Pall Corporation

OPERATING INSTRUCTIONS

Pall® PCM500 Series Portable Fluid Cleanliness Monitor

Filtration. Separation. Solution.SM

PREFACE

The Pall PCM500 On-line Fluid Monitor has been developed to provide accurate and continuous information on the cleanliness of aqueous solutions, hydraulic fluids and circulatory lubrication system fluids. Fluid contamination levels monitored are then converted to the widely used contamination codes: ISO4406, SAE AS4059 table 1 (NAS 1638) and AS4059 table 2. The result data can be exported to Flash Drive, Printer, PC, PLC or network device..

The self-contained unit provides a portable fluid contamination monitor that can be used with a range of fluids, including mineral oils and aqueous solutions. Fluid change procedures are included in this manual and these help ensure the PCM500 monitor is adequately flushed prior to testing on an alternative fluid application.

The contents of these operating instructions should be read before attempting any aspects of installation, operation or maintenance.

The product has been tested and quality controlled in accordance with Pall standard procedures. The customer should carefully inspect the product and ensure it is not damaged and or unsuitable for use. It is the user's responsibility to check actual operating conditions to ensure the PCM500 monitor is compatible with the application and is operated within local safety codes.

NOTICE TO USERS

The PCM500 user manual is provided to assist users in maximising the benefits of the PCM500 portable fluid cleanliness monitor.
As part of the continuous improvement process that Pall adopt in the development of technology and satisfying customer requirements, this information or procedure may be subject to change.
Pall welcomes feedback from users who should contact their designated Pall Service Centre.
Please note the PCM500 is shipped to users with, a protective fluid, Rust veto NTP 32, which is miscible in both aqueous liquids and oils. Please ensure the unit is flushed out before running tests. The unit should be run for at least three full test cycles on the system fluid before performing a reliable test.

! Important: Some fluids may react with Rust Veto to create gels, which can result in functional issues within the PCM500. One example is Mono Ethylene Glycol (MEG).
Please check with Pall if there is doubt over the compatibility of test sample and Rust Veto transit fluid.

! Important:
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

! Important:
The PCM500W model is fitted with a sensor measuring relative humidity in oil.
Do not use with water bearing fluids or permanent damage will occur.

Contents

Section 1	Describes the environmental, mechanical and electrical aspects of the PCM500 monitor to include product specifications.
Section 2	Inspection, packaging and guidance note
Section 3	Description of the PCM500 monitors main items
Section 4	PCM500 principle of operation
Section 5	Pre-check and connection of the PCM500 to a fluid system
Section 6	General operation of the PCM500 monitor, including communications to peripheral devices.
Section 7	Provides communication protocol for PLC control through RS232 Com port
Section 8	Details the fluid change procedure
Section 9	Describes the PCM500 monitor function codes, possible causes and corrective actions.
Section 10	Spare parts list
Section 11	Covers the disposal of equipment

Appendix A	Details the **Pall** PCM500 series worldwide aftermarket and calibration service.
Appendix B	Details the Mesh Screen Manifold exchange procedure

Pall Corporation

PALL MACHINERY AND EQUIPMENT
A DIVISION OF PALL EUROPE LTD.

EC DECLARATION OF CONFORMITY

PRODUCT DESCRIPTION:	Portable Cleanliness Monitor
PRODUCT PART NUMBER:	PCM500 and PCM500W
SERIAL NUMBER:	SEE NAMEPLATE

On behalf of Pall Machinery and Equipment division of Pall Europe Ltd, We hereby declare that the above product complies with the following transposed harmonised standards:-

BS EN 61010-1: 2010	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use. Part 1: General Requirements
BS EN ISO 12100 2010	Safety of Machinery – Risk Assessment
BS EN 61000-6-3: 2007	Electromagnetic Compatibility – Generic Emissions Standard Pt 1 Light Industrial
BS EN 61000-6-2: 2005	Electromagnetic Compatibility – Generic Immunity Standard Pt 2 Industrial Environment
BS EN 61000-3-2 : 2014	Harmonic Current Emissions
BS EN 61000-3-3 : 2008	Voltage Fluctuation and Flicker
BS EN 60529:1992+A2:2013	Degrees of Protection Provided by Enclosures

We declare the products specified above meet the Essential Health and Safety requirements of the EC Machinery Directive 2006/42/EC, the EMC Directive 2004/108/EC, the Low Voltage Directive 2006/95/EC and the Pressure Equipment Directive 2014/68/EU ,designated as Category One and has been manufactured in accordance with conformity assessment Module A "Internal Production Control".
This product must be regularly serviced by Pall and /or their approved agent for the declaration to remain effective after shipment.

A technical construction file number PCM500 Series for this product is retained at Pall Machinery and Equipment. See below for the person authorised to compile the technical file:

Name: Jamie Collard

Signed: ----------

Position: Global M&E Product Engineering Director

Date: 8th March 2016

For and on behalf of:
Pall Machinery and Equipment
5 Harbourgate Business Park,
Southampton Road
Portsmouth. UK
PO6 4BQ.

WARNINGS, CAUTIONS AND NOTES

Care must be taken in referring to this manual so as to ensure adherence with all warnings, cautions and important notes. These carry information related to the safety of personnel and the integrity and satisfactory operation of plant.

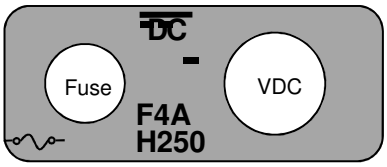
	***WARNINGS: THESE ARE INSTRUCTIONS THAT DRAW ATTENTION TO THE RISK OF INJURY OR DEATH.***

	***Cautions: These are instructions that draw attention to the risk of damage to the product, the process, the equipment or the surroundings.***

!	Important: These are instructions that draw attention to information that will aid installation, operation or maintenance.

Labels affixed to PCM

Caution label attached to Battery cover



Label indicating DC power and Fuse rating

Label indicating refer to manual

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Section 1: Pall PCM500 and PCM500W Fluid Cleanliness Monitors Specification and Requirements

1.1 General Description

The Pall PCM500/PCM500W is specifically developed as a portable diagnostic monitoring device that provides an assessment of system fluid cleanliness. A fixed display/controller allows for simple menu driven input of sample identification, monitor configuration and data output in ISO4406, SAE AS 4059 Table 1 (NAS 1638) or SAE AS 4059 Table 2 formats. The display/controller shows the test results, an option to graph results and this data is automatically stored for subsequent trending and evaluation. The self-contained design provides for a portable fluid contamination monitor that can be used with a range of fluids including mineral oils and aqueous solutions. Note: The PCM500W should not be used for aqueous solutions.
Fluid change procedures are included in this manual and these help to ensure the PCM500 monitor is adequately flushed ready for an alternative fluid application

See Pall Datasheet M&EPCM500EN for full technical specification

The full technical specification is given below.

1.2 Fluid Environment

Operating Pressure range	0 to 315 bar (4,570 psi) maximum	
Operating Viscosity range	1.5 to 450 Centistokes (30 to 2,200 SUS)	
Operating System Temperature	Mineral Oils	10C - 80ºC (50℉ - 176℉)
	Water Glycols	10ºC - 60ºC (50℉ - 140℉)
	Water Based Fluid	10ºC - 60ºC (50℉ - 140℉)
	Fuels	10ºC - 40ºC (50℉ - 104℉)
	Industrial Phosphate Esters & Polyesters	10ºC - 80ºC (50℉ - 176℉)

Be aware of possible danger associated with high oil temperatures and exposed metal surfaces of the PCM500

Fluid Compatibility

Aqueous solutions having a pH <11.0, water glycols, high water based fluids, petroleum based fluids, industrial phosphate esters, mineral oils and synthetic fluids.
Do not use Acetone based fluid.

Seals Fluorocarbon (Viton)

WARNING: Health and Safety.
Observe caution when handling fluids and pay attention to instructions of safe use in the Material Safety Data sheet and COSHH regulations.
Wear protective clothing if prescribed; e.g. safety gloves, clothing and footwear.

Caution: Health and Safety.
Ensure there is adequate lighting to operate the equipment.
Observe local regulations for factory use.

Section 1: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Specification and Requirements

1.3 Ambient Environment

Operating Temperature range	5°C - 40°C (41°F - 104°F)
Storage Temperature range (Monitor drained of fluid)	-20°C to 55°C (-4°F to 131°F)
Dust and water protection	IP65 (NEMA 4)
Relative Humidity	95%rh non-condensing
Operating Altitude	<2000 metres

WARNING: Do not use the PCM500 Series Monitor in an explosive atmosphere

1.4 Electrical

External Mains Power Supply Unit (PSU) Accessory	Input 100 – 240 VAC (Auto Ranging) Frequency 50 – 60 Hz Single Phase. Output 48V DC
Input Fuse	Quick Blow, 4A 5x20mm (250V)
Optional Mains Supply Unit	Input 100 – 240 VAC (Auto Ranging) Frequency 50 – 60 Hz Single Phase. Output 24VDC
Internal Battery	12VDC Lithium Ion rechargeable.
Battery Life	Typically 35 - 40 samples depending on cleanliness levels & oil viscosity
Communications	USB 1 (Data Acquisition) USB 2 (PC Setup of PCM) USB 3 (Printer) Ethernet Cat5 (Remote control & Data Acquisition) RS232C (PLC Control) Voltage Free Contacts (Alarm output – contact rating 1 Amp @ 24VDC)

1.5 Fluid Connections

Inlet – 2 options	**High Pressure:** Hose with ¼" BSP female swivel fitting and Metric, Imperial or NPT Test Point connector options. **Low Pressure:** Hose direct coupled on ¼" BSP female swivel fitting. Sampling stalk (for bottle sampling)
Outlet	M10 male fitted to 6mm OD. Clear plastic hose, with straight adapter and cap.

Section 1: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Specification and Requirements

1.6 Product Specification

Weight	11 Kg (24 lb)
Dimensions	400 x 260 x 250 mm (15.75” x 10.2” x 10“)
Monitoring range ISO4406	11/9/7 to 23/21/17
Monitoring range SAE AS4059F Table 1 (NAS1638)	1 to 12
Monitoring range SAE AS4059F Table 2	>4µm: 1 to 12, >6µm: 1 to 12 and >14µm: 1 to 12
Accuracy	±1/2 ISO4406 Code
Water-in-Oil (PCM500W only) %rh. (PPM switchable but requires C1, C2, C3 & C4 fluid constant input. Contact PALL representative).	± 2% at 5 to 95%rh (non-condensing) 0 to 100% full range
Enclosure Material and Flammability	ABS UL94 V-0
Enclosure Gasket Seals	Silicone Rubber
Noise Level	<70 dBA

Foreseen misuse of equipment

Within this manual are cautions and warnings to highlight potential dangers associated with operation of the PCM500. Here are a few points of note on misuse of the equipment.

A danger to the user can arise from connecting the PCM500 to a pressured system above the working limit, and / or, using an incorrect high-pressure connection.

Damage to the PCM500 can occur from using incompatible fluids.

A danger to the user and damage to the PCM500 can be from an incorrect mains voltage supply**.**

Section 2: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

2.1 Inspection and Packaging

The PCM500 is shipped in a transportation case. Use this case for re-shipping the PCM. Visually inspect the case for signs of external damage that may have occurred during shipping and bring any damage to the attention of the shipper.

Inspect the interior of the case for damage to the contents as listed below. Compare the contents of the case with the shipping papers to assure all the content is present. If any items are missing, contact Pall or an approved agent.

The PCM500 package comprises of:

- Integrated PCM500 series monitor with sample hoses
- Power supply unit
- Mains power lead
- PCM500 to PC communications cable
- PCM500 series Operating Instructions on CD ROM
- PCM500 series Quick Reference Guide
- Fluid Sampling stalk
- High Pressure test point connector (Choice of Imperial, Minimess or NPT)
- Certificate of Conformity
- Certificate of Calibration Verification
- Packing note checklist

The instruments' specific serial number and calibration/service record sheet is also included. It is important to keep this in a safe place and return them with the unit for future annual service requirements.

Caution: Health and Safety. Ensure there is adequate lighting to operate the equipment.
Observe local regulations for factory use.

Section 3: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

3.1 Description of the Monitor

The PCM500 is designed and built for light Industrial use while maintaining aesthetic and user friendly ergonomics. See section 1 for full specification. The materials are selected to meet the various fluid and environmental conditions that the PCM500 is likely to be subjected during operation.

As a self-contained unit, including sampling hose and adapters, the user is able to connect the PCM500 on-line or sample fluid directly from a system reservoir without breaking lines thereby avoiding extraneous contamination.

The PCM500 cleanliness monitor provides numerous display functions to assist the user at all stages of operation and provides function codes to warn of any problems with both the PCM500 and system fluid.

1. HMI (display/controller)
2. Communication Ports
3. Robust case with carry handle.
4. Integral 12VDC battery
5. Printer storage compartment
6. Last Chance Filter Housing
7. Hose Storage
8. Mesh Screen block
9. Power input and Fuse

Section 4: Pall PCM500 and PCM500W Series Fluid Cleanliness Monitor

Principles of Operation

4.1 General Principles

Upon starting a test sequence the PCM500 will self-prime and perform internal checks on the sample fluid condition. This is an automatic part of the test time. After approximately 30 seconds the PCM500 will start the analysis. The screen will display a progressive time bar for the duration of the sampling period and identify the specific stage in the monitoring cycle above the progress bar.

During the analysis cycle the sample fluid is presented to mesh screens in a specified sequence, which captures contamination that is larger than mesh pore size.
Particle concentrations are measured and computed for each specific mesh.

During the sampling sequence, data is constantly analysed to identify any excessive variance in temperature, viscosity, and pressure to ensure results are not spurious. The PCM500 will advise the user by function codes, if any excessive variance occurs.

4.2 HMI Control Panel

There are three light emitting diodes (LED) to indicate PCM500 operational status and two soft-touch control buttons.

BUTTONS:
- START/STOP/REPEAT (test)
- ON /OFF

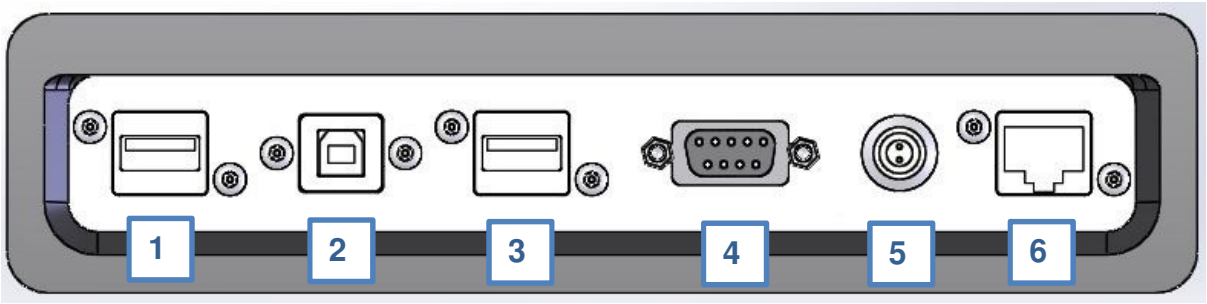
The test Start/Stop button is active on release. The ON button is active on release but OFF requires pressing for 2 - 3 seconds to shut down.

Blue LED		Green LED		Red	Description
On	Off	Flash	On	On	
x					External power connected and battery in charge mode.
	x				No external power (battery only)
		x			PCM500 On - Operational / Standby
			x		Test in Progress
				x	Hardware/Sampling problem detected

4.3 Test sampling

The HMI LCD display is designed to provide clear viewing of the screen menus and test data. The test sample sequence is initiated by use of the primary function keys. In edit mode a keyboard is displayed on the screen, which enables users to enter, or edit data including sample points and fluid types.

4.4 Communications Panel



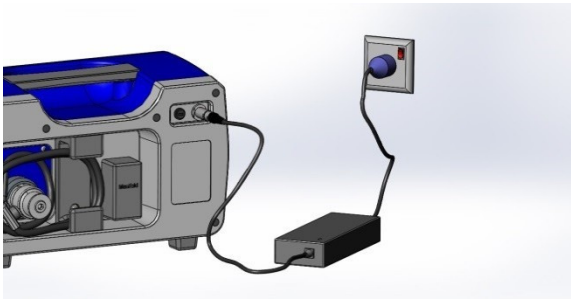
1	USB-A Socket 1	Text file upload/download from memory device
2	USB-B Socket	PC connection for setup/control of PCM500
3	USB-A Socket 2	Printer connection
4	DB9 Female	RS232 / PLC control (See section 7)
5	2-Pin Socket	Voltage free contact. Relay
6	RJ45 Cat5	Ethernet 10/100 base

Screen indication of valid port connection

A row of four small boxes in the bottom right corner of the display screen indicates when a port connection is active.

U = USB-A 1
E = USB-A 2
R = RS232/PLC
P = Ethernet

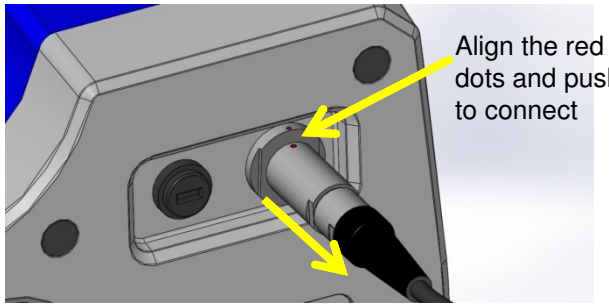
4.5 Power Schematic



The PCM500 is normally powered by a battery located in the front of the unit behind a plain panel. This has capacity at full charge to power the monitor for an average of 40 tests (depending on oil viscosity). A power supply unit (PSU), supplied as part of the PCM500 package, allows the monitor to be run from mains power and to charge the battery.

An indication of battery charge can be seen in the lower right corner of the display.

External Supply



Grip connector outer body and pull straight to disconnect.

Important:
The PSU cable connection uses a push – pull action on the outer body and both connector and receptacle align through a 'red dot' location mark. DO NOT attempt to remove by rotating the connector.

Important:
The monitor should not be operated with the battery pack disconnected. If a power outage occurs on mains supply during testing the battery will maintain power to the PCM to prevent loss of data and allow for a safe shut down

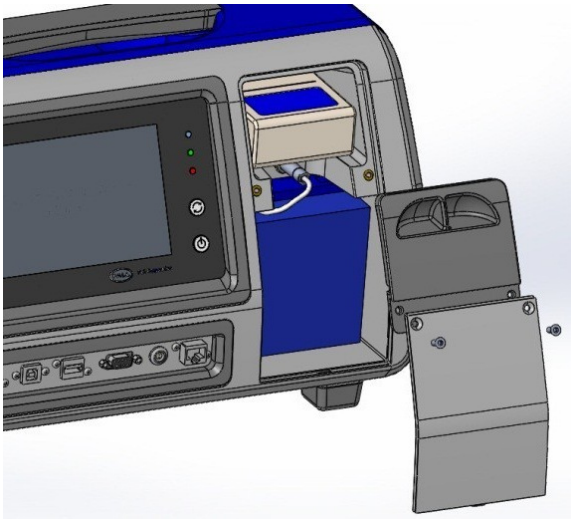
4.5 Battery

Important:
The monitor should not be operated with the battery pack disconnected. If a power outage occurs on mains supply during testing the battery will maintain power to the PCM to prevent loss of data and allow for a safe shut down.

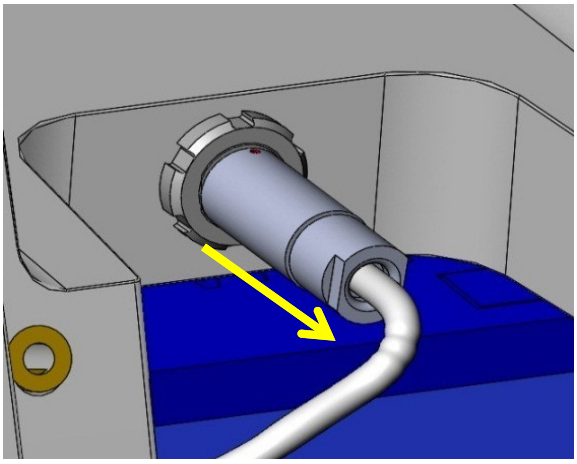
WARNING: Use only battery packs supplied by the manufacturer or Pall agent. Serious damage will occur if a battery of different chemistry or specification is used.

In the event of a battery replacement the following procedure should be followed.

1. Ensure the PCM500 is OFF and the external mains power supply disconnected.
2 . Remove the two M4x10 hex socket screws from the battery cover and lift out the cover and then the printer storage cover.

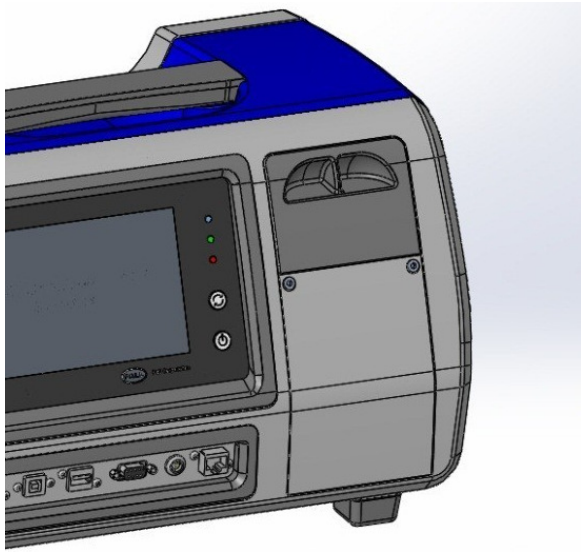


3. Remove the printer if present to allow full access to the battery connector



4. The battery connector is removed by pulling straight on the outer body. Do not rotate the connector, otherwise damage will result.
5. When connecting the new battery, align the red dots between connector and receptacle before insertion.

6. Replace the printer and battery covers and fix with the M4 hex socket screws.



Section 5: Connecting the PCM500

5.1 Connection Options

A general checklist for the user before starting is given in section 5.3 and also in the 'Useful information' quick reference card for PCM500 unit.

PCM500 is configured for two hose operation, inlet and return and these are stored within the rear of the instrument. The high-pressure hose is used for both high and low-pressure sampling. Fluid entering the PCM500 is filtered for contaminant larger than 65µm diameter by a mesh cartridge element (Last Chance Filter). This element is user changeable. In the event of a blocking filter, fluid entering the PCM will be restricted. The PCM will detect a loss of fluid and produce an error code and message on the display.

The sample take-off point in pressure systems should be cleaned of contaminant before connecting the PCM hose and in both high and low pressure sampling modes the return line must be unrestricted and allowed to drain into a waste container or system reservoir.

The PCM500 can be connected in various ways. High-pressure mode is considered to be the most appropriate to achieve representative sampling.

It is important to note that due to the very small bore through the high-pressure connector it must be removed from the inlet hose when sampling below 1 bar pressure. If not, an error may occur through insufficient fluid flow into the PCM.

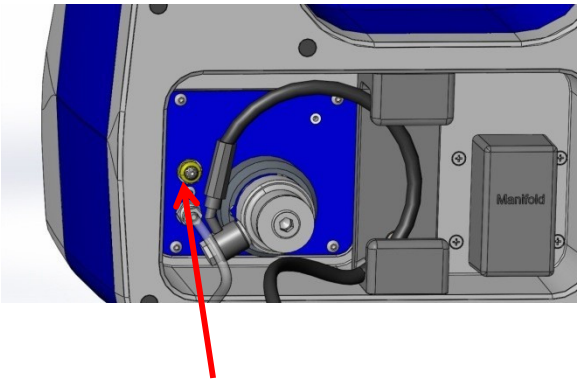
When sampling a closed system, it is advised to flush the PCM with one test to waste to prevent cross contamination by fluid remaining in the PCM from a previous test.

Caution:
Do not position the PCM that makes it difficult to disconnect power.

Caution: In the interests of safety, always remove the end cap from the return line before connecting the inlet hose to high-pressure. If the PCM Pressure Reduction Valve does not regulate properly then excess outlet pressure can escape through a relief-valve into the return line.
NEVER LEAVE A PCM CONNECTED TO HIGH-PRESSURE WITH THE RETURN LINE CAPPED.

If the return line is capped or blocked and a fault occurs with the Pressure Reduction Valve, then to prevent damage to the internal circuit a secondary relief valve will exhaust through a diffuser element at the rear of the PCM above the return outlet. It is important, therefore, to be aware of a possible loss of system fluid.

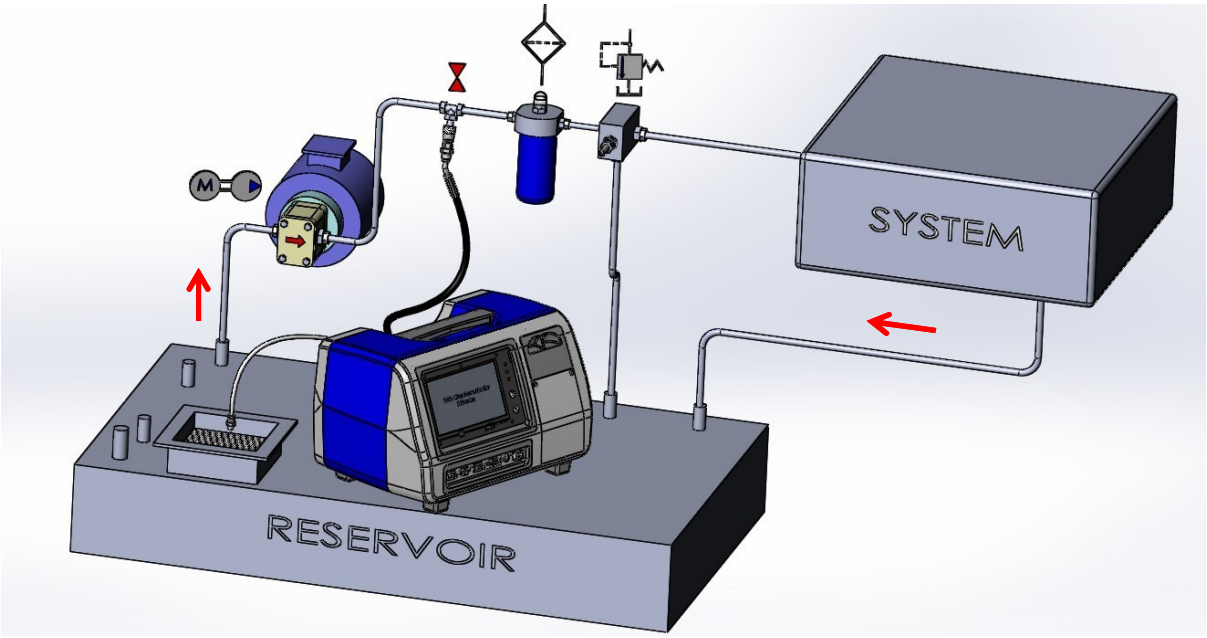
See the below image of diffuser location.



Safety Relief Exhaust Point

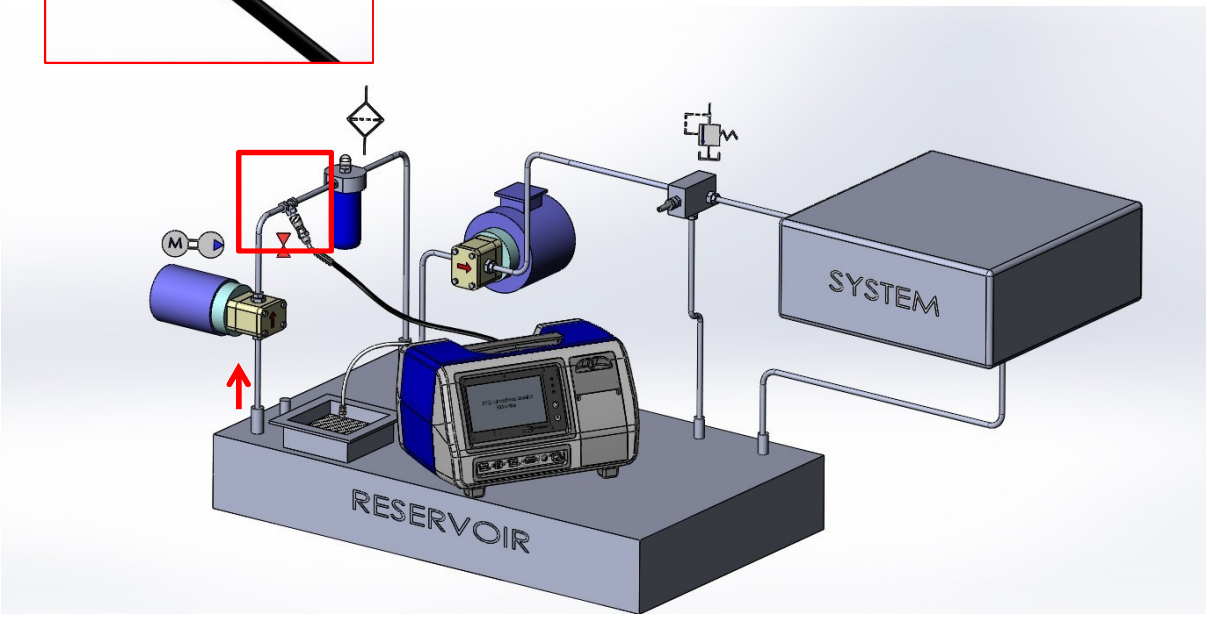
5.2 Connection Options

5.2.1 High Pressure Line (>1 to 315 bar)



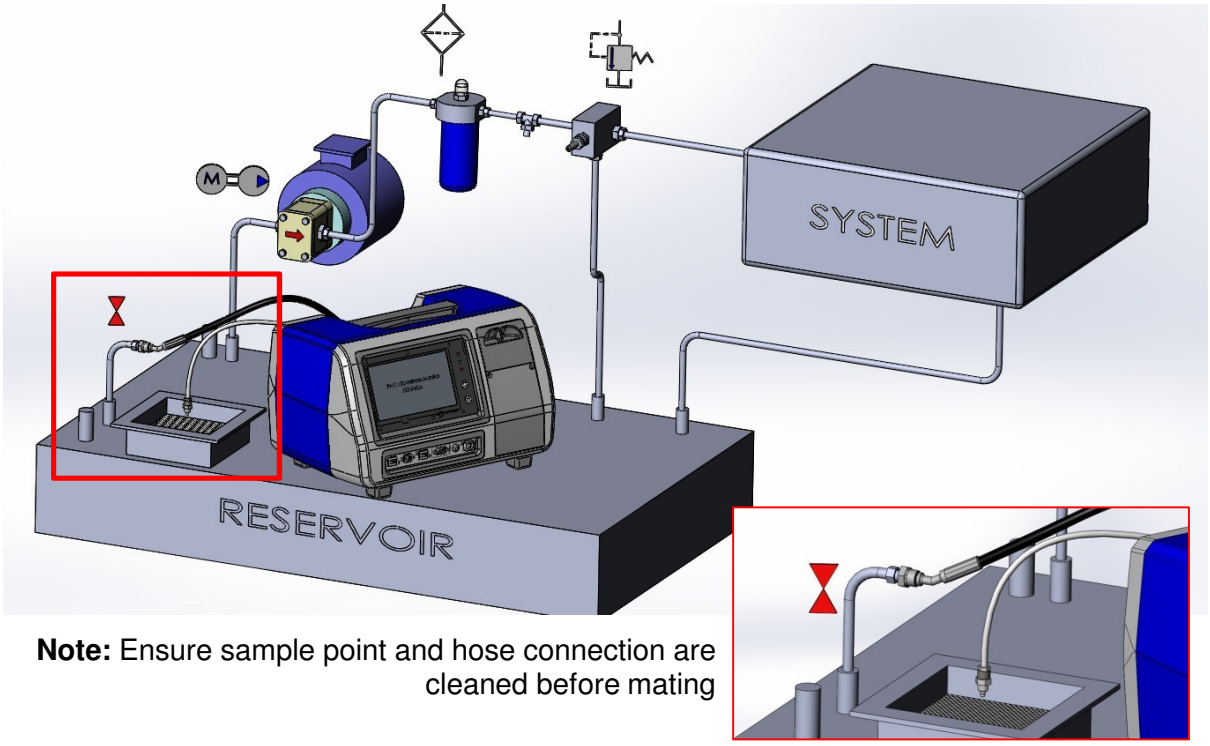
5.2.2 Low Pressure Line (0 - 1 bar)

<1 bar at test point: - remove HP connector and couple hose direct.



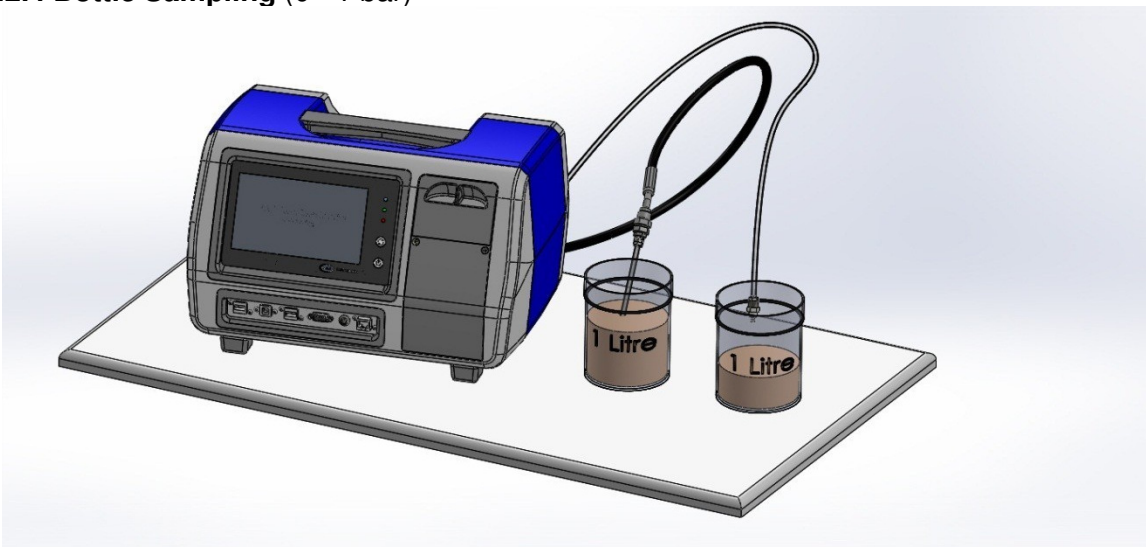
5.2 Connection Options

5.2.3 Reservoir Sampling (0 bar: - Direct coupled hose or use sampling stalk. Remove high-pressure connector)



Note: Ensure sample point and hose connection are cleaned before mating

5.2.4 Bottle Sampling (0 - 1 bar)



When sampling from a bottle or container, it is advised to run a single test to waste with a clean, compatible fluid (≤ ISO 12/10/8) and remove any residual contaminant from the PCM500. Depending on viscosity and cleanliness, the PCM500 may require up to a litre of fluid sample for a bottle test. Always ensure the containers are thoroughly cleaned prior to introducing a fluid sample..

When bottle sampling it is important to prevent extraneous contaminant entering the sample, such as may be found on the outer surface of the HP hose connection. It is advised to use the sampling stalk provided, which should be kept in a clean condition.
In order to check the repeatability of cleanliness results, a large sample (>3 Litre) may be cycled into the same container and averaged over a 3-test run for example.

5.3 Operational Checks

Preparation checks before going to the installation to be sampled.

Caution: The PCM500 display touch sensitive screen must not be pressed with a sharp or pointed implement. Finger contact is sufficient to operate the display menu icons and keyboard.

Press and release the PCM500 start button  The Control panel green LED will flash within a few seconds and the PCM500 enters the start-up phase. After a short period the display will turn on and a screen will appear with Pall logo. The next phase of start-up is test firing of the internal valves (six clicks). Following this the main menu screen is visible.
If the PCM fails to power up on battery, connect the external PSU and check the blue LED on the front panel is ON. If not, check or replace the input fuse with the correct value. If the PCM fails to start, consult Pall.

First screen

2. If the PCM500 has been used previously with a different fluid to the new sample then fluid change procedures detailed in section 7 should be adopted.

3. Switch off the PCM500 and you are now ready to proceed to the installation to be sampled.

5.4 Installation Checks

At installation to be sampled

1) Access the hoses at the rear of the PCM500.
2) Ensure the hose connectors are clean and free from any visual contaminants.
3) Ensure the installation to be sampled is in operation and has been running for a minimum of 30 minutes prior to taking the sample in order to distribute the contamination as evenly as possible within the fluid. This is necessary to allow a representative fluid sample to be taken.
4) Connect the clear return line hose to the system reservoir or suitable capacity container ensuring cap is removed
5) Connect the black hose to the appropriate sampling point. Check for any leakage, rectify as required.

Warning: Ensure the system operating pressure is within the PCM500 monitor specified limitation of 315 bar, 4,570 psi maximum.

6) The PCM500 can now be switched on and the screen sequence followed. The specific procedure for start-up is detailed in section 5.4 and section 6 ‘Getting started’.

Section 6: Getting Started

6.1 General

This section of the operating instructions enables a new user to perform tests using the PCM500 Cleanliness Monitor in a short space of time. It does not instruct the user in sampling techniques and the user should consult **Pall** for guidance on recommended sampling points.

6.2 System Components

- PCM500 Cleanliness Monitor
- Power Supply Unit
- Battery Pack
- Bluetooth / USB Printer (Option)

6.3 Button Descriptions

Main Menu

Home | Set-up | Tools | File | Info | Language

Navigation

Previous | Confirm | Undo | Cancel | Up | Down | Forward | Back

Editing & Data

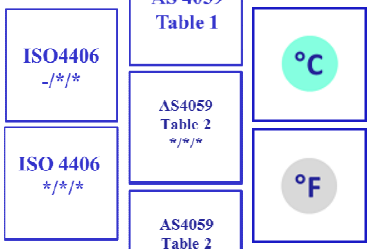
Delete | Create | Open | Edit

Warnings

Critical | Warning | Shutdown | Contact

Tools and Functions

Set Label | Clock | Date | Format | Print

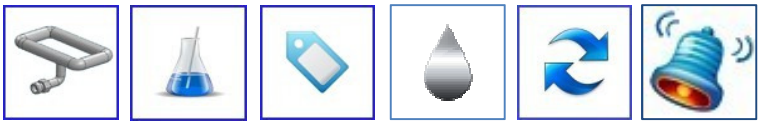


ISO 4406 Format | AS 4059 Format | Temp. Format

Communi-cation

Export | Bluetooth Setup | Wi-Fi Setup | Comms Port

Testing



Test Point | Fluid | Test Label | Water in Oil | Repeat | Alarm Set-up

Data Management

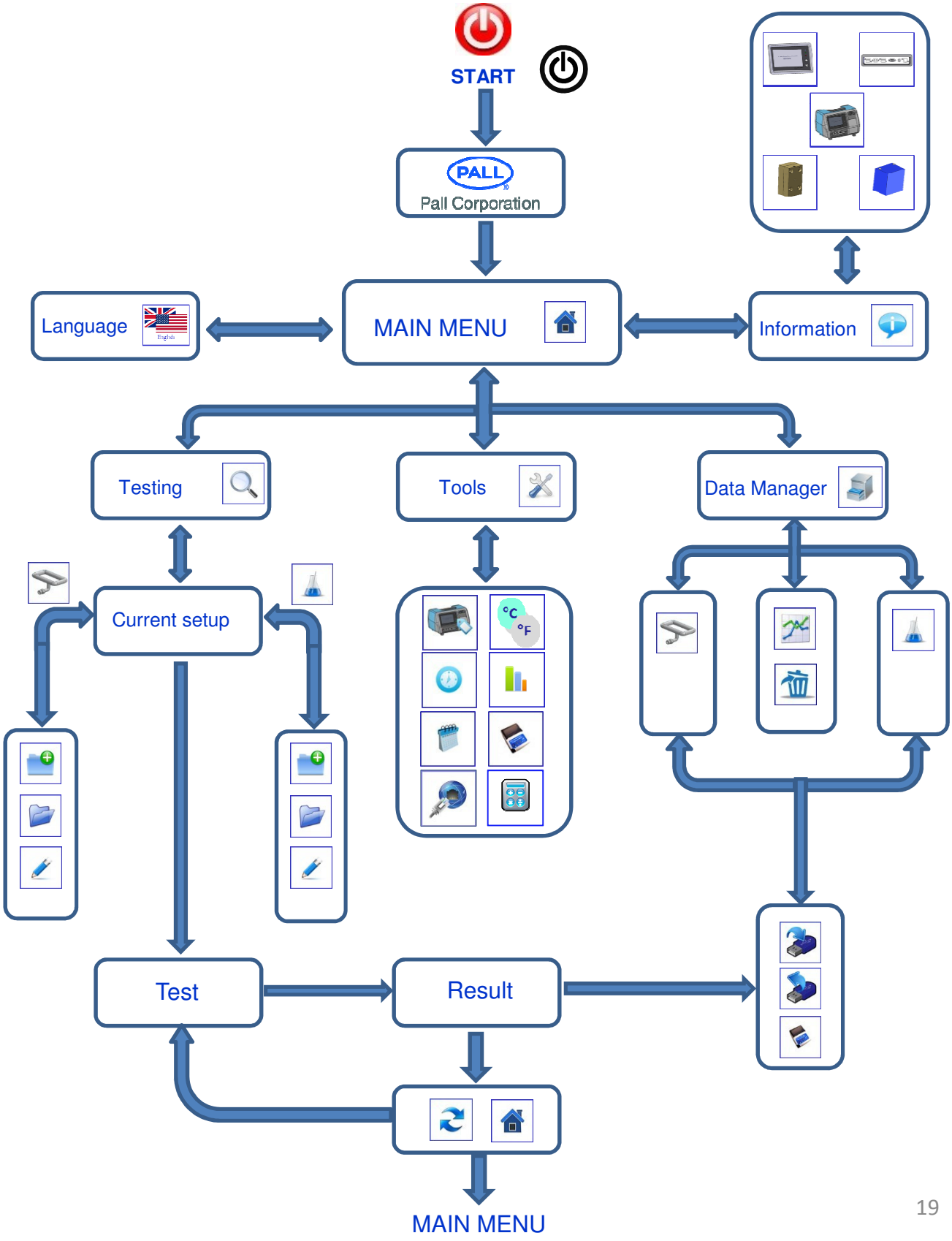
Upload to Flash Drive | Download to PCM | Test Label | Result Warning | Select All | Graph

Information

PCM500 Spec | Mesh Settings | Battery Data | Control Panel | Comms. Ports

6.4 Display Flow Chart

The display flow chart can be used to help the new user become familiar with the PCM500 display operating sequence. The flow chart consists of a number of views using the previous Icon listing to indicate their access within the screens.

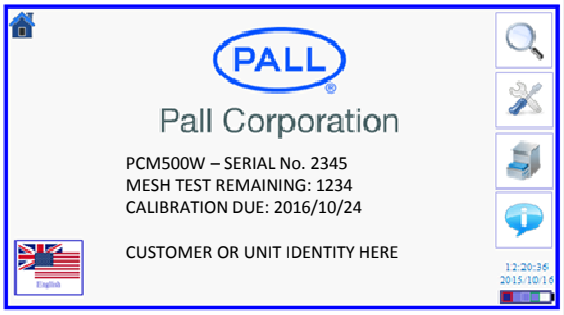


6.5 Example Screen

The screen below is an example of those that will be seen when using the PCM500. An explanation of common keys is incorporated here to prevent repetition.

The screens are structured into four main groups; Testing, Tools, Data Manager and Information. The home key will always return the user to the main menu. There is a flag icon that denotes the language setting. Use this active icon to change language setting.

An example screen shot of the PCM500 main menu:

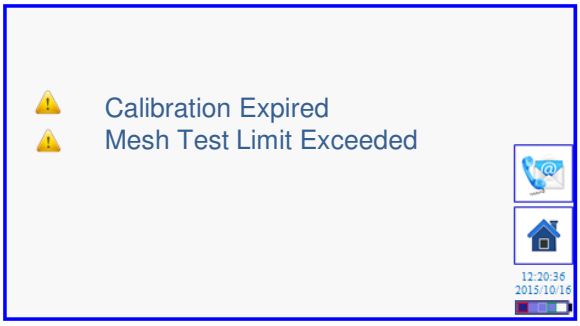


6.6 Start-up Sequence

Press and release the power on/off button on the front panel. This will power-up the PCM500 monitor and the green LED light will flash for several seconds. Whilst the unit powers up, the display will activate and the following screens appear:

Splash screen

If the PCM500 is out of calibration, requires an annual service or other intervention a warning screen will inform the user at start-up. This is to ensure the user keeps the PCM500 fully serviced and helps ensure the integrity of the high-pressure part of the instrument.



Press the contact button to open a contact details screen or proceed to home (Main Menu).

Contact screen for technical support

In the event of a major fault the next screen will appear and the PCM must be closed down and the problem reported to your local distributor or Pall Corporation.

Main Menu Screen

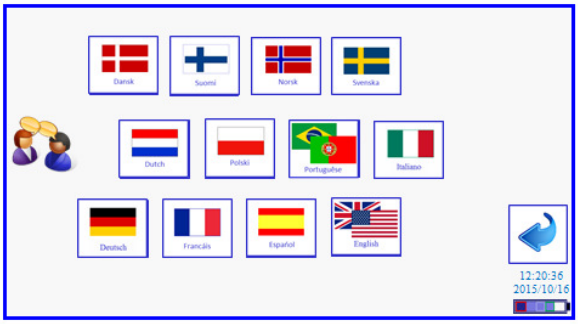
The main menu includes PCM500 serial number, mesh test detail, calibration date, and customer or unit identity if installed.

To the right hand side are buttons to access menus for testing, tools, data manager and information,.

The time and date and a 5-stage battery indicator is in the lower right corner.

To the bottom left is a button icon indicating the languages that are available. Press to select a different language.

Language select screen



Languages are installed for the following countries.

- Denmark
- Finland
- Norway
- Sweden
- Netherlands
- Poland
- Portugal / Brazil
- Italy
- Germany
- France
- Spain
- USA / UK

6.7 Sampling

Sample can be on-line, from a reservoir, or bottled oil sources. Refer to sections 1 ‘Specifications and section 5.1 ‘Connection Options’.

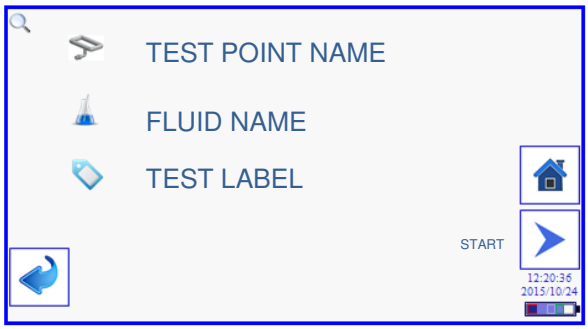
On Line or Tank Sampling Routine

From the main menu press the test button 

The user will be presented with a Test Configuration screen. If the parameters are correct then advance to the next screen using the right arrow button. To edit or change the setup select one of the top three left hand buttons.

Test Point screen:

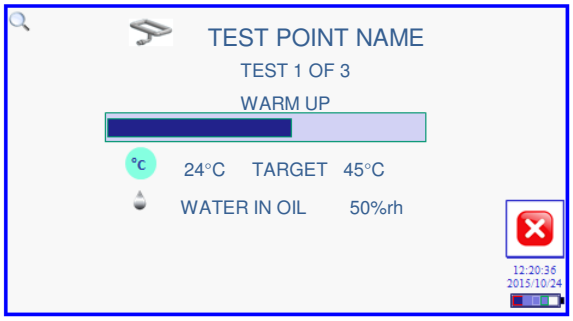
Final Check Screen:



Check the parameters are correct then Start test using RIGHT arrow button.

Warm Up Screen example.

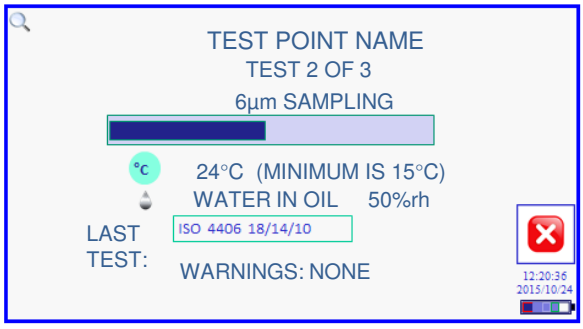
If the sample fluid temperature is below the value set in Test Point, the PCM will enter a warm-up cycle which pumps fluid continuously until the temperature measured in the PCM circuit is at the target temperature.



! Important: The PCM can tolerate up to a 1°C per minute change in sample temperature during a measurement cycle. It is important, therefore, to stabilise PCM temperature close to the system temperature for measurement accuracy.

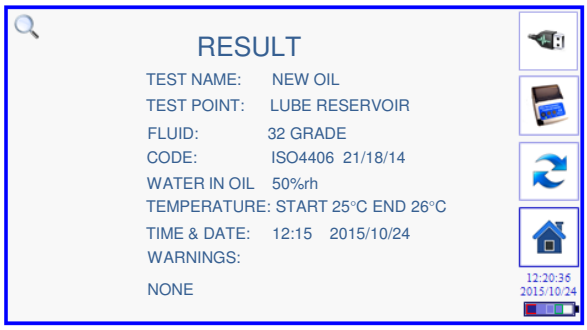
Once into the test measurement a progress screen provides real-time test data. The test can be cancelled at any time through the Cancel button icon.

The first measurement in the test cycle is 14µm particulate followed by the 6µm. Temperature and Water-in-Oil (PCM500W) data is provided and also details of the previous result code, if a multiple test



Should any test parameters be exceeded during a test a 'Warnings Present' label will be shown at the bottom of the screen. These will be recorded in the final test result detail screen.

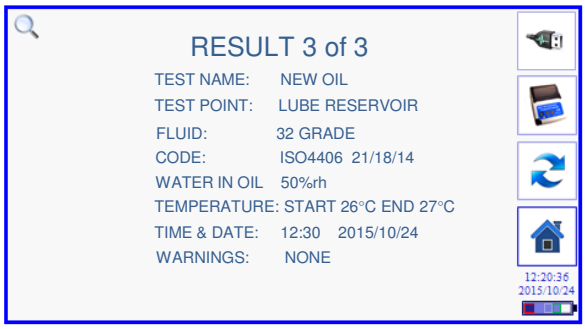
A single test result screen



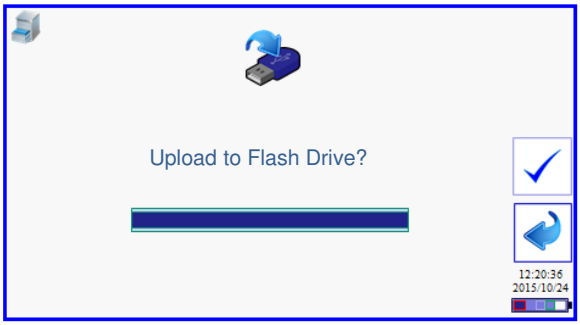
Screen for multiple test results.

UP and DOWN buttons allow access to all test results in the sequence. The results are automatically saved to memory and can also be viewed through the Data Manager screens.

The options from the result screens above are to transfer on USB; Print; Repeat the test sequence or return to the Home screen.

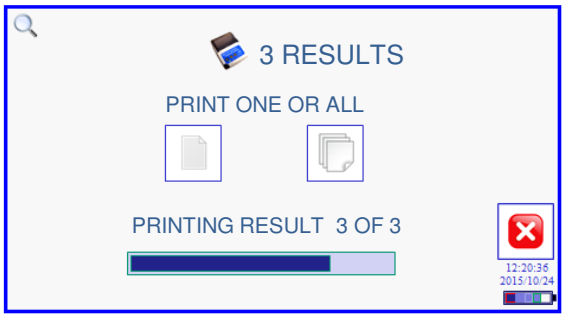


Transfer via USB will be to a Flash Drive / Memory Stick connected to a USB-A port on the COM port panel. Press the Tick button to upload and a progress bar indicates the rate of transfer. Press the Return button to go back to the results screen.



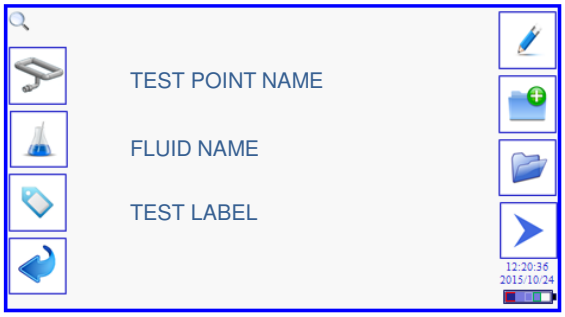
Print results screen

This follows the same control method as USB transfer but there is an option to print one or all results if multiple tests are available. If one is selected then it will be that currently open on the result screen.



6.8 Test Point & Fluid Setup

If a new Test Point or Fluid is to be created for loading into the test setup or the current settings require editing, this is done through the Test Setup screens,



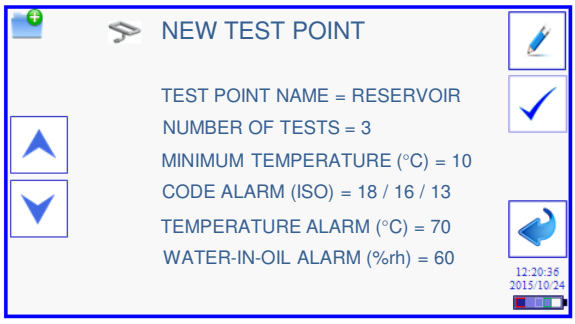
For example, if either the Test Point or Fluid buttons are pressed it activates a set of options to the right of the screen. Using the Test Label button will open the QWERTY keyboard.

Edit key to change values in Test Point and Fluid setup

Create New for Test Point or Fluid

Open an existing Test Point or Fluid setup

New Test point set-up



Use UP and DOWN arrows to select a parameter and press EDIT for the following action:

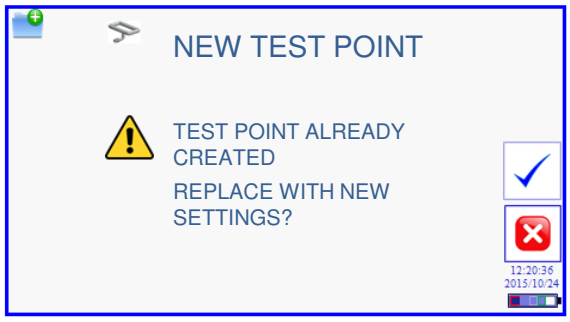
- Test Point name switches to qwerty keyboard screen
- Number of tests, minimum temperature and trigger time switches to calculator screen
- Code alarm screen is determined by the code format selected (Tools Screens)
- Temperature and water-in-oil alarm points are edited on the calculator screen.
- Save the setup using the tick button.
- To return to test setup screen or, cancel editing without saving use the Return button.

Important: The trigger period begins at the start of one test to the beginning of the next. The minimum set time is 7 minutes, which includes the maximum allowable test period and a 1 minute delay. e.g. Trigger time=7 min. test time=6 min. time from end of test to the beginning of the next test = 1 min

If a test is started by external control, such as from a PLC, then the trigger period can remain at 0 minutes.

Important: The water content alarm is applicable to the PCM500W monitor only. The PCM500W monitor must not be used with water bearing fluids. The PCM500 does not incorporate a water sensor

If a Test Point with the same name already exists a warning screen will appear to overwrite the old setup.

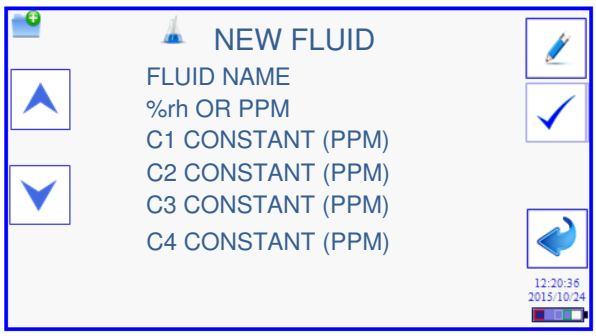


Fluid setup screen accessed through the Fluid button.

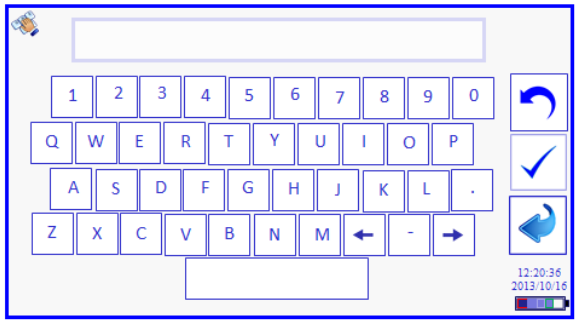
• Select Fluid name to edit through the QWERTY keyboard (enter/edit the name}.

• For PCM500W a water-in-oil entry is active and toggles between %rh and PPM on the press of the Edit button. If PPM is selected then four absolute water constants appear for editing. C1, C2, C3 and C4 are updated using values supplied by Pall Corporation, contact Pall for availability.

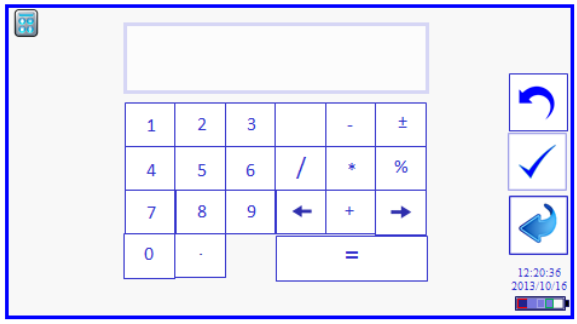
• Save the setup through the tick button and use the Return button to go back to the Test Point screen.



QWERTY Keybaord

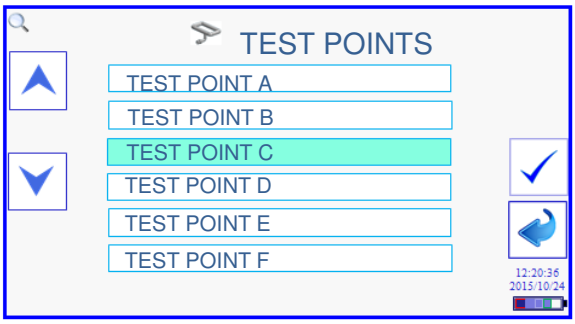


Number Entry screen



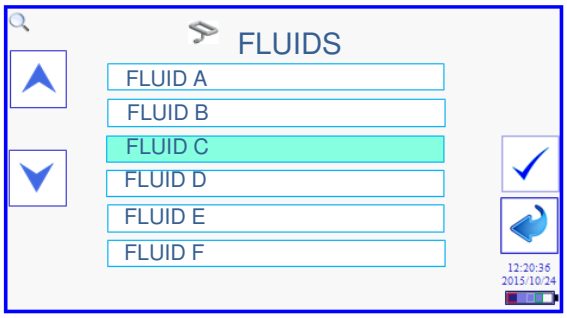
Load a stored Test Point

From the OPEN button in Test point, select a stored Test Point and make current by pressing the TICK button.



Load a stored Fluid

From the OPEN button in Fluids, select a stored Fluid and make current by pressing the TICK button.



6.9 Code Alarm Setup

Each Test Point is allocated an alarm point setup for the three coding standards and whether a two or three-part code is selected. The default alarms are set to maximum code numbers and the user can adjust the code alarms to their required limits.

If a different code standard is selected the alarm points change to that standard also. The VFC (Voltage Free Contact) is a two pin socket on the PCM communication panel (see section 4.4). A signal can be taken on an alarm state to control the switching in or out of a filtering system for example. In the example below, the alarm is set to trigger if 6µm is greater than ISO 14 code. This could signal the start of system filtration pumps.
To change a code number, touch to highlight and use the UP and DOWN arrows.
To change an alarm action the options are <, > and X (not applicable).

Example: ISO4406

AS4059 Table 1

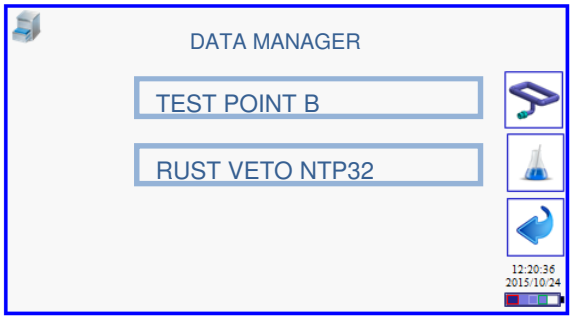
AS4059 Table 2

6.10 Data Manager Screens

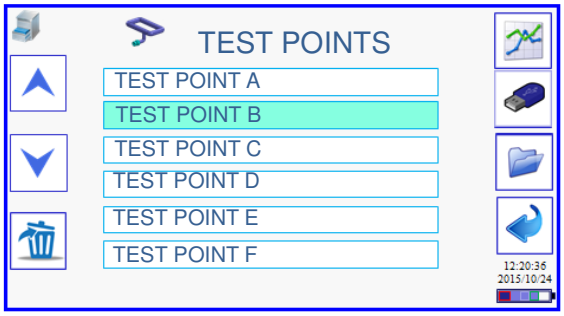
Any results saved on the PCM500 can be viewed and managed using the data manager. To get to the data manager press the data manager button in the main menu.

The data manager displays the current Test Point and Fluid.

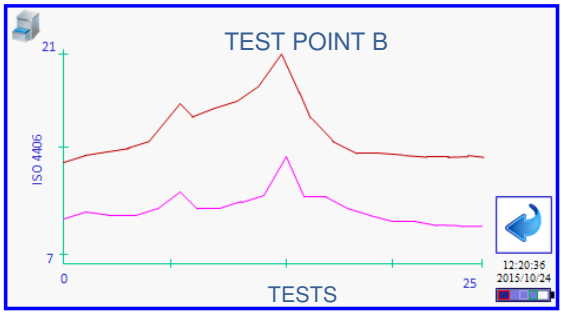
Press the Test Point button to access data.



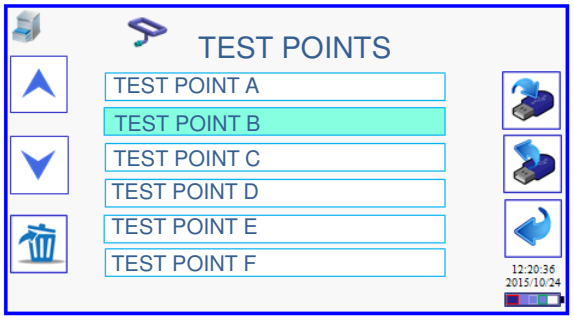
A list of all Test Points is now available to Graph, Transfer or Delete.



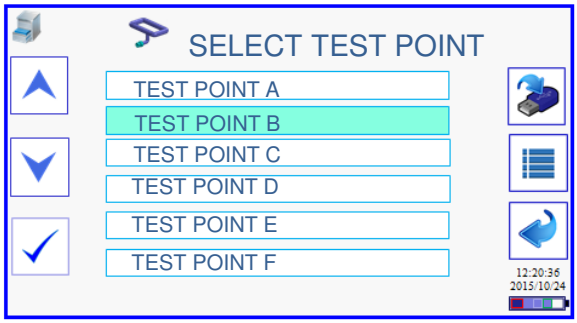
This button will graph all results under a selected Test Point using the current Code Format



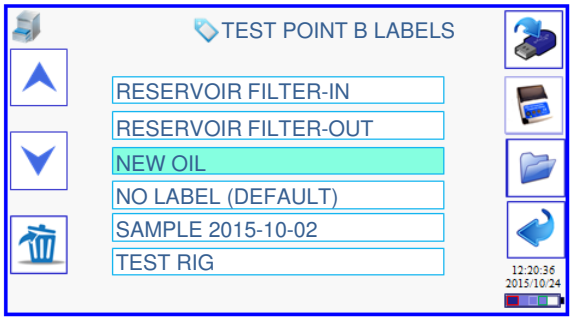
Flash Drive button will give a choice of uploading or downloading Test Point data



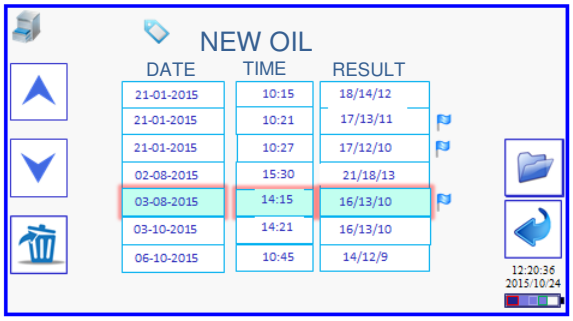
Upload to Flash Drive screen allows individual or All Test Points for selection.



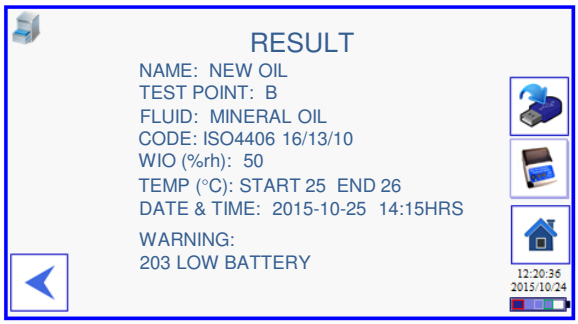
Opening an individual Test Point lists all tests under that name. Single or All Test Labels can be loaded to USB Flash Drive or printed



Open an individual Test Label to view individual tests. Then open and view the result in detail



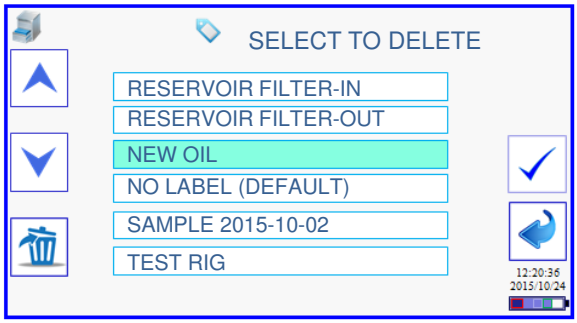
Individual Test detail can be uploaded to Flash Drive or Printed. A flag to the side of a test indicates a warning is attached



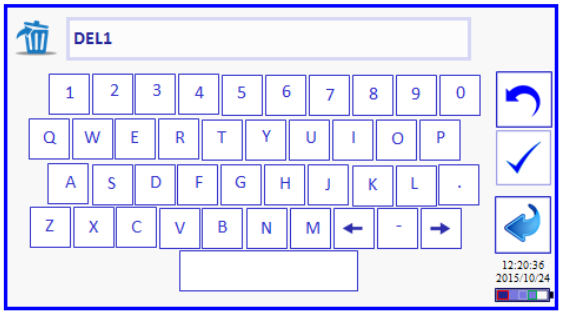
Deleting
Throughout the data management screens there are several that include the delete option. This includes Points; Names; Tests and Fluids. To enable this action a password must be entered. The default password issued is DEL1 but this can be changed by the user in the TOOLS screen.

Example:

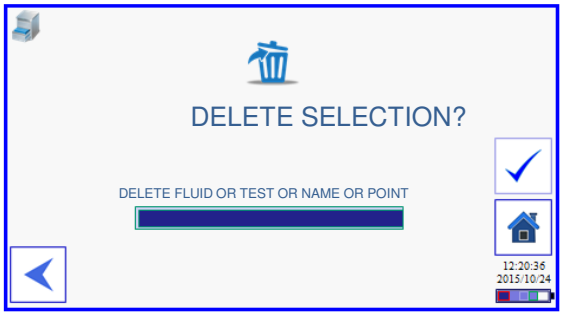
On pressing the DELETE button under the Test Label screen the screen header changes. The user may now select Label(s) by pressing the DELETE button and these remain highlighted. When the selection is complete the TICK button is pressed to go to a password screen.



The password is entered and TICK button pressed



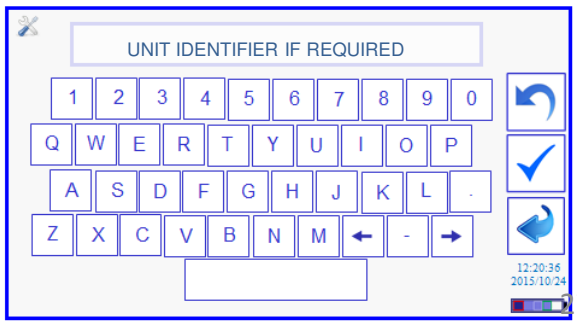
This next screen is a last chance before the data is removed. Pressing the TICK button removes the selected data. To abort this action the back arrow or Home button is pressed.



6.11 Tools

- PCM Label (Edited through the QWERTY screen)
- Code Format
- Remote Assistance
- Printer Test
- Calculator
- Temperature (Press to toggle between Fahrenheit and Celsius)
- Date
- Time

PCM Label
This is entered through the QWERTY keyboard and can be up to 40 characters in length

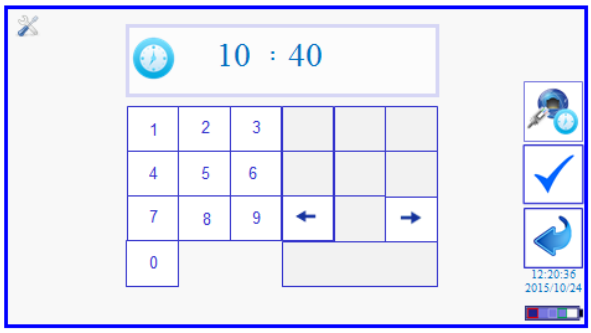


Code Format
There are several options for Code format within the three standards provided.

- ISO 4406 -/6µ/14µ (2-part)
- ISO 4406 4µ/6µ/14µ (3-part)
- AS4059 Revision F Table 1
- AS4059 Revision F Table 2 Size 6, and 14
- AS4059 Revision F Table 2 , Size 4, 6, & 14

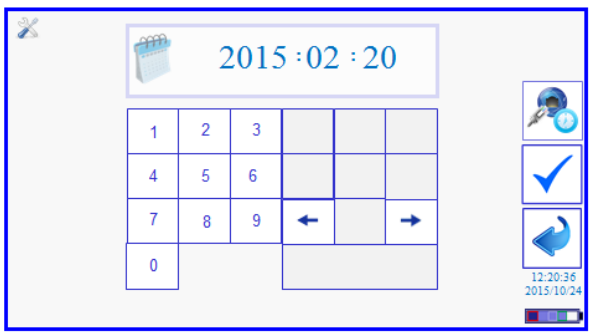
Time

Time is set to a 24 hour clock and can also be synchronised to a network clock using the network clock button. The PCM must be connected and logged on to a network first. In manual mode use the left and right buttons to select hours or minutes



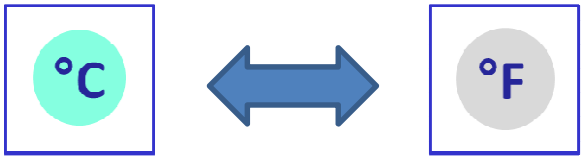
Date

The date is set using the same screen functions as in Time setting. Note: - date is in the international standard format to ISO 8601



Temperature

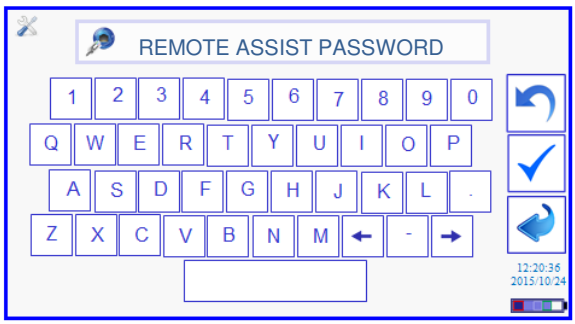
Temperature reporting is changed by simply pressing the button to switch between Fahrenheit and Celsius



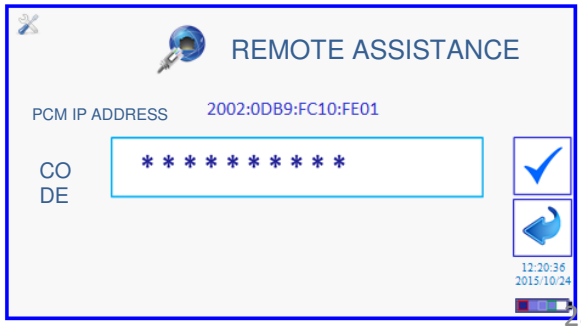
Remote Assistance

In the course of PCM operation a situation may arise that requires the intervention of a PCM Engineer to investigate operational issues. The Engineer screen provides such access. Pressing the Remote Assist button opens a code input screen, in which, the user enters an access code provided by the remote Engineer.

Each PCM has its own IP address and to enable remote access the PCM is connected to the Internet through a Network or modem on the Ethernet connection to allow a remote Engineer to analyse diagnostic data.

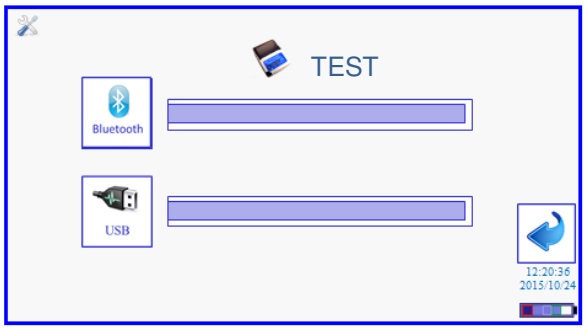


Press the Tick button to allow a remote connection.



Printer Test

To test a Bluetooth or USB connection between PCM500 and Printer press the Printer button. A progress screen will open to show the two connection options. Press the option required and a corresponding progress bar indicates the communication attempt between PCM and Printer. If a connection is made the Printer will print a ‘Printer Detected’’ message.



Section 7: Pall PCM500 Series Fluid Cleanliness Monitors

Interface Protocol for PLC control using DB9 Serial Port.

1. Hardware details

The RS232 settings are: 9600, 8, N, 1
Pin 2 TxD (Transmit Data)
Pin 3 RxD (Receive Data)
Pin 5 GnD (Ground)
Pin 2 and 3 must be crossed over when using a PC.

2. Protocol between PCM500 and PLC (or computer)

The commands available to the PLC or a computer start and end with a square bracket as follows:

[P] – "Ping" the unit to see the current status.
[L] – Request last result.
[S] – Start a test.
[A] – Abort a test.

Please note that the command letters are in UPPER CASE; it will not work with commands in lower case.

[P] – Ping

The purpose of this command is to verify the PCM500's current status.
When [P] is sent, the PCM500 responds with a comma-separated string, terminated by a carriage return and a new line.
e.g.

PCM,P,0,00,00,00,00

PCM	P	0	00	00	00	00
A	B	C	D	E	F	G

Where:

A - Label to identify that it is a valid transmission from the PCM500
B - The P signifies that the transmission doesn't contain a result.
C – PCM500 status:
0: The unit is in standby.
1: The unit has ended a test and it is waiting to start a new test at the set time interval.
2: The unit is currently performing a test.
D,E,F,G – Latest error codes if any. See below for details.

[L] – Request last result

The latest valid result is transmitted via DB9 communications port. An example data string appears like this:

PCM, R, 2005/11/20 20:28:00, 1,2,00,00, 00,00,AST1: 11,50,22,10,Test1, 39648

PCM	R	2005/11/20 20:28:00	1	2	0 0	0 0
A	B	C	D	E	F	G

0 0	0 0	AST1: 11	5 0	2 2	1 0	TEST1	39648
H	I	J	K	L	M	N	O

Where:
A. Label sent by the PCM to signify start of transmission.
B. The transmitted string is a result.
R=Result, A=Aborted test, P=Ping.
C. Date and time the test was performed.
D. Test number in the sequence.
E. Number of tests in the sequence.
F. Error codes (Hex) Byte 1. Hardware problems. (see below).
G. Error codes (Hex) Byte 2. Sampling problems. (see below).
H. Error codes (Hex) Byte 3. Sampling problems. (see below).
I. Error codes (Hex) Byte 4. User defined settings exceeded. (see below).
J. Result codes as selected on the unit (ISO, AST1: (AS4059 Table1), or AST2: (AS4059 Table2).
K. Viscosity.
L. Temperature.
M. Water In Oil (%SAT or PPM).
N. Test Label
O. Checksum.

PCM500 Error codes

The codes are in hexadecimal format.

Byte	Code	Description
1	0x01	Very low battery
1	0x02	High pulse width modulation
1	0x04	Viscometer blocked
1	0x08	Low mesh differential pressure
1	0x10	Pressure transmitter failure
1	0x20	Temp transducer failure
1	0x40	Internal controller failure
1	0x80	Internal error
2	0x01	Low battery
2	0x02	High line pressure
2	0x04	Low line pressure
2	0x08	Unstable temperature
2	0x10	Unstable viscosity
2	0x20	Unstable sampling
2	0x40	High mesh differential pressure
2	0x80	Water in oil sensor failure
3	0x01	Water in oil
3	0x02	Memory full
3	0x04	6-micron mesh blocking
3	0x08	14-micron mesh blocking
3	0x10	Mesh test limit exceeded
3	0x20	Calibration period exceeded
3	0x40	Viscosity band mismatch
3	0x80	High viscosity differential pressure
4	0x01	Solid contamination alarm
4	0x02	Water content alarm
4	0x04	Temperature alarm
4	0x08	Too much contaminant
4	0x10	Test aborted
4	0x20	Test sequence aborted
4	0x40	RESERVED
4	0x80	RESERVED

[S] – Starts a Test

The exact effect of this command depends on the status of the PCM500 unit.

The PCM500 is currently running a test: the command is ignored.
The PCM500 is in standby: the test series is initiated, with the maximum number of tests as previously entered from the display.
The PCM500 is waiting between tests: a test is initiated and the scheduled test is then started at the appropriate time. The total number of tests is decremented by one.

Once a test is started the results will be sent to the PLC on completion of the test.

[A] – Abort test.

By sending [**A]**, the entire test sequence is aborted and the result string would appear like this:

PCM, A, 2005/11/23
15:46:00,1,2,00,00,00,20,58695

The second string item is set to **A** (aborted), and error Byte number 4 contains the “Test sequence aborted” message (0x20). **The code field is NOT present**.

Another example data-string is included here following an aborted test due to the PCM500 fluid return-line being dead-ended:

PCM, A, 2005/11/23 16:15:00,0,2,04,
02,30,20,51384

Byte1 = 04: Viscometer blocked
Byte2 = 02: High line pressure
Byte3 = 30: (10+20) Mesh test limit exceeded (10) and Calibration period exceeded (20)
Byte4 = 20: Aborted test sequence.

(Byte3 has been artificially generated for the benefit of the example.)

If the last test was requested then it would be a result with the latest valid code.

PCM, R, 2005/11/23
10:22:00,2,2,00,00,00,00,AST1: 11,10323

If a ping were issued it would include the latest error codes.

PCM, P, 0,04,02,30,20

3. Modes of Operation

a). – **Test timing set on the PCM500**

In the PCM500 Test Point setup, enter the number of tests to be performed in a test-cycle and also include any delay between individual tests. A test sequence can then be started from the PCM500 or from the PLC. If an additional test is required, whilst in a test-cycle delay period, then the PLC can initiate this, without compromising the existing delay in the test-cycle setting. Please be aware, the delay period entered will start from the beginning of a test.

b). – **Test timing set by the PLC**

In the PCM500 Test Point setup, enter the number of tests to 1 (one) and enable the PLC to start a test at the appropriate time.
.

Section 8: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Fluid Change Procedure

! Important: Mixing of incompatible fluids with Rust Veto is likely to create gels and block the PCM500 meshes. One example is Mono Ethylene Glycol (MEG).

Contact Pall if there is doubt over the compatibility of test sample and Rust Veto transit fluid.

When Changing from mineral oil to water based fluids or vice versa, a strict fluid changeover procedure must be adhered too.

The changeover fluid is “Rust veto NTP 32”, which is miscible with both aqueous liquids and oils. All changeover and flushing fluid should be drained into a suitable waste container and disposed of in accordance with local Health and Safety legislation.

Mineral oil to water based fluids:

❶ Run a single test to waste using clean Rust Veto NTP32 to flush out the mineral oil.

❷ Run a test to waste using the water based fluid. Repeat testing until there are no traces of Rust Veto NTP32 in the return line.

Water based fluids to mineral oil:

❶ Run a single test to waste using clean Rust Veto NTP32 to flush out the water-based fluid.

❷ Run a test to waste using the mineral oil sample. Repeat testing until there are no traces of Rust Veto NTP32 in the return line.

! Important: The PCM500W should not be used on water-based fluids.
If fluid changes are regular, the monitoring programme should be modified so as to reduce the requirement for fluid changes. e.g. monitor mineral oil during a 4 week period, followed by 4 weeks monitoring water based fluids

Wet to dry Oil or vice versa:

❶ When using PCM500W, stabilization times can affect the water sensor accuracy when sampling fluids of vastly differing water content in short succession. The related precautions, recommended guidelines and test data related to this subject can be located in appendix D of this operating manual.

! Important: The PCM500W should never be used in applications whose water content is known to be at or above 100% saturation.

Section 9: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Function Codes, Possible Cause(s) and Corrective Actions

Function codes either are flags only to indicate to the user an awareness of a borderline test situation or curtail the test. An alarm will indicate registered function codes that can be cancelled by pressing any key. A message will appear indicating the problem to the user. Function codes generally occur during the warm up cycle first and while testing. There are several different function messages incorporated into the PCM500.
Below is a list of these messages, possible causes and corrective actions.

Function Code	PCM500 Condition	PCM500 Status	Possible Cause	Corrective Action
201	Low Battery	Unit gives warning of low battery charge level at the end of the test.	Low voltage level detected from internal battery	Connect Power Supply Unit (PSU) to a mains power supply
101	Very Low Battery	Unit gives warning of a very low battery charge level at the end of the test.	Extra low battery level detected	Connect Power Supply Unit (PSU) to a mains power supply
202	High Line Pressure	Unit halts the test and puts error message on screen indicating high line pressure. Red L.E.D. on HMI panel flashing on detection.	Blockage in hydraulic circuit. Fluid viscosity too high. Pressure transducer failure	Ensure return hose is not blocked. Decrease fluid viscosity. Contact Pall.
203	Low line pressure	Unit halts the test and puts error message on screen indicating low line pressure. Red L.E.D. on HMI panel flashing on detection.	No fluid. Last Chance Filter (LCF) blocked. Pump Malfunction. Pressure transducer failure.	Check fluid supply and inlet hose connection. Remove, clean or replace Pressure Relief Valve LCF. Contact Pall.
102	High Pulse Width Modulation	Unit halts the test and puts error message on screen. Red L.E.D. on HMI panel flashing on detection.	Fluid viscosity too high. Motor current over set limit. Pump malfunction.	Decrease fluid viscosity. Contact Pall or an approved agent
204	Unstable temperature	Unit halts test and displays error message on screen. Red L.E.D. on HMI panel flashing on detection.	Change >1deg / minute. High oil temperature. Low temperature.	Operate Warm-up Cycle refer to section 6.10. Allow system fluid temperature to stabilise
205	Unstable viscosity	Unit halts test and displays error message on screen. Red L.E.D. on HMI panel flashing on detection.	Fluid dilution. Large temperature gradient across PCM500	Operate Warm-up Cycle refer to section 6.10. Allow system fluid temperature to stabilise
206	Unstable sampling	Unit halts test and displays error message on screen. Red L.E.D. on HMI panel flashing on detection.	Aeration problem. Pressure spikes in system sampled. Fluid sample dilution/mixing. See Unstable viscosity.	Ensure inlet hose is in contact with system fluid. Ensure system return line is full of fluid.

Section 9: Pall PCM500 and PCM500W Fluid Cleanliness Monitors (continued)

Function Codes, Possible Cause(s) and Corrective Actions

Function Code	PCM500 Condition	PCM500 Status	Possible Cause	Corrective Action
301	Water in Oil	Unit completes test. Warning displayed on screen.	Outside set limit	Information only.
302	Memory Full	Memory Full message will appear on screen at start-up and when test store attempted.	Internal store for test data full	Upload test data to hand held programmer, refer to section 6.9
103	Viscometer blocked	PCM500 will abort current test and display warning message. Red L.E.D. on HMI panel flashing on detection.	Viscometer orifice blocked/blocking with contaminant causing differential viscosity and/or line pressure to exceed operational limits.	Flush by testing with clean, low viscosity oil. Contact Pall or an approved agent.
207	High mesh differential pressure	PCM500 will abort current test and report error/warning message on the display screen. Red L.E.D. on HMI panel flashing on detection.	Mesh element currently in the flow is blocked/blocking with contaminant causing differential mesh pressure to exceed operational limits	Flush by testing with clean, low viscosity oil. Contact Pall or an approved agent
104	Low mesh differential pressure	PCM500 will abort current test/cycle and report error/warning message on the display screen. Red L.E.D. on HMI panel flashing on detection.	Differential pressure across mesh element is below set limit. Probable cause; hole in the mesh, incorrect direction of flow, pressure transducer failure.	Contact Pall or an approved agent
105	Pressure transducer failure	PCM500 will abort test. Warning message on screen. Red L.E.D. remains ON	Incorrect or no signal received from pressure transducer during calibration / background check.	Contact Pall or an approved agent
208	Water in Oil (WIO) sensor failure (if applicable)	PCM500W will display error/warning on successive tests. .	Incorrect output from the sensor.	Contact Pall or an approved agent
106	Temperature transducer failure.	PCM500 will abort test. Warning message on screen. Red L.E.D. will remain ON	Incorrect output from the transducer.	Contact Pall or an approved agent

Section 9: Pall PCM500 and PCM500W Fluid Cleanliness Monitors (continued)

Function Codes, Possible Cause(s) and Corrective Actions

Function Code	PCM500 Condition	PCM500 Status	Possible Cause	Corrective Action
107	Internal peripheral micro-controller failure.	Error/warning message on screen (if possible). Alarm set. Hold in this state. Red L.E.D. will remain ON..	No communication with main controller.	Contact Pall or an approved agent
303	6-micron mesh blocking	PCM500 will abort current test and display warning message on screen. Red L.E.D. flashing.	Limits of ratio between dP and dV taken at the cycle start have been exceeded	Flush by testing with clean, low viscosity oil
304	14-micron mesh blocking	PCM500 will abort current test and display warning message on screen. Red L.E.D. activated	Limits of ratio between dP and dV taken at the cycle start have been exceeded	Flush by testing with clean, low viscosity oil
305	Mesh test limit exceeded	Display warning message on screen at PCM500 start-up or at the end of current test operation	Tests performed on the same mesh set above set limit.	Contact Pall or an approved agent for service details
306	Calibration period exceeded	Display warning message on screen at PCM500 start-up	12 month calibration interval expired	Contact Pall or an approved agent for service details
308	High viscosity differential pressure	Unit halts test and displays error message on screen. Red L.E.D. on HMI panel flashing on detection.	Fluid viscosity out of specification, low fluid temperature	Reduce fluid viscosity. Increase fluid temperature at PCM500
108	Internal error	Unit inoperative. Hold in this state. Red L.E.D. will remain ON.. Warning message on display.	Possible hardware failure	Contact Pall or an approved agent
???	Comms error	Ethernet		
???	Comms error	USB		

Section 9: Pall PCM500 and PCM500W Fluid Cleanliness Monitors (continued)

Function Codes, Possible Cause(s) and Corrective Actions

Function Code	PCM500 Condition	PCM500 Status	Possible Cause	Corrective Action
401	Solid Contamination Alarm	Display warning message on screen. VFC relay activated.	Pre-set Solid contamination level exceeded	Repeat test to verify. Investigate process.
402	Water Saturation Alarm	Display warning message on screen. Red L.E.D. flashing	Pre-set Fluid water saturation level exceeded	Investigate cause of elevated water contents
403	High fluid Temperature Alarm	Display warning message on screen. Red L.E.D. flashing	Pre-set Fluid temperature level exceeded	Investigate process, reduce operating temperature
404	Contamination Too High	Unit halts test and displays error message on screen. Red L.E.D. on HMI panel flashing on detection.	Maximum Solid contamination level exceeded	Investigate process. Dilute the sample with clean fluid
405	Test aborted	Unit halts test and displays warning message on screen.	Test aborted due to one of the other warning conditions, remote message received from COM port, or glitch generated in program during debug file creation	Repeat test if possible.
406	Test sequence aborted	Unit halts test sequence and displays warning message on screen.	Test sequence aborted due to one of the other warning conditions, stop button pressed on control panel, key pressed on display or received an abort test command from PLC.	Repeat test if possible.

NOTE: Refer to section 6 to review and / or amend your selected alarm levels

Coding:-	100	High priority warning
	200	Medium priority warning
	300	Low priority warning
	400	User defined alarm

Section 10: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Spare Parts List

Part Number	Description
PCM500.211	Power Supply Unit
PCM200.235A	Mains Cable UK
PCM200.235B	Mains Cable Europe
PCM200.235C	Mains Cable USA
PCM200.235D	Mains Cable Australasia
PCM200.235E	Mains Cable Japan
PCM500.213ASS	Battery Pack
PCM200.239	RS232 Communication Cable
PCM200.121	Last Chance Filter Element
PCM200.122	High Pressure Hose Assembly
PCM200.197	Low pressure Sampling Stalk
PCM200.154A	Metric Test Point Connector
PCM200.154B	Imperial Test Point Connector
PCM200.154C	NPT Test Point Connector
500.470A	Operating Instructions - PCM500 CD ROM
500.470B	Operating Instructions PCM500 Quick Reference Card
PCM500.520A	Printer Kit - UK
PCM500.520B	Printer Kit - EUROPE
PCM500.520C	Printer Kit - USA
PCM500.520D	Printer Kit - AUSTRALASIA
PCM500.520E	Printer Kit - JAPAN
PCM200.324	Printer Paper Roll (Pk.10)
PCM210.480	USB Cable
PCM500.600	Transit Case
PCM500.500	Replacement Mesh Manifold

Section 11: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Cleaning and Decontamination

As a matter of protection to the PCM enclosure and safety to the user it is advised to clean any fluid spills with suitable cleaning materials and dispose of these safely. Chemicals that may be harmful to the ABS material itself should be removed immediately.

Maintenance

Check the condition of the high-pressure hose (PCM200.122) for signs of external damage. This should be done before each analysis session. If in doubt, contact your Pall distributor or the manufacturer for advice on a replacement part. Replacement is carried out by a Pall service centre, where a new hose installation is validated for maximum operating pressure prior to release.

The Last Chance Filter element is a user serviceable part and can be accessed by releasing the housing end plug. The element is removed by inserting an M5 thread bolt into the end cap and is then retracted. Ensure no external contaminant enters the housing before a new element is fitted.

Disposal of Equipment

At the end of its life, the monitor should be dismantled and disposed of in accordance with all applicable local waste disposal laws and bylaws. Where facilities exist, component parts of the unit may be recycled. Details of the materials of construction are given on the product installation drawing and if required, more detailed information regarding specific items may be obtained from Pall or an approved agent.

If component parts of the equipment were previously contaminated with the service fluid, an appropriate Manufacturer's Safety Data Sheet (MSDS) for the fluid should be obtained and read to ensure that contaminated component parts are disposed of safely.

Appendix A: Pall PCM500 and PCM500W Fluid Cleanliness Monitors

Calibration and After Market Services

Calibration and Aftermarket Service

Pall PCM500 series fluid cleanliness monitors are designed to provide trouble free operation for many years. However, as for all condition monitoring equipment, optimal performance can only be achieved through regular routine maintenance. To ensure your PCM500 receives the maintenance necessary, Pall provides a maintenance package designed to increase the overall effectiveness of the monitor. Pall recommends returning the PCM monitor for Service and Calibration annually. Mesh replacement should be carried out when the test limit is exceeded. The limit is variable from 1000 to 3000 tests depending on fluid sample cleanliness and viscosity.

! Important: Pall recommends returning the PCM monitor for Service and Calibration annually. Mesh replacement should be carried out when **3000** usage points is exceeded.

The annual service includes;

- Analysis of engineers diagnostic report and rectification of any faults found
- Battery, Power supply and clock check
- Performance evaluation on calibration fluid
- Software update to latest release level
- Check for oil leaks and rectification as necessary
- Check condition of Last chance filter
- Low-pressure hose replacement
- Safety check of High-pressure hose. Replaced at two year interval.
- Flush, strip and clean internal hydraulic components
- Pressure Reduction Valve Assembly check and reset
- Replace 6µm and 14µm meshes, O-ring seals and flush housings
- Transducer calibrations
- Perform production validation procedures
- Software menu checks
- Return carriage to customer

Any additional work required is subject to a separate written quotation.

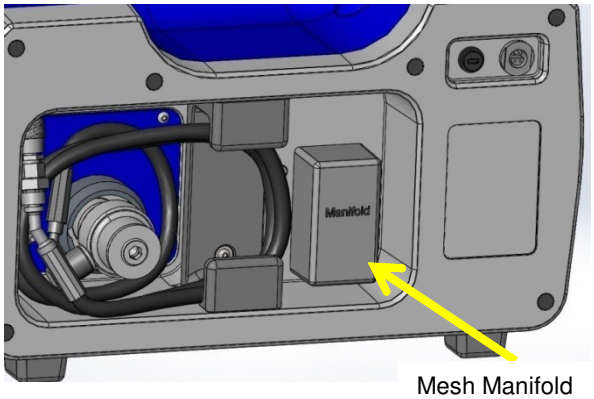
Please contact Pall Aftermarket Division or its approved agent for additional information.

Appendix B: PCM500.500 Mesh Manifold Exchange Procedure

This procedure must be carried out in a clean environment and great care taken to avoid extraneous contamination entering the PCM500. The mesh manifold should be replaced once 3000 points are accrued and to continue testing will produce a warning on screen and recorded as error code 305 on a test result until the mesh manifold is replaced.
Every completed test is allocated points between 1 and 3 depending on the severity of fluid condition. As example, a low contaminant, low viscosity sample will be given 1 point, whereas a dirt laden, high viscosity sample will be given 3 points. This is to ensure the integrity of the mesh will remain constant throughout the available usage. It can be seen, therefore, that the available tests range from 1000 to 3000 depending on sample condition.

Procedure:

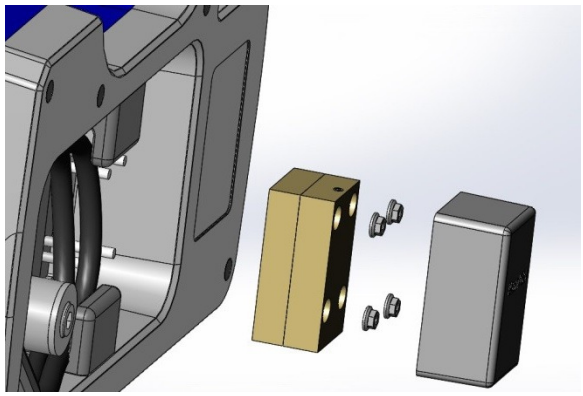
1. Place the PCM500 on a clean surface and have adsorbent lint free paper wipes available.
2. Ensure the PCM500 is switched OFF.
3. Cap off both hoses.
4. Remove the rubber manifold cover.



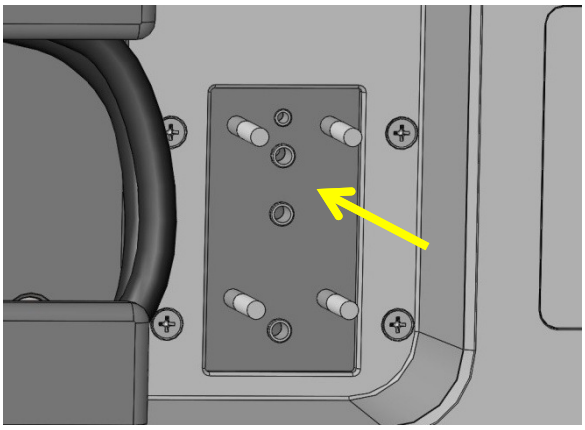
Mesh Manifold access

1. Use an M5 socket driver to remove four M5 Flange securing nuts.
2. Carefully remove the mesh manifold by pulling on the outer body and place in protective packaging that came with the replacement mesh manifold. Do not use mechanical grips that may damage the housing.
3. The old O-ring seals may remain on the main manifold stem connections. Remove these to waste and dry up any fluid spillage with the lint free wipes.

Mesh Manifold Removal



Main manifold stem connections

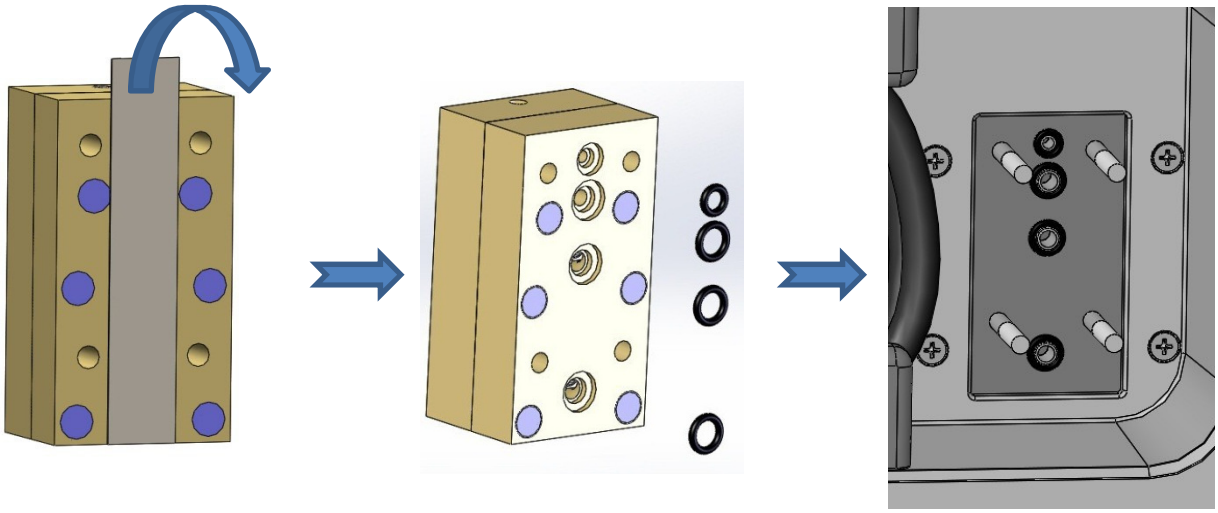


4. Remove the Replacement Mesh Manifold from its packaging and carefully remove the protective tape covering the ports. The O-rings may come away with the tape but this is normal and it is advisable to fit all four O-rings onto the main manifold stems before fitting the mesh manifold.

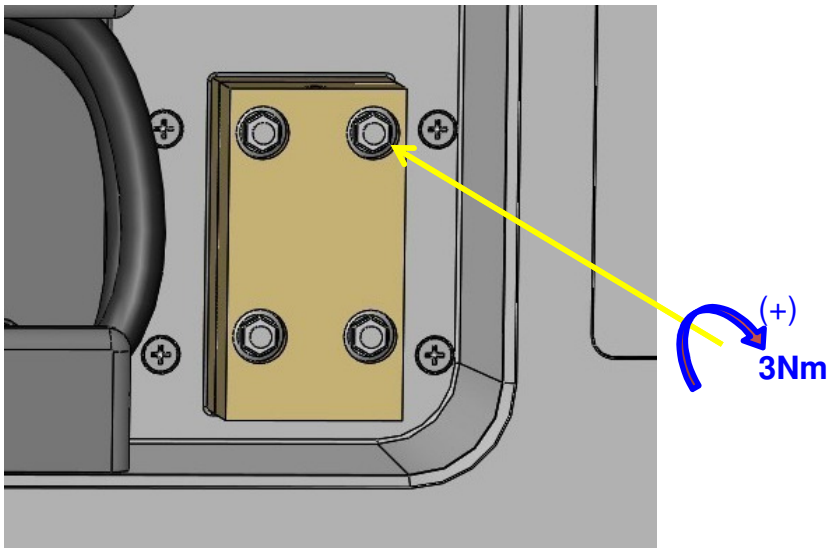
Appendix D: PCM500.500 Mesh Manifold Exchange Procedure

Replacement Mesh Manifold – 'O'-ring fitting

5. Slide the Mesh Manifold onto the four bolts and push firmly onto the O-rings.
6. Fit the four M5 Flange nuts. Be very careful not to cross thread onto the bolts.



7. Tighten the nuts to a maximum of 3 Newton-Metre.
8. Re-fit the rubber cover.
9. When the PCM500 is switched on it will automatically detect the new mesh manifold and reset the points total in program memory to zero.



World-wide Warranty

Pall products are rigidly inspected during manufacture and on completion by a modern Quality Control Department and are guaranteed for a period of one year from date of commissioning, against defective materials and workmanship when properly installed and operated at design conditions.

All parts proven to be defective within this period will be replaced free of charge FOB England or original FOB point as applicable.

However, claims for damage or labour will not be allowed; nor can the seller's equipment be warranted of failure where the operating conditions are beyond the control of the seller or beyond monitor specification. All claims must be accompanied by full particulars including system conditions if applicable.

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