VESDA® ECO™

by ◆ xtralis®

Product Guide

VESDA®

by ◆ xtralis®

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This product must only be installed, configured and used strictly in accordance with the General Terms and Conditions, User Manual and product documents available from Xtralis. All proper health and safety precautions must be taken during the installation, commissioning and maintenance of the product. The system should not be connected to a power source until all the components have been installed. Proper safety precautions must be taken during tests and maintenance of the products when these are still connected to the power source. Failure to do so or tampering with the electronics inside the products can result in an electric shock causing injury or death and may cause equipment damage. Xtralis is not responsible and cannot be held accountable for any liability that may arise due to improper use of the equipment and/or failure to take proper precautions. Only persons trained through an Xtralis accredited training course can install, test and maintain the system.

Liability

You agree to install, configure and use the products strictly in accordance with the User Manual and product documents available from Xtralis.

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Fitness for Purpose

You agree that you have been provided with a reasonable opportunity to appraise the products and have made your own independent assessment of the fitness or suitability of the products for your purpose. You acknowledge that you have not relied on any oral or written information, representation or advice given by or on behalf of Xtralis or its representatives.

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- ii. in the case of goods, the lowest cost of replacing the goods, acquiring equivalent goods or having the goods repaired.

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If any provision outlined above is found to be invalid or unenforceable by a court of law, such invalidity or unenforceability will not affect the remainder which will continue in full force and effect. All rights not expressly granted are reserved.

Document Conventions

The following typographic conventions are used in this document:

Convention	Description
Bold	Used to denote: emphasis Used for names of menus, menu options, toolbar buttons
Italics	**Used to denote:** references to other parts of this document or other documents. Used for the result of an action.

The following icons are used in this document:

Convention	Description
	Caution: This icon is used to indicate that there is a danger to equipment. The danger could be loss of data, physical damage, or permanent corruption of configuration details.
	Warning: This icon is used to indicate that there is a danger of electric shock. This may lead to death or permanent injury.
	Warning: This icon is used to indicate that there is a danger of inhaling dangerous substances. This may lead to death or permanent injury.

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Codes and Standards Information for Air Sampling Gas Detection

We strongly recommend that this document is read in conjunction with the appropriate local codes and standards for gas detection and electrical safety. This document contains generic product information and some sections may not comply with all local codes and standards. In these cases, the local codes and standards must take precedence. The information below was correct at time of printing but may now be out of date, check with your local codes, standards and listings for the current restrictions.

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures; re-orientate or relocate the receiving antenna, increase the separation between the equipment and receiver, connect the equipment to a power outlet which is on a different power circuit to the receiver or consult the dealer or an experienced radio/television technician for help

Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada:

EU Directive 2004/108/EC – EMC Directive

This equipment has been independently tested for compliance with the requirements of the harmonized standard

EN 50270:2006 -	Electromagnetic Compatibility – Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen.

Electrical Safety

The ECO Detector has been designed to meet the performance requirements of the following standards for electrical safety.

EN 61010-1:2001 -	Safety requirements for electrical equipment for measurement, control and laboratory use. General Requirements.

The ECO Detector has been independently tested for compliance with the requirements of the following standards for electrical safety.

Conforms to ANSI/UL 61010-1

Certified to CAN/CSA C22.2 No.61010-1

Gas Detection

The ECO Detector has been designed to meet the performance requirements of the following standards for gas detection.

EN 50271:2002 -	Electrical apparatus for the detection and measurement of combustible gases, toxic gases or Oxygen – Requirements and tests for apparatus using software and/or digital technologies.
EN 45544:2000 -	Workplace atmospheres – Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours.

The ECO Detector has been independently tested for compliance with the performance requirements of the following standards.

UNE 23300: 1984 -	Equipment for the detection of Carbon Monoxide

(For CO and CO + NO2 variants only)

Terms and Abbreviations

The following is a list of common terms and conditions relating to the product and gas detection in general that may be used in connection with this document.

ASD	Aspirating Smoke Detector
Analogue Output	A controlled current output, where the level is set to indicate a measured gas value on a linear scale
Bump Testing	A periodic application of gas to the product to verify its function
BSP	British Standard Pipe
CE	Product Mark that Indicates compliance to all relevant European directives.
CSA	Cross sectional area
EMC	Electromagnetic Compatibility. A measure of an electrical products susceptibility to and emission of EMI.
EMI	Electromagnetic Interference
EU	European Union
IEC	The International Electro-technical Committee, publishes internationally recognized product design standards.
LED	Light Emitting Diode, an indicating device which emits light of a specific colour when powered
LEL	Lower Explosive Limit, see LFL.
%LEL	An indication of a gas concentration expressed as a percentage of the LEL
LFL	Lower Flammable Limit, the minimum concentration, expressed as a percentage of volume, of a flammable gas in air that will generate an explosion if ignited. Also referred to as the LEL. This value is different for each type of flammable gas, and is defined by the appropriate local regulations for explosive atmospheres.
%LFL	An indication of the gas concentration as a percentage of the LFL
Modbus	A serial communications protocol published by the ModbusIDA for use with programmable logic controllers (PLCs). It is a commonly available means of connecting industrial electronic devices.
ppm	Parts per million, an indication of gas concentration as a fraction of the overall sample. 10,000 ppm is the equivalent of 1% of volume.
RFI	Radio Frequency Interference
RoHS	Restrictions of Hazardous Substances, EU Commission directive 2002/95/EC on the restrictions of usage of specified chemicals in the production of electronic products and components
RTC	Real Time Clock. An internal clock which maintains a count of the current date and time, including during periods when the unit is unpowered.
RTU	Remote Terminal Unit, a transmission method used by the Modbus Communications Protocol
TXX Time	The response time of the gas sensor to a step change in the input gas level to "XX"% of the final reading, e.g. T90 is the time taken for the measurement to reach 90% of a step change in the gas input level.
UL	Underwriters Laboratory, approval and certification of products in North America
USB	Universal Serial Bus, a serial interface standard for connecting PCs to peripheral devices
% v/v	An expression of the gas concentration as a percentage of the overall volume, also referred to as % Vol. or % Volume.
Xtralis VSC	Xtralis VSC is Xtralis bespoke software that configures, commissions and maintains the full range of VESDA by Xtralis fire detection and gas detection product. Xtralis VSC can configure a single VESDA smoke or gas detector or an entire network and is equipped with additional features that allow faster setup, fault resolution and event diagnostics.
WEEE	Waste Electronic and Electrical Equipment, EU Commission directive 2002/96/EC on the disposal of electrical and electronic equipment

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1   Overview

This product guide describes the features of the VESDA ECO gas detector, its technical specifications, an understanding of its components and their function. Instructions on installation, cabling and powering the detector, plus necessary routine maintenance requirements are also included.

This product guide is for anyone involved with the specification, installation, maintenance or purchasing of a VESDA ECO gas detector when used with a VESDA Aspirated Smoke Detection (ASD) system. It is assumed that anyone using this manual has knowledge and the appropriate certification from the local fire and electrical authorities.

1.1   Introduction to VESDA ECO

The VESDA ECO adds gas detection capability to existing or new installations of VESDA Aspirated Smoke Detection (ASD) systems; utilising the same 25mm or ¾" BSP air sampling pipe network.

The VESDA ECO can detect a range of flammable, toxic and oxygen gas hazards and provides a greater area of coverage than traditional fixed point gas detection systems.

VESDA ECO is designed for use in indoor/sheltered locations only.

VESDA ECO has been independently tested to verify full compatibility with Xtralis manufactured ASD without infringing associated performance approvals e.g. EN54-20 and UL 268

The embedded and PC software complimenting the VESDA ECO provides a wide range of user defined parameters and reporting capabilities.

The detector easily interfaces with remote audible / visual indicators or a 3rd party controller such as a fire alarm panel or building management system.

⚠ **Caution:**   This standard version of the product is NOT certified for use in areas classified as potentially explosive or hazardous and therefore must not be installed in such areas.

An alternative version of the product (VESDA ECO Ex) is available for use in areas classified as potentially explosive or hazardous. VESDA ECO Ex must be used with similarly approved aspirating smoke detector. Refer to relevant product technical data sheets or contact your local Xtralis sales representative for more information.

⚠ **Caution:**   To ensure correct application of the VESDA ECO gas detector it should be fitted and commissioned by Xtralis trained and accredited distributors / installers only.

The VESDA ECO gas detector has been designed and approved for use with compatible Xtralis manufactured aspirating systems only. The VESDA ECO product warranty will be invalidated if attached to any 3rd party aspirating product.

The use of 3rd party gas detection as part of an Xtralis aspirating sample pipe network will invalidate the Xtralis product approvals and warranty.

1.2   Packing Contents

As shipped, the product packaging contains the following items which are required for installation and commissioning of the product.

- VESDA ECO Gas Detector
- VESDA ECO Product Guide
- USB Interface Lead
- MicroSD Card (supplied fitted into card slot)

1.3   Product Overview

Figure 1-1: ECO Detector Layout

A	Enclosure Cover	H	USB Connection
B	Enclosure Cover Latch	I	microSD Card location
C	Sensor Cartridge	J	Status Indicators
D	Sensor Cartridge Label	K	Gas Test Port Plug
E	Enclosure Body	L	Flow indication Arrow
F	Main Product Label	M	Cable Entry Glands
G	Enclosure Cover Hinge	N	Calibration Label

1.4   Operation

The ECO is designed to be inserted into an aspirated air sampling pipe network to detect and indicate the concentration of background gas levels. An air sampling pipe network uses an aspirating fan or pump at one end to collect an air sample from a large area by means of sampling holes located at defined intervals along a length, or lengths, of fixed pipe work.

When inserted into the pipe network the ECO detector takes a sample of the air flowing through the pipe and passes it over the integrated gas sensors. The gas sensors are protected from dust, dirt and other contaminants by an innovative filter design which is integrated into the internal sensor cartridge itself.

The air flow through the detector is monitored by the ECO independently of the aspirating system. The ECO provides fault indication should the flow past the gas sensors fall outside acceptable limits.

In the event of an alarm threshold being exceeded; integral alarm indicators are lit, and onboard relays are activated for interface to remote warning devices or 3rd party systems.

Two alarm thresholds are provided for each of the gases being detected. The first threshold, the Low alarm threshold, can be used to provide a warning to site personnel and supervisory staff, and to initiate ventilation where available. The second threshold, the High Alarm threshold, can be used to initiate site evacuation or safety procedures.

For further information on specific Aspirated Smoke Detectors please see the specific Xtralis ASD product manual.

Caution: To maximise flammable gas sensor life; silicone free smoke test gas canisters should be used for testing ASD installations which incorporate one or more ECO detectors.

Caution: Smoke test canisters used for testing ASD installations contain hydrocarbons. ECO alarm and signal outputs should be isolated during use to avoid unwanted activation of remote executive actions. Refer to Section 5.4.3 on page 28 for details.

1.5   Key Features

Each ECO detector contains a plug in gas sensor cartridge which houses up to two gas sensors. This can provide significant cost savings over conventional point gas detection systems which require two or more detectors. At the end of the serviceable life of the gas sensors, a pre-calibrated plug-in replacement sensor cartridge can be supplied and fitted.

Four colour LED status indicators located on the enclosure cover show the power, alarm and fault conditions.

Four configurable on board relays are provided to indicate alarm and fault conditions and can be used to activate external remote indicators and beacons.

Two 4-20mA current source outputs are available, as supplied these are configured to each of the gas sensors and scaled to match the measurement range.

An RS485 Modbus RTU interface is provided by which a number of detectors can be interfaced to the Xtralis VSM4 monitoring package or 3rd party higher level system.

Event logs are stored on the removable microSD card and can be retrieved to a host PC running the Xtralis VSC software either directly using a microSD to SD Card adapter or via the USB interface.

Xtralis VSC gives the user the facility to read current and historical events, change the detector configuration settings and conduct detailed fault diagnostics.

An integrated gassing port allows simple application of zero and calibration test gas for set up and routine maintenance.

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2   System Design

Few international or national standards exist which specify the layout or design of a fixed gas detection system. Those standards that do exist limit their guidance to highlighting a list of key considerations and their effect on the system design.

These considerations include: the type of gas to be detected, relative density or buoyancy, gas temperature and pressure, area occupancy levels, environmental conditions, and ventilation effects amongst others.

The final system design requires input and agreement from all relevant project / site stake holders. Stake holders could include but may not limited to: The end user; site safety personnel; site process and maintenance personnel; project design consultants; installation contractors; Xtralis application support staff and the local authority having jurisdiction (AHJs).

To assist in the design of an effective ECO aspirated gas detection system refer to the "VESDA ECO Gas Detector – System Design Guide" (Document No. 20400) and complete the ECO application form which should be returned to, your local Xtralis Field Applications Engineer or qualified distributor / installer.

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3   Detector Location

There are many possible mounting configurations for the ECO detector, the three most common mounting locations are shown in Figure 3-1 below.
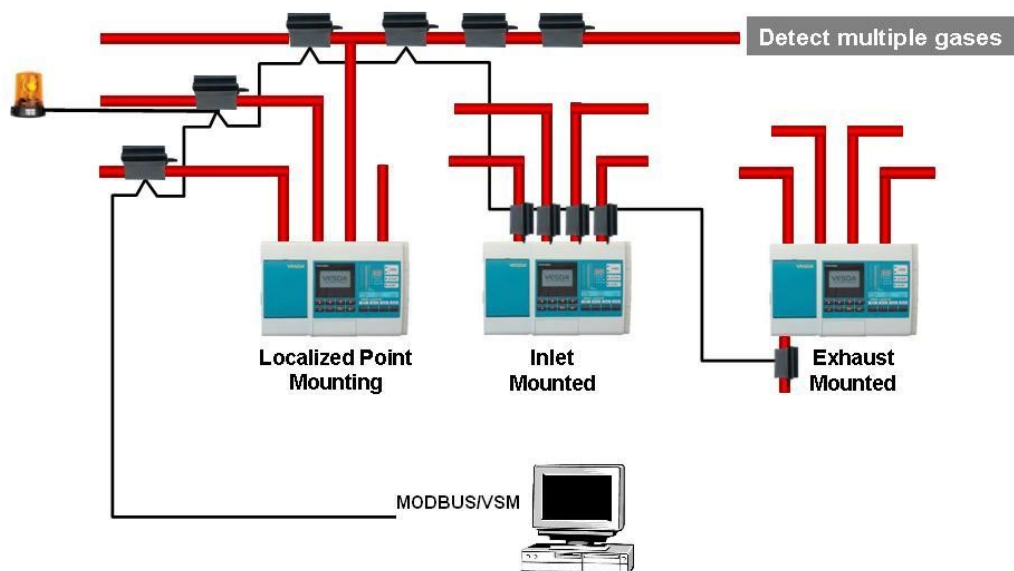

Figure 3-1: Alternative gas detection configurations

The final location of the ECO detector should be pre-planned to take account of all of the following factors. When being fitted to an existing aspirated smoke detection system it may be necessary to run additional pipe work for the benefit of gas detection.

- **Localized Point Mounting** - mounting a detector at a specific location in the pipe network permits localized monitoring to give earlier detection of gas levels in a higher risk area, reducing both the transport time and possibly the dilution of the sample.

- **Inlet Mounted** - mounting a detector on one of the inlets of the aspirator permits selective monitoring of that branch of the pipe network and provides ease of access for routine maintenance.

- **Exhaust Mounted** - mounting a detector on the exhaust of the aspirator permits the entire pipe network to be monitored by a single detector.

In choosing the location for the ECO detector(s) the installer must consider the following issues

- **Aspirator Proximity** – When fitted to the inlet pipe of the VESDA detector, the ECO should be located more than 0.5 m (20 inches) from the VESDA detector inlet.

- **Flow Restriction** – Effective ECO operation requires adequate sample flow. Flow levels vary when installing ECOs at different locations along a sampling pipe network. Adequate flow levels can be determined using the VESDA ASPIRE2 sample pipe design software. In addition ECOs have integral flow monitoring and alarms.

- **Gas Density** –Some gases are lighter than air, and others heavier than air. Consideration should be given to the location of sample points and areas where gas may accumulate, e.g. ceiling voids, floor trenches and inspection pits.

- **Cabling** – The installer must consider the cabling requirements of the ECO within the scope of the overall site installation.Refer to Section 4.5 on page 14.

- **Access** – The installer must ensure that there is sufficient access to the ECO detector, i.e. that the indicators can be seen, the cover can be removed for service and maintenance activities and that there is sufficient access to the gas test port if it is to be used.

- **Mounting** – Finding a suitably long straight section of pipe with sufficient access to fit the body of the

detector, without interfering with other equipment in the location.

- **Environment** – That the ambient local environment where the unit is to be placed does not exceed its specification, which must include the consideration of local sources of heat (e.g. radiators), cold (e.g. freezers), humidity and EMI (e.g. radio transmitters, electrical installations switching high currents and/or voltages etc).

4   Installation

Caution: Any installation of an ECO gas detector must comply with local electrical safety regulations and to the fire safety regulations when being fitted as part of a fire detection network.

4.1   Installation Process

To obtain the benefit of peak performance from the ECO product, it is suggested that the user follow the recommended installation procedure as outlined below:

- **Detector Location** – Determine the optimum position to place the ECO to maximize its ability to detect the gas hazard, as outlined in the section on page 9.

- **Physical Installation** – Mount the ECO correctly in its selected location, as outlined in the section on page 13.

- **Electrical Installation** – Connect the power and other interface wiring as instructed in the section on page 9.

- **Setup Xtralis VSC** – Install the free Xtralis VSC configuration software and connect PC to ECO USB port. Read/modify the factory default settings, review and download event logs.

- **Set Date and Time** – The ECO System date and time must be set to ensure logged events are correctly time stamped. To change the time and date refer to page 58 for details.

- **Flow Normalization** – "Normalize" the air flow reading to provide the reference for the flow fault conditions, as outlined in the section on page 44.

- **Gas Sensor Check** – "Bump" test the product using a calibrated sample gas to confirm proper measurement operation of the gas sensors, as outlined in the section on page 41.

- **System Test** – Use the Gas Test function in Xtralis VSC to verify the operation of the alarms, relays and current outputs, as outlined in the section on page 39.

- **Installation Checklist** – Complete and retain the installation checklist supplied in Appendix C on page 83.

4.2   Air Inlet/Outlet Pipe Connections

The tapered shape of the Air inlet/outlet port of the ECO are designed to accept standard pipes of OD 25mm (ID 21 mm) or BSP ¾ in (OD 1.05 in) and as such provide an air tight seal without gluing. Connection to pipe networks of other sizes should not be done without first confirming their compatibility with your Xtralis representative.
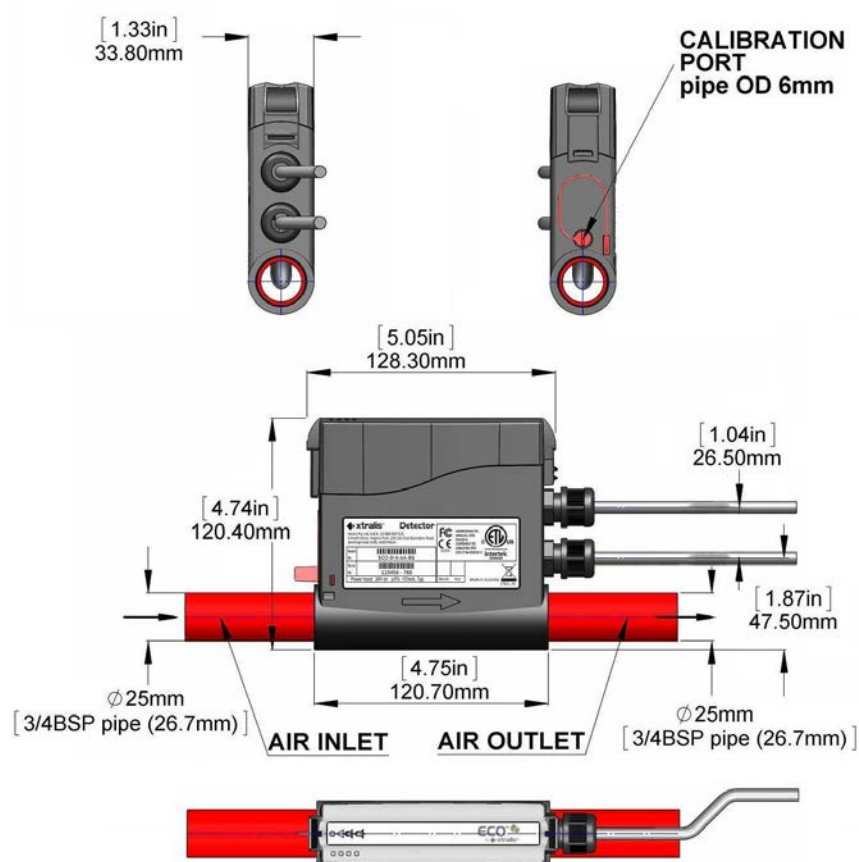
4.3   Mechanical Dimensions

Figure 4-1: ECO Mechanical Dimensions

4.4   Mechanical Installation

⚠️ **Caution:**   Do not install your ECO detector if there are any signs of shipping damage. Inform your
distributor if there is any visible damage.
Do not glue the detector into the sample pipe.

Check the Model of ECO Detector is correct as per design specifications for the site. Refer to the Model
number located on the main product label and ensure that the gas types and ranges are of the correct
specification.

Follow the steps below to fix the Detector to the pipe work:

- Before fitting the ECO detector to the pipe work, ensure that any glue used in fixing the sample pipes has
been given sufficient time to cure such that any vapours from the glue will not affect the gas detection.

- At the preferred location within the pipe work, as determined by reference to the previous section of this
document, remove a straight section from the pipe. The exact length of pipe to be removed will depend on
the tolerances of the pipe-work being used, but as a guide the lengths are approximately:

  - 60 mm when installing in a 25mm OD pipe
  - 4 inches (100 mm) when installing in a ¾" BSP pipe

  It is suggested that the pipe is cut to permit subsequent adjustment if required, to maintain a good airtight
  fit.

- Ensure that the cuts on the pipe are perpendicular to the pipe and that there are no burrs or sharp edges
present. If so, trim the pipe to remove these. Ensure the pipe if free of any debris.

- Verify correct orientation of ECO detector, in that the flow arrow on the side of the ECO enclosure is in the
same direction as the sample airflow.

- Insert the detector into the open section of the pipe, ensuring that the pipe entry to the detector is square
and the pipes sit correctly in the tapered air inlet/outlet ports and provides an air tight seal.

- **Do not glue the pipes to the detector**. This is not necessary and is an obstacle to future maintenance.

- If the gas test port is not to be permanently connected to a remote gassing pipe, ensure that the blanking
plug supplied with the unit is fitted firmly in place.

- Alternatively, if a permanent remote gassing pipe is to be installed, use 6mm OD pipe fitted into the gas
test port of the ECO at one end and ensure the opposite end is fitted with a gas tight plug during normal
operation.

- When mounting the ECO detector, ensure that the device is oriented such that the Status Indicators are
visible for inspection purposes.

- Ensure that there is sufficient access to the Enclosure cover such that it can be removed and the sensor
cartridge accessed. Refer to Chapter 8 on page 71.

4.5   Electrical Installation

⚠

Caution: Any installation of an ECO gas detector must comply with local electrical safety regulations. If any of the following instructions conflict with the local regulations governing the installation site, consult your distributor for advice.

Electrostatic discharge precautions need to be taken prior to removing the enclosure cover from the enclosure body otherwise damage may occur to the detector.

To gain access to the electrical connection terminals the enclosure cover must first be removed. Before removing the cover, ensure that there is no opportunity for water ingress into the detector once the IP seal has been broken.

Removing the cover is achieved by inserting a large (8 – 13 mm wide, 2mm thick) flat bladed screwdriver firmly into the slot of the cover latch; positioned just above the cable gland; at an angle of approximately 30 degrees, until a click is heard and then lever the screwdriver down until it is at right angles to the main body of the detector and then pull the cover upwards (see Figure 4-2). The cover should pivot upwards from the hinge on the opposite end of the cover. The cover can then be detached by simply sliding it away from the enclosure body.
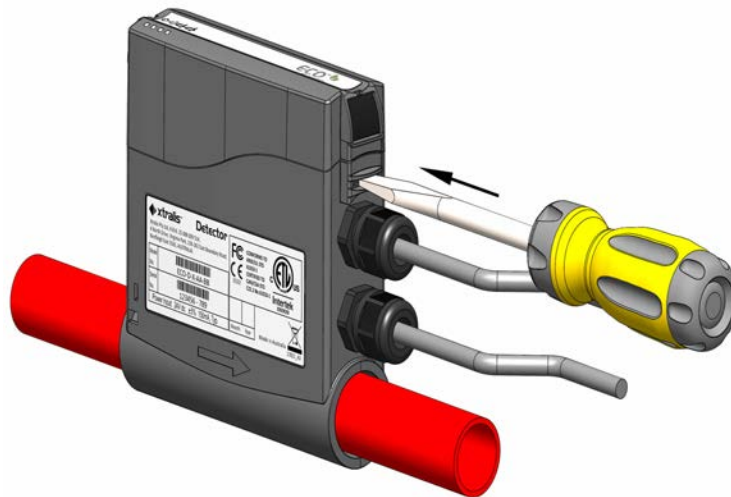

Figure 4-2: Enclosure Cover Removal

⚠

Caution: Be careful to ensure that the seal within the edge of the cover is retained and protected from damage whilst exposed.

Having removed the enclosure cover, the main PCB will be located inside of the cover. The main PCB has two removable field wiring terminal blocks which fit into two terminal sockets: SKT1 and SKT2 (refer to Figure 4-3). SKT1 is used for output relay connections, SKT2 for power, analogue and a Modbus RTU outputs.
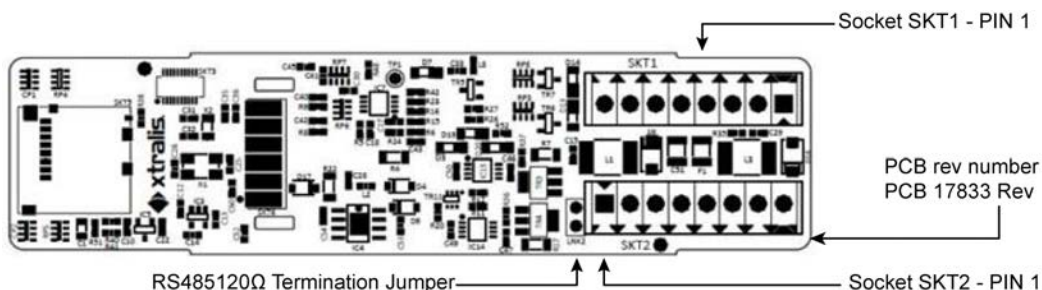

Figure 4-3: Main PCB Layout

The electrical functions of the terminals are as follows:

SKT1	Pin 1	Relay 1, Contact A
SKT1	Pin 2	Relay 2, Contact B
SKT1	Pin 3	Relay 3, Contact C
SKT1	Pin 4	Relay 4, Contact D
SKT1	Pin 5	Relay 5, Contact E
SKT1	Pin 6	Relay 6, Contact F
SKT1	Pin 7	Relay 7, Contact G
SKT1	Pin 8	Relay 8, Contact H

Note: The function of relays 1–4 can be programmed using the Xtralis VSC software (*"Refer to Section 6.6 on page 47"*).

SKT2	Pin 1	RS485 Signal A (Modbus D0)
SKT2	Pin 2	RS485 Signal B (Modbus D1)
SKT2	Pin 3	Power Supply Input (Nominally +24V)
SKT2	Pin 4	Power Supply return
SKT2	Pin 5	Cable Screen Termination
SKT2	Pin 6	Digital Input Remote Alarm Reset
SKT2	Pin 7	4-20mA Current source output A
SKT2	Pin 8	4-20mA Current source output B

The specific details of the connection to each function is detailed in the following sections.

4.5.1   Cable Specification

The 8 way screw terminals located on the main PCB will accept wire sizes up to 1.5 mm^2 (16AWG). If more than half of the terminals are to be used, a smaller diameter cable will be necessary to enable them to pass through the available space of the cable glands.

It should also be noted that the RS485 interface and Analogues Output connections of SKT2 must be made using a screened twisted pair cable. The screen of this cable should be terminated at the Screen terminal (pin 5) of connector SKT2 at one end, and to the return (0V) reference of the power supply system at the other.

4.5.2   Cable Preparation and Wiring

To ensure the ECO enclosure cover closes easily, it is recommended to pre-trim incoming cables to the dimensions shown in Figure 4-4 below. The larger dimension is applicable to cable using the cable gland furthest from the enclosure cover and the smaller dimension being applicable to cable using the nearest cable entry.
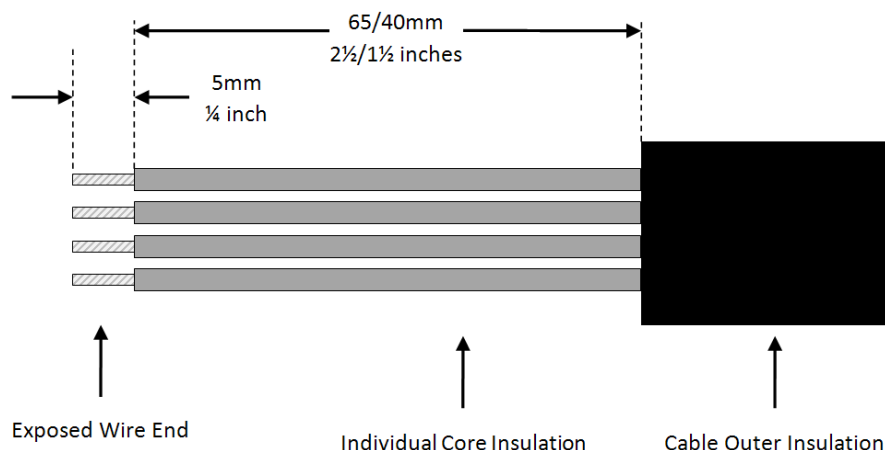

Figure 4-4: Cable Stripping Dimensions

It is also recommended to allow enough cable length, approximately 0.5m or 20 inches extra, to permit a small loop to be placed in the cable immediately prior to its entry to the cable glands. This will provide enough slack to remove the enclosure lid once the cable glands are loosened, and to pull the excess cable through the glands prior to tightening them. Including this loop of cable will also make for easier re-wiring if it should become necessary and will help to prevent water from running down the cable and settling onto the cable gland.

4.5.3   Power Supply Connection

ECO gas detectors are designed to operate at voltages between 18 and 30 VDC at the detector. When installing the detector consideration must be given to voltage drops along the power supply cable. The resistance, and therefore voltage drop, along this cable is a factor of the length and the cross sectional area of its individual cores.

Below is a table of representative values for resistance of different cable core ratings however it is only intended as a guide for cable size selection.

Table 4-1: Current Capacity and Resistance of Stranded Copper Wires

AWG	CSA mm^2	Maximum current (A)	Ω/ft @77°F	Ω/m @25°C
24	0.21	0.4	0.0349	0.115
22	0.33	0.7	0.0220	0.072
-	0.50	1.0	0.0107	0.035
20	0.52	1.0	0.0104	0.034
	0.75	1.5	0.0093	0.030
18	0.82	1.7	0.0065	0.021
-	1.00	2.0	0.0054	0.018
-	1.25	2.5	0.0043	0.014
16	1.31	3.7	0.0040	0.013

Caution: Wherever and whenever possible the user should refer to the manufacturers' specification for the cable to be used in the installation.

4.5.4   RS485 Interface Connection

ECO gas detectors are equipped to provide serial communication to Xtralis configuration and monitoring software or for interface to 3rd party higher level systems.

This serial interface (Modbus RTU) provides multi-drop serial communication capability to a number of ECO gas detectors via a screened twisted pair cable. When used to interface with Xtralis VSC or Xtralis VSM4 monitoring software a maximum of 32 devices can be attached to the bus.

For interfacing ECO to 3rd party higher level systems please refer to the separate ECO Modbus interface manual with regard to register mapping, data types and data limits.

The Modbus RTU interface on the ECO detector is implemented using the EIA-485 standard for the physical interface. This is a two wire differential, half duplex connection providing excellent noise immunity over cable lengths up to 1200m and at high data transmission rates.

The ECO has been designed to meet the requirements of the "Modbus over Serial Line, V1 2002" specification when using an RS485 interface.

By default, the Modbus protocol settings for an RS485 interface are:

- Baudrate 19200
- Parity Even
- Stop Bits 1

These are the default settings programmed into the ECO at shipping. Refer to Section 6.9 on page 54 for details of how to program the address.

The ECO detector is provided with a 120Ω termination resistor fitted to the PCB assembly along with a jumper connection next to SKT2, as shown in Figure 4-3, which permits the user to connect the 120Ω termination to the bus. The jumper is fitted as supplied and should be removed from all units except for the last one in the line.

Note: Different methods of termination must not be mixed on the same bus.

4.5.5   Relay Connections

The Rev 10 of the Main ECO PCB is equipped with 4 single pole switching relays. Three relays are allocated for the indication of gas alarms and one is allocated and fixed as a fault relay.

The relay contacts are rated to 30V DC 1A. Should higher power switching be required, the ECO relays can be used to control external slave relays.

ECO gas detectors are supplied with pre-configured alarm relays, See the table below.

Alarm relay assignment can be reconfigured using the Xtralis VSC software as indicated in Section 6.6 on page 47.

Table 4-2: ECO factory default relay configuration for main PCB Rev.10

Relay	Function	Terminals on SKT1	Relay state with ECO powered and not in alarm or fault	Relay state with ECO powered and in alarm / fault mode
1	1st stage gas alarm on a single or dual gas ECO	1 & 2	De energised Contact open	Energised Contact closed
2	2nd stage gas alarm on a single gas ECO or the first gas of a dual gas ECO	3 & 4	De energised Contact open	Energised Contact closed
3	2nd stage gas alarm on the second gas of a dual gas ECO	5 & 6	De energised Contact open	Energised Contact closed
4	Fault	7 & 8	Energised Contact open	De energised Contact closed

Note: The relay configuration on main PCBs prior to Rev.10 had relays that open in the event of a gas threshold being exceeded or in the event of a fault.

The relay connections on SKT1 can be made using a standard multi-core unscreened cable. There are four relays provided, numbered 1 to 4 along SKT1 as indicated in Figure 4-5.
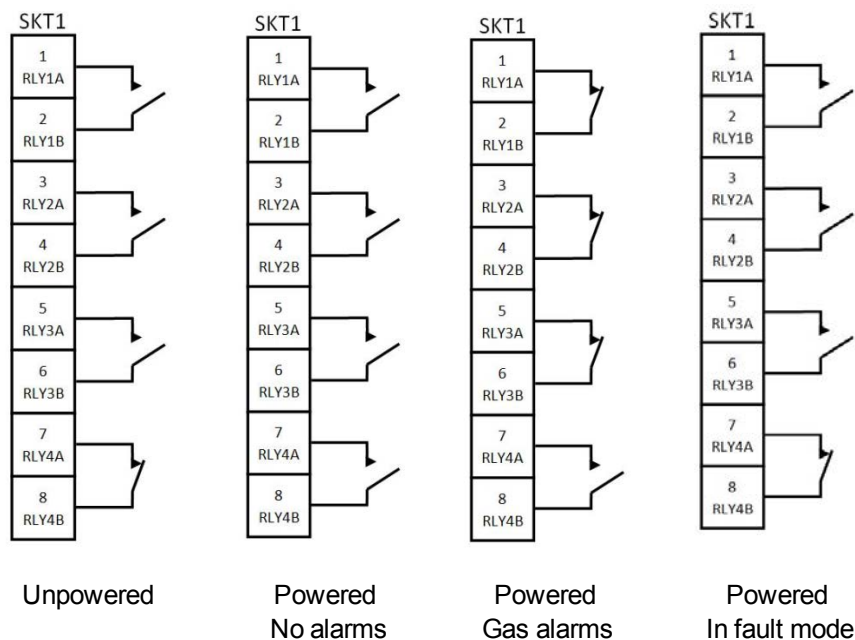
Figure 4-5: Relay Terminal Connections

Caution: Xtralis assumes no liability for any damage or injury caused as a result of using the ECO product to control voltages above those for which it is rated.

4.5.6   4-20mA Current Sources

Each ECO gas detector is provided with two analogue 4-20mA current source outputs (one per gas sensor). Each analogue output is scaled to reflect the default gas detection range of the gas sensor it is associated with.

Fixed level status indications include:

Fault – selectable as 3.5mA, 22mA or "None" (Default is 3.5mA)

Calibration – 2mA, when the associated Sensor is being calibrated

The two current source outputs (A and B) on the ECO are designed to be wired to industry standard 4-20mA current monitoring devices. Refer to the manufacturer's instructions for making connections to the current loop monitor. The ECO will support a maximum load resistance of 500Ω on each output, however the installer must take account of the cable resistance and supply voltage when determining the load resistance to ensure that there is sufficient dynamic range in the connection to transmit the full 0-22mA range of the output signal.

Where a load resistor is required to be fitted externally to the current loop monitor Xtralis recommend using a 300Ω, 0.5W, resistor mounted as closely to the current loop monitor end of the cable as is practical when using a nominally 24 VDC power supply.

Fitting of a load resistor is required when a generic voltage input monitoring device is used to monitor the loop, when devices specifically designed for current loop monitoring are used then the load resistance is not normally required, in either case refer to the operating instructions of specific monitoring device being used, and if necessary consult an Xtralis Field Service Engineer if the device instructions are unclear or appear to contradict the ECO installation instructions given above.
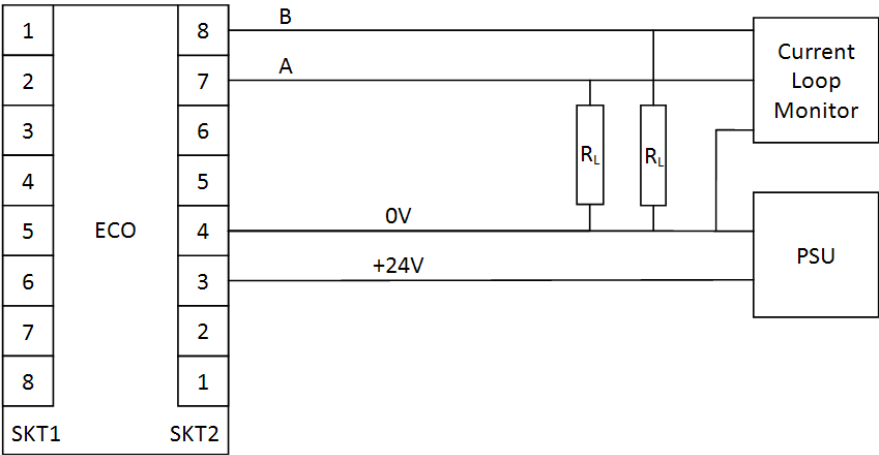
Figure 4-6: Current Output Connections

4.5.7   Remote Manual Alarm Reset Facility

A digital input can be used to provide a remote manual reset of latching alarm and fault conditions including status LEDs, relays and active events. This facility requires an external momentary switch; supplied by a 3rd party and connected between terminals 6 and 4. To reset latched functions the switch will need to be depressed for a minimum of 5 seconds.
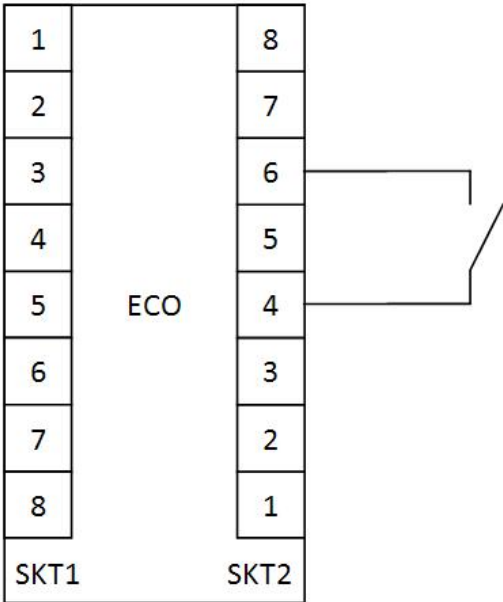
Figure 4-7: Digital Input Connection

As this input is used to reset the Alarm annunciation within the detector, it is suggested that for safety reasons the switch be protected by key access in some manner to prevent accidental de-activation of alarms.

The digital inputs from up to 20 ECO detectors can be physically connected to the same switch connection.

5   Getting Started with Xtralis VSC

5.1   Xtralis VSC Installation

To perform configuration operations on the ECO Detector you will need to have the Xtralis VSC software installed on your computer. The software is available from the Xtralis website along with all of the necessary installation instructions. Before installing the Xtralis VSC application, please ensure that your computer meets the minimum specification as listed below.

Operating System:	Windows 2000, XP, Vista, 7 ™
Processor Minimum:	1 GHz 32-bit (x86) or 64-bit (x64)
RAM:	Preferred: 1GB, Minimum 512MB
Disk Space:	200 MB Free
Display:	Single monitor, Graphics Card with 128MB

To download Xtralis VSC you will need to register your details and login to the Xtralis Partner Extranet. The 'Login' page of the Xtralis extranet site can be found at the following browser address:

http://Xtralis.com/o.cfm?o=412

Having registered and gained access, the Xtralis VSC installation file can be found at the following location:

"Library/VESDA ECO by Xtralis Resources/Software/Xtralis ECO VSC Installation Program build xxxx"

Where "xxxx" is the build number. Click on the link to save the file to your hard disk. Double click on the file to start the installation process. Then Follow the on-screen instructions.

5.2   Connecting to the ECO

It is possible to connect and configure the ECO Unit using a USB connection made to the integrated USB connector which is located beneath the rubber grommet on the enclosure cover (see Figure 5-1) using the cable supplied.
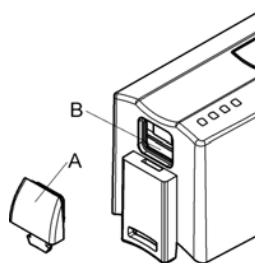

Figure 5-1: USB Connection

Note: While it is possible to communicate with the ECO unit via the USB port without the need for additional connections, some of the internal systems within the ECO require the presence of the power supply input connection. Without the principle power supply applied, some fault conditions may be reported.

5.3 Xtralis VSC Connection Configuration

The first time the Xtralis VSC application is used, the communications ports must be configured to enable it to communicate with the ECO. This can be done as follows:

Select the '**Connection**' option from the Xtralis VSC menu bar and then click the '**Manager**' item. This will display the '**Connection Manager**' dialog as shown below:
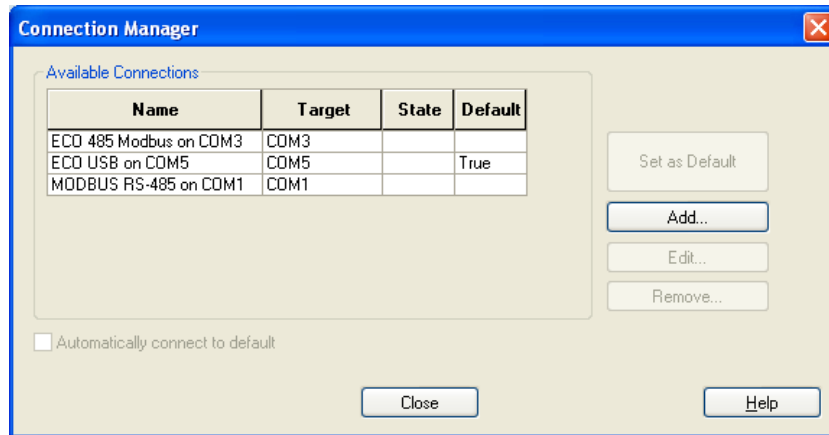

Figure 5-2: Connection Manager

To create connections click the '**Add**' button. The '**Add Connection**' Wizard will be displayed as shown in Figure 5-3:
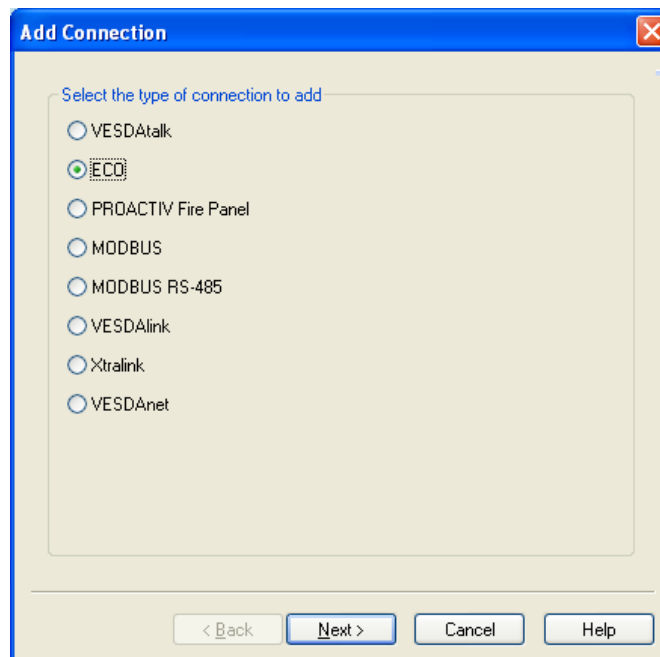

Figure 5-3: Add Connection, Select Connection Type

Select the 'ECO' option and then click the '**Next**' button. The wizard now prompts the user to select the type of serial communications to use when communicating with ECO. See Figure 5-4:
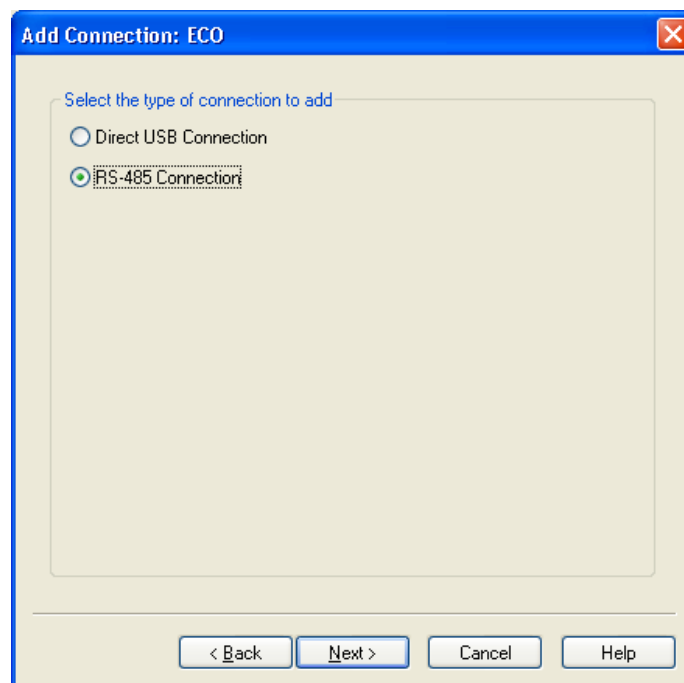
Figure 5-4: Add Connection Dialog

Click the on the button for the required option and click the '**Next**' button. The Wizard will update and prompt the user to select the Serial Communications port to use when communicating with ECO as shown in Figure 5-5:
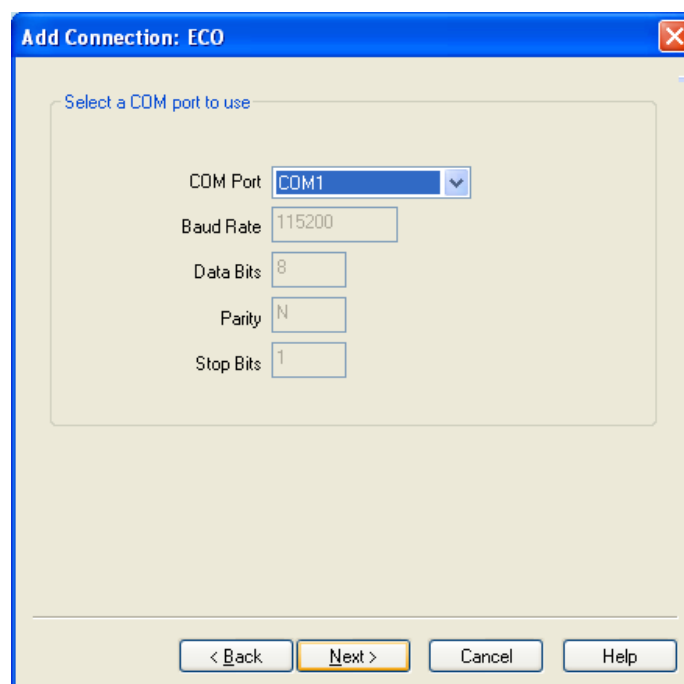

Figure 5-5: Select Comm. Port

To determine which COM port the ECO is attached to you will need to look at the hardware device manager. To do this:

- Double click on the "System" icon in the Control Panel window of your PC.
- When the "System Properties" dialog is displayed select the "Device Manager" button shown (shown on the "Hardware" tab when using Windows XP).
- The Device Manager dialog will be displayed showing a list of the hardware interfaces on the PC.
- Double click on the "Ports (COM & LPT)" item in the hardware list to view a list of the communications ports on your PC.
- Whilst viewing this list, plug the ECO into the USB connection.

- When the ECO is connected a new interface port entry should be displayed in the list of Ports. At the end of this entry, in brackets, will be indicated the COM port number that the ECO has been allocated.
- Use this port number in the Xtralis VSC connection dialog above.

When using the same physical USB connection, the PC will generally always allocate the same port number unless it is already being used by some other connection, so it should not be necessary to continually check which port is allocated each time the ECO is connected. If, however, Xtralis VSC subsequently does not find the connection when requested, recheck the Device Manager list as described above. This process may vary somewhat for different versions of the Windows™ operating system.

Select the serial communications port you wish to use from the '**COM Port**' drop down list. Click the '**Next**' button once more and the connection Wizard **'Save Connection'** page is displayed as shown in Figure 5-6:
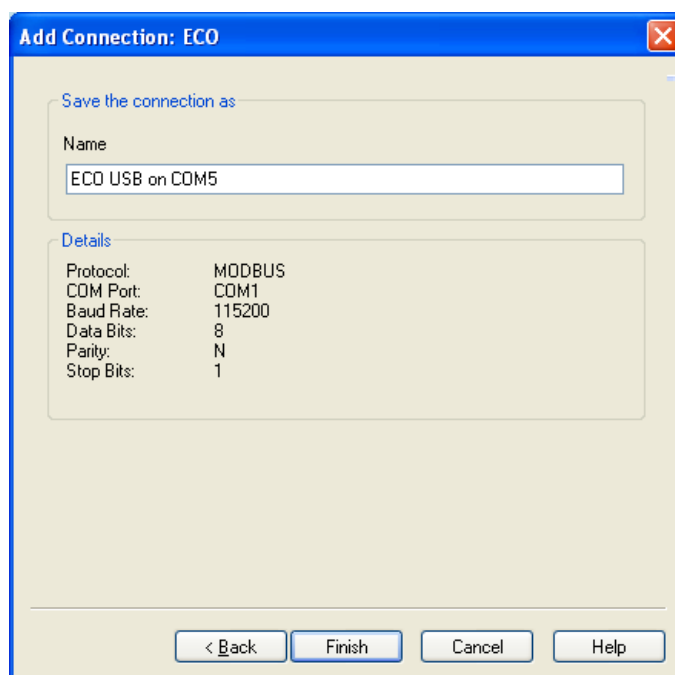

Figure 5-6: Save Connection Dialog

Edit the '**Name**' field to give the connection a user friendly, easy to remember name.

Click the '**Finish**' button to save the connection. The Wizard dialog will close and the '**Connection Manager**' dialog is re-displayed, this time showing the added connection. To make a connection the default, highlight the required connection and then click the '**Set as Default**' button. (Recommended)

To make Xtralis VSC automatically use the default connection whenever the user opens a connection, check the '**Automatically connect to default**' check box.

The '**Connection Manager**' dialog box should now look similar to that shown in Figure 5-7 below:
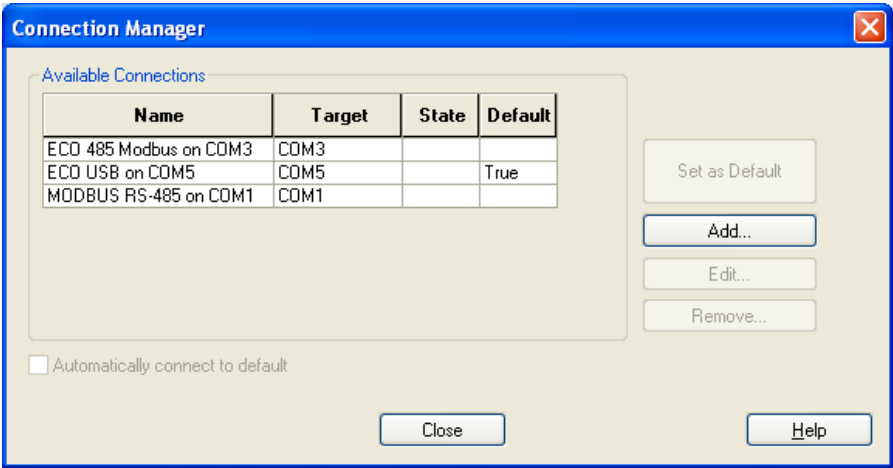
Figure 5-7: Connection Manager

Click the '**Close**' button to return to the main window of main window Xtralis VSC.

5.4   Using Xtralis VSC with ECO

The following sections of this product guide are focused on ECO configuration and operation using Xtralis VSC. For more information on general use of Xtralis VSC please refer to the Xtralis VSC online help.

5.4.1   Opening a Connection

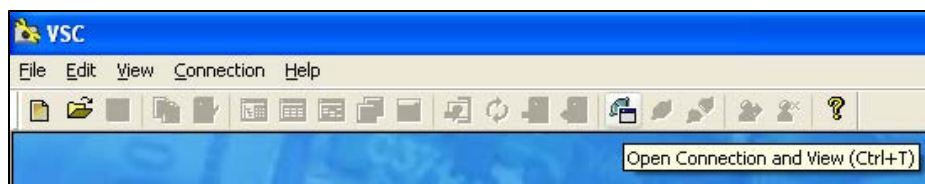To open a connection with ECO detectors click the 'Open Connection and View' toolbar Icon as shown in Figure 5-8:

Figure 5-8: Open Connection and View

If the '**Open Connection**' dialog shown in Figure 5-9 is displayed, and the connection shown is not the connection that is to be used, click the '**Details >>>**' button, the dialog will grow to show more connection options. Highlight the connection to use and click the '**OK**' button.
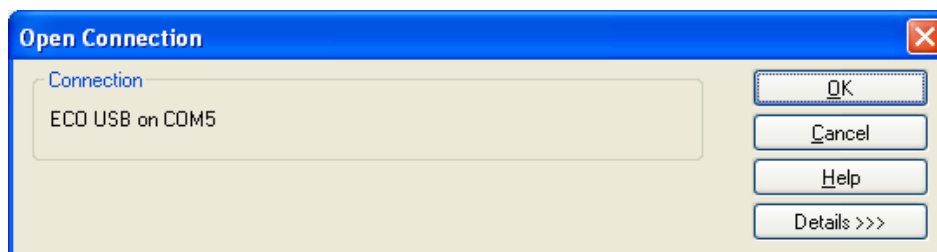

Figure 5-9: Open Connection

Xtralis VSC will now connect to the attached ECO detectors. The main window will update and show the '**Device View**'. It will look similar to that shown in Figure 5-10 below:
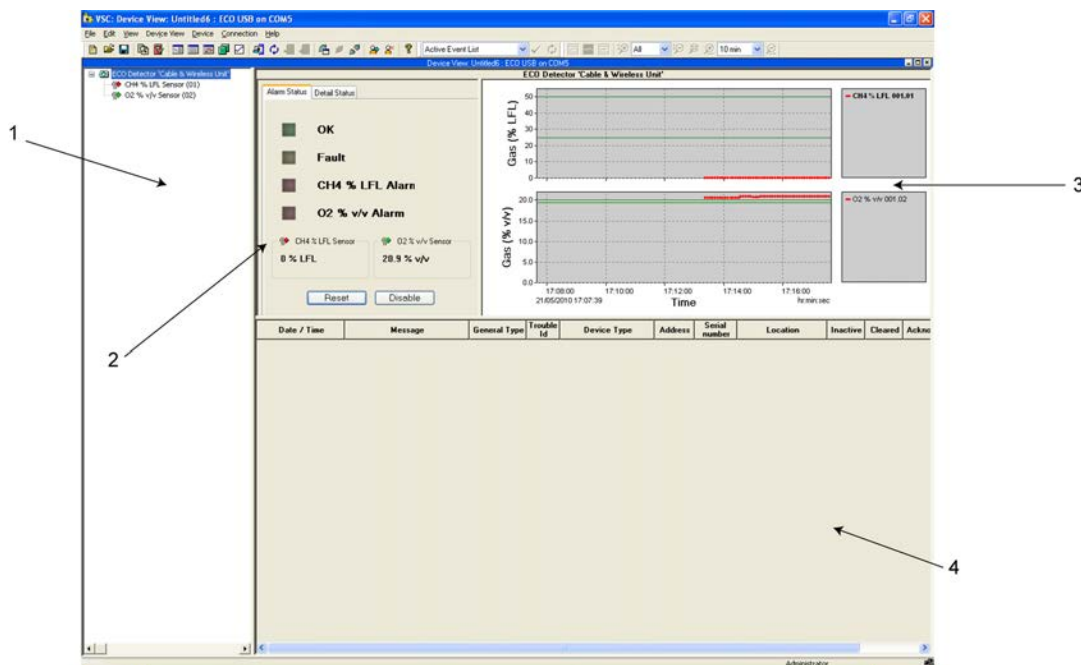

Figure 5-10: Xtralis VSC Main Window

An Xtralis VSC window comprises a number of distinct zones as shown above. A description of each of their definitions and functions can be found in the following table and in the subsequent text.

Table 5-1: Xtralis VSC Window Zone/Purpose Mapping

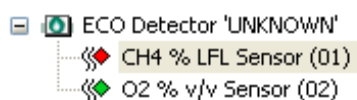| Zone	Name	Purpose
1	Detector Overview	Detector Overview Displays connected ECO detectors and their respective sensor modules
2	Detector Status	Displays ECO Alarm status mimic and ECO/Sensor detail
3	Trend graphs	Displays trend graph of sensor readings
4	Active Event List	Displays current and previously un-cleared events

5.4.2   Detector Overview Zone

The '**Detector Overview**' zone of the main window of Xtralis VSC provides a snapshot of the ECO detectors in the system. It takes the form of a tree view.

The tree branches or nodes can be expanded to view the sensors fitted to the detectors by clicking on the '**+**' next to each ECO detector. To hide the sensor view collapse the node by clicking the '**-**'.

Clicking on the tree at either the Detector or Sensor levels will cause the '**Detail**' and '**Trend**' zones of the main window of Xtralis VSC to refresh and display that detector or sensors current status. When a detector is in an Alarm/Fault state a '**Warning Sign**' will appear next to the detector and sensors, as shown in Figure 5-11.

Detector without Alarms or Faults   **Detector with Alarms or Faults**
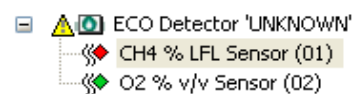

Figure 5-11: Device View Detector Icons

Note: Different sensor types will display a different icon next to the sensor gas type.

  Flammable Gas Sensors

  Oxygen Depletion Sensors

  Toxic Gas Sensors

5.4.3   Detector Status Zone

The '**Detector Status Zone**' of the main window of Xtralis VSC provides an easy way of checking the status of the ECO detector, its alarms and faults conditions. The '**Alarm Status**' tab displays a snapshot of the selected detector alarms, faults and gas readings, as shown in Figure 5-12.
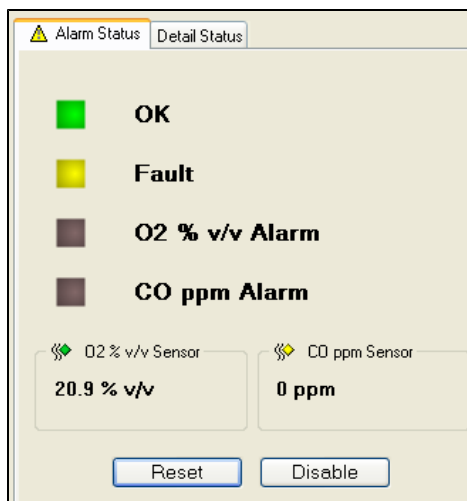

Figure 5-12: Alarm Status

A mimic of the detector LEDs is displayed and indicates the operational status of the detector. This mimic follows the layout of the detector local status indicators. To reset all Alarms and Faults for the selected detector click the '**Reset**' button.

- The reset function will reset the current alarm states. If the alarm condition is still present the alarms will not be cleared. Latched alarm states are cleared if the alarm condition is no longer active.

To disable or isolate the selected detector click the '**Disable**' button.

- The Disable state inhibits the alarm relays from activating during an alarm condition and may be used during testing or calibration.

Note: When a sensor is selected in the '**Detector Overview**' zone of the main window of Xtralis VSC, only the current sensor reading for that sensor will be displayed. The '**Reset' and 'Disable**' buttons will also disappear.

The '**Detail Status**' tab displays all relevant detector status information to permit accurate fault diagnosis. The appearance of the detailed status tab is different depending on whether the user is looking at the Detector Detailed Status (as shown on the left hand side in below) or an individual sensor Detailed Status (as shown on the right hand side in Figure 5-13 below).

Figure 5-13: Detail Status

5.4.4   Active Event List Zone

The '**Active Event List** displays all currently active alarm and fault or trouble conditions. See Figure 5-14. The event list will automatically update as new alarms or events occur.

Date / Time	Message	General Type	Trouble Id	Device Type	Address	Serial number	Location	Inactive	Cleared	Ackno
21/05/2010 19:50:07	Minor high airflow	Trouble	2042	ECO Detector	001	91508002	UNKNOWN	☐	☐	☐
21/05/2010 19:50:07	Major high airflow	Trouble	2012	ECO Detector	001	91508002	UNKNOWN	☐	☐	☐

Figure 5-14: Sample Active Event List

Note: For more detailed information regarding the event list '**Trouble Ids**' please refer to Chapter 7 on page 61 of this manual. For more information regarding the use of the '**Active Event List**' and menu please refer to the online help of Xtralis VSC, which is accessible by selecting the "**?**" button at the top right of the Xtralis VSC toolbar (shown in Figure 5-8). Additionally, context related information for each Trouble ID can be obtained by selecting the required event in the list and pressing the F1 key.

5.4.5   Trend Graph Zone

The trend graphs show the gas reading over time in red, and indicate the primary alarm thresholds in green. These are very useful when performing longer term monitoring of gases. An example of this can be seen in Figure 5-15.

Figure 5-15: Trend Graphs

The Trend Graph toolbar, shown in Figure 5-16, is available when the trend graph is selected to allow users to analyze the display in more detail. Users can zoom both time and sensor value axes. For more detailed information regarding the use of the trend graphs and the associated toolbar please refer to the online help of Xtralis VSC.

Figure 5-16: Trend Graph Toolbar

The trend graph can also be zoomed by using the mouse. Click and hold the left mouse button down at the start of the area you which to zoom. Then drag the mouse to the end of the zoom area. Release the mouse button and the graph will zoom into the required area and auto-fit the gas data to the graph. See Figure 5-17

Figure 5-17: Graph Zoom Using Mouse

When a specific sensor is highlighted in the '**Detector Overview**' zone of the main window of Xtralis VSC, only the trend graph for that sensor will be displayed.

5.5   User Access Limitations

To change some of the configuration settings of an ECO unit it will be necessary to have access at an appropriate level. When the user attempts to access a variable or function that requires approved access, Xtralis VSC will display the logon dialog shown in Figure 5-18.

Figure 5-18: Logon Dialog

There are three levels of access available:

- **User** (PIN 1234) – This is the minimal access level that allows key functions to be performed by authorized personnel on a day to day operational basis, such as:
    - Enable/Disable Device
    - Resetting latched alarms
    - Retrieving event logs
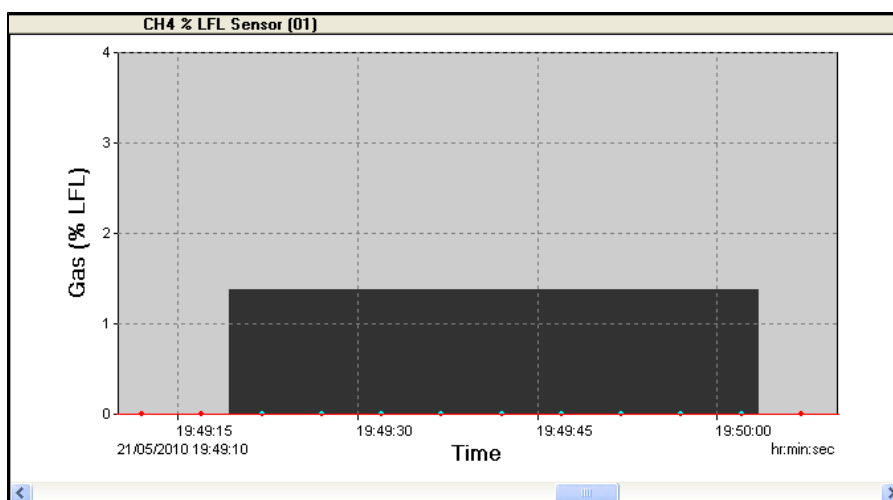- **Administrator** (PIN 0999) - This is the normal access level for important functions to be performed only by sufficiently trained and experienced service personnel on an operational level above that of the user, such as.
    - Set System Date and Time
    - Flow Normalization
    - Modification of the Detector Configuration
    - Calibration Operations
    - Return to Factory Defaults
    - Simulated Gas Test
- **Distributor** - This is the advanced access level that is for factory use only.

To gain access at the selected level the user is required to enter the specified PIN for that level of access. These PINs should be held by the site authority and only distributed to personnel that are sufficiently trained for that level of access.

Figure 5-19: Selecting the Access Level

To complete the login process, select the required access level from the drop down list (the list will contain all those levels which have access to the required function) and enter the PIN in the field provided.

6   Operation and Configuration

6.1   Status Indicator Operation

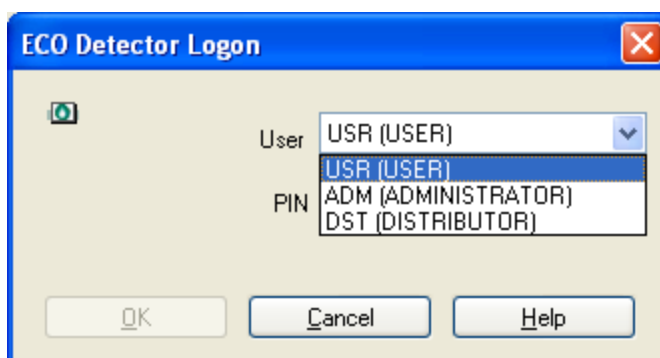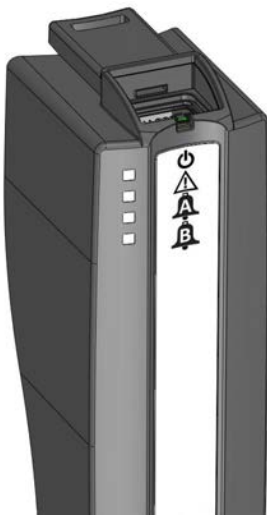The VESDA ECO has four status indicators to show the power, fault and alarm conditions of the unit. These indicators can be inactive; flashing or on steady, depending on its assigned function and the level of alarm severity. (See table below).

Table 6-1: Status Indicators

	Colour	Label	Function
	Green	⏻	Power
	Yellow	⚠	Fault
	Red	🔔 A	Sensor A Alarm
	Red	🔔 B	Sensor B Alarm

Power Indicator	The Green "Power" indicator will be illuminate whenever there is power applied to the ECO. It will flash for approximately the first 6 minutes after power is applied to indicate the presence of the Power up inhibit feature (refer to Section 6.2 on page 34 for details), after which it will remain constantly on or flash to indicate the presence of activity on one of the communications interfaces (USB or RS485).
Fault Indicator	The Yellow Fault indicator will flash to indicate the presence of a minor fault condition. It will remain constantly illuminated to indicate the presence of a Major fault condition. Xtralis VSC can be used to identify the exact fault and potential corrective action.
Sensor A Indicator	The Red Sensor A indicator will flash quickly to indicate the presence of a Low Alarm condition and will remain constantly illuminated to indicate the presence of a High Alarm condition. (Refer to Section 6.2 on page 34 for details on Alarm operation).
Sensor B Indicator	The Red Sensor B indicator will operate in the same manner as the Sensor A indicator for the second gas sensor on a dual gas unit.

During a Gas Calibration or Flow normalization process both the Sensor A and Sensor B indicators will flash slowly in unison.

6.2   Power On Inhibit

After power is first applied to the ECO unit the device will remain in a "Power On Inhibit" state for approximately six minutes. This state is indicated by the regular flashing of the Green power indicator after power is applied.

Note: Do not confuse this indication with the irregular flashing of the Green power indicator which occurs when communications are active subsequent to the end of the "Power On Inhibit" period.

The purpose of the "Power On Inhibit" state is to prevent any spurious operation of the ECO until the unit has had a chance to adequately settle into a stable operating condition.

While the ECO is in the "Power On Inhibit" state it will suppress reporting of all alarms conditions and will prevent the user from activating a Gas Calibration operation. In addition, the Xtralis VSC software will also prevent any Flow Normalization operation from being performed while the ECO is in the "Power Up Inhibit" state.

6.3   Gas Measurement

The VESDA ECO is designed to monitor a wide variety of gas threats. These gas threats can generally be grouped into three types.

- Flammable Gases – Where the buildup or escape of these gases can lead to the presence of an explosive atmosphere. These are measured using the Catalytic Pellistor type sensing. When looking at the Detector Overview in the Xtralis VSC application, Flammable gas sensors are indicated with a RED diamond next to the Gas name.

- Toxic Gases – Where the buildup or escape of these gases can lead to serious health problems for those exposed to them in excessive concentrations. These are generally detected using Electrochemical cells or Infrared sensing technology. When looking at the Detector Overview in the Xtralis VSC application, Toxic gas sensors are indicated with a YELLOW diamond next to the Gas name.

- Oxygen Depletion – Where the buildup or escape of large concentrations of other gas types, e.g. inert gases such as Nitrogen, can lead to a reduction in the Oxygen content of the surrounding air causing respiratory problems for those working in the area. When looking at the Detector Overview in the Xtralis VSC application, Oxygen depletion sensors are indicated with a Green diamond next to the Gas name.

For each type of Gas sensor, Alarm thresholds can be programmed into the ECO such that external executive actions can be initiated on the detection of excessive gas concentrations or the depletion of Oxygen.

6.3.1   Gas Sensor Configuration

All ECO gas sensors are supplied pre-configured. This section describes how to re-configure the factory default values should it be considered necessary to meet the requirements of a specific system design or application.

To re-configure an ECO gas sensor, using the mouse select and double click on the sensor that is to be set-up in the 'Detector overview' zone of Xtralis VSC main window as shown in Figure 6-1.
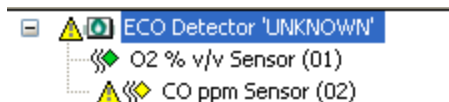

Figure 6-1: Sensor Configuration

The sensor configuration dialog will then be displayed as shown below in Figure 6-2 although the appearance of this dialog will vary depending on the types of gas being monitored.
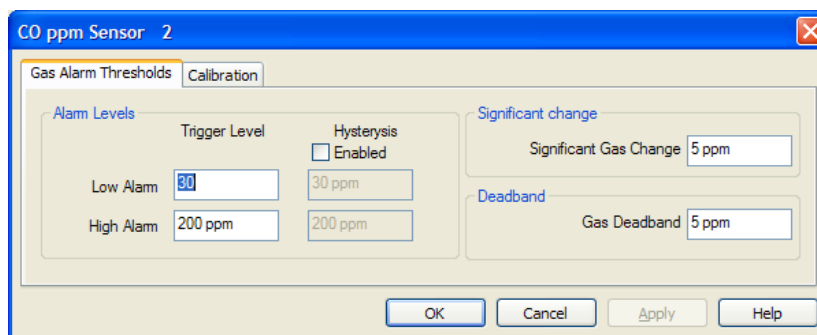
Figure 6-2: Sensor Dialog

The sensor configuration dialog allows the user to configure the Alarm Thresholds, sensor dead band and the Significant Change Threshold. The function and operation of these settings is described in the following settings.

6.3.2   Alarm Thresholds and Hysteresis

The ECO detector will generate Alarm conditions whenever the measured gas levels exceed the programmed thresholds. These alarm conditions can be used to switch the state of the Relays, are logged into the Event log and their presence can be read digitally through the serial communications interface. In addition, the Sensor indicators integrated into the enclosure of the ECO will be illuminated by the presence of Alarm conditions.

The thresholds at which the Alarm conditions are triggered can be fully configured by the user in the Sensor Configuration dialog as shown in Figure 6-2. In the case of the Toxic and Flammable sensor types the alarm conditions are generated on gas readings which exceed the Alarm thresholds, and therefore the Low Alarm must be set to a value less than the High Alarm. In the case of the Oxygen Depletion sensor type the alarm conditions are generated by gas readings which are less than the configured thresholds an therefore must have the Low Alarm set to a value greater than the High Alarm.

The limits and factory default values for these Alarm thresholds are listed in section B on page 81.

In addition, the user can select to apply Hysteresis to the Alarm condition, by selecting the "Hysteresis Enabled" checkbox in the dialog box. This will permit the user to specify a separate, lower threshold (or higher in the case of Oxygen depletion) at which point the Alarm condition will be cancelled.

Mapping of the Alarm conditions to the relay outputs is explained in section 6.6. The operation of the enclosure cover indicators during the Alarm conditions is explained on page Status Indicator Operation.

The default alarm thresholds in the ECO detector are set during manufacture dependent on the Gas sensor configuration (refer to Appendix A on page 79 for details).

6.3.3   Alarm Latching

The ECO product provides the user with the ability to "Latch" the alarm conditions, that is to hold the Alarm condition in an active state even after the gas level has returned to a value below the programmed threshold. When configured to "Latch" the Alarm condition, a reset command is required to clear the annunciation of the Alarm condition. This reset command can either be issued using the Xtralis VSC application, as shown on page Detector Status Zone, or by activating the digital input as described on page Remote Manual Alarm Reset Facility.

The user can view and/or modify the latching state of the Gas sensor alarms within the Detector configuration dialog, which can be displayed by double clicking on the appropriate ECO detector within the Detector Overview window of the Xtralis VSC application as shown below.

Figure 6-3: Configuring the Alarm Latching Function

When selected the ECO detector configuration dialog will be displayed, simply select the "Latching" tab to view and/or re-configure the Alarm latching configuration, as shown in Figure 6-4 below.

Figure 6-4: Alarm Latching Configuration

Note: The number of checkboxes and their labels vary with the number of sensors fitted and the gas types being monitored.

6.3.4   Pellistor Saver Mode

The catalytic Pellistor sensor types used to monitor flammable gases will become damaged if exposed to excessive concentrations of flammable gas whilst operating. For this reason the Flammable gas sensors within the ECO are designed to disable themselves if a level greater than 120%LFL is detected. This is called the "Pellistor Saver Mode". During this condition the ECO will fix the measured gas concentration at 120%LFL until either 5 minutes elapse, after which it will be cancelled, or instructed to do so by the user using the Xtralis VSC software.

Note: If the excessive gas level is still present when the "Pellistor Saver Mode" is cancelled then the unit will immediately return to the "Pellistor Saver Mode".

The presence and state of the "Pellistor Saver Mode" is indicated for flammable sensors in the Sensor Detailed status tab as shown in Figure 6-5 below, but will not appear in the status tab for non-flammable sensors.

Figure 6-5: Pellistor Saver Mode Indication

To manually cancel the Pellistor Saver Mode within the Xtralis VSC software, select the menu item from the context menu as shown in Figure 6-6 below.

Figure 6-6: Pellistor Saver Mode Termination

6.3.5   Sensor Calibration Intervals

ECO gas detectors should be re-calibrated with certified calibration test gas at regular intervals. The recommended re-calibration frequency is 6 months and this is set as the default period as the product leaves the factory. Refer to Section 6.4 on page 41 for details of how to perform the calibration.

Based on the setting of the internal RTC (Real Time Clock) the date of the last calibration is used as a reference to generate the fault conditions associated with the sensor requiring re-calibration. Refer to Section 6.12 on page 59 for details of how to set the RTC time. The ECO will generate a Minor Fault condition 2 weeks prior to the calculated due date.

Site conditions may demand a shorter re-calibration period, or permit a longer interval between calibrations. The re-calibratio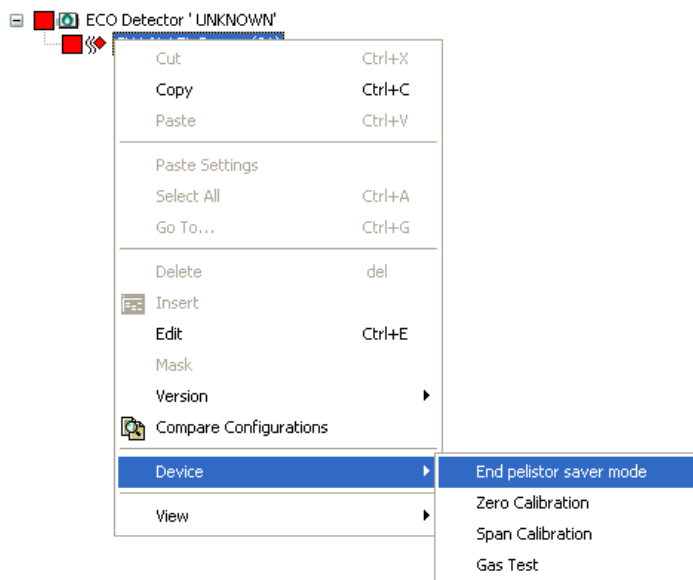n frequency can be set between 1 and 12 months via the "Calibration" tab in the Sensor Configuration dialog box, as shown in Figure 6-7 below.

Figure 6-7: Calibration Interval

6.3.6   Logging Gas Values

Logging of gas values occurs when a specific magnitude of change has occurred between the last value that was logged and the current sensor reading. This logging "event" is determined by the setting of the "Significant Change" field in the Sensor Configuration dialog as shown in Figure 6-2. For example, given the Significant Change setting of 5ppm as indicated in Figure 6-2, if the last logged reading was 12.3ppm, the next reading to be logged will be when the reading is either greater than 17.3ppm or less than 7.3ppm.

6.3.7   Dead Band Operation

To suppress noise in the gas readings and subsequent Analogue output levels when there is no gas present, the ECO product implements a "Dead Band" around the zero reading. When doing this, the ECO will suppress all readings within the dead band range of the zero gas reading to read exactly zero. For example, in Figure 6-2, any reading within the range of ± 5ppm will be forced to read 0ppm.

The value of the "Dead Band" can be adjusted by the user if necessary in the sensor configuration dialog, as shown in Figure 6-2, but it should be noted that the default factory setting is selected to be an optimum value that should not need to be changed unless the unit is located in a very noisy environment or where there is a small background level of gas above zero.

When the need arises to adjust the Dead Band setting, the user should note that the value is internally limited to a range from 0 to the minimum pre-alarm threshold for that sensor type, as indicated in Appendix B. Attempts to set values outside of this range will be rejected and an appropriate warning will be indicated.

6.3.8   Simulated Gas

To provide the user with a method of testing and/or demonstrating the functionality of the ECO relays, current outputs and data logging a "Gas Test" function has been included in the Xtralis VSC application. This feature permits the user to simulate a fixed gas level and view the resulting alarms and other status messages.

To use the "Gas Test" function, right click on the sensor to be tested in the detector overview window. A menu will pop-up as shown in Figure 6-8.

Figure 6-8: Gas Test Menu Option

Select the gas test function from the menu. A warning message will be displayed to inform the user that external alarm devices connected to the output relays, analogue outputs and or RS485 output will be activated in they proceed further.

To proceed, simply click on the "Yes" button. To abandon the test click on the "No" button. On selecting the "Yes" button the "Gas Test" dialog will be displayed as shown in Figure 6-9.

Figure 6-9: Gas Test Function

Selecting the "Low Alarm" or "High Alarm" check boxes will set the simulated gas level to the appropriate gas level for that alarm condition. Alternatively the user can increment or decrement the gas value using the up and down arrow buttons on the side of the gas value input window. Alternatively, the user can enter a level directly into the gas value reading input window.

Note: Due to limitations in the resolution of the Gas test input reading, it will sometimes be the case that the number will round up/down to the nearest permitted reading.

To end the test and return to normal operation simply select the "**End Test**" button.

6.4 Calibrating Gas Sensors

It is important to bump test and re-calibrate the ECO detector on a periodic basis, typically every 6 months, to ensure that it is fully functional and maintains its accuracy.

A bump test is the application of test gas via the gas test port to confirm that the detector responds to gas. Verification can be confirmed by the integral alarm indicators or Xtralis VSC trend graphs with the aspirator running.

Calibration is the application of a known concentration of test gas to ensure that the gas readings are within an acceptable tolerance of accuracy with the aspirator off.

It is recommended that a re-calibration be performed at least at each service interval. Refer to Chapter 8 on page 71 for more details on the service periods. Regular bump testing will also provide increased confidence in the functionality of the system.

To perform a calibration of the ECO unit, the user will need to have access to the configuration interface on the device, either using Xtralis VSC or a 3rd party tool.

Supplies of the necessary calibration and test gas can be obtained from a number of sources. Xtralis does not supply calibration gas directly, but your local Xtralis sales contact or distributor will be able to provide you with a list of suppliers.

The recommended test gas concentrations for each sensor type/range are given in Appendix A on page 79. The calibration gas should be supplied in an appropriate cylinder with provision to supply the gas at a controlled flow rate (0.5 Litres/minute, unless otherwise stated in section A) via a sufficiently rugged flow regulator with a 6mm (¼") outside diameter pipe for connection to the ECO calibration port.

Note: For flammable gases other than Methane (CH4) or Pentane (C5H12) it is common practice to "Cross Calibrate" the detector using one of these two gases. Refer to Section 6.4.1 on page 41 for the specific details of Cross Calibration.

For Zero calibration of flammable gas sensors the zero calibration gas should be "clean" Air, i.e. ambient atmospheric air without any combustible components present. For Zero Calibration operations of Toxic and Oxygen Sensors, it is recommended that an inert gas such as Nitrogen is used, especially in circumstances where the gas being measured can be expected to be normally present in the ambient Air, for example Oxygen or Carbon Dioxide.

For calibration of Oxygen sensors it is recommended that the local atmosphere sampled by the aspirator is used to perform the span calibration. The user must therefore ensure that the area being monitored is sufficiently well ventilated to ensure the presence of ambient atmospheric air. It is advisable to verify the ambient Oxygen concentration in the monitored area using a portable Oxygen detector.

It is recommended that a Zero calibration is performed before a Span calibration and that the unit is flushed with Zero gas upon completion of the Span calibration.

6.4.1 Cross Calibration

When calibrating for more complex flammable gases which would normally be expected to be detected as vapours it is common practice to "cross calibrate" the detector using a 50 %LFL concentration of either Pentane or Methane. This ensures that an accurate, and available, calibration gas source is used and at the same time minimises the number of gas types that are required to be stocked and carried by the service and calibration engineers.

In section Environmental Limits and Calibration Gas Concentrations, where the recommended calibration gas concentrations are listed for each sensor type, those that are recommended to be cross calibrated are indicated by a "†" symbol next to the recommended test gas concentration.

When performing the calibration, apply the cross calibration gas (50 %LFL Methane or Pentane as indicated) and when prompted to enter the Span Calibration "Test Gas Applied" as shown in the Calibration Process below, enter the %LFL indicated in the table in the appropriate row of the "Recommended Test Gas Concentration" column. The calibration process is otherwise identical as for the other gas types and upon completion the resulting reading should be the entered "Test Gas Applied" value.

Warning: Before using any test gas, ensure that there is sufficient ventilation in the area to prevent ingestion of potentially harmful levels of the test gas or build up of potentially explosive concentrations.Review the chemical hazard and safety recommendations for each gas type before use. Ensure particularly that ceiling spaces and voids are ventilated when using gases that are lighter than air.Also ensure that low lying areas (inspection pits, cellars) are sufficiently ventilated when using gases that are heavier than air.
Always adhere to local health and safety regulations when handling hazardous gases.

6.4.2   Calibration Procedure

Perform the calibration/bump test as follows:

- Before calibration can be performed the ECO detector MUST have been powered up for at least 5 minutes. Attempting to calibrate before this time period expires is prevented by the unit. It is recommended that the unit is allowed to stabilize for 30 minutes prior to calibration.

- To perform a calibration the Aspirator must be switched off. If a response only bump test is being performed, it is not necessary to switch off the aspirator.

- If the ECO is not installed with a permanent calibration pipe, remove the red blanking plug from the gas cal port by depressing the black outer ring of the port fitting and pulling on the plug. Insert the calibration gas pipe into the calibration port.

- If the ECO is installed with a permanent calibration pipe to the calibration port, remove its end seal/plug and attach the calibration gas supply to the fitted calibration pipe.

- When bump testing, if necessary disable the Alarm relays using Xtralis VSC to avoid initiation of associated executive actions, refer to page 28 for details of how to do this.

- To perform the calibration using the Xtralis VSC application:
  - Right click on the sensor to be calibrated in the detector overview window. A menu will pop-up as shown in Figure 6-10

Figure 6-10: Zero and Span Calibration Menu Option

  - Select the required calibration type, Zero or Span, and the appropriate Zero or Span Calibration dialog will then be displayed as shown in:

Zero Calibration   **Span Calibration**

Figure 6-11: Calibration Dialogs

- ○ The 'Test Gas Applied' field is set by default from the factory for optimized calibration of the relative gas sensor. Enter the concentration of the applied calibration gas here to facilitate an accurate calibration. This should be supplied with or printed on the calibration gas cylinder.
- ○ With the gas connections made and checked for tightness, apply the calibration gas at a controlled flow rate of 0.5 litres per minute to the unit and then click on the 'Run Calibration' button in the calibration dialog.

- ○ Calibration will start and the 'Performing Calibration' dialog will now pop up as shown in Figure 6-12.

Figure 6-12: Calibration Status Dialog

- ○ Once calibration is complete this dialog will disappear.

- When the calibration is complete ensure that the resulting reading is stable and within the expected limits and if so switch off the gas supply and disconnect the pipe from the ECO device, making sure that the gas cylinder is securely closed.

- When bump testing, ensure that the measured value is within the expected range for the gas concentration applied, and that any related indicators, relays and current outputs react as expected. Be aware that if the aspirator is left running during the bump test then the measured reading may be as low as 50% of the applied gas concentration.

- When the bump test/re-calibration process is complete, reseal the connection to the calibration gas port. Replace the red blanking plug when the gas supply pipe is removed from the calibration port or seal the end of the calibration pipe if this is permanently installed. This is required for the unit to be able to accurately measure the gas and flow in the sample chamber during normal operation.

6.5   Flow Measurement and Normalization

The VESDA ECO directly measures the flow of air across the two gas sensors to monitor for blockages or dust build up in the sample pipe. A fault condition is raised when the flow changes beyond preset thresholds. The flow measurement circuit operates over a five minute filtered average as designed to detect long term flow degradation. Therefore step changes in flow may take several minutes to respond and is designed to reduce unwanted alarms resulting from short term changes in flow.

Flow normalization is the process by which the present volume of air passing through the ECO detector is scaled to give an air flow "quality" reading of "100". The ECO performs its Air Flow fault monitoring based on this "Normalized" value. Flow normalization needs to be performed after installation to establish the standard by which the air flow fault conditions will be monitored. However, the flow normalization of an ECO gas detector should only be performed after successful installation and flow normalization of the associated ASD.

6.5.1   Flow Normalization

Flow normalization is performed by right clicking the detector to be normalized within the ECO Detector Overview window of the Xtralis VSC application. A context sensitive menu will pop-up, as shown in Figure 6-13.

Figure 6-13: Flow Normalization

Alternatively the user may select the '**Device**' menu option and then click the '**Normalize Air Flow**' menu option.

As a result the '**Air Flow Normalizing**' entry on the '**Detail status**' tab will now show '**On**' as shown in Figure 6-14 below. While performing flow normalization, care should be taken to NOT vary the volume air passing through the ECO detector until it is complete.

Figure 6-14: Normalizing Status

On completion of normalization the status will return to 'Off' and the Normalized flow reading in the Detector status tab will be set to 100. The flow normalization should take approximately 6 minutes to complete.

6.5.2   Flow Fault Reporting

The VESDA ECO will raise Minor and Major flow fault conditions based on the configured Airflow thresholds. The user can view and/or modify these thresholds within the Detector configuration dialog, which can be displayed be double clicking on the appropriate ECO detector within the Detector Overview window of the Xtralis VSC application as shown in Figure 6-15 below.

Figure 6-15: Configuring the Flow Fault Threshold

On the resulting ECO Detector dialog, select the 'Air Flow' tab as shown in Figure 6-16 below to see the thresholds for the Airflow fault conditions.

Figure 6-16: Detector Air Flow Tab

When the configured thresholds are exceeded, the appropriate Flow faults conditions will be raised. From the factory, the default settings for the Airflow faults thresholds are as indicated in Figure 6-16 above.

A delay before annunciating the flow fault condition can be defined by setting the Air Flow Fault Delay values, defined in seconds, on the "Air Flow" tab.

6.5.3   Logging Flow Variation

Logging of variations in the flow reading is performed by generating a log event when the Normalized flow changes by a prescribed level, called the significant flow change. The magnitude of this change can be altered by the user in the Air Flow tab as shown in Figure 6-16.

6.5.4   Flow Measurement in Scanning ASD Systems

When using a VESDA ECO in conjunction with one of the VESDA scanning ASD products, the user should ensure that the scanning operation performed by the ASD does not cause the ECO to indicate a flow Fault condition.

Under normal circumstances the slow filtering on the ECO flow measurement will allow the ASD to scan through its channels without the ECO detecting a significant drop-off in the flow reading.

During installation the user should force the ASD into a scanning operation to determine if any drop in the ECO flow reading is witnessed and whether any flow faults are reported.

Should a flow Fault be observed, Major and Minor flow Fault reporting can be delayed by up to 10 minutes (600 seconds) by setting the appropriate flow fault delay periods, see Airflow configuration Tab as shown in Figure 6-16 above.

The recommended settings for these delays for each VESDA scanning ASD product are shown in the table below.

VESDA Scanning Aspirator	Aspirator Scanning Time	Recommended ECO Air Flow Fault Delay Period	
		Major	**Minor**
VLS	60 seconds	360 seconds	360 seconds
VFT-15	150 seconds	450 seconds	450 seconds

6.6   Relay Configuration and Operation

The ECO product is supplied with 4 configurable relay contacts, refer to Section 4.5 on page 1 for details of how to wire to the relay terminals.

The relays can be configured to operate under a number of Alarm conditions (Relays 1-3) or on the presence of Major and/or Minor fault conditions (Relay 4). The default configuration from the factory is as displayed in Figure 6-18 below. Relay 4 is a dedicated fault relay and cannot be re-mapped to one of the Alarm conditions, likewise Relays 1-3 cannot be mapped to operate on the presence of a fault condition.

6.6.1   Alarm and Fault Mapping

To reconfigure the mapping of the relays simply double click of the appropriate ECO device within the Device Overview window in the Xtralis VSC application as shown in Figure 6-17 below.
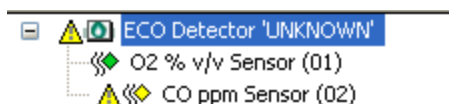

Figure 6-17: Configuring the Relay Mapping

The ECO Detector configuration tab will be displayed, select the "Relays" tab and the mapping matrix for the Relays to the Alarms and Faults is displayed, as shown in Figure 6-18 below.

Figure 6-18: ECO Detector, Relays Tab

Selecting one of the check boxes associates the alarm/fault condition to the checked relay. For example, in Figure 6-18 above;

Whenever a 'Major Fault' occurs, relay four will always be activated.

Whenever 'O2 % v/v High Alarm' occurs, relay 2 will be activated.

Note: The number of checkboxes and their labels will vary with the number of sensors fitted and the gas types being monitored.

6.6.2   Disable

When the detector is "Disabled" the relays will be deactivated regardless of the Alarm states or any Fault conditions present. Refer to Section 5.4.3 on page 28 for details of how and when the ECO is disabled.

During calibration alarm relays are automatically disabled and will not initiate external alarm devices.

6.7   Current Output Configuration and Operation

The VESDA ECO product is supplied with two analogue current output signals which can be used to transmit the active gas readings over long distances to central monitoring equipment. Each current output is designed to output a signal between 4mA and 20 mA that is a direct extrapolation of the detection range of the associated Gas sensor, Sensor A is assigned to Current Output A and Sensor B to Current Output B.

By default, 4mA represents a zero gas and 20mA represents a full scale gas reading.

For example, a 0-100ppm gas sensor will output a 4mA level when the gas reading is 0ppm and a 20mA level when the gas reading is 100ppm. When the gas reading is 50ppm, i.e. half range, the output level will be 12mA as shown in Figure 6-19 below.

Figure 6-19: Current Output vs Gas Reading

6.7.1   Current Output Configuration

It is permissible for the user to re-range the Current output to transmit a required specific range within the limits of the Sensor measurement range. To reconfigure the current output simply double click of the appropriate ECO device within the Device Overview window in the Xtralis VSC application as shown inFigure 6-20 below.

Figure 6-20: Configuring the Current Outputs

This will bring up the ECO Detector configuration dialog, select the "Analog Output" tab as shown in Figure 6-21 below. Within this dialog the user can re-scale the 4mA and 20mA equivalent readings to provide the required Current output scale. These values are limited to the specified range of the Sensor in question, 0-25% v/v in the case of the Oxygen sensor shown below.

Figure 6-21: ECO Detector, Analog Output Tab

It is possible for the user to set the 4mA level to be a higher gas sensor reading than the 20mA level to provide an inverted output which may be preferred when the using a deprivation mode of measurement such as when using Oxygen. i.e. a reduction in the Oxygen reading causes a proportional increase in the Current output level.

6.7.2   Fixed Level Indications

There are a number of potential conditions under which each of the current outputs will be fixed to a specific level outside of the 4 to 20mA range. As can be seen from Figure 6-21 above, the current output can be programmed to assume a fixed level of 3.5mA or 22mA when a Major fault condition is present. This provides a definitive communication to the monitoring system that a fault is present. If there is no requirement to transmit the presence of a Major Fault condition then the "Fault Mode" should be set to "none". By default this is set to indicate a Major fault with a fixed 3.5mA output level.

Additionally, when the related gas sensor is being calibrated the current output will assume a fixed output level of 2mA until the calibration is completed.

6.7.3   Disabled

When the detector is "Disabled" the current outputs will be fixed at the selected Fault output level regardless of the gas reading. Refer to Section 5.4.3 on page 28 for details of how and when the ECO is disabled.

6.8   Event Logging and Retrieval

The VESDA ECO is supplied with a large capacity microSD card to log the ongoing gas measurement and status of the product.

Logging of events to the microSD Card is integral to the operation of the unit, this allows the retrieval of historical data from the unit either using one of the Serial Communications interfaces or, when accessible, the microSD card can be removed and the data read using a PC. In either case, Xtralis VSC is required to read and correctly format the data.

An event is logged when the monitored gas or flow reading alters by more than a prescribed amount, and whenever an event such as a fault condition or user action (such as calibration) occurs. An event is a notable occurrence at a particular point in time. On occurrence of an event, its type, time and, where appropriate its value, are logged.

All of the defined events are logged locally within the ECO, subsequently it is possible using Xtralis VSC to selectively retrieve and display groups of events by their type (refer to Section 6.8.1 on page 50).

6.8.1   Event Log Retrieval

To retrieve the event log directly from the VESDA ECO via one of the serial communications interfaces, the user can select from the "View" menu item as shown in Figure 6-22 below.

Figure 6-22: Retrieve Event Log

After selecting to retrieve the Event Log the "Filter Events" dialog should be displayed as shown in Figure 6-23 below.

Figure 6-23: Event Log Filter

From the Filter Events dialog the user can simply select what types of Events are retrieved and over what time frame. These events are grouped as five different types.

- Alarm – An Event logged when any of the Alarm conditions occur.

- Trouble – An event logged when any of the Major or Minor fault conditions occur.

- User – An event logged when the user alters the state of the unit for example when the "Disable" function is activated.

- Value Change – An event logged when a change in a gas or flow reading is logged as determined by the significant change setting.

- Notify - An event logged when an operation within the ECO occurs, such as Flow normalization start and finish, Gas Calibration start and finish and any configuration changes.

Alternatively the user can remove the microSD card and plug it into a appropriate SD card slot on the PC, however an SD card adaptor may be required (Not Supplied). To retrieve this data select the VSC menu item as indicated inFigure 6-24 below.

Figure 6-24: Open Event Log from MicroSD Card

As a result of either of the above methods, the Xtralis VSC software will open a new window displaying the list of logged events in reverse chronological order, i.e. the last logged event is shown first in the list, as shown in Figure 6-25 below.

Date / Time	Address	Device Type	Trouble Id	General Type	Message	Value	Sequence Number
21/05/2010 19:50:27	001	ECO Detector	2042	Trouble	Clear trouble: 2042 Minor high airflow		442
21/05/2010 19:50:25	001	ECO Detector	2012	Trouble	Clear trouble: 2012 Major high airflow		441
21/05/2010 19:50:24	001.02	O2 % v/v Sensor		Value change	Gas Level 21 % v/v	21 % v/v	440
21/05/2010 19:50:09	001.02	O2 % v/v Sensor		Value change	Gas Level 21 % v/v	21 % v/v	439
21/05/2010 19:50:06	001	ECO Detector	2012	Trouble	Trouble: 2012 Major high airflow		438
21/05/2010 19:50:04	001	ECO Detector	2042	Trouble	Trouble: 2042 Minor high airflow		437
21/05/2010 19:48:13	001	ECO Detector	2042	Trouble	Clear trouble: 2042 Minor high airflow		436
21/05/2010 19:48:11	001	ECO Detector	2012	Trouble	Clear trouble: 2012 Major high airflow		435
21/05/2010 19:48:10	001.02	O2 % v/v Sensor		Value change	Gas Level 21 % v/v	21 % v/v	434
21/05/2010 19:47:55	001.02	O2 % v/v Sensor		Value change	Gas Level 21 % v/v	21 % v/v	433
21/05/2010 19:47:52	001	ECO Detector	2012	Trouble	Trouble: 2012 Major high airflow		432
21/05/2010 19:47:50	001	ECO Detector	2042	Trouble	Trouble: 2042 Minor high airflow		431
21/05/2010 19:45:19	001.01	CH4 % LFL Sensor		Value change	Zero Calibration: CH4 % LFL Sensor 1		430
21/05/2010 17:29:28	001	ECO Detector		Notify	Flow normalization Completed		429
21/05/2010 17:28:58	001	ECO Detector		Notify	Flow normalization Start		428

Figure 6-25: Event Log

6.8.2   Exporting Event Log Data

It is possible for the user to save the Event log data provided by the Xtralis VSC application to a standard spreadsheet application. There are two ways of achieving this.

The best way to export the entire log data to a spreadsheet is to save the data as a comma separated variable or ".csv" file. This can then be very simply imported into the required spreadsheet application. To do this, select the Event Log window within the Xtralis VSC application and select "File" "Save As" from the top menu bar. Determine the required destination directory and file name, and then select the "CSV (Comma delimited) (*.csv)" format from the "Save as type" drop down list located below the file name entry box, as shown in 6.8.2 below.

Figure 6-26: Save Event Log as ".csv" file

Alternatively the user can choose to simply select a group of events from within the Xtralis VSC Event Log window using the mouse and, from the menu displayed by pressing the right mouse button, copy these selected events. It is then possible to simply "paste" the copied data straight into the required spreadsheet application.

6.8.3   Removing the MicroSD Memory Card

It is possible to remove the internal memory card for off-line data analysis. The memory card is situated underneath the USB interface connector, behind the same cover. The card release mechanism is a standard push to release type.

If the microSD Card is removed or inserted whilst the unit is powered, it may cause the unit to undergo a restart. Furthermore, if the microSD Card is absent while the unit is powered it will indicate a fault condition and the event data for that period will be lost.

6.9   Serial Communication Interfaces

Communication between the VESDA ECO detector and Xtralis VSC/ Xtralis VSM4, or a customer's existing data acquisition system, can be made using the RS485 2-wire bus or USB interfaces provided. In either case the software protocol is the same.

Whereas the RS485 connection can connect a single master device to up to 32 slave devices on the same bus connection, each USB connection can only be made to one ECO unit at a time, though multiple USB connections can be deployed from the same PC. The Xtralis VSC application can connect to the ECO Detector using either the USB or RS485 interfaces.

When using the USB interface, the Modbus interface settings are not used. This allows Xtralis VSC to be used to configure any ECO unit without prior knowledge of its Modbus address or its serial interface settings. Before adding an ECO Detector to a system connected by the RS485 bus, it needs to be assigned a unique Modbus address.

6.9.1   Modbus Settings

To set the Modbus Address simply double click of the appropriate ECO device within the Device Overview window in the Xtralis VSC application as shown in Figure 6-27 below.

Figure 6-27: Configuring the Modbus Interface

The ECO Detector configuration dialog will now be displayed as shown in Figure 6-28. The "Modbus Address" and "Location" fields are shown on the "General" tab and can be edited there. From the factory, the default value of the Address is "1". The valid range for the "Modbus Address" is from 1 to 32. If two units on the same RS485 bus have the same "Modbus Address" then communications to these two units will be disrupted and this may further impact communication to all of the other units on the bus.

Figure 6-28: ECO Detector, General Tab

The '**Location**' field is a text field provided by the ECO to allow the user to label each ECO such that its location can be determined when interrogated remotely using the RS485 bus. It should be edited to clearly identify where in the system pipe network the ECO detector is placed, and is limited to 32 characters. The contents of this field will appear next to the ECO device in the Xtralis VSC overview field as shown in Figure 6-29 below:

Figure 6-29: ECO Overview Showing Location

6.9.2   Modbus Interface

The interface to the USB and RS485 communications is implemented as a Modbus Protocol interface in compliance with the requirements of the "Modbus Application Protocol Specification V1.1b" as published by the Modbus-IDA organisation.

The Xtralis VSC and Xtralis VSM4 software are supplied with this interface embedded within them and so therefore there is no requirement for detailed user knowledge of the Modbus implementation when using these software.

Where a 3rd party control application is to be used instead, the installer should refer to the ECO Modbus Interface specification, document number 17885, available from your distributor or local Xtralis sales representative. This specification will define the Modbus implementation used within the ECO including all of the required register and data type definitions.

6.10   Fault Reporting

The ECO performs constant validation and verification of its operating condition whilst powered and will indicate to the user the presence of any condition which may impair the performance of the unit. These conditions are split into two categories.

- Major Fault. A state in which the ability of the product to communicate a gas level or alarm condition may be impaired.

- Minor Fault. A state where operation of the unit may be impaired, but this does not affect the ability of the unit to correctly measure gas levels or communicate alarm conditions.

The presence of any of these conditions is reported in the active event window of the Xtralis VSC application and by the Yellow Fault indicator. For details of the meaning and corrective active for each of these conditions please refer to Chapter 7 on page 61.

6.10.1   Fault Delays

The ECO product provides the user with the opportunity to adjust the timing settings for indication of any Fault conditions. These periods, in seconds, are used by the ECO to determine how long a fault flag has to have been present before the external notification (relays, current outputs or logged files) is initiated.

Note: The delay of the Fault notification does not occur for all Fault conditions, refer to Chapter 7 on page 61 for details of which fault conditions are affected by the configured delay period.

To reconfigure the Fault delays simply double click of the appropriate ECO device within the Device Overview window in the Xtralis VSC application as shown in Figure 6-30 below.
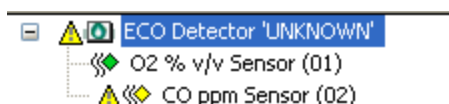

Figure 6-30: Configuring the Fault Delays

In the resulting ECO Detector dialog that is displayed, select the "Faults Tab" as shown in Figure 6-31 below.

Figure 6-31: ECO Detector, Faults Tab

The default settings for the fault delays are programmed into the unit during the production process, Xtralis recommends that they are not changed unless absolutely necessary.

6.10.2   Fault Latching

The ECO product provides the user with the ability to "Latch" fault conditions in a similar way to the Alarm conditions as indicated earlier in this manual. Setting the faults to be "Latched" causes the reporting of the fault condition to still be reported even after the condition has disappeared. When faults are latched, it is required for the user to provide a reset, either in the Detector Alarm status window or using the remote reset, to remove the fault reports. For details on the Alarm status window, refer to Section 5.4.3 on page 28 for details. The connection and function of the remote reset is described on 20.

To set the Fault latching state, select the "Latching" tab from within the ECO Detector dialog and click on the appropriate check box to enable and disable the Fault latching, as shown in Figure 6-32 below.

Figure 6-32: Fault Latching Configuration

Note: The number of checkboxes and their labels vary with the number of sensors fitted and the gas types being monitored.

6.11 Restoring Factory Default Settings

While every effort is made to ensure that it is not possible to mis-configure or badly calibrate the ECO product it does sometimes happen that a long series of configuration changes places the unit in an undesirable, though still fully functional, condition from which it is difficult to backtrack to a known condition.

To this end, the ECO product is provided with a facility to reset its configuration back to that with which it originally left the factory. To use this feature, the user is required to be logged in at an administrator level.

Within Xtralis VSC there are two methods to initiate a "Reset to Factory Defaults", either by selecting the menu item from the menu bar at the top of the main window as shown in Figure 6-33 below:

Figure 6-33: Restore Factory Defaults Menu Item

Or by selecting the menu item in the context sensitive menu that appears when the right hand mouse button is pressed whilst the ECO detector is selected in the system tree view on the left hand side of the main window, as shown in Figure 6-34 below:

Figure 6-34: Restore Factory Defaults Device Context Menu

When either of these methods is used to initiate the "Reset to Factory Defaults" a confirmation dialog will be displayed to ensure that the operation is not selected accidentally. To confirm the action, simple select the "Yes" button with the mouse pointer or select the "No" button to abort the operation.

Figure 6-35: Restore Factory Defaults Warning Message

6.12   Setting ECO Date and Time

It is important that the ECO detector Real Time Clock (RTC) is set correctly. The RTC is used to Timestamp all data logged to the micro-SD card.

To set the time of the ECO RTC, right click on the detector and select "Set system date and time" from the context sensitive menu which appears, as shown in Figure 6-36 below.

Figure 6-36: Set System Date and Time Menu

When the '**Set system date and time**' menu option is selected Xtralis VSC will prompt the user to enter the time and date, using the PC time as a default. If this is not correct, adjust the time and select OK to set the time in the ECO.

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7   Troubleshooting

In the rare event that the product is not operating as expected, below is a list of conditions, explanations and corrective actions.

Condition	Possible Explanations and Corrective Actions
Green Power Indicator not lit	Check power connections
Green Indicator Flashing	This indicates serial communication between the ECO gas detector and an external device
Yellow Indicator Lit	There is a Major Fault condition present. Review using Xtralis VSC. See below
Yellow Indicator Flashing	There is a Minor Fault condition present. Review using Xtralis VSC. See below
No Communications via RS485/Modbus	a. Check correct connection polarity - ensure that D0 (A) and D1 (B) are connected correctly at each end.
	b. Ensure that there is a 0V connection present between the ECO and the RS485 driver (contrary to some popular belief, a 0V reference between the two is required)
	c. Ensure that correct termination resistors are fitted in the correct positions (one at each end of the bus), refer to page 17 for details
	d. Ensure that the maximum number of devices on the bus has not been exceeded (again refer to page 17 for details)
	e. Ensure that the correct cable type has been used.
	f. Ensure that the maximum cable length has not been exceeded.
	g. Check using Xtralis VSC via the USB port that the settings of the Modbus interface are correct (Address, Baudrate etc)
The connection to the USB port is not working	Ensure that you have installed the necessary USB drivers. Try using an alternate USB port on your PC
The microSD card does not store logged data correctly	Check that the card is correctly inserted, and that the event and data logging configuration is correct. Replace the memory card. Any microSD compatible card up to 16GB is suitable
The Internal Clock is resetting to Midnight on 1st January 2000	Check that the clock is being set correctly by Xtralis VSC. If the clock settings are being lost when power is removed from the unit, it may be that the internal battery needs to be replaced.
The Current Output does not track the gas readings	Check the current output configuration settings using Xtralis VSC. Ensure that the load resistor used, and general connections of the output are as specified in the Electrical installation section on page 20. If the unit is being powered via the USB connector, i.e. without the main power connected, the Current Outputs will not operate as they require the main power input to function.

The Relays do not respond to alarms or faults	Check that the relay configuration settings are correct using Xtralis VSC. If any warnings or faults are indicated, refer to the Xtralis VSC faults section below. If the unit is being powered via the USB connector, i.e. without the main power connected, the Relays will not operate as they require the main power input to function.
The Sensor readings or alarms do not respond when the target gas is applied.	Ensure that the gas being applied is of the correct mixture, and that the "balance" is appropriate, e.g. do not use gas mixtures with a balance of Nitrogen when testing any of the flammable sensors. Check the gas connection to the unit. If the sensor readings are responding but not generating alarms conditions then check the Alarm configurations using Xtralis VSC.

If/when the Yellow fault indicator is illuminated continuously then there is a Major Fault present within the unit

- A Major Fault is a state in which the ability of the product to communicate a gas level or alarm condition may be impaired

When the Yellow fault indicator is flashing, a Minor Fault is present within the unit

- A Minor Fault is a state where operation of the unit may be impaired, but this does not affect the ability of the unit to correctly measure gas levels or communicate alarm conditions

In either case, it is important not to leave the unit in either condition and to use Xtralis VSC to determine the nature of the fault and the corrective action required.

Below is a list of the fault and warning conditions that may occur, and will be indicated by Xtralis VSC with the description of each and the corrective action.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2000	System board failure	N	Major	The detector suffered an internal memory failure try to reboot / re-commission detector. If unable to reboot replace main PCB.
2001	System board failure	N	Major	The detector suffered an internal memory failure try to reboot / re-commission detector. If unable to reboot replace main PCB.
2002	System board failure	N	Major	The detector suffered an internal software failure try to reboot / re-commission detector. If unable to reboot replace main PCB.
2003	System board failure	N	Major	The detector suffered an internal software failure try to reboot / re-commission detector. If unable to reboot replace main PCB.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2004	An internal Software fault has occurred in the IO Board	N	Major	The detector suffered an internal software failure, try to reboot / re-commission detector. If unable to reboot replace main PCB.
2005	Sensor module failure	N	Major	The Sensor cartridge suffered an internal memory failure try to reboot. If unable to clear replace sensor cartridge and re commission.
2006	Sensor module failure	N	Major	The Sensor cartridge suffered an internal memory failure try to reboot. If unable to clear replace sensor cartridge and re commission.
2007	Sensor module failure	Y	Major	The Sensor cartridge suffered an internal software failure try to reboot. If unable to clear replace sensor cartridge and re commission.
2008	Sensor module failure	Y	Major	The Sensor cartridge suffered an internal software failure try to reboot. If unable to clear replace sensor cartridge and re commission.
2009	Sensor module failure	Y	Major	The Sensor cartridge suffered an internal software failure try to reboot. If unable to clear replace sensor cartridge and re commission.
2010	Sensor module not present	Y	Major	The detector has not recognised the sensor cartridge. Check sensor cartridge is inserted the correct way round and is seated correctly. Click clear to reset. If unable to clear error replace the sensor cartridge and or the main PCB and reconfigure / commission detector.
2011	SD card failure	Y	Major	The detector cannot recognise the SD card. Remove and re insert SD card and click reset to clear. If unable to clear error replace SD card. If error persists replace main PCB.
2012	The monitored Air Flow is greater than the Major Threshold High Limit	Y	Major	Sample air flow increased above acceptable limits. Select "Reset" to clear. If unable to clear the fault, check the ECO detector inlet and outlets, ASD and sample pipe-work installation. If the error persists and the ASD is in good operation, check the sensor cartridge for blockages and clogged filters. Finally, if the flow reading does not return to normal after all of the above checks, attempt to re-"Normalise" the airflow. If this does not cure the problem, replace the sensor cartridge.
2013	The monitored Air Flow is less than the Major Threshold Low Limit	Y	Major	Sample air flow decreased below acceptable limits. Select "Reset" to clear. If unable to clear the fault, check the ECO detector inlet and outlets, ASD and sample pipe-work installation. If the error persists and the ASD is in good operation, check the sensor cartridge for blockages and clogged filters. Finally, if the flow reading does not return to normal after all of the above checks, attempt to re-"Normalise" the airflow. If this does not cure the problem, replace the sensor cartridge.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2015	Relay 1 fails to operate as expected	Y	Major	Detector relay 1 failed Replace main PCB and re-commission.
2016	Relay 2 fails to operate as expected	Y	Major	Detector relay 2 failed Replace main PCB and re-commission.
2017	Relay 3 fails to operate as expected	Y	Major	Detector relay 3 failed Replace main PCB and re-commission.
2018	Relay 4 fails to operate as expected	Y	Major	Detector relay 4 failed Replace main PCB and re-commission.
2021	Flow sensor failure. Circuit failure in the Flow system	Y	Major	Sensor cartridge flow sensors have failed. This may occur as the result of powering the unit from the USB connector, i.e. without the main power supply connected, as the flow measurement electronics require the main power supply input to be present in order to function correctly. Otherwise, if the main supply input is present and within specified limits, replace the sensor cartridge and re-commission.
2024	Module Configuration Different	N	Major	Gas Cartridge replaced with sensors of different type. Use sensor cartridge with same gas types as originally supplied or accept changes via Xtralis VSC by activating 'Return to Factory Defaults' from the device drop down menu.
2030	There has been a power Failure Since this error was last Reset	Y	Minor	The detector has been powered down since the last inspection. Click reset to clear error. If unable to clear error replace detector main PCB and reconfigure.
2031	There has been a system Reboot since this error has been last reset	Y	Minor	The detector has rebooted since the last inspection. Click reset to clear error. If unable to clear error replace detector main PCB and reconfigure.
2032	Configuration change rejected	N	Minor	The detector has rejected the previous change to the configuration on the basis of either insufficient access rights or the value written falls outside the permissible limits for that configuration variable.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2033	Calibration Failed Signal too noisy or calibration gas is outside acceptable tolerance limits	N	Minor	Sensor cartridge failed to calibrate. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission.
2034	Flow Normalization Failed The air flow is not stable enough to allow calibration	N	Minor	Sample air flow was not stable during the commissioning procedure. Check ECO detector inlet and outlets for obstructions. Check ECO sensor filter assembly for damage or contamination. Check ASD and sample air pipe work installation and re-commission. If error persists and ASD is in good operation replace main sensor cartridge and reconfigure / re-commission.
2036	The air temperature is less than the specification permits	Y	Minor	The detector has been exposed to temperatures below its specified operating temperature. Check sample air temperature. Click clear to reset. If unable to reset and sample air temperature is within specified limits, replace sensor cartridge and re-commission. If still unable to clear the error, replace complete detector and re commission.
2037	The input voltage to the device exceeds specification	Y	Minor	The power supply to the detector has increased above it's specified voltage limit. Check supply voltage is within specification. Click clear to reset. If unable to clear error replace complete detector and re commission.
2038	The input voltage to the device does not meet minimum specification requirements	Y	Minor	The power supply to the detector has decreased below it's specified voltage limit. Check supply voltage is within specification. Click clear to reset. If unable to clear error replace complete detector and re commission.
2039	The device is drawing excessive current. An internal Hardware fault is indicated	Y	Minor	The current draw of the detector has increased above an acceptable limit. Click clear to reset. If unable to clear error replace complete detector and re commission.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2040	The device is drawing insufficient current. An internal Hardware fault is indicated	Y	Minor	The current draw of the detector has decreased below an acceptable limit. Click clear to reset. If unable to clear error replace complete detector and re commission.
2041	RTC battery failed. The internal battery is not working within specification	Y	Minor	The real time clock has failed. Replace battery and reconfigure date and time. If unable to reset error replace main PCB and re commission.
2042	The monitored Air Flow is greater than the Minor Threshold High Limit	Y	Minor	Sample air flow increased above acceptable limits. Select "Reset" to clear. If unable to clear the fault, check the ECO detector inlet and outlets, ASD and sample pipe-work installation. If the error persists and the ASD is in good operation, check the sensor cartridge for blockages and clogged filters. Finally, if the flow reading does not return to normal after all of the above checks, attempt to re-"Normalise" the airflow. If this does not cure the problem, replace the sensor cartridge.
2043	The monitored Air Flow is less than the Minor Threshold Low Limit	Y	Minor	Sample air flow decreased below acceptable limits. Select "Reset" to clear. If unable to clear the fault, check the ECO detector inlet and outlets, ASD and sample pipe-work installation. If the error persists and the ASD is in good operation, check the sensor cartridge for blockages and clogged filters. Finally, if the flow reading does not return to normal after all of the above checks, attempt to re-"Normalise" the airflow. If this does not cure the problem, replace the sensor cartridge.
2046	Internal Voltage Over Range	Y	Minor	Click clear to reset. If unable to clear error replace complete detector and re-commission.
2047	Internal Voltage Under Range	Y	Minor	Click clear to reset. If unable to clear error replace complete detector and re-commission.
2048	Current Input Over Range	Y	Minor	Click clear to reset. If unable to clear error replace complete detector and re-commission.
2053	Micro SD Card Almost Full	N	Minor	Data will over write when micro SD card is full, based on first is first out. Alternative download data and store on alternative storage device by using the USB interface or by powering down the detector and removing the micro SD card. Format the micro SD card before replacement.
2054	Sensor Board Failure	N	Minor	The detector suffered an internal software failure try to reboot / re-commission detector. If unable to reboot replace main PCB.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2055	Sensor Module Failure	N	Minor	The Sensor cartridge suffered an internal memory failure try to reboot. If unable to clear replace sensor cartridge and re commission
2056	A restart of the Sensor Cartridge software has occurred	N	Minor	The sensor cartridge rebooted since last inspection. Click reset to clear. If unable to clear replace sensor cartridge.
2100	Sensor Module Fault Sensor temperature over range	Y	Major	The sensor cartridge has been exposed to temperatures above its specified operating temperature. Check sample air temperature. Click clear to reset. If unable to reset and sample air temperature is within specified limits replace sensor cartridge and re-commission. If unable to clear error replace complete detector and re commission.
2101	Sensor Module Fault Sensor temperature under range	Y	Major	The sensor cartridge has been exposed to temperatures below its specified operating temperature. Check sample air temperature. Click clear to reset. If unable to reset and sample air temperature is within specified limits replace sensor cartridge and re-commission. If unable to clear error replace complete detector and re commission.
2102	Sensor Module Fault Sensor ROM Error	N	Major	The Sensor assembly suffered an internal memory failure try to reboot. If unable to clear replace sensor cartridge and re commission
2103	Sensor Module Fault Sensor RAM Error	N	Major	The Sensor assembly suffered an internal memory failure try to reboot. If unable to clear replace sensor cartridge and re commission
2104	Sensor Module Fault Sensor configuration error	N	Major	The Sensor assembly suffered an internal software failure try to reboot. If unable to clear replace sensor cartridge and re commission
2106	Gas under range. Sensor more than 10% (of range) below the defined minimum range (Zero)	Y	Major	An ECO gas sensor is experiencing negative zero drift. Click reset to clear. If unable to clear re zero / calibrate sensor cartridge. If error persists replace sensor cartridge.
2107	Sensor Module Fault	N	Major	The Sensor assembly suffered an internal software failure try to reboot. If unable to clear replace sensor cartridge and re commission
2109	Sensor Module Fault	Y	Major	Sensor failure. Replace sensor cartridge and re-commission.

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2110	Sensor Module Fault	Y	Major	Sensor failure. Replace sensor cartridge and re-commission.
2111	Sensor Module Fault Sensor communication error	N	Major	The Sensor cartridge suffered an internal communications failure. Replace sensor cartridge and re commission
2114	Sensor Serial Number Mismatch	N	Major	Sensor module has been changed. Connect to Xtralis VSC and accept configuration changes.
2120	Sensor Module Fault	Y	Major	The Sensor cartridge suffered an internal communications failure. Replace sensor cartridge and re commission
2121	Sensor Module Fault	Y	Major	The Sensor cartridge suffered an internal communications failure. Replace sensor cartridge and re commission
2122	Sensor Module Requires replacement	Y	Major	The sensor cartridge suffered an internal communications failure. Replace sensor cartridge and re-commission.
2123	Sensor Module Requires replacement	Y	Major	The sensor cartridge suffered an internal communications failure. Replace sensor cartridge and re-commission.
2140	Gas over range. Sensor more than 10% (of range) above the defined maximum range	Y	Minor	An ECO gas sensor was exposed to a gas concentration greater than 110% of scale. Click reset to clear. If unable to clear re calibrate sensor cartridge. If error persists replace sensor cartridge.
2142	Zero calibration failed Signal too noisy or calibration gas is outside acceptable tolerance limits	N	Minor	Sensor cartridge failed to calibrate zero level. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2143	Span calibration failed Signal too noisy or calibration gas is outside acceptable tolerance limits	N	Minor	Sensor cartridge failed to calibrate span. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission
2144	Calibration due. Within 2 weeks of next due calibration date	N	Minor	The sensor cartridge is within 2 weeks of needing recalibration. Recalibrate sensor cartridge.
2145	Calibration out of date. Calibration Due Date has passed	N	Minor	The sensor cartridge is out of calibration. Recalibrate.
2146	Gas More Than 5% Below Minimum Range	Y	Minor	An ECO gas sensor is experiencing negative drift. Click reset to clear. If unable to clear re zero / calibrate sensor cartridge. If error persists replace sensor cartridge.
2149	Span calibration too noisy. Signal too noisy or more than 10% of range beyond applied gas level	N	Minor	Sensor cartridge span calibration too noisy. Check calibration gas, connections and settings then recalibrate. If the error persists, replace the sensor cartridge and re-commission
2150	Span calibration over range. Signal too noisy or more than 10% of range beyond applied gas level	N	Minor	Sensor cartridge span calibration over range. Check calibration gas, connections and settings then recalibrate. If the error persists, replace the sensor cartridge and re-commission

Xtralis VSC Fault Number	Root cause	Delayed? (see 56)	Major/ Minor	Fault Solution (Visible within Xtralis VSC via F1)
2151	Span calibration under range . Signal too noisy or more than 10% of range beyond applied gas level	N	Minor	Sensor cartridge span calibration under range. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission
2152	Zero calibration too noisy. Signal too noisy or more than 10% of range beyond applied gas level	N	Minor	Sensor cartridge zero calibration too noisy. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission
2153	Zero calibration over range Signal too noisy or more than 10% of range beyond applied gas level	N	Minor	Sensor cartridge zero calibration over range. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission
2154	Zero calibration under range. Signal too noisy or more than 10% of range beyond applied gas level	N	Minor	Sensor cartridge zero calibration under range. Check calibration gas, connections and settings then recalibrate. If error persists, replace sensor cartridge and re-commission
2164	Sensor Module Rebooted	N	Major	2164Sensor cartridge watchdog initiated a reset. Reset error via Xtralis VSC. If error persists, replace sensor cartridge and re-commission. Report failure via Xtralis service reporting system.

8   Service and Maintenance

Caution: Prior to carrying out any work or maintenance on the ECO take the necessary steps to advise the monitoring authority that power may be removed and the system disabled.

Caution: Electrostatic discharge precautions need to be taken prior to removing the ECO cover from the detector body to avoid any static discharge damage to the ECO control board or sensor cartridge.

8.1   Service Intervals and Inspection

The majority of routine service tasks can be performed with the detector fitted to the aspirating pipe-work. Should it be necessary to remove the detector from the aspirating pipe-work, follow the detector removal procedure below.

Most gas sensors have a finite life. Sensor life is dependent upon its' design, internal chemistry and the operating environment. With the exception of electro-chemical Oxygen deficiency detectors; electro-chemical toxic and catalytic flammable gas sensors do not provide an indication of sensor failure.

Routine (typically 6 monthly) exposure to test / calibration gas is necessary to verify gas sensor response and re-validate the accuracy of gas concentration readings. Routine service intervals may be extended if site specific data repeatedly shows no loss of sensitivity or accuracy of reading. However routine service intervals should not exceed 12 months. Service intervals should be shortened if site specific data shows a high loss of sensor sensitivity.

ECO is supplied with a software driven service flag, defaulted to 6 months. The default value can be reconfigured from 1 to 12 months in increments of one month via Xtralis VSC.

The following checks and their outcomes will help determine whether the service intervals can be changed from the 6 month default.

- Remove and check the condition of the Filter assembly on the bottom of the Sensor cartridge. Refer to Section 8.2 on page 72 for instructions on removing the filter cartridge assembly. If the filter membranes are damaged, replace the filter cartridge. If not, remove any dirt and dust build up. If the buildup of contaminates on the filter membranes is excessive then consideration should be given to reducing the service and inspection period. Replace the Filter cartridge into the sensor cartridge and replace the sensor cartridge into the detector body.
- Apply a known zero gas level for each sensor to the Gas test port, and check for drift and inaccuracies. Recalibrate the Zero level if necessary. If excessive drift of the Zero reading has occurred, consideration should be given to reducing the service and inspection period.

- Apply a known span gas level for each sensor to the Gas test port, and check for drift and inaccuracies. Recalibrate the Span level if necessary. If excessive drift of the Span reading has occurred, consideration should be given to reducing the service and inspection period.

8.2   Detector Removal

To remove the entire ECO Detector from the installed pipe work, follow these instructions:

1. Disable the VESDA detector which is the source of the ECO air flow.
2. Invoke the Stand-by Mode on the VESDA detector to shut down the aspirator.

3. Isolate the power connection to the ECO Detector.

4. Remove the enclosure lid as indicated in Figure 4-2 on 14. This will reveal the ECO power and communications cabling. Mark up all of the associated cabling to the ECO terminals, and detach all of the cable connections. Loosen The compression nut on the cable glands and slide the cabling out of the ECO main body.

5. If fitted, remove the pipe inserted in the gas test port.

6. With the cables and gas test port pipe detached, remove the detector body from the sampling pipe work. The ECO detector is now free and can be serviced and or replaced as necessary.

8.3   Sensor Cartridge Removal

To remove the Sensor Cartridge sub-assembly from the ECO Detector body, follow these instructions:

Caution: Removing the lid of the Sensor cartridge sub-assembly will void the product warranty.

1. Isolate the power connection to the ECO Detector.
2. Remove the enclosure lid as indicated in Figure 4-2 on 14. This will reveal the ECO power and communications cabling. Lay these to the side of the Detector body to provide access to the Sensor Cartridge.

3. Place index finger and thumb on each end of the sensor cartridge in the textured positions provided. Support the body of the ECO Detector with the other hand whilst carefully pulling the sensor cartridge. The cartridge can now be inspected, serviced and or replaced as is necessary.

4. If the Cartridge is being replaced, ensure that the correct part is being fitted in its place.

5. When refitting the cartridge in the ECO detector body, remember that the two parts are keyed such that they cannot be fitted in the incorrect orientation without excessive use of force.

8.4   Filter Cartridge Removal and Replacement

Depending on site conditions the ECO filter cartridge can become contaminated and eventually block. This will reduce the ECO's ability to detect a threat. In particularly dirty environments the filter cartridge must be inspected regularly. Having removed the Sensor cartridge from the body of the ECO detector as instructed above.

1. Gently pull the filter cartridge assembly away from the bottom of the Sensor cartridge. Be careful not to damage the exposed flow circuit sensors.
2. Inspect, Service or replace the filter cartridge as required.

3. To replace the filter cartridge within the Sensor cartridge sub-assembly, ensure that the filter cartridge is correctly orientated as indicated in Figure 8-1 below.

4. With the filter correctly orientated and re-positioned carefully over the flow circuit sensors, gently push the filter assembly into the Sensor Cartridge. A positive click should be felt to indicate that the filter is firmly in position.

A	Sensor Cartridge
B	Filter Cartridge
C	Gas Scoop
D	Filter (1 of 2)
E	Sensor Cartridge O Ring
F	Filter Cartridge O Ring
G	Orientation key

Figure 8-1: Sensor and Filter Cartridge Assembly

8.5   Replaceable Parts

Part	Xtralis Part/Order Number
Filter Cartridge Assembly	LF41333
USB access port Rubber Bung	LF41291
USB Connection Lead	LF41313
VESDA ECO Product Guide	LF41308
Sensor Cartridge O-Ring	LF41301
Filter Cartridge O-Ring	LF41302
microSD Card	LF41312
Sensor Cartridge	It is recommended to look at the Sensor Cartridge part number as indicated on the side label of the Sensor Cartridge to be replaced and to use this to order the replacement part. If the cartridge type is to be changed, refer to Section 4.3 on page 1.

8.6   Changing Gas Sensor Types

If it is required to change the type of gas being monitored by the ECO the sensor cartridge can be replaced with one of the required combination. The Sensor cartridge part number is of the from ECO-SC-AA-BB, as with the principle product part number, where "AA" and "BB" are replaced with the required gas types as indicated in section 9 on page 77. The new cartridge can then be substituted for the one supplied within the ECO.

When the cartridge type is changed, the ECO will detect that a different gas sensor combination has been fitted and will raise a fault condition (2024) to prevent accidental/unintentional gas type changes when performing routine service replacements.

To complete the changeover it is necessary to acknowledge the change of gas type using the Xtralis VSC configuration tool. To do this, when the fault condition is indicated the user must apply the methods explained in "Restoring Factory Default Settings" as shown on page Restoring Factory Default Settings. When this is complete, use the reset button in Xtralis VSC to clear the fault conditions, the 2024 fault condition should now be gone and the new sensor gas type settings should be displayed. The ECO is now ready for use.

Note: Be sure to replace the gas type label on the exterior of the ECO with the replacement gas type label supplied with the new cartridge.

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9   Product Specification

Model	ECO-D-B-AA-BB
Detection	
Available Sensors	11 - Hydrogen (H2) 0-100 %LFL
	12 - Methane (CH4) 0-100%LFL
	13 - Propane (C3H8) 0-100 %LFL
	14 - Hydrogen (H2) 0-2000 ppm
	15 - Gasoline Vapor 0-100 %LFL
	16 - Pentane (C5H12) 0-100 %LFL
	19 - Ammonia (NH3) 0-100 %LFL
	20 - Alcohols 0-100 %LFL
	31 - Oxygen (O2) 0-25 %v/v – Depletion
	32 - Oxygen (O2) 0-25 %v/v – Depletion & Enrichment
	41 - Carbon Monoxide (CO) 0-500 ppm
	42 - Ammonia (NH3) 0-100 ppm
	43 - Hydrogen Sulphide (H2S) 0-100 ppm
	44 - Sulphur Dioxide (SO2) 0-10 ppm
	45 - Nitrogen Dioxide (NO2) 0-10 ppm
	47 - Chlorine (Cl2) 0-20 ppm
	49 - Carbon Dioxide (CO2) 0-5 %v/v
Substitute AA and BB in the Model number with the two digit code shown above for the desired sensor type. e.g. ECO-D-B-12-31 is an ECO detector complete with a dual gas (Methane and Oxygen) sensor cartridge	
Note: Not all of the combinations of gas detectors listed above are compatible. Refer to your Xtralis sales office for details of the allowable combinations of the detectors listed.	
Accuracy	Better than ⊕ 5% of range, gas dependant (for O2 between 10% v/v and 25% v/v only)
Mechanical	
Case Material	PC (Polycarbonate) / ABS
Colour	Black
Weight	approx. 250 g (0.6 lbs)
Dimensions	34 mm x 125 mm x 110 mm (1.3" x 4.9" x 4.4")
Sample Pipe Diameter	External 25mm (EU), ¾" BSP (US/CAN)
Cable Access	2 x PG9 cable glands
Wire/Terminal Size	1.5 mm^2 diameter / 16AWG maximum
Electrical	
Supply	Voltage18-30 V DC
Maximum Power Consumption	3.6W @ 24 V DC for dual gas detector
Typical Current Consumption	60mA @ 24 V DC for dual gas detector
Alarm Relay Output	4 x SPST rated 30 VDC, 1 A
Digital I/O pin	Open collector (24 VDC, 50mA)

Model	ECO-D-B-AA-BB
Current Source Outputs	4 - 20 mA, 1 per gas sensor
Serial communication	RS 485 Modbus RTU
Configuration interface	Xtralis VSC via local USB 2.0 connection
Data storage	microSD card (Max 2GB)
Environmental (Refer to Appendix A on page 79)	
Ambient Temperature	-20 to 55ºC (-4 to 131ºF)
Sampled Air	-20 to 55ºC (-4 to 131ºF)
Humidity	10-95 % RH, non-condensing
Ingress protection	For indoor use only

A   Environmental Limits and Calibration Gas Concentrations

Gas Name	Chemical Formula	Measurement Range	Temperature Limit		Humidity Limit		Recommended Test Gas Concentration
			Low	High	Low	High	
Ammonia	NH_3	0-100 ppm	-20 °C	+40 °C	15 %RH	90 %RH	50 ppm
Carbon Dioxide	CO_2	0-5% v/v	-10 °C	+50 °C	10 %RH	90 %RH	2.0% v/v
Carbon Monoxide	CO	0-500 ppm	-20 °C	+50 °C	15 %RH	90 %RH	100 ppm
Chlorine	Cl_2	0-20 ppm	-20 °C	+40 °C	10 %RH	90 %RH	5 ppm*
Hydrogen	H_2	0-2000 ppm	-20 °C	+50 °C	15 %RH	90 %RH	1000 ppm
Hydrogen Sulphide	H_2S	0-100 ppm	-20 °C	+50 °C	15 %RH	90 %RH	20 ppm
Nitrogen Dioxide	NO_2	0-10 ppm	-20 °C	+50 °C	15 %RH	90 %RH	5 ppm
Oxygen	O_2	0-25% v/v	-20 °C	+55 °C	5 %RH	95 %RH	20.9% v/v
Sulphur Dioxide	SO_2	0-10 ppm	-20 °C	+50 °C	15 %RH	90 %RH	5 ppm
Alcohols	-	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	42 %LFL in Air[†]
Ammonia	NH_3	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	36 %LFL in Air[††]
Gasoline	-	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	46 %LFL in Air[†]
Hydrogen	H_2	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	50 %LFL in Air
Methane / Natural Gas	CH_4	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	50 %LFL in Air
Propane	C_3H_8	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	42 %LFL in Air[†]
Pentane	C_5H_{12}	0-100% LFL	-20 °C	+50 °C	5 %RH	90 %RH	50 %LFL in Air

Notes:

(*) Requires a gas flow at 1 litre per minute

(†) Cross-calibrated using 50% LFL Pentane (C5H12) in Air

(††) Cross-calibrated using 50% LFL Methane (CH4) in Air

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B   Alarm Threshold Ranges and Defaults

ECO alarm thresholds are user adjustable using Xtralis VSC and can be set to meet the monitoring objectives of the system. Monitoring objectives may include:

- The detection and alarm of flammable gases before an explosive concentration is reached (approximately 25 and 50 %LFL)
- The detection and alarm of toxic gases at published occupational exposure limits
- The detection and alarm of falling ambient Oxygen levels before adversely affecting personal health and safety

To minimize the effects of gas sample dilution it is recommended that no more than 5 sample holes precede any ECO within a sample pipe network. Should a combined aspirated smoke and gas detection system design require more than 5 sample holes; for the benefit of the smoke detection; it may be necessary to consider running a separate sample pipe dedicated to detecting gas.

ECO default alarm thresholds have been set assuming a 4 hole sampling setup. Alarm thresholds can be set lower for a 5 hole system or raised when less sample holes are to be used. See the "VESDA ECO Gas Detector – System Design Guide" (Document No. 20400) for more information or contact your local Xtralis Field Applications Engineer or qualified distributor/installer.

Gas Name	Measurement Range	Pre-Alarm Threshold			Alarm Threshold		
		Default	Minimum	Maximum	Default	Minimum	Maximum
Ammonia	0-100 ppm	6 ppm	5 ppm	30 ppm	9 ppm	7 ppm	90 ppm
Carbon Dioxide	0-5% v/v	0.5% v/v	0.2% v/v	1.5% v/v	1.5% v/v	0.3% v/v	3.0% v/v
Carbon Monoxide	0-500 ppm	7 ppm	5 ppm	100 ppm	50 ppm	40 ppm	450 ppm
Chlorine	0-20 ppm	0.1 ppm	0.1 ppm	5.0 ppm	0.3 ppm	0.3 ppm	10.0 ppm
Hydrogen	0-2000 ppm	500 ppm	200 ppm	1500 ppm	1000 ppm	300 ppm	2000 ppm
Hydrogen Sulphide	0-100 ppm	1 ppm	1 ppm	10 ppm	2 ppm	2 ppm	90 ppm
Nitrogen Dioxide	0-10 ppm	0.3 ppm	0.2 ppm	5.0 ppm	0.5 ppm	0.4 ppm	9.0 ppm
Oxygen	0-25% v/v	20.0 % v/v	15.0% v/v	21.0% v/v	19.5% v/v	12.0% v/v	20.0% v/v
Oxygen (Dep. & Enrich.)	0-25% v/v	19.5 % v/v	12.0% v/v	21.0% v/v	22.5% v/v	18.5% v/v	25.0% v/v
Sulphur Dioxide	0-10 ppm	0.3 ppm	0.2 ppm	5.0 ppm	0.5 ppm	0.4 ppm	9.0 ppm
Alcohols	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL
Ammonia	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL
Gasoline	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL

Gas Name	Measurement Range	Pre-Alarm Threshold			Alarm Threshold		
		Default	Minimum	Maximum	Default	Minimum	Maximum
Hydrogen	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL
Methane / Natural Gas	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL
Propane	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL
Pentane	0-100% LFL	7% LFL	5% LFL	50% LFL	12% LFL	10% LFL	60% LFL

C   Installation Check List

Scope:

This installation check list should used by VESDA ECO installation / commissioning engineers as an aid to verify the basic requirements of a good installation and could be used as the basis for site acceptance and sign off.

Note: Meeting the requirements of this check list does not guarantee optimal system performance. Sample pipe layout, local environmental conditions, and routine servicing are additional contributory factors effecting system performance, which are beyond the scope of this document.
Should you have difficulty meeting the requirements of this check list or obtaining reliable performance of your VESDA ECO installation; contact your local VESDA ECO supplier or Xtralis representative for assistance.

Site Installation Details:

ECO Part Number:	
ECO Serial Number:	
ECO Site Location:	
End User:	
Site Address:	
End User Representative:	
Signature:	
Date:	
Installation Company:	
Installation Engineer:	
Signature:	
Date:	

	Yes	No
Hardware and Mounting Checks	☐	☐
Is the ECO free of any signs of mechanical damage?	☐	☐
Has the correct sensor cartridge gas type/s been fitted for the identified gas hazard?	☐	☐
Is the ECO more than 500mm (20") before an ASD and after a pipe fitting?	☐	☐
Is the ECO easily accessible for routine maintenance?	☐	☐
Are the status LEDs easily visible during normal operation?	☐	☐
Is the gassing port plug securely fitted?	☐	☐
Is the enclosure cover securely fitted?	☐	☐
Has the sample pipe network been installed with sample holes at locations relevant to the relative density of the gas being detected?	☐	☐
Electrical Checks	☐	☐
Are the cable connections to the VESDA ECO securely held by the cable glands?	☐	☐
Have all terminal connections been made correctly?	☐	☐
Is there an 18 to 30V DC supply at the detector?	☐	☐
Have output relays been exercised to confirm operation of external devices?	☐	☐
Has the termination jumper been fitted if this the last VESDA ECO on the RS485 bus?	☐	☐
Configuration and Operation Checks	☐	☐
Has the VESDA ECO internal clock, date and time been set?	☐	☐
Has the Flow been normalised?	☐	☐
Is the power LED on?	☐	☐
Are the alarm LEDs off?	☐	☐
Is the fault LED off?	☐	☐
Does Xtralis VSC show no current fault or warning codes?	☐	☐