SERVOMEX
EMISSIONS ANALYSERS

SERVOPRO 4900
Continuous Emissions Analyser

Installation and Operation Manual

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Xentra 4900
Continuous Emissions Analyser
Installation and Operation Manual

Ref:04900/001B/4
Order as part 04900 001B

The configuration of this *xentra 4900* Continuous Emissions Analyser															
Model and Issue: 0490_B1															
Feature and option code number															
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**F13**	**F14**	**F15**	**F16**
_ _	_ _	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Serial number __ __ __ __ __															

Instrument Configuration

Transducer I1 Type: Serial No:	Transducer I2 Type: Serial No:
Transducer I3 Type: Serial No:	Transducer I4 Type: Serial No:
Servomex Order Reference No:	
Software Revision No:	
Completed By:	Date :

WARNINGS, CAUTIONS AND NOTES

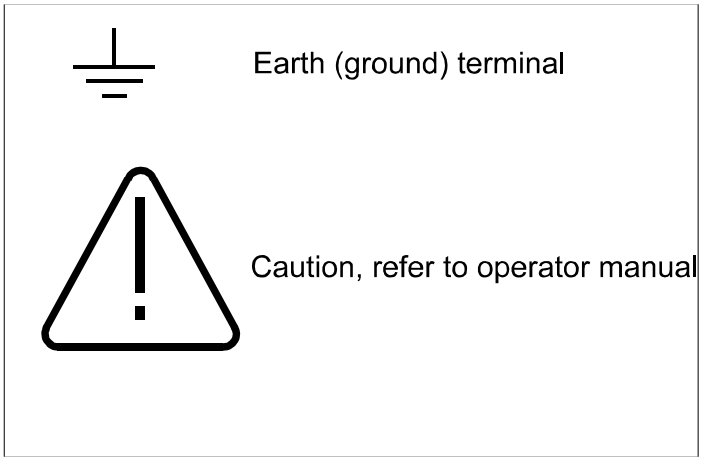
This publication includes WARNINGS, CAUTIONS AND NOTES which provide information relating to the following:

WARNINGS	**:**	**Hazards which could result in personal injury or death.**
CAUTIONS	**:**	**Hazards which could result in equipment or property damage.**
NOTES	**:**	**Alert the user to pertinent facts and conditions.**

NOTE

This manual covers installation, normal operation, routine maintenance and fault diagnosis on the *xentra* models 4902B1 and 4904B1.

The following symbols are used on the rear of the analyser:



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SECTION 1 INTRODUCTION

1.1 Introduction

This manual contains the essential information regarding installation, operation and configuration of the Servomex xentra 4902 and 4904 Continuous Emissions Analysers.

Complete details of the xentra hardware and full instructions for servicing by qualified personnel only are presented in the xentra 4900 Service Manual. The service manual may be ordered from Servomex using part number 4900002A.

WARNING

The user should note that the xentra 4900 instrument contains no user serviceable parts inside. The instrument enclosure protects the user from electric shock and other hazards. All servicing should be referred to qualified personnel.

1.2 Glossary

FSD	Full scale deflection, the maximum range over which a measurement may be made (see section 1.8).
DV	Dead volume.
Top level menu	The first menu, this leads on to a succession of other menus.
VARS	Variables for each sensor.
UDEF	User-defined data.
I1....I4	Internal gas sensor modules 1...4.
E1,E2	External analogue inputs 1 and 2.
Gfx	Gas filter correlation infra-red.
Pm	Paramagnetic.

1.3 General description

The Servomex xentra chassis is a platform into which gas sensor modules may be fitted to make precise measurements.

Up to three modular gas sensors, for a wide range of gases and concentration levels selected according to the customer's needs, reside in the xentra chassis. The xentra chassis provides power, gas connections and other support functions to the gas sensor modules and receives their outputs from which it calculates sample gas concentrations. The calculated gas concentrations then may be displayed on the LCD display screen, directed to the analogue outputs and/or directed to the serial RS232 output.

The xentra chassis also supports two external analogue input signals. The data from the external inputs may be displayed on the screen, output to the analogue outputs and/or output via the serial RS232 output.

The xentra 4900 is designed for use in modern industrial and laboratory environments. The analyser is controlled using an on-board microprocessor which gives the flexibility to configure the analyser to suit a wide range of applications. The xentra is operated via simple keypad controls mounted on the front fascia of the analyser. Adjacent to the keypad is a large, Liquid crystal display (LCD), on which are displayed measurement values, alarms and other data.

A number of optional features are available for the xentra 4900. These include the following:-

- Flow meters and needle valves to monitor and control sample gas flow through the instrument.
- A sample filter to protect the gas sensor modules from particulate contamination.
- A sample flow alarm to monitor the sample flow and alarm when the flow falls below a defined level.
- An Autocalibration manifold to allow the instrument to be calibrated without user intervention.
- Relay ouput contacts to allow autocalibration of the analyser via externally located valves.
- Additional signal output cards to extend the number of analogue outputs and relay outputs available to the user.

Full technical specifications for this xentra model are presented in the Technical Data Sheet in Appendix B of this manual.

Start up and commissioning of the xentra should be performed in the order presented in this manual:-

Installation (section 2)

This section takes commissioning to the point where the xentra is powered and operational. The installer is advised to read this section completely before commencing installation.

Initial configuration (section 3)

This section serves as a tutorial for the user interface and ensures that the password and clock are set before calibration. Setting the clock ensures that calibration activity is correctly recorded in the calibration history file.

Calibration (section 4)

This section describes manual calibration, automatic calibration, manual calibration check and automatic calibration check.

Main configuration (section 5)

This section describes setting up of alarm levels, analogue outputs, relays and other parameters.

Review (section 6)

This section describes how to display analogue output settings, relay allocation, alarms, faults and analyser identity without changing the analyser settings.

1.4 Location of components

Figure 1.1 identifies the location of the key features of the xentra 4900 Continuous Emissions Analyser.

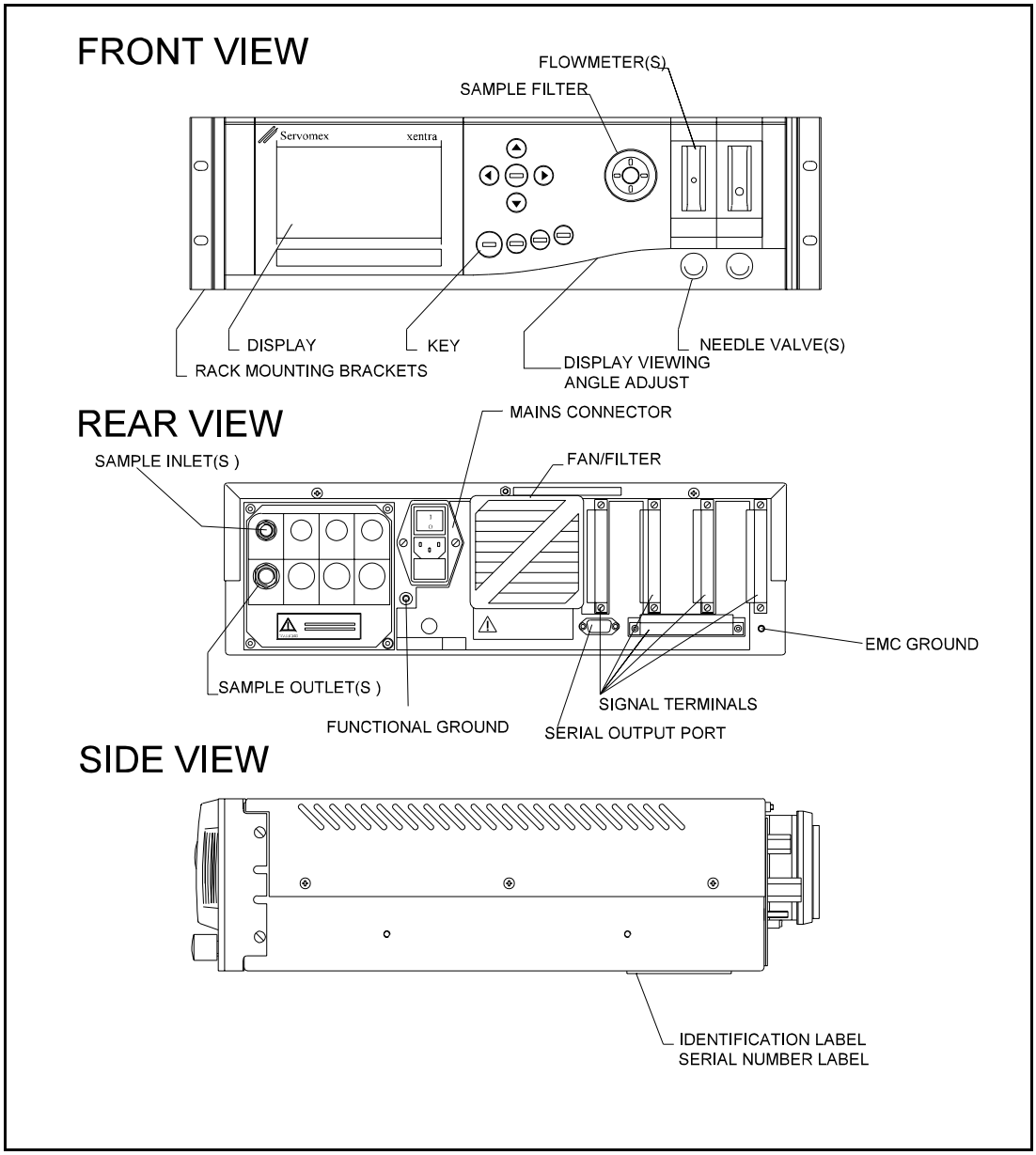


Figure 1.1 Key features of Xentra

1.5 Introduction to the xentra user interface

The xentra user interface consists of a keypad with nine keys and a large edge-lit LCD display (see Figure 1.1). During normal use of the instrument the LCD screen will display either the default measurement display or a menu based screen editor display. Toggling between the measurement display and the menu based editor is via the keypad. User input to the menu based screen editor is also via the keypad.

1.5.1 The xentra measurement display

The measurement display is the default display that is presented to the user of the xentra 4900. The display can be user configured to show the gas concentrations measured by the gas sensor modules fitted and/or the external analogue inputs. The status of the instrument plus the occurence of an alarm or fault active are also displayed on the measurement display via icons positioned at the bottom of the screen. The contents of the measurement display are shown in figure 1.2.

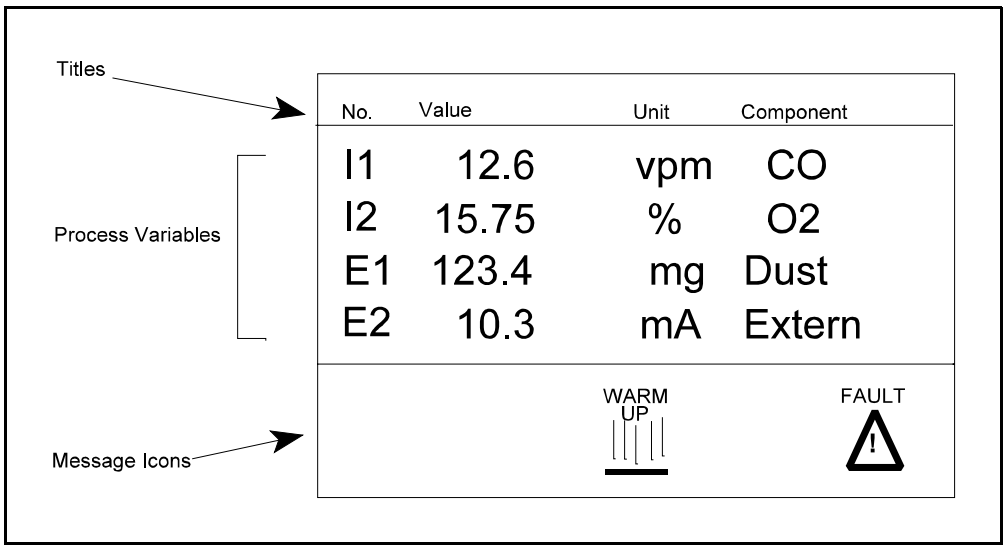


Figure 1.2 Xentra measurement display

Each measured value on the display is known as a process variable and consists of four fields as shown in figure 1.3.

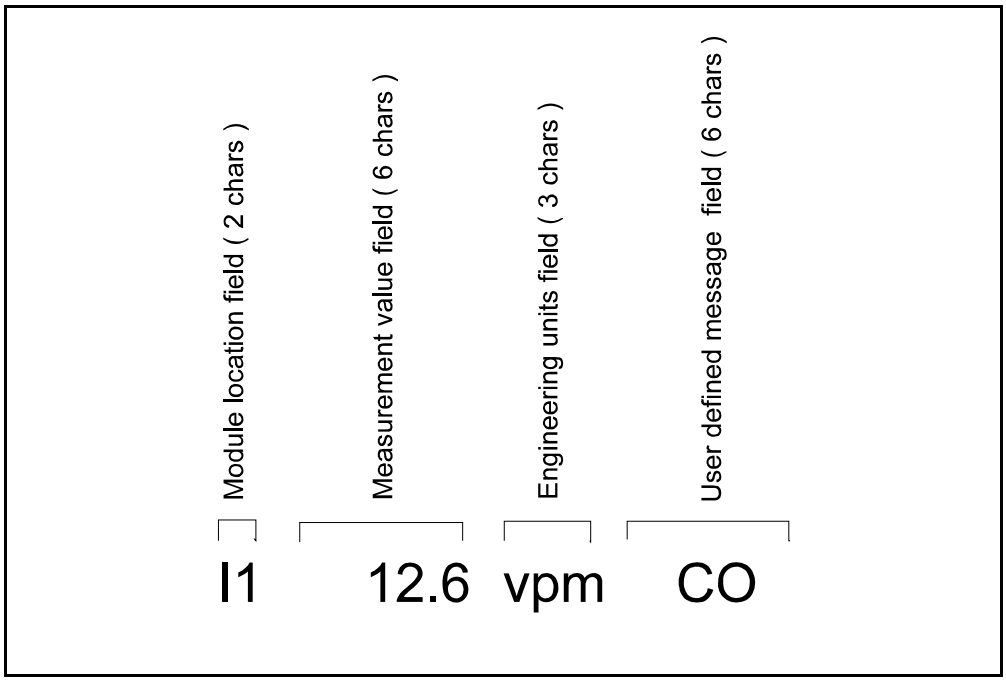


Figure 1.3 Xentra process variable format

1 A module location field (2 characters).
2 A measurement value field (6 characters).
3 An engineering units field (3 characters).
4. A user defined message (UDM) field (6 characters).

The module location field defines whether the process variable represents an internal transducer or an external analogue input. The letter 'I' indicates an internal gas sensor module. The letter 'E' indicates an external analogue input. The letter is followed by a number defining the gas sensor module site number.

The measurement field is a 6 character number representing the concentration measured by an internal transducer or the scaled analogue input value. Should the measured value for a transducer exceed 120% of the specified full scale deflection for that transducer then the measurement field is replaced by the word 'OVER' to indicate that the transducer is in over range condition.

The engineering units field is a user defined 3 character message identifying the units of measurement. For Gfx transducers the user is offered a choice of the units to be displayed. The options available are volume parts per million (vpm) or mg per normal cubic meter. For paramagnetic oxygen transducers the displayed unit is fixed as volume percent.

The user defined message (UDM) field represents the component name of the process variable.

The xentra display may be returned to measurement display at any time by pressing the 'MEASURE' key (see figure 1.4). If no user key presses are input then the Xentra returns to the measurement display after a one minute time out. This time-out is extended to 20 minutes during the calibration options.

When first powered up, the display will show a sequence of power up messages before returning to the measurement display (see section 2.12). If the user does not wish to see the power up messages then these can be disabled by pressing the measure key during the 'SYSTEM OK' message. The warming-up icon (see figure 1.5) will also be displayed until all gas sensor modules are at their respective operating temperature, This may take up to 1 hour.

Icons located at the bottom centre of the measurement display indicate the status of the instrument (see figure 1.5). These icons show that the instrument is warming up or being calibrated using the autocalibrate facility. Icons at the bottom of the display also indicate the presence of alarms or faults. If the fault or alarm icons appear on the measurement display the exact nature of the fault or alarm may be determined via the user interface, (see 6.2 'Displaying alarms present' and 6.3 'Displaying faults present').

1.5.2 The xentra keypad

User input to the ***xentra*** instrument is via the ***xentra*** keypad. A view of the keypad is given in figure 1.4.

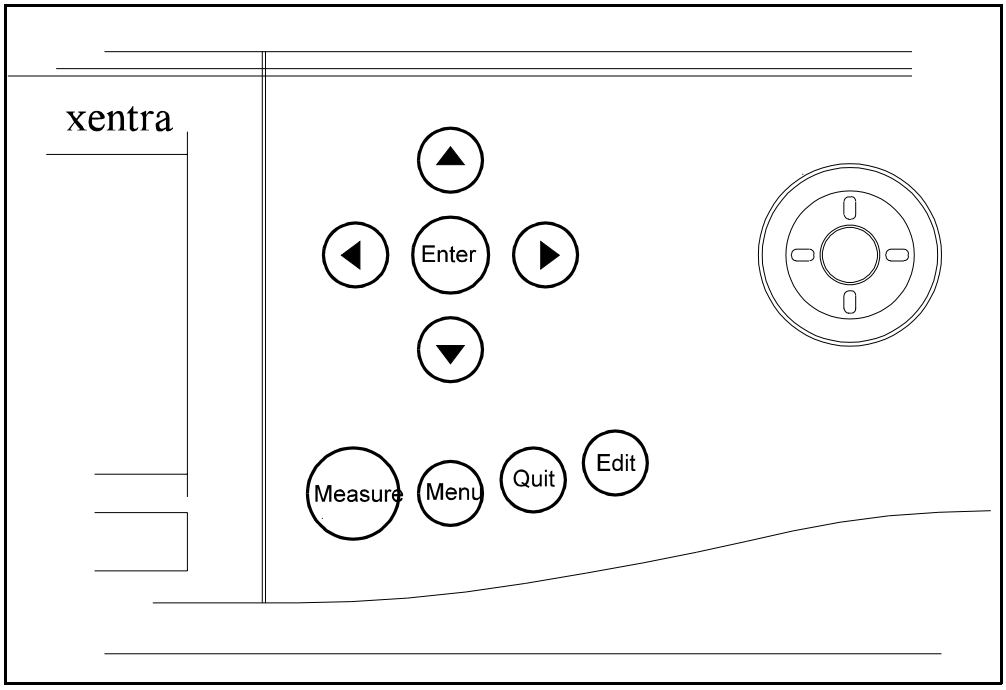


Figure 1.4 The ***xentra*** keypad

The functions of the keys on the ***xentra*** keypad are as follows.

Measure key

Pressing the 'MEASURE' key at any time returns the instrument to the default measurement display (see section 1.5.1).

Menu key

Pressing the 'MENU' key activates the ***xentra*** top level menu.

Quit key

Pressing the 'QUIT' key aborts the current activity and returns the user interface to the menu level at which the activity was selected. Pressing the 'QUIT' key while in the top level menu (or edit menu if activated via the 'EDIT' key) has no effect.

Edit key

Pressing the 'EDIT' key will give immediate access to the edit functions provided to modify the text on the measurement display. This includes the names of measured variables , the measurement units, the displayed precision and the filtering applied.

▲ ▼◄ ► keys

Within menu displays the user highlights the desired option using the arrow keys(▲ ▼ ◄ ►) and then presses the 'ENTER' key.

When entering numeric information or text, the left and right arrow keys (◄ ►) are used to move between characters or digits and the up and down arrow keys (▲ ▼) are used to change each character or digit. Reverse video is used to indicate the active WORD, character or digit position.

Enter key

The user presses the 'ENTER' key to indicate that the indicated menu selection is to be actioned or to indicate completion of text or numerical input. If, when inputing text or numerical data, the key press is ignored then this is because the data entered is invalid; otherwise the data will be saved.

1.5.3 The *xentra* screen icons

The space at the bottom of the measurement display is reserved for status icons. The screen icons that may be displayed are shown in figure 1.5.

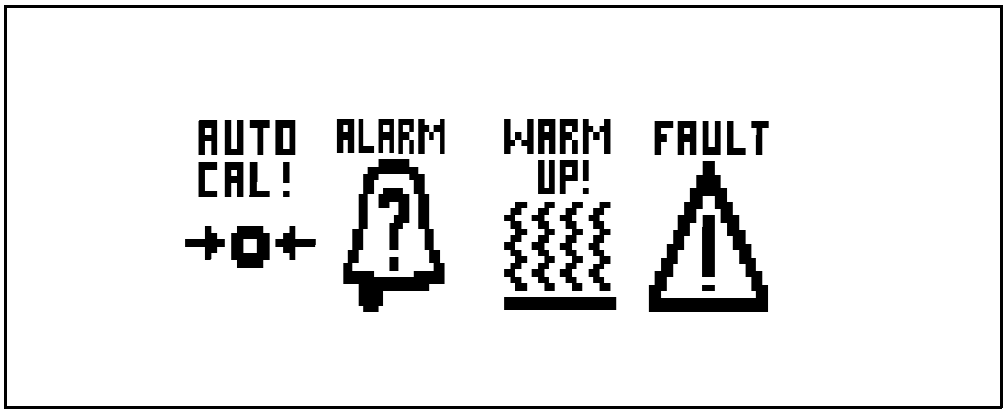


Figure 1.5 ***xentra*** status Icons

The function of these icons is as follows:-

Autocal icon

This icon is displayed when an instrument auto calibration is in progress. The appearance of the icon will change as the Autocalibration procedure progresses (see section 4.9).

Alarm icon

This icon is displayed if any of the user defined alarm levels are triggered. If this icon is displayed then the nature of the alarm may be found from the user interface (see section 6.2 'Displaying alarms present').

Warm Up icon

This icon is displayed if any of the transducers fitted inside of the ***xentra*** are operating at a temperature less than their normal operating temperature band. This is normally displayed when the instrument is turned on. If any of the transducers fails to achieve its normal temperature operating conditions within a specified time then the warm up icon will be turned off and a fault icon raised.

Fault icon

This icon is displayed if a fault condition is identified within the analyser. The cause of the fault may be identified from the user interface (see section 6.2 'Displaying faults present').

1.5.4 The *xentra* menu display

To initiate any user interface menu operation the 'MENU' key should be pressed. The ***xentra*** will then present the top level menu, which in turn leads on to other menus. A tree showing the menu structure in its entirety is given in appendix A.

At each menu the user highlights the desired option using the arrow keys(▲ ▼ ◄ ►) and then presses the 'ENTER' key. Reverse video is used to highlight the selected menu option. Pressing the 'MEASURE' key at any time returns to the measurement display.

The 'EDIT' key is used as a short cut key. Pressing the 'EDIT' key will give immediate access to the edit functions provided to modify the text on the measurement display. This includes the names of measured variables and the measurement units.

During any user interface operation, the fundamental measurements are still being made by the ***xentra*** and all relevant outputs, alarms and diagnostics remain active.

1.5.5 Numeric data input

When numeric data input is required then a field of individual digits will be offered to the user. Each of these digits is edited independently using the arrow keys (▲ ▼ ◄ ►). For numeric information each digit position may be changed to :-

i) Any number in the range 0 to 9
i) A decimal point
iii) A minus sign

The minus sign may only be positioned in the first character.

The position of the decimal point may be changed from that offered as a default. Any digit position except the right most digit may be used for the decimal point. The following are examples of valid numeric data entries:-

-.2033
-0100

The following is an example of an invalid data entry:-

-9999. (Last character should not be decimal point)

If an invalid data entry is made at a point in the user interface then the input will be ignored and the display return to the start of the data entry screen that precipitated the invalid entry. No warning message will be generated.

NOTE

If the Measure, Menu, Quit or Edit keys are used to terminate a data entry (rather than the Enter key) then the data entered is lost.

1.5.6 Password protection

Some user interface operations require the use of a password. There are two passwords, a supervisor password which gives access to SETUP and CALIBRATION and an operator password which gives access to CALIBRATION only. Both of the passwords are factory set to 4000, these may be changed if required. (See 3.1 'Setting passwords')

1.6 Transducer site numbering system

The ***xentra*** chassis may accommodate a number of internal transducers which are assigned site locations represented as I1, I2 and I3 on the display.

For the 4902 analyser, the chassis may accommodate up to two internal transducers. This is normally a Gfx transducer plus a paramagnetic oxygen transducer. The Gfx transducer will always be configured in location I1 and the paramagnetic oxygen transducer will always be configured in location I2.

For the 4904 analyser then the chassis may accomodate up to three internal transducers. This would normally be two Gfx transducers plus a single paramagnetic oxygen sensor. The Gfx transducers will always be configured in locations I1(Gfx 1) and I3 (Gfx 2) with the paramagnetic oxygen transducer configured in location I2.

1.7 Output numbering system

The outputs from the ***xentra*** have a two digit identification number of the following format :

Card number **.** Output

eg. the outputs fitted as standard in card position 1 are :

1.1 Analogue output
1.2 Analogue output
1.3 Relay
1.4 Relay
1.5 Relay

These identification numbers appear on the rear label to identify the terminals where each output appears and on the display when the outputs are being configured.

1.8 Transducer full scale deflection

The transducer full scale deflection (FSD) is the maximum concentration level that may be measured and displayed with the precision and accuracy specified for that transducer. This may also be termed the measurement range for the transducer. Concentration levels that exceed 120% of the FSD are considered as over range and are indicated by the word ‘OVER’ on the analyser display.

There are three set up parameters on the ***xentra*** instrument that are expressed in terms of the FSD.

- Calibration tolerances for the transducers.
- Alarm hysteresis.
- The upper limit of the analogue output.

The FSD values for the different transducer types that may be fitted inside the ***xentra*** 4900 chassis are shown in table 1.1.

Table 1.1 Transducer FSD values	
Transducer	**FSD**
Pm 1156 O_2	100% O_2
Gfx1210 CO Standard sensitivity	3000vpm CO
Gfx1210 CO High sensitivity	500vpm CO
Gfx 1210 SO_2 Standard sensitivity	2500 vpm SO_2
Gfx 1210 NO High sensitivity	1000 vpm NO

1.9 Technical assistance and spare parts

Technical assistance and spare parts are available from Servomex outlets listed on the back cover of this manual or from their local agents (see 9.2 'Spare parts list').

SECTION 2 INSTALLATION

2.1 Introduction

This section provides all the information required to install the ***xentra*** 4900 Continuous Emissions Analyser. The installer is advised to read this section completely before commencing installation.

Installation of the ***xentra*** requires the use of standard hand tools only.

The analyser is configured for either panel mount or 19" rack mount. If fitted with rack mount brackets, but without slides, adequate support for the analyser weight must be provided. The analyser must never be carried or supported by the rack mounting brackets.

The ***xentra*** complies with EN 61010-1 : 1993 which requires that the installation requirements specified for the analyser include the pollution degree and installation category for which the analyser is suitable. Pollution degree is concerned with the type of material which may enter the analyser and degrade the electrical insulation. The ***xentra*** is rated for 'POLLUTION DEGREE 2' where normally only non-conductive pollution occurs. Installation category is concerned with the level of over-voltage transients experienced on the electrical power supply. The ***xentra*** is suitable for 'INSTALLATION CATEGORY II' which is characterised as being local level (ie not distribution level), appliances and portable equipment with over-voltage impulse withstand up to 2500 Volts. For further guidance see IEC 664.

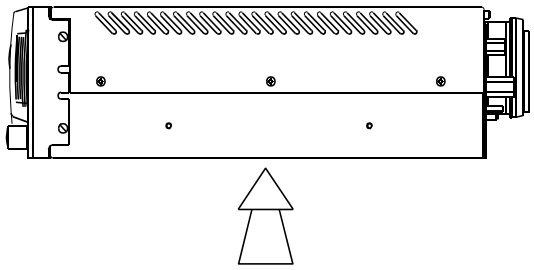
Ambient Operating Conditions:

Operating Temperature:	5 to 45ºC / 41 to 113ºF
Storage Temperature:	-20 to +60ºC / -4 to +140ºF
Atmospheric Pressure:	79 to 124 kPaa/11 to 18 psia (for operating altitudes to 2000m)

2.2 Unpacking and Inspection

WARNING

Xentra 4900 analysers weigh up to 22kg (45lb) and care must be taken when handling. It is recommended that they are lifted with both hands positioned on either side of the base of the chassis



WHEN LIFTING ANALYSER, HANDLE VIA UNDERSIDE OF CHASSIS ON EITHER SIDE IN POSITION INDICATED.

Figure 2.1 Recommended handling

The weight of the ***xentra*** (nominally 20 Kg) will vary according to configuration. The rack mounting brackets (See Figure 2.2 item 1) are not designed to be used as handles or grips. When removing the instrument from its packing, and for subsequent handling, ensure that the analyser is gripped securely underneath in the positions indicated in Figure 2.1). Lift and remove the ***xentra*** from its packing and inspect for any damage incurred during transit. If damage has occurred, inform Servomex or its agent immediately. Retain all packing and shipping information. The shipping carton may be used for future transportation.

After the initial visual inspection, perform the following checks:

(1) Check that the specification details table in the front of this manual are in order and agree with the purchase requirements. Pay particular attention to any inserted Instrument Modification Sheets.

(2) Check that the accessories are present and undamaged.

Standard ***xentra*** accessories provided are :-

- Spare mains fuses suitable for electrical power voltage range ordered.
- Two connectors for wiring to standard chassis signal output plugs (PL1 and PL5).
- Electrical power cord with moulded IEC connector or loose IEC connector for wiring during installation.

Optional ***xentra*** accessories are:-

- Connectors for wiring to each optional signal output plug (PL2 to PL4).
- Spanner and spare filter elements for those analysers configured with a sample filter.
- Rack mounting slides and kit of parts (See Figure 2.3)**.**

WARNING

- **The Xentra 4900 is not suitable for use in hazardous areas.**
- **The Xentra 4900 is not suitable for use with corrosive or flammable samples.**
- **The sample gas may be toxic or asphyxiant and must be vented to a safe location.**

CAUTION

Install the 4900 so that fan and cover vents are not obstructed.

2.3 Panel mount installation

See Figure 2.2 for panel mounting detail. In panel mounting format the ***xentra*** 4900 is supplied with a pair of mounting brackets (item 1 on figure 2.2) suitable for mounting the front of the instrument against a panel. These brackets are not intended to provide the sole means of support for the analyser. The user must provide additional means of support at the rear of the instrument (item 2 on figure 2.2).

WARNING

The rack mounting brackets are not intended to provide the sole means of support. The user must provide additional support at the rear of the instrument.

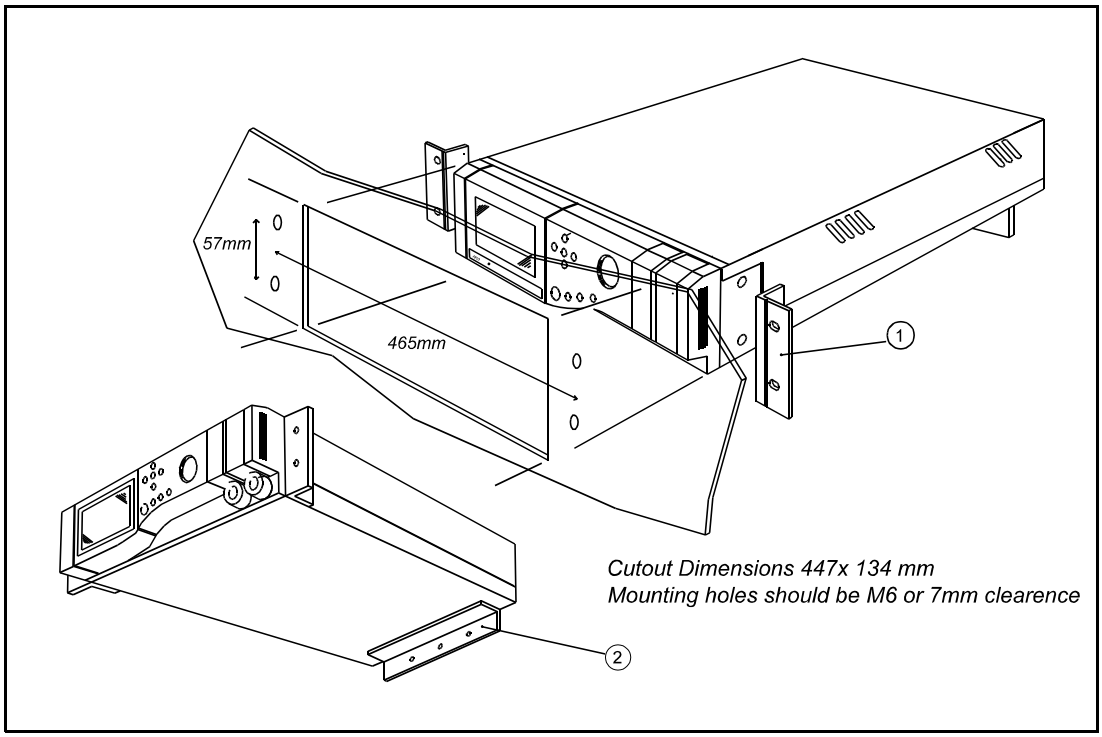


Figure 2.2 Panel mounting detail.

2.4 Rack slide mounting installation

See Figure 2.3 and Table 2.1. The 19" optional rack slide mount version is supplied with a mounting kit which includes either long or short slides and rack mounting brackets. Do not attempt to support or carry the analyser by the rack mount brackets. The analyser is suitable for installation in most standard rack types including Schroff and Rittall

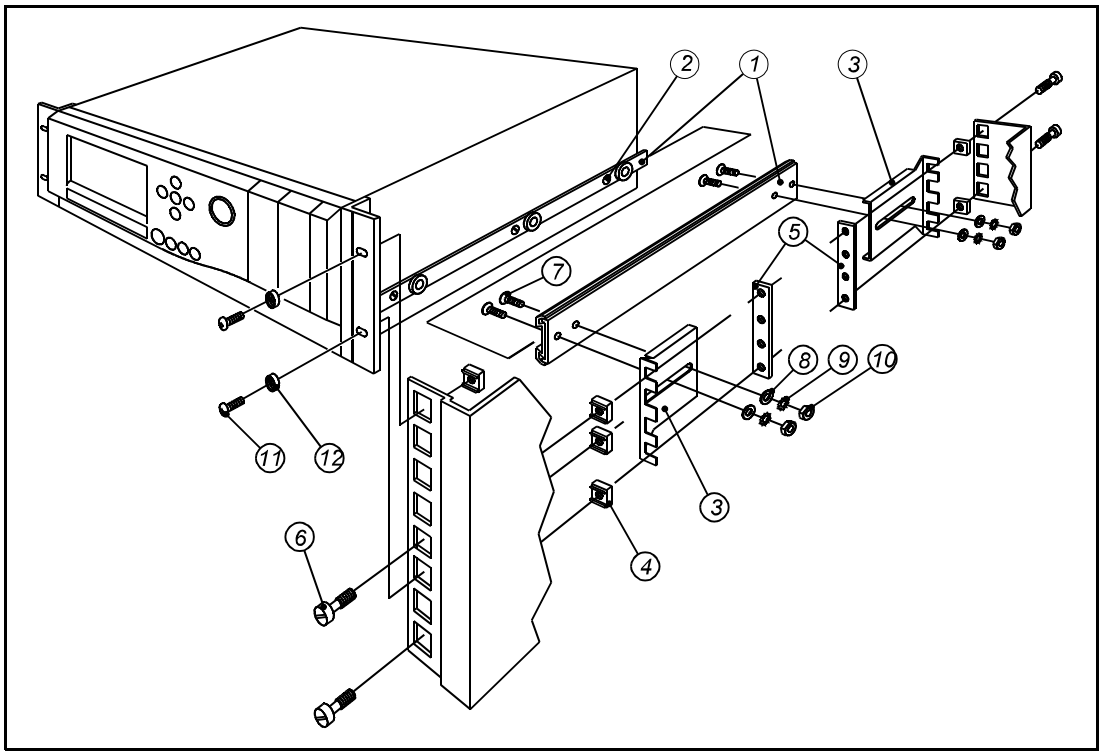


Figure 2.3 Rack installation exploded view

Table 2.1 Rack mount installation kit parts list	
Item	**Description**
1	Telescopic slide, inner and outer
2	Screw M5
3	Slide support bracket
4	Cage nut
5	Slide support clamp
6	Waisted screw, brass, M5
7	Screw, M4
8	Washer, M4
9	Locking washer, M4
10	Nut, M4
11	Screw, chrome plated, cross head, M5
12	Cup washer, plastic

If the instrument has been purchased with the rack mounting option then the rack slide inners will already be mounted on the analyser chassis. If the rack mounting kit has been purchased as a spare then the instructions in this section detail fitting. The rack mounting kit contains two slides (item 1) which have an inner and outer section.

The analyser occupies 3U/5.25"/133 mm of rack space. Determine at what height the analyser is to be installed in the rack enclosure. The analyser will occupy nine rack flange cage nut positions. Note that intermediate cage nut positions need not be punched out.

- Remove the inner section from each slide (item 1) and fix one to each side of the chassis using 3 screws (item 2) for 4902 models or 4 screws (item 2) for 4904 models.
- Counting from the bottom cage nut position, install cage nuts (item 4) in positions 1,3,4 and 8 on front two rack enclosure flanges. Install cage nuts in positions 1 and 4 on rear two rack enclosure flanges.
- Insert the two waisted screws (item 6) fully into front cage nuts, positions 1 and 4, on both front and rear rack enclosure flanges.
- Present the slide support clamp (item 5) behind the rack enclosure front flange, and line up with cage nut positions 1 and 4.
- Engage the two waisted screws (item 6) in the slide support clamp, but do not tighten.
- Fit the slide support (item 3) between the cage nuts (item 4) and the slide support clamp (item 5), note that the front slide supports face backwards and the rear slide supports face forwards.
- Tighten the two waisted screws (item 6) to clamp the slide support (item 3) between the cage nuts (item 4) and the slide support clamp (item 5).
- Loosely fit the two rack slide outer sections (item 1), to the slide supports (item 3) in four places using fixings (items 7,8,9,10). Note that the slide outer section item 1 should be mounted so that the slide inner (item 1)

slides in from the front.

- Position the rack slide outer sections (item 1) so that the front edge is 35 mm behind the rack enclosure front flange. Tighten the fixings (items 7,8,9,10).
- Install the analyser in the rack locating the inner slide section (item 1) inside the outer slide section (item 1).
- Secure the analyser into the rack cabinet using the screws (item 11) and the plastic cup washers (item 12).

2.5 Electrical power connection

WARNINGS

- The installer must be satisfied that the Xentra 4900 installation conforms to the relevant safety requirements, National Electrical Code and any other local regulations, and that the installation is safe for any extremes of conditions which may be experienced in the operating environment of the analyser.
- This appliance must be connected to a protective earth.
- No user serviceable parts inside. Enclosure protects against shock and injury. Refer servicing to qualified personnel.
- To comply with the European Community EMC Directives for industrial environments the interconnecting cables used for the mains supply, relay contact outputs and/or analogue output signals should be screened or provide equivalent protection.

Electrical power is connected to the chassis via an IEC appliance adaptor located on the rear of the chassis.(see Figure 1.1). The ***xentra*** supplied will already be configured for the mains voltage range ordered ('85 to 132V' or '170 to 264V').

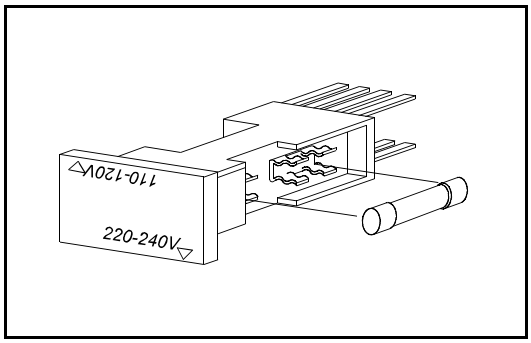


Figure 2.4 Position of F2 in voltage selector for 170V to 264V operation

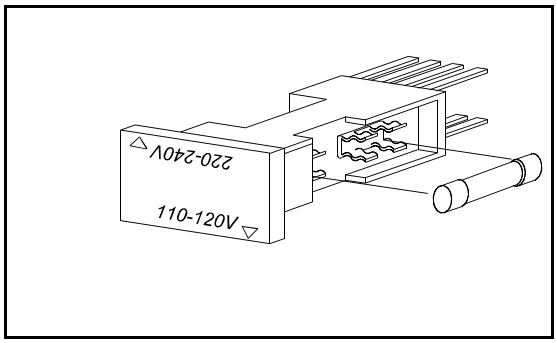


Figure 2.5 Position of F2 in voltage selector for 85V to 132V operation

The voltage setting may be changed as follows. The fuse value must be changed when the voltage setting is changed:-

- Unplug the mains connector (see Figure 1.1)
- Remove the voltage selector, a screwdriver may be used in the slot at the top of the voltage selector to aid ejection.
- Rotate the voltage selector through 180° so that the required voltage is shown at the bottom of the voltage selector.
- Fit fuse F2 to the right hand side of the voltage selector according to the voltage selected. Voltage selector position 220/240V for 170 to 264V

operation fit fuse T3.15A HBC to IEC 127 (Figure 2.4). Voltage selector position 110/120V for 85 to 132 V operation fit fuse T5.0A HBC to IEC 127 (Figure 2.5). If a 20mm fuse is used then ensure that the fuse does not extend into the spring clips provided for a 1 inch fuse (see Figure 2.6).

- Replace the voltage selector and mains connector.

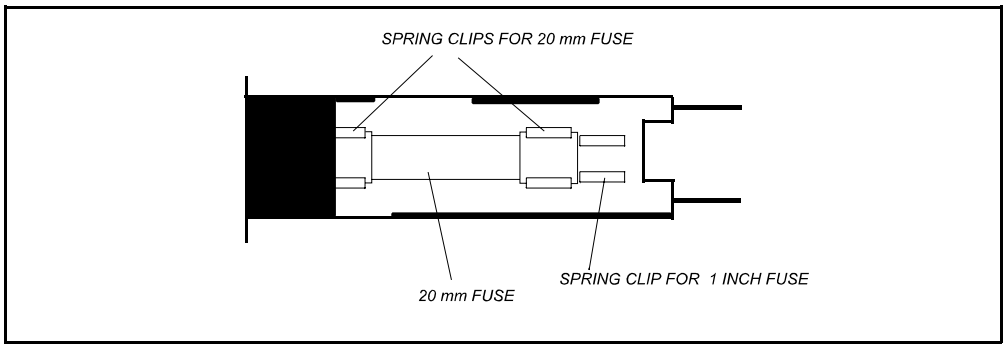


Figure 2.6 Fuse holder spring clips

If a loose IEC socket has been supplied this must be wired in accordance with national and local regulations. The flexible power cord used should be rated as follows:-

Current 6 A
Voltage According to voltage setting

The analyser should be connected to a clean, single phase electrical power supply meeting the requirements of 'Installation category II' (IEC 664, see page 2.1), at a voltage within the range selected. The electrical power supply should be fused at a value to protect the power cord. It is recommended that the electrical power supply is fused at 6A.

For compliance with EMC emissions and susceptibility standards - EN 50081-1 (1992), and EN 50082-2 the EMC ground must always be connected to a local earth (see Figure 1.1).

After wiring the power cord, check earth continuity from the power connection earth to the EMC ground on the rear of the chassis (see Figure 1.1).

The user must ensure that when installed in a rack, cabinet or other fixture, the mains switch is readily accessible or where this is impractical, the installation must be provided with a separate means of disconnecting power which complies with the relevant local and national standards.

2.6 Signal connections

It is recommended that the analyser is switched off while signals are being connected or disconnected. Signal terminals are located on the rear of the analyser and are identified as plugs PL1 to PL5. Two plugs PL1 and PL5 are always fitted, PL2, PL3 and PL4 are present only when the corresponding option cards are fitted.

A loose 14-way socket connector with accessories is provided to make connections to each plug. The plugs and sockets are keyed so that the sockets may only be located in the correct plug position. The loose socket covers have an identification number which corresponds to the mating plug. Ensure that each socket is always fitted with the correct covers. The separate covers on PL1 to PL4 provide segregation between current output and relay wiring. The sockets and cover must always be fitted and secured, even when signals are not required. Figure 2.7 shows the assembly of plugs PL1 to PL4 with segregated covers. The assembly for plug PL5 is similar but with a single 14-way cover provided.

The loose sockets have screw terminal connections. These will accept a flexible conductor which has a cross sectional area in the range 20 AWG to 16 AWG, 0.5 to 1.5 mm^2 or a solid conductor which has a cross sectional area in the range 20 AWG to 14 AWG, 0.5 to 2.5 mm^2. Solid conductors larger than 18 AWG, 1 mm^2 are difficult to dress inside socket covers and are therefore not recommended.

For compliance with EMC standards connections to current outputs must use screened or shielded cable, with either separate screened pairs or two pairs with an overall screen. The screens (or drain wire for foil screens) must be terminated at pin 1 or pin 6 (both if separate screened pairs are used). All signal inputs (plug PL5) must use screened or shielded cables with the screen or drain wire terminated at the functional earth stud (M4) adjacent to PL5.

After wiring the loose sockets, the covers must be re-fitted for safe operation. To avoid straining the screw terminal connections attach the cable sheath to the cover by trimming and folding out the appropriate section of the cover and securing the cable to it using the cable tie provided. Clip the remaining cover sections into place around the cable.

The loose sockets are provided with end blocks and jack screws which must be fitted and used to secure them to the corresponding plug. Do not over tighten screws.

The signal terminals each have a legend indicating their function.

Plugs PL1 to PL4 provide the analogue output and relay output electrical connections. PL1 is provided as standard and contains 3 relay outputs and two analogue outputs. PL2 to PL4 are optional and provide two relay outputs and two analogue outputs each. The connection details for PL1 to PL4 are summarised in Table 2.3.

The option card population may be determined by reading the code number from the label on the under side of the chassis and referring to the technical data sheet included in this manual.

Plug PL5 provides the electrical connections for the analogue inputs, the autocalibrate initiate input and the range change input. The connection details for PL5 are summarised in Table 2.4.

Each analogue input signal consists of an analogue current input (for example pins 1 and 2 on PL5 for analogue input 1) plus a digital status input (for example pins 9 and 10 on PL5 for analogue input 1). The status input defines the validity of the analogue input signal. A high input, or open circuit, on the digital signal indicates that the data is invalid. A low input on the digital signal indicates that the data is valid. Connection in this way ensures that disconnection of the analogue input source or removal of the connector from PL5 will result in an invalid measurement indication. If no suitable status indication is available from the source of the analogue input signal then the status input pin should be shorted to the neighbouring ground pin within the PL5 connector.

NOTE

If the analogue input status signal is not connected then the digital line will be pulled high internally. This indicates that the data is invalid and no reading will be measured.

The external autocalibrate initiate input is located at pins 11 and 12 of connector PL5 (see table 2.4). The autocalibration facility is started by shorting these two pins together or by providing a digital low signal to pin 12. The signal should be applied for a minimum of two seconds.

NOTE

The external autocalibration initiate signal should be applied to pins 11 and 12 of connector PL5 for at least 2 seconds to ensure that the input has been recognised.

The external range change input is located at pins 13 and 14 of connector PL5 (see table 2.4). The second analogue output range for all outputs is obtained by shorting these two pins together or by providing a digital low signal to pin 14.

WARNING

If the external circuits connected to PL1, PL2, PL3 and PL4 are at a voltage exceeding 30 Vrms (42.4 V peak) or 60 V dc the following precautions must be observed to prevent an electric shock hazard:

a) The external circuits connected to PL1, PL2, PL3 and PL4 must not be powered with the connector unplugged.

b) The analyser must be mounted in a rack, enclosure, cabinet or similar fixture and have the external cabling for PL1, PL2, PL3 and PL4 secured as close as practical to the connector. This is to prevent strain on the cable pulling the cover from the socket.

c) Fit covers to loose sockets.

Do not exceed the specified relay rating of 264V rms maximum and 1A maximum.

CAUTION

The current outputs must not be allowed to exceed 30 vrms (42.4vpeak) or 60 volt DC to earth when connected to associated equipment.

NOTE

For reliable operation, relays should switch not less than 10 mA

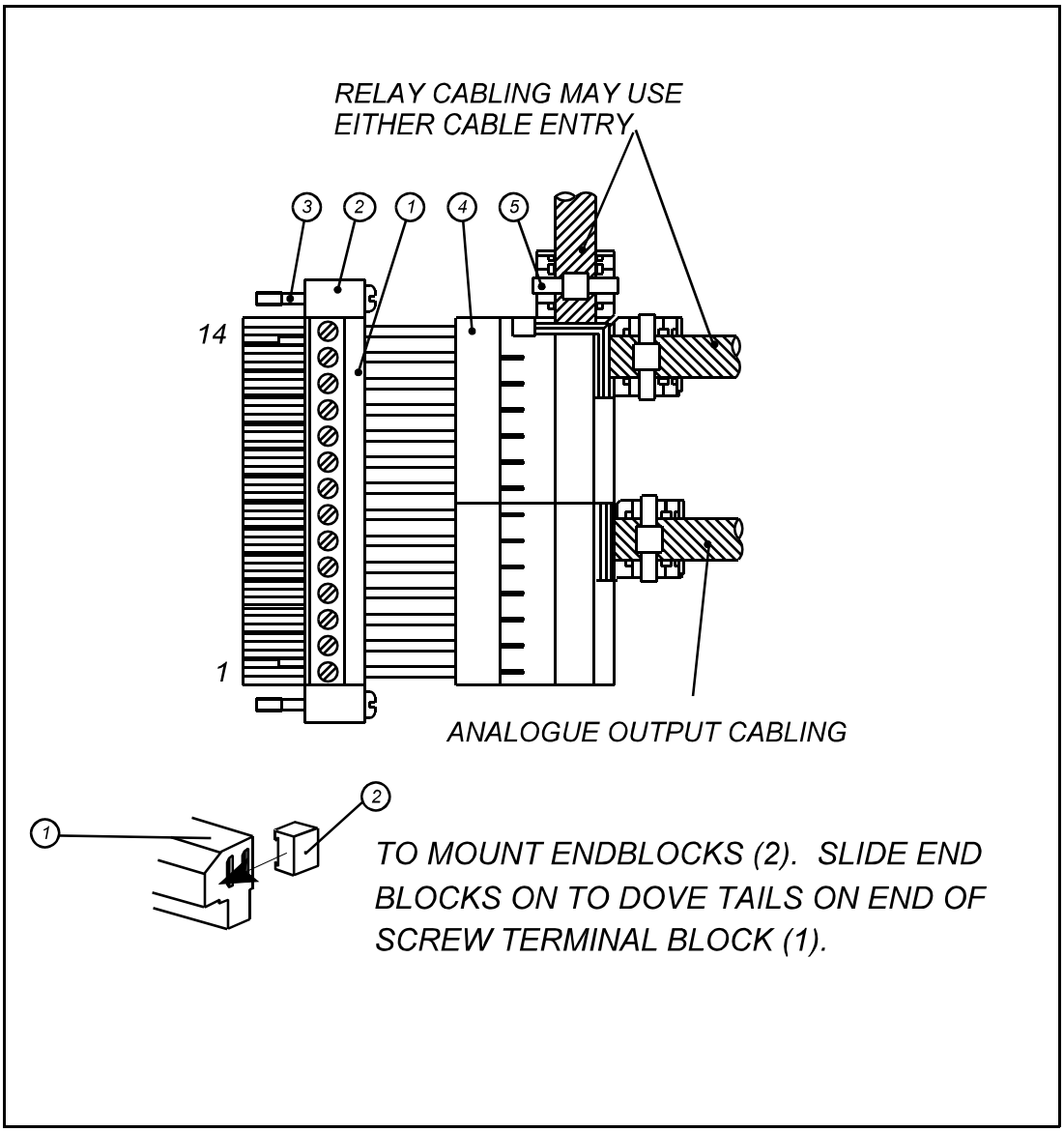


Figure 2.7 Signal socket assembly

Table 2.2 Loose socket parts	
Item	**Description**
1	Screw terminal block
2	End block
3	Jacking screw
4	Cover
5	Cable tie

Table 2.3 Signal terminal location PL1 to PL4					
Terminal number		**PL4 (optional)**	**PL3 (optional)**	**PL2 (optional)**	**PL1**
Top cover	14	screen	screen	screen	screen
	13 12	Not used	Not used	Not used	Relay 1.5 A B
	11 10	Relay 4.4 A B	Relay 3.4 A B	Relay 2.4 A B	Relay 1.4 A B
	9 8	Relay 4.3 A B	Relay 3.3 A B	Relay 2.3 A B	Relay 1.3 A B
Bottom cover	7	screen	screen	screen	screen
	6	screen	screen	screen	screen
	5 4	*mA 4.2 - +	*mA 3.2 - +	*mA 2.2 - +	mA 1.2 - +
	3 2	*mA 4.1 - +	*mA 3.1 - +	*mA 2.1 - +	mA 1.1 - +
	1	screen	screen	screen	screen

* Fitted if option card type is 'Dual relay and dual mA output'.

Table 2.4 Signal terminal location PL5	
Terminal	**Function**
1	Analogue input 1 +ve
2	Analogue input 1 -ve
3	Analogue input 2 +ve
4	Analogue input 2 -ve
5	Not used
6	Not used
7	Analogue input 2 valid
8	0 V
9	Analogue input 1 valid
10	0 V
11	0 V
12	Auto calibration initiate
13	0 V
14	Range change

2.7 Serial output connection

The serial data output is provided via the 9 pin 'D' type connector located on the rear of the instrument (PL6) conforming to the EIA RS-232C interface specification. The connections for the RS232 output are shown in table 2.5. For compliance with EMC standards, connections to PL6 must be made using a screened cable, not exceeding 3 metres in length. The screen is terminated at the EMI shielded 'backshell' or conductive cover, of the 'D' type connector. For unidirectional serial data output only pins 3, 5 and 8 are used. Pin 8 is only used if hardware handshaking using DTR (data terminal ready) is enabled. In DTR mode the instrument will wait until CTS (pin 8) becomes active. At this point an output data set will be transmitted via pin 3. See section 5.9 for details on configuring the serial output port.

Table 2.5 Serial output connections PL6	
Terminal	**Function**
2	Received data (RXD)
3	Transmitted data (TXD)
5	Signal common/ground
7	Request to send (RTS)
8	Clear to send (CTS)

2.8 External autocalibration connection

For analysers configured with the external autocalibration option, an additional output connector, PL 8, is fitted into the sample gland plate (see figure 2.10). This connector supplies two pairs of relay contacts which may be used to control external valves. These relay contacts are rated at 1.0 A, 264 V AC and 1.0 A, 30 V DC (non-inductive). Screened cable should be used to connect to solenoid valves of length not exceeding 3m with the screen terminated at the instrument end. It will be necessary to fit a suppression device across the coils of the solenoid valves. For DC supplies a diode is recommended. For AC supplies a 0.047uF capacitor in series with a 100Ω resistor would generally be found satisfactory.

Table 2.6 contains the connector pin out details. Table 2.7 contains the truth table showing the relay contact conditions for sample gas, calibration gas 1 and calibration gas 2.

Table 2.6 External autocalibration connections

Terminal	Function
1	Ground.
2	Relay contacts for valve 1. Sample / Calibration selection.
3	
4	Not Used
5	Relay contacts for valve 2. Cal. Gas 1 / Cal. Gas 2 selection.
6	
7	Ground.

Table 2.7 External autocalibration truth table

Gas Required	Relay Contacts for Valve 1	Relay Contacts for Valve 2
Sample gas	OPEN	OPEN
Calibration gas 1	CLOSED	OPEN
Calibration gas 2	CLOSED	CLOSED

2.9 Sample stream connection

WARNING

- **Verify that connections are leak free at full operating pressure before applying sample or calibration gases. These gases may be toxic or asphyxiant.**
- **Consideration should be given to the toxicity and asphyxiant nature of the sample gas when selecting a vent location.**

The ***xentra*** 4900 is supplied with the internal transducers configured on either one or two sample streams. Sample and calibration gases pass into and out of the chassis via a gland plate mounted on the rear of the chassis. This gland plate will be provided in one of the three following versions.

- No autocalibration.
- Internal autocalibration valve manifold.
- External autocalibration manifold.

The sample gland plate without auto calibration (See Figure 2.8) provides up to four sample inlets and a corresponding outlet for each inlet.

When optional internal auto calibration solenoid valves are used a valve manifold is mounted in the sample gland plate (See Figure 2.9). This provides ports for sample inlet and outlet, and inlets for two calibration gases. The internal autocalibration manifold is only used with the single gas stream configuration.

When the external autocalibration option is used then an interface PCB and connector (PL 8) are mounted on the sample gland plate (See Figure 2.10). This provides ports for up to two sample inlets and a corresponding outlet for each inlet. The electrical connector provides for two sets of voltage free relay contacts that may be used to operate external sample valves. Connection details for the external electrical contacts are given in section 2.8. The external autocalibration option is available for both the single and dual sample stream configurations.

Sample gas connections are shown in Table 2.8.

Table 2.8 Sample ports

	Inlet	Outlet	Cal. Gas 1	Cal. Gas 2
Standard	⅛" NPT female	¼" NPT female	N/A	N/A
With internal Auto Calibration	⅛" NPT female	¼" NPT female	⅛" NPT female	⅛" NPT female

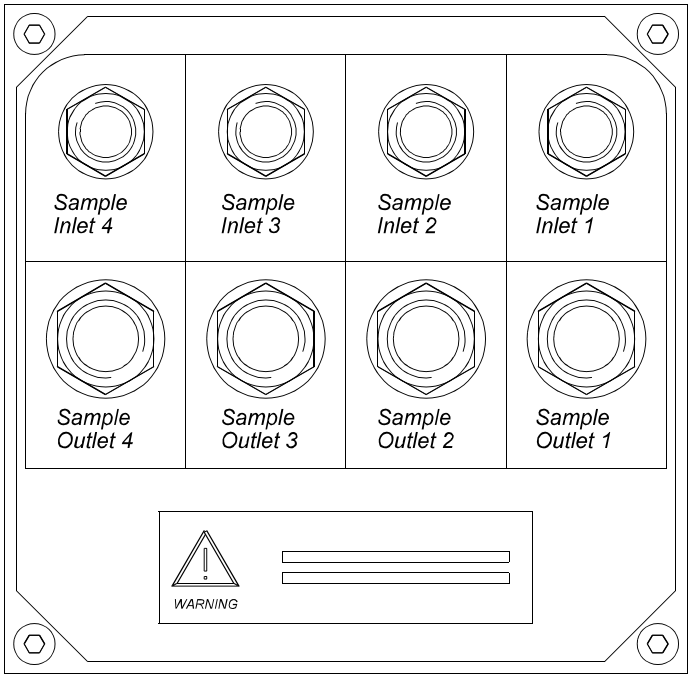


Figure 2.8 Sample gland plate without auto calibration

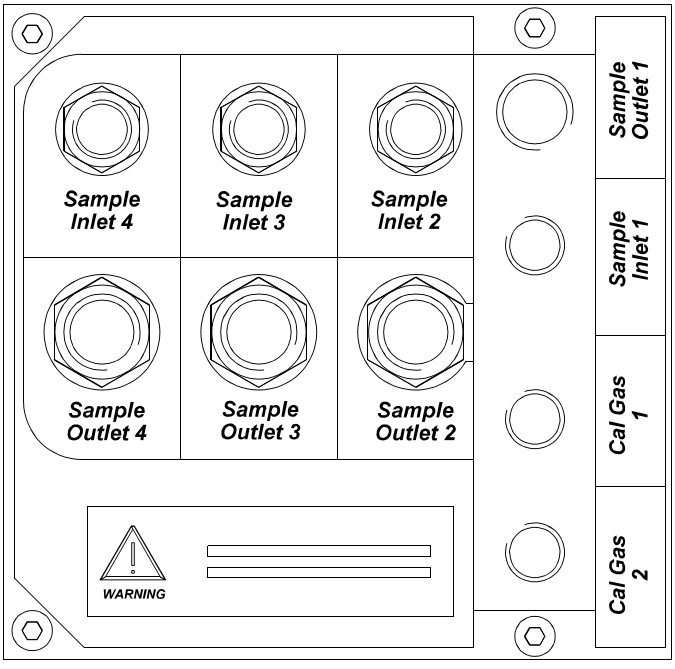


Figure 2.9 Sample gland plate with internal auto calibration

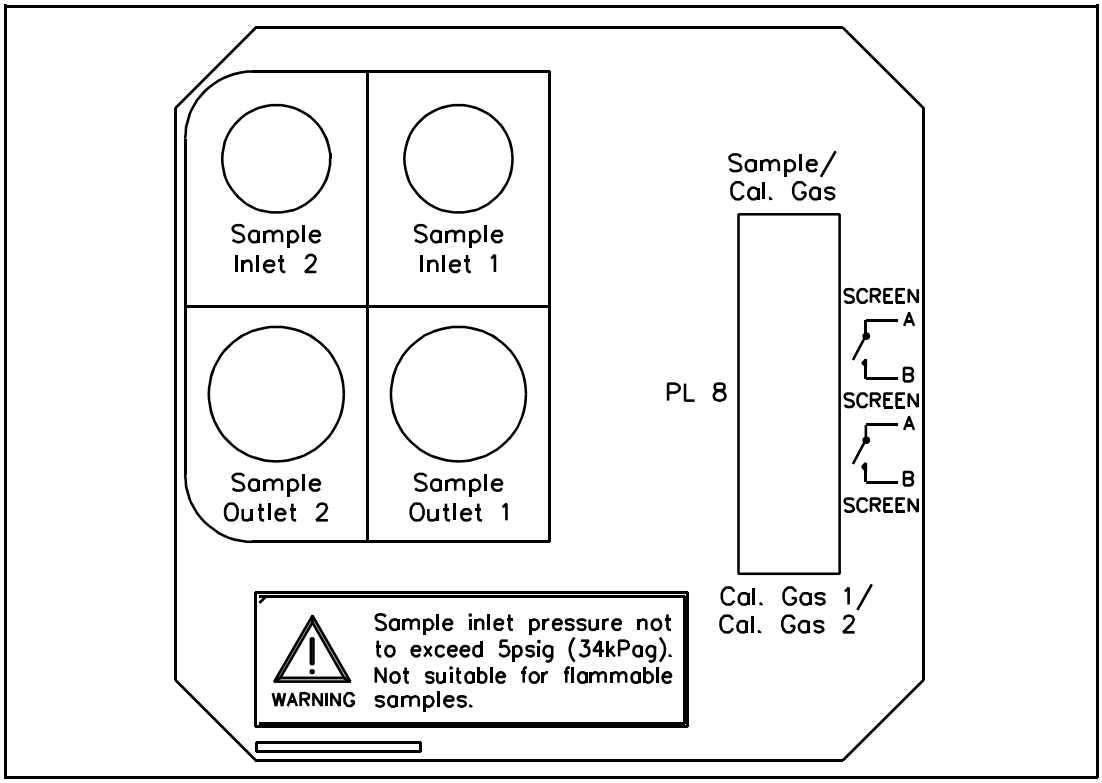


Figure 2.10 Sample gland plate with external auto calibration

Single gas stream configuration

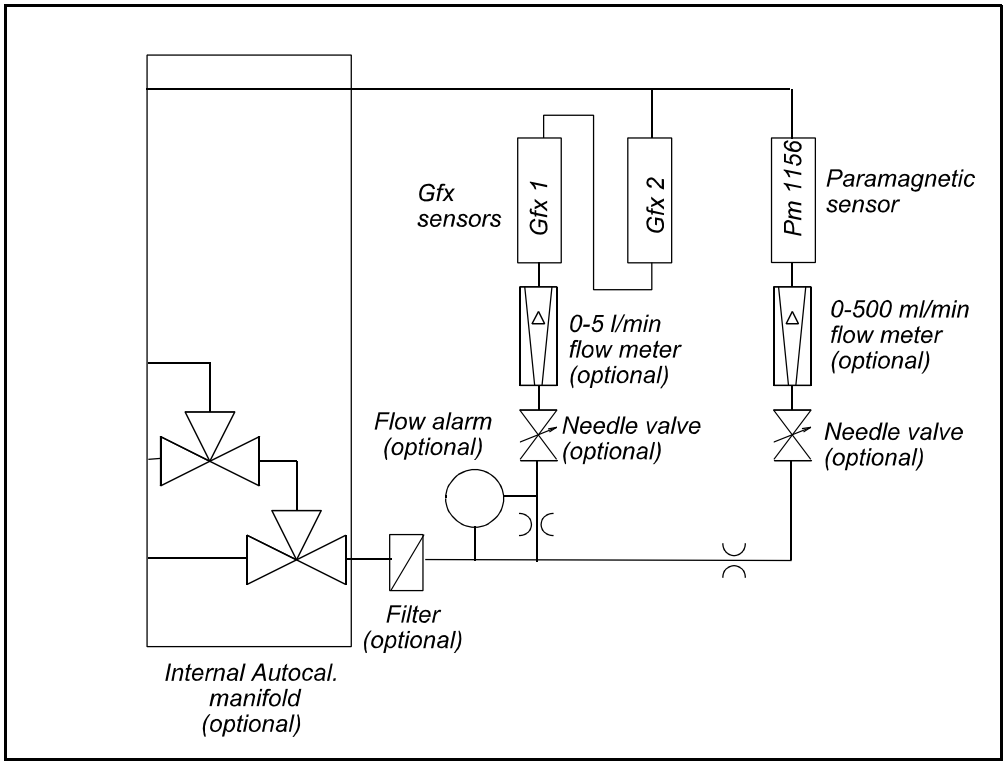


Figure 2.11 Typical single stream, dual Gfx configuration

Figure 2.11 contains a typical flow diagram for single stream configuration analysers. Here up to three transducers are connected to a common inlet and outlet port. If two Gfx transducers are supplied then these will be connected in series so that the sample

gas passes through the first transducer then passes into the second transducer. The paramagnetic transducer is connected in parallel with the Gfx transducers.

An orifice restrictor is connected in series with the paramagnetic transducer to limit the sample flow rate through the transducer. This restrictor will produce approximately 250 ml/min flow through the paramagnetic transducer for an inlet pressure of 5 psig.

A number of optional sampling components are available with the single stream configuration analyser. These include needle valves to regulate the flow through the Gfx transducers. The flow through the Gfx transducers should not exceed 2.0 l/min. If the optional needle valves are not used then external provision to limit the sample flow to 2.0 l/min should be provided.

The single stream analyser configuration may be used with either internal or external calibration valves.

Dual gas stream configuration

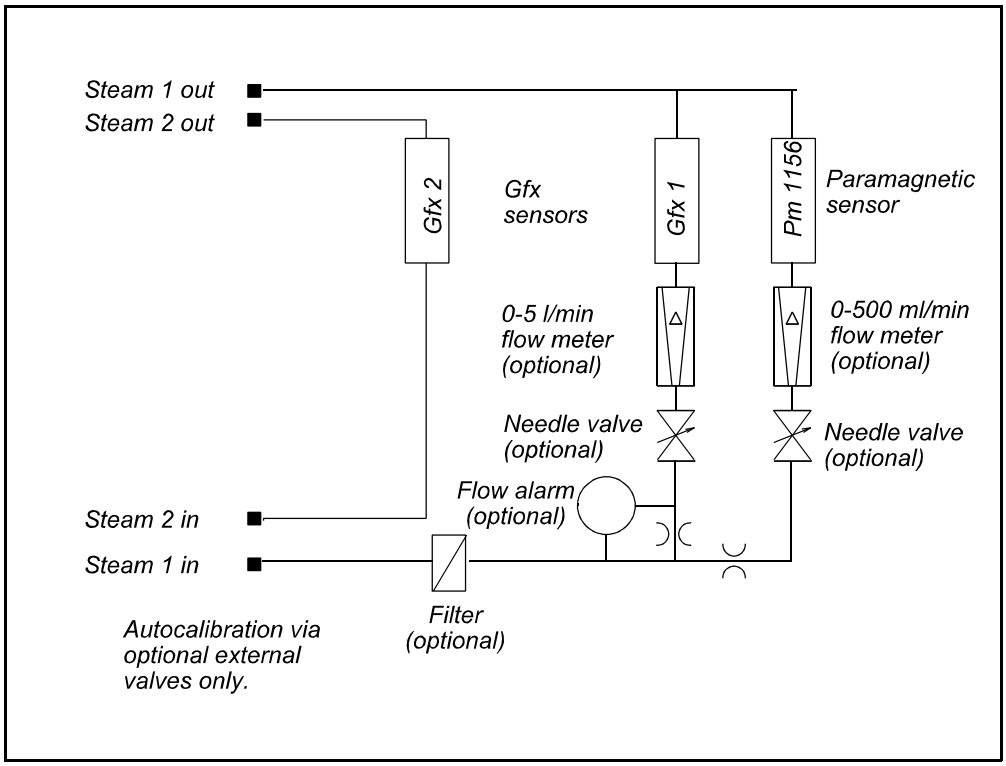


Figure 2.12 Typical dual stream, dual Gfx configuration

Figure 2.12 contains a typical flow diagram for dual stream configuration analysers. The dual stream configuration is only used in the 4904 analyser when two Gfx transducers are fitted. Here the two Gfx transducers are connected to two separate sample streams with different inlets and outlets. If a paramagnetic transducer is supplied then this will be connected in parallel with the first Gfx transducer.

An orifice restrictor is connected in series with the paramagnetic transducer to limit the sample flow rate through the transducer. This restrictor will produce approximately 250 ml/min flow through the paramagnetic transducer for an inlet pressure of 5 psig.

A number of optional sampling components are available with the dual stream

configuration analyser. These include needle valves to regulate the flow through the Gfx transducer. The flow through the Gfx transducer should not exceed 2.0 l/min. Where the optional needle valves are not used then external provision to limit the sample flow to 2.0 l/min should be provided.

The dual stream analyser configuration may only be used with external calibration valves. It is not possible to use the optional internal calibration manifold in this configuration.

2.10 Sample gas condition

WARNING

- **Verify that connections are leak free at full operating pressure before applying sample or calibration gases. These gases may be toxic or asphyxiant.**
- **Consideration should be given to the toxicity and asphyxiant nature of the sample gas when selecting a vent location.**

Table 2.9 Sample gas conditions

Sample pressure	1-5 psig / 7 - 34 kPag. Externally regulated to provide correct transducer flow rate.	
Temperature	Up to 60 °C	
Conditions	Oil free, non-corrosive, non-condensing	
Flow rate	Paramagnetic transducer	50-250 ml/min
	Gfx transducer	500-1500 ml/min
Particulates	Filtered to remove particles exceeding 1 µm	
Dew point	5 °C / 9 °F below lowest ambient temperature	

CAUTION

Do not exceed the rated flow or pressure as transducer damage may result! This is especially important for paramagnetic transducers!

NOTE

For best performance the flow, or pressure, supplied to the analyser should be kept at a constant value for both normal sampling and for calibration gas input.

2.11 Calibration gas sample connection

If your analyser has the optional internal auto calibration solenoids then the appropriate calibration gases must be connected to the instrument at the appropriate ports on the manifold. If no auto calibration manifold is fitted or the external autocalibration option is used then the calibration gases should be connected to the sample gas port by external means. These should be delivered to the ***xentra*** at the same pressure and flow rate as the sample gas.

WARNING

Internal autocal is unsuitable for use with toxic samples.

If toxic samples are present, the maximum pressure to the analyser must be limited to 5 psig by means of a suitable release system.

Two calibration mixtures are required to perform the low and high calibrations of the transducers fitted. The analyser software may be configured to specify which of the two gases should be used as low gas for each transducer. The other will then be the high gas for that transducer. It is possible for the low calibration gas mixture of some transducers to function as the high calibration gas for other transducers and *vice versa*.

The gas mixtures recommended for calibration of the instrument will depend on the gas components measured by the transducers fitted to the gas stream and the measurement ranges of the transducers. The recommended gases are limited by the long term storage stability of the components of the mixture. Certain gas mixtures should be avoided as these will not be stable with time. For example gas mixtures containing O_2, N_2 and NO are not stable and should not be used.

Table 2.10 shows gas components recommended in the two gas mixtures needed. Table 2.11 shows the recommended concentration of the gas components in the mixture. For example, the recommended gas mixtures for a ***xentra*** 4900 analyser fitted with a paramagnetic transducer, NO Gfx transducer and standard sensitivity CO transducer would be as follows:-

Calibration gas 1

CO	200 vpm
Air	Balance

Calibration gas 2

NO	100 vpm
N_2	Balance

Table 2.10 Recommended calibration gases		
Gas Components Measured	Calibration gas 1	Calibration gas 2
CO only or $CO+O_2$	"zero grade" N_2^*	CO in air gas mix
NO only or $NO+O_2$	NO in N_2 gas mix	Air
SO_2 only or SO_2+O_2	"zero grade" N_2^*	SO_2 in air gas mix
CO+NO or $CO+NO+O_2$	NO in N_2 gas mix	CO in air gas mix
$CO+SO_2$ or $CO+SO_2+O_2$	"zero grade" N_2^*	CO, SO_2 in air gas mix
$NO+SO_2$ or $NO+SO_2+O_2$	NO in N_2 gas mix	SO_2 in air gas mix

* Zero grade nitrogen is 99.998% purity with total impurities not exceeding 20 vpm.

Table 2.11 Recommended component concentrations	
Gas Measured	Recommended calibration level
Paramagnetic O_2	21%
Gfx High sensitivity CO (0-50 to 0-500 vpm)	50 vpm
Gfx Standard sensitivity CO (0-200 to 0-3000 vpm)	200 vpm
Gfx NO (0-100 to 0-500 vpm)	100 vpm
Gfx High sensitivity SO_2 (0-100 to 0-500 vpm)	100 vpm
Gfx Standard sensitivity SO_2	500 vpm

The accuracy of the calibration materials used with the analyser is an important contribution to the quality of the data measured. Servomex recommend that the ***xentra*** 4900 Continuous Emissions Analyser be calibrated using certified gravimetric gas mixtures from a reputable supplier. These should be accompanied by a compositional analysis certificate of certified accuracy . Pressure regulators used with the calibration gas mixtures should be good quality two stage regulators compatible with the gas composition. The calibration gas supply pressure will be in the range 1-5 psig. The pressure regulators should provide a stable delivery pressure of 0-10 psig (0-1 bar) at a standard flow rate of up to 2l/minute.

WARNING

The sample and calibration gases supplied to the instrument may be toxic. Verify that connections are leak free at full operating pressure before proceeding to admit toxic gases.

2.12 Reading flowmeters

The optional flow monitors are provided to control and measure the flow of sample gas through the analyser. The flow monitor consists of a needle valve and a rotameter type flowmeter. The reading of the flow rate through the flowmeter is obtained by observing the scale indication at the top of the float.

2.13 Power up

The ***xentra*** may now be powered up. A message sequence will be displayed, eg:

SYSTEM OK

xentra 4900
REV 4900/652/XX

MODEL 4902B1 0302
2100 24101 00011

SERIAL NO XXXX
ORDER NO XXXXXX

MEASURING

The measurement display should now appear. If the display is unclear then the display viewing angle may be adjusted using a small cross-point screwdriver. See Figure 1.1 for location of the viewing angle adjustment potentiometer, this is accessed from the bottom of the front fascia.

SECTION 3 INITIAL CONFIGURATION

3.1 Setting passwords

The ***xentra*** has two passwords, the operator's password gives access to CALIBRATE, while the supervisor's password gives access to EDIT, SETUP and CALIBRATE. The ***xentra*** is delivered with both of the passwords set to 4000. The passwords may be changed to any four digit number. To change the passwords follow the procedure in Table 3.1.

Table 3.1 Changing the passwords

☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ to move the cursor to SETUP (cursor position shown in reverse video). ☞ ENTER to choose SETUP.
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ to move the cursor to DISPLAY ☞ ▸ to move the cursor to UTILITY ☞ ENTER to choose UTILITY
ENTER PASSWORD 0000	Both user and supervisor passwords are factory set to 4000. The cursor will be on digit furthest to the left initially. ☞ ▲ ▲ ▲ ▲ to increment the first digit to 4. The display should now be showing 4000. ☞ ENTER to enter the password
UTILITY 1 UTILITY 2	☞ ENTER to choose UTILITY 1
CLOCK/NEW PASS COMMS/WINDOW	☞ ▸ to move the cursor to NEW PASS ☞ ENTER to choose NEW PASS
SUPERVISOR OPERATOR	To change supervisor password: ☞ ENTER to choose SUPERVISOR. To change operator password: ☞ ▾ to move the cursor to OPERATOR ☞ ENTER to choose OPERATOR.
NEW OPERATOR (NEW SUPERVISOR) PASS = 0000	Enter new password. To change the value of a digit ☞ ▲ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
NEW PASS IS ???? ACCEPT YES/NO	To accept the new password ☞ ENTER To reject the new password ☞ ▸ ENTER
SUPERVISOR OPERATOR	To return to measurement display ☞ MEASURE

3.2 Setting time and date

The time, date and date format (Day/Month/Year or Month/Day/Year) may be set by following the procedure in Table 3.2. History log entries will have an incorrect time and date stamp prior to setting the clock time and date. The time and date must be set correctly before setting up auto calibration. The time and date are retained for at least two days while the analyser is switched off, the configuration and all calibrations are retained indefinitely.

Table 3.2 Setting time and date

☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ▸ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
UTILITY 1 UTILITY 2	☞ ENTER
CLOCK/NEW PASS COMMS/WINDOW	☞ ENTER
TIME = 12:54 DATE = 10/12/95	Example of temporary display.
CHANGE DATE,TIME YES/NO	☞ ENTER
SET CLOCK SET YEAR 0000	To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
SET MONTH 00	"
SET DAY 00	"
SET HOUR 00	"
SET MINUTE 00	"
SELECT FORMAT DDMMYY/MMDDYY	To select Day/Month/Year format ☞ ENTER To select Month/Day/Year format ☞ ▸ ENTER
TIME = 12:57 DATE = 10/12/95	Example of temporary display.
CLOCK/NEW PASS COMMS/WINDOW	To return to measurement display ☞ MEASURE

SECTION 4 CALIBRATION

4.1 Introduction to calibration

The calibration of the analyser may be checked or adjusted. Either of these activities will result in an entry in the calibration history log.

Calibration may be manual or automatic. In manual calibration the operator is guided through the required sequence of steps by messages on the ***xentra*** screen. Each gas sensor module must be calibrated separately and each type has its own user interface as detailed later.

When the optional external autocalibration or internal autocalibration manifold are fitted, a manual calibration adjustment or calibration check will use the autocalibration valves to select the calibration sample gases as required. It is important to note that different calibration gases may be used to LOW and HIGH calibrate each transducer. Also the gas used to LOW calibrate one transducer may be used to HIGH calibrate another. The calibration gas (CAL1 or CAL2) that is to be used as LOW and HIGH calibration for each transducer is set up in the autocalibration parameters set up menu. The procedure for setting the gases to be used as LOW and HIGH calibration is given in section 4.9 (see also table 4.7).

If the analyser is still warming-up (as indicated by the warming-up icon) and a calibration is attempted, a warning message will be given with an option to proceed. The warming up icon indicates that at least one of the fitted gas sensor modules is still warming up. The transducer that the user may wish to calibrate may, of course, already be at its operating temperature and be capable of calibration even though the warming up icon is still displayed. The warming-up icon will normally have cleared within 1 hour. The warming-up icon clears when all gas sensor modules are within temperature band. For optimum performance, a further period of time should be allowed for the gas sensor modules to reach final temperature before performing calibration. This may take up to 6 hours.

Alternatively, calibration checking and calibration adjustment may be performed automatically provided that either the internal or external auto calibration options are fitted. The auto calibration options appear in the user interface menus only when the relevant hardware is fitted. When an automatic calibration is performed then all of the gas sensor modules selected will be calibrated simultaneously.

The auto calibration process can be initiated in three ways: by an internal timer; by an external contact closure; or by operator request through the user interface. Details of each are given in sections 4.10 to 4.12. If any one of these events occurs while the auto calibration cycle is in progress the request will be ignored. Touching the keypad during auto calibration will initiate the abort sequence (section 4.13).

The instrument will only respond to a request for auto calibration from the internal timer or external input if there are no faults indicated. Auto calibration can be initiated from the user interface when there is a fault condition.

If auto calibration or auto check is to be disabled see section 4.11 ’Disabling auto calibration’.

4.2 Recommended calibration check periods

It is recommended that the calibration of gas sensor modules is checked at the periods shown in Table 4.1 and recalibration performed if required.

Table 4.1 Recommended calibration periods

Gas sensor module	Low calibration	High calibration
Gfx sensor	weekly	monthly
Paramagnetic sensor	weekly	monthly

4.3 Setting low and high calibration tolerances

A limit may be placed on the amount by which a calibration operation may change the stored calibration parameters. This limit is called the low or high calibration tolerance. If the calibration tolerance limit is exceeded during auto calibration then the auto calibration will be aborted and a fault will be indicated. If the calibration tolerance limit is exceeded during manual calibration a warning will be given with an option to proceed. See Table 4.2 for information on setting these tolerances. The calibration tolerance values are expressed in terms of the full scale deflection (FSD) of the transducer (see section 1.8).

Table 4.2 Setting low and high calibration tolerances	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ▸ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
UTILITY 1 UTILITY 2	☞ ▾ ENTER
UTILITY 2 I1 Oxygen % ↑	To select desired gas sensor module ☞ ▴ or ▾ then ☞ ENTER, if only one module is fitted this section will be omitted.
LOW & HIGH TOL	☞ ENTER
I1 Oxygen LO TOL 00.00 % OF FSD	Enter the required low calibration tolerance.* Any digit position may be used for the decimal point. To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
I1 Oxygen HI TOL 00.00 % OF FSD	Enter the required high cal tolerance.* Any digit position may be used for the decimal point. To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
LOW & HIGH TOL	☞ MEASURE to return to measurement display.

* The tolerance must not be greater than 10% FSD, if an illegal figure is entered a prompt to enter a new number will be given.

4.4 Paramagnetic transducer low and high manual calibration

The low calibration gas for paramagnetic gas sensor modules may be specified between -3% and +3% oxygen. This is to allow for the situation where the background gas affects the paramagnetic zero (Appendix D). Zero grade nitrogen is recommended for low calibration. See Section 2.11 for further discussion of recommended calibration gases.

The high calibration gas can be in the range 5 to 100% oxygen. For the Pm1156 transducer a high calibration gas with approximately 21% oxygen is recommended. Care should be taken when measuring gases with an oxygen content greater than the high calibration gas.

The procedure for performing a paramagnetic low and high manual calibration is given in table 4.3.

Table 4.3 Paramagnetic low and high calibration	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
CALIBRATE I1 Oxygen % ↑	To select desired gas sensor module ☞ ▲ or ▼ then ☞ ENTER, if only one module is fitted this section will be omitted.
LOW CAL/HIGH CAL HISTORY/CHK L&H	☞ ENTER (*)
I1 LOW TARGET Oxygen 000.00%	Change the number to the concentration of oxygen in the calibration gas (between -3 and +3%), for equivalent oxygen values of gases see appendix D. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
LT00.00 LC00.04 I1 Oxygen OK? Y/N	LT is the target concentration. LC is the current concentration eg. Introduce low cal gas, when the current concentration has stabilised it may be accepted (**) ☞ ENTER or rejected ☞ ► ENTER.
LOW CAL IN PROGRESS	Temporary message.
CAL RESULT LT 00.00 LC 00.00	The reading following calibration is displayed for 1 minute (***). ☞ QUIT to obtain next menu.
LOW CAL/HIGH CAL HISTORY/CHK L&H	The low point cal is now complete, either ☞ MEASURE to go to measurement display or ☞ ENTER to repeat the low point calibration ☞ ► ENTER to continue with a high point calibration (*)
I1 HIGH TARGET OXYGEN= 20.95 %	Change the number to the concentration of oxygen in the calibration gas (between 5% and 100%). To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER

HT20.95 HC20.74 I1 Oxygen OK? Y/N	HT is the target concentration. HC is the current concentration eg. Introduce high cal gas, when the current concentration has stabilised it may be accepted (**) ☞ ENTER or rejected ☞ ▸ ENTER.
HIGH CAL IN PROGRESS	Temporary message.
CAL RESULT HT20.95 HC20.95	The reading following calibration is displayed for 1 minute (***). This completes the calibration, to return to the measurement display ☞ MEASURE, to repeat the calibration ☞ QUIT.

* If the gas sensor module is warming-up a warning will be given with an option to proceed.

** If the calibration has changed by more than user set limit a warning will be given with an option to proceed.

*** If the calibration was not successful a temporary message will be displayed eg 'BAD LOW CAL , CAL IGNORED'. This indicates that the output of the gas sensor module is outside of the expected range for the calibration gas being used. In this event check the value of the calibration gases used. If the calibration is still not successful call a service engineer.

4.5 Gfx gas transducer low and high manual calibration

The low calibration gas for Gfx gas sensor modules may be specified between -5vpm and +5vpm of the measured component. Zero grade nitrogen is recommended for low calibration.

The high calibration gas can be in the range 6 to 110% of the transducer's FSD. Table 2.11 gives the recommended calibration levels to be used to calibrate the transducers. The procedure for performing a Gfx low and high manual calibration is given in table 4.4. The tables use the CO transducer as an example. The measured component displayed on the ***xentra*** screen will be the component measured by the transducer being calibrated.

Table 4.4 Gfx sensor low and high calibration	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
CALIBRATE I1 CO vpm ↑	To select desired gas sensor module ☞ ▲ or ▼ then ☞ ENTER. If only one module is fitted this section will be omitted.
LOW CAL/HIGH CAL HISTORY/CHK L&H	☞ ENTER (*)
I1 LOW TARGET CO 000.00vpm	Change the number to the concentration of CO in the calibration gas. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
LT00.00 LC00.04 I1 CO OK? Y/N	LT is the target concentration. LC is the current concentration eg. Introduce low cal gas, when the current concentration has stabilised it may be accepted (**) ☞ ENTER or rejected ☞ ► ENTER.
LOW CAL IN PROGRESS	Temporary message.
CAL RESULT LT 00.00 LC 00.00	The reading following calibration is displayed for 1 minute (***). ☞ QUIT to obtain next menu.
LOW CAL/HIGH CAL HISTORY/CHK L&H	The low point cal is now complete, either ☞ MEASURE to go to measurement display or ☞ ENTER to repeat the low point calibration ☞ ► ENTER to continue with a high point calibration (*)

I1 HIGH TARGET CO = 50.8 vpm	Change the number to the concentration of the target gas in the calibration gas. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
HT50.8 HC49.8 I1 CO OK? Y/N	HT is the target concentration. HC is the current concentration eg. Introduce high cal gas, when the current concentration has stabilised it may be accepted (**) ☞ ENTER or rejected ☞ ► ENTER.
HIGH CAL IN PROGRESS	Temporary message.
CAL RESULT HT50.8 HC50.8	The reading following calibration is displayed for 1 minute (***). This completes the calibration, to return to the measurement display ☞ MEASURE, to repeat the calibration ☞ QUIT.

* If the gas sensor module is warming-up a warning will be given with an option to proceed.

** If the calibration has changed by more than user set limit a warning will be given with an option to proceed.

*** If the calibration was not successful a temporary message will be displayed eg 'BAD LOW CAL , CAL IGNORED'. This indicates that the output of the gas sensor module is outside of the expected range for the calibration gas being used. In this event check the value of the calibration gases used. If the calibration is still not successful call a service engineer.

4.6 Manual cal check low and high

Both low and high calibration checks should be performed using the same samples as used for calibration adjustment. The programme assumes that the target gas is that specified for manual calibration. See Table 4.5 for low calibration check procedure and Table 4.6 for high calibration check procedure. The procedure uses the paramagnetic oxygen sensor as an example. The procedure is identical for the other gas sensors only the component name and measurement units change.

Table 4.5 Low cal check	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
CALIBRATE I1 Oxygen % ↑	To select desired gas sensor module ☞ ▲ or ▼ then ☞ ENTER, if only one module is fitted this section will be omitted.
LOW /HIGH HISTORY/CHK L&H	☞ ▼ ► ENTER (*)
CHECK LOW CHECK HIGH	☞ ENTER
I4 Oxygen CHK L CONC = 0.5%	Introduce low cal gas, when the reading has stabilised ☞ MEASURE to return to the measurement display and stamp the calibration check results in the history buffer

Table 4.6 High cal check	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
CALIBRATE I1 Oxygen % ↑	To select desired gas sensor module ☞ ▲ or ▼ then ☞ ENTER, if only one module is fitted this section will be omitted.
LOW /HIGH HISTORY/CHK L&H	☞ ▼ ► ENTER (*)
CHECK LOW CHECK HIGH	☞ ▼ ENTER
I4 Oxygen CHK H CONC = %	Introduce high cal gas, when the reading has stabilised ☞ MEASURE to return to the measurement display and stamp the calibration check results in the history buffer

4.7 Auto calibration overview

As implied by the name, the auto calibration facility allows the instrument's calibration to be updated or checked without user intervention. The auto calibration software function is only available if an autocalibration hardware option is fitted to the instrument.

Autocalibration facilities are offered to either measure or check the following:-

- Transducer low calibration ('zero' calibration).
- Transducer low and high calibration (both 'zero' and 'span').

In auto calibration two user defined gases (cal gas 1 and cal gas 2) are provided to the instrument. These gases may be either for low or high calibration of the transducers. In some cases the same gas may be used for low calibration of one transducer while being the high calibration of another. The gases are introduced to the analyser in three phases:-

Phase 1	cal gas 1
Phase 2	cal gas 2
Phase 3	cal gas 1 again.

All of the transducers connected will be autocalibrated simultaneously but the specific zero or span calculations may occur during different phases.

The following stages define the autocalibration process. The numbers refer to the stage indications as shown in figure 4.1. This figure shows the transducer response of a typical transducer during the auto calibration process. In figure 4.1 the first calibration gas (cal gas 1) is used to measure the transducer zero response and the second calibration gas (cal gas 2) the span response.

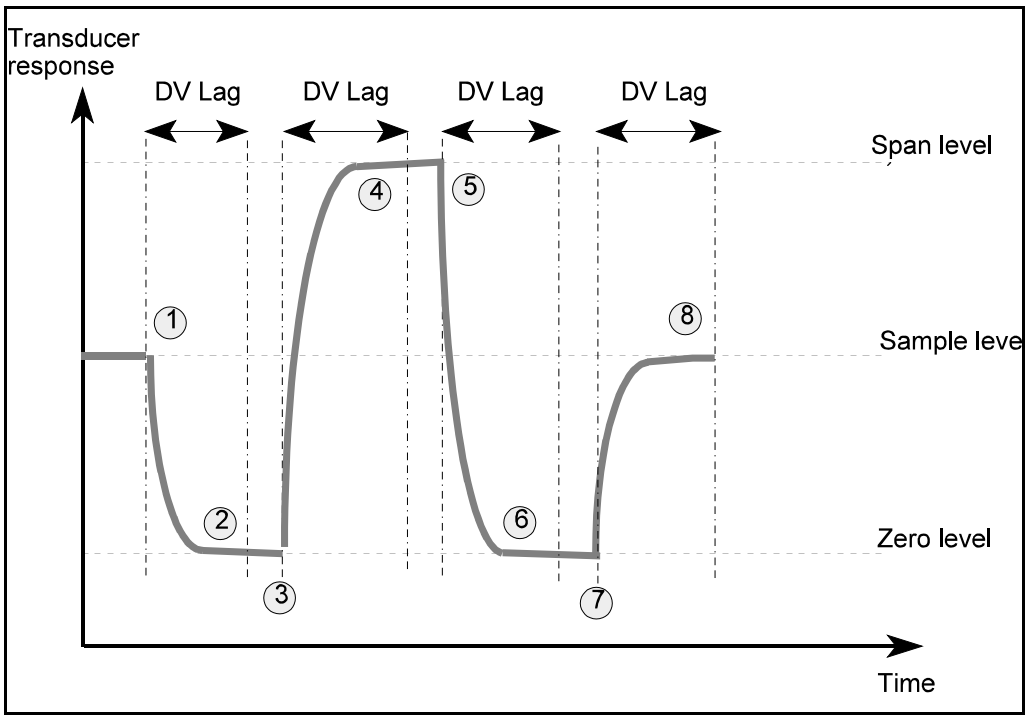


Figure 4.1 Typical autocalibration sequence

1 The automatic calibration procedure is started by either user keyboard input, triggered by the instrument internal clock or via external contact closure. At this point the "Calibration in Progress" output signal is turned on.
The first calibration gas is applied and the instrument then waits for the user specified DV lag. This is the time for the transducer response to settle to its stable value.

2 At the end of the DV lag period the response of the transducer is measured and a zero correction calculated. A new value for the correction is stored and applied to the output immediately which may result in a change. The instrument waits for one minute in this state to provide a visible chart-recorder trace of the new output. In addition, the magnitude of the change is stored in the low calibration history log.

3 The second calibration gas is applied to the transducer and the instrument waits for the user specified DV lag.

4 At the end of the DV lag period the response of the transducer is measured and a span correction calculated. A new value for the correction is stored and applied to the output immediately which may result in a change. The instrument waits for one minute in this state to provide a visible chart-recorder trace of the new output. In addition, the magnitude of the change is stored in the high calibration history log.

5 The first calibration gas is re-applied to the transducer and the instrument waits for the DV lag.

6 No action is taken at this point for the type of transducer in this example since both its zero and span calculations have completed.

7 The sample gas is re-admitted to the transducer and the instrument waits for the user specified DV lag.

8 Upon completion of this final DV lag period the "Calibration in Progress" output signal is turned off. The instrument is now returned to normal operation.

If auto check had been selected, values of correction parameters would not have been calculated at points 2 and 4 in the cycle. Instead, differences between the transducer reading at these points and the specified test gas would be recorded in the corresponding calibration history log.

For a transducer where calibration gas 1 is the span gas and calibration gas 2 is the zero gas then the zero calculation occurs at point 4 and the span calculation at point 6 in the cycle.

NOTE

If an out of calibration tolerance fault is generated during the autocalibration procedure then this may only be removed by performing a subsequent successful (ie in limits) auto calibration.

4.8 Monitoring the progress of auto calibration

When the autocalibration facility is initiated an icon appears at the bottom of the screen. Progress of the autocalibration cycle can be monitored through each of the phases described in section 4.8 from the appearance of the icon. Figure 4.2 shows the different icon shapes that indicate the progress of the calibration.

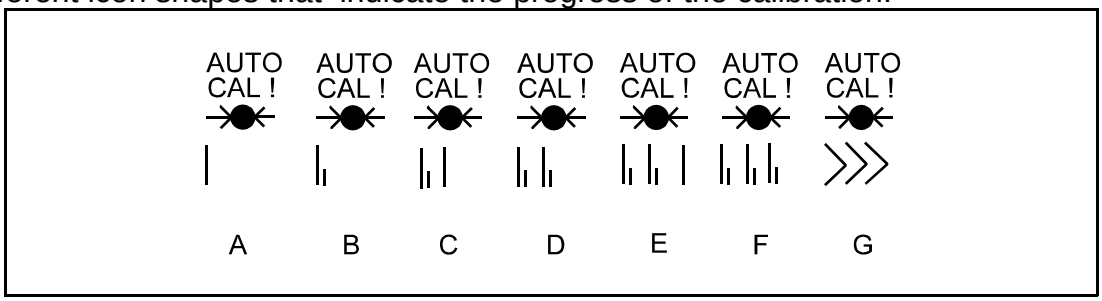


Figure 4.2 Screen icons indicating autocalibration progress

The phase of autocalibration represented by each icon is as follows (the numbers refer to the events in Fig. 4.1):-

A First calibration gas flushing: DV lag between 1 and 2;
B Measuring first calibration gas: period between 2 and 3;
C Second calibration gas flushing: DV lag between 3 and 4;
D Measuring second calibration gas: period between 4 and 5;
E First calibration gas flushing again: DV lag between 5 and 6;
F Re-measuring first calibration gas: period between 6 and 7;
G Sample gas flushing: DV lag between 7 and 8.

4.9 Auto calibration and auto check setup

The time and date must be correctly set before setting up auto calibration or auto check (see 3.2 'Setting time and date'). This will prevent unexpected behaviour due to incorrect clock set up. The following calibration parameters must be set up when auto calibration or auto check is to be used:-

- 'Low' or 'low and high' autocalibration/checks
- Low sample concentration for each process variable
- High sample concentration for each process variable
- Auto calibration or auto check
- Auto calibration period ie. time between auto calibrations/checks
- Date and time of first autocal - note that a time already past will disable timed autocals
- Dead volume (DV) lag

Refer to Table 4.7 for the procedures required to set these values.

The DV lag may be set between 0.5 and 8 minutes in steps of 0.5 minutes. After the DV lag each calibration gas will flow for a further minute. This is to allow the new level to be recorded on a chart recorder.

The autocalibration sequence will calibrate all transducers fitted. It is important to note that different gas bottles may be used for low and high calibration of each transducer. All calibration concentration values are set and displayed in the primary unit for the transducer regardless of the units used for the display.

Table 4.7 Setting up auto calibration and auto check	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ▼ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
SET UP CAL PARM ONE CYCLE	☞ENTER
SELECT AUTO CAL LOW/LOW & HIGH	☞ ENTER to select low only ☞ ► ENTER to select low and high
I1 CO LOW= 00000 %	Change the number to the concentration of the low gas. The unit of measure will be the primary unit for the transducer. Any digit position may be used for the decimal point. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
I1 CO HIGH=00000 %	As per low conc entry above. This display will only appear if 'LOW & HIGH' has been selected.
I1 CO IS LOW CAL1? Y/N	This selects the calibration gas bottle to be used for low calibration. ☞ ENTER If CAL1 is low cal gas ☞ ► ENTER If CAL2 is low cal gas The previous 3 steps will be repeated for each transducer fitted.
SELECT MODE AUTO CAL/CHK	To select cal ☞ ENTER To select check ☞ ► ENTER
SET DV LAG 0.5 Min ↑	☞ ▲ or ▼ to obtain the required time for flushing of sample system with calibration gas (8 minutes max).
ENTER PERIOD DAYS 00	Change the number as required. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
ENTER PERIOD HOURS 00	As per period entry above.
TIME 12:07:16 DATE 10/11/95	* Temporary display of current time and date.
ENTER START TIME YEAR 0000	As per period entry above.
ENTER START TIME MONTH 00	As per period entry above.
ENTER START TIME DAY 00	As per period entry above.

ENTER START TIME HOUR 00	As per period entry above.
ENTER START TIME MINUTE 00	As per period entry above.
TIME 12:00:00 DATE 10/12/95	Temporary display of start time and date. This must be later than the current time and date.
SET UP CAL PARM ONE CYCLE	☞ ▼ ENTER to perform an auto cal or check ☞ MEASURE to return to measurement display

Note

* The autocalibration parameters can be changed without changing the autocalibration timing already installed by pressing the "Quit" key at the beginning of the start date entry section.

4.10 Initiating auto calibration or auto check from keypad

An auto calibration or auto check may be initiated from the keypad by following the procedure in Table 4.8.

Table 4.8 Initiating auto cal or check from keypad

☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ▼ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
SET UP CAL PARM ONE CYCLE	☞ ▼ ENTER

4.11 Initiating auto calibration or auto check by external contact closure

An auto calibration or auto check may be initiated by closing a switch between PL5/11 and PL5/12. The switch must be closed for at least 2 seconds to guarantee operation and opened before the calibration is complete.

4.12 Aborting an auto calibration in progress

Aborting an autocalibration is accomplished by pressing any key during the autocalibration process. The procedure is shown in table 4.9.

Table 4.9 Aborting auto cal or auto check	
☞ ANY KEY to obtain the following screen	
AUTO CAL IN PROG TERMINATE YES/NO	☞ ENTER to abort the auto cal or auto check ☞ ▸ ENTER to continue auto cal or auto check

On aborting the auto calibration or auto check then a post flush with sample gas will be performed with the relevant icon (G in figure 4.1) displayed on the measurement screen. If it is required to abort the post flush then the procedure given in table 4.9 may be repeated.

NOTE

Once an autocalibration abort is activated, the only way to avoid the abort is to use the ☞ ▸ ENTER sequence. Hitting any other key (including the QUIT key) whilst in the abort screen will only act to initiate a post flush.

Using the QUIT key will not cancel an autocalibration abort.

4.13 Disabling auto calibration and autocheck

To disable auto calibration or auto check it is necessary to:-

i) Set PERIOD DAYS = 0 and PERIOD HOURS = 0
ii) QUIT without entering a start time

See Table 4.7 setting up auto calibration and auto check for the procedure.

NOTE

If a start time that has already passed is set this will also disable the internal timer.

4.14 Restarting auto calibration or auto check after disabling

To re-enable auto calibration or auto check it is necessary to:-

i) Set PERIOD to a non zero time (either hours or days).
ii) Enter a valid start time. Here 'valid' means later than the current time/date.

See Table 4.7 setting up auto calibration and auto check for the procedure.

4.15 Scaling (calibration) of the external analogue inputs

The external analogue inputs are scaled via the MANUAL CAL menu entry. The mechanism for scaling of the inputs is to specify the variable value that corresponds to the minimum analogue input (0 or 4mA) and the maximum analogue input (20mA). The instrument then applies a linear scaling to input signals between these limits. The user also defines if the analogue input is true zero (0-20mA) or live zero (4-20mA). The variable value specified for the maximum analogue input value (20mA) must be a positive number and must be greater than the variable value specified for the minimum analogue input (0 or 4 mA). The procedure for definition of the analogue input scaling is given in table 4.10.

Table 4.10 External analogue input scaling

☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTOCAL	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
CALIBRATE E1 Extern mA ↑↓	Use ☞ ▲ or ▼ until selected analogue input is displayed then ☞ ENTER.
SCALE INPUT	☞ ENTER
E1 MINIMUM INPUT TRUE 0/LIVE 0	☞ ◄ or ► to select desired choice then ☞ ENTER
E1 MINIMUM 0mA= 000.00 mA Extern	Change the number to the variable value that corresponds to the minimum analogue input. Any digit position may be used for the decimal point except the right most digit. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
E1 MAXIMUM 20mA= 000.00 mA Extern	Change the number to the variable value that corresponds to the maximum analogue input. Any digit position may be used for the decimal point except the right most digit. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
SCALE INPUT	To set up the other input ☞ QUIT and select MANUAL CAL from the menu.

SECTION 5 MAIN CONFIGURATION

5.1 Alarms

The ***xentra*** has four user configurable concentration software alarm settings for each gas sensor module fitted. These are referred to as AL1, AL2, AL3 and AL4. Each alarm may be enabled or disabled. On first power up of the instrument the default state of the alarms is that they are disabled. For each alarm of each gas sensor module which is enabled, the following parameters need to be set up:-

i) Freeze alarm state during calibration or alarm as dictated by calibration sample concentration.
ii) High concentration alarm or low concentration alarm.
iii) The concentration level at which the alarm is to occur (alarm level).
iv) Hysteresis (see below).

See Table 5.1 for procedure.

The alarm hysteresis is used to set a dead band so that the alarm does not 'chatter' when the sample concentration level is similar to the alarm level.

For a high alarm, the alarm will be initiated when the sample concentration rises above the alarm level. The alarm will be cleared when the sample concentration falls further below the alarm level than the value of hysteresis set. ie the hysteresis band sits directly below the alarm level

For a low alarm the alarm will be initiated when the sample concentration falls below the alarm level and will be cleared when the sample concentration rises further above the alarm level than the value of hysteresis set. ie the hysteresis band sits directly above the alarm level

The alarm hysteresis level is specified in terms of the full scale deflection (FSD) for the transducer concerned. The FSD values for the transducers fitted within the ***xentra*** 4900 are given in section 1.8. The maximum value of hysteresis is 5% of the FSD.

Allocation of the alarms to a relay is covered in 5.2 'Allocation of relays'.

Table 5.1 Setting up alarms	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
SELECT MEASURE I1 Oxygen % ↑	☞ ▲ or ▼ to select required measurement. When selected ☞ ENTER
I1 Oxygen SELECT AL1/2/3/4	☞ ▸ to select required alarm. When selected ☞ ENTER.
I1 Oxygen AL1 ENABLE/DISABLE	To enable alarm ☞ ENTER. To disable alarm ☞ ▸ ENTER.
I1 Oxygen AL1 FREEZE/FOLLOW	To freeze this alarm state during calibration ☞ ENTER. To allow this alarm state to change during calibration ☞ ▸ ENTER
I1 Oxygen AL1 HIGH/LOW ALARM	To alarm when the sample concentration is greater than the alarm level ☞ ENTER To alarm when the sample concentration is less than the alarm level ☞ ▸ ENTER
I1 Oxygen AL1 LO LEVEL = 00.000%	Change the number to the required alarm level. Any digit position may be used for the decimal point. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
I1 Oxygen AL1 LO HYST =00.000%FSD	Change the number to the required hysteresis. Any digit position may be used for the decimal point. To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
I1 Oxygen SELECT AL1/2/3/4	☞ ▸ to select required alarm. Repeat procedure for the remaining alarms for this gas sensor module. When all alarms have been set for a gas sensor module ☞ QUIT to select another gas sensor module. When all alarms have been set up ☞ MEASURE to return to measurement display.

5.2 Allocation of relays

Each relay is set up by selecting the conditions under which it is to operate. Each relay may be set up to respond to any combination of the following :-

i) Fault
ii) Calibration in progress
iii) Any number of alarms

See Table 5.2 for procedure.

Any existing relay allocation may be edited or cleared. See Table 5.3 for relay assignment clearing procedure.

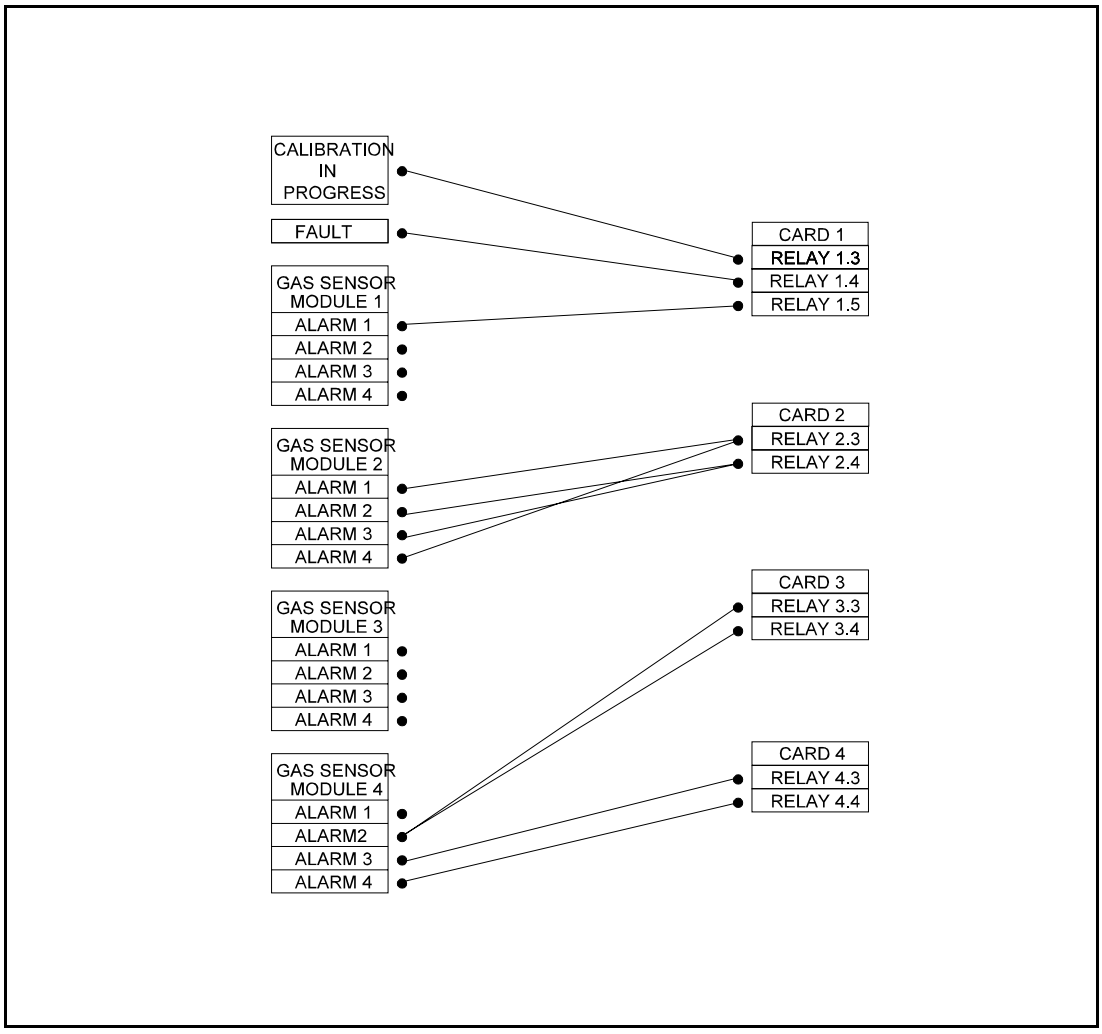


Figure 5.1 Allocation of relays

Figure 5.1 illustrates the allocation of relays to analyser conditions. Any condition (individual alarm, fault or calibration in progress) may 'tied' to any relay or number of relays ie any number of links may be made between the analyser conditions on the left hand side and the relays on the right hand side.

Table 5.2 Allocation of relays	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▸ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
RELAYS ANALOGUE	☞ ENTER
SELECT RELAY 1.3 ASSIGNED ↑ or 1.3 UNASSIGNED↑	The ASSIGNED and UNASSIGNED informs the user if the relay has been previously assigned. ☞ ▲ or ▼ to select the required relay then ☞ ENTER
RELAY ASSIGNMENT 1.3 EDIT/CLEAR or 1.3 ASSIGN? Y/N	EDIT or CLEAR an existing relay assignment or ASSIGN a new one. To change to selection ☞ ◂ or ▸. When correct selection is highlighted then ☞ ENTER.
1.3I1 Oxygen AL1 HI 10.000 % Y/N or 1.3 CAL IN PROG YES/NO or 1.3 FAULT YES/NO	The display will now show a series of items which may be selected to operate the relay being configured. ☞ ◂ ENTER to allocate the item to the relay. ☞ ENTER to move to the next item. If the item being offered for selection is an alarm the alarm setpoint will be displayed, an H or L will also be displayed indicating wether it is configured to be a High or Low alarm.
SELECT RELAY 1.3 ASSIGNED ↑ or 1.3 UNASSIGNED↑	☞ ▲ or ▼ to select another relay then ☞ ENTER or ☞ MEASURE to return to measurement display

Table 5.3 Clearing of relay assignment	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▸ ENTER
RELAYS ANALOGUE	☞ ENTER
SELECT RELAY 1.3 ASSIGNED ↑ or 1.3 UNASSIGNED↑	☞ ▲ or ▼ to select the required relay (must already be ASSIGNED) then ☞ ENTER
RELAY ASSIGNMENT 1.3 EDIT/CLEAR	☞ ▸ ENTER to clear the assignment.
SELECT RELAY 1.3 UNASSIGNED↑	☞ MEASURE to return to measurement display.

5.3 Analogue outputs

The ***xentra*** has between two and eight analogue outputs depending on the number of option cards fitted. Each analogue output has two ranges, referred to as R1 and R2. Range R1 is the default range, if range R2 is to be selected using the external contact facility then both ranges need to be set up. Both ranges for an analogue output may be set to the same value so that switching between R1 and R2 has no effect.

The analogue output assignments have the facility for full zero suppression and range expansion. This is user specified by defining the concentration values that represent the minimum and maximum analogue output value. The difference between these maximum and minimum concentrations is known as the span of the analogue output. The minimum and maximum span of the analogue outputs is subject to limits that are dependent on the transducer to which the output is assigned. Each transducer has a minimum and maximum span. The maximum value for the span is scaled to the transducer full scale deflection (FSD) concentration value (FSD see section 1.8). It is set to 2 times the transducer FSD value. There are no enforced limits to the minimum output span. The minimum Recommended limits are based on 100 times the normal transducer noise level. When set to the minimum Recommended span the output noise level will be 1% of the maximum analogue output value. The user is free to set output span values that are below this Recommended minimum but the consequence will be a higher noise level on the output trace. The limits on the analogue output span value are shown in table 5.4.

Table 5.4 Analogue output span limits		
Transducer	Minimum Recommended analogue output span	Maximum analogue output span
Pm 1156 O_2	0.5% O_2	200% O_2
Gfx Standard CO	200 vpm CO	6000 vpm CO
Gfx High Sensitivity CO	50 vpm CO	1000 vpm CO
Gfx NO	100 vpm NO	2000 vpm NO
Gfx Standard SO_2	500 vpm SO_2	5000 vpm SO_2

Each analogue output may be assigned to any gas sensor module.

For each range of each analogue output used the following parameters need to be set up:-

i) Gas sensor module to which analogue output is to be assigned
ii) Range to which analogue output is to correspond.
iii) True or live zero (ie 0 to 20 mA or 4 to 20 mA).
iv) Freeze analogue output during calibration or follow calibration sample concentration.

See Table 5.5 for procedure.

The existing parameters for an analogue output may be edited or cleared. See Table 5.6 for analogue output clearing procedure.

Table 5.5 Setting up analogue outputs	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▸ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
RELAYS ANALOGUE	☞ ▼ ENTER
SELECT ANALOGUE 1.1 ASSIGNED ↑ or 1.1 UNASSIGNED ↑	☞ ▲ or ▼ to select the required analogue output then ☞ ENTER. The message ASSIGNED indicates that this output has been assigned previously.
ANALOGUE ASSIGN 1.1 EDIT/CLEAR or 1.1 ASSIGN ? Y/N	☞ ENTER. The message ASSIGN appears if the output selected has not previously been assigned otherwise the message EDIT appears.
SELECT MEASURE I1 Oxygen % ↑	☞ ▲ or ▼ to select the measurement to be output then ☞ ENTER
1.1 I1 Oxygen R1 L=000.00U=100.00	Change the numbers L (Lower) and U (Upper) to the to the lower and upper sample concentration levels to which the analogue output is to correspond. Note that negative values may be entered and that the decimal point may be moved. Any digit position may be used for the decimal point. To change the value of a digit ☞ ▲ or ▼ To change to another digit or number ☞ ◂ or ▸ When both values are correct ☞ ENTER
1.1 I1 Oxygen R1 TRUE 0/LIVE 0	To select 0 to 20 mA ☞ ENTER To select 4 to 20 mA ☞ ▸ ENTER
1.1 I1 Oxygen R1 FREEZE/FOLLOW	To hold analogue output during calibration ☞ ENTER To allow analogue output to vary with calibration sample concentration ☞ ▸ ENTER
1.1 I1 Oxygen R2 L=00.00 U=100.00	Repeat the process for range R2

SELECT ANALOGUE 1.1 ASSIGNED ↑ or SELECT ANALOGUE 1.1 UNASSIGNED ↑	☞ ▲ or ▼ to select another output then ☞ ENTER or ☞ MEASURE to return to measurement display

Table 5.6 Clearing an analogue output assignment	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▸ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
RELAYS ANALOGUE	☞ ▼ ENTER
SELECT ANALOGUE 1.1 ASSIGNED ↑	☞ ▲ or ▼ to select the required previously assigned output analogue output then ☞ ENTER.
ANALOGUE ASSIGN 1.1 EDIT/CLEAR	☞ ▸ ENTER to clear the assignment.
SELECT ANALOGUE 1.1 UNASSIGNED ↑	☞ MEASURE to return to measurement display.

5.4 Component name definition

The component name of each measurement the ***xentra*** makes will already have been defined. This may be changed to any name up to six characters in length. See Table 5.7 for procedure. The characters which may be used are listed in appendix C.

The default character is '|' which is used to indicate the maximum number of characters allowed. If fewer than the maximum number of characters is ENTERed the first '|' is taken to be the last character.

The measurement display unit and component name are displayed right justified in fields of three and six characters, respectively. To left justify or centralise them the appropriate number of spaces can be added at either end of the string.

Table 5.7 Component name definition

☞ EDIT to obtain window edit menu	
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ ► ENTER
SELECT UDEF I1 Oxygen % ↕	☞ ▲ or ▼ to select the required gas sensor module then ☞ ENTER
I1 COMPONENT | | | | | |	This entry determines the measurement name displayed, this is factory set to a relevant gas measurement name. Any combination of up to 6 characters may be used eg 'STRM 1'. The character set available is listed in appendix C. To change a character ☞ ▲ or ▼ To change to another character ☞ ◄ or ► When the name is correct ☞ ENTER. Note any character after the '|' symbol is ignored.
I1 ENG UNIT | | |	This entry determines the label which follows the measurement value, it does not affect the units used to display the measurement value. It is factory set to % or vpm. Changing this label does not affect the value displayed. Change characters as above.
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ MEASURE to return to measurement display.

5.5 External analogue input configuration

The naming and configuration of external analogue inputs is treated identically to internal process variables. Two external analogue inputs are provided on the instrument. The process variables associated with these inputs are identified as E1 and E2 (the internal transducer process variables are I1 to I4). The name and engineering units for these variables are modified using the UDEF menu entry.

The procedure for configuring the external inputs is given in table 5.8. Definition of the input scaling (calibration) of the external analogue inputs is accomplished via the MANUAL CAL menu (see section 4.16).

Table 5.8 External analogue input definition

☞ EDIT to obtain window edit menu	
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ ► ENTER
SELECT UDEF E1 ||||| mA ↕	☞ ▲ or ▼ to select the required external analogue inputs (E1 or E2) then ☞ ENTER
E1 COMPONENT | | | | | |	This entry determines the measurement name displayed. Any combination of up to 6 characters may be used eg 'STRM 1'. The character set available is listed in appendix C. To change a character ☞ ▲ or ▼ To change to another character ☞ ◄ or ► When the name is correct ☞ ENTER. Note any character after the '|' symbol is ignored.
E1 ENG UNIT | | |	This entry determines the label which follows the measurement value. It is factory set to mA. Changing this label does not affect the value displayed. Change characters as above.
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ MEASURE to return to measurement display.

5.6 Defining and selecting measurement displays

Up to five measurement display screens may be defined. Each screen definition may have up to four measurements. These screen definitions must then be selected. The selected screen definitions may then be scrolled manually by pressing MEASURE or scrolled automatically every ten seconds. See Table 5.9 for setting up procedure.

Table 5.9 Defining and selecting measurement displays	
☞ EDIT to obtain window edit menu	
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
SELECT SCRN/UDEF DEFINE SCRN/VARS	To define screens ☞ ▼ ENTER
DEFINE SCREEN NUMBER : 1	☞ ▲ or ▼ to select the required screen number ☞ ENTER
SELECT 1ST UDEF I1 O2 % ↕	☞ ▲ or ▼ to select the required gas sensor module ☞ ENTER
MORE UDEFS? YES/NO	☞ ENTER to add more measurements to this screen definition or ☞ ► ENTER to select another screen for definition When all required screen definitions have been entered ☞ ► ENTER QUIT ENTER to obtain select screens menu.
SELECT SCRN/UDEF DEFINE SCRN/VARS	To select screens ☞ ENTER
SELECT ORDER 1ST SCREEN IS : 1	☞ ▲ or ▼ to select first screen to be displayed ☞ ENTER
MORE SCREENS? YES/NO	☞ ENTER to select more screen definitions ☞ ► ENTER if no further screens are required.
AUTOSCROLL ? YES/NO	☞ ENTER to select auto-scrolling ☞ ► ENTER to select manual scrolling
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ MEASURE to return to measurement display.

5.7 Display resolution

The number of decimal places displayed for each measurement may be selected between 0 to 3 digits. The transducer display resolution will be factory configured with a relevant number of decimal places. See table 5.10 for the procedure for changing the display resolution.

5.8 Response time

The response time may be increased by adding a LC type time constant which may be set between 0 and 60 seconds. The display reading is not effected by the time constant when the unit is in calibration mode. See table 5.10 for the procedure for changing the response time.

5.9 Display units

This option allows the user to select the units that will be used for each measurement display. Each transducer type has a primary unit set, used for calibration purposes, which may be assigned a user defined units description. For the Pm1156 transducer this is % and for the Gfx 1210 transducers this is vpm. In addition, the Gfx 1210 transducers outputs can alternatively be displayed in units of mg per cubic metre. See table 5.10 for the procedure for changing the display units type.

Table 5.10 Setting response time and resolution

☞ EDIT to obtain window edit menu	
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number shown is correct ☞ ENTER
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ ▼ ► ENTER
SELECT MEASURE I1 Oxygen % ↑	To select desired gas sensor module ☞ ▲ or ▼ then ☞ ENTER, if only one module is fitted this section will be omitted.
I1 Oxygen % DECI PTS=0/1/2/3	☞ ◄ or ► to select the number of decimal points to be displayed then ☞ENTER
I1 Oxygen % TIME CONST = 00	The time constant may be set between 0 and 60 seconds. The displayed reading and analogue output are both affected. . To change a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the number is correct ☞ ENTER
I1 Oxygen % DISPLAY IN % ↕	☞ ▲ or ▼ to select the physical units for the displayed value then ☞ENTER
SELECT SCRN/UDEF DEFINE SCRN/VARS	☞ ▼ ENTER to set response time and resolution on another gas sensor module ☞ MEASURE to return to measurement display

5.10 Calculation of total nitrogen oxides (NO_x) concentration

For analysers fitted with the Gfx 1210 transducer option for measuring nitric oxide (NO) the facility exists within the analyser software to calculate an estimate of the total nitrogen oxides (NOx) level, based on the measured NO level. This estimate of total NOx concentration can also be displayed, and output, as a separate measurement in the normal way.

The total NOx estimate is derived from the measured NO concentration according to the formula:

$$[NOx] = a * [NO] + b * [NO]^2$$

where a = a linear term
b = a quadratic term

The use of both linear and quadratic coefficients provides the opportunity to accommodate a non-linear relationship between NO concentration and estimated NOx measurement.

In most simple combustion processes it is generally recognised that the NO concentration accounts for approximately 95% of the total NOx. In this case the total NOx content can be estimated from the NO measurement using a simple linear factor (a) of 100/95 (= 1.053), and a quadratic term (b) of zero (0.00). These should be regarded as the default coefficients when this feature is utilised.

In more complex combustion processes the user may have available, or decide to obtain, actual data relating the NO levels to total NOx levels, using other measurement methods (e.g. other analysers or wet chemical testing), under various operating conditions. This data can then be used to derive the practical relationship of NO concentration versus NOx concentration for the process being monitored, from which ideal linear (and quadratic, if necessary) terms can be obtained for use by the 4900 using a suitable mathematical (software) method.

The procedure for entering the coefficients in the conversion equation is given in Table 5.11. After this has been entered the NOx estimate can be added to the display as a measurand (see Section 5.6) and be given an output allocation (see Section 5.3).

Table 5.11 Setting the NO_x conversion parameters	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ▸ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the number shown is correct ☞ ENTER
UTILITY 1 UTILITY 2	☞ ▾ ENTER
UTILITY 2 I1 Oxygen % ↑	To select desired gas sensor module ☞ ▴ or ▾ then ☞ ENTER, if only one module is fitted this section will be omitted.
LOW & HIGH TOL NOx DERIVATION	☞ ▾ ENTER
I1 NOx LINEAR COEF 00.000	Enter the required linear term coefficient (a). Any digit position may be used for the decimal point. To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
I1 NOx SQUARE COEF 00.000	Enter the required square term coefficient (b). Any digit position may be used for the decimal point. To change the value of a digit ☞ ▴ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
LOW & HIGH TOL NOx DERIVATION	☞ MEASURE to return to measurement display.

5.11 Serial output communications

This sections details the configuration of the serial outputs communications via the 9 way D type plug (PL6) located on the rear of the instrument. The serial output option operates by transmitting a data frame to the RS232 output port at a user defined interval. The format of the data frame is a semi colon separated list of process variables terminated by <carriage return><line feed>. The data frame is time and date stamped. An example of the data frame format is given in figure 5.2. The example shows the output from a 4902 instrument configured with a single gas stream fitted with a Gfx1210 CO transducer and a Pm1156 O_2 transducer. The format of the process variables is the same as is displayed on the screen including the same number of decimal places in the output number. The data frame could be sent to either a dumb terminal, a distributed control system (or PC) or a serial printer.

The following facilities are provided to configure the system:-

- SET FRAME FREQ

This sets up the frequency of transmission of the data frame down the RS232 communications port. For example if the value is set to 15 seconds then the output data frame will be transmitted once every 15 seconds. The frequency is set in steps of one seconds from 1 to 9999 seconds. If the value is set to zero then the transmission of data down the RS232 port stops and will not restart until a non zero value is entered. The procedure for setting the frame frequency is given in table 5.13.

- SET COMMS PARMS

This sets up all the serial communications related parameters. These are defined in table 5.12. The procedure for setting up the communications parameters is given in table 5.14.

Table 5.12 Serial communications parameters

Parameter	Default
Stop bit - 1, 1.5 or 2	1
Number of data bits - 5, 6, 7 or 8	8
Parity - EVEN, ODD or NONE	EVEN
Baud rate (characters per second) - 9600, 4800, 2400 or 19200	9600
Hardware handshaking - DTR or NONE	DTR

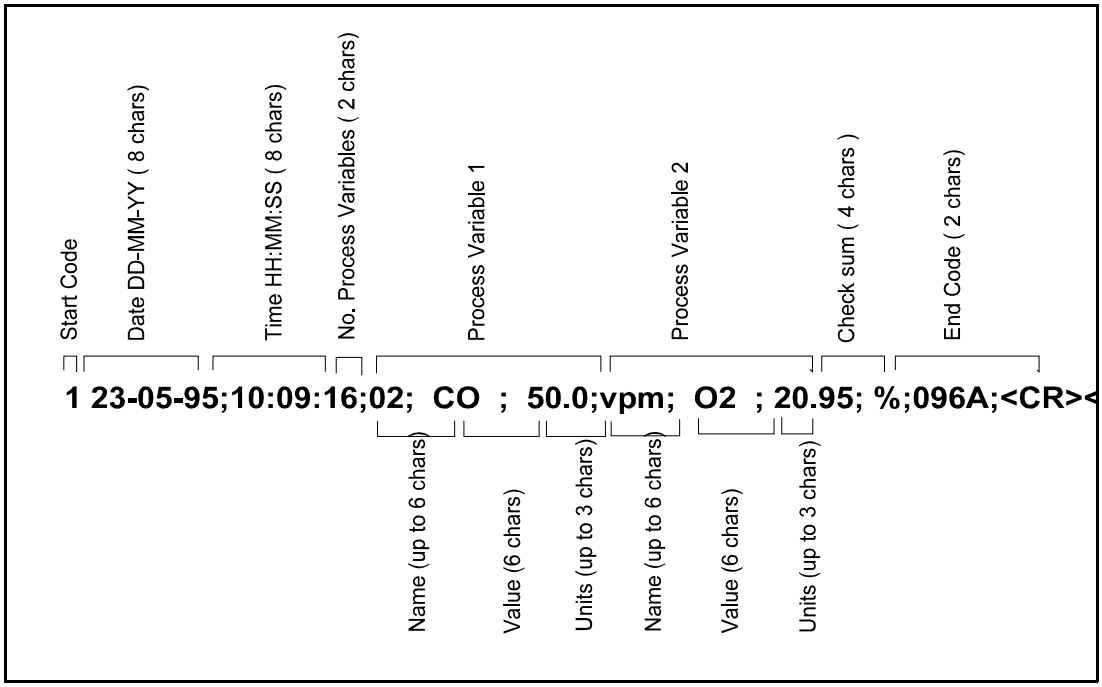


Figure 5.2 Format of serial output data frame

Table 5.13 Setting the serial output frame frequency

☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ to move the cursor to SETUP (cursor position shown in inverse video). ☞ ENTER to choose SETUP.
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ to move the cursor to DISPLAY ☞ ▸ to move the cursor to UTILITY ☞ ENTER to choose UTILITY
ENTER PASSWORD 0000	Both user and supervisor passwords are factory set to 4000. The cursor will be on digit furthest to the left initially. ☞ ▲ ▲ ▲ ▲ to increment the first digit to 4. The display should now be showing 4000. ☞ ENTER to enter the password
UTILITY 1 UTILITY 2	☞ ENTER to choose UTILITY 1
CLOCK/NEW PASS COMMS/WINDOW	☞ ▾ to move the cursor to COMMS ☞ ENTER to choose COMMS
SET FRAME FREQ SET COMMS PARMS	☞ ENTER to choose SET FRAME FREQ.
FRAME FREQUENCY= 0000	Enter frame frequency. To change the value of a digit ☞ ▲ or ▾ To change to another digit ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
CLOCK/NEW PASS COMMS/WINDOW	To return to measurement display ☞ MEASURE

Table 5.14 Setting the serial output communications parameters	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ to move the cursor to SETUP (cursor position shown in inverse video). ☞ ENTER to choose SETUP.
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ to move the cursor to DISPLAY ☞ ▸ to move the cursor to UTILITY ☞ ENTER to choose UTILITY
ENTER PASSWORD 0000	Both user and supervisor passwords are factory set to 4000. The cursor will be on digit furthest to the left initially. ☞ ▲ ▲ ▲ ▲ to increment the first digit to 4. The display should now be showing 4000. ☞ ENTER to enter the password
UTILITY 1 UTILITY 2	☞ ENTER to choose UTILITY 1
CLOCK/NEW PASS COMMS/WINDOW	☞ ▾ to move the cursor to COMMS ☞ ENTER to choose COMMS
SET FRAME FREQ SET COMMS PARMS	☞ ▾ to move the cursor to SET COMMS PARMS ☞ ENTER to choose SET COMMS PARMS.
SELECT STOP BIT 1/1.5/2	Enter required stop bit. To change to another selection ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
SELECT DATA BITS 8/7/6/5	Enter required number of data bits. To change to another selection ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
SELECT PARITY EVEN/ODD/NONE	Enter required parity. To change to another selection ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
SELECT BAUD RATE 9K6/4K8/2K4/19K2	Enter required transmission baud rate. To change to another selection ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
SELECT CONTROL DTR/NONE	Enter required hardware hand shaking. To change to another selection ☞ ◂ or ▸ When the value shown is correct ☞ ENTER
1,8,E,9K6,DTR ACCEPT ? YES/NO	Confirm that the specified communications parameters are correct. To change to another selection ☞ ◂ or ▸ When the value shown is correct ☞ ENTER. New values are applied to the output port at this time.
CLOCK/NEW PASS COMMS/WINDOW	To return to measurement display ☞ MEASURE

NOTES

SECTION 6 REVIEW

6.1 Introduction to review section

This section describes the procedures for reviewing the analyser configuration without changing it. The only procedure which requires a password in this section is review of the calibration history.

6.2 Displaying alarms present

If the measurement display shows the 'ALARM' icon the number and nature of the alarms present may be determined using the procedure described in Table 6.1.

Table 6.1 Displaying alarms present	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▼ ENTER
DISPLAY ALARMS ALARM HISTORY	☞ ENTER
I1 O2 AL1 99.98 HIGH ↑	The first alarm is displayed, if further alarms are present an arrow will be shown, ☞ ▲ or ▼ to access information on further alarms. When alarms have been viewed ☞ MEASURE to return to measurement display.

6.3 Displaying faults present

If the measurement display shows the 'FAULT' icon the number and nature of the faults present may be determined using the procedure described in Table 6.2.

Table 6.2 Displaying faults present	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▼ ▸ ENTER
DISPLAY FAULTS FAULT HISTORY	☞ ENTER
I1 CELL TEMP LOW ↑	The first fault is displayed, if further faults are present an arrow will be shown, ☞ ▲ or ▼ to access information on further faults. When faults have been viewed ☞ MEASURE to return to measurement display.

6.4 Displaying relay configuration

The conditions under which each relay will operate may be determined using the procedure described in Table 6.3.

Table 6.3 Displaying relay configuration	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ENTER
OUTPUTS/ALARMS DIAGNOSTICS/ID	☞ ENTER
RELAY ANALOGUE	☞ ENTER
DISPLAY RELAY 1.3 ASSIGNED ↑ or 1.3 UNASSIGNED↑	☞ ▲ or ▾ to select the required relay then ☞ ENTER
1.3 I4 Oxygen AL4 LO 0.000 % ↑ or 98.00 HIGH ↑ or 1.3 FAULT↑ or 1.3 CAL IN PROG↑	The first allocation to this relay will be displayed, if there are further allocations an arrow will be shown, ☞ ▲ or ▾ to access further allocations. When all allocations for this relay have been viewed ☞ QUIT to select another relay or ☞ MEASURE to select measurement display

6.5 Displaying analogue output configuration

The configuration of each analogue output may be determined by using the procedure described in Table 6.4.

Table 6.4 Displaying analogue output configuration	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ENTER
OUTPUTS/ALARMS DIAGNOSTICS/ID	☞ ENTER
RELAY ANALOGUE	☞ ▾ ENTER
DISPLAY ANALOGUE 1.1 Oxygen ↑ or 1.1 UNASSIGNED	☞ ▴ or ▾ to select the required analogue output then ☞ ENTER
1.1 I1 Oxygen R1 L=99.000U=100.00↑	The information on each analogue output is shown on four screens, to obtain the next screen ☞ ▴
1.1 I1 Oxygen R1 LIVE 0 FREEZE ↕	To obtain the next screen ☞ ▴
1.1 I1 Oxygen R2 L=99.000U=100.00↕	To obtain the next screen ☞ ▴
1.1 I1 Oxygen R2 TRUE 0 FOLLOW↓	This is the last of the four screens ☞ MEASURE to return to measurement display ☞ QUIT to select another analogue output

6.6 Displaying alarm settings

The conditions under which each alarm is configured to operate may be determined using the procedure described in Table 6.5.

Table 6.5 Displaying alarm settings

☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ENTER
OUTPUTS/ALARMS DIAGNOSTICS/ID	☞ ▸ ENTER
SELECT MEASURE I1 Oxygen ↑	☞ ▲ or ▾ to select required measurement. When selected ☞ ENTER
I1 Oxygen AL1 LO 80.00% DISAB ↑	The configuration of each of the four alarms (AL1 to AL4) is shown on two screens making a total of eight screens to be viewed. To obtain the next screen ☞ ▲
I1 Oxygen AL1 LO HYST 0.1% FOL ↕	To obtain the next screen ☞ ▲
I1 Oxygen AL2 LO 95.45% ENABL ↕	To obtain the next screen ☞ ▲
I1 Oxygen AL2 LO HYST 0.3% FRZ ↕	To obtain the next screen ☞ ▲
I1 Oxygen AL3 LO 96.00% ENABL↕	To obtain the next screen ☞ ▲
I1 Oxygen AL3 LO HYST 0.1% FOL ↕	To obtain the next screen ☞ ▲
I1 Oxygen AL4 HI 99.00% DISAB ↕	To obtain the next screen ☞ ▲
I1 Oxygen AL4 LO HYST 0.1% FOL ↓	This is the last of the eight screens ☞ MEASURE to return to measurement display ☞ QUIT to select another measurement

6.7 Displaying analyser identity

The analyser identity display shown during the start up message sequence may be displayed by using the procedure described in Table 6.6.

Table 6.6 Displaying analyser identity	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ENTER
OUTPUTS/ALARMS DIAGNOSTICS/ID	This operation shows the analyser identity on the following three temporary screens and then returns to this screen, ☞ ▾ ▸ ENTER
xentra 4900 REV 04900/652/0	
MODEL4902B1 0302 2100 24101 00011	
SERIAL NO 1234 ORDER NO 845123	
OUTPUTS/ALARMS DIAGNOSTICS/ID	☞ MEASURE to return to measurement display ☞ ▾ ▸ ENTER to view the analyser identity again.

6.8 Displaying alarm history

An entry is made in the alarm history buffer each time an alarm appears or is cleared. The alarm history buffer contains the most recent 20 events. The information is displayed in the following format.

[gas sensor module site number] [measurement name]
[alarm level] [alarm sense]

eg I2 O2 AL2
98.00 LOW

The alarm shown is AL2 on the Oxygen gas sensor in site 2, a low alarm with an alarm level of 98.00 showing that the sample concentration is below 98.00. Note that if hysteresis has been specified when configuring the alarm, the alarm will not clear until the concentration has reached the alarm level plus the hysteresis. Table 6.7 describes the procedure for displaying the alarm history.

Table 6.7 Displaying alarm history	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▼ ENTER
DISPLAY ALARMS ALARM HISTORY	☞ ▼ ENTER
Oxygen AL2 ON 12:13:20 12/06 ↑	☞ ▲ or ▼ to view further entries ☞ MEASURE to return to measurement display

6.9 Displaying fault history

An entry is made in the fault history buffer each time a fault appears or is cleared. The fault history file contains the most recent 20 occasions where a fault appeared or was cleared. Table 6.8 describes the procedure for displaying the fault history.

Table 6.8 Displaying fault history	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▼ ▸ ENTER
DISPLAY FAULTS FAULT HISTORY	☞ ▼ ENTER
I1 CELL T LOW ON 12:13:20 12/06 ↑	☞ ▲ or ▼ to view further entries ☞ MEASURE to return to measurement display

For details of the information provided by the fault messages, please refer to Section 4 of the Service Manual (Part No 04900002B).

6.10 Displaying calibration history

An entry is made in the calibration history buffer each time a calibration or calibration check is performed. The calibration history file contains the most recent 20 occasions when a calibration or check was performed. The following data is recorded for each occasion

i) gas sensor module site number
ii) measurement name.
iii) type of check or calibration
C or V **C**alibration or calibration check (**V**alidate).
M or A **M**anual or **A**uto.
L or H **L**ow or **H**igh.

iv) difference between measured and actual concentration, (current measured value - value specified during calibration), ie a positive number indicates a positive drift.

The information is displayed in the following format:-

[gas sensor module site number] [measurement name] [type] [difference] [time and date]

eg. I2 Oxygen CML -0.213
01:15:20 28/11

the event recorded is a manual low calibration of the Oxygen sensor in site 2 with a correction of -0.213 at 1:15 on 28th November.

Table 6.9 Displaying paramagnetic gas sensor calibration history	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ENTER
MANUAL CAL AUTO CAL	☞ ENTER
ENTER PASSWORD 0000	To change the value of a digit ☞ ▲ or ▼ To change to another digit ☞ ◄ or ► When the value shown is correct ☞ ENTER
CALIBRATE I2 Oxygen % ↑	To select desired gas sensor module ☞ ▲ or ▼ then ☞ ENTER, if only one module is fitted this section will be omitted.
LOW/HIGH HISTORY/CHK L&H	☞ ▼ ENTER
LOW/HIGH	☞ ENTER to view Low cal history ☞ ► ENTER to view High cal history
I2OxygenCML0.213 01:15:20 28/11↑	☞ ▲ or ▼ to view further entries ☞ MEASURE to return to measurement display

NOTE

If an autocal is unsuccessful, it will not appear in the Calibration History. However, the fault codes associated with that event will be held in the Fault History.

6.11 Displaying diagnostics information

The signals from gas sensors may be displayed. These may be useful in diagnosing any problems which may arise. The procedure for displaying diagnostics information is described in Table 6.10.

Table 6.10 Displaying diagnostic information	
☞ MENU to obtain top level menu	
CALIBRATE/SETUP ALARMS/FAULTS	☞ ▸ ENTER
SET ALARM/ASSIGN DISPLAY/UTILITY	☞ ▾ ENTER
OUTPUTS/ALARMS DIAGNOSTICS/ID	☞ ▾ ENTER
I2 CELL EMF 0.234 Volts ↑	☞ ▲ to view further diagnostics information
I2 CELL TEMP 35.5 °C ↑	☞ ▲ to view further diagnostics information
I1 CO DIF SIG 0.003 Volts ↑	☞ ▲ to view further diagnostics information
I1 CO GAS SIG 0.900 Volts ↑	☞ ▲ or ▾ to view further diagnostics information ☞ MEASURE to return to measurement display

SECTION 7 ROUTINE MAINTENANCE

7.1 Replacing fan filter element

The external fan filter element should be checked every six months in laboratory conditions, for environments with a high dust content this period should be reduced. The filter element is washable and in laboratory or light dust conditions may be washed and refitted rather than replaced.

- Remove power from the analyser and unclip the filter cover complete with filter element and plastic gauze.
- Remove the plastic gauze and old filter element from the cover.
- Fit new filter into cover followed by plastic gauze.
- Clip cover back onto fan.

7.2 Replacing sample filter element

Analysers fitted with a sample filter should have the element replaced every six months, or more frequently if required.

WARNING

Sample and calibration gases may be toxic. Stop sample flow into analyser to avoid releasing gas into atmosphere when sample filter cap is removed

- Stop sample flow to analyser.
- Use spanner provided to unscrew sample filter cap.
- Remove old filter element and rubber 'o' ring.
- Fit new sample filter and rubber 'o' ring. Ensure that rubber '0' ring is properly seated on the filter cap.
- Fit sample filter cap and tighten using spanner.
- Verify that there are no leaks

7.3 Cleaning

The exterior of the analyser should be regularly cleaned using a slightly damp cloth. Remove power before cleaning. Ventilation holes must be kept clear. Do not use solvents or abrasive cleansers to clean the analyser.

7.4 Toxic Samples - routine leak test

WARNING

If toxic samples are being analysed it is essential to check the analyser and associated sample lines/system for leaks (every 6 months is recommended period). MAX pressure that may be applied to each module is 8 psig, however, this **must** be applied **slowly** to both the inlet and outlet simultaneously to avoid damage to the measuring sensors.

SECTION 8 FAULT DIAGNOSIS

8.1 Introduction

This section describes the faults which may be indicated for each type of gas sensor module and the chassis as well as the diagnostic signals which may be accessed through the user interface. See 'Review' section 6 for directions on accessing fault and diagnostic information. When requesting technical assistance from Servomex you should advise the following:-

- A list of which faults are present
- A list of the corresponding diagnostic signal levels
- The analyser serial number.

Guidance on locating and rectifying problems is given where appropriate. For instructions on displaying the current fault status then see section 6.3. For instructions on displaying the diagnostic signals then see section 6.11.

8.2 Fault diagnosis on the Pm1156 transducer

Table 8.1 shows a list of the indicated fault conditions for the 1156 paramagnetic transducer.

Table 8.1 Fault diagnosis on the Pm1156 transducer

Fault indicated	Possible causes	Recommended action
CELL VOLTS HIGH	Faulty component	Call service engineer
CELL VOLTS LOW	Faulty component	Call service engineer
CELL TEMP HIGH	Ambient temperature too high or faulty component	Check ambient operating temperature is < 40°C or call service engineer
SAMPLE FLOW LOW	Sample flow recorded by optional flow monitor is too low.	Check sample inlet pressure and flow rate. Check for blocked sample lines, filter or vent pipes. If all OK then call service engineer.
CELL TEMP LOW	Faulty component	Call service engineer

HIGH CAL/CHK OUTSIDE TOL or LOW CAL/CHK OUTSIDE TOL	User set low or high calibration tolerance has been exceeded during auto calibration	Check that calibration gas is not empty. Increase tolerance if necessary. Check that the concentration of the calibration sample corresponds with the concentration specified in the autocalibration configuration. Perform an ONE CYCLE autocalibration to clear the fault. If a successful calibration can not be achieved then call a service engineer.
HI CAL/CHK OUTSIDE RANGE or LO CAL/CHK OUTSIDE RANGE	The gas concentration specified in the autocalibration configuration is outside of acceptable limits.	Respecify the calibration gas concentration.
HI CAL RESULT OUTSIDE LIMITS or LO CAL RESULT OUTSIDE LIMITS	The results of an autocalibration are different from the existing values by more than the specified tolerance limits.	Check that calibration gas is not empty. Check that the concentration of the calibration sample corresponds with the concentration specified in the autocalibration configuration. Perform an ONE CYCLE autocalibration to clear the fault. If a successful calibration can not be achieved then call a service engineer.

Table 8.2 shows a list of the diagnostic signals available for the paramagnetic transducer.

Table 8.2 Diagnostic signals for the Pm1156 transducer			
Fault	**Description**	**Typical level**	**Range**
CELL VOLTS	Cell output volts	0.2 V	-0.1 to 1.2 V
CELL TEMP	Cell temperature	35 °C	5 to 70 °C

8.3 Fault diagnosis on the Gfx 1210 transducer

Table 8.3 shows a list of the indicated fault conditions for the Gfx 1210 transducer.

Table 8.3 Fault diagnosis on the Gfx1210 transducer		
Fault indicated	**Possible causes**	**Recommended action**
TRANSDUCER NOT RESPONDING	Faulty component	Call service engineer
SAMPLE FLOW LOW	Sample flow recorded by optional flow monitor is too low.	Check sample inlet pressure and flow rate. Check for blocked sample lines, filter or vent pipes. If all OK then call service engineer.
CHOP TEMP LOW or CHOP TEMP HIGH	Faulty component.	Call service engineer.
LO V/C OUTSIDE TOL or HI V/C OUTSIDE TOL	User set low or high calibration tolerance has been exceeded during autocalibration.	Check that auto calibration gas is not exhausted. Increase tolerance if necessary. Check that concentration of calibration sample corresponds with concentration specified in auto calibration configuration. Perform an automatic ONE CYCLE calibration to clear fault. If a successful calibration can not be achieved or excessive drift is suspected call service engineer.

LO V/C OUTSIDE RANGE or HI V/C OUTSIDE RANGE	The gas concentration specified in the autocalibration configuration is outside of acceptable limits.	Respecify the calibration gas concentration.
LO CAL OUTSIDE LIMITS or HI CAL OUTSIDE LIMITS	The results of an autocalibration are different from the existing values by more than the specified tolerance limits.	Check that calibration gas is not empty. Check that the concentration of the calibration sample corresponds with the concentration specified in the autocalibration configuration. Perform an ONE CYCLE autocalibration to clear the fault. If a successful calibration can not be achieved then call a service engineer.

Table 8.4 shows a list of the diagnostic signals available for the Gfx1210 transducer.

Table 8.4 Diagnostic signals for the Gfx 1210 transducer

Fault	Description	Typical level	Range
DIF SIG	Difference signal between the CO and N_2 filled filters	0.000V	-0.25 to 1.31 V
GAS SIG	Signal level for the CO filled filter	1.000 V	0.5 to 1.31 V
N2 SIG	Signal level for the N_2 filled filter	1.000 V	0.5 to 1.31 V
SAMPLE TEMP	Sample temperature	20°C	0 to 50°C
CHOPPER TEMP	Chopper box temperature	60 °C	50 to 70 °C

8.4 Fault diagnosis with a non-functioning display

Table 8.5 describes checks which can be made if the display is blank or not illuminated

Table 8.5 Fault finding with non functioning display

Symptoms	Possible causes	Recommended action
DIM DISPLAY	Improper viewing angle	Adjust viewing angle of display
DIM DISPLAY	Edge light failed	Call service engineer
NO DISPLAY	Unit power is off	Turn on power
NO DISPLAY	Blown fuse	Replace fuse

If the display is functional but a measured value field is replaced by the word ‘OVER’ the related transducer is outside its operating range, see Section 1.8.

NOTES

SECTION 9 SPARES

9.1 Ordering spares

Spare parts may be ordered from addresses shown on the rear cover of the manual. When ordering spares always give the model and serial number of your analyser. The analyser serial number is on the identification label on the underside of the analyser, it may also be displayed via the user interface.

WARNING

There are no user serviceable parts inside of the *xentra* 4900 analyser. The instrument enclosure protects against electrical shock and injury. Refer servicing to qualified personnel.

Removal of the enclosure lid may invalidate the instrument warranty.

9.2 Spare parts list

Spare parts common to all ***xentra*** 4900 models

04900001B	Operator manual, 4900 Model B
04900002B	Service manual, 4900 Model B
S4000978	Main power fuses for 170-264V operation, 10 off 20mm T3.15 A HBC *
S4000979	Main power fuses for 85-132V operation, 10 off 20mm T 5.0 A HBC *
S4000986	Kit socket 14W signal
2388-1981	Filter element, 80 mm Sq fan*

Spare parts for rack mounting

S4000984	Rack mount kit, short chassis
S4000985	Rack mount kit, long chassis

Spare parts for sample filter

S4000987	Kit, fine filter cap and ’o’ ring
S4000988	Kit, filter elements 6µm*

* Recommended spares

NOTES