OceanTools
World Leading Underwater Technologists

OCEANTOOLS USER MANUAL

C-LEVEL DUAL AXIS SUBSEA INCLINOMETER & DISPLAY

REV 001

NOTICE

Every precaution has been taken in the preparation of this Operators Manual; however, OceanTools Limited assumes no responsibility for any errors or omissions.

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VERSION CONTROL

REVISION DATE	REVISION NUMBER	EDITOR	APPROVED
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CONTENTS

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If you are unsure how to operate this system or require technical support, contact someone within your organisation who holds a Supervisory role or contact OceanTools using the details above.

If you need to use our technical support, please have the following information to hand:

* Serial Number
* Fault Description
* Any remedial action taken

INTRODUCTION

This manual contains Operation and Maintenance information relating to the C-Level Dual Axis Subsea Inclinometer & Display manufactured by OceanTools Limited, Aberdeen, UK. This manual is only intended to provide information and instructions to personnel suitably qualified to operate such equipment. Please read this manual until you are familiar with the principles of operation of the equipment, and you are sure in your own mind that you know how to operate it safely.

The OceanTools C-Level Inclinometer & Display is a simple "place on" device that accurately measures inclination in two axes in a subsea environment and displays this inclination on an LED display. The display is an advanced subsea display that allows an ROV or a diver to view the output of the inclinometers in real time.

The unit outputs data in RS485 format via the G5507-1508 Glenair bulkhead connector. The output can be reconfigured in RS232 format if required and other connectors are available. Surface display software is available and if supplied should be loaded on a PC/Laptop according to suppliers' instructions. The C-Level is provided with a bar handle as standard or can be provided with an ROV d-type, t-type or fishtail handle.

The OceanTools C-Level incorporates a 3.6Ah Lithium-Polymer (Li-Polymer) battery pack. The battery pack is supplied with a special fast charger. The current draw of the C-Level is approximately 85mA in sleep more and 184mA in display mode.

SAFETY

This unit, when connected correctly and according to these instructions, will have DC voltages within it.

Generally, DC voltages at these levels are non-hazardous but safety procedures should always be followed. These include but are not limited to the following:

* Read and understand this manual and all relevant company procedures.
* Make sure power is removed from the unit before cleaning or disconnecting any electrical connectors.
* If the unit is damaged then consider returning it to OceanTools rather than undertaking repairs yourself.
* Be aware that if the unit should flood underwater it is possible that high pressure water may be contained within the unit. Follow appropriate procedures for reducing pressure BEFORE opening the equipment.
* Check the unit regularly for damages to any cables, connectors or the housing. If any damage is detected then seek advice from OceanTools or an OceanTools approved agent.
* Please also refer to Appendix 1: Risk of Serious Injury.

IMPORTANT SAFETY INSTRUCTIONS AND WARNINGS FOR THE OCEANTOOLS LI-POLYMER RECHARGEABLE BATTERIES

You must read these safety instructions and warnings before using or charging the C-Level.

Li-Polymer batteries are volatile. Failure to read and follow the below instructions may result in fire, personal injury and damage to property if charged or used improperly.

* By purchasing Li-Polymer batteries, the buyer assumes all risks associated with lithium batteries.
* Li-Polymer batteries and packs may explode and cause fire if misused or defective.
* When charging leave the battery pack and charger on non-flammable surfaces.
* Never make wrong polarity connection when charging and discharging battery packs. Always double check the polarity of battery.

INSTALLATION

The arrows on the top of the C-Level unit indicate the direction of the normal moments for Pitch (P) and Roll (R). The unit can be placed with Pitch and Roll in whatever direction the user prefers.

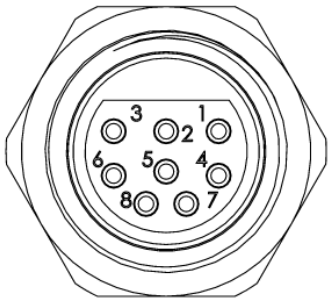
POWER SUPPLY

The unit is powered via an internal 25.9V, 3,650mAh lithium-ion rechargeable battery. Only charge the C-Level using the battery charger supplied by OceanTools.

The C-Level is supplied with a blanking plug that should be connected to the G5507-1508 before operation. The display and inclinometer will not operate without this plug in place.

CONNECTOR: 8 Pin Bulkhead Connector – G5507-1508

Pin	Function
1	Charge VDC
2	0 VDC
3	N/C
4	N/C
5	0 VDC
6	RS485 A
7	RS485 B
8	N/C



CHARGING

The C-Level should only be charged with the supplied charger.

While charging keep the charger and the C-Level indoors in a dry place on a non-flammable surface.

****DO NOT ALLOW PINS 1 AND 2 TO BE SHORTED TOGETHER****

First plug the subsea connector from the charger into the 8-pin Glenair connector or 5-pin Subconn connector of the battery pack. Then plug the charger into a mains socket (100-240VAC, 50-60Hz, 2A max), and switch it on. The charger will initially indicate it is charging via a red LED on the charger. If the LED is lit the battery is already fully charged and the charger should be turned off and removed.

****Charging temperature range: 0 to 45°C.****

Note: Due to self-heating the batteries contained within the enclosed acetal housing will likely be at a higher temperature than the ambient temperature.

Please monitor the charger and battery pack during charging for excessive heat. If there is any excessive heat stop charging immediately. Once the LED changes to green the charging process is finished, and the C-Level is ready for use. Unplug the charger from the mains. Allow the batteries to rest for 30 minutes before use for the internal circuitry to perform cell balancing for optimum performance.

Unlike lead-acid batteries, lithium batteries are not suited to prolonged 'Trickle Charge.' They should be removed from the supply voltage once the charge cycle is complete, not left connected in standby. They are well suited to partial charges – you may recharge the battery from a low level of partial charge to a higher level of partial charge repeatedly.

CHARGING NOTES

* *Do not charge batteries in series.*
* Let battery cool down to ambient temperature before charging.
* Charge each C-Level individually. Failure to do so may result in incorrect battery recognition and charging functions. Overcharging may occur and fire may be the result.
* Use the OceanTools supplied charger only. Do not use a NiMH or NiCd chargers. Failure to do so may a cause fire, which may result in personal injury and/or property damage.
* Never charge batteries unattended. When charging Li-Polymer batteries you should always remain in constant observation to monitor the charging process and react to potential problems that may occur. Battery observation should occur in a safe area outside of any building or vehicle and away from any combustible material.
* If at any time you witness a battery starting to balloon, swell up, smoke, or go hot, discontinue charging process immediately, disconnect the battery and observe it in a safe place for approximately 15 minutes. This may cause the battery to leak, and the reaction with air may cause the chemicals to ignite, resulting in fire.
* Wire lead shorts can cause fire! If you accidentally short the wires, the battery must be placed in a safe area for observation for approximately 15 minutes. Additionally, if a short occurs and contact is made with metal (such as rings on your hand), severe injuries may occur due to the conductibility of electric current.
* If for any reason you need to cut the terminal wires, it will be necessary to cut each wire separately, ensuring the wires to not touch each other or a short may occur, potentially causing a fire.
* In the event of any impact damage e.g. due to damage in transit or any other reason, you must remove battery for observation and place in a safe open area away from any combustible material for approximately 15 minutes.
* A battery can still ignite even after 10 minutes.
* Never store or charge the C-Level in extreme temperatures, since extreme temperature could ignite fire.

STORAGE & TRANSPORTATION

* Store C-Level at room temperature between 4 and 26°C (40 and 80° F) for best results.
* Do not expose C-Level to direct sunlight (heat) for extended periods.
* When transporting or temporarily storing in a vehicle, temperature range should be greater than -6°C (20°F) but no more than 65°C (150°F).
* Attention should be paid to any current regulations regarding the transport of Dangerous Goods when transporting Lithium Polymer batteries. See any relevant documentation accompanying the battery pack on receipt.
* For longer term storage Li-Polymer batteries should be stored part-charged (approximately 50%).

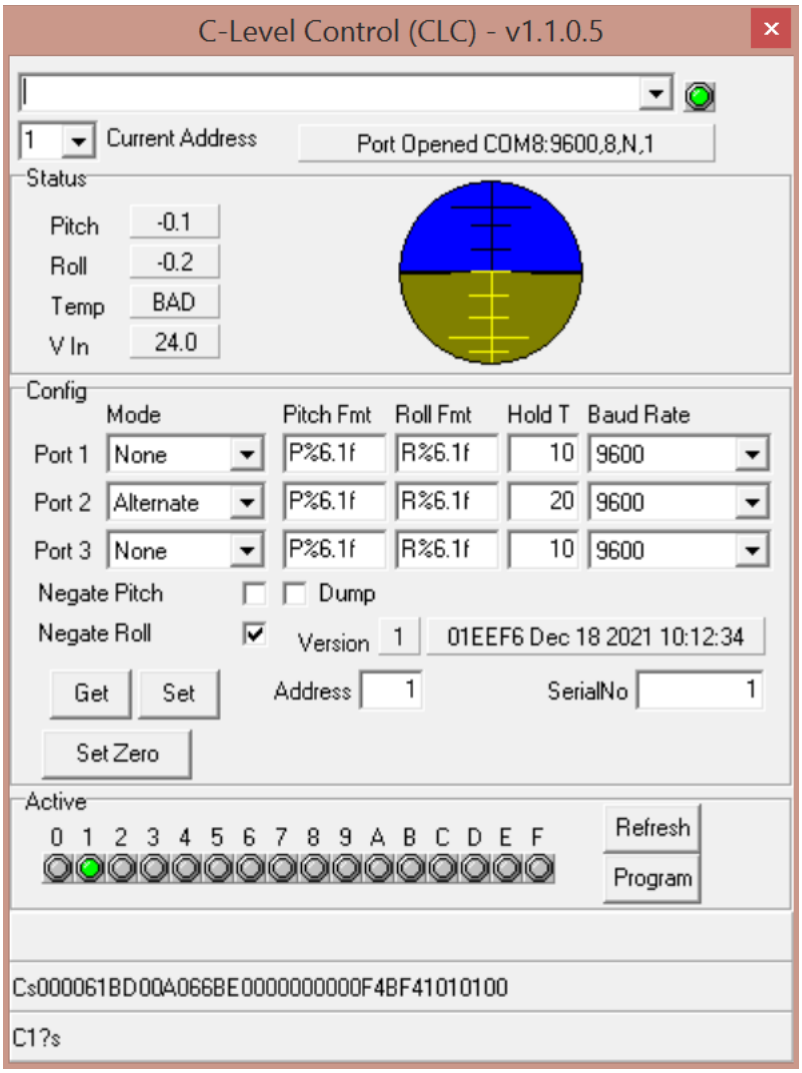
Storing the C-Level at temperatures greater than 76°C (170°F) for extended periods of time (more than 2 hours) may cause damage to the battery and possible fire.

BATTERY LIFE

* Batteries that lose 20% of their capacity must be removed from service and disposed of properly.
* The expected lifetime of a Li-Polymer battery is approximately 3 years or 500 charge/discharge cycles.
* Discharge the battery making sure output wires are insulated, and then wrap battery in a bag for disposal. Please adhere to the appropriate disposal regulations in your area.

C-LEVEL CONTROL SOFTWARE

The C-Level control software can be loaded onto a PC or laptop to allow the user to modify the parameters of the C-Level monitoring. Generally, it is recommended that this isn't changed as the unit will be supplied set up by OceanTools.



SOFTWARE VERSION & COM PORT SELECTION

The header bar shows the software description along with the version. Please have the version number to hand if contacting OceanTools with queries regarding the software.

The top dropdown box lets you select a COM port to communicate with the C-Level on. Current Address selects the address to use, and the port selected will be shown on the right. The indicator will be a constant green colour to indicate communication.

STATUS

The Status area shows real time readings for Pitch, Roll, Temp and V In, plus has a visual indication of the C-Level position. Normally each heading will show a numerical reading. This will output "BAD" if no signal has been received from the C-Level. In the example above no temperature sensor has been connected, meaning "BAD" is displayed.

CONFIG

This area is used for describing how the C-Level data will be displayed. It is recommended that this section is always left as supplied by OceanTools and only changed on recommendation from OceanTools. Mode determines the input for each port, Pitch Fmt and Roll Fmt shows how the pitch and roll data will be displayed, Hold T is the hold time in seconds for the display and Baud Rate allows the Baud Rate to be changed.

Negate Pitch and Negate Roll will reverse the polarity of pitch or roll respectively. Dump is only to be used upon explicit advice from OceanTools. The firmware information is shown here, as is the address for the C-Level and the unit serial number.

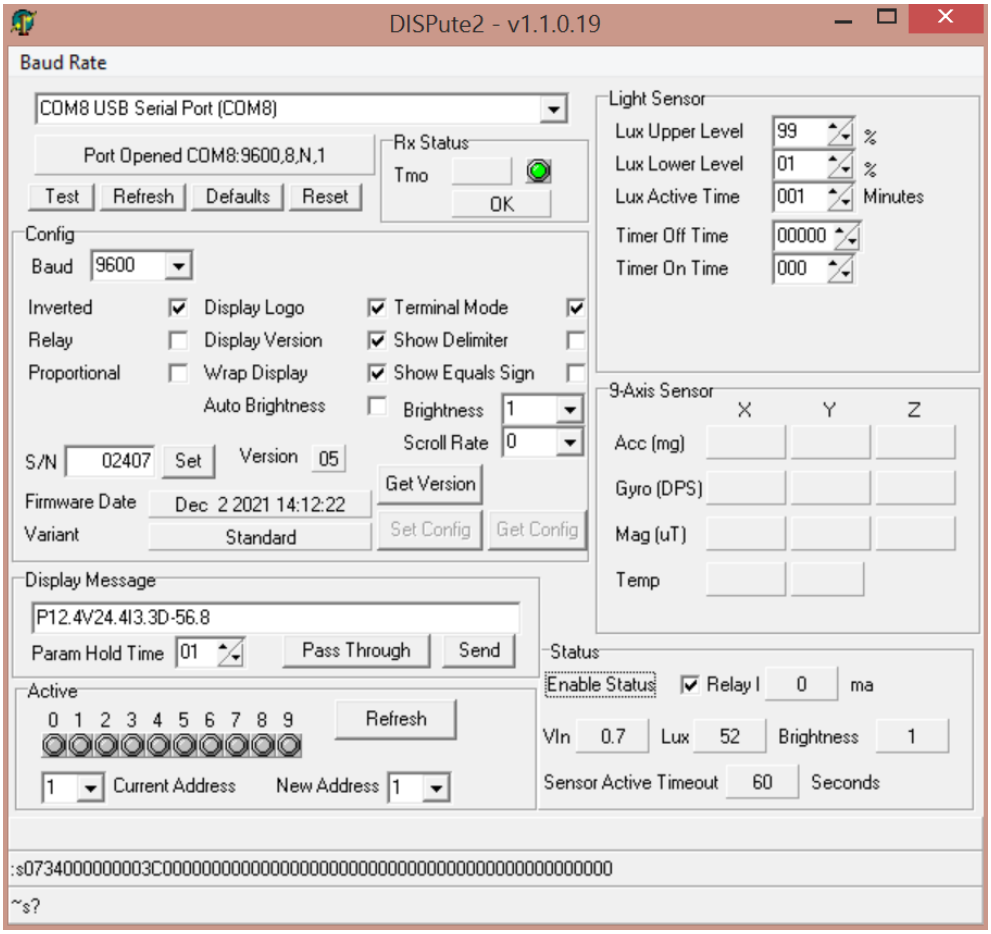
Get will get the current configuration of the C-Level after it has been connected to the software while Set will set the current settings as the new settings on the C-Level. Set Zero resets all settings to zero.

ACTIVE

This shows which address is being used. It will light up green to show good communication. If the number is lit up red there is an error, or it will be off if it hasn't been set yet.

DISPLAY SOFTWARE

The DISPute2 software can be loaded onto a PC or laptop and is used to modify the data displayed on the C-Level.



SOFTWARE VERSION & COM PORT SELECTION

The header bar shows the software description along with the version. Please have the version number to hand if contacting OceanTools with queries regarding the software.

The top left section of the software window is used to select and test the required COM port. The light in the Rx Status box will be green when it is correctly connected and red if there is a fault.

CONFIG

The required Baud Rate can be set here, as can the brightness and scroll rate. Additionally, the unit serial number and firmware information can be found here. It is recommended that the tick boxes are not adjusted after receiving the C-Level from OceanTools or are only changed upon advice from OceanTools.

DISPLAY MESSAGE

This section allows the user to type a message and click Send to have the C-Level display the typed message. The duration for the message to be on the screen can be set here in seconds as well.

ACTIVE

This shows which address is being used. It will light up green to show good communication. If the number is lit up red there is an error, or it will be off if it hasn't been set yet.

LIGHT SENSOR

This section is used to set the light activation for the C-Level. The upper and lower limits specify the light range in which the unit will turn on and Lux Active Time sets the time in minutes that the unit will remain on once it is no longer within these light levels. Timer Off Time and Timer On Time are only to be modified upon advice from OceanTools.

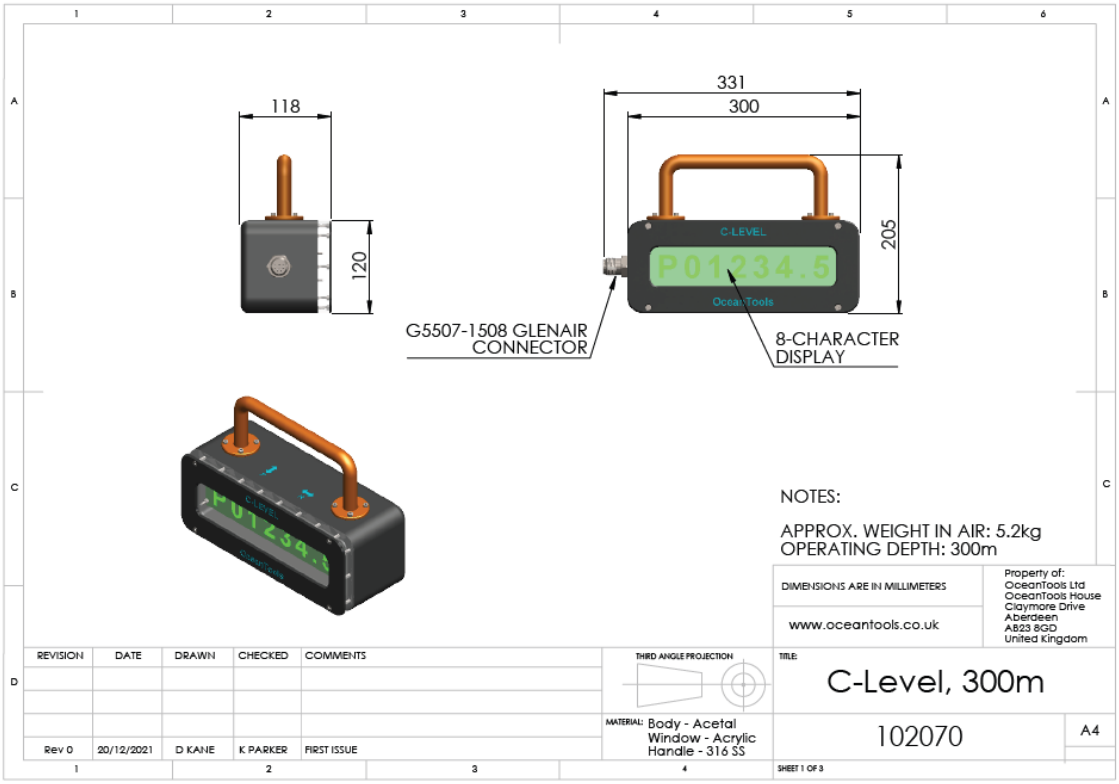
9-AXIS SENSOR

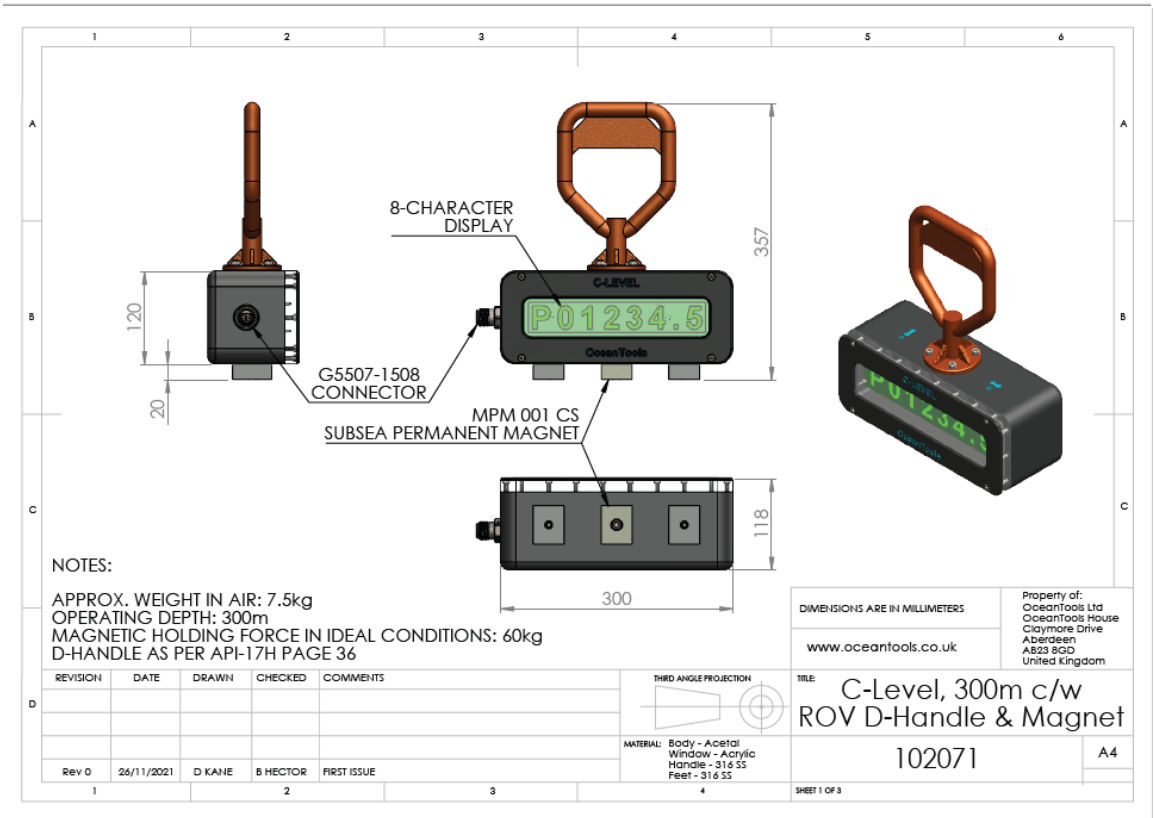
This is not used on the C-Level.

STATUS

The status window displays a summary of the C-Level settings.

GENERAL ASSEMBLY





APPENDIX 1 – RISK OF SERIOUS INJURY

INTRODUCTION

This document aims to set out the necessary precautions which should be taken to avoid serious injury in the event of recovering an item of equipment, comprising an atmospheric enclosure that is suspected of suffering an ingress of water, the following precautions shall be observed.

Additionally, Personal Protective Equipment (PPE) shall be provided as per Directive 89/686EEC as amended by Directive 93/95/EEC, 93/68EEC and 96/58/EC. In particular, Eye Protection shall be worn, Work Gloves shall be worn and it is advisable to wear Latex Gloves under Work Gloves as any leakage from enclosures may be corrosive.

DO NOT:

* Remove end cap retaining screws without reference to the section regarding this procedure.

DO:

* **Securely clamp down item of equipment such that the end is facing away from all personnel, preferably towards a solid wall or such like. When releasing any threaded components endeavour to avoid placing any part of the body 'across' the component. Consider also, when dealing with threaded connectors, that under high pressure, once rotation has commenced it is possible for the pressure to continue the rotation if the thread is well lubricated.**

  Due consideration should also be given to the possibility that the air being released maybe poisonous, explosive or both.

If the equipment is fitted with a vent plug that is pulled flush onto a spot face:

* Undo the plug, 2 or 3 turns, to pull the face seal free of the spot face. Using a paintbrush or similar, apply a generous amount of slightly diluted washing-up liquid around the plug and observe for the appearance of any bubbles. If any appear, leave the equipment to stand until there are no more bubbles. If necessary re-apply more washing-up liquid. Undo the plug a little more and re-check. The plug is fitted with a retaining nut internally, but a slow approach is advised until convinced that there is no trapped air within.

If the equipment is fitted with a vent plug that is not flush with a spot face, or there is no spot face present (A taper thread):

* Follow the above procedure but commence with less turns of the plug each time. Leave to stand until it is no longer showing signs of venting.

If the equipment is not fitted with a vent plug, the above checks will have to be achieved via a connector. If possible, obtain a data sheet for the connector and establish the location and quantity of seals in the connector body. Then the following applies:

* Flanged connector, face seal only: Remove one screw to establish the length of thread engagement in the end cap. Replace the screw finger tight, 'crack' the remaining screws and commence turning each screw equal amounts 2 or 3 turns at a time. Again, apply diluted washing-up liquid and check for bubbles as the seal begins to 'break'. Leave to stand until it is no longer showing signs of venting.

* Flanged connector, face and piston (barrel) seal: Establish the gap necessary between the flange and the end cap to bring the piston seal to the upper edge of the bore. Remove one screw to establish size, thread rate and engagement length in end cap. It will be necessary to obtain one or possibly two sets of longer screws to ensure that it will be possible to maintain sufficient engagement as the connector is withdrawn. Remove 2, diagonally opposed screws and replace with screws that will have full engagement and reach the flange when the other 2 screws have at least 0.5D engagement. Remove the 2 shorter screws and replace with 2 screws that will fulfil the same function as above for the first pair of longer screws. Repeat this procedure until the piston seal has reached a point where it is just able to vent. Again, apply diluted washing-up liquid and check for bubbles as the seal begins to 'break'. Leave to stand until it is no longer showing signs of venting.

* Threaded connector, face seal only: 'Crack' the thread and slowly turn until the face seal begins to 'break'. **Do not continue turning.** Again, apply diluted washing-up liquid and check for bubbles as the seal begins to 'break'. Leave to stand until it is no longer showing signs of venting.

* Threaded connector, face seal and piston (barrel) seal or piston (barrel) seal only: **Check with OceanTools as it may not be possible to turn the connector a sufficient number of times to 'break' the seal due to internal wiring.** If this is the case it will be necessary to release the end cap seal. Remove 1 end cap screw to establish size, thread rate and length of engagement. Replace screw. **Check with OceanTools to determine how far the end cap will need to be released to allow the seal to 'break', and how many seals there are.** Obtain a range of screw lengths to allow 50% of the total number of end cap screws to maintain 1D of engagement. Remove every alternate screw and replace with the next size up. **Consider that even if the end cap does not 'want' to release, it is not a guarantee that there is no internal pressure as the seals may have 'stuck' due to internal corrosion.** A generous amount of diluted washing-up liquid should be applied around the end cap/body tube interface. Continue up-sizing screws as described above until the last seal 'breaks' Leave to stand until it is no longer showing signs of venting.