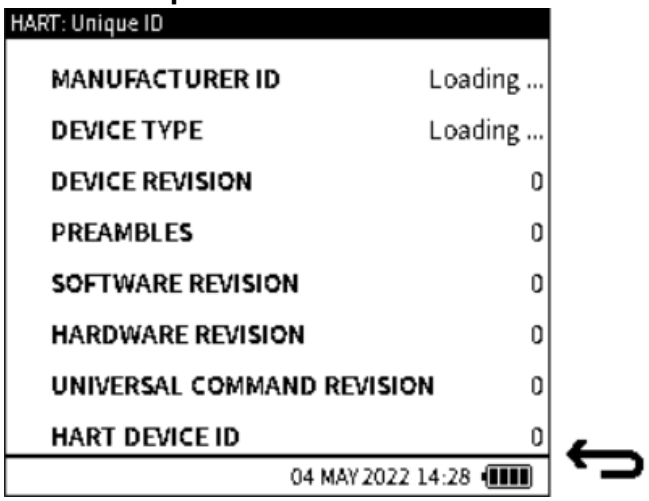

Figure 12-1: Unique ID screen

The **Unique ID** screen gives identity information about the connected **HART** device. This **HART** command gets the long address of the device plus other manufacturer information available and shows it in this screen.

The **PREAMBLES** data relates to the code that identifies the start and end of a data packet.

Note: this is a read-only screen.

12.3.2 Device Information



Figure 12-2: Device Information screen

The **HART: Device Information** screen displays editable information about the device. The information options available are shown in the Figure 12-2 above.

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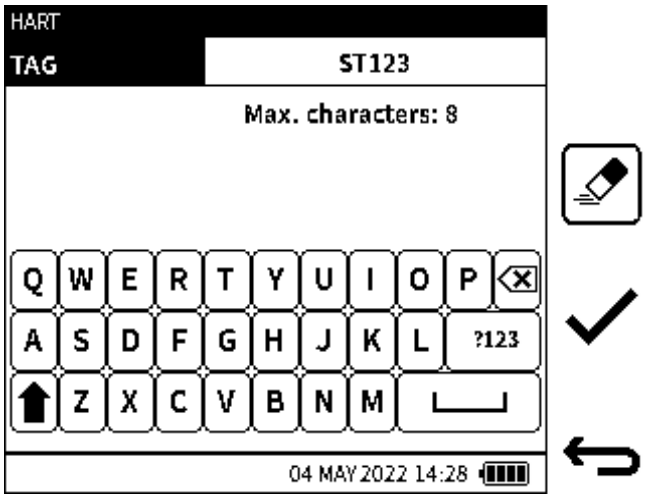
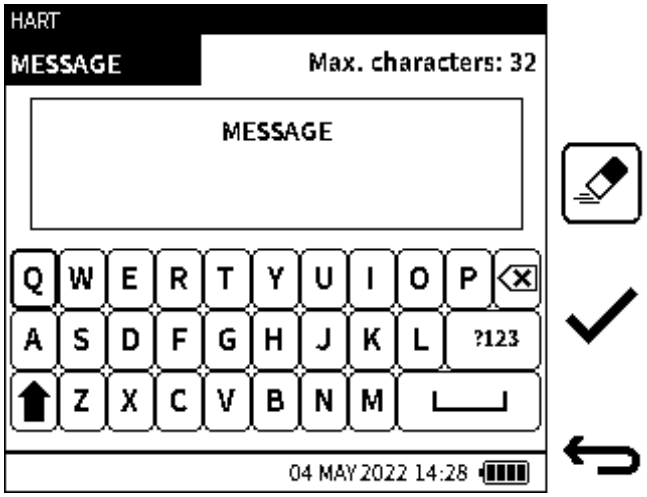
To edit any of the device information, select the option and enter the desired value or text. Select the **Tick** ✓ softkey to confirm and write this new change to the device

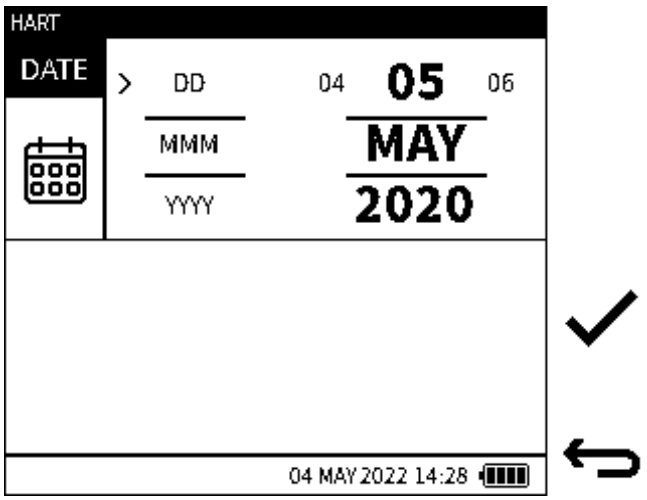
- **TAG**.



- **POLL ADDRESS**
- **DESCRIPTION**
- **MESSAGE**.



- **DATE**.



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- **PREAMBLES**

The **PREAMBLES** data relates to the code that identifies the start and end of a data packet.

Note: The Device Information screen options are all user editable as indicated by the mini pencil icon at the end of each option line.

12.3.3 Measure Variables

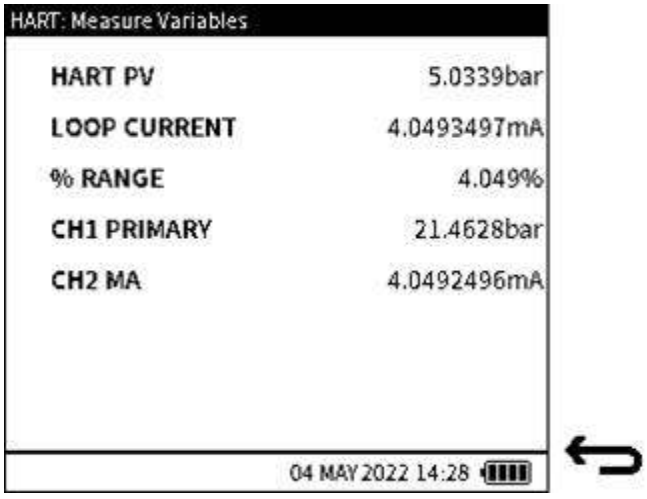

Figure 12-3: Measure Variables screen

This screen shows the following variables:

- HART PV (Primary variable)
- Loop Current (Output by HART device)
- % Range (Percentage - the current PV reading of the PV range)
- CH1 Primary (Primary reading on CH1)
- CH2 MA (Loop current measured by the DPI610E).

12.3.4 Signal Condition

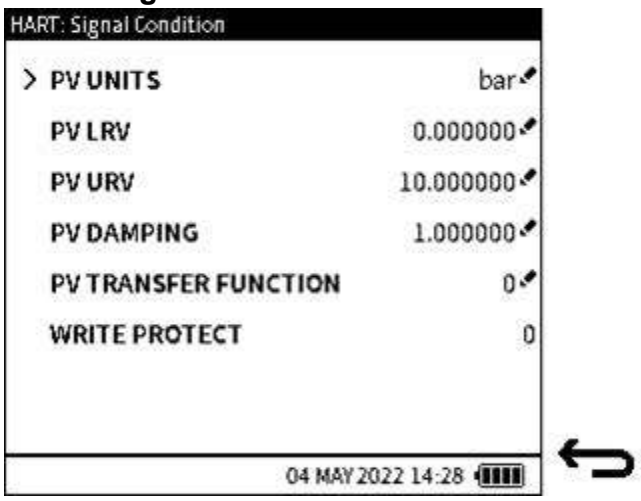

Figure 12-4: Signal Condition screen

This screen shows the following variables (variables with a pen icon can be edited):

- PV Units (Measurement units the primary variable is displayed)
- PV LRV (Primary variable Lower Range Value)

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- PV URV (Primary variable Upper Range Value)
- PV Damping (Primary variable damping value in seconds)
- PV Transfer Function (Primary function transfer function selection code)
- Write Protect (Write protect code).

12.3.5 Sensor Information

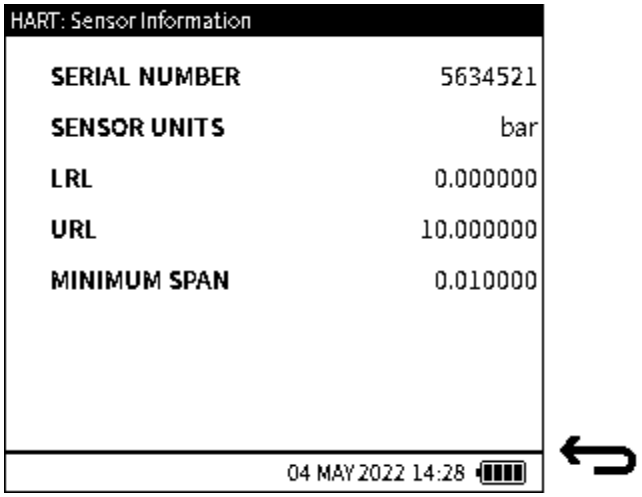

Figure 12-5: Sensor Information screen

This screen shows the following variables:

- Serial Number
- Sensor Units
- LRL (Lower Range Limit)
- URL (Upper Range Limit)
- Minimum Span.

Note: This is a read-only screen.

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12.4 HART Service Methods

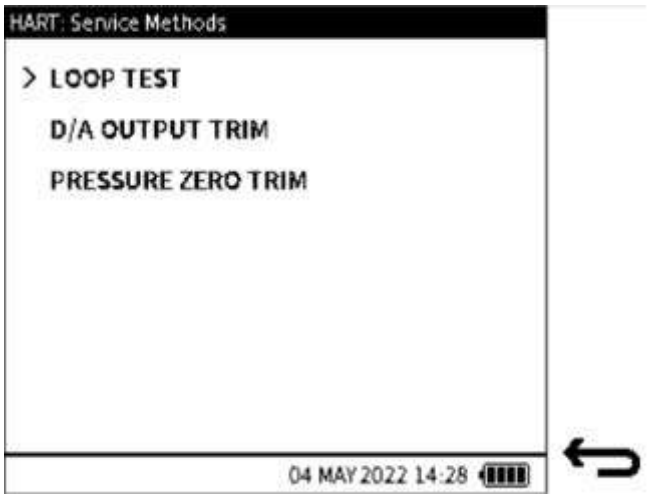


Figure 12-6: Service Methods screen

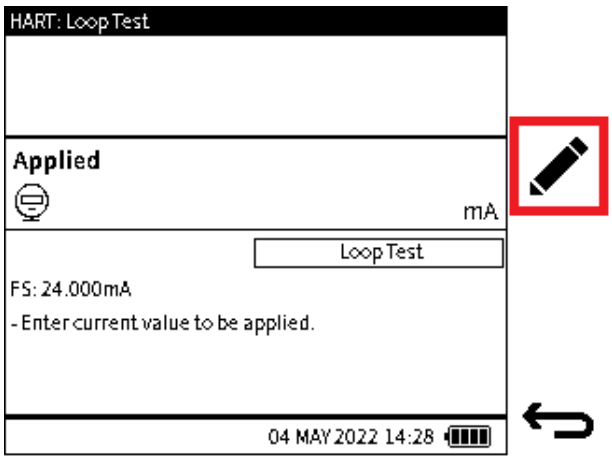
The Service Methods available on the DPI610E are:

1. **LOOP TEST**
2. **D/A OUTPUT TRIM (page 249)**
3. **PRESSURE ZERO TRIM (page 253).**

12.4.1 LOOP TEST

This method sets the output of the **HART** device to a user specified analog (current) value. It is useful in testing the integrity of the current loop and makes sure the system is functioning correctly. With the DPI610E Loop test method, the user can force an output current between 4 and 20 mA for normal transmitter operation or <3.6 mA and >21 mA to verify failure alarm indication in the device and verify the A to D Trim. The actual current output from the HART device is measured by the mA input of the DPI610E calibrator.

To output a current:

Step 1		Select **LOOP TEST** from the **HART: Service Methods** screen. In the **Loop Test** screen, select the **Edit** softkey.

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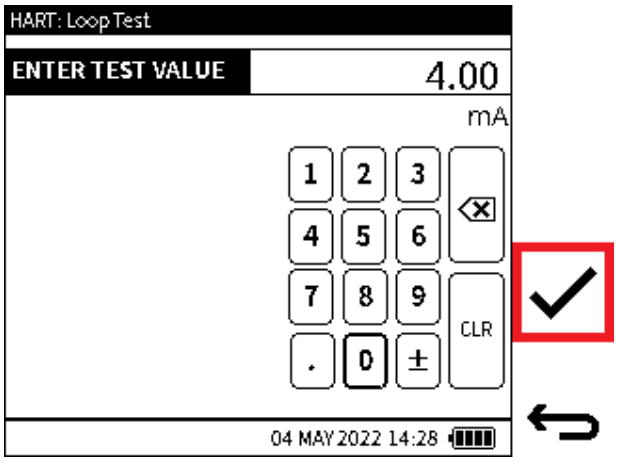
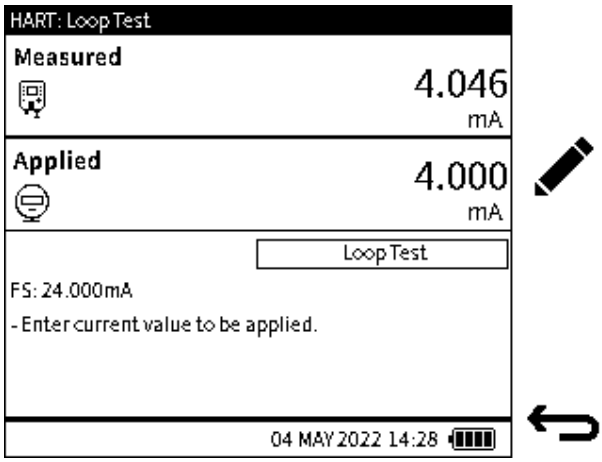
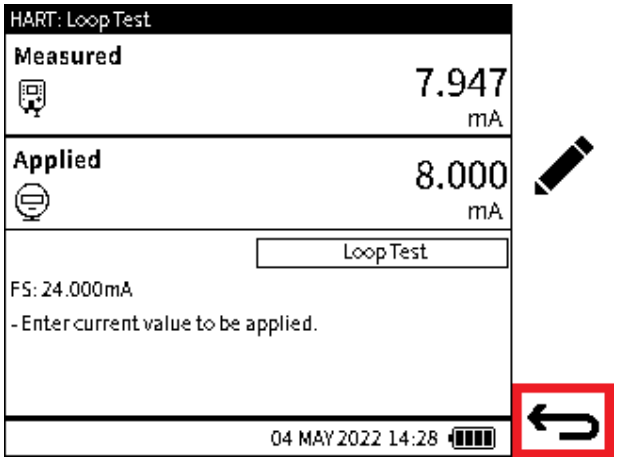
Step 2		Enter the required output value and select the **Tick** ✓ softkey.
Step 3		On this screen, the current measured by the DPI610E appears as the result of the forced current output from the **HART** device. **Note**: The signal measured by the DP610E is indicated by the icon , while that measured by the **HART** device is indicated by the icon.
Step 4		Repeat as required with all the desired current output values and check the measured current value. To exit the loop test, select the **Back** ⮌ softkey.

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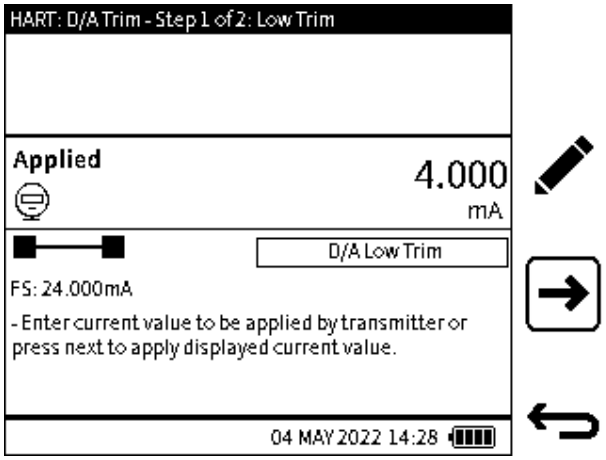
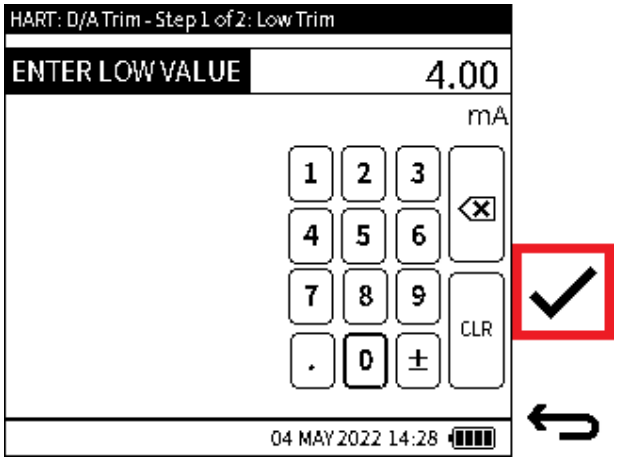
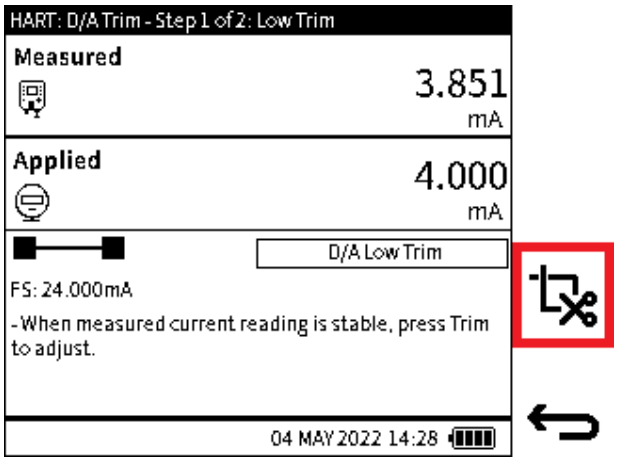
12.4.2 D/A OUTPUT TRIM

The D/A trim will trim the analog current output for the HART device under test to be consistent with the mA measure input of the DPI610E calibrator. If required, a trim is performed at the low value point and/or the high value point which adjusts the transmitters digital to analog converter.

To perform a D/A Trim:

Step 1		Select **D/A OUTPUT TRIM** from the **HART: Service Methods** screen (See Figure 12-6 on page 247.) The screen on the left is the first part of the D/A trim procedure which focuses on the Low (value) trim. The default Low Trim value is 4 mA. This value can be edited if required by selecting the **Edit** softkey (Step 2). If no change is required, select the **Next** softkey to proceed (Step 3).
Step 2		Enter the required Low Trim value and select the **Tick** softkey to confirm this value.
Step 3		The Low Trim value has been applied and the measured value now appears. **Note**: The signal measured by the DPI610E is indicated by the icon, while that measured by the HART device is indicated by. Make sure that the reading is stable. To perform the trim at this point, select the **Trim** softkey.

Step 3 continues on next page

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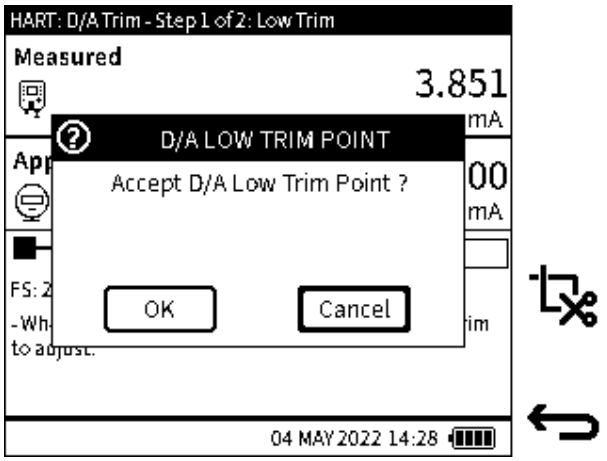
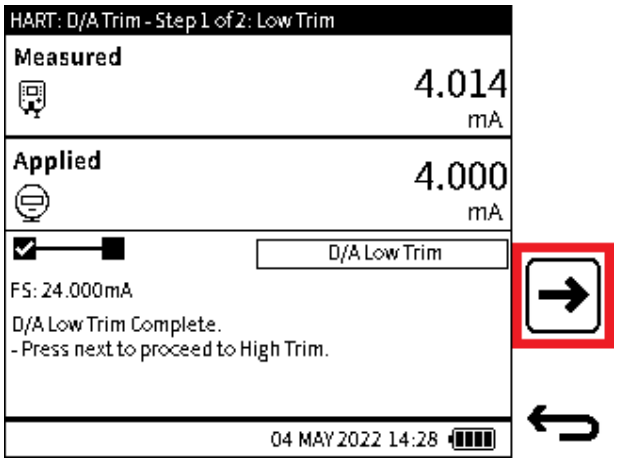
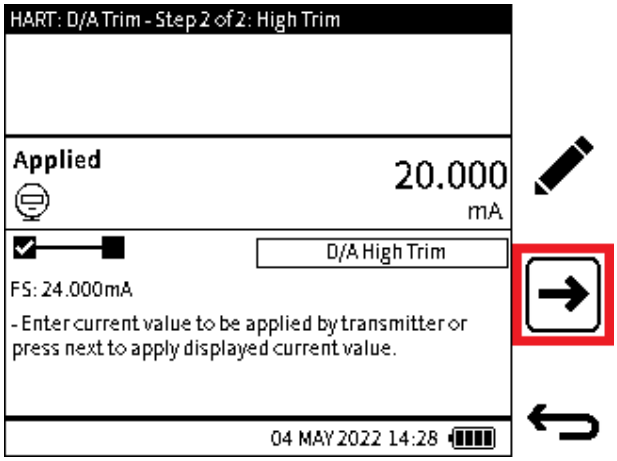
Step 3 Cont'd		Select **OK** in the popup message window to accept the Trim. Or select **CANCEL** to return to the previous step.
Step 4		When the Low trim is complete, select the **Next** softkey to proceed to the High Trim procedure or select the **Back** softkey to exit.
Step 5		The second part of the D/A trim procedure focuses on the High (value) trim. The default High Trim value is 20 mA. This value can be edited if required by selecting the **Edit** softkey (Step 6). If no change is required, select the **Next** softkey to proceed (Step 7).
Procedure continues on next page		

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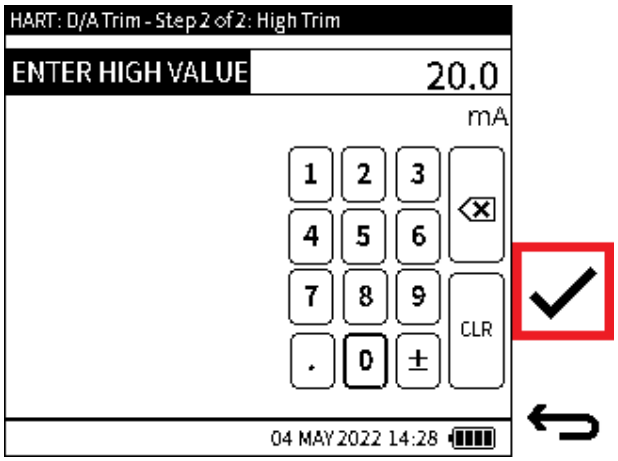
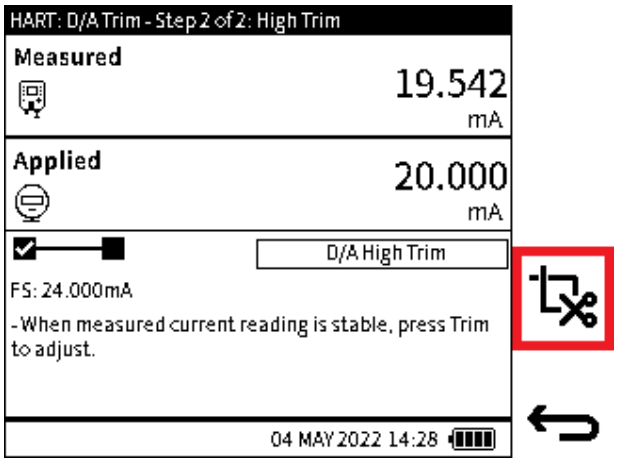
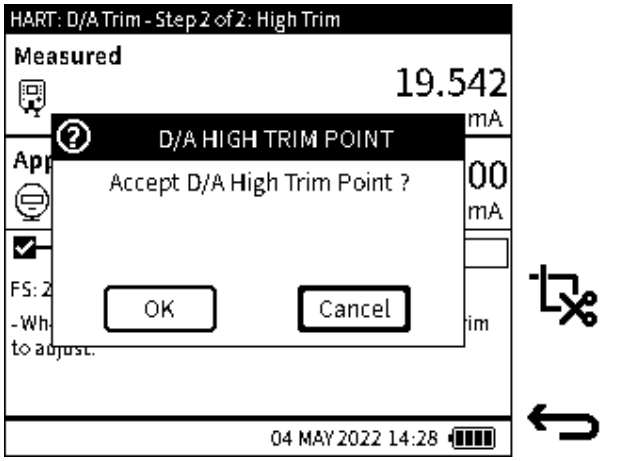
Step 6		Enter the required High Trim value and select the **Tick** ✓ softkey to confirm.
Step 7		The High Trim value has been applied and the measured value is now displayed. **Note**: the signal measured by the DPI610E is indicated by the icon, while that measured by the HART device is indicated by . Make sure that the reading is stable. To perform the trim at this point, select the **Trim** softkey.
Step 8		Select **OK** in the popup message window to accept the Trim, or select **Cancel** to return to the previous step. The High Trim is complete, which finishes this stage of the D/A trim procedure. The final step of the procedure is to verify that the D/A trim adjustment is sufficient.

Procedure continues on next page

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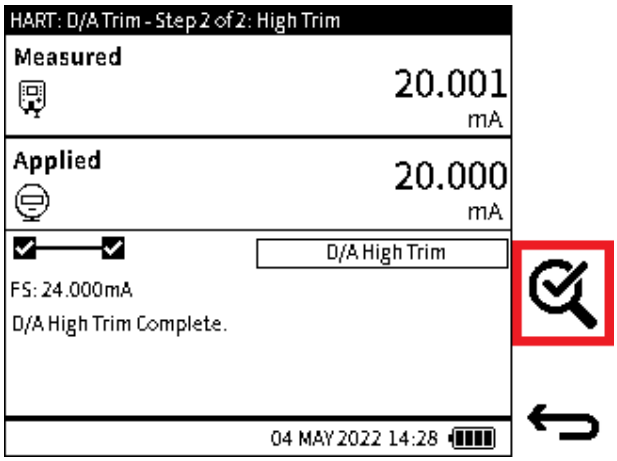
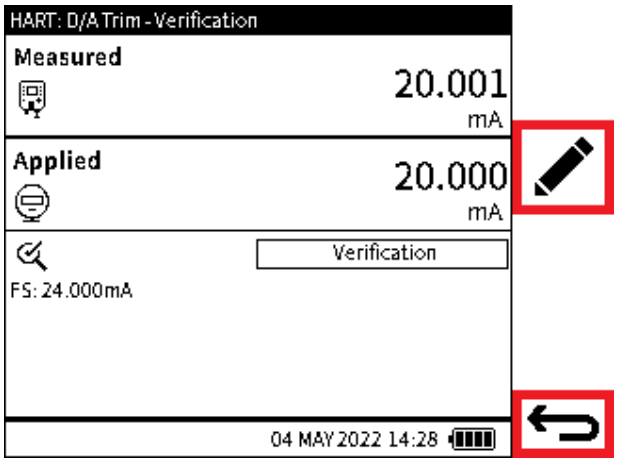
Step 9		Select the **Verification** softkey to test if the adjustment has been sufficient.
Step 10		In the **Verification** screen, use the **Edit** softkey to enter test current output values between 0 and 24 mA and check the measured values at each point. To exit the Verification screen, use the **Back** softkey.

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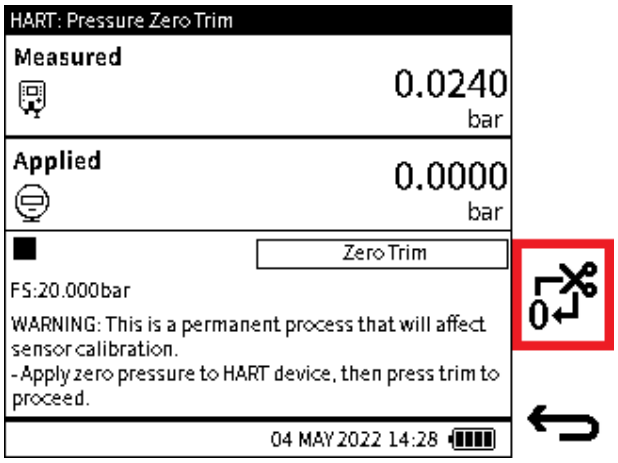
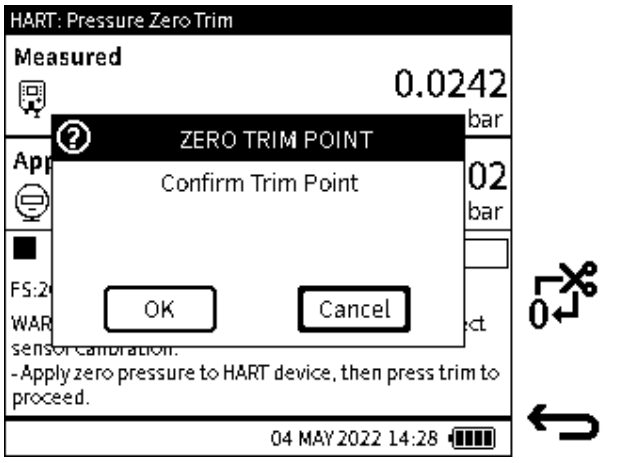
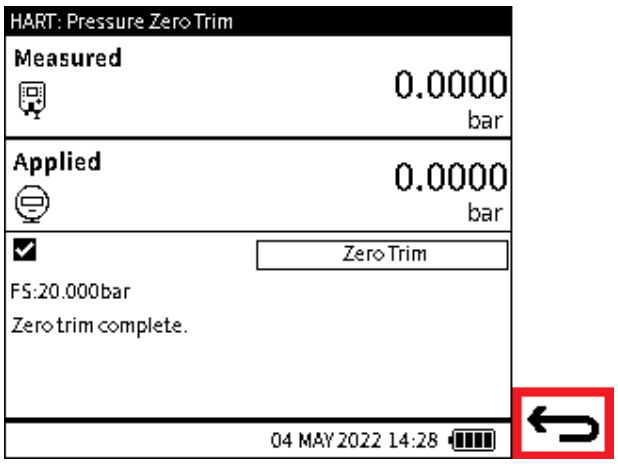
12.4.3 PRESSURE ZERO TRIM

A Zero Trim is a method to cancel out zero-shift that could arise from sensor zero drift or change in installation orientation. It allows for the characterization data to be adjusted by correcting the zero (pressure) value when a “zero” input is applied.

Note: Zero trim should only ever be applied to Gauge or Differential pressure sensors.

Step 1		Select **PRESSURE ZERO TRIM** from the **HART: Service Methods** screen (See Figure 12-6 on page 247). Make sure the **HART** device has a secure process connection to the DPI610E. Apply 0 pressure using the pump/volume adjuster on the instrument or vent the system. Wait and make sure the reading is stable. **Note**: the signal measured by the DPI610E is indicated by the icon , while that measured by the HART device is indicated by . Select the **Trim** softkey.
Step 2		Select **OK** in the popup message window to accept the Trim, or select **Cancel** to return to the previous step.
Step 3		When the Zero Trim is complete, use the **Back** softkey to exit or repeat the Trim if required.

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12.5 HART Error and Message Codes

Error Code	Description
0	Success
1	Undefined Error
2	Invalid Selection
3	Passed Parameter Too Large
4	Passed Parameter Too Large
5	Too few data bytes received
6	Device-specific Command Error
7	In Write Protect Mode
8-14	Multiple Meaning Warning
16	Access Restricted
17	Invalid Device Variable Index
18	Invalid Unit Code
19	Device Variable Index Not Allowed
20	Invalid Extended Command Number
21	Invalid I/O Card Number
22	Invalid Channel Number
23	Sub-device Response Too Long
24-27	Reserved Warning
28	Multiple Meanings Error
32	Device is Busy
33	Delayed Response Initiated
34	Delayed Response Running
35	Delayed Response Dead
36	Delayed Response Conflict
37-59	Reserved Error
60	Payload too Long
61	No Buffer Available
62	No Alarm/Event Buffers Available
63	Priority too low
64	Command Not Implemented
65-72	Multiple Meanings Error
96-111	Reserved Warning

Table 12-1: HART Error Codes

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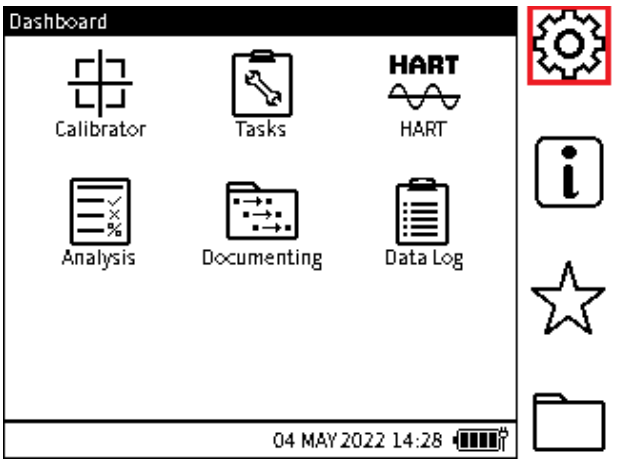
13. Instrument Calibration

13.1 How to show the Instrument Calibration screen

Step 1		Select the **Settings** icon on the Dashboard. Tap on the icon or press the softkey on the right of icon.
Step 2		Select **ADVANCED** at the bottom of the **General Settings** screen. Tap on **ADVANCED** or use the Navigation Pad to move to bottom row and press the Pad's **Enter** key to select.

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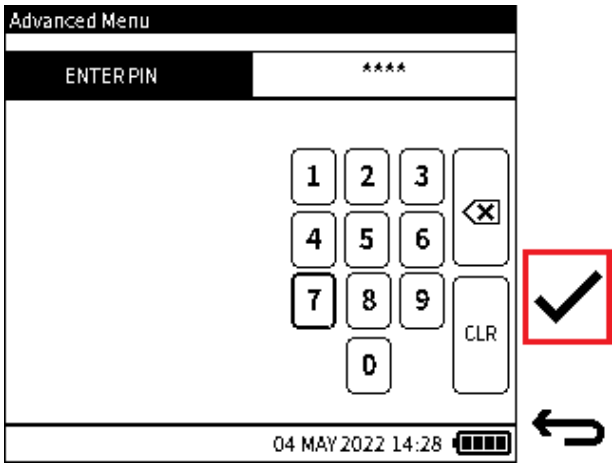
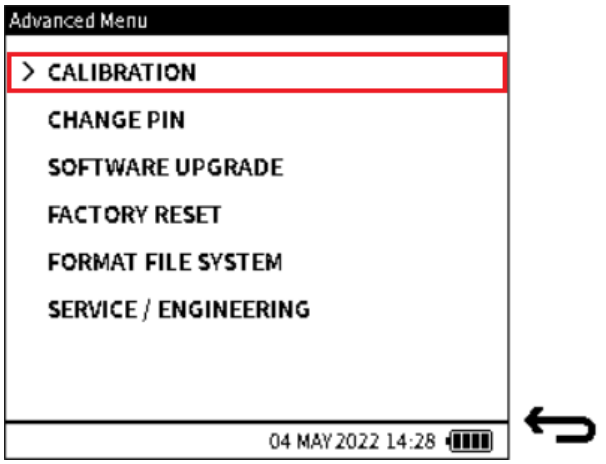
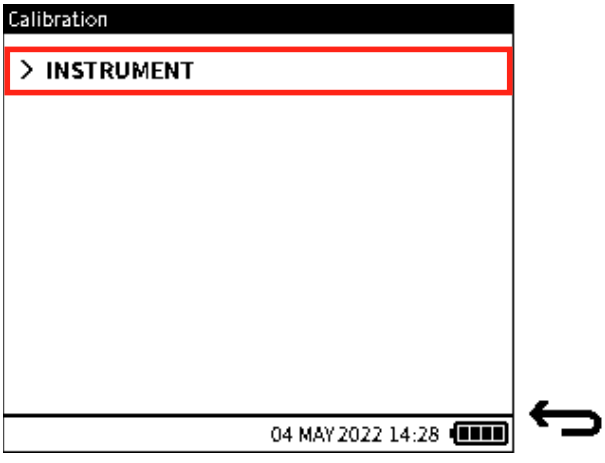
Step 3		Use the onscreen keypad in the **Advanced Menu** screen to enter the PIN number (**4321** is the default value until a custom PIN is selected) and then select the **Tick** ✓ icon.
Step 4		In the Advanced Menu screen, select **CALIBRATION**. Refer to Chapter 5, “Advanced Menu” on page 44, for instructions on how to use the other Advanced Menu options.
Step 5		Select **INSTRUMENT** in the **Calibration** screen to show the **Instrument Calibration** menu.

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Step 6		The different **Instrument Calibration** options are now available.

13.1.1 The Instrument Calibration screen options

Option	Description
PERFORM CALIBRATION	Calibrate the instrument
INTERNAL PRESSURE SENSOR STATUS	View internal pressure sensor details
SET CALIBRATION DATE & INTERVAL	Set instrument date and interval
BACKUP CALIBRATION	Back up current calibration status
RESTORE CALIBRATION	Restore instrument to a previous calibration status
RESTORE FACTORY CALIBRATION	Return to the factory (default) calibration status

Note: The information in this chapter is for calibrating Internal and External sensors. The configuration of external sensors, to enable the DPI610E to recognise and use external sensors, is explained in Chapter 8, “External Sensors” on page 133.

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13.2 PERFORM CALIBRATION

The following functions are available in the **Perform Calibration** screen:

Function	Direction	Range
Current	Measure	20 mA 55 mA
	Source	24 mA
Voltage	Measure	20 V 30 V
	Source	10 V
Millivolts	Measure	200 mV 2000 mV
Pressure	Measure	Dependent on sensor fitted
Barometer	Measure	750 to 1150 mbar

Note: To access the **Perform Calibration** screen (Figure 13-1), select **PERFORM CALIBRATION** from the **Instrument Calibration** screen.

Note: The **Filter** process option must be **ON** for sensor calibration, see Section 6.3.3 on page 107 for the procedure.

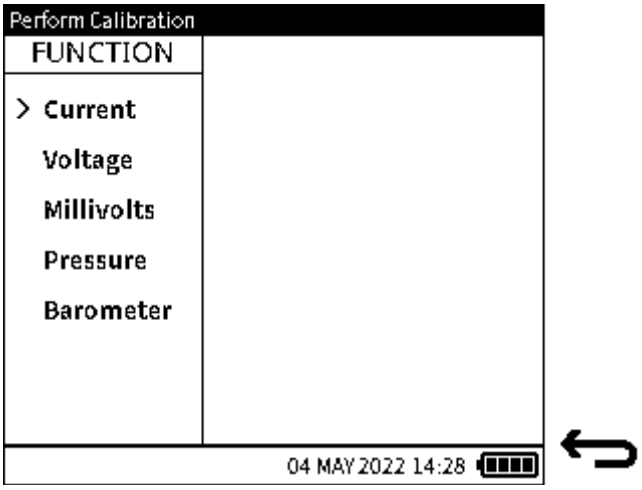

Figure 13-1: Perform Calibration screen

13.2.1 Calibration - Electrical Functions

The editing of **Current**, **Voltage** and **Millivolts** options is similar in procedure. Therefore, on the following pages the procedure used for editing Current variables is the same as for Voltage and Millivolts. The **Pressure** and **Barometer** options are described separately.

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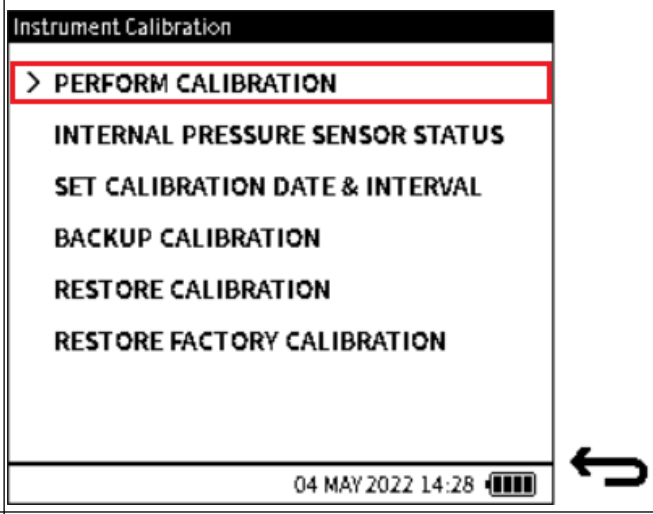
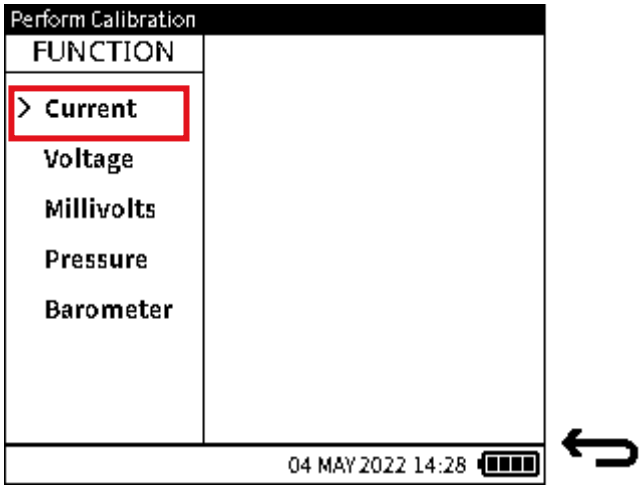
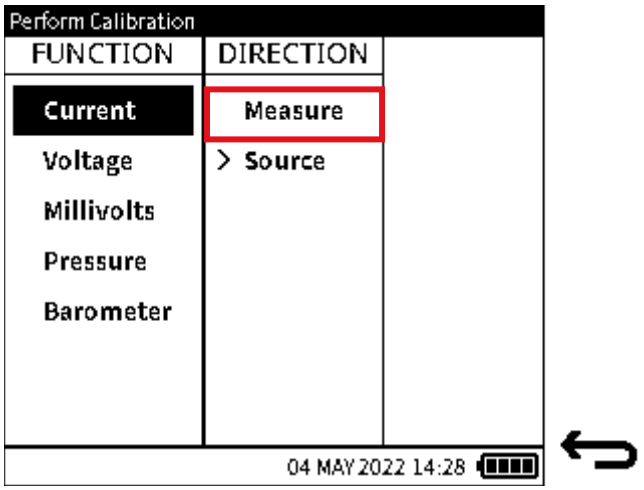
To calibrate an electrical function (Current Measure is used in this example), make sure the electrical connection between the DPI610E and the external calibrated equipment is correct (See Section 6.2.9 on page 80 for Current Measure electrical connection diagram).

Step 1		Select **PERFORM CALIBRATION** from the **Instrument Calibration** menu.
Step 2		Select a **FUNCTION** option (e.g., **Current**).
Step 3		Select a **DIRECTION** option if applicable (e.g., **Measure**).

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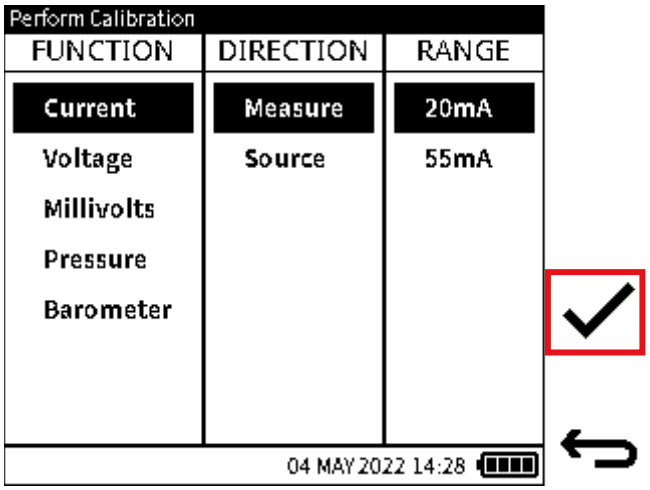
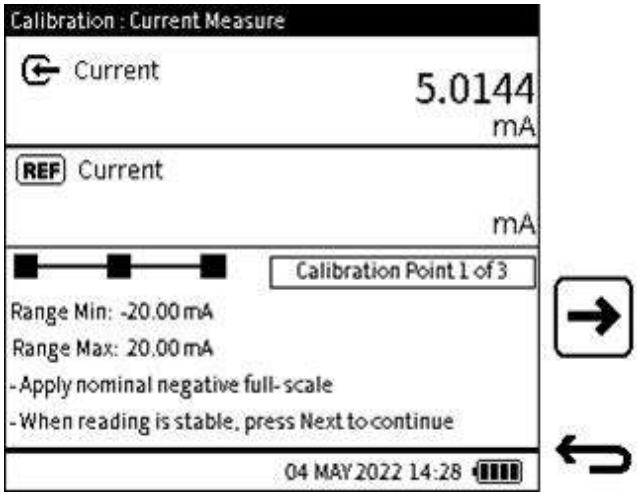
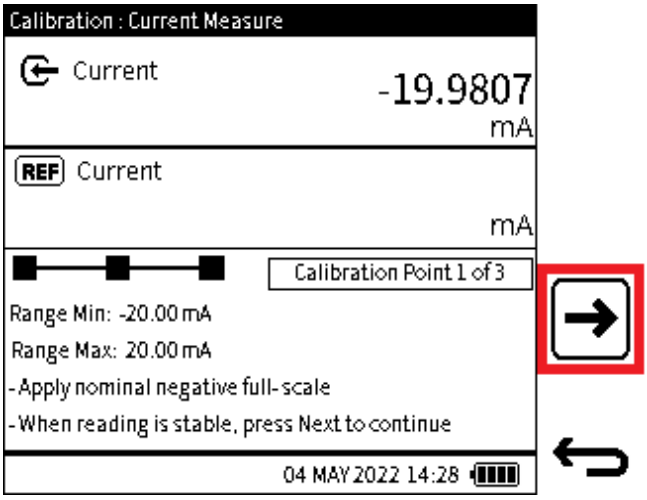
Step 4		Select a **RANGE** option if applicable (e.g., 20 mA). Select ✓ to confirm.
Step 5		This screen has three sections. The top two sections give: • The reference reading from external calibrated equipment. • The measured (or sourced) reading from the DPI610E. The bottom section gives the following information: 1. Function minimum range (or negative full-scale) value. 2. Function maximum range (or positive full-scale) value 3. Calibration procedure step status (visual status boxes and text status) 4. User instructions for each step of the procedure.
Step 6		To start the calibration, apply nominal negative full-scale Current (approximately -20 mA) as per the displayed instruction. This is the Calibration point 1. When the measured Current reading is stable, select the **Next** → icon to continue. **Note**: • All electrical measure functions require a 3-point calibration. • Current Source function requires a 2-point calibration. • Voltage source function requires a 1-point calibration.

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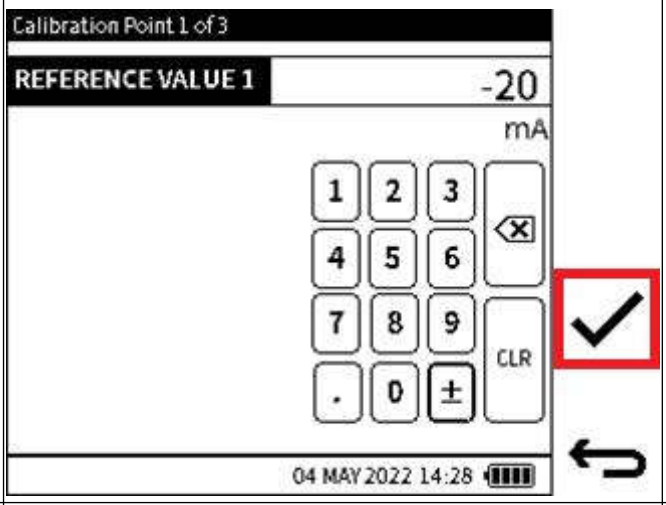
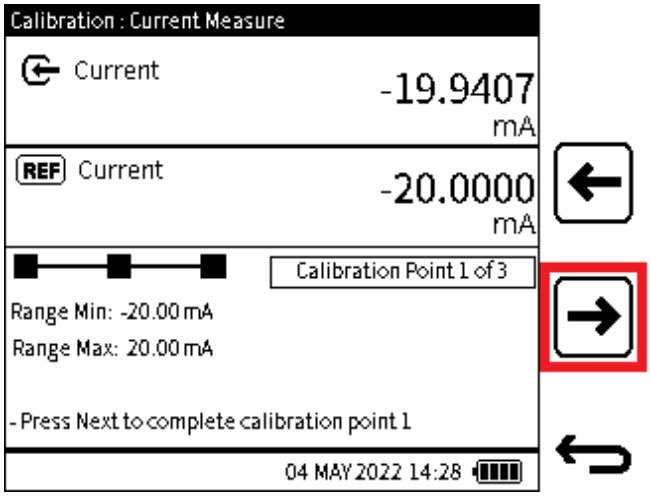
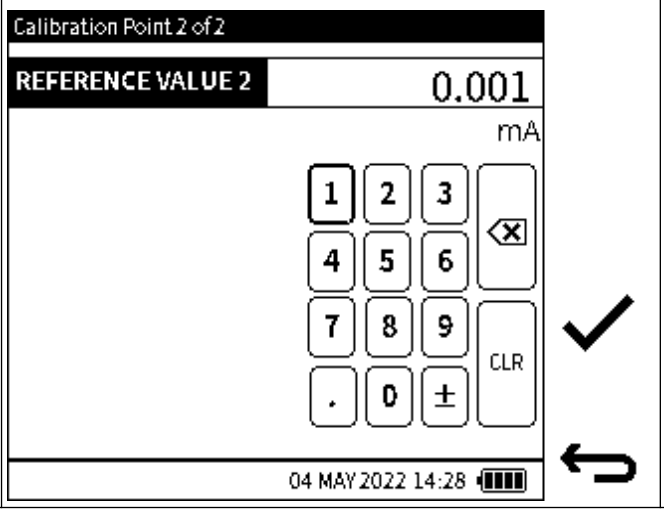
Step 7		Enter the **REFERENCE VALUE 1** value as displayed on the external calibrated equipment. Press the Tick ✓ softkey to confirm and return to the **Calibration** screen.
Step 8		Press the **Next** → softkey to complete **Calibration point 1** and proceed to **Calibration point 2**.
Step 9		Apply Steps 6 to 8, but this time begin by applying the nominal zero Current (approximately 0 mA) to the DPI610E. This completes Calibration point 2.

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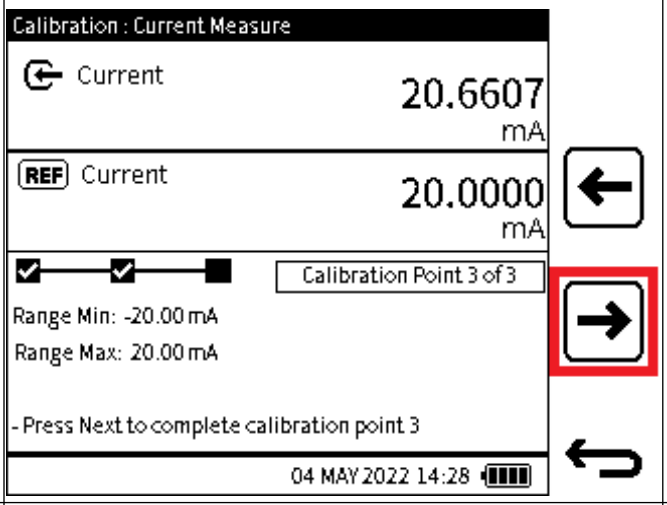
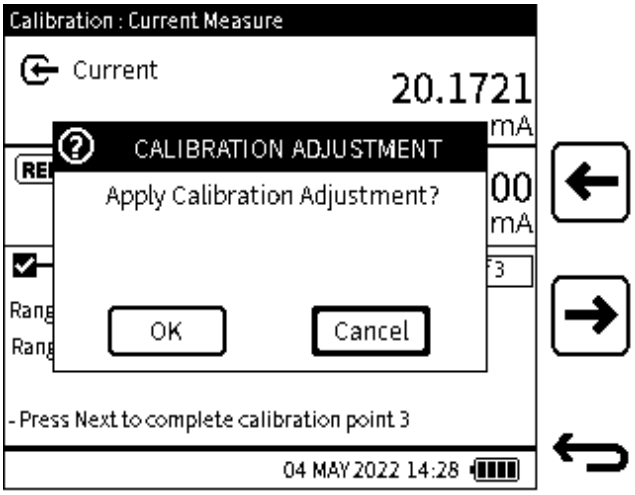
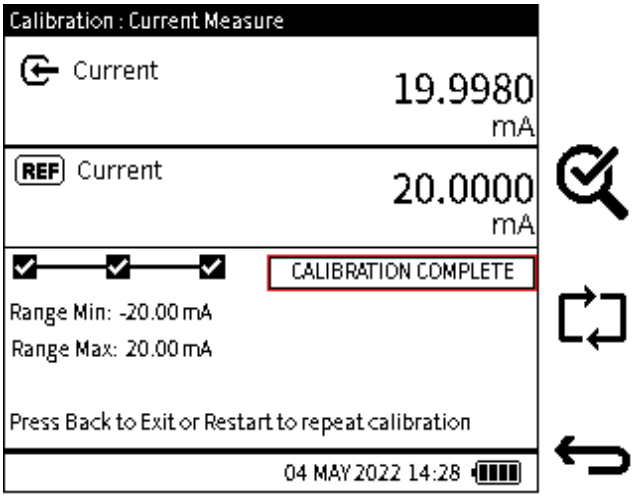
Step 10		Once again, apply Steps 6 to 8, but this time begin by applying the positive full-scale Current (approximately 20 mA) to the DPI610E. Press the **Next** softkey to complete Calibration point 3.
Step 11		A message window appears, requesting confirmation to perform the calibration adjustment based on the calibration points used in the procedure. Select **OK** to apply the calibration adjustment. Otherwise, select the **Cancel** button to return to the **Calibration** screen.
Step 12		If **OK** is selected, the **CALIBRATION COMPLETE** message appears in the status box, to confirm the adjustment has been made. At this stage, there are three icons for three ways to proceed. These are: **VERIFICATION** softkey navigates to the Verification screen (see Step 13). **RESTART** softkey allows the calibration procedure to be restarted if a repeat calibration is required. **BACK** softkey exits the calibration procedure and returns the user to the **Perform Calibration** menu screen.

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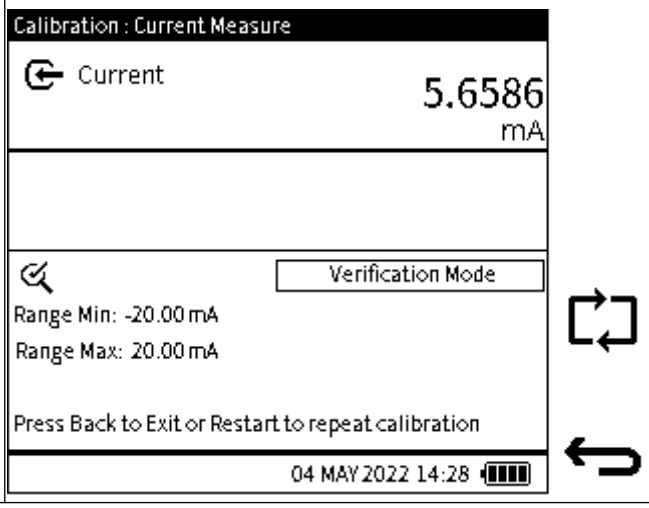
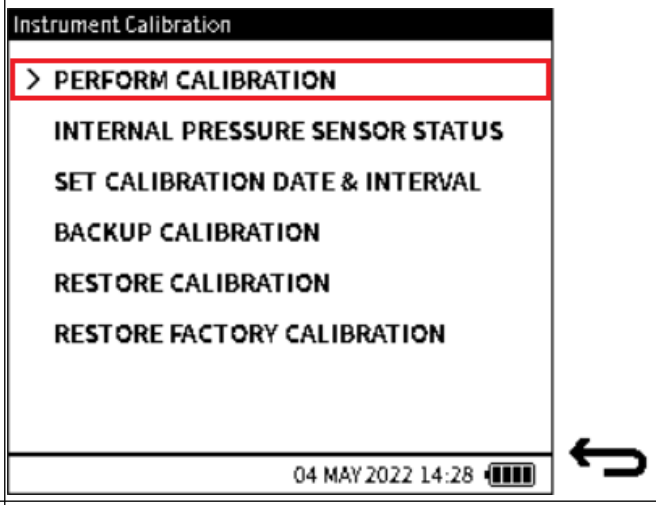
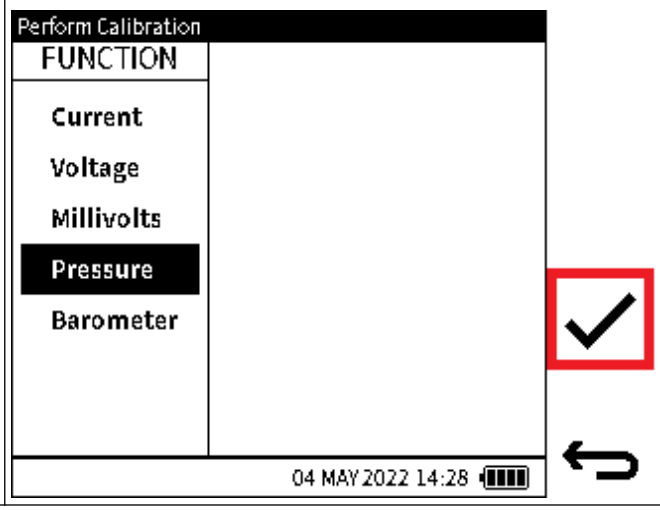
Step 13		The **Verification** mode shows live reference and measured (or sourced) values. Here, different values or points within the measured (or sourced) range can be checked to verify the adjustment is satisfactory. Once verification is complete, select the **Back** icon to exit the calibration procedure or select the **Restart** softkey to repeat the calibration.

13.2.2 Calibration - Internal Pressure Sensor

To calibrate the internal pressure sensor of the DPI610E, make sure the correct pressure connection is made from the test port and the external calibrated pressure source. This sensor calibration should only be done by approved service centres and personnel.

Step 1		Select **PERFORM CALIBRATION** from the **Instrument Calibration** menu.
Step 2		Select **Pressure** function. Select ✓ to confirm.

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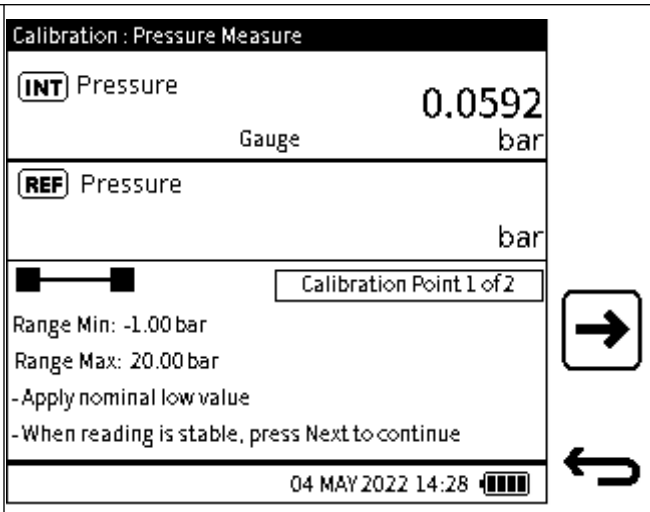
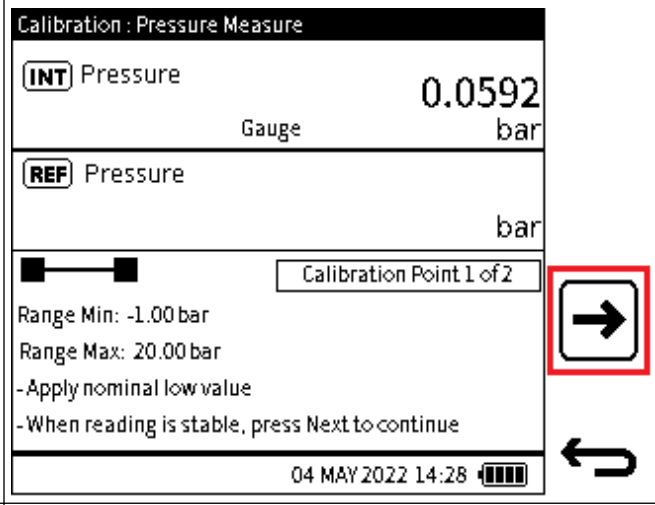
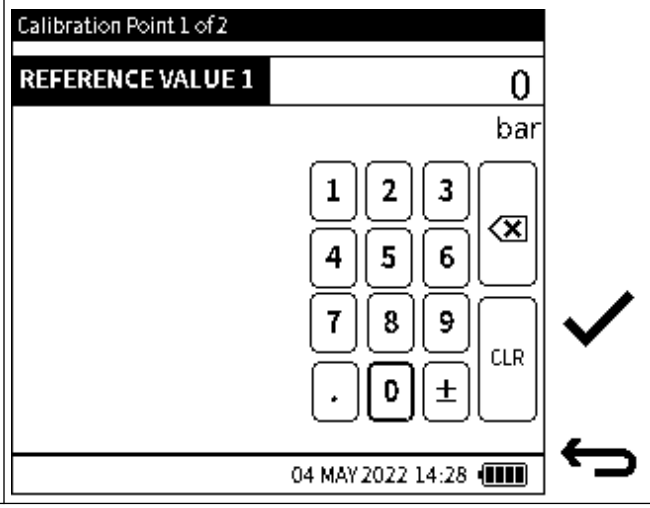
Step 3		This screen has three sections. The top two sections give: • The reference reading from external calibrated equipment. • The measured (or sourced) reading from the DPI610E. The bottom section gives the following information: 1. Function minimum range (or negative full-scale) value 2. Function maximum range (or positive full-scale) value 3. Calibration procedure step status (visual status boxes and text status) 4. User instructions for each step of the procedure.
Step 4		To start the calibration, apply nominal negative full-scale or zero pressure as per the displayed instruction. This is **Calibration point 1**. When the measured **Pressure** reading is stable, select the **Next** icon to continue. **Note**: Pressure sensor calibration requires two valid calibration points.
Step 5		Enter **REFERENCE VALUE 1** as displayed on the external calibrated equipment. Press the **Tick** ✓ softkey to confirm and return to the **Calibration** screen.

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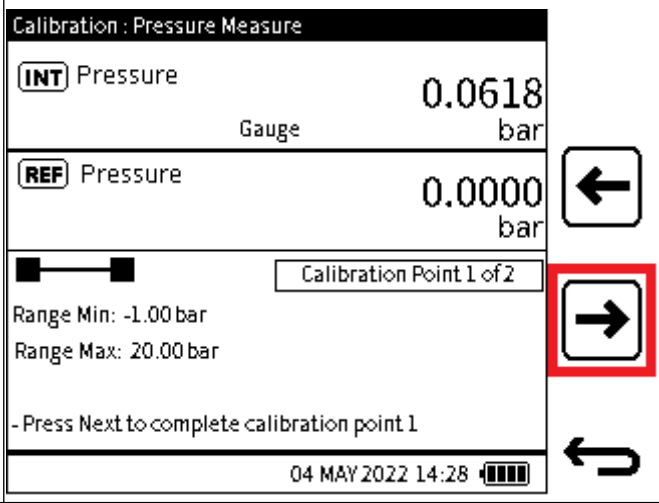
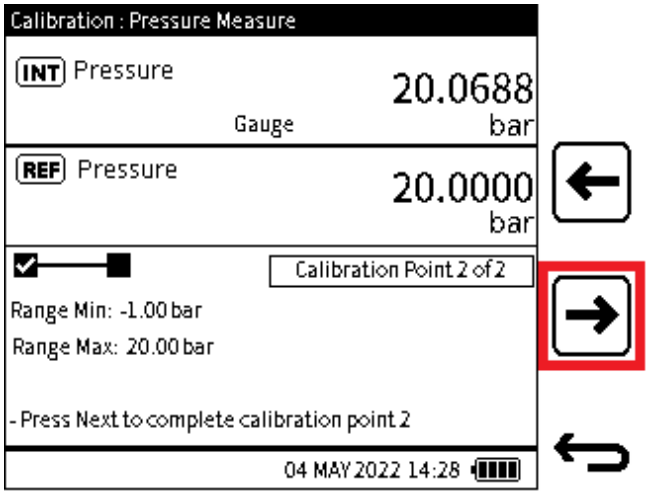
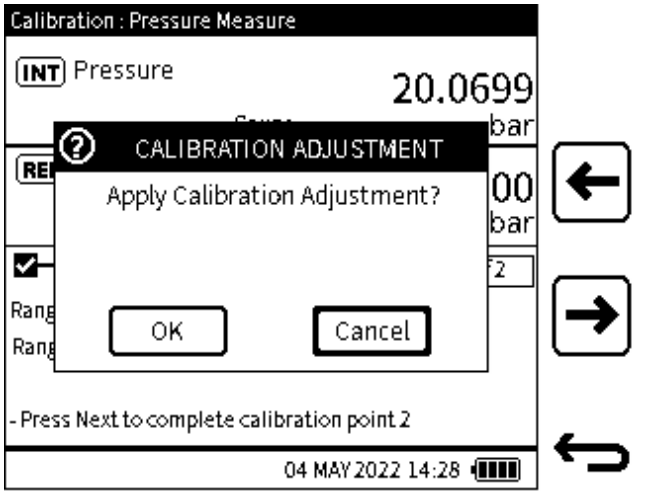
Step 6		Press the **Next** softkey to complete **Calibration point 1** and proceed to **Calibration point 2**.
Step 7		Apply Steps 4 to 6, but this time begin by applying the nominal positive full-scale pressure to the DPI610E. Press the **Next** softkey to complete **Calibration point 2** and proceed to **Calibration point 3**.
Step 8		A message window appears, requesting confirmation to perform the calibration adjustment based on the calibration points used in the procedure. Select **OK** to apply the calibration adjustment. Otherwise, select the **Cancel** button to return to the **Calibration** screen.

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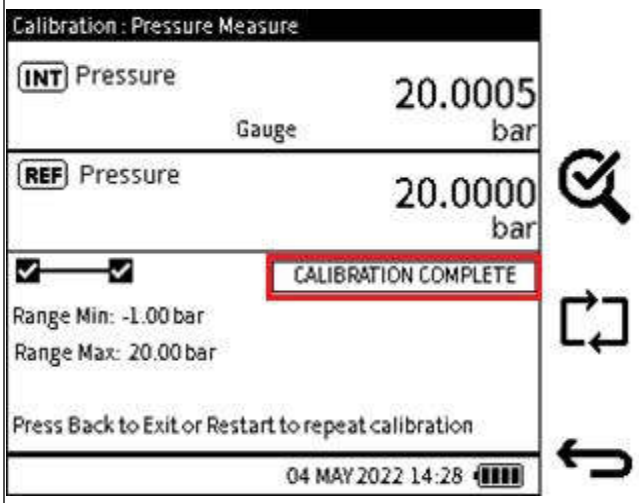
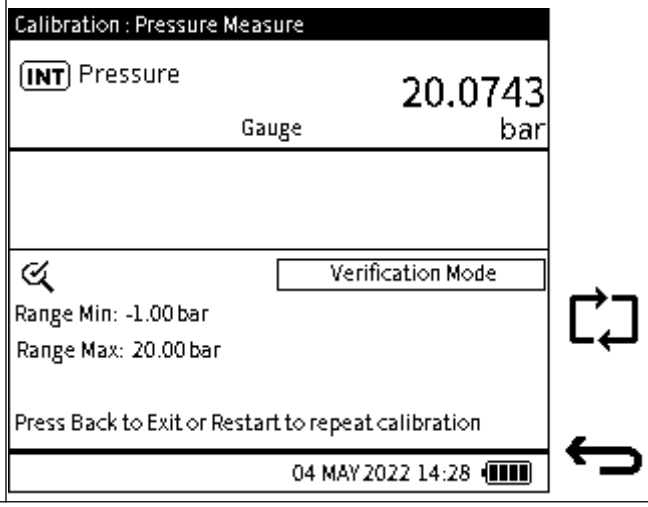
Step 9		If **OK** is selected, the **CALIBRATION COMPLETE** message appears in the status box, to confirm the adjustment has been made. At this stage, there are three icons for three ways to proceed. These are: **VERIFICATION** softkey navigates to the Verification screen (see Step 13). **RESTART** softkey allows the calibration procedure to be restarted if a repeat calibration is required. **BACK** softkey exits the calibration procedure and returns the user to the **Perform Calibration** menu screen.
Step 10		The **Verification** mode shows live reference and measured (or sourced) values. Here, different values or points within the measured (or sourced) range can be checked to verify the adjustment is satisfactory. Once verification is complete, select the **Back** icon to exit the calibration procedure or select the **Restart** softkey to repeat the calibration.

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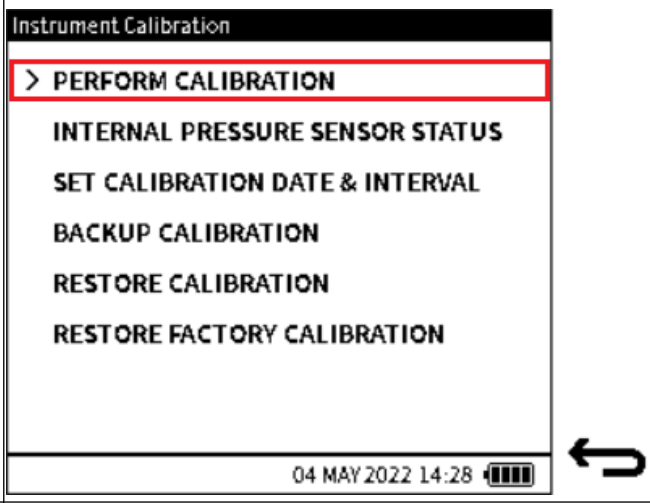
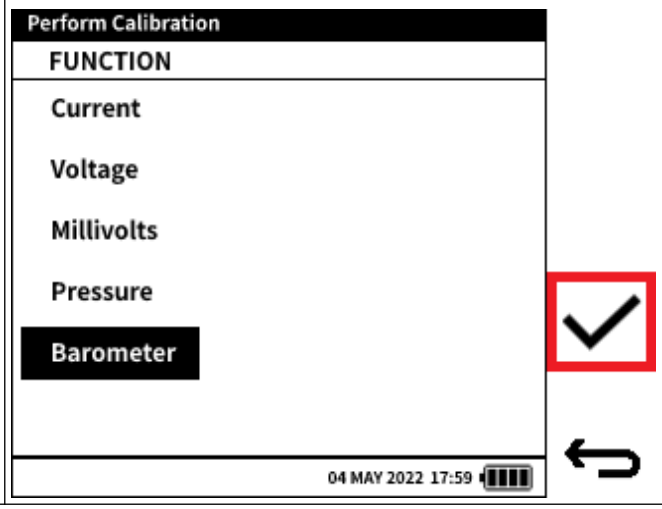
13.2.3 Calibration – Internal Barometer

To calibrate the internal barometer sensor of the DPI610E, make sure the correct pressure connection is made from the barometer port and the external calibrated pressure source. This sensor calibration should only be done by approved service centres and personnel.

Step 1		Select **PERFORM CALIBRATION** from the **Instrument Calibration** menu.
Step 2		Select **Barometer** function. Select ✓ to confirm.

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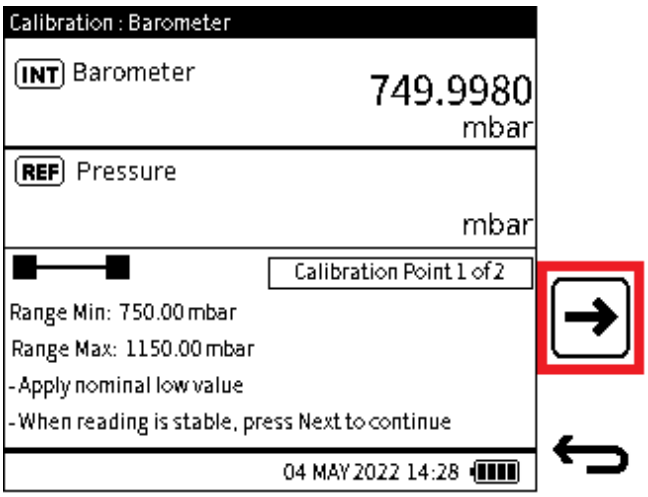
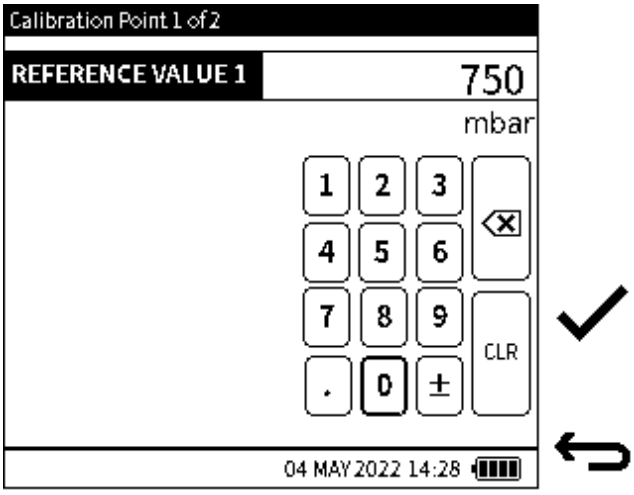
Step 3		The **Calibration - Barometer** screen has three sections. The top two sections give: • The reference reading from external calibrated equipment • The measured (or sourced) reading from the DPI610E. The bottom section gives the following information: 1. Function minimum range (or negative full-scale) value 2. Function maximum range (or positive full-scale) value 3. Calibration procedure step status (visual status boxes and text status) 4. User instructions for each step of the procedure. To start the calibration, apply nominal negative full-scale or zero pressure as per the displayed instruction. This is **Calibration point 1**. When the measured Pressure reading is stable, select the **Next** icon to continue. **Note**: Barometer sensor calibration requires two valid calibration points.
Step 4		Enter **REFERENCE VALUE 1** as displayed on the external calibrated equipment. Press the Tick softkey to confirm and return to the **Calibration** screen.

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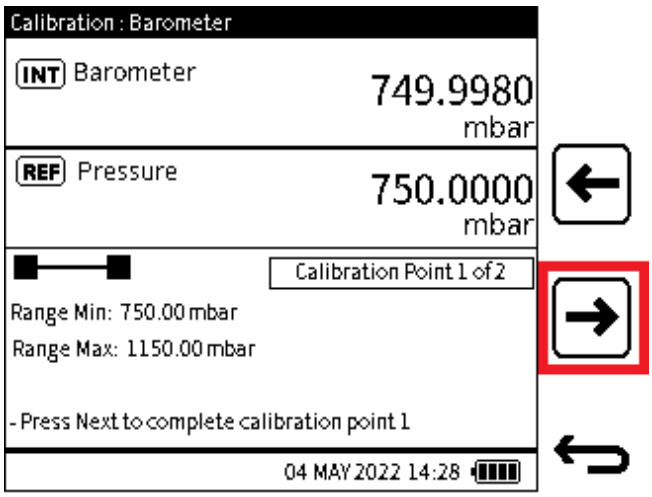
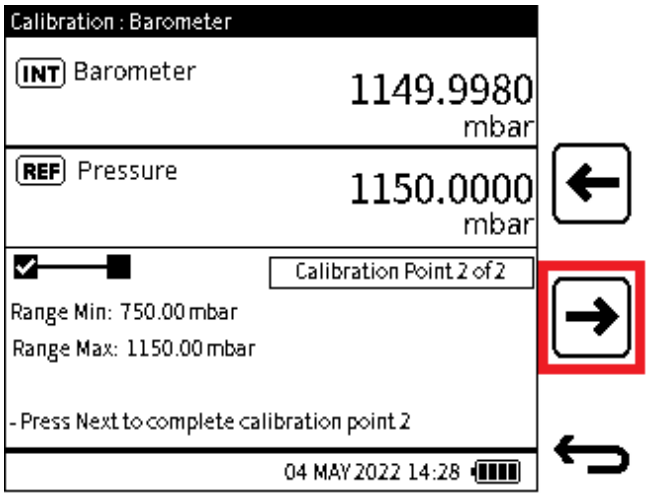
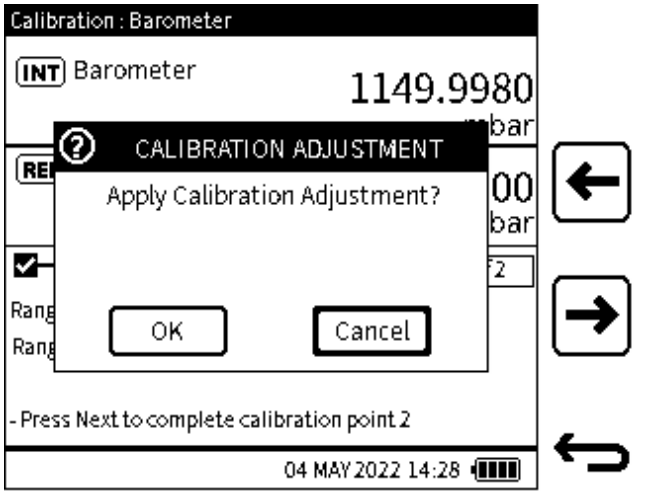
Step 5		Press the **Next** softkey to complete **Calibration point 1** and proceed to **Calibration point 2**.
Step 6		Apply Steps 3 to 5, but this time begin by applying the nominal positive full-scale pressure to the DPI610E. When the measured Pressure reading is stable, select the **Next** icon to continue. This completes **Calibration point 2**.
Step 7		After pressing the **Next** icon from the previous step, a message window will appear This window requests confirmation to perform the calibration adjustment based on the calibration points used in the procedure. Select **OK** to apply the calibration adjustment. Otherwise, select the **Cancel** button to return to the **Calibration** screen

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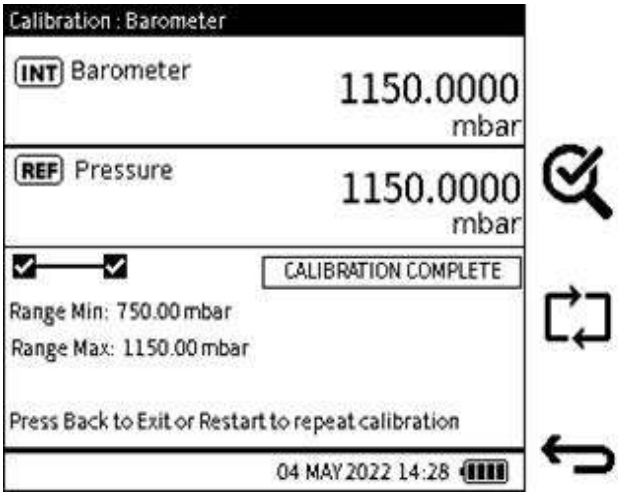
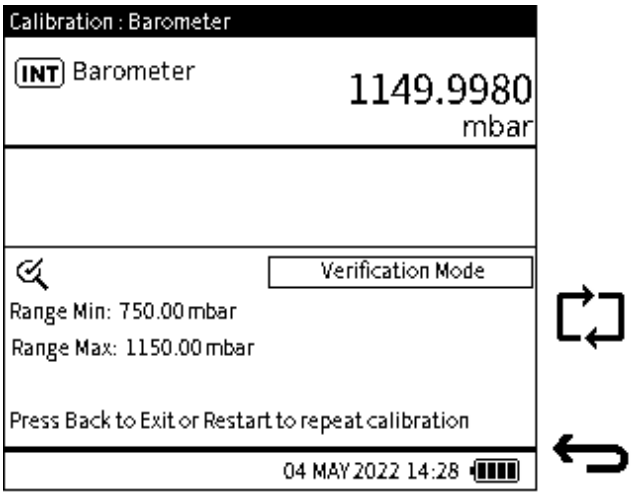
Step 8		If **OK** is selected, the **CALIBRATION COMPLETE** message appears in the status box, to confirm the adjustment has been made. At this stage, there are three icons for three ways to proceed. These are: **VERIFICATION** softkey navigates to the Verification screen (see Step 9). **RESTART** softkey allows the calibration procedure to be restarted if a repeat calibration is required. **BACK** softkey exits the calibration procedure and returns the user to the **Perform Calibration** menu screen.
Step 9		The **Verification** mode shows live reference and measured (or sourced) values. Here, different values or points within the measured (or sourced) range can be checked to verify the adjustment is satisfactory. Once verification is complete, select the **Back** button to exit the Calibration procedure or select the **Restart** softkey to repeat the calibration.

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13.3 INTERNAL PRESSURE SENSOR STATUS

The **Internal Pressure Sensor Status** screen (Figure 13-2) provides information about the instrument's internal pressure sensor:

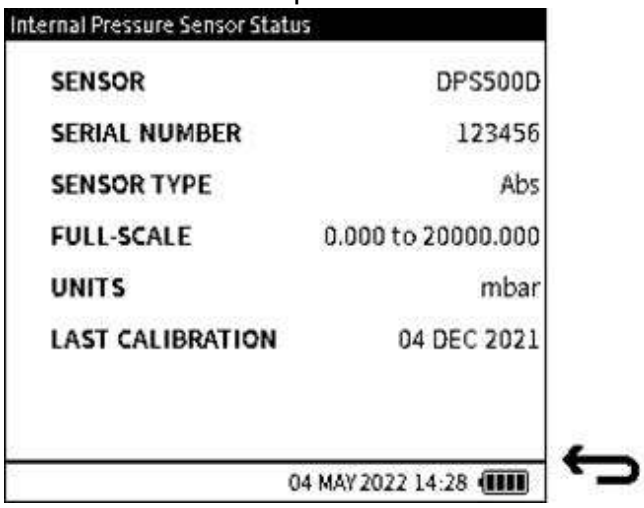

Figure 13-2: Instrument Status screen

To access the **Internal Pressure Sensor Status** screen (Figure 13-2), select **INTERNAL PRESSURE SENSOR STATUS** from the **Instrument Calibration** screen as shown below:

Step 1		Select **INTERNAL PRESSURE SENSOR STATUS** from the **Instrument Calibration** screen.

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13.4 SET CALIBRATION DATE & INTERVAL

The following options are available in the **Instrument Calibration Date & Interval** screen:

Option	Description
LAST CALIBRATION	Set the date the instrument was last calibrated
CALIBRATION INTERVAL	Enable user notification by setting the number of days between the last calibration and the next scheduled calibration (default is 365 days)
CALIBRATION DUE	Enable user notification by setting a specific date to schedule next calibration (default is based on the date of the last calibration and the specified calibration interval)

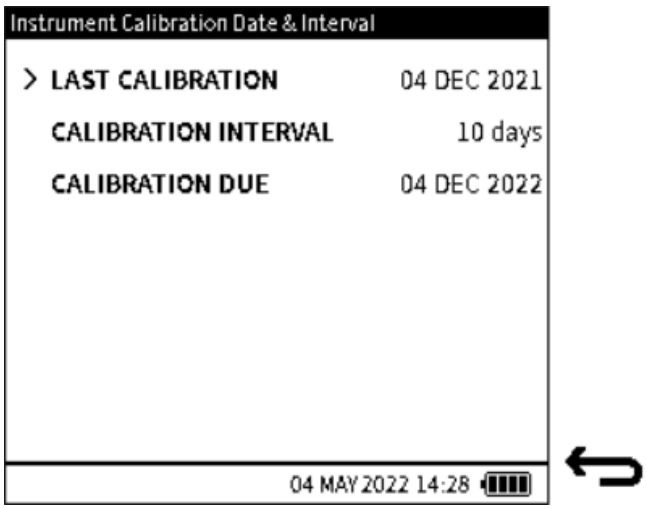
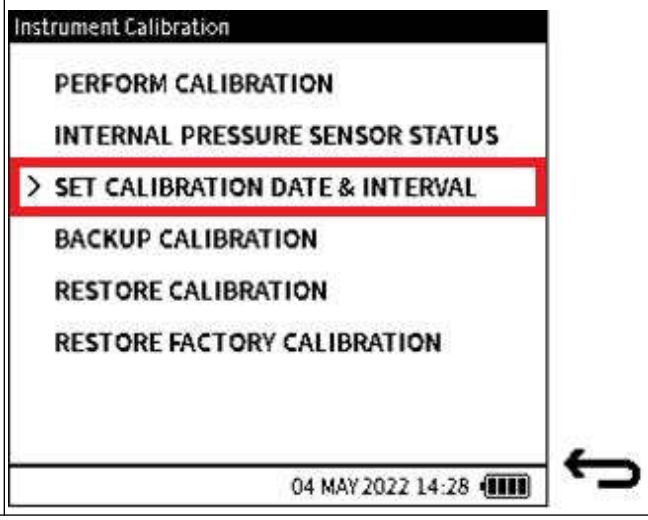


Figure 13-3: Instrument Calibration Date & Interval screen

To access the **Instrument Calibration Date & Interval** screen (Figure 13-3), select **SET CALIBRATION DATE & INTERVAL** from the **Instrument Calibration** menu as shown below:

Step 1		Select **SET CALIBRATION DATE & INTERVAL** from the **Instrument Calibration** menu.

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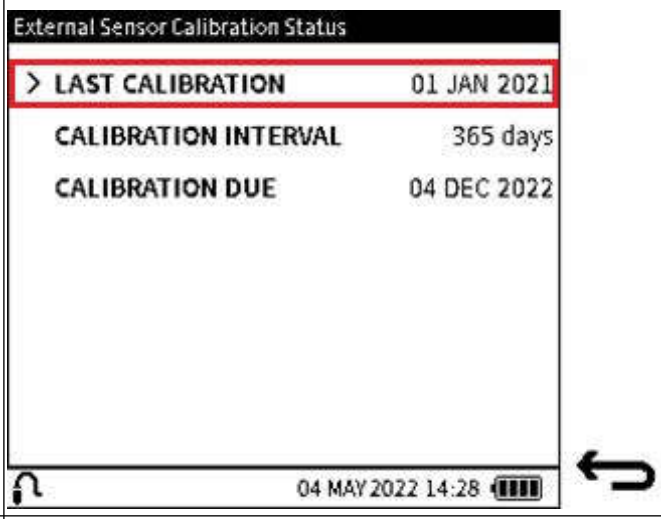
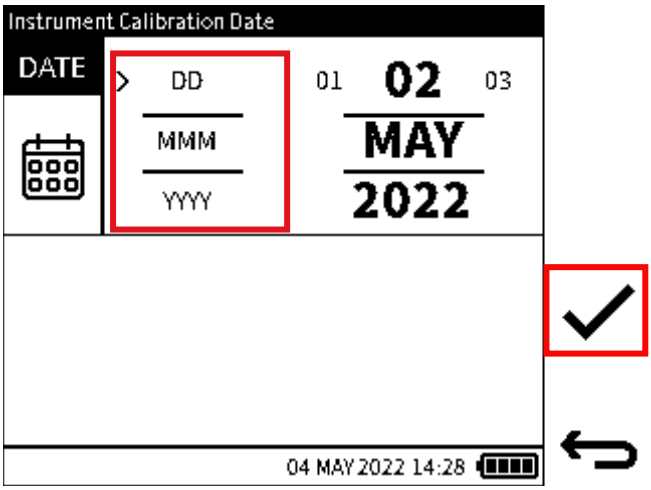
13.4.1 Change Last Calibration Date

Step 1		Select **LAST CALIBRATION** from the **Instrument Calibration Date & Interval** screen.
Step 2		Select the required day, month, and year, as required (see Chapter 1.19.3 on page 17). To change the value, select the row of the variable. Press the value on the left of the current value to decrease the value and the value on the right to increase the value. Repeat pressing of either left or right value decreases or increases the selected current value. Select ✓ to confirm the changes.

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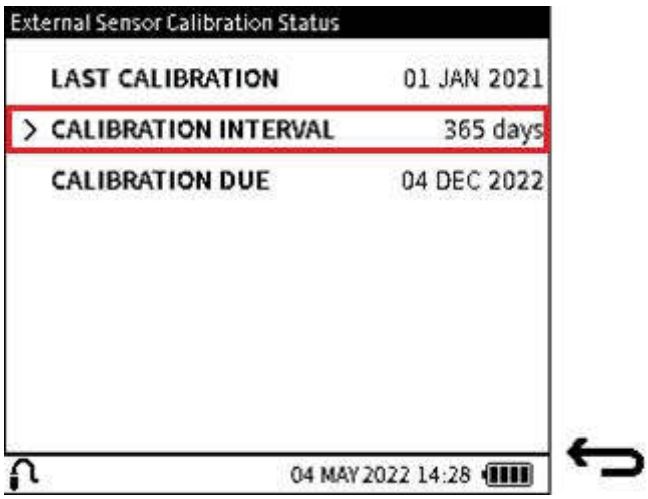
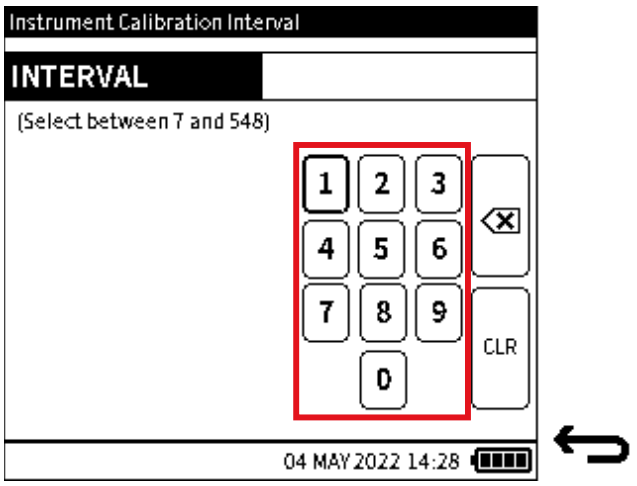
13.4.2 Change Calibration Interval

Step 1		Select **CALIBRATION INTERVAL** from the **Instrument Calibration Date & Interval** screen.
Step 2		Enter a calibration interval between 7 and 548 (days). Select ✓ to confirm.

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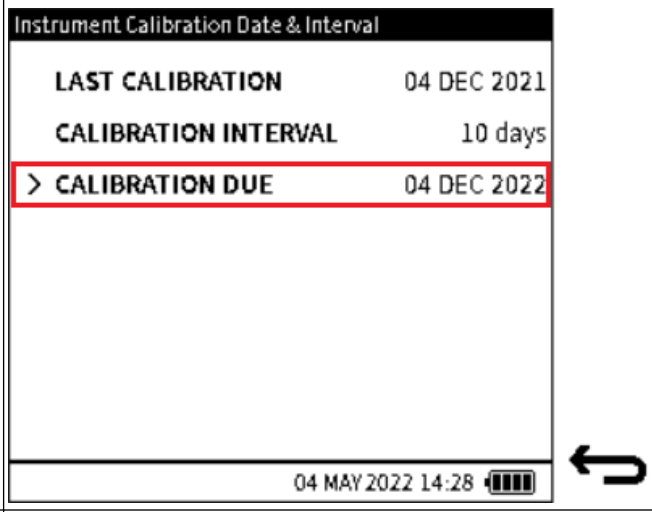
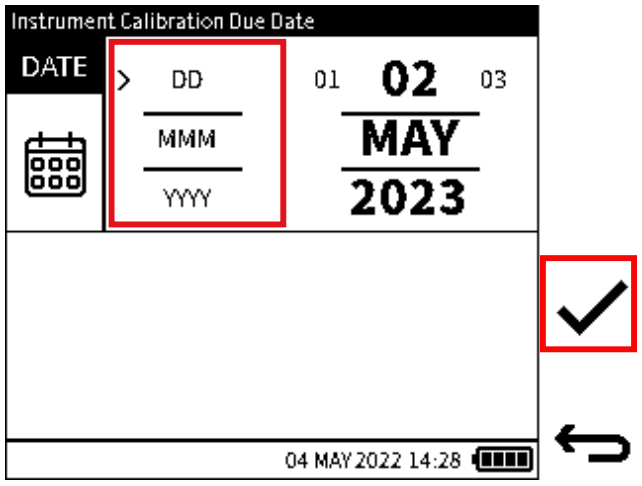
13.4.3 Change Calibration Due Date

Step 1		Select **CALIBRATION DUE** from the **Instrument Calibration Date & Interval** screen.
Step 2		Select the required day, month and year, as required (see Chapter 1.19.3 on page 17). To change the value, select the row of the variable. Press the value on the left of the current value to decrease the value and the value on the right to increase the value. Repeat pressing of either left or right value decreases or increases the selected current value. Select ✓ to confirm the changes.

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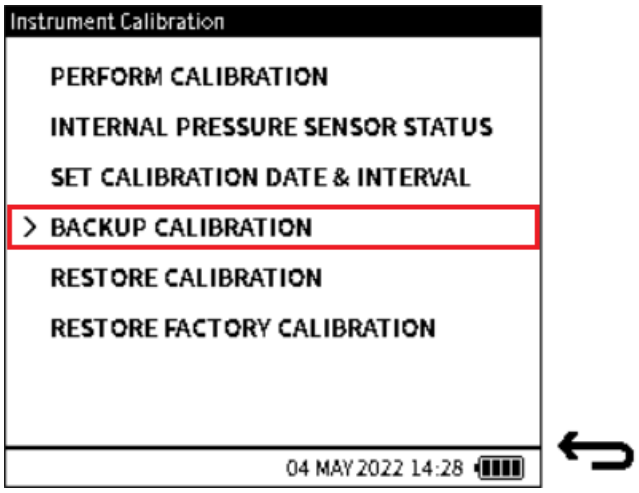
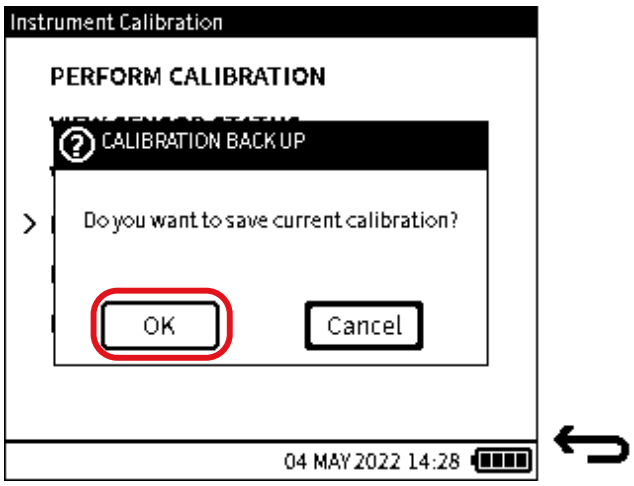
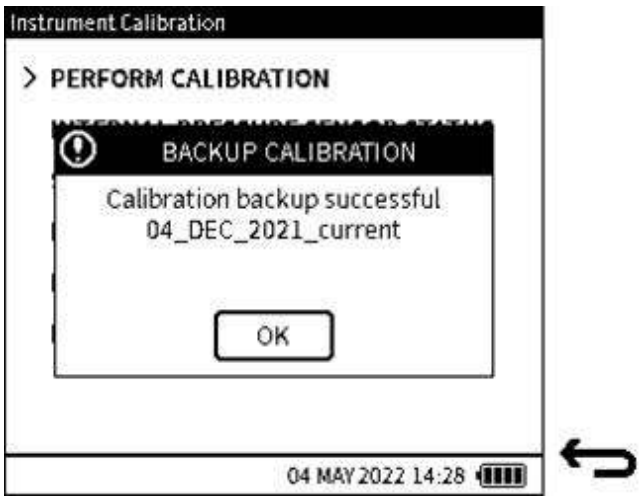
13.5 BACKUP CALIBRATION

The current calibration configuration can be saved in the form as a Backup file. This Backup file can be used to restore the instrument's calibration if necessary.

Step 1		Select **BACKUP CALIBRATION** from the **Instrument Calibration Date & Interval** screen. **Note**: Only one user calibration configuration can be backed up at any one time.
Step 2		Select **OK** to confirm backup.
Step 3		Check that the **CALIBRATION BACKUP** notification appears. If the notification does not appear, repeat steps 1 and 2.

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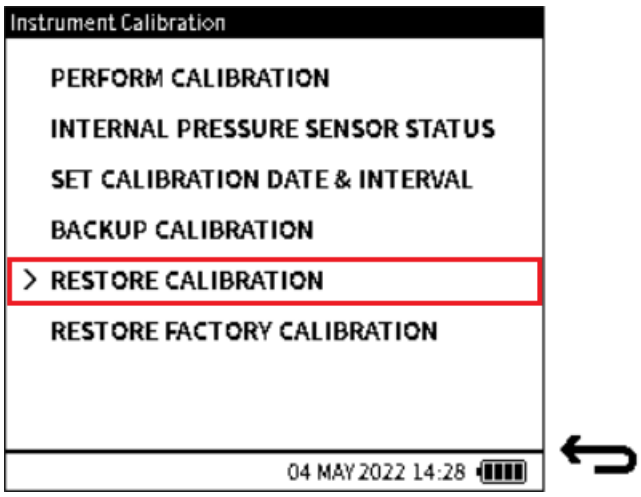
13.6 RESTORE CALIBRATION

This function allows the user to restore a previous calibration configuration.

Note: A valid calibration backup file must exist, to enable this calibration restore feature to be available. See Section 13.5 on page 276 for how to create this file.

Step 1		Select **RESTORE CALIBRATION** from the **Instrument Calibration** screen.
Step 2		Select **OK** to confirm restore.
Step 3		Check that the **CALIBRATION RESTORE** notification appears. If the notification does not appear, repeat steps 1 and 2.

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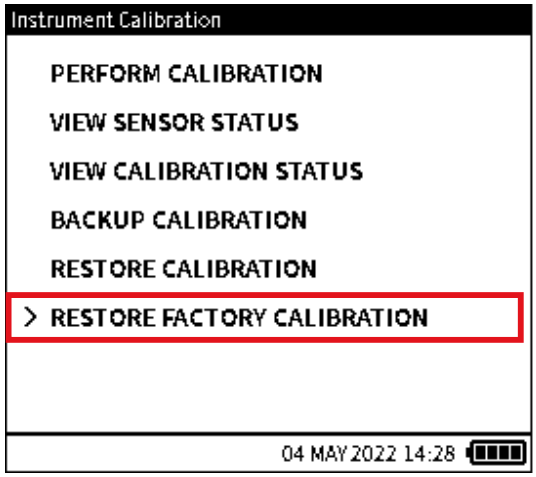
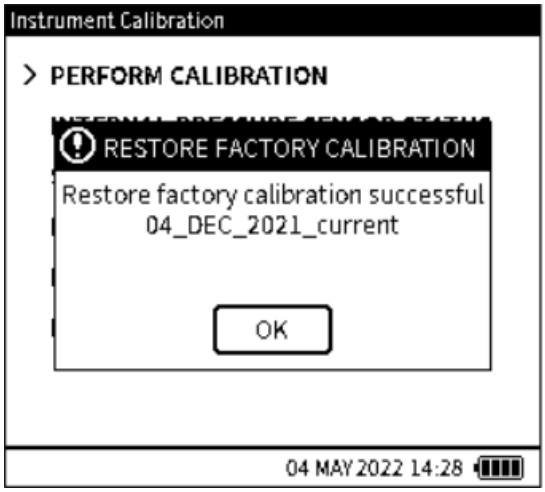
13.7 RESTORE FACTORY CALIBRATION

The instrument has its factory calibration saved internally before it is delivered from our factory. If for any reason (for example, if an incorrect calibration adjustment has been made), the instrument needs its calibration resetting to the point at which it was shipped, the **Restore Factory Calibration** feature can be used.

Step 1		Select **RESTORE FACTORY CALIBRATION** from the **Instrument Calibration** screen.
Step 2		A valid factory calibration file will be automatically retrieved and displayed in the popup message. Select **OK** to confirm restore.
Step 3		Check that the **FACTORY CALIBRATION RESTORE** notification appears.

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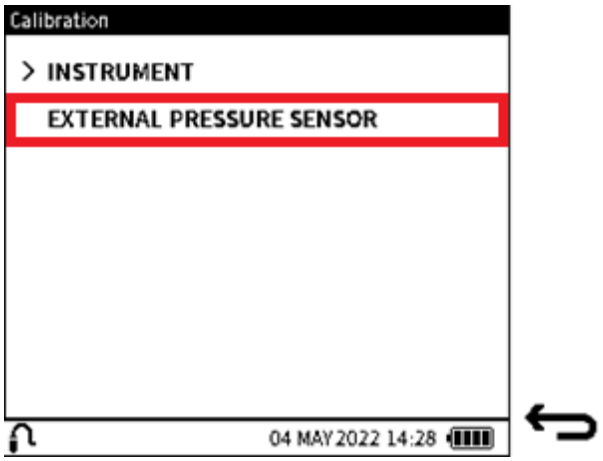
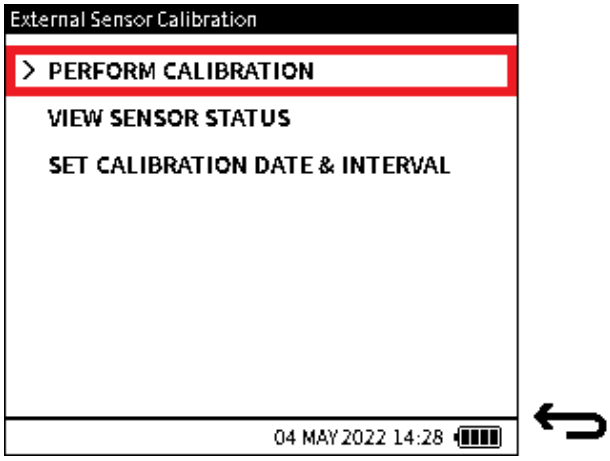
13.8 EXTERNAL PRESSURE SENSOR CALIBRATION MENU

See Section 13.1 on page 255 for how to access the **Calibration** menu from the Dashboard.

Step 1		Select **EXTERNAL PRESSURE SENSOR** from the main **Calibration** screen. **Note**: To see the **External Pressure Sensor** option, the **EXT** Pressure function must be already configured in the **Calibrator** menu and the sensor connected successfully. See Section 8, “External Sensors,” on page 133.

13.8.1 PERFORM CALIBRATION

To calibrate the external pressure sensor PM700E using the DPI610E, make sure the correct pressure connection is made from the sensor and the external calibrated pressure source. Also, ensure the sensor is connected to the **EXT SENSOR** port on the DPI610E using the sensor cable supplied. This sensor calibration should only be done by approved service centres and personnel.

Step 1		Select **PERFORM CALIBRATION** from the **External Sensor Calibration** menu screen.

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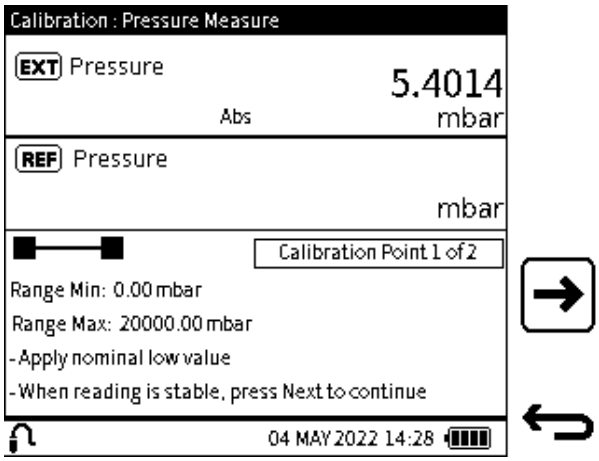
Step 2		The calibration procedure of the external PM700E sensor is like that of the DPI610E internal pressure sensor. See Section 13.2.2, “Calibration - Internal Pressure Sensor,” on page 263.

13.8.2 VIEW EXTERNAL PRESSURE SENSOR STATUS

The **External Pressure Sensor Status** screen (Figure 13-4) provides information about the instrument’s external pressure sensor.

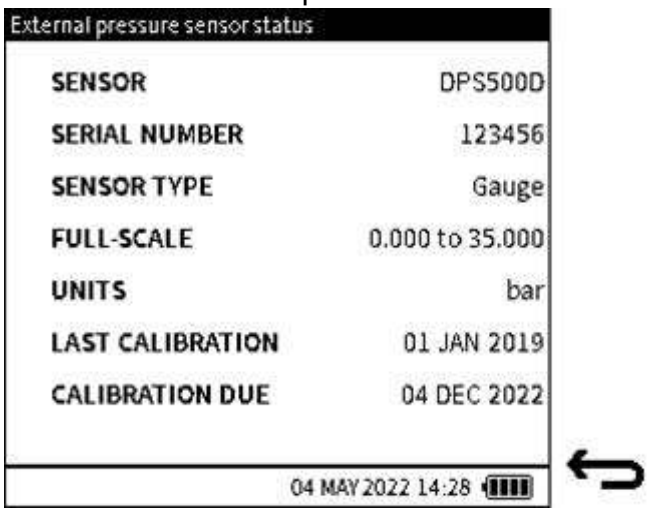
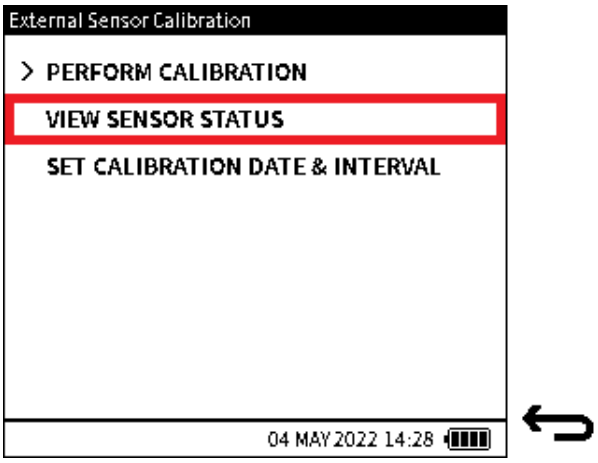


Figure 13-4: External Pressure Sensor Status

To access the **External Pressure Sensor Status** screen:

Step 1		Select **VIEW SENSOR STATUS** from the **External Sensor Calibration** screen.

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13.8.3 SET CALIBRATION DATE & INTERVAL

The **External (Pressure) Sensor Calibration Status (Date & Interval)** screen provides the following options:

Option	Description
LAST CALIBRATION	Set the date the instrument was last calibrated
CALIBRATION INTERVAL	Enable user notification by setting the number of days between the last calibration and the next scheduled calibration (default is 365 days)
CALIBRATION DUE	Enable user notification by setting a specific date to schedule next calibration (default is based on the date of the last calibration and the specified calibration interval)

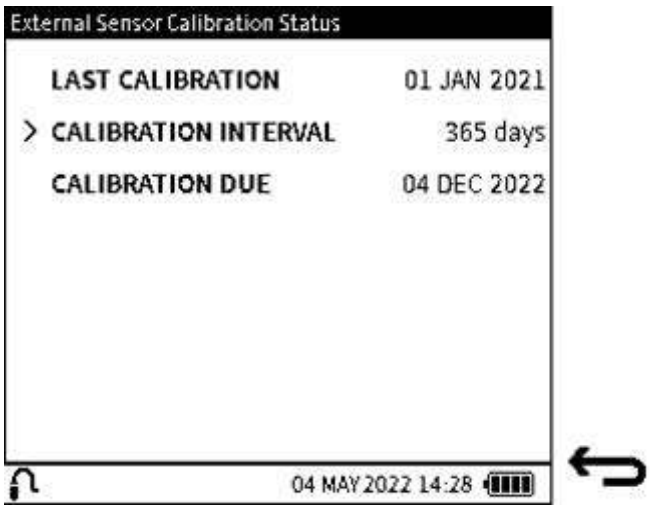
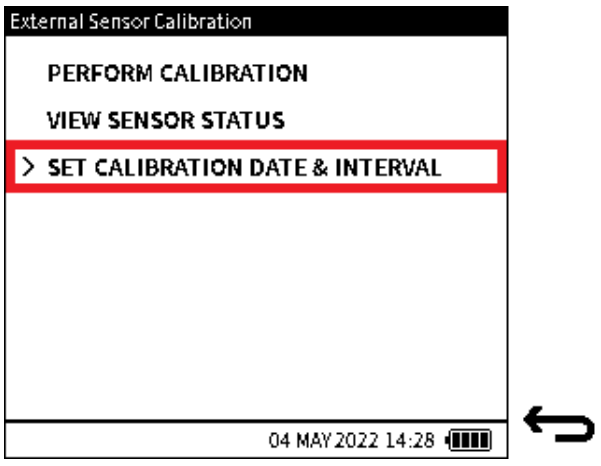


Figure 13-5: External Sensor Calibration Date & Interval Screen

To access the **SET CALIBRATION DATE & INTERVAL** screen:

Step 1		Select **SET CALIBRATION DATE & INTERVAL** screen from the **External Sensor Calibration** screen.

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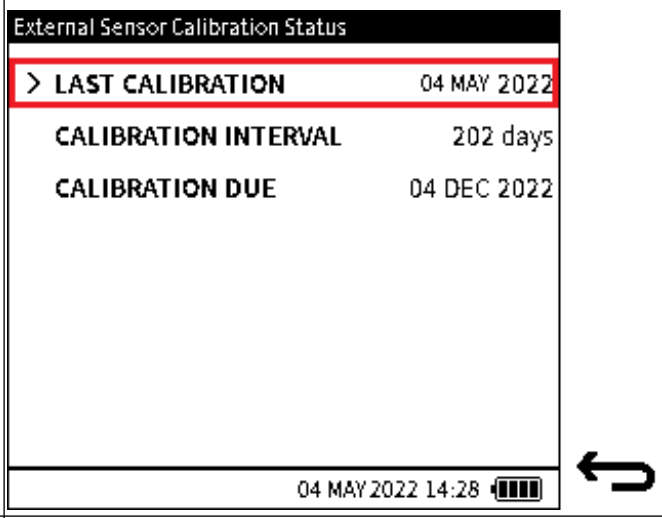
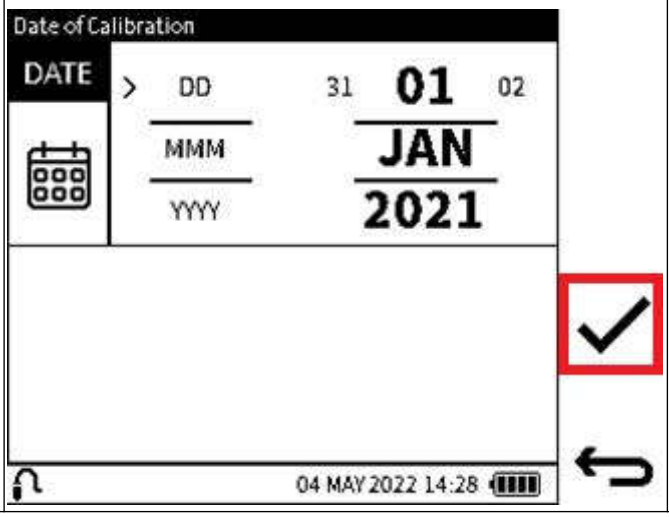
13.8.3.1 Change LAST CALIBRATION Date

Step 1		Select **LAST CALIBRATION** from the **External Sensor Calibration Status** screen.
Step 2		Select the required day, month, and year, as required (see Section 1.19.3, “Set Date, Time and Language,” on page 17). To change the value, select the row of the variable. Press the value on the left of the current value to decrease the value and the value on the right to increase the value. Repeat pressing of either left or right value decreases or increases the selected value. Select ✓ to confirm the changes.

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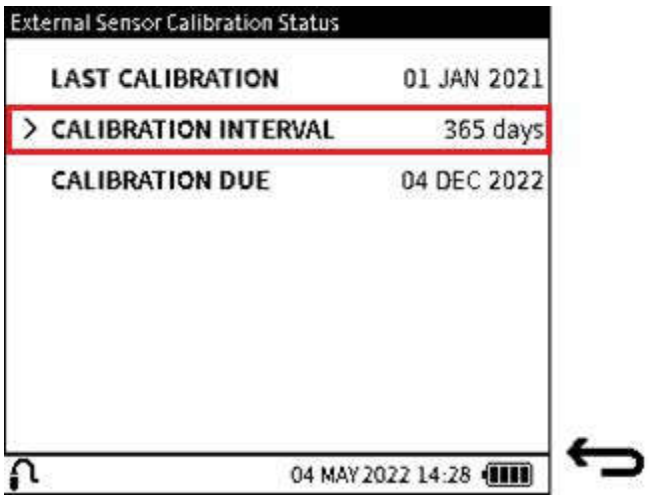
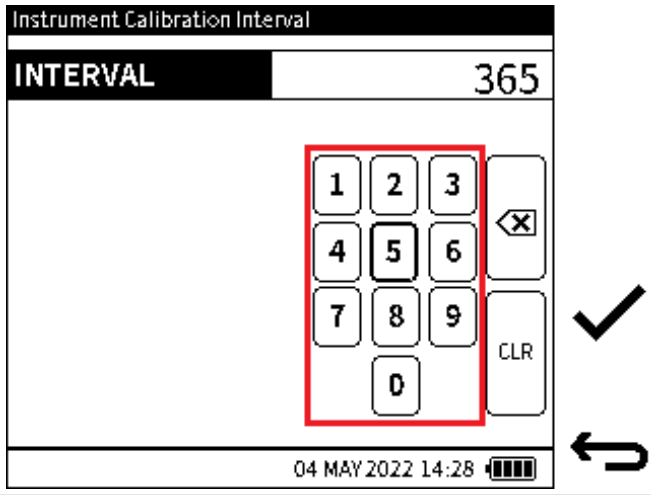
13.8.3.2 Change CALIBRATION INTERVAL

Step 1		Select **CALIBRATION INTERVAL** from the **External Pressure Sensor Status** screen.
Step 2		Enter a calibration interval between 7 and 548 (days). Select ✓ to confirm.

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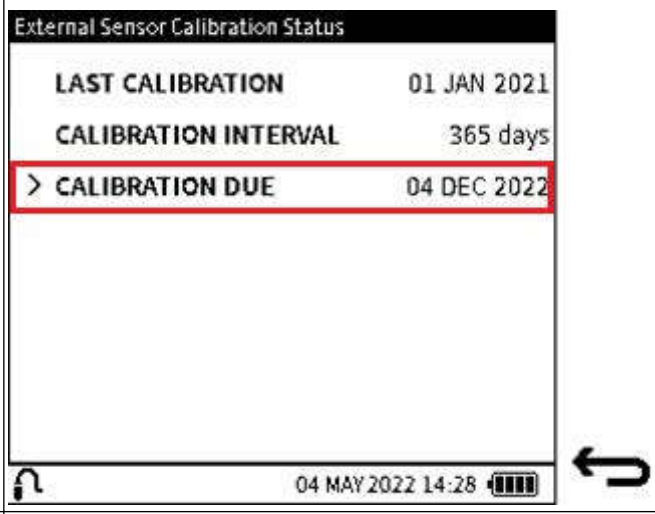
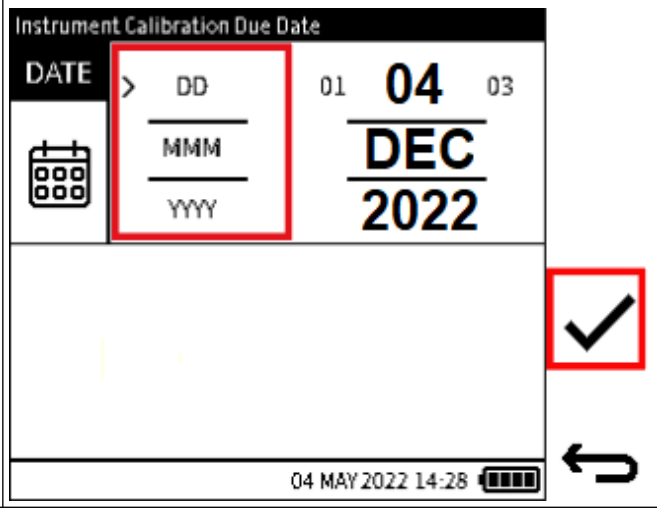
13.8.3.3 Change CALIBRATION DUE Date

Step 1		Select **CALIBRATION DUE** from the **Instrument Calibration Date & Interval** screen.
Step 2		Select the required day, month and year, as required (see Section 1.19.3, “Set Date, Time and Language,” on page 17). To change the value, select the row of the variable. Press the value on the left of the current value to decrease the value and the value on the right to increase the value. Repeat pressing of either left or right value decreases or increases the selected current value. Select ✓ to confirm the changes.

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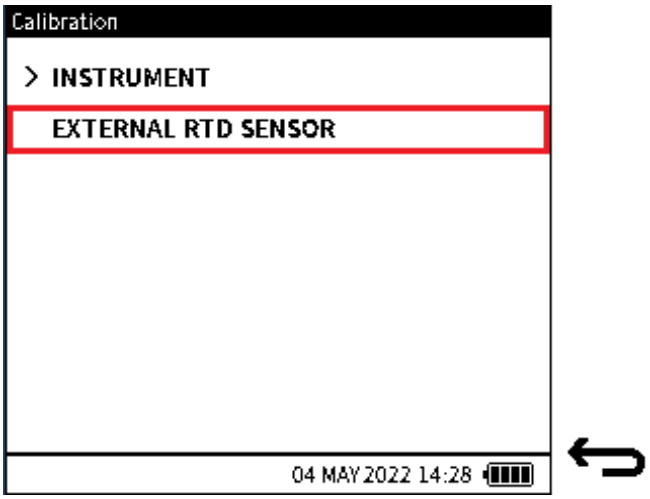
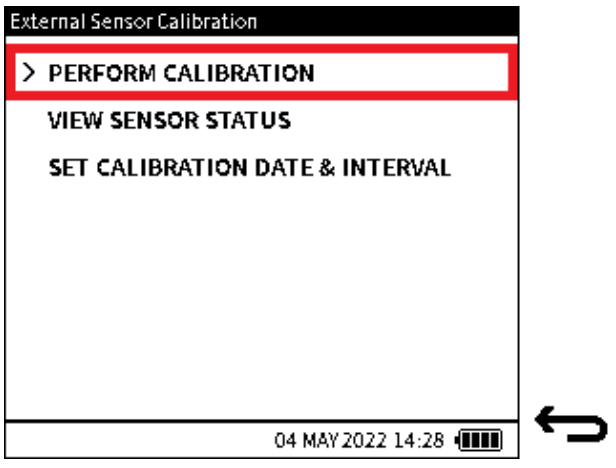
13.9 EXTERNAL RTD SENSOR CALIBRATION MENU

Refer to Section 8 on page 133 for how to configure the DPI610E to recognize and use an external RTD sensor. This is necessary to enable the DPI610E user interface to show the RTD sensor calibration options.

Step 1		Select **EXTERNAL RTD SENSOR** from the main **Calibration** menu. **Note**: To see the **External RTD Sensor** option, the RTD function must be already configured in the Calibrator menu and the sensor connected successfully. Use the cross-reference given at the top of this page for instructions.

13.9.1 PERFORM CALIBRATION

To calibrate the external RTD sensor using the DPI610E, make sure the correct connection is made between the RTD & RTD-Interface and the external calibrated resistance/temperature source. Also, make sure the RTD-Interface is connected to the **EXT SENSOR** port on the DPI610E using the sensor cable supplied. This sensor calibration should only be done by approved service centres and personnel in accordance with the instructions in Section 8 on page 133. To access the **External Sensor Calibration** (RTD) screen. Follow the steps below:

Step 1		Select **PERFORM CALIBRATION** from the **External Sensor Calibration** screen.

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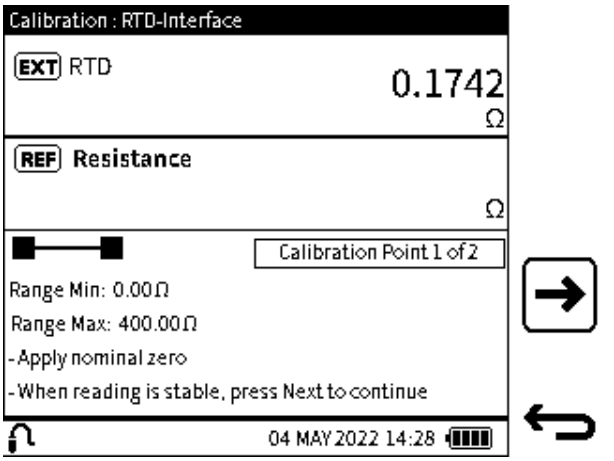
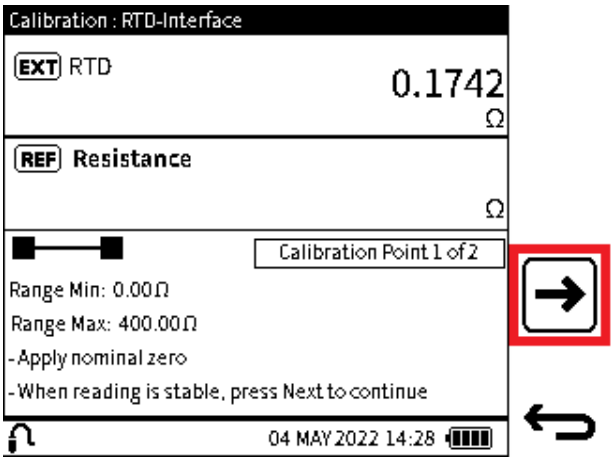
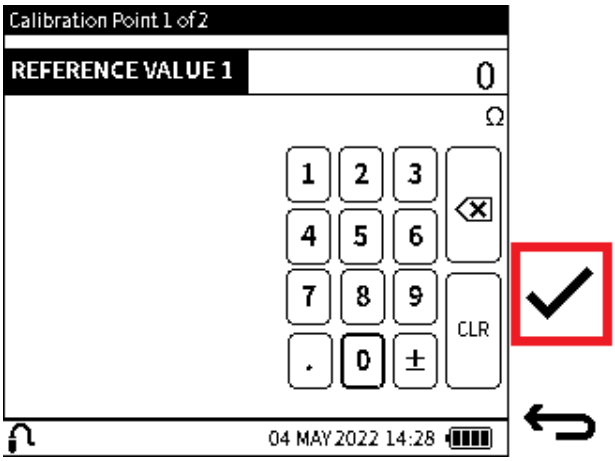
<table>
<tr>
<td>Step 2</td>
<td>




</td>
<td>
This screen has three sections.
The top two sections give:
• The reference reading from external calibrated equipment
• The measured (or sourced) reading from the DPI610E.
The bottom section gives the following information:
1. Function minimum range (or negative full-scale) value
2. Function maximum range (or positive full-scale) value
3. Calibration procedure step status (visual status boxes and text status)
4. User instructions for each step of the procedure.

To start the calibration, apply nominal negative full-scale or zero value as per the displayed instruction. This is Calibration point 1.
When the measured temperature or resistance reading is stable, select the Next icon to continue.
Note: RTD sensor calibration requires two valid calibration points.
</td>
</tr>
<tr>
<td>Step 3</td>
<td>


</td>
<td>
Enter REFERENCE VALUE 1 as displayed on the external calibrated equipment. Press the Tick ✓ softkey to confirm and return to the Calibration screen.
</td>
</tr>
</table>

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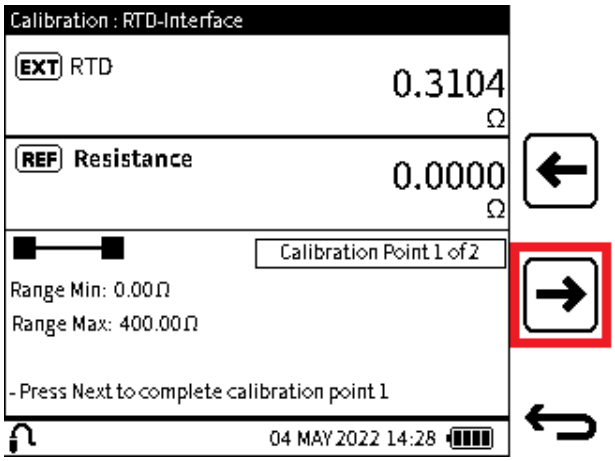
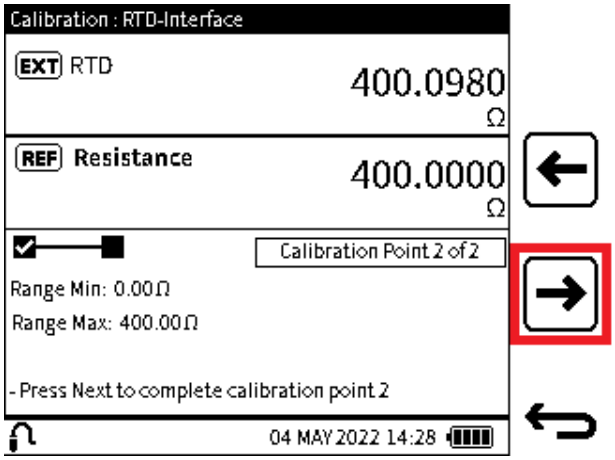
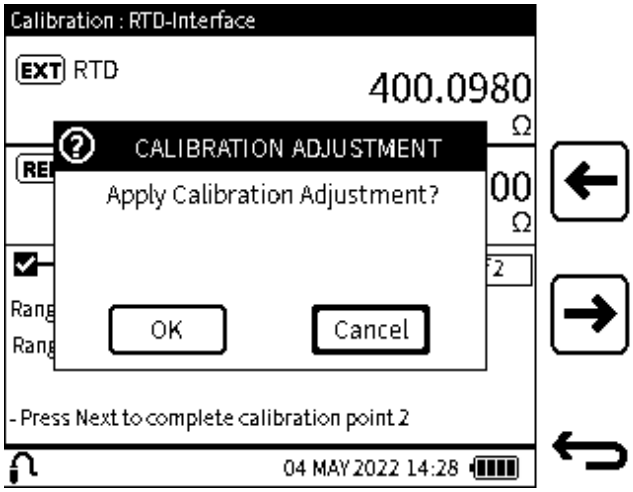
Step 4		Press the **Next** softkey to complete **Calibration Point 1** and proceed to **Calibration Point 2**.
Step 5		Repeat Steps 2 to 4, but begin by applying the nominal positive full-scale resistance or temperature value to the DPI610E. This completes **Calibration Point 2**. Press the **Next** softkey to show the next screen.
Step 6		After pressing **Next** from the previous step, a message window will appear, requesting confirmation to perform the calibration adjustment based on the calibration points used in the procedure. Select **OK** to apply the calibration adjustment. Otherwise, select the **Cancel** button to return to the **Calibration** screen

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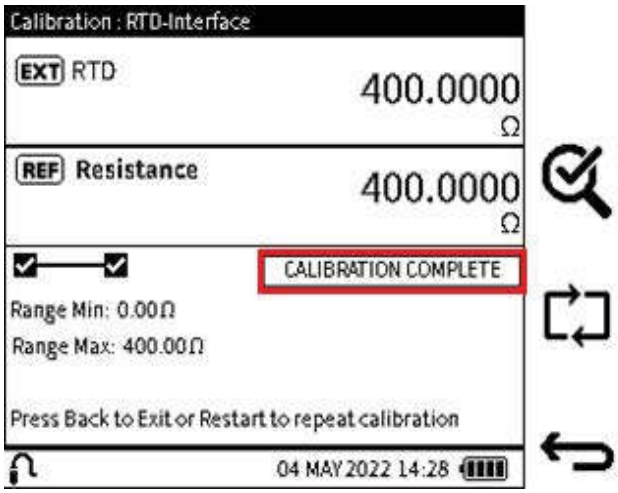
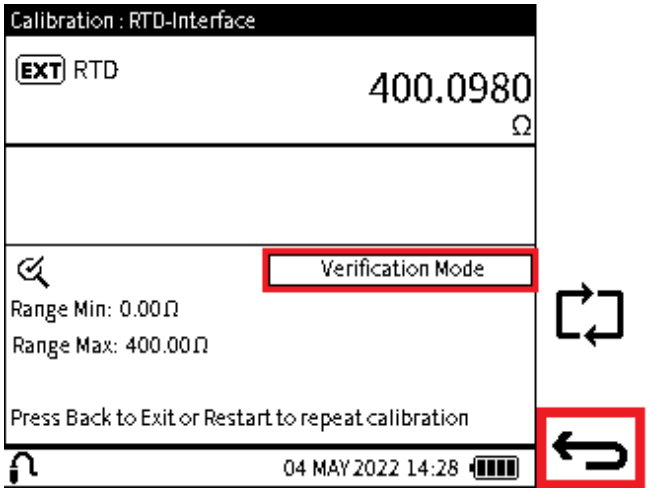
Step 7		If **OK** is selected, the **CALIBRATION COMPLETE** message appears in the status box, to confirm the adjustment has been made. At this stage, there are three icons for three ways to proceed. These are: **VERIFICATION** softkey navigates to the **Verification** screen (see Step 8). **RESTART** softkey allows the calibration procedure to be restarted if a repeat calibration is required. **BACK** softkey exits the calibration procedure and returns the user to the **Perform Calibration** menu screen.
Step 8		The verification mode shows live reference and measured (or sourced) values. Here, different values or points within the measured (or sourced) range can be checked to verify the adjustment is satisfactory. Once verification is complete, select the **Back** icon to exit the calibration procedure or select the **Restart** softkey to repeat the calibration.

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13.9.2 SET CALIBRATION DATE & INTERVAL

The **External (RTD) Sensor Calibration Status** screen has the following options:

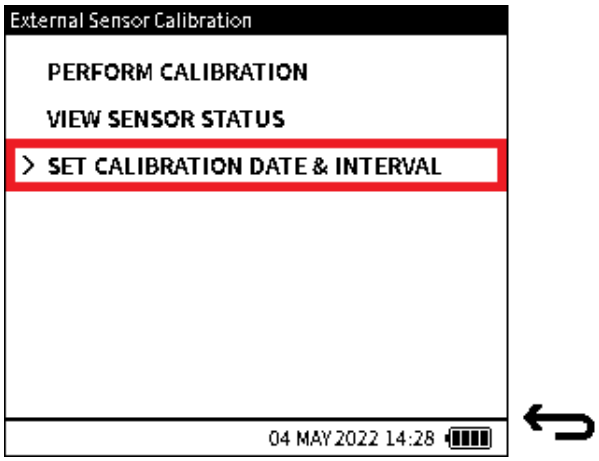
Option	Description
LAST CALIBRATION	Set the date the instrument was last calibrated.
CALIBRATION INTERVAL	Enable user notification by setting the number of days between the last calibration and the next scheduled calibration (default is 365 days).
CALIBRATION DUE	Enable user notification by setting a specific date to schedule next calibration (default is based on the date of the last calibration and the specified calibration interval). This is View Only - this variable cannot be changed on this screen.

.



Figure 13-6: External Sensor Calibration (Date & Interval) Status Screen

To access the **External RTD Calibration Date & Interval** screen:

Step 1		Select **SET CALIBRATION DATE & INTERVAL** from the **External Sensor Calibration** screen.

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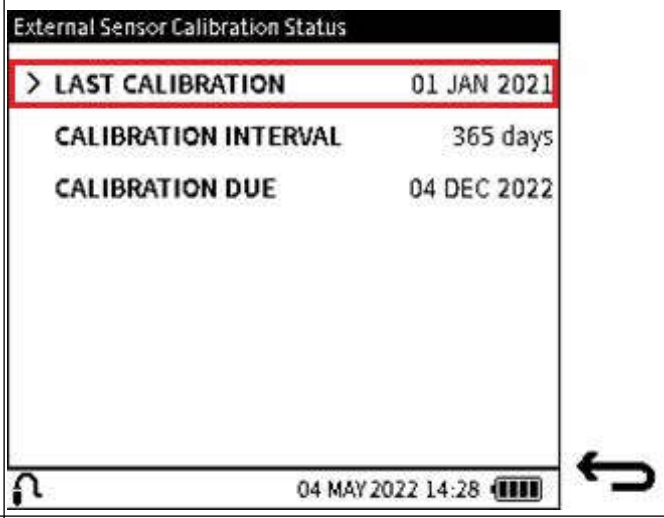
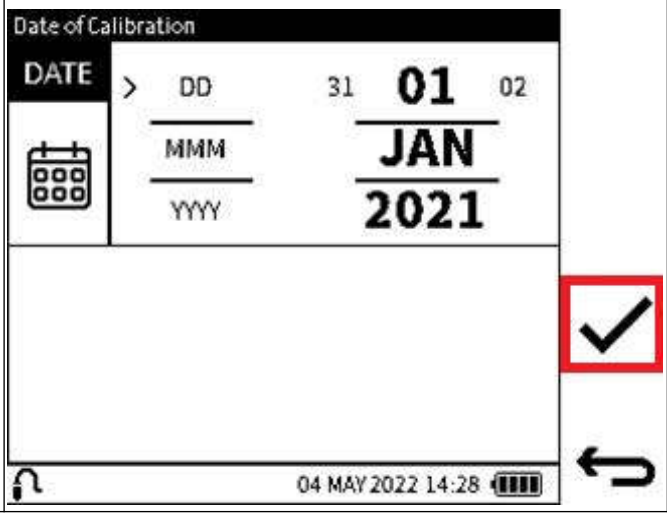
13.9.2.1 Change Last Calibration Date

Step 1		Select **LAST CALIBRATION** from the **Instrument Calibration Date & Interval** screen.
Step 2		Select the required day, month, and year, as required (see Section 1.19.3 on page 17). To change the value, select the row of the variable. Press the value on the left of the current value to decrease the value and the value on the right to increase the value. Repeat pressing of either left or right value decreases or increases the selected current value. Select ✓ to confirm the changes.

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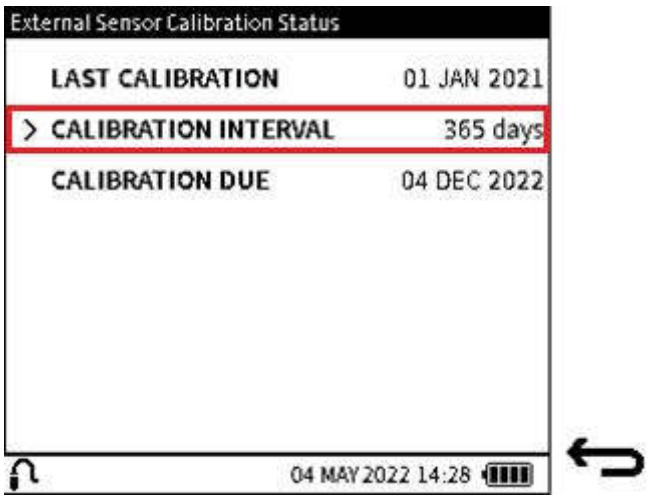
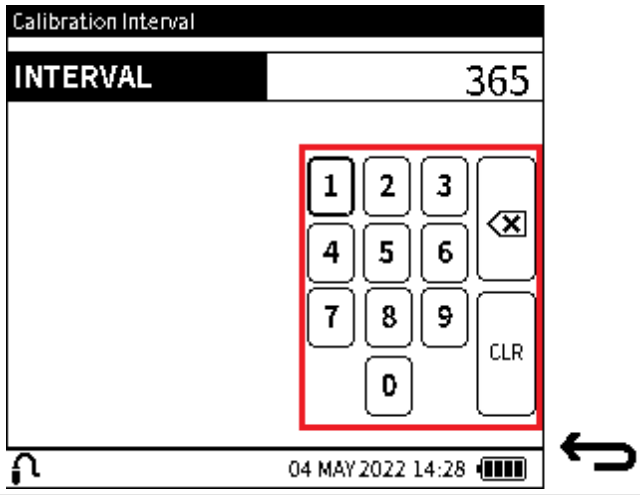
13.9.2.2 Change Calibration Interval

Step 1		Select **CALIBRATION INTERVAL** from the **External Sensor Calibration Status** screen.
Step 2		Enter a calibration interval between 7 and 548 (days). Select ✓ to confirm.

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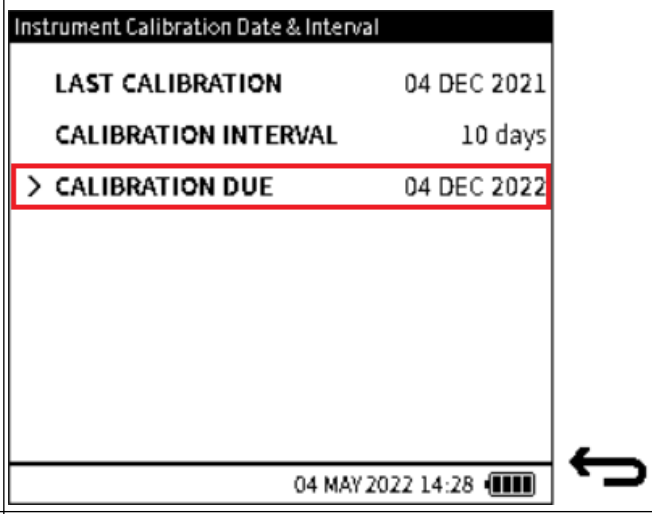
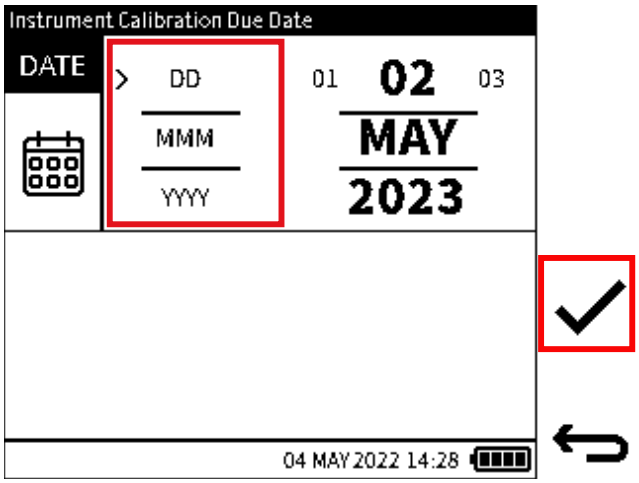
13.9.2.3 Change Calibration Due Date

Step 1		Select **CALIBRATION DUE** from the **Instrument Calibration Date & Interval** screen.
Step 2		Select the required day, month and year, as required (see Section 1.19.3 on page 17). To change the value, select the row of the variable. Press the value on the left of the current value to decrease the value and the value on the right to increase the value. Repeat pressing of either left or right value decreases or increases the selected current value. Select ✓ to confirm the changes.

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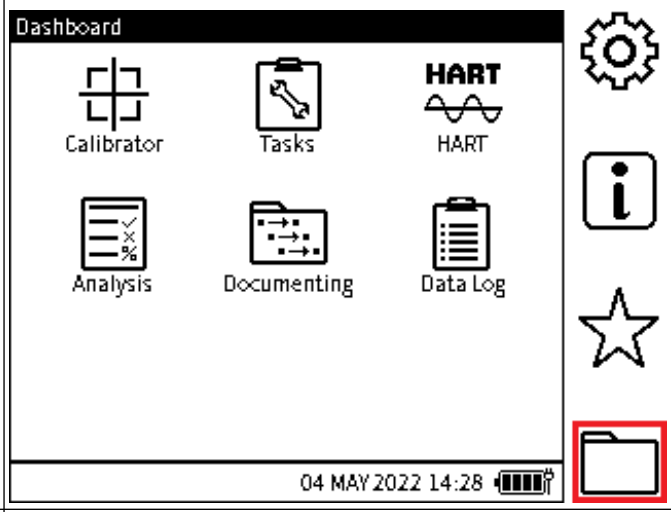
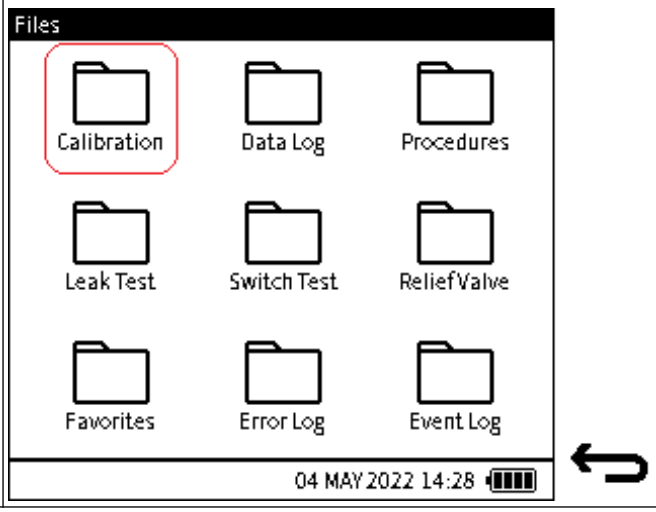
14. Files System

The **Files** system menu provides access to all user files stored in the internal memory of the DPI610E. It is accessible from the Dashboard screen and displays a structure of directories used to organize the files for easy and reliable viewing.

14.1 How to access the Files system menu

Step 1		Select the **Files** softkey from the Dashboard.
Step 2		Select the required folder from the **Files** menu. In this example, the Calibration folder is selected.

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14.1.1 The Files system screen options

Option	Description
Calibration	Export / View instrument calibration files
Data Log	View / Open / Delete data log files
Procedures	View / Delete test procedures, assets, and results files
Leak Test	View saved leak test result files
Switch Test	View saved switch test result files
Relief Valve	View saved relief valve test result files
Favorites	View a task or channel configuration saved as a Favorite
Error Log	Export / View error log files
Event Log	Export / View event log files

14.2 Calibration

When the **Calibration** folder is selected, any previously exported calibration files will be listed.

If no export has been done before, select the **Export** softkey to generate the calibration files stored on the unit. There are three types of calibration files:

Factory Calibration – this is the default calibration done on the instrument in the factory prior to shipping. It is saved in permanent storage and cannot be accessed directly or deleted by the user.

Current Calibration – this is the calibration data used by the instrument at any moment in time. If the instrument is new and has not been used, the Current calibration will be the Factory calibration. After calibration adjustment has been done on the instrument, this new data will replace the factory calibration data as the new Current calibration. Subsequent calibrations will overwrite this user calibration data.

Backup Calibration – if the **Backup** calibration feature is used (See Section 13.5 on page 276), a copy of the Current Calibration data is saved as a Backup data file.

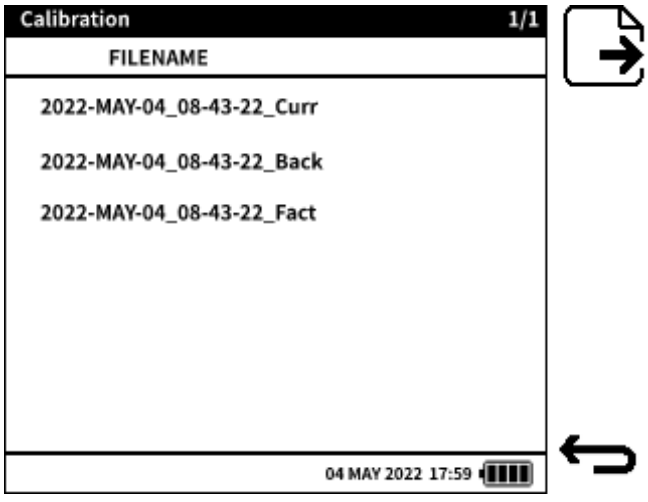

Figure 14-1: Calibration Files screen

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14.3 Data Log

Select the **Data Log** folder, to show a list of log files saved on the instrument. The log files are accessed, and their contents displayed from this menu.

Delete unwanted log files by the use of either the **Single Delete** softkey for single files, or the **Delete All** softkey for all log files.

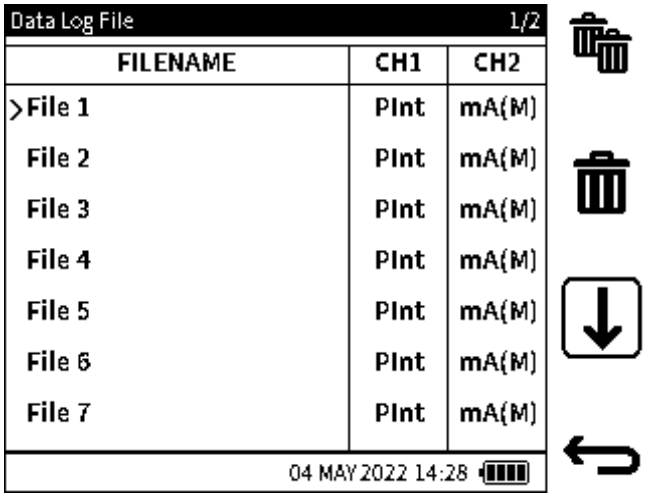

Figure 14-2: Data Log files screen

14.4 Procedures

The **Procedures** option provides a list of all test procedures created or uploaded and saved on the instrument by the **Documenting** function (see Chapter 11 on page 182). To view the list of available internal procedures, select the **Local (Procedures)** sub-folder and to view the list of stored 4Sight2 procedures, select the **Remote** sub-folder.

Note: Only the list of files can be viewed in the **Files** application. There is the option to delete unwanted procedure files within each sub-folder by using either the **Single Delete** softkey to delete individual files or the **Delete All** softkey to delete all files in the sub-folder:

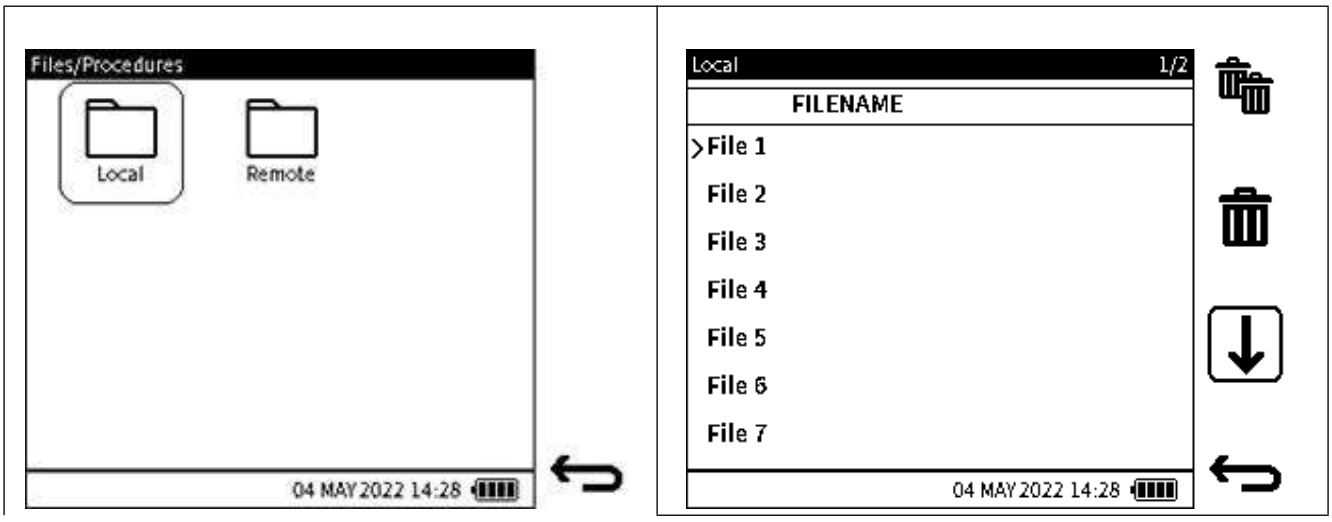

Figure 14-3: Local Procedures files

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14.5 Leak Test

The **Leak Test Results** folder displays a list of saved results files from completed leak tests. This is view only: details of the test results can be viewed by opening the file on a PC.

Unwanted results files within the folder can be deleted the use of either the **Single Delete** softkey (to delete individual files) or the **Delete All** softkey (to delete all files in the sub-folder).

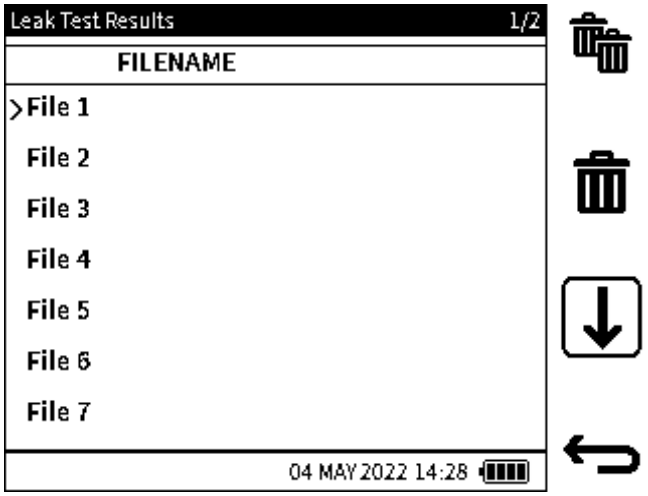

Figure 14-4: Leak Test Results screen

14.6 Switch Test

The **Switch Test Results** folder displays a list of saved results files from completed switch tests. This is view only: details of the test results can be viewed by opening the file on a PC.

Unwanted results files within the folder can be deleted the use of either the **Single Delete** softkey (to delete individual files) or the **Delete All** softkey (to delete all files in the sub-folder).

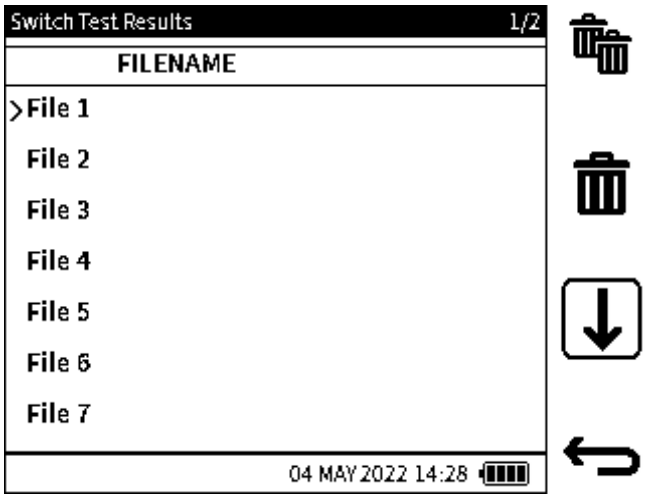

Figure 14-5: Switch Test files screen

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14.7 Relief Valve

The **Relief Valve Results** folder displays a list of saved results files from completed Relief Valve tests. This is view only: details of the test results can be viewed by opening the file on a PC.

Unwanted results files within the folder can be deleted the use of either the **Single Delete** softkey (to delete individual files) or the **Delete All** softkey (to delete all files in the sub-folder).

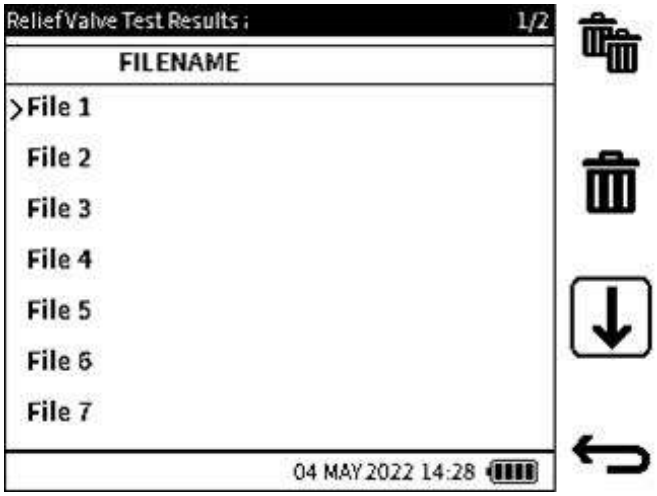
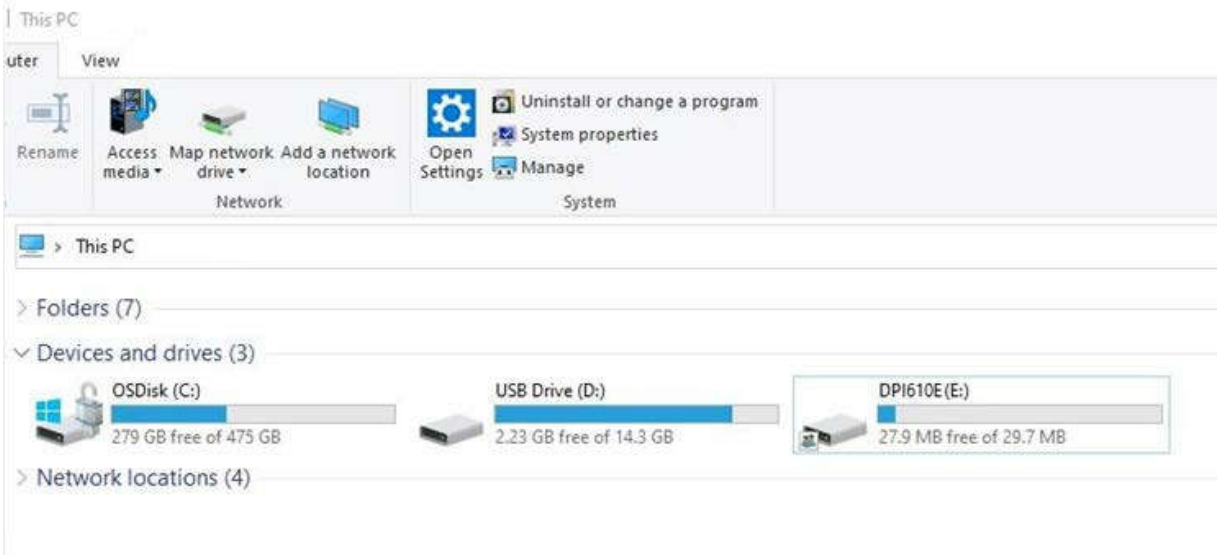


Figure 14-6: Switch Test files screen

14.8 How to view the File System on a PC

To access the contents of the internal storage of the DPI610E: first connect the DPI610E, using the micro-USB cable supplied (or any compatible mini-USB cable) to the USB port of the PC.

From the device Dashboard, select the **Settings** softkey, then select USB: change the USB setting to “Storage” if not already set. This allows the DPI610E device to appear as a mass storage drive labeled “DPI610E” or “DPI610E-IS” in the Windows File Explorer on the PC.



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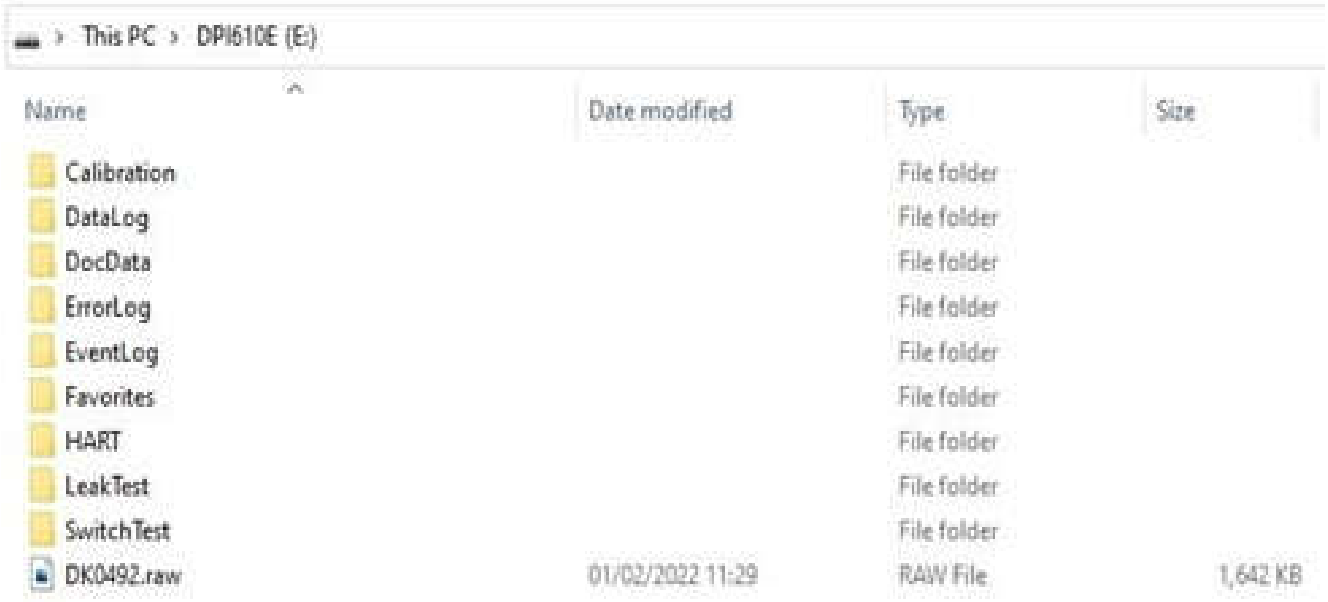
The contents of the DPI610E storage are similarly structured to what can be viewed on the device in terms of the folder structure. The **HART** folder is the exception, because its folder and contents can only be accessed from a PC.

It is possible to copy files in the device storage to a different file location on the PC or files can be deleted to free up space on the device.

Double-tap on the DPI610E drive and select the required **File System** folder from the root directory.



14.9 Favorites, Error Log and Event Log

Refer to Chapter 16, “Favorites Menu,” on page 307 for information about how to use the **Favorites** function.

Refer to Section 15.8 on page 305 for information about how to use the **Error Log** function.

Refer to Section 15.9 on page 306 for information about how to use the **Event Log** function.

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15. Status Menu

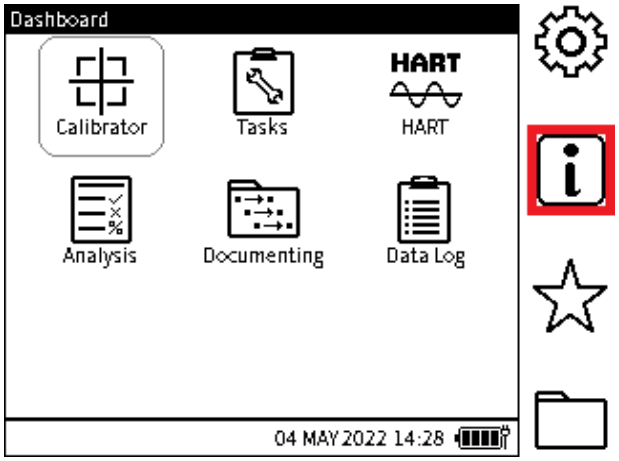
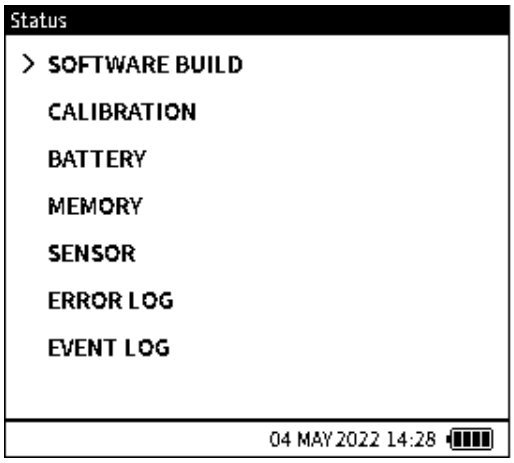
15.1 Status Menu Options

The **Status** menu is a read-only menu that provides important information about the DPI610E instrument. It is accessible from the Dashboard and has the following view options:

Table 15-1: Status Menu Options

Option	Description
SOFTWARE BUILD	View software build installed on the instrument
CALIBRATION	View Calibration information (instrument and external sensors)
BATTERY	View battery status
MEMORY	View internal memory status
SENSOR	View Sensor information (instrument and external sensors)
ERROR LOG	Export (and view) error log files
EVENT LOG	Export (and view) event log files

15.2 How to show the Status menu screen

Step 1		Select the **Status** (Information) softkey from the Dashboard.
Step 2		A screen of **Status** menu options appears. To select the row that has the required option, tap on the row or use the Navigation pad.

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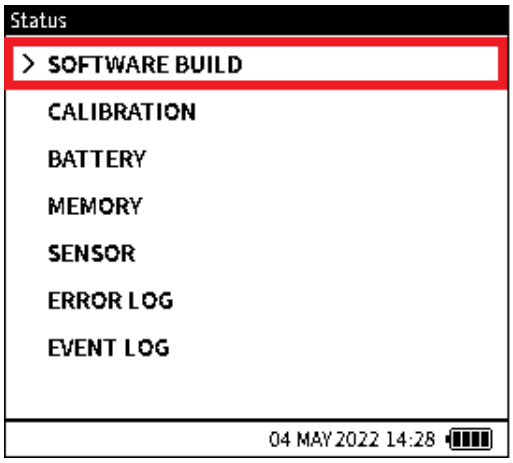
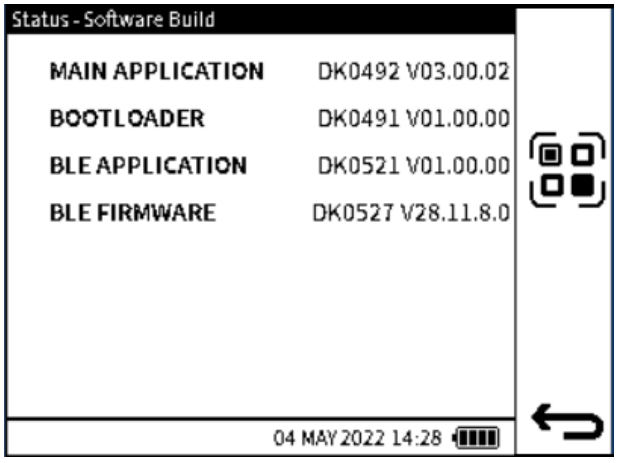
15.3 SOFTWARE BUILD

Step 1		In the **Status** menu screen select the **SOFTWARE BUILD** row, to show the **Status - SOFTWARE BUILD** screen.
Step 2	 	The **Status - SOFTWARE BUILD** screen shows the **MAIN APPLICATION** (DK492) and the **BOOTLOADER** (DK491) build version information. **BLE APPLICATION** and **BLE FIRMWARE** relate to BLUETOOTH in the device. In addition, a QR softkey is available which when selected goes to the programming tool information screen. This screen provides the URL and scanable QR code. This code takes the user to where the software programming tool can be downloaded, with instructions on how to use it to do software upgrades.

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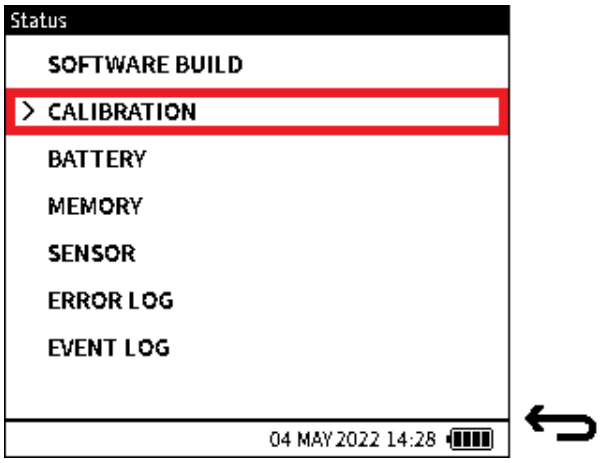
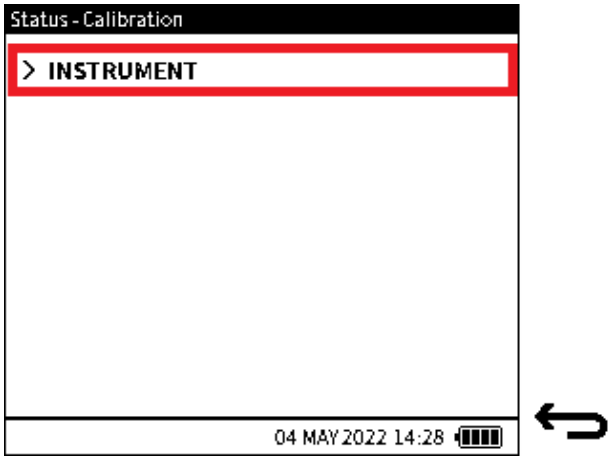
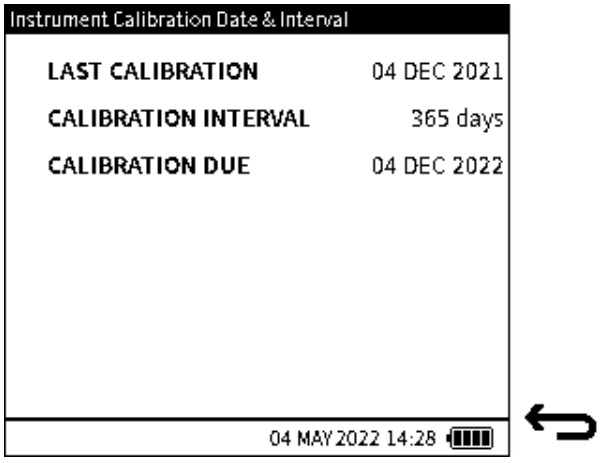
15.4 CALIBRATION

Step 1		In the **Status** menu screen select the **CALIBRATION** row, to show the **Status - Calibration** screen.
Step 2		The **Status - Calibration** screen shows the **INSTRUMENT** (or sensor) option. **Note**: For the **EXTERNAL PRESSURE SENSOR** option to be available in this screen, the **EXT pressure** (see Section 8.1.6 on page 136) or **EXTERNAL RTD** function (see Section 8.2.4 on page 142) must be configured in the **Calibrator** menu.
Step 3		View the instrument (or sensor) details. Select the **Back** softkey to return to the **Status - Calibration** menu

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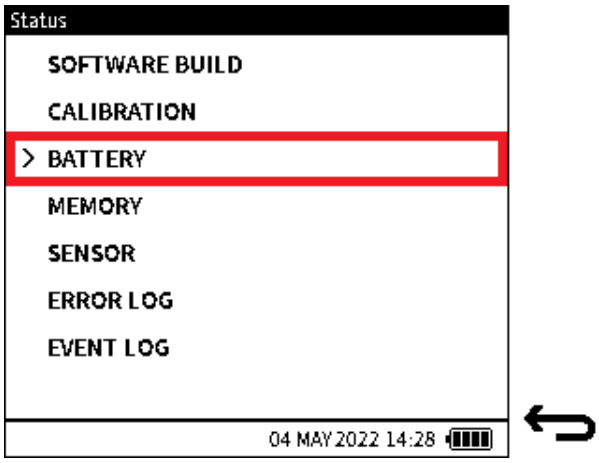
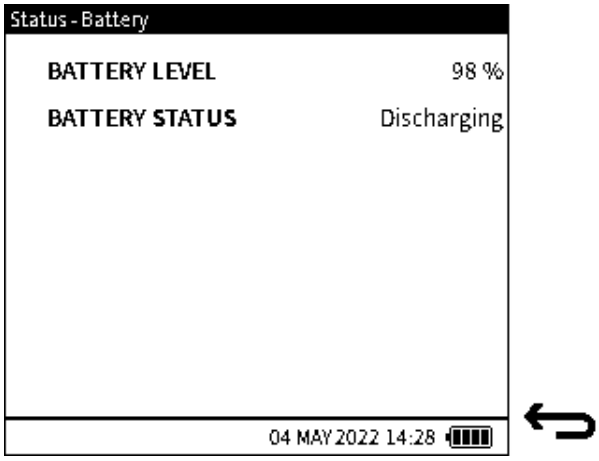
15.5 BATTERY

Step 1		In the **Status** menu screen select the **BATTERY** row, to show the **Status - Battery** screen.
Step 2		The **Status - Battery** screen shows the current instrument battery level and if the battery is either discharging or being charged.

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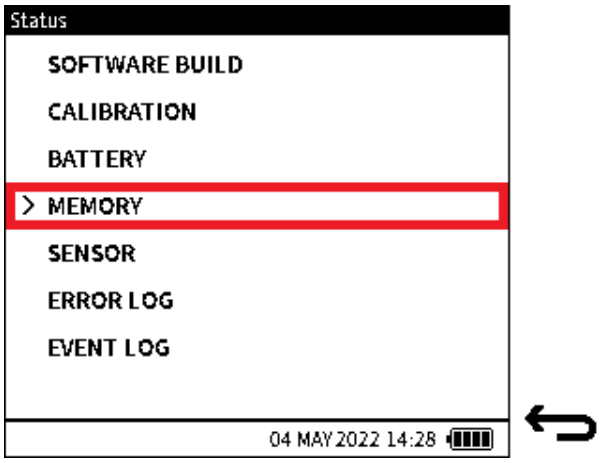
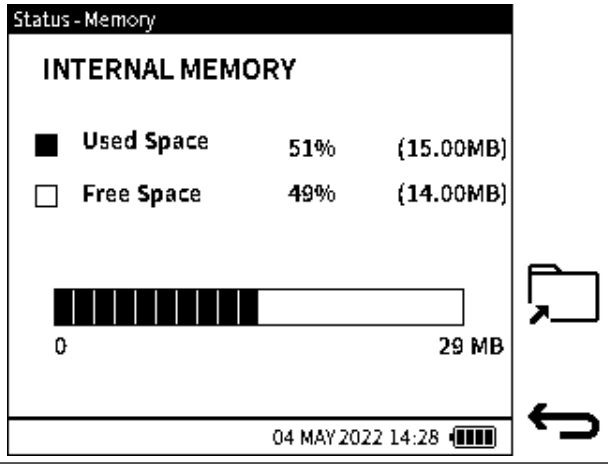
15.6 MEMORY

Step 1		In the **Status** menu screen select the **MEMORY** row, to show the **Status - Memory** screen.
Step 2		The **Status - Memory** screen shows the current free and used space in the instrument's internal memory.

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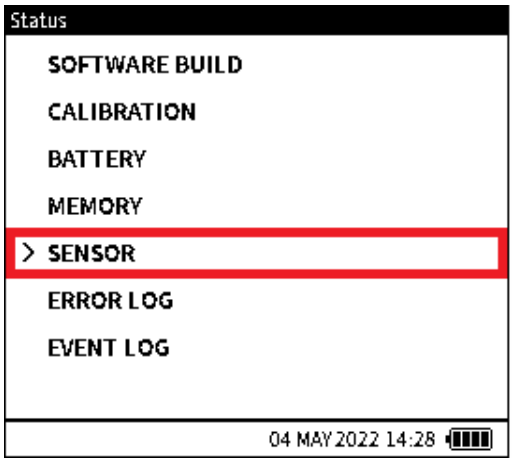
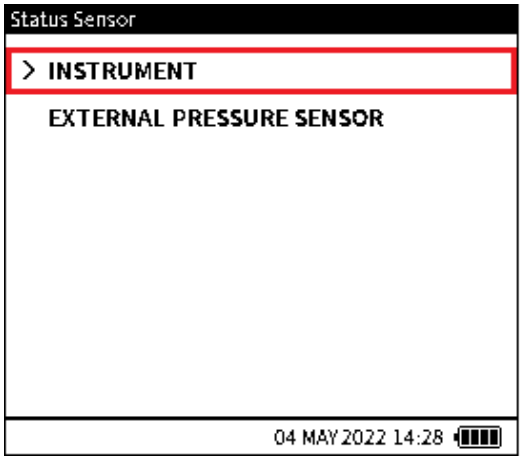
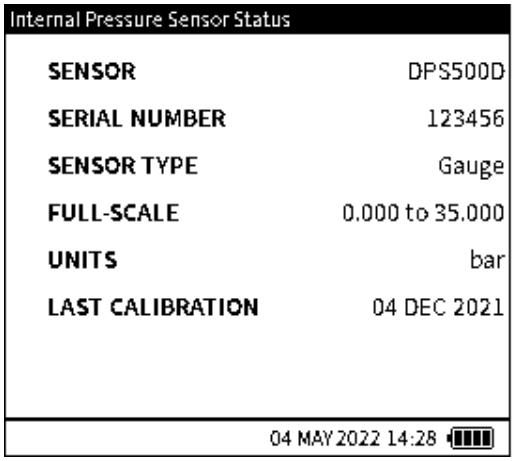
15.7 SENSOR

Step 1		In the **Status** menu screen select the **SENSOR** row, to show the **Status - Sensor** screen.
Step 2		The **Status - Sensor** screen appears because the instrument has been configured to use an external sensor (see Section 8.1.6 on page 136.) **Note**: For the **EXTERNAL SENSOR** option to be available in this screen, the **EXT pressure** or **RTD** function must be configured in the **Calibrator** menu and the sensor successfully connected: refer to Chapter 8 on page 133 for information.
Step 3		View the sensor details. Select the **Back** softkey to return to the **Status - Sensor** screen.

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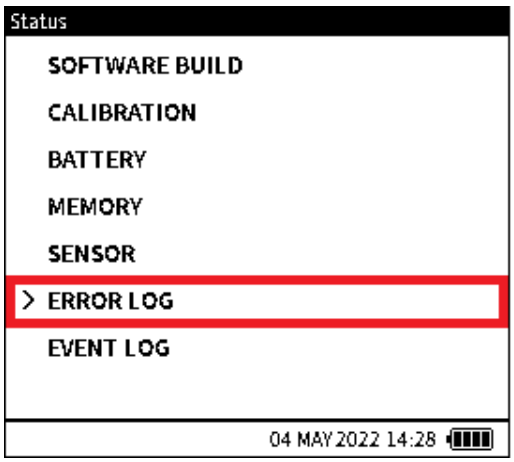
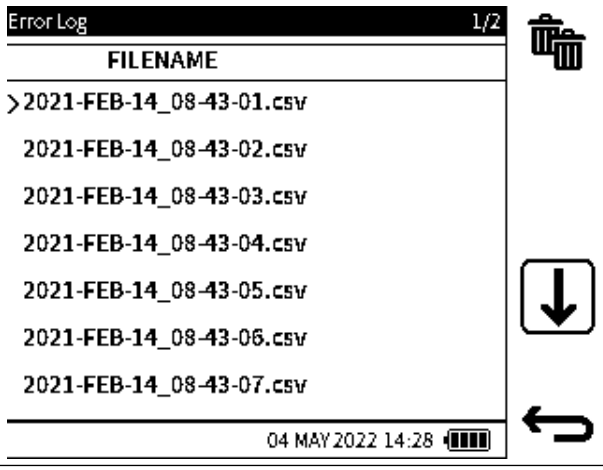
15.8 ERROR LOG

The DPI610E records detailed information whenever it encounters any operational software or firmware issues.

Note: Each time the **ERROR LOG** is selected, an export of the currently logged errors is automatically created as a CSV file. This export file(s) is displayed in the **Error Log** screen but can only be opened if transferred and accessed from a PC: (refer to Section 9.6.1 on page 171 for how to find and read these files).

15.8.1 How to export and view Exported Error Log files

Step 1		Select the **ERROR LOG** from the **Status** menu screen. **Note**: A “Please Wait” popup message will appear while the log file is being created. It may take up to 1 minute to complete.
Step 2		View the list of **ERROR LOG** files. To delete all files in the list, tap (or press the associated softkey) the **Multiple trashcan** (**Delete All**) icon. A message window appears asking “Delete all files?”. Select **OK** or **Cancel**. Press the down icon to show one more page of available files. Press the **Back** icon to go back to the **Status** screen.

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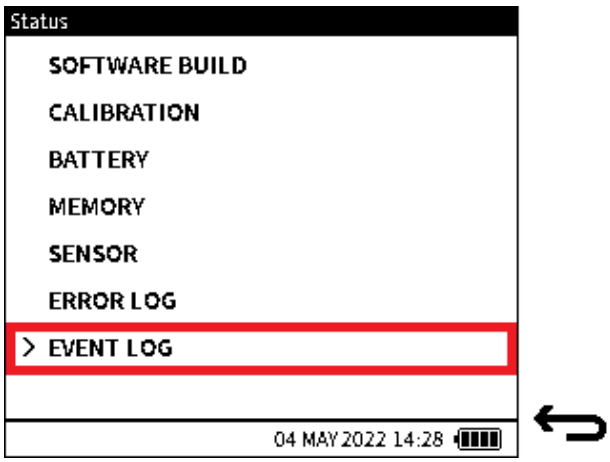
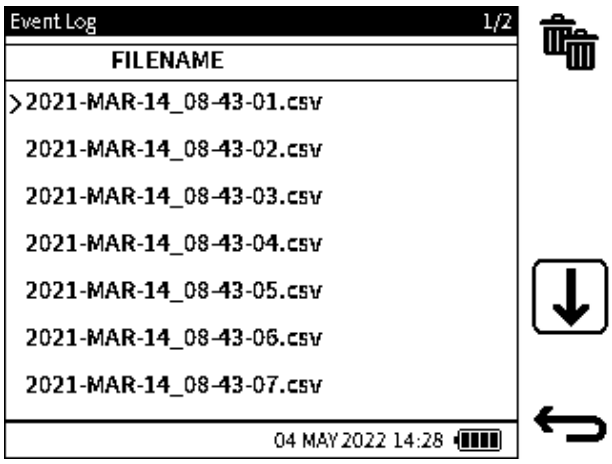
15.9 EVENT LOG

The DPI610E records detailed information about significant events that occur on the instrument during operation. These events can include errors, warnings, etc.

Note: Each time the **EVENT LOG** is selected, an export of the currently logged system events is automatically created as a CSV file. This export file(s) is displayed in the **Event Log** screen but can only be opened if transferred and accessed from a PC: (refer to Section 9.6.1 on page 171 for how to find and read these files).

15.9.1 How to export and view Exported Event Log files

Step 1		Select the **EVENT LOG** from the **Status** menu screen. **Note**: A “Please Wait” popup message will appear while the log file is being created. It may take up to 1 minute to complete.
Step 2		View the list of **Event Log** files. To delete all files in the list, tap (or press the associated softkey) the **Multiple trashcan** (**Delete all**) icon. A message window appears asking “Delete all files?”. Select **OK** or **Cancel**. Press the down icon to show one more page of available files. Press the **Back** icon to go back to the **Status** screen.

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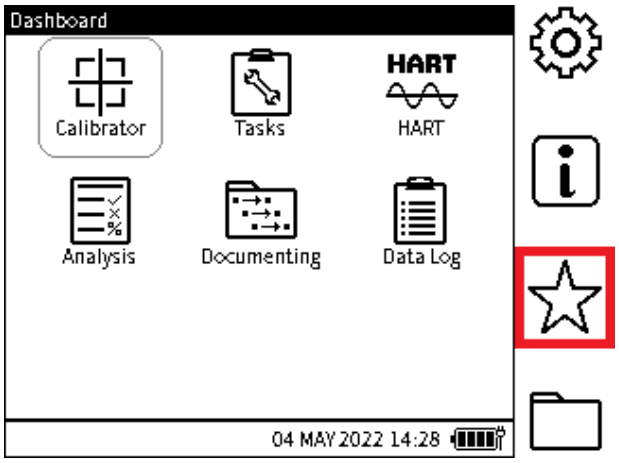
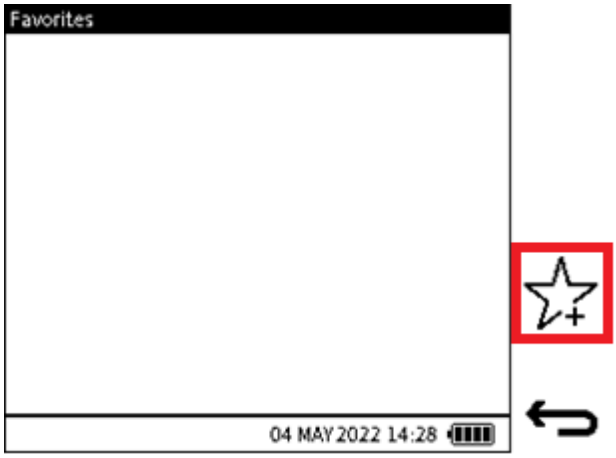
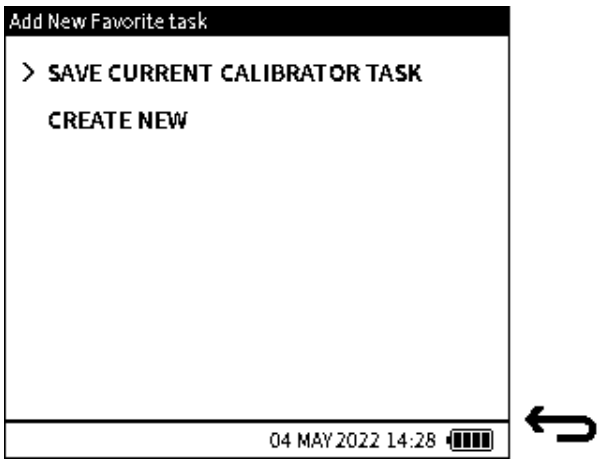
16. Favorites Menu

16.1 Favorites Menu Options

A currently active task or channel configuration can be saved as a Favorite. This includes all channel setup parameters i.e., units, Process options, digit resolution and any other associated configurations.

This saved configuration can be selected to automatically load and configure the Calibrator task. Up to 10 Favorite configurations can be saved.

Step 1		Select the **Favorites** icon or softkey from the Dashboard.
Step 2		The **Favourites** screen appears. The list on this screen will be empty if no Favorites are available. Select the **Add New** softkey to show the **Add New Favorite task** screen.
Step 3		There are two methods available to save a Favorite configuration: 1. **SAVE CURRENT CALIBRATOR TASK**. See Section 16.1.1 on page 308. 2. **CREATE NEW** to save a new configuration. See Section 16.1.2 on page 310. Tap on a row to select the method.

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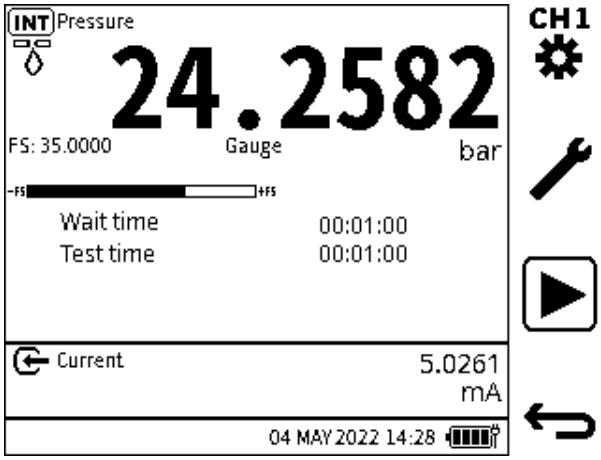
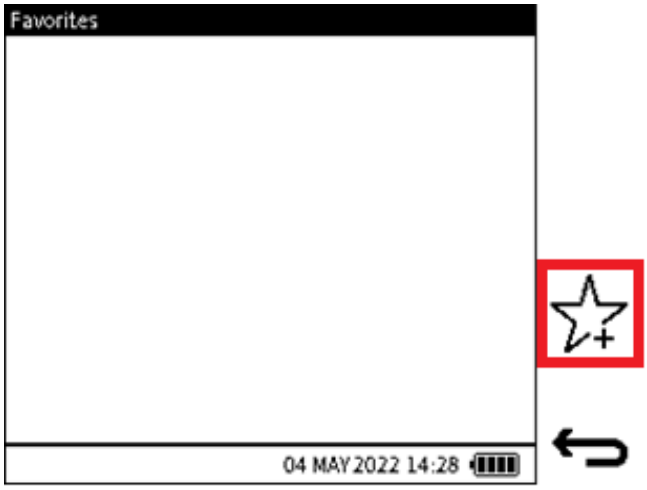
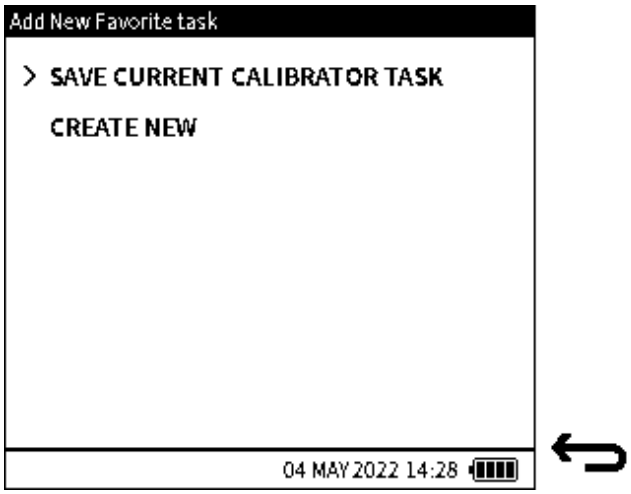
16.1.1 Save Current Calibrator Task

To save the current Calibrator task and all its settings as a Favorite, first make sure the desired configuration has been made within the Calibrator application.

Step 1		This example screen relates to a Calibrator task for a Leak Test and Current Measure. Select the **Back** ⮌ icon on this screen to show the Dashboard screen. Select the **Favorites** ☆ softkey from the Dashboard. (For this screen image see Step 1 in Section 16.1 on page 307).
Step 2		Select the **Add New** ☆+ softkey in the **Favorites** screen.
Step 3		Select the **SAVE CURRENT CALIBRATOR TASK** option in the **Add New Favorite task** screen.

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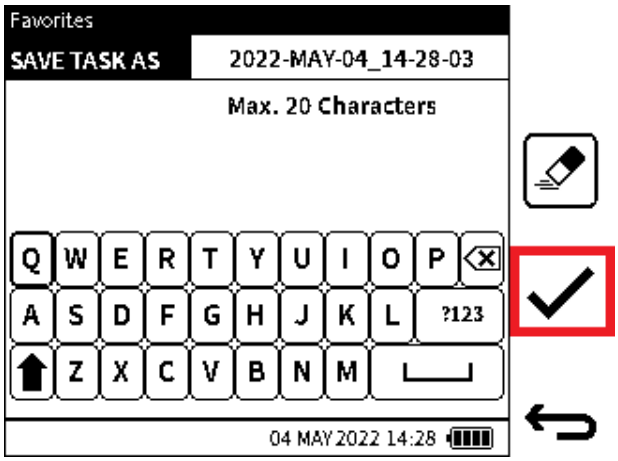
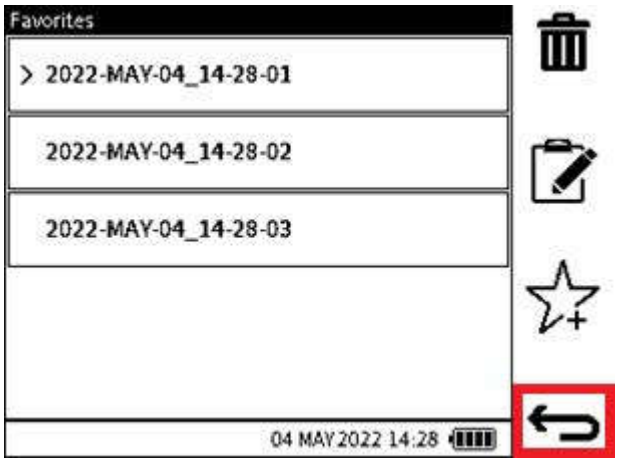
Step 4		Enter a new file name into the **SAVE TASK AS** field or accept the default file name based on the current date. To save the configuration select the **Tick** ✓ softkey. (Maximum characters: 20).
		The new configuration file appears in the list in the **Favorites** screen.

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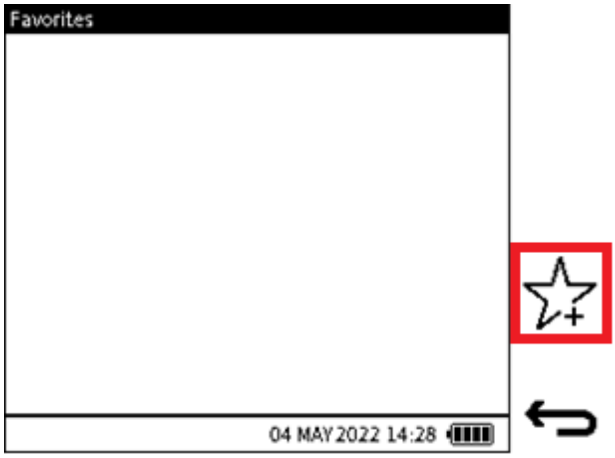
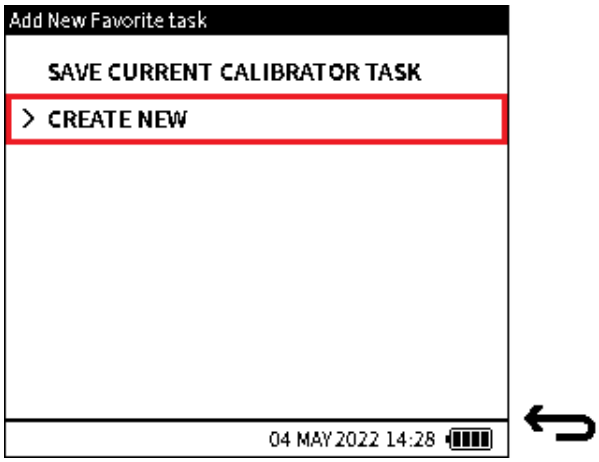
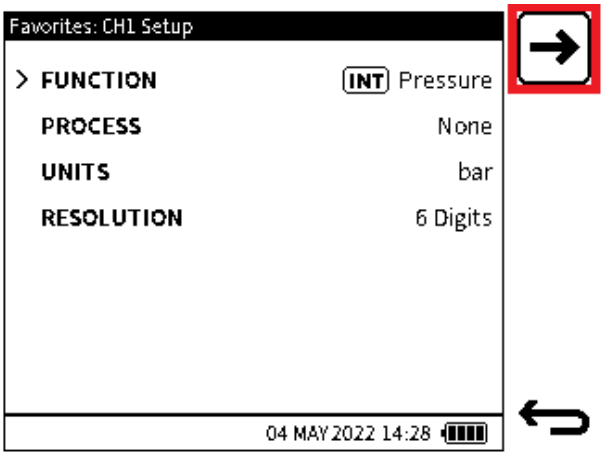
16.1.2 Save New Configuration as Favorite

This option allows manual configuration of the individual channels within the **Favorites** menu.

Step 1		Select the **Favorites** ☆ softkey from the Dashboard. (For this screen image see Step 1 in Section 16.1 on page 307). Select the **Add New** ☆+ softkey from the **Favorites** screen.
Step 2		Select the **CREATE NEW** option.
Step 3		The **Favorites CH1 Setup** screen will appear in its current configuration. Select any of the setup parameters to change. When the setup is complete, select the **Next** → softkey to move to the **Favorites CH2 Setup** screen.

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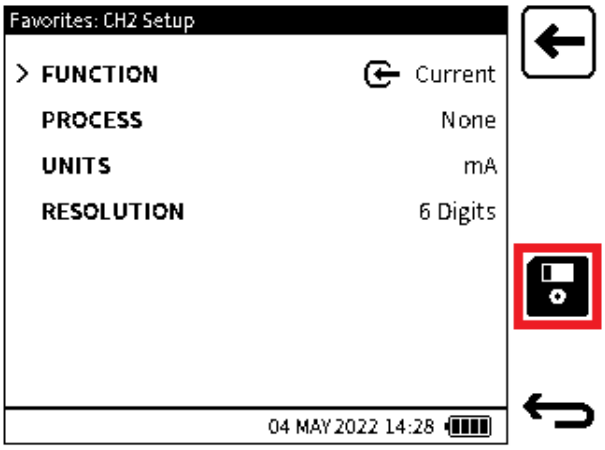
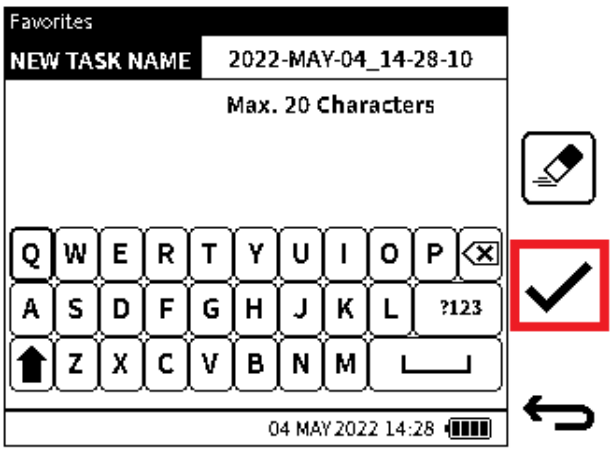
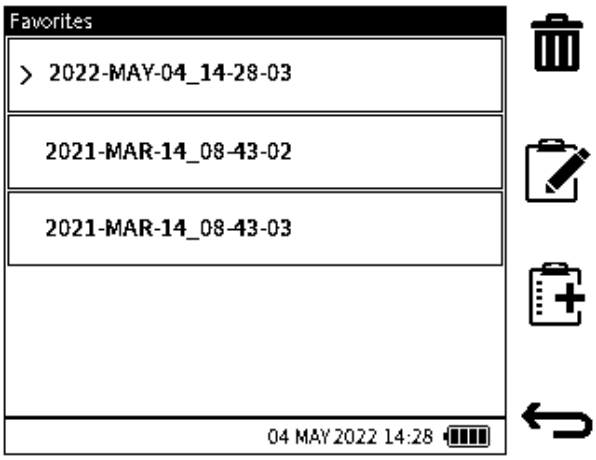
Step 4		Change any of the setup parameters in the **Favorites CH2 Setup** screen if required and then select the **Save** softkey.
Step 5		Enter the new file name into the **NEW TASK NAME** field **Favorites** screen (or accept the default file name based on the current date). Select the **Tick** softkey to save the configuration. (Maximum characters: 20).
Step 6		The new configuration file appears in the list in the **Favorites** screen.

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16.2 To Load a Favorites Configuration

From the **Favorites** menu, navigate to the desired saved **Favorites** file by tapping the filename or using the Up/Down button on the navigation keypad. Tap again to load the configuration or press the **Enter** button if using the navigation keypad.

16.3 Edit an Existing Favorite File

From the **Favorites** menu, navigate to the desired saved **Favorites** file by tapping the file name or using the Up/Down button on the navigation keypad.

Select the **Edit** softkey to make changes to the Favorites file configuration. Once the edit is complete, select the **Save** softkey to save the changes made.

16.4 Delete Favorite Files

From the **Favorites** menu, navigate to the desired saved **Favorites** file by tapping the file name or using the Up/Down button on the navigation keypad. Select the **Delete** softkey to delete the file.

16.5 Transferring Favorite Files

Favorite configuration files can be accessed from a PC via the USB cable connection and appear in the **Favorites** folder in the root directory of the DPI610E. Use the Windows **Copy** command to copy a file to another folder. These configuration files can then be moved into another DPI610E instrument and used within that instrument.

Note: Care must be taken when transferring these files to make sure the DPI610E share the same supported functionality. For example, transferring a configuration file involving the Barometer function from a pneumatic DPI610E variant to a hydraulic variant which does not support the Barometer function.

16.6 Accessing Favorite Files via the File System

Saved **Favorites** configuration files can be viewed in the File System menu by selecting the File System softkey from the Dashboard and choosing the **Favorites** folder. Refer to Section 14.8 on page 297 for more information.

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17. General Specification

Refer to **www.druck.com/dpi610e** for the Datasheet that gives the technical specifications for the DPI610E.

17.1 Leak Rates

Pneumatic version: Instrument leak rate is less than ±50mbar/min ??(from pressure/vacuum).

Hydraulic version: Instrument leak rate is less than 1.5bar/minute ??(from pressure).

17.2 Open Source Software Licenses

Two files are available with the software installation:

1568-notices-report-08_08_2022_17_04.txt covers DK0491 DPI610E Bootloader.

1563-notices-report-08_08_2022_16_01.txt covers DK0492 DPI610E Main Application.

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18. Manufacturer

18.1 Contact details

Druck Limited
2 Fir Tree Lane
Groby
Leicester
LE6 0FH
United Kingdom

Tel: +44 (0)116 231 7100
www.Druck.com

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Appendix A. COMPLIANCE STATEMENTS

A.1 FCC (USA)

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in an installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference; and,
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement

This product complies with the US portable RF exposure limit set forth for an uncontrolled environment and is safe for intended operation as described in this manual. Further RF exposure reduction can be achieved if the product is kept as far as possible from the user body or is set to a lower output power if such function is available.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

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A.2 CANADA

ISED Canada Statement

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage;
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radiation Exposure Statement

The product complies with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The minimum separation distance for portable use is limited to 15mm assuming use of antenna with 2 dBi of gain. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

Déclaration d'exposition aux radiations

Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé. La distance de séparation minimale pour l'utilisation portative est limitée à 15mm en supposant l'utilisation de l'antenne avec 2 dBi de gain. Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

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