



# ABB

## The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

The UKAS Calibration Laboratory No. 0255 is just one of the ten flow calibration plants operated by the Company and is indicative of our dedication to quality and accuracy.

EN ISO 9001:2000



Cert. No. Q 05907

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A

Stonehouse, U.K.



0255

## Electrical Safety

This instrument complies with the requirements of CEI/IEC 61010-1:2001-2 "Safety requirements for electrical equipment for measurement, control, and laboratory use". If the instrument is used in a manner NOT specified by the Company, the protection provided by the instrument may be impaired.

## Symbols

One or more of the following symbols may appear on the instrument labelling:

	<b>Warning</b> – Refer to the manual for instructions		Direct current supply only
	<b>Caution</b> – Risk of electric shock		Alternating current supply only
	Protective earth (ground) terminal		Both direct and alternating current supply
	Earth (ground) terminal		The equipment is protected through double insulation

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

### 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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## 2C PREPARATION

### 2.1C Access to Commissioning Page and Calibration Parameters – Fig. 2.1C

The Commissioning Page and Calibration Parameters are enabled/disabled by a pair of rocker switches located inside the analyser. For access to the switches:

- 1 Unlock and open the door.
- 2 Identify the switches.
- 3 Set the positions of **both** switches as required.

**N.B.** Ensure that the switches are **disabled** after any commissioning or calibration checks/changes to prevent any tampering with the settings.

## 1C INTRODUCTION

The commissioning and calibration procedures detailed in this manual are additional to those in the operating instructions (ZMT/0011) and are usually carried out prior to despatch.

If however, any of the following is required, the commissioning set-up and calibration can be checked:

A change to instrument operation.

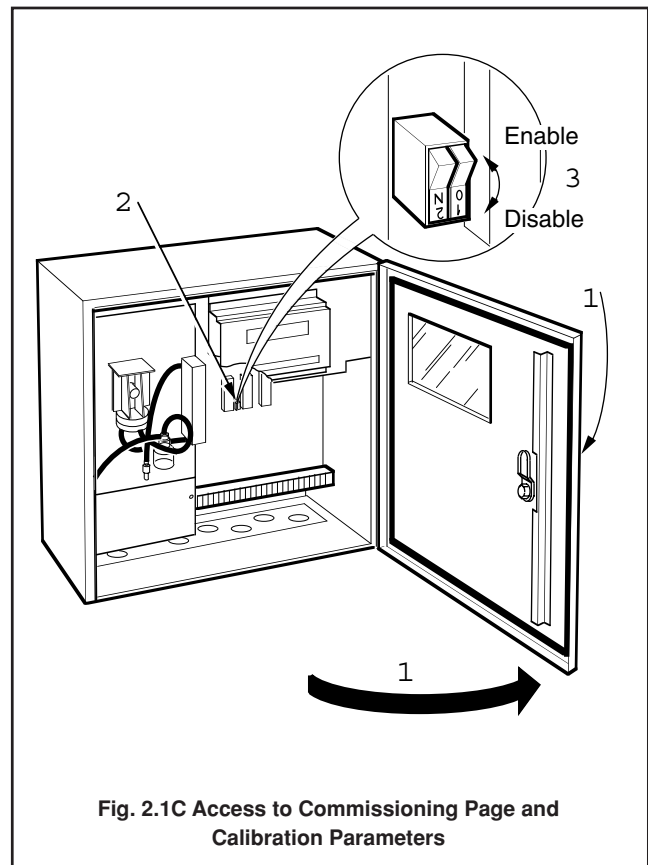
Inclusion of additional features, e.g. relay and/or retransmission outputs.

Confirmation of calibration settings, e.g. if instrument response or readings are suspect.

An internal switch is used to prevent tampering with the commissioning and calibration settings – see Section 2.1C.

The **Commissioning Page** is used for initial analyser set-up to suit individual applications (usually specified at the time of ordering). The page facilitates the introduction of additional parameters/pages or the omission of non-applicable parameters/pages from the overall programme chart (Fig. 10 in ZMT/0011), e.g. the analogue retransmission page is omitted if retransmission outputs are not used. A summary of the Commissioning Page parameters is shown in Fig. 3.1C overleaf.

The **Electrical Calibration Parameters** are contained within the Commissioning Page and are used for calibrating the oxygen and thermocouple inputs. Additional calibration parameters are also incorporated in the analogue retransmission and carbon dioxide/monoxide page for their respective calibrations.



**Fig. 2.1C Access to Commissioning Page and Calibration Parameters**

### 3C COMMISSIONING

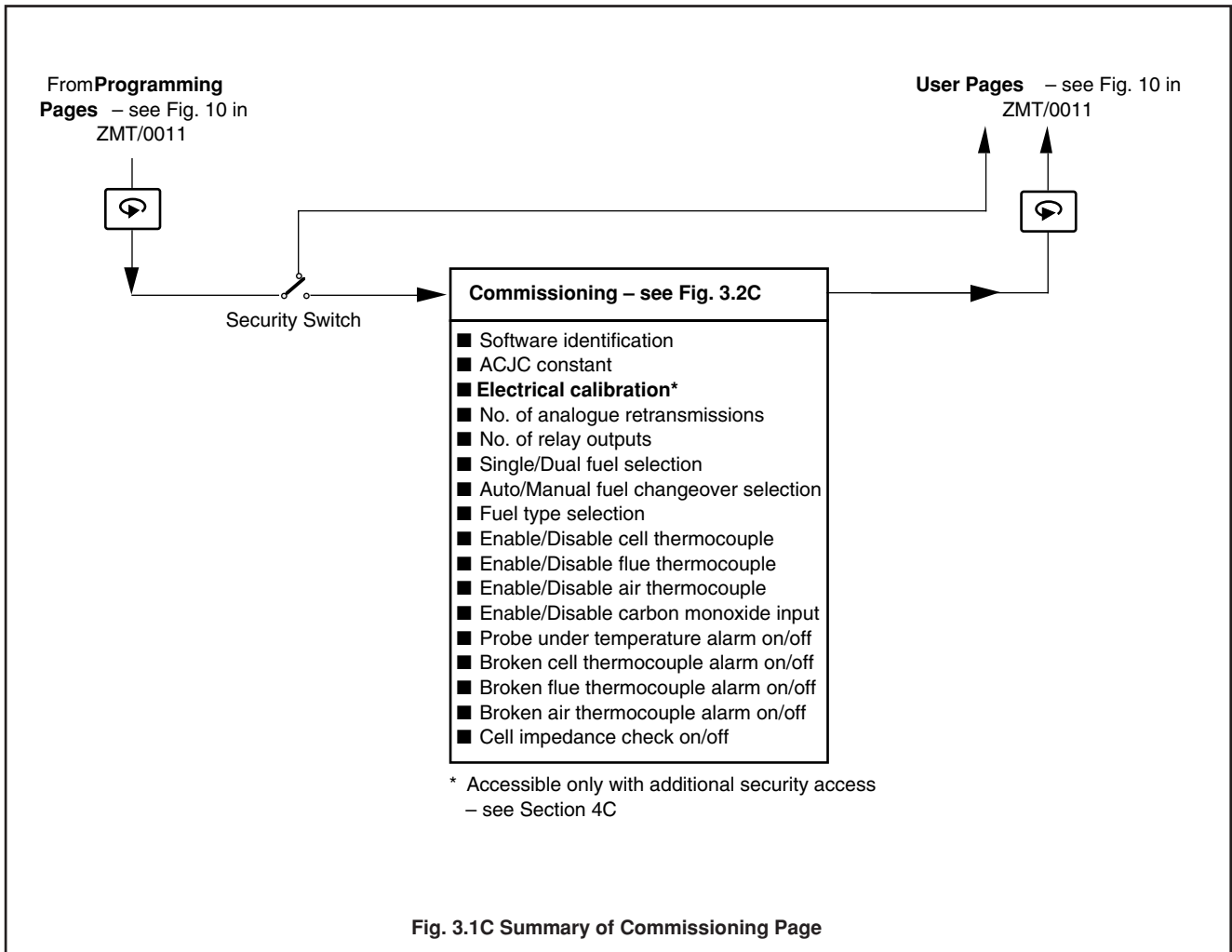
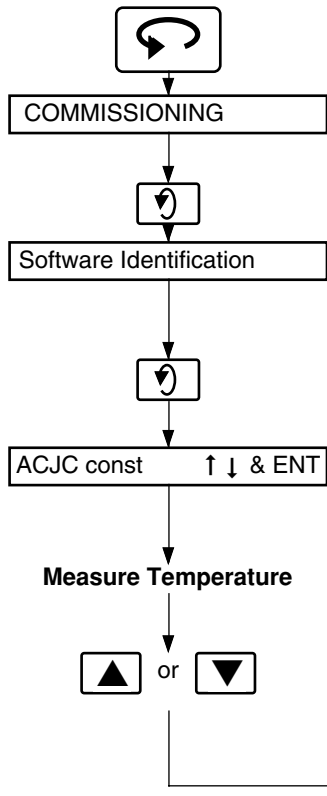


Fig. 3.1C Summary of Commissioning Page

**Fig. 3.2C Commissioning Page Programme Chart**

### 3.1C Commissioning Page



Select the **Commissioning Page**.

**Note.** It is possible to access the **Electrical Calibration** procedures further down this page using Security Access at this point – see Section 4.

Advance to next parameter.

**Software Identification**

Shows the software type and issue number to be quoted on any correspondence with the Company.

Advance to next parameter.

**Automatic Cold Junction Compensation (ACJC) Constant**

The cold junction reference temperature (in °C) is shown on the upper display. If the value is suspect it may be checked as follows:

- a) Measure the temperature at the ACJC transistor (TR1) with a mercury-in-glass thermometer – see Fig. 3.3C.
- b) Adjust the displayed value to that of the measured temperature.

**Note.** Adjusting the ACJC constant affects the calibration.

Continued opposite.

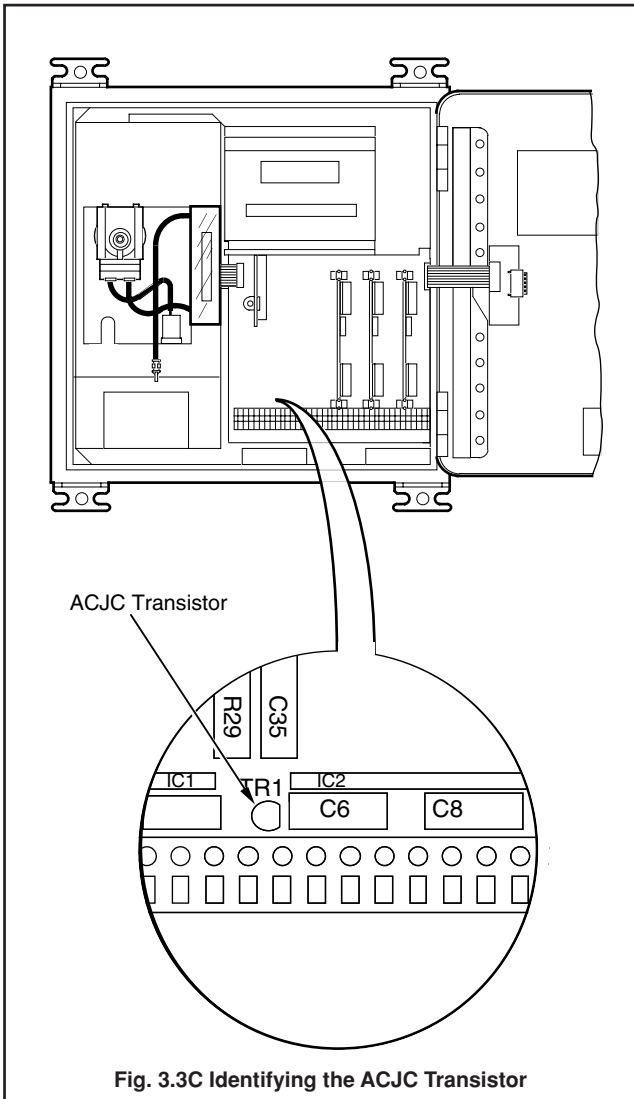


Fig. 3.3C Identifying the ACJC Transistor

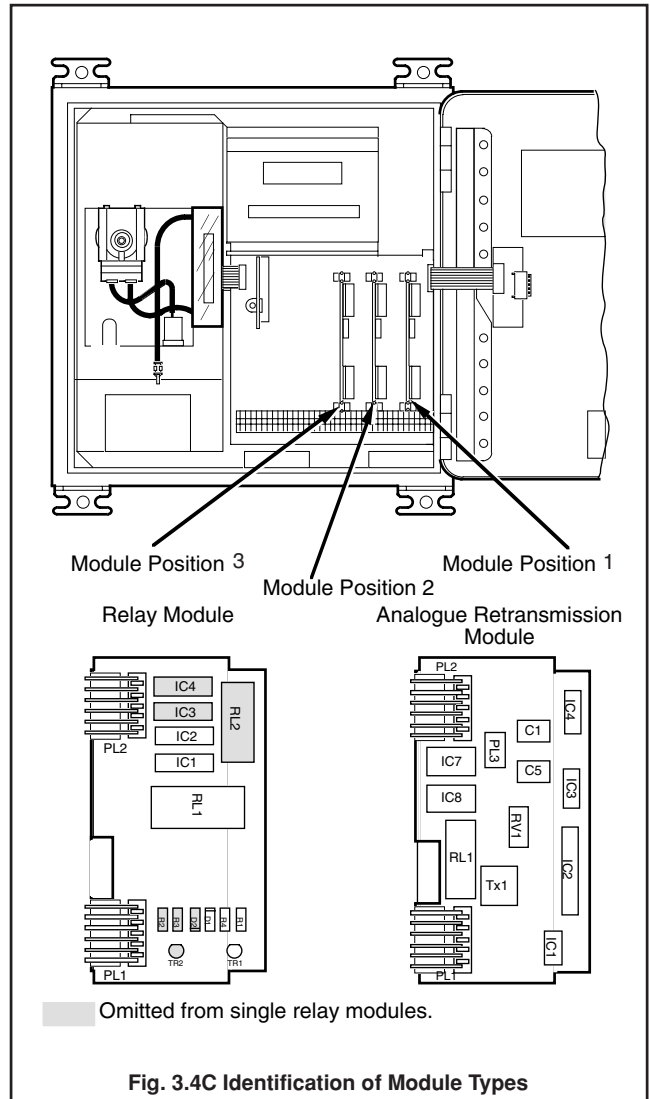
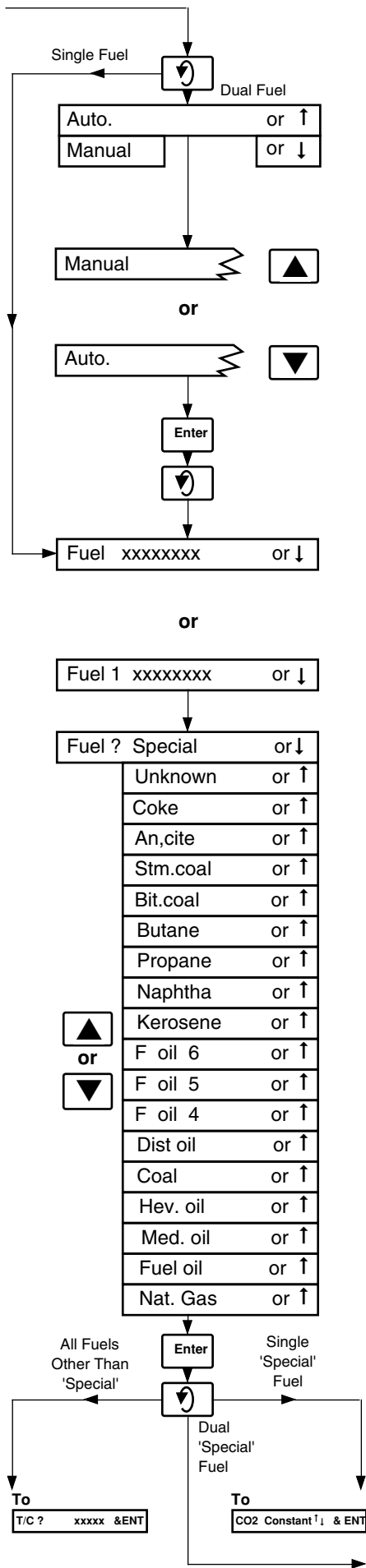


Fig. 3.4C Identification of Module Types





Continued from previous page.

Advance to next parameter.

**Fuel Changeover (dual fuel versions only)**

Fuel changeover can be implemented either manually (using the front panel controls) or automatically (using an external switch/logic signal) – see **Alarm Page** and **ELECTRICAL CONNECTIONS** in the Operating Instructions. Select the fuel changeover required:

Manual

or

Automatic (remote).

Store.

Advance to next parameter.

**Fuel Type (fuel 1 type, dual fuel versions)**

Single fuel versions

or

Dual fuel versions.

Select the fuel type required (fuel type 1 on dual fuel versions).

**Notes.**

- a) If 'Unknown' is selected, e.g. if burning variable industrial refuse, the combustion efficiency cannot be calculated and 'Not available' is displayed in the **Combustion Efficiency Page** – see ZMT/0011.
- b) If 'Special' fuel is selected the following combustion data is required for the fuel:
  - Carbon dioxide constant
  - Water constant
  - Combustion efficiency constant

If these are unknown, or cannot be calculated, contact the Company.

Store.

Advance to **Cell Thermocouple** (all fuels other than 'Special').

or

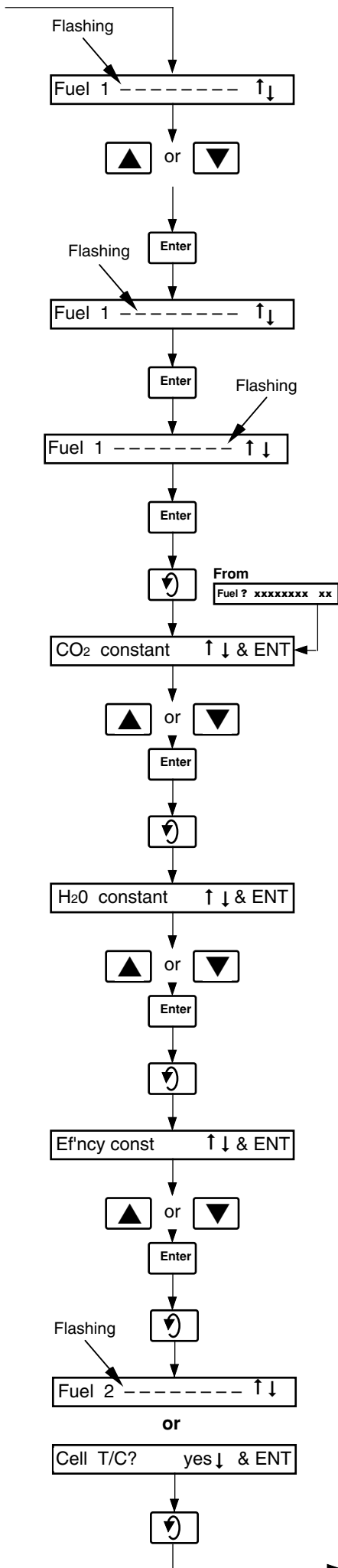
Advance to **Carbon Dioxide Constant** (single fuel version with 'Special' fuel).

or

Advance to **Special Fuel 1 Name** (dual fuel versions with 'Special' fuel).

Continued opposite.





Continued from opposite page.

**Special Fuel 1 Name (dual fuel versions only)**

Any 8-character name can be programmed for the special fuel.

Set the first character of fuel 1 name (upper or lower case letters, numbers 0 to 9 and spare).

Store and advance to next letter.

Set the second character of fuel 1 name.

Store and advance to next letter.

Repeat for remaining characters.

Store.

Advance to next parameter.

**Carbon Dioxide Constant**

Set the required constant for the fuel used.

Store.

Advance to next parameter.

**Water Constant**

Set the required constant for the fuel used.

Store.

Advance to next parameter.

**Efficiency Constant**

Set the required constant for the fuel used.

Store.

Advance to next parameter.

**Fuel 2 Type (dual fuel versions only)**

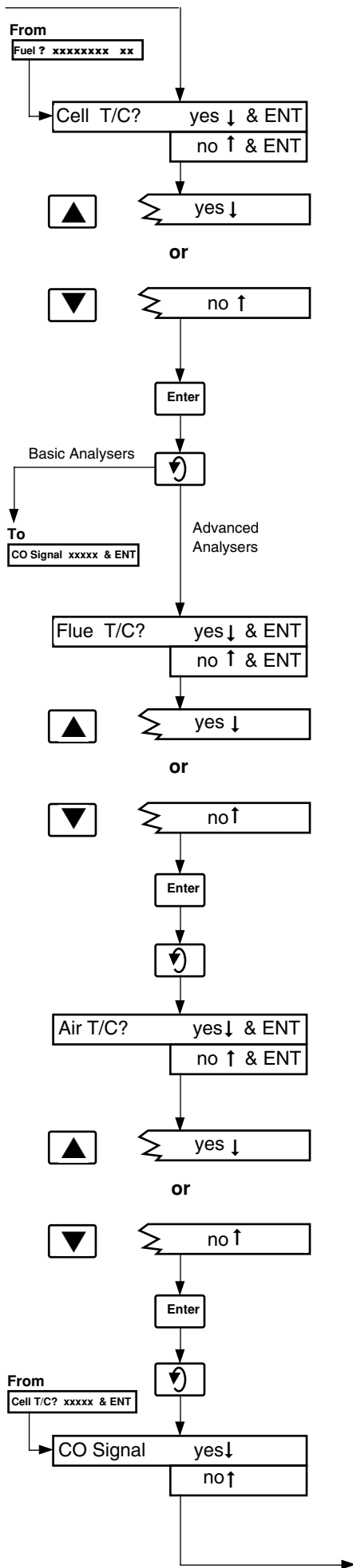
Repeat the procedure as for **Fuel Type (fuel 1 type, fuel versions)**, above.

**Cell Thermocouple (single and dual fuel versions)**

See overleaf.

Advance to next parameter.

Continued overleaf.



Continued from previous page.

**Cell Thermocouple**

Select whether or not a cell thermocouple is to be used:

If cell thermocouple is used (general applications).

or

If cell thermocouple is not used (special applications only).

**Note.** A preset cell temperature (>600°C) must be used if 'no' is selected.

Store.

Advance to **Carbon Monoxide Signal** (basic analysers).

or

Advance to next parameter (advance analysers).

**Flue Thermocouple**

Select whether or not a flue thermocouple is to be used:

If flue thermocouple is used.

or

If flue thermocouple is never to be used.

Store.

Advance to next parameter.

**Air Thermocouple**

Select whether or not an air thermocouple is to be used:

If air thermocouple is used.

or

If air thermocouple is never to be used.

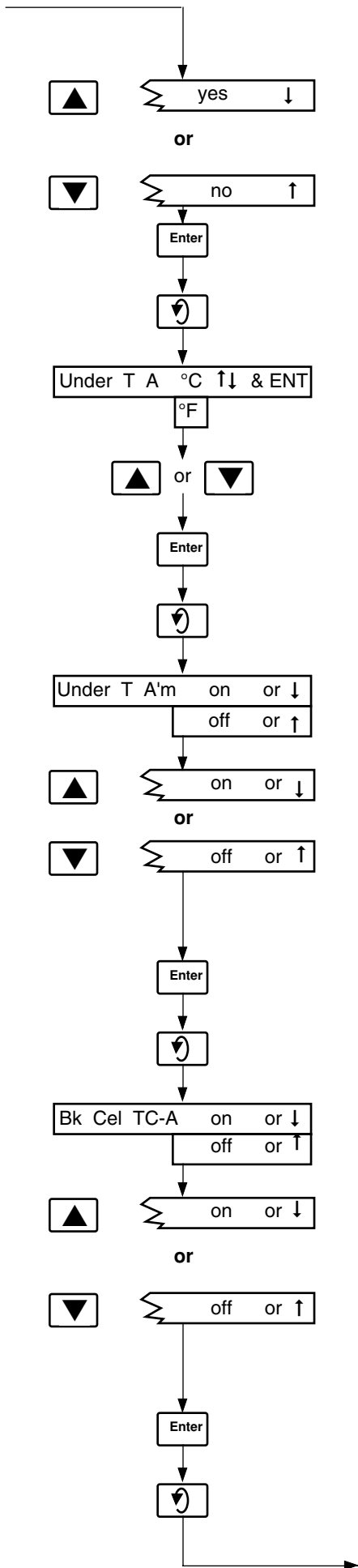
Store.

Advance to next parameter.

**Carbon Monoxide Signal**

A signal from an external carbon monoxide monitor can be used for display of carbon monoxide content in the **Carbon Dioxide/Carbon Monoxide Page** – see Operating Instructions.

Continued opposite.



Continued from previous page.

If carbon monoxide signal is used.

or

If carbon monoxide signal is not used.

Store.

Advance to next parameter.

**Probe Under Temperature Alarm Point**

Set the minimum operating temperature of the probe on the upper display (600°C or 1112°F for standard probes).

Store.

Advance to next parameter.

**Probe Under Temp Alarm**

The alarm can be switched on or off:

Switch on.

or

Switch off.

**N.B.** The alarm must only be switched off for special applications.

Store.

Advance to next parameter.

**Broken Cell Thermocouple Alarm**

The alarm can be switched on or off:

Switch on.

or

Switch off.

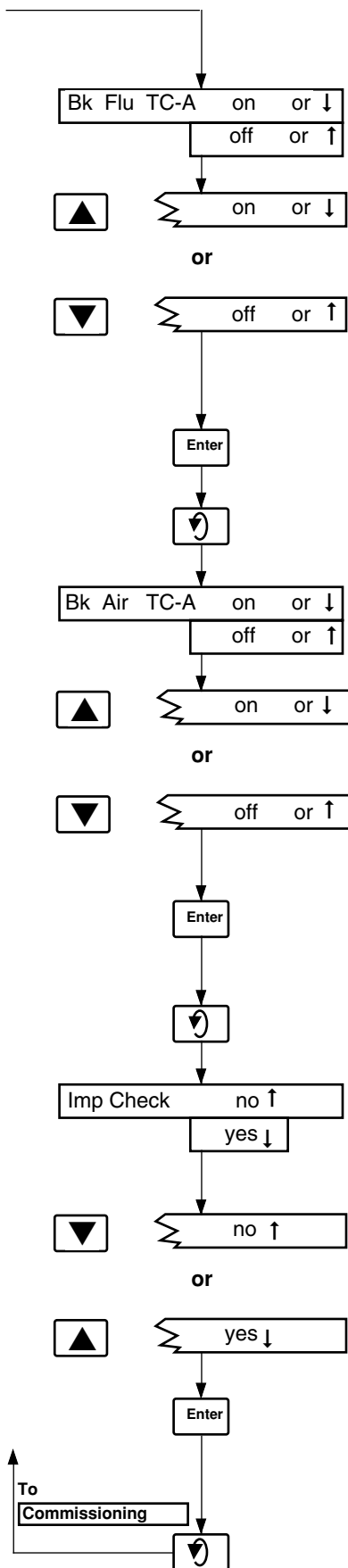
**N.B.** The alarm must only be switched off for special applications.

Store.

Advance to next parameter.

Continued overleaf.

Continued from previous page.



**Broken Flue Thermocouple Alarm**

The alarm can be switched on or off:

Switch on.

or

Switch off.

**N.B.** The alarm must only be switched off for special applications.

Store.

Advance to next parameter.

**Broken Air Thermocouple Alarm**

The alarm can be switched on or off:

Switch on.

or

Switch off.

**N.B.** The alarm must only be switched off for special applications.

Store.

Advance to next parameter.

**Cell Impedance Check**

The cell impedance check in the **Diagnostics Page** (see Operating Instructions) can be disabled if not required.

Check not required.

or

Check required.

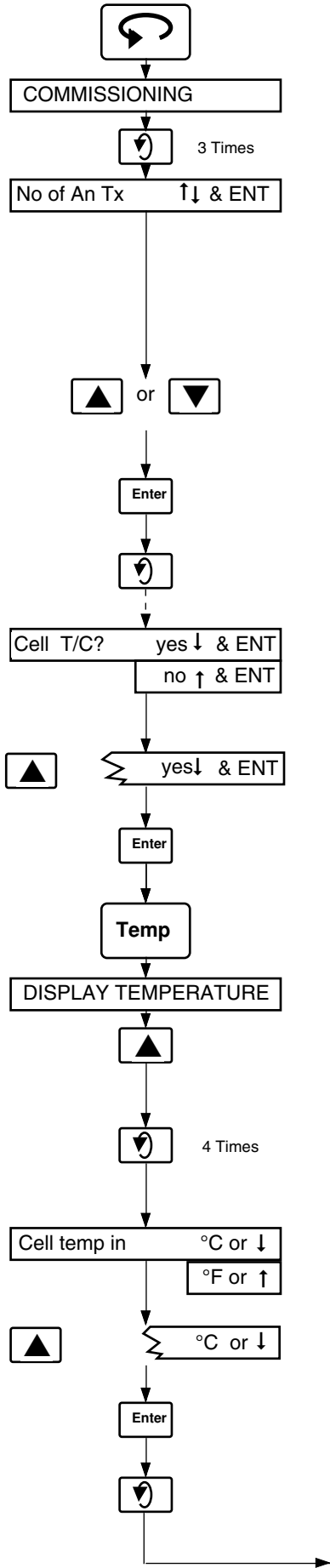
Store.

Return to top of **Commissioning Page**.



### 4.3C Setting Up the Analogue Retransmission

All analogue retransmission outputs are calibrated to the cell thermocouple input range. The input must be set up for a type K thermocouple, with °C display units, to give the widest span (and hence the maximum accuracy), as follows:



Select the **Commissioning Page**.

#### Number of Retransmission Outputs

Identify the number of retransmission modules fitted – see Fig. 3.4C on page 4.

Make a note of the retransmission range(s) and then reset it for 4 to 20mA operation – see Section 6.2 in ZMT/0011.

Set the number of retransmission outputs being used (2 maximum on basic analysers).

Store.

Advance to cell thermocouple parameter.

#### Cell Thermocouple

Select cell thermocouple.

Store.

Select the **Display Temperature Page**.

Operate for approximately three seconds to gain access to the **SECURE PARAMETERS** within the Temperature Page.

Advance to **SECURE PARAMETERS**.

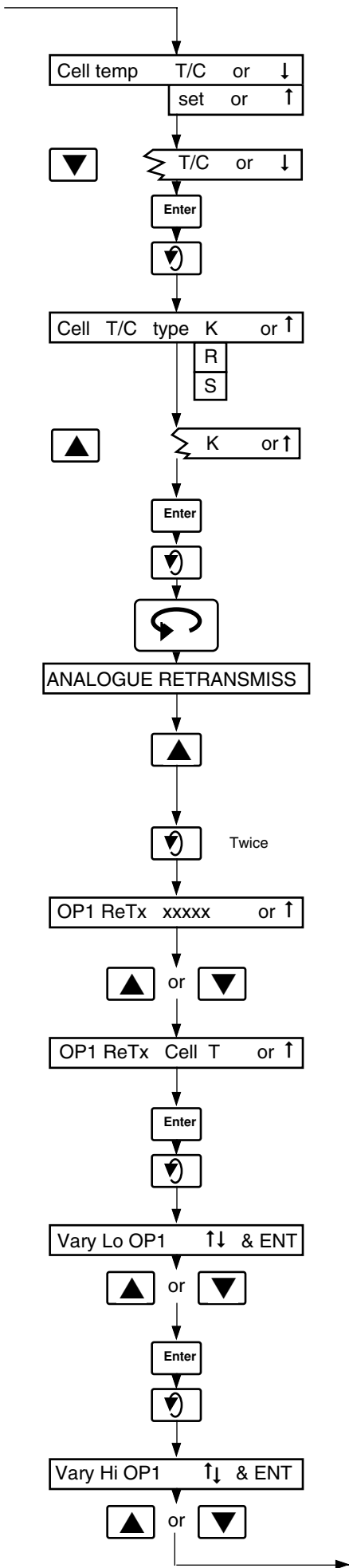
#### SECURE PARAMETERS Cell Temperature, Display Units

Select °C display units.

Store.

Advance to next parameter.

Continued opposite.



Continued from opposite page.

**Cell Temperature, Thermocouple or Preset Temperature**

Select thermocouple for cell temperature measurement.

Store.

Advance to next parameter.

**Cell Temperature Thermocouple Type**

Select the thermocouple being used for cell temperature measurement:

Make a note of the thermocouple type and then reset it to Type K.

Store.

Advance to next parameter.

Select the **Analogue Retransmission Page**.

Operate for approximately three seconds to gain access to the **SECURE PARAMETERS (retransmission 1)** within the Analogue Retransmission Page.

Advance to **SECURE PARAMETERS (retransmission 1)** .

**SECURE PARAMETERS (retransmission 1). Retransmission Output 1**

Make a note of the parameter range assigned to retransmission output 1 and then assign the cell temperature range.

Store.

Advance to next parameter.

**Retransmission Output 1, Lower Retransmission Value**

Make a note of the value on the upper display and then reset it to '0.0'.

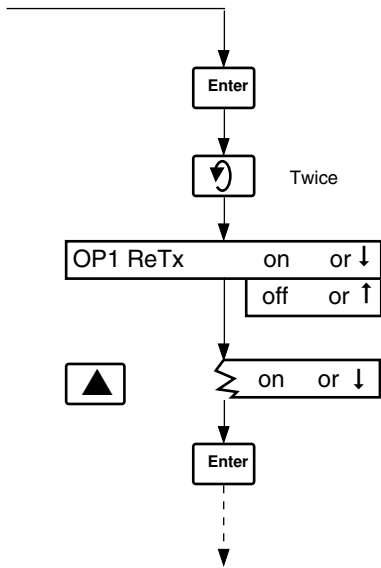
Store.

Advance to next parameter.

**Retransmission Output 1, Higher Retransmission Value**

Make a note of the value on the upper display and then reset it to '1400'.

Continued overleaf.



Continued from previous page.

Store.

Advance to **Retransmission Output 1, On or Off**.

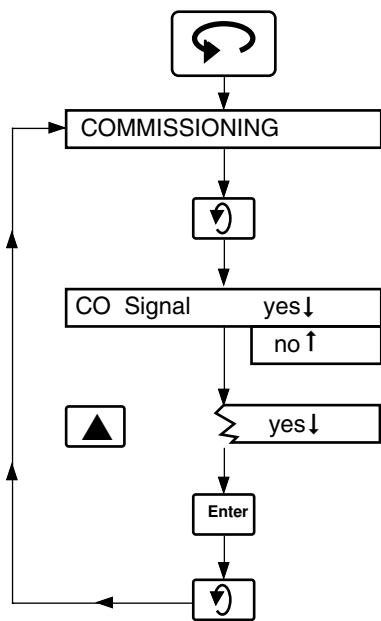
**Retransmission Output 1, On or Off**

Switch retransmission output on.

Store.

Repeat for all other retransmission outputs, as applicable.

**4.4C Setting Up the Carbon Dioxide/Monoxide Input**



Select the **Commissioning Page**.

Advance to **Carbon Monoxide Signal**.

**Carbon Monoxide Signal**

Select carbon monoxide signal.

Store.

Return to top of Commissioning Page.



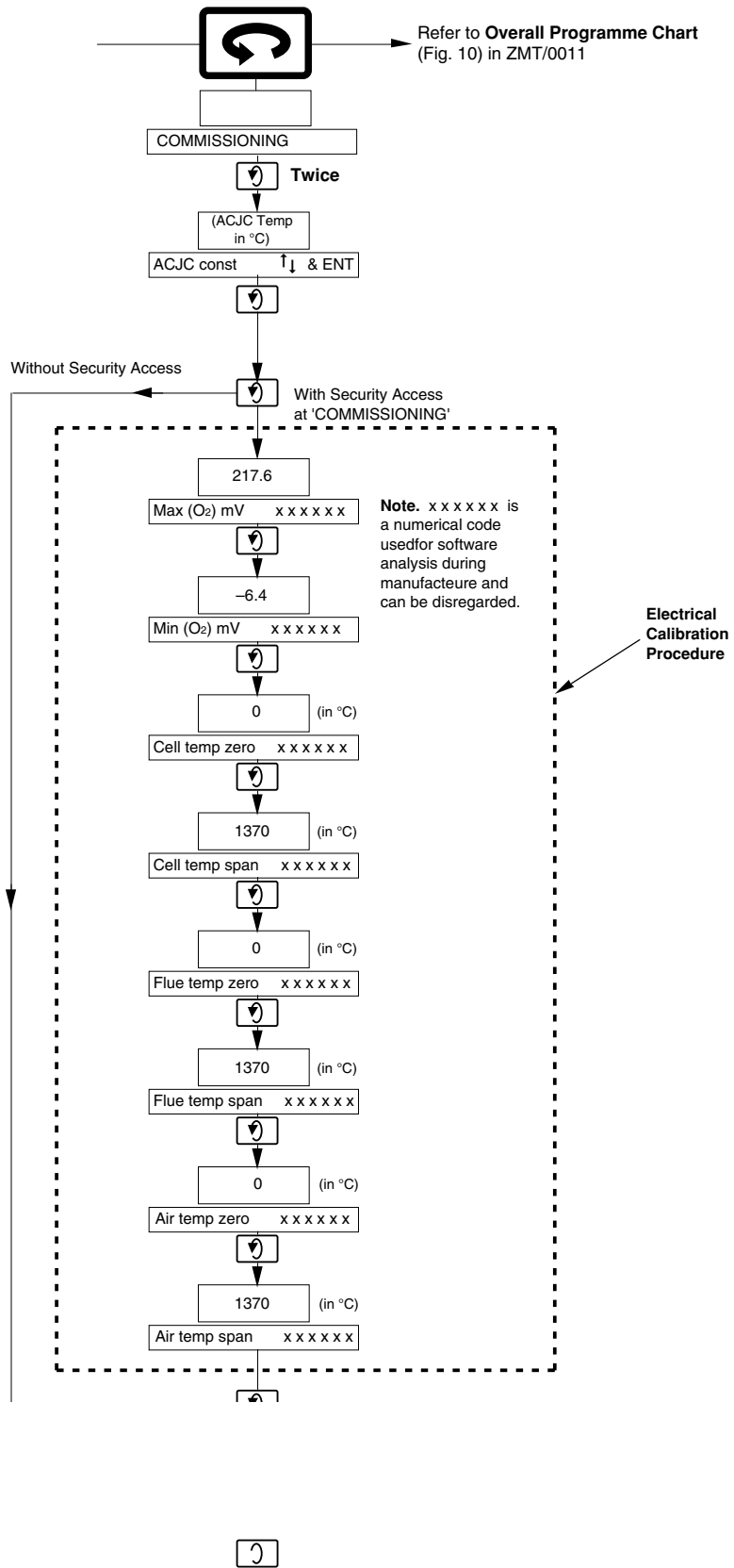
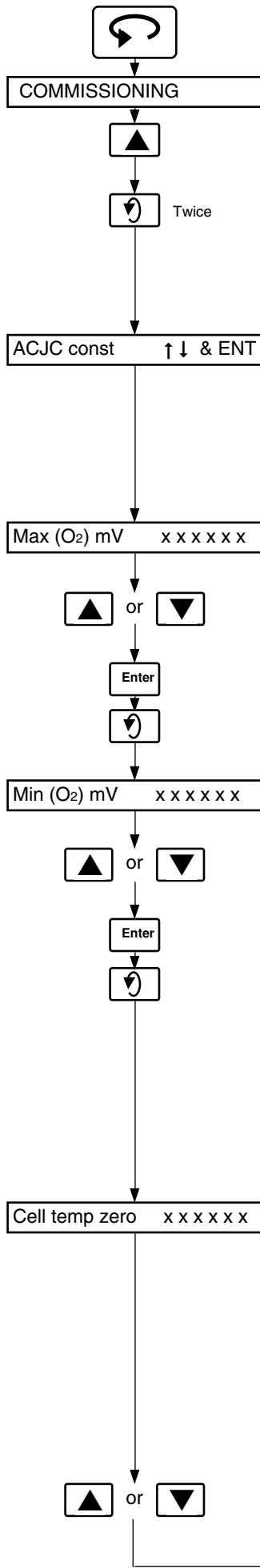


Fig. 4.1C Electrical Calibration Programme Chart

#### 4.5C Calibrating the Oxygen and Thermocouple Inputs

Refer also to Fig 4.1C on previous page.



Select the **Commissioning Page**.

Operate for approximately three seconds to gain access to the electrical calibration procedures within the Commissioning Page.

Advance to electrical calibration procedures.

**Note.** 'x x x x x x' in the following illustrations is a numerical code used for software analysis during manufacture and can be disregarded.

#### Automatic Cold Junction Compensation (ACJC) Constant

##### OXYGEN INPUT ELECTRICAL CALIBRATION

Connect the millivolt source in place of the 'PROBE CELL' connections – see Section 5.4.1 or 5.4.2 in ZMT/0011.

##### Range Maximum

Set 217.6 mV on the millivolt source, i.e. simulating 0.05%O<sub>2</sub> at 1400°C.

Set '217.6' on the upper display.

Store.

Advance to next parameter.

##### Range Minimum

Set -6.4mV on the millivolt source, i.e. simulating 25%O<sub>2</sub> at 1400°C.

Set '-6.4' on the upper display.

Store.

Advance to next parameter.

Disconnect the millivolt source from the 'PROBE CELL' terminals and remake original cell connections.

##### CELL THERMOCOUPLE INPUT ELECTRICAL CALIBRATION

Connect the millivolt source in place of the 'CELL T/C' connections using Ni-Cr/Ni-Al compensating cable – see Section 5.4.1 or 5.4.2 in ZMT/0011.

##### Cell Temperature Zero

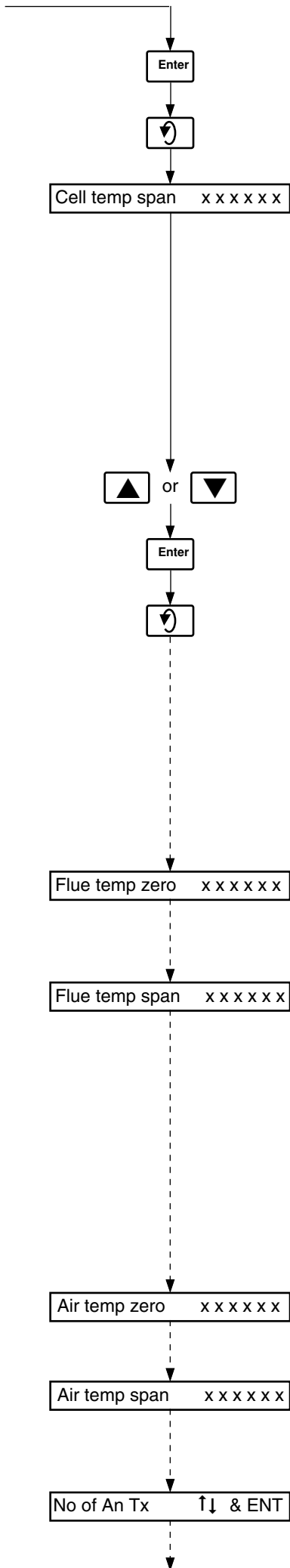
Measure the ambient temperature at the 'CELL T/C' terminals and, from standard type K thermocouple tables, obtain the millivolt equivalent of this temperature (a).

Subtract (a) from 0 and set the resultant value on the signal source.

**Example.** Ambient Temperature: 25°C  
 Millivolt equivalent: 1.00mV  
 Set millivolt source to: 0 – 1.00(mV)  
 -1.00mV

Set '0' on the upper display.

Continued opposite.



Continued from opposite page.

Store.

Advance to next parameter.

**Cell Temperature Span**

Measure the ambient temperature at the 'CELL T/C' terminals and, from standard type K thermocouple tables, obtain the millivolt equivalent of this temperature (a).

Subtract (a) from 54.81 (the millivolt equivalent of 1370°C for a type K thermocouple) and set the resultant value on the signal source.

**Example.** Ambient Temperature: 25°C  
 Millivolt equivalent: 1.00mV  
 Set millivolt source to: 54.81 – 1.00(mV)  
**53.81mV**

Set '1370' on the upper display.

Store.

Advance to next parameter.

Disconnect the millivolt source from the 'PROBE T/C' terminals and remake original cell thermocouple connections.

**FLUE THERMOCOUPLE INPUT ELECTRICAL CALIBRATION**

Connect the millivolt source in place of the 'FLUE T/C' connections using Ni-Cr/Ni-Al compensating cable – see Section 5.4.1 or 5.4.2 in ZMT/0011.

**Flue Temperature Zero**

Repeat the procedure as for **Cell Temperature Zero**, above, but measuring the ambient temperature at the 'FLUE T/C' terminals.

**Flue Temperature Span**

Repeat the procedure for **Cell Temperature Span**, above, but measure the ambient temperature at the 'FLUE T/C' terminals.

Disconnect the millivolt source from the 'FLUE T/C' terminals and remake original flue thermocouple connections.

**AIR THERMOCOUPLE INPUT ELECTRICAL CALIBRATION**

Connect the millivolt source in place of the 'AIR T/C' connections using Ni-Cr/Ni-Al compensating cable – see Section 5.4.1 or 5.4.2 in ZMT/0011.

**Air Temperature Zero**

Repeat the procedure for **Cell Temperature Zero**, above, but measure the ambient temperature at the 'AIR T/C' terminals.

**Air Temperature Span**

Repeat the procedure for **Cell Temperature Span**, above, but measure the ambient temperature at the 'AIR T/C' terminals.

**Number of Retransmission Outputs**

As for the remainder of the Commissioning Page – see Section 3C.

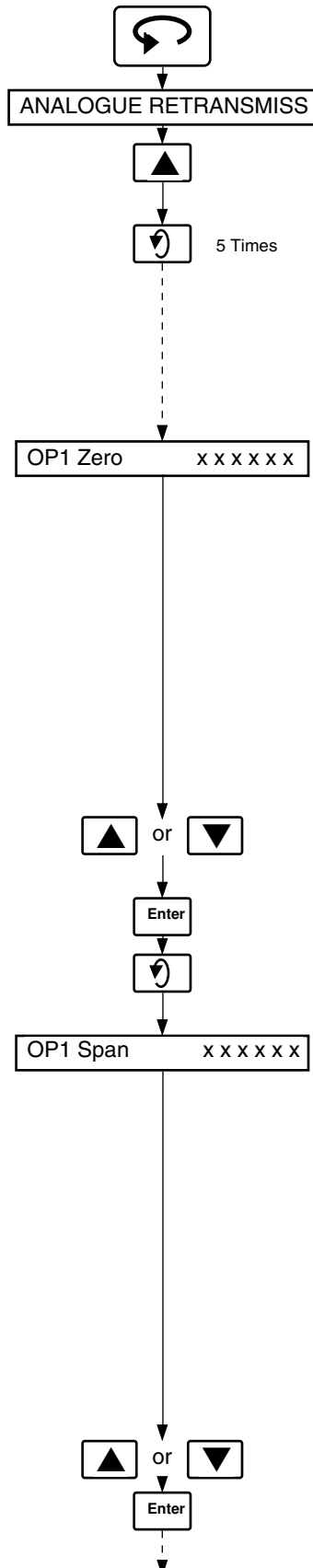
#### 4.6C Analogue Retransmission Output(s) – Fig. 4.2C

Connect the milliammeter in place of the retransmission output to be calibrated, i.e. terminals '1' and '2' for 'O/P MODULE 1', 'O/P MODULE 2' or 'O/P MODULE 3'.

Connect the millivolt source in place of the 'PROBE T/C' connections using copper wire. Switch on.

#### Notes.

1. The 'PROBE INPUT' must be calibrated before attempting to calibrate the retransmission output(s) – see Section 4.5C.
2. The following procedure is for calibration of retransmission output 1. Retransmission outputs 2 and 3 are carried out in a similar manner but with the milliammeter connected to the appropriate 'O/P MODULE' terminals.



Select **Analogue Retransmission Page**.

Operate for approximately three seconds to gain access to the electrical calibration procedures within the Analogue Retransmission Page.

Advance to electrical calibration procedures.

**Note.** 'x x x x x x' in the following illustrations is a numerical code used for software analysis during manufacture and can be disregarded.

#### SECURE PARAMETERS (Retransmission 1)

##### Retransmission Output 1, Zero Calibration

Measure the ambient temperature at the 'CELL T/C' terminals and, from standard type K thermocouple tables, obtain the millivolt equivalent of this temperature (a).

Subtract (a) from 0 and set the resultant value on the signal source.

**Example.** Ambient Temperature: 25°C  
 Millivolt equivalent: 1.00mV  
 Set millivolt source to:  $0 - 1.00(\text{mV}) = -1.0\text{mV}$

**Note.** The upper display on the ZMT shows the equivalent temperature of the millivolt signal applied, i.e. 0°C

Set the milliammeter reading to 0.00mA.

Store.

Advance to next parameter.

##### Retransmission Output 1, Span Calibration

Measure the ambient temperature at the 'CELL T/C' terminals and, from standard type K thermocouple tables, obtain the millivolt equivalent of this temperature (a).

Subtract (a) from 55.80 (the theoretical millivolt equivalent of 1400°C for a type K thermocouple) and set the resultant value on the signal source.

**Example.** Ambient Temperature: 25°C  
 Millivolt equivalent: 1.00mV  
 Set millivolt source to:  $55.80 - 1.00(\text{mV}) = 54.80\text{mV}$

**Note.** The upper display on the ZMT shows the equivalent temperature of the millivolt signal applied, i.e. 1400°C

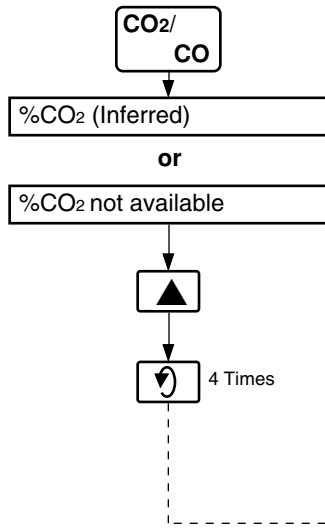
Set the milliammeter reading to 20.00mA.

Store.

Repeat for other output(s), if applicable.

**4.7C Carbon Monoxide Monitor Input – Fig. 4.3C (overleaf)**

Connect the milliamp source in place of the 'CO I/P' connections. Switch on.



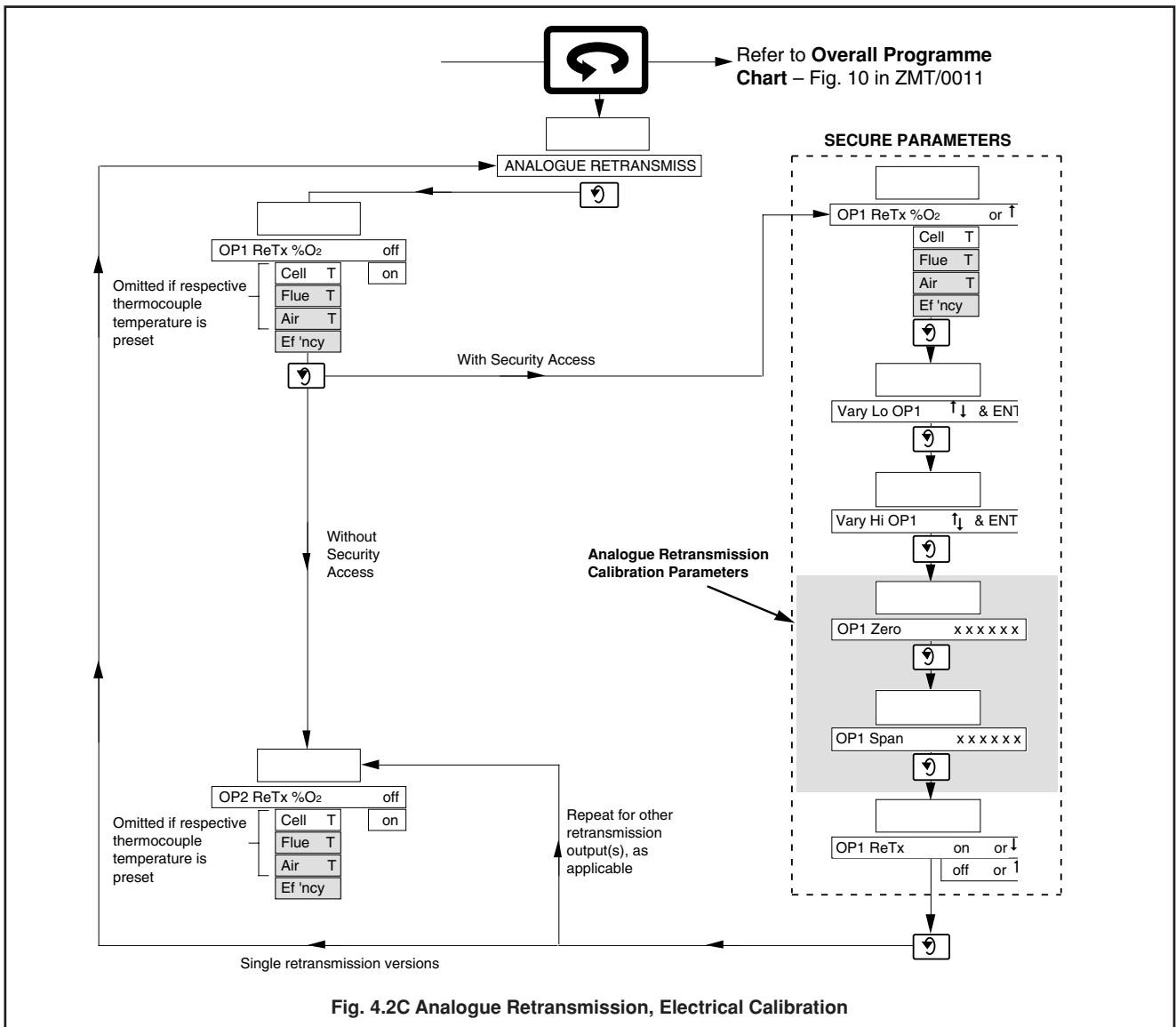
Select the **Carbon Dioxide/Carbon Monoxide** page.

Operate for approximately three seconds to gain access to the electrical calibration procedures within the Carbon Dioxide/Monoxide page.

Advance to electrical calibration procedures.

**Note.** 'x x x x x' in the following illustrations is a numerical code used for software analysis during manufacture and can be disregarded.

Continued overleaf.



**Fig. 4.2C Analogue Retransmission, Electrical Calibration**

Continued from previous page.

**SECURE PARAMETERS**

**Minimum Calibration Value**

Set 4mA on the milliamp source.

Set the value on the upper display to '0.0'.

Store.

Advance to next parameter.

**Maximum Calibration Value**

Set 20mA on the milliamp source.

Set the value on the upper display to '20.0'.

Store.

Return to top of Carbon Monoxide/Dioxide Page.

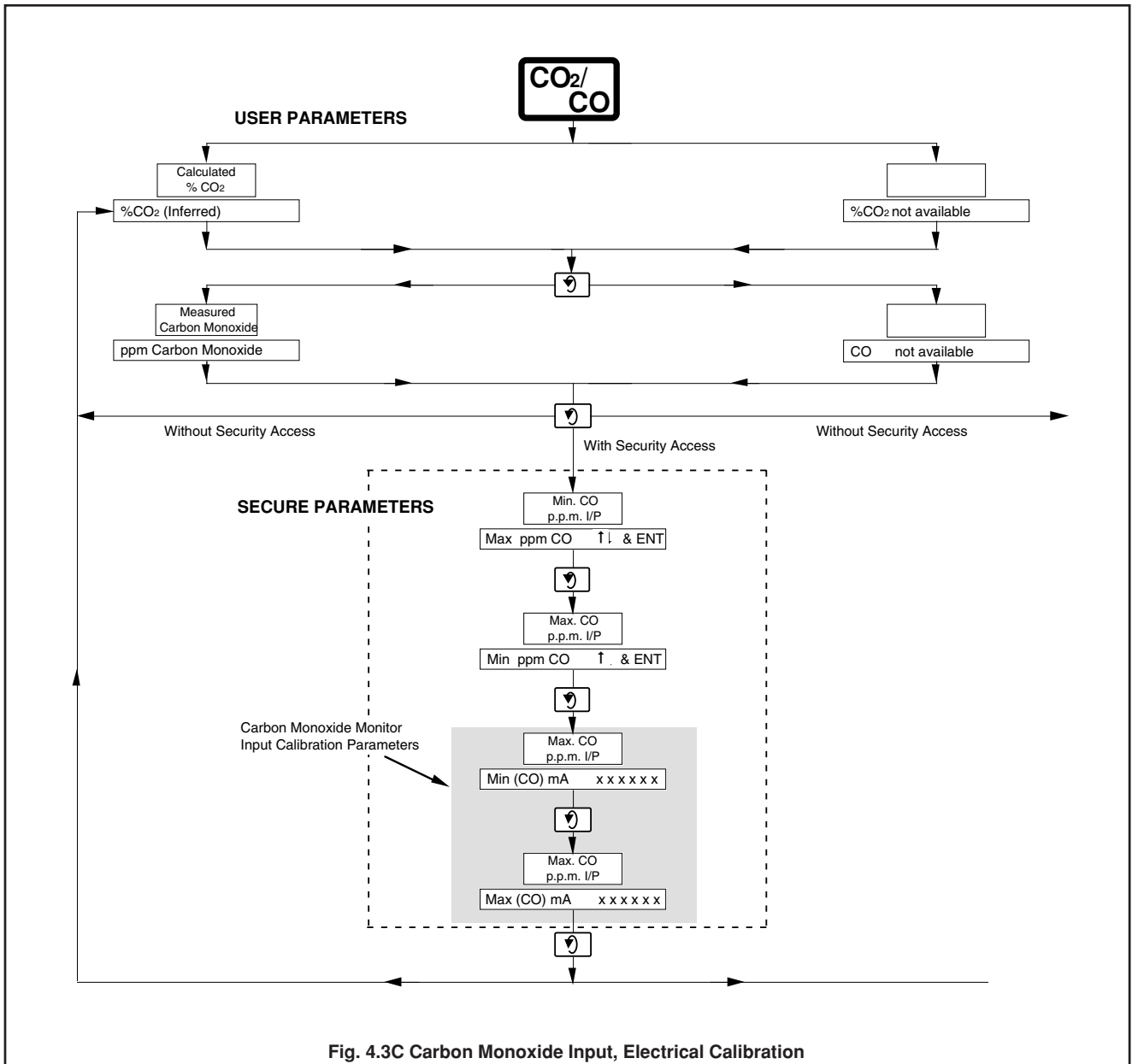
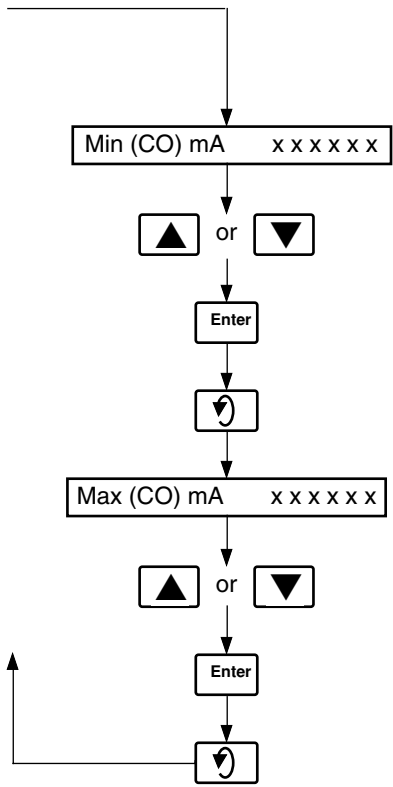


Fig. 4.3C Carbon Monoxide Input, Electrical Calibration

# PRODUCTS & CUSTOMER SUPPORT

## Products

### Automation Systems

- *for the following industries:*
  - Chemical & Pharmaceutical
  - Food & Beverage
  - Manufacturing
  - Metals and Minerals
  - Oil, Gas & Petrochemical
  - Pulp and Paper

### Drives and Motors

- *AC and DC Drives, AC and DC Machines, AC motors to 1kV*
- *Drive systems*
- *Force Measurement*
- *Servo Drives*

### Controllers & Recorders

- *Single and Multi-loop Controllers*
- *Circular Chart, Strip Chart and Paperless Recorders*
- *Paperless Recorders*
- *Process Indicators*

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- *Industrial Robots and Robot Systems*

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- *Electromagnetic Flowmeters*
- *Mass Flow Meters*
- *Turbine Flowmeters*
- *Flow Elements*

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- *Electrical Systems*
- *Marine Equipment*
- *Offshore Retrofit and Refurbishment*

### Process Analytics

- *Process Gas Analysis*
- *Systems Integration*

### Transmitters

- *Pressure*
- *Temperature*
- *Level*
- *Interface Modules*

### Valves, Actuators and Positioners

- *Control Valves*
- *Actuators*
- *Positioners*

### Water, Gas & Industrial Analytics Instrumentation

- *pH, conductivity, and dissolved oxygen transmitters and sensors*
- *ammonia, nitrate, phosphate, silica, sodium, chloride, fluoride, dissolved oxygen and hydrazine analyzers.*
- *Zirconia oxygen analyzers, katharometers, hydrogen purity and purge-gas monitors, thermal conductivity.*

## Customer Support

We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

### United Kingdom

ABB Limited  
Tel: +44 (0)1453 826661  
Fax: +44 (0)1453 829671

### United States of America

ABB Inc.  
Tel: +1 775 850 4800  
Fax: +1 775 850 4808

#### Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification.

Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

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ABB has Sales & Customer Support  
expertise in over 100 countries worldwide

[www.abb.com](http://www.abb.com)

The Company's policy is one of continuous product  
improvement and the right is reserved to modify the  
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Printed in UK (11.08)

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