Control Panel

Operation Manual

Document Ref: SL-014 V2.7

2-Wire
Addressable

*Images for illustration only - see specification within for dimensions and labelling

TOC 635 PLUS
&
TOC 635 MICRO

Addressable Gas Detector Control Panel

Operation, Maintenance and Safety Instruction Manual

V2.7

Read in Conjunction With Installers Guide

internationalgasdetectors.com
+44 (0)161 483 1415
sales@internationalgasdetectors.com
/international-gas-detectors-ltd

Triton House
Crosby Street
Stockport
SK2 6SH

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Brief Introduction

The Tocsin 635 series control panels use the latest technology 2-wire addressable highways to control gas detectors and associated accessories. Providing an extremely flexible and low cost solution.

Main Features

635 Series
Up to 32 Detector Nodes
Jog Wheel Interface
RGB Backlit Display

Service & Maintenance

It is recommended that control panels and all connected detectors are commissioned upon installation and serviced every 6 months by an IGD trained technician. IGD can offer full training to enable your staff to do the servicing or offer a competitive service from our fleet of service engineers.

Warnings and Performance Statements

This control panel is NOT to be located in a classified Ex area, devices installed in an Ex area can be connected to this unit but shall be protected with one of the types of protection listed in IEC 60079-0 corresponding to their own category. We recommend users read the procedures described in IEC 60079-29-2 for reference. The controller is intended for indoor use and can only be used outside when fitted into a suitable IP rated IGD field enclosure.

This product must be earthed in accordance with local safety regulations. A switch or circuit breaker must be included in the installation; it must be suitably located; easily reached and it must be marked as the disconnect device for the equipment.

The Control Panel leaves the factory configured for the supply voltage stated on the customers order. Standard options are indicated in the basic specifications on page 4

Should the control panel be used in conjunction with portable generating equipment, care should be taken to ensure that the electrical supply is within the tolerance band described above.

The control panel may be stored at temperatures between -25°C and 60°C. If stored at low temperatures and then brought into a warmer environment care should be taken to ensure that condensation does not form or enter critical electrical components, for example the power supply. Allow 24 hours to stabilise extremes of temperature.

The Control Panel is designed to operate within specification for ambient temperature between -20°C and 55°C, relative humidity up to 90% (non-condensing). Sensor specifications may differ.

Do not use a Control Panel for protection applications that has not been calibrated. If calibration seals are missing from the control panel or have been tampered with or broken, then the control panel must be re-calibrated and sealed by a trained engineer.

Substances and interfering gases can cause adverse effects on the performance or electrical safety of the gas detection systems. Care should be taken to limit exposure to these poisoning substances, for further advice and information contact head office

The response time of the entire system is determined by the time of response of all the parts of the equipment within the gas detection system.

The relationship between the output signal and the gas concentration is linear, the control panel interprets the signal and the gas level is displayed on the RGB backlit display. IGD hold evidence of this linear performance which is available upon request.

Basic Specification

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Power	110-230V AC 50/60Hz 57W (Full Load)
Construction	ABS
Display	2 Lines x 8 Digit LCD Display Multi-Colour Backlight (Red-Alarm, Yellow-Fault, Blue-Normal)
User	IGD Jog Wheel Option Select, Alarm Reset, RGB
Outputs	3 off SPCO Relays 4A Non-Inductive User Configurable 1 off Fault Relay SPCO Relays 4A Non-Inductive 1 off Solid State Beacon Sounder Output Additional Digital Inputs/Relay Outputs Can Be Added To Highways if Required see feature table for model differences
Other I/O	Sounder 85dB @ 300mm (Mutable) 1 off RS485 Port Modbus in/out (PLUS only) 2 off Multi-Function Inputs mA or Digital (PLUS only) 6 User Defined Alarm Indication LEDs Illuminated RGB Light Ring, Alarm, Fault, Menu etc
Inputs	Up to 8 or 32 off Addressable Series Detectors or I/O Modules see feature table Note external Booster PSU may be required
Measurement Ranges, Based on Sensor	0-100 %LEL, 0-100% Vol, 0-25% Vol, 0-5pppm, 0-25ppm, 0-100ppm, 0-500ppm, 0-1000ppm, 0-5000ppm
Temperature	-20 to +55 Deg C Full Specification.
Usage	Indoor use
Humidity	20-90% RH Non-Condensing
Sealing	IP54
Mounting	Wall Mount
Maximum Altitude	2000m
Weight	1.2Kg
Overvoltage Catagory	OVC II
Pollution Degree	PD 2

Features

	TOC-635-PLUS	TOC-635-MICRO
Detector Ports	1	1
Supported Detectors/Modules	99	99
On-Board relays	4	3
External Relays/SSR	99	99
Digital Inputs	2	0
Sounder	YES	YES
Real Time Clock	YES	YES
RGB Display	YES	YES
Illuminated RGB Menu Wheel	YES	YES
WiFi Connectivity	YES	NO
6 Assignable Alarm LEDs	YES	NO
Event Log Report	YES	NO
Beacon Sounder Output Port	YES	NO
Modbus Connectivity	YES	NO
Battery Backup Port	YES	NO
System Status Report	YES	NO
Calibration Status Report	YES	NO

Note that ultimately the number of supported devices will be determined by the internal PSU capacity. This is limited to 42W for the TOC-635 Highway. When planning installations refer to the installers guide check power consumption for the proposed installation.

Important Notes

Gas detection systems must be correctly specified, installed and maintained in order to be effective. Anyone undertaking elements of this work should have access to the necessary equipment and be able to demonstrate competence. This will usually mean having passed a training competency course. International Gas Detectors run training courses for safety survey, specification , installation and service aspects of hazardous gas detection systems. In addition IGD can supply test equipment and calibration gases necessary to undertake this work.

Please the following points

1. A zero grade gas usually instrument air or Nitrogen and a suitable calibration gas mixture is required.
2. The correct gas adaptors must be used to apply gases to detectors when zeroing and calibrating. Incorrect application of gases can affect calibration results
3. Use equipment and gases traceable to a national standard. Any calibration will only be as good as the equipment and materials used.
4. IGD supply fixed flow regulators for use with IGD calibration gas bottles which supplies gas at 0.5l/min

Panel Options

Part Number	Description
TOC-635-PLUS	230V AC Control Panel 57W Standard Features including 2 x 8 RGB Display and Jog Wheel 4 Relays, 1 Highways, 32 Devices See Feature Table
TOC-635-MICRO	230V AC Control Panel 57W Standard Features including 2 x 8 RGB Display and Jog Wheel 2 Relays, 1 Highways, 8 Devices See Feature Table

Available Accessories for use with the TOCSIN 650 & 635

TOCSIN 750 Series Annunciator
Options With:
Display, Relay Output, Digital or Analogue Input, Flammable Gas Detector

TOCSIN 750 Series Detectors
Flammable Gases, Toxic Gases
Oxygen

TOCSIN 102 Series Detectors 2-WIRE
Flammable Gases, Toxic Gases
Oxygen For ATEX Applications

General

Note cables run with modules sequentially wired.

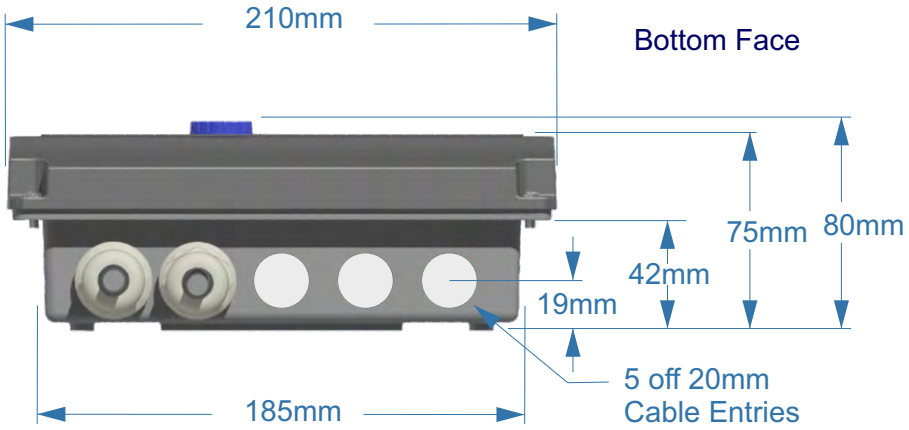
Power can be taken from system modules for small current devices such as LED beacon sounders and is limited to 100mA per module

Highways are fused at 2A, observe load calculations when planning, use boosters where necessary

Observe interface requirements for relays, fitting freewheel diodes and snubbers as indicated

End of line terminators, supplied with panels must be fitted for correct operation

TOCSIN 635 MICRO AND PLUS PHYSICAL

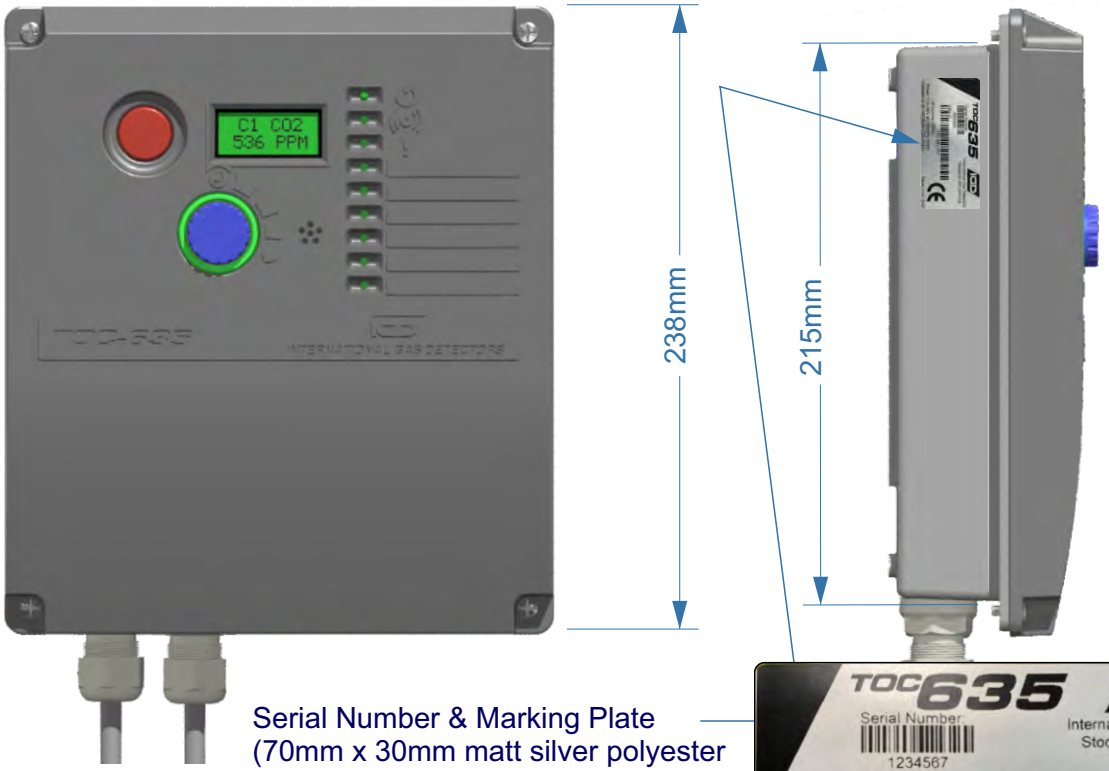


2-Wire Addressable

Front Face

Weight: 2.7kg

Side Face



Installation Cables

Serial Number & Marking Plate (70mm x 30mm matt silver polyester including the Ex marking and all the information requested in IEC 60079-0 and IEC 60079-29-1) see examples

Supported Installation Cables 2 Core 1.0 or 1.5mmSQ See IGD Cable System Calculator

Typically SWA, MICC, FP200, SY, CY, System cables must be screened, refer to installers guide

Installation Guide

Your 635 control panel has been supplied with a separate installation guide. Please read this before installing your system. The Installation guide provides information for correct cable selection, how to correctly install cables and devices and ensure correct cable segregation. It is important to read and understand this document prior to installation.

Copies of the installation guide are available in the downloads section of our website. Always check you are using the latest versions of the supplied manuals by checking on the IGD website.

Failure to follow correct installation may result in poor performance and/or damage to system components.

IGD-Academy

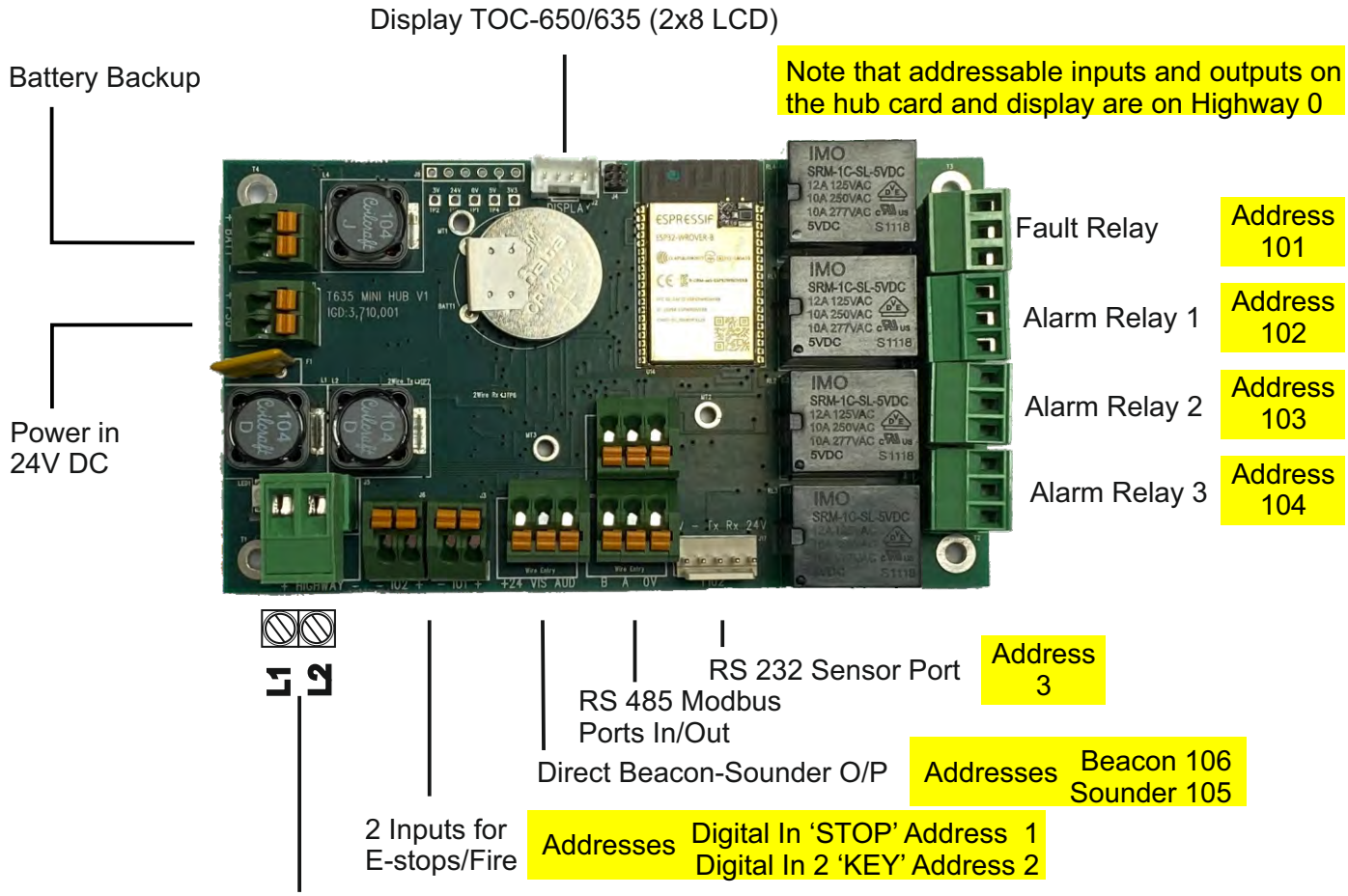
IGD's On-Line training academy is available to support your companies activities. The Academy features a range of CPD approved training courses and 'how to' videos.

The academy can be found at: https://igdacademy.internationalgasdetectors.com

Please note that some courses are only available on a request basis. If you require a request only course please email sales@internationalgasdetectors.com to request your account and course.

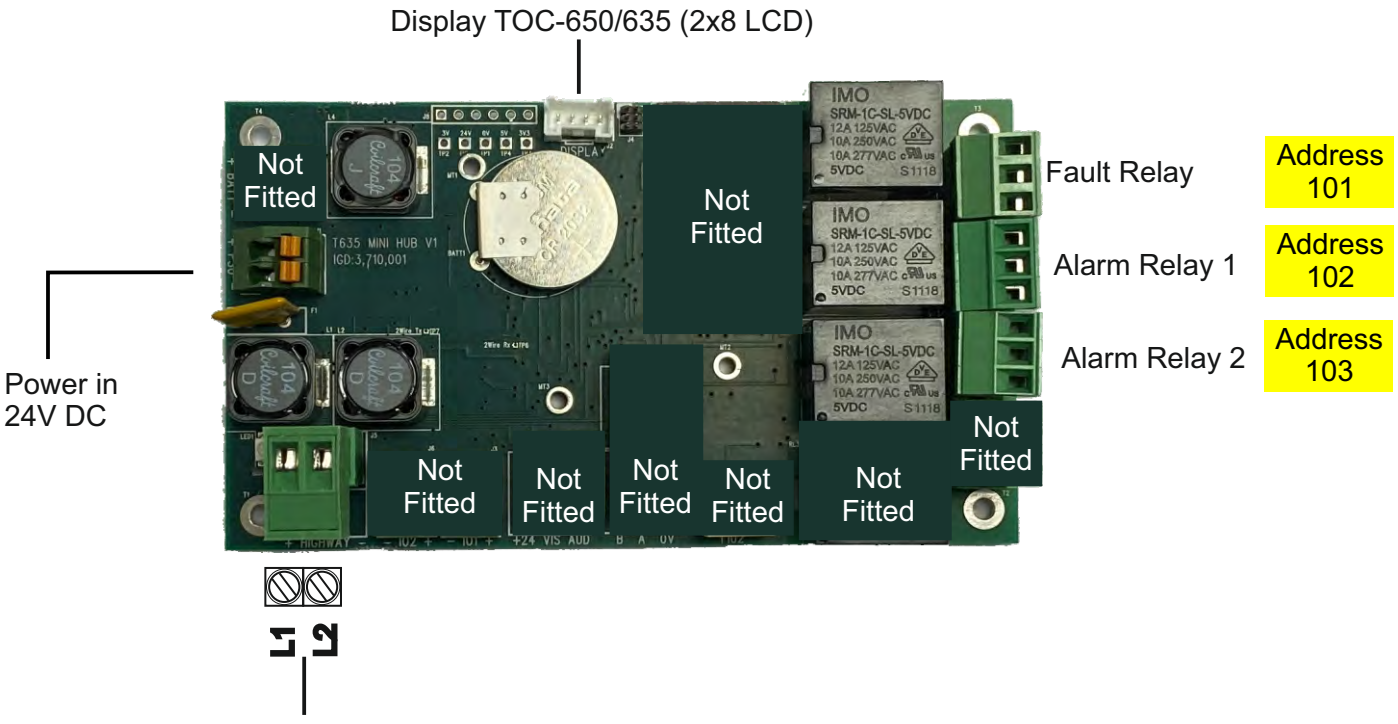
T635 PLUS Control Panel & 2 Wire Hub Controller PCB Features & I/O Addresses

Fitted to Controller PN TOC-635-PLUS



T635 MICRO Control Panel & 2 Wire Hub Controller PCB Features

Fitted to Controller PN TOC-635-MICRO



T635 PLUS Control Panel & 2 Wire Hub Controller PCB Features & I/O Addresses

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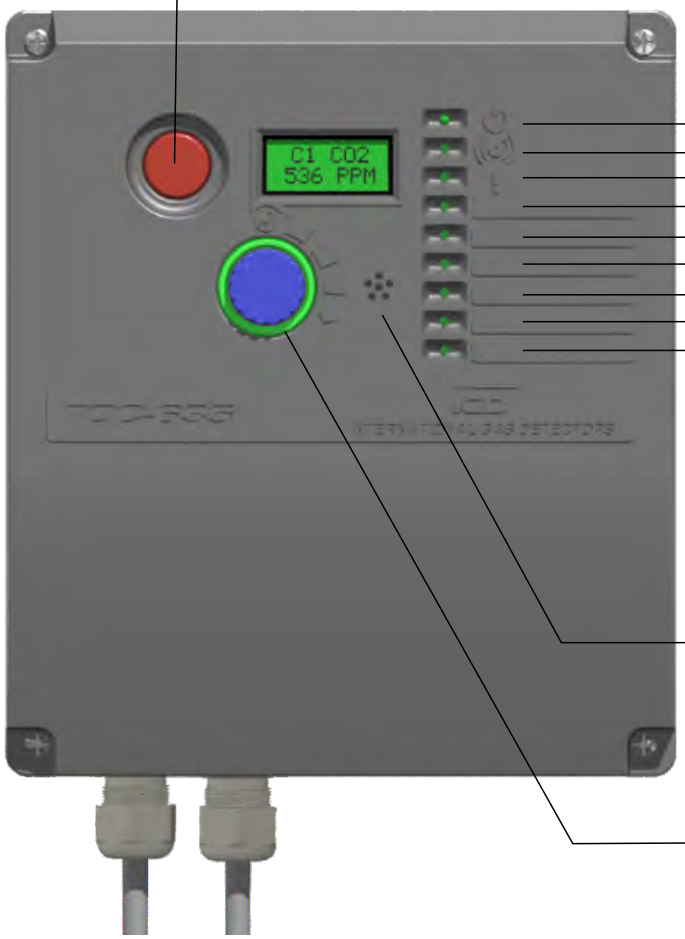
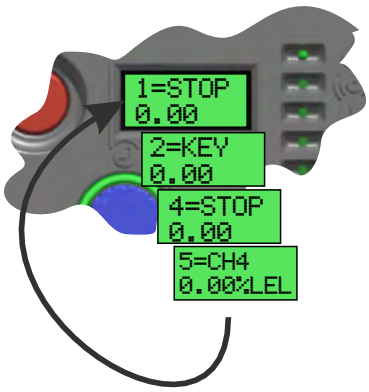
Note that addressable inputs and outputs on the hub card and display are on Highway 0



Reading the Display



After warm up the display will sequentially indicate each detector. The detector channel number is shown along with gas type, units and level. The first channel is always digital input 1. By default this is labelled 'STOP' for an emergency stop input, but can be changed. Input 2 is digital input 2, labelled 'KEY'. Input 3 is the onboard sensor input which is by default, disabled. As such this channel does not display on screen. Channel 4 is then the on-board E-STOP on the display.
The first detector channel cabled to the detector highway port is channel 5.
Any other channels 'found' during installation are sequentially numbered from 5 onwards.
Note that channel numbers are related to detector addresses. This can be seen by downloading using the WiFi feature, the panel setup.
Note also that inputs run from addresses 1 to 99 and outputs run from addresses 101 to 199

Special Status States

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State	Indication	State
Warm up	On Screen Count Down ‘Blue’	Modbus State Available* Fault Relay Normal Alarm Relays Normal
Fault Communication	Comms Error Displayed ‘Yellow’	Modbus State Available* Fault Relay Active Alarm Relays Normal
Fault Over Range	Channel/Display Indication Yellow	Modbus State Available* Fault Relay Active Alarm Relays Normal
Fault Under Range	Channel/Display Indication Yellow	Modbus State Available* Fault Relay Active Alarm Relays Normal
Fault Failed Self Test Processor Voltage	On Screen Display Indication Yellow	Modbus State Available* Fault Relay Active Alarm Relays Normal
Fault Failed Self Test Flash Memory	On Screen Display Indication Yellow	Modbus State Available* Fault Relay Active Alarm Relays Normal
Fault Failed Self Test RAM	On Screen Display Indication Yellow	Modbus State Available* Fault Relay Active Alarm Relays Normal
Alarm 1, 2, or 3 Active	On-Screen Red Alarm 1, 2, or 3 Active Display Each Channel in Alarm	Alarm Relay 1, 2, or 3 Active** Modbus State Available* Fault Relay Normal
Zero/Calibration in Progress	Calibration in Progress	Modbus State Available* Fault Relay Normal Alarm Relays Normal
Inhibit Controller	On-Screen Blue	Modbus State Available* Fault Relay Normal Alarm Relays Normal
Output Test	On-Screen Blue	Modbus State Available* Fault Relay Normal Alarm Relays Normal

* See Modbus information for available registers and options

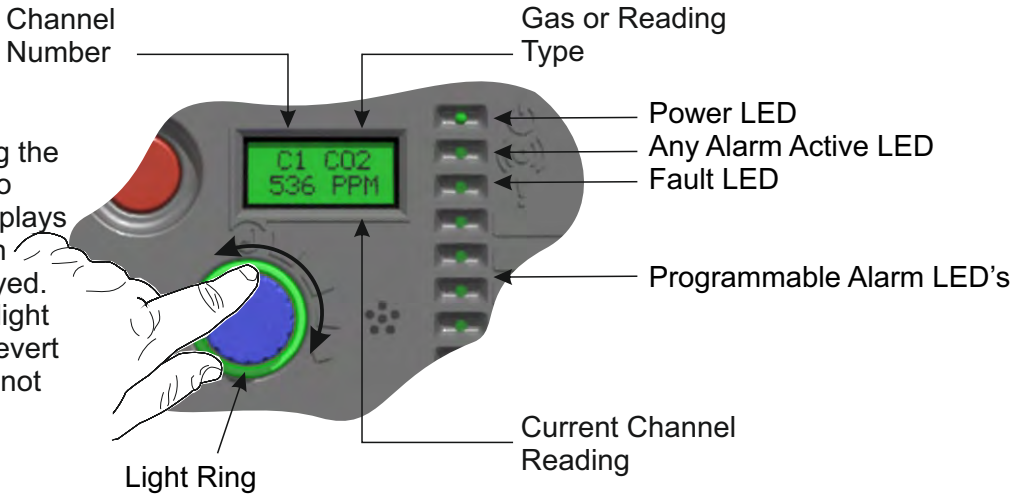
** Alarm Relays can be setup via the controller software, see alarm options. Each channel on the system will automatically have at the least an alarm level one. This is not optional

The following Pages indicate some of these special states and how they are displayed

User Actions....Day to Day Operation

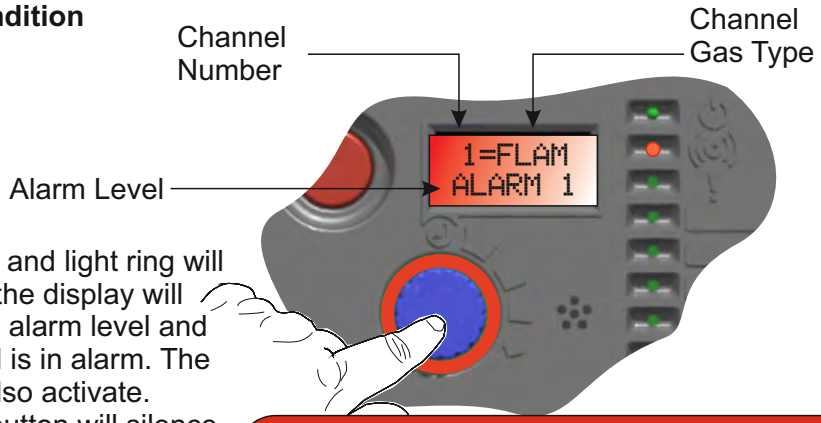
Once fully installed the TOC-635 controller will continuously monitor connected gas detectors and sensors and compare current values with any set alarm thresholds. The display will cycle to display each channel in turn.

Display and jog wheel Use



In normal operation rotating the jog wheel allows the user to move between channel displays rather than waiting for each channels data to be displayed. Note the display will show light blue when doing this and revert to green if the jog wheel is not used for a few minutes

In Alarm Condition



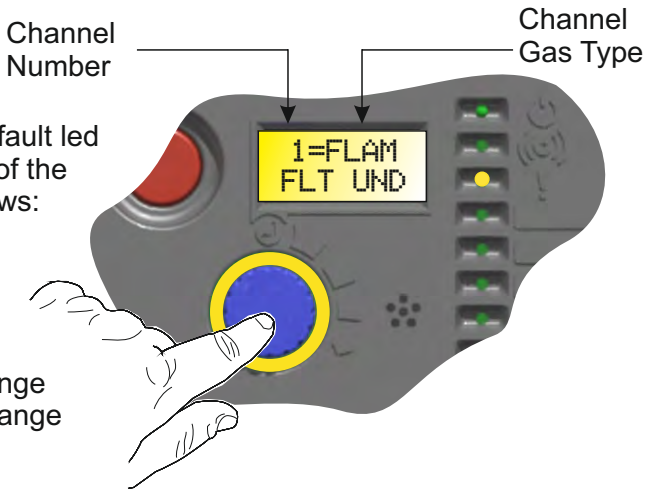
In alarm mode the RED alarm led will either be flashing for alarm level 1 or solid for alarm level 2. The bottom line of the display will indicate:

Alarm 1
Alarm 2
Alarm 1&2

The back light and light ring will flash red and the display will indicate which alarm level and which channel is in alarm. The sounder will also activate. Pressing the button will silence the sounder. If the gas is still breaching the alarm threshold it will not be possible to reset the alarm. The sounder re-instates if the next alarm level is breached

In the event of alarm or fault, CALL FOR SERVICE.
The owner operator is not usually a gas engineer or competent person as defined by Health and Safety guidelines. If there is any doubt call your service company and get it checked.

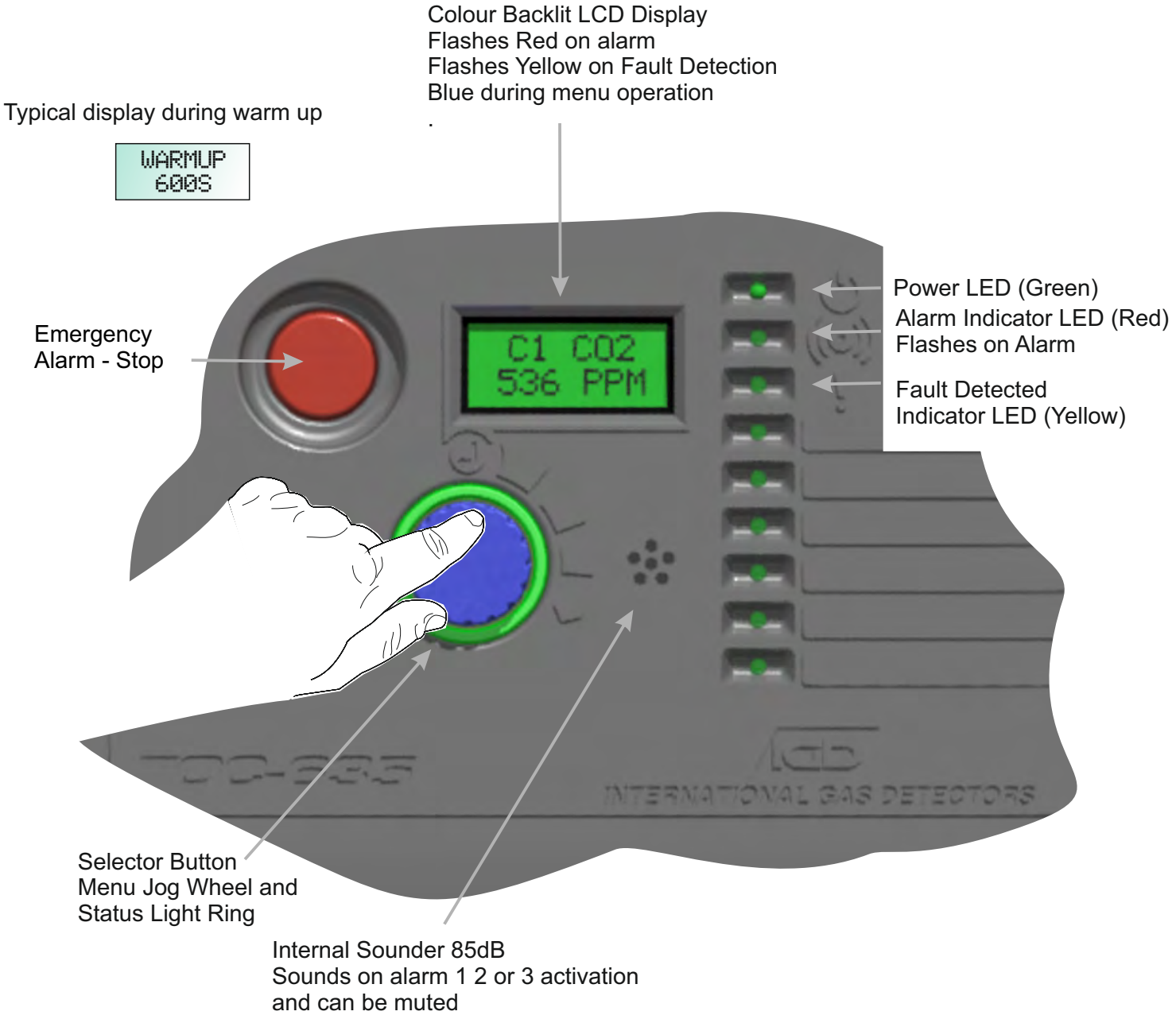
In Fault Condition



In FAULT mode the Yellow fault led will be on. The bottom line of the display will indicate as follows:

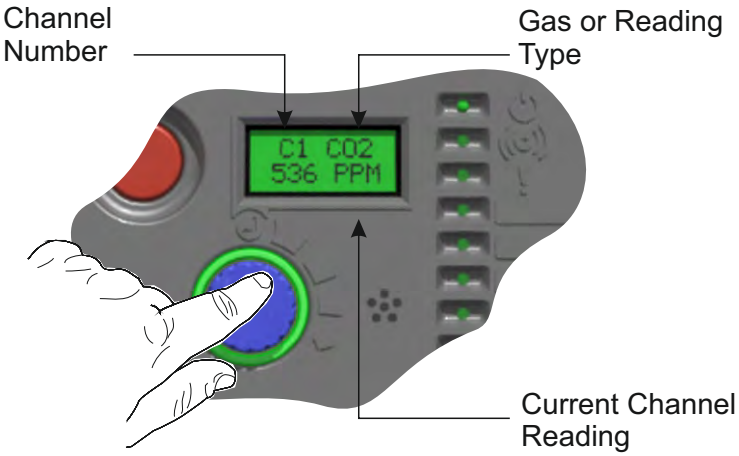
FLT COM	communication error to sensors
FLT SEN	Sensor Error
FLT OVR	Sensor Over Range
FLT UND	Sensor Under Range

Controller Interface Overview



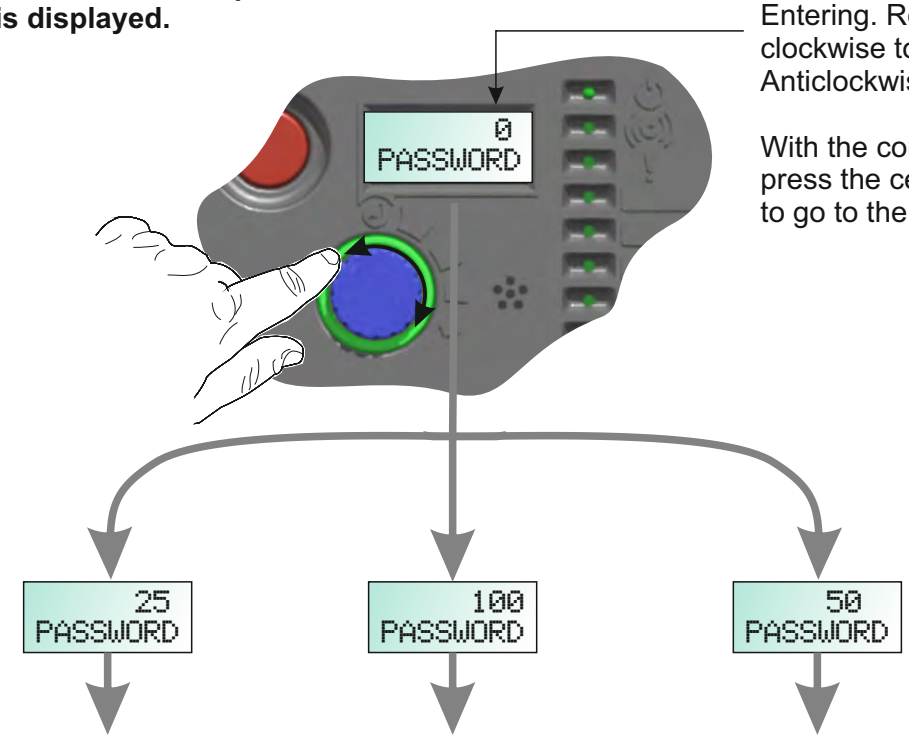
- Initial power up sequence is:
  - Indicate board tested status (end user should see “PASSED” with a green backlight)
  - Display then shows Software version, Checksum and date, Display version, display checksum and date, connected sensor info
  - Countdown

To View Channels Rotate the Jog Wheel



Data entry and menu selection using the password entry as an example.

To access the menu system press the button until the message "Release button and enter password" message is displayed.



INHIBIT

Inhibit the control panel for up to 60 minutes. Use this option if calibrating or accessing the connected devices using a laptop running IGD Configurator software. Inhibiting the panel means it stops communicating to connected devices this prevents alarms or data clashes during PC access.

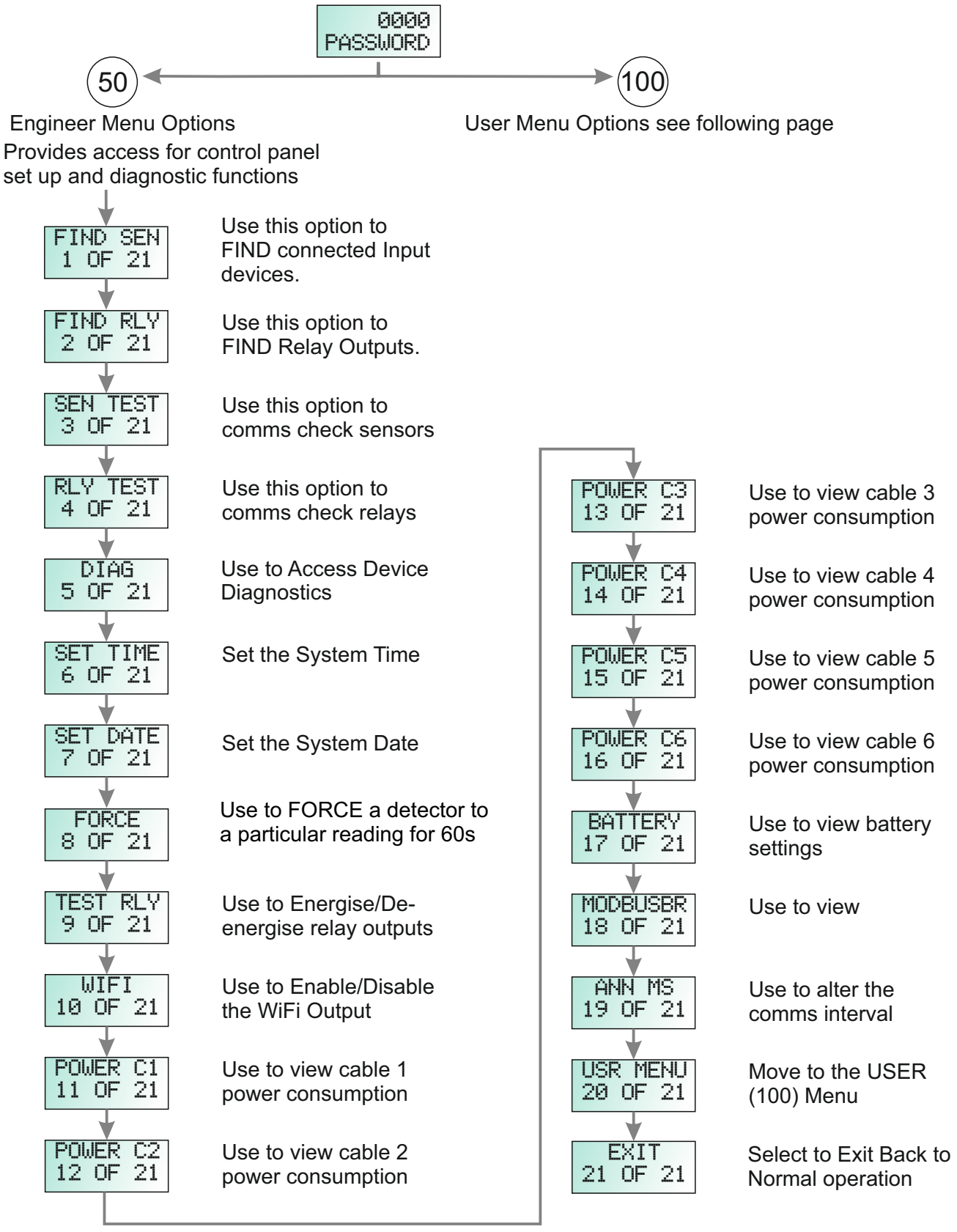
USER MENU CALIBRATIONS & ALARMS

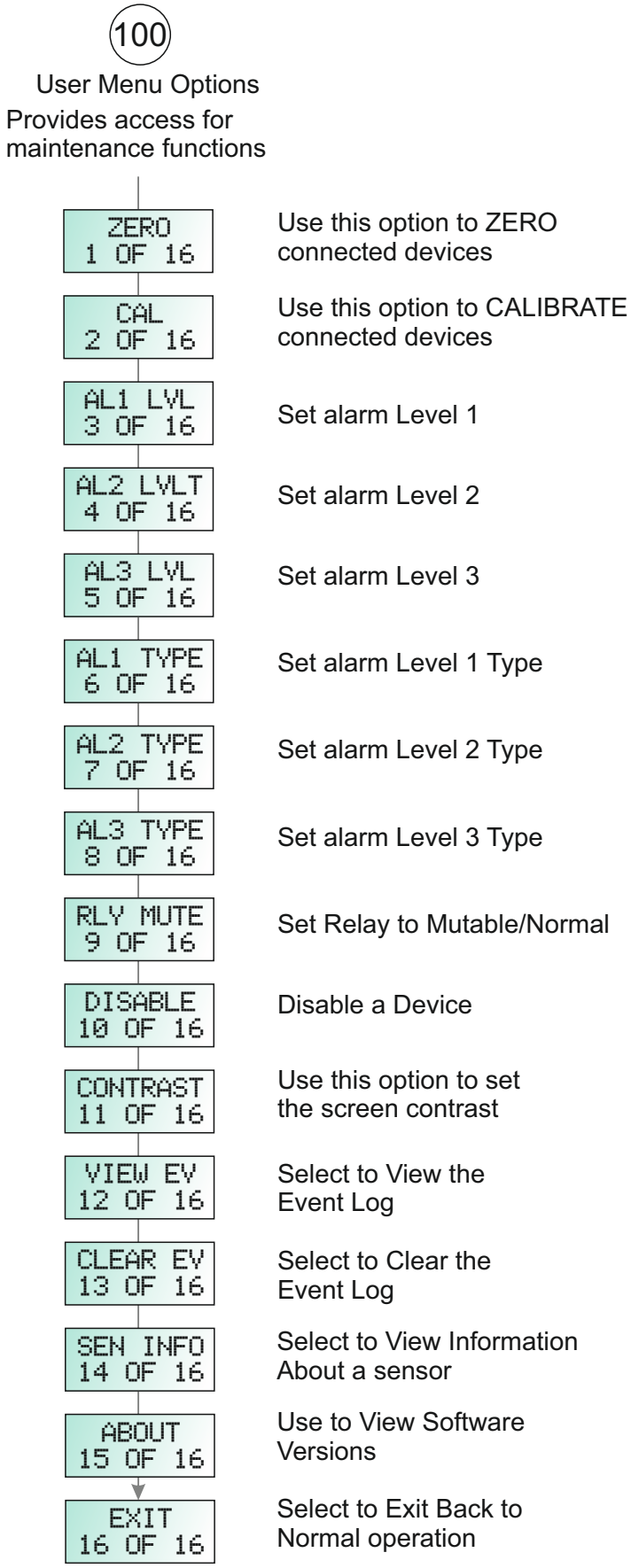
Zero and Calibrate Sensors. Setup alarm levels and relay actions.

ENGINEER MENU PANEL TEST & SETUP

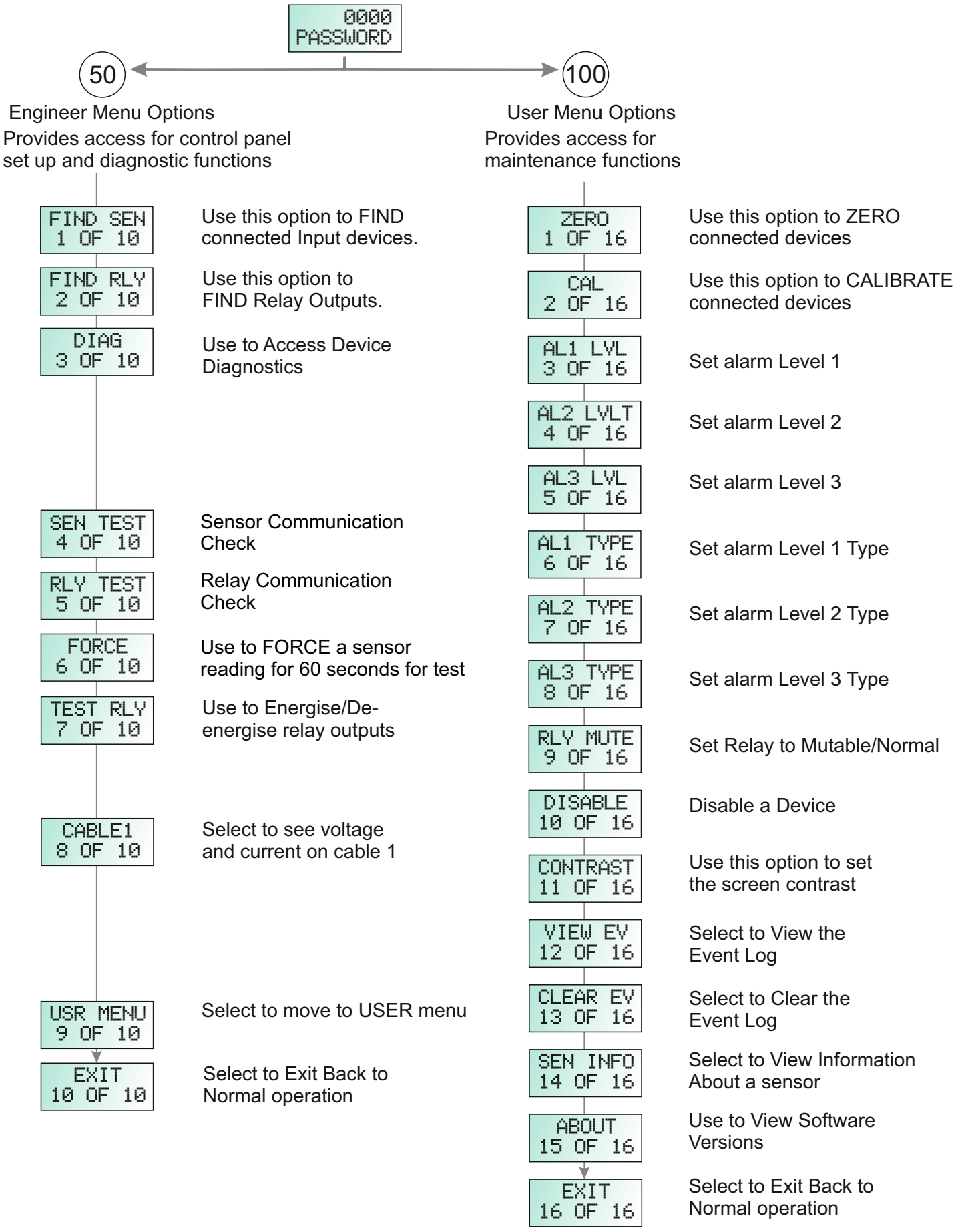
Test I/O Functions, FIND connected devices. Setup channels, Modbus addressing etc.

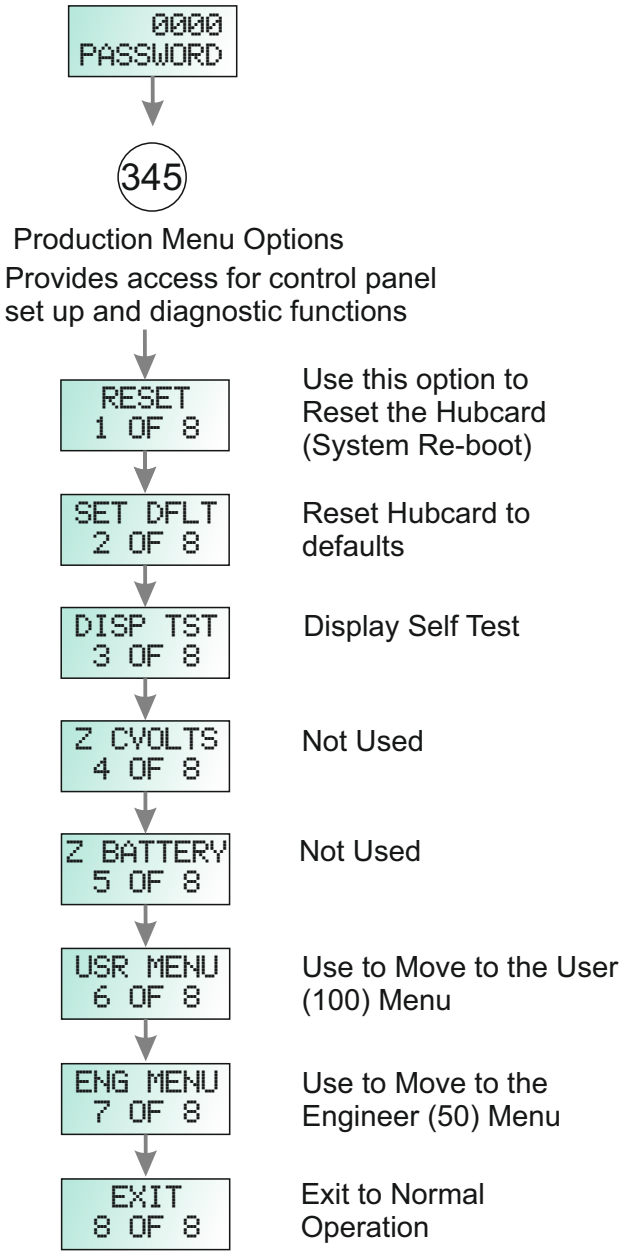
TOC-635-PLUS Menu Overview




100
User Menu Options
Provides access for maintenance functions
ZERO 1 OF 16
Use this option to ZERO connected devices
CAL 2 OF 16
Use this option to CALIBRATE connected devices
AL1 LVL 3 OF 16
Set alarm Level 1
AL2 LVLT 4 OF 16
Set alarm Level 2
AL3 LVL 5 OF 16
Set alarm Level 3
AL1 TYPE 6 OF 16
Set alarm Level 1 Type
AL2 TYPE 7 OF 16
Set alarm Level 2 Type
AL3 TYPE 8 OF 16
Set alarm Level 3 Type
RLY MUTE 9 OF 16
Set Relay to Mutable/Normal
DISABLE 10 OF 16
Disable a Device
CONTRAST 11 OF 16
Use this option to set the screen contrast
VIEW EV 12 OF 16
Select to View the Event Log
CLEAR EV 13 OF 16
Select to Clear the Event Log
SEN INFO 14 OF 16
Select to View Information About a sensor
ABOUT 15 OF 16
Use to View Software Versions
EXIT 16 OF 16
Select to Exit Back to Normal operation

TOC-635-MICRO Menu Overview




0000
PASSWORD
345
Production Menu Options
Provides access for control panel
set up and diagnostic functions
RESET
1 OF 8
Use this option to
Reset the Hubcard
(System Re-boot)
SET DFLT
2 OF 8
Reset Hubcard to
defaults
DISP TST
3 OF 8
Display Self Test
Z CVOLTS
4 OF 8
Not Used
Z BATTERY
5 OF 8
Not Used
USR MENU
6 OF 8
Use to Move to the User
(100) Menu
ENG MENU
7 OF 8
Use to Move to the
Engineer (50) Menu
EXIT
8 OF 8
Exit to Normal
Operation

It is necessary to follow the correct setup sequence for the controller to function correctly, observe all permit to work or hot work permit systems etc. In all cases refer to latest revisions local wiring standard for example in the UK:

BS 7671	IET Wiring Regulations
BS 60079-14	Explosive atmospheres - Electrical installations design, selection and erection
BS60079-17	Explosive atmospheres - Electrical installations inspection and maintenance
SL-016	IGD 2-Wire Installers Guide (see IGD website for latest revision)
SL-035	IGB JB3 ATEX Junction Box Manual
SL-xxx	Latest revision controller, detector and device manuals (use latest revision)

Note for the TOC-635 it is required to use the controllers embedded web pages to access making changes to alarm levels and relay cause and effect etc. See previous section as to how to access.

NOTE TOC-635 MICRO has a fixed controller setup based on detectors fitted and does not have a WIFI Interface. Alarm levels can be altered but not the cause and effect for relays

1. Before commencing ensure that the controller is being fed via a suitable fused mains supply spur and that it has been correctly tested for polarity and Earth continuity. Fit a 2 Amp Fuse

2. Ensure each detector cable leg has been tested for insulation resistance prior to connecting the controller and or nodes. Performing an insulation resistance test with detector and or the controller in circuit cause damage to the electronics, ensure only cable runs are tested.

3 Ensure all devices are terminated following instructions in the latest version 2-Wire installers guide. Make sure cables used are of the correct type and terminated correctly. Check all cable screens are continuous.

4. With all devices connected the controller can be powered. Check the following:

a. Adjust the PSU to 27.5V DC

b. Detector nodes should all be showing green power LED's

c. Use a suitably calibrated clamp meter to ensure highway power is less than 2 Amps

d. Check that a terminator is fitted to each cable highway and that end of line voltage is greater than 18V DC

5. Check each detector node for its base address and that the addresses do not clash with any other devices on the same highway. Resolve clashes by altering base addresses as necessary. Where ancillary devices such as beacon-sounders or mA input sensors are connected check the setup on the node is correct using an IGD dongle and IGD setup software.

7. Perform a **SENSOR FIND**. find sen 1 of 12

This will setup the correct sensor channel configuration and correct number of channels. Sensors will be allocated to channel numbers based on the lowest sensor address being allocated to the first available channel number and then sequentially thereafter. Note that the channel sequence can be adjusted afterwards using the **Re-order** function, to group sensors if required. Use the **Sensor Comms test** function to check for correct communication.

8. Perform a **RELAY FIND**, find rly 1 of 12

this will set up the correct number of system relays. Note that the relay sequence cannot be moved around in the same manner that the sensors can and MUST be programmed in the sequence they are found. If relays are moved around after a FIND then the alarm relay setup will still work but relay diagnostics will not perform correctly. The reason for this is that the diagnostic routines will expect relay addresses to be grouped, correlating to their devices. For example an 8 way relay card may number 110 to 118 but an annunciator may only be using one relay address. Mixing the single relay address into the sequence of an 8 way relay card will stop the diagnostic routine displaying and operating correctly. Use the **relay comms test** function to check for correct communication. **Relay Test** can be used to turn the installed relays on and off individually. This provides a method to test that the correct external devices are wired and function correctly to the expected system relay.

9. Use the **Alarm Relays** and Alarm **Levels** functions via the controllers embedded web pages to determine and setup what triggers each system relay to perform the desired cause and effect. Note alarm relays can action on rising or falling levels, can be latching or non latching and can be normally on or normally off. In addition each relay can action on any or specific alarm levels. See specific sections in the manual regarding this.

10. Check through **System Options** via the controllers embedded web pages to ensure all required global settings are correct, generally the defaults can be used.

11. Use the '**Force Reading**'

function to ensure the programmed cause and effect operates as required including external interfaces to other systems.

12. Ensure the Event log is cleared. Addressable gas detectors are shipped pre-calibrated. This does not obviate the installer from testing each detector with a suitable calibration and zero gas to prove they a) function correctly b) meet calibration. If necessary re-calibrate any detectors that are outside +/-2% accuracy. Ensure detectors are fully warmed up before undertaking any checks. It is advised that detectors have been powered for at least 4 hours. Where test gases exceed the alarm set points, alarms that are activated will be stored in the event log which can be retained as part of the commissioning records

13. Once the system is operating correctly download the system setup via the embedded web page menu's as part of the commissioning record.

14. Use the system options menu to store a backup of the commissioned system setup onto the controller itself.

15. Use IGD Dongle and software to save detector calibration data where detectors have been re-calibrated otherwise store 'as shipped' calibration information.

16. Set calibration interval on the control panel, initially to 6 months.

Finally clear the system event log so that it only reflects future events.

The system is now fully operational.

The following pages discuss each menu option in turn.

Follow the 2-Wire Installation guide
This provides location as well as cabling/installation guidance.
Failure to observe correct installation can have an adverse affect on system operation and performance
if you don't have a copy of this download it from www.internationalgasdetectors.com

If you are uncertain how to zero/calibrate or locate your gas detectors and system components then use IGD's online training academy.

If your application is safety related you must ensure you are a competent person with demonstrable training. If in doubt check with IGD for help and support.

Warm Up Period

With power applied the system should undertake its power up sequence and then commence a warm up period. The warm up period is there to allow connected detectors to stabilise before operation. Note that certain detector types, Oxygen sensors in particular take longer to stabilise. Typical warmup periods as:

Systems incorporating Oxygen detectors : 15 Minutes

Systems without Oxygen detectors: 5 Minutes

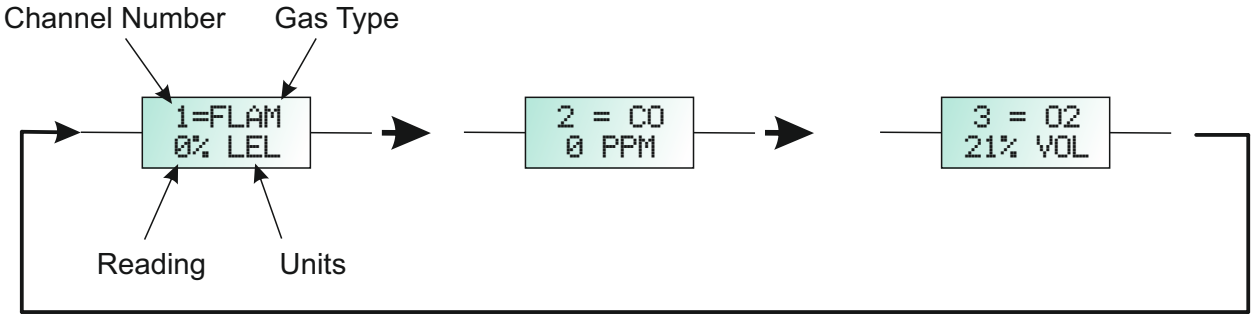
During the warm up period check that each connected detector or device has power and communication. The following diagram shows the three main terminal PCB types for detectors and I/O interface nodes and the relevant check points.

With sensors connected and after the TOC-635 controller has completed its warm up the operating system will go to normal operation mode.

Normal Operation

In normal operation mode the TOC-635 communicates to each detector or node in turn and displays the data on screen. Pressing the button once will activate the back light, each button press then cycles the display through each channel.

For example a three channel system with a Flammable gas detector, a Carbon Monoxide Detector and an Oxygen detector would read as:



If you need to perform a complete new set up

Then presuming the system is correctly installed and cabled the process would be as follows:

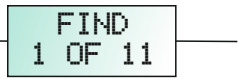
1. Use the FIND command to discover connected devices and install them to the controller

2. Set up the required alarm levels and relay actions

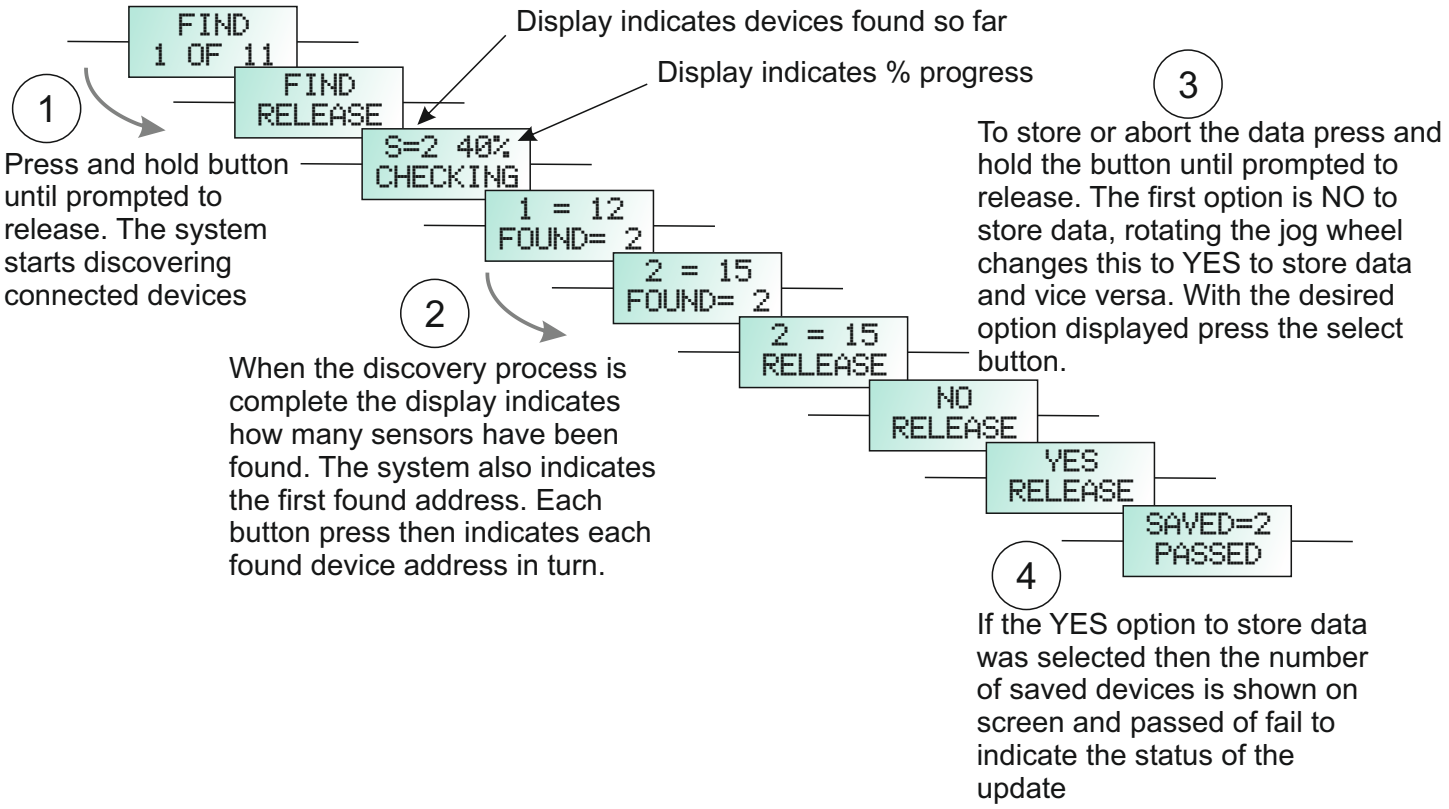
3. Test using zero and calibration gases

The following dialogues describe each function to use

The FIND Command



As previously described enter password mode and enter password 50 to gain access to the engineers menu. The first menu option (menu option 1 of 11) is the FIND menu. To run this option the detectors must be correctly connected to the controller and displaying green power LED function as a minimum (some of the green power LED's may be flashing if detectors already have communication.) The FIND function then works in the following manner

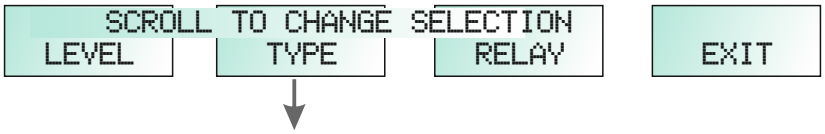


If the control panel has been shipped pre-configured then once correctly connected the system will be operational. The controller should correctly cycle through each channel with no indicated errors.

Relay Test

The alarm relay outputs can now be connected (if they are being used). The relay outputs can be forced on and off using the 'test relay' function (TEST RLY).

Once the alarm level has been set you then need to set the Alarm TYPE and decide which relay activates once the set alarm level is breached. The following sequence continues from the previous page and describes the set up sequences



To select an option rotate the jog wheel and press the selection button to select the required option

Top line indicates “select alarm type” Rotate the jog wheel to select the desired alarm type option. Press the selection button to select.

Rising Latching Alarm

Latching alarms remain set until the button is pressed to reset the alarm. The gas level must be below the alarm level threshold for the reset to operate. This type of alarm is typically used in safety applications. Where alarm is required in response to rising gas levels

Press and hold until prompted to release to select this option.

Rising Alarm

Rising alarms will automatically reset once the gas level falls below the alarm threshold. This type of alarm is typically used in control applications where action is required in response to rising gas levels.

Press and hold until prompted to release to select this option.

Falling Latching Alarm

Latching alarms remain set until the button is pressed to reset the alarm. For a falling alarm the gas level must be above the alarm level threshold for the reset to operate. This type of alarm is typically used in safety applications for Oxygen deficiency monitoring where you are monitoring for a falling Oxygen level.

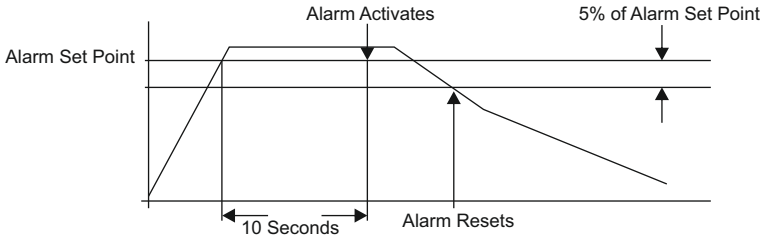
Press and hold until prompted to release to select this option.

Falling Alarm

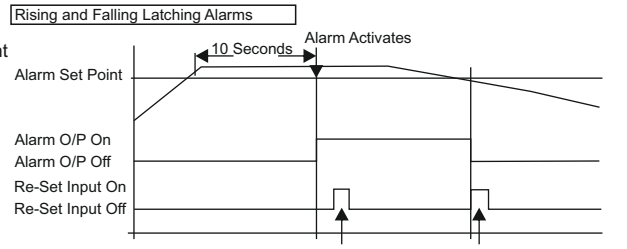
Falling alarms will automatically reset once the gas level rises above the alarm threshold. This type of alarm is typically used in control applications where action is required in response to falling gas level (typical in Oxygen deficiency applications).

Press and hold until prompted to release to select this option.

Rising and Falling Non Latching Alarms



Rising and Falling Latching Alarms



Indicates pressing the front panel ‘jog wheel’ to cancel the alarm

If alarm devices, output contacts or alarm signal outputs are provided as part of continuous duty gas detection equipment and are intended to operate when a potentially hazardous gas concentration is detected, they shall be of a latching type requiring a deliberate manual action to reset. If two or more alarm set points are provided, the lower may be non-latching - based on user preference. Alarms shall remain in operation while the alarm condition is still present, although audible alarms may be silenced if this audible alarm is not the only alarm.

Alarm Presets

Three alarms levels can be set against each detector channel on the system. The channel range, gas type and units of measurement are uploaded during a FIND from the detector itself and cannot be altered from the controller.

The alarm levels set against each detector channel are based on the type and range. The controller automatically sets alarm levels. The levels set are published in IGD document “OIGD193". Always refer to the latest version of this published in the downloads section of the IGD website. The enclosed sample document is for indication only, levels will change as new guidance is issued by governing authorities.

Information for Alarm Levels for IGD Fixed Gas Detection Systens

Gas Type	Chemical Formula	First Alarm Level	Second Alarm Level	Third Alarm Level (Optional)	Standard Range
Flammable	CxHx	10% LEL	20% LEL	40% LEL	0-100% LEL
Oxygen	O2	19.5% Vol	18.5% VOL	23% VOL	0-25% VOL
Carbon Monoxide*	CO	20ppm	55ppm	75ppm	0-100ppm
Hydrogen Sulphide	H2S	5ppm	10ppm	Optional	0-50ppm
Sulphur Dioxide*	SO2	0.5ppm	1ppm	Optional	0-5ppm
Chlorine	CL/CL2	0.2ppm	0.5ppm	Optional	0-5ppm
Nitrogen Dioxide*	NO2	0.5ppm	1ppm	Optional	0-5ppm
Nitric Oxide *	NO	2ppm	2.5ppm	Optional	0-25ppm
Nitrous Oxide*	N2O	100ppm	200ppm	Optional	0-1000ppm
Hydrogen Cyanide*	HCN	0.9ppm	4.5ppm	Optional	0-10ppm
Ammonia	NH3	25ppm	35ppm	Optional	0-100ppm
Hydrogen Chloride	HCL	1ppm	5ppm	Optional	0-10ppm
Ozone	O3	0.1ppm	0.2ppm	Optional	0-5ppm
Carbon Dioxide	CO2	3500ppm	4500ppm	Optional	0-5000ppm
Carbon Dioxide	CO2	0.5%VOL	1.5%VOL	Optional	0-5%VOL
Formaldehyde	CH2O	1ppm	2ppm	Optional	0-5ppm
Boron Trichloride*	BCL3	0.5ppm	1ppm	Optional	0-10ppm
Ethlyene Oxide*	C2H4O	5ppm	10ppm	Optional	0-10ppm
Hydrogen Fluoride	HF	1ppm	3ppm	Optional	0-10ppm
Hydrogen	H2	500ppm	1000ppm	Optional	0-1000ppm
Silane	SiH4	0.5ppm	1ppm	Optional	0-10ppm
Volatile Organic Compounds	VOC	See PID Manual			

Note Oxygen enrichment is also a hazard with a normal alarm point at 23% VV

Note these alarm levels are used where clients do not request their own preferred alarm levels when commissioning systems. These are in accordance to DSEAR, HSE EH 40 and MSDS datasheets

* New alarm levels as of January 2019, in accordance to EH 40. The above alarm levels are standard alarm levels when a cause and effect is not given.

Document Ref: OIGD193 V6

IGD International Gas Detectors
OLIVER IGD
Triton House
Crosby Street
Stockport
SK2 6SH
England
Tel: +44 (0)161 483 1415
Fax: +44 (0) 161 484 2345
Email: sales@internationalgasdetectors.com
Website: www.internationalgasdetectors.com
FS646773

The following should be noted:

1. At least Alarm Level 1 MUST be set and it MUST be greater than 5% of range.

2. The Alarm Level 1 relay on the controller cannot be altered and is always set to be the first alarm level.

3. Alarm levels can be altered via the menu system if required but MUST reflect published data to be effective for compliance to DSEAR, COSHH and similar national requirements.

4. Default values reflect UK requirements which may differ in other countries, check and adjust as appropriate.

5. There are no limitations as to how the second and third alarm levels are set.

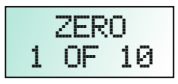
All gas detectors will require periodic ZERO and CALIBRATION. The calibration interval depends on a number of environmental factors such as: temperature variance, exposure to wind chill, rain, humidity changes and vibration to list a few. As a guide line gas detectors should be checked at least yearly. As with any measuring instrument if calibration is not held over the intervening interval then a shorter calibration interval may be required.
Detectors should always be zeroed first and then calibrated. Alarms should be isolated during this process. A normal calibration sequence would consist of:

1. Assess zero reading in pre-zero condition and record by applying a zero gas typically Nitrogen or Instrument air
2. Assess calibration point by applying a known calibration gas. and record
3. If the zero and calibration points are within +/-2% of range then take no further action. zeroing and calibrating a detector that already reads correctly will not improve its performance. If either is out then proceed to step 4.
4. Apply a suitable zero gas and zero the channel, observe and record result.
5. Apply a known calibration gas and calibrate the channel, observe and record the result.

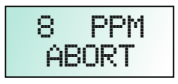
Notes

Do not rely on the ambient environment to provide a zero point, Nitrogen or Instrument air should always be used as appropriate. If there is a background level of the target gas and a zero is performed then the zero point will not be correctly set.

To Zero the detector enter password mode as previously described and enter password 100 to enter the user menu.
Select menu item 1 ZERO

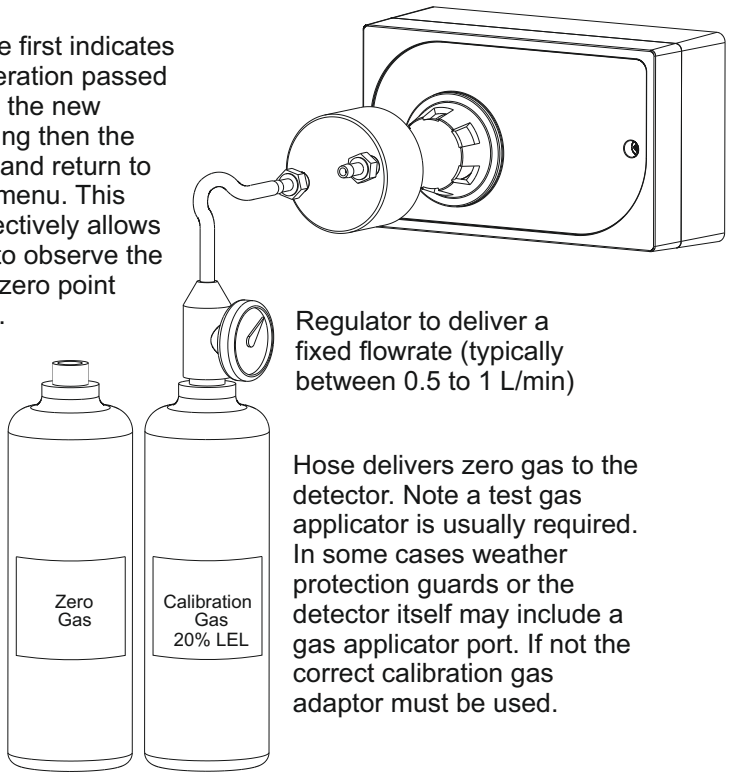


The top line of the display shows the current reading. The bottom line shows the current option.

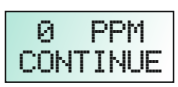


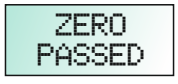
With zero gas flowing and the reading stable press the button to select CONTINUE. Now press and hold the button until prompted to release to action the zero request.

This sequence first indicates if the zero operation passed or failed, then the new detector reading then the option to end and return to the engineer menu. This sequence effectively allows the engineer to observe the new detector zero point before exiting.



Bottled Nitrogen or Instrument grade zero air





The display shows the result of the zero request, note that the actual zero and calibration values are stored on the individual detector heads. When carrying out a zero or calibration the controller sends the request to the detector head for action and monitors the result. This means that detectors can be supplied pre-calibrated
The reading is now displayed so the result of the zero request can be observed.
The reading should be stable. Click the button to return to the previous menu.
Repeat the sequence if you are not within +/-2% of zero.

Zero and calibration functions should only be undertaken by trained competent personnel. The effectiveness of a gas detection system is largely down to how well it is maintained and this means how well it is calibrated.

Apply zero gas to the detector.

It is important that the detector zero point is correctly set. It must be considered that there is the possibility that the gas to be detected is already present in the area of the detector. For this reason never zero on just the ambient surroundings.

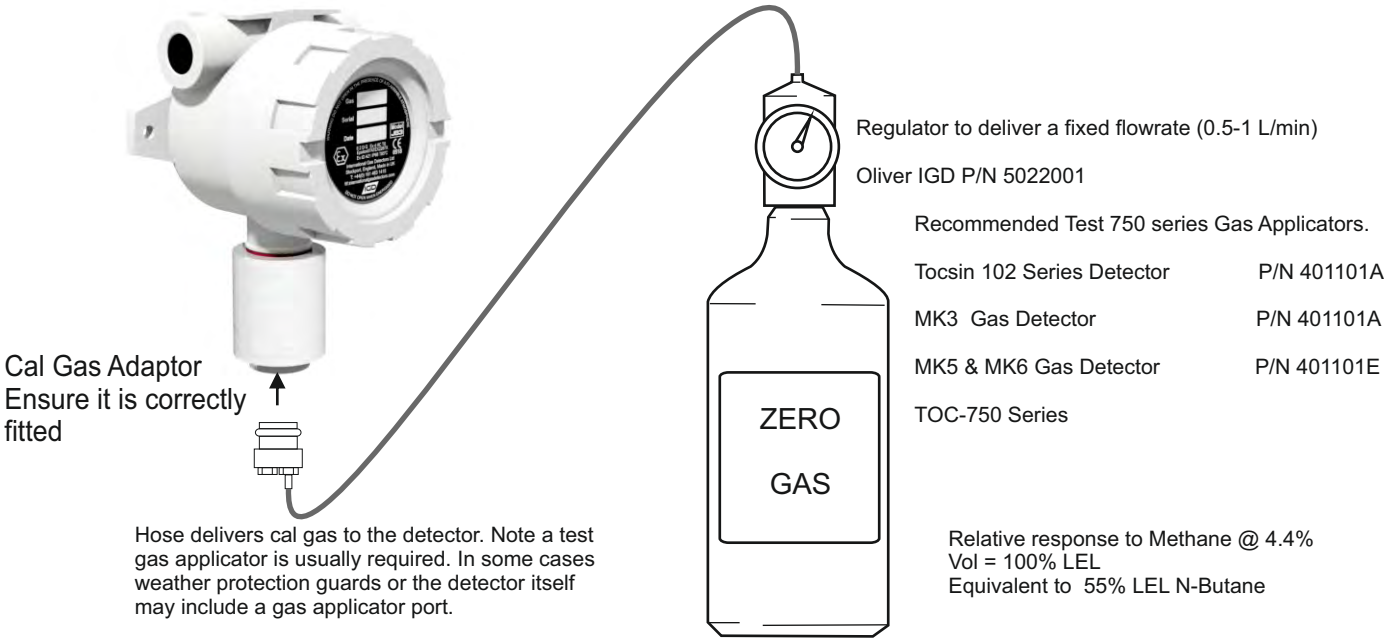
There are two possibilities

A. confirm there is no gas present by using a portable detector

B. Use a suitable ZERO gas as follows. Zero gas should have a humidity between 0-90%RH

GAS	RECOMMENDED ZERO GAS
O2/CO2	NITROGEN
PELLISTOR	INSTRUMENT AIR
TOXIC GASES	NITROGEN

The following diagram shows a typical equipment set up.



IMPORTANT: Flow gas for a minimum of 60 Seconds. Some detectors with longer response times may take longer to stabilise.

Procedure for check reaction time to gas

Ensure detector is at zero +/- 1% LEL
Use standard IGD professional gas introduction kit with 2M hose.
Connect calibration gas but do not turn on
Using a stop watch turn on the calibration gas and time to 50% and 90% LEL
Time to 50% should be less than 30 seconds
Time to 90% should be less than 60 seconds

Note on a 20% LEL bottle T50 point is 10% LEL and T90 point is 18% LEL
on a 50% LEL bottle T50 point is 25% LEL and T90 point is 45% LEL

replace non conforming sensors

Gas Detector CAL Function

Gas detectors must be calibrated with known calibration gases traceable to National Standards. As previously discussed detectors require regular calibration. Calibration gases should have values chosen that either:

a) Are at the alarm set point to get maximum accuracy at this point

or

b) Are between 50 to 90% of the range of the detector. The detector measuring range will normally be marked on the detector.

To CAL the detector enter password mode as previously described and enter password 100 to enter the user menu.

Select menu item 2 CAL

```
  CAL
2 OF 8
```

Enter the channel number you wish to calibrate.

```
      1
SENSOR
```

Enter the calibration gas value, this will be marked on the gas bottle and enter.

```
     50
BOTTLE
```

The top line of the display shows the current reading. The bottom line shows the current option.

```
55  PPM
ABORT
```

With CAL gas flowing and the reading stable press the button to select CONTINUE. Now press and hold the button until prompted to release to action the zero request.

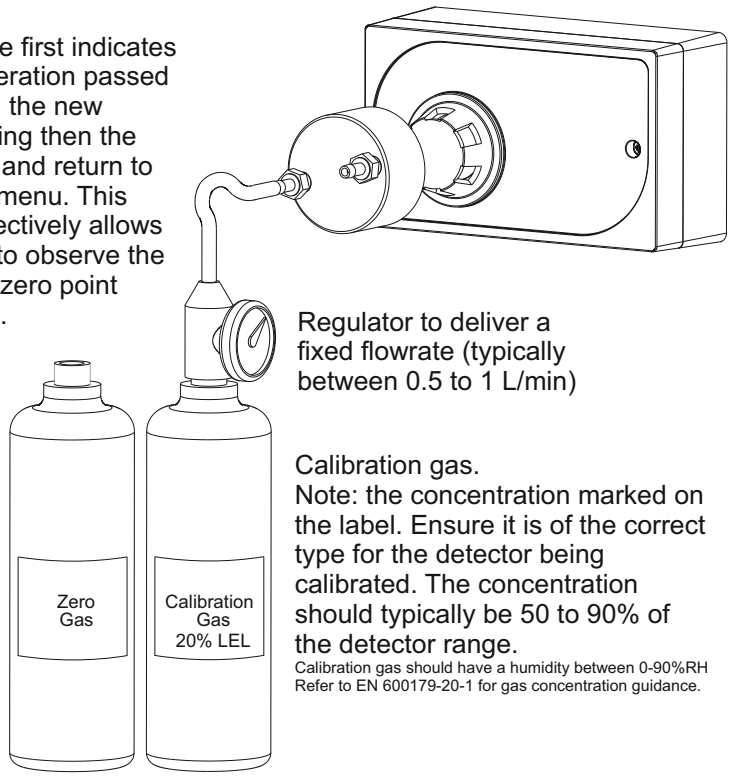
```
55  PPM
CONTINUE
```

```
  CAL
PASSED
```

```
50 PPM
CLICK TO
```

Repeat this sequence if you are not within +/-2% of the gas bottle value.

This sequence first indicates if the zero operation passed or failed, then the new detector reading then the option to end and return to the engineer menu. This sequence effectively allows the engineer to observe the new detector zero point before exiting.



Regulator to deliver a fixed flowrate (typically between 0.5 to 1 L/min)

Calibration gas.
Note: the concentration marked on the label. Ensure it is of the correct type for the detector being calibrated. The concentration should typically be 50 to 90% of the detector range.
Calibration gas should have a humidity between 0-90%RH
Refer to EN 600179-20-1 for gas concentration guidance.

Bottled Nitrogen or Instrument grade zero air

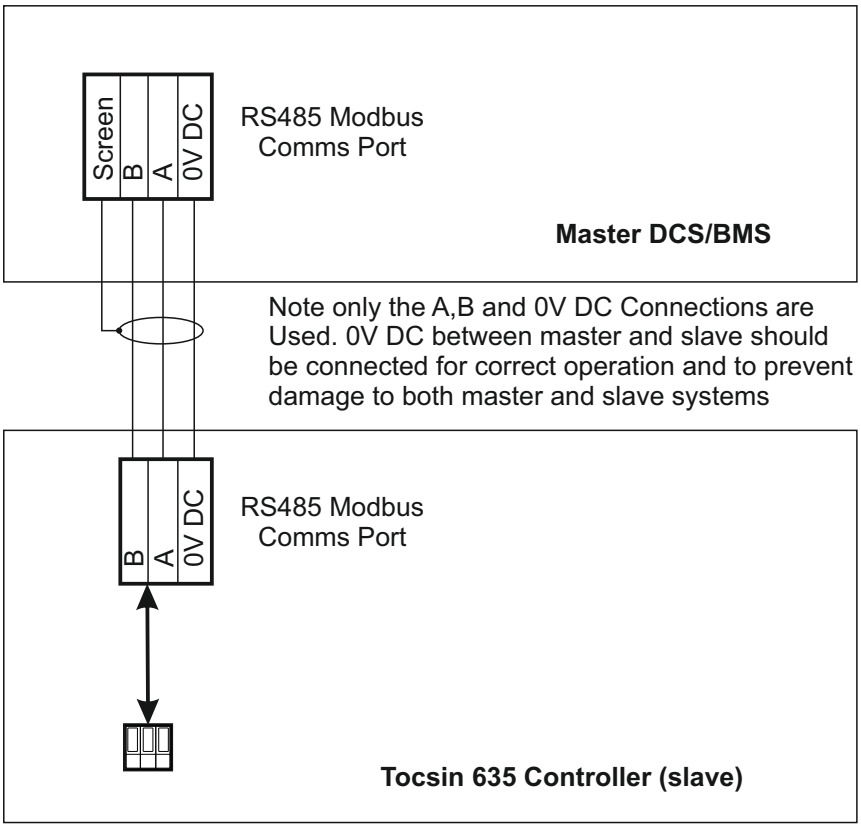
The display shows the result of the cal request, note that the actual zero and calibration values are stored on the individual detector heads. When carrying out a zero or calibration the controller sends the request to the detector head for action and monitors the result. This means that detectors can be supplied pre-calibrated

The reading is now displayed so the result of the cal request can be observed. The reading should be stable. Click the button to return to the previous menu.

Interfacing to the Remote Modbus Port (635 PLUS Only)

SL-014 V2.5

The TOC 635 controller has an in-built memory map allowing access to alarm status, panel status, readings etc using Modbus RTU protocol. Wiring between units is as follows:



MODBUS INTERNAL MEMORY MAP ADDRESSES

COMMAND STRUCTURE

Parameter	Setting
1: Modbus Mode	RTU Mode Only
2: Operating Mode	Slave Mode Only
3: Response Time [#1]	Maximum = 100mS (5s for Zero Command)
4: Requests	Maximum = 32 per Second
5: Panel Address	100 to 131 (100=default)
6: Baud Rate	4800, 9600, 19200 (19200=default)
7: Start Bits	1
8: Data bits	8
9: Parity	None, Odd, Even (Odd=default. None=T700 only)
10: Stop	1, 2 (1=default & T700 only)
11: Flow Control	None
12: Physical Interface	2 Wire RS232, 2 Wire RS485 (2 Wire RS485=Optional on T900)
13: Bit Order	Least significant bit transmitted first
14: Byte Order	Least significant byte transmitted first
15: Inter-byte spacing	Maximum = 1.5 bytes times (781uS @ 19200 Baud)
16: Inter-packet spacing	Minimum = 3.5 bytes times (1823uS @ 19200 Baud)

FUNCTIONS:

Command	Function	Register	Sensor	Returned Word
Read Sensor Conc	04	30,001 to 30,999	1 to 999	Min = 0 (-10% LEL) Max = 1200 (110% LEL) Resolution = 0.1%
Read Sensor Volts	04	31,001 to 31,999	1 to 999	Min = 0 (0.00V) Max = 500 (5.00V) Resolution = 0.01V
Read Area Status (T700 = Common Alarms)	04	32,001 to 32,999	AREA 1 to 999	Bit0 = AL1 Bit1 = AL2 Bit2 = AL3 Bit3 = Fault Bit4 = Sensor Disabled Bit5 – Bit15 = Spare
Read Sensor Status	04	33,001 to 33,999	1 to 999	Bit0 = AL1 Bit1 = AL2 Bit2 = AL3 Bit3 = Fault Bit4 = Sensor Disabled Bit5 = Sensor Fault Bit6 = Under Range Fault Bit7 = Over Range Fault Bit8 = Comms Fault Bit9 = Spare Bit10 = Spare Bit11 = Spare Bit12 = Spare Bit13 = AL1 Muted Bit14 = AL2 Muted Bit15 = AL2 Muted
Mute all Alarms	05	1	ALL	Pass = 0 Fail = 1
Reset all Alarms	05	2	ALL	Pass = 0 Fail = 1
Disable Sensor	05	1,001 to 1,999	1 to 999	Pass = 0 Fail = 1
Enable Sensor	05	2,001 to 2,999	1 to 999	Pass = 0 Fail = 1
Zero Sensor	05	3,001 to 3,999	1 to 999	Pass = 0 Fail = 1
Set Add. Relay = On	05	4,201 to 4,232	4201 to 4232	Pass = 0 Fail = 1,2,3 (1=Timeout, 2=Already Used, 3=Not Implemented)
Set Add, Relay = Off	05	5,201 to 5,232	4201 to 4232	Pass = 0 Fail = 1,2,3 (1=Timeout, 2=Already Used, 3=Not Implemented)

Troubleshooting

State	Indication	State
Warm up	On Screen Count Down ‘Blue’	Modbus State Available* Fault Relay Normal Alarm Relays Normal
Fault Communication	Comms Error Displayed ‘Yellow’	Check Wiring to Detector Nodes Check Terminator is fitted
Fault Over Range	Channel/Display Indication Yellow	Follow Site Safe Operating Procedure, ventilate area. When Safe check detector calibration
Fault Under Range	Channel/Display Indication Yellow	Check detector Zero and Calibration points with test Gas
Fault Failed Self Test Processor Voltage	On Screen Display Indication Yellow	Replace Main Hub Card
Fault Failed Self Test Flash Memory	On Screen Display Indication Yellow	Replace Main Hub Card
Fault Failed Self Test RAM	On Screen Display Indication Yellow	Replace Main Hub Card

Recommendations for maintenance after measuring range is exceeded

Allow to stabilise in clean air or use instrument air at 0.5L/Min for 4 hours. If reading is greater then 5% LEL after this period replace otherwise re-zero and calibrate

Standard accessories Supplied

1 x Terminator Set 2 off)
1 x Quick Reference Card
1 x Quick Installers Guide