EXGP
Oxygen Analyzer System

Installation & Operating Guide

Oxygen Transmitters
Models 4680 & 4685

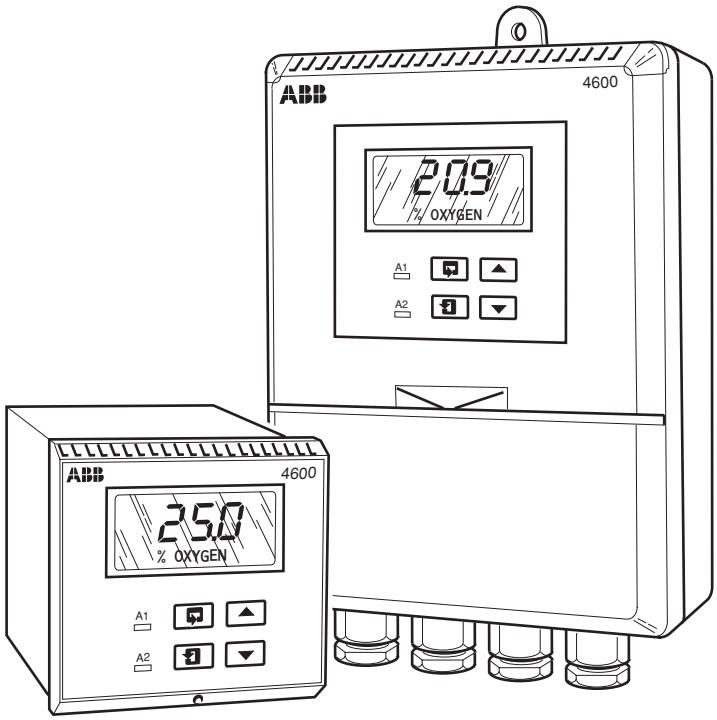


ABB Analytical

ABB ANALYTICAL

The Company

ABB Analytical specializes in the engineering, manufacture, sale and support of high quality, highly functional, analytical instrumentation for on-line analysis of process streams.

ABB Analytical is committed to quality leadership in the on-line analyser industry. The Company-wide, world-wide commitment is well expressed in the **quality statement** for ABB Analytical:

'We will conform to requirements and deliver defect-free products on time, to satisfy the needs of our internal and external customers.'

Use of Instructions

Warning.
An instruction that draws attention to the risk of injury or death.

Note.
Clarification of an instruction or additional information.

Caution.
An instruction that draws attention to the risk of damage to the product, process or surroundings.

Information.
Further reference for more detailed information or technical details.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

CONTENTS

1 INTRODUCTION

1.1 Documentation

Documentation for the EXGP Oxygen Analyzer System is shown in Fig. 1.1.

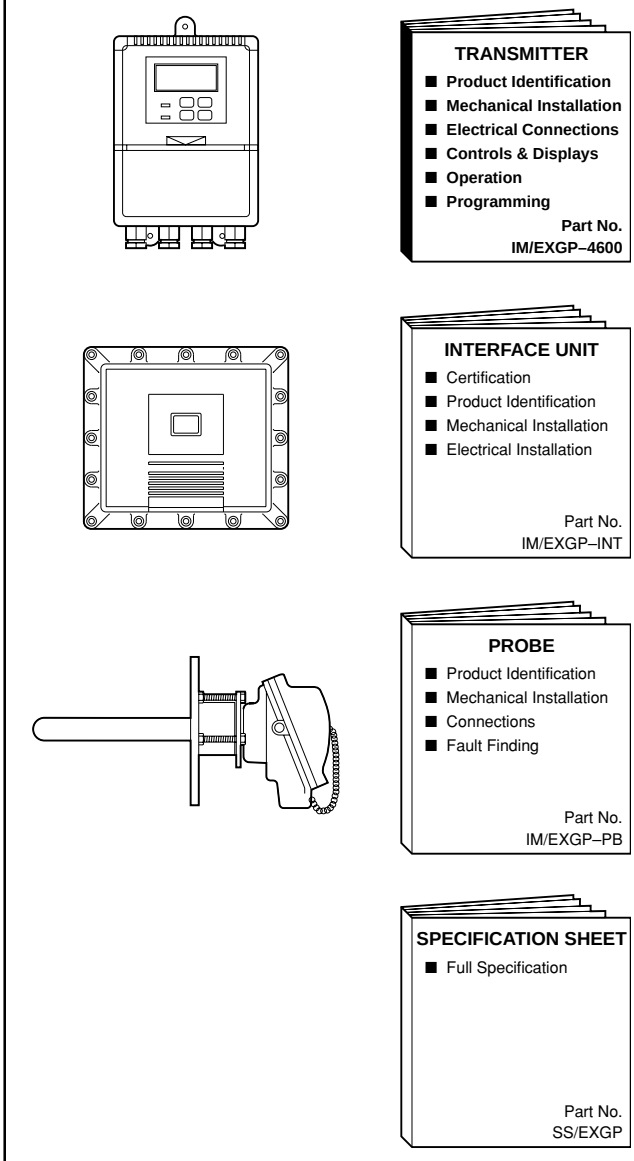


Fig. 1.1 System Documentation

1.2 System Hardware – Fig. 1.2

The 4680 and 4685 transmitters are part of the EXGP Oxygen Analyzer System which measures oxygen content and temperature within a gas flue. The system comprises an EXGP oxygen probe, an interface electronics unit and a 4680/85 transmitter – see Fig. 1.2. Signals from the transmitters can also be retransmitted to remote monitoring equipment.

The 4680/501 model is a wall-mounted instrument and the 4685/501 model is a panel-mounted, DIN-sized instrument. Both have a single programmable input channel and a single temperature input channel.

Instrument operation and programming is via four tactile membrane switches located on the front panel. Programmed functions are protected from unauthorized alteration by a five-digit security code.

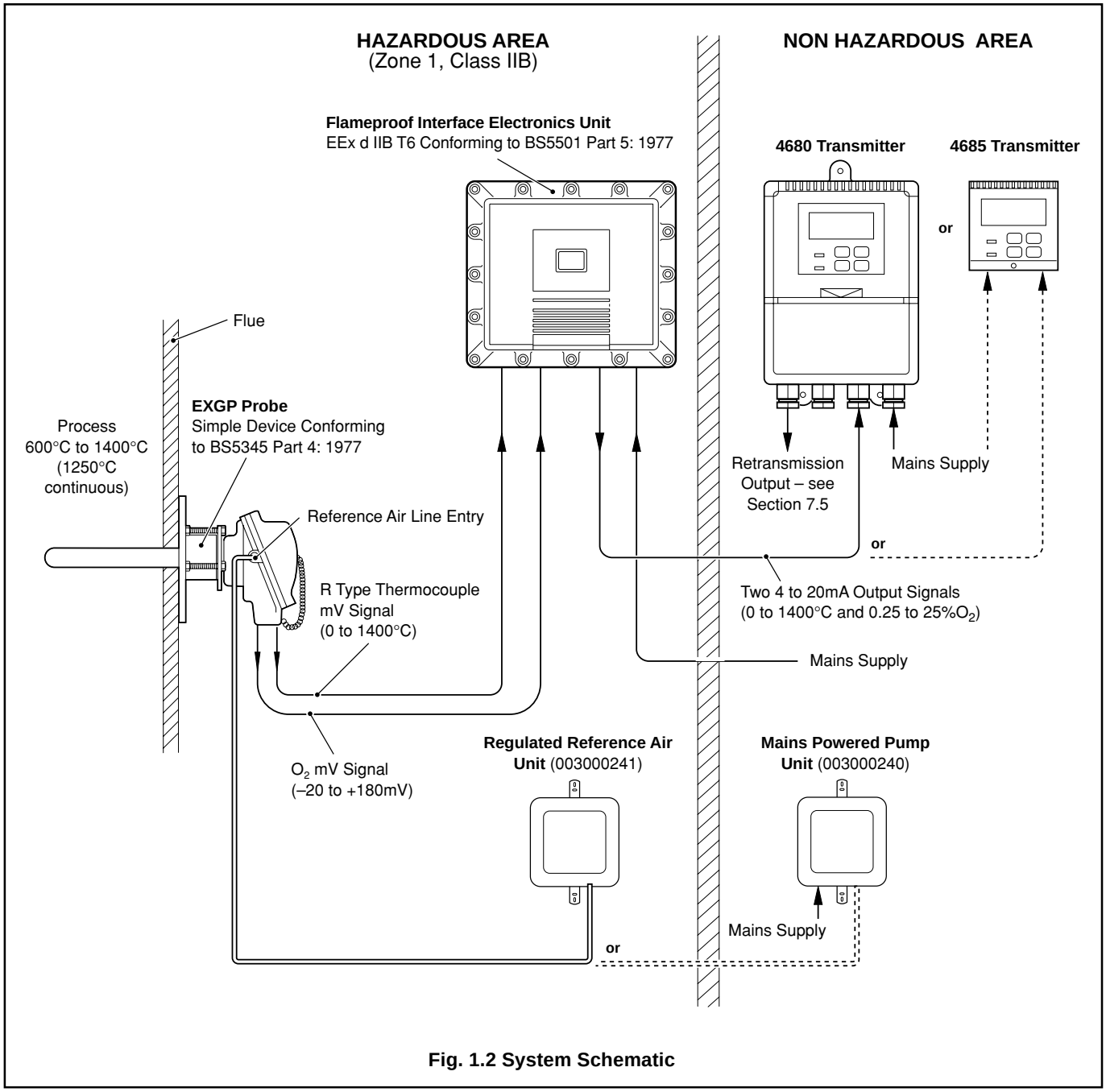


Fig. 1.2 System Schematic

2 PREPARATION

2.1 Checking the Instrument Type

2.1.1 Wall-/Pipe-mounted Instruments – Fig. 2.1

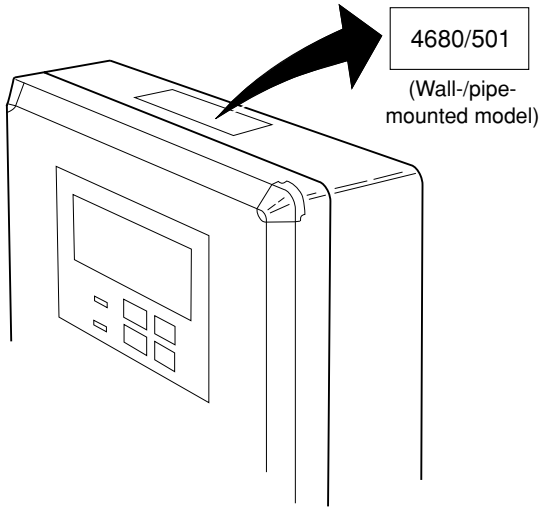


Fig. 2.1 Checking the Code Number (Model 4680)

2.1.2 Panel-mounted Instruments – Fig. 2.2

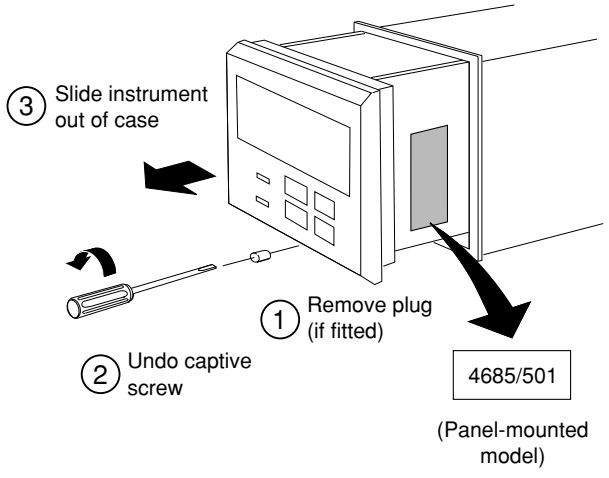


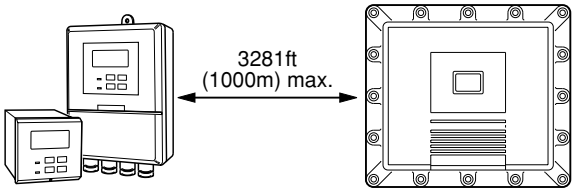
Fig. 2.2 Checking the Code Number (Model 4685)

3 MECHANICAL INSTALLATION

3.1 Siting Requirements – Fig. 3.1

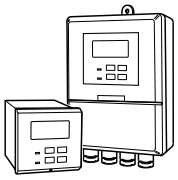
Caution.
- Mount in a location free from excessive vibration.
- Mount away from harmful vapors and/or dripping fluids.

Information. It is preferable to mount the instrument at eye level, allowing an unrestricted view of the front panel displays and controls.



A – Maximum Distance to Interface Electronics Unit

B – Within Temperature Limits



C – Within Environmental Limits

Fig. 3.1 Siting Requirements

3.2 Mounting

3.2.1 Wall-/Pipe-mounted Instruments – Figs. 3.2 and 3.3

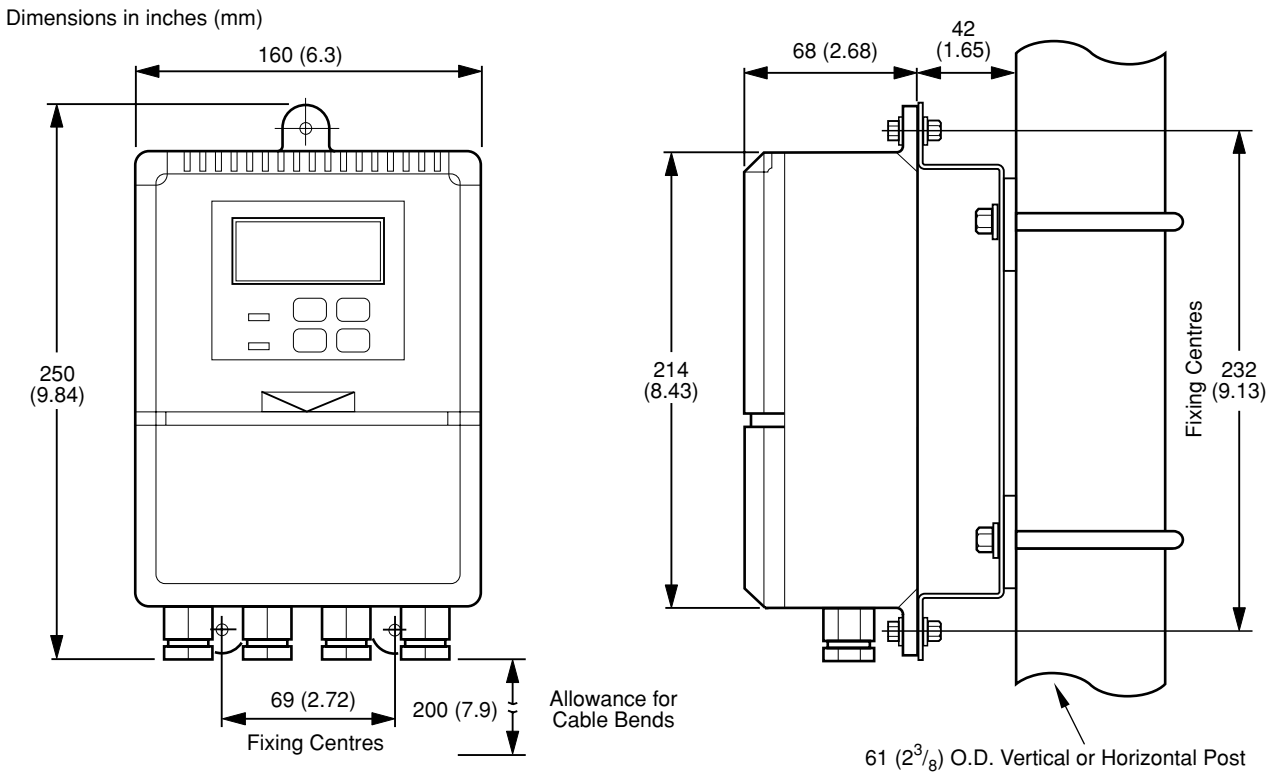
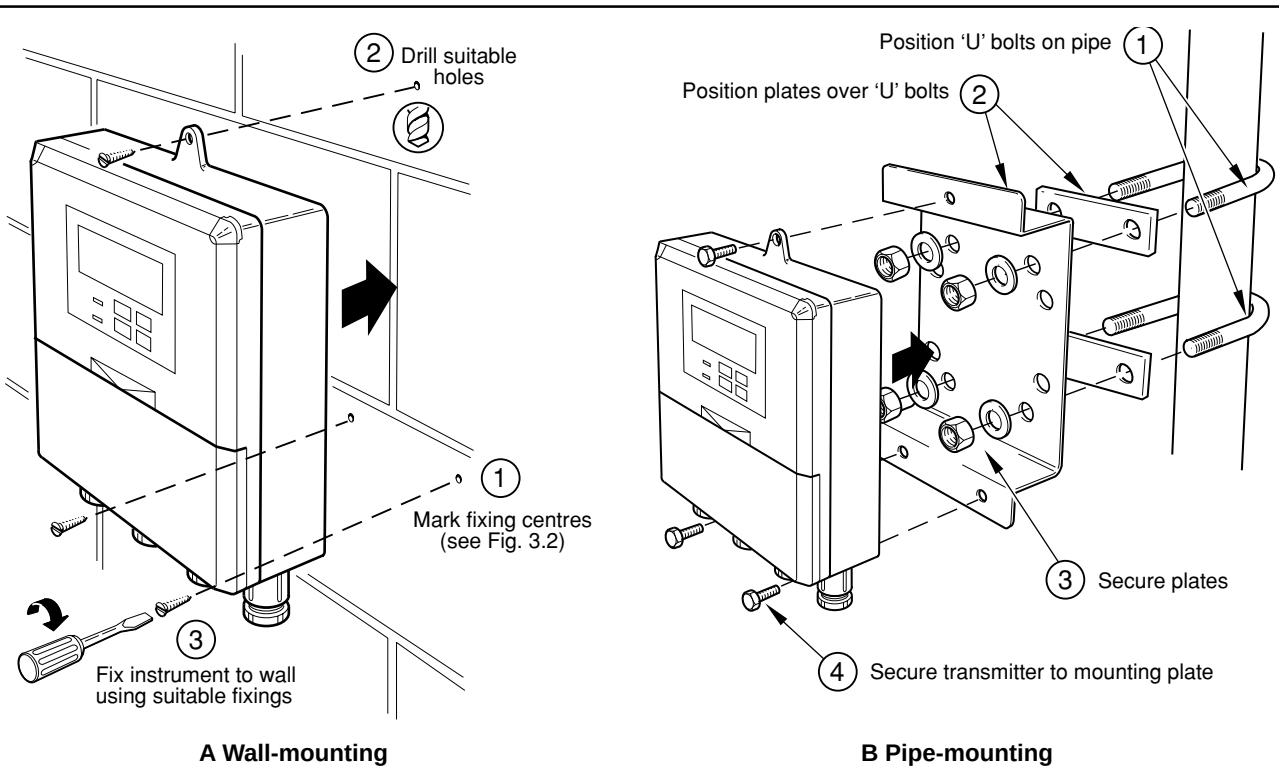


Fig. 3.2 Overall Dimensions



A Wall-mounting **B Pipe-mounting**

Fig. 3.3 Wall-/Pipe-mounting

…3.2 Mounting

3.2.2 Panel-mounted Instruments – Figs. 3.4 and 3.5

Dimensions in inches (mm)

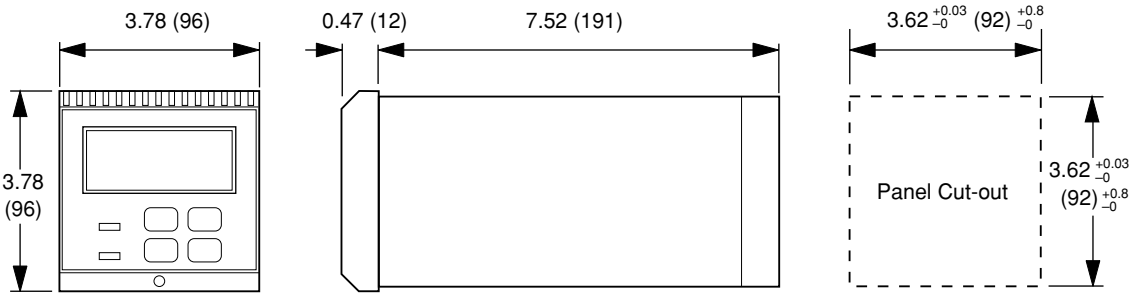


Fig. 3.4 Overall Dimensions

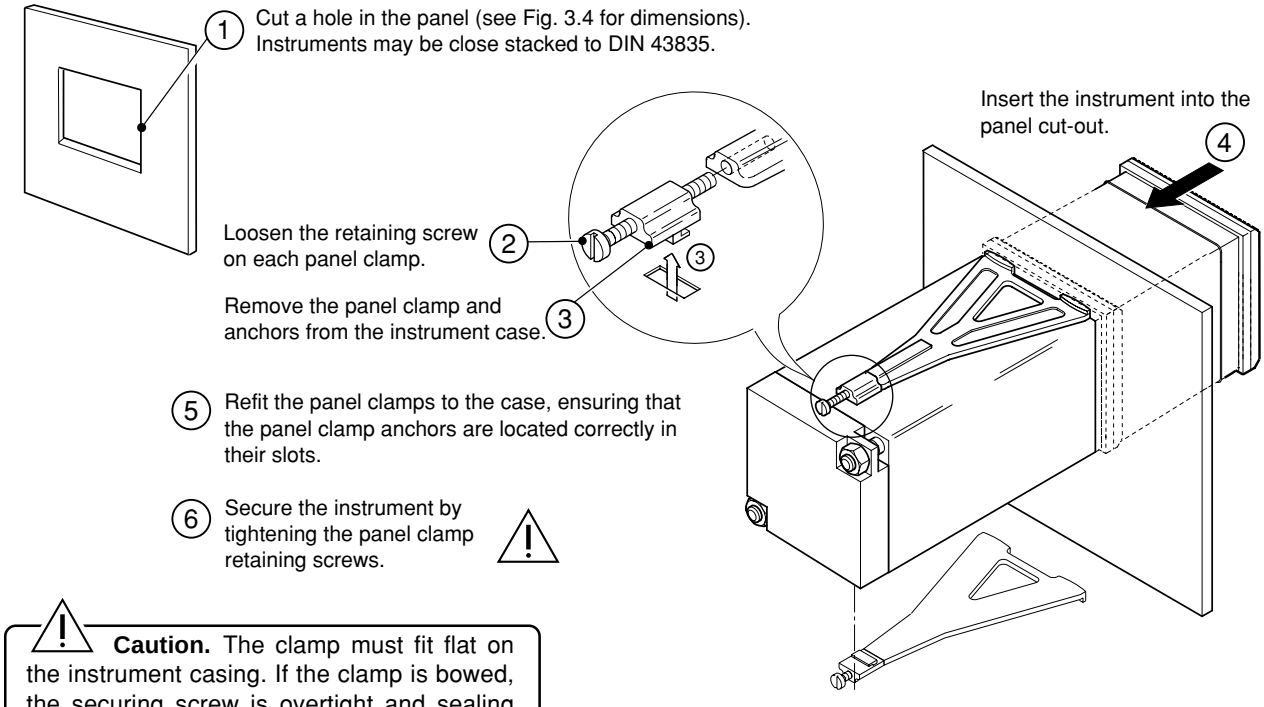


Fig. 3.5 Panel-mounting

4 ELECTRICAL CONNECTIONS

Warning.

- **Mains power –** before making any connections, ensure that the power supply, any high voltage-operated control circuits and high common mode voltages are switched off.

4.1 Connections – General

Information.

- **Earthing (grounding) –** stud terminal(s) is fitted to the transmitter case for bus-bar earth (ground) connection – see Fig. 4.2 or 4.5.
- **Cable routing** – always route signal output cable leads and mains-carrying/relay cables separately, ideally in earthed metal conduit. Twist the signal output leads together or use screened cable with the screen connected to the case earth stud.

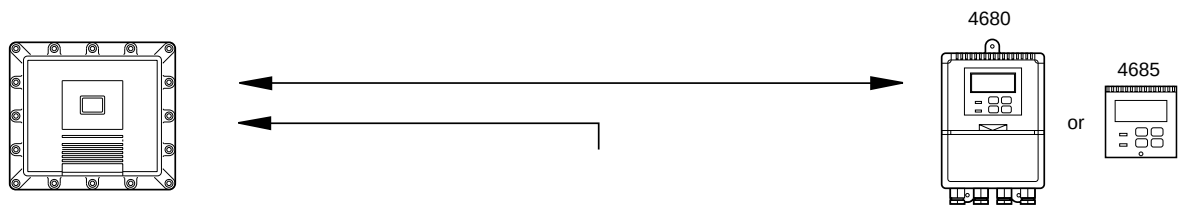
  Ensure that the cables enter the transmitter through the glands nearest the appropriate screw terminals and are short and direct. Do not tuck excess cable into the terminal compartment.
- **Relays** –the relay contacts are voltage-free and must be appropriately connected in series with the power supply and the alarm/control device which they are to actuate. Ensure that the contact rating is not exceeded. Refer also to Section 4.1.2 for relay contact protection details when the relays are to be used for switching loads.
- **Retransmission output** – Do not exceed the maximum load specification for the selected current retransmission range (see the associated Specification sheet).

  Since the retransmission output is isolated the –ve terminal **must** be connected to earth (ground) if connecting to the isolated input of another device.

4.1.1 Cable and Gland Specifications

Caution.

- **Cabling –** connections between the Transmitter and the Interface Electronics Unit must be in accordance with BS5345 pt3 – Installation and Maintenance Requirements for Electrical Apparatus with type 'd' Protection Flameproof Enclosure.
- **Glands –** EEx d glands used on the Interface Electronics Unit must be of the EEx d 'Barrier Gland' type with BASEEFA certification because the enclosure is over 2 liters volume, has a source of ignition within and is designed for use in Zone 1 areas (reference BS5345 part 3).



Gland Specification – Interface	Cable Specification (EEx d Signals)	Gland Specification – Transmitter
M20 BASEEFA Certified barrier gland 'd' (flameproof)	Retransmission (mA) Output Signals (Oxygen and Temperature): 16/0.2, 4-core 2TP copper, overall screen, flameproof. (Not supplied) NB: max loop resistance 750	4680: M20 Uncertified (fitted) 4685: No gland required
M20 BASEEFA Certified barrier gland 'd' (flameproof)	Mains Power Supply: 3-core, 0.5mm copper (min.) (Not supplied)	4680: M20 Uncertified (fitted) 4685: No gland required

Table 4.1 Cable and Gland Specifications (electrical requirements only)

Information.

- The M20 glands ready-fitted to wall-mounted instruments accept cable of between 4 and 7mm diameter.
- A spare set of grommets is supplied for cable sizes between 8 and 12mm diameter.

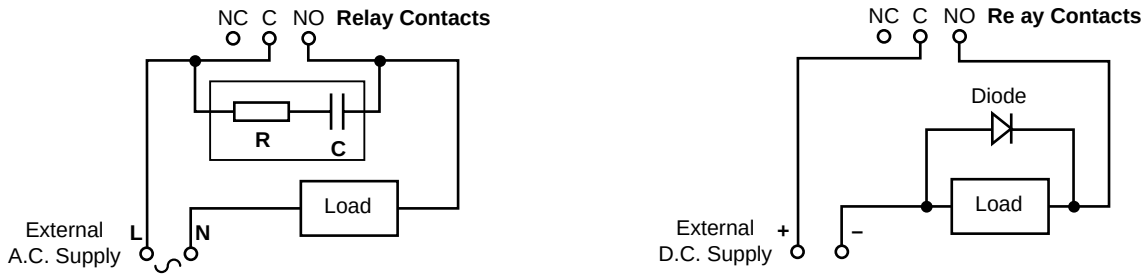
4.1.2 Relay Contact Protection and Interference Suppression – Fig. 4.1

If the relays are used to switch loads on and off, the relay contacts can become eroded due to arcing. Arcing also generates radio frequency interference (RFI) which can result in instrument malfunctions and incorrect readings. To minimize the effects of RFI, arc suppression components are required; resistor/capacitor networks for a.c. applications or diodes for d.c. applications. These components can be connected either across the load or directly across the relay contacts. On 4600 Series instruments the RFI components must be fitted to the relay terminal block along with the supply and load wires – see Fig 4.1

For **a.c. applications** the value of the resistor/capacitor network depends on the load current and inductance that is switched. Initially, fit a 100R/0.022µF RC suppressor unit (part no. B9303) as shown in Fig. 4.1A. If the instrument malfunctions (incorrect readings) or resets (display shows 88888) the value of the RC network is too low for suppression an alternative value must be used. If the correct value cannot be obtained, contact the manufacturer of the switched device for details on the RC unit required.

For **d.c. applications** fit a diode as shown in Fig. 4.1B. For general applications use a 1N5406 type (600V peak inverse voltage at 3A – part no. B7363)

✶ **Note.** For reliable switching the minimum voltage must be greater than 12V and the minimum current greater than 100mA.



A – A.C. Applications **B – D.C. Applications**

Fig. 4.1 Relay Contact Protection

4.2 Wall-mounted Instrument Connections – Figs. 4.2 and 4.3

Caution. Slacken terminal screws fully before making connections.

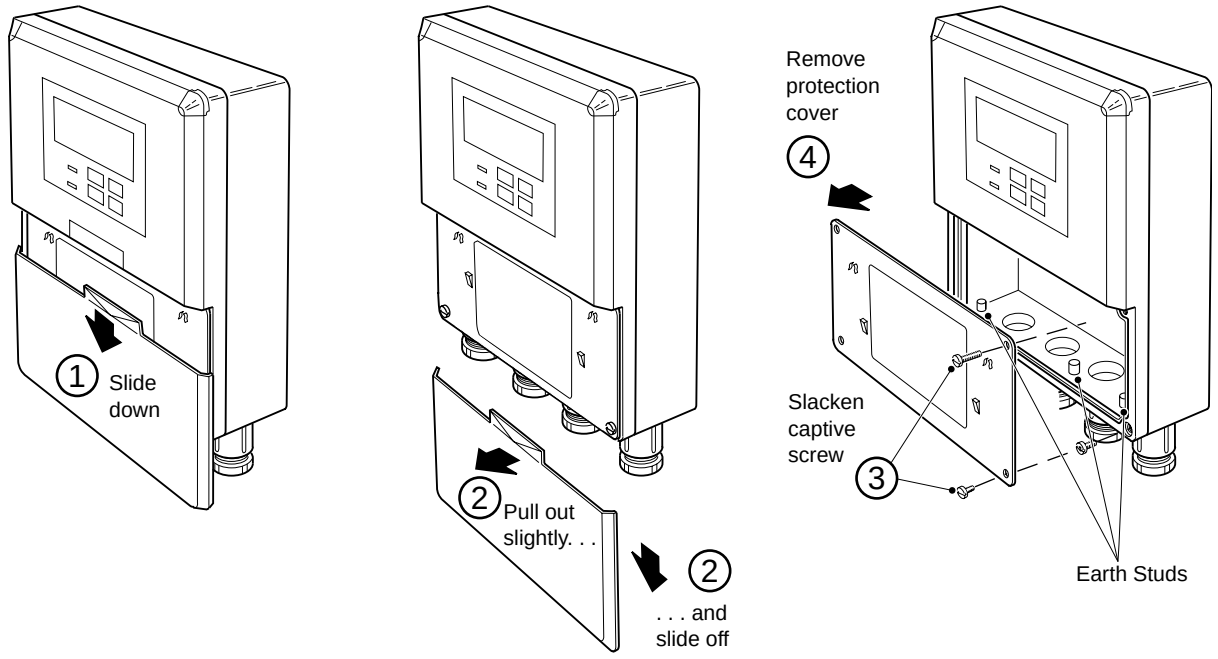


Fig. 4.2 Access to Terminals – Wall-mounted Instruments

…4.2 Wall-mounted Instrument Connections– Figs. 4.2 and 4.3

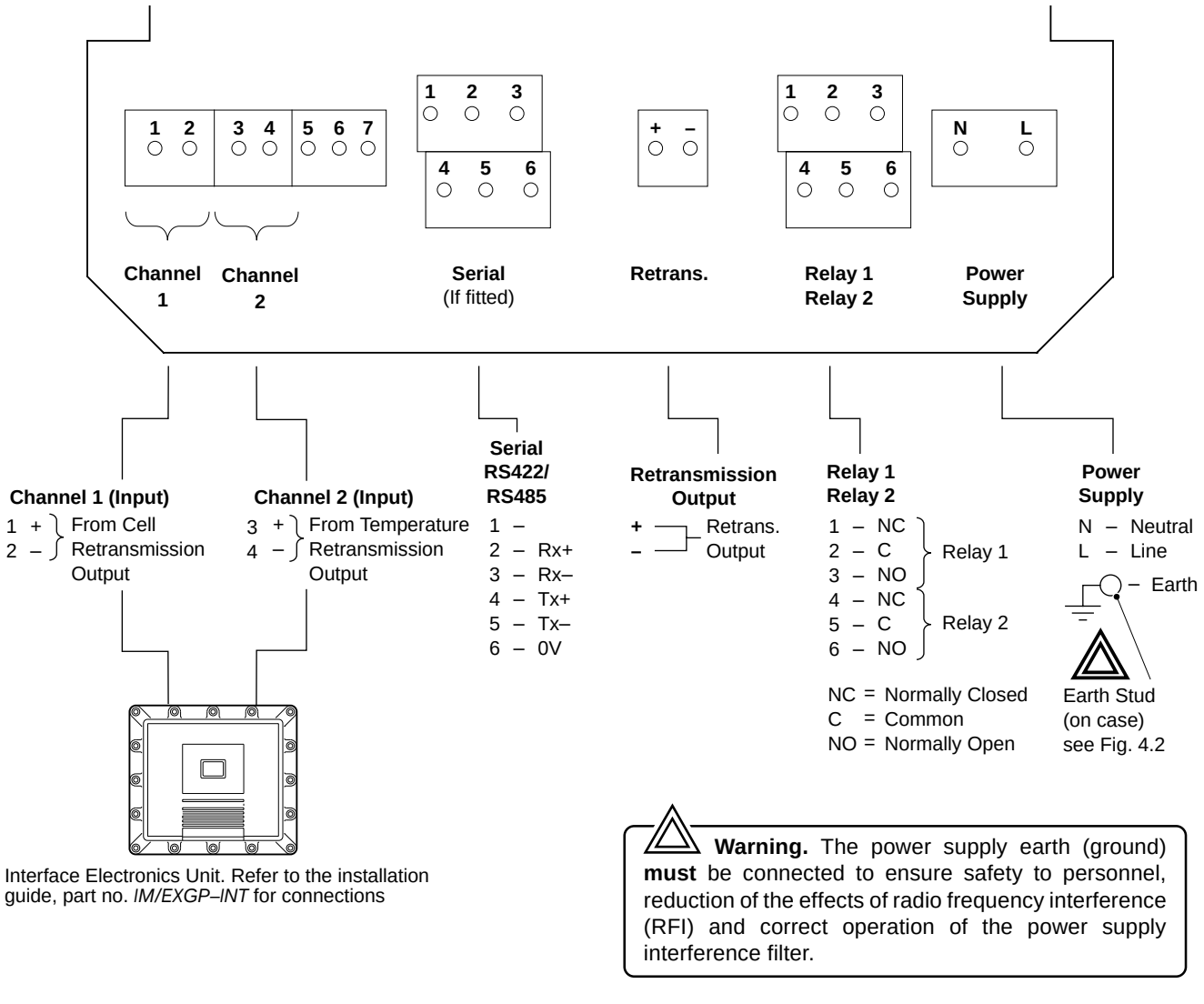


Fig. 4.3 Wall-mounted Instrument Connections

4.3 Panel-mounted Instrument Connections – Figs. 4.4 and 4.5

Caution. Slacken terminal screws fully before making connections.

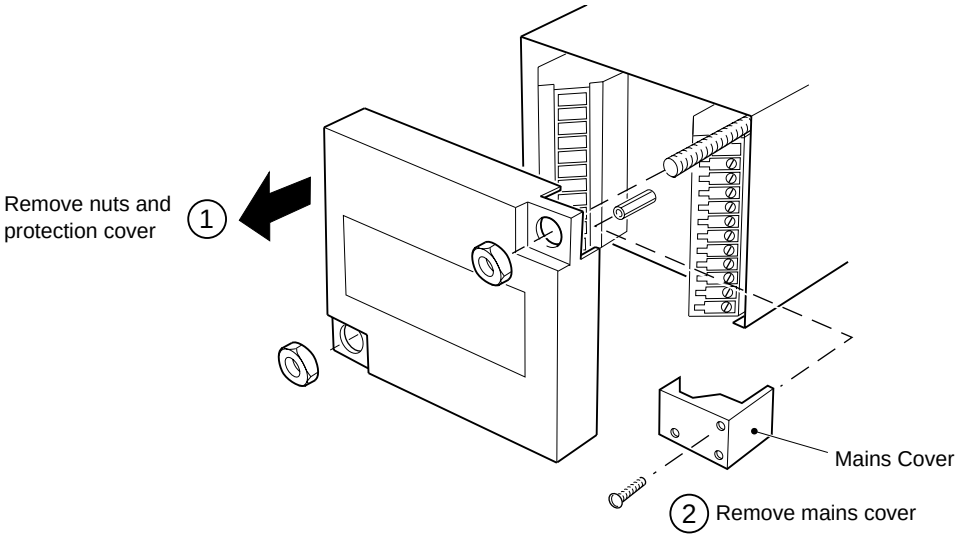
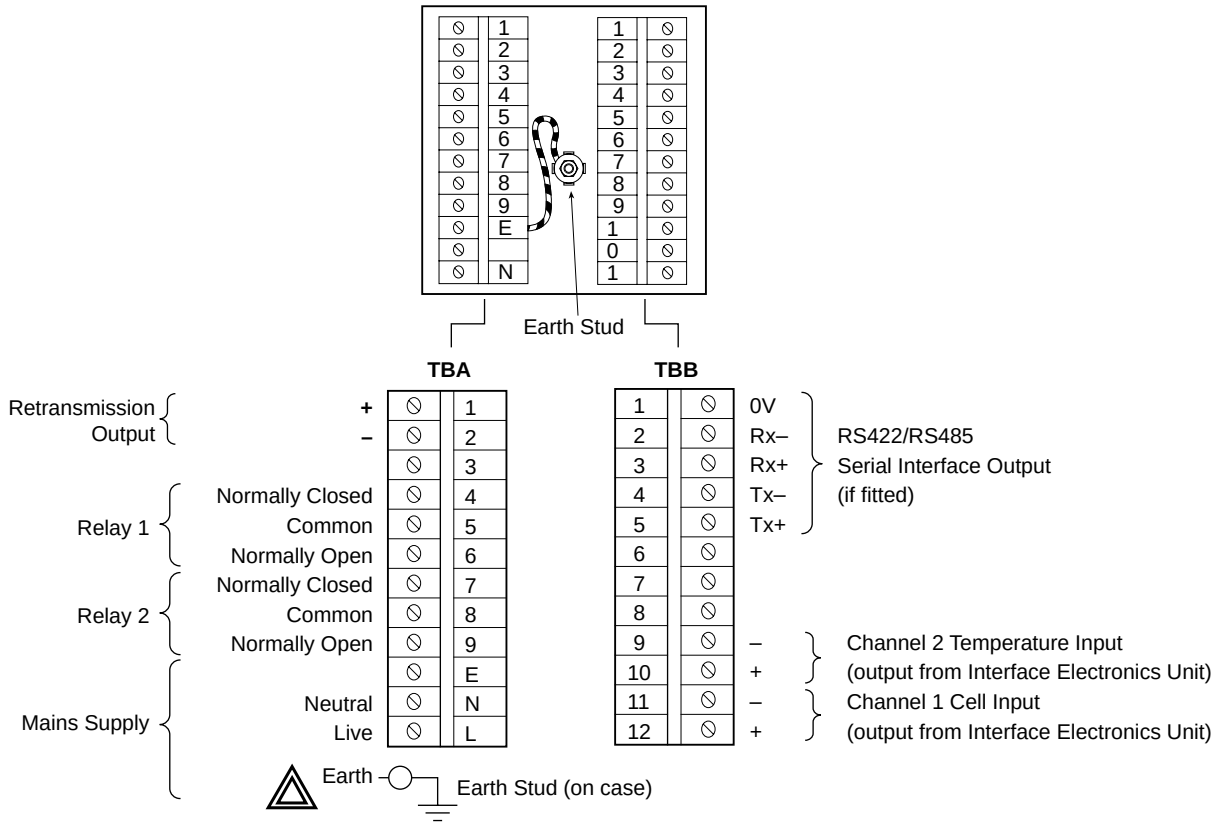


Fig. 4.4 Access to Terminals – Panel-mounted Instruments

…4.3 Panel-mounted Instrument Connections – Figs. 4.4 and 4.5



Warning. The power supply earth (ground) **must** be connected to ensure safety to personnel, reduction of the effects of radio frequency interference (RFI) and correct operation of the power supply interference filter. Connect the earth lead directly to the case earth stud and **not** to the 'E' terminal.

Fig. 4.5 Panel-mounted Instrument Connections

4.4 Selecting the Mains Voltage

4.4.1 Wall-/Pipe-mounted Instruments – Fig. 4.6

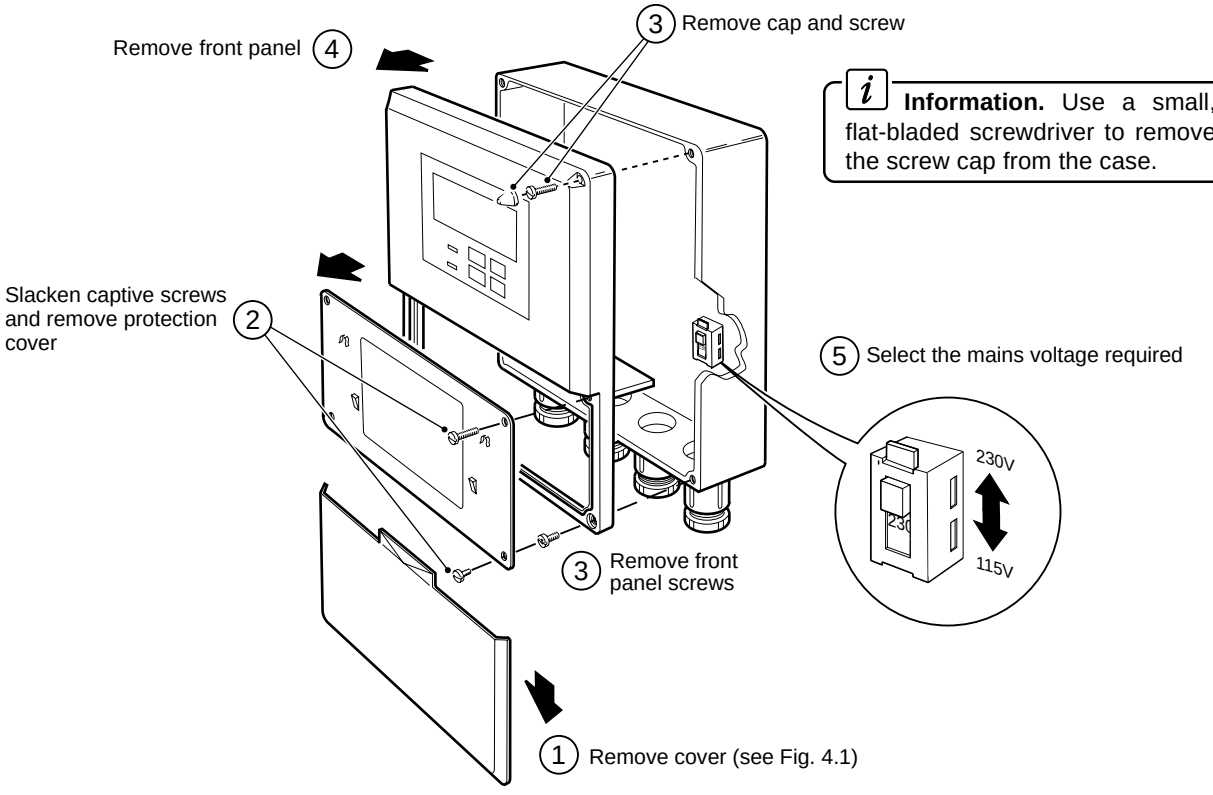


Fig. 4.6 Selecting the Mains Voltage – Wall-/Pipe-mounted Instruments

4.4.2 Panel-mounted Instruments – Fig. 4.7

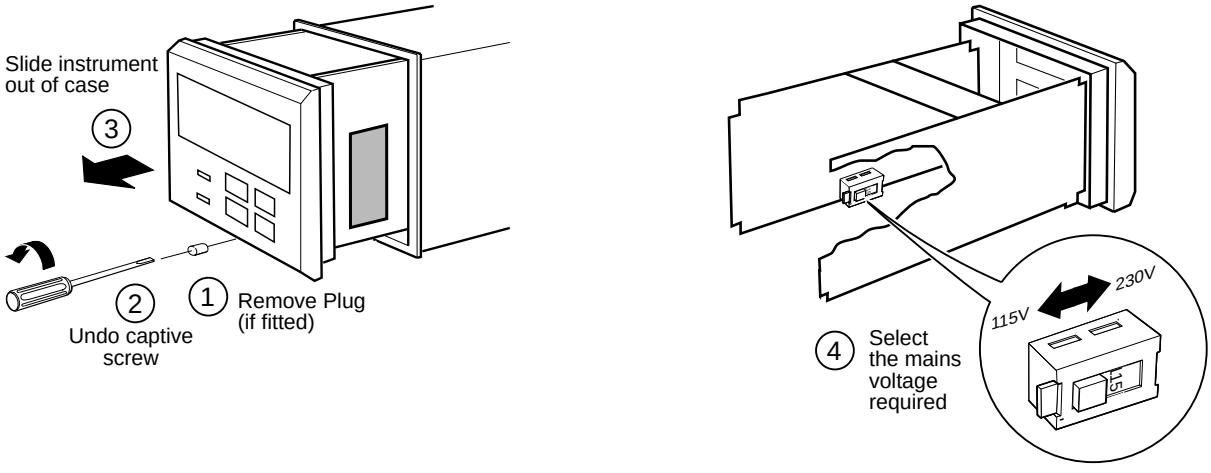


Fig. 4.7 Selecting the Mains Voltage – Panel-mounted Instruments

5 CONTROLS AND DISPLAYS

5.1 Displays – Fig. 5.1

The display comprises a 5-digit, 7-segment digital upper display line and a 16-character dot-matrix lower display line. The upper display line shows actual values of % oxygen, temperature, alarm set points or programmable parameters. The lower display line shows the associated units or programming information.

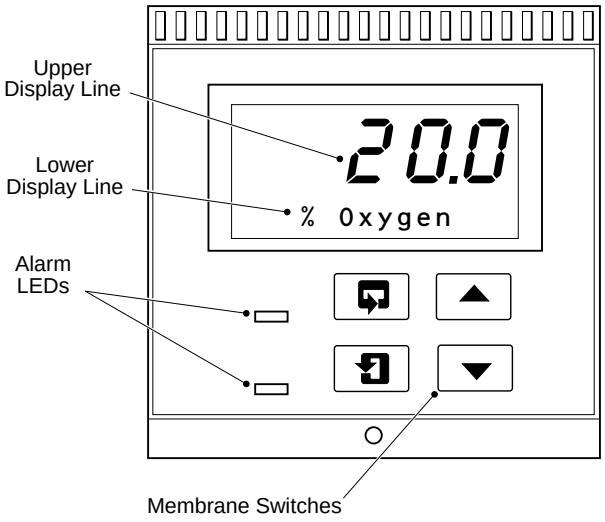
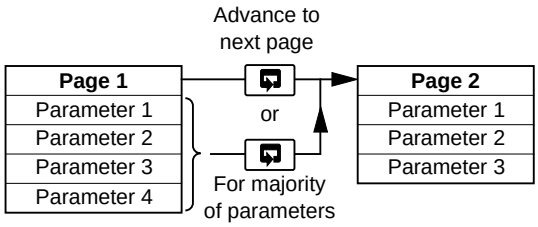
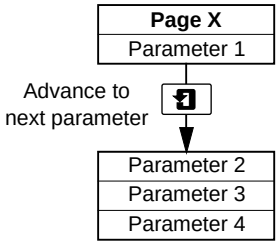


Fig. 5.1 Location of Controls and Displays

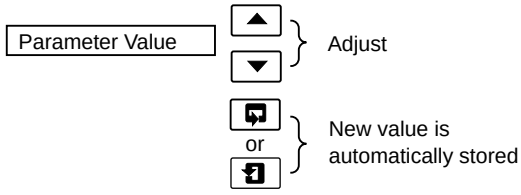
5.2 Switch Functions – Fig. 5.2



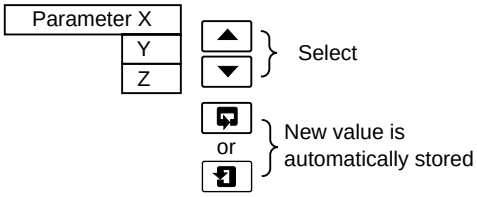
A – Advancing to Next Page



B – Moving Between Parameters



C – Adjusting and Storing a Parameter Value



D – Selecting and Storing a Parameter Choice

Fig. 5.2 Membrane Switch Functions

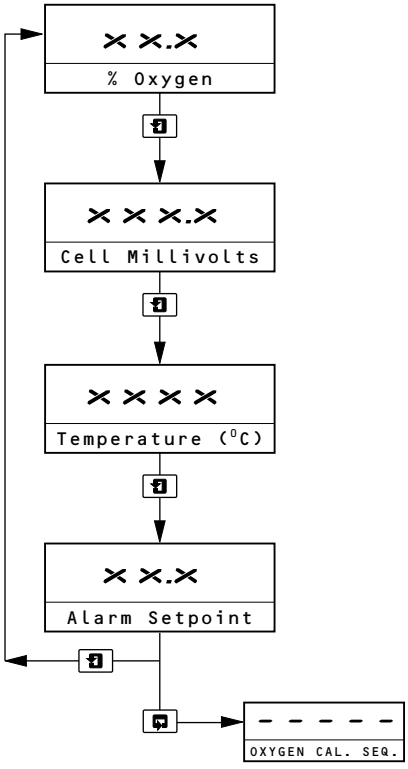
6 OPERATION

6.1 Instrument Start-up

Ensure all electrical connections have been made correctly and switch on.

6.2 Operating Page

The **Operating Page** is a general use page in which frames are viewed only and cannot be altered. To alter or program a frame refer to the programming pages in Section 7.



% Oxygen
The upper display indicates the measured oxygen value. If over or under temperature is monitored, the upper display shows '– – – – –' and an error message is displayed on the lower dot matrix display – see Table 6.1.

Cell Millivolts
The upper display indicates the measured cell millivolts**.**

Temperature (°C)
The upper display indicates the measured cell temperature.

Alarm Set Point
The upper display indicates the alarm set point, displayed as % oxygen. The set point value and the relay/l.e.d. action can be programmed in the **Set Up Outputs Page** – see Section 7.4.

Advance to **Oxygen Calibration Sequence Page**.

6.2.1 Operating Page Error Messages

When an error has been detected, the appropriate error message (see Table 6.1) will appear in the **Operating Page** instead of the % oxygen scroll.

Note. Relay 2 is assigned as a malfunction alarm and de-energizes when an error condition is present. Also the l.e.d. assigned to this relay is illuminated when in an error condition.

Error Message	Possible Cause
NV MEMORY ERROR	The contents of the non-volatile memory have not been read correctly during power up. To rectify the fault, switch off, wait 10 seconds and switch on again. If the fault persists contact the Company.
CELL UNDER TEMP.	The temperature at the probe sensor is not high enough to obtain suitable readings (<600°C).
CELL OVER TEMP.	The temperature at the probe sensor has exceeded the maximum permissible (>1400°C).
OUT OF LIMITS	The measured % oxygen value is outside the limits of the instrument. (The upper display flashes if outside the limits of 0.25% to 25%).

Table 6.1 Error Messages

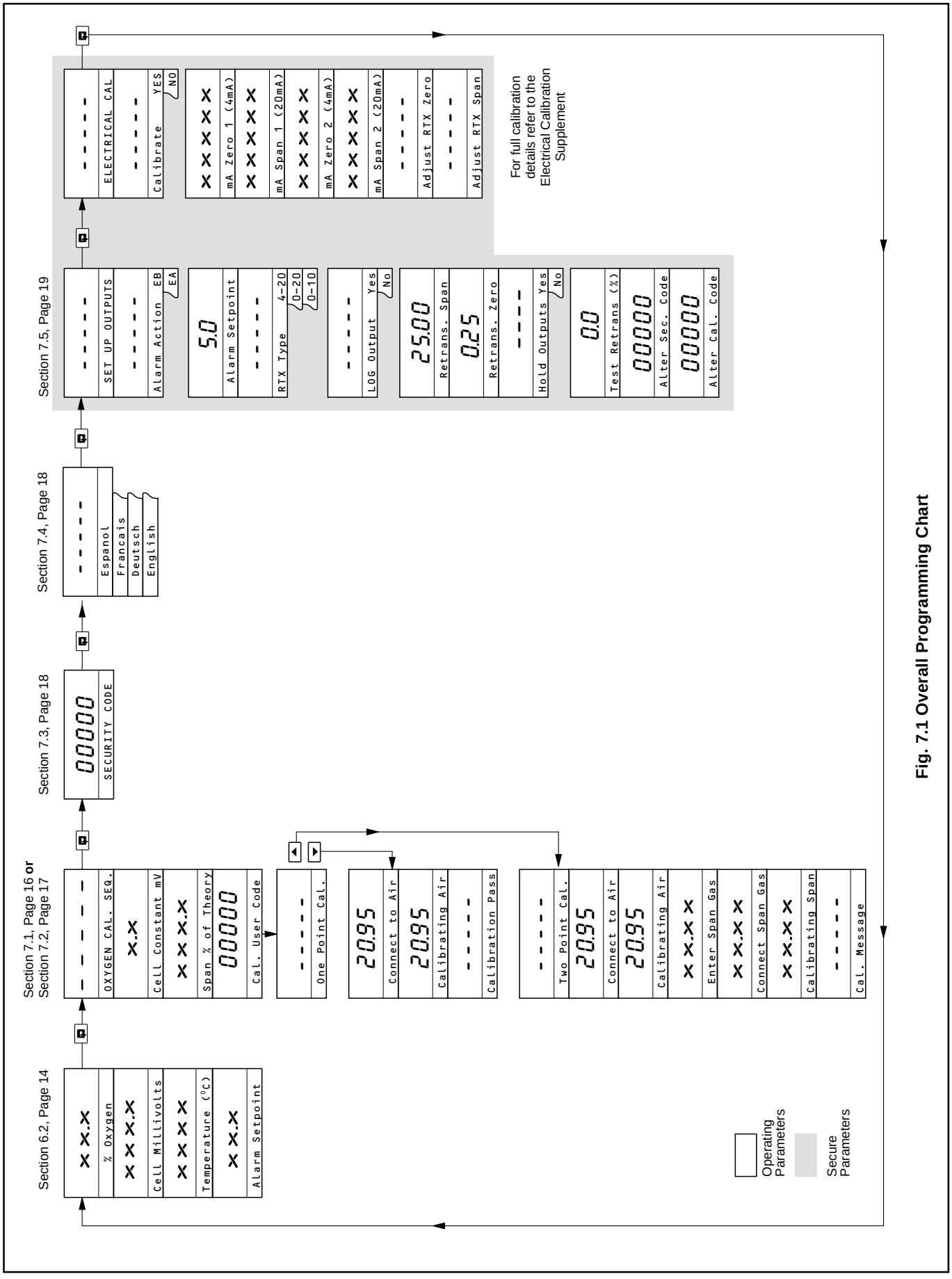
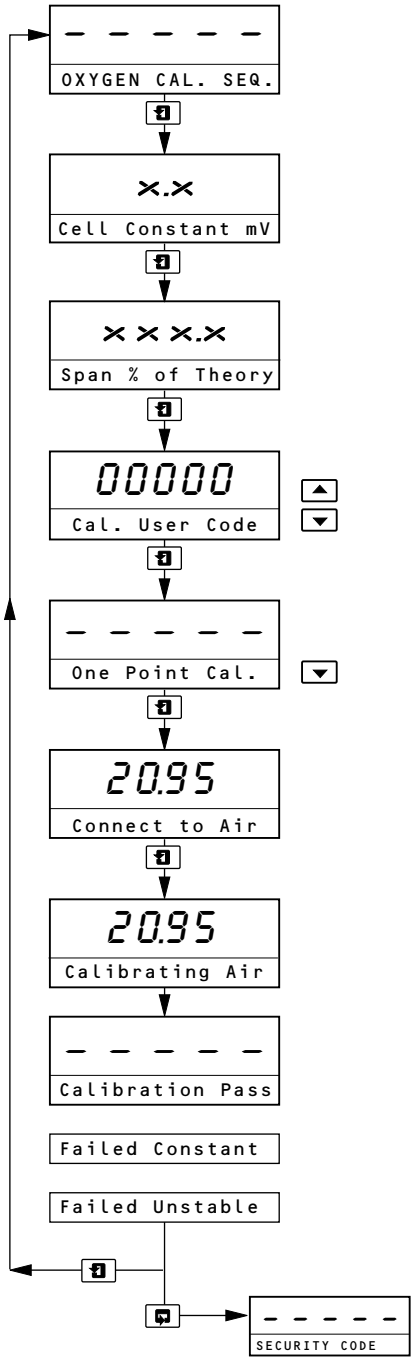


Fig. 7.1 Overall Programming Chart

7.1 System Calibration (Single Point)

A single-point oxygen calibration sequence involves standardizing the instrument and the oxygen probe, using air as the standard test gas. The existing slope remains unaffected.



Oxygen Calibration Sequence
Page header.

Cell Constant mV
The upper display shows the millivolt offset of the oxygen probe from the last successful calibration.

Span % of Theory
A value between 90 and 110% should be displayed. If the value is outside these limits then the oxygen probe must be checked.

Calibration User Code
Enter the required code number between 00000 and 19999, to gain access to the calibration page. If an incorrect value is entered, access to the calibration page is barred.

One Point Calibration
Select one-point calibration sequence.

Connect to Air
Connect the air supply to the probe (refer to *Probe Guide)*. The upper display indicates the test gas value in % oxygen.

Calibrating Air
The upper display indicates the measured % oxygen until a stable reading is detected and the display automatically advances to the next frame.

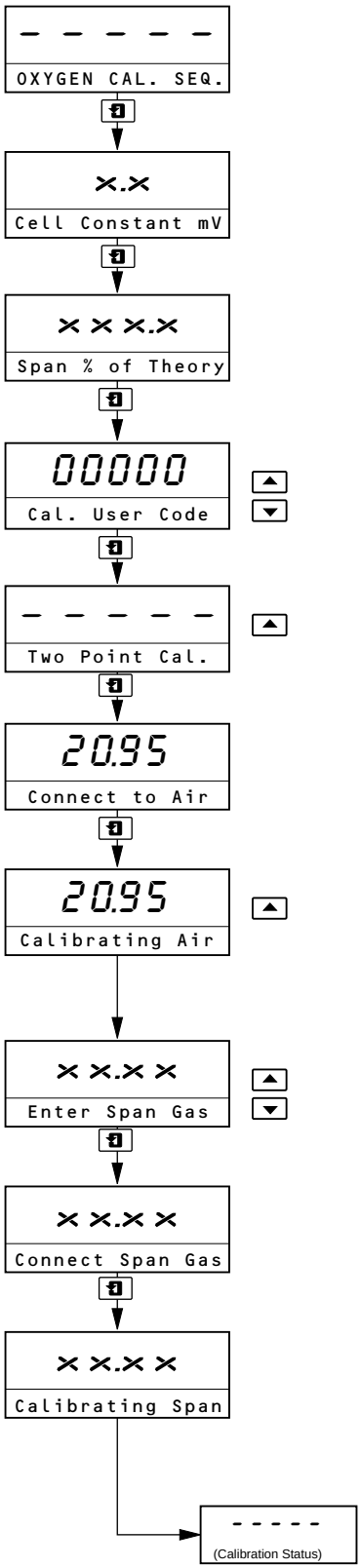
Calibration Pass/Fail
On completion a calibration status message is displayed:

`Calibration Pass`	–	calibration sequence successful
`Failed Constant`	–	cell offset >10mV (upper display shows cell constant)
`Failed Unstable`	–	cell output unstable.

Advance to **Access to Secure Parameters Page**.

7.2 System Calibration (Two Point)

A two-point oxygen calibration sequence involves standardizing the instrument and the oxygen probe, using air as the zero standard test gas and a known span test gas.



Oxygen Calibration Sequence
Page header.

Cell Constant mV
The upper display shows the millivolt offset of the oxygen probe from the last successful calibration.

Span % of Theory
A value between 90 and 110% should be displayed. If the value is outside these limits then the oxygen probe must be checked.

Calibration User Code
Enter the required code number between 00000 and 19999, to gain access to the calibration page. If an incorrect value is entered, the calibration page cannot be accessed.

Two Point Calibration
Select two-point calibration sequence.

Connect to Air
Connect the air supply to the probe (refer to the *Probe Guide)*. The upper display indicates the test gas value in % oxygen.

Calibrating Air
The upper display indicates the measured % oxygen until a stable reading is detected and the display advances automatically to the next frame.
To abort calibration, press either the ↵ or ↻ switch to advance to the next frame.

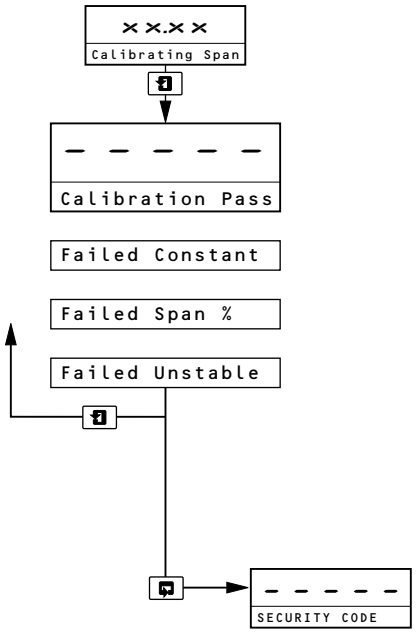
Enter Span Gas
Enter the value of the calibration span gas used (between 0.25 and 10.00% O_2).

Connect Span Gas
Connect the span gas to the probe (refer to *Probe Guide)*. The upper display indicates the test gas value in % oxygen.

Calibrating Span
The upper display indicates the measured % oxygen until a stable reading is detected and the display automatically advances to the next frame.
To abort calibration, press either the ↵ or ↻ switch to advance to the next frame.

Continued on next page…

…7.2 System Calibration (Two Point)



Calibration Pass/Fail
On completion, a calibration status message is displayed.

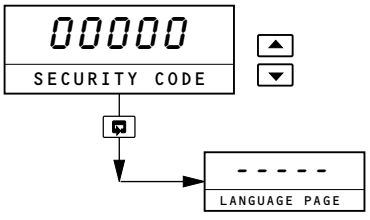
`Calibration Pass`	–	calibration sequence successful
`Failed Constant`	–	EXGP cell offset >10mV (upper display shows cell constant)
`Failed Span %`	–	EXGP cell output <90% or >110% of slope (upper display shows measured slope)
`Failed Unstable`	–	EXGP cell output unstable (drifting).

Note. If a calibration fail is indicated, it is recommended that the EXGP probe mV outputs are checked against the test gases direct, to determine which part of the system is at fault (refer to *Probe Guide*).

Advance to **Access to Secure Parameters Page**.

7.3 Access to Secure Parameters

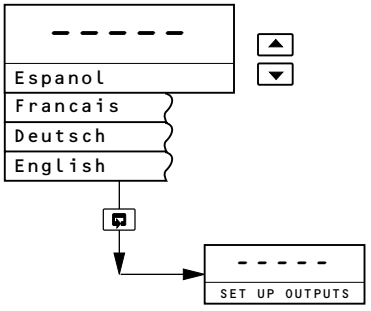
A 5-digit security code is used to prevent tampering with the secure parameters.



Enter the required code number between 00000 and 199999, to gain access to the secure parameters. If an incorrect value is entered, subsequent programming pages cannot be accessed.

Advance to **Language Page**.

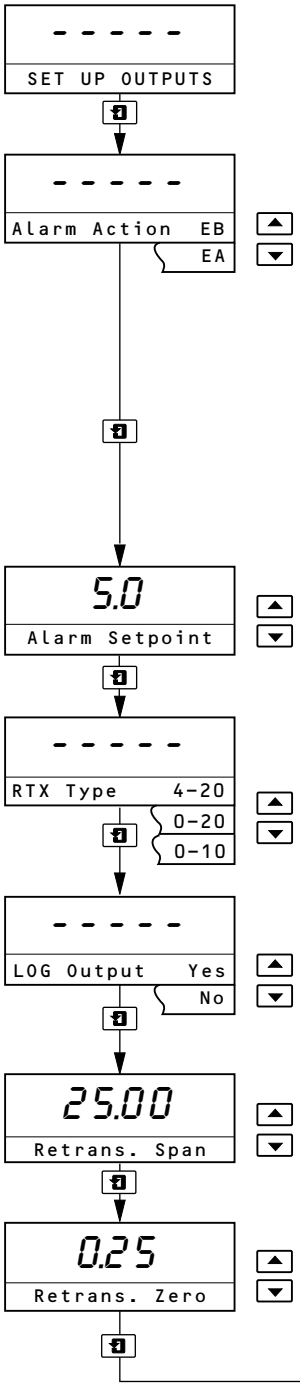
7.4 Language Page



Language Page
Select the language that all subsequent pages are to be displayed in.

Advance to **Set Up Outputs Page**.

7.5 Set Up Outputs Page



Set Up Outputs
Page header

Alarm Action
Set the required alarm action from the following table.

Alarm Action	LED Action for Input Above Set Point	LED Action for Input Below Set Point	Relay Action for Input Above Set Point	Relay Action for Input Below Set Point
EB	ON	OFF	De-energized	Energized
EA	OFF	ON	Energized	De-energized

The Set Point band is defined as the actual value of the Set Point plus or minus the hysteresis value. The hysteresis value is fixed at 0.1% oxygen. Alarm action occurs if the input value is above or below the Set Point band. If the input moves within the Set Point band the last alarm action is maintained.

Alarm Set Point
The alarm set point can be set to any value within the oxygen range of 0.3% to 25.0%.

Retransmission Type
The retransmission output is assigned to the oxygen range.
Select the retransmission output current range required (4 to 20mA, 0 to 20mA or 0 to 10mA).

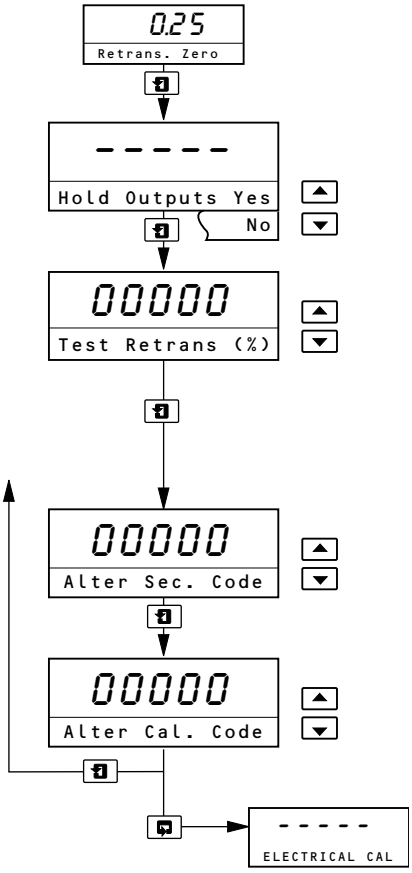
Logarithmic or Linear Output
The retransmission can be assigned to give a logarithmic or linear output.
Select YES for Logarithmic, NO for Linear.

Retransmission Span
Select the required retransmission span value, in % oxygen units, from 5.25% to 25.00%.

Retranmission Zero
Select the required retransmission zero value, in % oxygen units, from 0.25% to 20.00%.

Continued on next page…

…7.5 Set Up Outputs Page



Hold Outputs
The retransmission and alarm output can be held to prevent inadvertent operation during a test gas calibration sequence.

Test Retransmission
The instrument automatically transmits a test signal of 0, 25, 50, 75 and 100% of the retransmission range selected above. The % test signal selected is shown on the upper display.

Example: for a selected range of 0 to 20mA and 50% retransmission test signal, 10mA is transmitted.

Alter Security Code
Set the security code to a value between 00000 and 199999.

Alter Calibration Code
Set the calibration code to a value between 00000 and 199999.

Advance to **Electrical Calibration Page**.

Note. Electrical calibration is carried out prior to despatch and should not be altered. However, if inaccurate or inconsistent readings are obtained, refer to the *Electrical Calibration Supplement* for full calibration procedures.

CUSTOMER SUPPORT

Service, Support and Maintenance

ABB Analytical's commitment to quality doesn't end when we deliver our equipment.

We also provide, at the client's request: start-up services, maintenance services, training services, reconditioning, repair and replacement parts services.

Training services are available for virtually every aspect of operating and maintaining ABB Analytical analyzers and systems. Training may be arranged on-site or at any of our training centres.

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For complete information and assistance with ABB Analytical analyzers, systems and services, contact any of our facilities for details of your nearest Service and Repair Centre.

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