ANALOX

Ax60+ Multi-Gas

Service Manual

Contents

1   Introduction

This Service Manual explains how to service and calibrate the Ax60+. It is intended for system installers and service engineers. For information on installation and operation, refer to the Ax60+ User Manual P0159-800, downloadable from Analox.

1.1   Warnings, Cautions and Notes

⚠   **WARNINGS ARE USED IN THIS MANUAL TO INDICATE POTENTIALLY HAZARDOUS SITUATIONS WHICH COULD RESULT IN SERIOUS INJURY OR DEATH.**

◆   **CAUTIONS ARE USED IN THIS MANUAL TO INDICATE POTENTIALLY HAZARDOUS SITUATIONS WHICH COULD RESULT IN EQUIPMENT DAMAGE OR LOSS OF DATA.**

📋   **NOTES ARE USED IN THIS MANUAL TO INDICATE SUPPLEMENTARY INFORMATION THAT IS NOT HAZARD RELATED.**

1.2   Safety information

⚠   **WARNING: READ THE SAFETY INFORMATION IN THIS MANUAL BEFORE SERVICING THE AX60+.**

⚠   **WARNING: DO NOT TEST THE ALARM WHEN IT IS CLOSE TO THE EARS. IT HAS A HIGH VOLUME SOUNDER WITH A SOUND LEVEL OF 88 DECIBELS AT A DISTANCE OF 3 METRES.**

⚠   **WARNING: DO NOT TEST THE ALARM WHEN IT IS CLOSE TO THE EYES. IT HAS A HIGH VISIBILITY STROBE LIGHT WITH A LUMINOUS INTENSITY OF 100 CANDELA.**

⚠   **WARNING: DO NOT OPEN THE CENTRAL DISPLAY, SENSORS OR ALARMS IF THEY ARE CONNECTED TO THE POWER SUPPLY. FIRST DISCONNECT AND ISOLATE THEM FROM LIVE HAZARDOUS VOLTAGE.**

1.3   Other information

📋   **NOTE: THE DATA OUTPUT MODULE DOES NOT REQUIRE ANY ON-SITE SERVICING, HOWEVER, THE DATA OUTPUT MODULE DOES CHECK FOR A NUMBER OF FAULT CONDITIONS, SEE SECTION 11.2 FOR DETAILS ON FAULT INDICATIONS**

1.4   Alarm terminology (CO_2) – Standard sensors

Alarms will display in priority order, in the order of AL4 to TWA

Display name for users	Alarm description	Identification by software	Default setpoint	Notes
TWA	Time weighted average over 8 hours	Alarm 1 or A1	0.5% CO_2	Fixed alarm. At present it is not possible to change a TWA alarm set-point.
AL1	High alarm	Alarm 2 or A2	1.5% CO_2	This alarm must be set lower than Alarm 3 (it may be set to 0.5% to give a pre-alarm condition).
CO2	High-high alarm	Alarm 3 or A3	3.0% CO_2	This alarm must be set higher than Alarm 2.
AL4	High-high alarm	Alarm 4 or A4	3.5% CO_2	Alarm is disabled by default.

- The time-weighted average alarm is displayed to users as 'TWA' and identified by the software as 'A1' or 'Alarm 1' and is announced by the Central Display only.
- The high alarm is displayed to users as 'AL1' and identified by the software as 'A2' or 'Alarm 2' and triggers the Alarm strobe once every 2 seconds, sounder is disabled by default, but if enabled by the user it will also sound once every 2 seconds.
- The high-high alarm is displayed to users as 'CO2' and identified by the software as 'A3' or 'Alarm 3' and triggers the Alarm strobe/sounder once every second.
- The fourth alarm level 'AL4' is disabled by default; this is identified by the software as 'A4' or 'Alarm 4'. If enabled the Alarm strobe and sounder would trigger once every second.

1.5   Alarm terminology (CO_2) – US IFC sensors

Alarms will display in priority order, in the order of AL4 to TWA

Display name for users	Alarm description	Identification by software	Default setpoint	Notes
TWA	Time weighted average over 8 hours	Alarm 1 or A1	0.5% CO_2	Fixed alarm. At present it is not possible to change a TWA alarm set-point.
AL1	Low level pre-alarm	Alarm 2 or A2	0.5% CO_2	This alarm must be set lower than Alarm 3
AL2	Low alarm	Alarm 3 or A3	1.5% CO_2	This alarm must be set higher than Alarm 2.
AL3	High alarm	Alarm 4 or A4	3.0% CO_2	This alarm must be set higher than Alarm 3.

- The time-weighted average alarm is displayed to users as 'TWA' and identified by the software as 'A1' or 'Alarm 1' and is announced by the Central Display only.
- The Low level pre-alarm alarm is displayed to users as 'AL1' and identified by the software as 'A2' or 'Alarm 2' and triggers the Alarm strobe once every 2 seconds, sounder would trigger once every 2 seconds.
- The low alarm is displayed to users as 'AL2' and identified by the software as 'A3' or 'Alarm 3' and triggers the Alarm strobe once every second, sounder would trigger once every 2 seconds.
- The high alarm is displayed to users as 'AL3' and identified by the software as 'A4' or 'Alarm 4' and triggers the Alarm strobe/sounder once every second.

1.6   Alarm terminology (O$_2$)

Alarms will display in priority order, in the order of AL4 to AL1

Display name for users	Alarm description	Identification by software	Default setpoint	Notes
AL1	Low alarm	Alarm 1 or A1	19.5% O$_2$	Alarm is disabled by default.
AL2	Low alarm	Alarm 2 or A2	19.5% O$_2$	This alarm must be set lower than Alarm 3.
AL3	High-high alarm	Alarm 3 or A3	23.0% O$_2$	This alarm must be set higher than Alarm 2.
AL4	Low-low alarm	Alarm 4 or A4	18.0% O$_2$	This alarm must be set lower than Alarm 2.

- The first low or high alarm 'AL1'AL1 is disabled by default; this is identified by the software as 'A1' or 'Alarm 1'. If enabled the Alarm strobe and sounder would trigger once every 2 seconds.
- The low-level alarm is displayed to users as 'AL2' and identified by the software as 'A2' 'Alarm 2' and triggers the Alarm strobe once every 2 seconds, sounder is disabled by default, but if enabled by the user it will also sound once every 2 seconds.
- The high-high alarm is displayed to users as 'AL3' and identified by the software as 'A3' or 'Alarm 3' and triggers the Alarm strobe/sounder once every second.
- The low-low alarm is displayed to users as 'AL4' and identified by the software as 'A4' or 'Alarm 4' and triggers the Alarm strobe/sounder once every second.

2   Configuring sensors

2.1   Hardware setting

In a standard Ax60+ system (not including the Kiosk option) each sensor must have its jumper link set to a different location e.g. Sensor 1=location 1; Sensor 2=location 2.

The Sensor has a hardware setting that is factory configured for a system with only one Sensor. If a system includes two, three, or four Sensors then the hardware must be reconfigured by moving a jumper link ( ) in each Sensor installed in the system.

⚠ **WARNING: DISCONNECT AND ISOLATE THE AX60+ SYSTEM FROM THE MAINS POWER SUPPLY BEFORE OPENING THE CO₂ SENSOR ENCLOSURES.**

To access the jumper link, open the Sensor enclosure. The printed circuit board (PCB) has a SENSOR LOCATION selector with one link, factory installed in LOCATION 1.

The image to the right shows the jumper link in position 1 (Factory default).
For a system with only **one Sensor**, the jumper link should be retained in LOCATION 1.
For a system with **two Sensors**, the first Sensor's jumper link should be in LOCATION 1 and the second Sensor's link in LOCATION 2.
For a system with **three Sensors**, the first Sensor's link should be in LOCATION 1, the second Sensor's link in LOCATION 2 and the third Sensor's link should be in LOCATIONLOCATION 3.
For a system with **four Sensors**, the first Sensor's jumper link should be in LOCATION 1, the second Sensor's link in LOCATION 2, the third Sensor's link in LOCATION 3 and the fourth Sensor's link should be in LOCATION 4.
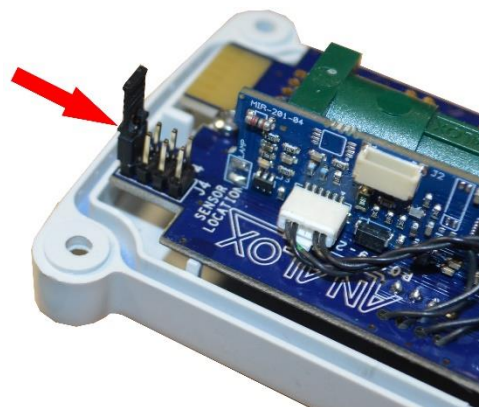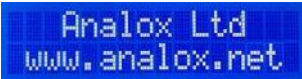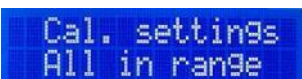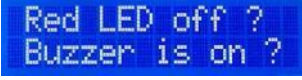
3   Software Overview

> **NOTE:**   THIS SECTION SPECIFICALLY RELATES TO THE AX60+ STANDARD OPTIONS, HW AND QC. HOWEVER, A CENTRAL DISPLAY CAN BE TEMPORARILY CONNECTED TO THE AX60+ KIOSK SENSOR TO ENABLE A SERVICE ENGINEER TO RECONFIGURE THE SYSTEM (SEE SECTION 10).

3.1   Powering up

When you power up the Ax60+, the software performs an automatic power-on-self-test (POST) which takes about 30 seconds. The results are shown on the Central Display.

Operator input	Software response	Central Display text	Optional text / notes
Switch on power supply to Ax60+	Displays vendor name and website (default is Analox Ltd)	Analox Ltd www.analox.net	Vendor name may vary, depending on contract
No further operator input is required. The POST is an automatic process	Performs a checksum configuration check	Config. checksum CORRECT	
	Performs a software validation check	Software failure NO FAILURE	
	Checks the Sensor(s) have been calibrated	Cal. settings All in range Cal. settings No sensors!	No sensors are configured
	Confirms top line of LCD OK, no pixels are missing	Is line 1 OK ?	
	Confirms bottom line of LCD OK, no pixels missing	Is line 2 OK ?	
	Confirms buzzer is off and green LED switches on	Buzzer is off ? Green LED on ?	
	Confirms green LED is off and yellow switches on	Green LED off ? Yellow LED on ?	

Operator input	Software response	Central Display text	Optional text / notes
	Confirms yellow LED is off and red switches on	Yellow LED off ? Red LED on ?	
	Confirms red LED is off and buzzer switches on	Red LED off ? Buzzer is on ?	
	Displays current software. Buzzer switches off	Software version v1.0.0	
	Displays unique serial number of the unit	Serial number: 0000000	
Wait for Sensors to warm up...		>OK OK --- --- 1: Warm-up	
		This screen may display for a few seconds to show Sensor warm-up status. It is for information only. It requires no operator input	

🔶 **CAUTION: EACH SENSOR MUST HAVE ITS JUMPER SET TO A DIFFERENT LOCATION (E.G. SENSOR 1 = LOCATION 1; SENSOR 2 = LOCATION 2), OTHERWISE THE CENTRAL DISPLAY WILL ANNOUNCE A FAULT. REFER TO SECTION 2 FOR JUMPER SETTINGS INFORMATION.**

▼

Operator input	Software response	Central Display text	Optional text / notes
Wait for system status screen...	Displays system status screen. Each Sensor is represented by 'OK' in the top line. For example, a system with two CO_2 Sensors displays >OK OK. The '>' character identifies which Sensor is highlighted (Sensor 1 is highlighted by default)	>OK OK --- --- 1: 450 PPM	In this example - The CO_2 concentration is by default displayed in ppm (parts per million). The example shown here displays 450 PPM, which is equal to 0.045%.

📝 **NOTE: THE SYSTEM STATUS SCREEN DISPLAYS UP TO FOUR SENSORS. A SPARE SENSOR LOCATION DISPLAYS AS: '- - -'**

The bottom line displays the concentration of measured gas at the Sensor

Operator input	Software response	Central Display text	Optional text / notes
		▼	
Press Cycle	Displays Sensor 2 details (if installed) and the current level of measured gas	OK >--- --- --- 2: Not installed	In this example, Sensor 2 is not installed
		▼	
Press Cycle	Displays Sensor 3 details (if installed) and the current level of measured gas	OK --->--- --- 3: Not installed	In this example, Sensor 3 is not installed
		▼	
Press Cycle	Displays Sensor 4 details (if installed) and the current level of measured gas	OK --- --->--- 4: Not installed	In this example, Sensor 4 is not installed
		▼	
Press Cycle	Redisplays the system status screen	>OK OK --- --- 1: 450 PPM	

4   Menu options

To display the Top-level Menu options, press and hold Cancel + Cycle for at least 6 seconds.

Press and hold down [❌ Cancel] + [🔄 Cycle] for six seconds to enter the Top-level Menu:

```
Top-level Menu

    ┌─── Show config  >    [✓ Accept/Test]
    │                          ┌─── Num of Sensors >
    │                          ├─── Evacuation mode>
    │                          ├─── Rly 1 on fault >      [The Show config menu allows you
    │                          ├─── Rly 2 on fault >      to display the current configuration]
    │                          ├─── Rly 1 failsafe >
    │                          ├─── Rly 2 failsafe >
    │                          └─── Show Sensor    >
    │                                  Config ?
    ├─── List Alrm pnts >  [✓ Accept/Test]
    │                                                     [The List Alrm pnts menu allows you
    │                          └─── Select Sensor  >      to display current alarm setpoints]
    ├─── List Alrm descs>  [✓ Accept/Test]
    │                                                     [The List Alrm descs menu allows you
    │                          └─── Select Sensor  >      to display current alarm descriptions]
    ├─── Test relays   >   [✓ Accept/Test]
    │                          ┌─── Activate Rly 1?>
    │                          │                          [The Test relays menu allows you to
    │                          ├─── Activate Rly 2?>      check that the relays are operating]
    │                          └─── Rlys inactive? >
    ├─── Calibration   >   [✓ Accept/Test]
    │                          ┌─── Zero cal.    >        [The Calibration menu allows you to
    │                          └─── Span cal.    >        zero and span calibrate the sensors]
    ├─── Central Config >  [✓ Accept/Test]
    │                          ┌─── Attached snsrs >
    │                          ├─── Set Evacuation >
    │                          ├─── Rly 1 fail-safe>
    │                          ├─── Rly 2 fail-safe>
    │                          ├─── Rly 1 on fault >      [The Central Config menu allows you
    │                          ├─── Rly 2 on fault >      to configure the central display unit]
    │                          ├─── Snr Display Opt>
    │                          ├─── Rly 1 on alarms>
    │                          └─── Rly 2 on alarms>
    └─── Sensor Config >   [✓ Accept/Test]
                               ┌─── Enable alarms   >
                               ├─── Enable Evac  >
                               ├─── Alarm Direction>
                               ├─── Enable Sounder >      [The Sensor Config menu allows you
                               ├─── Enable Strobe >       to configure the attached sensors]
                               ├─── Alarms Latching>
                               └─── Alrm set-pnts >
```

🗒 **NOTE: IF THERE IS NO USER ACTIVITY FOR 60 SECONDS THE MENU WILL TIME OUT.**

4.1   Read-only menus

The Show config option enables you to view read-only information about the system configuration. It displays information on Sensor connections and relay configuration.

> 📧 **NOTE:**   **THE SHOW CONFIG OPTION PROVIDES READ-ONLY INFORMATION THAT CAN NOT BE CHANGED. IF YOU WANT TO SET UP OR CONFIGURE THE AX60+, USE THE TOP-LEVEL MENUS, CENTRAL CONFIG OPTION.**

4.1.1   Show configuration (Displayed as Show config)

1]   To display the Top-level Menu Show config option, press and hold down the Cancel + Cycle buttons for at least 6 seconds.

2]   Press Accept/Test to display the Show Config? Option.

3]   Press Cycle to cycle through each of the config options.
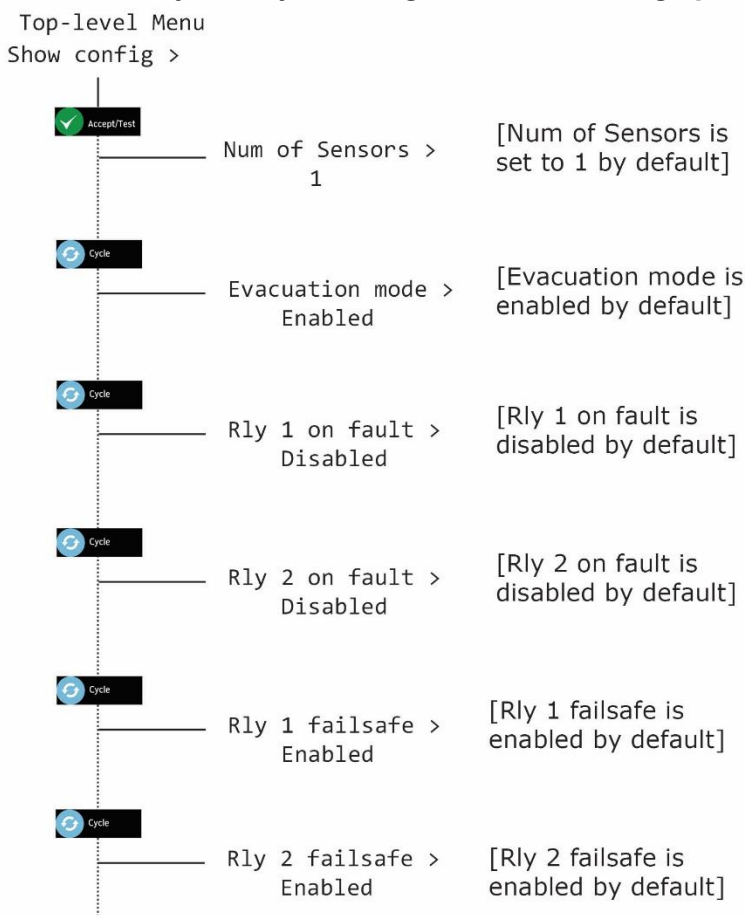
```
Top-level Menu
Show config >
        |
        |
  [✓ Accept/Test]
        |_____ Num of Sensors >       [Num of Sensors is
                        1                 set to 1 by default]


  [⟳ Cycle]
        |_____ Evacuation mode >      [Evacuation mode is
                      Enabled             enabled by default]


  [⟳ Cycle]
        |_____ Rly 1 on fault >       [Rly 1 on fault is
                     Disabled             disabled by default]


  [⟳ Cycle]
        |_____ Rly 2 on fault >       [Rly 2 on fault is
                     Disabled             disabled by default]


  [⟳ Cycle]
        |_____ Rly 1 failsafe >       [Rly 1 failsafe is
                      Enabled             enabled by default]


  [⟳ Cycle]
        |_____ Rly 2 failsafe >       [Rly 2 failsafe is
                      Enabled             enabled by default]
        |
```

> 📧 **NOTE:**   **TO RETURN TO THE SYSTEM STATUS SCREEN AT ANY TIME PRESS CANCEL. THE CANCEL BUTTON REDISPLAYS THE PREVIOUS MENUS, ONE AT A TIME.**

4.1.2   Show Sensor configuration (Displayed as Show Sensor config)

The Show Sensor config option enables you to view read-only information about the sensor configuration. It displays information on Sensor alarms, sounders and strobes.

> **NOTE:** THE SHOW SENSOR CONFIG OPTION PROVIDES READ-ONLY INFORMATION THAT CAN NOT BE CHANGED. IF YOU WANT TO SET UP OR CONFIGURE THE AX60+, USE THE TOP-LEVEL MENU, SENSOR CONFIG OPTION.

1]   To display the Top-level Menu Show config option, press and hold down the Cancel + Cycle buttons for at least 6 seconds.

2]   Press Accept/Test, then press Cycle six times to display the Show Sensor Config? option.

3]   Press Accept/Test to enter the menu, then press Cycle to view each config item.

> **NOTE:** TO RETURN TO THE SYSTEM STATUS SCREEN AT ANY TIME PRESS CANCEL. THE CANCEL BUTTON REDISPLAYS THE PREVIOUS MENUS, ONE AT A TIME.

4.2   List Alarm points (Displayed as List Alrm pnts)

4.2.1   List Alrm pnts (CO_2 example)

The Top-level Menu, List Alrm pnts option enables you to view read-only information about the alarm setpoints configured for each Sensor.

> 📋 NOTE: THE LIST ALRM PNTS OPTION PROVIDES READ-ONLY INFORMATION THAT CAN NOT BE CHANGED. IF YOU NEED TO SET UP OR CONFIGURE THE ALARM SETPOINTS, USE THE TOP-LEVEL MENU, SENSOR CONFIG, ALRM SET-PNTS OPTION.

1]   **To display the Top-level Menu List Alrm pnts option, press and hold down the Cancel + Cycle buttons for at least 6 seconds. Then press the Cycle button once.**

2]   **Press Accept/Test to go to the Select Sensor screen, this displays the Sensors and highlights Sensor 1**

3]   **Press Cycle to highlight other sensors.**

4]   **Press Accept/Test to select the sensor that you want to view alarms on, then press Cycle to cycle through the alarms.**

5]   **Press Cancel to exit the Alarm screen and return to Select another sensor or press Cancel to return to the Top-level Menu, List Alrm pnts**

4.2.2   List Alrm pnts (O$_2$ example)

The Top-level Menu, List Alrm pnts option enables you to view read-only information about the alarm setpoints configured for each Sensor.

📧   NOTE: THE LIST ALRM PNTS OPTION PROVIDES READ-ONLY INFORMATION THAT CAN NOT BE CHANGED. IF YOU NEED TO SET UP OR CONFIGURE THE ALARM SETPOINTS, USE THE TOP-LEVEL MENU, SENSOR CONFIG, ALRM SET-PNTS OPTION.

1]   To display the Top-level Menu List Alrm pnts option, press and hold down the Cancel + Cycle buttons for at least 6 seconds. Then press the Cycle button once.

2]   Press Accept/Test to go to the Select Sensor screen, this displays the Sensors and highlights Sensor 1.

3]   Press Cycle to highlight other sensors.

4]   Press Accept/Test to select the sensor that you want to view alarms on, then press Cycle to cycle through the alarms.


```
Top-level Menu
List Alrm pnts >    ✓ Accept/Test
```

In this example, sensor 2 is an oxygen (O$_2$) sensor. The default alarm setpoints are shown.

```
                    Select sensor
                    1  >2   3   4
                         ⟳ Cycle

                         ✓ Accept/Test
```

```
Alarm 1  (AL1)      [Alarm 1 setpoint is set by default
O2     19.5   %      to 19.5% - disabled by default]
       ⟳ Cycle

Alarm 2  (AL2)      [Alarm 2 setpoint is set
O2     19.5   %      by default to 19.5%]
       ⟳ Cycle

Alarm 3  (AL3)      [Alarm 3 setpoint is set
O2     23.0   %      by default to 23.0%]
       ⟳ Cycle

Alarm 4  (AL4)      [Alarm 4 setpoint is set
O2     18.0   %      by default to 18.0%]
```

5]   Press Cancel to exit the Alarm screen and return to Select another sensor or press Cancel to return to the Top-level Menu, List Alrm pnts

4.3   List Alarm descriptions (Displayed as List Alrm descs)

4.3.1   List Alrm descs (CO$_2$ example)

The Top-level Menu, List Alrm descs option enables you to view read-only information about the alarm descriptions configured for each Sensor.

> 🗒 **NOTE:**   THE LIST ALRM DESCS OPTION PROVIDES READ-ONLY INFORMATION THAT CANNOT BE CHANGED. IF YOU NEED TO SET UP OR CONFIGURE THE ALARM SETPOINTS, USE THE TOP-LEVEL MENU, SENSOR CONFIG, ALRM SET-PNTS OPTION.
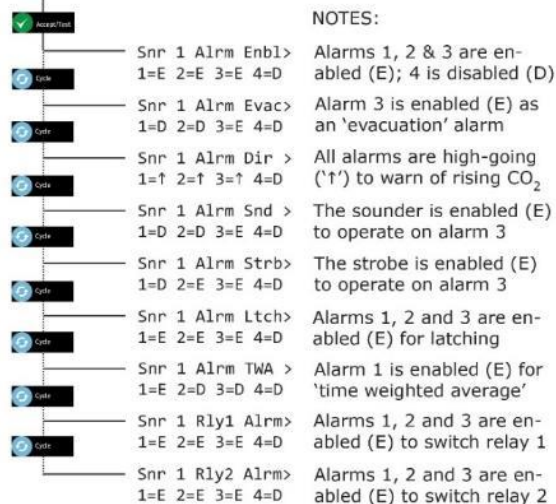
1]   **To display the Top-level Menu List Alrm descs option, press and hold down the Cancel + Cycle buttons for at least 6 seconds. Then press the Cycle button twice.**

2]   **Press Accept/Test to go to the Select Sensor screen, this displays the CO2 Sensors and highlights Sensor 1.**

3]   **Press Cycle to highlight other sensors.**

4]   **Press Accept/Test to select the sensor that you want to view alarms on, then press Cycle to cycle through the alarms.**

5]   **Press Cancel to exit the Alarm screen and return to Select another sensor or press Cancel to return to the Top-level Menu, List Alrm descs.**

4.3.2   List Alrm descs (O$_2$ example)

The Top-level Menu, List Alrm descs option enables you to view read-only information about the alarm descriptions configured for each Sensor.

> 📧   NOTE: THE LIST ALRM DESCS OPTION PROVIDES READ-ONLY INFORMATION THAT CANNOT BE CHANGED. IF YOU NEED TO SET UP OR CONFIGURE THE ALARM SETPOINTS, USE THE TOP-LEVEL MENU, SENSOR CONFIG, ALRM SET-PNTS OPTION.

1]   To display the Top-level Menu List Alrm descs option, press and hold down the Cancel + Cycle buttons for at least 6 seconds. Then press the Cycle button twice.

2]   Press Accept/Test to go to the Select Sensor screen, this displays the CO2 Sensors and highlights Sensor 1.

3]   Press Cycle to highlight other sensors.

4]   Press Accept/Test to select the sensor that you want to view alarms on, then press Cycle to cycle through the alarms.


```
Top-level Menu
List Alrm descs>      [✓ Accept/Test]
```

In this example, sensor 2 is an oxygen (O$_2$) sensor. The default alarm descriptions are shown.

```
                    Select sensor
                    1  >2  3  4
```
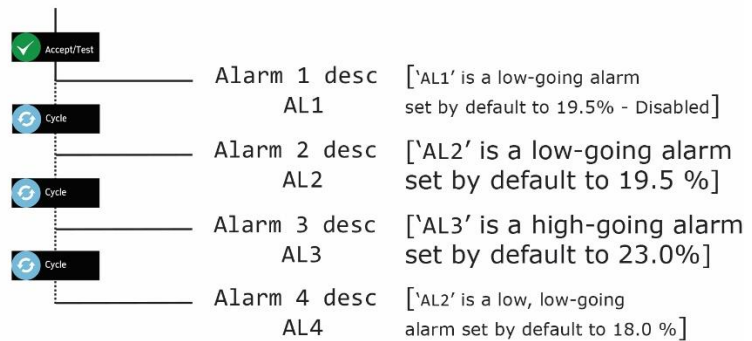
Alarm 1 desc AL1	['AL1' is a low-going alarm set by default to 19.5% - Disabled]
Alarm 2 desc AL2	['AL2' is a low-going alarm set by default to 19.5 %]
Alarm 3 desc AL3	['AL3' is a high-going alarm set by default to 23.0%]
Alarm 4 desc AL4	['AL2' is a low, low-going alarm set by default to 18.0 %]

5]   Press Cancel to exit the Alarm screen and return to Select another sensor or press Cancel to return to the Top-level Menu, List Alrm descs.

4.4   Testing relays (Displayed as Test relays)

The Test relays option is used to switch Relays 1 and 2 to check they are functioning.

⚠️ **WARNING: DURING A RELAY TEST, ANY CONNECTED DEVICES OR CIRCUITS WILL OPERATE. DISCONNECT AND ISOLATE ANY DEVICES OR CIRCUITS CONNECTED TO THE RELAYS BEFORE TESTING THEM.**

📋 **NOTE: IF YOU FORGET TO SWITCH OFF THE RELAYS DURING THE TEST THEY WILL AUTOMATICALLY SWITCH OFF WHEN YOU EXIT THE MENU OR WHEN THE SOFTWARE TIMES OUT AFTER 60 SECONDS.**

📋 **NOTE: RELAYS ARE NOT TRIGGERED WHEN CARRYING OUT THE 'ALARM TEST' FUNCTION.**

1]   To display the Top-level Menu Test relays option, press and hold down the Cancel+Cycle buttons for at least 6 seconds. Then press the Cycle button three times.

2]   Press Accept/Test to go to the Activate Rly 1 screen, Press Accept/Test to activate the relay.

3]   Press Cycle to go to Activate Rly 2 screen, Press Accept/Test to activate the relay.

4]   Press Cycle to go to Rlys inactive screen, Press Accept/Test to deactivate the relays.
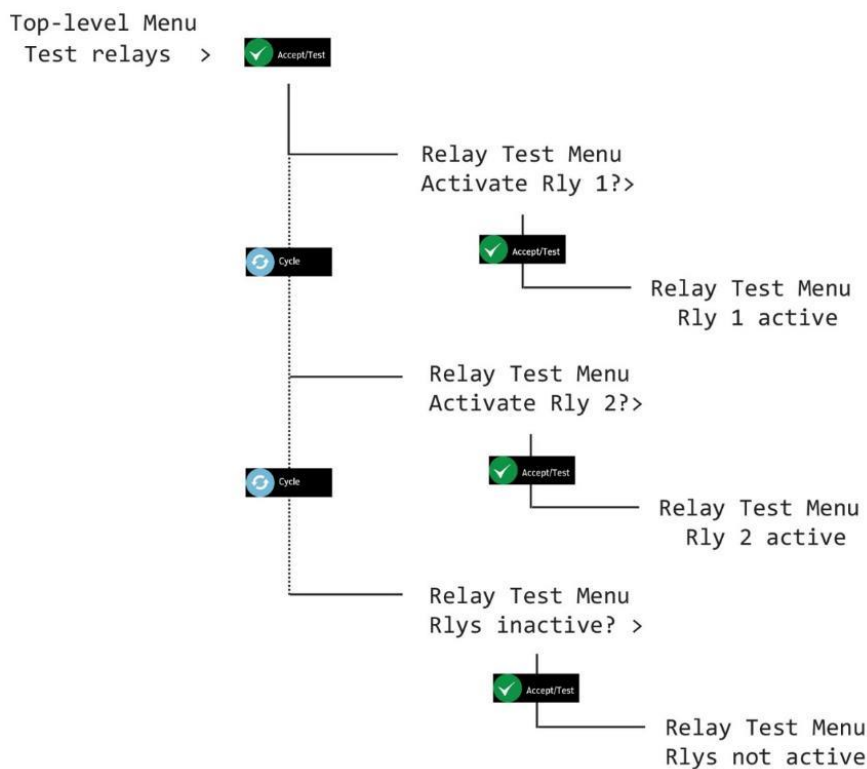
📋 **NOTE: YOU WILL HEAR CLICKS FROM THE CENTRAL DISPLAY DURING TESTING OF RELAYS.**

5]   Press Cancel to return to Top-level Menu, Test relays.

5   Calibrating Ax60+ sensors

5.1 CO_2 sensor calibration proof test

The Ax60+ CO_2 Sensors can be checked to ensure that they accurately measure carbon dioxide and display the correct reading.

> 📩 **NOTE: A PROOF TEST SHOULD BE CARRIED OUT AT LEAST EVERY 12 MONTHS*.**

*Typical performance, with fixed temperature, humidity and pressure. Adjustment may be required.

Ax60+ CO_2 Check Kit comprising:		
Part number	**Description**	**Gas type**
Contact Analox or source locally	3.0% carbon dioxide, balance nitrogen	CO2 Check
Contact Analox or source locally	Suitable 0.5-litre/minute regulator to fit calibration gas bottle	
1817-5000	2-metre neoprene tubing	
8000-0910A	Push-in flow adaptor	

Checking CO_2 Sensors is an easy task that does not require software input. This procedure is suitable for the standard Ax60+ option only. Follow the procedure below:

> 📩 **NOTE: IF THE OPTIONAL SENSOR SPLASHGUARD IS FITTED, REMOVE IT BEFORE CHECKING AND/OR CALIBRATING THE SENSORS.**

1]   **Ensure the Ax60+ is powered on and operating normally.**
2]   **Fit the neoprene tubing to the flow adaptor.**
3]   **Fit the flow adaptor into the aperture on the CO2 Sensor (see below, left).**

Step 3] Fit the flow adaptor into the aperture on the CO₂ Sensor   **Step 4] Fit the regulator to the CO₂ check gas bottle**

4] **Fit the regulator to the CO_2 check gas bottle.**
5] **Open the regulator valve and allow the CO_2 check gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.**
6] **Ensure that the Ax60+ display reading is between 30000 – 30150ppm CO_2**
7] **Close the regulator valve, acknowledge the alarm and ventilate the area.**

5.2 CO_2 sensor calibration adjustment

The Ax60+ CO_2 Sensor(s) can be recalibrated to ensure they accurately measure carbon dioxide at the specified levels.

Ax60+ CO_2 Calibration Kit comprising:		
Part number	**Description**	**Gas type**
Contact Analox or source locally	Pure air (20.9% oxygen, balance nitrogen)	CO2 Zero
Contact Analox or source locally	3% carbon dioxide, balance nitrogen	CO2 Span
Contact Analox or source locally	Suitable 0.5-litre/minute regulator to fit calibration gas bottle	
1817-5000	2-metre neoprene tubing	
8000-0910A	Push-in flow adaptor	

> **NOTE:**   ZERO CALIBRATION ADJUSTMENT MUST BE PERFORMED BEFORE SPAN CALIBRATION ADJUSTMENT.

5.2.1 CO_2 sensor zero calibration (Displayed as Zero cal.)

> **NOTE:**   THE SENSOR THAT IS BEING CALIBRATED IS AUTOMATICALLY DISABLED DURING CALIBRATION. THE OTHER SENSORS CONTINUE TO OPERATE.

> **NOTE:**   CALIBRATION MODE AUTOMATICALLY TIMES OUT AFTER TEN MINUTES.

To zero calibrate a CO_2 Sensor, follow the procedure below (in both text and menu map):

1] **Ensure the Ax60+ is powered on and operating normally.**
2] **Press and hold Cancel+Cycle for 6 seconds to display Top-level Menu.**
3] **Press Cycle four times to display Calibration. Press Accept/Test to display Zero cal.**
4] **Press Accept/Test to show the Select sensor screen, press Cycle to select the Sensor you want to calibrate.**
5] **Press Accept/Test to select the Sensor. The Zero level (#) screen displays.**
6] **Fit the neoprene tubing to the flow adaptor.**
7] **Fit the flow adaptor into the aperture on the CO_2 Sensor.**
8] **Fit the regulator to the CO_2 zero gas bottle.**
9] **Open the regulator valve and allow the CO_2 zero gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.**
10] **The CO2 reading on the Zero level screen will begin to reduce. Wait for the reading to stabilise.**
11] **Press Accept/Test to confirm the zero calibration.**
12] **If zero calibration is successful the Zero msg sent screen is displayed.**

```
Top-level Menu
Calibration   >   [Accept/Test]
                        |
              Calibration Menu
                Zero cal.    >
                        |
[Cycle]---------        [Accept/Test]
                |
Calibration Menu        Select sensor        NOTE: In this example,
  Span cal.    >        >1  2  3  4          sensor 1 is a CO2 sensor.
                        [Cycle]
NOTE: Refer to               |
Span cal. section        [Accept/Test]   Zero level(1)
for menu details                         CO2   0.2  %
                                              |
                                         [Accept/Test]
                                         Zero level(1)
                                          Zero msg sent
                                              |
                                         [Accept/Test]
                                         Zero level(1) OK
                                         CO2   0.0  %
```

13] **Press Cancel repeatedly to return to system status screen**

> NOTE: IF THE CALIBRATION IS UNSUCCESSFUL, A FAULT CODE MAY BE DISPLAYED. REFER TO SECTION 11 FOR DETAILS.

> NOTE: THE VALUE SHOWN DURING A CALIBRATION IS THE 'RAW' SENSOR READING. WHEN YOU EXIT THE MENU AND RETURN TO THE SYSTEM STATUS SCREEN THE VALUE SHOWN IS A SLIGHTLY ELEVATED VALUE.

> CAUTION: ONLY ONE SENSOR CAN BE CALIBRATED AT A TIME. TO CALIBRATE ANOTHER SENSOR, EXIT THE MENUS BACK TO THE SYSTEM STATUS SCREEN THEN REPEAT THE CALIBRATION PROCESS FOR THE NEXT SENSOR.

5.2.2 CO_2 sensor span calibration (Displayed as Span cal.)

> NOTE: THE SENSOR THAT IS BEING CALIBRATED IS AUTOMATICALLY DISABLED DURING CALIBRATION. THE OTHER SENSORS CONTINUE TO OPERATE.

> NOTE: CALIBRATION MODE AUTOMATICALLY TIMES OUT AFTER TEN MINUTES.

Standard increments for calibration are factory set at 0.01 %, however, by pressing and holding the Cycle button this increases the increment value x 10 (0.10 %)

To span calibrate a CO_2 Sensor, follow the procedure below (in both text and menu map):

1]   **Ensure the Ax60+ is powered on and operating normally.**
2]   **Press and hold Cancel+Cycle for 6 seconds to display Top-level Menu.**
3]   **Press Cycle four times to display Calibration. Press Accept/Test to display Zero cal.**
4]   **Press Cycle to show Span cal., press Accept/Test to show the Select sensor screen,   press Cycle to select the Sensor you want to calibrate.**
5]   **Press Accept/Test to show the Span Cal Value screen.**
6]   **Press Cycle repeatedly to enter the span calibration value you want in 0.01% increments, or press and hold Cycle to increment the value at 0.10% increments.**
7]   **To reset the value and start again, repeatedly press Cycle or press and hold Cycle until you exceed 6.00 %, this will take the value back to 2.50 % and you can cycle through again until you reach the required value.**
8]   **Press Accept/Test to confirm the span calibration value.**
9]   **Fit the neoprene tubing to the flow adaptor.**
10]   **Fit the flow adaptor into the aperture on the CO_2 Sensor.**
11]   **Fit the regulator to the CO_2 span gas bottle.**
12]   **Open the regulator valve and allow the span gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.**
13]   **The CO_2 reading on the Span level screen will begin to increase. Wait for the reading to stabilise.**
14]   **Press Accept/Test to confirm the calibration.**
15]   **If span calibration is successful the Span msg sent screen is displayed.**

```
Top-level Menu
  Calibration  >  [✓ Accept/Test]
                    |
              Calibration Menu
                Zero cal.  >
                    |
  [⟳ Cycle]--------- · · · · · · · [✓ Accept/Test]------ Calibration Menu          NOTE: Refer to
                                                           Zero cal.   > ——————   Zero cal. section
  Calibration Menu                                                                 for menu details
    Span cal.  >
        |
  [✓ Accept/Test]
        |
  Select sensor · · · · · · · · [⟳ Cycle]
     >1  2  3  4
        |
  [✓ Accept/Test]
        |
```

Span cal value
CO2   2.77 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   2.78 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   2.79 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   2.80 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   2.90 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   3.00 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   3.10 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   3.20 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   3.30 %

[⟳ Cycle] · · · · · · · [✓ Accept/Test]

Span cal value
CO2   3.40 %

```
+--------------------------+
| Span level(1)            |
| CO2    2.90 %            |
|                          |
|     [✓ Accept/Test]      |
|                          |
| Span level(1)            |
|   Span msg sent          |
|                          |
|     [✓ Accept/Test]      |
|                          |
| Span level(1) OK         |
| CO2    3.00  %          |
+--------------------------+
```
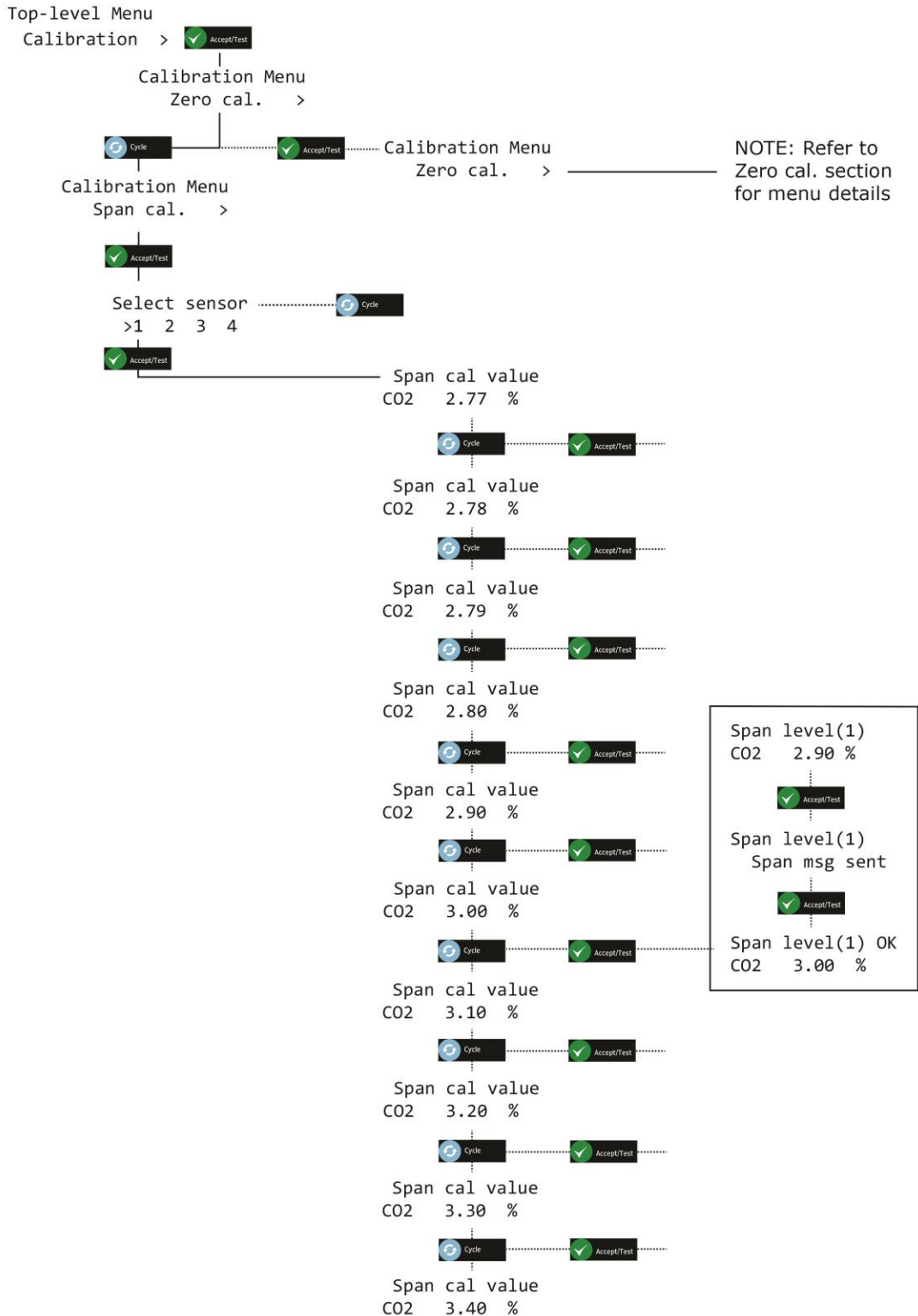
> 🗒 **NOTE:** IF THE CALIBRATION IS UNSUCCESSFUL, A FAULT CODE MAY BE DISPLAYED. REFER TO SECTION 11 FOR DETAILS.

> 🗒 **NOTE:** THE VALUE SHOWN DURING A CALIBRATION IS THE 'RAW' SENSOR READING. WHEN YOU EXIT THE MENU AND RETURN TO THE SYSTEM STATUS SCREEN THE VALUE SHOWN IS A SLIGHTLY ELEVATED VALUE.

5.3   O$_2$ sensor calibration proof test

The Ax60+ O$_2$ Sensors can be checked to ensure that they accurately measure oxygen and displays the correct reading.

> **NOTE:**   A PROOF TEST SHOULD BE CARRIED OUT AT LEAST EVERY 12 MONTHS*.

*Typical performance, with fixed temperature, humidity and pressure. Adjustment may be required.

Ax60+ O$_2$ Check Kit comprising:		
Part number	**Description**	**Gas type**
Contact Analox or source locally	3.0% carbon dioxide, balance nitrogen	O2 Low Check
Contact Analox or source locally	Pure air (20.9% oxygen, balance nitrogen)	O2 High Check
Contact Analox or source locally	Suitable 0.5-litre/minute regulator to fit calibration gas bottle	
1817-5000	2-metre neoprene tubing	
8000-0910A	Push-in flow adaptor	

Checking O$_2$ Sensors is an easy task that does not require software input. Follow the procedure below:

> **NOTE:**   IF THE OPTIONAL SENSOR SPLASHGUARD IS FITTED, REMOVE IT BEFORE CHECKING AND/OR CALIBRATING THE SENSORS.

1] **Ensure the Ax60+ is powered on and operating normally.**
2] **Fit the neoprene tubing to the flow adaptor.**
3] **Fit the flow adaptor into the aperture on the O$_2$ Sensor (see below, left).**

Step [3] Fit the flow adaptor into the aperture on the O$_2$ Sensor

Step [4] Fit the regulator to the O$_2$ low check gas bottle

4]   **Fit the regulator to the O₂ low check gas bottle.**

5]   **Open the regulator valve and allow the O₂ low check gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.**

6]   **Ensure the Ax60+ display reads under 1% O₂.**

7]   **Close the regulator valve, acknowledge the alarm and ventilate the area.**

8]   **Repeat the procedure using the O₂ high check gas bottle to check the display reads 20.9% O₂ ± 1%.**

5.4 O_2 sensor calibration adjustment

The Ax60+ O_2 Sensor(s) can be recalibrated to ensure they accurately measure oxygen at the specified levels. Analox can supply the following calibration kit:

Ax60+ O_2 Calibration Kit comprising:		
Part number	**Description**	**Gas type**
Contact Analox or source locally	3% carbon dioxide, balance nitrogen	O2 Zero
Contact Analox or source locally	Pure air (20.9% oxygen, balance nitrogen)	O2 Span
Contact Analox or source locally	Suitable 0.5-litre/minute regulator to fit calibration gas bottle	
1817-5000	2-metre neoprene tubing	
8000-0910A	Push-in flow adaptor	

Recalibrating O_2 Sensors is a similar task to checking but it also requires software input. The recalibration procedure can only be performed on the standard Ax60+ option.

Calibration adjustment is a two-point process: a 'zero calibration adjustment' and a 'span calibration adjustment'.

    ⬛   **NOTE:**   **ZERO CALIBRATION ADJUSTMENT MUST BE PERFORMED BEFORE SPAN CALIBRATION ADJUSTMENT.**

5.4.1 O_2 sensor zero calibration

    ⬛   **NOTE:**   **THE SENSOR THAT IS BEING CALIBRATED IS AUTOMATICALLY DISABLED DURING CALIBRATION. THE OTHER SENSORS CONTINUE TO OPERATE.**

    ⬛   **NOTE:**   **CALIBRATION MODE AUTOMATICALLY TIMES OUT AFTER TEN MINUTES.**

To zero calibrate an O_2 Sensor, follow the procedure below (in both text and menu map):

1]   **Ensure the Ax60+ is powered on for a minimum of 24hrs and operating normally.**

2]   **Press and hold Cancel+Cycle for 6 seconds to display Top-level Menu.**

3]   **Press Cycle four times to display Calibration. Press Accept/Test to display Zero cal.**

4]   **Press Accept/Test to show the Select sensor screen, press Cycle to select the Sensor you want to calibrate.**

5]   **Press Accept/Test to select the Sensor. The Zero level (#) screen displays.**

6]   **Fit the neoprene tubing to the flow adaptor.**

7]   **Fit the flow adaptor into the aperture on the O₂ Sensor.**

8]   **Fit the regulator to the O₂ zero gas bottle.**

9]   Open the regulator valve and allow the zero gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.

10]   Wait for the O_2 reading on the Zero level screen to stabilise.

      📋 NOTE: THE READING MAY NOT RETURN EXACTLY TO ZERO. THIS IS NORMAL DURING THE CALIBRATION PROCESS.

11]   Press Accept/Test to confirm the zero calibration.

12]   If zero calibration is successful, the Zero msg sent screen is displayed.
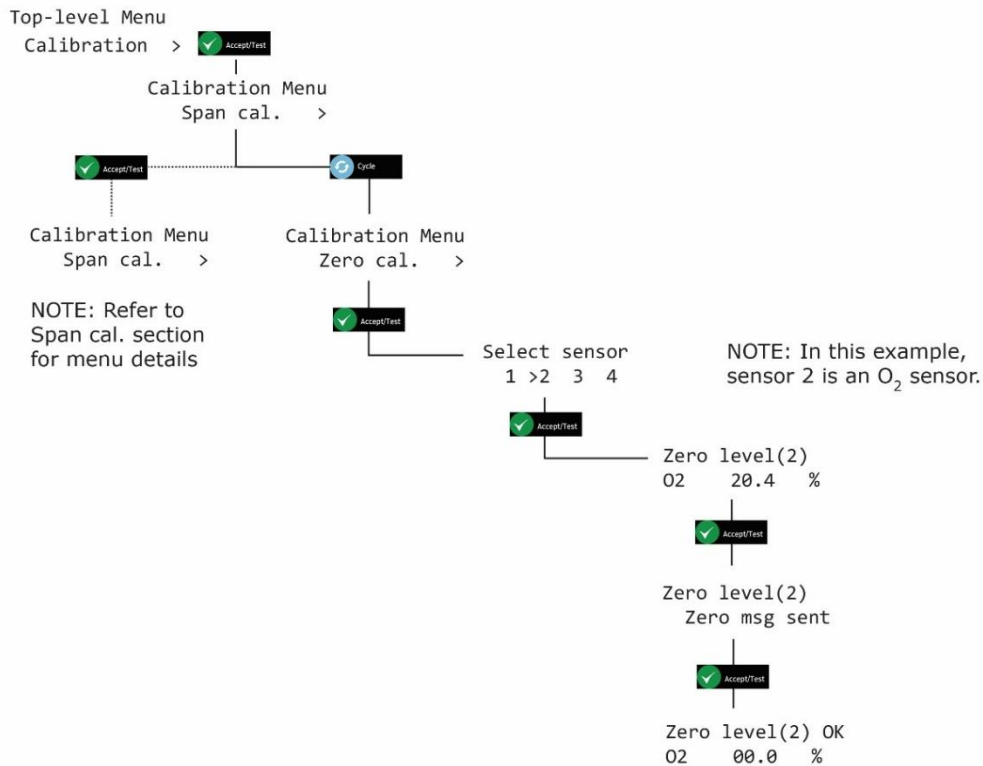
13]   Press Cancel repeatedly to return to system status screen

      📋 NOTE: IF THE CALIBRATION IS UNSUCCESSFUL, A FAULT CODE MAY BE DISPLAYED. REFER TO SECTION 10 FOR DETAILS.

      📋 NOTE: THE VALUE SHOWN DURING A CALIBRATION IS THE 'RAW' SENSOR READING. WHEN YOU EXIT THE MENU AND RETURN TO THE SYSTEM STATUS SCREEN THE VALUE SHOWN IS A SLIGHTLY ELEVATED VALUE.

      ◈ CAUTION: ONLY ONE SENSOR CAN BE CALIBRATED AT A TIME. TO CALIBRATE ANOTHER SENSOR, EXIT THE MENUS BACK TO THE SYSTEM STATUS SCREEN THEN REPEAT THE CALIBRATION PROCESS FOR THE NEXT SENSOR.

5.4.2   O$_2$ sensor span calibration

> 📝 **NOTE:**   THE SENSOR THAT IS BEING CALIBRATED IS AUTOMATICALLY DISABLED DURING CALIBRATION. THE OTHER SENSORS CONTINUE TO OPERATE.

> 📝 **NOTE:**   CALIBRATION MODE AUTOMATICALLY TIMES OUT AFTER TEN MINUTES.

To span calibrate an O$_2$ Sensor, follow the procedure below (in both text and menu map):

1] **Ensure the Ax60+ is powered on for a minimum of 24hrs and operating normally.**
2] **Press and hold Cancel+Cycle for 6 seconds to display Top-level Menu.**
3] **Press Cycle four times to display Calibration. Press Accept/Test to display Zero cal.**
4] **Press Cycle to show Span cal. press Accept/Test to show the Select sensor screen, press Cycle to select the Sensor you want to calibrate then press Accept/Test.**
5] **Press Cycle repeatedly to enter the span calibration value you want in 0.1% increments. or press and hold Cycle to increment the value at 1.0% increments. To reset the value to 20.9% and start again, repeatedly press Cycle until you exceed 25%.**
6] **Press Accept/Test to confirm the span calibration value (for example, 21%).**
7] **Fit the neoprene tubing to the flow adaptor.**
8] **Fit the flow adaptor into the aperture on the O$_2$ Sensor.**
9] **Fit the regulator to the O$_2$ span gas bottle.**
10] **Open the regulator valve and allow the span gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.**
11] **The O$_2$ reading on the Span level screen will begin to increase. Wait for the reading to stabilise.**
12] **Press Accept/Test to confirm the calibration.**
13] **If span calibration is successful the Span msg sent screen is displayed.**

```
Top-level Menu
  Calibration  >    [✓ Accept/Test]
                         |
              Calibration Menu
                 Span cal.   >
                 |
[✓ Accept/Test] · · · · · · [↻ Cycle] · · · · · Calibration Menu        NOTE: Refer to
                                                   Zero cal.   >  ————— Zero cal. section
     Select sensor                                                      for menu details
       1 >2  3  4
     [✓ Accept/Test]
         |
                                        Span cal value
                                        O2    20.9  %
                                             [↻ Cycle] · · · · · [✓ Accept/Test]

                                        Span cal value
                                        O2    21.0  %                   ┌─────────────────────┐
                                             [↻ Cycle] · · · · · [✓ Accept/Test] · · · ·│ Span level(2)       │
                                                                       │ O2    21.0 %        │
                                        Span cal value                 │                     │
                                        O2    21.1  %                  │    [✓ Accept/Test]  │
                                             [↻ Cycle] · · · · · [✓ Accept/Test]           │                     │
                                                                       │ Span level(2)       │
                                        Span cal value                 │    Span msg sent    │
                                        O2    21.2  %                  │                     │
                                             [↻ Cycle] · · · · · [✓ Accept/Test]           │    [✓ Accept/Test]  │
                                                                       │                     │
                                        Span cal value                 │ Span level(2) OK    │
                                        O2    21.3  %                  │ O2     21.0 %       │
                                             [↻ Cycle] · · · · · [✓ Accept/Test]           └─────────────────────┘

                                        Span cal value
                                        O2    21.4  %
                                             [↻ Cycle] · · · · · [✓ Accept/Test]

                                        Span cal value
                                        O2    21.5  %
                                             [↻ Cycle] · · · · · [✓ Accept/Test]

                                        Span cal value
                                        O2    21.6  %
                                             [↻ Cycle] · · · · · [✓ Accept/Test]

                                        Span cal value
                                        O2    21.7  %
                                             [↻ Cycle] · · · · · [✓ Accept/Test]

                                        Span cal value
                                        O2    21.8  %
                                             [↻ Cycle] · · · · · [✓ Accept/Test]

                                        Span cal value
                                        O2    21.9  %
```

📇 **NOTE:** IF THE CALIBRATION IS UNSUCCESSFUL, A FAULT CODE MAY BE DISPLAYED. REFER TO SECTION 11 FOR DETAILS.

📇 **NOTE:** THE VALUE SHOWN DURING A CALIBRATION IS THE 'RAW' SENSOR READING. WHEN YOU EXIT THE MENU AND RETURN TO THE SYSTEM STATUS SCREEN THE VALUE SHOWN IS A SLIGHTLY ELEVATED VALUE.

6   Calibrating Ax60+ Kiosk sensors

6.1 CO_2 sensor calibration proof test

The Ax60+ CO_2 Sensors can be checked to ensure that they accurately measure carbon dioxide and trigger the alarms correctly.

> 📋 **NOTE: A PROOF TEST SHOULD BE CARRIED OUT AT LEAST EVERY 12 MONTHS*.**

*Typical performance, with fixed temperature, humidity and pressure. Adjustment may be required.

Ax60+ CO_2 Check Kit comprising:	
Part number	**Description**
Contact Analox or source locally	1.6% carbon dioxide, balance nitrogen (low alarm check gas)
Contact Analox or source locally	3.2% carbon dioxide, balance nitrogen (high alarm check gas)
Contact Analox or source locally	Suitable 0.5-litre/minute regulator to fit calibration gas bottle
1817-5000	2-metre neoprene tubing
8000-0910A	Push-in flow adaptor

Checking CO_2 Sensors is an easy task that does not require software input. This procedure is suitable for the Ax60+ Kiosk option only. Follow the procedure below:

> 📋 **NOTE: IF THE OPTIONAL SENSOR SPLASHGUARD IS FITTED, REMOVE IT BEFORE CHECKING AND/OR CALIBRATING THE SENSORS.**

1]   **Ensure the Ax60+/Ax60+ Kiosk is powered on and operating normally.**
2]   **Fit the neoprene tubing (1817-5000) to the flow adaptor (8000-0910A).**
3]   **Fit the flow adaptor into the aperture on the CO2 Sensor (see below, left).**

Step [3] Fit the flow adaptor into the aperture on the CO₂ Sensor

Step [4] Fit the regulator to the 1.6% CO₂ gas bottle

4] **Fit the regulator to the 1.6% CO2 gas bottle (see above, right).**

5] **Carefully open the regulator valve and allow the 1.6% CO2 gas to flow across the sensor. Do not block the exit of the flow adaptor.**

6] **Ensure that the Ax60+/Ax60+ Kiosk low alarm (1.5% CO2) operates.**

7] **Close the regulator valve, acknowledge the alarm and ventilate the area.**

8] **Repeat the procedure using 3.2% CO2 gas to check the high alarm (3% CO2).**

6.2 CO_2 sensor calibration adjustment

The Ax60+ CO_2 Sensor(s) can be recalibrated to ensure they accurately measure carbon dioxide at the specified levels. Analox can supply the following calibration kit:

Ax60+ CO_2 Calibration Kit comprising:	
Part number	**Description**
Contact Analox or source locally	100% nitrogen (zero gas)
Contact Analox or source locally	3% carbon dioxide, balance nitrogen (span gas)
Contact Analox or source locally	Suitable 0.5-litre/minute regulator to fit calibration gas bottle
1817-5000	2-metre neoprene tubing
8000-0910A	Push-in flow adaptor

Recalibrating CO_2 Sensors is a similar task to checking but it also requires software input. The recalibration procedure is the same for both the standard Ax60+ and the Ax60+ Kiosk. However, before you adjust the Ax60+ Kiosk you must temporarily fit the portable calibration unit, part number AX60CNQNXA (see section 10 for further details).

Calibration adjustment is a two-point process: a 'zero calibration adjustment' and a 'span calibration adjustment'.

> **NOTE:**   ZERO CALIBRATION ADJUSTMENT MUST BE PERFORMED BEFORE SPAN CALIBRATION ADJUSTMENT.

6.2.1 CO_2 sensor zero calibration (Displayed as Zero cal.)

> **NOTE:**   THE SENSOR THAT IS BEING CALIBRATED IS AUTOMATICALLY DISABLED DURING CALIBRATION. THE OTHER SENSORS CONTINUE TO OPERATE.

> **NOTE:**   CALIBRATION MODE AUTOMATICALLY TIMES OUT AFTER TEN MINUTES.

To zero calibrate a CO_2 Sensor, follow the procedure below (in both text and menu map):

1] **Ensure the Ax60+/Ax60+ Kiosk is powered on and operating normally.**

2] **Press and hold Cancel+Cycle for 6 seconds to display Top-level Menu.**

3] **Press Cycle four times to display Calibration. Press Accept/Test to display Zero cal.**

4] **Press Accept/Test to show the Select sensor screen, press Cycle to select the Sensor you want to calibrate.**

5] **Press Accept/Test to select the Sensor. The Zero level (#) screen displays.**

6] **Fit the neoprene tubing (1817-5000) to the flow adaptor (8000-0910A).**

7] **Fit the flow adaptor into the aperture on the CO2 Sensor.**

8] **Fit the regulator to the 100% nitrogen zero gas.**

9] Carefully open the regulator valve and allow the zero gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.

10] The CO_2 reading on the Zero level screen will begin to reduce. Wait for the reading to stabilise at around 0.0%.

> 📝 NOTE: THE READING MAY NOT RETURN EXACTLY TO ZERO. THIS IS NORMAL DURING THE CALIBRATION PROCESS.

11] Press Accept/Test to confirm the zero calibration.

12] If zero calibration is successful the Zero msg sent screen is displayed.

13] Press Cancel repeatedly to return to system status screen

> 📝 NOTE: IF THE CALIBRATION IS UNSUCCESSFUL, A FAULT CODE MAY BE DISPLAYED. REFER TO SECTION 11 FOR DETAILS.

> 📝 NOTE: THE VALUE SHOWN DURING A CALIBRATION IS THE 'RAW' SENSOR READING. WHEN YOU EXIT THE MENU AND RETURN TO THE SYSTEM STATUS SCREEN THE VALUE SHOWN IS A SLIGHTLY ELEVATED VALUE.

> ◆ CAUTION: ONLY ONE SENSOR CAN BE CALIBRATED AT A TIME. THIS IS BECAUSE A SENSOR IS REMOVED FROM CALIBRATION MODE ONLY WHEN YOU EXIT FROM THE MENUS. TO CALIBRATE ANOTHER SENSOR, EXIT THE MENUS BACK TO THE SYSTEM STATUS SCREEN THEN REPEAT THE CALIBRATION PROCESS FOR THE NEXT SENSOR.

6.2.2   CO$_2$ sensor span calibration (Displayed as Span cal.)

> NOTE: THE SENSOR THAT IS BEING CALIBRATED IS AUTOMATICALLY DISABLED DURING CALIBRATION. THE OTHER SENSORS CONTINUE TO OPERATE.

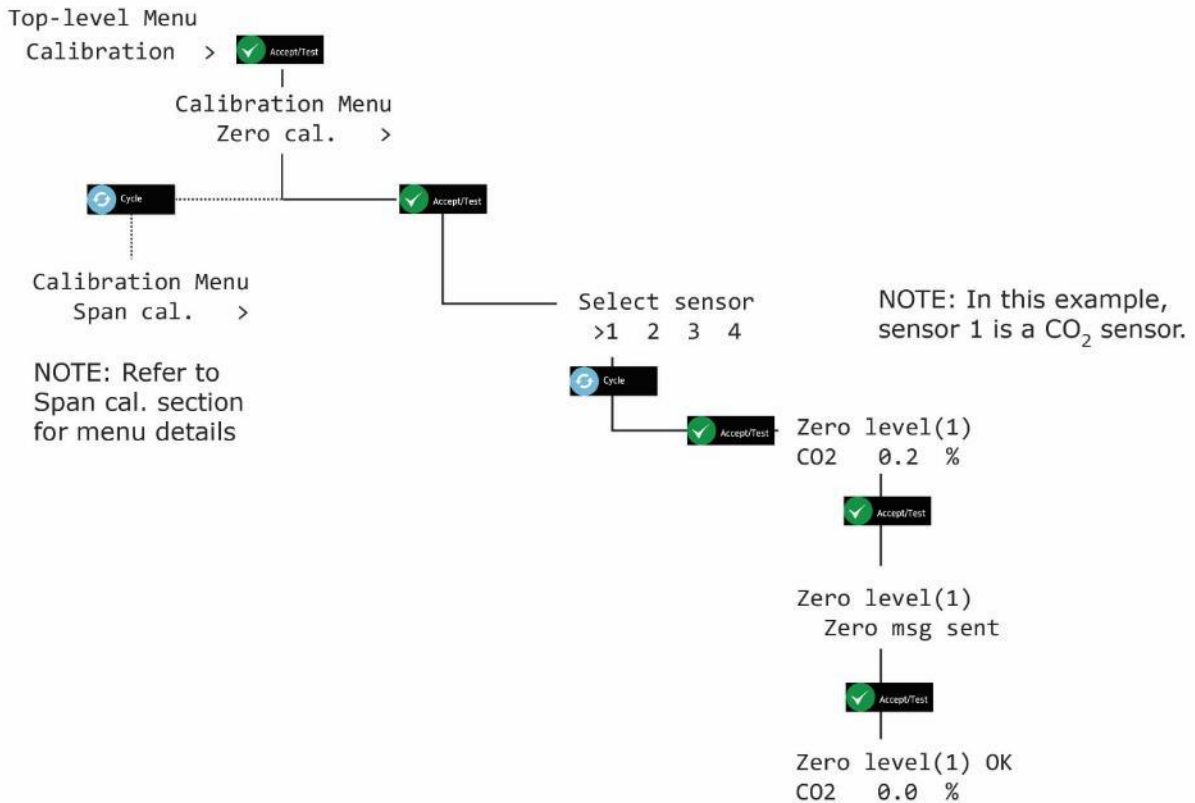> NOTE: CALIBRATION MODE AUTOMATICALLY TIMES OUT AFTER TEN MINUTES.

Standard increments for calibration are factory set at 0.01 %, however, by pressing and holding the Cycle button this increases the increment value x 10 (0.10 %)

To span calibrate a CO$_2$ Sensor, follow the procedure below (in both text and menu map):

1] **Ensure the Ax60+/Ax60+ Kiosk is powered on and operating normally.**
2] **Press and hold Cancel+Cycle for 6 seconds to display Top-level Menu.**
3] **Press Cycle four times to display Calibration. Press Accept/Test to display Zero cal.**
4] **Press Cycle to show Span cal., press Accept/Test to show the Select sensor   screen, press Cycle to select the Sensor you want to calibrate.**
5] **Press Accept/Test to show the Span Cal Value screen.**
6] **Press Cycle repeatedly to enter the span calibration value you want in 0.01% increments, or press and hold Cycle to increment the value at 0.10% increments.**
7] **To reset the value and start again, repeatedly press Cycle or press and hold Cycle until you exceed 6.00 %, this will take the value back to 2.50 % and you can cycle through again until you reach the required value.**
8] **Press Accept/Test to confirm the span calibration value (for example, 3.00 %).**
9] **Fit the neoprene tubing (1817-5000) to the flow adaptor (8000-0910A).**
10] **Fit the flow adaptor into the aperture on the CO2 Sensor.**
11] **Fit the regulator to the 3% CO2 span gas.**
12] **Carefully open the regulator valve and allow the span gas to flow across the sensor for 1 to 2 minutes. Do not block the exit of the flow adaptor.**
13] **The CO2 reading on the Span level screen will begin to increase. Wait for the reading to stabilise at (or close to) 3.00 %.**
14] **Press Accept/Test to confirm the calibration.**
15] **If span calibration is successful the Span msg sent screen is displayed.**

```
Top-level Menu
  Calibration  >   [✓ Accept/Test]
                        |
          Calibration Menu
            Zero cal.   >
                        |
[⟳ Cycle]·········[✓ Accept/Test]---- Calibration Menu      NOTE: Refer to
                                          Zero cal.  >  ———— Zero cal. section
  Calibration Menu                                          for menu details
    Span cal.   >
        |
   [✓ Accept/Test]

   Select sensor ········[⟳ Cycle]
     >1  2  3  4
   [✓ Accept/Test]
```

```
                           Span cal value
                           CO2   2.77  %
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]·····
                           Span cal value
                           CO2   2.78  %
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]·····
                           Span cal value
                           CO2   2.79  %
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]·····
                           Span cal value
                           CO2   2.80  %                    Span level(1)
                                    :                       CO2   2.90 %
                        [⟳ Cycle]·······[✓ Accept/Test]·····          :
                           Span cal value                      [✓ Accept/Test]
                           CO2   2.90  %
                                    :                       Span level(1)
                        [⟳ Cycle]·······[✓ Accept/Test]·····   Span msg sent
                           Span cal value                          :
                           CO2   3.00  %                       [✓ Accept/Test]
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]———— Span level(1) OK
                           Span cal value                   CO2   3.00  %
                           CO2   3.10  %
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]·····
                           Span cal value
                           CO2   3.20  %
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]·····
                           Span cal value
                           CO2   3.30  %
                                    :
                        [⟳ Cycle]·······[✓ Accept/Test]·····
                           Span cal value
                           CO2   3.40  %
```
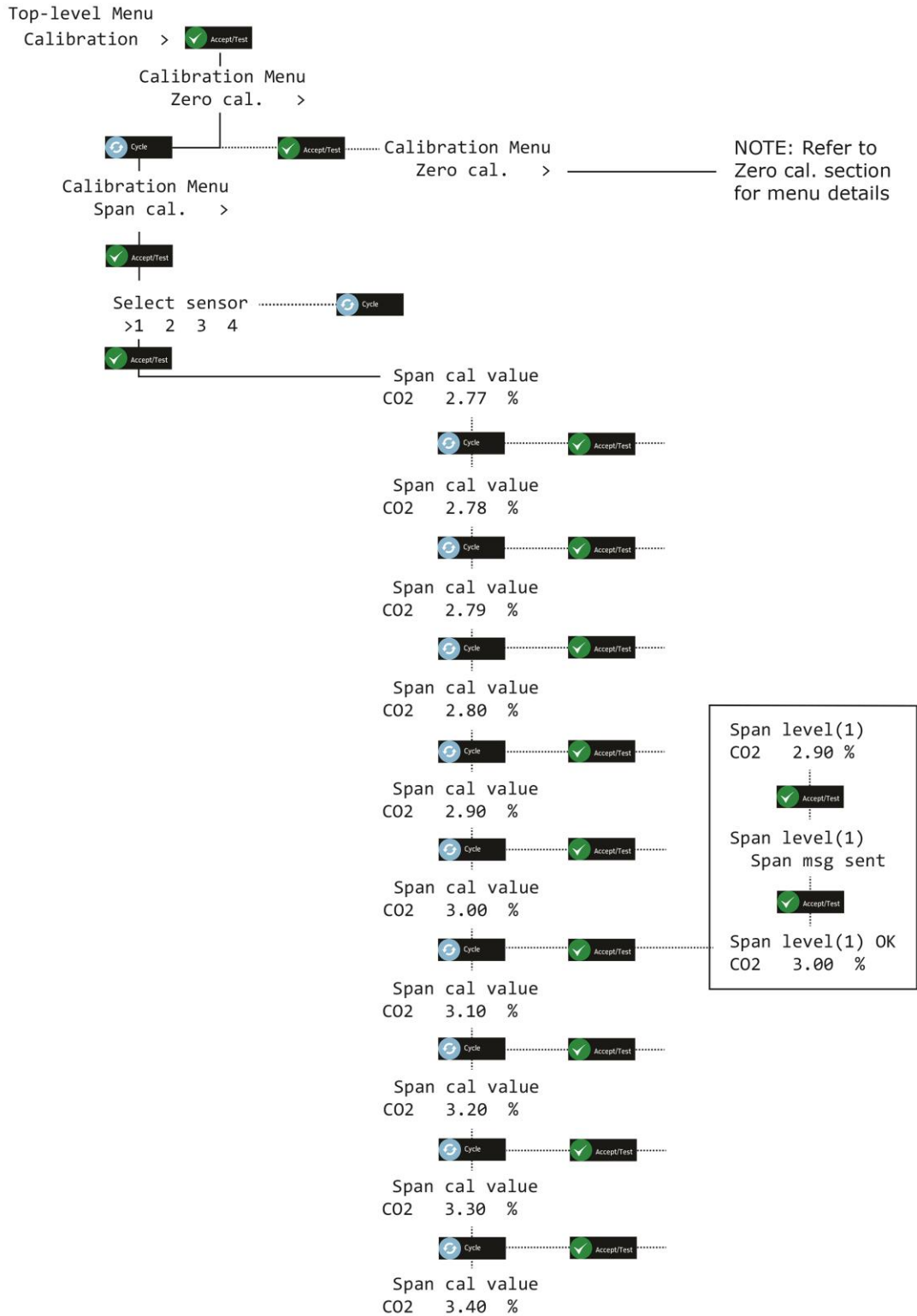
📋 **NOTE:**   **IF THE CALIBRATION IS UNSUCCESSFUL, A FAULT CODE MAY BE DISPLAYED. REFER TO SECTION 11 FOR DETAILS.**

📋 **NOTE:**   **THE VALUE SHOWN DURING A CALIBRATION IS THE 'RAW' SENSOR READING. WHEN YOU EXIT THE MENU AND RETURN TO THE SYSTEM STATUS SCREEN THE VALUE SHOWN IS A SLIGHTLY ELEVATED VALUE.**

7   Electrochemical sensor replacement

To replace an exhausted electrochemical sensor module, a new sensor module (Quick Connect or Hard Wired) should be ordered, contact Analox for further information.

> 📩 **NOTE:**   **ONCE A NEW SENSOR MODULE IS FITTED, A FULL CALIBRATION SHOULD BE PERFORMED, SEE SECTION 5 FOR THE RELEVANT SENSOR CALIBRATION PROCEDURE.**
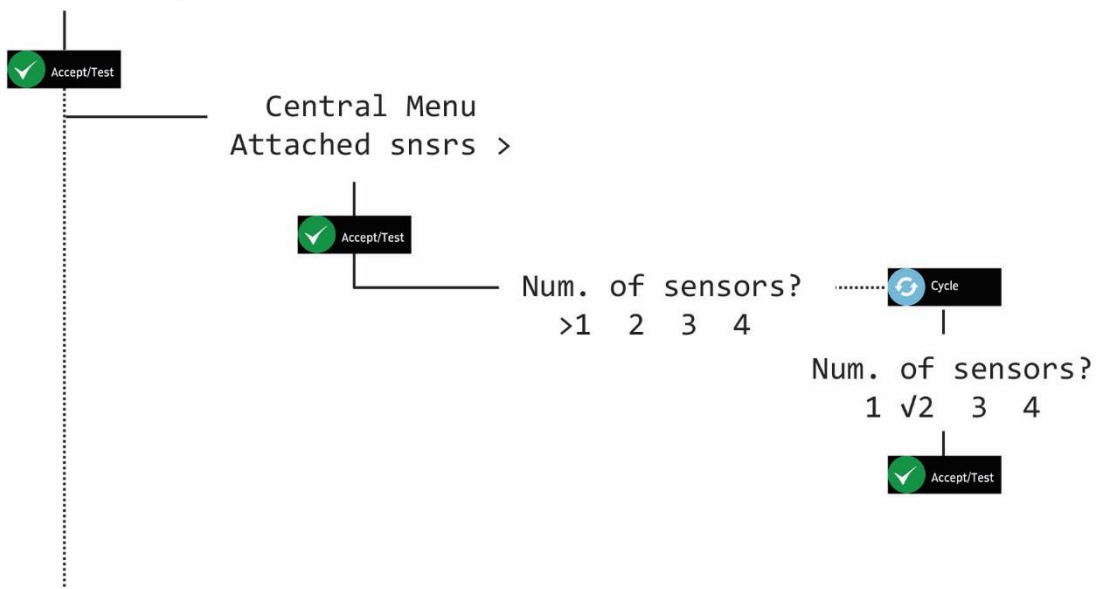
8   Central Configuration (Displayed as Central Config)

8.1   Attached snsrs

The Central Display software is factory configured for a system that has one sensor. If there are two, three, or four sensors the software must be reconfigured. This is done by using the Top-level Menu, Central Config, Attached snsrs option.

1]   Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.
2]   Press Accept/Test to display the Attached snsrs screen.
3]   Press Accept/Test again to select the Num. of sensors? Screen.
4]   Press Cycle to toggle the number of sensors then press Accept/Test to confirm.
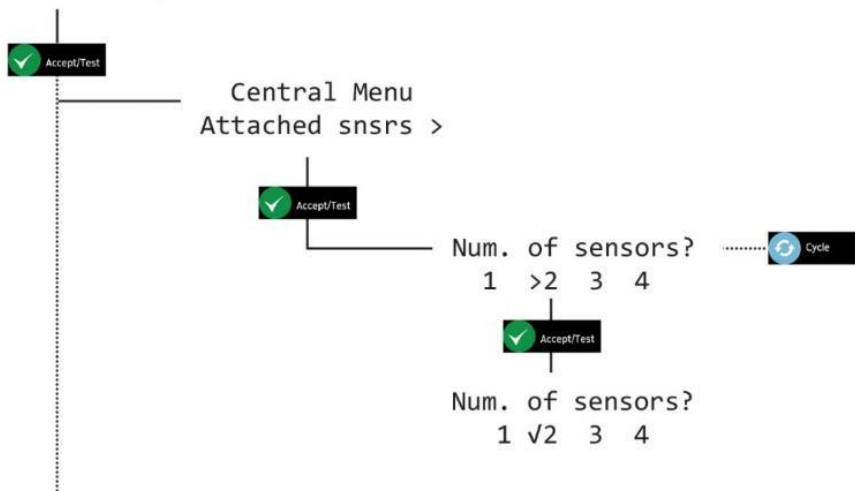
5]   Press Cancel repeatedly to return to system status screen.

8.2   Sensor Display Option (Displayed as Snr Display Opt)

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.**

2]   **Press Accept/Test, then press Cycle six times, press Accept/Test to display the Set as Ax60? Screen.**

3]   **Press Cycle to toggle Y or N, then press Accept/Test to confirm.**

```
 Top-level Menu
Central Config >



                        Central Menu
                     Snr Display Opt >

                    [✓ Accept/Test]

                                    Set as Ax60 ? ············ [⟳ Cycle]
                                       >Y  N

    [⟳ Cycle]                       [✓ Accept/Test]

                                    Set as Ax60 ?
                                      √Y  N
```
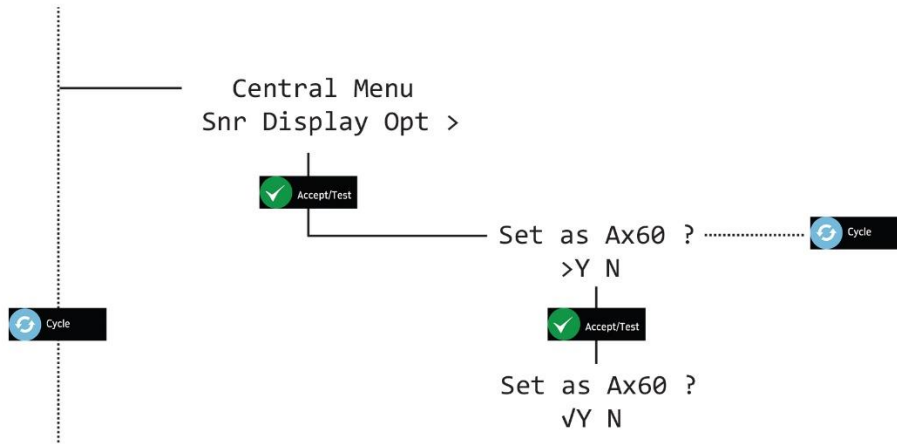
4]   **Press Cancel repeatedly to return to system status screen.**

8.3   Set Evacuation

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.**

2]   **Press Accept/Test, then press Cycle once to display the Set Evacuation screen.**

3]   **Press Accept/Test to display the Enable Evac ? screen, press Cycle to toggle Y or N, then press Accept/Test to confirm.**
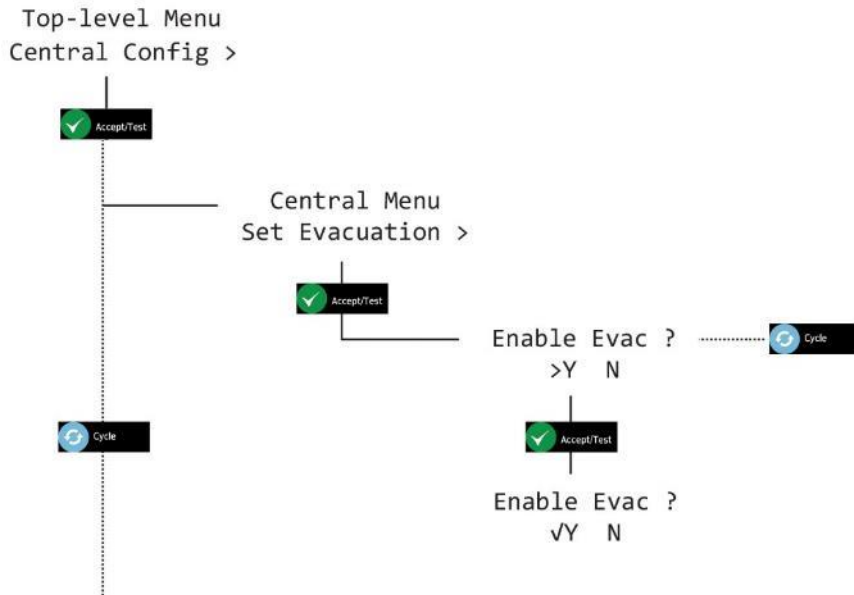
4]   **Press Cancel repeatedly to return to system status screen.**

8.4   Relay configuration

Two relays are installed in the Central Display, R1 and R2. These can be independently configured to be triggered by any alarm or fault raised in the system. The installer is responsible for any connections from R1 and R2 to external devices such as mains relays or control systems. Relays R1 and R2 are both factory configured as per the below detail:

Relay configuration for standard CO2 alarms

R1 will energise on alarm 2 (1.5%), on alarm 3 (3.0%) being reached R2 will energise and R1 will remain energised.

R1 & R2 will only de-energise when the gas level has fallen below the respective alarm levels AND the alarms have been accepted and reset.

Relay configuration for US IFC CO2 alarms

R1 will energise on alarm 1 (0.5%) and on alarm 2 (1.5%), on alarm 3 (3.0%) being reached R2 will energise and R1 will remain energised.

R1 & R2 will only de-energise when the gas level has fallen below the respective alarm levels AND the alarms have been accepted and reset.

Relay configuration for O2 alarms

R1 will energise on alarm 2 (19.5% or lower), R1 will de-energise when the gas level has risen above 19.5% and the alarm has been accepted and reset.

R2 will energise on alarm 3 (23.0% or higher), R2 will de-energise when the gas level has dropped below 23.0% and the alarms have been accepted and reset. On alarm 4 (18.0%) both R1 and R2 will energise, R2 will de-energise when the gas level has risen above 18.0%, R1 will de-energise when the gas level has risen above 19.5%.

Each relay can be reconfigured to switch on a different alarm, fault or combination of alarms & faults.

8.4.1   Fail safe relays

The Ax60+ central unit is fitted with two relays which operate in conjunction with the sensor alarms. The relays have single pole change-over contact arrangements, rated to switch up to 3 Amp at 250V AC/30V DC. The default configuration has the relays set in a Fail-Safe state.

The relays may be configured to be energised or de-energised, when the instrument is in a non-alarm state. If the relays are configured to be in a normally energised state, this will provide a 'Fail-Safe' facility in that a total power failure will cause the relays to release and signal an alarm condition. Contact arrangement is shown on the PCB for a non-Fail-Safe or normally de-energised relay.

8.4.2   Hardware overview

R1 and R2 are single pole double throw (SPDT) rated for 250V AC/30V DC 3A Max. They have volt-free contacts, normally open (NO) or normally closed (NC), to switch external systems such as fire alarms, building management systems or ventilation via an external mains relay.

> 📋   **NOTE: R1 AND R2 PROVIDE VOLT-FREE SWITCH CONTACTS, NOT A POWER SUPPLY.**

The connecting cables to Relays 1 and 2 can be installed either through a cable gland (supplied) on the underside of the Central Display or via a knockout on the rear of the enclosure.

Central Display PCB showing the screw terminals for connecting to Relay 1 and Relay 2

Relay 2 Relay 1

> ⚠   **WARNING: TO COMPLY WITH THE APPROPRIATE SAFETY STANDARDS, ANY CIRCUITS CONNECTED TO RELAYS 1 AND 2 MUST BE PROTECTED WITH DOUBLE/REINFORCED INSULATION FROM THE MAINS.**

8.4.3   Relay 1 fail-safe (Displayed as Rly 1 fail-safe)

1]   Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.

2]   Press Accept/Test, then press Cycle twice, press Accept/Test to display the Rly 1 fail-safe screen.

3]   Press Cycle to toggle Y or N, then press Accept/Test to confirm.
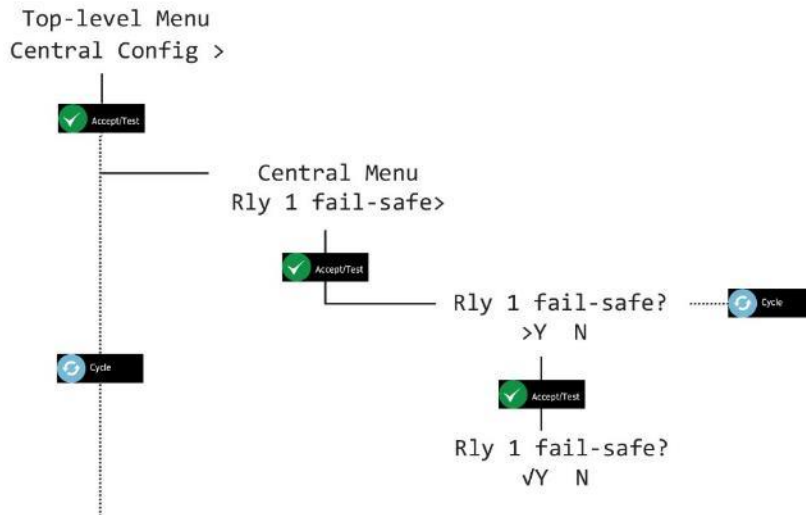
4]   Press Cancel repeatedly to return to system status screen

8.4.4   Relay 2 fail-safe (Displayed as Rly 2 fail-safe)

1]   Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.

2]   Press Accept/Test, then press Cycle three times, press Accept/Test to display the Rly 2 fail-safe screen.

3]   Press Cycle to toggle Y or N, then press Accept/Test to confirm.

4]   Press Cancel repeatedly to return to system status screen.

8.4.5 Relay 1 on fault (Displayed as Rly 1 on fault)

1] Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.

2] Press Accept/Test, then press Cycle four times, press Accept/Test to display the Rly 1 on fault ? screen.

3] Press Cycle to toggle Y or N, then press Accept/Test to confirm.

```
Top-level Menu
Central Config >

        ✓ Accept/Test

                        Central Menu
                        Rly 1 on fault >

                    ✓ Accept/Test

                                Rly 1 on fault ?  ········· ⟳ Cycle
                                    Y >N

    ⟳ Cycle                            ✓ Accept/Test

                                Rly 1 on fault ?
                                    Y √N
```

4] Press Cancel repeatedly to return to system status screen

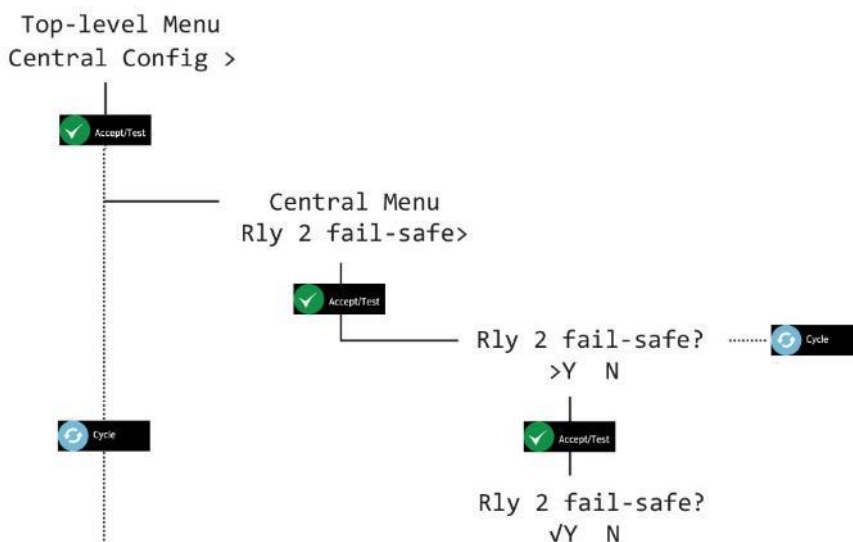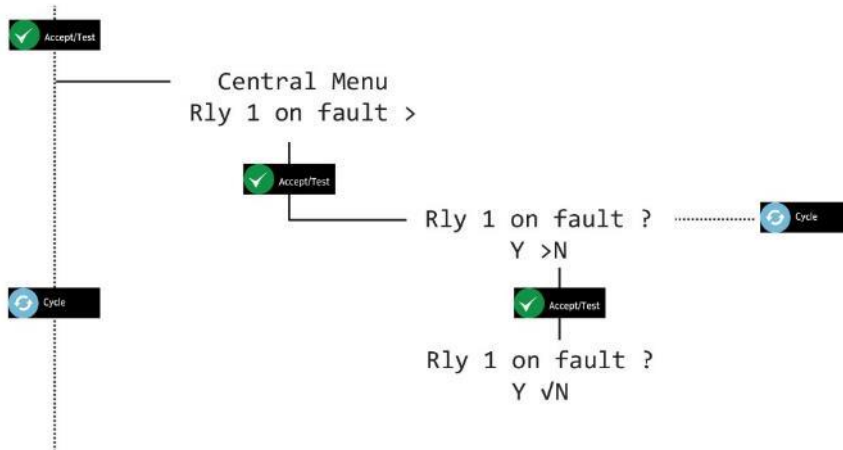### 8.4.6 Relay 2 on fault (Displayed as Rly 2 on fault)

1] Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.

2] Press Accept/Test, then press Cycle five times, press Accept/Test to display the Rly 2 on fault ? screen.

3] Press Cycle to toggle Y or N, then press Accept/Test to confirm.

```
Top-level Menu
Central Config >

        ✓ Accept/Test

                        Central Menu
                        Rly 2 on fault >

                    ✓ Accept/Test

                                Rly 2 on fault ?  ········· ⟳ Cycle
                                    Y >N

    ⟳ Cycle                            ✓ Accept/Test

                                Rly 2 on fault ?
                                    Y √N
```

4] Press Cancel repeatedly to return to system status screen.

8.4.7   Relay 1 on alarms (Displayed as Rly 1 on alarms)

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.**

2]   **Press Accept/Test, then press Cycle seven times, press Accept/Test to display the Rly 1 on alarms option.**

3]   **Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.**

4]   **Press Cycle to toggle to chosen alarm, press Accept/Test to display the Set on Alarm option, press Cycle to toggle Y or N, then press Accept/Test to confirm.**
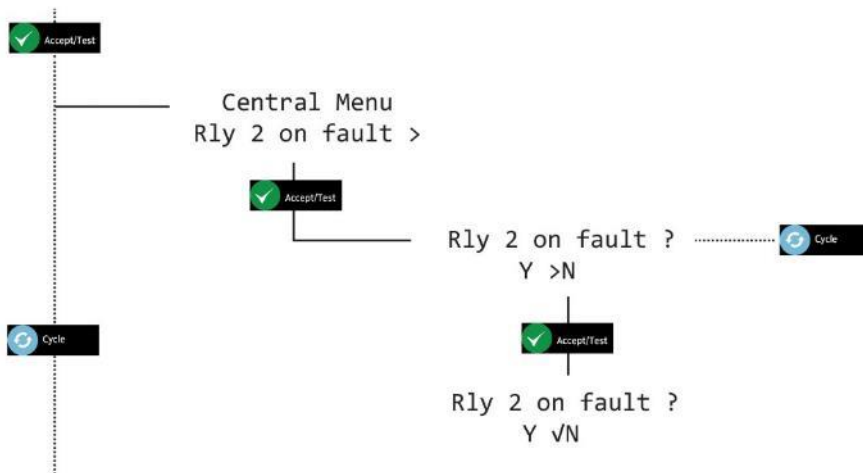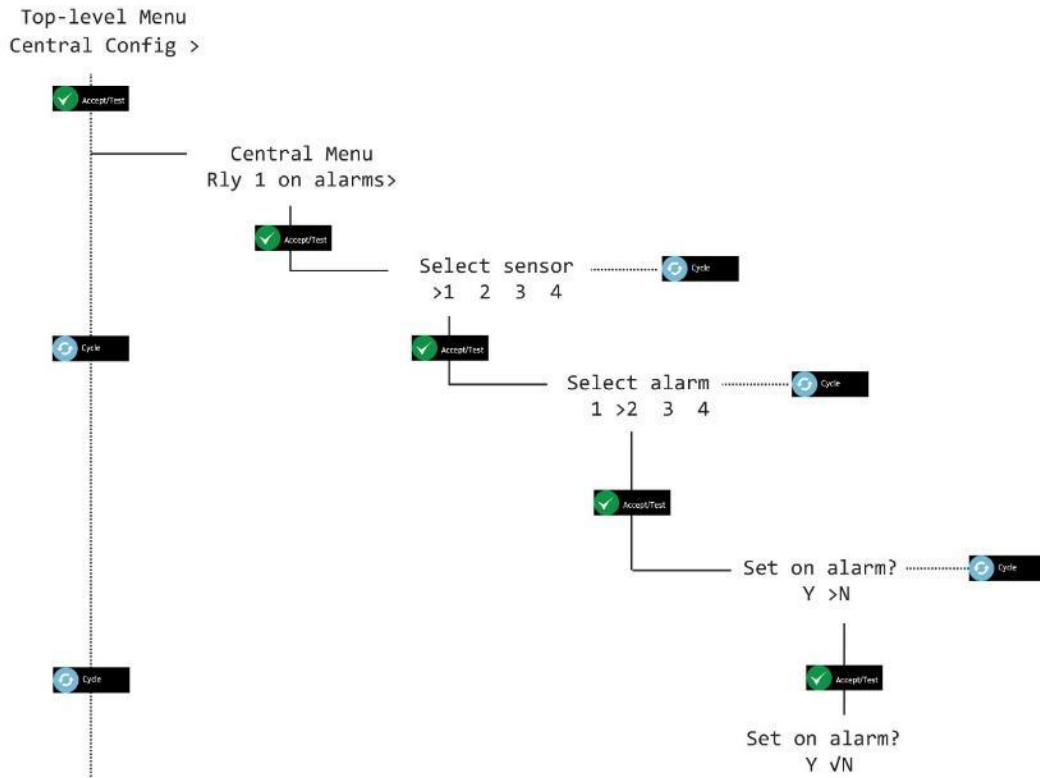

5]   **Press Cancel repeatedly to return to system status screen.**

8.4.8   Relay 2 on alarms (Displayed as Rly 2 on alarms)

1]   Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle five times to display Central Config.

2]   Press Accept/Test, then press Cycle eight times, press Accept/Test to display the Rly 2 on alarms option.

3]   Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.

4]   Press Cycle to toggle to chosen alarm, press Accept/Test to display the Set on Alarm option, press Cycle to toggle Y or N, then press Accept/Test to confirm.
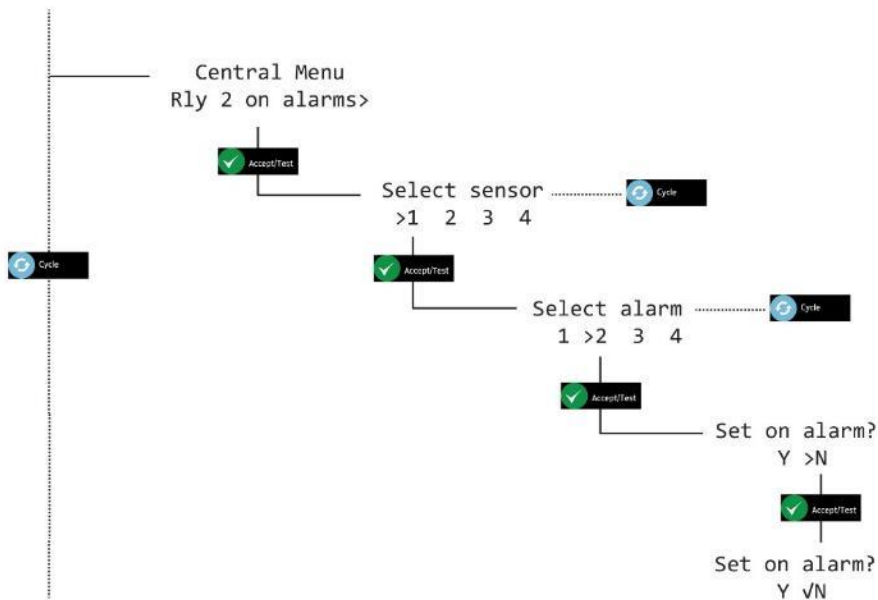
```
Top-level Menu
Central Config >

                        Central Menu
                        Rly 2 on alarms>

                            [Accept/Test]

                                    Select sensor .......... [Cycle]
                                      >1  2  3  4

        [Cycle]                   [Accept/Test]

                                        Select alarm .......... [Cycle]
                                          1 >2  3  4

                                            [Accept/Test]

                                                Set on alarm?
                                                   Y >N

                                                  [Accept/Test]

                                                Set on alarm?
                                                   Y √N
```

5]   Press Cancel repeatedly to return to system status screen.

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9   Sensor Configuration (Displayed as Sensor Config)

9.1   Enable alarms

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.**

2]   **Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.**

3]   **Press Cycle to toggle through the alarms, then press Accept/Test display the Set alarm screen**

4]   **Press Cycle to toggle Y or N, then press Accept/Test to confirm.**
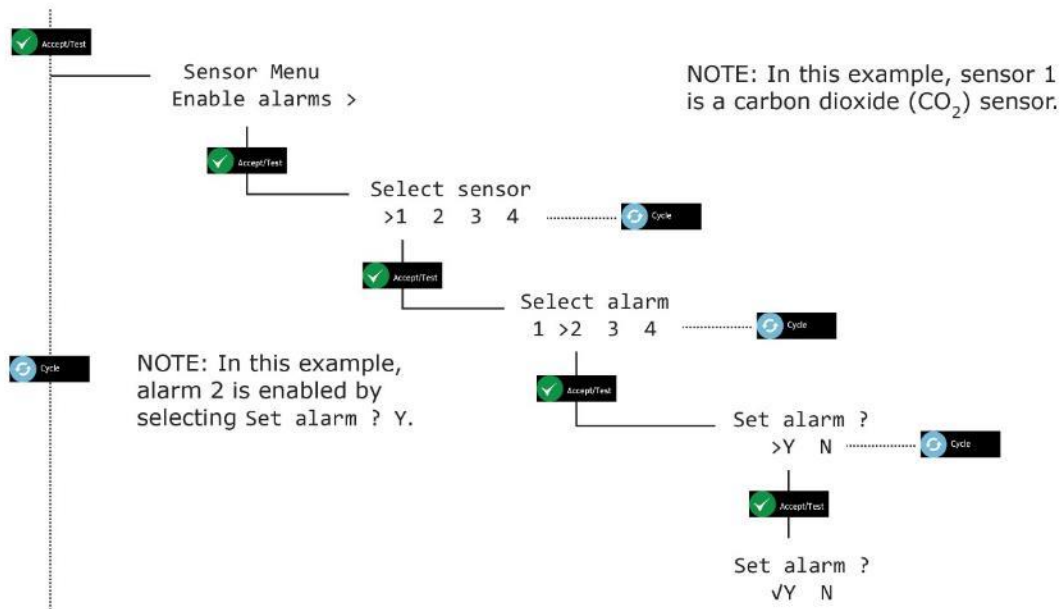
5]   **Press Cancel repeatedly to return to system status screen.**

9.2   Enable Evacuation (Displayed as Enable Evac)

🗒 NOTE: TAKE CARE WHEN ADJUSTING SENSOR OPTIONS TO ENSURE THAT SETTINGS ALIGN

1] Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.
2] Press Cycle once to display the Enable Evac screen.
3] Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.
4] Press Cycle to toggle through the alarms, then press Accept/Test to display the Set Evac screen, press Cycle to toggle Y or N, then press Accept/Test to confirm.

5] Press Cancel repeatedly to return to system status screen.

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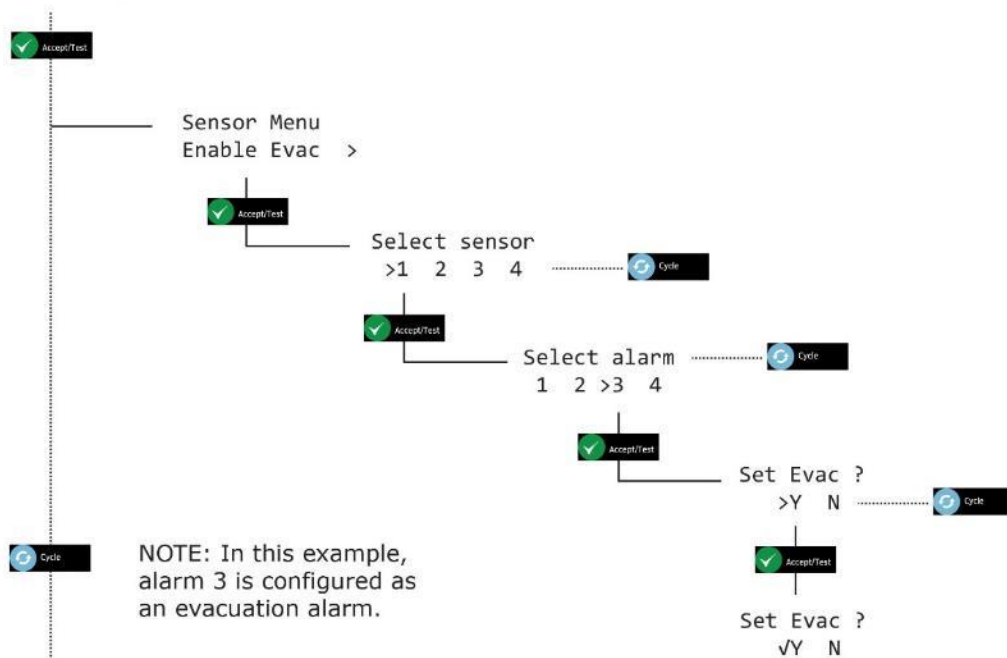
9.3   Alarm Direction

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.**

2]   **Press Cycle twice to display the Alarm Direction screen.**

3]   **Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.**

4]   **Press Cycle to toggle through the alarms, then press Accept/Test to display the Alarm direction? screen, press Cycle to toggle ↑ or ↓, then press Accept/Test to confirm.**
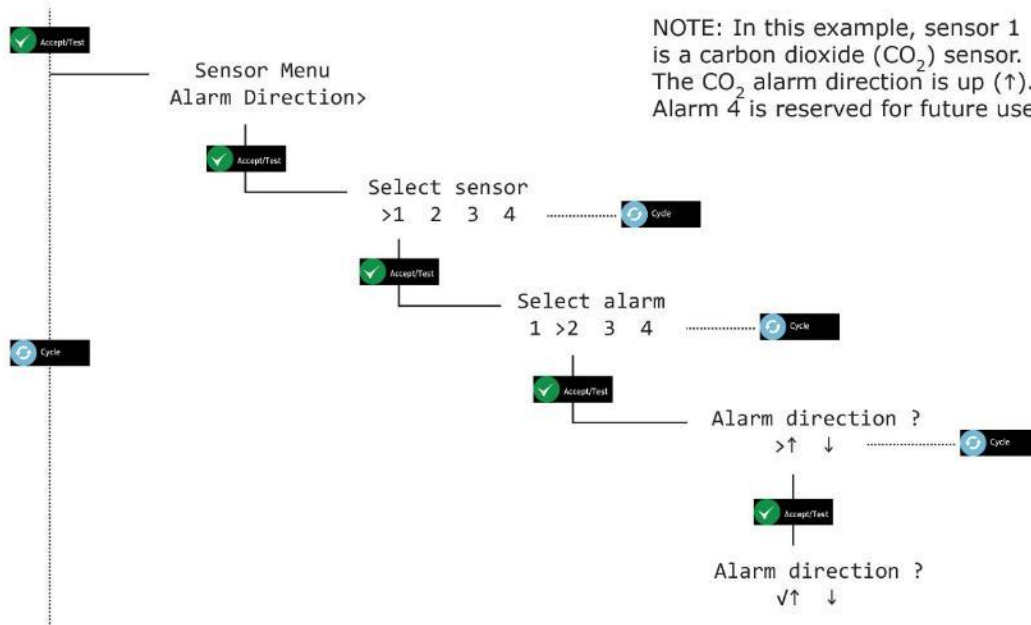
5]   **Press Cancel to return Press Cancel repeatedly to return to system status screen.**

9.4   Enable Sounder

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.**

2]   **Press Cycle three times to display the Enable Sounder screen.**

3]   **Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.**

4]   **Press Cycle to toggle through the alarms, then press Accept/Test to display the Enable Sounder screen, press Cycle to toggle Y or N, then press Accept/Test to confirm.**

```
Top-level Menu
Sensor Config >
```

```
Sensor Menu
Enable Sounder >
```

```
Select sensor
>1  2  3  4
```

```
Select alarm
1  2 >3  4
```

```
Enable sounder ?
>Y  N
```

NOTE: In this example, alarm 3 is configured to switch on the sounder.

```
Enable sounder ?
√Y  N
```

5]   **Press Cancel repeatedly to return to system status screen.**

9.5   Enable Strobe

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.**

2]   **Press Cycle four times to display the Enable Strobe screen.**

3]   **Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.**

4]   **Press Cycle to toggle through the alarms, then press Accept/Test to display the Enable Strobe screen, press Cycle to toggle Y or N, then press Accept/Test to confirm.**
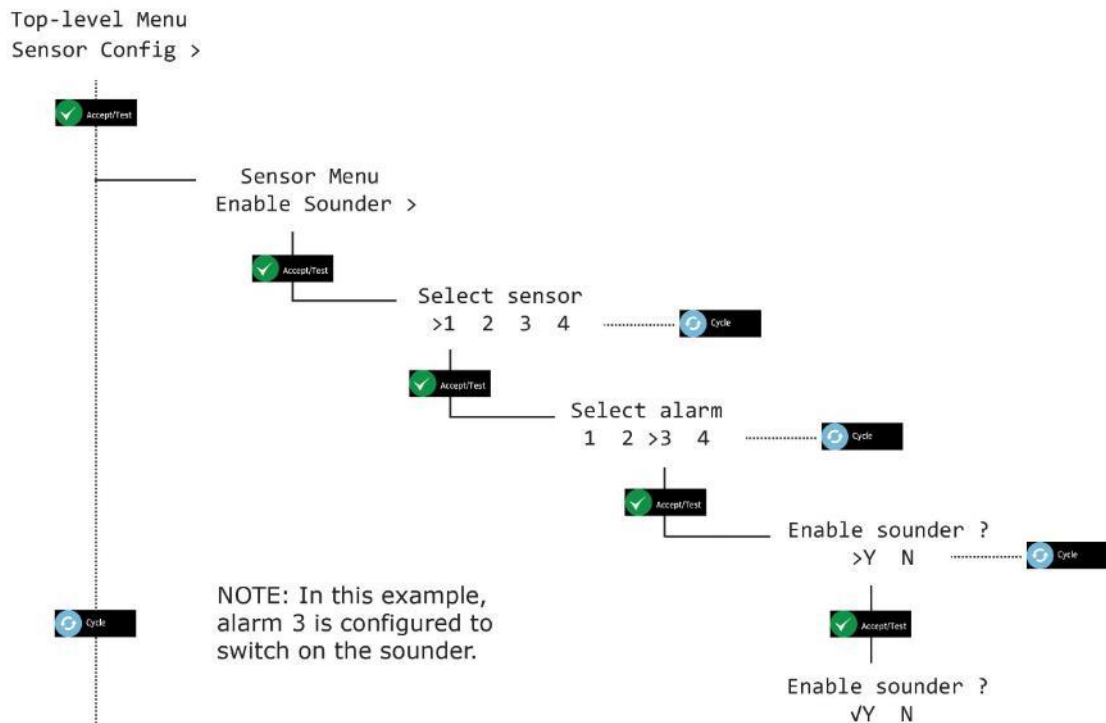

5]   **Press Cancel repeatedly to return to system status screen.**

9.6   Alarms Latching/Non Latching (Displayed as Alarms Latching)

📑 NOTE: ALARMS ARE SET BY DEFAULT TO LATCHED

1]   **Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.**
2]   **Press Cycle five times to display the Alarms Latching screen.**
3]   **Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.**
4]   **Press Cycle to toggle through the alarms, then press Accept/Test to display the Alarm latching screen, press Cycle to toggle Y or N, then press Accept/Test to confirm.**
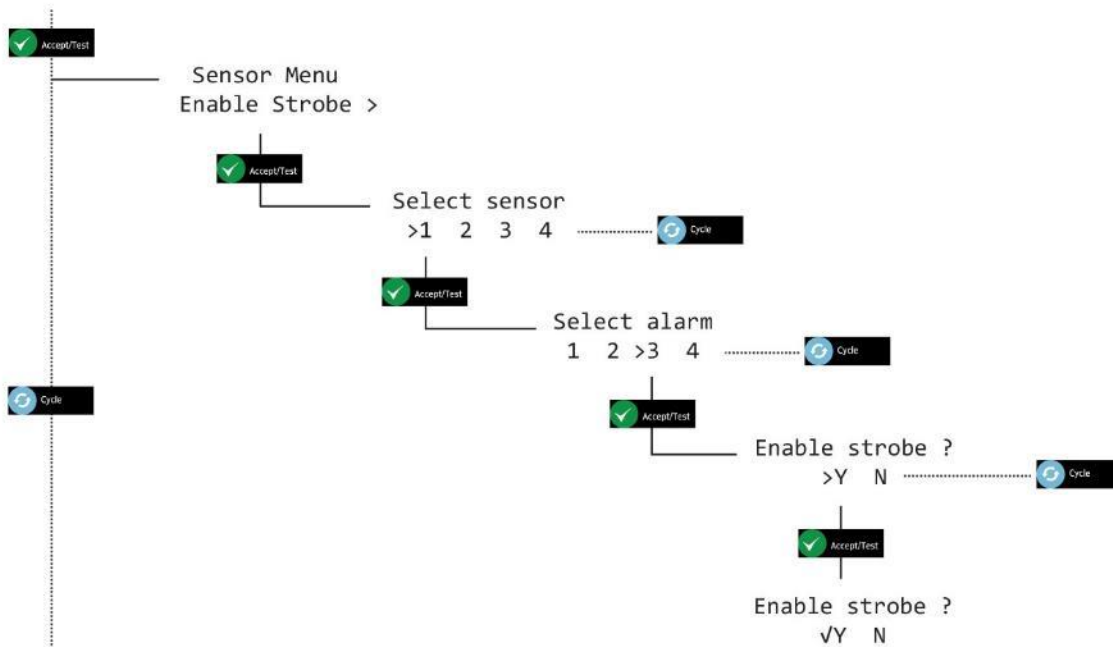

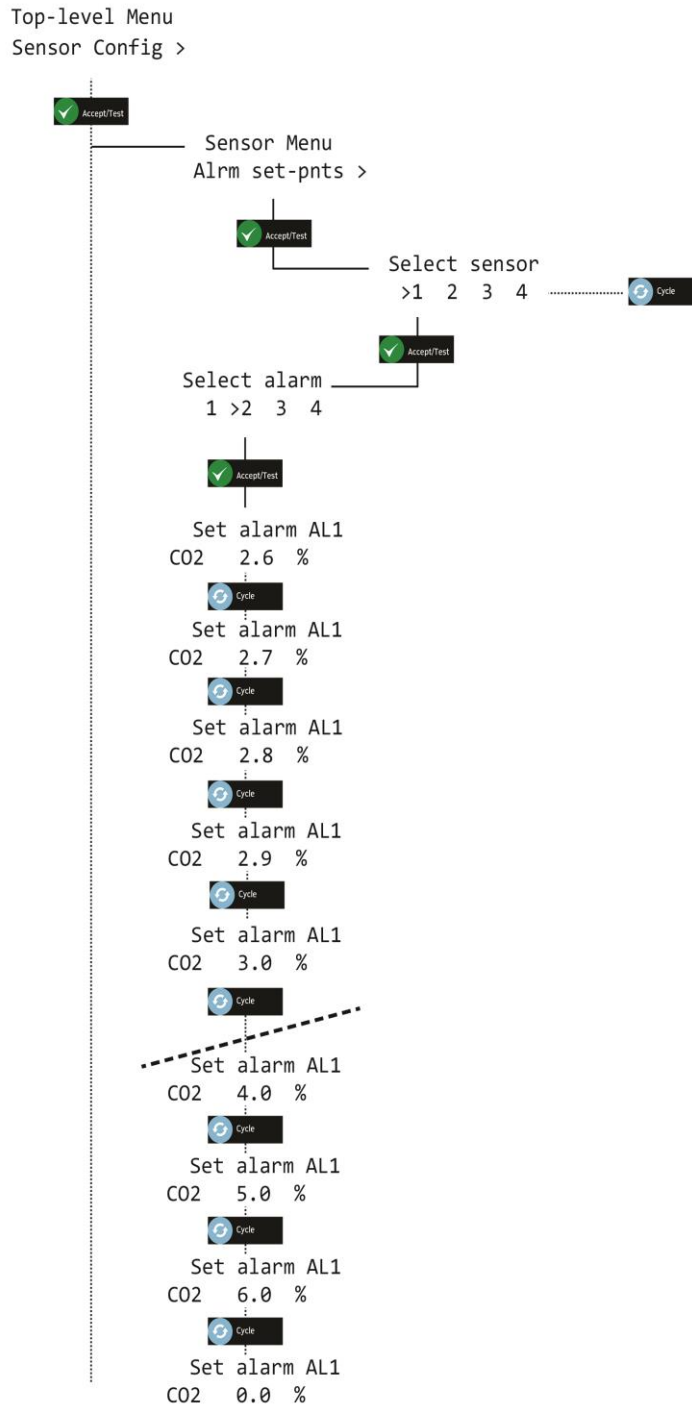5]   **Press Cancel repeatedly to return to system status screen.**

9.7   Alarm set-points (Displayed as Alrm set-pnts)

◆ **CAUTION: ALARMS ARE LATCHING. THIS MEANS THE SENSORS ALWAYS REMEMBER THEIR CURRENT ALARM STATE, EVEN AFTER A POWER OUTAGE. FOR EXAMPLE, IF A SENSOR IS EXPOSED TO 3% CO_2 BUT THE ALARM IS NOT ACKNOWLEDGED AND THE POWER IS REMOVED, WHEN POWER IS RESTORED IT GOES STRAIGHT INTO ALARM.**

◆ **CAUTION: DEFAULT ALARM LEVELS SHOULD BE CHANGED ONLY BY AN AUTHORISED AX60+ INSTALLER OR SERVICE ENGINEER.**

📙 **NOTE: ALARM LEVELS ARE STORED IN EACH SENSOR UNIT, THESE WILL NEED TO BE SET AT SENSOR INSTALLATION IF THE REQUIRED LEVELS DIFFER FROM DEFAULT.**

1] Press and hold Cancel + Cycle for at least 6 seconds. Then press Cycle six times to display Sensor Config.

2] Standard increments for alarm setpoints is factory set at 0.10 %, however, by pressing and holding the Cycle button this increases the increment value x 10 (1.00 %).

3] Press Cycle six times to display the Alrm set-pnts screen.

4] Press Accept/Test to display the Select sensor screen, press Cycle to toggle to chosen sensor, then press Accept/Test to display the Select alarm screen.

5] Press Cycle to toggle through the alarms, then press Accept/Test to display the Set alarm AL? screen (Where ? could be AL1, AL2, AL3 or AL4).

6] Press Cycle repeatedly to enter the alarm value you want in 0.10% increments, or press and hold Cycle to increase the value at 1.00% increments.

7] To reset the value and start again, repeatedly press Cycle or press and hold Cycle until you exceed 6.00 %, this will take the value back to 0.00 % and you can cycle through again until you reach the required value.

8] Press Accept/Test to accept the alarm set point.

```
Top-level Menu
Sensor Config >
```

```
        ✓ Accept/Test
```

```
                    Sensor Menu
                    Alrm set-pnts >
```

```
              ✓ Accept/Test
```

```
                          Select sensor
                          >1  2  3  4 ............  ⟳ Cycle
```

```
                    ✓ Accept/Test
```

```
              Select alarm
                 1 >2  3  4
```

```
              ✓ Accept/Test
```

```
              Set alarm AL1
        CO2    2.6  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    2.7  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    2.8  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    2.9  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    3.0  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    4.0  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    5.0  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    6.0  %
              ⟳ Cycle
```

```
              Set alarm AL1
        CO2    0.0  %
```
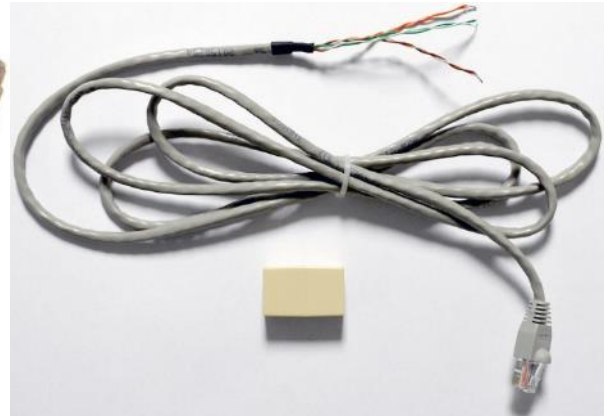
9] **Press Cancel repeatedly to return to system status screen.**

10   Ax60+ Kiosk Option

The Ax60+ Kiosk can be serviced in the same way as the standard Ax60+ by temporarily fitting a portable calibration unit (part no. AX60CNQNXA). This is supplied with a pre-fitted cable terminating in an RJ45 plug, an RJ45 cable coupler and a length of cable:

AX60CNQNXA portable calibration unit   **AX60CNQXA temporary cable and coupler**

To connect the AX60CNQNXA calibration unit to the Ax60+ Kiosk Sensor, follow this procedure:

⚠   **WARNING: DISCONNECT AND ISOLATE THE AX60+ KIOSK FROM THE MAINS POWER SUPPLY BEFORE OPENING THE CO$_2$ SENSOR ENCLOSURE.**

[1]   **Remove the front cover from the Ax60+ Kiosk Sensor enclosure.**

[2]   **Install the temporary cable through the cable gland and connect as follows:**

ORG PAIR (temporary cable); Black (existing cable)

BRN PAIR (temporary cable); Black (existing cable)

GRN (temporary cable)

GRN/WHT (temporary cable)

ORG PAIR (existing cable)

BRN PAIR (existing cable)

GRN/WHT (existing cable)

GRN (existing cable)

BLU/WHT (existing cable)

SPARE (not used)

[3]   **Replace the front cover on the Ax60+ Kiosk Sensor enclosure.**
[4]   **Reconnect the mains supply and power-up the Ax60+ Kiosk.**

---

11   Fault finding

11.1   Fault codes

Faults are announced by the Central Display as follows:

- the internal buzzer will sound
- the Fault indicator will flash
- the fault code will display (see below)
-

Fault type	Fault code	Description	Action
Communications fault	COMMS FAULT	Sensor has a communications fault	May be caused by accidental cable disconnection. To clear a COMMS FAULT press Accept/Test to silence the buzzer then reconnect the cable. Other faults must be reported to Analox
Sensor fault	FLT02 - FLT11, FLT14, FLT15, FLT17, FLT32	The sensor unit is in fault	**1.** Acknowledge the Fault **2.** Power cycle the device
	FLT12 - FLT13, FLT16, FLT23 - FLT24	Calibration required	**1.** Carry out a zero and span calibration
	FLT31	Sensor unit button fault (only applicable to the Ax60k)	**1.** Acknowledge the fault **2.** Check for correct operation of the sensor unit button **3.** Power cycle the device
Central Display fault	FLT51 - FLT55	Central Display unit is in fault	**1.** Acknowledge the Fault **2.** Power cycle the device

11.2 Data Output Module fault indication

The DOM indicates its internal operating condition in one of three ways:

1) By its Status and Fault LEDs (see below).
2) By setting all of the 4-20mA channels to indicate a fault condition.
3) By setting Modbus registers which can be read via the Modbus interface (See Appendix D for more information).

11.2.1 Status and Fault LEDs

The table below shows the combination of LEDs which indicate a specific operating condition:

Status LED	Fault LED	Meaning
Flashing	Off	Normal operation
On	Flashing	Critical Fault (see below)
Off	Flashing	Fault (see below)
On	On	Warm-up (30 seconds)

A Critical Fault is:

- An error has occurred with the internal storage memory of the unit and needs replacing.

A Fault can be one of the following:

- The unit is not receiving data from the Ax60+ system. Check the cabling.
- The unit has not received valid data from the Ax60+ system. Check the cabling and / or power cycle the system.
- If connected to a BMS, an invalid message has been received over the Modbus interface. Check the cabling.
- An internal error has occurred with the unit and will it have to be replaced.

12 Appendix A – Default Central Unit configuration settings

The following table shows the configurable items that can be changed in the Central Unit software menus

Item	Default setting	Comment
Global Evacuation mode	Evacuate	Each alarm has its own evacuation mode.
Number of attached sensors	1	A COMMS fault will occur if the correct number of sensors have not been attached.
Relay fail-safe mode	Fail-safe	Default applies to both relays, but each can be set independently

13   Appendix B – Default CO$_2$ sensor configuration settings

The following table shows the configurable items that can be changed in the CO$_2$ Sensor software menus.

Item	Default setting	Comment
Alarm One Enabled	TRUE	Enable alarm
Alarm One Set-point	0.50%	Threshold for the alarm
Alarm One Direction	Hi going	Can be set to either low going or high going
Alarm One Strobe Enable	Off	Activates the strobe on alarm
Alarm One Sounder Enable	Off	Activates the sounder on alarm
Alarm One Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm One Latching Enable	On	Requires the user to mute and acknowledge the alarm before the alarm will clear
Alarm Two Enabled	TRUE	Enable alarm
Alarm Two Set-point	1.50%	Threshold for the alarm
Alarm Two Direction	Hi going	Can be set to either low going or high going
Alarm Two Strobe Enable	On	Activates the strobe on alarm
Alarm Two Sounder Enable	Off	Activates the sounder on alarm
Alarm Two Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Two Latching Enable	On	Requires the user to mute and acknowledge the alarm before the alarm will clear
Alarm Three Enabled	TRUE	Enable alarm
Alarm Three Set-point	3.00%	Threshold for the alarm
Alarm Three Direction	Hi going	Can be set to either low going or high going
Alarm Three Strobe Enable	On	Activates the strobe on alarm
Alarm Three Sounder Enable	On	Activates the sounder on alarm
Alarm Three Evacuation Enabled	On	Activates the strobe and sounder of connected sensors on alarm
Alarm Three Latching Enable	On	Requires the user to mute and acknowledge the alarm before the alarm will clear
Alarm Four Enabled	FALSE	Enable alarm
Alarm Four Set-point	3.50%	Threshold for the alarm
Alarm Four Direction	Hi going	Can be set to either low going or high going
Alarm Four Strobe Enable	Off	Activates the strobe on alarm
Alarm Four Sounder Enable	Off	Activates the sounder on alarm
Alarm Four Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Four Latching Enable	On	Requires the user to mute and acknowledge the alarm before the alarm will clear

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14 Appendix C – US IFC CO$_2$ sensor configuration settings

The following table shows the configurable items that can be changed in the CO$_2$ Sensor software menus.

Item	Default setting	Comment
Alarm One Enabled	TRUE	Enable alarm
Alarm One Set-point	0.50%	Threshold for the alarm
Alarm One Direction	Hi going	Can be set to either low going or high going
Alarm One Strobe Enable	Off	Activates the strobe on alarm
Alarm One Sounder Enable	Off	Activates the sounder on alarm
Alarm One Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm One Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Two Enabled	TRUE	Enable alarm
Alarm Two Set-point	0.50%	Threshold for the alarm
Alarm Two Direction	Hi going	Can be set to either low going or high going
Alarm Two Strobe Enable	On	Activates the strobe on alarm
Alarm Two Sounder Enable	On	Activates the sounder on alarm
Alarm Two Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Two Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Three Enabled	TRUE	Enable alarm
Alarm Three Set-point	1.50%	Threshold for the alarm
Alarm Three Direction	Hi going	Can be set to either low going or high going
Alarm Three Strobe Enable	On	Activates the strobe on alarm
Alarm Three Sounder Enable	On	Activates the sounder on alarm
Alarm Three Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Three Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Four Enabled	FALSE	Enable alarm
Alarm Four Set-point	3.00%	Threshold for the alarm
Alarm Four Direction	Hi going	Can be set to either low going or high going
Alarm Four Strobe Enable	On	Activates the strobe on alarm
Alarm Four Sounder Enable	On	Activates the sounder on alarm
Alarm Four Evacuation Enabled	On	Activates the strobe and sounder of connected sensors on alarm
Alarm Four Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear

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15 Appendix D – Default Kiosk CO₂ sensor configuration settings

The following table shows the configurable items that can be changed in the CO_2 Sensor software menus.

Item	Default setting	Comment
Alarm One Enabled	TRUE	Enable alarm
Alarm One Set-point	0.50%	Threshold for the alarm
Alarm One Direction	Hi going	Can be set to either low going or high going
Alarm One Strobe Enable	Off	Activates the strobe on alarm
Alarm One Sounder Enable	Off	Activates the sounder on alarm
Alarm One Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm One Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Two Enabled	TRUE	Enable alarm
Alarm Two Set-point	1.50%	Threshold for the alarm
Alarm Two Direction	Hi going	Can be set to either low going or high going
Alarm Two Strobe Enable	On	Activates the strobe on alarm
Alarm Two Sounder Enable	Off	Activates the sounder on alarm
Alarm Two Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Two Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Three Enabled	TRUE	Enable alarm
Alarm Three Set-point	3.00%	Threshold for the alarm
Alarm Three Direction	Hi going	Can be set to either low going or high going
Alarm Three Strobe Enable	On	Activates the strobe on alarm
Alarm Three Sounder Enable	On	Activates the sounder on alarm
Alarm Three Evacuation Enabled	On	Activates the strobe and sounder of connected sensors on alarm
Alarm Three Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Four Enabled	FALSE	Enable alarm
Alarm Four Set-point	3.50%	Threshold for the alarm
Alarm Four Direction	Hi going	Can be set to either low going or high going
Alarm Four Strobe Enable	Off	Activates the strobe on alarm
Alarm Four Sounder Enable	Off	Activates the sounder on alarm
Alarm Four Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Four Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear

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16 Appendix E – US IFC Kiosk CO$_2$ sensor configuration settings

The following table shows the configurable items that can be changed in the CO$_2$ Sensor software menus.

Item	Default setting	Comment
Alarm One Enabled	TRUE	Enable alarm
Alarm One Set-point	0.50%	Threshold for the alarm
Alarm One Direction	Hi going	Can be set to either low going or high going
Alarm One Strobe Enable	Off	Activates the strobe on alarm
Alarm One Sounder Enable	Off	Activates the sounder on alarm
Alarm One Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm One Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Two Enabled	TRUE	Enable alarm
Alarm Two Set-point	0.50%	Threshold for the alarm
Alarm Two Direction	Hi going	Can be set to either low going or high going
Alarm Two Strobe Enable	On	Activates the strobe on alarm
Alarm Two Sounder Enable	On	Activates the sounder on alarm
Alarm Two Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Two Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Three Enabled	TRUE	Enable alarm
Alarm Three Set-point	1.50%	Threshold for the alarm
Alarm Three Direction	Hi going	Can be set to either low going or high going
Alarm Three Strobe Enable	On	Activates the strobe on alarm
Alarm Three Sounder Enable	On	Activates the sounder on alarm
Alarm Three Evacuation Enabled	Off	Activates the strobe and sounder of connected sensors on alarm
Alarm Three Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Four Enabled	FALSE	Enable alarm
Alarm Four Set-point	3.00%	Threshold for the alarm
Alarm Four Direction	Hi going	Can be set to either low going or high going
Alarm Four Strobe Enable	On	Activates the strobe on alarm
Alarm Four Sounder Enable	On	Activates the sounder on alarm
Alarm Four Evacuation Enabled	On	Activates the strobe and sounder of connected sensors on alarm
Alarm Four Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear

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17 Appendix F – Default O₂ sensor configuration settings

The following table shows the configurable items that can be changed in the O₂ Sensor software menus.

Item	Default setting	Comment
Alarm One Enabled	FALSE	Enable alarm
Alarm One Set-point	19.50%	Threshold for the alarm
Alarm One Direction	Low Going	Can be set to either low going or high going
Alarm One Strobe Enable	FALSE	Activates the strobe on alarm
Alarm One Sounder Enable	FALSE	Activates the sounder on alarm
Alarm One Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm One Latching Enable	TRUE	Requires the user to mute and acknowledge the alarm before the alarm will clear
Alarm Two Enabled	TRUE	Enable alarm
Alarm Two Set-point	19.50%	Threshold for the alarm
Alarm Two Direction	Low Going	Can be set to either low going or high going
Alarm Two Strobe Enable	TRUE	Activates the strobe on alarm
Alarm Two Sounder Enable	FALSE	Activates the sounder on alarm
Alarm Two Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm Two Latching Enable	TRUE	Requires the user to mute and acknowledge the alarm before the alarm will clear
Alarm Three Enabled	TRUE	Enable alarm
Alarm Three Set-point	23.00%	Threshold for the alarm
Alarm Three Direction	High Going	Can be set to either low going or high going
Alarm Three Strobe Enable	TRUE	Activates the strobe on alarm
Alarm Three Sounder Enable	TRUE	Activates the sounder on alarm
Alarm Three Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm Three Latching Enable	TRUE	Requires the user to mute and acknowledge the alarm before the alarm will clear
Alarm Four Enabled	TRUE	Enable alarm
Alarm Four Set-point	18.00%	Threshold for the alarm
Alarm Four Direction	Low Going	Can be set to either low going or high going
Alarm Four Strobe Enable	TRUE	Activates the strobe on alarm
Alarm Four Sounder Enable	TRUE	Activates the sounder on alarm
Alarm Four Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm Four Latching Enable	TRUE	Requires the user to mute and acknowledge the alarm before the alarm will clear

18   Appendix G – US IFC O$_2$ sensor configuration settings

The following table shows the configurable items that can be changed in the O$_2$ Sensor software menus.

Item	Default setting	Comment
Alarm One Enabled	FALSE	Enable alarm
Alarm One Set-point	19.50%	Threshold for the alarm
Alarm One Direction	Low Going	Can be set to either low going or high going
Alarm One Strobe Enable	FALSE	Activates the strobe on alarm
Alarm One Sounder Enable	FALSE	Activates the sounder on alarm
Alarm One Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm One Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Two Enabled	TRUE	Enable alarm
Alarm Two Set-point	19.50%	Threshold for the alarm
Alarm Two Direction	Low Going	Can be set to either low going or high going
Alarm Two Strobe Enable	TRUE	Activates the strobe on alarm
Alarm Two Sounder Enable	FALSE	Activates the sounder on alarm
Alarm Two Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm Two Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Three Enabled	TRUE	Enable alarm
Alarm Three Set-point	23.00%	Threshold for the alarm
Alarm Three Direction	High Going	Can be set to either low going or high going
Alarm Three Strobe Enable	TRUE	Activates the strobe on alarm
Alarm Three Sounder Enable	TRUE	Activates the sounder on alarm
Alarm Three Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm Three Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear
Alarm Four Enabled	TRUE	Enable alarm
Alarm Four Set-point	18.00%	Threshold for the alarm
Alarm Four Direction	Low Going	Can be set to either low going or high going
Alarm Four Strobe Enable	TRUE	Activates the strobe on alarm
Alarm Four Sounder Enable	TRUE	Activates the sounder on alarm
Alarm Four Evacuation Enabled	FALSE	Activates the strobe and sounder of connected sensors on alarm
Alarm Four Latching Enable	Off	Does not require the user to mute and acknowledge the alarm before the alarm will clear

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19 Appendix H – Data Output Module MODBUS detail

The tables below show port and register configurations for interfacing to the DOM via Modbus.

19.1 MODBUS communications protocol

The table below lists the port settings and communications protocol required to interface to the DOM.

Parameter	Setting
Baud rate	19200
Data length	8 bits
Parity	Even
Stop bits	One
Protocol	Modbus RTU
Transfer	Half-duplex
Hardware protocol	RS485

19.2   MODBUS register map

The following table shows which Modbus registers hold additional information about the operation of the DOM and Ax60+ system. **Data is sent in big-endian format on the wire**.

Important restriction: the DOM only supports the requesting of one item at-a-time. For example, to request the contents of Read Input register 1 (Sensor Unit 1's gas reading) the request message will be for only two registers (1 & 2). If a request is made for multiple items, then exception code "Illegal Function" will be returned.

The table below lists the Read Input Status.

Function	Register	Length	Comment
Read Input Status (02)	10001	1	Sensor Unit 1 fault condition
Read Input Status (02)	10002	1	Sensor Unit 2 fault condition
Read Input Status (02)	10003	1	Sensor Unit 3 fault condition
Read Input Status (02)	10004	1	Sensor Unit 4 fault condition
Read Input Status (02)	10005	1	Sensor Unit 1 alarm level 1 active
Read Input Status (02)	10006	1	Sensor Unit 2 alarm level 1 active
Read Input Status (02)	10007	1	Sensor Unit 3 alarm level 1 active
Read Input Status (02)	10008	1	Sensor Unit 4 alarm level 1 active
Read Input Status (02)	10009	1	Sensor Unit 1 alarm level 2 active
Read Input Status (02)	10010	1	Sensor Unit 2 alarm level 2 active
Read Input Status (02)	10011	1	Sensor Unit 3 alarm level 2 active
Read Input Status (02)	10012	1	Sensor Unit 4 alarm level 2 active
Read Input Status (02)	10013	1	Sensor Unit 1 alarm level 3 active
Read Input Status (02)	10014	1	Sensor Unit 2 alarm level 3 active
Read Input Status (02)	10015	1	Sensor Unit 3 alarm level 3 active
Read Input Status (02)	10016	1	Sensor Unit 4 alarm level 3 active
Read Input Status (02)	10017	1	Sensor Unit 1 alarm level 4 active
Read Input Status (02)	10018	1	Sensor Unit 2 alarm level 4 active
Read Input Status (02)	10019	1	Sensor Unit 3 alarm level 4 active
Read Input Status (02)	10020	1	Sensor Unit 4 alarm level 4 active
Read Input Status (02)	10021	1	DOM fault condition

The table below lists the Read Input Registers.

Function	Register	Length	Comment
Read Input Register (04)	30001	2	Sensor Unit 1 live reading
Read Input Register (04)	30003	2	Sensor Unit 2 live reading
Read Input Register (04)	30005	2	Sensor Unit 3 live reading
Read Input Register (04)	30007	2	Sensor Unit 4 live reading
Read Input Register (04)	30009	1	Sensor Unit 1 measurement display units
Read Input Register (04)	30010	1	Sensor Unit 2 measurement display units
Read Input Register (04)	30011	1	Sensor Unit 3 measurement display units
Read Input Register (04)	30012	1	Sensor Unit 4 measurement display units
Read Input Register (04)	30013	4	Sensor Unit 1 short description
Read Input Register (04)	30017	4	Sensor Unit 2 short description
Read Input Register (04)	30021	4	Sensor Unit 3 short description
Read Input Register (04)	30025	4	Sensor Unit 4 short description
Read Input Register (04)	30029	4	DOM status flags (see below)

The table below lists the DOM status flags.

Register value (HEX)	DOM status
0 (00)	No fault
1 (01)	DOM firmware corrupt
2, 4 or 6 (02, 04 or 06)	No / corrupt Ax60+ comms
8 (08)	No Ax60 configuration
16 (10)	Corrupt Modbus comms
32 (20)	DAC convertor failed
64 (40)	Corrupt DOM configuration
128 (80)	Corrupt DAC configuration

19.3   Changing DOM Node Addresses

The rotary encoder on the PCB can be used to change the node address of the data output modules if required when using the MODBUS output.

The factory setting of the node address is 1 (position 0).

For instance, if there are multiple systems in the building and all of the data output modules are connected to the building management system, then each of the data output module will require their node address changing so the building management system can communicate correctly with them via MODBUS.

Encoder position	Node address
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
A	30
B	45
C	87
D	100
E	151
F	246

MODBUS RTU CONNECTIONS
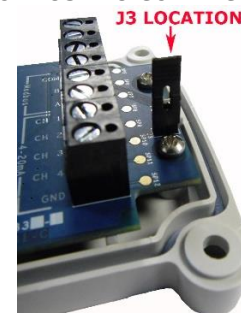
MODBUS connections to a building management system can be made via a RS485 link to the COM, A & B.

> **NOTE:**   J3 IS USED TO LINK IN THE BUS TERMINATION RESISTOR. THIS
> LINK IS TO BE FITTED IF THIS MODULE IS THE END NODE ON THE   RS485 BUS.