ZDT Oxygen Analyzer System

Installation and Operating Guide

High Temperature Version, for use with ZGP2 Probes

ABB Process Analytics
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.
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</tr>
</tbody>
</table>
The ZDT Oxygen Analyzer is designed for continuous monitoring of oxygen content in applications using ‘in situ’ ZGP2 probes.

Operation and programming of the ZDT Analyzer is via four tactile membrane switches and a digital display located on the front of the instrument. Two l.e.d.’s on the front panel provide local alarm indication.

In operation, the instrument can display measured % oxygen, cell mV, or cell temperature. Set up of alarm, retransmission and calibration parameters is achieved in programming mode, where key parameters are protected by a five-digit security code.

Measured %O₂ values can be retransmitted to remote equipment using the retransmission output facility. The range of values retransmitted can be set anywhere within the instrument's display range of 0 to 25% O₂, subject to limits detailed in Section 7.7.

Remote alarm indication is provided by two relay outputs. Relays are programmed to activate when the oxygen level moves either above or below a pre-defined set point. The second alarm relay can also be used as a ‘general alarm’ which activates in the event of an instrument or system fault.

An optional external reference air unit is used to provide reference air supply for the ZGP2 probe. If this unit is not specified, reference air must be supplied to the probe from an alternative source.

For full installation and operation details of the ZGP2 probe refer to the operating manual, IM/ZGP2.

![Fig. 1.1 Schematic Diagram]
2.1 Checking the Instrument Type – Fig. 2.1

**Caution.**
Both front panels are held in position by the front panel screws only and are not otherwise captive.
When removing the panels, ensure they are adequately supported.

1. Release the lower panel and remove from the front of the instrument.
2. Check the instrument code number against Table 2.1.

![Fig. 2.1 Checking the Code Number](image)

### Table 2.1 Instrument Identification

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZDT Oxygen Analyzer</td>
<td>ZDT/</td>
</tr>
<tr>
<td>Probe Type</td>
<td>ZGP2</td>
</tr>
<tr>
<td>Thermocouple Type</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Type K</td>
</tr>
<tr>
<td></td>
<td>Type R</td>
</tr>
<tr>
<td></td>
<td>Type S</td>
</tr>
<tr>
<td>Reference Air Supply</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>External Output</td>
</tr>
<tr>
<td>Mains Voltage</td>
<td>230V 50/60Hz</td>
</tr>
<tr>
<td></td>
<td>110V 50/60Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe Type</td>
<td>ZGP2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermocouple Type</td>
<td>None</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type K</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type R</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type S</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Air Supply</td>
<td>None</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External Output</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mains Voltage</td>
<td>230V 50/60Hz</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>110V 50/60Hz</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 MECHANICAL INSTALLATION

3.1 Siting Requirements – Fig. 3.1
The instrument is designed for wall mounting and weighs approximately 9kg (20lb).

- **A – Close to Oxygen Probe**
- **B – At Eye Level**
- **C – Avoiding Vibration**
- **D – Avoid Harmful Vapours and Dripping Fluids**
- **E – Within Temperature Limits**
- **F – Within Environmental Limits**

**Caution.** Permanent damage may occur if contaminated liquid or vapour is allowed to reach the probe.

**Note.** The retransmission output operates to specification within the range –20°C to +70°C.

**IP66 (NEMA 4x)**

Fig. 3.1 Siting Requirements
3.2 Overall Dimensions – Fig 3.2

Fig. 3.2 Overall Dimensions

3.3 Mounting – Fig. 3.3

1. Mark-out the fixing centers of the four mounting holes – see Fig. 3.2.
2. Drill suitable holes for the type of fixings to be used.
3. Fix the instrument securely to the wall.

Fig. 3.3 Mounting Details
4 CONNECTIONS

⚠️ Warning.

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

4.1 Cable, Tubing and Gland Specifications

🔍 Information.

- Five 22mm diameter cable entries are provided in the base of the terminal chamber. The cable entries accept M20 glands (not supplied).
- External reference air connections are made via ¼ in. compression fittings.

<table>
<thead>
<tr>
<th>Cable/Tubing Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell output cable</td>
<td>16/0.2mm laid up red and blue twin copper braid with overall p.v.c. sheath</td>
</tr>
<tr>
<td>Thermocouple cable</td>
<td>See Table 4.2</td>
</tr>
<tr>
<td>Air Tubing (Reference Air)</td>
<td>¼ in. o.d. x ¼ in. i.d. stainless steel, nylon or p.v.c. tube</td>
</tr>
</tbody>
</table>

Table 4.1 Cable References and Air Tubing Specification

<table>
<thead>
<tr>
<th>Type of Thermocouple</th>
<th>British BS1843; 1952</th>
<th>German DIN 43714</th>
<th>American ANSI IMC96.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ni-Cr/Ni-Al (Type K)</td>
<td>+</td>
<td>–</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Brown</td>
<td>Blue</td>
<td>Red</td>
</tr>
<tr>
<td>Pt/Pt-Rh (Types R and S)</td>
<td>White</td>
<td>Blue</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 Cable Colours

4.2 Electrical Connections

4.2.1 General

🔍 Information.

- **Earthing (grounding)** – a stud terminal is fitted to the case bus-bar earth (ground) connection – see Fig. 4.1
- **Cable routing** – always route signal output cables 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.

Use only the cables and air tubing specified in Table 4.1.

Fit suitable cable glands into the entries to be used and blank-off any unused entries using the bungs supplied.

Ensure that the cables enter the instrument 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 connected in series with a power supply and the alarm/control device which they are to actuate. Ensure that the contact rating is not exceeded.

Refer also to Section 4.2.4 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, SS/ZDT/GP).

The retransmission output is isolated. Therefore the –ve terminal must be connected to earth (ground) if connecting to the isolated input of another device.
4.2.2 Access to Terminals – Fig. 4.1

Caution.
Both front panels are held in position by the front panel screws only and are not otherwise captive.
When removing the panels, ensure they are adequately supported.

1. Unlock and remove the lower panel from the front of the instrument – see Fig. 3.1
2. Undo the two retaining screws and remove the terminal shroud.

Fig. 4.1 Access to Terminals

4.2.3 Connections – Fig. 4.2

1. Mains:
   - Live to 'L'
   - Neutral to 'N'
   - Earth to 'E'

2. Retransmission Output (4 to 20mA):
   - Positive to 'RTX +'
   - Negative to 'RTX –'

3. Relay outputs 1 and 2
   - 'N/C' – normally closed
   - 'C' – common
   - 'N/O' – normally open

4. Secure the probe conduit fitting in the appropriate gland and make the following connections:
   - Cell output – red to 'CELL +'
     blue to 'CELL –'
     screen to 'CELL SCR'
   - Thermocouple – see Table 4.2

Note. Cable core colour is dependent on cable type – see Table 4.2
4.2.4 Relay Contact Protection and Interference Suppression – Fig. 4.3

To reduce the risk of instrument malfunction or incorrect readings when switching inductive loads, suppression components must be fitted across the relay contacts.

For a.c. applications, fit a 100R/0.022μF RC suppressor unit (part no. B9303) as shown in Fig. 4.3A. If the instrument malfunctions (incorrect readings) or resets (display shows '88888') when the relays operate, a larger RC network is required. Contact the manufacturer of the switched device for details of the RC unit required.

For d.c. applications fit a diode, – see Fig. 4.3B. 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.

4.3 Selecting the Mains Input Voltage – Fig. 4.4

Input voltages (230V or 110V) for the main analyzer p.c.b. and the probe heater supply p.c.b. are selected by two switches located on their respective p.c.b.’s.

Fig. 4.3 Relay Contact Protection

Fig. 4.4 Selecting the Mains Input Voltage
4.4 Replacing the Fuses – Fig 4.5
The instrument is protected by two fuses located on the probe heater supply p.c.b. In order to replace the fuses, the main analyzer p.c.b. must be removed for access as shown.

1. Unlock and carefully remove the upper enclosure cover.
2. Disconnect the front panel ribbon cable at the main p.c.b. end.
3. Locate and replace the fuses as required.
4. Fuse 1 – Probe Heater Supply
5. Fuse 2 – Mains Supply
6. Note.
   - Fuse Part No: B10144
   - Rating: 2.5A
   - Size: 20mm
   - Type: Anti-surge
7. Relocate the main p.c.b. and secure with the screws.
8. Offer the cover up to the enclosure and reconnect the ribbon cable.
9. Refit the upper enclosure cover and lock securely.

Fig. 4.5 Replacing the Fuses
...4 CONNECTIONS

4.5 Reference Air Supply – Fig. 4.6

<table>
<thead>
<tr>
<th>ZDT Analyzer Code Number</th>
<th>Reference Air Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZDT/110X</td>
<td>Reference air to the probe must be provided from a separate source – refer to the installation and operating instructions supplied with the probe.</td>
</tr>
<tr>
<td>ZDT/111X</td>
<td>For use with any ZGP2 probe.</td>
</tr>
</tbody>
</table>

**Table 4.3 Analyzer and Probe Compatibility**

[Information] The location of the Analyzer code number is shown in Fig. 2.1. Refer to the probe’s operating instructions, IM/ZGP2, for information on locating the code number of the probe.

![Fig. 4.6 External Reference Air Connections]

**Note.** Permanent damage may occur if contaminated air surrounding the instrument is allowed to reach the probe head. If necessary, to prevent contaminated air or water being pumped via the analyzer to the probe head, connect a length of suitable piping to the reference air inlet gland and route to an uncontaminated environment.
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. In operation, the upper display line shows actual values of % oxygen, temperature, cell millivolts or alarm set points. In programming mode it is used to display, programmable parameters. The lower display line shows the associated units and/or other programming information.

Fig. 5.1 Location of Displays and Controls

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 Switches
6  OPERATION

6.1 Instrument Start-up
Ensure all electrical connections have been made correctly and apply power to the instrument.

6.2 Operating Page
The operating page is a general use page in which continuously updated measured values and preset parameters can be viewed but not altered. To adjust or set a parameter 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 Section 6.3. The lower display indicates the measured cell temperature in °C.

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

Cell Millivolts
The upper display indicates the measured cell millivolts.

Alarm 1 Set Point
The upper display indicates the alarm 1 set point, displayed as % oxygen. The set point value and the relay/l.e.d. action is programmed in the Set Up Outputs Page – see Section 7.7.

Alarm 2 Set Point
Note. This frame is not displayed if the Alarm 2 Action parameter has been set to General Alarm – see Section 7.7.

The upper display indicates the Alarm 2 set point, displayed as % oxygen.

Press [ ] to return to the top of the Operating Page.
Press [ ] to advance to Oxygen Calibration Page.

Note. If Alarm 2 has been programmed as a general system/instrument alarm, the associated front panel l.e.d. is illuminated when the alarm is active and Relay 2 has de-energized.

6.3 Operating Page Error Messages
When an error has been detected, the following error messages appear in the Operating Page, in place of the % oxygen scroll.

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Possible Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>NV MEMORY ERROR</td>
<td>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.</td>
</tr>
<tr>
<td>CELL WARMING UP</td>
<td>The probe has not reached a sufficient temperature to obtain suitable readings (&lt;600°C).</td>
</tr>
<tr>
<td>CALIBRATION FAIL</td>
<td>The last single- or two-point calibration failed.</td>
</tr>
<tr>
<td>T/C OPEN CIRCUIT</td>
<td>The thermocouple connections are open circuit or the thermocouple temperature is greater than 1200°C/2192°F (type K thermocouple) or 1500°C/2732°F (type R &amp; S thermocouples).</td>
</tr>
</tbody>
</table>
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---

OXYGEN CAL. SEQ.

- Cell Constant mV: 100.0
- Span % of Theory: 0.0000
- Two Point Cal.: 

Section 7.1, Page 14

- Security Code: 
- Section A.3, Page 23
- English

Section 7.2, Page 15

- Connect to Air
- Connect to Air
- Calibrating Air
- Span Theory: NO
- Failed
- Failed Unstable

Section 7.3, Page 17

- Cal. User Code: One Point Cal.
- Adjust Cell Zero
- Failed
- Failed

Section 7.4, Page 18

- Security Code: 
- Section 7.6, Page 18
- Security Code: 
- Section 7.7, Page 20
- Security Code: 
- Section 7.5, Page 18

Section A.3, Page 23

- English
- Deutsch
- Français
- Español

Fig. 7.1 Overall Programming Chart
7.1 Single-point Calibration
Calibration sequence involves standardizing the analyzer and the oxygen probe, using air as the test gas. Until a calibration sequence has been completed successfully, the existing slope remains unaffected.

Oxygen Calibration Sequence

Cell Zero 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. The display indicates the oxygen probe output slope using parameters derived at the last successful two-point calibration or the preset values.

Calibration User Code
[0000 to 19999]
If an incorrect value is entered, access to the calibration page is inhibited and the display returns to the top of the oxygen calibration page.

One Point Calibration
Select one-point calibration sequence.

Connect to Air
Connect the air supply to the probe (refer to the probe's installation and operating instructions, IM/ZGP2). The upper display indicates the measured % oxygen.

Calibrating Air
The upper display indicates the measured % oxygen. When a stable reading is detected the display advances automatically to the next frame. To abort calibration, press either the [ ] or [ ] switch.

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 mV output)
- Failed Unstable: Cell output unstable (drifting).

Note. If the sensor calibration is unsuccessful then the Cell Zero mV and Span % of Theory parameters are unaffected. The instrument continues to operate using parameters stored during the last successful calibration.

Press [ ] to return to the top of the Oxygen Calibration Page.

Press [ ] to advance to the Secure Parameters Page.
7.2 Two-point Calibration

Oxygen Calibration Sequence

Cell Zero 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. The display indicates the oxygen probe output slope using parameters derived at the last successful two-point calibration or the preset values.

Calibration User Code
[00000 to 19999]
If an incorrect value is entered, access to the calibration page is inhibited and the display returns to the top of the oxygen calibration page.

Two Point Calibration
Select the two-point calibration sequence.

Connect to Air
Connect the air supply to the probe (refer to the installation and operating instructions supplied with the probe). The upper display indicates the test gas value in % oxygen.

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

Enter Span Gas
[between 0.10 and 10.00% O₂]
Set the oxygen content of the gas used to calibrate the span.

Connect Span Gas
Connect the span gas to the probe (refer to the probe's installation and operating instructions, IM/ZGP2). The upper display indicates the test gas value in % oxygen.

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

Continued on next page.
...7 PROGRAMMING

...7.2 Two-point Calibration
Continued from previous page

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 Span %**: Cell output <90% or >110% of slope
(upper display shows measured slope)

**Failed Unstable**: Cell output unstable (drifting).

⚠️ **Note.** If sensor calibration is unsuccessful then the Cell Zero mV and Span % of Theory parameters are unaffected. The instrument continues to operate using parameters stored during the last successful calibration.

Press [·] to return to the top of the Oxygen Calibration Page.

Press [·] to advance to the Secure Parameters Page.
7.3 Preset Calibration

**Oxygen Calibration Sequence**

**Cell Zero 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 inhibited.

**Preset Calibration**
Select the preset calibration sequence.

**Adjust Cell Zero**
[0 to ±10mV]
The upper display shows the cell output (in mV) corresponding to a reading of 20.95 %O₂. Adjust the reading to correspond with the probe.

**Span Theory**
Select YES if the Span % of Theory parameter is to be reset to 100%. Select NO to retain the existing value.

Press ☑️ to return to the top of the Oxygen Calibration Page.

Press ☑️ to advance to the Secure Parameters Page.
7.4 Access to Secure Parameters

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

**Security Code**

[00000 to 199999]

If an incorrect value is entered, access to programming pages is inhibited.

Press ![arrow] to advance to the Language Selection Page.

7.5 Language Selection Page

**Language Selection**

Select the language in which all text is subsequently displayed:

- English
- German
- French
- Spanish

Press ![arrow] to advance to the Set Up Thermocouple Page.
7.6 Set Up Thermocouple Page

**Set Up Thermocouple**
Page header

**Thermocouple Type**
Set the thermocouple type required: Type K, R, S or NONE. If thermocouple type is set to NONE, a preset temperature must be used – see below.

**Preset Temperature**
If a thermocouple is not used, set the process temperature.
[600 to 1400°C in 1°C steps]

*Note.* This frame is not displayed unless Thermocouple Type is set to NONE.

Press [ ] to return to the top of the Oxygen Calibration Page.

Press [ ] to advance to the Set Up Outputs Page.
7.7 Set Up Outputs Page

**Set Up Outputs**

Page header

### Alarm A1 Action

Set the required alarm action from the following table:

<table>
<thead>
<tr>
<th>Alarm Action</th>
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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% of set point. 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 1 Set Point

The alarm set point can be set to any value within the oxygen range. [0.00% to 25.00%]

### Alarm A2 Action

Set the required alarm action from the above table. If the alarm action is set to General Alarm, the relay is de-energized and the associated front panel l.e.d. is illuminated when one or more of the following conditions is true: thermocouple open circuit; cell warming up; calibration fail, cell stability check, power failure.

### Alarm A2 Set Point

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

**Note.** This frame is not displayed if the Alarm 2 Action parameter has been set to General Alarm.

### 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 the output required:

- YES  – Logarithmic
- NO   – Linear

Continued on next page.
...7.7 Set Up Outputs Page

Continued from previous page

- **Retransmission Zero**
  - Set the required retransmission zero value, in % oxygen units.
  - [0% to 20.00% (linear output)]
  - or
  - [0.01% to 0.25% (logarithmic output)].

- **Retransmission Span**
  - **Linear Output** – Set the required retransmission span value, in % oxygen units. [5% to 25.00%]
  - **Logarithmic Output** – The retransmission span is preset to two decades above the zero value and cannot be adjusted. For example, if the zero is set to 0.2%, the span is preset to 20.00%.

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

- **Test Retransmission**
  - The instrument 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:** When the Retransmission Current Range is set to 0–20 (mA) and the Test Retransmission signal is set to 50%, the retransmission output value is forced to 10mA.

- **Alter Security Code**
  - [00000 to 199999]
  - Set the security code used to gain access to secure parameters – see Section 7.4.

- **Alter Calibration Code**
  - [00000 and 199999]
  - Set the code used to gain access to the oxygen calibration facility – see Sections 7.1 to 7.3.

Press [ 返回 to return to the top of the Set Up Outputs Page.

Press [ 进入 to advance to the Electrical Calibration Page.
APPENDIX A – ELECTRICAL CALIBRATION

**Note.** Electrical calibration is carried out prior to despatch and further calibration should never be necessary. However, if inaccurate or inconsistent readings are obtained, follow the procedures detailed in this Section.

### A.1 Equipment Required

a) Millivolt source (cell input simulator), –20.0 to 180.0mV.

b) Millivolt source (temperature input simulator), 10.0 to 40.0mV.

c) Digital voltmeter (current output), 0 to 20mA.

d) Thermometer, to measure ambient temperature.

### A.2 Preparation

a) Switch off the mains supply. Disconnect the probe and retransmission output terminations from the instrument – see Fig. 4.2.

b) Connect the millivolt sources and the milliammeter to the appropriate terminals – see Fig. A.1.

c) With both front panel covers in place, switch on the mains supply to the instrument and allow ten minutes for the circuits to stabilize.

d) Select the **Electrical Calibration Page** and proceed as detailed in Section A.3, following.

---

**Fig. A.1 Electrical Connections – Calibration**
A.3 Electrical Calibration Page

In this section the actual values denoted by 'x x x x x' are unimportant and are used to determine display reading stability, when carrying out the electrical calibration procedure.

---

Electrical Calibration Page

(To access this page see Fig. 7.1)

---

Calibrate

Select YES to access the electrical calibration sequence. Select NO to advance to the Adjust RTX Zero parameter.

---

mV Zero 1

Set the Cell simulator millivolt source to –20mV and allow the display to stabilize.

---

mV Span 1

Set the Cell simulator millivolt source to 180mV and allow the display to stabilize.

---

mV Zero 2

Set the Temperature simulator millivolt source to 10mV and allow the display to stabilize.

---

mV Span 2

Set the Temperature simulator millivolt source to 40mV and allow the display to stabilize.

---

Adjust Cold Junction Value

Measure the ambient temperature and set the display to the measured value, in °C.

---

Adjust RTX Zero

Adjust the display until the milliammeter reads the minimum retransmission level, i.e. 4mA.

---

Adjust RTX Span

Adjust the display until the milliammeter reads the maximum retransmission level, i.e. 20mA.

---

Press  to return to the top of the Electrical Calibration Page.

Press  to advance to the Operating Page.
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