Novatech CONTROLS PTY. LTD.

Oxygen Transmitter

Model 1732
Operators Manual

April 2007

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This manual describes the transmitter firmware version 1.00, April 2007

The product described in this manual and products for use with it, are subject to continuous developments and improvement. All information of a technical nature and particulars of the product and its use (including the information in this manual) are given by Novatech in good faith. However, it is acknowledged that there may be errors or omissions in this manual. A list of details of any amendments or revisions to this manual can be obtained upon request from Novatech Controls Technical Enquiries. Novatech Controls welcome comments and suggestions relating to the product and this manual.

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1. USING THIS MANUAL

This manual is intended to be used by the operator. It is not intended to describe how the 1732 oxygen transmitter should be connected, configured or serviced. If more detailed information is required than is shown in this manual the 1732 Technical Manual should be used. This is supplied with each transmitter and is also available on the Novatech web site at www.novatech.com.au

It is assumed in this manual that the transmitter has been installed by competent personal and that the wiring to the main power supply, the oxygen probe and all the associated signal devices complies with the local safety codes and regulations.

1.1 Cautions

Please read the safety information below before connecting power to the transmitter.

CAUTION 1

The probe heater is supplied with mains voltage. This supply has electrical shock danger to maintenance personnel. Always isolate the transmitter before working with the probe.
The EARTH wire (green) from a heated probe must ALWAYS be connected to earth.

CAUTION 2

Combustion or atmosphere control systems can be dangerous. Burners must be mechanically set up so that in the worst case of equipment failure, the system cannot generate explosive atmospheres. This danger is normally avoided with flue gas trim systems by adjustment so that in the case of failure the appliance will not generate CO in excess of 400 ppm in the flue. The CO level in the flue should be measured with a separate CO instrument, normally an infrared or fuel cell type.

CAUTION 3

The oxygen probe is heated to over 700℃ (1300℉) a nd is a source of ignition. Since raw fuel leaks can occur during burner shutdown, the transmitter has an interlocking relay that removes power from the probe heater when the main fuel shut-off valve power is off. If this configuration does not suit or if it is possible for raw fuel to come into contact with a hot oxygen probe then the Model 1732 transmitter with a heated probe will not be safe in your application.
An unheated probe can be utilised in such applications, however the oxygen readings are valid only above 650℃ (1200℉).

CAUTION 4

The reducing oxygen signal from the transmitter and the associated alarm relay can be used as an explosive warning or trip. This measurement assumes complete combustion. If incomplete combustion is possible then this signal will read less reducing and should not be used as an alarm or trip. A true excess combustibles analyser, normally incorporating a catalyst or thermal conductivity bridge, would be more appropriate where incomplete combustion is possible.
Also read the probe electrical shock caution in the probe heater interlock caution in chapter 4.7 of the Model 1732 Technical Manual.

CAUTION 5

FIL-3 filter. If the optional FIL-3 has been fitted to the 1231 probe in this installation, please read the Important Notice in the Technical Manual.

1.2 Heater Warning

The probe heater is supplied with mains voltage. This supply has electrical shock danger to maintenance personnel. Always isolate the transmitter before working with the probe.
The EARTH wire (green) from the probe must always be connected to earth.

The heater is supplied from the mains power directly, and the temperature is controlled at 720℃ (1300℉). The outside of the process end of the probe can get to temperatures that are dangerous to touch. Wear insulating gloves when handling a probe that has been on.

2. INTRODUCTION

The Novatech 1732 oxygen transmitter is based on the well known model 1632 transmitter. It includes a number of hardware and software improvements such as a graphic display, larger characters, faster microprocessor, simplified set up menu, alarm logging, faster probe heater control and more calculated values such as burner efficiency.

The 1732 Oxygen Transmitter has a variety of user-selectable functions. They are simple to use because each selection is menu driven. For options you are not sure about, read the manual on that particular item in chapter 5, SETUP mode.

Features include:-

Inputs
Two zirconia oxygen probe, heated or unheated
Oxygen range from 1 x 10^{-30} to 100%
Furnace, kiln or flue thermocouple, field selectable as type K, J, R or S
Main flame established safety interlock (for heated probes only)
Purge pressure or flow switch

Outputs
Two linearised 4-20mA or 0-20mA DC isolated outputs, max. load 1000Ω, 12 bit resolution
The output function and the range are field selectable
Common alarm relay
Three other alarm relays with selectable functions

Computer
RS 232-C or RS 485 for connection of a computer terminal or printer for diagnostics of the transmitter, probe or combustion process. This connection is suitable for network connection to a computer, DCS or PLC using MODBUS™ protocol.

Display
Multi font graphical display
Large font characters for the oxygen on the top line
Multiple lower line items for the secondary functions. ie Probe temperature, % Oxygen for the second probe
Alarm display mode that shows the time the alarm occurred and the acceptance time
Alarm log mode that keeps the time the alarm occurred, the acceptance time and the time the alarm was cleared for the last 4,000 alarms

Power
Universal mains supply voltage, 85 to 265VAC
Automatically detects the mains voltage and frequency and set the power control accordingly

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3.1 Hardware Specifications

Number of oxygen probes:	1 or 2
Oxygen range:	1 x 10^{-30} to 100%
Oxygen accuracy:	±1% of actual measured oxygen value with a repeatability of ±0.5% of the measured value
Thermocouple types:	Type K, J, R and S
Temperature accuracy:	+/- 2°C
Analog outputs:	0-20mA or 4-20mA field selectable Active outputs (Do NOT loop power these outputs)
Output load:	1000 ohm max
Alarm relays:	4
Alarm relay contacts:	2Amp 240VAC, 2A 30VDC
Mains voltage supply:	85 to 265VAC 50/60 Hz
Power:	3Watts for controller plus probe power (100W max)
Environmental Rating:	Operating Temperature -25℃ to 55℃ Relative Humidity 5% to 95% (non-condensing)
Degree of Protection:	IP65 IP54 with internal reference air pump
Case Size:	260mm (10.2”) wide, 160mm (6.3”) high, 90mm (3.5”) deep
Case Weight:	3 Kg (6.6 lbs.)

3.2 Operational Specifications

Range of outputs: Field selectable from the following:

Function	Minimum Range	Maximum Range
Linear oxygen #1	1%	0 to 100%
Linear oxygen #2	1%	0 to 100%
Average oxygen	1%	0 to 100%
Log oxygen	0.1 to 20%	Fixed
Reducing oxygen	2 decades	1x10^{-30}% to 100%
Oxygen deficiency	-10 to 0%	-10 to 20%
Aux temperature	100°C	0 to 1600°C
Combustibles	0.5%	0 to 2.0%
Burner efficiency	20.0%	0 to 100.0%
No output	-	-

Range of local indication: 1.0 x 10^{-30} to 100%
0.01 to 10,000ppm (automatically defaults to % range above 10,000ppm (1%))

Local display, secondary functions:

	Range
Oxygen probe #2	$1x10^{-30}$ to 100%
Average oxygen of both probes	$1x10^{-30}$ to 100%
Probe #1 temperature	Up to 1760°C (3200℉)
Probe #2 temperature	Up to 1760°C (3200℉)
Probe #1 probe EMF	-30 to 1350mV
Probe #2 probe EMF	-30 to 1350mV
Probe #1 probe impedance	0 to 300k Ω
Probe #2 probe impedance	0 to 300k Ω
Aux temperature	Up to 1760°C (3200℉)
Ambient temperature	0 to 70°C (158℉)
Ambient RH	5 to 95%
Carbon dioxide	0 to 40.0%
Combustibles	0 to 2.0%
Oxygen deficiency	-10.0 to 20.0%
Burner efficiency	0 to 100.0%

The oxygen deficiency output can be used in the same way as a combustibles analyser to signal the extent of reducing conditions of combustion processes.

3.3 Heater Interlock Relays

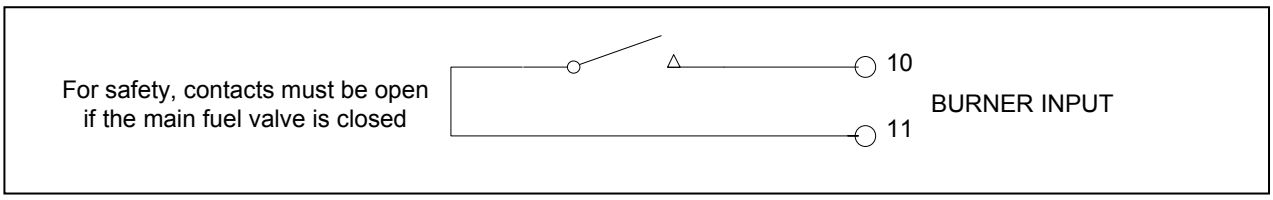
CAUTION

Explosion protection when using heated probes is achieved by switching the power to the probe heater off whenever the main fuel valve is closed.

The principle of safety is that if the main fuel valve is open then main flame has been established. With this primary source of ignition on, the probe heater can be safely switched on. The most dangerous situation is if fuel leaks into the combustion appliance when the fuel valve is closed. When power is removed from the main fuel valve the heater should also be switched off.

To achieve this protection, connect a main fuel valve voltage free contact to the 'BURNER ON SWITCH' terminals 10 & 11. When the main fuel valve is open, the voltage free contact should be closed. For installations where there is no risk of explosion, connect a link between terminals number 10 & 11.

Heater Supply Interlock Connection for Heated Probes



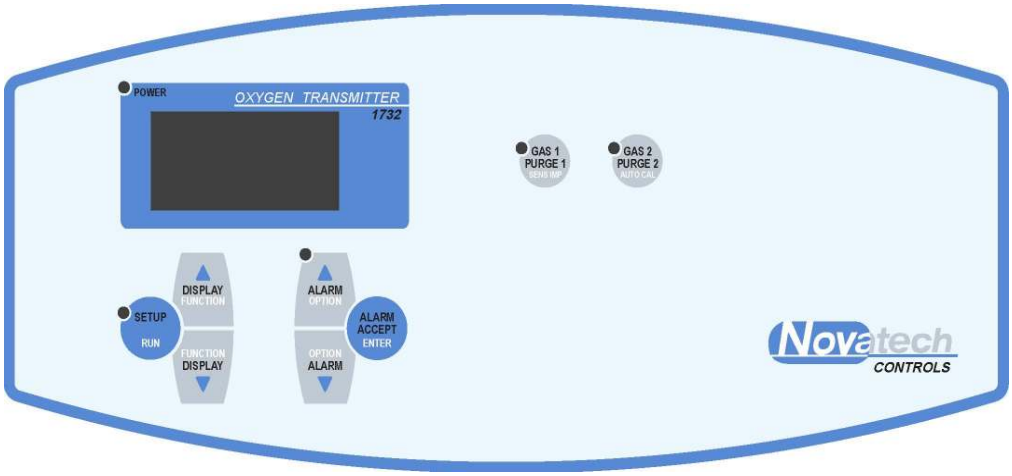
If a safety interlock is not required, a wire must be connected between terminals 10 &11 to enable –

- The heaters on heated probes
- Process alarms
- Auto-purge and auto-cal checking.

The 1732 transmitter has a graphic display, 8 keys that are accessed from the outside of the cabinet and 5 LED indicators to show the status of the transmitter.

All the keys have a dual function. The black text on the key is the function while the transmitter is in the RUN mode and the white text on the key is the function in the SETUP mode.

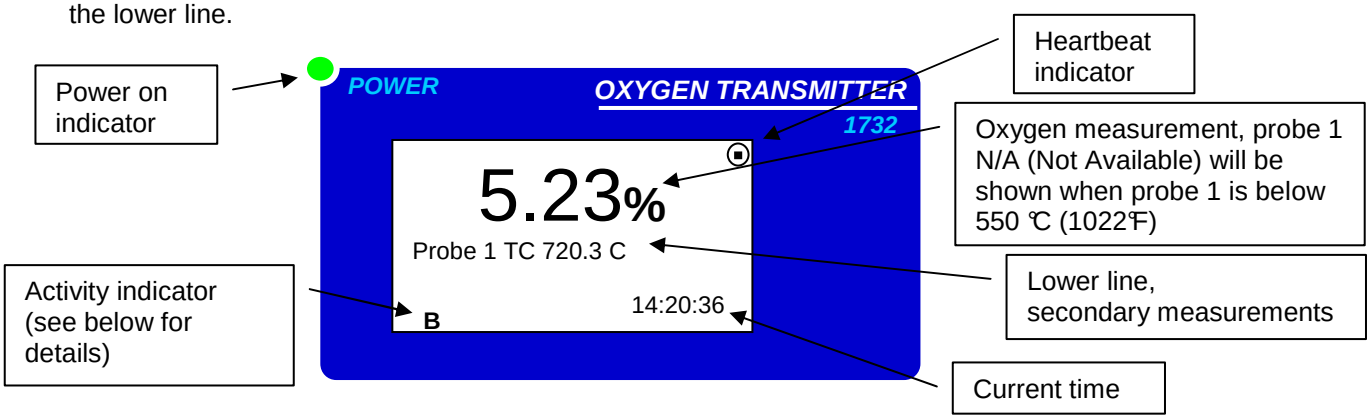
The SETUP mode is accessed by pressing the SETUP key. The transmitter will return to the RUN mode when the SETUP key is pressed again or one minute after the last key is pressed.



The front panel of the model 1732 oxygen transmitter

4.1 Display

The 1732 display is used to show the oxygen in a large font and the secondary functions in a smaller font. The default display is shown below with probe #1 oxygen on the top line and the probe #1 temperature on the lower line.



In addition to displaying the current oxygen and the various secondary values, the display is also to used show the current and active alarm conditions and to configure the transmitter. This is achieved by entering the SETUP mode (see chapter 5).

The Activity indicators show actions that are happening in the background.

B The burner input has been enabled (terminals 10&11)
A The transmitter is doing an auto calibration. This happens every minute or when the AUTO CAL key is pressed in setup mode
T (Flashing) The probe(s) is(are) below operating temperature (650℃, 1200℉)
Z The transmitter is doing an impedance check of the probe(s).

4.2 Oxygen display

The oxygen measurement is displayed on the top line of the transmitter. It can be shown in either % or ppm (see chapter 5.2.3, Oxygen display units).

If "%" is chosen the transmitter will maintain the best resolution available. The display will show oxygen in the following format –

Oxygen measurement	Display format
30.0 to 100.0%	##.#%
10.00 to 29.99%	##.##%
0.200 to 9.999%	#.###%
<0.200%	Scientific notation (#.## x $10^{-\#\#}$ %)

If "ppm" is chosen in Set-up , the transmitter will show the oxygen in ppm format between 10 and 9,999ppm. Outside this range the oxygen will be shown in % format.
The show oxygen in the following format –

Oxygen measurement	Display format
>10.000%	% format (see above format)
1,000 to 9,999ppm	#,###ppm
100 to 999.9ppm	###.#ppm
10 to 99.99ppm	##.##ppm
<10ppm	Scientific notation (#.## x $10^{-\#\#}$ %)

4.3 Keypad

There are 8 keys built into the decal on the outside of the door of the 1732 transmitter. The key function is written in BLACK and WHITE to identify the function of the key in either RUN mode or SETUP mode.

Key text	RUN mode (BLACK text)	SETUP mode (WHITE text)
SETUP / RUN	*Enter SETUP mode*	*Return to RUN mode*
DISPLAY / FUNCTION Δ	*Display scroll up*	*Function scroll up*
DISPLAY / FUNCTION ∇	*Display scroll down*	*Function scroll down*
ALARM / OPTION Δ	*Alarm scroll up*	*Option scroll up*
ALARM / OPTION ∇	*Alarm scroll down*	*Option scroll down*
ALARM ACCEPT / ENTER	*Alarm accept*	*Enter*
GAS 1 PURGE 1 / SENS IMP	*Gas 1 / Purge 1 manual activate*	*Probe impedance*
GAS 2 PURGE 2 / AUTO CAL	*Gas 2 / Purge 2 manual activate*	*Auto calibrate*

4.3.1 Keypad in RUN mode

When the transmitter is turned on, and has gone through the start-up procedure, it will go to the RUN mode. In this mode the top line of the display will show the oxygen measurement from probe 1. The other key functions are –

SETUP / RUN key
Pressing this key once will put the transmitter into the SETUP mode. The function of all the keys will then change to the functions that they have in the SETUP mode. Pressing the SETUP / RUN key again will return the transmitter to the RUN mode, or it will return automatically one minute after the last key press.

DISPLAY up / down keys
The display keys are used to scroll the lower line up and down through the variety of measurements that are available on the lower line display. The list can be changed to suit the operator by using SETUP function #4.

ALARM up key
If there is either a new alarm or an active alarm the ALARM UP key can be pressed to examine the alarm status. The alarm light will be flashing if there is a new alarm or steady if there is an existing alarm. (see chapter 6, Alarms).

ALARM down key
When the transmitter is in the run mode or the alarm mode (the ALARM UP key has been pressed), the ALARM DOWN key and the ALARM UP key allow the operator to examine the alarm log. The date / time of last 1000 alarms can be scrolled through. Each alarm record consists of the alarm name and the date / time that the alarm was initiated, accepted and cleared (see chapter 6, Alarms).

ALARM accept key
The ALARM ACCEPT key is used to accept a new alarm (see chapter 6, Alarms).

GAS 1 / PURGE 1 and GAS 2 / PURGE 2 keys
These two keys are used to turn on the gas / purge solenoids. When the transmitter is in the manual cal / purge mode (Commissioning function #20) the solenoid will be activated for as long as the key is pressed. When the transmitter is in the auto cal / purge mode the automatic cal / purge cycle is started. The cycle can be stopped by pressing any key. (See chapter 7, Gas Calibrate and Purge)

4.3.2 Keypad in SETUP mode

When the SETUP / RUN key is pressed once, the transmitter will go into the SETUP mode.

For information about the additional user-selectable options, see the 1732 Technical Manual.

The following key functions are then available in the SETUP mode.

SETUP / RUN key
Pressing this key once will put the transmitter into the SETUP mode. The function of all the keys will then change to the functions that they have in the SETUP mode. Pressing the SETUP / RUN key again will return the transmitter to the RUN mode, or it will return automatically one minute after the last key press.

FUNCTION up and FUNCTION down keys
These two keys allow the selection of the required setup function from the list shown at the start of chapter 5.1 (SETUP mode).

OPTION up and OPTION down keys
These two keys allow for the selection of the options that are available in the selected function. See the details of these in chapter 5.2 (Setup mode details).

ENTER key
The ENTER key saves the selected option. If the ENTER key is not pressed when a new option is chosen, the previous option will be retained.

Probe impedance key
When this key is pressed the transmitter will measure the impedance of the sensor in the probe(s). This will only happen if the burner is enabled (terminals 10 and 11) and the probe temperature is over 700℃ (1290℉).

Auto calibrate key
When this key is pressed the transmitter will calibrate the analog output channels. This is done by directing the output current away from the output terminals (terminals 12 &13 and 14 & 15) and directing the current back into the transmitter input. The transmitter will then calculate a zero and a span calibration factor for each of the output channels. The output calibration will only happen if the channel is not set to manual output calibration. (see Technical Manual for more details)

This chapter describes the functions available when the SETUP mode is selected on the transmitter.

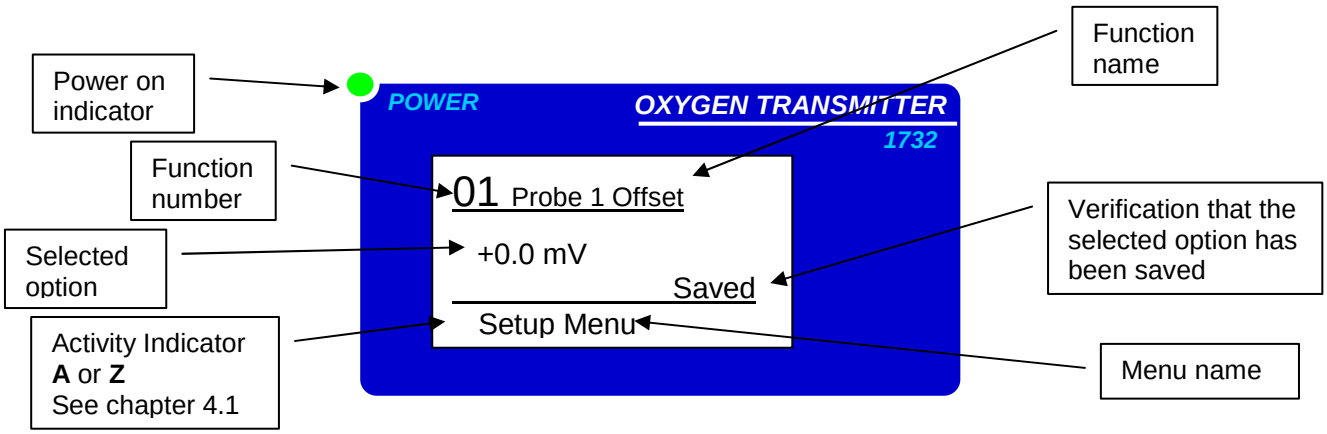
The SETUP mode is accessed by pressing the SETUP key. The transmitter will return to the RUN mode when the SETUP key is pressed again or 1 minute after the last key is pressed.

5.1 SETUP mode function summary

When the transmitter is in the SETUP mode the SETUP light will be on. The following table shows the SETUP menu functions:

Menu #	Function name (top line)	Range	Default value
01	Probe 1 offset	-6.0 to +6.0mV	0.0mV
02	Probe 2 offset	-6.0 to +6.0mV	0.0mV
03	Lower line items	-	See SETUP function #3 for details (chapter 5.2.2)
04	Oxygen display units	Oxygen % / Oxygen ppm	Oxygen%
05	Damping factor	No damping to 10 samples averaged	5 samples averaged
06	Process alarms	Enabled / Disabled	Disabled
07	Very low oxygen alarm	0.001 to 2.000%	0.500%
08	Very low oxygen alarm delay	0 to 200 seconds	2 seconds
09	Low oxygen alarm	0.1 to 100.0%	2.5%
10	Low oxygen alarm delay	0 to 200 seconds	10 seconds
11	High oxygen alarm	0.1 to 100.0%	10.0%
12	High oxygen alarm delay	0 to 200 seconds	60 seconds
13	Oxygen Deviation alarm	0.1 to 21.0%	2.0%
14	Oxygen deviation alarm delay	0 to 200 seconds	30 seconds

5.2 SETUP mode details



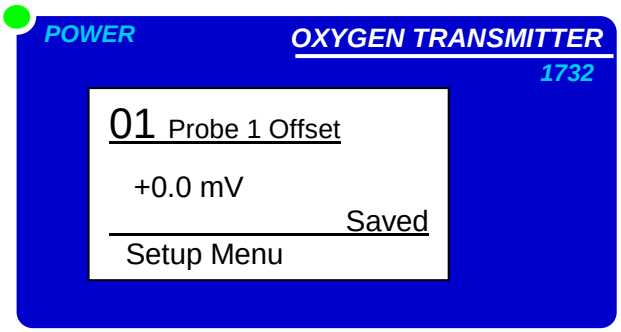
5.2.0 To change an option in the SETUP menu:

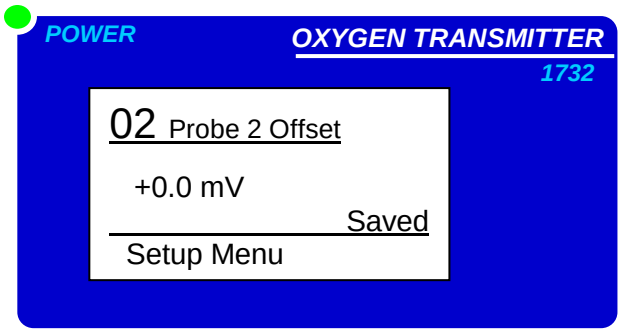
1. Select the SETUP mode by pressing the SETUP / RUN key once. The SETUP light will come on and the display will have the format shown above. The operations of the keys are now the operations written in white on the keypad. The menu name is written at the bottom of the display.
2. When the SETUP mode has been selected the required function can be found by using the FUNCTION UP and FUNCTION DOWN keys.
3. The options available for that function can be seen by using the OPTION UP and OPTION DOWN keys.
4. When the required option is on the display the ENTER key is used to save that option.
5. Press the SETUP / RUN key to return to the RUN mode.

The details of each function are given below.

NOTE: An asterisk (*) on the end of the line identifies the default option that is set during a COLD-START.

5.2.1 Probe 1 offset



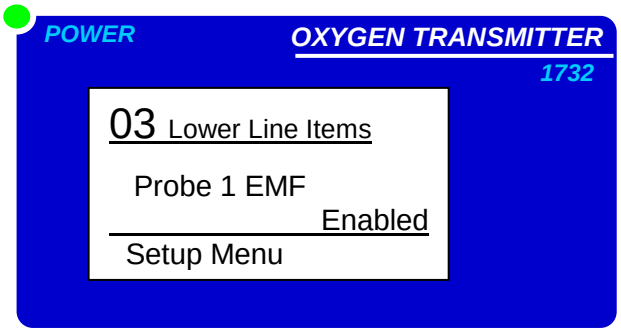


Each Novatech probe has an offset calibration value printed on a tag that is attached to the probe when it is dispatched. The offset value must be entered into this setup function to achieve the most accurate measurements. The value is usually between -1.0 to +1.0mV.
RANGE: -6.0 to +6.0mV (0.0mV is set after a COLD-START)

NOTE: An error of 1mV in the probe offset will change the oxygen reading by about 1% oxygen when the probe is in ambient air. However, the reading is changed by much less when the probe is in a process. At a process gas oxygen concentration of 2%, the 1mV offset error will only change the reading by 0.1%.
If in any doubt about the correct offset value, set it to 0.0mV.

The function '02 Probe 2 Offset' will only appear if the transmitter has been configured for 2 probes.

5.2.2 Lower Line Items



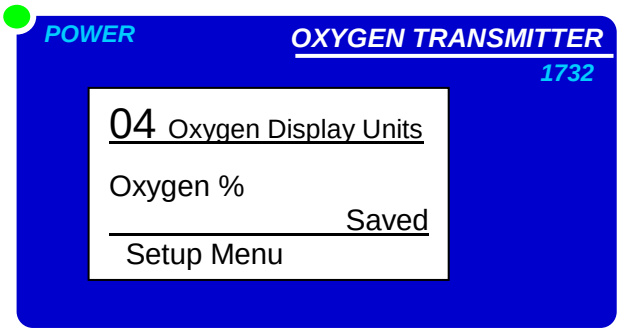
This function allows the operator to change the items that are available to be displayed on the lower line of the transmitter when it is in the RUN mode. If the word "Enabled" appears on the display for a selected lower line measurement option, the measurement will be available to be shown on the display in the RUN more by scrolling through the list using the DISPLAY up and DISPLAY down keys.
A lower line selection can be "Enabled" or disabled by pressing the ENTER key.

OPTIONS:

Temperature, probe #1	*
Temperature, probe #2	*
Sensor EMF, probe #1	*
Sensor EMF, probe #2	*
Sensor impedance, probe #1	*
Sensor impedance, probe #2	*
Oxygen, probe #2	*
Oxygen, Average probe 1 and probe 2	*
Aux temperature	
Ambient temperature	*
Oxygen deficiency, probe #1	
Oxygen deficiency, probe #2	
Combustibles, probe #1	

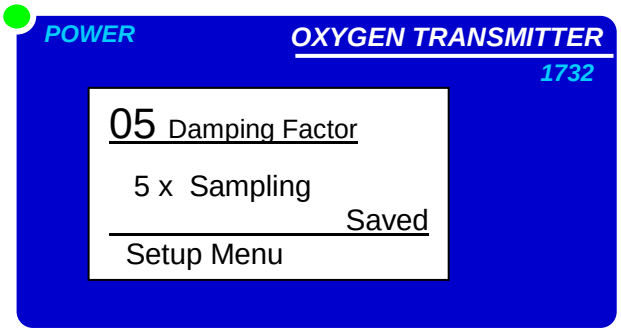
Combustibles, probe #2
Carbon dioxide, maximum dry, probe #1
Carbon dioxide, maximum dry, probe #2
Boiler efficiency (requires “Single probe” and “Aux TC Type” to be set)
Burner run time
Service date

5.2.3 Oxygen Display Units



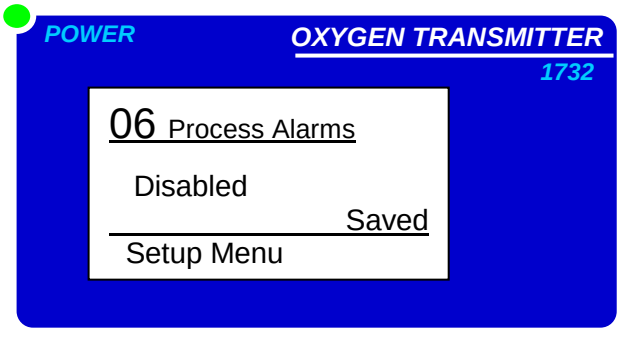
The top line of the display that shows the oxygen measurement can be displayed in either % or ppm (see chapter 4.1, Display)
OPTIONS:
Oxygen % *
Oxygen ppm

5.2.4 Damping Factor



The oxygen measurement can be damped if there are annoying fluctuations in the process gas. Of course any damping will slow down the reaction time of the transmitter. The larger the number selected here, the steadier the measurement will be.
The damped oxygen value is also used in the calculation of all other parameters that are based on the oxygen value.
RANGE: “No Damping” to 10 (5 x Samples is set after a COLD-START)

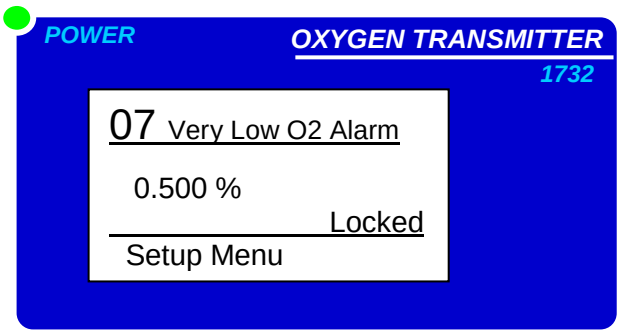
5.2.5 Process Alarms

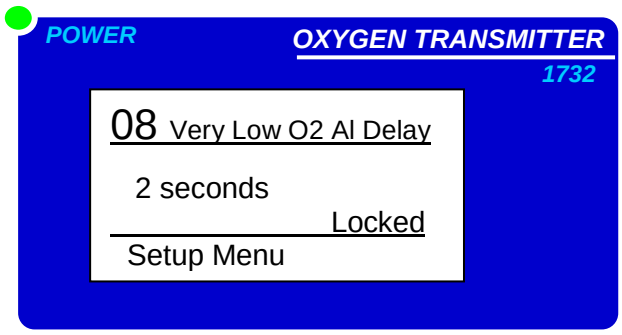


This function allows the operator to “Disable” process alarms.
Setup functions 7 to 14 show the alarm trip points that have been set in the transmitter.
OPTIONS:
Enabled
Disabled *

5.2.6 Very Low Oxygen Alarm and Delay

NOTE: These menu functions are read only. To change these settings see, the Technical Manual.



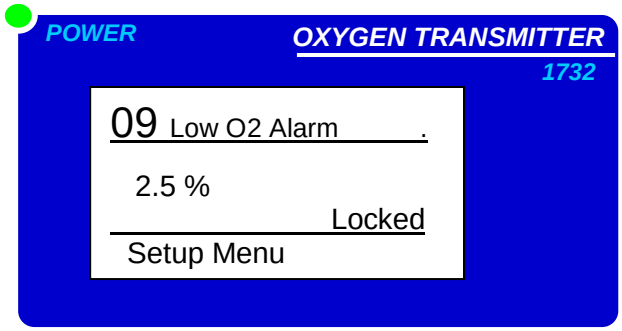


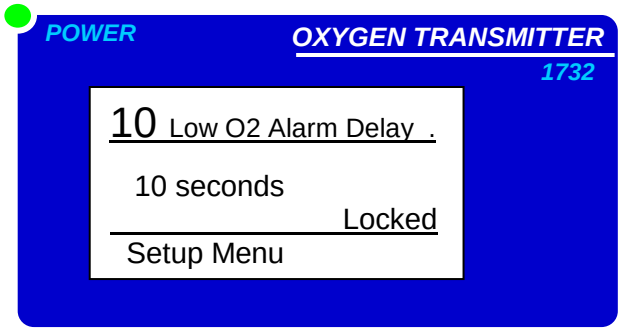
If the transmitter has been selected to run a single probe, it will show a very low oxygen alarm when the oxygen measurement of probe 1 goes below the trip level for longer than the delay time.
If the transmitter has been selected to run dual probes, it will show a very low oxygen alarm when the average of the two oxygen measurements is below the trip level for longer than the delay time. If either one of the probes has a failure alarm (High sensor impedance, thermocouple open circuit, heater failure) the alarm will then trip on the oxygen measurement from the remaining working probe.

RANGE:	0.001 to 2.000 %	(0.500 % is set after a COLD-START)
RANGE:	0 to 200 seconds	(2 seconds is set after a COLD-START)

5.2.7 Low Oxygen Alarm and Delay

NOTE: These menu functions are read only. To change these settings see, the Technical Manual.



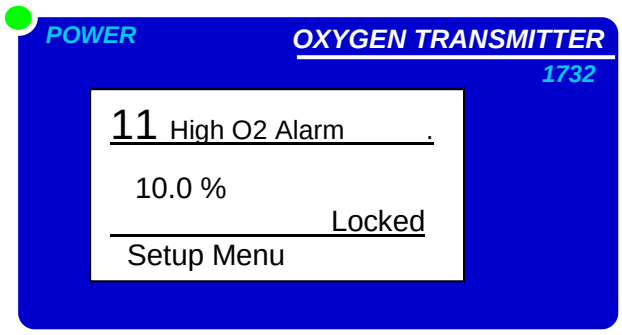


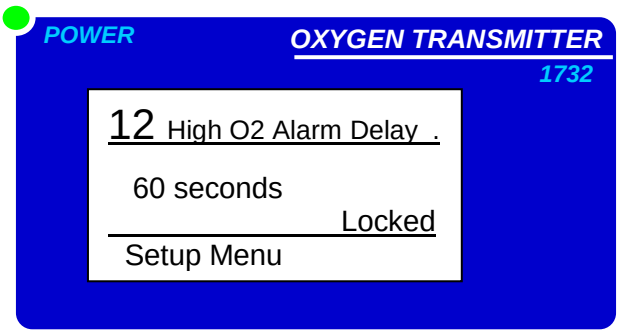
If the transmitter has been selected to run a single probe, it will show a low oxygen alarm when the oxygen measurement of probe 1 goes below the trip level for longer than the delay time.
If the transmitter has been selected to run dual probes, it will show a low oxygen alarm when the average of the two oxygen measurements is below the trip level for longer than the delay time. If either one of the probes has a failure alarm (High sensor impedance, thermocouple open circuit, heater failure) the alarm will then trip on the oxygen measurement from the remaining working probe.

RANGE:	0.1 to 100 %	(2.5 % is set after a COLD-START)
RANGE:	0 to 200 seconds	(10 seconds is set after a COLD-START)

5.2.8 High Oxygen Alarm and Delay

NOTE: This menu function is read only. To change this setting, see the Technical Manual.



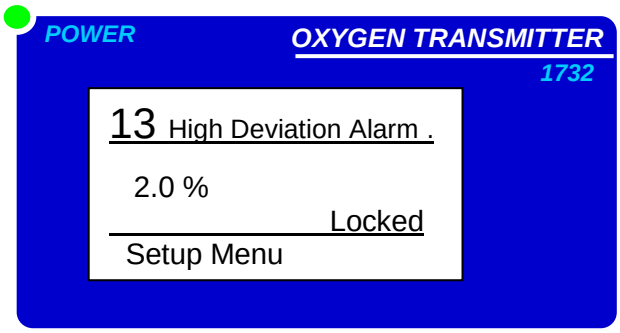


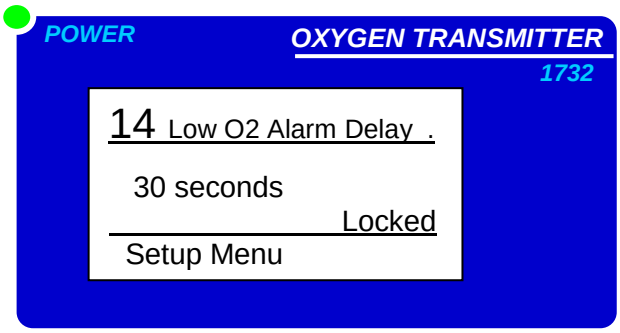
If the transmitter has been selected to run a single probe, it will show a high oxygen alarm when the oxygen measurement of probe 1 goes above the trip level for longer than the delay time.
If the transmitter has been selected to run dual probes, it will show a high oxygen alarm when the average of the two oxygen measurements is above the trip level for longer than the delay time. If either one of the probes has a failure alarm (High sensor impedance, thermocouple open circuit, heater failure) the alarm will then trip on the oxygen measurement from the remaining working probe.

RANGE:	0.1 to 100 %	(10.0 % is set after a COLD-START)
RANGE:	0 to 200 seconds	(60 seconds is set after a COLD-START)

5.2.9 High Deviation Alarm and Delay

NOTE: This menu function is read only. To change this setting, see the Technical Manual.





If the transmitter has been selected to run a single probe these alarm screens will not appear.
If the transmitter has been selected to run dual probes, it will show a high oxygen deviation alarm when the difference between the two oxygen measurements is above the trip level for longer than the delay time.

RANGE:	0.1 to 100 %	(2.0 % is set after a COLD-START)
RANGE:	0 to 200 seconds	(30 seconds is set after a COLD-START)

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The 1732 has 4 alarm relays and a built in alarm annunciator and an alarm log. When an alarm occurs and the ALARM up key is pressed, the transmitter goes into the alarm display mode. In this mode some of the keys take on a special function.

Key text	RUN mode	ALARM mode
SETUP / RUN		*Return to RUN mode*
DISPLAY / FUNCTION up		*Next alarm time*
DISPLAY / FUNCTION down		*Previous alarm time*
ALARM / OPTION up	*Enter ALARM display mode*	*Next Alarm*
ALARM / OPTION down	*Enter ALARM log mode*	*Previous Alarm*
ALARM ACCEPT / ENTER		*Accept alarm*

When the alarm mode has been entered the SETUP light flashes once a second.

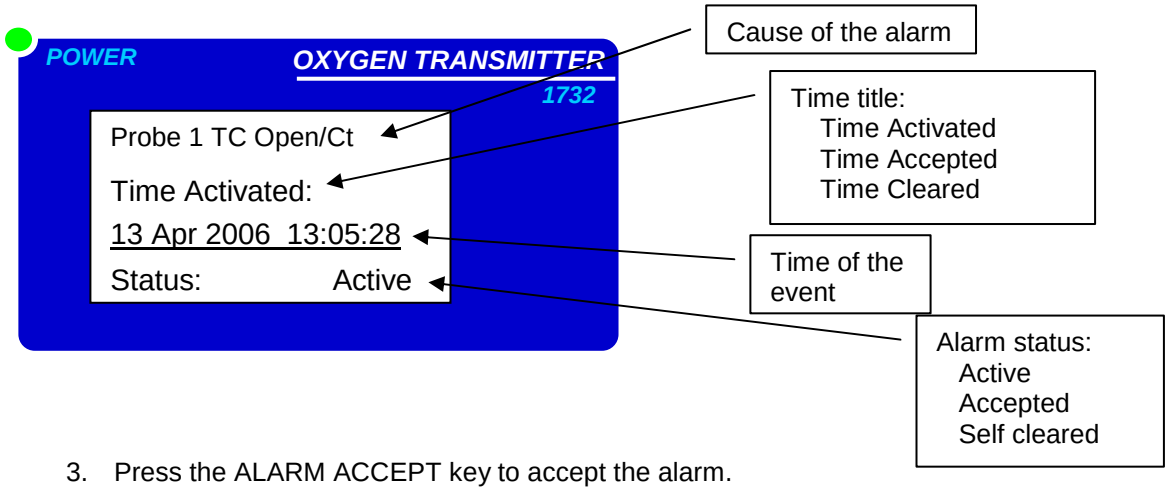
All relays have fail-safe alarm contacts. That is –
- When the transmitter is off the contacts are open circuit
- When the transmitter is on but there are no alarms the contacts are closed
- When there is a current alarm event the contacts are open circuit

All alarms drive the alarm light on the front door.
- The light will be off if there are no alarms current
- The light will flash if there is a current alarm that has not been accepted
- The light will be on steady if there are current alarm(s) that have been accepted
- The light will flash faster as more alarms occur

6.1 Checking and Accepting an Alarm

When a new alarm occurs, either a process alarm or an alarm that will appear in the common alarm list, the ALARM light will flash. The more new alarms there are, the faster the light will flash.
To check the cause of the alarm –

1. Press the ALARM up key. This will put the transmitter into the current alarm mode. The SETUP light will flash.
2. The alarm screen will appear displaying the cause of the alarm on the top line.



3. Press the ALARM ACCEPT key to accept the alarm.
4. Press the OPTION up key to see the next active alarm or the OPTION down to see the previous active alarm.
5. When all the new alarms have been ACCEPTED the ALARM light will stop flashing.
6. Accept each alarm and then press the SETUP / RUN key to return to the run mode.

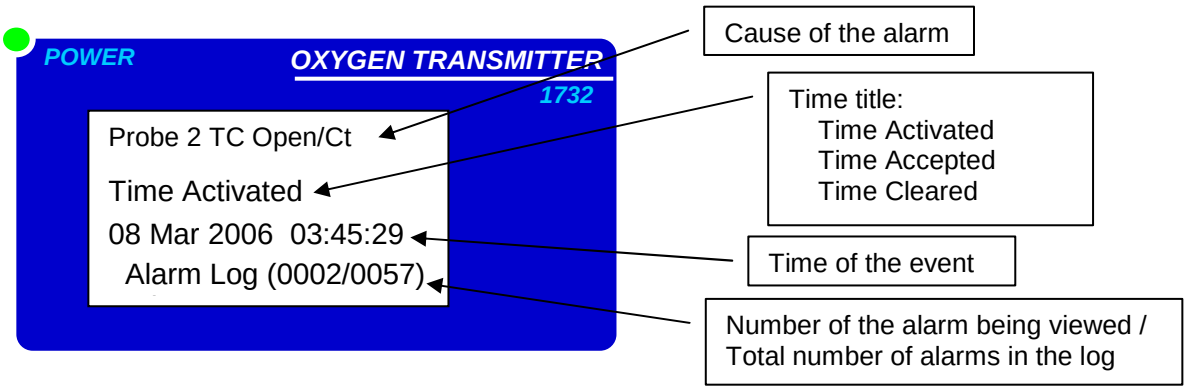
6.1.1 Current Alarms

To view the alarms that are still current press the ALARM up key from the RUN mode and then use the ALARM up and down keys to view all alarms. Use the DISPLAY up and down keys to view the Time Activated, Time Accepted and the Time Cleared of each alarm.

6.1.2 Alarm Log

The alarm log keeps a record of the alarm events after the cause of the alarm has been cleared. It will hold a record of up to 1000 alarm events and will be retained even with the transmitter power off.

To view all the alarms that have occurred in the alarm log press the ALARM down key from the RUN mode. The display will look like this:



Use the OPTION up and down to scroll through the alarm events that have been saved in the alarm log. The alarm event will be transferred to the alarm log when the alarm has been cleared.

The alarms are stored in the alarm log in chronological order. However, it may be seen that the current alarm number will skip some numbers. These numbers have been reserved for alarm events that are still current. When the alarm cause has been removed, these alarm events will be transferred to the alarm log.

6.2 Alarm Relays

The common alarm relay is used to monitor faults within the transmitter and the probe. The list of events that will cause the common alarm relay to be activated is shown in chapter 6.3, Common Alarms. The relay contacts will be open circuit if there is a current alarm condition.

The other three alarm relays are user defined and are used to monitor the process. The function of the process alarm relays is user selectable. See chapter 6.4, Selectable Process Alarms, and the Technical Manual for further information.

6.3 Common Alarms

The events that drive the common alarm relay are –

1. 'Probe 1 High Impedance'
2. 'Probe 2 High Impedance'

Oxygen probe or electrode failure (high impedance). This alarm is inhibited when the probe temperature is under 650℃ (1200℉).

3. 'Probe 1 Heater Fail'
4. 'Probe 2 Heater Fail'

In the first 20 minutes of power being applied to the heater after being switched on, this alarm will not occur, but a 'Probe 1(2) Low Temp' display will be shown and the common alarm relay will be activated. If an ADC alarm occurs, the heaters will automatically be turned off. If the probe has not reached 650℃ (1200° F) in 20 minutes the 'Probe 1(2) Heater Fail' alarm will be raised.

5. 'Probe 1 TC Open Circuit'
6. 'Probe 2 TC Open Circuit'

Probe thermocouple is open circuit. The heater in heated probes will switch off.

7. 'Auxiliary TC Open Circuit'

Stack thermocouple is open circuit. If the thermocouple is not needed, select "NO T/C" for "Aux TC Type" or place a short circuit between terminals 7 & 8.

8. 'Reference Air Pump Fail'

The reference air pump in the transmitter has failed.

9. 'ADC Calibration Fail'

The analog to digital converter has been found to fall outside the normal calibration specifications. In this case the probe heater will automatically be turned off.

10. 'Output 1 Failure'
11. 'Output 2 Failure'

The digital to analog and voltage isolator circuit has been found to fall outside the normal calibration specifications. This check is only performed when the 'AUTO CAL' button is pressed.
Refer to chapter 4.2.2.

12. 'BBRAM Fail'

All of the setup options are held in the battery backed memory (BBRAM). This is the battery shaped device at the bottom centre of the 1730-1 PCB labeled MEM1. This alarm will occur when this device fails and will need to be replaced.

13. 'Heater 1 SSR Failure'
14. 'Heater 2 SSR Failure'
15. 'Heater SSR Leakage'

The 1732 has the ability to monitor the operation of the heater current. As a result, the transmitter will give an alarm within 1 second of a heater power control switch (Solid State Relay) failure. If either of the SSR's are found to be faulty, both heaters will be turned off immediately and the alarm will be raised. The SSR must be replaced. The 'SSR Leakage' alarm will occur if one of the heater SSR's are partly shorted.

If probe #1 SSR has failed and only one probe is being used, the 1732 Technical Manual describes how the SSR for probe #2 can be selected instead. If 2 probes are being used but neither of the solenoid outputs are being used consult the Technical Manual.

16. 'Probe 1 Filter Blocked'
17. 'Probe 2 Filter Blocked'

Blocked probe filter. This test is only performed when automatic purging of the probe is selected. Refer to the Technical Manual for further details. This alarm will not reset until the next purge cycle that can be initiated manually or automatically, or the power to the transmitter is turned off and back on.

18. ‘Gas 1 Calibration Error’
19. ‘Gas 2 Calibration Error’
This alarm will only be raised if the oxygen measurement during an automatic gas calibration check falls outside the set gas % limits. This alarm will not reset until the next purge cycle that can be initiated manually or automatically, or the power to the transmitter is turned off and back on.

6.4 Selectable Process Alarms

There are three user configurable alarm relays. Any or all of the following functions can be selected for each relay.
The description of how the trip levels and the delay times are set is in the 1732 Technical Manual.

NOTE: The process alarms will only be activated if they are enabled in SETUP menu function 06.

19. ‘Oxygen 1 Very Low’
20. ‘Oxygen 2 Very Low’
The measured oxygen level on the indicated probe has been below the trip level shown in setup function #07 for longer than the delay time shown in setup function #08.

21. ‘Oxygen 1 Low’
22. ‘Oxygen 2 Low’
The measured oxygen level on the indicated probe has been below the trip level shown in setup function #09 for longer than the delay time shown in setup function #10.

23. ‘Oxygen 1 High’
24. ‘Oxygen 2 High’
The measured oxygen level on the indicated probe has been above the trip level shown in setup function #11 for longer than the delay time shown in setup function #12.

25. ‘Oxygen Deviation’
The difference between the oxygen level measured on probe #1 and the oxygen level measured on probe #2 is greater than the trip level shown in setup function #13 and the time delay shown in setup function #14 has expired.

6.5 Warning Messages

26. ‘Probe 1 Temperature Low’
27. ‘Probe 2 Temperature Low’
The probe temperature is under 650°C (1200℉). The oxygen reading is therefore invali d. If the probe heater has been on for more than 20 minutes and the temperature is less than 650°C (1200℉) a ‘Probe 1(2) Heater Fail’ alarm will occur. There will be a flashing ‘T’ symbol on the bottom left hand corner of the display until the temperature of the probe(s) is over 650℃ (1200℉).

NOTE: The ‘Probe 1(2) Temperature Low’ function is also used with unheated probes to show that the probe temperature is below 650℃ (1200℉) when the proces s temperature falls below this level. With heated probes this relay will be de-energised while the probe is heating up from ambient, making the contacts open circuit.

28. ‘Cal 1 in Progress’
29. ‘Cal 2 in Progress’
A calibration check is occurring, either manual or automatic mode. The ‘1’ symbol will be shown in the bottom left hand corner of the display, and it will flash during the post purge freeze time.

30. ‘Purge 1 in Progress’
31. ‘Purge 2 in Progress’
A probe purge is occurring, either manual or automatic mode. The ‘2’ symbol will be shown in the bottom left hand corner of the display, and it will flash during the post purge freeze time.

7. GAS CALIBRATE AND PURGE

The Novatech oxygen sensor that is used in the Novatech oxygen probe is extremely predictable, stable and reliable. For this reason, the calibration of a Novatech oxygen system does not require the use of calibration gases.

However, all Novatech oxygen probes have a built in gas connection that does allow the accuracy of the probe to be checked. This chapter describes the operation of this gas checking system. For further details see the 1732 Technical Manual.

The 1732 has a timer and solenoid driving system that can be configured to admit a certified calibration gas into the probe or an air supply to purge the probe filters through the gas connection. Both the calibration gas and the filter purge gas must be piped to the port on the probe labeled “CAL/PURGE”.

There are two solenoids drivers in the 1732 transmitter. They can be used for a variety of combinations of gas checking and probe purging functions. The available options depend on the way that the transmitter has been configured.

Single probe

Configuration	
Gas 1 & Purge 2	Solenoid 1 should be connected to calibration gas and Solenoid 2 should be connected to the purge gas
Gas 1 & Gas 2	Solenoid 1 should be connected to calibration gas #1 and Solenoid 2 should be connected to calibration gas #2

Dual probe

Configuration	
Purge 1 & Purge 2	Solenoid 1 should be connected to the purge gas on probe #1 and Solenoid 2 should be connected to the purge gas on probe #2
Gas 1 & Gas 2	Solenoid 1 should be connected to calibration gas #1 and Solenoid 2 should be connected to calibration gas #2

The transmitter can also be configured to be in a MANUAL or AUTOMATIC purge and gas check mode.

The information on configuring the transmitter is contained in the 1732 Technical Manual.

7.1 Actions That Occur When the Gas Solenoid Keys Are Pressed

Purge and Gas check mode	Number of probes	Gas option	
Automatic	Single	Gas 1 & Purge 2	Pressing the GAS 1/ PURGE 1 key will start the timed gas check cycle on solenoid #1 to probe #1 Pressing the GAS 2/ PURGE 2 key will start the timed filter purge cycle on solenoid #2 to probe #1
Automatic	Single	Gas 1 & Gas 2	Pressing the GAS 1/ PURGE 1 key will start the timed gas check cycle on solenoid #1 to probe #1 Pressing the GAS 2/ PURGE 2 key will start the timed gas check cycle on solenoid #2 to probe #1
Automatic	Dual	Purge 1 & Purge 2	Pressing the GAS 1/ PURGE 1 key will start the timed filter purge cycle on solenoid #1 to probe #1 Pressing the GAS 2/ PURGE 2 key will start the timed filter purge cycle on solenoid #2 to probe #2
Automatic	Dual	Gas 1 & Gas 2	Pressing the GAS 1/ PURGE 1 key will start the timed gas check cycle on solenoid #1 to probe #1 Pressing the GAS 2/ PURGE 2 key will start the timed gas check cycle on solenoid #2 to probe #2
Manual	Single	Purge 1 & Purge 2	Pressing the GAS 1/ PURGE 1 key will turn on solenoid #1 to purge probe #1 for as long as the key is pressed Pressing the GAS 2/ PURGE 2 key will turn on solenoid #2 to purge probe #1 for as long as the key is pressed
Manual	Single	Gas 1 & Gas 2	Pressing the GAS 1/ PURGE 1 key will turn on solenoid #1 to pass calibration gas to probe #1 for as long as the key is pressed Pressing the GAS 2/ PURGE 2 key will turn on solenoid #2 to pass calibration gas to probe #1 for as long as the key is pressed
Manual	Dual	Purge 1 & Purge 2	Pressing the GAS 1/ PURGE 1 key will turn on solenoid #1 to purge probe #1 for as long as the key is pressed Pressing the GAS 2/ PURGE 2 key will turn on solenoid #2 to purge probe #2 for as long as the key is pressed
Manual	Dual	Gas 1 & Gas 2	Pressing the GAS 1/ PURGE 1 key will turn on solenoid #1 to pass calibration gas to probe #1 for as long as the key is pressed Pressing the GAS 2/ PURGE 2 key will turn on solenoid #2 to pass calibration gas to probe #2 for as long as the key is pressed

Refer to the person responsible for the commissioning to find out how the transmitter has been configured.

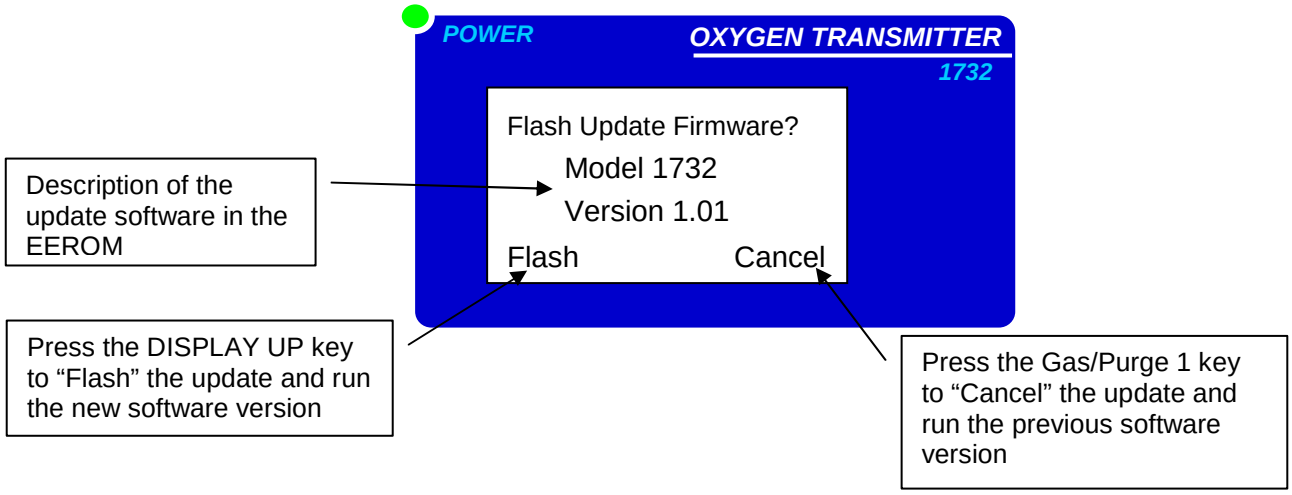
8. UPDATING THE SOFTWARE

The programme for 1732 transmitter is run from memory that is inside the main microprocessor. The programme is inserted at the time of manufacture. If the software needs to be updated to a later version, the factory can supply an EEROM (electrically erasable read only memory) containing the update. The following procedure should be used –

Turn the power off to the transmitter
Carefully remove the update EEROM from the packaging

NOTE: The EEROM is static sensitive. Avoid static discharges trough the pins of the EEROM by earthing yourself before picking up the EEROM.

Remove the shield by undoing the 2 M4 screws



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