Apollo Smart Heating Oil Energy Monitor

Contents

1. Product Information

1.1 Definitions/Glossary

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Ullage	The distance from the sensor to the surface of the liquid in the tank
Outlet	The connection on point from which oil is drawn from the tank to feed the boiler. It is typically located 8cm above the bottom of the tank in one of the sidewalls. Oil below the outlet level is not usable.
Brim-full Tank Capacity	The maximum amount of liquid that can fit in the tank.
Normal Tank Capacity	The maximum amount to which the tank should be filled according to OFTEC and EN standards. Normally 95% of the Brim-full capacity.
Usable Capacity	The nominal capacity of the tank minus the amount of oil that is below the outlet point. If the oil level falls to the level of the outlet, the tank is effectively empty.
Matching	The process of uniquely matching the sensor and the Eco Oil Monitor.
Days to Empty (DTE)	A prediction of the number of days in which the oil level will reach the outlet point. The DTE is calculated based on the recent usage patterns.
RF	Radio Frequency – The tank level measurements are conveyed wirelessly to the Eco Oil Monitor from the sensor using RF transmissions.
KgCO$_2$	Kilogrammes of Carbon dioxide.
SETUP mode	Used to configure the Eco Oil Monitor for the oil tank.
LEARN mode	Used to match the sensor with the Eco Oil Monitor.
NORMAL mode	For day to day use of the Eco Oil Monitor. This mode displays current and historical information.
CURRENT information screens	Screens in NORMAL mode that display information about the current status of the amount of oil remaining in the tank in Litres, as %, and the DTE.
HISTORICAL information screens	Screens in NORMAL mode that display information about the historical usage of oil in terms of Litres, cost and environmental impact.

1.2 Introduction

Thank you for selecting the **Apollo Smart** Heating Oil Energy Monitor. This revolutionary home energy monitoring system allows today's energy and environmentally conscious consumers to monitor and track their heating oil consumption, its costs, and the heating systems environmental impact through carbon emissions, on a daily, weekly, monthly, and annual basis.

The **Apollo Smart Oil** product from Dunraven Systems consists of the **Apollo Smart Sensor** and the **Apollo Smart Oil Monitor**. The Apollo Smart Sensor is easily installed on your oil storage tank to measure the level of the oil. It transmits the oil level information wirelessly to the Apollo Smart Oil Monitor which may be located in a convenient location inside your home.

The Apollo Smart Sensor uses ultrasonic technology to measure the distance from the sensor on top of the tank to the surface of the liquid in your oil tank. As the amount of oil in your tank decreases, the distance measured increases accordingly. The distance information or 'ullage' is transmitted wirelessly to the Apollo Smart Oil Monitor.

Litres and % fuel

Once programmed with information about your oil tank's shape and size, the Apollo Smart Oil Monitor calculates and displays the amount of fuel remaining in your tank in litres or as a percentage of the tank capacity. In addition (as oil is consumed over time) the Apollo Smart Oil Monitor calculates and displays usage information including the average amount of litres used per day, per week, over the last 30 days, and over the last 365 days.
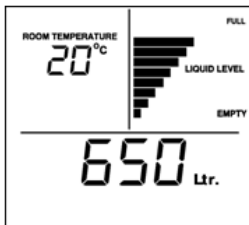
Days to Empty (DTE)

As the Apollo Smart Sensor continuously measures and transmits the oil level, the Apollo Smart Oil Monitor retains this information allowing it to 'learn' historical heating system usage patterns and so predict the '**Days to Empty**' for your home. With this information you can ensure that you order your oil at the correct time – not too soon, and more importantly, not too late.
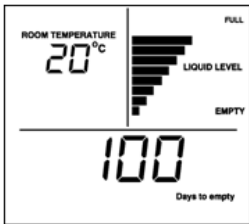
Costs

By entering the cost you pay for your oil during the setup process of your Apollo Smart Oil Monitor and subsequently when you take deliveries of oil (if the price has changed), the Apollo Smart Oil can present your oil usage in terms of its costs, i.e. average cost per day and per week, and the cost for the usage over the last 30 days and 365 days.
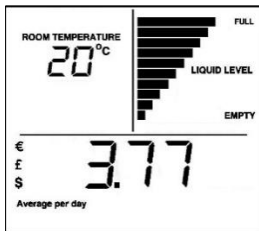
Environment

Similarly, the Apollo Smart Oil Monitor can display your oil usage in terms of the associated production of CO_2 emissions, as the equivalent quantity of $KgCO_2$ emitted per day, per week, the last 30 days and 365 days.

Installation

The Apollo Smart Sensor fits into the standard 32mm aperture found on most modern oil storage tanks and is suitable for use with almost any plastic or metal tank up to 3m tall, including Bunded and Single Skin Oil tanks. If your tank is a bunded tank, ensure that you mount the Apollo Smart Sensor on the inner tank.

As part of the installation the Apollo Smart Sensor and Monitor are 'synchronised' together to ensure there is no interference from other nearby sensors.

Easy to install

2. Features and Functions

2.1   Features

| 1	LCD Display	11	Error code information
2	MODE key	12	Power/data cable
3	DOWN key	13	Manufacturing information
4	ENTER key	14	Location feature (see Installation Guide)
5	UP key	15	USB connector
6	SETUP key	16	Mains power plug
7	Alarm Red LED	17	Apollo Smart Oil Transmitter
8	Screw mount hanger	18	Self-tapping screws x 2
9	Beeper aperture	19	Weather seal (Gasket)
10	RESET button access	20	Apollo Smart Oil Sensor oil level display
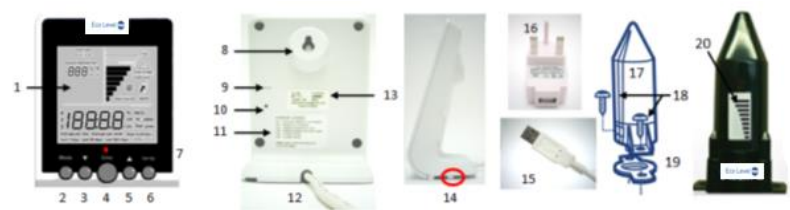
2.2   Functions

MODE	When in NORMAL mode press **MODE** to move between the current and the historical information screens.
△	Press **UP** to move between screens when in NORMAL mode. Use it to increase a setting when in SETUP mode.
ENTER	The **ENTER** key is used only in SETUP mode. It is used to save the settings shown on the display and then move automatically to the next SETUP number.
▽	Press **DOWN** to move between screens when in NORMAL mode. Use it to decrease a setting when in SETUP mode.
SETUP	Press **SETUP** for 3 seconds to enter SETUP. When in **SETUP**, press SETUP to exit from SETUP mode.
▽+△	When in NORMAL mode, by pressing together **UP** and **DOWN** and releasing, the screen will flash the current tank configuration for 20 seconds. Press any key to return to NORMAL mode.

2.3   LED

The red light above the ENTER key flashes when there is an Alarm condition (see 3. Alarms) and on receiving data from the Apollo Smart Sensor.

2.4   Display – Symbols & Indicators

The Apollo Smart Oil Monitor contains a display that conveys a variety of information during normal use and during its initial setup and configuration for use with your oil tank. The display contains three sections (1, 2, & 3) as indicated in the diagram.
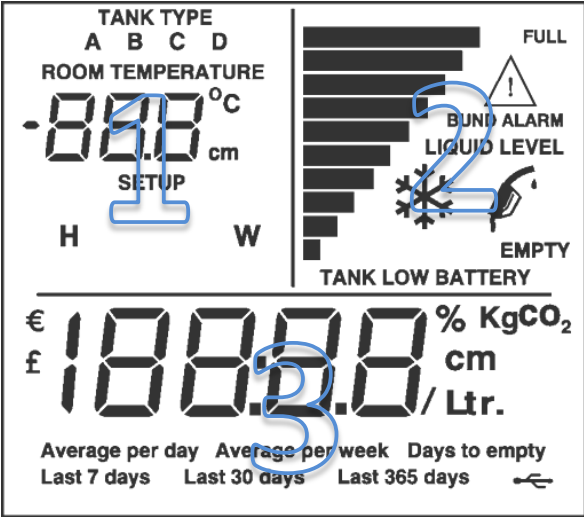
1 - Used for SETUP and displays SETUP number, and in normal use displays room temperature.
2 - Tank information including a visual bar-graph of the oil level in the tank.
3 - Information about the remaining usable oil in litres or as a %, the 'Days to Empty', and the average and cumulative use of oil in litres, cost and KgCO$_2$. Time is also displayed here.

	Apollo Smart Oil Monitor and Sensor Display Symbol reference	
	TANK TYPE	Indicates the tank type being selected.
	A,B,C	A, B, C are types of tank shapes (see Installation Guide).
	ROOM TEMPERATURE	The value displayed is the room temperature.
1	**20**	Numeric display - shows the room temperature in normal mode e.g. 20.
	3	Shows the SETUP mode number when in SETUP mode, e.g. SETUP mode 3
	˚C & ˚F	The value displayed is temperature in degrees Celsius/Fahrenheit.
	cm\inch	The value displayed is in centimetres/inches.
	SETUP	SETUP mode is active.

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	H	The value displayed is the tank height.
	W	The value displayed is the tank width.
	◢	Monitor Display: Bar graph indicator of liquid level - each bar represents 10% of tank height. .
	〔〕	Apollo Smart Oil Sensor Display: Tanks 1m/3.3ft. in height or greater - each bar represents 1/10th of the top 1m/3.3ft of the tank. Tanks less than 1m/3.3ft. in height - each bar represents 1/10th of 1m/3.3ft
	Full	Indicates the 'Full' level of the bar graph indicator.
	Liquid Level	Indicates the bar graph is showing the liquid level.
2	**EMPTY**	Indicates the 'Empty' level of the bar graph indicator.
	BUND ALARM	When flashing, there has been a leak into the 'Bund' (double skinned tanks). The 10 bars and the RED LED will also be flashing at the same time.
	🔔	Flashing in the monitor—The liquid level in the tank is less than 14cm. Flashing in the sensor—The liquid level in the tank is less than 10% of the tank height.
	⚠	Flashing – There is a problem with the RF signal from the sensor. Refer to "Troubleshooting" for more details. Static – Attempt to change the monitor system of measurement (SETUP mode 3) with the risk of losing saved data.
	❄	The temperature of the sensor is measured at –8°C or below — the information accuracy may be affected.
	%	The value displayed is the % of usable oil remaining in the tank.
	cm\inches	The value displayed is in centimetres/inches
	Ltr\Gal	The value displayed is in litres/gallons.
	⟜	USB data activity.
3	**AVERAGE PER DAY**	The value displayed is the average per day based on the last 7 days' usage.
	AVERAGE PER WEEK	The value displayed is the average per week based on the last 14 days' usage.
	DAYS TO EMPTY	The value displayed is the estimated number of days of oil remaining in the tank. It is computed by dividing the volume of usable oil left in the tank
	LAST 30 DAYS	The value displayed is the estimated usage over the last 30 days.
	LAST 365 DAYS	The value displayed is the estimated usage over the last 365 days.

2.5   Display Screens

There are two types of information displayed on the Apollo Smart Oil Monitor:

CURRENT information screens – used in normal mode to show the current status of the oil level in your tank. Change between the 'Ltr.', '%', 'Days to empty', and Clock screens using the △ and ▽ keys.
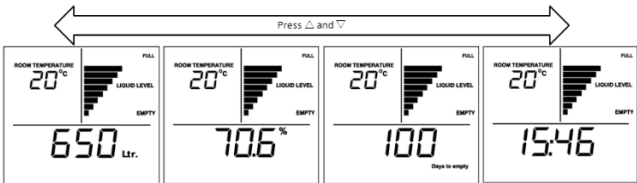

For approximately 1 week after the Apollo Smart -Oil is installed, it collects data so that the 'Average per day' value may be calculated. During this period the screen will flash '---' when showing 'Days to empty'. (In the picture, 'flashing' is indicated in red).

After this period, the display may continue to show '---' (but not flashing). This indicates that a meaningful value could not be calculated. This may occur in periods when there is no (or extremely low) usage. The '---' may be displayed in any of the HISTORICAL information screens under these conditions.

This may also happen if the Apollo Smart Oil Monitor has been unplugged for some time. When sufficient data has been gathered, the screen will revert to normal after a period from a few hours up to a maximum of 1 week.
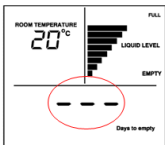
HISTORICAL information screens showing 'Fuel usage – Litres', 'Fuel usage – Cost' and 'Fuel Usage – Carbon'. Pressing MODE and △/▽ accesses these screens.
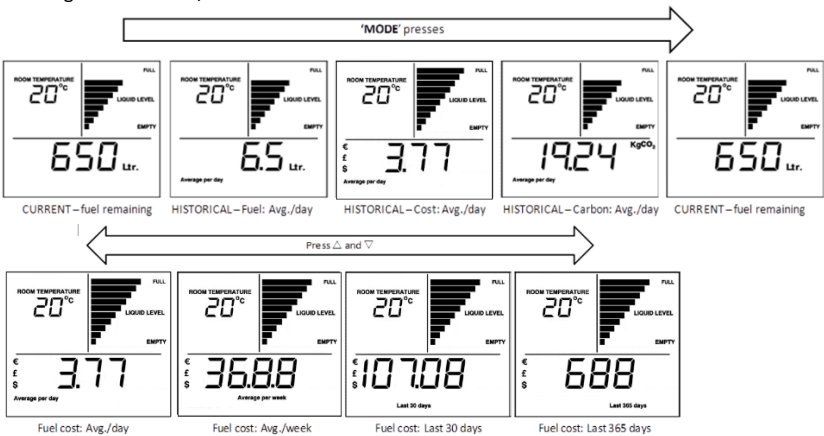

The Apollo Oil -Monitor will automatically return to the CURRENT information screen after 30s with no key presses within the HISTORICAL information screens. The maximum value displayed is 19999.

3. Alarms

3.1 Full Indication

When the level in your tank reaches 12 cm from the top of the tank, i.e., from the bottom of the Apollo Smart Sensor, the main display will show 'FULL'.
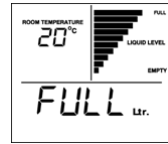
3.2 Low Level Indications

When the tank level falls to within 14cm of the bottom of the tank the ![refuel symbol] 're-fuel' symbol will flash. When the tank level is such that there is below 10% of the usable volume of oil left in the tank, the CURRENT information screen alternates between showing the 'Ltr.' (or % or DTE) and 'Lo'.

If the level, then drops such that there is below 5% of usable oil left:

- 'Lo' is displayed constantly on the CURRENT information screens.
- The monitor beeps 5 times, repeating every hour, i.e., 10:00, 11:00, 12:00, 13:00, 14:00...
- The RED light flashes.

This continues until there is an oil delivery and the level rises.
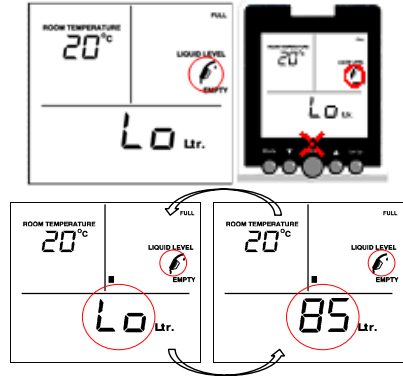
3.3 Sudden drop in fuel level (possible theft)

When a sudden drop in fuel level is detected

- An audible alarm sounds continuously
- The RED light flashes
- The LCD bar graph cycles down continuously indicating a fuel level drop
- The amount of fuel remaining in Litres flashes

To silence the Alarm buzzer:

Press any of the 5 buttons on the front of the Apollo Smart Monitor
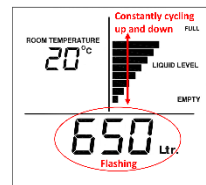
4. Technical Specifications

4.1 Tank Size

Min. Depth: 0.5m / 20 inch
Max. Depth: 3m / 118 inch
Max. Tank Volume: 19999Litres / 5,200Gallons

4.2 Displays

Multi-function LCD display including:

- 10 bar-graph level indication on both Apollo Smart Oil Monitor and Sensor
  Note: The graph displayed on the sensor only represents the top 1M of the tank contents
- Display of various current and historical values (Apollo Smart Oil Monitor only)
- Display control with five control buttons
- Red LED for low level indication at 5% or less of usable fuel remaining.

4.3 Audible Alarm

Audible alarm sounds every hour on the hour when the tank level is low.

4.4 Max communication distance

Typically, up to 500m/1640feet in normal 'line of sight' conditions

4.5 Wireless Communications

~~915MHz FM transmission (FCC part 15)~~
433MHz FM transmission (EN300-220)

4.6 Dimensions (Sensor)

140mm x 70mm x 40mm / 5.51'' x 2.75'' x 1.57''

4.7 Dimensions (Monitor)

120mm x 90mm x 50mm / 4.72'' x 3.54'' x 1.96''

4.8 Power Supply

- Apollo Smart Sensor—3V LiMn cell, CR2450 or CR2430 (Depending on sensor)
- Apollo Smart Oil Monitor:
    - Receiver: 5V DC (40mA)
    - Backup battery: 3V LiMn cell, CR2450 or CR2430

4.9 Mains Power Supply (incl.) for Apollo Smart Monitor

~~North America: 110V +/- 10% 60Hz, meets UL60950-1~~
Other: 150V-240V, 50-60 Hz, meets EN60950-1
(Eco Oil Monitor use only—not for use with any other device)

4.10 Battery Life

Apollo Smart Sensor: 5 years (estimated life)
Apollo Smart Oil Monitor – Receiver memory back-up battery: 3yr if device is not plugged in.
Note: The Eco Oil Monitor contains a small battery to keep time during power cuts. If the device is left unpowered for an extended period, then the battery will deplete.

4.11 Max and Min Operation (Sensor)

Operating temperature range: -20°C/-4°F to +60°C/140°F
Operating Humidity: 15 - 95% non-condensing

4.12 Max and Min Operation (Monitor)

Operating temperature range: 0°C/32°F to +50°C/122°F
Operating Humidity: 0 - 95% non-condensing

4.13 Hole size for fitting sensor

32mm diameter

5. Apollo Smart sensor battery change

If the battery in the Apollo Smart Sensor needs to be changed, the display will provide an error message E02.
• Remove the Apollo Smart Sensor from the tank and move to a safe location.
• The battery can be accessed by removing the 4 self-tapping screws from the base of the unit.
• Remove the old battery noting the orientation ('+' mark facing outwards) and replace it with a new battery, 3V.
• Re-assemble, ensuring the O-ring is undamaged and secured in position.
• Re-locate the sensor on the tank.
There is no need to re-synchronise the sensor with the monitor when the sensor battery is changed.

Disposal
The crossed-out dustbin on the packaging indicates that this product and its battery shall not be treated as household waste. Proper disposal will help prevent potentially negative consequences for the environment and human health. For more detailed information about recycling of this product or battery, please contact your local recycling centre or the shop where you purchased the product.
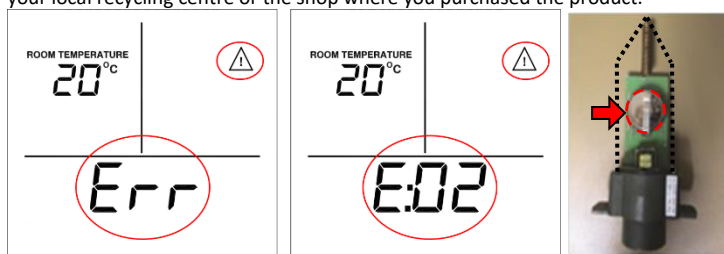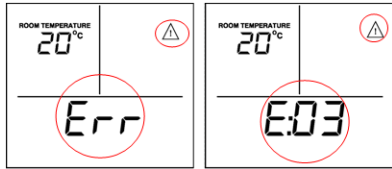

6. General Product safety, care and user guide lines

• To ensure that you use your product correctly and safely, please read the warnings, safety precautions and notes below regarding use of and caring for your Apollo Smart Oil Monitor and Sensor.
• Do not use this product where the use of radio frequency products can cause malfunction in the control devices of other equipment i.e., hospitals, aircraft, etc.
• Do not subject the product to excessive force, shock, dust, temperature, or humidity.
• The LCD panel behind the display lens is made of glass, and may break if the unit is dropped, impacted, or subjected to shock.
• Take special care when handling a damaged display, as the liquid crystals can be harmful to your health.
• Keep the product away from heat sources i.e., radiators, stoves, heaters, etc.
• Do not use the Apollo Smart Oil Monitor in or near water or in high moisture areas i.e., Bathroom.
• Do not tamper with the Apollo Smart Oil Monitor's internal components. This will invalidate the warranty.
• Do not attempt to repair the product yourself. Contact the retailer or our Customer Service Department.
• Do not dispose of old batteries as unsorted municipal waste, do so in accordance with your local waste disposal regulations.
• When disposing of this product do so in accordance with your local waste disposal regulations
• Do not scratch hard objects against the Apollo Smart Oil display as this may cause damage.
• Do not replace batteries in a potentially explosive atmosphere.

7.   Troubleshooting

If the Apollo Smart Oil Monitor does not receive or cannot understand the RF signal from the Apollo Smart Sensor, an error message will be displayed on the Apollo Smart Oil Monitor. The error message appears as an alternating screen showing 'Err' and 'E:0?' where? is a number.
Error codes are listed on a label on the rear of your Apollo Smart Oil Monitor.

Error	Description	To Rectify
E01	Received reading is inconsistent	- Check that the sensor is vertical on the tank. - Check positioning of the sensor (ensure that the sensor is not too close to the tank sides or internal obstructions. - Ensure that the sensor is not tightly attached to the tank. - Ensure that the tank is not overfilled and that the bottom of the sensor is clean.
E02	Reading not received after 6 hours	- Check that the sensor is within range of the monitor. Try and relocate the monitor to a position that is nearer a window. Remember that the sensor communicates with the monitor using an FM signal and moving the monitor plug from possible metal obstructions can improve the signal. - Ensure the monitor is not too close to, or obstructed by, other electrical appliances. - If the sensor display is showing a blank screen, replace the battery on the sensor (chapter 5, page 10). If the sensor has no display, replace the battery on the sensor.
E03	Reading received but void	- Check positioning of the sensor (ensure that the sensor is not too close to the tank sides or internal obstructions). - Ensure that the sensor is not too tightly attached to the tank. - Ensure that the tank is not overfilled i.e. there is a minimum of 120mm/5ins free space between the sensor and oil level. - Ensure that the bottom of sensor is clean. - If a bund tank, ensure that the sensor is located on the inner tank.
E04	Received Reading greater than tank height	- Check the tank height and ensure that this information is correct on the monitor, press the r and s keys together to view your tank configuration. If height is incorrect, enter the SETUP mode by pressing SETUP for 3 secs, press ENTER until you reach screen 5 and adjust the height using r and s keys. Press ENTER to save. Press SETUP to exit Setup mode. Wait 3 hours for updated readings. - Check the sensor is vertical and the positioning of the sensor (ensure the sensor is not too close to the tank sides or internal obstructions.
E05	Contact Vendor	- This is a hardware fault and requires contact with the vendor.
E06	Contact Vendor	- This is a hardware fault and requires contact with the vendor.

9-6309-01

8. Notes

- Please retain this product manual and the installation guide. It contains practical instructions, technical specifications, and safety precaution warnings you should know about.
- The maximum *displayed* value for all measurements and computed values is 19999. If a measurement exceeds this value, the display will flash. This does not affect data calculations or alarm functions.
- When used according to recommendations, the Apollo Smart Oil monitors the oil level in your tank and calculates and presents figures relating to the remaining oil, the historical usage, and the related monetary and environmental costs. The Apollo Smart Oil monitor must not be used as verification of a 'Weights and Measures' certified dispensing meter.
- Patents pending or covered by one of the following patents: S2003/0882, EP2131164 (A1), US2006261966 (A1), US7277020 (B2), IE20030882 (A2), S2008/0466, US2009/0303059 A1
- For correct usage calculation, a minimum of 7 days between tank fills is required.
- The Apollo Smart Oil Monitor is intended to be connected to a power source continuously. It contains a small battery to keep time during power cuts. If the Apollo Smart Monitor is left unpowered for an extended period, then the battery will deplete, and information may be lost. When you are not using your domestic oil heating system, you may unplug the Apollo Smart Oil and store it until you wish to use your heating again. Its back-up battery and internal clock keep track of the days as they pass.
- When you next use it, on starting to use your heating again, the Apollo Smart Oil monitor will continue monitoring your oil usage and calculating the financial cost and environmental impact.
- When the Apollo Smart Oil has been unplugged and is plugged in again, it will start up in 'Lrn' mode. Simply press any key to exit.
- When you are receiving an oil fill, the Apollo Smart Sensor cannot receive a reliable echo due to turbulence within the tank and may cause the Apollo Smart Oil Monitor to temporarily display some error messages. Should the tank be filled above the recommended 95% this will obstruct the sensor signal until the oil level drops below 120mm from the sensor. The sensor will be unable to send accurate readings during this period.
- The Apollo Smart Oil owner should note that the first fill amount of oil into a tank will differ from the amount shown on the display. This is due to the fact that the Apollo Smart Oil Monitor displays the volume of Usable oil available. The Apollo Smart Oil Monitor in its calculations makes an allowance of 8cm of unusable oil in the bottom of the tank due to the location of the bottom outlet or the top discharge pipe.
- Not suitable for pressurised containers. Only use on tanks vented to the atmosphere.
- Only access the Reset Switch if instructed by customer service.
- Changes in temperature can result in contraction and expansion of the tank and hence can affect the tank capacity. Such changes may affect your readings.
- You only need to complete this step if there was a gap of more than an hour between completing STEP 2 and STEP 3.
- To **reset the usage calculations,** press **SETUP** for 3 seconds to enter SETUP mode and then press **ENTER** repeatedly until SETUP 10 is shown.
  The segments at the bottom of the display will be flashing. Press the **ENTER** key for 5 seconds. The screen will temporarily show 'CALC' and then returns to showing SETUP 1 - Setting the Time (hrs). Press **SETUP** to leave SETUP mode.
- Do not open the transmitter if the product is still under the warranty.

9.   Warranty

This product carries a 24-month warranty from date of original purchase from Dunraven against any deficiency or fault in manufacture. This does not affect your statutory rights, or any warranty offered by the seller if different to Dunraven Systems.

This warranty does not cover normal wear and tear, damage cause by negligence, accident, improper use or incorrect installation. Any change or modification made by the purchaser or user to the appliance will invalidate the warranty, as would any attempted repair.

The warranty applies only when the appliance has been operated in accordance with the instructions and connected to an electricity supply which matches that shown in the manual.

The warranty will be rendered invalid if the product is resold by the end user. The product must be used solely for domestic purposes.

Dunraven Systems obligations are limited to the repair, or at its sole discretion, replacement of the unit.

The unit should only be returned to Dunraven Systems upon receiving confirmation from Dunraven Systems that the return will be accepted. Dunraven Systems distributors should get in touch in this regard with their normal sales contact at Dunraven Systems. Other parties should only return the product for warranty assessment via the point of original purchase.

Dunraven systems and its distributors shall not be liable for indirect or consequential loss or damage resulting from the use of this product.