TAKING INVENTIVE STEPS IN INFRARED….

Platinum IR Sensor Configuration Application V3.3.7

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Firmware Version: **7.x.xU**

Exd Certified, SIL1, Red text / logo

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AMENDMENT RECORD	**Original date of issue**: 27/06/2012

Date	Modification	New Issue	Approval Signature
27/06/2012	Initial creation.	1.00	F. Kups
26/11/2012	Modified to reflect user PC Application.	2.00	F. Kups
07/12/2012	Biogas mode expanded. Fixed typo errors in the range section. Added fixed baud rates. Added extra functional description in the Range selection flags.	2.10	F. Kups
14/12/2012	Added illegal range notes.	2.11	F. Kups
19/12/2012	Document re-formatting. Typo errors fixed. Enhanced Version comments. More examples for % maximum output. Added Data logging Section.	2.12	F. Kups
20/12/2012	Calibration text enhanced. Added single carbon dioxide sensor ranges.	2.13	F. Kups
07/01/2013	Updated Range 3 conditions.	2.14	F. Kups
09/01/2013	Added ® recognition of trade marks for Excel.	2.15	F. Kups

AMENDMENT RECORD	**Original date of issue**: 27/06/2012

Date	**Modification**	**New Issue**	**Approval Signature**
12/02/2013	Added details of Comms modes BW and Calibration	2.16	F. Kups
10/03/2014	Added sensor pictures for SIL1 sensors	2.17	F. Kups

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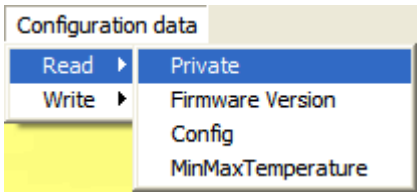
Platinum Sensor Configuration

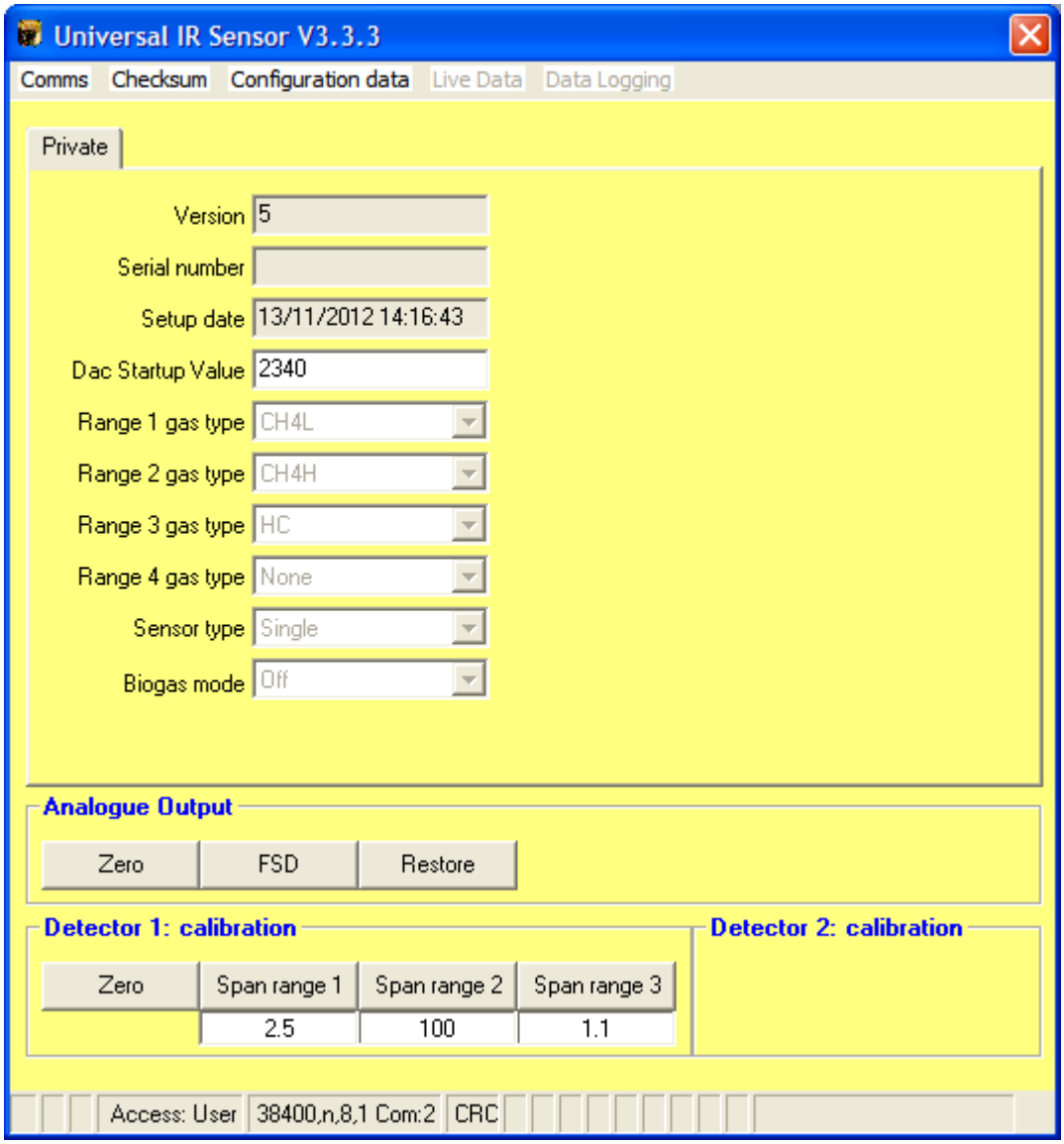
The Platinum sensor firmware V07.YY.ZZ can be used for both single gas and dual gas sensors. It is the configuration settings that determine the way the sensor behaves. Detector 1 in both sensors can have multiple ranges.

Below is seen a screen shot of the bespoke PC application used by the user to configure the sensor and perform tasks such as configuration, calibration, and data logging.
The Private configuration data is accessed by selecting *Configuration data, Read, Private.* i.e.



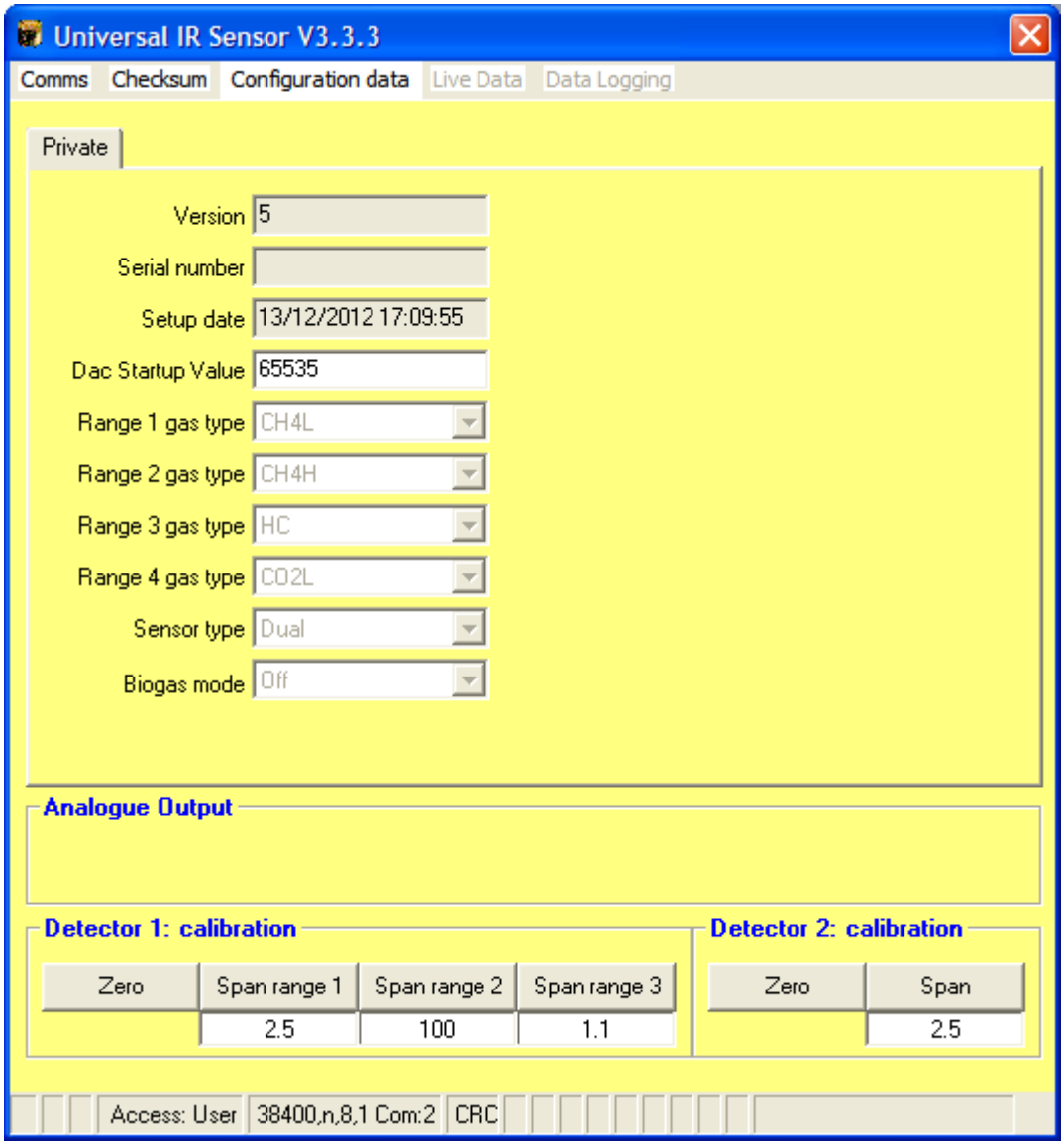
Private Configuration Data

Single Gas Sensor



The only field that can be changed by the user is the *Dac Start-up Value*.
All the remaining fields are setup during manufacture and cannot be changed by the user.

Dual Gas sensor



Note 1: The *DAC start-up value* has no effect as the sensor does not have an analogue output.
Note 2: The Analogue output buttons are not available.

Data Fields

Version
The version of the structure file.

Serial number
A unique number that is derived from the *Build type hardware*, *Build type* and a number from 000000 to 999999.

Setup date
The date / time when the sensor was first configured.

Dac Start-up value
This setting is used to output a voltage level at the instant the sensor is powered, directly from the boot loader. This is necessary when the sensor emulates a pellistor type sensor. The range is 0 – 65000.

Range 1, 2, 3 and 4 gas types

Sets the gas type associated with ranges 1 to 4.
The *Range 1* gas type to *Range 4* gas type simply serves to give a name to the gas that the sensor will be used for. They do not effect the operation of the sensor.

Single gas sensor
The *Detector 1* is can be either a hydrocarbon element or a carbon dioxide element. The singe gas sensor allows up to 3 ranges.

Dual gas sensor
The *Detector 1* is usually the hydrocarbon element while *Detector 2* is usually the carbon dioxide element. The Detector 1 has up to 3 ranges while the Detector 2 has only one range.

Note however in the single gas sensor configuration only *Detector 1* is active and this can be any sensing element i.e. HC, CO2, NO2, N2O, CO etc

Possible settings are:

None	Range is de-selected and not used.
CH4L	Methane, usually 0-5%
CH4H	Methane, usually 0-100%
HC	Propane, usually 0-2%
HHC	Propane, usually 0-100%
CO2P	Carbon dioxide, usually 0-5000 ppm
CO2L	Carbon dioxide, usually 0-5%
CO2H	Carbon dioxide, usually 0-100%
Ethanol	Usually 0-LEL
Toluene	Usually 0-LEL
Propane	Usually 0-LEL
Butane	Usually 0-LEL
Hexane	Usually 0-LEL

Sensor type

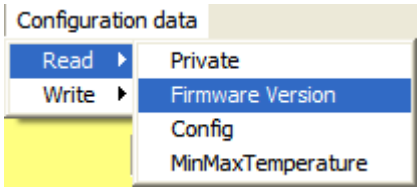
This can be either *Single* or *Dual* depending upon the hardware build. *Single* is where only one type of gas can be measured, while *Dual* is where the sensor is fitted with two gas detectors.

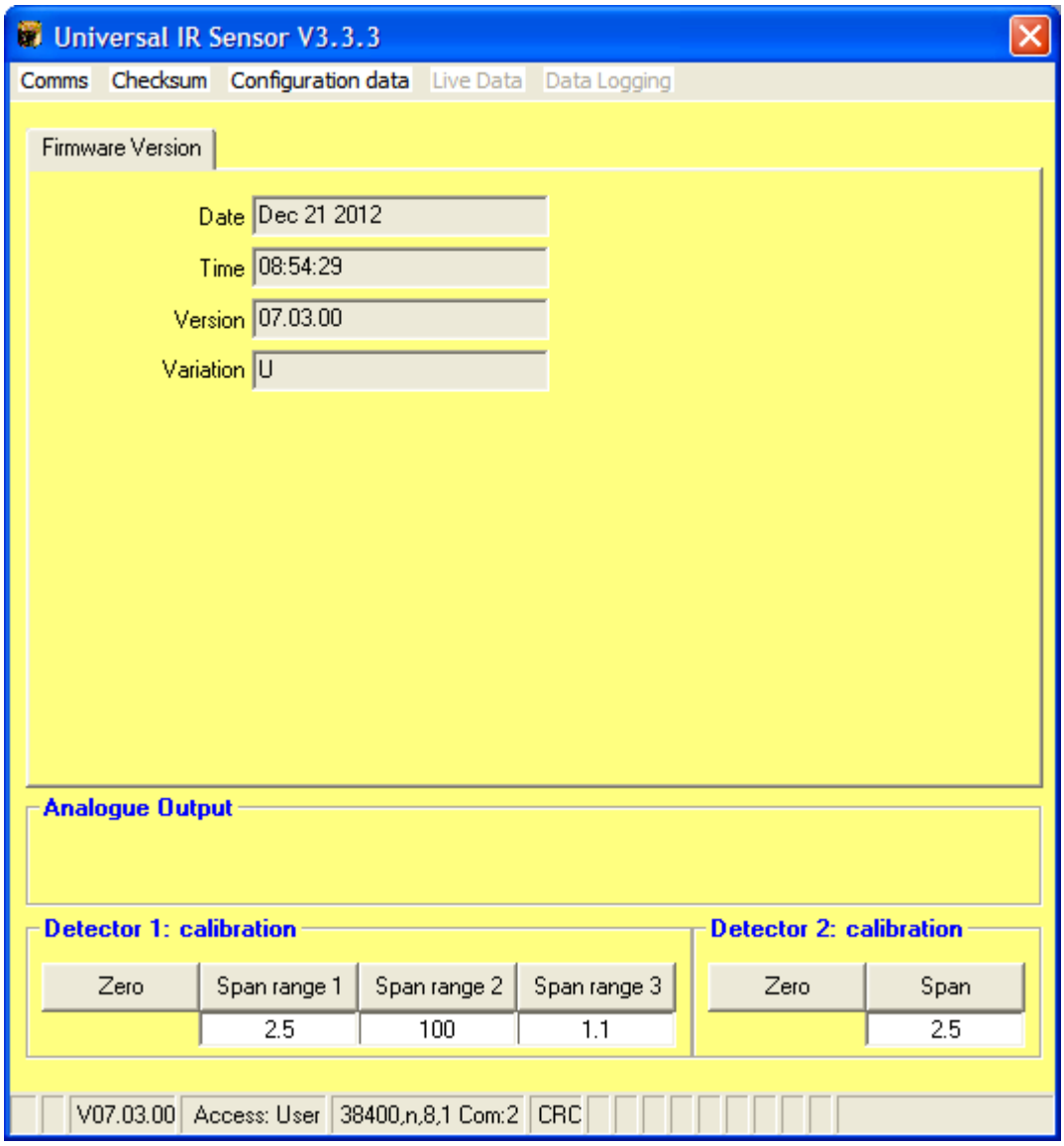
Biogas mode

This setting is either On or Off and is set during manufacture depending upon the range of the CO2 sensor. The reason for this setting is that the methane gas sensor readings are enhanced in the presence of high levels of CO2. By setting this option the methane gas readings can be compensated automatically by the firmware.

Firmware Version

The firmware version of the sensor can be read as follows:





Date: The date that the firmware was created.

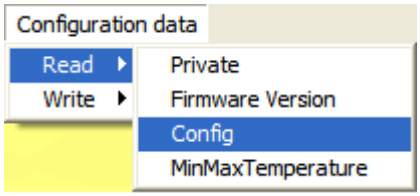
Time: The Time that the firmware was created.

Version: The version of the firmware, XX.YY.ZZ, where:
XX = Major, reserved for hardware changes.
YY = Minor, reserved for features.
ZZ = Revision, reserved for bug fixes.

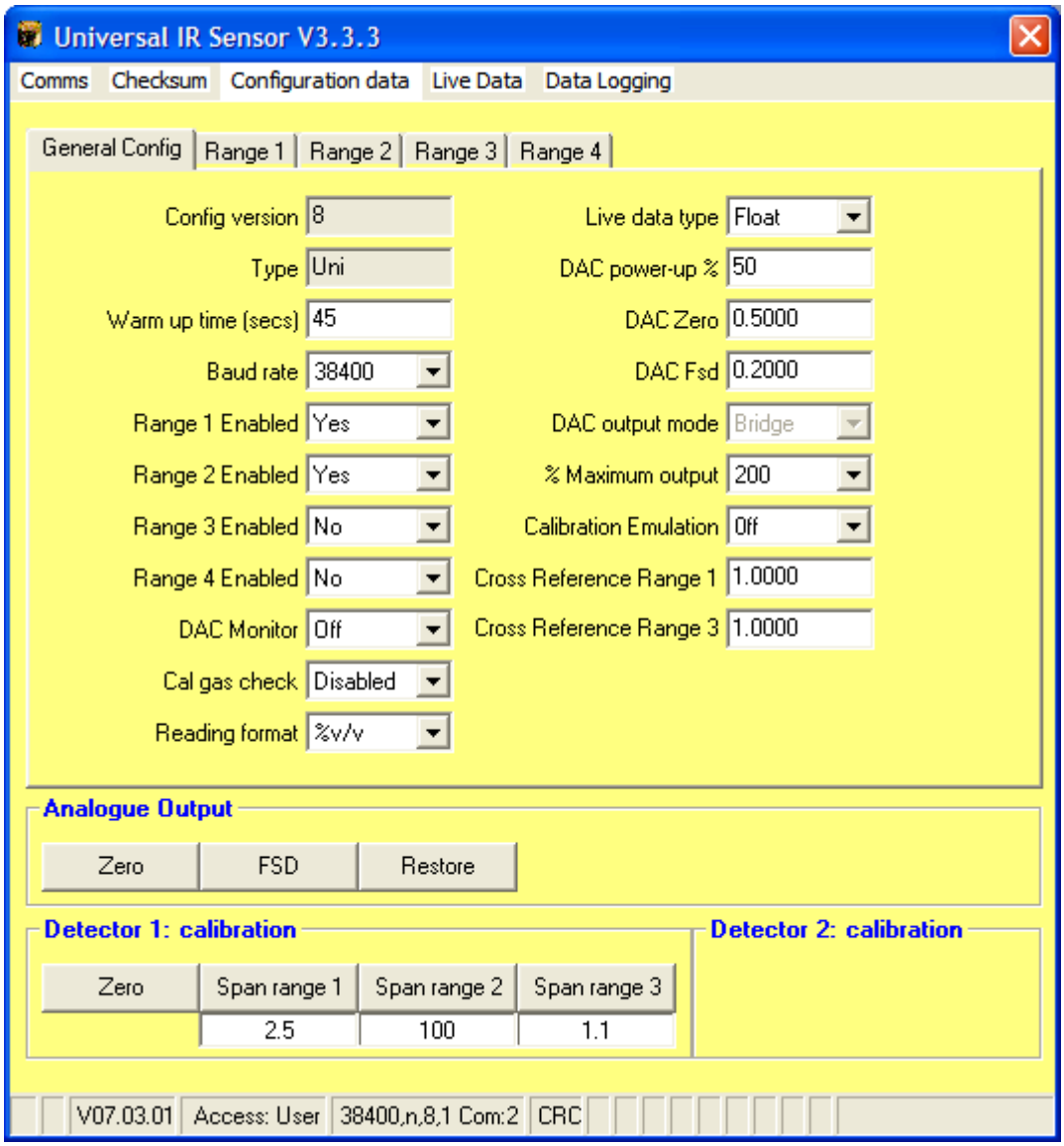
Variation: Special conditions.
'D' = Dual sensor, 'S' = Single sensor.
'E' = EN50271 code.
'U' = Universal code.

Configuration Data

The configuration data can be accessed as follows:

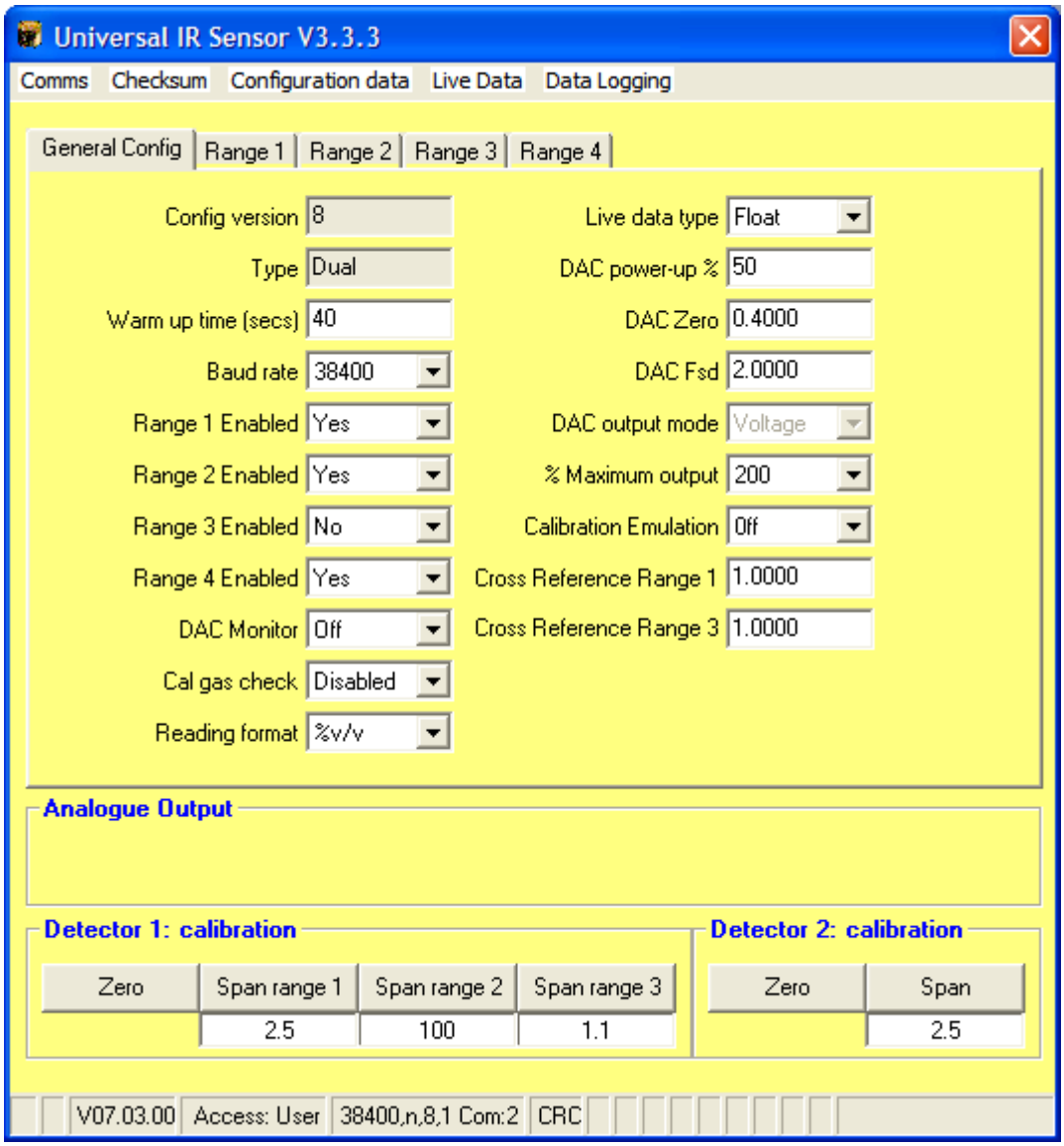


Single Gas Sensor



Note 1: The sensor is fitted with a DAC, as such the Analogue output buttons are available.
Note 2: The DAC output mode is shown but cannot be changed by the user.

Dual Gas Sensor



Note The '*DAC'* fields do not have any effect on the sensor operation but are shown because the Single / Dual sensor types share the same structure data to enable a universal code model.

Data Fields

Config Version
The version of the structure file.

Type
This is a string of up to 8 characters that is used to describe the sensor.

Warm up time
This setting sets the number of seconds that is required for the sensor to give valid readings after power has been applied. The limits are 45 to 120.

Baud rate
The serial communications speed, 4800, 9600, 19200 & 38400 are available. The default setting is 38400.
The serial communications can be over-ridden to place the sensor into one of two different modes:

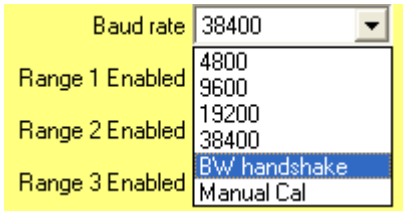
1) BW mode
2) Calibration mode.

BW Mode

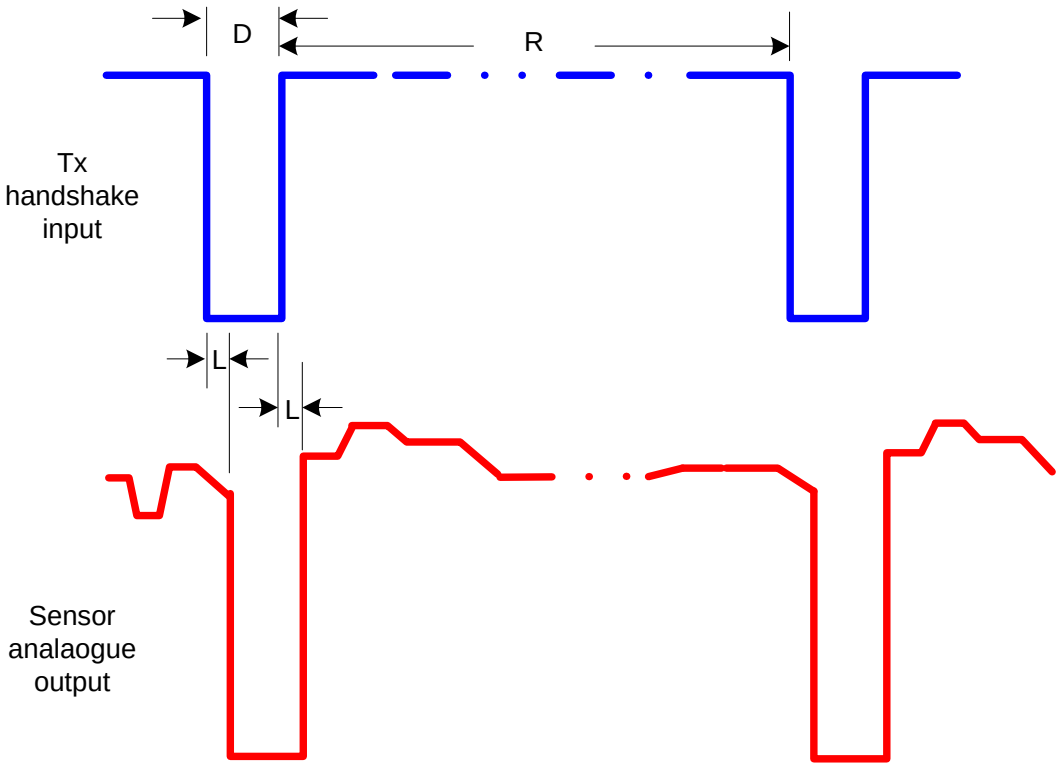
The Platinum sensor can be placed in a mode that replaces the normal serial communications with a hand shake system that directly affects the analogue output.

If the user relies solely on the analogue output then there is no way to know if the sensor processor is working or if it has 'frozen'.

To this end the 'BW' mode of operation changes the serial I/O lines to digital inputs. When the Tx pin goes low the analogue output of the sensor is driven to 0Volts. When the Tx pin goes high the analogue outputs reverts to normal operation.



The timing is shown in the following diagram:



L = Latency, max 2 milliseconds

D = Duration, min 4 milliseconds

R = Repitition, min 500 milliseconds

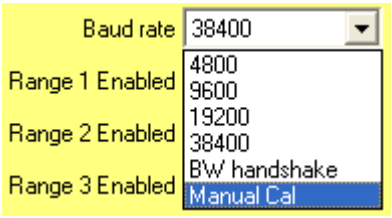
Note: The dual sensor does not have an analogue output so this option should not be used.

Platinum sensor - Cal Mode

The Platinum sensor can be placed in a mode that replaces the normal serial communications with view to calibration

The sensor can be instructed to either Zero the sensor or Span the sensor using the Rx (zero) and Tx (Span) pins. The cal option uses the internal gas setting to span the sensor, thus it is important to apply the correct gas before a calibration is performed.

Selecting the Cal Mode is achieved via the PC Application as follows:



The Serial Tx and Rx pins will only be changed to calibration pins when the sensor has been powered for approximately 10 minutes. This makes sure that the user cannot be calibrated before the sensor has been powered for a sufficient time.

The normal comms mode can be resumed by removing power or by holding the Tx & Rx pins at 0V for > 15 seconds.

Note This is only suitable for single gas sensors.

Range 1, 2, 3 & 4 enable settings

The standard configuration of the hydrocarbon sensor is as follows:

Range 1 = CH4L, (0-5% v/v CH4)
Range 2 = CH4H, (0-100% v/v CH4)
Range 3 = C3H8, (0-2% v/v C3H8)

The standard configuration of the carbon dioxide sensor is as follows:

Range 1 = CO2L, (0-1% v/v)
Range 2 = CO2L, (0-2% v/v)
Range 3 = CO2L, (0-5% v/v)

The range flag settings can be changed depending upon the Private data settings.

Note1: Care must be taken when changing the Range enable flags to ensure that the selected combination gives rise to accurate gas readings. In particular if Range 1, Range 2 and Range 3 are selected then the sensor Range 3 should be verified to be the same gas type as ranges 1 and 2.

Note2: Illegal range configurations are:

1) Range 1 Enabled - No
   Range 2 Enabled - No
   Range 3 Enabled - No
   Range 4 Enabled - No

2) Range 1 Enabled - Yes
   Range 2 Enabled - No
   Range 3 Enabled - Yes
   Range 4 Enabled - Yes / No

3) Range 1 Enabled - No
   Range 2 Enabled - Yes
   Range 3 Enabled - Yes
   Range 4 Enabled - Yes / No

HC Single Gas Sensor, Private Data sensor type set to Single

Range 1 = CH4L
Range 2 = CH4H
Range 3 = C3H8
Range 4 = Not Applicable

1) range 1 -

Range 1 Enabled - Yes
Range 2 Enabled - No
Range 3 Enabled - No
Range 4 Enabled - No

Notes: The Range 3 equivalent gas reading is also available in the serial liveData2.
The DAC output is relative to Range 1 FSD.

2) range 2

Range 1 Enabled - No
Range 2 Enabled - Yes
Range 3 Enabled - No
Range 4 Enabled - No

Notes: The Range 3 equivalent gas reading is also available in the serial liveData2.
The DAC output is relative to Range 2 FSD.

3) range 3

Range 1 Enabled - No
Range 2 Enabled - No
Range 3 Enabled - Yes
Range 4 Enabled - No

Notes: The Range 3 gas reading is duplicated in all the serial liveData1 & liveData2 fields for the hydrocarbon sensor.
The DAC output is relative to Range 3 FSD

4) auto ranging between R1 and R2

Range 1 Enabled - Yes
Range 2 Enabled - Yes
Range 3 Enabled - No
Range 4 Enabled - No

Notes: The Range 3 equivalent gas reading is also available in the serial liveData2.
The DAC output is relative to Range 2 FSD.

5) auto ranging between R1 and R2 and R3

Range 1 Enabled - Yes
Range 2 Enabled - Yes
Range 3 Enabled - Yes
CO2 Enabled - No

Notes: The gas level automatically selects the lowest range to give maximum resolution in the serial data.
The DAC output is relative to the highest range, i.e. Range 3 FSD.
The EL, Power and FSD setting reflect the three ranges to be used.

Carbon dioxide Single Gas Sensor, Private Data sensor type set to Single

Range 1 = 0-1% CO2
Range 2 = 0-2% CO2
Range 3 = 0-5% CO2
Range 4 = Not Applicable

1) range 1 -

Range 1 Enabled - Yes
Range 2 Enabled - No
Range 3 Enabled - No
Range 4 Enabled - No

Notes: The Range 3 equivalent gas reading is also available in the serial liveData2.
The DAC output is relative to Range 1 FSD.

2) range 2

Range 1 Enabled - No
Range 2 Enabled - Yes
Range 3 Enabled - No
Range 4 Enabled - No

Notes: The Range 3 equivalent gas reading is also available in the serial liveData2.
The DAC output is relative to Range 2 FSD.

3) range 3

Range 1 Enabled - No
Range 2 Enabled - No
Range 3 Enabled - Yes
Range 4 Enabled - No

Notes: The DAC output is relative to Range 3 FSD

4) auto ranging between R1 and R2

Range 1 Enabled - Yes
Range 2 Enabled - Yes
Range 3 Enabled - No
Range 4 Enabled - No

Notes: The Range 3 equivalent gas reading is also available in the serial liveData2.
The DAC output is relative to Range 2 FSD.

5) auto ranging between R1 and R2 and R3

Range 1 Enabled - Yes
Range 2 Enabled - Yes
Range 3 Enabled - Yes
CO2 Enabled - No

Notes: The gas level automatically selects the lowest range to give maximum resolution in the serial data.
The DAC output is relative to the highest range, i.e. Range 3 FSD.
The EL, Power and FSD setting reflect the three ranges to be used.

Dual Gas Sensor, Private Data sensor type set to Dual

Range 1 = CH4L, 0 - 5%
Range 2 = CH4H, 0 - 100%
Range 3 = C3H8, 0 - 2%
Range 4 = CO2L, 0 - 5%

1) range 1 -

Range 1 Enabled - Yes
Range 2 Enabled - No
Range 3 Enabled - No
Range 4 Enabled - Yes

Notes: Gas readings for Range 1 and Range 4 are available in the serial liveData2.
The Range 3 equivalent gas reading is also available in the serial liveData2.

2) range 2

Range 1 Enabled - No
Range 2 Enabled - Yes
Range 3 Enabled - No
Range 4 Enabled - Yes

Notes: Gas readings for Range 2 and Range 4 are available in the serial liveData2.
The Range 3 equivalent gas reading is also available in the serial liveData2.

3) range 3

Range 1 Enabled - No
Range 2 Enabled - No
Range 3 Enabled - Yes
Range 4 Enabled - Yes

Notes: Gas readings for Range 3 and Range 4 are available in the serial liveData2.

4) auto ranging between R1 and R2

Range 1 Enabled - Yes
Range 2 Enabled - Yes
Range 3 Enabled - No
Range 4 Enabled - Yes

Notes: Gas readings for Range 1 and Range 2 are available as a combined auto-ranging gas reading in the serial liveData2.
The Range 3 equivalent gas reading is also available in the serial liveData2.
The Range 4 gas reading is available in the serial liveData2.

5) auto ranging between R1, R2 and R3

Range 1 Enabled - Yes
Range 2 Enabled - Yes
Range 3 Enabled - Yes
CO2 Enabled - Yes

Notes: Gas readings for Range 1, Range 2 and Range 3 are available as a combined auto-ranging gas reading in the serial liveData2.
The Range 3 equivalent gas reading is also available in the serial liveData2.
The Range 4 gas reading is available in the serial liveData2.

DAC monitor

This setting enables, On or disables, Off the DAC monitoring function. When enabled the actual DAC output is checked to see if it is as expected and produce an error condition if it is not as expected.

Cal gas check

This setting enables or disables the feature whereby the sensor response to gas is checked to see if it is as expected and produce an error result if it is not as expected. This is used in the serial communication command to span the sensor. It's primary function is to stop a calibration when no gas is present.

Reading format

The gas reading can be expressed as either %v/v or as a percentage of the FSD. Thus when set to a percentage of the FSD and the FSD is set to the lower explosive level, LEL, the sensor outputs the gas readings directly in LEL terms.

Live data type

The gas reading can be expressed as either float or integer types. This only affects the serial data.
When the setting is set to Integer the 4 byte float result is replaced by two 2 byte integers. The first integer is a multiplier whilst the second integer is the actual gas level.

This is used where users for one reason or another cannot handle IEEE floating point numbers.

The multiplier takes the following format:

Reading	Scale Factor
>5000	1
>2000	2
>1000	8
>100	16
>60	128
>20	256
>10	512
>5	1024
>2	2048
Else	4096

DAC power-up percent

This value is used to output a DAC value during the warm up period. It is usually set below the zero level and is used to indicate that the sensor is not ready. It is expressed as a percentage of the DAC zero setting. The range is -100 to +100.

DAC Zero

This value is used to output a DAC value equivalent to 0% gas.

Voltage setting: the limits are 0.2 to 0.5 (Volts absolute).
Bridge setting: the limits are 0.4 to 0.6 (times supply voltage).

DAC Fsd
This value is used to output a DAC value equivalent to 100% FSD gas.

Voltage setting: the limits are 1.0 to 2.5 (Volts absolute).
Bridge setting: the limits are -0.2 to + 0.2 (Volts change relative to the zero point)

DAC output mode
This is an indication only value. This value sets the DAC output to either the voltage or bridge output and is configured at the time of manufacture.

% Maximum Output
The computed gas reading may result in a level that is above the selected range. This reading will not be accurate but may give an indication of the actual gas level. The setting can be programmed to clamp the reading to a maximum reading as follows:

Sensor range FSD = 2

100	readings above 2 will be clamped to 2
125	readings above 2 will be clamped to 2.5
150	readings above 2 will be clamped to 3
200	readings above 2 will be clamped to 4

Sensor range FSD = 5

100	readings above 5 will be clamped to 5
125	readings above 5 will be clamped to 6.25
150	readings above 5 will be clamped to 7.5
200	readings above 5 will be clamped to 10

Sensor range FSD = 100

100	readings above 100 will be clamped to 100
125	readings above 100 will be clamped to 125
150	readings above 100 will be clamped to 150
200	readings above 100 will be clamped to 200

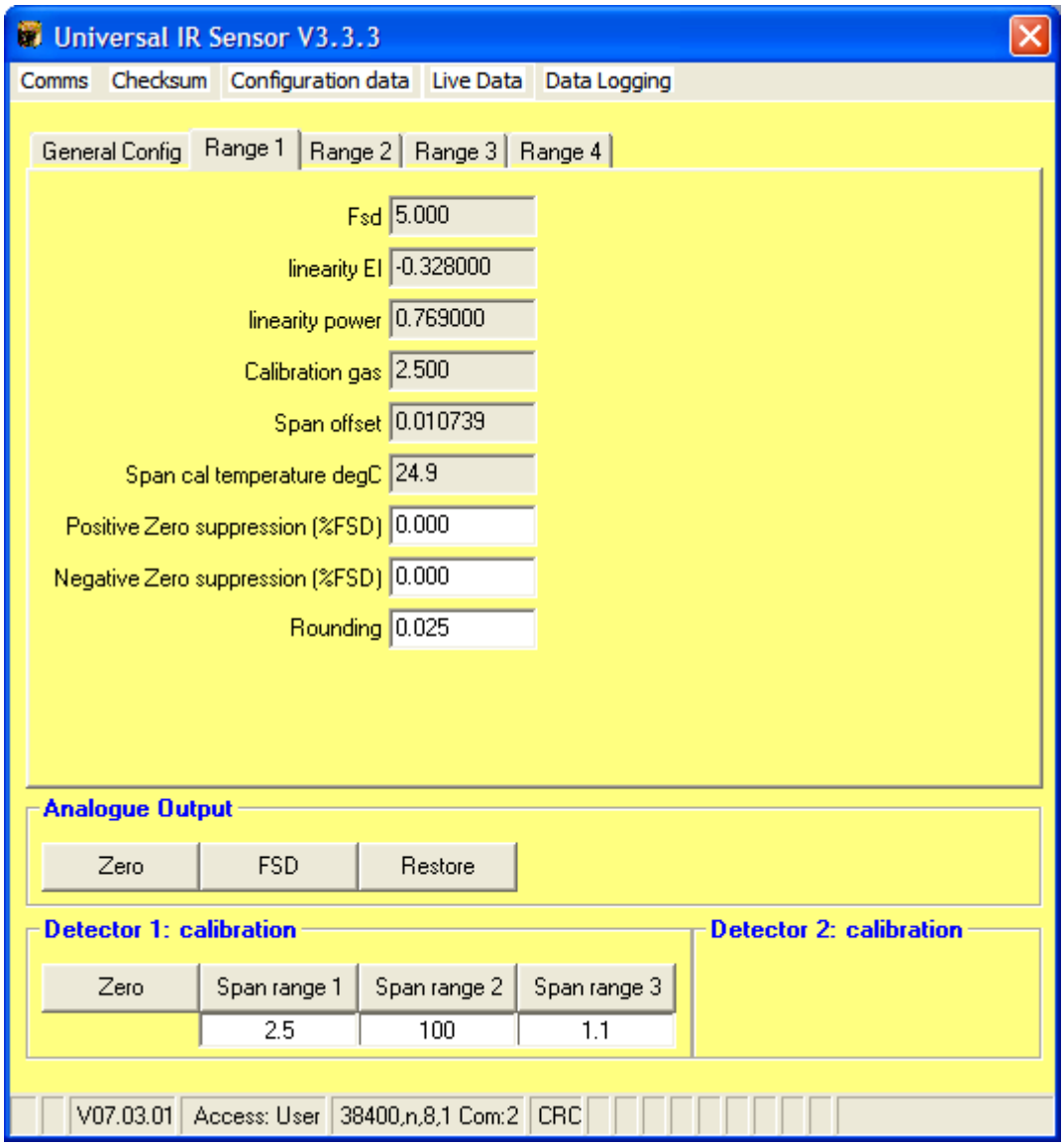
Calibration Emulation
The platinum sensor uses a new method to calibrate the sensor due to it's multi-range features. The sensor can be configured to emulate old designs, i.e. single gas / single range sensors. Thus the sensor can be made to provide legacy support when this setting is 'On'.

Cross reference ranges 1 & 3
The hydrocarbon platinum sensor is usually calibrated for methane, CH4 (range 1) and Propane, C3H8 (range 3). A vast number of hydrocarbon gases are detected by the platinum sensor but vary in their response to the type of gas. Some of these gases have similar responses to CH4 while others have a similar response to C3H8.

In these cases a cross reference factor can be applied that will allow the gas to be displayed more accurately. The limits are 0.5 to 5.0

Range Data Fields

This is a separate tab in the configuration window, one for each range. It can only be viewed, click on the relevant tab, i.e. Range 1



FSD

Indicating the maximum reading for the selected range. It can only be viewed.

Linearty EI

Indicating the constant used to convert the non-linear output from the sensor to a linear range. It can only be viewed.

Linearty Power

Indicating the power constant used to convert the non-linear output from the sensor to a linear range. It can only be viewed.

Calibration Gas

Indicating the gas level used to calibrate the sensor. It can only be viewed.

Span Offset

Indicating the deviation from the temperature compensated span factor. It can only be viewed.

Span Cal temperature
Indicating the temperature of the sensor when a gas calibration was performed. It can only be viewed.

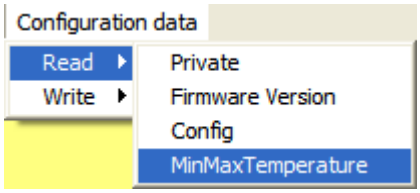
Positive Zero Suppression %
The amount of gas, expressed as a percent of the FSD, required to give a non-zero reading. Limits 0 – 5.

Negative Zero Suppression %
The amount negative drift in the sensor zero, expressed as a percent of the FSD, to give a negative reading. Limits 0 – 5.

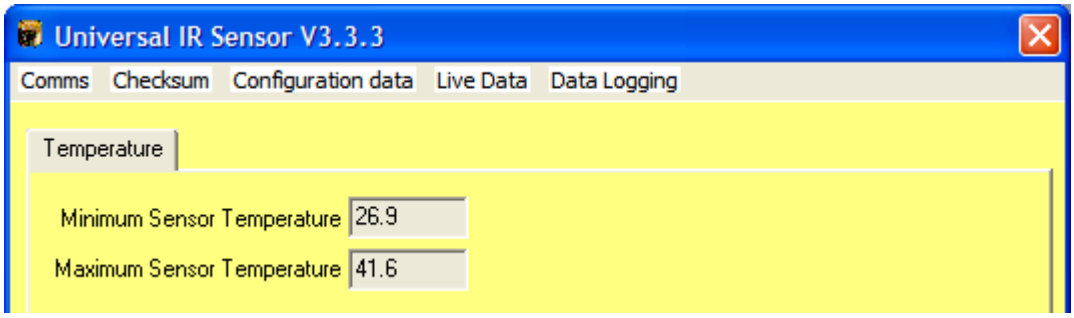
Rounding
The sensor sensitivity, expressed in absolute terms. Limits 0 – 1.

Min / Max Temperature

The sensor logs the temperature conditions it is exposed to, these are stored in non-volatile memory and can be accessed as follows:



Temperature window



Data Fields

Minimum Sensor Temperature
The minimum temperature that the sensor has been exposed. It can only be viewed.

Maximum Sensor Temperature
The maximum temperature that the sensor has been exposed. It can only be viewed.

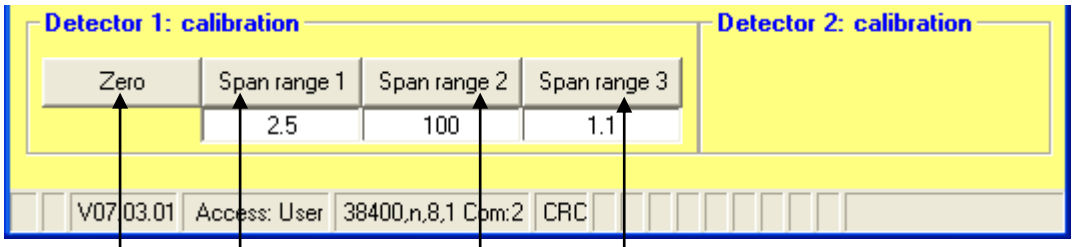
Calibration

The sensor can be calibrated by applying the correct gas and pressing the appropriate button.

Note 1: The appropriate gas level must be entered into the box immediately below the button.

Note 2: The hydrocarbon sensor should be purged with gas for at least 2 minutes, while the CO2 sensor should be gassed for at least 5 minutes prior to performing a zero or span operation.

Single gas sensor (Detector 1, hydrocarbon or carbon dioxide)



Zero sensor
Apply zero gas at a rate of 500 CC/Min, wait for reading to stabilise then press the Zero button.

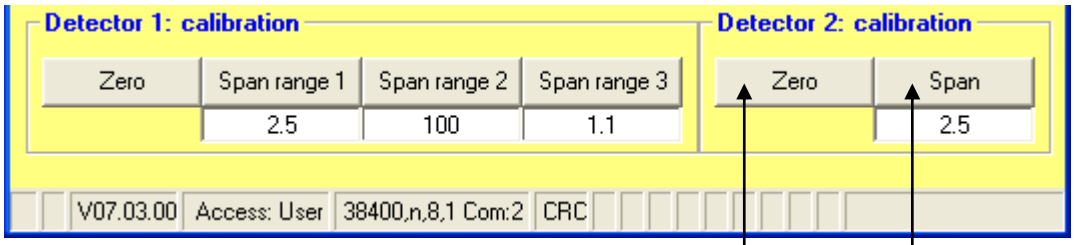
Span range 1
Apply a suitable gas level, usually about 50% FSD at a rate of 500 CC/Min, wait for the reading to stabilise then press the *Span range 1* button.

Span range 2
Apply a suitable gas level, usually about 100% FSD at a rate of 500 CC/Min wait for the reading to stabilise then press the *Span range 2* button.

Span range 3
Apply a suitable gas level, usually about 50% FSD at a rate of 500 CC/Min, wait for 2 minutes then press the *Span range 3* button.

Dual Gas Sensor (Detector 1 usually hydrocarbon, Detector 2, usually CO2)

Calibrate the sensor as above. In addition calibrate the detector 2 channel.

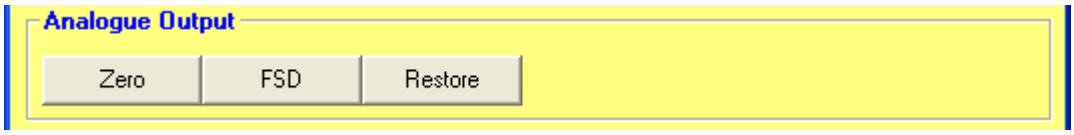


Zero
Apply zero gas at a rate of 500 CC/Min, wait for 5 minutes then press the *Zero* button.
Note that the *Zero* button can be pressed during the previous zero calibration

Span
Apply a suitable gas level, usually about 50% FSD at a rate of 500 CC/Min, wait for 5 minutes then press the *Span* button.

Analogue output

The analogue output can be tested by the following buttons:



Zero

Press the *Zero* button to force the analogue output to the zero gas level. This level is maintained until the Restore button is pressed or power is removed from the sensor.

FSD

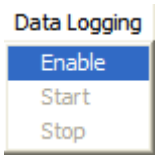
Press the *FSD* button to force the analogue output to the FSD gas level. This level is maintained until the Restore button is pressed or power is removed from the sensor.

Restore

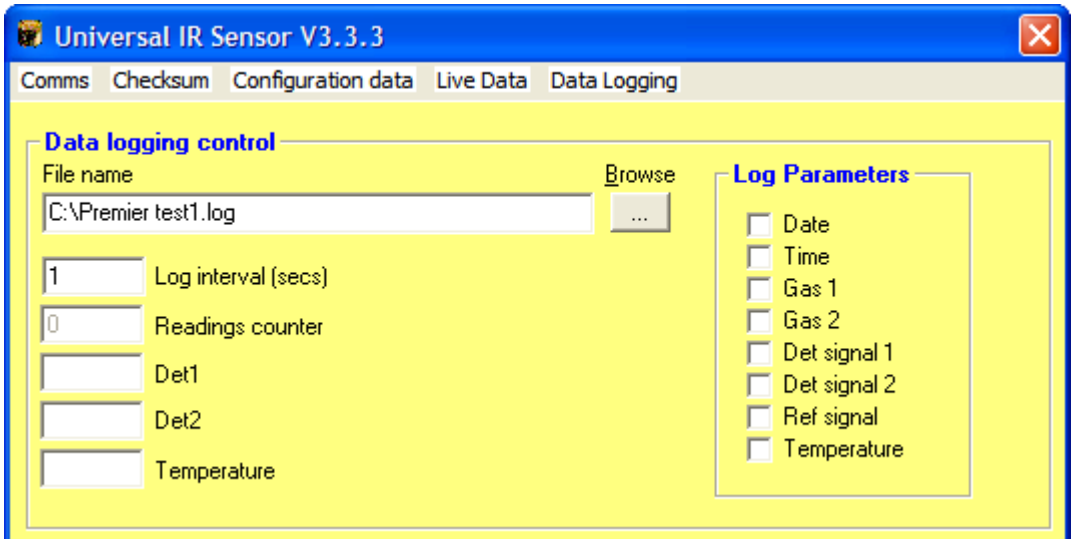
Press the *Restore* button to return the analogue output to normal operation.

Data Logging

The Application can log results from the sensor to determine if it is working to specification. To start data logging select *DataLogging* | *Enable* as follows:

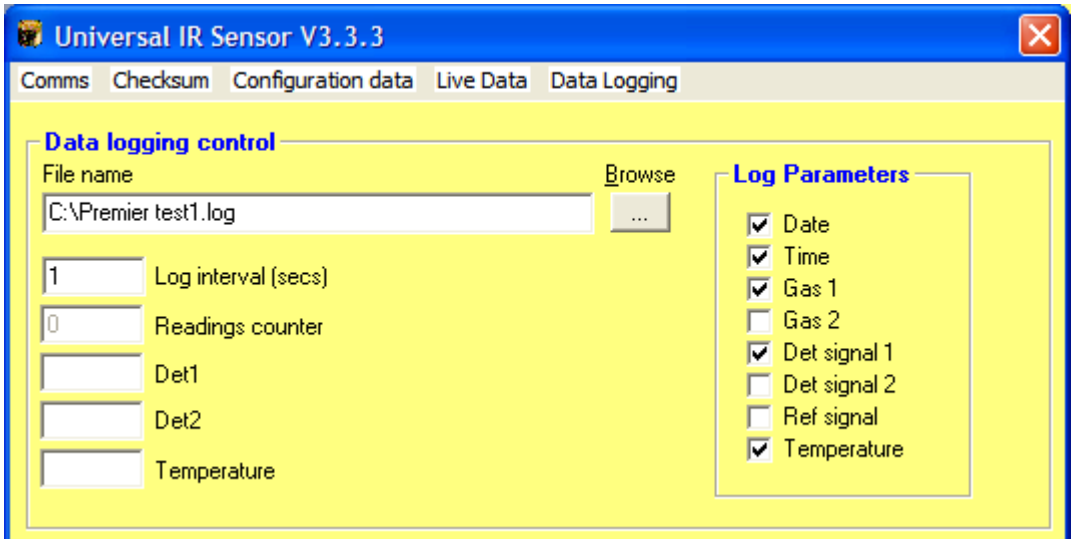


The following screen is shown:

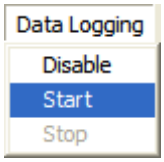


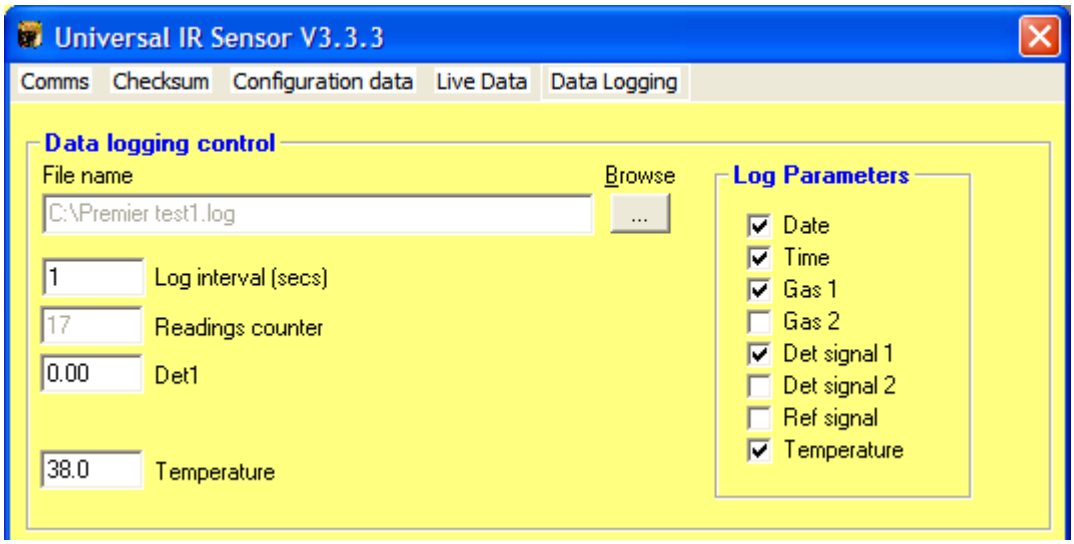
Enter a file name, with the .log extension, or use the Browse button to locate an existing file. If an existing file is selected then it will be over-written and all data will be lost.
Set the log interval to the desired frequency.

Select the parameters that are required for data logging, i.e.



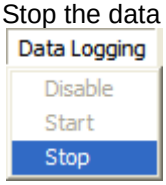
Start the data logging as follows:





Note the readings counter incrementing every reading.

Stop the data logging as follows:



The Log file is a tabbed delimited file that can be viewed by word processors or imported to Excel® etc. for viewing or manipulation.

Date	Time	Temp deg C	Det1 Reading	Det1 Counts
19/12/2012	14:24:13	38.0	0.00	2534
19/12/2012	14:24:14	38.0	0.00	2534
19/12/2012	14:24:15	38.0	0.00	2534
19/12/2012	14:24:16	38.0	0.00	2533
19/12/2012	14:24:17	38.0	0.00	2533
19/12/2012	14:24:18	38.0	0.00	2533
19/12/2012	14:24:19	38.0	0.00	2533
19/12/2012	14:24:20	38.0	0.00	2533
19/12/2012	14:24:21	38.0	0.00	2533
19/12/2012	14:24:22	38.0	0.00	2533
19/12/2012	14:24:23	38.0	0.00	2533
19/12/2012	14:24:24	38.0	0.00	2533
19/12/2012	14:24:25	38.0	0.00	2533
19/12/2012	14:24:26	38.0	0.00	2533
19/12/2012	14:24:27	38.0	0.00	2533
19/12/2012	14:24:28	38.0	0.00	2533
19/12/2012	14:24:29	38.0	0.00	2533

The data can be manipulated in Excel®, example as follows: