



# AMC-1 BXX

Standalone Monitor

## USER MANUAL



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# **1 GENERAL INFORMATION**

## **1.1 WARRANTY**

The AMC-1BXX Gas Monitor is warranted against defects in material and workmanship for a period of two years from date of delivery. Maintenance items are not warranted. During the warranty period, *The Armstrong Monitoring Corporation* will repair or replace components that prove to be defective in the opinion of AMC. Any equipment deemed to be defective by the user should be returned to *The Armstrong Monitoring Corporation* for evaluation (see product return below). Site visits by Armstrong personnel, to evaluate/repair equipment, are not covered by this warranty unless covered under site contract. AMC is not liable for auxiliary interfaced equipment, nor for consequential damage. This warranty shall not apply to any product, which has been modified in any way, which has been repaired by any other party other than a qualified technician or authorized AMC representative, or when failure is due to misuse or conditions of use.

Note: extended warranty and mail in calibration programs are available (please call 1-800-465-5777) or see our contacts page at [www.armstrongmonitoring.com](http://www.armstrongmonitoring.com)

## **1.2 LIABILITY**

All AMC products must be installed and maintained according to instructions. Only qualified personnel should install and maintain the equipment. The AMC-1BXX Gas Monitor must not be located in hazardous locations where combustible gases could be 100% LEL (potentially explosive environments).

AMC shall have no liability arising from auxiliary interfaced equipment, for consequential damage, or the installation and operation of this equipment. AMC shall have no liability for labor or freight costs, or any other costs or charges in excess of the amount of the invoice for the products.

**THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND SPECIFICALLY THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE THEREOF.**

## **1.3 PRODUCT RETURN**

All products returned for warranty or service should be shipped by prepaid freight and will be accepted only with RMA or repair number issued by AMC. All products returned to the client will be shipped by freight collect.

## **1.4 CONTACT INFORMATION**

For information please call 1-800-465-5777, visit [www.armstrongmonitoring.com](http://www.armstrongmonitoring.com) or email directly [support@armstrongmonitoring.com](mailto:support@armstrongmonitoring.com).

## 1.5 MODIFICATIONS AND SUBSTITUTIONS

Due to an ongoing development program, AMC reserves the right to substitute components and change specifications at any time without incurring any obligations.

## 1.6 GLOSSARY

Act Delay	The delay in seconds between the gas concentration reaching an alarm setpoint, and the corresponding alarm level activating.
Alarm	Alarm is an audible, visual, or physical presentation designed to warn the instrument user that a specific level of a dangerous gas/vapor concentration has been reached or exceeded.
Calibration	Calibration is the procedure used to adjust the instrument for proper response.
Calibration Gas	Calibration Gas is a gas of known concentration(s) used to set the instrument span.
Gas Concentration	Gas Concentration is measured in: <ul style="list-style-type: none"><li>• PPM</li><li>• %LEL</li><li>• % Volume</li></ul>
Hysteresis	A user specified difference, or delta, from an alarm setpoint. Used to prevent undesired repeated toggling of alarm activation. The concentration must return above/below the setpoint +/- hysteresis (based on a decreasing or increasing alarm type) before an alarm level can become inactive. Hysteresis does not affect the activation (only de-activation) of an alarm, which is based solely on the alarm setpoint.
LEL	Lower explosive limit is the lowest concentration (percentage) of a gas or a vapor in air capable of combusting in the presence of an ignition source (arc, flame, heat).
Min Run	The minimum time in seconds that an alarm level will remain active, even if the gas concentration has returned above/below the setpoint +/- hysteresis (based on a decreasing or increasing alarm type).
PPM	Parts Per Million (1% volume = 10,000PPM)
Percent by volume	Concentration of gas in a mixture expressed as a percentage of total volume.
Span	Full range of a sensor i.e. a CO sensor with a full range of 0-100 PPM has a 100 PPM span.
T90	Response Time in seconds to achieve 90% gas concentration reading. This is a typical calibration point that allows for sensor aging, but tends to be less accurate than a T99 calibration,
T99	Response Time in seconds to achieve 99% gas concentration reading. This is a more accurate calibration point.
Zero Buffering	Zero buffering is transmitter function which forces the gas concentration reading to zero when sensor is exposed to low concentration of a gas. The zero buffer is indicated in the sensor specification.
Zero Gas	Zero gas is gas in which the target gas is not present. The presence of oxygen is required. Clean air is an excellent source for zero calibration. A known gas concentration can be entered during zero calibration.

## 2 PRODUCT SPECIFICATIONS

### 2.1 AMC-1BXX MONITOR

<b>System</b>	
System Warranty Period	2 Years
Power Supply Requirement	120 VAC, 60 Hz, 53 VA
Relays (2)	DPDT, 250 VAC, 10 A
Operating Temperature	-4° to 104°F (-20° to 40° C)
Operating Pressure	0.9 to 1.1 atm
Humidity Range	15 to 90% RH, non-condensing
Terminal Block Torque	7 inch-pounds (0.8 N-m)
<b>Analog Out</b>	
Topology	Sourcing
Voltage Range	0-10 V
Current Range	0-20 mA
Corner Frequency	300 KHz
<b>Analog In</b>	
Voltage Range	0-30 V
Current Range	0-20 mA
Corner Frequency	250 KHz
<b>Real Time Clock (RTC)</b>	
Battery Size	LR44 (or equivalent)
Expected Life	> 2 years



## 2.2 SENSOR MODULE

### 2.2.1 Carbon Monoxide (AMC-1BCO Monitor)

Gas Type	CARBON MONOXIDE (CO)
Sensor Module Order Number	AMC-SM-91A01
Detection Range	0 – 100ppm
Operating Temperature	-4° to 104°F (-20° to 40° C)
Sensor Height Above Finished Floor (as part of Gas Monitor)	4-6 Feet (1.2-1.8m)
Sensor Life	Up to 6 Years
Sensor Warranty	3 Years
Zero Buffering of Display	<5ppm
Calibration Kit Part Number	AMC-C1-FM1
Recommended Calibration Gas	100ppm CO
Gas Flow Rate	0.176 cfm (0.5L/min)

### 2.2.2 Carbon Monoxide/Nitrogen Dioxide (AMC-1BVC Monitor)

Gas Type	CARBON MONOXIDE (CO) NITROGEN DIOXIDE (NO <sub>2</sub> )
Sensor Module Order Number	AMC-SM-VCA01
Detection Range	0-100ppm CO 0-10ppm NO <sub>2</sub>
Operating Temperature	-4° to 104° F (-20° to 40° C)
Sensor Height Above Finished Floor (as part of Digital Transmitter)	4-6 Feet (1.2-1.8m)
Sensor Life	Up to 6 years CO Up to 2 years NO <sub>2</sub>
Sensor Warranty	2 Years
Zero Buffering of Display	<5ppm CO <0.5ppm NO <sub>2</sub>
Calibration Kit Part Number	AMC-C1-FM1
Recommended Calibration Gas	100ppm CO 10ppm NO <sub>2</sub>
Gas Flow Rate	0.01765 cfm (0.5L/min)

### 3 PRODUCT DESCRIPTION



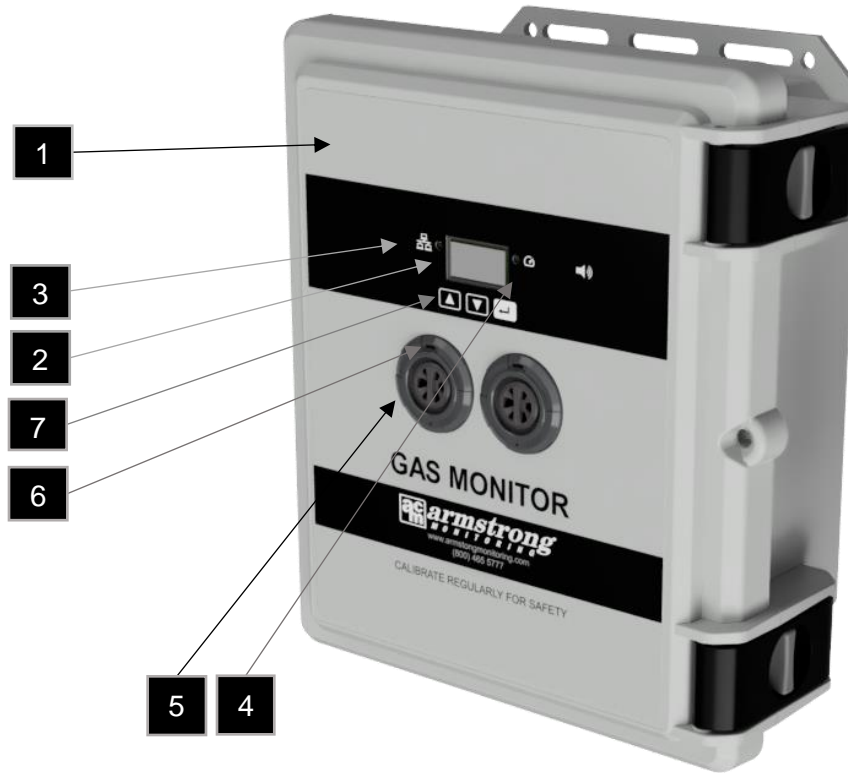
The AMC-1BXX Gas Monitors are designed to provide continuous, reliable monitoring of ambient air for the target gas(es) via onboard sensor module.

The Monitor provides a digital representation of the gas concentration, this information is displayed locally via OLED. Plug-and-play modular architecture accommodates; hot-pluggable Power/Comms via the BusPower Module and field replaceable Sensor Modules (eligible for the EZ-CAL exchange program).

In addition, each Monitor features alarm / system status indicators, audible feedback, 2 relays, 2 analog outputs and color-coded connection terminal blocks, as listed and described herein.

NOTE: The AMC-1BXX is a variant of our UTx platform. As such many of the menu items directly reference the parent product.

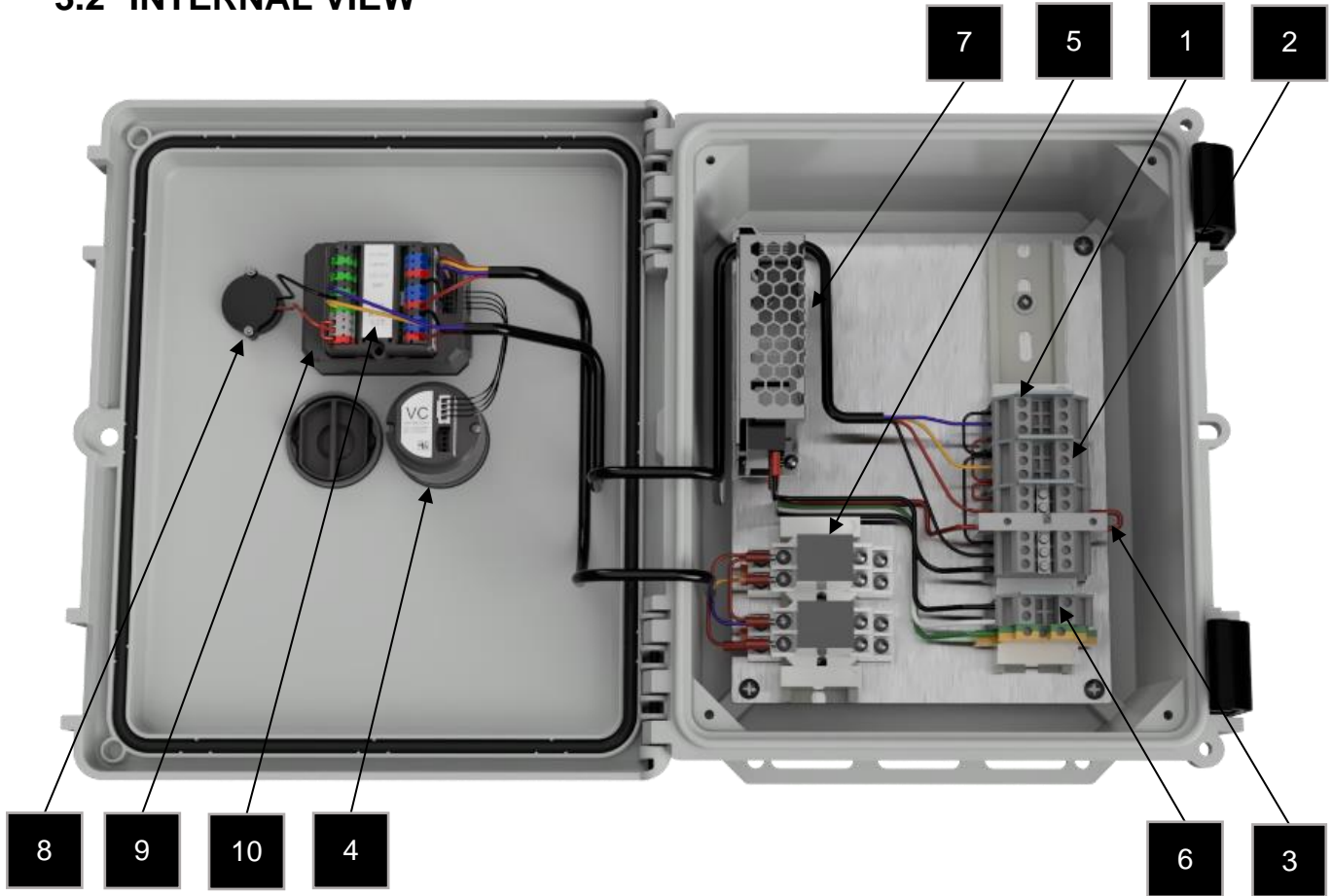
### 3.1 EXTERNAL VIEW



**Figure 3-1: External View**

1. Enclosure:	Enclosure and Lid Assembly, UV Stabilized Polycarbonate, 11.750" L x 9.980" W X 5.460" (300 x 250 x 140 mm)
2. Digital Display:	Displays gas concentration & Status information
3. Network Status LED:	Not applicable to 1BXX series
4. Alarm Status LED:	The Sensor Status LED will show the same error code that is being communicated by the Sensor Module(s) or display the highest priority error (if multiple errors codes are being communicated to it by the Sensor Module(s))
5. Sensor Module Opening:	This inlet allows target gas to flow into the sensor. The inlet is also used for gas calibration.
6. Sensor Module LED:	Sensor Module LEDs will show the status of the sensor element within the Sensor Module, or the status of the Sensor Module itself
7. Menu Buttons:	Momentary Pushbuttons for user Interface.

### 3.2 INTERNAL VIEW



**Figure 3-2: Internal View**

1. Analog Output 1:	Terminal Block for signal output 1
2. Analog Output 2:	Terminal Block for signal output 2
3. 2A Fuse:	Device level input protection
4. Sensor Module:	Contains sensor elements for hazardous gas detection
5. External Relays:	Connection for alarm/warning system
6. 120 VAC IN:	Terminal Block for main power in
7. Power Supply:	Regulates power for the device
8. Buzzer:	Provides audible indication upon alarm state
9. UTx Main Module:	Information processing and communications hub
10. Bus Power Module:	Provides power and communications interface to the UTx

### 3.3 ACCESSORIES

The following accessories are available for use with the AMC-1BXX Gas Monitors

Accessory Description	Order Code
Calibration Kit	AMC-C1-FM2
Calibration Adaptor	AMC-FM1

#### 3.3.1 UTx Calibration Kit

The Calibration Kit, as shown below, consists of the AMC-FM1 Calibration Adaptor that secures the calibration gas hose to the front of the Sensor Module along with hose to connect to the calibration gas cylinder regulator.



**Figure 3-3: Sensor Module Calibration Kit**

## 4 INSTALLATION

The installation of the AMC-1BXX Gas Monitor is very important as the operational quality is a direct result of the quality of the installation. The following sections provide guidelines for installation; location and mounting, wiring, and cable selection.

### 4.1 MONITOR MOUNTING

Care should be taken to securely fasten the monitor unit on a solid, non-vibrating surface or structure at 5 – 6 ft (1.5 - 1.8 m) from the floor. Install the unit in an area where the local concentration of gas is unaffected by the presence of ventilation systems and away from sources of interference gases. Mount the monitor where the unit can be observed periodically. See Figure 4-1 for mounting hole locations.

**CAUTION:** All cable entry **MUST BE** through the **BOTTOM** of the monitor enclosure only. Other entry locations will allow foreign materials to enter the enclosure, causing possible damage to the internal components.

#### **Warning:**

**The monitor should not be placed near cleaning products/solvents, particularly ones that contain alcohol. This can permanently damage sensor elements or cause negative output values.**

**Conduit entry from the top or back of the housing is Not Recommended. Any water damage related to conduit entry from the top or back will not be covered under warranty.**

**Qualified personnel should perform the installation according to applicable electrical codes, regulations and safety standards. Ensure correct cabling practices are implemented.**

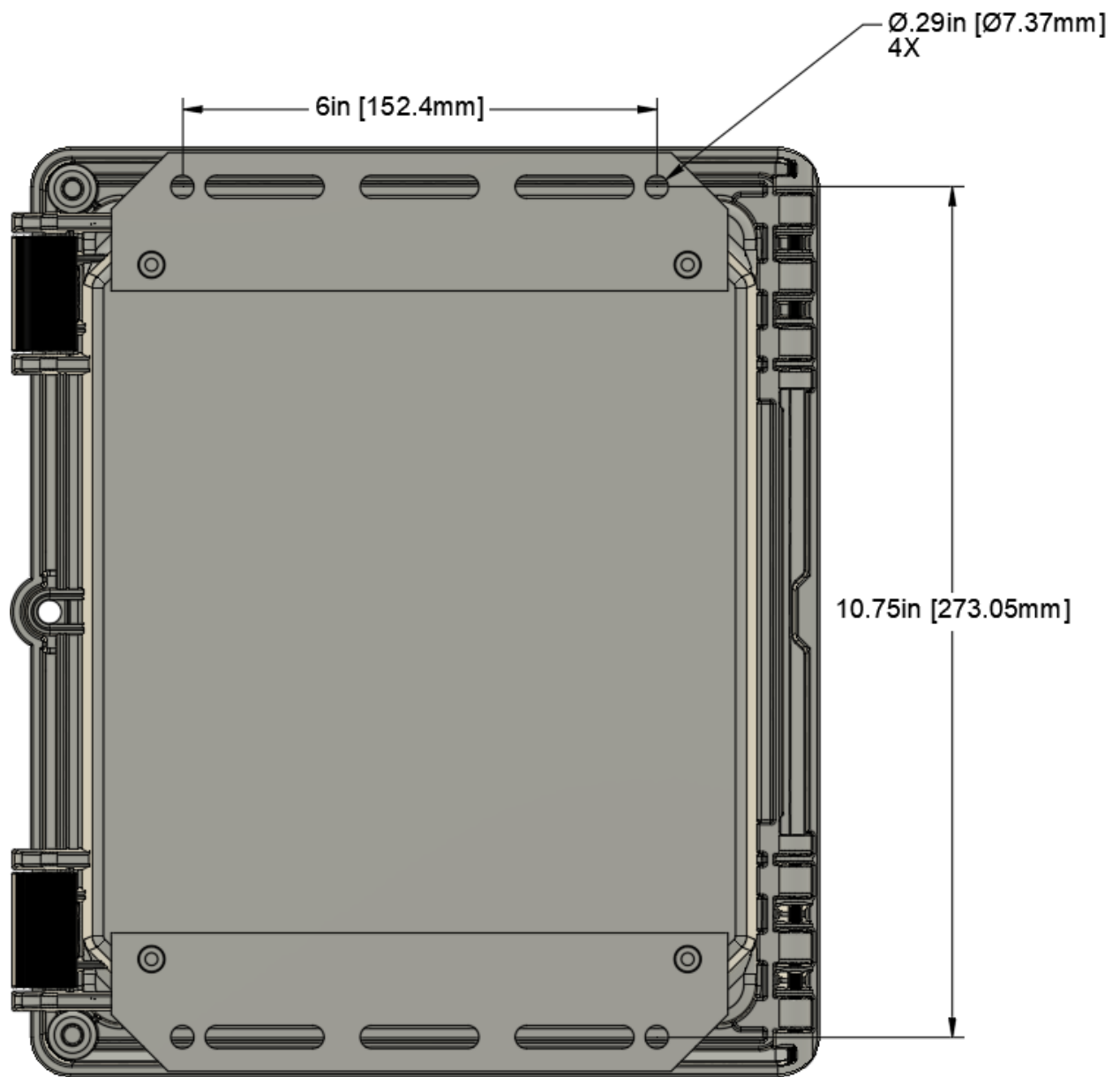


Figure 4-1: Enclosure Mounting

## 4.2 WIRING

### 4.2.1 POWER SUPPLY

The monitor operates on 120 VAC, 60 Hz. The power supply connections are made at the power terminal block located inside the monitor.

All power and grounding connections to equipment must be made in accordance with applicable electrical and building codes.

A separate, dedicated, noise free, 15 Amp power circuit, with an appropriately labeled circuit breaker.

### 4.2.2 RELAYS

The Monitor houses 2 relays. The relay contacts are rated for 10Amps @ 28VDC/120VAC resistive. For relay contact arrangement, see Below.

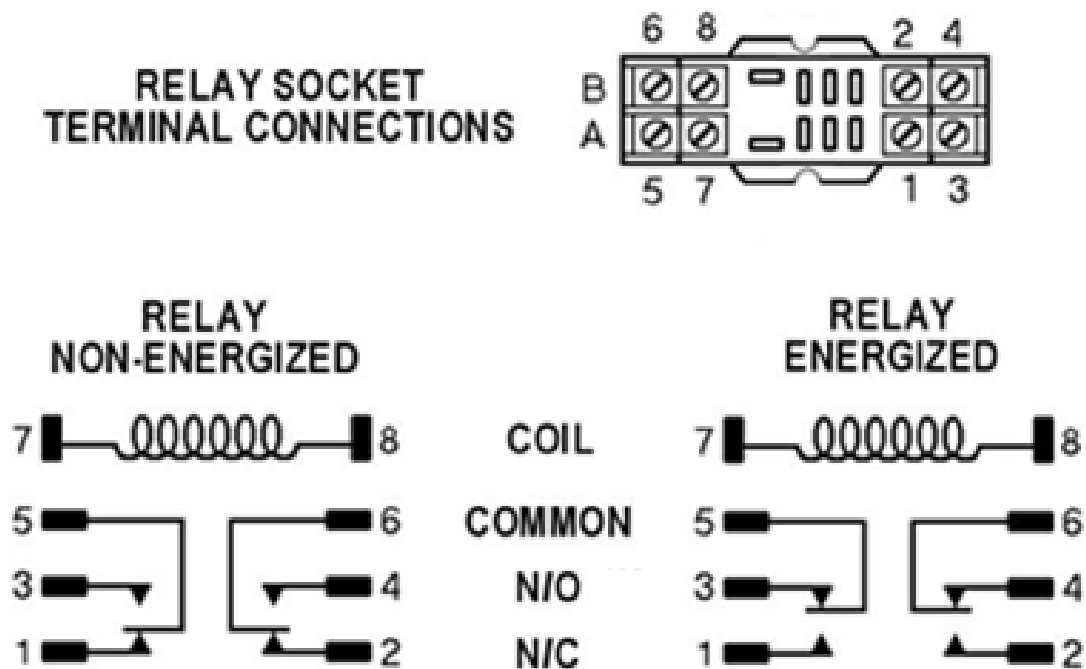


Figure 4-2: Relay Connections



### 4.2.3 ANALOG OUT

Typically, analog output is used to communicate with a Building Automation System or control a Variable Frequency Drive within a ventilation system.

Each analog output accommodates either 4-20mA, 0-10V, 2-10V or AMC-Multidrop (proprietary).

Please contact us for configurations to match your needs.

### 4.2.4 RAM3

The AMC-RAM3 provides a remote alarm indication when employed with monitors such as the AMC Gas Monitor 1B. Each RAM3 has a red strobe light to provide a visual indicator of an alarm condition and remains active until the alarm is cleared. The Audio alert is provided by a buzzer which emits a 2900hz tone at in excess of 90 dB(A) at a distance of 24 inches. The audio alert is activated upon entry into an alarm condition and is silenced by either pushing the Acknowledge Switch or clearing the alarm.



**Figure 4-3: RAM3 Module**

To support connecting RAM3 modules to the 1B Monitor the optional AMC-RAM-1B-WH (Wiring Interface for RAM-3 and 1B Monitor) must be ordered. The item provides the terminal block interfaces for wiring the RAM3 to the 1B Monitor and to the High Alarm Relay output that drives activation of the RAM3.

Further details are available in the AMC-RAM3 User Manual available on the AMC Website.

## 5 OPERATION

This section describes how the functionalities of the AMC-1BXX Gas Monitor are operated and performed. Please consult the operation and initial configuration chapters below before attempting to use or calibrate the Gas Monitor.

### 5.1 STATUS LEDS

Refer to Section 3.1 for LED location and descriptions.

During operation the LEDs will display the following configurations:

Table 5-1: Status LEDs

LED States	Network	Alarm Status	Sensor Module	Display Screen Message
<b>Start Up</b>				
<ul style="list-style-type: none"> <li>Initialization and discovery of Sensor Modules (after UTx is powered up)</li> </ul>	Off	Solid White	Solid White	AMC Splash Screen
<ul style="list-style-type: none"> <li>Sensor Warm-up</li> </ul>	Flashing Green (.5 sec. cycle)	Solid White	Solid White	Main Info Screen (or blank) No sensor gas readings shown
<b>Network Status</b>				
No network connection (assume all sensors operational)	Flashing Green (.5 sec. cycle)	Solid Green	Solid Green	Main Info Screen (or blank)
<b>Faults</b>				
<ul style="list-style-type: none"> <li>At least one sensor has gone under range (more -ve than zero blanking setting)</li> <li>Bad sensor configuration</li> <li>Corrupted Sensor Module Signal</li> <li>Sensor Module Missing</li> <li>Incorrect Sensor Module found</li> <li>Sensor Module not Communicating</li> </ul>	Not Applicable	Solid Red	Solid Red	Not indicated on Display Screen
<ul style="list-style-type: none"> <li>Stuck in Bootloader</li> </ul>	Solid Blue	Solid Blue	Solid Blue	Not indicated on Display Screen

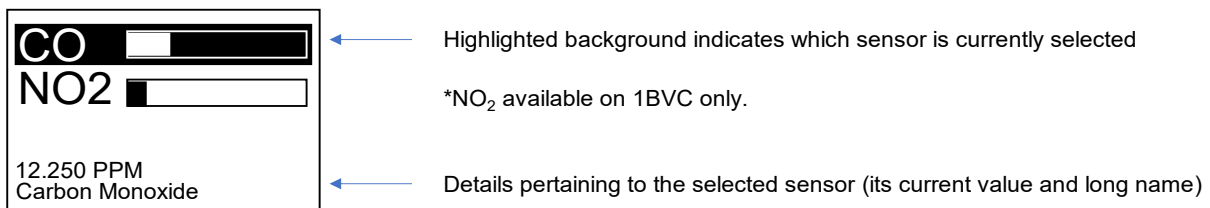
<b>LED States</b>	<b>Network</b>	<b>Alarm Status</b>	<b>Sensor Module</b>	<b>Display Screen Message</b>
• Real-Time Clock (RTC) disabled or uninitialized	Not Applicable	Solid Magenta	Solid Green	Not indicated on Display Screen
<b>Alarms</b>				
Warning threshold reached	Flashing Green (.5 sec. cycle)	Solid Yellow	Solid Yellow	Not indicated on Display Screen
Alarm threshold reached	Flashing Green (.5 sec. cycle)	Solid Red	Solid Red	Not indicated on Display Screen
<b>Calibration</b>				
Cal Needed	Flashing Green (.5 sec. cycle)	Flashing Cyan and Yellow (0.5 sec. cycle)	Flashing Cyan and Yellow (0.5 sec. cycle)	Not indicated on Display Screen
In Calibration Mode / Calibration activity waiting to start	Flashing Green (.5 sec. cycle)	Solid Green	Solid Cyan	Calibration Routine Prompts
Calibration looking for stable	Flashing Green (.5 sec. cycle)	Solid Green	Flashing Cyan (0.5 sec. cycle)	Calibration Routine Prompts
Calibration Pass	Flashing Green (.5 sec. cycle)	Solid Green	Flashing Cyan and Green (1 sec. cycle)	Calibration Routine Prompts
Calibration Fail	Flashing Green (.5 sec. cycle)	Solid Green	Flashing Cyan and Red (1 sec. cycle)	Calibration Routine Prompts
Calibration Warning	Flashing Green (.5 sec. cycle)	Solid Green	Flashing Cyan and Yellow (1 sec. cycle)	Calibration Routine Prompts
Calibration Complete	Flashing Green (.5 sec. cycle)	Solid White	Solid White	Display returns to Sensor Service Menu

## 5.2 MENU OVERVIEW

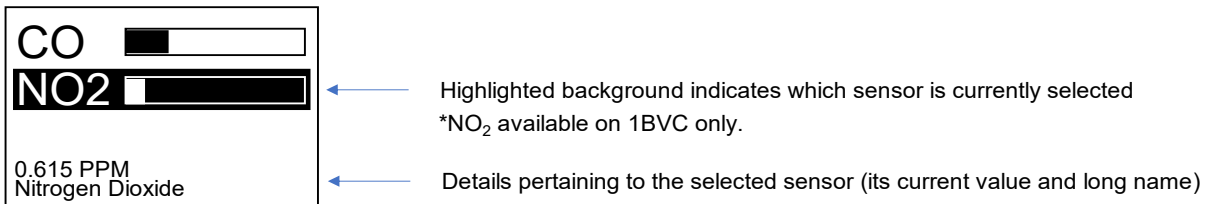
Note a Menu Flow Chart is available in section 9.

### 5.2.1 Menu System – Normal Operation

Upon startup, a brief splash screen is shown on the display which includes the Armstrong Monitoring Corp's logo and the current version of the firmware. After a couple of seconds, the display will update to display the main info screen as shown below. **NOTE: The bar graphs indicating the gas concentration are not visible while the sensor modules are warming up. The warm-up period will be shown in the details section for the selected sensor until the warm-up period expires.**



As shown above, two sensors are currently attached to the transmitter. Only one sensor can be selected at a time for the purpose of inspecting its details. Use the **UP** and **DOWN** buttons to navigate between each sensor. The following diagram illustrates the main info screen after pressing the **DOWN** button from the previous display. Notice how the details are updated to reflect the newly selected sensor.



After a programmed timeout period without any button presses, the display will go blank (screen saver mode). To re-enable the display, simply press the **ENTER** button.

### 5.2.2 Menu System – Failed Sensor

In the event of a failed sensor, the bar graph is replaced with a large FAIL indication and the detailed description is updated accordingly. If the sensor fails while the display is OFF, the display will immediately turn ON and the failed sensor will be selected by default. In addition, the FAIL indication will toggle between normal and inverse 'white space' mode at a rate of once per second as shown below.



Highlighted background indicates which sensor is currently failed. FAIL in normal video mode.

\*NO<sub>2</sub> available on 1BVC only.

Details pertaining to the failed sensor



Highlighted background indicates which sensor is currently failed. FAIL in inverse video mode.

\*NO<sub>2</sub> available on 1BVC only.

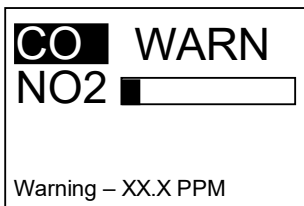
Details pertaining to the failed sensor

If the failure condition is resolved, the main display for the failed sensor will resume normal operation by indicating the sensor reading via a bar graph.

### 5.2.3 Menu System – Warning/Alarm Indication

When a warning or an alarm occurs, the bar graph is replaced with a large WARN indication for warnings or a large ALARM for alarms. If the sensor enters a warning or alarm state while the display is OFF, the display will immediately turn ON and the sensor responsible for the warning/alarm will be selected by default. Like the FAIL indication, the WARN/ALARM indication will toggle between normal and inverse 'white space' mode at a rate of once per second as shown below.

The user has the option to silence the buzzer while the warning/alarm condition is still active. To silence the alarm, the sensor responsible for the warning/alarm needs to be selected and the user needs to press the **ENTER** button. Once silenced, the detailed description will provide an indication of how long the audio buzzer will remain silenced. Once this period expires, the previous 'Press ENTER to ACK' message will return, and the buzzer will resume operation.



Highlighted background indicates which sensor is currently in a warning state. WARN in normal video mode.

\*NO<sub>2</sub> available on 1BVC only.

Details pertaining to the sensor



Highlighted background indicates which sensor is currently in a warning state. WARN in inverse video mode.

\*NO<sub>2</sub> available on 1BVC only.

Details pertaining to the sensor



Highlighted background indicates which sensor is currently selected with latched relays. LATCH in normal video mode.

\*NO<sub>2</sub> available on 1BVC only.

Details pertaining to the selected sensor which currently has its relays in Latched mode. The current sensor reading is shown with an instruction to press the **ENTER** button to release the relays from their active state.



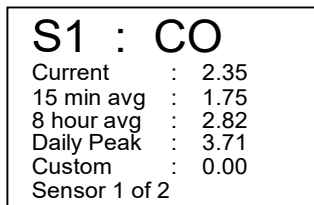
Highlighted background indicates which sensor is currently selected with latched relays. LATCH in inverse video mode.

\*NO<sub>2</sub> available on 1BVC only.

Details pertaining to the selected sensor which currently has its relays in Latched mode. The current sensor reading is shown with an instruction to press the **ENTER** button to release the relays from their active state.

## 5.2.4 Menu System – Detailed Sensor Screen

To access more detailed information for each sensor, press and hold the **UP** button until the following screen appears



Label indicates which sensor is currently selected

Current instantaneous value for the selected sensor

15 min average value for the selected sensor

8 hour average value for the selected sensor

Daily peak value for the selected sensor

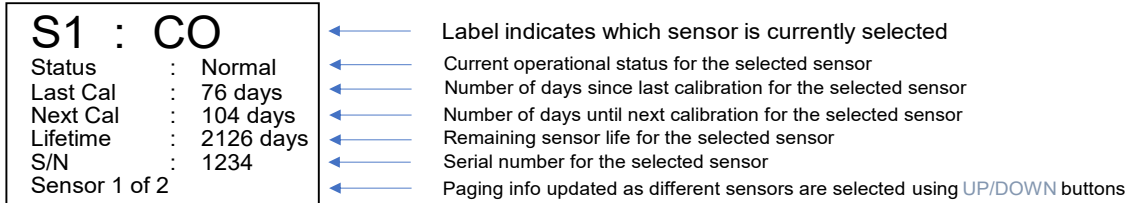
Custom filter value for the selected sensor (if specified, 0 otherwise)

Paging info updated as different sensors are selected using **UP/DOWN** buttons

The detailed sensor screen provides several values for each sensor. Use the **UP** and **DOWN** buttons to page through all the attached sensors (1BCO will show only a single sensor). This detailed screen will timeout after 30 seconds if no button is pressed thereby returning the user back to the main info screen. Alternatively, the user can exit the detailed sensor screen on demand by pressing the **ENTER** button to return back to the main info screen.

## 5.2.5 Menu System – Detailed Status Screen

To access the detailed status for each sensor, press and hold the **DOWN** button until the following screen appears.

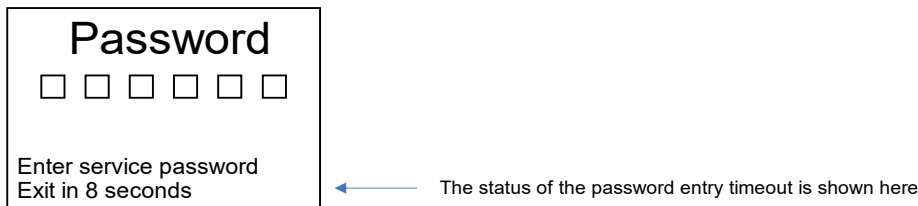


The detailed status screen provides the complete status for each sensor (1BCO will show only a single sensor). Use the **UP** and **DOWN** buttons to page through all the attached sensors. This detailed screen will timeout after 30 seconds if no button is pressed thereby returning the user back to the main info screen. Alternatively, the user can exit the detailed status screen on demand by pressing the **ENTER** button to return to the main info screen.

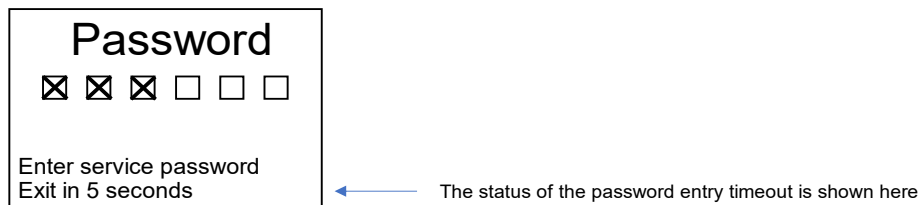
NOTE: All information dependent on the real-time clock (RTC) such as ‘Last Cal’ or ‘Next Cal’ may be incorrect if the RTC is currently disabled or uninitialized (as indicated by a solid magenta on the Alarm Status LED).

## 5.2.6 Menu System – Password Entry

To access the service menu system, the user needs to press and hold the **ENTER** button until the following password entry screen is displayed.

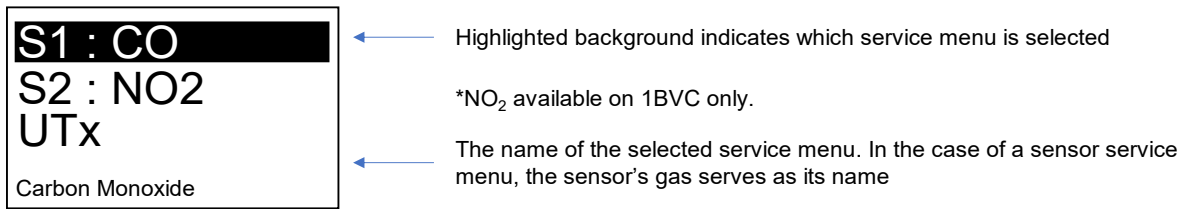


Enter the password using a combination of the **UP**, **DOWN** and **ENTER** buttons. The password is factory set to **UP - DOWN - UP - DOWN - ENTER - ENTER**. As the password is being entered, the display updates with each button press. The diagram below illustrates the state of the password entry after 3 button presses. The password entry screen will timeout after 10 seconds if no button is pressed thereby returning the user back to the main info screen.



## 5.2.7 Menu System – Main Service Menu

Once the correct password is entered, the main service menu is displayed as shown in the following diagram.



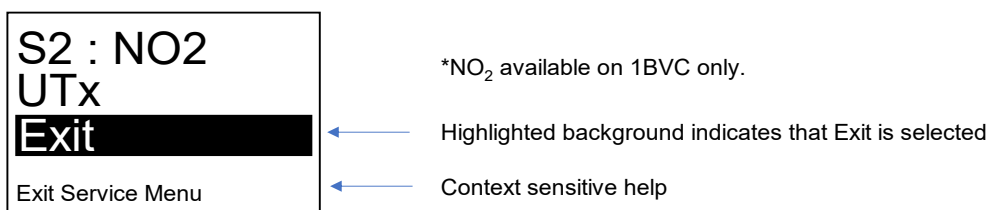
Once again, the **UP** and **DOWN** buttons can be used to navigate the list of service menus. The main service menu provides the following menu items:

**Table 5-2: Service Menu Options**

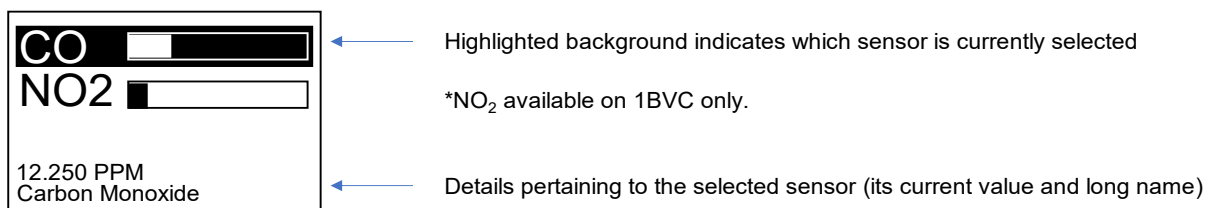
Menu Item	Description
<Sensor #> : <Gas Label>	Each sensor is included in the service menu indicated by its number and gas label (Ex: S2 : CO)
UTx	Access the settings for the transmitter module through the 'UTx' menu item
Exit	Select this menu item to exit the service menu

## 5.2.8 Menu System –Service Menu

Press **DOWN** repeatedly until the end is reach and Exit is highlighted as shown below.



With 'Exit' highlighted (as above), press **ENTER** to exit the service mode and return back to the main info screen as shown below.

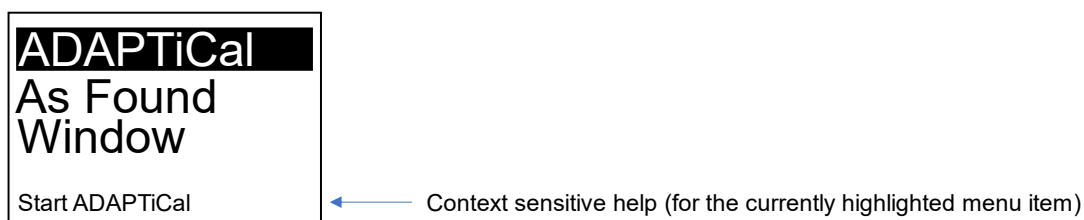




The service menus remain unlocked for a programmed timeout period (set to 5 minutes). Within that period, the service menus can be re-enabled by long pressing the **ENTER** button. If the timeout period is allowed to expire, the password entry screen will appear prior to accessing the service menus. Also, if the service menu is active when a timeout occurs, the service mode is disabled, and the display will go blank (i.e. power saving mode). Lastly, the service menu timeout is reset with each button press while the service menus are active.

### 5.2.9 Menu System – Sensor Service Menu

If the **ENTER** button is pressed while the service menus are active and a sensor is currently selected, then the following menu is shown for sensors associated with sensor module sensors. This menu is common to all sensor module sensors therefore selecting any sensor module sensor will produce the same menu.



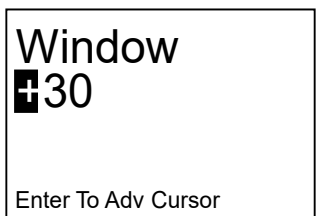
The **UP** and **DOWN** buttons can be used to navigate the list of service menus for the selected sensor. The sensor's service menu provides the following menu items:

**Table 5-3: Sensor Service Menu Options**

Menu Item	Description
ADAPTiCal	Activate this menu item to start calibration for the selected sensor. Refer to section 5.3.4.1 for a complete description of the calibration sequence for sensor module sensors
As Found	Activate this menu item to enter the background concentration reading before performing a bump test (refer to section 5.3.3 for explanation)
Window	Activate this menu item to edit the custom window filter for the selected sensor
Override	Activate this menu item to activate the override sub-menu for the selected sensor
Reset	Activate this menu item to trigger a software reset of the selected sensor
Exit	Select this menu item to return to the main service menu. The current sensor will be selected when the main service menu appears

Window is a custom average filter for gas readings, where the averaging "window" can be selected from a multiplier of 2 - 60. This refers to the "Custom" average that can be seen through the detailed sensor screen for each sensor (see section 5.2.5). The averaging time of the custom filter is the product of the multiplier and 15 minutes. For example, a multiplier of 3 would correspond to an averaging window of 45 minutes.

If 'Window' is activated from the sensor's service menu, then the display will be updated to show the following editing screen.

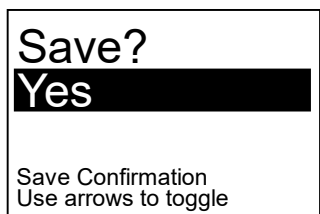


← 'Window' serves as a label only.

← Edit the window filter value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.

← Context sensitive help

When the ENTER button is pressed while the last digit is highlighted, the screen will update to the following thereby requesting confirmation from the user. The response (Yes/No) can be toggled using either UP or DOWN buttons. Press ENTER when the desired response is shown to confirm the edit value (Yes) or the reject it (No).

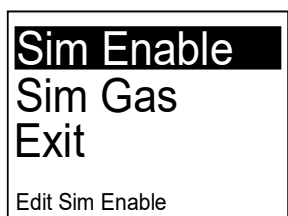


← Confirmation defaults to Yes. Use UP/DOWN arrow buttons to toggle between Yes and No. Press ENTER button to confirm selection.

← Context sensitive help

If 'Yes' is selected, the edit value is persisted as the new value for the window filter. Otherwise, the edit value is rejected. In either case, the menu returns to the sensor's service menu with the Window menu item selected.

If the 'Override' sub-menu is activated (refer to section 6.4.1 for a detailed description) from the sensor's service menu, then the display will be updated to show the following sub-menu.



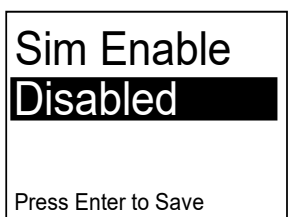
← Activate this menu item to edit the simulated gas enable flag for the selected sensor

← Activate this menu item to edit the simulated gas concentration for the selected sensor

← Activate this menu item to exit the "Override" sub-menu

← Context sensitive help (for the currently highlighted menu item)

If 'Sim Enable' is activated from the 'Override' sub-menu, then the display will be updated to show the following editing screen.

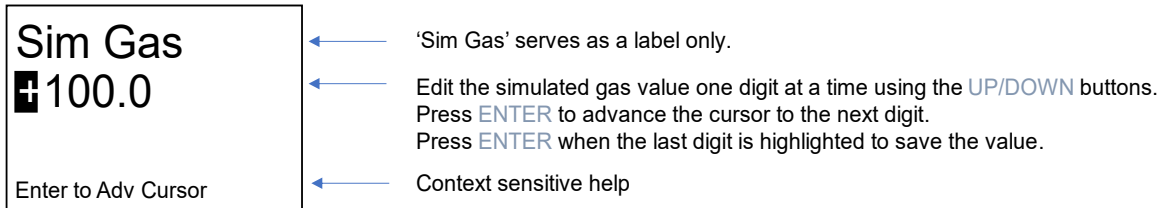


← Defaults to the current value of the Sim Enable flag. Use UP/DOWN arrow buttons to toggle between Disabled and Enabled. Press ENTER button to confirm selection.

← Context sensitive help (for the currently highlighted menu item)

When the **ENTER** button is pressed, the confirmation screen (described previously) is displayed. If 'Yes' is selected, the edit value is persisted as the new value for the Sim Enable flag. Otherwise, the edit value is rejected. In either case, the menu returns to the Override sub-menu menu with the 'Sim Enable' menu item selected.

If 'Sim Gas' is activated from the 'Override' sub-menu, then the display will be updated to show the following editing screen.



The screenshot shows a rectangular box representing the editing screen. Inside the box, the text 'Sim Gas' is at the top. Below it is a small square icon with a plus sign followed by the number '100.0'. At the bottom of the box, the text 'Enter to Adv Cursor' is displayed. To the right of the box, three blue arrows point to the text 'Sim Gas', the value '100.0', and the bottom text respectively. To the right of these arrows are three lines of explanatory text.

← 'Sim Gas' serves as a label only.

← Edit the simulated gas value one digit at a time using the **UP/DOWN** buttons. Press **ENTER** to advance the cursor to the next digit. Press **ENTER** when the last digit is highlighted to save the value.

← Context sensitive help

When the **ENTER** button is pressed with the last digit highlighted, the confirmation screen (described previously) is displayed. If 'Yes' is selected, the edit value is persisted as the new value for the Sim Gas concentration value. Otherwise, the edit value is rejected. In either case, the menu returns to the Override sub-menu menu with the 'Sim Gas' menu item selected.

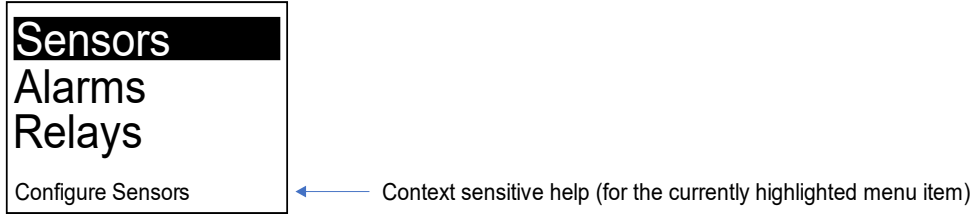
Selecting 'Exit' from the 'Override' sub-menu returns the user to the sensor's service menu with the 'Override' menu item selected.

If 'Reset is activated from the sensor's service menu, then a software reset will be initiated on the selected sensor with any confirmation. This command should be reversed for cases when the sensor module appears to be non-responsive.

If 'Exit' is activated from the sensor's service menu, the user is returned to the main service menu as outlined in section 5.2.7.

## 5.2.10 Menu System – Transmitter Service Menu

If the 'UTx' menu item is activated from the main service menu via the **ENTER** button, then UTx service menu will appear on the display as shown in the following diagram.



The **UP** and **DOWN** buttons can be used to navigate the list of service menus for the UTx. The following table outlines all the menu items from the UTx menu:

**Table 5-4: Transmitter Service Menu Options**

<b>Menu Item</b>	<b>Description</b>
Sensors	Select this menu item to activate the Sensors sub-menu
Alarms	Select this menu item to activate the Alarms sub-menu
Relays	Select this menu item to activate the Relays sub-menu
Test	Select this menu item to toggle the test enable flag
Buzzer	Select this menu item to toggle the low alarm buzzer enable flag
Ack Timer	Select this menu item to adjust the buzzer acknowledgement timeout (30 – 120 secs)
Reset	Select this menu item to trigger a software reset of the UTx
Exit	Select this menu item to return to the main service menu. The menu item for the UTx will be selected when the main service menu appears.

### 5.2.10.1 TRANSMITTER SENSOR SETTINGS

From the UTx service menu, selecting 'Sensors' will update the display to show the following sub-menu.



\*NO<sub>2</sub> available on 1BVC only.

← Context sensitive help (for the currently highlighted menu item)

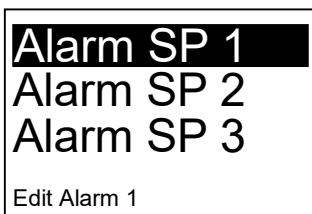
The UP and DOWN buttons can be used to navigate the list of menus for the sensors sub-menu. The following table outlines all the menu items from the sensors sub-menu:

**Table 5-5: Sensor Module Configuration Menu**

Menu Item	Description
S1 : <Gas Label>	Select this menu item to activate the configuration sub-menu for sensor 1
S2 : <Gas Label>	Select this menu item to activate the configuration sub-menu for sensor 2
Exit	Select this menu item to return to the UTx service menu

NOTE: <Sensor> represents a placeholder for the sensor's part number which is dynamically applied to each menu-item. \*\* this menu items only appear if the associated sensor is configured (NO<sub>2</sub> available on 1BVC only).

Selecting a sensor from the 'Sensors' sub-menu (ex: S1 : CO) will update the display to show the following sub-menu.



← Context sensitive help (for the currently highlighted menu item)

The UP and DOWN buttons can be used to navigate the list of menus for the 'Sensors' sub-menu. The following table outlines all the menu items from the sensor sub-menu:

**Table 5-6: Sensor Alarm Configuration**

Menu Item	Description
Alarm SP 1-3	Select this menu item to edit the alarm setpoints for the selected alarm (1-3)
Alarm Hyst	Select this menu item to edit the alarm hysteresis. This hysteresis value is applied to all alarm setpoints.
Zero Buff	Select this menu item to edit the zero buffer level for the display of small gas concentrations.
Cal Freq	Select this menu item to edit the time period between re-calibrations
Exit	Select this menu item to return to the Sensors sub-menu

If 'Alarm SP 1' is activated from the sensor sub-menu, then the display will be updated to show the following editing screen.

← 'Alarm SP 1' serves as a label only.

← Edit the alarm 1 setpoint value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.

← Context sensitive help

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously).

The same process is repeated for Alarm SP 2 and Alarm SP 3. In all cases, once the confirmation dialog is reached, regardless of which option it selected, the user is returned back to the Sensors sub-menu.

If 'Alarm Hyst' is activated from the sensor sub-menu, then the display will be updated to show the following editing screen.

← 'Alarm Hyst' serves as a label only.

← Edit the alarm hysteresis setpoint value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.

← Context sensitive help

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously). If Yes is selected, the edit value is persisted as the new value for the Alarm Hysteresis for the selected sensor. Otherwise, the edit value is rejected. In either case, the menu returns to the Sensor sub-menu menu with the 'Alarm Hyst' menu item selected.

If 'Zero Buff' is activated from the sensor sub-menu, then the display will be updated to show the following editing screen.

'Zero Buff' serves as a label only.

Edit the alarm hysteresis setpoint value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.

Context sensitive help

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously). If Yes is selected, the edit value is persisted as the new value for the Zero Buffer for the selected sensor. Otherwise, the edit value is rejected. In either case, the menu returns to the Sensor sub-menu menu with the 'Zero Buff' menu item selected. If 'Cal Freq' is activated from the sensor sub-menu, then the display will be updated to show the following editing screen.

'Cal Freq' serves as a label only.

The calibration frequency can be selected from a list of options using the UP/DOWN buttons to cycle between each option. Press ENTER to save the selected options.

Context sensitive help

The available options for 'Cal Freq' are listed in the following table.

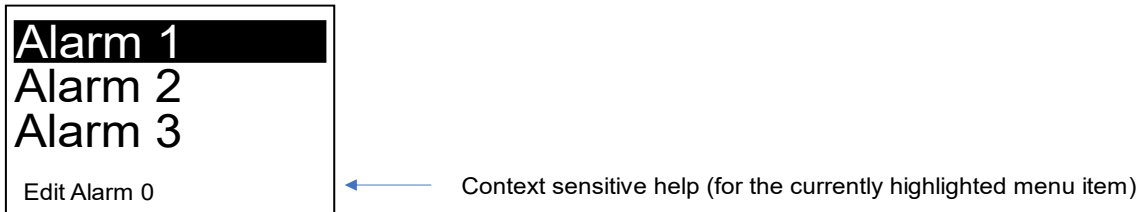
**Table 5-7: Calibration Frequency Configuration**

Menu Item	Description
Off	Next cal due date is not calculated
3 Months	Next cal due date is calculated as 3 months from last cal timestamp
4 Months	Next cal due date is calculated as 4 months from last cal timestamp
6 Months	Next cal due date is calculated as 6 months from last cal timestamp
12 Months	Next cal due date is calculated as 12 months from last cal timestamp

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously).

### 5.2.10.2 TRANSMITTER ALARM SETTINGS

From the UTx service menu, selecting 'Alarms' will update the display to show the following sub-menu.

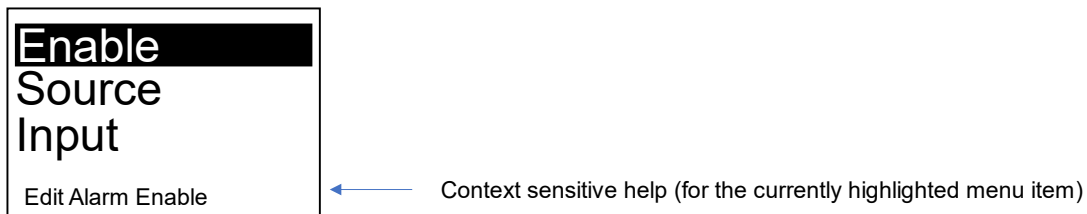


The UP and DOWN buttons can be used to navigate the list of menus for the Alarms sub-menu. The following table outlines all the menu items from the Alarms sub-menu:

**Table 5-8: Transmitter Alarm Settings**

Menu Item	Description
Alarm 1-10	Select this menu item to activate the configuration sub-menu for the selected alarm (ranging from 1 to 10)
Exit	Select this menu item to return to the UTx service menu. The Alarms menu item will be selected when the UTx service menu appears

Selecting an alarm from the alarms sub-menu will update the display to show the following:



The following table outlines all the menu items from the alarm sub-menu:



**Table 5-9: Transmitter Alarm Sub-Menu Settings**

Menu Item	Description
Enable	Select this menu item to edit the alarm's enable state
Source	Select this menu item to edit the alarm's source (i.e. from the available sensors)
Input	Select this menu item to edit the alarm's input value
Level	Select this menu item to edit the alarm's setpoint
Type	Select this menu item to edit the alarm's type (increasing or decreasing)
Trigger	Select this menu item to edit the alarm's trigger output (i.e. activate which relays)
Act Delay	Select this menu item to edit the alarm's act delay in terms of seconds
Min Run	Select this menu item to edit the alarm's minimum run time in terms of seconds
Exit	Select this menu item to return to the Alarms sub-menu

If 'Enable' is activated from the alarm sub-menu, then the display will be updated to show the following editing screen.

← 'Enable' serves as a label only.  
 ← Defaults to the current value of the Enable flag. Use UP/DOWN arrow buttons to toggle between Disabled and Enabled. Press ENTER button to confirm selection.  
 ← Context sensitive help

When the ENTER button is pressed, the confirmation screen (described previously) is displayed.

If 'Source' is activated from the alarm sub-menu, then the display will be updated to show the following editing screen.

← 'Source' serves as a label only.  
 ← The source can be selected from a list of sensors. Cycle through all the values using the UP/DOWN buttons.  
 ← Context sensitive help

The available options for 'Source' is equal to the list of sensors currently configured for the UTx. The label for each sensor is dynamically assigned to S<n> : <Gas Label> where n represents the sensor's 1 base index and gas represents the sensor's gas name in short form. For the 1BCO, the only source option is thus "S1 : CO".

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously).

If 'Input' is activated from the alarm sub-menu, then the display will be updated to show the following editing screen.

'Input' serves as a label only.

The input can be selected from a list of options using the UP/DOWN buttons to cycle between each option. Press ENTER to save the selected options.

Context sensitive help

The available options for 'Input' are listed in the following table.

**Table 5-10: Alarm Input Options**

Menu Item	Description
Inst. Value	Instantaneous gas value, updated once per second
15m Avg	Gas concentration averaged over the past 15 minutes
8h Avg	Gas concentration averaged over the past 8 hours
Custom	Gas concentration averaged over a custom filter window (15 minute multipliers of 2-60, refer to section 5.2.9 for details)
Daily Peak	Daily peak value

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously).

If 'Level' is activated from the alarm sub-menu, then the display will be updated to show the following editing screen.

'Level' serves as a label only.

The level can be selected from a list of options using the UP/DOWN buttons to cycle between each option. Press ENTER to save the selected options.

Context sensitive help

The available options for 'Level' are listed in the following table.

**Table 5-11: Alarm Setpoint Options**

Menu Item	Description
Alarm SP 1	Alarm setpoint 1 from the selected source
Alarm SP 2	Alarm setpoint 2 from the selected source
Alarm SP 3	Alarm setpoint 3 from the selected source

When the **ENTER** button is pressed, the screen will update to display the confirmation dialog (described previously).

If 'Type' is activated from the alarm sub-menu, then the display will be updated to show the following editing screen.

Annotations for the 'Type' editing screen:

- 'Type' serves as a label only.
- The type can be selected from a list of options using the **UP/DOWN** buttons to cycle between each option. Press **ENTER** to save the selected options.
- Context sensitive help

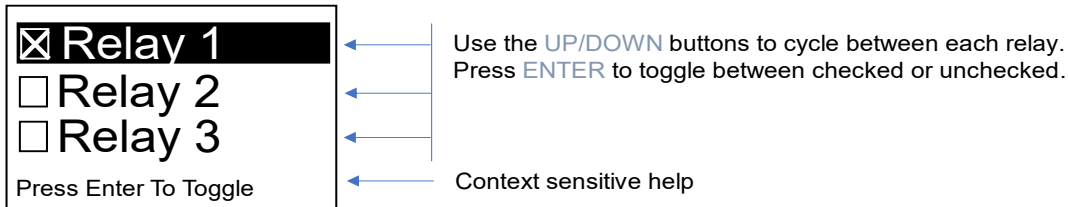
The available options for 'Type' are listed in the following table.

**Table 5-12: Alarm Type Options**

Menu Item	Description
Increasing	Alarm is triggered when alarm exceeds its threshold in an increasing direction
Decreasing	Alarm is triggered when alarm exceeds its threshold in a decreasing direction

When the **ENTER** button is pressed, the screen will update to display the confirmation dialog (described previously).

If 'Trigger' is activated from the alarm sub-menu, then the display will be updated to show the following editing screen.

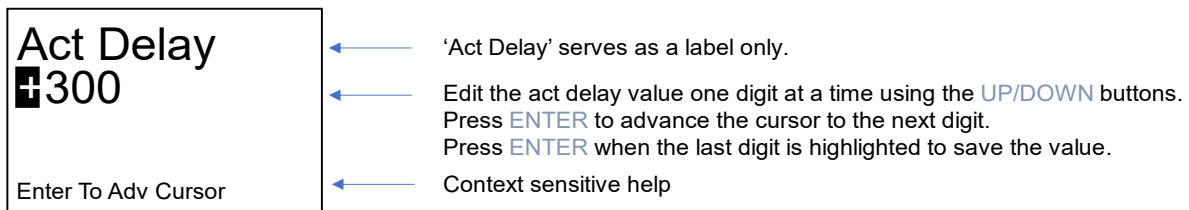


The available options for 'Trigger' are 'Local' and 'Relay 1' through 'Relay 5'. If the checkbox next to the relay is checked, then that relay will activate when the associated alarm is active. Otherwise, the relay will not activate.

NOTE: Relays 3 through 5 are unavailable in the AMC-1BXX Series. Any attempt to toggle the state of a checkbox associated with an unavailable relay will be ignored.

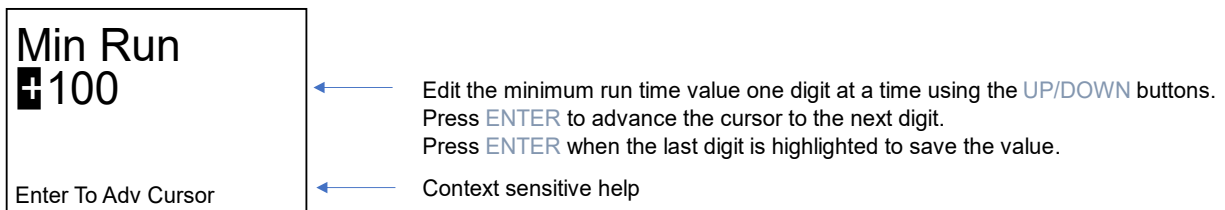
When the ENTER button is pressed with 'Done' selected, the screen will update to Transmitter Alarm Sub-Menu.

If 'Act Delay' is activated from the Alarm sub-menu, then the display will be updated to show the following editing screen.



When the ENTER button is pressed while the last digit is highlighted, the screen will update to display the confirmation dialog (described previously).

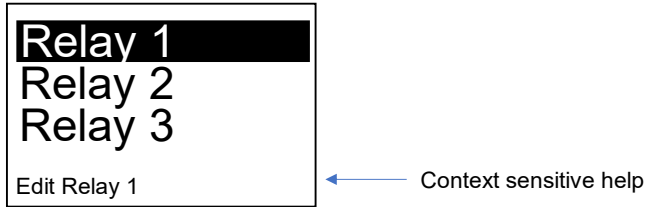
If 'Min Run' is activated from the Alarm sub-menu, then the display will be updated to show the following editing screen.



When the ENTER button is pressed while the last digit is highlighted, the screen will update to display the confirmation dialog (described previously).

### 5.2.10.3 TRANSMITTER RELAY SETTINGS

From the UTx service menu, selecting 'Relays' will update the display to show the following sub-menu.

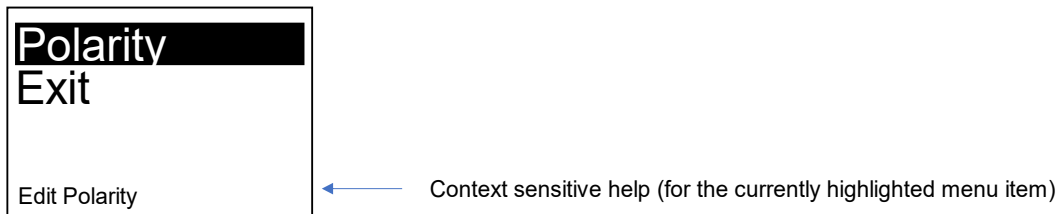


The **UP** and **DOWN** buttons can be used to navigate the list of menus for the Alarms sub-menu. The following table outlines all the menu items from the Alarms sub-menu:

**Table 5-13: Relay Menu**

Menu Item	Description
Relay 1-5	Select this menu item to activate the configuration sub-menu for the selected relay (ranging from 1 to 5)
Exit	Select this menu item to return to the UTx service menu. The Relays menu item will be selected when the UTx service menu appears

Selecting a relay from the alarms sub-menu will update the display to show the following:



The following table outlines all the menu items from the relay sub-menu:

**Table 5-14: Relay Sub-Menu**

Menu Item	Description
Polarity	Select this menu item to edit the relay's polarity setting
Exit	Select this menu item to return to the Relays sub-menu

If 'Polarity' is activated from the relay sub-menu, then the display will be updated to show the following editing screen.

'Polarity' serves as a label only.

The polarity can be selected from a list of options using the UP/DOWN buttons to cycle between each option. Press ENTER to save the selected options.

Context sensitive help

The available options for 'Polarity' are listed in the following table.

**Table 5-15: Relay Polarity Menu**

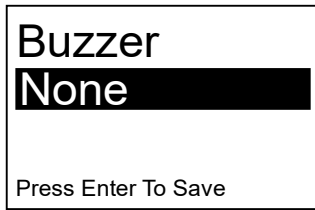
Menu Item	Description
Normal	Relay coil is energized when associated alarm is active. Otherwise, the relay coil is de-energized
Reverse	Relay coil is de-energized when associated alarm is active. Otherwise, the relay coil is energized

When the ENTER button is pressed, the screen will update to display the confirmation dialog (described previously).

NOTE: The 1BCO system configuration is factory-set to use the reverse setting for the fail-safe mode. Fail safe mode provides continuity between COM to NC during WARN/ALARM/FAULT and power failure, and the associated relay LED indicator will be off.

#### 5.2.10.4 BUZZER

From the UTx service menu, selecting 'Buzzer' will update the display to show the following:



← 'Buzzer' serves as a label only.

← The buzzer activation level can be selected from a list of options using the UP/DOWN buttons to cycle between each option. Press ENTER to save the selected options.

← Context sensitive help

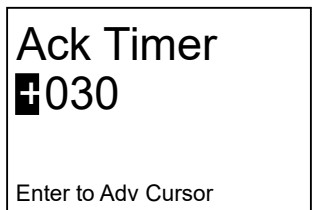
The available options for 'Buzzer' are listed in the following table.

**Table 5-16: Buzzer Menu**

Menu Item	Description
None	Disable local buzzer completely
Alarm	Local buzzer sounds for alarm level and fault
All Levels	Local buzzer sounds for warning, alarm, high alarm levels, and fault

#### 5.2.10.5 ACTIVATION TIMER

From the UTx service menu, selecting 'Ack Timer' will update the display to show the following:



← 'Ack Timer' serves as a label only.

← Edit the activation timer value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.

← Context sensitive help

When the ENTER button is pressed while the last digit is highlighted, the screen will update to display the confirmation dialog (described previously).

The allowable values for the activation timer are 30-120 seconds. During an alarm state, the local buzzer may be silenced for a period equal to activation timer, by pressing the ENTER button.

## 5.3 CALIBRATION

Sensors naturally degrade over time, losing about 2% of their sensitivity per month. Over time a sensor will start to underreport gas concentrations, meaning that a calibration is necessary to maintain a safe environment.

When the Sensor Module(s) are due for calibration the respective LED will blink cyan-yellow as opposed to its usual green to be able to see at a glance which sensor(s) is(are) overdue.

Information on Calibration Dates (when calibration is due, calibration frequency) can be found in the UTx Menu.

### Caution:

- Only qualified personnel should perform the actual calibration.
- Users new to gas calibration are advised to consult with Armstrong Monitoring

The Armstrong Monitoring Corporation offers the following calibration plans:

1. Factory pre-calibrated exchange replacement smart sensor 2 modules.
2. On site installation by Armstrong Monitoring.
3. On site calibration by Armstrong Monitoring.
4. Training by Armstrong Monitoring for end users.

For additional details please refer to Section 1.4 Contact Information.

### 5.3.1 REQUIRED EQUIPMENT; EZ Cal EXCHANGE PROGRAM

The following is a recommended list of equipment required:

- Phillips and Robertson (Square) screwdriver set

### 5.3.2 REQUIRED EQUIPMENT; ON-SITE SENSOR MODULE CALIBRATION

We recommend calibration gas concentrations be as close to the maximum detection range as possible. See Section 2.2 for recommended calibration gas and concentration.

Note: Calibration gas concentrations 20% higher than maximum detection range are not supported by the Monitor's Menu.

Please refer to Section 3.3.1 for the Calibration Kit that provides the mating adaptor for connecting the calibration gas cylinder to the face of the Sensor Module.



### 5.3.3 PRE BUMP TEST

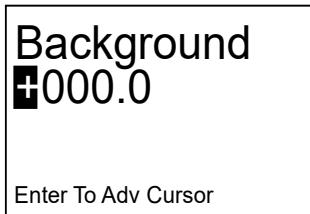
Before calibration, an “As Found” (bump test) is usually performed to ensure each sensor is in working order and returning reasonable responses. The bump test involves applying a test gas to the sensor. However, sensors such as CO have a recovery time measured in multiple hours. As a result, the calibration routine would find a zero at a concentration that is not the true background concentration, should the sensor not have sufficient recovery time.

The “As Found” menu item allows the user to enter the measured background concentration before performing a bump test. This value is persisted in memory for 24 hours. If a calibration is performed during this 24h period, the persisted background concentration will be used to negate the effect of the bump test and sensor recovery time on the calibration process.



← Context sensitive help (for the currently highlighted menu item)

Before performing a bump test, navigate to the “As Found” menu and enter the current background reading. The user should then navigate to the main screen so that the gas concentration may be monitored during the bump test. The user may then apply a target gas and monitor the response.



← 'Background' serves as a label only.

← Edit the current background one digit at a time using the UP/DOWN buttons.  
Press ENTER to advance the cursor to the next digit.  
Press ENTER when the last digit is highlighted to save the value.

← Context sensitive help

## 5.3.4 CALIBRATION PROCEDURE

### 5.3.4.1 Calibration Menu

Navigate to the Service Menu and select the sensor to be calibrated. If the **ENTER** button is pressed then the following menu is shown. This menu is common to all sensors therefore selecting any sensor will produce the same menu.



← Context sensitive help (for the currently highlighted menu item)

The **UP** and **DOWN** buttons can be used to navigate the list of service menus for the selected sensor. The sensor's service menu provides the following menu items:

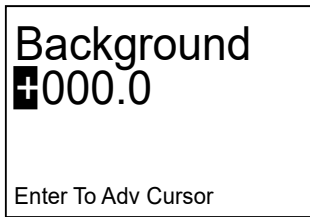
**Table 5-17: Calibration Menu**

Menu Item	Description
ADAPTiCal	Select this menu item to start calibration for the selected sensor
As Found	Allows user to enter the background concentration reading before performing a bump test. (Refer to Section 5.3.3 for further explanation).
Window	Allows user to edit the custom window filter for the selected sensor (Refer to Section 5.2.9)
Override	Allows user to edit the override the current sensor value for the selected sensor. (Refer to Section 6.4.1)
Reset	Allows user to trigger a software reset of the selected sensor
Exit	Select this menu item to return to the main service menu. The current sensor will be selected when the main service menu appears



← Context sensitive help (for the currently highlighted menu item)

With 'ADAPTiCal' highlighted (as above), press **ENTER** to initiate a calibration sequence for the selected sensor. Once initiated, the user will be presented with the following screens in which the background and span level concentrations used for the calibration can be entered:

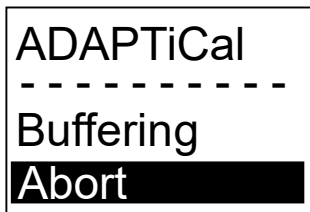


- ← 'Background' serves as a label only.
- ← Edit the current background one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.
- ← Context sensitive help



- ← 'Span Level' serves as a label only.
- ← Edit the span level value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.
- ← Context sensitive help

Once the background and span level gas concentrations are entered, the calibration procedure will start automatically and the state of the calibration will be displayed on the display as shown below. Throughout the entire calibration procedure, the Abort command remains highlighted therefore the procedure can be aborted at any time by pressing the ENTER button.



- ← Current state of the calibration procedure
- ← Abort command remains highlighted throughout the entire procedure

During calibration, the procedure will transition through the following set of states:

**Table 5-18: Calibration States**

Menu Item	Description
Buffering	A software register is acquiring data before the gas level can be evaluated
Find Zero	The gas concentration for 'zero' gas is determined
Apply Gas	Procedure is ready for the user to apply gas. User will be prompted to press the ENTER button after the OK command is highlighted in order to indicate when they have applied gas.
Find Gas	Calibration routine will stay in this state until it has detected the full application of gas
Find Span	Calibration is underway with the specified gas applied. This state will remain active until it either passes or fails

When the calibration procedure completes its cycle, the result will either be a PASSED or FAILED with calibration results as shown by the following two images.

```
CAL PASSED
Zero Level : 780
Base Level : 800
Span Level : 2700
Orig. Span : 1900
% of Orig. : 100 %
Press Enter to Ack
```

← Pressing the **ENTER** button returns the display to the ADAPTiCal menu item

```
CAL FAILED
Zero Level : 781
Base Level : 1058
Span Level : 2956
Orig. Span : 1900
% of Orig. : 100 %
Press Enter to Ack
```

← When a calibration fails for a sensor that was previously calibrated successfully (e.g. factory calibrated), original span is retained.

← Pressing the **ENTER** button returns the display to the ADAPTiCal menu item

In either case, the OK command is highlighted, therefore, press the **ENTER** button to return back to the sensor's service menu.

### 5.3.4.2 Calibration Routine

Note: If an "as found" (bump test) is to be performed prior to calibration, follow the routine outlined in section 5.3.3, Pre Bump Test, first.

1. To begin calibration, go to the menu, and select the sensor to be calibrate, then select "ADAPTiCal". Refer to Section 5.3.4.1 for details of the Calibration Menu.
2. The operator will be asked to provide a background gas concentration. Use the arrow keys to adjust the rightmost digit while pressing enter to commit each digit. Repeat this for all digits.
  - a. It is recommended that prior to calibration to manually set the ventilation system to reduce the background gas concentration to near zero.
  - b. It is recommended to use a trusted secondary measurement device (such as a handheld gas meter) to obtain an accurate reading of the background gas concentration. Enter this value for the background gas concentration when prompted.
  - c. If background gas concentration cannot be reduced to near zero or if the background gas concentration cannot be established, apply pure nitrogen gas to the sensor prior and during the finding zero stage of calibration. Enter 0 for the background gas concentration when prompted.

## Caution:

**In the case of repeated CO Gas Calibrations performed in quick succession (i.e. less than 30 minutes apart) first follow the routine outlined in section 5.3.3, Pre Bump Test. Then use the Background value provided by the unit during ADAPTiCAL startup.**

**A CO sensor element has a tendency to increase its background zero offset after each span gassing. Entering a Background of 0.0 in the second or third attempt can lead to failed calibration.**

3. The operator will then be asked to provide a span level gas concentration (i.e. the concentration of the target gas that is in the cylinder being used to calibrate). Use the arrow keys to adjust the rightmost digit while pressing enter to commit each digit. Repeat this for all digits.
  - a. It is recommended that this concentration be relatively close to the maximum span range of the sensor for best results (as an example, service technicians could use 75ppm gas concentration cylinder for calibrating 100ppm CO Span sensor, however we recommend 100ppm CO).
4. The sensor will enter buffering and the “Find Zero” stage of calibration, assessing the output at the background concentration. When this stage succeeds, the operator will be notified on screen and the calibration routine will pause until acknowledged. Before acknowledging, get the target span gas ready to flow. When **ENTER** is pressed start applying the gas.
5. The sensor will wait until it detects gas and will enter the “Find Span” stage of calibration. This typically takes between 30 and 180 seconds.
6. Once this stage succeeds, the sensor will check that the result is within limit and notify the operator whether the calibration routine has failed or succeeded. The operator maybe be notified if sensor is nearing end of life.
7. If the calibration failed, the calibration can be attempted again right away, but it is recommended that the operator accepts the background gas concentration provided by the unit since the unit will retain the original background gas concentration.

## **6 MAINTENANCE**

Maintenance is a very important activity that should be done at the proper time intervals, which are discussed below.

### **6.1 GENERAL**

The AMC-1BXX should be cleaned (brushed or wiped) as required, depending on the rate of accumulation of any dust or dirt.

To avoid sensor damage, the unit **MUST NOT** be submerged, hosed or splashed with any liquids.

Ensure the green indicators (LEDs) are slowly blinking to indicate a healthy state.

### **6.2 SCHEDULED CALIBRATION**

Scheduled calibration is critical in maintaining proper function of the AMC-1BXX. It is recommended that the Sensor Module(s) be calibrated a minimum of twice a year or more often for demanding applications. Armstrong Monitoring Corporation offers a number of different maintenance plans to suit your requirements. Please see Section 1.4 for CONTACT INFORMATION.

### **6.3 SENSOR MODULE**

The Sensor Module tracks time since last calibration and will indicate via LED status when service is required. When the Sensor Module can no longer be calibrated, replacement is required; see section 2.2 for replacement sensor P/N.

#### **6.3.1 SENSOR MODULE REPLACEMENT**

AMC-SM-xx Sensor Modules are designed to be field replaceable. When changing the sensor module, first ensure that the AMC-1BXX is fully powered down.

##### **6.3.1.1 REMOVE SENSOR MODULE**

Detach the IPC Cable from the Sensor Module. Rotate the Sensor Module so the tab aligns as shown in image below and remove from the Lid Assembly.



**Figure 6-1: Disconnect Sensor Module**

### **6.3.1.2 INSTALL SENSOR MODULE**

Rotate the replacement Sensor Module so the tab aligns as shown. Push and turn clockwise until the Sensor module is secured. Attach the IPC Cable to the top connector on the Sensor Module.



**Figure 6-2: Installing Sensor Module**

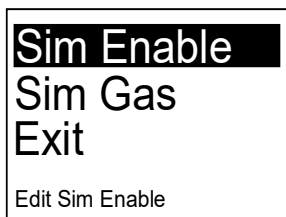
## 6.4 VERIFICATION OF OPERATION

Verification of operation should be performed at least once every 6 months. For highly demanding applications more frequent verification is recommended.

### 6.4.1 SIMULATION OF GAS LEVELS

The Monitor Service Menu allows the current gas reading to be overridden by a simulated gas level. This may be useful during system configuration to verify operation of the Monitor or alarm relays.

If 'Override' is activated from the sensor's service menu, then the display will be updated to show the following sub-menu.



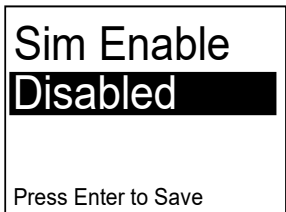
← Activate this menu item to edit the simulated gas enable flag for the selected sensor

← Activate this menu item to edit the simulated gas concentration for the selected sensor

← Activate this menu item to exit the "Override" sub-menu

← Context sensitive help (for the currently highlighted menu item)

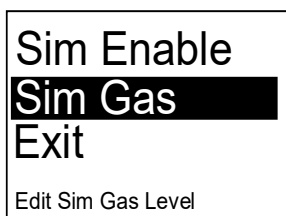
If 'Sim Enable' is activated from the 'Override' sub-menu, then the display will be updated to show the following editing screen.



← Defaults to the current value of the Sim Enable flag. Use **UP/DOWN** arrow buttons to toggle between Disabled and Enabled. Press **ENTER** button to confirm selection.

← Context sensitive help (for the currently highlighted menu item)

When the **ENTER** button is pressed, the confirmation screen (described previously) is displayed. If Yes is selected, the edit value is persisted as the new value for the Sim Enable Flag. Otherwise, the edit value is rejected. In either case, the menu returns to the Override sub-menu menu with the 'Sim Enable' menu item selected.



← Activate this menu item to edit the simulated gas enable flag for the selected sensor

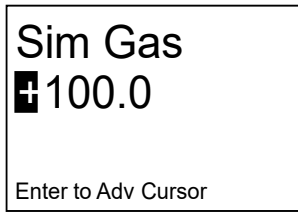
← Activate this menu item to edit the simulated gas concentration for the selected sensor

← Activate this menu item to exit the "Override" sub-menu

← Context sensitive help (for the currently highlighted menu item)

If 'Sim Gas' is activated from the 'Override' sub-menu, then the display will be updated to show the following editing screen.





- ← 'Sim Gas' serves as a label only.
- ← Edit the simulated gas value one digit at a time using the UP/DOWN buttons. Press ENTER to advance the cursor to the next digit. Press ENTER when the last digit is highlighted to save the value.
- ← Context sensitive help

When the ENTER button is pressed with the last digit highlighted, the confirmation screen (described previously) is displayed. If Yes is selected, the edit value is persisted as the new value for the Sim Gas concentration value. Otherwise, the edit value is rejected. In either case, the menu returns to the Override sub-menu menu with the 'Sim Gas' menu item selected.

Selected 'Exit' from the 'Override' sub-menu returns the user to the sensor's service menu with the 'Override' menu item selected.

### 6.4.2 LED/RELAY ACTIVATION TEST

The Service Menu allows the activation of all relays and LEDs, regardless of alarm state. This may be useful during system configuration to verify operation of the LEDs and relays, as well as to verify that the polarity settings are correct.

From the Service menu, selecting 'Test' will update the display to show the following:



- ← 'Test' serves as a label only.
- ← Defaults to the current value of the test enable flag. Use UP/DOWN arrow buttons to toggle between Disabled and Enabled. Press ENTER button to confirm selection.
- ← Context sensitive help

When the ENTER button is pressed, the confirmation screen (described previously) is displayed.

In addition to activating all relays (taking into account polarity settings), all display and sensor LEDs will appear solid white, if functional.

## 7 TROUBLESHOOTING

Table 7-1 Troubleshooting Table

Symptom	Possible Cause	How to Verify	Corrective Action
Network LED is not flashing .5 second flashing Green	Network noise internal to Bus Module due to wires connected to A 1 and B 1 terminal on Bus Module	Network LED periodically flashes Red or Green at 1 second rate.	Remove any wires connected to A 1 and B 1 Terminals on Bus Module.
No Gas Concentration on Display	Sensor Module not connected or broken or loose wire to Sensor Module	No Sensor Module LED. Sensor LED Red.	Check wiring from UTx Module to Sensor Module.
Only one Gas Concentration Bar on Display	Second Sensor Module not connected or broken or loose wire to second Sensor Module	No Sensor Module LED. Second Sensor LED Red.	Check wiring from first Sensor Module to second Sensor Module.
	Not a dual Sensor Module	Sensor LED Red.	Check if Sensor Module has dual sensors or correct type.
Sensor LED or Sensor Module LED(s) are not Solid green.	Refer to Section 5.1	Refer to Section 5.1	Check wiring from UTx Module to Sensor Module. Check if Sensor Module has dual sensors or correct type. Calibrate Sensor Module if needed. Replace Sensor Module with correct type.  Refer to Section 5.1

Symptom	Possible Cause	How to Verify	Corrective Action
Buzzer or Relays not activating.	Bad Connection to Buzzer or Relays.	No continuity between COM and NO Bus Module terminals.	Re-seat wiring connections for buzzer and relay coils.
	Configuration incorrect.	No continuity between Relay coil connection and relay coils.	<p>Check UTx-&gt; Buzzer menu parameters. Check if either Alarm or All Levels are selected in item.</p> <p>Check UTx-&gt; Alarms-&gt; Alarm 1/2/3/4-&gt; Trigger menu parameters; ensure Relay 1 and 2 are checked (enabled).</p> <p>The Relay 1 coil is energized during the WARN state, while the Relay 2 coil is energized during the ALARM state.</p> <p>Alarm 1 is used to control Relay 1 for CO. Alarm 2 is used to control Relay 2 for CO.</p> <p>For 1BVC only: Alarm 3 is used to control Relay 1 for NO<sub>2</sub>. Alarm 4 is used to control Relay 2 for NO<sub>2</sub>.</p>

## 8 SENSOR MODULE DEFAULT SETTINGS

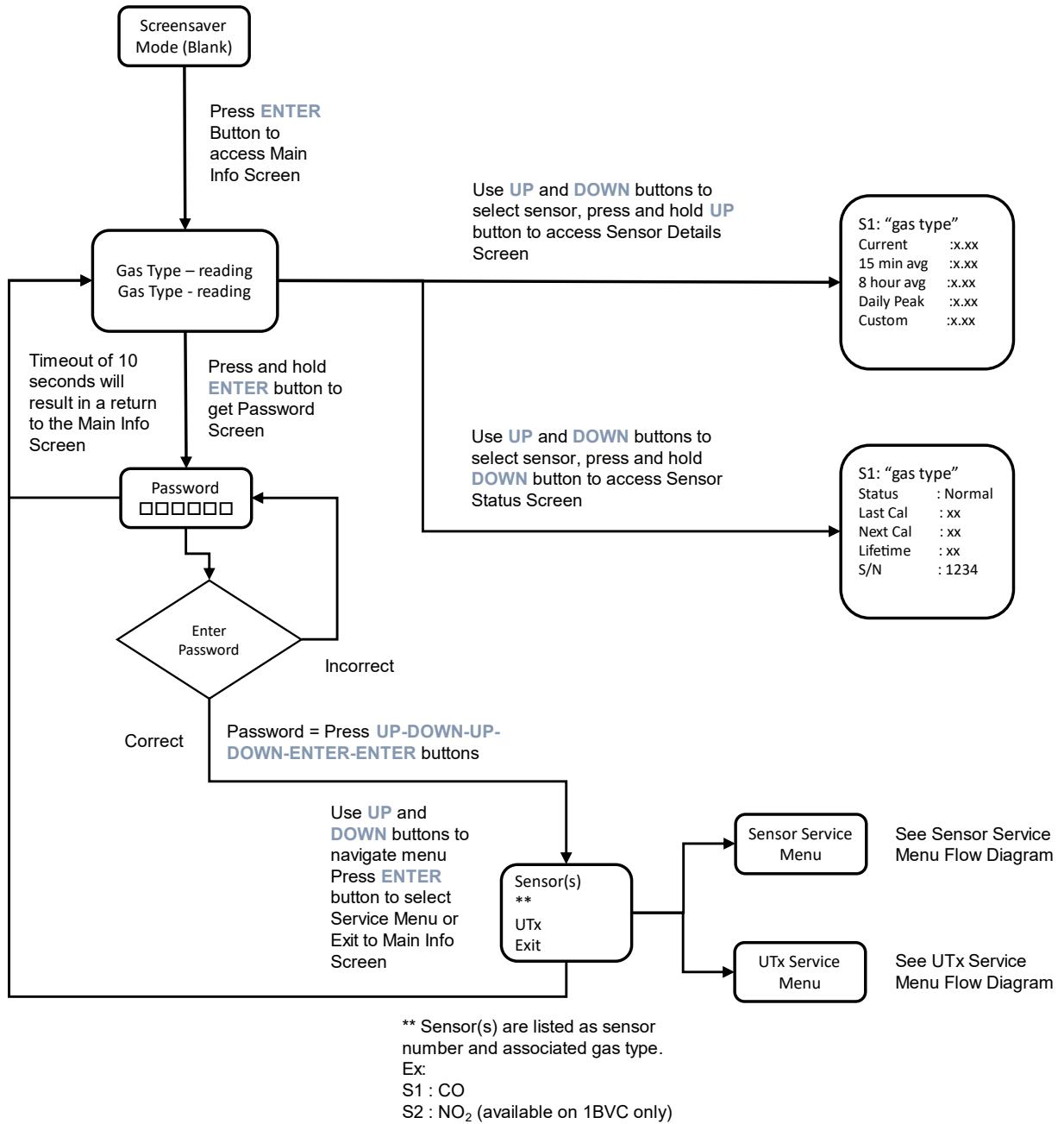
Table 8-1: Default Alarm Settings

SM Code	Short Gas Name	Long Gas Name	Set Point 1	Set Point 2	Set Point 3
91A	CO	Carbon Monoxide	25	100	100
VC	CO	Carbon Monoxide	25	100	100
	NO <sub>2</sub>	Nitrogen Dioxide	1	3	3

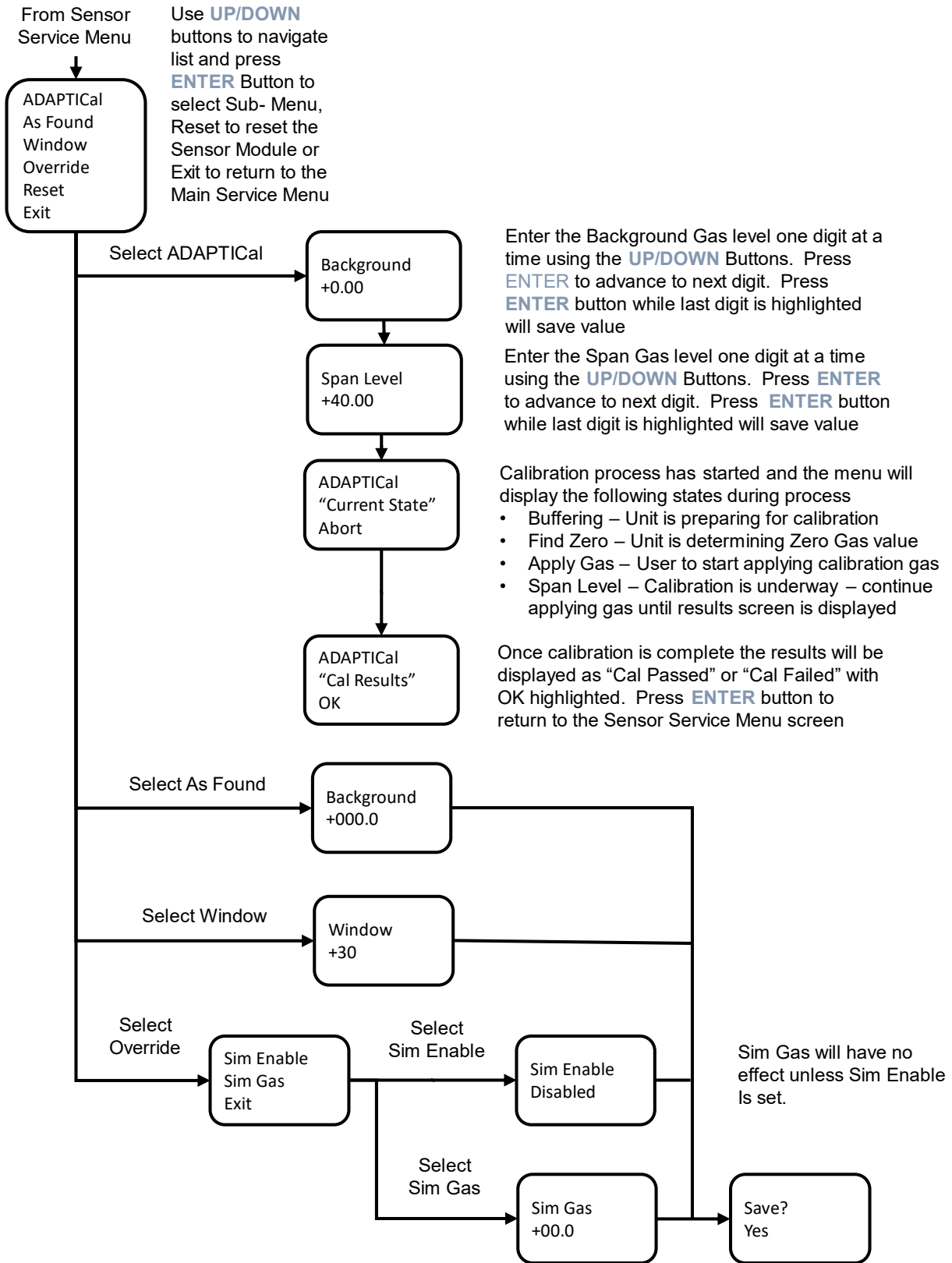
Table 8-2: Default Sensor Module Settings

SM Code	Short Gas Name	Long Gas Name	Span	Engineering Units	Hysteresis	Zero Blanking
91A	CO	Carbon Monoxide	100	PPM	2.50%	+/-5%
VC	CO	Carbon Monoxide	100	PPM	2.50%	+/-5%
	NO <sub>2</sub>	Nitrogen Dioxide	10	PPM	2.50%	+/-5%

# 9 MENU FLOW DIAGRAMS



**Figure 9-1: Main Screen / Password Flow**



**Figure 9-2: Sensor Service Menu Flow Diagram**

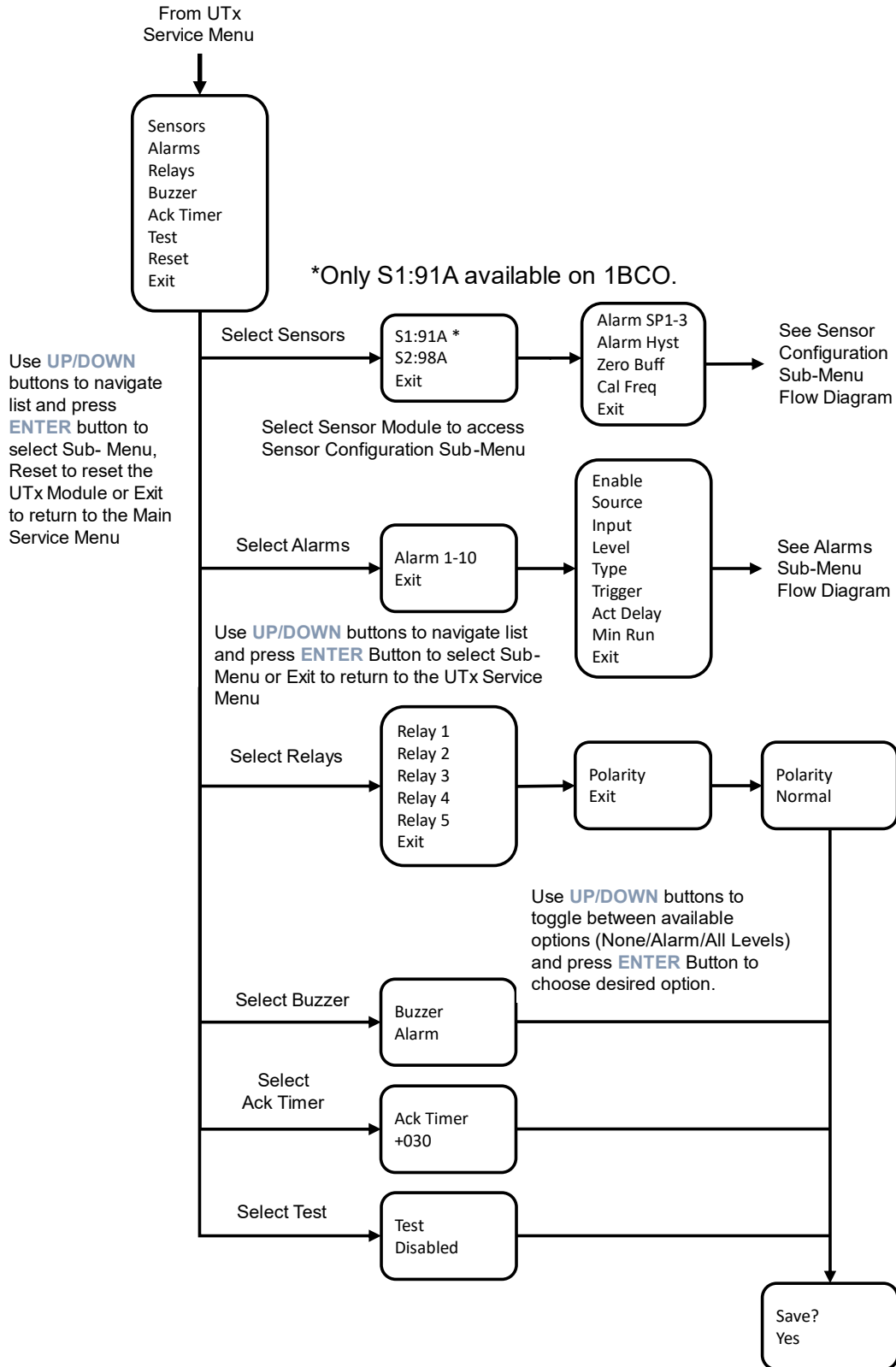
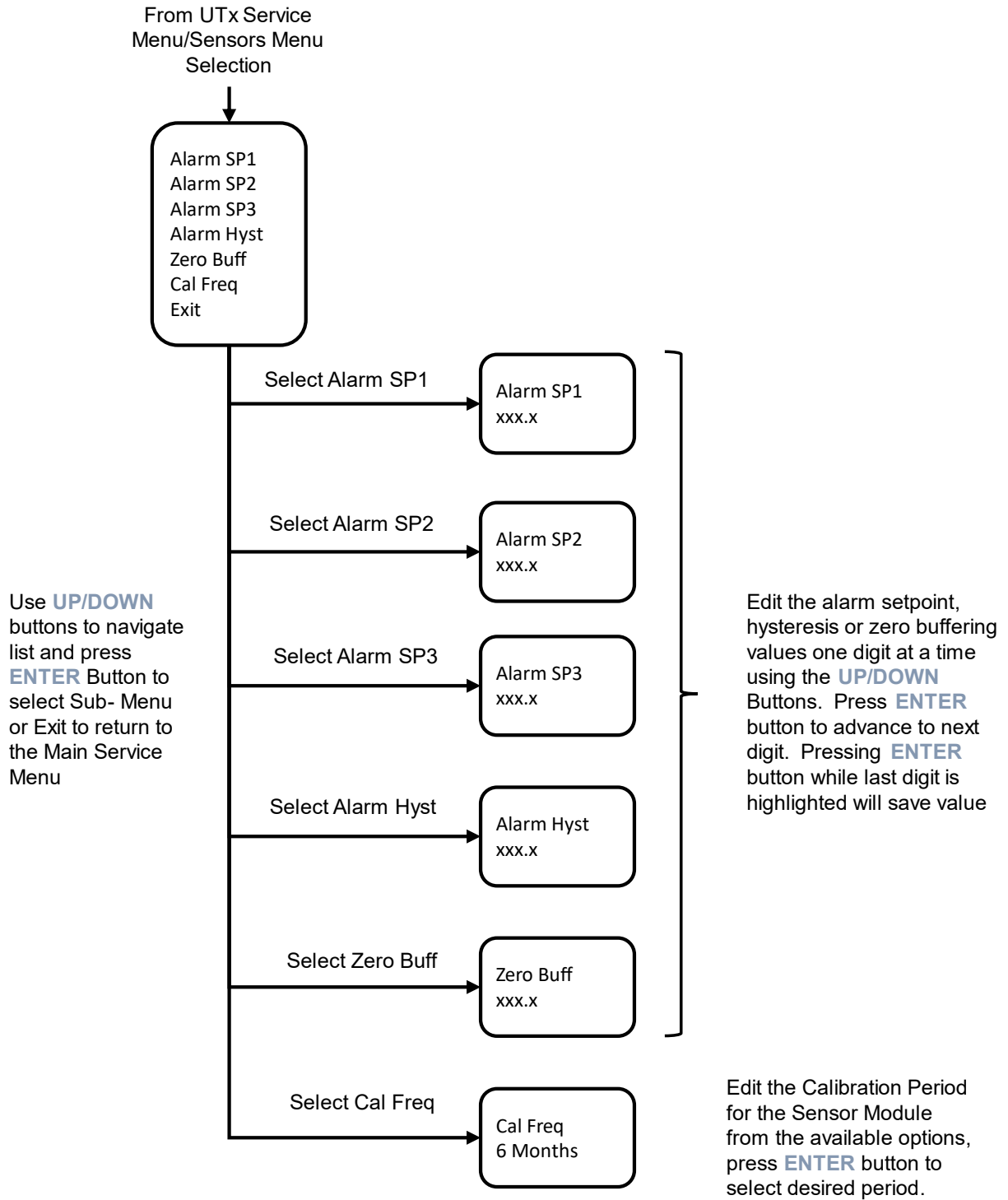


Figure 9-3: Service Menu Flow Diagram



**Figure 9-4: Sensor Configuration Menu Flow Diagram**



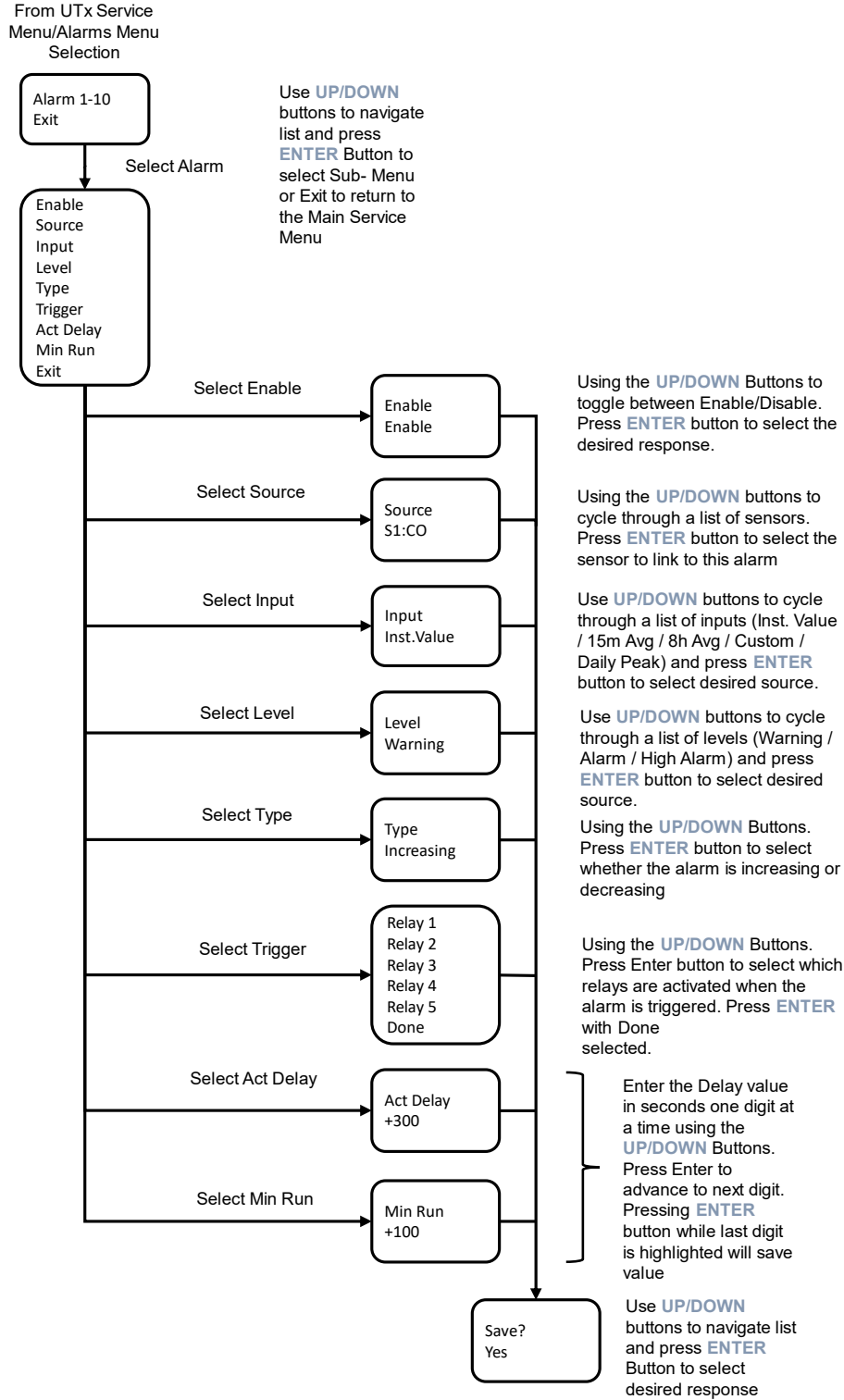


Figure 9-5: Alarm Menu Flow Diagram