



PSM INSTRUMENTATION LTD

Installation Operation & Maintenance Instruction Manual

VPM4300 SERIES DISPLAY

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1.0 GENERAL INTRODUCTION TO THE VPM4300

VPM is an abbreviation of Versatile Process monitor and is an indication of the flexibility of the VPM4300 HMI display.

The VPM4300 has a number of core functions

- Data Acquisition – It acts as a master device to Slave PSM APT1000 liquid level transmitters which it interrogates via an RS485 multi-drop network using Modbus RTU communication protocol.
- Data Processing – The raw values obtained from the APT1000 transmitters are processed using data held within the VPM4300's configuration to provide scaled and calculated results.
- Data Display – Using the calculated results the VPM4300 can provide a real-time status of its monitored parameters in its integral screen with layouts tailored to suit the application.
- Data Output – the VPM4300 can present scaled data with content and order in a specific format via a second RS485 port. In this case the VPM4300 acts as a Modbus RTU slave and responds to a request from an external master Device. This data output also contains information on the units status.
- Interconnection – The VPM4300 has a dedicated function Ethernet port which allows sharing of data between two directly connected VPM4300 units, or up to ?? Units via an Ethernet Switch.
- Contact Outputs – Optionally fitted dedicated VFCO outputs can be triggered to provide a hard-wired signal to external devices for internal fault or alarm conditions.

2.0 ABOUT THIS MANUAL

Incorrect function or damage to associated equipment may occur if VPM 4315 is not used in accordance with this manual. The information in this manual may be highlighted by the following headings indicating that special care should be taken when performing these associated actions.

A Note highlights points where particular attention should be paid to the information provided and due consideration made before changing settings.

A Caution indicates actions or procedures if not performed correctly may cause incorrect functionality, loss of information or damage to the equipment.

A Hazard indicates actions or procedures which if not performed correctly may invalidate safety certification or endanger personnel.

3.0 APPLICABILITY OF THIS MANUAL

The flexibility of the VPM 4300 series means that it is suited for many applications.

For each application the unit must be configured with the parameters appropriate for its intended duty.

This manual has been produced to provide guidance on the general set-up and operation of the VPM4300. Specific data configuration and drawings will be provided as is appropriate for each installation and these should be read in conjunction with this manual.

An installation can include a single VPM4300 or up to 6 units interconnected and sharing data via an ethernet connection. Where more than 2 VPM's are connected an Ethernet network Switch will also be included to facilitate interconnection.

The monitored APT1000 transmitters are connected to the VPM4300 via an RS485 multi-drop network. Where some or all of this network is in a Hazardous area interconnection will be via an IS Barrier to protect the communication lines and DC power to the sensors - PSM model RFM-ISR.

Interconnection of the network cabling will also make use of PSM RFM1 and RFM4 termination modules. The RFM1 provides a connection point for one APT1000 and the RFM4 for up to four. The RFM1 / 4 modules also have connections for the DC power and RS485 communications

cabling. Installation and use of each of these additional PSM components will be covered by its own manual.

In operation the VPM4300 acts as a Modbus Master and interrogates each of the APT1000 transmitters in its network which are all identified by a unique ident number. This interrogation is repeated in sequence such that the VPM4300 holds a continually updated register of all input levels.

The VPM4300 reads a mmWg value from all tanks, and, by application of scaling parameters it holds, it will calculate the current contents of each Tank, as well as all Draught values and current Ship Trim and Heel conditions if these are also to be monitored. All parameters are then available for display on the VPM4300's integral display.

The VPM4300 also constructs an internal register of data which is made available via a second RS485 port to a remote system. The output protocol is Modbus and the content, order and format of this data is defined based on the VPM's configuration.

Finally, the VPM4300 may optionally be equipped with a relay card. This provides 4 relay outputs providing a changeover contact. These relays may be set up to trigger on common high or low alarms for some or all of the tanks and there is a dedicated "error" alert option where the VPM detects an internal error with its back up memory.

The VPM stores configuration data which it uses to process and display the raw signal received from the APT1000 transmitters. In addition there are specific settings stored for alarms, communication port settings, and the Modbus output register. All of these settings are held in non-volatile memory and are retained in the event of power failure.

The VPM used two SD memory cards for the purpose of storing this configuration data. One is the primary card and the second is used as a back-up. For a full explanation of the function of the SD cards refer to Section 16.0 Emergency Restore.

The VPM is factory set to automatically boot up into run mode when power is applied.

Whereas, as detailed in this manual, it is possible to fully configure the VPM (or make changes to configuration) through the touch-screen interface, in most cases the unit will be delivered pre-configured according to data provided to PSM.

This data is normally supplied by completion of a spreadsheet which covers all configuration options and from which PSM generate a configuration file for the VPM.

If changes are required they can be made through the unit's own menu system or if advised to PSM an amended configuration file can be provided which may then be uploaded via the USB ports on the front of the VPM.

As detailed in this manual it is recommended that a back-up copy of any configuration changes is kept.

Note that changes to configuration (by whatever means) may be password protected to prevent unauthorised access. The impact of any changes must also be fully considered to ensure that they are valid and will not result in errors of measurement / display or loss of communications. Refer to the Configuration Mode section for details of these configuration change options.

4.0 MECHANICAL INSTALLATION

Refer to section 17.0 Drawings for details of the enclosure and panel cut out dimensions.

With respect to Intrinsic Safety the VPM4300 MUST be installed in a designated Safe Area as MUST any RFM-ISR Barrier through which the VPM provides power to and communicates with, the APT1000 network.

The VPM4300 may be panel mounted, wall mounted or may have been specified in a secondary enclosure. Refer to specific project drawings provided for details.

Tools needed for the installation will depend upon the intended location and mounting type but will require a means of preparing suitable mounting studs or bolts on the bulkhead and suitable spanners for tightening the selected fixings. Fixing nuts / bolts should be secured using spring or shake-proof washers to prevent loosening in accordance with normal practice.

For units supplied in a secondary wall mount enclosure the supplied mounting brackets provide for different orientations and the unit may be directly mounted without the need for anti-vibration straps.

In general the unit should be located away from extremes of temperature and vibration and in a position where the display is readily viewable.

5.0 ELECTRICAL INSTALLATION

Refer to Section 17.0 Drawings for details of the connections. The VPM4300 requires 24V DC for operation. This is applied directly to the VPM but where a secondary enclosure has been provided this may incorporate a Power Supply Unit to accept AC Mains voltage in and provide the required 24V DC. Again refer to the specific project documentation.

Hazard: Ensure that where AC power is to be used that the power supply to the VPM is isolated at the distribution point before attempting to connect or make any changes to internal wiring of the unit.

Where a secondary enclosure is supplied, all internal connections between the plugs on the rear of the VPM4300 Display module and the field terminations are completed during manufacture and so all external connections should be made to the provided terminals. A suitable terminal screwdriver and hand tools for preparation of cable ends will be required.

The base of the unit has a removable gland plate to allow glands to be fitted by the installer suitable for the cabling being used. The gland plate must be removed before drilling to prevent damage to the enclosure internals.

All cabling should be identified with permanent markings in accordance with normal practice.

Direct connection Plug & Socket or Screw Terminal Connections are provided for

RS485 Port 1

RS485 Port 2

Ethernet Port.

Relay Outputs (if applicable)

AC Power Supply (if applicable)

Cable Types

Ethernet CAT 5: For the VPM to VPM direct connection. Note that this is a 'standard patch cable.

RS485 / 24V DC network Supply : A 2 twisted pair cable is required for this. One pair for DC power and one for the RS485 communication network This cable connects to the RFM-ISR then on to entire network. The cable must have an overall braided screen with a minimum of 95% coverage. It is essential that correct polarity is maintained throughout the entire network, i.e.

positive and negative conductors for the DC power, and A & B conductors for the RS485 network
Supply cable: Suitable for 24V DC or AC Voltage as applicable

6.0 USING THE DISPLAY

When all external connections are made and confirmed to be in accordance with the referenced wiring diagrams the VPM4300 may be powered up.

Following a power up sequence and internal self-checking of all functions the unit will boot up directly into "Operational Mode" as detailed in section 7.0 of this manual.

The VPM4300 has an integral 7" color display which presents the status of all connected tanks and draughts and also provides an indication of any alarm conditions which may arise. The screen presentation and layout is covered in specific detail in the following section "Operational

Mode” but in general operation of the unit is fully automatic.

Depending upon the number of monitored tanks the information may be presented over a number of display pages where each has been laid out to provide maximum clarity of information.

In normal mode the unit will automatically scroll round each of the display pages in sequence, pausing on each one before moving to the next. The display can also be scrolled and held on a particular page by the operator

The screen is touch sensitive and has virtual “buttons” which may be pressed to select specific tank groups or display pages. The available buttons will depend upon the page being presented.

Note: The screen is of the resistive variety, this means that it is pressure responsive, rather than being touch sensitive as a capacitance based display is. ONLY LIGHT FINGER PRESSURE IS NEEDED. If preferred a blunt object may be used but great care should be taken to ensure the screen is not damaged in this way.

7.0 OPERATIONAL MODE

This is the normal running mode for the VPM4300. The content and format of each available display page will have been defined to suit the specific application.

Information is presented mainly in textual format with the tank level pages featuring a header identifying the parameter along the top and actual tank name in a column on the left.

The Vessels Draught, Trim, and Heel if monitored are shown on a page with a dedicated layout. Refer to section 7.9 for details.

7.1 Tank Level Display

Name	Content	SG	Volume	UOM	%	Level	UOM	Alarm
FRESH WATER N1 9H03	Fresh Water	1	761	Litres	3	107	mm	LOW
FRESH WATER N2 9H04	Fresh Water	1	745	Litres	3	105	mm	LOW
GREY WATER N1 9H01	Grey Water	1	197	Litres	2	98	mm	LOW
GREY WATER N2 9E01	Grey Water	1	168	Litres	3	122	mm	LOW
OIL FREE WW N1 9F01	Waste Water	1	131	Litres	9	215	mm	LOW
OIL FREE WW N2 9E04	Waste Water	1	0	Litres	0	118	mm	LOW
WATER MIST 9I02	Water	1	0	Litres	0	0	mm	COMMS FAIL
OW COLLECTING 9F06	Oily Water	1	681	Litres	14	170	mm	CLEAR

Navigation buttons: Main (green), SG Edit (black), Alarms (red), JP5 (black), Oil (black), Water (grey), Right Arrow (black)

Tanks are arranged in groups of similar types. Up to 20 tanks may be contained in a group. The display shows up to 10 tanks per page and if a group contains more than 10 tanks it will automatically alternate between the first and second 10 at user defined intervals. The tank groups are shown on the bottom right hand side of the screen with the currently displayed group highlighted in green. All other groups are in black. Pressing a group button will manually select

that group for display. An arrow indicates if there are further groups which may be selected. Press the arrow to scroll to these further groups. Considering the columns from left to right:-

Name: Identifies the specific tank.

Content: Identifies the fluid in the tank

SG: Identifies the Specific Gravity value currently in use (refer to “SG Edit” button below)

Volume: Identifies the current quantity in the tank in the UOM displayed.

UOM: Identifies the unit of measure that the current Volume is reporting in.

%: Identifies the current tank content as a percentage of total volume.

Alarm: Identifies the status of any alarms assigned to the tank and if they have been acknowledged. The possible conditions are:-

NOT USED: No alarm points are set for this tank.

CLEAR: Tank is within normal range.

HIGH: Tank content is above the defined high level.

HIGH HIGH: Tank content is above the defined high high level.

LOW: Tank content is below the defined low level.

LOW LOW: Tank content is above the defined low low level.

The active alarm status will be followed by NACK or ACK.

NACK: Alarm has not been acknowledged by an operator.

ACK: Alarm has been acknowledged by an operator.

The last column in the tabular display will also show any active alarms, with a flashing symbol for unacknowledged alarms changing to a solid illumination once the alarm is acknowledged.

In addition to the tank status display there are a number of onscreen “buttons”

7.2 Run Mode Display - Alarm / Alarm Ack: When there are no tank level alarms active this button will be shown in black with the label “Alarms”. If there are one or more active alarms it will be shown in red with the label “Alarm Ack”

Pressing this button leads to a further screen which will show active alarms (if any), identifying which inputs have alarms and what their status is.

Alarm Acknowledgement

Name	Alarm			
DFM N1 9I01	LOW		Acknowledge	
DFM DS N2 9G05	LOW		Acknowledge	
DFM N4 9G01	LOW		Acknowledge	
DFM N3 9G02	LOW		Acknowledge	

A flashing red indicator means the alarm is not acknowledged and a solid red indicator means the alarm is acknowledged but remains active. To acknowledge an alarm there is a button named "Acknowledge" beside each alarm.

If there are more active alarms than can be displayed on a single page pressing the up/down scroll arrows allows all to be seen.

Rather than acknowledging each alarm individually the user may acknowledge ALL active alarms by pressing the button labelled "Acknowledge ALL"

The Alarm Acknowledgement page also has a button labelled "Alarm History". Pressing this button leads to a History screen where the previous 100 alarms may be viewed.

Alarm History

Date	Time	Name	Type	Duration
05/09/2019	14:00	DFM N1 9I01	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM N3 9G02	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM DS N1 9G04	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM DS N2 9G05	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM N4 9G01	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM DS N4 9F07	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM DS N3 9F08	LOW	0 Hr 9 Min
05/09/2019	14:00	DFM N6 9F03	LOW	0 Hr 9 Min
05/09/2019	14:00	BALLAST N1 9K01	LOW	0 Hr 9 Min
05/09/2019	14:00	BALLAST N2 9J01	LOW	0 Hr 10 Min
05/09/2019	14:00	FRESH WATER N2 9H04	LOW	0 Hr 10 Min
05/09/2019	14:00	GREY WATER N1 9H01	LOW	0 Hr 10 Min

Back

Save History

Using the up/down scroll arrows all alarms may be viewed. This alarm history may also be saved to a USB memory device which is temporarily connected to one of the USB ports located under the removable cover on the bezel of the VPM.

Selecting the Save History button prompts for a USB device to be inserted and pressing continue will save the history

Save Alarm History

Please ensure only one USB drive is inserted.

When you have one USB drive inserted into the VPM, click the button below to continue.

Continue

Cancel

Once the history is saved the screen will confirm “DONE” and the USB device may be removed. The Alarm History file is saved as a CSV file which may be opened in Microsoft Excel or similar. **Note:** Setting up of alarms is covered in the **Configuration Mode** section of this manual.

Note that the button labelled “Back” returns the display to the previous page. Returning to the options on the main display page:-

7.3 Run Mode Display - Hold: This button allows the screen to be locked on a specific display page. If the display is not held the button will be shown Black and the display will automatically scroll through each of the display groups and their individual pages in sequence pausing on each page for a time period defined in the unit’s configuration. If pressed, the button will illuminate Green and the display is held on the current page. Pressing the button again will resume auto-scrolling.

The arrow buttons can be used in both Held and auto-scroll mode to step through the display pages.

7.4 Run Mode Display - Left and Right arrows: Scroll to next / previous page These scroll buttons are only effective if there is more than one page per display group and will immediately scroll within the group.

7.5 Run Mode Display - Illumination: When this symbol is pressed the display will increment its brightness in 25% steps in the range 25 to 100%

7.6 Run Mode Display - Main: When pressed normal operation screen is exited (although monitoring continues in the background) and a new screen provides further options. Refer to section **8.0 MAIN MENU** later in this manual.

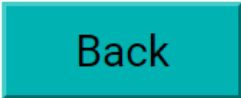
7.7 Run Mode Display - SG Edit: When pressed a new screen shows a list of the currently set value for Specific Gravity for each tank . The user is able to change the currently stored value for each tank from this screen.



Note: Depending upon the setting in System Controls in Configuration Mode the user may first have to enter a password to enable editing .

If no changes are made the unit will revert to the normal tank level display in 1 minute.

Specific Gravity Edit

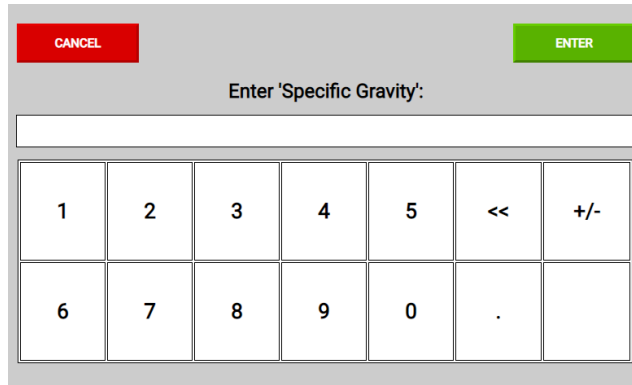
CH #	Name	SG Value
1	BALLAST N7 9B01	1.025
2	AFT DRAUGHT	1.025
3	SLDG JP5 DFM DRAIN 9D01	1
4	GREY WATER N2 9E01	1
5	LUB OIL N2 9E02	0.9
6	OIL FREE WW N2 9E04	1
7	BALLAST N5 9E06	1.025
8	BALLAST N6 9E05	1.025
9	USED LUBE OIL 9E07	0.9
10	No2 SLDG FO DRAIN 9E03	1



To change a value, select it, using the arrows to scroll if required and enter the new value using

the onscreen keypad which will be displayed



Once the correct value is entered press ENTER to save the value and return to the S.G. list.

Note: Valid values for S.G. are within the range limits of 0.500 to 2.000.

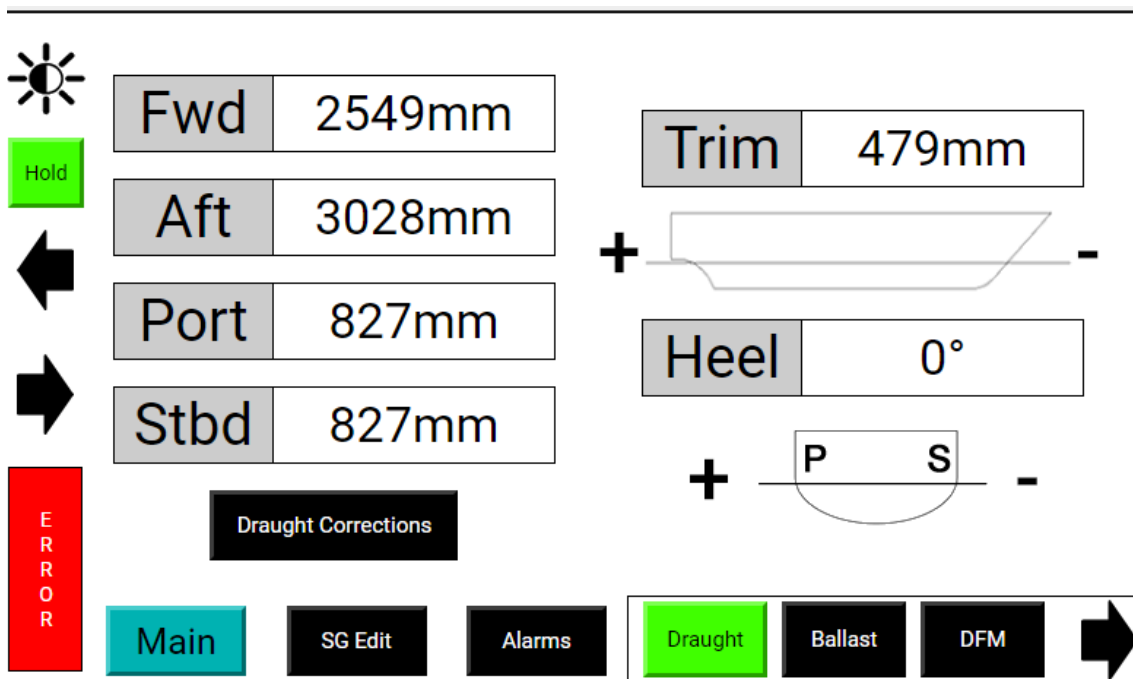
Note It is essential for correct indication of tank content that an accurate S.G. value is used. APT1000 transmitters provide a value of the liquid pressure in the tank and the VPM4300 then calculates the actual level (and so volume) by correcting for the actual SG of the liquid. Any error in the SG value will translate directly to a corresponding error of tank content displayed.

Caution: If an S.G. value is changed on one VPM the same changes **MUST** be made on the partner VPM in the other Fire Zone. If both VPM's are not using the same S.G. value for each tank then their displayed contents will also be different.

7.8 Run Mode Display - Display Groups: The buttons on the bottom right hand corner of the normal display page are used to switch the display between specific display groups.

The display for tank groups follow the format as illustrated above but the display for **Draught, Trim, and Heel** values has a dedicated layout as follows.

7.9 Run Mode Display—Draught Display



This page is optionally available and is enabled in configuration mode. There is a choice to display draught values alone or include Trim & Heel displays. This screen will require that draught measurements sensors are installed. There is an additional button "Draught Correction". This leads initially to a caution screen which explains the function of the corrections

Access Control

The calculated Fwd and Aft draughts are given at the vessel centreline. For comparison of the calculated draught with a visual draught it is necessary to use the mean average value of the visual Port and Stbd draught readings for both the Fwd and Aft draughts.

For example : If only the Stbd Aft draught is visually read as the 'Aft draught' then any heel angle on the vessel will cause a false correction to the Indicated Aft draught

The visual draught readings must be made when the vessel is in a steady state condition. The vessel must remain in this condition until after the draught corrections have been entered

OK

Pressing OK brings up a password screen to ensure that only authorised personnel may make changes to the corrections.

Access Control

This area of the VPM is restricted.

Please enter your passcode to access.

Passcode

Login

Cancel

CANCEL

ENTER

Enter 'Passcode':

1	2	3	4	5	<<	+/-
6	7	8	9	0	.	

Once the password is entered the following screen is displayed

Draught Corrections

Enter Visual Reading in Metres	Measured Draught	Corrected Display	Correction Applied	Back
Fwd 2.55	2.55m	2.55m	0.00	Save Configuration
Aft 3.03	3.03m	3.03m	0.00	
Port 0.83	0.83m	0.83m	0.00	
Stbd 0.83	0.83m	0.83m	0.00	

Enter visual draught to 2 decimal places.



This function is included to allow the operator to enter visually observed draught values, which the VPM then applies to provide a corrected display based upon a comparison between observed draught values and measurements from the APT1000 transmitters. This corrects for the difference in location between the two measurement points.

Enter the visually observed values by using the arrows to highlight the parameter to change, pressing ENTER and then keying in the actual value on the pop up keypad. Use the Save Configuration button to save changes and Back button return to the draught display.

Note: The Visual Draught readings must be entered in Metres to 2 decimal places but the actual unit of measure for the Draught display screen is configured for this application to be Millimetres.

7.10 Run Mode Display - Error: This button is only displayed if the VPM has detected a communications error - as distinct from tank high / low alarms. Pressing the button brings up an error list.

Error History

Date	Time	Name	Type	Duration	Back
06/09/2019	10:01	DFM N2 9H02	APT COMMS FAIL	ACTIVE	  Save History
06/09/2019	10:01	DFM N5 9F04	APT COMMS FAIL	ACTIVE	
06/09/2019	10:01	WATER MIST 9I02	APT COMMS FAIL	ACTIVE	
06/09/2019	10:00	DFM DS N7 9D03	APT COMMS FAIL	ACTIVE	
06/09/2019	10:00	BALLAST N7 9B01	APT COMMS FAIL	ACTIVE	
06/09/2019	10:01	PS DRAUGHT	APT COMMS FAIL	1 Hr 0 Min	
06/09/2019	08:41	PS DRAUGHT	APT COMMS FAIL	1 Hr 18 Min	
05/09/2019	14:11	DFM DS N7 9D03	APT COMMS FAIL	19 Hr 48 Min	
05/09/2019	14:11	BALLAST N7 9B01	APT COMMS FAIL	19 Hr 48 Min	
05/09/2019	14:11	DFM N2 9H02	APT COMMS FAIL	19 Hr 48 Min	
05/09/2019	14:11	DFM N5 9F04	APT COMMS FAIL	19 Hr 48 Min	
05/09/2019	14:11	WATER MIST 9I02	APT COMMS FAIL	19 Hr 49 Min	

The VPM4300 continually monitors for correct operation of its internal processes, the connected APT1000 Transmitters, and its partner VPM4300 and will notify of any errors detected. Errors which can be reported are:-

Communication loss with one (or more) APT1000 level transmitters

The VPM4300 continually scans and interrogates all of the APT1000 units connected to its RS485 port, interrogating each in sequence. For each network scan it will request data from the APT and if it receives no response will make two further attempts. If no response is received after these three attempts it will move onto the next APT. On the next network scan it will again try 3 times to communicate with the sensor. If this second attempt also fails the Alarm column on the main Run Mode display will display "COMMS FAIL" In addition the ERROR Button on the main Run Mode Display will flash - see section 7.10

The APT which has failed to respond will then be recorded within the VPM4300 and will be excluded from further network scans for a period of 60 minutes. In this way the network scan is not slowed by repeated attempts to communicate with unresponsive APT1000 transmitters. The "COMMS FAIL" message will be displayed all the time the APT1000 is not being included in the network scan.

After 60 minutes the block on scanning will be removed and the VPM4300 will again attempt to communicate for 2 network cycles. If there is still no response it will again be excluded for 60 minutes. This cycle will repeat until the cause is investigated and corrected.

This "COMMS FAIL" message will remain displayed for as long as the APT1000 fails to respond. During this time the displayed values for Level and Volume will be held at the last valid value received, but the user should be aware that this may now be inaccurate.

When the cause of the issue is rectified and communication with the APT1000 is restored the alarm status is automatically cleared, and live data is again displayed. The user should be aware though that if the VPM is within the 60 minute exclusion period valid values will not be displayed until this has timed out. In order to reset the network scan exclusion immediately there is button on the "About" screen. Refer to section 8.3

If communication is lost with one of the four dedicated Draught input signals this is indicated on the dedicated Draught display page. The display box which shows the value for the affected measurement will flash red and a message "COMMS FAIL" will be displayed at the top of the screen. Note that calculation of Draught, Trim, & Heel displays requires valid inputs from all 4 draught sensors and so if one is failed none of the parameters will be displayed.

The network exclusion cycle defined above also applies for the Draught measurements.

In all cases of communications failure the ERROR Button will be displayed red and when pressed will show a History log as detailed above.

Note: Although in the event of a communications failure the VPM will continue to display the last valid value received, the value sent to the remote system as part of the External Data Exchange information will depend on the configuration settings - see section 9.2.3. It can be set such that the last valid reading is also sent or it can be set such that it sends a value the receiving system can interpret as data loss.

In addition, when a partner VPM requests tank data via the Ethernet connection a "channel error" message will be sent for the offline channel(s). The other VPM(s) will also continue to display the last valid reading and in addition the "COMMS FAIL" message.

In addition the global alarm relay function can provide a communications error alert - see Section 7.11, and a status bit may be set in the Modbus output Status Byte.

Communication loss via the dedicated Ethernet VPM to VPM Link

Where communication between VPM4300 units is lost then they will show "COMMS FAIL" against all tank levels which are received from the another VPM4300. The ERROR Button will be displayed and the error message in the history log will show "Ethernet fail".

If Ethernet communication is restored the alarm status automatically clears and normal operation

is resumed. While such an error is present the appropriate error status bit will be set in the Modbus output to the IPMS as detailed in PSM document 170424-IDD-002

Internal Memory error

If the VPM is unable to write to or read from the secondary SD card (back-up) a “2nd SD Card Error” will be recorded and again the appropriate error status bit will be set in the Status Byte Modbus output.

7.11 Alarm Relay Output (for system errors)

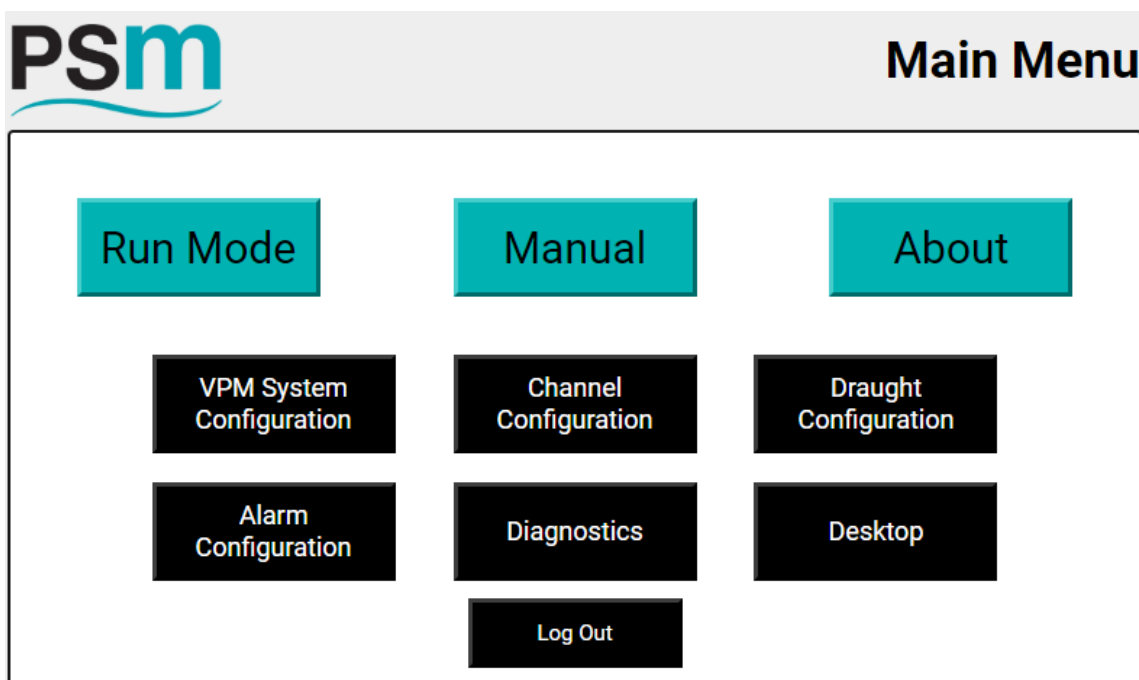
The VPM4300 may be provided with a dedicated function alarm relay.

In normal operation this relay is held energised such that the normally open contact (with relay powered off) is held closed, and the normally closed is held open.

A “COMMS FAIL” status on either the RS485 APT1000 network or the VPM to VPM Ethernet connection, or if the VPM detects an error in writing to or reading from the secondary (back up) SD card will cause this relay to de-energise

In addition, loss of power to the VPM will also cause the relay to change state.

8.0 MAIN MENU



This screen is accessible from the normal tank display page by pressing the Main button. To return to normal operation mode press the button “Run Mode”

The Log Out button is only displayed if the unit is currently in Configuration Mode—see section 9.0. If pressed the unit is logged out of configuration mode and returns to run mode.

If no selection is made on this screen the unit will automatically revert to run mode after one minute.

Note: This screen provides access to the VPM4300 configuration settings and to test / diagnostic facilities. If, for some reason these menu options do need to be accessed, be aware that although normal operation continues in the background it is not possible to see tank contents, draught, or any alarm conditions. The Modbus output will still respond to requests from the remote system for values, but depending upon the parameters being changed this may be suspended and also any system failure alarms may not trigger the alarm relay. This may cause an alarm on the IPMS

Caution: No changes should be made to the configuration without being fully aware of the need to do so and the resulting outcome. All changes have a direct affect on how the VPM4300 operates and processes the information from the APT1000 transmitters. Incorrect or invalid entry

of configuration may cause loss of communications and errors of display and alarm handling. Each button on the Main Menu provides access to a further menu and functionality. A summary of the functions each button provide is given below and described fully in section 9.0.

8.1 Main Menu > Run Mode

Returns the unit to the normal display screen.

8.2 Main Menu > User Manual

User Manual

[Back](#)

You can export the full user manual to a USB drive.

To proceed, please tap the button in the bottom right corner.

[Export Full Manual](#)

The Export Full Manual Button allows the full manual (this manual) to be exported as a PDF file to a USB drive temporarily connected to one of the front USB ports. The manual may then be read using any PDF viewer.

8.3 Main Menu > About

About

VPM Version	1.4.0
Serial Number	17043048

support@psmmarine.com

www.psmmarine.com

PSM Instrumentation Ltd
Haywards Heath
West Sussex
RH16 1TW

Tel: +44 (0)1444 410040
Fax: +44 (0)1444 410121

[Back](#)[Reset Error Timers](#)[Reload User Interface](#)[Export Diagnostic Report](#)

This page displays the units serial number and contact information for Service Support .

In addition there are 3 buttons

Reset Error Timers : This button resets any channels which have been locked out from being interrogated due to their failing to respond to previous requests for data. This is fully detailed in section 7.10. If a channel or channels fail to respond after 2 network cycles they are excluded from the network scan for a period of 60 minutes before the VPM4300 again attempts to communicate. Pressing this button immediately reinstates the exclusion of all channels such that they are again included in the network scan

Reload User Interface: Where the onscreen keyboard becomes inaccurate or unresponsive or double characters are entered this button will reset the interface to restore normal operation.

Export Diagnostic Report: This generates a full report of the units current configuration together with any alarm / error logs, a network scan report, and a list of connected APT1000 transmitters identified by their Ident number and Serial number. This is output in CSV format to a USB Memory device temporarily connected to one of the USB ports located under the removable front cover.

This report can be emailed to PSM or local support.

Caution: Ensure that the front cover is correctly replaced after the USB drive is removed to preserve the displays Ingress Protection.

All other buttons on the **Main Menu** are used to configure the VPM and require entry of the appropriate password to access.

A summary of all sub menus accessible from the main menu is given below. For full explanations of each refer to the section **Configuration Mode**.

8.4 Main Menu > VPM System Configuration

This accesses a further page with settings the VPM4300 uses for the following parameters
Port Settings:

- The Modbus ident number of the VPM4300 and RS485 Communication
- Port Settings for connection to the APT1000 network, interconnection between multiple VPM units, and a remote master.
- External data exchange format between VPM and remote master.
- VPM network: Ethernet port settings for VPM to VPM links
- Relay Outputs: Settings for the Alarm Relay outputs
- System Controls: allow setting of system time / date, screen timeouts, and what controls are accessible in run mode.
- Access controls: defines what access to change configuration each passcode level has

8.5 Main Menu - Channel Configuration

This accesses and allows setting of:-

- Channel Groups: The name and quantity of each group of tanks and whether or not the dedicated Draught display page is shown.
- Channel Data: Entry of all data relating to the connected APT1000 Transmitters and the specific data for the Tank they are monitoring.
- System Map: Illustrates which Channel Group a specific channel belongs to and the order in which they are listed on the main display.

8.6 Main Menu - Draught Configuration

This accesses and allows setting of all parameters relating to the connected APT1000 Transmitters and the factors and constants used to calculate Draught, Trim, and Heel values.

8.7 Main Menu - Alarm Configuration

This accesses and allows setting of the alarm settings for each Tank.

Note: For the application covered by this manual these alarms are for visual indication on the VPM only, they do not trigger the units relay output. Triggering of the relay output is controlled

under the settings for the relay card.
Note that the alarm status of each tank is shown on the main display page .

8.8 Main Menu - Diagnostics

This accesses various diagnostic tools used for system commissioning / proving or fault-finding in service.

8.9 Main Menu - Desktop

This is reserved for manufacturer access only. In normal operation there is no need to use this menu option.

8.10 Main Menu > Log Out

This button is only displayed if the unit is currently logged in to configuration mode. Pressing it logs the system out of configuration mode.

9.0 CONFIGURATION MODE

This section details the various parameters that must be set in the VPM4300 in order to set it up for a specific application.

Note: The VPM4300 features two USB connections located under a removable cover on the front bezel. A standard PC QWERTY keyboard and mouse may be temporarily connected to these ports to assist in data entry. The VPM4300 will automatically recognize a keyboard and mouse being plugged in.

Where no external keyboard / mouse are connected the VPM4300 has an onscreen QWERTY keyboard for data entry.

Caution: Ensure that the protective cover is properly replaced after the keyboard / mouse are removed to preserve the ingress protection of the enclosure. Failure to do so may result in liquid ingress and failure of the unit.

Note: Once all parameters are set up in the VPM4300 it is highly recommended that a back up copy of all configuration data is made and that this back up is kept safely and available in case the configuration has to be restored, or if a unit is replaced. Refer to Section 9.2.4 System Controls for details of how to make a back up of all specific configuration settings and section 13.5 for details of how to make a full back up.

9.1 Configuration Mode - Access Control

The screenshot shows a screen titled "Access Control" with a grey header. Below the header, the text reads: "This area of the VPM is restricted." followed by "Please enter your passcode to access." There is a text input field with a grey label "Passcode" on the left and a teal "Login" button on the right. At the bottom center, there is a black "Cancel" button.

When a specific menu item is selected and depending upon the factory settings specified at time of manufacture access may first require entry of a passcode.

If this is the case the passcode will be known to personnel authorised to make changes to the configuration. Item selected.

Note that there are different levels of password access which allow either limited or all areas of the configuration to be edited. The levels of access are set up under the menu **Access Controls**. This screen only presents the options for editing that the passcode used to log in permits. Highlighting the passcode entry box brings up a keypad.

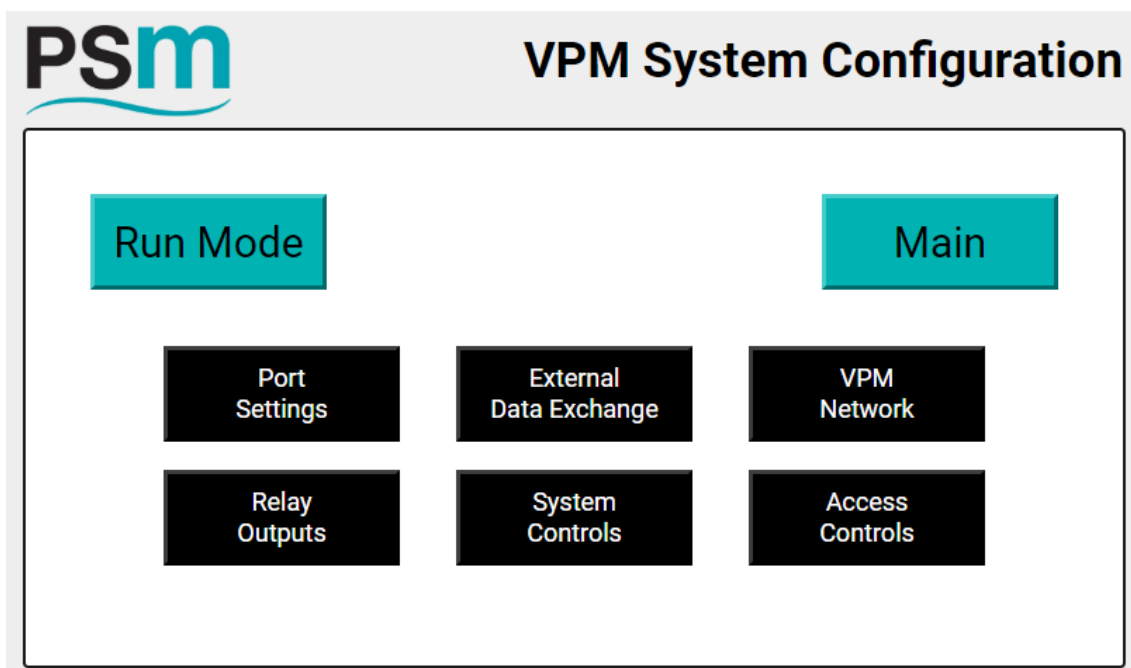
Key in the passcode and press enter to return to the Access control then Login to open up the requested configuration page (provided the passcode used has the correct access privileges). Note that once logged in the access remains open all the while changes are being made. If there are no changes within 5 minutes the VPM will revert to run mode. During this period it is possible to return to Run Mode and re-enter configuration mode without re-entering the password.

Note: Each screen allows manual entry of data and in addition there are two buttons :-

Load Configuration: This enables the configuration parameters for the specific page being edited to be loaded from a setup file located on a temporarily connected USB memory device. If selected the VPM will search for the connected USB device and present a list of available files.

Save configuration: This button is used to save changes made to parameters on the current screen to the VPM's configuration memory. If the Back button is used without first saving the changes the user will be prompted to save changes Yes / No. This ensures all changes are saved and gives the option to abandon changes made to the current screen.

9.2 Configuration Mode—VPM System Configuration



This screen leads to further options

9.2.1 Port Settings

Port Settings

VPM ID	2		
RS485 Port 1		Function	APT Network ▾
Baud Rate	9600 ▾	Parity	None ▾
Data Bits	8 ▾	Stop Bits	1 ▾
RS485 Port 2		Function	IPMS ▾
Baud Rate	19200 ▾	Parity	None ▾
Data Bits	8 ▾	Stop Bits	1 ▾
Ethernet Port		Function	VPM to VPM ▾
IP Address	192.168.1.201	Gateway	192.168.1.1
Subnet	255.255.255.0	DNS	192.168.1.1

Back

Load Configuration

Save Configuration

VPM ID : This is the ident number of the VPM when it is acting as a Slave to a remote master. Note that if more than one slave device is connected on a single RS485 Network the ident number must be unique to each. Set a Value between 1 and 100

RS485 Port 1 & 2

Function: Identifies if the Port is connected to an “APT Network” or to a remote master “IPMS”
 Baud Rate: Select 9600 for APT network and either 9600 or 19200 for remote master depending on the Master device.
 Parity: Set as None for both ports
 Bits: Set as 8 for both ports
 Stop Bits: Set as 1 for both ports
 Refer to PSM if the remote master requires different settings

Ethernet Port settings

Function: Set as “None” if there is no interconnection or as “VPM to VPM” if VPM’s are sharing data via Ethernet link
 IP Address: Setting depends on how if and how many VPM’s are connected via Ethernet. Each VPM on the network must have a unique IP Address
 VPM1: set as 192.168.1.201
 VPM2: set as 192.168.1.202
 VPM3: set as 192.168.1.203
 VPM4: set as 192.168.1.204
 VPM5: set as 192.168.1.205
 VPM6: set as 192.168.1.206
Note: The IP address of each VPM on a network must be recorded along with it’s location or some other information which identifies it . This information is needed when setting up the display channels (see section 10.2) so that the VPM can identify which specific VPM a particular tank is connected to.
 Gateway: All VPM’s set as 192.168.1.1
 Subnet: All VPM’s set as 255.255.255.0
 DNS: All VPM’s set as 192.168.1.1

9.2.2 Relay Outputs

Relay Outputs

Relay 1	Global System Error ▾	Failsafe	NE ▾
Relay 2	Disabled ▾	Failsafe	NDE ▾
Relay 3	Disabled ▾	Failsafe	NDE ▾
Relay 4	Disabled ▾	Failsafe	NDE ▾

Back

Load Configuration

Save Configuration

The VPM may be optionally fitted with a 4 channel relay card. Each relay can be set to be triggered by the following conditions. Refer to Section 7.9 Run Mode Display - Error for details.
Disabled ; not used

Global High Alarm: triggers if any channel that has been configured with a high alarm activates

Global Low Alarm: triggers if any channel that has been configured with a low alarm activates

Global High High Alarm: triggers if any channel that has been configured with a high high alarm activates

Global Low Low Alarm: triggers if any channel that has been configured with a low low alarm activates

Global System Error: The events which will trigger this alarm are: -

- Communications failure, one or more connected APT1000, or VPM to VPM.
- Failure of back-up memory
- Failure of power supply to the VPM will also cause the relay to change state

9.2.3 - External Data Exchange

PSm External Data Exchange

Run Mode

Back

Settings

Data Order

Channel Order

Note: The following section describes the content and order of the information which is output via the RS485 link using Modbus protocol to the remote master.

For a full explanation of the Protocol and definition of the Status Byte refer to Annex A of this manual. VPM Output Protocol

Note: Before defining the output settings for the data link to the IPMS the channels must first be set up as detailed in **Section 10.0 Channel Configuration**.

There are three buttons

Settings

External Data Settings

Channel Error Settings		Back
Value on Comm Error (blank = n/a)	-500	
Status Byte Settings		Save Configuration
Status Byte Type	Expanded (2 x VPM) ▾	

Channel Error Settings

This field allows a fixed value to be sent to the remote master if a specific channel cannot be read by the VPM4300. If left blank the setting is ignored but, if for example it was set to -500 for any parameter where the VPM4300 cannot calculate a valid value -500 is sent to the master. This setting is for all parameters on all channels, i.e. for Tank Volume, Tank Level, Tank Percent. If left blank then the last valid value calculated is sent to the master.

Status Byte Settings

The VPM 4300 continually monitors its operational health. Issues detected are brought to the operators attention by means of the Error Button as detailed in Section 7.10 - Run Mode Display - Error, and if fitted, the Global Relay output described in Section 7.11 - Alarm Relay Output. In addition the VPM can report certain failure conditions to the remote master device as part of the Modbus output via a dedicated format Status Byte which is enabled if required - see below description for "Unit Status"

There are two versions of the Status Byte, "Normal" and "Expanded (2 x VPM)" In both cases the Status message is actually allocated 2 Data Bytes (16 Bits).

Where a single VPM is in use and for most multiple VPM networks the Status Byte Type should be set to Normal. The individual Bits within the status Byte have the following meaning when they have the value "1"

- Bit 1 = Failure to communicate with one or more APT1000 transmitters on the RS485 network
- Bit 2 = Failure to communicate with ALL APT1000 transmitters on the RS485 Network
- Bit 3 = Failure to communicate with one or more VPM units on the Ethernet network
- Bit 4 = Failure of internal back-up memory (2nd SD Card)
- Bits 5 - 16 = Not used, will always be '0'.

The Expanded (2 x VPM) setting may be used where there are 2 VPM units sharing data via Ethernet and provides additional information as follows: -

Bit 1 = Failure to communicate with one or more APT1000 transmitters on the local RS485 network

Bit 2 = Failure to communicate with ALL APT1000 transmitters on the local RS485 Network

Bit 3 = Failure to communicate with partner VPM (this alarm is set on the local VPM only)

Bit 4 = Failure of internal back-up memory (2nd SD Card) of local VPM (set on the Local VPM only)

Bit 5 = Failure to communicate with one or more APT1000 transmitters on the remote VPM's RS485 network

Bit 6 = Failure to communicate with ALL APT1000 transmitters on the remote VPM's RS485 Network

Bit 7 = Communications failure with remote VPM (this alarm is set on the remote VPM only)

Bit 8 = Failure of internal back-up memory (2nd SD Card) of remote VPM (set on the remote VPM only)

Data order:

External Data Order

Order	Data Type
1	Tank Volume ▾
2	Tank Level ▾
3	Tank Percent Full ▾
4	Draught Measurements ▾
5	Unit Status ▾

Back

Load Configuration

Save Configuration

This screen defines the order in which each parameter type is sent to the remote master. Determine the order by highlighting the relevant position and selecting the required parameter from the dropdown choices. Note that there is a choice to select "none" in which case no data is sent. The order should be completed starting from 1 to 5

If selected, parameters for Draught Measurements, and Unit Status are sent in a predefined order in their group, for the parameters which relate to tank content it is possible to select the order in which they are arranged in the group using Channel order

Channel order:

External Channel Order

Order	Channel	
1	[Ch 1] - Ballast Tk 7 9B01	▼
2	[Ch 3] - Drain Tank 9D01	▼
3	[Ch 4] - Grey Water Tk 2 9E01	▼
4	[Ch 5] - Lub Oil Tk2 9E02	▼
5	[Ch 6] - Oil Free Waste Water 9E04	▼
6	[Ch 7] - Ballast Tk 5 9E06	▼
7	[Ch 8] - Ballast Tk 6 9E05	▼
8	[Ch 9] - Used Lube Oil 9E07	▼
9	[Ch 10] - No2 Sludge Fuel Drain 9E03	▼
10	[Ch 11] - JP5 Tk 1 9C02	▼

Back

Load Configuration

Save Configuration

Defines the order of channels in which data is sent to the remote master.
 Select the relevant tank for each position to determine the order in which the data is sent
 For further information regarding the output protocol refer to Annex A of this Manual - **VPM Output Protocol**.

9.2.4 System Controls

System Controls

Time Outs			
Run Mode Scrolling (sec)	15		
Group Display (Min)	15		
Hold Screen (sec)	3600		

Back

Factory Reset

Import Full Configuration

Export Full Configuration

Save Configuration

Controls			
SG Edit	PW	▼	
Alarm Setpoints	3		
Display Decimal Places	0 DP	▼	

Set Time and Date					
Time (HH : MM : SS)	13	:	43	:	29
Date (DD : MM : YYYY)	06	:	09	:	2019

Selecting a field for editing will bring up a keypad in the normal way

Time outs

Run mode Scrolling: Enter a value in Seconds - Defines the interval in Run Mode display for switching between one tank group to the next. Note, where tank groups have more than 10 tanks the first 10 followed by the second 10 will be displayed before moving to the next group,.

Group Hold Display: Enter a value in minutes - Defines how long each channel group is displayed if manually selected on the run mode screen before reverting to auto-scroll of all tank groups. If the group has more than one page it will alternate between pages.

Hold Screen: Enter a value in seconds - Defines how long the display is held on a specific page when the Hold button on the run mode screen is pressed. At the end of the time period selected the VPM will resume automatic scrolling.

Controls

SG Edit: This defines whether the user needs to enter a passcode to make changes to the SG values when using the SG button in run mode. NO PW means no passcode needed, and PW means a passcode is required.

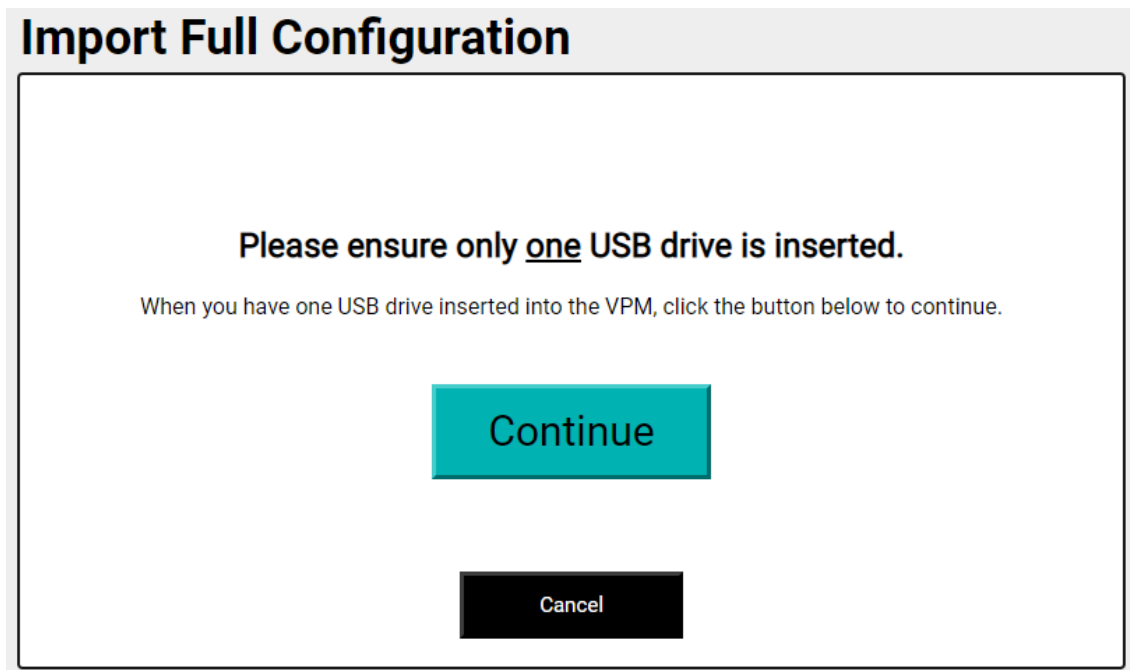
Alarm Setpoints: This defines the number of alarm setpoints that each channel can be configured with. A maximum of 3 per channel can be set. Setting of the alarm setpoint parameters are done under the Alarm Configuration Menu detailed later in this manual.

Display Decimal Places: This defines to how many decimal places values for tank volume, level and percentage are displayed on the run mode screen, select from 0,1,2, or 3 places.

Set Time and Date

Select each field to bring up a keypad to enter the correct time & date.

This screen also has two buttons “Import Full Configuration, and “Export Full Configuration” These buttons allow the entire configuration of the unit, i.e. all set up parameters specific to the intended application, to be either imported to the unit, from a temporarily connected USB memory device or exported in the same way.



Note the on-screen warning that only one USB drive must be connected.

If importing the VPM will check the connected USB device for a suitable configuration file which must be located on the root of the device. If more than one file is found a choice will be shown for selection.

If a file is exported it will likewise be placed on the root of the drive.

Configuration files for the unit are held in comma separated variable (CSV) file format. And are saved with an automatically generated file name in the format DDMMYY_HHMMSS.CSV.

Using this function it is possible to quickly set up a new or replacement VPM with all parameters required for the specific application.

It is suggested that a back up is made of all configuration once the unit is commissioned and kept separate from the unit to facilitate simple replacement,

Note: As referenced at the start of this section many screens also have the option to import configuration. The process is the same but in these cases only the data for the specific page being set up is uploaded from a back up file.

Factory Reset

This button can be used to clear all user configuration to rest the unit to factory default settings

9.2.5 VPM Network

VPM Network

Local VPM IP Address	192.168.1.201	Back
To disable any of the VPM slave's below, set the relevant IP address field to '0'.		
Remote VPM IP Address 1	192.168.1.202	
Remote VPM IP Address 2	0	
Remote VPM IP Address 3	0	
Remote VPM IP Address 4	0	
Remote VPM IP Address 5	0	
Sync Frequency (Secs)	End of Modbus Scan ▾	Load Configuration
		Save Configuration

This screen defines the IP addresses of any VPM display connected via ethernet to the unit being configured. These should be set depending on which VPM is being configured.

The currently set address for the unit being configured (see section 9.2.1. Port Settings) is shown in Local VPM Address and is non-editable.

All additional VPM's must be included and have a unique address in sequence.

VPM2: set as 192.168.1.202

VPM3: set as 192.168.1.203

VPM4: set as 192.168.1.204

VPM5: set as 192.168.1.205

VPM6: set as 192.168.1.206

Note: The IP address of each VPM on a network must be recorded along with it's location or some other information which identifies it . This information is needed when setting up the display channels (see section 10.2) so that the VPM can identify which specific VPM a particular tank is connected to.

Synch Frequency is predefined as "End of RS485 Network Scan" This means that each time a VPM completes a scan of it's own connected APT1000 transmitters it will send the updated results to the partner VPM.

9.2.6 Access Controls

Access Control


	1	2	3	4
SG Edit	Y ▾	Y ▾	Y ▾	Y ▾
Alarm Configuration	Y ▾	Y ▾	Y ▾	Y ▾
Draught Configuration	Y ▾	Y ▾	Y ▾	Y ▾
Channel Configuration	Y ▾	Y ▾	Y ▾	Y ▾
VPM System Configuration	Y ▾	Y ▾	- ▾	- ▾
Diagnostics	Y ▾	Y ▾	- ▾	- ▾
Access Control	Y ▾	Y ▾	- ▾	- ▾

1. Master	123456
2. Configuration	234567
3. Service	345678
4. View	456789

This screen allows definition of the different level passcodes and the access levels each has to the various configuration options.

Note: These will only be visible and available for editing according to the passcode level that has been used to access configuration mode.

10.0 CHANNEL CONFIGURATION



Channel Configuration

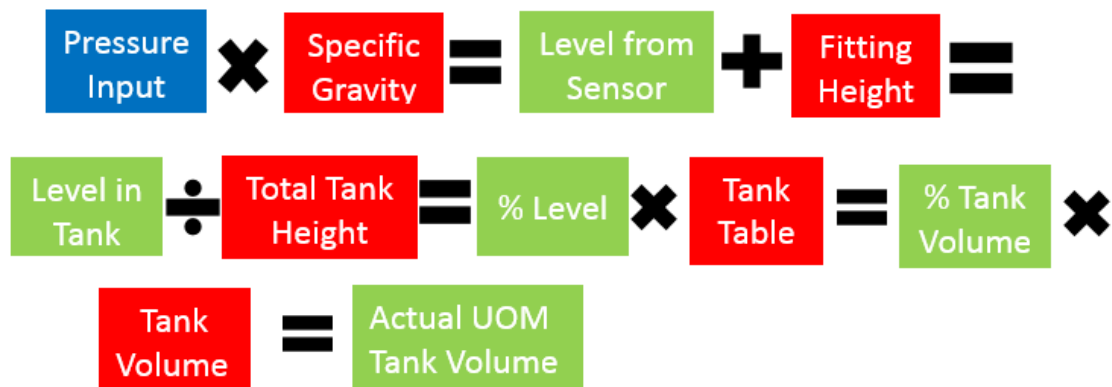
These menu options allow setting of all parameters relating to the connected APT1000 Transmitters and the specific data for each Tank being monitored

The VPM4300 reads each of the connected APT1000 transmitters in sequence via the RS485 / Modbus network and obtains a value in mmWG of the current liquid level of the tank / draught. Each APT1000 has a unique Modbus ident and so this must be assigned to a specific tank to ensure the correct value is being used.

The VPM4300 also passes the mmWG values it reads from its own network of connected

APT1000 transmitter to the partner VPM4300 so it can perform the same signal processing to derive tank contents.

The Data flow for calculation of tank contents is as follows:-



The blue parameter is the mmWG value from the APT1000

The parameters shown in red are configured to suit the tank.

The parameters in green are calculated results

The VPM holds a “look up” table which relates % liquid level to % tank volume. This allows the VPM to derive actual tank volume.

10.1 Channel Groups

Channel Groups

Button	Group Name
1	Ballast
2	DFM
3	JP5
4	Oil
5	Water

Draught Display Active

Back

Load Configuration

Save Configuration

Note: Channel Groups are the first parameters that must be configured since further configuration of individual channels require that they are assigned to a specific group.

Channel groups allow similar tank types to be combined into a group. There can be up to 5 groups, each of which may hold up to 20 channels. These groups are shown as buttons along the bottom of the main display page enabling quick selection.

Each tank group has a unique name up to 6 characters in length.

There is a further specific function group option for Draught Display. When enabled this adds a display page to the run mode specifically for displaying Draught values, and where Trim and List may also be shown based on calculations from the Draught values.

10.2 Channel Data

Channel Data

Channel	1	Name	BALLAST N7 9B01	
Modbus ID	101	Group	Ballast	7
Port	VDE 1			
Contents	Ballast Water			
Specific Gravity	1.025			
Volume UOM	Litres	Level UOM	Millimetres	
Tank Capacity	23300			
Tank Height [mm]	2048			
Sensor Offset [mm]	171			

Back

← →

[1] BALLAST N7

Copy

Load Configuration

Save Configuration

Reset Channel

Channel Table

Having defined the channel groups the next step is to define specific details of each input channel and assign them to a channel group.

Select the Channel to be configured by using the left / right arrows observing that the number in the Channel box will change as the arrows are pressed.

Name: Enter a descriptive name for the channel as required to appear on the main display. For example Ballast 4P. A maximum of 10 Characters including spaces may be used .

Modbus ID: Enter the Modbus Ident number of the APT1000 transmitter connected to this tank.

Group: Select the Tank Group or Draught from the dropdown list that this channel is to appear in, and from the adjacent dropdown select the position it is to appear in the tank group (from 1 to 20), or for the Draught group which Draught input it represents.

Port: The available choices will depend upon what has been set in Port Settings. Select from :

- Disabled - Select if the channel is to be disabled and not displayed
- RS1 or RS2 (whichever is displayed) Select when the APT1000 sensor is directly connected on the RS485 network the VPM is monitoring
- VDE1 to VDE5 - Select when the APT1000 sensor is connected to another VPM and the data is sent via the Ethernet link.

Contents: Enter the tank content, for example Fuel Oil to a maximum of 14 characters.

Specific Gravity: Enter the Specific Gravity value for the fluid in the tank to 3 decimal places.

Volume UOM: Enter the volume unit for the displayed value to a maximum of 8 Characters

Level UOM: Select the required unit of measurement for the Level display from the drop down menu

Tank Capacity: Enter a numeric value (maximum 999999) in the Volume units of measure in use.

Tank Height (mm) : Enter the total tank height in millimetres. Tank height is the full 100% value used in the channel look up table (see below)

Sensor Offset: Enter an offset parameter in millimetres. This offset parameter is defined as the measurement to the sensor diaphragm above the bottom of the tank. The bottom of the tank is defined as the zero point for the tank look up table. Note that if the sensor is external to the tank and BELOW the bottom of the tank then this value is entered as a negative value.

There are 2 specific buttons on the channel data page to assist with set up

Copy: above this button is a drop down selection box. By first selecting the details from another channel and then pressing Copy the details from the other channel are copied across. Check each parameter and correct as needed before saving the configuration

Reset Channel: This button clears all entered parameters for the channel so they may be re-entered.

There is a further button Channel Table

As described previously, the APT1000 provides a an output value in mmWg of the current tank level.

The channel table is used to define the relationship between liquid level and tank volume so that the VPM4300 can calculate and display in Volume terms.

The data is entered in percentage terms in pairs, i.e. at XX% of the full tank depth enter the corresponding XX% of tank volume at this level.

In both cases the 100% value is what has been entered for the channel under the previous Channel Data screen under Tank Capacity and Tank Height.

The table has a maximum of 100 data entry points. It is not necessary to use all 100 points, for example, if the tank is a linear shape, and the table will be considered completed by the VPM once both level and volume values are at 100%

The actual number of points required will be determined by the profile of the tank. The VPM employs linear interpretation to calculate actual volume where the level is between points and so a more irregular shape of tank will require more points for best accuracy.

The button "Channel Table" leads to a further screen



The three options presented allow entry of a look up table for the channel

View / Edit : Enables the tank table currently configured for the channel to be viewed. Note that this is greyed out if no table is currently loaded.

The existing table can be edited if necessary. The editing screen shown is identical to the one shown for "Create New" below.

Create New:

Create Channel Table

Channel	1	Name		Table #	
	% Level	% Vol		% Level	% Vol
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Back

↓ ↑

LINEAR ▾

Copy

Load Configuration

Save Configuration

This button opens up an empty table for editing. Either a complete new table is entered, or, there is an option to copy details from an existing table. To copy an existing table select it in the drop down list above the Copy button and then press the button.

Once the data is copied, make any edits needed to the table data and then enter a new name in the Name box. Save Configuration saves this table to the channel being edited and also saves it to the list of tables meaning it is available for selection for other channels as described below.

Load existing:

Load Channel Table

Name	Table #
BALLAST N7 9B01	1
AFT DRAUGHT	2
SLDG JP5 DFM DRAIN 9D01	3
GREY WATER N2 9E01	4
LUB OIL N2 9E02	5
OIL FREE WW N2 9E04	6
BALLAST N5 9E06	7
BALLAST N6 9E05	8
USED LUBE OIL 9E07	9
No2 SLDG FO DRAIN 9E03	10
JP5 N1 9C02	11
JP5 N2 9C01	12

Back

↓ ↑

Delete Table

Load Table

This is useful where more than one tank has the same look up table. It allows selection of an already created table as detailed above.

Highlight the existing table to be used and press "Load Table"

There is also a button with allows existing tables to be deleted. Highlight the relevant table and then press Delete.

Caution: Ensure that if deleting an existing table it is not in use on other channels

Note: Refer to PSM document 170424-CON-002 for details of all configuration values that should be used for the application covered by this manual

10.3 System Map

System Map

Ch.	Port	Modbus ID	Channel Name	Group	Group Pos.
1	VDE	101	BALLAST N7 9B01	Ballast	7
2	VDE	102	AFT DRAUGHT	Draught	AFT
3	VDE	103	SLDG JP5 DFM DRAIN 9D01	Oil	7
4	VDE	104	GREY WATER N2 9E01	Water	4
5	VDE	105	LUB OIL N2 9E02	Oil	2
6	VDE	106	OIL FREE WW N2 9E04	Water	6
7	VDE	107	BALLAST N5 9E06	Ballast	5
8	VDE	108	BALLAST N6 9E05	Ballast	6
9	VDE	109	USED LUBE OIL 9E07	Oil	3
10	VDE	110	No2 SLDG FO DRAIN 9E03	Oil	5

Back

The System Map is a view only page that provides a summary of all channel data that has been entered, and is a simple way to check that all entered parameters are correct.

CH#: Shows the channel number.

Port: Shows where the channel is read from. The choices are Disabled, RS1, or VDE as defined in the earlier section covering Channel Data.

Modbus ID: Is the Modbus Ident number of the APT1000 in the tank monitored by this channel

Channel Name: The display name on the run mode display page

Channel Group: Identified which group the channel will be displayed in on the run mode display

Group position: Shows where the channel appears in the group display.

Press the Back button to exit the System Map and return to the Channel Configuration page

11.0 DRAUGHT CONFIGURATION

The VPM4300 reads the mmWG signal from connected APT1000 transmitters measuring draught forward, aft, and midships port & starboard.

These values are corrected to relate the signal from the APT1000 transmitters to the actual draught markings on the Ship.

Further, using the draught values the VPM4300 also calculates the ship's Trim and Heel values.

Selection of the Draught Calculation option brings up the following page.

Draught Configuration

All draught configuration values should be entered in Metres to 3 decimal places.

F-A	74.00225	A(s-k)	2.96611
P-S	9.27246	P(s-k)	0.8567
F(p)	6.5284	S(s-k)	0.8567
A(p)	-12.26435	F(cl)	0.475
P(p)	5.61512	A(cl)	-0.99373
S(p)	5.61512	P(lp)	2.56377
F(s-k)	2.58491	S(lp)	2.56377

Trim by Stern: Heel to Port: Trim UOM:

Display Trim: Display Heel:

[Back](#)

Modbus ID

AFT	102
PORT	123
STBD	124
FWD	136

[Load Configuration](#)

[Save Configuration](#)

These parameters must be entered Metres to 3 decimal places. The unit of Measure actually used for the draught display is configured in the input channel settings. See Section 10.2 Channel Data.

F-A Distance between Fwd and Aft sensors. Entered as a positive value.

P-S Distance between Port and Stbd sensors. Entered as a positive value.

F(p) Fwd projection (distance from Fwd sensor to Fwd draught marks). Where the sensor is mounted aft of the Fwd draught marks this value is entered as a positive, where sensor is fwd of the Fwd draught marks it is entered as a negative value.

A(p) Aft projection (distance from Aft sensor to Aft draught marks). Where the sensor is mounted aft of the Aft draught marks this value is entered as a positive, where sensor is fwd of the Aft draught marks it is entered as a negative value.

P(p) Port projection (distance from Port sensor to Port draught marks). Where the sensor is mounted aft of the Port Midships draught marks this value is entered as a positive, where sensor is fwd of the Port Midships draught marks it is entered as a negative value.

S(p) Stbd projection (distance from Stbd sensor to Stbd draught marks). Where the sensor is mounted aft of the Stbd Midships draught marks this value is entered as a positive, where sensor is fwd of the Stbd Midships draught marks it is entered as a negative value.

F(s-k) Vertical distance from Fwd sensor to ships keel. Entered as a positive value.

A(s-k) Vertical distance from Aft sensor to ships keel. Entered as a positive value.

P(s-k) Vertical distance from Port sensor to ships keel. Entered as a positive value.

S(s-k) Vertical distance from Stbd sensor to ships keel. Entered as a positive value.

F(cl) Distance between Fwd sensor and ships centre line. For sensors mounted Stbd of the centreline this value is entered as a positive and for sensors port of the centreline it is entered as a negative value.

A(cl) Distance between Aft sensor and ships centre line. For sensors mounted Stbd of the centreline this value is entered as a positive and for sensors port of the centreline it is entered as a negative value.

P(lp) Port lateral projection (distance from Port sensor to Port side of ships hull). Entered as a positive value.

S(lp) Stbd lateral projection (distance from Stbd sensor to Stbd side of ships hull). Entered as a negative value.

Trim by Stern: Select either positive or negative to determine how the Vessel being Trimmed by Stern is displayed in run mode

Heel to Port: Select either positive or negative to determine how the Vessel being Heeled to Port is displayed in run mode

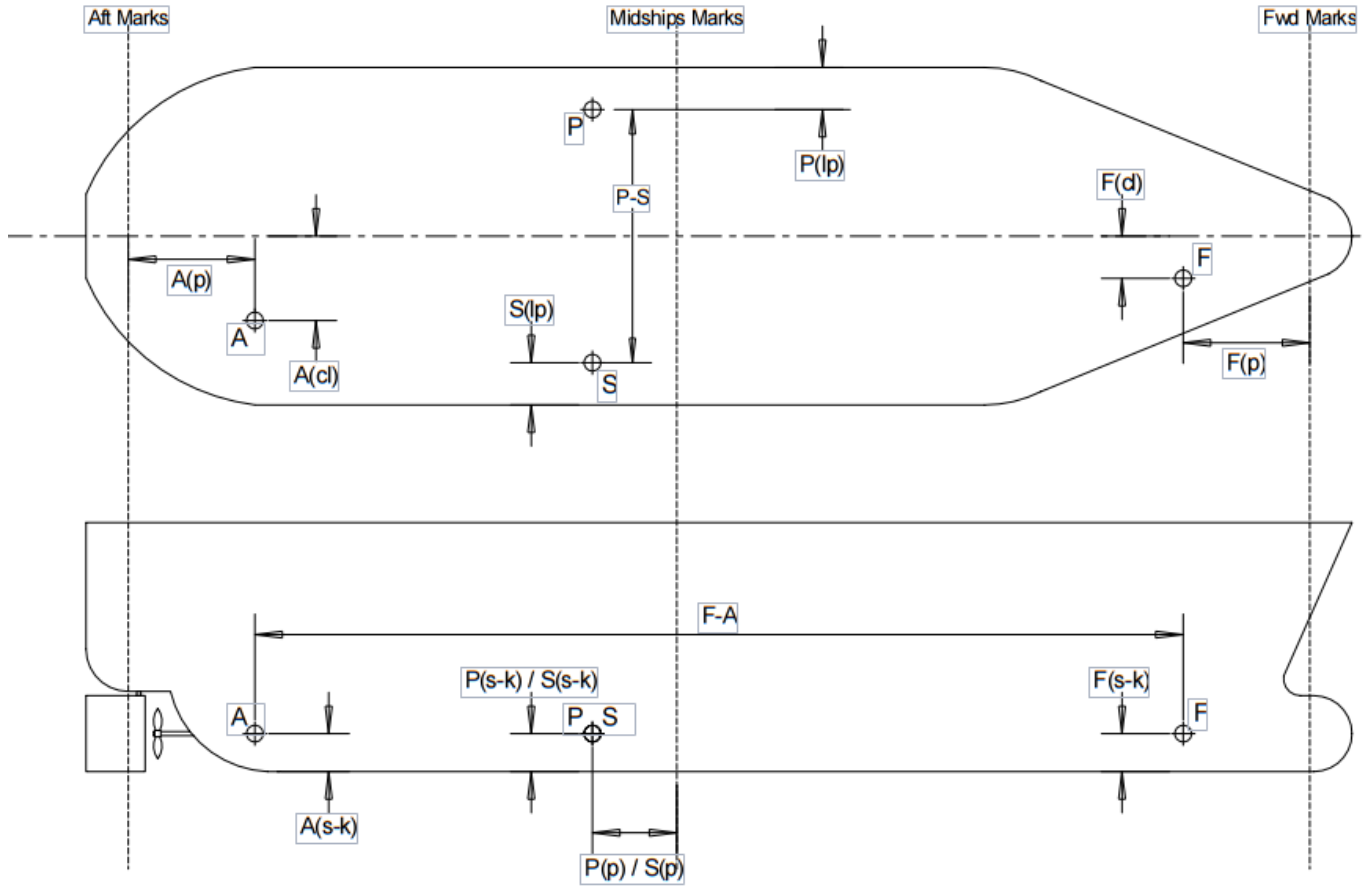
Trim UOM: Select the required Units of Measure for the run mode display.

Display Trim: Defines if Trim is or is not displayed in run mode

Display Heel: Defines if Heel is or is not displayed in run mode

Modbus ID: Read only information that shows the Ident number of the APT1000 that has been assigned for this measurement in channel data.

The following drawing will assist in defining the parameters.



Note: To reduce calculation errors Port and Starboard sensors should be located on the same frame - i.e. $P(p) = S(p)$

And at the same height above the keel - i.e. $P(s-k) = S(s-k)$

12.0 ALARM CONFIGURATION

The VPM 4300 can provide a visual (on-screen) indication of the alarm status for each tank. The various states that can be displayed are detailed in the section covering Run Mode display.

Alarm Configuration

Channel	1	Name	Ballast Tk 7 9B01	
---------	---	------	-------------------	--

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Setpoint 1	HIGH ▾			
Action	MOR ▾	Setpoint (%)	80	
Hysterisis (%)	5	Delay (Sec)	5	

Setpoint 2	LOW ▾			
Action	MOF ▾	Setpoint (%)	10	
Hysterisis (%)	5	Delay (Sec)	5	

Setpoint 3	Disabled ▾			
Action	▾	Setpoint (%)	0	
Hysterisis (%)	0	Delay (Sec)	0	

←
→

Load Configuration
Save Configuration

At the top of the page the Channel number and name are shown. Use the scroll arrows to select the channel to be configured

Each Channel can have up to 3 alarm set-points assigned to it.

For each set-point select the required option from the drop down list.

Setpoint 1 : This identifies what will be shown on the Run Mode Display, Choose from Disabled, Low Low, Low, High, High High.

Action : Defines if alarm is trigger when level is rising - MOR, or falling - MOF

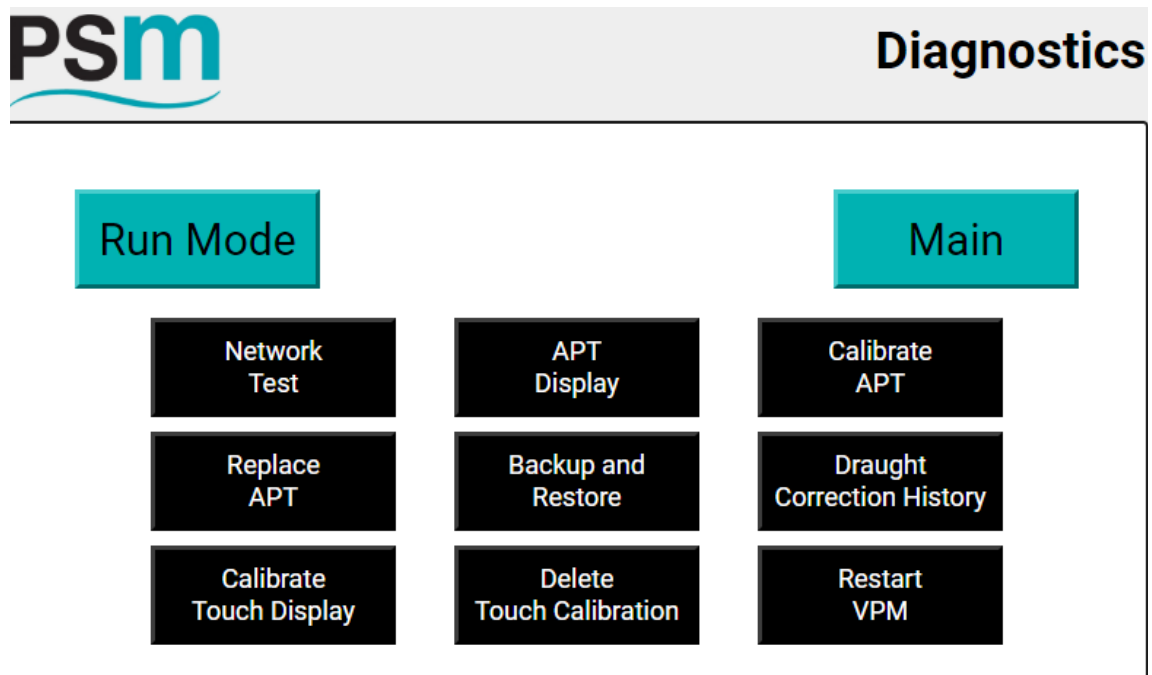
Setpoint : Percentage value of tank volume where alarm is triggered

Hysteresis: Difference in % volume between alarm setting and resetting. E.g. a 5% hysteresis with an alarm setpoint of 80% MOR would require that volume dropped below 75% before it reset

Delay : The time, in seconds, for which an alarm must be continually active before triggering

13.0 DIAGNOSTICS

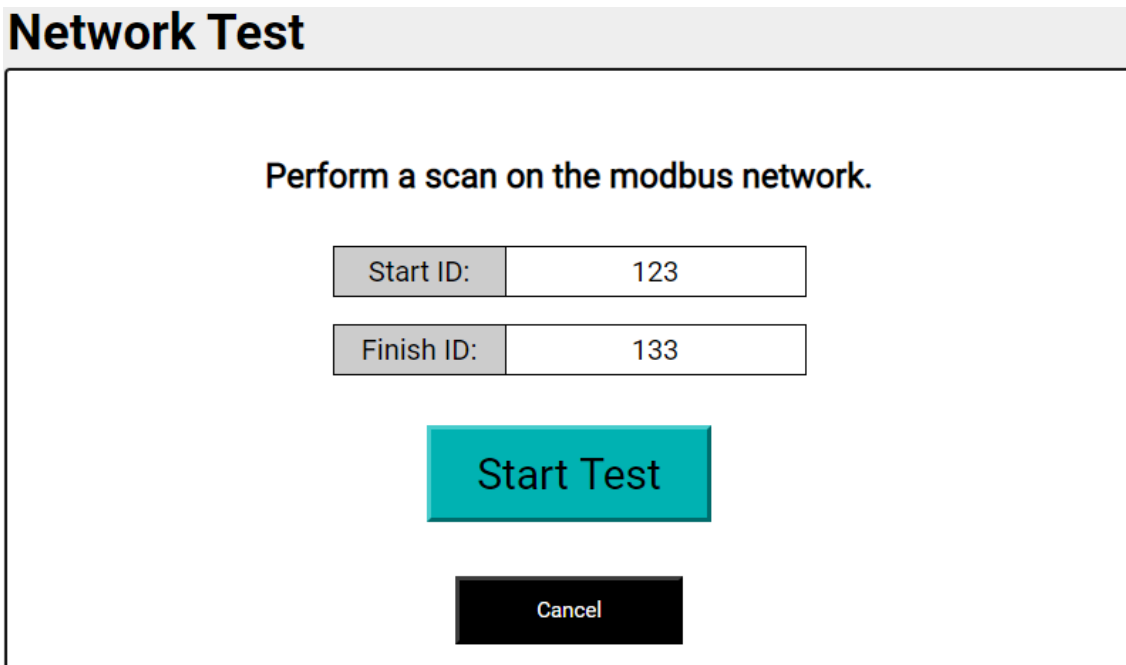
Selection of this menu option leads to a further screen.



From this menu various functions can be accessed to check the operational health of the network the VPM4300 is monitoring, set up a replacement APT1000 transmitter, back up and restore the entire configuration of the unit, review historical data and perform VPM maintenance.

The buttons available on this page lead to further screens.

13.1 Network Test

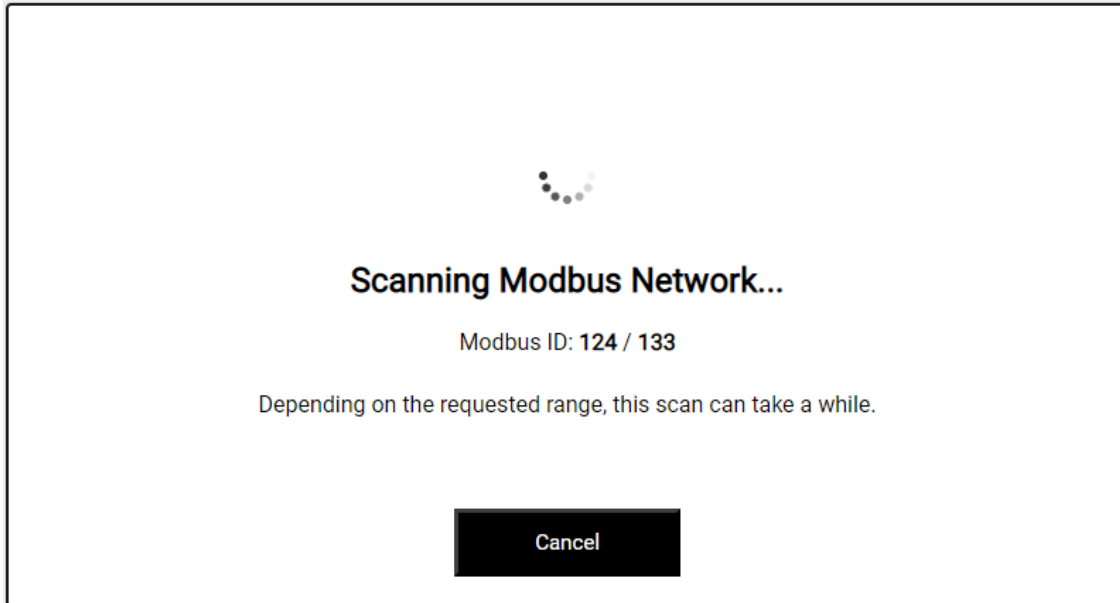


Enter the Modbus address range of the APT1000 transmitter(s) to be scanned for. Enter the same number in both fields to scan for just that Ident.

Note: This scan will only detect transmitters which are directly connected to the VPM's RS485 network. It will not detect APT transmitters connected to another VPM's RS485 network.

The following screen is shown while the scan is being undertaken

Network Test



Depending upon the number of selected Transmitters the test may take a while to perform. The Cancel button returns to the previous screen and only the APT1000 Transmitters ident numbers tested to that point will be displayed. Once the scan is completed the following screen will be displayed.

Network Test

ID	Found?
123	YES
124	YES
125	YES
126	YES
127	YES
128	YES
129	YES
130	YES
131	YES
132	YES
133	YES

Back

↓ ↑

Idents not found are identified as **NO** and those found as **YES**.

13.2 APT1000 Display

This screen allows a live reading of the pressure value from a specific APT1000

APT Display

View details of a single APT

Modbus ID:	125
------------	-----

Read APT

Cancel

Enter the ident number of the APT1000 for which details are required
Press Read APT1000 and after the information is read the following screen will be displayed

APT Display

APT Details

Modbus ID:	125	Serial Number:	0
Sensor Type:	Gauge	Firmware:	65
Raw Pressure:	-3.864	Sensor Tag:	
Press. Offset:	0.0	Change Pressure Offset	

Refresh Done

Modbus ID: Current Ident number of APT1000

Serial Number: Unique manufacturing number (factory set)

Sensor Type: Gauge or Absolute pressure measurement

Firmware: identifies the Firmware Version

Raw pressure: Shows the current applied pressure in mm WG

Sensor Tag: Shows the tag information the sensor is configured with (if any). e.g. Tank name.

Press. Offset: Shows if the APT1000 has been programmed with an offset. (see below)

Refresh: repeats the interrogation of the APT1000

Done: returns to Diagnostic menu

Change Pressure offset: This button leads to a further screen which provides the facility to apply a correction offset to the value being received from the APT1000.

Note: This correction should be used ONLY to correct any zero offset error that the APT1000 being monitored has.

Note: It must be confirmed before making any changes that the APT1000 sensor is correctly installed in its intended location, that it is dry (i.e. the tank is empty), any isolating valves are fully opened and the tank is fully ventilated. If there is any pressure inadvertently applied to the APT1000 then the correction will be incorrectly applied.

Once it is confirmed that there is no pressure applied to the APT1000 press "Change Pressure Offset"

A warning screen will appear

APT Pressure Offset

CAUTION


Please ensure the sensor (Modbus ID: 125) does not have any pressure applied.
Once the sensor has no pressure applied, tap the button below to start the process.

Continue

Cancel

Press Continue

APT Pressure Offset



Setting offset, please wait...

This can take some time, please do not switch off the VPM during this process.

Cancel

Once the process is completed the following screen confirms

APT Pressure Offset

Process completed successfully.

The new pressure offset was successfully applied, tap the button below to go back to APT Display.

Press Done and the display will return to the APT details page

APT Display

APT Details

Modbus ID:	125	Serial Number:	0
Sensor Type:	Gauge	Firmware:	65
Raw Pressure:	-0.247	Sensor Tag:	
Press. Offset:	3.706	<input type="button" value="Change Pressure Offset"/>	

The Press. Offset field will now show the correction value that has been applied to the APT1000. This value is stored in the APT1000 and is added to the mmWG value it reads before transmitting the result as raw mmWG to the VPM. The VPM takes this value to be actual pressure from the APT.

13.3 APT1000 Recalibration

Note: The VPM4300 provides a procedure for recalibrating an APT1000 if it is necessary. However, recalibration requires that an accurate known pressure is applied to the transmitter at each step of the 5 point calibration. This requires that an independent pressure source and an accurate (certified) pressure indicator is available. There are many types of pressure source / indication available for instrument calibration and description of their use is outside of the scope

of this manual but the following general points must be observed

- This procedure is only applicable to Gauge Pressure type APT1000 sensors. Absolute Type Sensors cannot be recalibrated in the field
- The source and indicator should have traceable calibration to validate its accuracy
- A low pressure source should be used with the ability to make fine adjustments
- It is **ESSENTIAL** to avoid damage to the transmitter that the pressure source does not allow a pressure of more than 2 x the transmitters Nominal measurement range to be applied.

To calibrate the APT1000 first connect a suitable pressure source as described above and then select the Calibrate APT option. The following screen is shown.

Calibrate APT

Calibrate an APT on the modbus network.

APT Modbus ID:

5-Point Calibration

Cancel

Enter the Modbus ID of the transmitter to be calibrated and press Enter.
The following screen is displayed

Calibrate APT

Please enter the pressure points.

Pressure Point 1 (mmH2O):	<input type="text"/>
Pressure Point 2 (mmH2O):	<input type="text"/>
Pressure Point 3 (mmH2O):	<input type="text"/>
Pressure Point 4 (mmH2O):	<input type="text"/>
Pressure Point 5 (mmH2O):	<input type="text"/>

Start Calibration

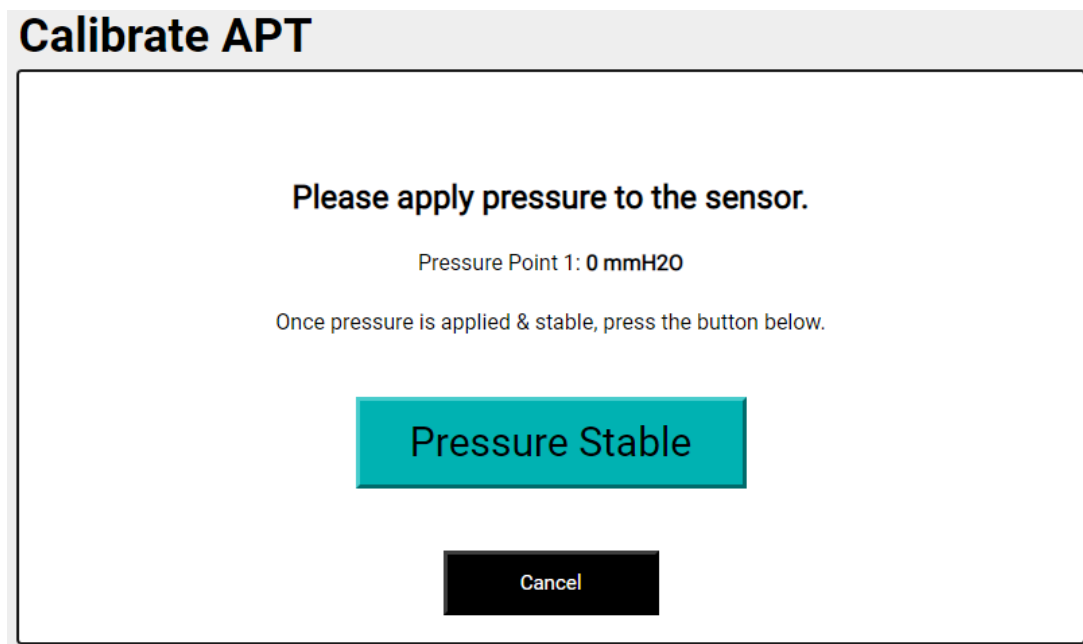
Cancel

Enter the pressure point values according to the following table . These must be calculated as 25% steps of the nominal range of the APT1000 being calibrated.

For example for a 0.5 Bar sensor with a set range of 0 to 5000 MM WG and a 1.0 Bar sensor with a set range of 0 to 10000 MM WG use the following data

Pressure Point	% of Range	mmH2O Value for 0.5 Bar sensor	mmH2O Value for 1.0 Bar Sensor
1	0	0	0
2	25	1250	2500
3	50	2500	5000
4	75	3750	7500
5	100	5000	10000

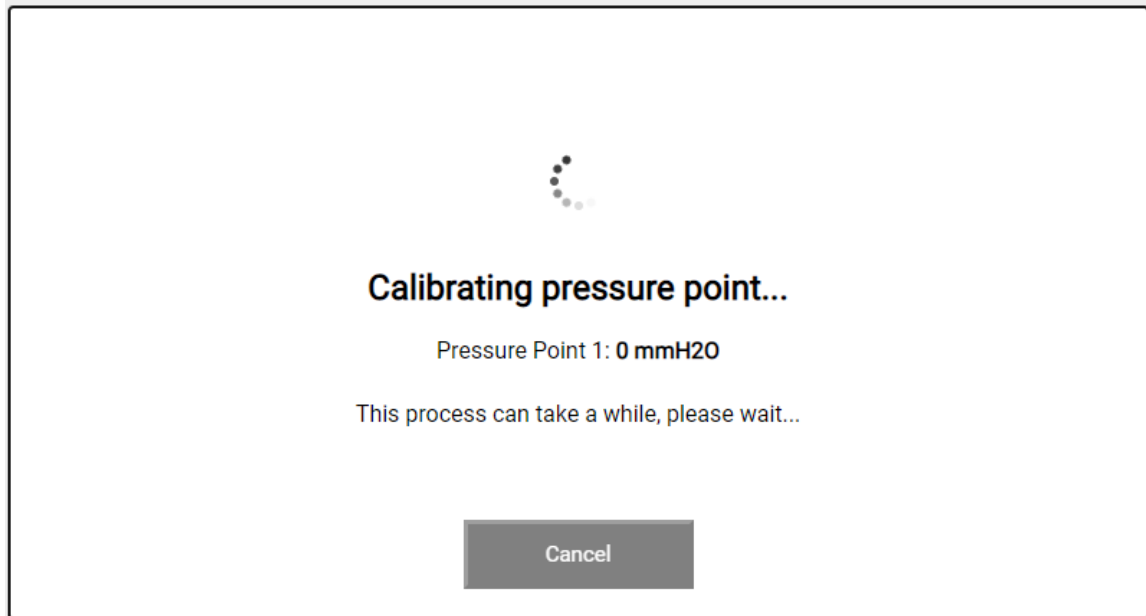
Once all values are entered press “Start Calibration”. The following screen will appear



Apply the indicated pressure (in the above example 0mm) and after ensuring that the pressure is stable press the “Pressure Stable” button

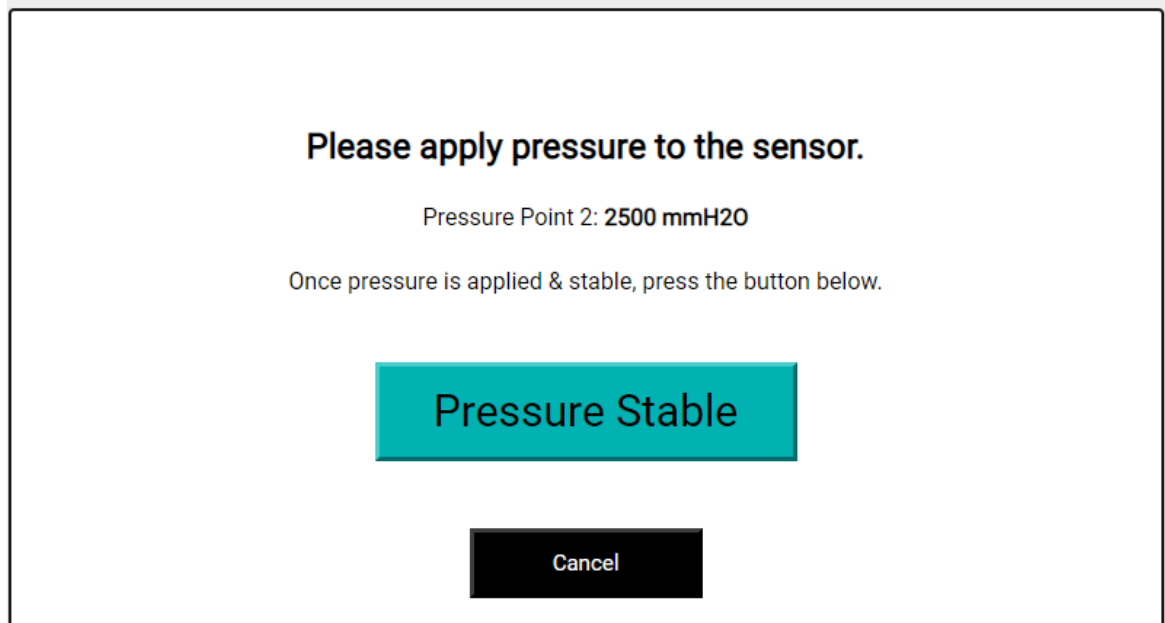
The following screen indicates that the pressure point is being calibrated on the APT. This may take up to 1 minute while the APT samples and averages the measured value

Calibrate APT



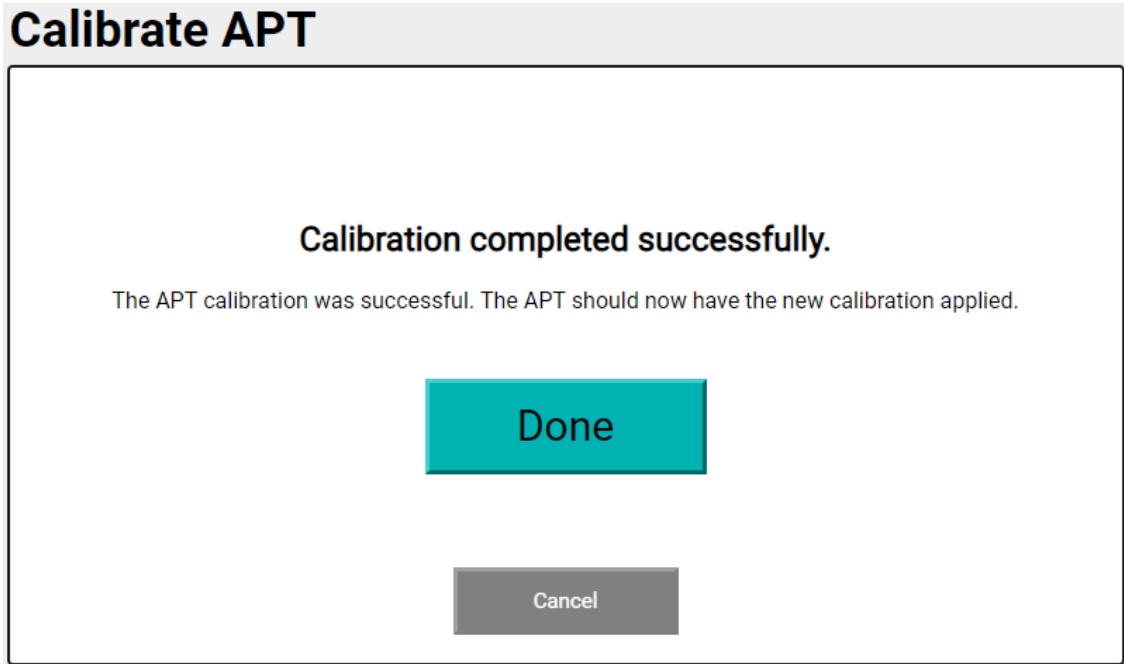
Once the APT1000 has stored this pressure point the VPM4300 will request that the pressure for the next calibration point is applied.

Calibrate APT



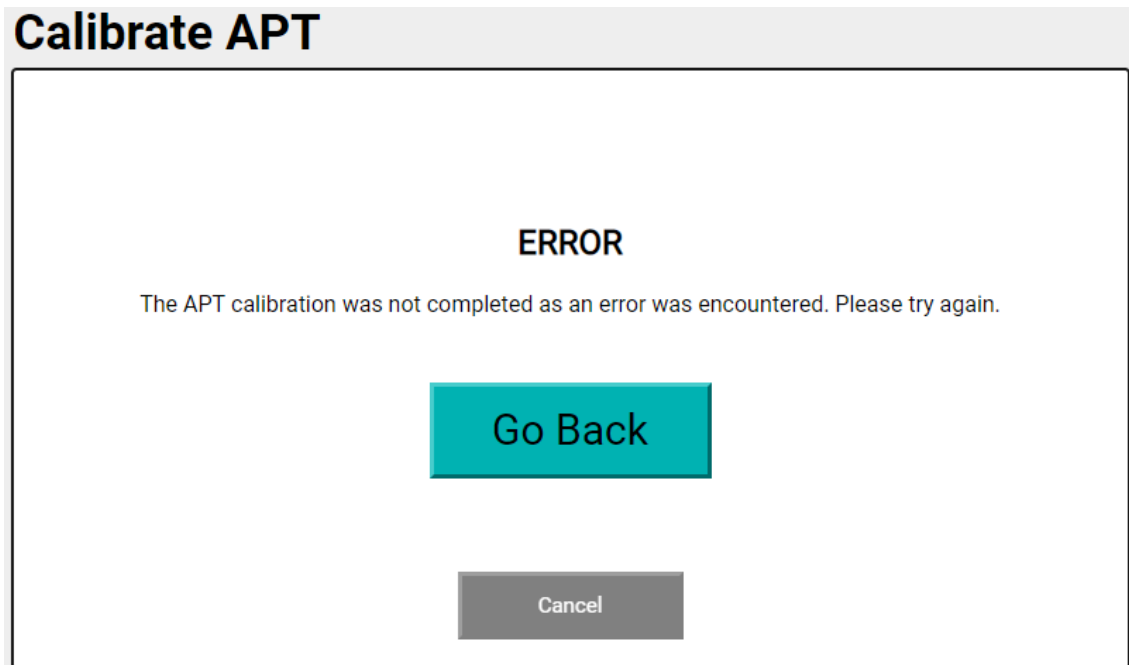
This step is repeated for all 5 calibration points by applying the requested pressure at each stage

Once the 5th calibration pressure is successfully read and stored into the APT1000 the following message will appear.



Pressing "Done" will return to the main Diagnostics menu.

Note: If the VPM4300 is unable to communicate with the APT1000 which has been selected by its ident number , or if communication fails part way through the calibration procedure the following screen is displayed.



Pressing "Done" reverts to the main Diagnostic page. Confirm by "Network Test" Section 13.1 that the APT1000 to be calibrated is present on the network

13.4 Replace APT1000

As described under the Channel Configuration section, the VPM4300 identifies the APT1000 for each channel by using its Modbus Ident . Each channel / APT1000 must therefore have a unique ident number.

Where an APT1000 transmitter requires replacement it is necessary to change the replacement transmitters Modbus ident number so that it is the same as the original unit.

By selecting the channel configuration option from the Main menu and scrolling to the appropriate channel (tank), the ident number that the replacement APT1000 must be changed to can be noted.

Note: To avoid bus contentions it must be ensured that the replacement APT1000 transmitter to be used does NOT have an ident number that is already in use on the network. By default APT1000 are manufactured with an ident number equal to the last 2 digits of their unique serial number but it is possible this may have been changed previously or a specific ident number was requested when ordered.

If there is any doubt about the ident number of the replacement transmitter, before installing it the actual ident number can be confirmed by using the Network Test function as described in Section 13.1.

To do this, temporarily disconnect the entire APT1000 network from the VPM at the RS485 port.

In it's place connect the replacement APT1000 Sensor direct to the VPM.

Enter what is believed to be the ident number of the replacement transmitter for both the start and finish address and confirm that the APT1000 responds. If it does not then repeat the Network Test again but with start address of 1 and finish address of 250 will identify the correct ident number. Note that this process will take some time while the VPM scans all Modbus addresses.

Once the ident number of the replacement APT Transmitter is known it can be changed while still directly connected to the VPM. Alternatively, if the ident number is not already in use on the network it can be installed and connected in it's intended location and the complete network reconnected to the VPM.

Once ready, on the Replace APT1000 screen enter the current modus Ident of the replacement and also the new Modbus ident required to match it to the tank it will be used for.

Replace APT

Replace an APT on the modbus network.

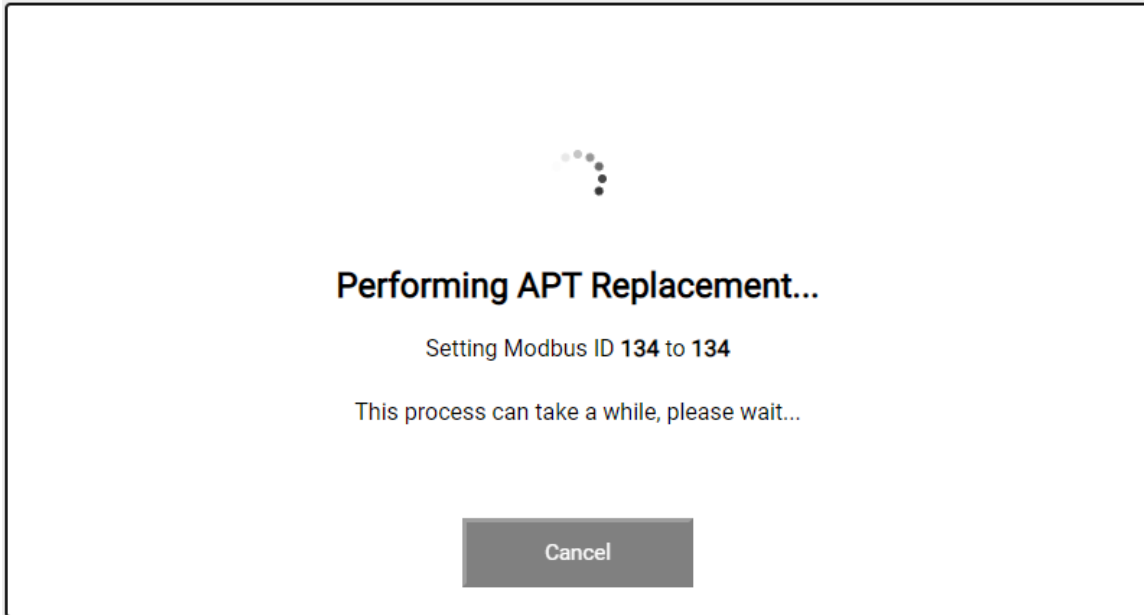
Current Modbus ID:	10
New Modbus ID:	112

Start Replacement

Cancel

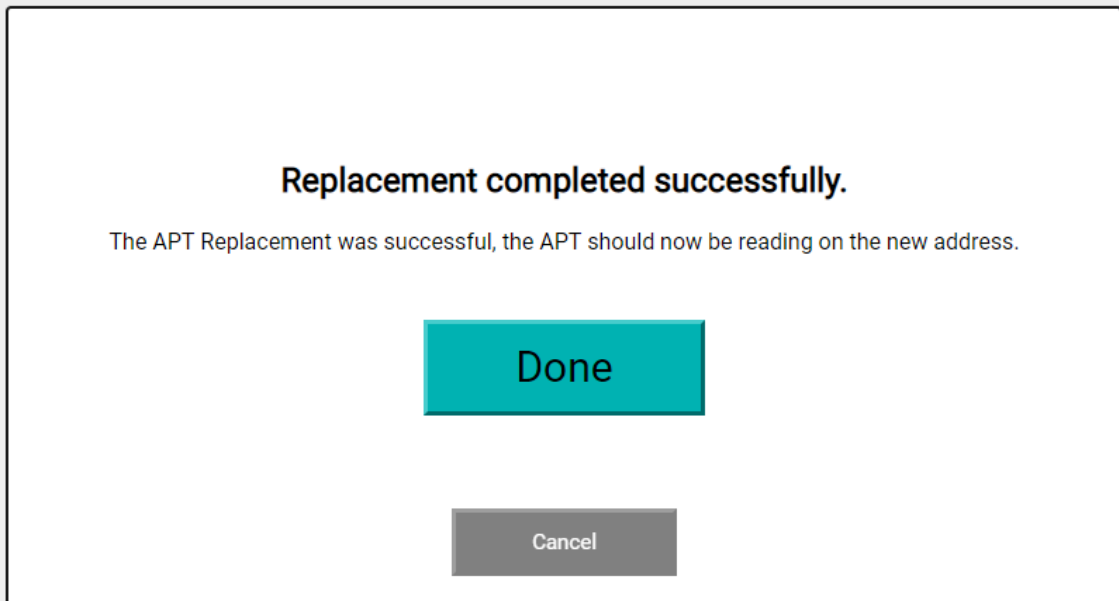
Press "Start Replacement" and screen confirms "performing APT1000 Replacement "

Replace APT

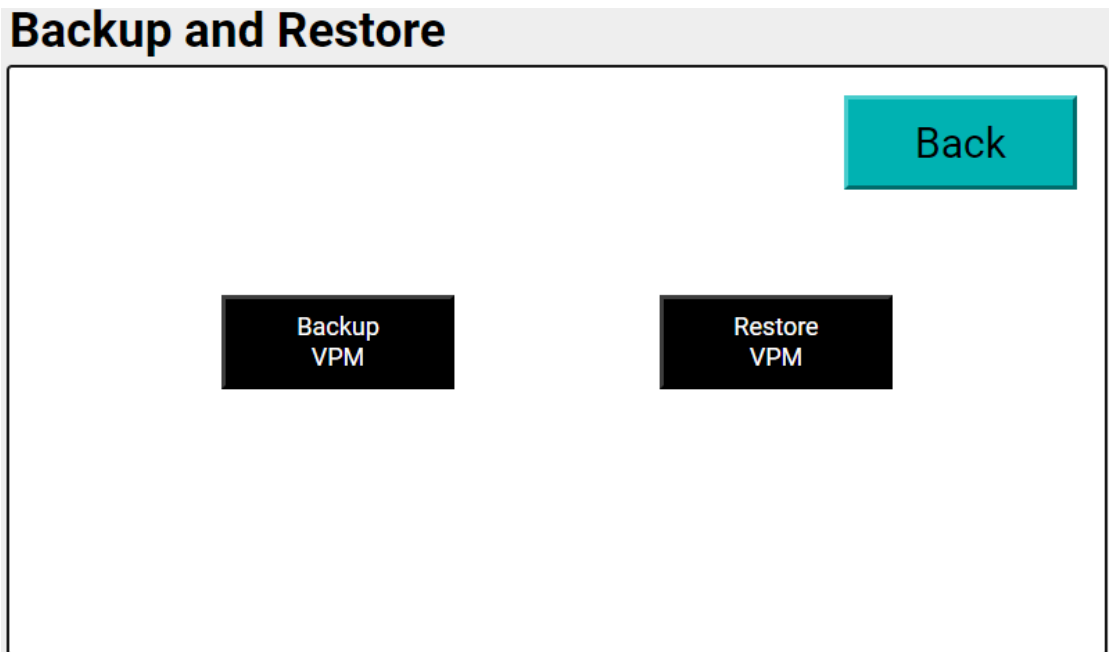


A further screen will confirm that the VPM has updated the ident number.

Replace APT



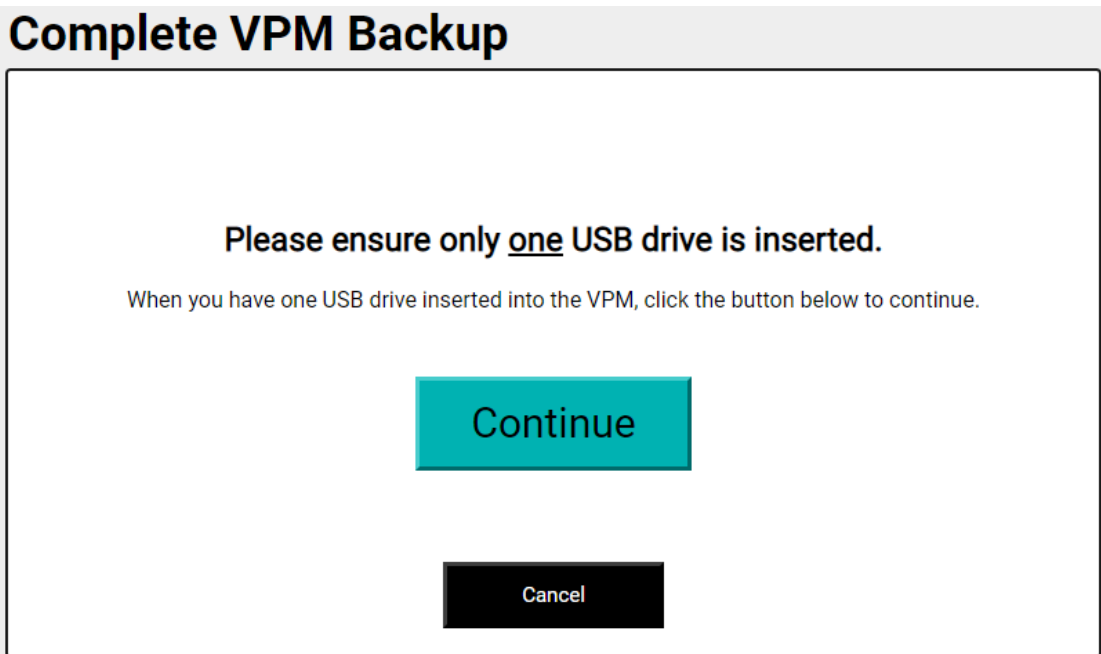
13.5 Back up and Restore



This screen enables a full back-up of the VPM4300 including the current user configuration and operating software settings

Note that this is a different function to that described in section 9.2.4 System Controls which details how the user configuration settings may be backed up or restored.

To back up the VPM temporarily connect a USB drive to one of the ports in the front panel observing the warning



Once the USB drive is connected select continue.

When the back up is completed a confirmation screen is displayed

13.7 Calibrate Touch Display

This utility enables the touch screen to be calibrated to improve precision of selection. When selected the VPM quits to a screen with a target and instructions. Follow the instructions to touch each indicated target. If the target is missed the utility will restart. Once all 4 corner points are accepted the unit will resume normal operation

13.8 Delete Touch Calibration

This function should not normally be required. Only if the above operation to recalibrate the touch screen is unsuccessful should it be used. Selecting it will cause the unit to restart (after accepting the prompt) and reset the calibration of the touch screen to default.

13.9 Restart VPM

This triggers a complete restart (power cycle) of the VPM. Be aware that the unit will power up and return to normal run mode.

14.0 GENERAL MAINTENANCE

The VPM4300 has no moving or wearing parts and requires no lubrication and as such there is no requirement for routine maintenance.

In accordance with normal good practice onboard, the unit should periodically be checked for security and tightness of mounting bolts and that all cabling remains secure.

The protective cover for the front USB ports and Status LED's must remain in place to preserve the units ingress protection rating.

15.0 FAULT FINDING

Considering the replacement modules available failure modes can be considered in 2 categories

- 1) Unit will not power up
- 2) Unit powers up and there is a display screen but there is no communication or the displayed values are incorrect.

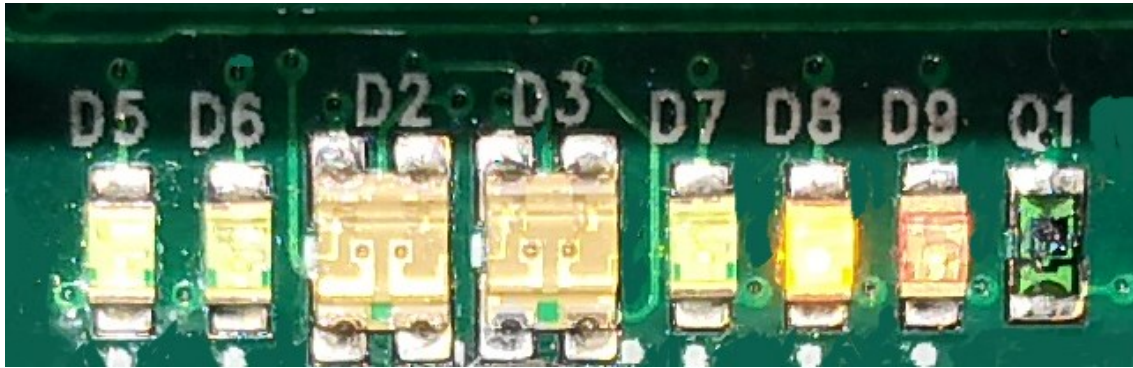
Unit does not power up

- a) Check for presence of supply voltage at the enclosure terminations and if present test at the input terminals of the Power Supply Unit. If there is power at the input terminations but not at the power supply, ISOLATE THE 220V AC supply and then check integrity of all cable connections.
- b) If 220V AC is present at the Power Supply Unit next check for a DC output from the Power Supply unit which should be 24V DC. If there is no DC output, the Power Supply Unit must be replaced. Before undertaking replacement ISOLATE THE 220V AC supply and make careful note of the correct internal wiring before disconnecting it. The PSU is held to the baseplate by screws which must be removed and retained to fit the replacement PSU. After checking all connections reapply the 220V AC supply and check for correct operation.

Unit powers up but there is no communication or displayed values are incorrect.

There are status LED's located under the protective cover on the front bezel which provide an indication of the health of various functions

Viewed left to right



Function

- D5** Main power supply:
- D6** CPU power supply:
- D2** RS-485 Channel 1 (APT1000 Network):
- D3** RS-485 Channel 2 (VPM to IPMS Network) :
- D7** Ethernet cable connection (VPM to VPM):
- D8** Ethernet activity (VPM to VPM)::
- D9** Not used

Colour

- Green OK
- Green OK
- Green RX / Red TX
- Green RX / Red TX
- Green connected
- Yellow RX / TX OK

In all cases an LED which does not show the expected condition is normally an indication of a cabling error. Cabling should be checked for integrity and to ensure there are no open circuits or shorts between conductors or ground.

In addition

In normal run mode check for the presence of the onscreen red ERROR button. Press the button for an indication of the detected error(s). Refer to Section 7.10 Run Mode Display - Error.

Observe the screen to see if any communication error messages are present on the channel indications. These will provide an indication of where the fault may be. If communication is lost to all APT1000 transmitters then it is possibly an indication of a cable fault. Check all cabling for integrity and continuity of connections. If communication is lost to all APT1000 transmitters located in the Hazardous Areas it is perhaps an indication that the RFM-ISR protective barrier has fused, rather than a fault with the VPM4300 itself.

Note: If an RFM-ISR barrier is found to have fused then the cause of this failure must be identified and rectified otherwise simply replacing the unit may lead to the replacement unit immediately fusing. Refer to the RFM-ISR Manual for further guidance.

If communication between multiple VPM units is lost first check that the partner VPM(s) is/are powered and fully operational. If so check integrity of the interconnecting Ethernet cabling.

Where there are no communication errors showing on the display but displayed values are believed to be incorrect this may be an indication that the user settings or configuration data has been changed or has become corrupted. In this case if a back-up has previously been made it is possible to restore the original configuration. Refer to Section 9.2.4 System Controls for details of how to restore the user settings. If this does not resolve the problem then a full restore of user data and software settings can be preformed. Again this is only possible where an earlier back up is available. Refer to section 13.5 - Back Up and Restore for guidance.

16.0 EMERGENCY RESTORE

If the VPM4300 is evidently powered but not operating at all there is a further method which can be attempted.

Caution: This procedure replaces the internal primary SD card which carries the VPM4300's operating software and all application specific data. It will leave the VPM4300 with no means of performing its routine automatic back up of data to the secondary SD card and so must be considered as a temporary fix. The Secondary SD card must be replaced with a suitably set up card as soon as possible.

Note: As detailed below the VPM4300 performs an automatic regular back up its the internal primary SD card to the secondary SD card. This back up includes saving of any manually entered changes made by an operator to the specific configuration data for the application. This will mean that if the issue being investigated is due to incorrect configuration data then this incorrect data will have been copied across to the secondary SD card. Therefore, substituting the primary card with the secondary card will not resolve incorrect configuration. This procedure should only be used then where the VPM4300 fails to operate at all.

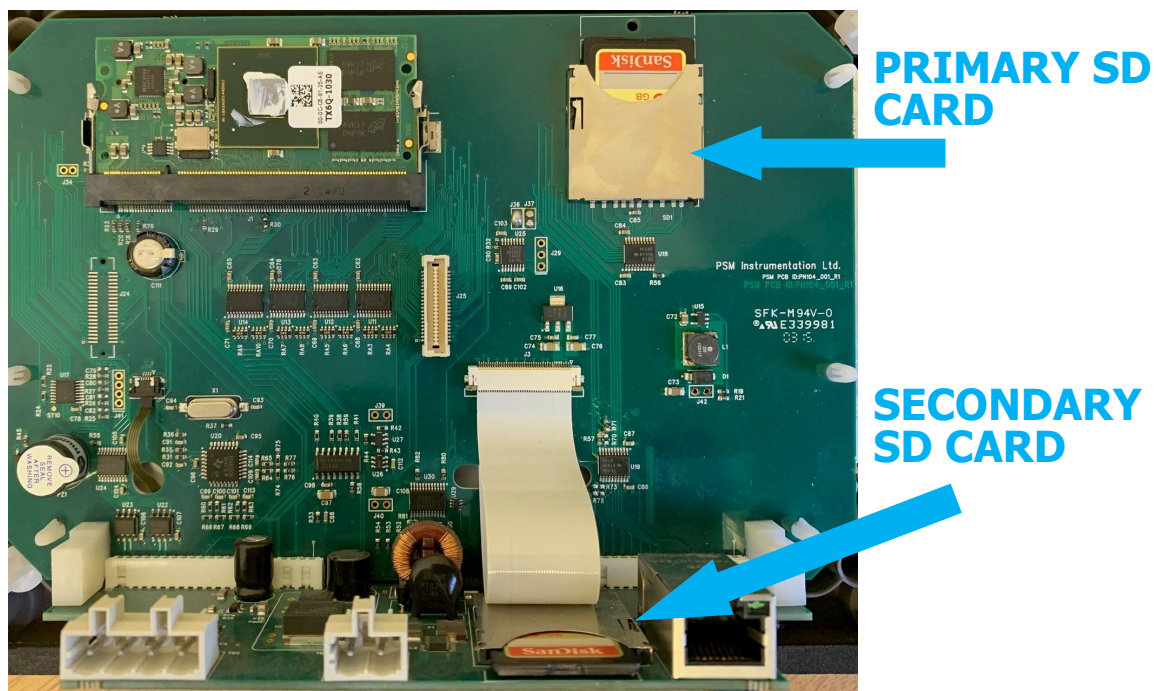
Caution: This method requires some disassembly of the VPM4300 to access a secondary SD card slot and so must only be undertaken by suitably qualified personnel. The VPM4300 must be completely isolated from the power supply before any disassembly is undertaken.

Caution:

Note: Replacement SD cards must have the following minimum specification 16 GB capacity Class 10, 90 MB/s Read, 40 MB/s Write.

They must also be set up with the same version of operating software as the primary in use has.

The VPM4300 is equipped with two SD cards located as shown of the following image



The internal primary SD card holds the operating system, VPM4300 software, and a database file holding application specific configuration.

In normal use the VPM4300 boots from and uses this card.

The secondary SD card is fitted to a slot which is accessible from the rear of the unit, and also

contains the same versions of operating system and VPM4300 software.

The database file holding specific application data is created and saved to the primary card when the unit is initially set up.

When the unit exits configuration mode and returns to Run Mode a 60 second countdown is started. After 60 seconds, this database file is also backed up to the secondary SD card.

This back up stage is indicated on the Run Mode display by the "Main" button.

While the unit is performing the back up this button is disabled and reads '...'. This process will take only a few seconds depending on the size of the database being backed up.

This process is automatically repeated each time the VPM4300 is put into Configuration Mode and then exited to Run Mode, ensuring that the secondary SD card has a copy of the latest configuration database.

To replace the primary SD card with the secondary card proceed as follows, omitting relevant steps if the unit is not mounted within a secondary enclosure,

- 1) Power down the VPM4300 and isolate the AC supply. Disconnect the plugs in the rear of the display for
 - (i) the RS485 connection
 - (ii) the 24V DC supply
 - (iii) the ethernet connection
 - 2) Locate the 4 white retaining clips at each corner of the back cover. Compress the retaining spring on these clips which will enable the back cover to slide off. Note that the relay card located on the back cover does not need to be removed, it will unplug as the cover is removed.
 - 3) The primary internal SD card is secured in place by a retaining pin. Remove the retaining pin and gently press the SD card into its holder to activate the spring release. The secondary SD card has a cover which must be rotated away from the card to allow its release.
 - 4) Replace the primary card with the secondary card by gently pressing it into the slot until the spring clip engages.
 - 5) Do not fit the original primary card to the secondary slot but retain safely. If a fresh SD card with a copy of the same version of Operating System and VPM software is available this should be installed. Check the labeling to ensure both cards have the same versions
 - 6) Replace the retaining pin on the primary card and cover on the secondary card.
 - 7) Reattach the back cover to the white retaining clips ensuring that the relay card is correctly located in its socket.
 - 8) Reconnect the plugs for the RS485, DC power, and ethernet cables.
 - 9) Reconnect the AC supply. The VPM will boot up and check for the presence of a back up of the configuration database on the installed card and restore from this. Once restored the VPM will automatically restart and enter normal Run Mode.
- Once the unit is in normal Run Mode it can be established if the original issue is now resolved.

Note: If the secondary SD card is not refitted the ERROR button on the Run Mode display will be displayed when re-entering Run Mode. The error log will record "2nd SD Card Error". This does not prevent normal operation but a replacement with the same operating software version as the primary SD card should be fitted as soon as possible.

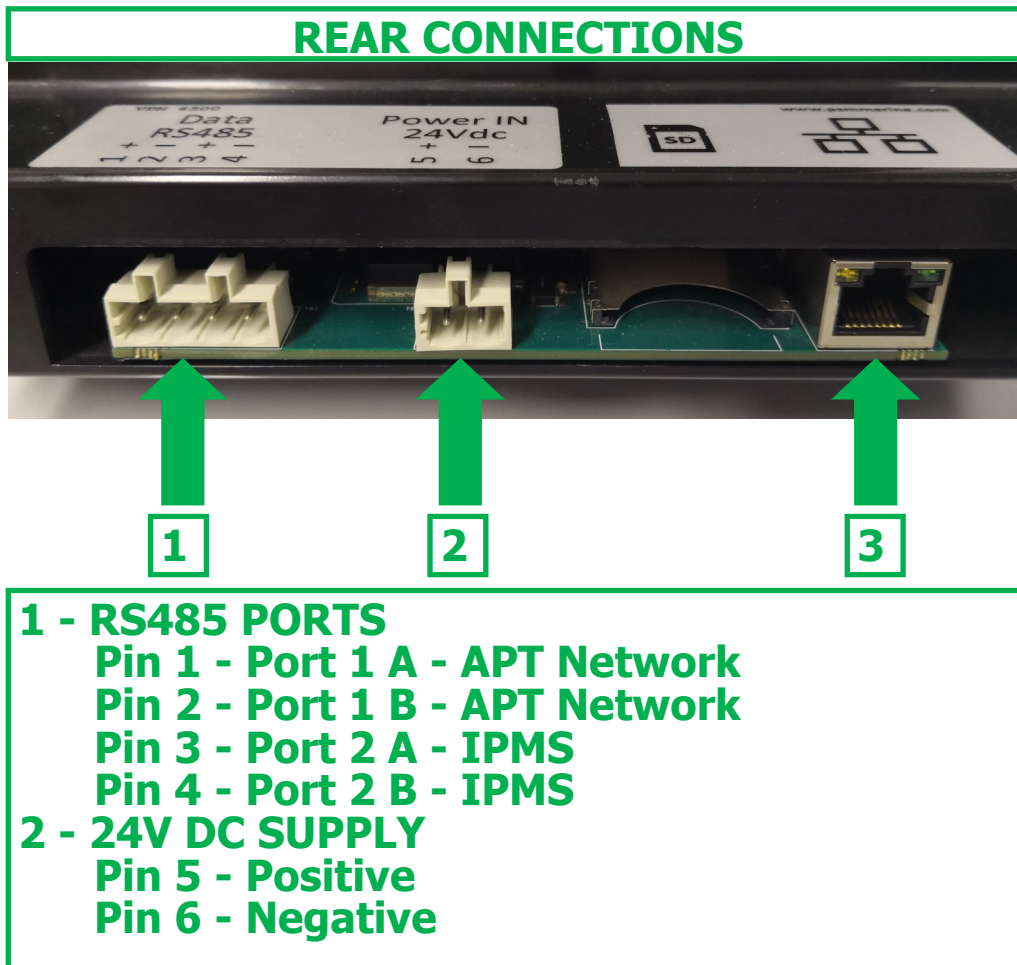
This error message will be displayed each time the VPM exits Configuration Mode into Run Mode and also logged in the error log. It will only cease when a valid SD card is again inserted into the secondary slot.

SD Card Labelling

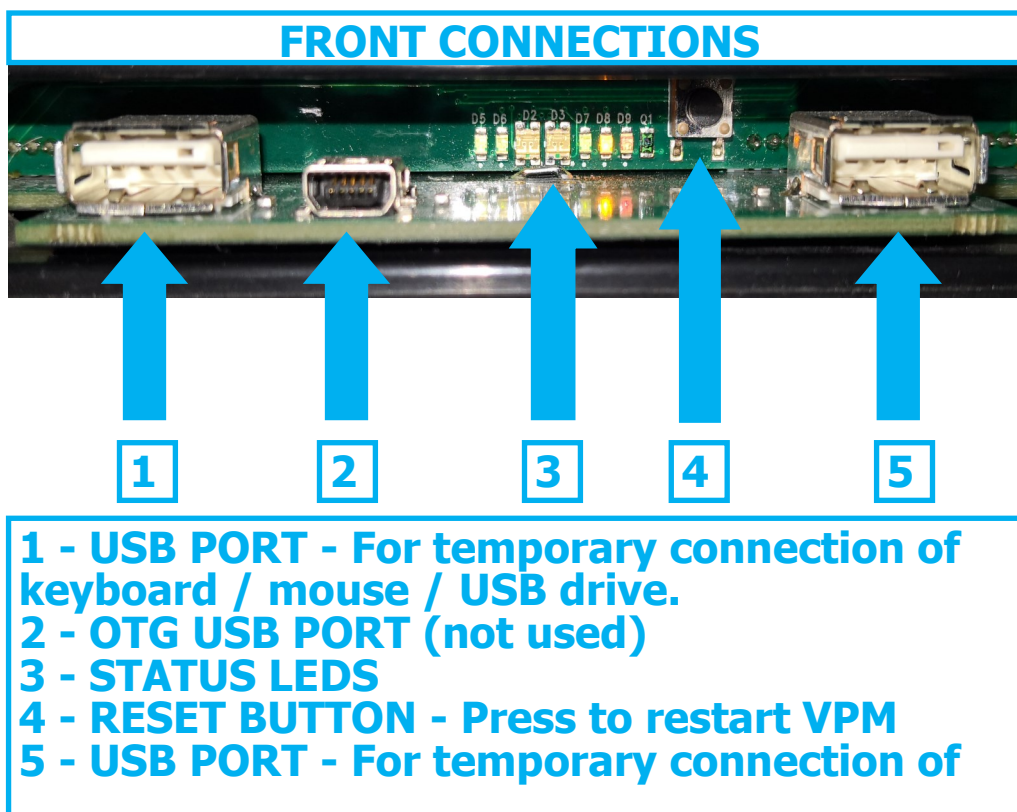
The version of Operating System and VPM Firmware is identified on the SD card label. When fitting a replacement secondary SD card it must be confirmed that it is identified with the same Operating System and VPM Firmware versions.

17.0 DRAWINGS

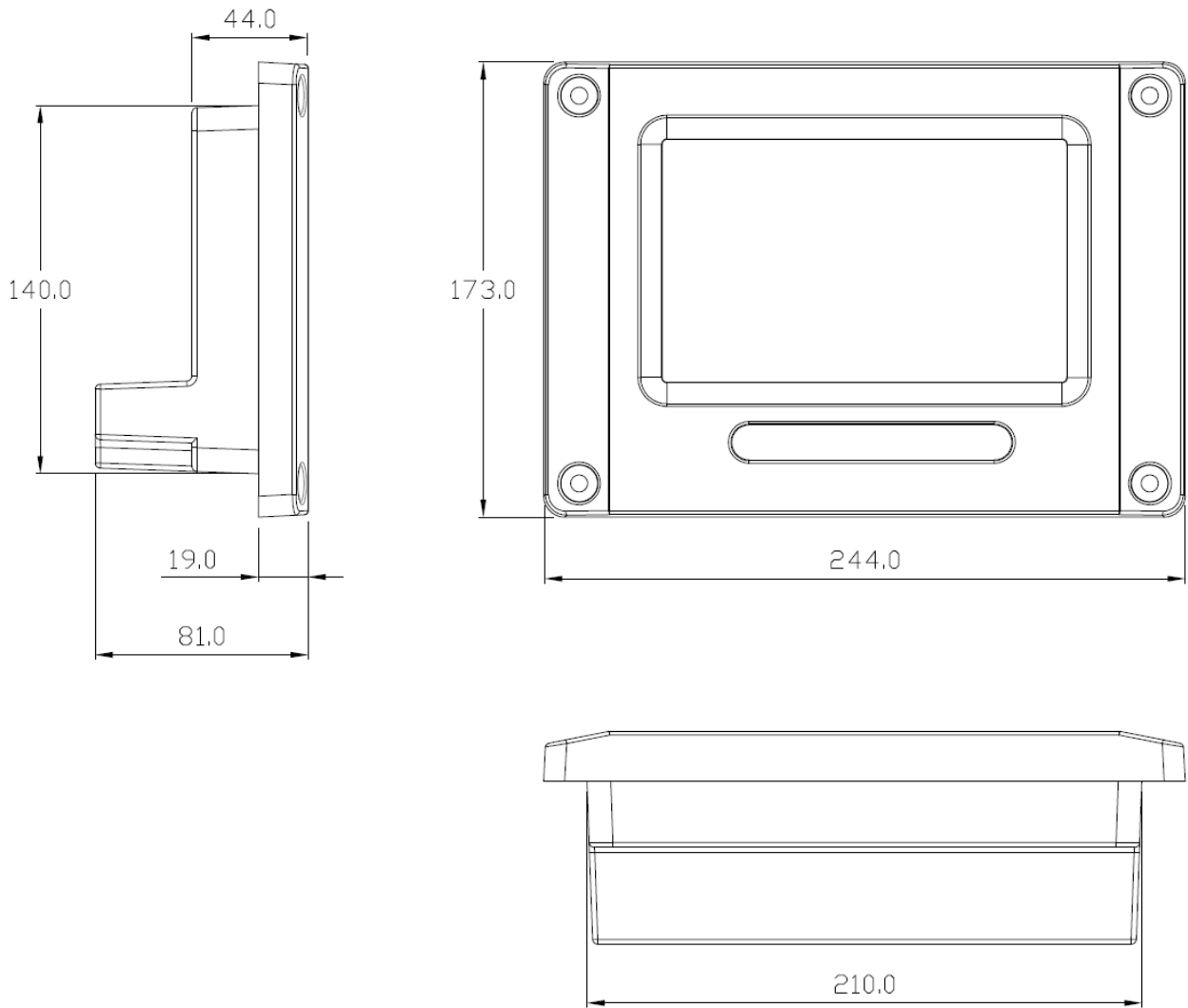
17.1 Rear Panel Connections



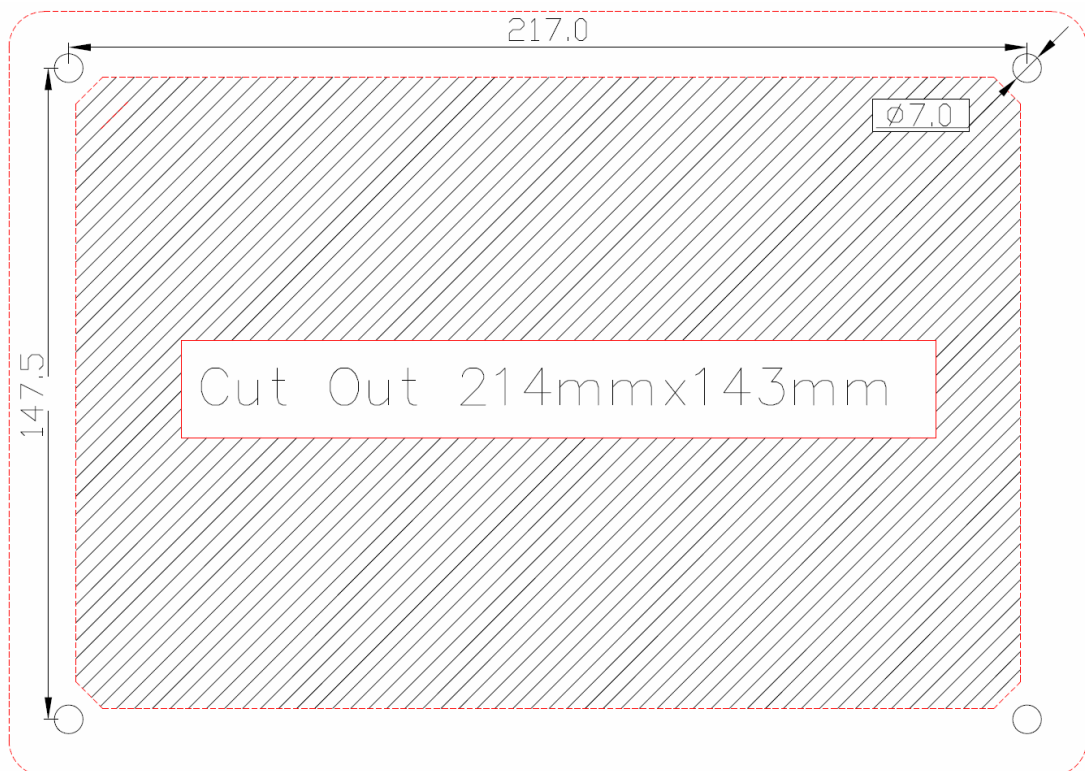
17.2 Front Panel Connections



17.3 Outline Dimensions



17.4 Panel Cut-out dimensions



ANNEX A VPM OUTPUT PROTOCOL

The VPM4300 can be configured to provide a serial data output from one of its 2 RS485 Data ports. This serial output is based on the Modbus RTU protocol and provides a consolidated packet which contains the specified data. The VPM4300 acts as a Modbus Slave and responds to commands from a remote Master device.

For communication with a Master device the appropriate RS485 port must be set up as follows:-

Port: Select the Communication Type as IPMS

Baud rate: Set both VPM and Master to either 9600 or 19200

Data Bits: Set as 8

Stop Bits: Set as 0

Parity: Set as None

Refer to Section 9.2.1 of this manual for guidance on port settings.

The type and order of data registers that the VPM uses to construct the overall data packet is defined by the configuration settings. This is fully detailed in this manual in Section 9.2.3 -

External Data Exchange

It is possible to select in the "Data order" settings from the following data types

Volume

Level

Percent Full (Volume)

Draught

Unit Status

For the first 3 data types, (volume, Level, % full) it is then also possible to set "Channel order". This determines the order in which the channel information is transmitted for each of the above data types.

Draught settings have a fixed order as follows: -

Forward Draught

Aft Draught

Portside Draught

Starboard Draught

Trim - Note: sent as a 15 Bit Number and 1 Bit for Sign.

Heel - Note: sent as a 15 Bit Number and 1 Bit for Sign.

Note, the availability of this data will depend upon whether the VPM is actually set up to measure and calculate draught parameters.

Units Status is also a fixed format output. It consists of 2 Bytes of data which provide information on any errors the VPM has detected in local communication or internal memory. There are 2 choices for the format of these status bytes which are fully detailed in Section 9.2.3 - External Data exchange - Status Byte Settings.

Note: for the majority of applications the setting for Status Byte will be "Normal"

There is one further setting described in Section 9.2.3 "Channel Error Settings" This allows entry of a specific value which the VPM will send in the event that it is unable to read the relevant transmitter to calculate a particular channels values. If it is left blank the VPM will continue to send the last valid data but if a value is entered this will immediately replace the last valid value. Any value which is entered should be one which cannot occur in normal operation. This will alert the Master device that data is lost on the channel.

Note that this value will be transmitted for all Volume, Level, Percent, and Draught values where the VPM cannot calculate a valid reading. For the Draught parameters loss of any one Draught measurement will mean the VPM is unable to calculate actual values and so all will be transmitted as the error value.

Construction of the data packet

As described above the content of the data packet is defined by the VPM configuration. As a simple example:-

If Data Order is set as Tank Volume then Tank Percent then Status Byte

And Channel Order is set as Ch 1 then Ch 3 then Ch2

The resulting Modbus Map (all holding registers, starting from address 1) would be:-

- 1: Ch 1 Tank Volume
- 2: Ch 3 Tank Volume
- 3: Ch 2 Tank Volume
- 4: Ch 1 Tank Percent
- 5: Ch 3 Tank Percent
- 6: Ch 2 Tank Percent
- 7: Status Byte

All data values are sent as a single un-signed 16 bit integer (range 0 to 65535), and are stored as a single word in the Modbus map.

The exception to this are values for Trim and Heel which are signed 16 bit integers (range – 32768 to 32768)

All values are represented to 0 decimal places, i.e. integer value EXCEPT for Heel, which is multiplied by 100 to give a result to 2 decimal places. This means that the value for Heel will require dividing by 100 by the IPMS to get the true value in Degrees.

The register is transmitted with most significant Byte first.

The Status Byte has the meaning assigned according to the settings detailed earlier in this annex.

Interrogation of the VPM

Communication between the Master and Slave VPM follows Modbus standard protocol. The standard function code FC03 - Read holding Registers an example of which is given below

Request: This command is requesting the content of analog output holding registers # 40108 to 40110 from the slave device with address 17.

11 03 006B 0003 7687

11: The Slave Address (11 hex = address17)

03: The Function Code 3 (read Analog Output Holding Registers)

006B: The Data Address of the first register requested.

(006B hex = 107 , + 40001 offset = input #40108)

0003: The total number of registers requested. (read 3 registers 40108 to 40110)

7687: The CRC (cyclic redundancy check) for error checking.

Response

11 03 06 AE41 5652 4340 49AD

11: The Slave Address (11 hex = address17)

03: The Function Code 3 (read Analog Output Holding Registers)

06: The number of data bytes to follow (3 registers x 2 bytes each = 6 bytes)

AE41: The contents of register 40108

5652: The contents of register 40109

4340: The contents of register 40110

49AD: The CRC (cyclic redundancy check).