

Non-Intrusive Signaller Ultrasonic Active Topside Operating Manual

**The ID5000A is a fully ATEX certified,
non-intrusive pig signaller which detects,
signals and logs the passage of pigs at
critical points along the pipeline both on land
and off shore**



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1. GENERAL DESCRIPTION

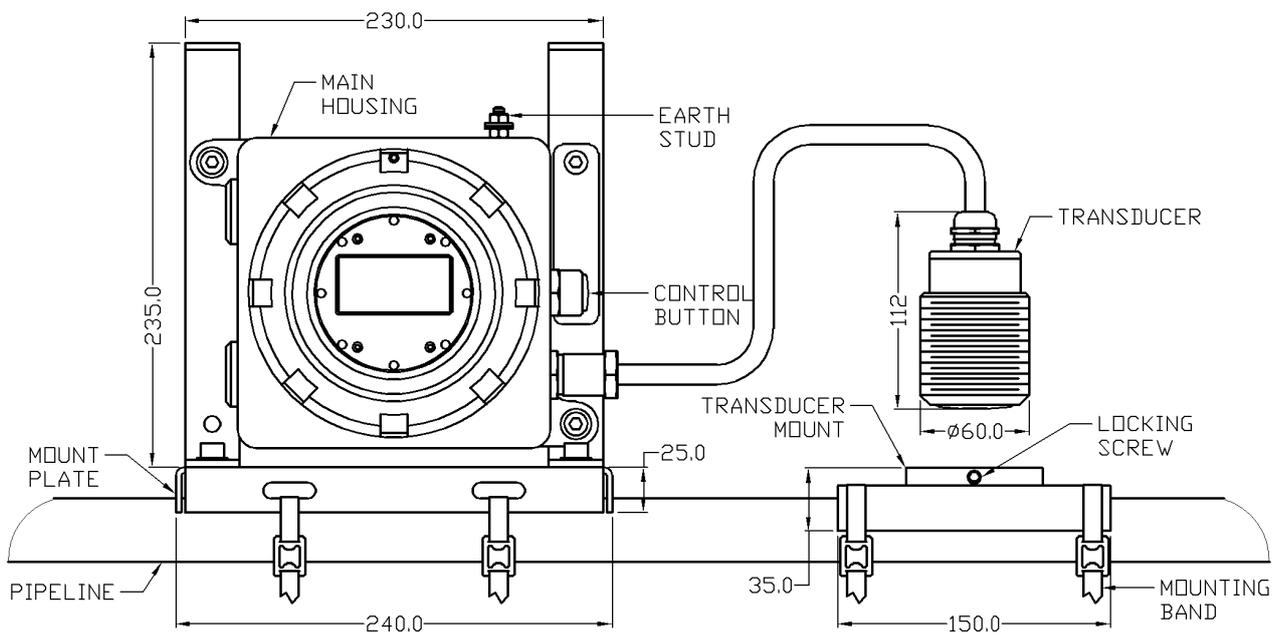
The ID5000A (Active) Ultrasonic pig signaller is a fully ATEX certified, non-intrusive, pig signaller which detects, signals, and logs the passage of pigs at critical points along fluid filled pipelines both on land and offshore.

The signaller uses the pulse-echo method to detect the time of flight of ultrasonic pulses through the pipe. An ultrasonic pulse is sent through the pipe wall and provided that an acoustically transparent column of fluid is passing through the pipe (single phase, no gas bubbles, no large solid particles), the unit is able to see a "reflection" of energy from the other side of the pipe. When a pig passes, the fluid path is disturbed, removing the reflection, and the pig is detected.

Events are signalled as they occur via a 2.7" graphical display and high brightness LEDs positioned around the perimeter of the display. Events can also be signalled remotely using several optional outputs.

The unit logs the time and date of up to 100 events which can be viewed at any point using the local display. The user can turn the unit ON and OFF as well as modify several settings using a single control button and intuitive menu system.

The unit has two basic parts as shown below. The transducer is permanently connected to the main housing via a cable. The transducer is screwed into a mounting block which can be quickly and easily attached to the pipeline using ratchet straps or steel banding. The main housing contains all electronics, battery (if fitted), display and the control button. The main housing is mounted onto the pipeline using a mounting block and straps in a similar fashion to the transducer.



2. SYSTEM SPECIFICATION

GENERAL

| | |
|--|--|
| Battery Type..... | 15V Alkaline Non-Rechargeable Battery Pack |
| Battery life LISTENING at +20°C (from 15V Alkaline Non-Rechargeable Pack)..... | 120 Days |
| Rechargeable Battery Type | 12V NiMH Rechargeable Battery Pack |
| Battery life LISTENING at +20°C (from 12V NiMH Rechargeable Battery Pack)..... | 12 Days |
| External Supply | 24.0VDC |
| Ambient Temperature Range | See section 9 ATEX APPENDIX |
| ATEX Code..... | II 2 G Ex d mb IIC T5...T6 |
| EC Type Examination Certificate Number..... | TRL08ATEX21161X |
| Housing Material (SS Unit Only) | 316L Stainless Steel |
| Housing Material (Al Unit Only) | Copper Free Aluminium Alloy LM25 (Al) |
| Transducer Material | 316L Stainless Steel |
| Weight in Stainless Steel | 15kg |
| Weight in Aluminium..... | 11.5kg |

OUTPUTS

| | |
|--|--|
| SPDT Relay Outputs (Volt Free Contacts)..... | 2A @ 30VDC / 0.5A @ 125VAC |
| Current Loop Output..... | 5.0mA ±1.0mA (LISTENING) / 19.0mA ±1.0mA (DETECTION) |
| Logging | 100 Events with Time and Date |

3. OPERATION

The Special Conditions for Safe Use detailed in section 9 ATEX APPENDIX must be observed and followed at all times.

3.1. TURN ON SEQUENCE

To turn the unit on simply press and hold the control button until the company logo appears on the display and then release, this takes approximately 5 seconds.

The next screen shows the product logo. This screen will be displayed for 5 seconds as shown by the counter at the bottom left corner of the display.

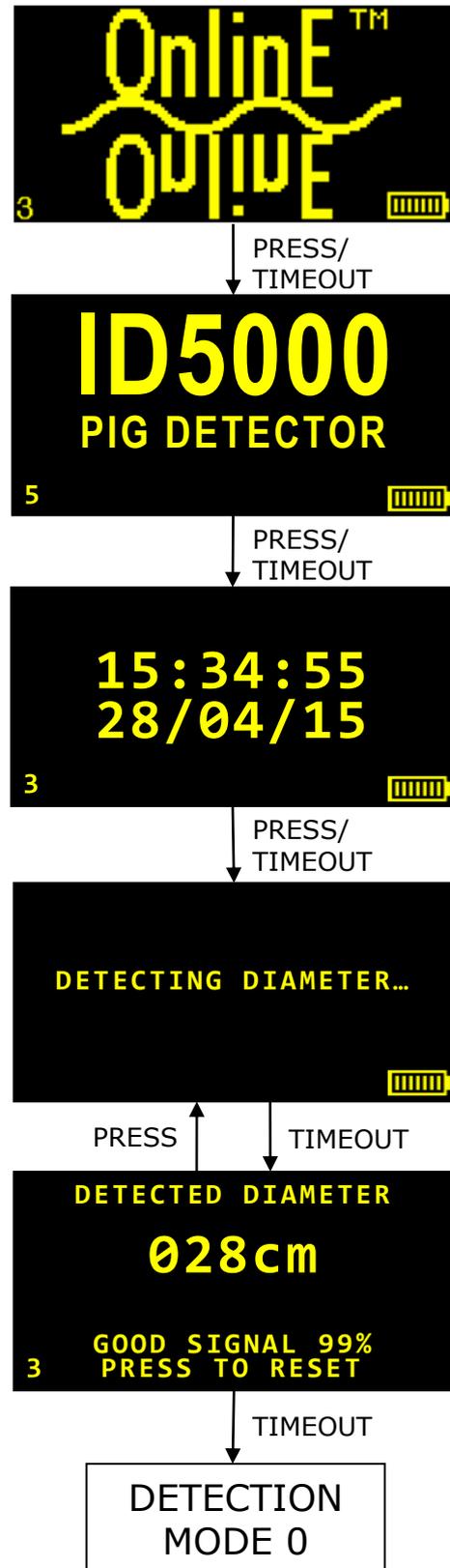
When the countdown indicator at the bottom left of the screen reaches zero, or the control button is pressed, the next screen will appear.

The next screen shows the time and date currently set in the unit.

The next screen indicates that the unit is trying to detect the pipe diameter. While this screen is visible the unit is shooting ultrasound into the pipe several hundred times per second and from the received reflections is calculating the diameter. A switch press at this stage will have no effect. After the unit is finished it will display the DETECTED DIAMETER screen.

The distance in the centre of this screen shows the average diameter which the unit detected. The next line gives an idea of the quality of this signal path between 00-99%. The measured diameter should be very close to the external diameter of the pipeline but will vary slightly due to pipe wall thickness and the type of fluid in the pipe. Factors which could cause a poor signal quality include how well the transducer is coupled to the pipe surface, foreign particles within the pipe fluid, gas bubble within the pipe fluid or non-uniform pipe wall material.

While on the DETECTED DIAMETER screen, to re-detect the pipe diameter, the switch can be pressed before the counter reaches zero. If the counter reaches zero the unit will enter DETECTION MODE 0. See section 3.2 DETECTION MODE 0.



3.2. DETECTION MODE 0

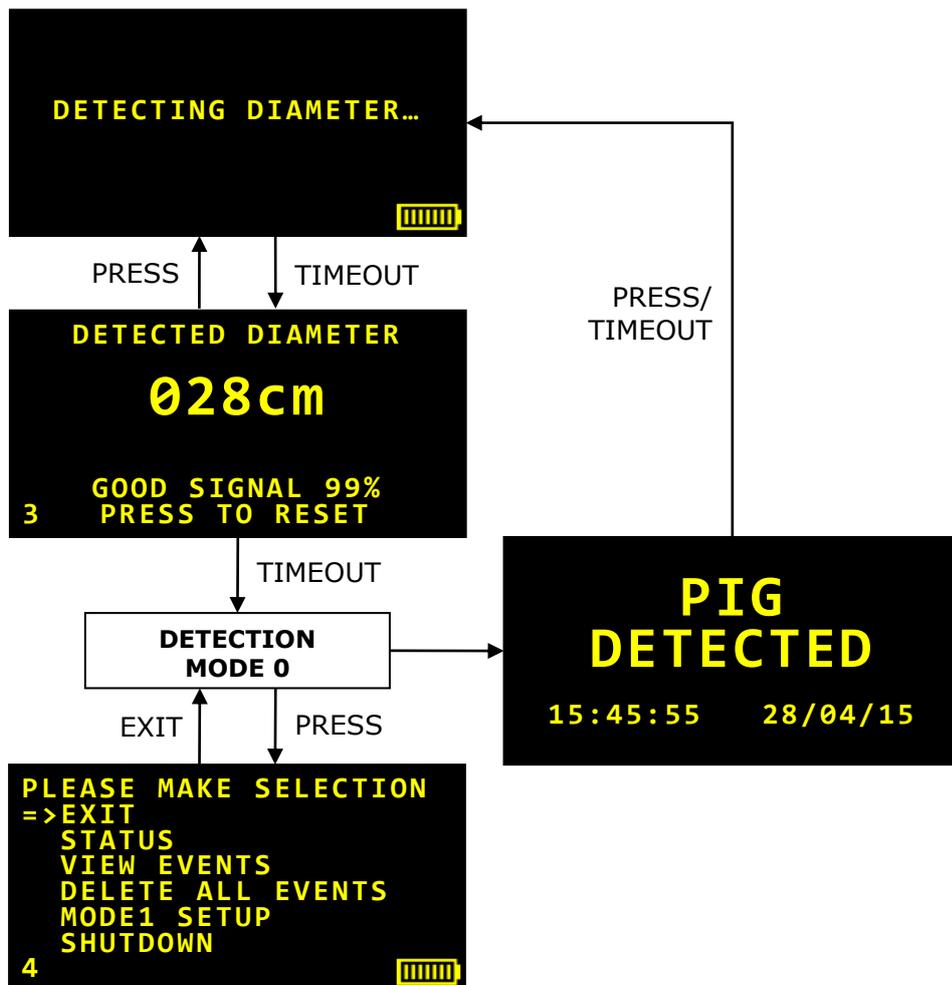
Whilst in DETECTION MODE 0 nothing is visible on the display itself however the LEDs around the perimeter of the window will flash once every 5 seconds to indicate that the unit is alive and waiting in this mode for a pig passage. There are 2 events that will cause the unit to react:

PIG DETECTION: If a pig passage occurs then the unit will immediately log the event time and date to its internal memory. It will then turn the display on and show a PIG DETECTED message with event time and date. The LEDs will start flashing every second to give a long range indication of the pig passage.

The length of time which the unit keeps indicating the pig passage in this way is determined by the INDICATOR DELAY value. See section 3.3.12 SET INDICATOR DELAY for a description of this parameter and how to alter its value.

SWITCH PRESS: A single, short press of the switch will enter the display menu interface described in section 3.3 SINGLE BUTTON MENU INTERFACE.

If the unit is not properly calibrated to a pipeline then it may repeatedly signal a PIG DETECTED message. If this is the case then while the pig passage is being signalled press the switch once then immediately press again and hold for approximately 3 seconds. This will enter the display menu where SETUP MODE 1 should be selected and then refer to section 4.3 PARAMETER SETUP to calibrate the unit to the pipeline.



3.3. SINGLE BUTTON MENU INTERFACE

While in DETECTION MODE 0, the control button can be pressed at any point to enter the menu interface. While in the menu interface, the unit will ignore all pig passages. From the menus the user can configure several parameters which are discussed in this section.

To enter the menu interface from SETUP MODE 1 a long press on the control button is required as per section 3.4 SETUP MODE 1.

Note that the menus entered from DETECTION MODE 0 and SETUP MODE 1 contain different items. All items are covered by the following sections and each section indicates whether the item is accessed from DETECTION MODE 0 or SETUP MODE 1.

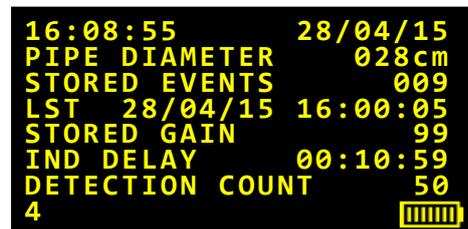
While in the menu system, every time the user presses the control button the => cursor will move down one line and the timer at the bottom left of the screen will be reset to 5. Once the cursor is pointing at the desired item the user simply allows the timer to reach 0 and the selected item will be executed. This simple behaviour is used throughout the menu interface to modify settings and interact with the unit.

To modify parameters, simply follow the instructions provided on the screen. All parameters are incremented by pressing the control button until they are at the desired value then allowing the timer to reach 0.

If you do not wish to modify a parameter then simply allow the timer to reach 0 without operating the control button. The menu system is designed so that the unit will always EXIT if the control button is left released for a long enough time.

3.3.1. STATUS

Accessed from DETECTION MODE 0. Selecting this item shows current time and date, pipe diameter detected, the number of stored events, the date and time of the last event, stored gain value, current indicator delay, and the detection counter setting.



When the counter indicator reaches zero the screen will go blank and the unit will start looking for a pig passage again. If the user wants to pause the screen to read it they can press and hold the switch to pause the timer.

3.3.2. VIEW EVENTS

Accessed from DETECTION MODE 0. Selecting this item allows the user to scroll through logged event data. If no data has been logged then a NO EVENTS message will be displayed.



The events are displayed one at a time from newest to oldest. At the very top of each display the current date and time are shown. Below this the event number is shown with the event date and time. If the switch is pressed before the counter reaches zero the screen will show the next event. If the counter reaches zero then the display will switch off and the unit will return to DETECTION MODE 0.

3.3.3. DELETE ALL EVENTS

Accessed from DETECTION MODE 0. Selecting this item will display the message *WARNING* PRESS TO ERASE ALL EVENTS. If the user wishes to delete all logged data then they should press the switch once before the counter reaches zero. If they do not wish to erase all logged data then simply allow the counter to reach zero without pressing the switch.

3.3.4. MODE1 SETUP

Accessed from DETECTION MODE 0. Selecting this item leaves DETECT MODE 0 and enters SETUP MODE 1. See section 3.4 SETUP MODE 1.

3.3.5. SHUTDOWN

Accessed from DETECTION MODE 0. Selecting this item switches off the unit. When the counter reaches zero the display will go blank and the LEDs will flash once. All logged events and parameters will still be available when the unit is next switched on.

3.3.6. SAVE GAIN AND PW

Accessed from SETUP MODE 1. This saves the current GAIN and PULSE WIDTH values configured from within SETUP MODE 1. This should be done whenever any changes are made to the GAIN and PULSE WIDTH values from within SETUP MODE 1 which are to be stored. If this is not done then any changes to GAIN and PULSE WIDTH will be lost if SETUP MODE 1 is exited.

3.3.7. MODE0 DETECT

Accessed from SETUP MODE 1. Selecting this item leaves SETUP MODE 1 and enters DETECT MODE 0. If the SAVE GAIN AND PW item was not selected prior to this then any changes to their values will not be saved.

3.3.8. ADJUST GAIN UP

Accessed from SETUP MODE 1. This item changes the function of the switch to increment GAIN. The unit will return to SETUP MODE 1 after choosing this option and every short press of the switch will increment the gain value. Once GAIN is set the SAVE GAIN AND PW option should be selected.

3.3.9. ADJUST GAIN DOWN

Accessed from SETUP MODE 1. This item changes the function of the switch to decrement GAIN. The unit will return to SETUP MODE 1 after choosing this option and every short press of the switch will decrement the gain value. Once GAIN is set the SAVE GAIN AND PW option should be selected.

3.3.10. AJST PULSE WIDTH

Accessed from SETUP MODE 1. This item changes the function of the switch to adjust PULSE WIDTH. The unit will return to SETUP MODE 1 after choosing this option and every short press of the switch will increment the pulse width value. Once the pulse width is set the SAVE GAIN AND PW option should be selected.

3.3.11. SET DETECT COUNT

Accessed from SETUP MODE 1. DETECT COUNT controls how easy or hard it is for the unit to be triggered. It is available as a setting to allow the unit to discriminate between a pig passage and a spurious loss of signal caused by for example gas bubbles passing the transducer. The unit transmits 100 pulses through the pipe every second. If DETECT COUNT is set to 01 then if one of these pulses does not get reflected back then a pig passage is assumed. If DETECT COUNT is set to 255 then 255 consecutive pulses would have to be missed before a pig passage is assumed, meaning the signal was removed for 2.55 seconds. The table below shows recommended values for a range of pipe sizes assuming a **spherical** pig (i.e. worst case) with speed of 10 metres per second or 1 metre per second. See section 3.6 DETECTION ALGORITHM for more information.

| PIPE DIAMETER | DETECT COUNT (PIG SPEED 10m/s) | DETECT COUNT (PIG SPEED 1m/s) |
|----------------|-----------------------------------|----------------------------------|
| 6" (15.24cm) | 1 | 15 |
| 12" (30.48cm) | 3 | 30 |
| 24" (60.96cm) | 6 | 60 |
| 36" (91.44cm) | 9 | 90 |
| 48" (121.92cm) | 12 | 120 |

3.3.12. SET INDICATOR DELAY

Accessed from SETUP MODE 1. This parameter determines how long the unit will signal a PIG DETECTION for. See section 3.2 DETECTION MODE 0.

The INDICATOR DELAY can be set between 00:00:00 and 99:99:99 in HH:MM:SS format. Note that the time entered will be the time that the LEDs will flash every second for. The **seconds** field will be the total number of seconds which the display shall show the pig detection time and date for. E.g. if INDICATOR DELAY is set to 01:59:60 the unit will flash every second for 2 hours and for the first 60 seconds of this time it will show the pig passage time and date on the display.

3.3.13. SET MINIMUM DIAMETER

Accessed from SETUP MODE 1. The MINIMUM DIAMETER value determines how long the unit shall wait for after it transmits a pulse before it looks for a reflection. Basically it allows the user to force the unit to ignore any spurious signals which take place between the transmit pulse and the reflected signal.

The first signal received after the MINIMUM DIAMETER value which has amplitude greater than the threshold level shall be measured and if it is within 2cm of the pipe diameter a 'good' reflection will be assumed. Normally a minimum echo value which is approximately 33% of the pipeline diameter will be sufficient. E.g. if pipe is 30cm diameter then a value of 10cm for MINIMUM DIAMETER will suffice.

If the transmit pulse is not dying away quick enough or there are significant spurious echoes present then choosing a larger MINIMUM DIAMETER value may be required but it should never be set within 6cm of the actual pipe diameter.

3.3.14. SET TIME

Accessed from SETUP MODE 1. This option allows the user to set the internal system time.

3.3.15. SET DATE

Accessed from SETUP MODE 1. This option allows the user to set the internal system date.

3.3.16. SET TRIG DELAY

Accessed from SETUP MODE 1. This option sets a time delay after detection. As the unit will detect debris and gas being pushed in front of the PIG, the unit continues to monitor the pipe for a PIG passage during the TRIG DELAY period. If a trigger is received during this time the delay will be reset to ensure the recorded event time is more accurate.

3.3.17. SET FILTER

Accessed from SETUP MODE 1. If there is a poor signal path through the pipeline due to gas or solids in the pipeline product then the FILTER value may be increased to avoid the possibility of false triggers. It may be adjusted to any value from 001 to 255. See section 3.6 DETECTION ALGORITHM for more information.

3.3.18. SET CONFIG

Accessed from SETUP MODE 1. The SET CONFIG menu allows the user to enable special functions within the unit. The number the CONFIG option is chosen by adding up the values for the desired options in the table below.

| Option | Number | Effect when selected |
|------------------------|--------|---|
| Invert Relay Operation | 1 | Relay will be normally closed and will open when signalling |
| Debug display | 2 | Displays information useful for debugging on the OLED when something is detected in the pipe. |
| LED Flash disable | 4 | Disables the flashing LEDs while listening. The LEDs will still flash when a PIG is detected |
| Rechargeable Battery | 8 | Enables unit to recognise rechargeable battery fitted and to adjust battery monitor accordingly |

For example if you want the relay option to be inverted and the LED flash disabled:

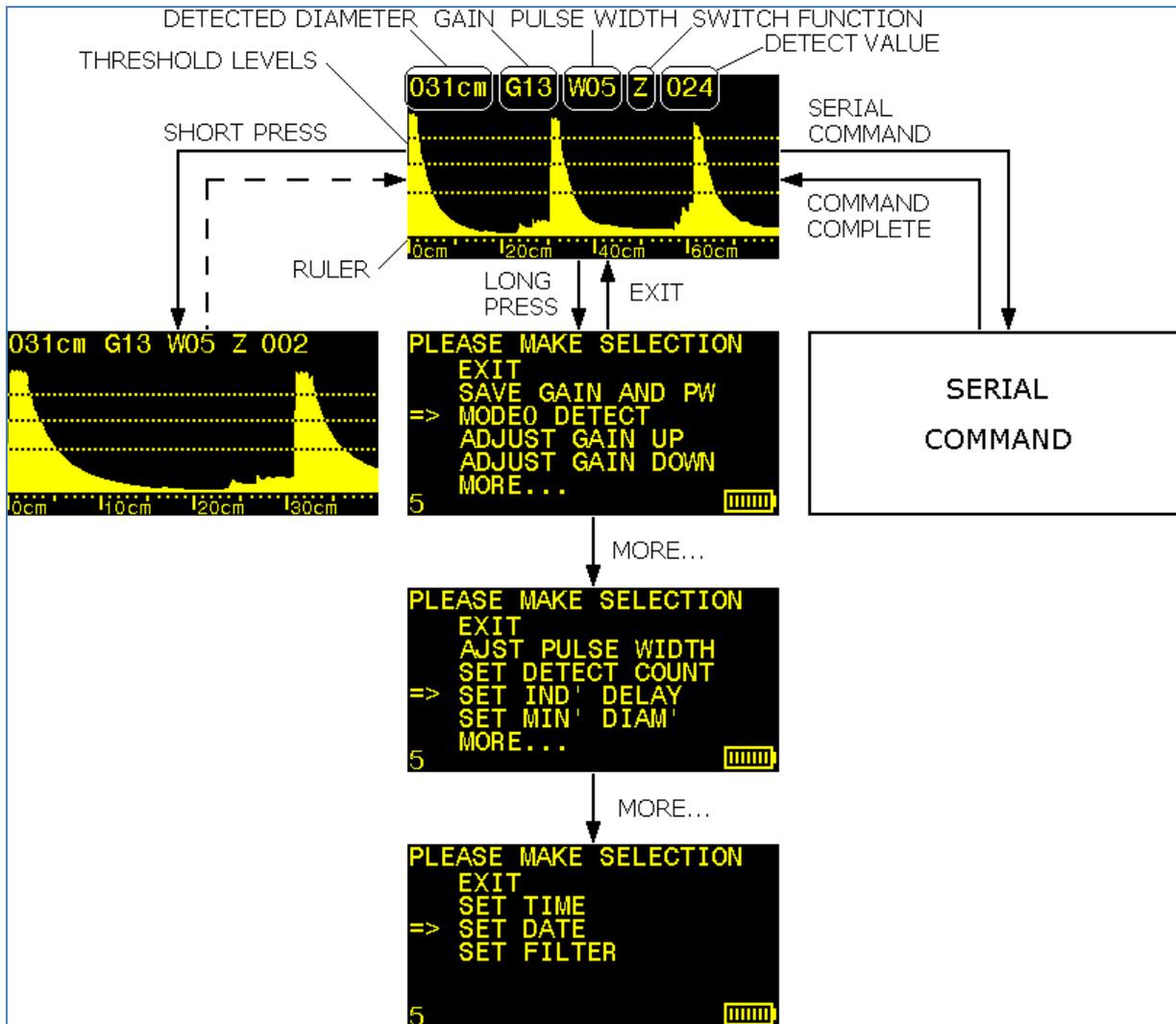
Number for inverting relay = 1
 Number for Debug display = 0
 Number for LED flash disable = 4

CONFIG number = 1 + 0 + 4 = 5

There for the number to be input to the CONFIG menu is 5.

3.4. SETUP MODE 1

The figure below shows the flow diagram for SETUP MODE 1. This mode is used to configure the units various parameters and calibrate the unit to a particular pipe.



The main screen shows the actual waveform which the unit is processing and examining. In this mode the unit is shooting 10 times per second. The 'pulse' on the immediate left is the transmit signal injected into the pipe and pulses to the right show the reflected signals from the other side of the pipe. Using the ruler along the bottom of the screen you can see that the first reflected signal in the above example occurs around 31cm from the injected pulse and this is confirmed by the value highlighted as the DETECTED DIAMETER. This means that the unit is installed on a pipeline with a 31cm diameter. As you can see from this example we are also seeing a secondary echo and if we zoomed out further we would see further echoes gradually dying away.

There are 3 events which will exit from this screen:

1. A short switch press will adjust gain, pulse width, or zoom level depending what the SWITCH FUNCTION field contains.
2. A long switch press (held until screen goes blank) will enter the display menus.

3.4.1. ZOOM AND RULER

The ruler along the bottom of the screen allows the user to visually measure the diameter of a pipeline by observing the position of any reflections along the ruler. The user can select one of 4 zoom levels which will show rulers of length 40cm, 80cm, 160cm or 320cm. The zoom level is cycled by applying a short press on the switch while the SWITCH FUNCTION field is Z.

3.4.2. THRESHOLD LEVELS

The horizontal lines are used to help calibrate the unit to a particular pipeline. The middle line represents the THRESHOLD level of detection. To be detected a signal must cross this line. The GAIN and PULSE WIDTH can be adjusted to make sure a signal crosses this threshold. The position along the ruler where the first reflected signal crosses this line should match the value shown in the DETECTED DIAMETER field. The upper and lower lines give a guide as to the best minimum signal level and maximum noise level respectively.

3.4.3. DETECTED DIAMETER

This field shows the pipe diameter which the unit is detecting. This should be checked by looking at the waveform and noting the position of the first reflection along the RULER. GAIN and PULSE WIDTH can be adjusted to make the waveform cross the THRESHOLD level.

3.4.4. GAIN

The current GAIN is shown in this field and can have any value from 00-99.

An increase in gain will cause an increase in signal amplitude. To adjust the GAIN enter the menus by pressing and holding the switch until the screen goes blank. Then cycle down to ADJUST GAIN UP or ADJUST GAIN DOWN and let the counter reach zero. When the unit re-enters the original screen the SWITCH FUNCTION field should contain G to tell the user that a short switch press will increment or decrement the GAIN.

When the user applies a short switch press the GAIN field will increment or decrement and the waveform should increase or decrease in amplitude. In this way a weak reflection can be made to cross the THRESHOLD line and cause the correct DETECTED DIAMETER to be detected.

Once a suitable gain has been determined the value should be saved permanently by re-entering the menus and selecting SAVE GAIN AND PW. If this step is not taken then when the MODE is changed or the unit switched off the value will be lost.

3.4.5. PULSE WIDTH

The current PULSE WIDTH is shown in this field and can have any value from 00-09.

The effect of changing pulse width is not always predictable but generally a wider pulse width will cause more power to be injected into the pipe and result in stronger reflections. Normally the PULSE WIDTH is left at the default value 01 and GAIN adjusted to increase signal strength.

To set the PULSE WIDTH enter the menus by pressing and holding the switch until the screen goes blank. Then cycle down to AJST PULSE WIDTH on the second menu page and let the counter reach zero. When the unit re-enters the original screen the SWITCH FUNCTION field should contain W to tell the user that a short switch press will increment the PULSE WIDTH.

When the user applies a short switch press the PULSE WIDTH field will increment and the effect should be seen on the waveform. Once a suitable PULSE WIDTH has been found SAVE GAIN AND PW should be selected to save the value. If this step is not taken then when the MODE is changed or the unit switched off the value will be lost.

3.4.6. SWITCH FUNCTION

The SWITCH FUNCTION field tells the user what a short switch press will do at any particular moment. There are 3 alternatives: G, W, or Z which will alter GAIN, PULSE WIDTH, or ZOOM respectively.

3.4.7. DETECT VALUE

The DETECT VALUE gives an indication of the quality of the signals which the unit is receiving. Ideally the DETECT value should remain at 000 unless a pig passage is occurring when it should immediately start to increase. Basically every time the unit does not see a reflection from the back wall of the pipeline this value will be incremented. If this value every reaches a value greater than the user adjustable value DETECTION COUNT the unit will assume a pig passage. Note that in SETUP MODE 1 the unit is only transmitting through the pipeline 10 times per second, while in DETECTION MODE 0 it is transmitting 100 times per second. See section 3.6 DETECTION ALGORITHM for more information.

3.5. BATTERY INDICATOR

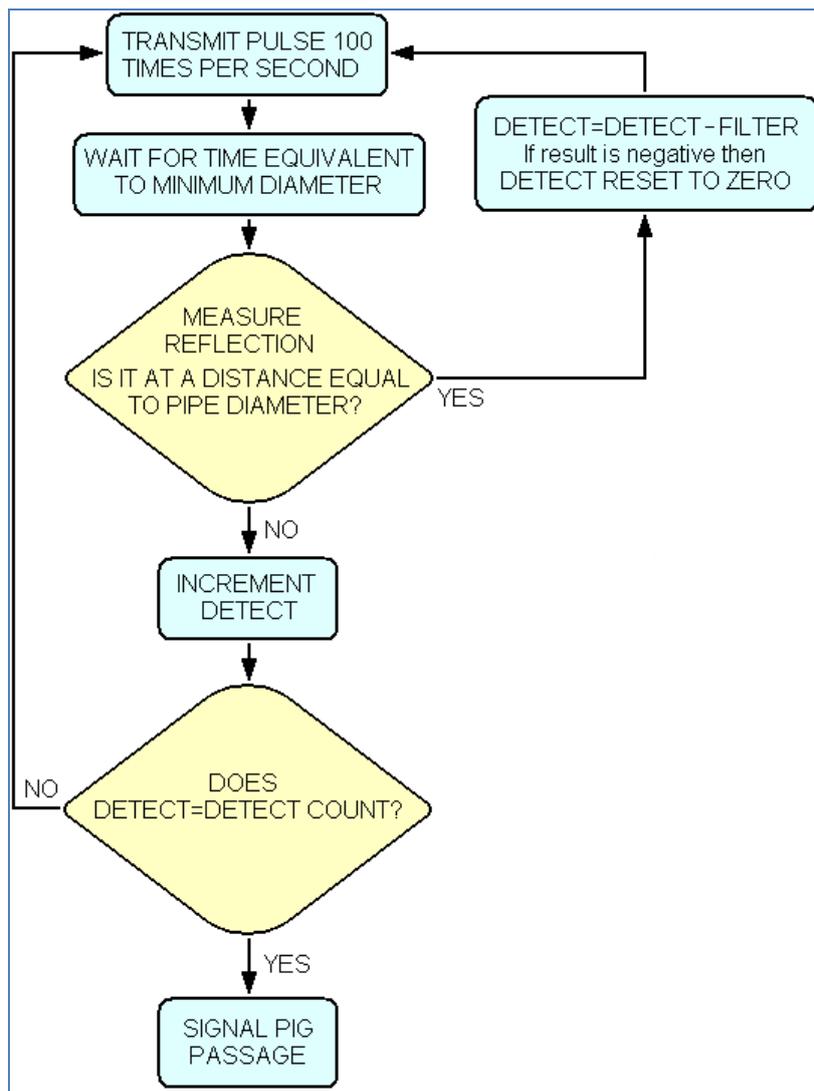
The battery indicator is shown at the bottom right corner of most screens and gives the user an indication of the battery status.

If CONFIG (see section 3.3.18 SET CONFIG) does not have the Rechargeable Battery option enabled then all bars are displayed when the battery/external supply > 15 Volts. No bars are displayed when the voltage < 11 Volts. If CONFIG is set to enable Rechargeable Battery option then all bars are illuminated when the voltage > 13 Volts and are all off when the voltage < 10.5 Volts.

3.6. DETECTION ALGORITHM

This section gives a brief description of the detection algorithm used to enable the user to make more educated changes to the detection parameters. Refer to the figure below to understand the basic decisions and actions which are taken to detect a pig passage. There are basically 3 values of interest here:

1. DETECT is an internal value which is constantly changing depending on whether the unit receives a reflection from the pipe wall or not. If a constant good signal from the far wall of the pipe is present then this value will remain at zero. If this reflection is removed then DETECT will begin to rise, if it reaches the same value as DETECT COUNT then a pig passage will be signalled.
2. FILTER is a user adjustable value which can be set from 001 to 255. As can be seen this value is subtracted from DETECT every time the unit receives a good reflection from the far pipe wall. If a reflection is seen then it is assumed that a pig passage cannot be taking place. If there is a poor signal path through the pipeline then increasing this value may help.
3. DETECT COUNT is a user adjustable value which can be set from 001 to 255. If the unit is not receiving reflections from the back wall of the pipeline then the DETECT value will be increasing. If it ever reaches DETECT COUNT then a pig passage is signalled. If there is a poor signal path through the pipeline then increasing this value may help.

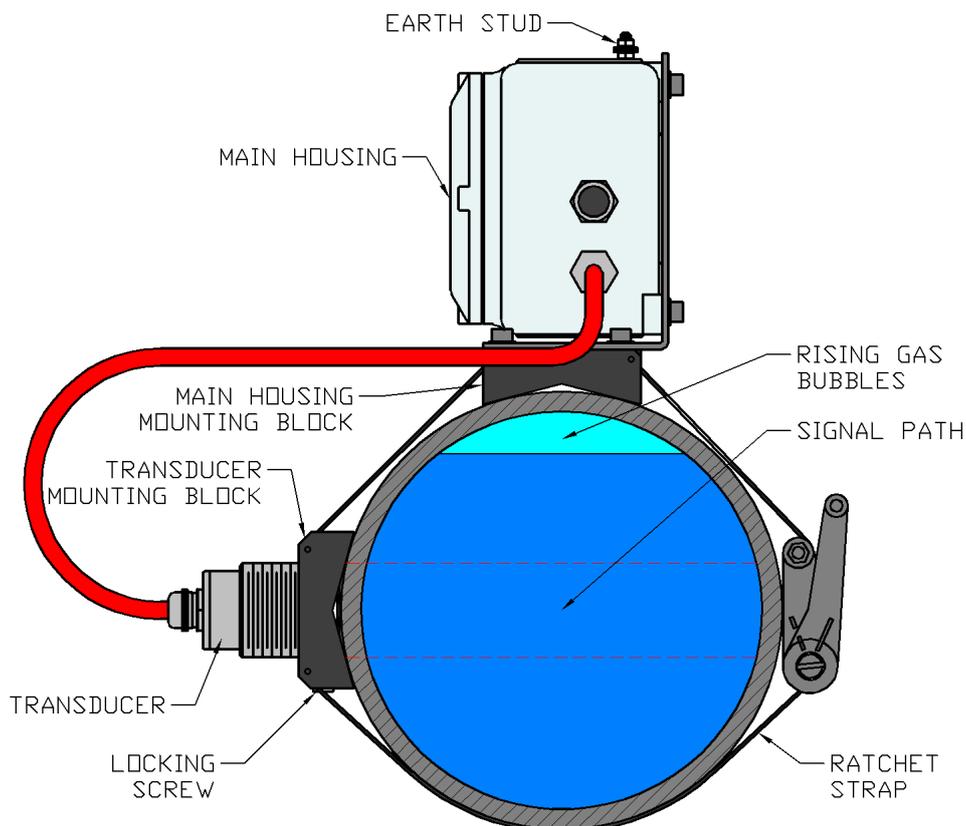


4. INSTALLATION

The Special Conditions for Safe Use detailed in section 9 ATEX APPENDIX must be observed and followed at all times.

In order to effectively install and calibrate the unit to a particular pipeline the pipeline should be filled with an acoustically transparent fluid at the time of installation (single phase, no gas bubbles, no large solid particles).

Because the transducer is permanently connected to the main housing via a cable and the transducer is screwed into contact with the pipeline some precautions must be taken to avoid the cable becoming excessively twisted. The figure below shows the preferred mounting positions for the system.



4.1. MAIN HOUSING INSTALLATION

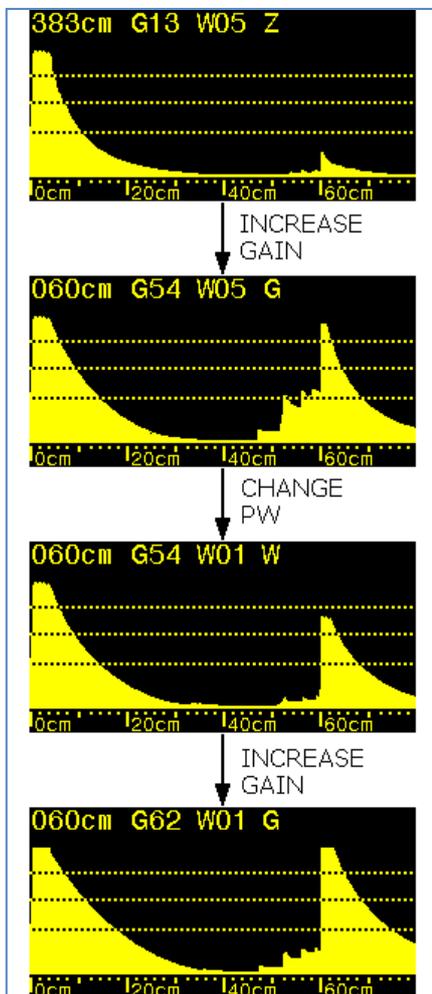
1. Referring to the figure above fit the main housing mounting plate onto the main housing mounting block with 4xM8x35 CAP screws and washers.
2. Fit the main housing onto the mounting plate with 2xM8x25 CAP screws, washers, and NYLOC nuts.
3. With the help of another person sit the main housing assembly on the pipeline at a suitable location and using the provided straps securely tighten the assembly onto the pipeline.
4. Connect the earth stud on top of the main housing to a suitable earth bonding point at the point of installation.

4.2. TRANSDUCER INSTALLATION

1. For optimum results ensure that the pipeline surface at the point of installation is uniform, clean and smooth. If the surface is irregular, corroded, or has flaking paint then abrasive paper or a wire brush should be used to prepare the surface. The unit will operate effectively through most painted layers as long as they are clean, uniform and are fully bonded to the pipeline surface. The unit will not operate through layers which are not bonded well to the pipeline surface, coatings which contain air gaps, foam coatings, concrete coatings, insulated coatings, or composite coatings consisting of several different materials with different densities. In these cases remove an area of the coating and install the transducer directly onto the bare pipeline surface.
2. Before the transducer mounting block is strapped to the pipeline screw it onto the transducer until the transducer is barely touching the pipeline surface when the transducer assembly is pressed onto the pipeline. This should mean that when strapped to the pipeline it should take less than one turn to securely press the transducer face onto the pipeline surface.
3. Apply couplant to the centre of the transducer face and to the area of pipeline surface where the transducer is to be installed.
4. Securely strap the transducer assembly onto the pipeline surface so the transducer is transmitting horizontal. If it is mounted vertically and there is a significant amount of gas in the pipeline fluid then this will tend to float up to the top of the pipe and disturb the signal path through the pipeline.
5. Make sure the transducer mounting block is sitting securely on the pipeline so that the transducer is held perpendicular to the pipeline surface. If the transducer is engaged too far into its mounting block then you may need to loosen it slightly to allow the mounting block to sit properly on the pipe surface.
6. When happy with the transducer mounting block installation hand tighten the transducer itself onto the pipeline surface. Do not tighten excessively, just enough so that it is secure, otherwise the transducer face may be damaged. If more than 1 full turn is required to tighten the transducer then repeat the above procedure from step 2.
7. Tighten the transducer locking screw to prevent the transducer from turning. Do not tighten excessively as the mounting block may be damaged.

4.3. PARAMETER SETUP

Every time the unit is installed on a pipeline this setup procedure should be followed. For the following example let's assume we know the external diameter of the pipe is 24" so we should expect to see a detected diameter of around 61cm.



1. With the unit mounted on the pipeline switch to SETUP MODE 1. We see the screen to the left. Notice the strong transmit pulse and a weak reflection at 60cm – we know we are working on a 60cm diameter pipe. The signal is too weak as it does not cross the threshold level (middle, horizontal line) so the diameter is not being detected. We will increase gain until it is well over this level.
2. After increasing gain, notice that when the signal crosses the threshold level (middle, horizontal line) the correct diameter is detected. It would be enough to leave the unit as it is now however there are some spurious signals immediately before the main reflection which cross the maximum noise level (bottom horizontal line). We may be able to reduce these by varying the pulse width.
3. After varying the pulse width we have found the position at which the reflected signal is proportionally largest compared to the spurious signals before it. However, the overall signal strength has reduced to below the minimum signal level (top horizontal line) so we need to turn up gain again.
4. After increasing the gain notice we now have a good strong signal well above the threshold level (middle horizontal line), the maximum signal level is above the minimum signal level and the spurious signals are well below the maximum noise level. Also we can see the detected diameter reflects the position of the first reflection along the ruler. It may be necessary to readjust gain and pulse width a few times to iteratively reach these optimum settings.

5. Once the optimum settings have been determined select SAVE GAIN AND PW from the display menu to save the settings. If this step is omitted then the settings will be lost next time the mode is changed or the unit is switched off.
6. Set DETECT COUNT as per section 3.3.11 SET DETECT COUNT.
7. Set INDICATOR DELAY as per section 3.3.12 SET INDICATOR DELAY.
8. Set MINIMUM DIAMETER as per section 3.3.13 SET MINIMUM DIAMETER.
9. Return to DETECTION MODE 0 and ensure that after the DETECTING DIAMETER... message the correct pipe diameter is displayed and that the signal quality is over 95%. The unit will then start waiting for a pig passage. If this is not the case re-enter SET UP MODE 1 and adjust settings as necessary.

5. RECOMMENDED MAINTENANCE

The Special Conditions for Safe Use detailed in section 9 ATEX APPENDIX must be observed and followed at all times.

Frequent inspections should be made. A schedule for maintenance checks should be generated according to the environment and frequency of use but should be regular enough to ensure the equipment continues to operate in the designed manner. It is recommended that it should be at least once a year.

External parts of the equipment should be periodically cleaned using fresh water to ensure that deposits are not allowed to accumulate. Avoid the use of aggressive chemicals.

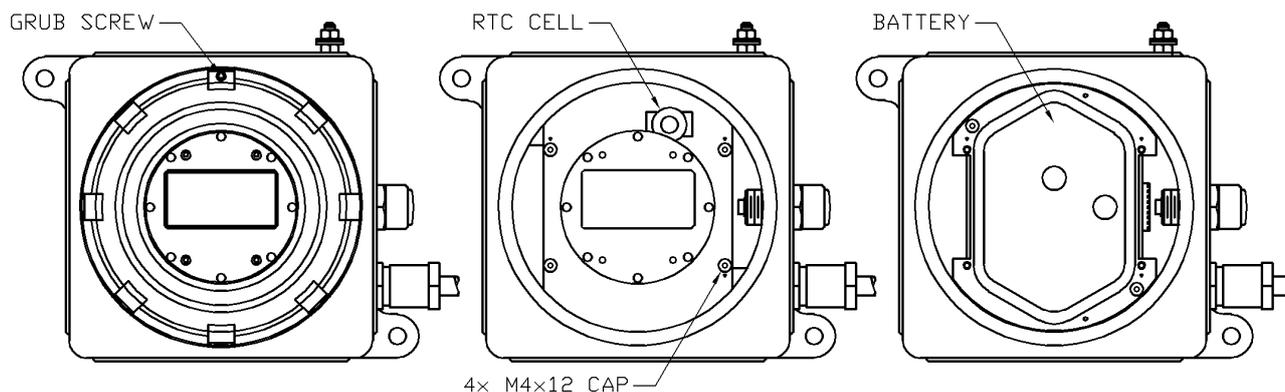
Check flame paths / threads on the enclosure body and lid for signs of corrosion or damage. If badly pitted or damaged, replace the relevant component.

The unit contains a coin cell (BR2032) used to power the Real Time Clock (RTC) circuitry which provides system date and time. This battery should be replaced every 5 years.

All components that are replaced must be in accordance with the manufacturers' specifications. Failure to use such components may invalidate the certification/approval and may make the equipment dangerous.

5.1. MAIN BATTERY REPLACEMENT

1. The Special Conditions for Safe Use detailed in section 9 ATEX APPENDIX of this manual must be observed and followed at all times.
2. Referring to the figure below use a 3mm AF Hex key to loosen the locking GRUB SCREW which locks the main housing lid shut. Unscrew and remove the lid to expose the electronics and display.



3. Using a 3mm AF Hex key remove the 4x M4x12 cap screws holding the main PCB down and then carefully lift off the main PCB to reveal the battery pack. Place the main PCB somewhere safe where it will not be accidentally damaged while the battery pack is being replaced. Note the position of the RTC cell behind the display.
4. Note the orientation of the battery with the two metal contacts on the same side as the button and cable entries as shown in the figure above.
5. Re-assemble the unit following these instructions in reverse. When replacing the main PCB ensure it is located properly using the dowel pins provided. Ensure that all PCB connections mate properly. Do not over tighten the locking GRUB SCREW.

6. EXTERNAL CONNECTIONS

The Special Conditions for Safe Use detailed in section 9 ATEX APPENDIX of this manual must be observed and followed at all times.

A suitable cable and ATEX certified gland must be provided by the user. A suitable gland to use with a non-mineral filled cable would be a Peppers Cable Glands Limited CR-XSCK1/20S/M20 barrier gland. A single M20x1.5 threaded entry is provided as standard. The cable cores should have a length of approximately 150mm inside the unit to allow for ease of connection.

Unless the unit has been ordered with a battery pack the unit will be delivered with a 4mm² TERMINAL BLOCK and PARTITION PLATE already fitted inside the battery compartment as shown.

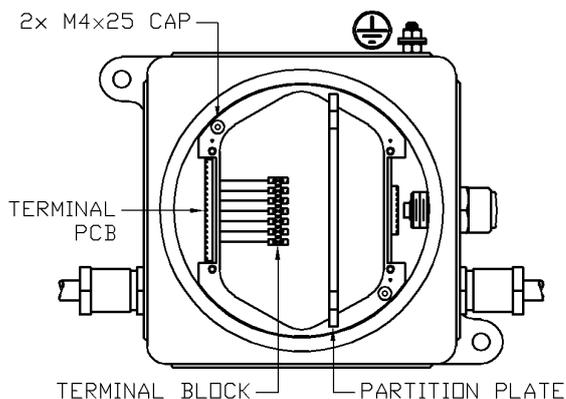
If the unit is to be connected to any external circuitry such as an external power supply or SCADA system then the unit must be fitted with a PARTITION PLATE and the main battery must be removed.

Remove the lid and main PCB to gain access to the battery compartment as described in section 5.1 MAIN BATTERY REPLACEMENT.

If a TERMINAL BLOCK and PARTITION PLATE are fitted already then the unit is ready for connecting external circuits.

If a TERMINAL BLOCK and PARTITION PLATE are not fitted then follow the instructions below to fit them.

1. Observe how the wires connected to the transducer cable are routed inside the housing before removing the 2x M4x25 cap screws holding the plastic battery compartment in place and carefully withdrawing the entire assembly out of the main housing. While withdrawing the battery compartment be very careful not to damage any existing wiring.
2. Observe how the transducer cable is connected to the assembly and then disconnect.
3. To fit the TERMINAL BLOCK, terminate the wires to the TERMINAL PCB as per section 6.1 STANDARD TERMINAL PCB.
4. While in LISTENING state the current loop output shall be 5mA \pm 1.mA. While in DETECTION the current loop output shall be 19mA \pm 1.mA.
5. To fit the PARTITION PLATE simply slot into position in the battery compartment and lock into place using the 2mm dowels provided.
6. Re-connect the transducer cable and then carefully re-fit the battery compartment inside the housing. While refitting the battery compartment be very careful not to damage any of the wiring by initially positioning the wiring so that it points straight down into the housing until the wiring has passed the housing lip and then repositioning the wiring from inside the compartment so that it passes along one of the slots on the bottom of the battery compartment. Ensure all wiring is safely located inside the enclosure and is not trapped under the battery compartment
7. Secure the battery compartment with the 2x M4x25 cap screws.
8. Refer to section 6.1 STANDARD TERMINAL PCB to make the required external connections.

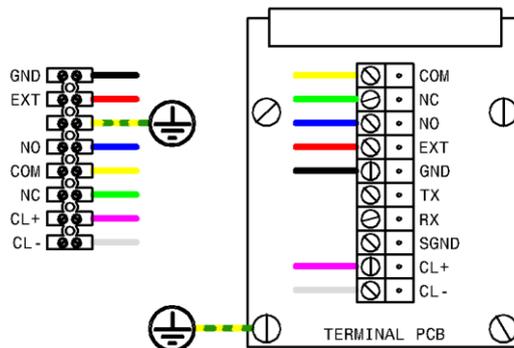


6.1. STANDARD TERMINAL PCB

This is the standard TERMINAL PCB fitted to the unit. It provides connections for external power and SPDT relay output.

All connections are made to the PCB using 3.5mm pitch removable terminal blocks which can accept wire sizes up to 1.5mm². Connections are clearly labelled on the PCB and are connected to a TERMINAL BLOCK using the wire colours shown below.

- COM - Common contact of relay
- NC - Normally Closed contact of relay
- NO - Normally Open contact of relay
- EXT - Positive side of external 24VDC supply
- GND - Negative side of external 24VDC supply
- Tx - Do not use this connection
- Rx - Do not use this connection
- SGND - Do not use this connection
- CL+ - Positive side of current loop 24VDC supply
- CL- - Negative side of current loop 24VDC supply



7. WARRANTY

Online products are guaranteed for one year from the date of purchase. Goods should be returned transportation prepaid to Online Electronics Limited.

There is no charge for parts or labour should any product require repair due to a manufacturing deficiency during the guarantee period.

In the event of a manufacturing deficiency the inward transportation costs will be repaid to the client.

8. DISPOSAL OF UNIT

Online Electronics Ltd takes its responsibilities under the WEEE Regulations extremely seriously and has taken steps to be compliant in line with our corporate and social responsibilities. In the UK, OEL has joined a registered compliance scheme WeeeCare (registration number **WEE/MP3538PZ/SCH**).

Electrical and electronic equipment should never be disposed of with general waste but must be separately collected for the proper treatment and recovery. The crossed out bin symbol, placed on the product, reminds you of the need to dispose of it correctly at the end of its life.

When buying a new product you will have the possibility to return, free of charge, another end of life product of equivalent type that has fulfilled the same functions as the supplied equipment. These items may be deposited at:

Online Electronics Ltd
 Online House
 Woodburn Road
 Blackburn Business Park
 Aberdeen
 AB21 0PS
 UK

Alternatively, to arrange a collection of any waste electrical equipment, obligated to OEL please telephone WeeeCare on **0844 800 2004**.

9. ATEX APPENDIX

| | |
|------------------------------|--|
| EQUIPMENT | ID5000A |
| MANUFACTURER: | Online Electronics Ltd Web: www.online-electronics.com |
| NOTIFIED BODY NUMBER: | 2812 |
| TYPE EXAMINATION No: | TRL08ATEX21161X |
| MARKINGS: |  II 2 G Ex d mb IIC T5...T6 |
| APPLICABLE STANDARDS: | EN 60079-0:2012+A11 EN 60079-1 EN 60079-11 EN 60079-18 |

SPECIAL CONDITIONS FOR SAFE USE:

1. Transducer face must be positioned close to the pipeline surface and adequately protected from impacts.
2. Transducer, cable and electronics shall only be used as a complete assembly.
3. Internal and external threaded holes are provided for earthing and equipotential bonding.
4. Protective earthing conductors employed shall be no greater than equal to the size of the phase conductors, equipotential conductors shall have a minimum cross-sectional area of 4mm²
5. External power and signals shall only be supplied according to manufacturer's instructions by suitable cable using a suitable certified cable gland.
6. For equipment with temperature class T5, cables must be suitable for use at temperatures of 100°C.
7. Only ID5000A battery packs shall be used with the ID5000A.
8. The battery pack must be removed if the external power supply is attached.
9. Do not open enclosure nor replace battery packs when a potentially explosive atmosphere is present.
10. The battery pack shall only be charged when removed from the equipment and moved to a safe area.
11. Where painted or powder coated, the enclosures could present an electrostatic hazard. Clean only with a damp cloth or anti-static cloth.
12. Temperature class is reliant on the operating temperature, the internal power dissipation (Pd), and whether internal cells are fitted.

| Power Dissipation (Pd) Watts | External Power | | Alkaline Battery | | Rechargeable Battery | |
|------------------------------|----------------|------------|------------------|------------|----------------------|------------|
| | T5 | T6 | T5 | T6 | T5 | T6 |
| 7W < Pd <= 10W | -40...70°C | -40...55°C | -20...54°C | -20...54°C | -20...65°C | -20...55°C |
| 3W < Pd <= 7W | -40...75°C | -40...60°C | -20...54°C | -20...54°C | -20...65°C | -20...60°C |
| 2W < Pd <= 3W | -20...75°C | -20...65°C | -20...54°C | -20...54°C | -20...65°C | -20...65°C |
| 1W < Pd <= 2W | -20...80°C | -20...65°C | -20...54°C | -20...54°C | -20...65°C | -20...65°C |
| Pd <= 1W | -20...85°C | -20...70°C | -20...54°C | -20...54°C | -20...65°C | -20...65°C |