



PSM INSTRUMENTATION LTD

VPM 4310
Integrated Tank Gauging System
Installation & Operation Manual

Burrell Road Industrial Estate
Haywards Heath, West Sussex RH16 1TW, UK
Tel: +44 (0)1444 410040 Fax: +44 (0)1444 410121
www.psmmarine.com E-mail: sales@psmmarine.com

MAN 082 Iss B Jan 2016

2. About the VPM 4310 integrated tank gauging system

2.1 Powerful, versatile, simple to use and cost effective

VPM 4310 is an integrated system that provides the user with a clear picture of the current status for a complete tank gauging solution.

Level measurement readings are made by PSM ICT 1000 smart hydrostatic level transmitter using Modbus serial communications to the VPM 4300.

Display and alarm functionality is provided by the VPM 4300 operator panel, a compact touch-screen HMI module running the tank gauging and control software.

Each level transmitter input is represented by a graphical Tank Object which shows the current status in both graphical bar graph and numeric format. Numeric values such as level, volume and alarm status are displayed according to the configuration supplied at time of order.

2.2.1 Notes about this manual

Incorrect function or damage to associated equipment may occur if VPM 4310 is not used in accordance with this manual. The information in this manual may be highlighted by the following symbols indicating that special care should be taken when performing these associated actions.



A hazard indicates actions or procedures which if not performed correctly may invalidate safety certification.



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



A note indicates that further information or functionality is available.

2.2.2 Scope of this manual

This document describes the mechanical, electrical connection and user operator for the VPM 4300 operator panel and VPM xx10 tank gauging software only.



Refer to MAN 049 for installation and operation of the ICT 1000 level transmitters and other associated components such as power supplies, RFM ISR network safety barrier modules and RFM 1 & RFM 4 network connection modules.

2.3.1 Safety instructions

To prevent any damage to the device or any injury to the user it is essential that you read the information in this document and observe applicable national standards and safety requirements.

This document is provided to help facilitate the safe and efficient operation of the instrument.

2.3.2 Product liability and warranty

All apparatus is carefully examined and tested before shipment and is sent out in perfect order and condition. We, therefore, give the following Guarantee which takes the place of any Guarantee by Statute, common law or otherwise. If within 12 months from date of despatch, any defect or fault is discovered in any component of our manufacture, due to faulty material or bad workmanship, we undertake to make good the defect without charge, provided that notice is given to us immediately on the discovery of the defect and the defective components or parts thereof, are forwarded to us carriage paid for inspection. This guarantee does not apply to defects caused by ordinary wear and tear, misuse, neglect, or by circumstances over which we have no control.

***Full terms and conditions are available from our website:
www.psmmarine.com/about-us***

2.3.3 Scope of delivery

Inspect the packaging and immediately report any signs of damage to your local agent or PSM Instrumentation.

Check the delivery note to ensure you have received the correct instrument(s).

2.3.4 Storage

- Store the instrument in a dry location
- Storage Temperature range -20°C to $+80^{\circ}\text{C}$

2.3.5 Instrument identification

Each instrument is marked with a unique serial number and model code, that identifies type and construction options. This takes the form 123456(78)

2.3.6 Operations and maintenance

There is no routine maintenance required for the ICT 1000 or RFM modules , other than an occasional check to ensure all wiring/cable glands are in good condition

For the ICT 1000 periodically check that the measurement cell is free from contamination. See MAN 049 for details.

2.3.7 Instrument return

All equipment is carefully examined and tested before leaving the workshop and is sent out in perfect order and condition.

Should it prove necessary to return any equipment for inspection, please ensure you follow the process:

- Contact PSM for an RVN form and number
- The equipment must be accompanied by an RVN with clear instructions as to the reason for return and what actions are requested.
- An explanation of the apparent fault together with details of the service conditions are also required.
- Health & Safety requirements mean that we must be fully aware of any potential hazards prior to working on returns.

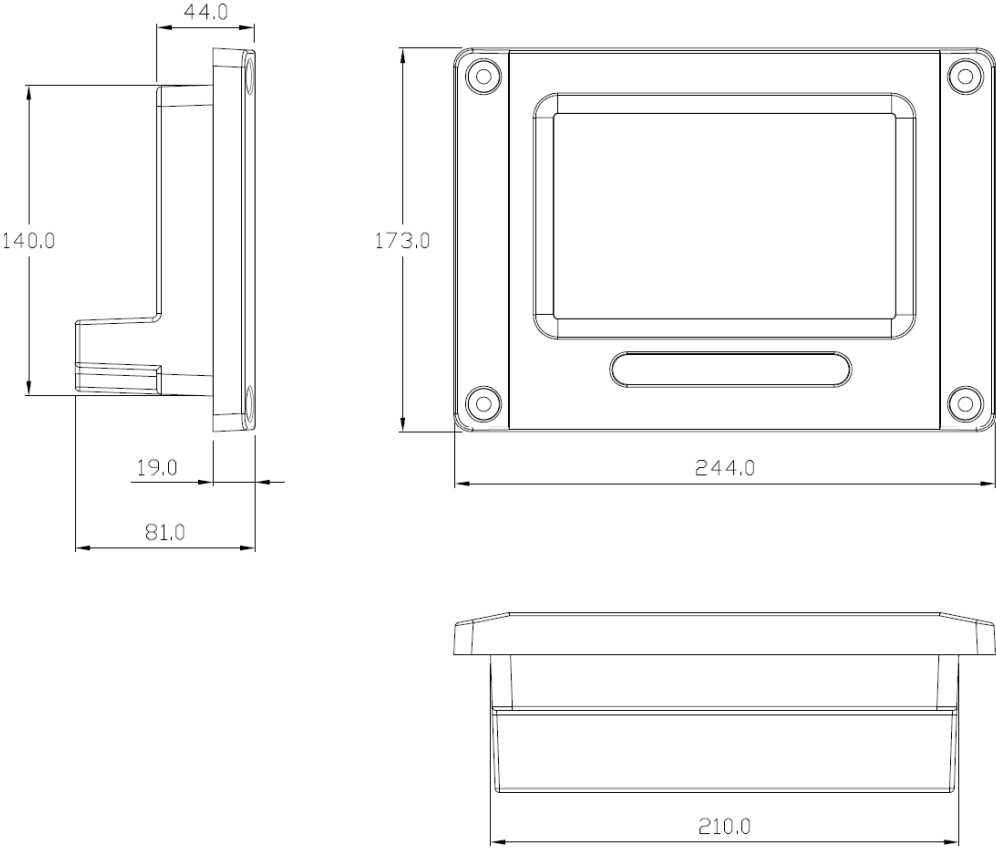
2.3.8 EC Declaration of Conformity

The products detailed within this manual meet the legal requirements of the applicable EC Directives.

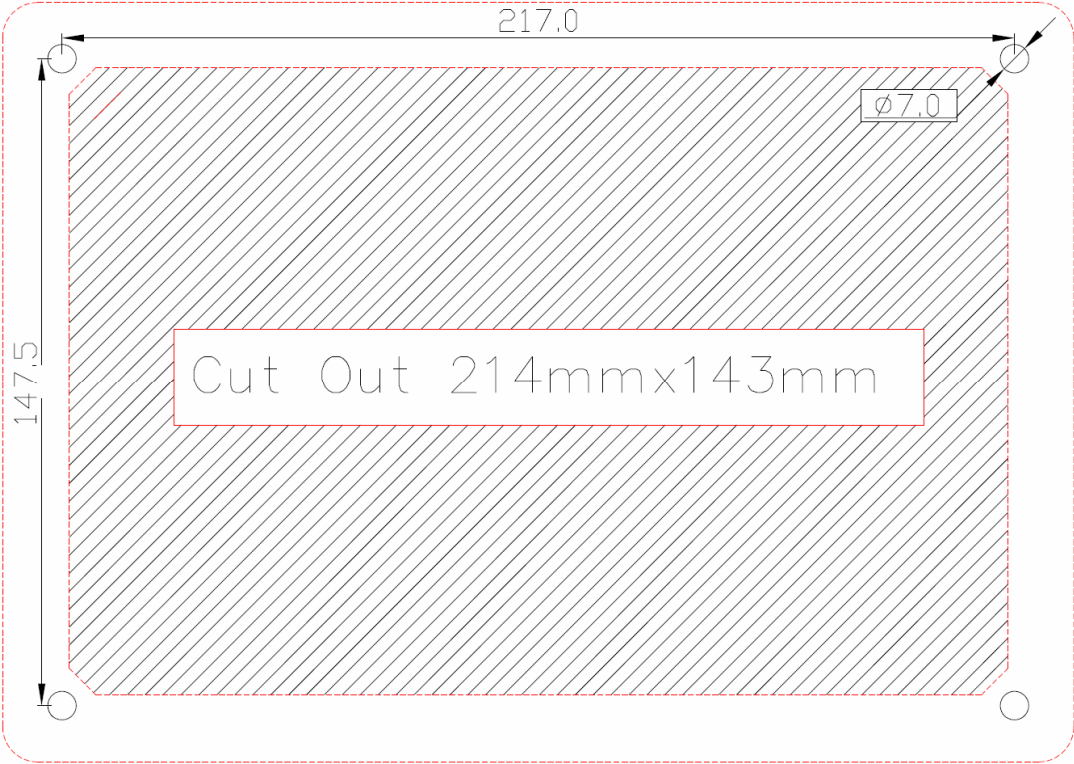
All EC Declaration of Conformities are available for download from our website www.psmmarine.com

3. Mechanical installation

3.1 General Arrangement drawing



3.2 Panel mount cut out dimensions



3.2.1 Dimensions for panel mount cut out and fixing screw hole centres

Available as a 1:1 template when printed on A4 paper size: <http://www.psmmarine.com/documentation/vpm-4300-hmi-module> in the GA drawings section

3.3 Gasket

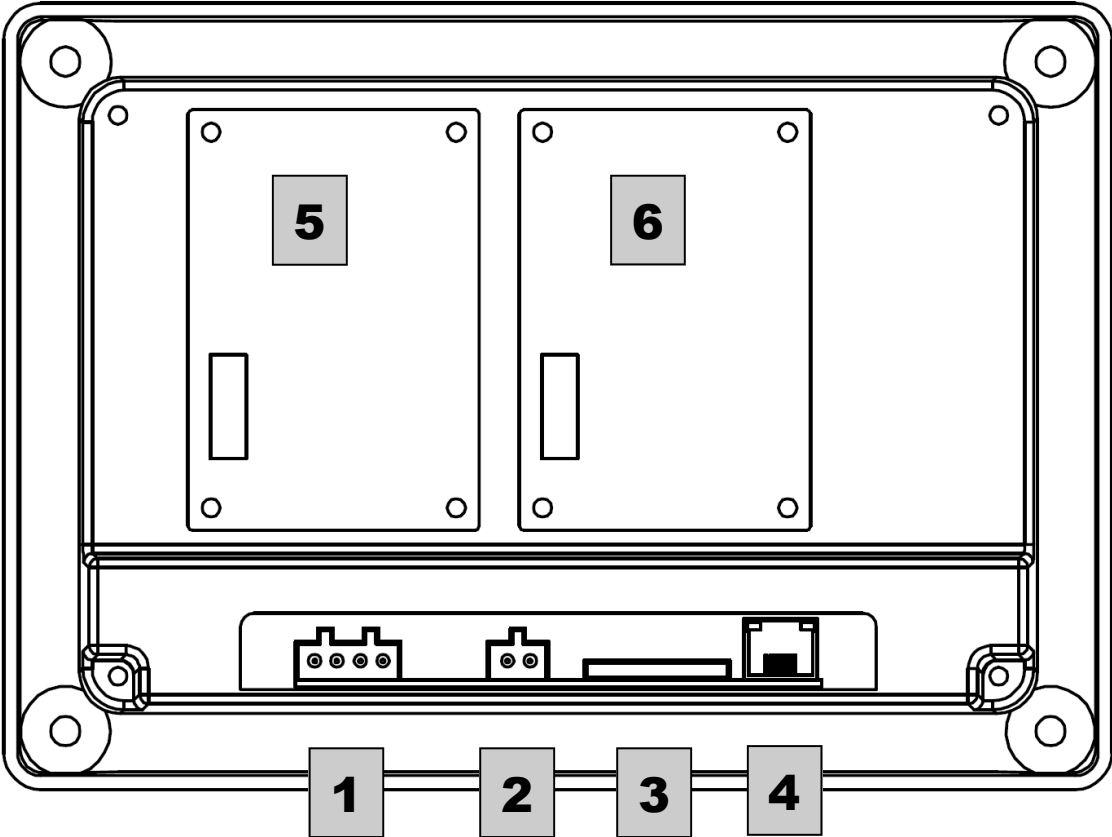
Ensure the supplied sealing gasket is fitted between mounting flange rear face and mounting panel front face.

3.4 Fixings

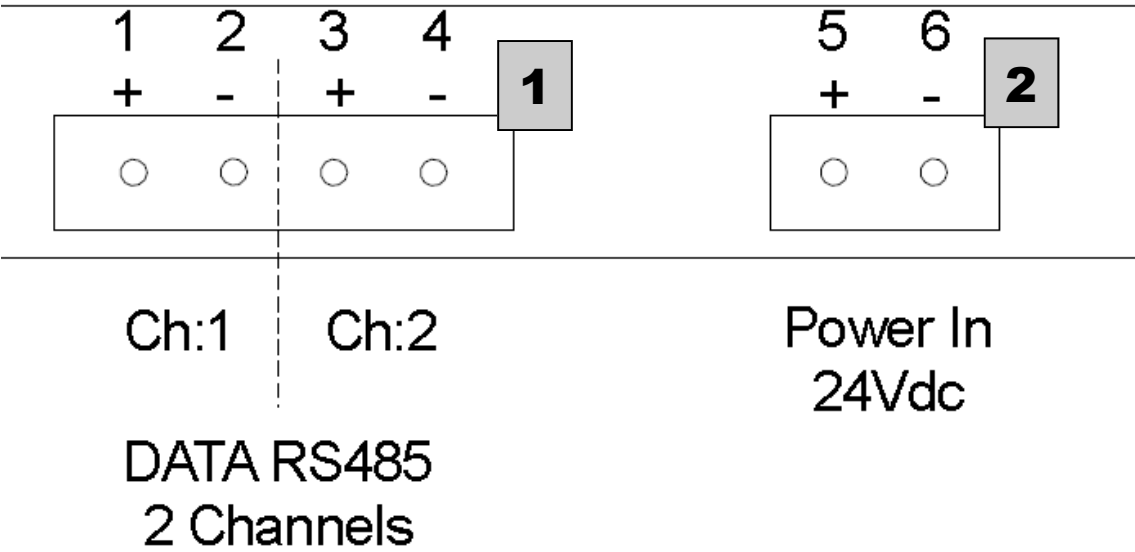
Ensure only the supplied black colour, hex button head, socket screws M6 x 30mm are used for securing into the mounting panel

4. Electrical installation

4.1 Rear panel



4.1.1 Network and 4.1.2 power supply connections



Always use the plugs supplied with the VPM 4300 for connections [1] and [2].



Otherwise damage to the socket or unreliable electrical connections may occur if other parts are used. Contact PSM Instrumentation for replacements if required.

4.1.1 [1] Modbus network connection to ICT 1000 level transmitters

Channel 1 is always used by default.

4.1.2 [2] Power supply connection

24 Vdc. Protected internal by 3A PTC resettable fuse with reverse polarity protection

4.1.3 [3] SD card slot

SD card only fitted if specified at time of order. Is used for increasing data logging memory capacity.

4.1.4 [4] Ethernet connection

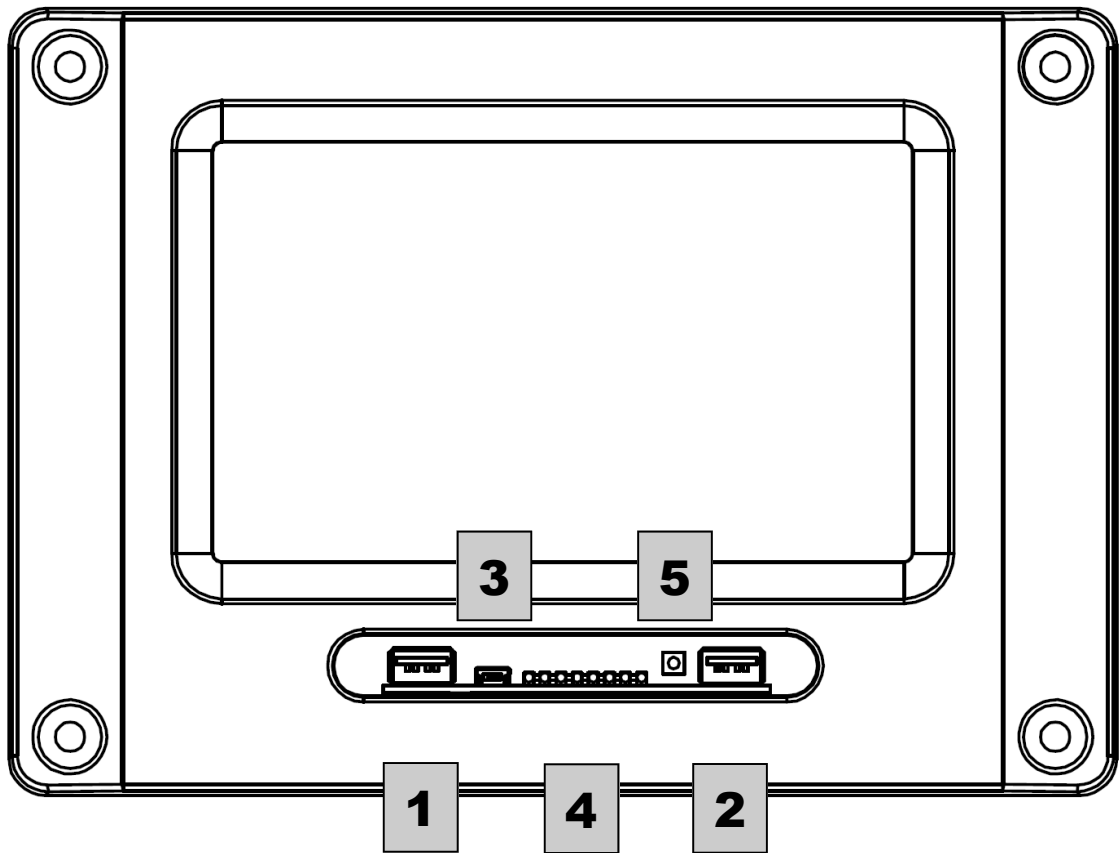
Allows the VPM 4300 to connect to other networks if required.

4.1.5 & 6 [5] & [6] Relay output modules and/or addition input and output modules

Only fitted if specified at time of order.

4. Electrical installation

4.2 Front panel



4.2.1 [1] and [2] 2.0 USB ports & 2

For connection of external keyboard, mouse and USB memory drive as required for configuration and service.

4.2.3 [3] micro USB port

To be used by PSM Service only. Cannot be used by customer

4.2.4 [4] System status LED's

See section 10 Fault finding for further details.

4.2.5 [5] System reset button

Resets the Operator Panel back through the boot routine into Run Mode. Does not change any configuration programming.

4.3 Cover for front panel connections

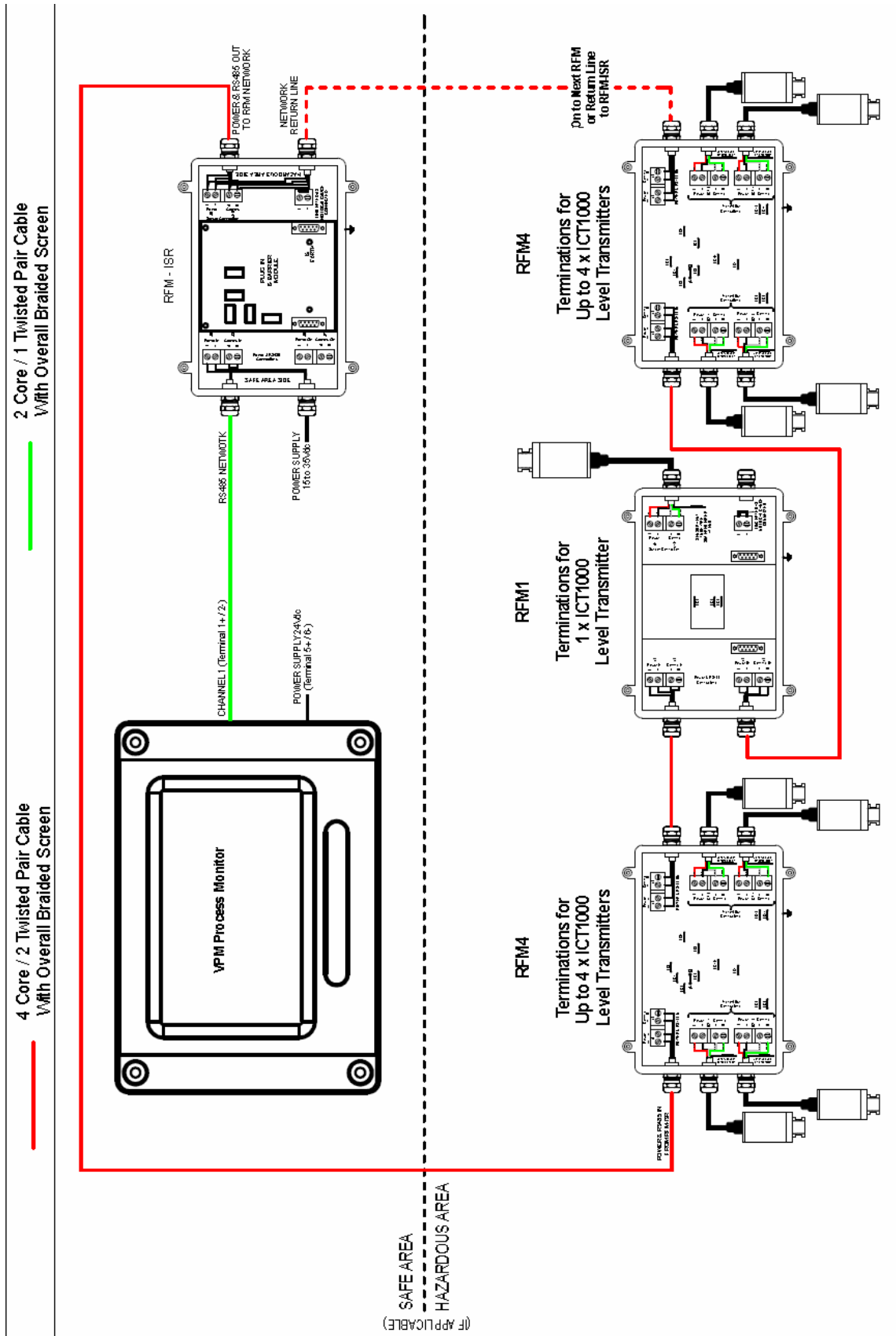
Provides access to connectors for external devices (4.2).



Ensure the cover is replaced correctly after use, otherwise IP rating of the operator panel front face may be affected.

5. Connection of ICT 1000 level transmitters

5.1 Example of complete system connection diagram



5.1.1 Each customer system will be designed and configured for the specific application.



Refer to MAN 049 for details on connection of ICT 1000 level transmitters, RFM ISR power & barrier modules and RFM 1 & 4 transmitter connection modules



The VPM4310 is not approved for use in the hazardous area and MUST be located in the Safe Area.

It can be connected downstream of the safety barrier, refer to MAN049 for details of how to deploy an intrinsically safe ICT network.

6. User interface with the HMI display

6.1 Touch screen keyboard

| | | | | | | | | | | | | | | |
|-------|------|-----|---|---|---|---|---|---|---|---|---|-------|---|------|
| Esc | ` | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | - | = | Bksp |
| Tab | q | w | e | r | t | y | u | i | o | p | { | } | \ | |
| Caps | a | s | d | f | g | h | j | k | l | ; | # | Ret | | |
| Shift | z | x | c | v | b | n | m | , | . | / | | Shift | | |
| äëö | Ctrl | Alt | | | | | | | @ | ↑ | ↓ | ← | → | |

6.2 Touch screen keypad

| | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |
| - | 0 | . |
| ← | | ↵ |
| | ■ | |


Touching the screen inside a user dialog box will trigger a touch screen entry device

6.1.1 A keyboard is shown where alpha numeric information is required.

6.2.1 A keypad is shown where only numeric information is required.

 Backspace / erase

 Return / enter

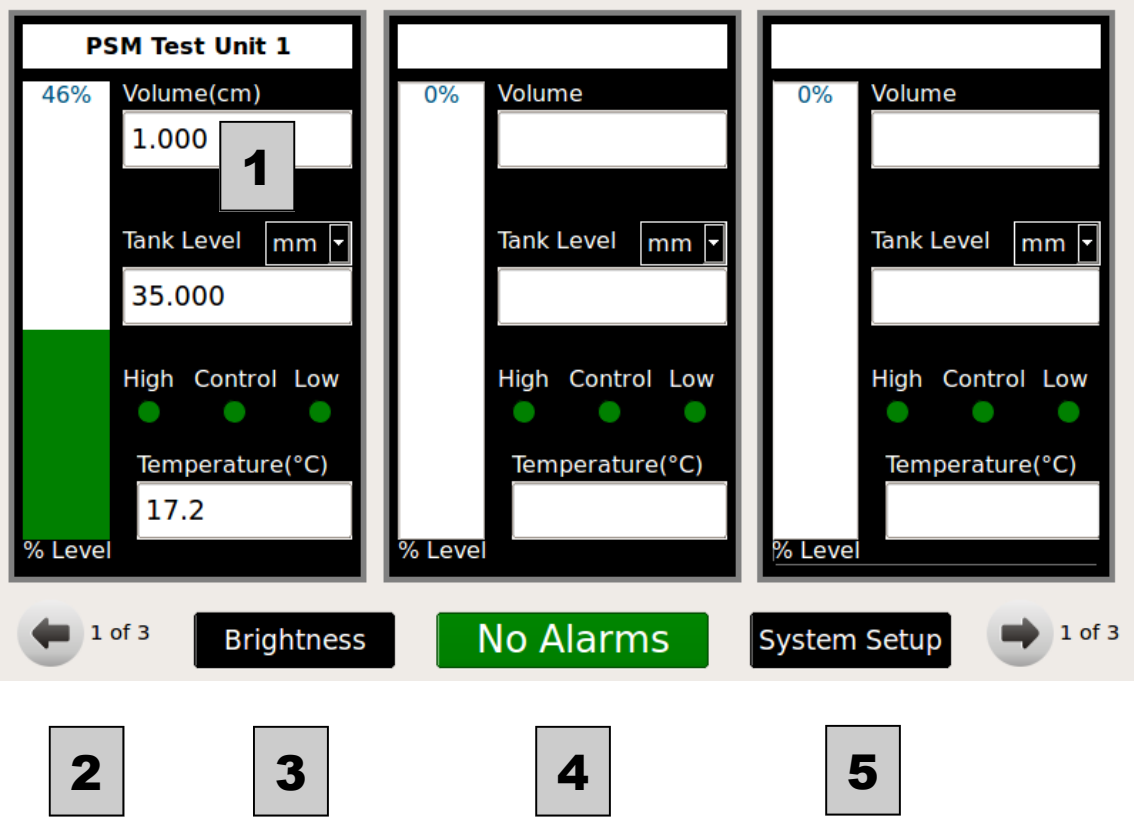
 Closes the keypad

6.3 A USB connected keyboard & mouse (4.2)

Separate keyboard and mouse can be used in both USB ports, or a keyboard with integrated mouse in either USB port

7. Run Mode

7.1 HMI display during Run Mode



Run Mode

Run Mode describes the normal operation of the integrated tank gauging system.

The system firmware is written to automatically switch into the Run Mode once the various self-checks and boot loads have completed after power is applied. It is not possible to interrupt this process.

By default, the HMI display shows three (or fewer) Tank Objects on each page, along with control icons at the bottom of the display.

7.1.1 [1] Tank Objects

A Tank Object is the term used to describe the information displayed by a specific level transmitter. This information comprises:

- Tank name / reference as the header
- Volume or level as a % bar graph
- Volume, level, and temperature as engineering units
- Alarm status (green = clear, red = active)



The layout of the HMI display and Tank Objects (including the calculation of volume based on tank dimensions) is factory programmed to match the application according to the order information. It is not possible for the user to change these. Contact PSM Instrumentation if any changes are required.

Only the Tank Level engineering unit is able to be changed using the drop down selection box.

7.1.2 [2] Previous and Next screen select

Scrolls the HMI display to alternate groups of three Tank Objects.

The VPM 4310 system is capable of displaying the measurements of maximum 15 level transmitters.

7.1.3 [3] Brightness control

Brings up a slider overlay for adjustment of the HMI display brightness. By default the display is always configured to its maximum level.

7.1.4 [4] Alarm handling

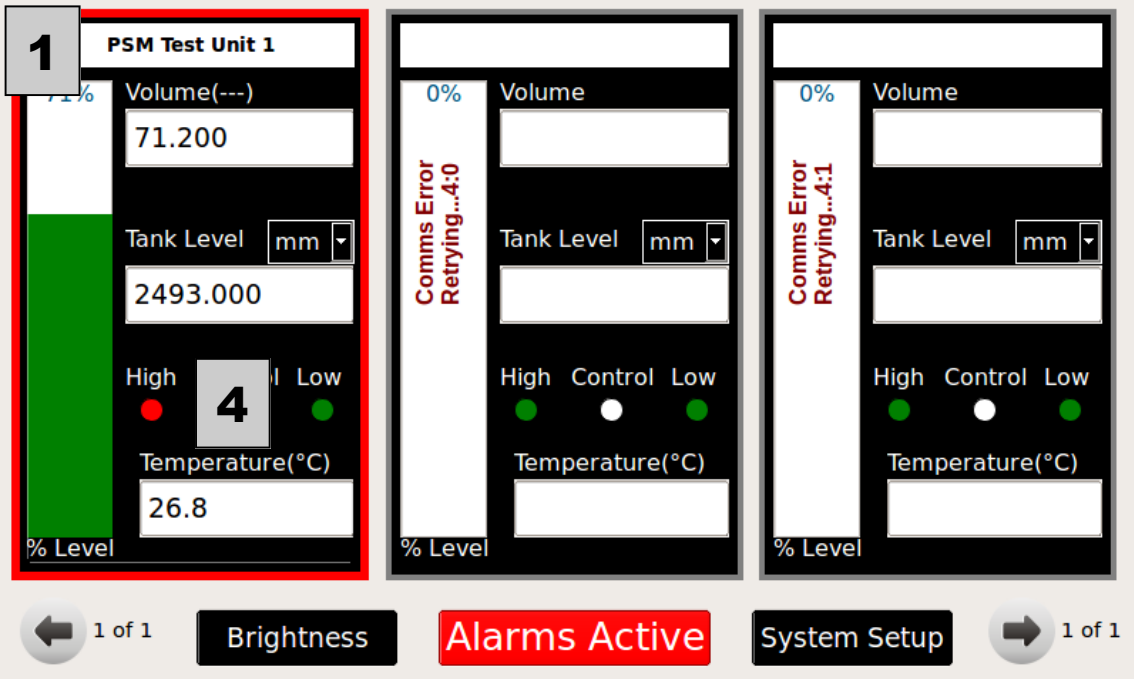
See section (8) for details to investigate and clear an Alarm condition

7.1.5 [5] System Setup

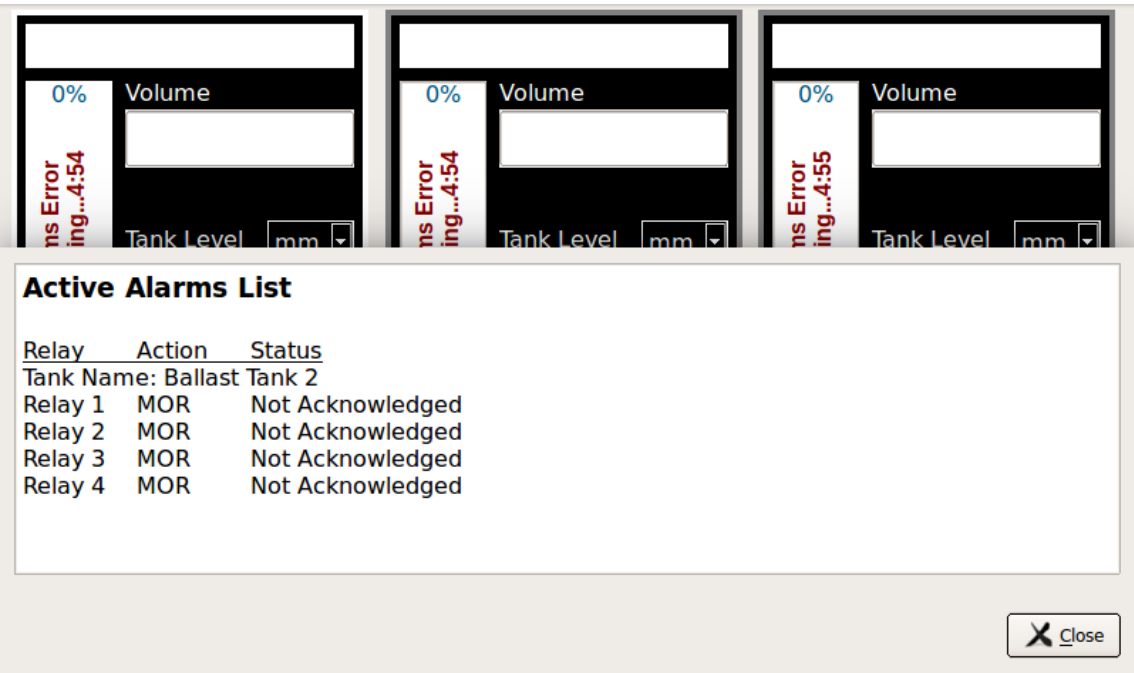
Brings up the Password screen (9) which allows access to Help, About and Diagnostic options. There is a 30 second time-out function to return to the Run Mode from this screen.

8. Alarm Handling

8.1 Notification of an alarm condition



8.2 Identification of alarm conditions



8.1.1 Alarm conditions

Are factory programmed according to the order information for each measurement object. They are typically low or high level measurement conditions (setpoints) defined as a % of the tank height.

8.1.2 User notification of alarms

If the alarm condition is triggered there are two visual indicators shown together: [1] a flashing red border around the measurement object concerned, and [2] the Alarm Status button changes from a static green colour to a flashing red colour.

Additionally, the status indicator [3] (high level or low level) will change colour from green to red to shown the nature of alarm



If the HMI display is showing other measurement objects than those associated with the alarm condition, then only the Alarm Status button will show the condition. The display must be scrolled left or right until the group of three containing specific measurement object is shown.

8.2.1 Identification of alarm conditions

Pressing the Active Alarms button (using the touchscreen or keyboard & mouse) will bring up a list of all active alarm conditions and their associated Tank Object.

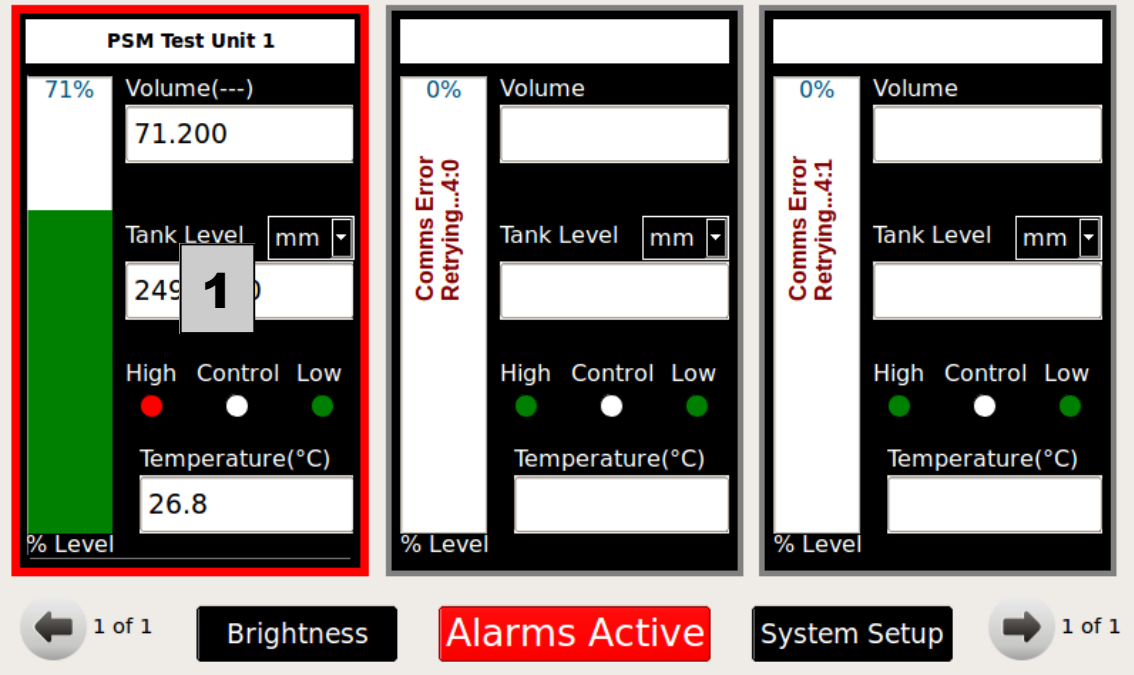
This list will also include historic alarm conditions that have been successfully acknowledged.

8.2.2 Clearing the alarm list

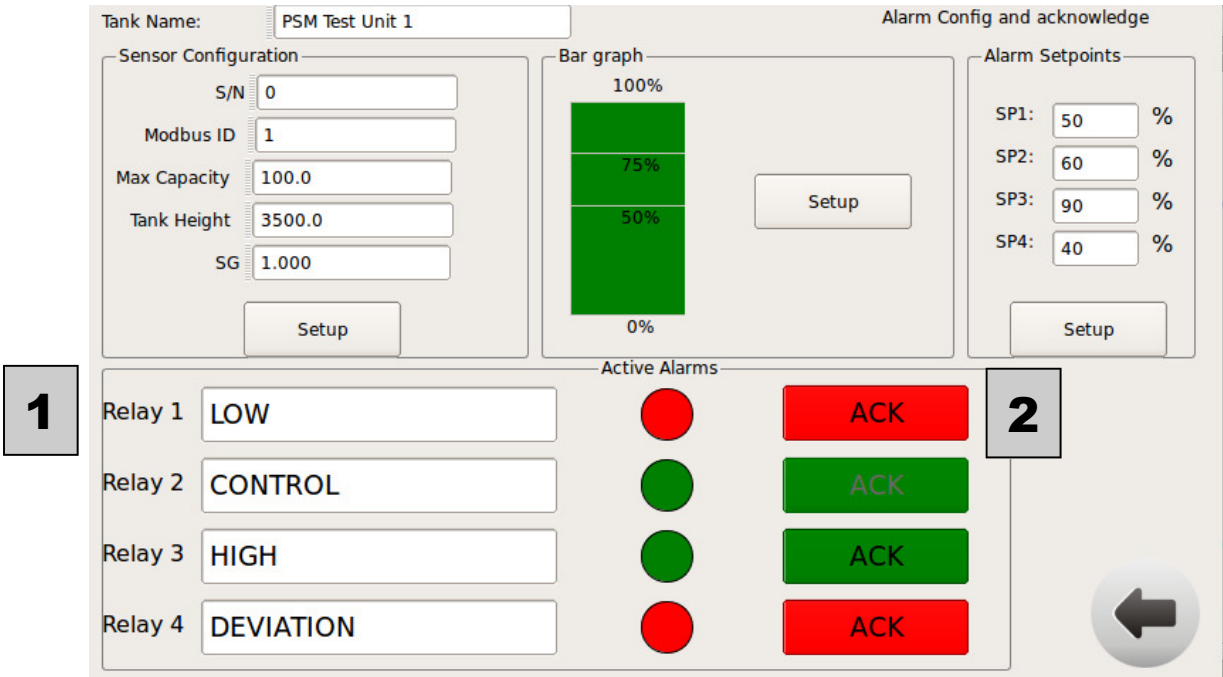
See section 8.3.

8. Alarm Handling

8.3 Notification of an Alarm Condition



8.4 Identification and Acknowledge an alarm



8.3.1 [1] Alarm conditions

Pressing anywhere in a Tank Object showing an alarm condition allows identification of the alarm type and option to acknowledge (clear) it [8.3.2].

8.4.1 [1] Identification and acknowledgement of an alarm

The type of alarm, and its associated relay output (only fitted if specified at time of order) is shown.

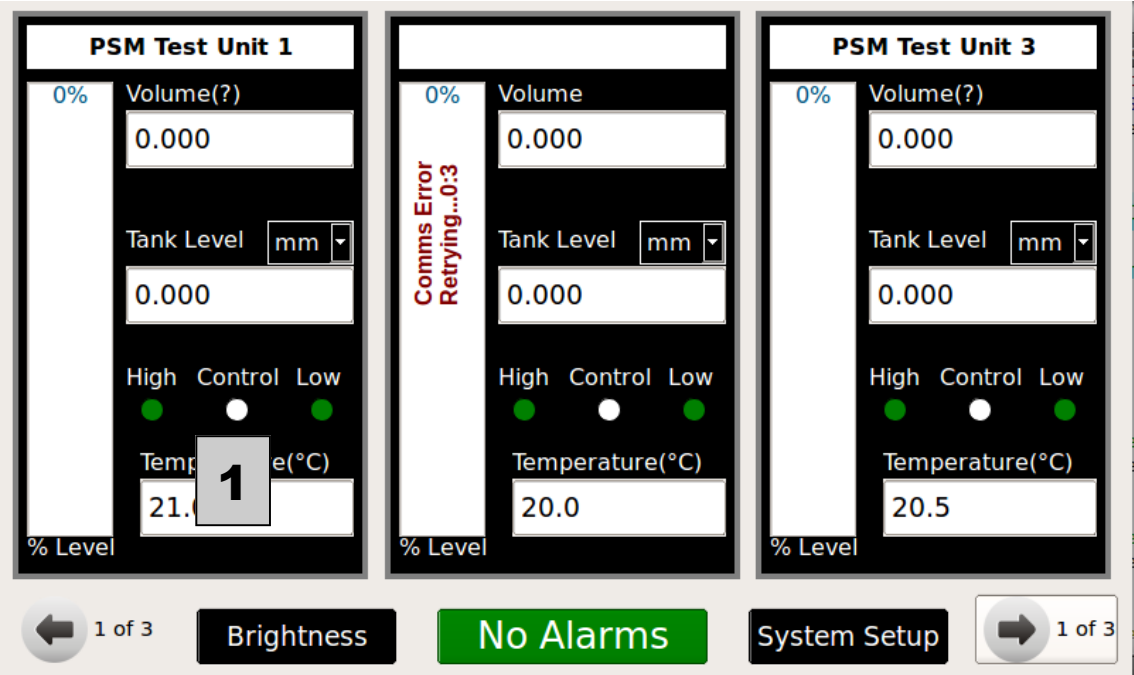
[2] Pressing the Acknowledge button will clear the alarm notification for the Tank Object.



The cause of the alarm condition must be resolved or the alarm will trigger and display again once the system returns to Run Mode.

9. Control Function

9.1 Notification of a control function



9.1.1 Control functions

Are factory programmed according to the order information for each measurement object. It is typically used as trigger conditions for a pump control relay (setpoint) defined as a % of the tank height accompanied by a hysteresis band to clear the condition.

8.1.2 User notification of control function activation

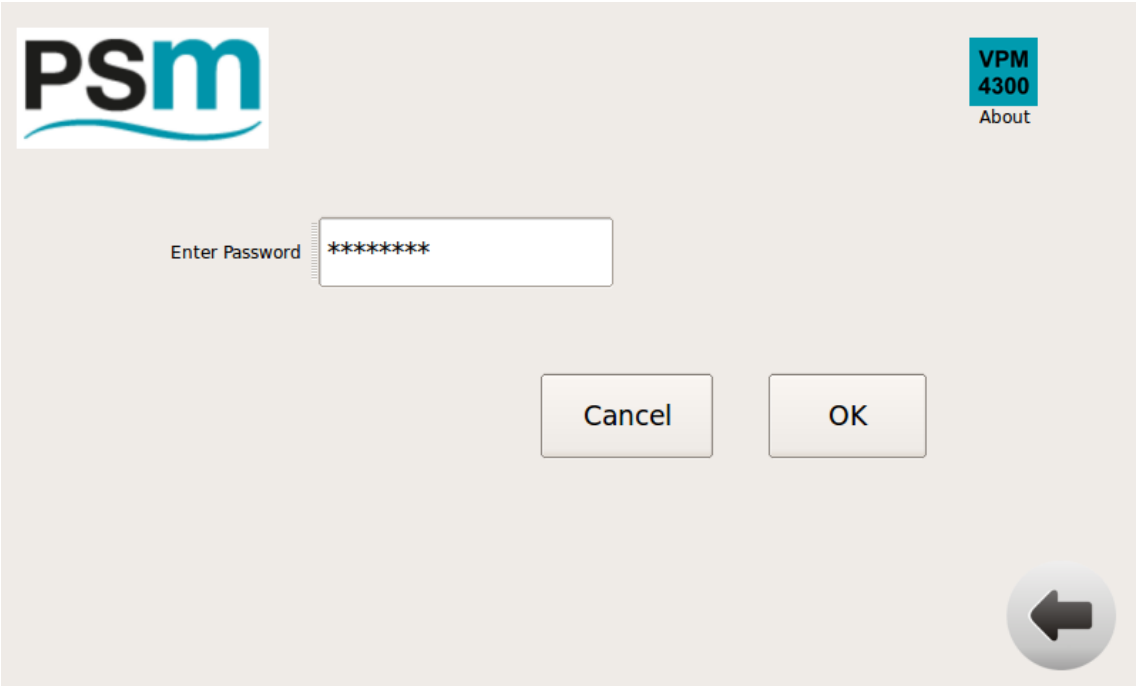
The status indicator [1] will change colour from white to red. It will revert once the condition triggering the control function has cleared.



A control function activation does not trigger any of the notifications associated with alarm conditions (section 8.1.2).

10. Password access

10.1 Password entry screen



10.2 Standard access - top level menu



10.1.1 Password access for Standard level functions

Is: 511111. This provides access to diagnostic functions (9) only .

No configuration changes to the HMI design, tank mapping & Modbus network or ICT 1000 level transmitter configuration can be made at this Standard level.



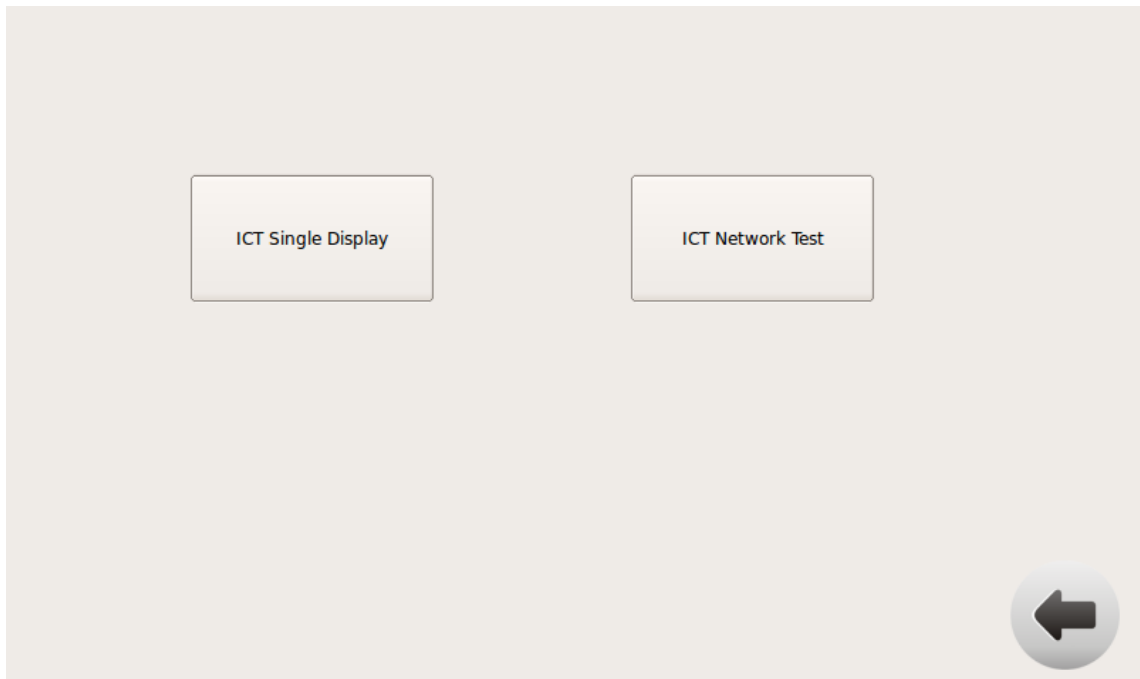
Please contact PSM Instrumentation for assistance with this other functionality.

10.2.1 Standard access - top level menu functions

- Run Mode: Returns to operation and display of the tank gauging system (6).
- ICT Diagnostics Menu: Provides access to tools for displaying the real-time measurement data from a specific level transmitter (10.2), and testing the integrity of the Modbus network connecting the ICT 1000 level transmitters to the VPM 4300 operator panel (10.3).

11. ICT Diagnostics Menu

11.1 Diagnostics Menu - top level



11.2 ICT I000 Single Display

The screenshot displays the "ICT I000 Single Display" interface. At the top, there are two input fields: "ICT Serial No" with the value "12019002" (callout 2) and "ICT Modbus ID" with the value "1" (callout 1). Below these is a section for the "Primary Variable: Liquid Level", featuring a large green display showing "34.5" (callout 3) and a dropdown menu set to "mmH2O@20C". The "Secondary Measurements" section includes "Temperature" at "16.3 °C" (callout 4) and "Loop Current" at "mA Off". The "iCT History" section shows "Maximum Level" at "3675.0 mmH2O" (callout 5), "Supply Voltage" at "23.5 V", "Maximum Temperature" at "32.0 °C", and "Minimum Temperature" at "10.8 °C". A "Status" section at the bottom has three radio buttons: "Pressure Input Fault", "Temperature Input Fault", and "Loop Current Fault". A checkbox labeled "Disable timeout to Runmode" is checked (callout 6). A back arrow is in the bottom right corner.

11.1.1 The top level diagnostics menu provides access to two lower level functions (10.2 & 10.3)

11.2 ICT 1000 Single Display function - diagnose problems with an individual transmitter. Allows testing of an individual ICT 1000 level transmitter



This tool is based on identification of the specific Modbus network node (Modbus ID) that the transmitter being tested has been configured to.

This Modbus map is supplied as part of the order documentation.

11.2.1 [1] ICT Modbus ID - set by the user

Can be set to test a single transmitter over the Modbus range 1 ... 15.

11.2.2 [2] ICT Serial Number - read only

Display the serial number of the transmitter assigned during manufacture

11.2.3 [3] Instantaneous level / pressure measurement - read only

Display the actual level / pressure measurement at the instant in time. Engineering units can be changed using the drop-down menu.

11.2.4 [4] Instantaneous temperature and loop current - read only

Display the actual temperature measurement at the instant in time.

By default for the VPM 4310 system, the Loop Current measuring is Off, as communication is via a Modbus network and not mA analog loops.

11.2.5 [5] Historic data logging of measurement limits - read only

Displays the maximum & minimum measurements since transmitter calibration. Is used as a service tool in case of transmitter failure to diagnose application and installation problems



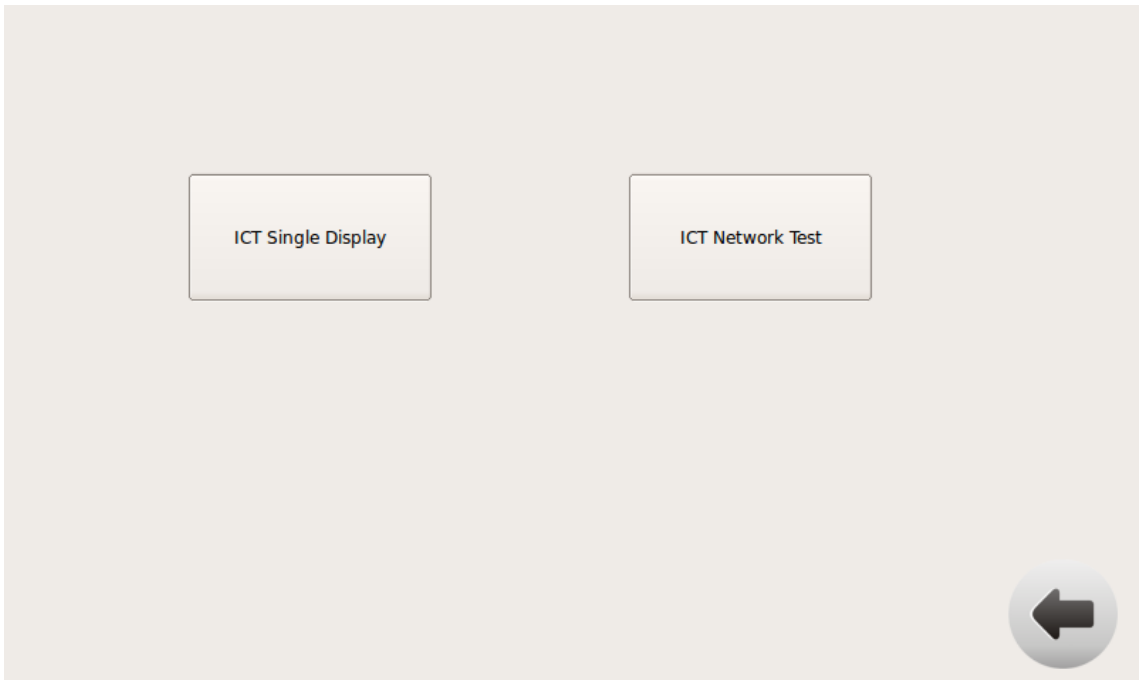
It is not possible to reset this recorded data.

11.2.6 [6] Timeout return to Run Mode - set by user

Locks the display to show this diagnostic tool. Otherwise unit will return to Run Mode after a short period.

11. ICT Diagnostics Menu

11.1 Diagnostics Menu - top level



11.3 ICT I000 Network Test

The screenshot shows the configuration screen for the ICT I000 Network Test. It includes several input fields and a table. Numbered callouts are placed over various elements:

- 1**: Points to the 'Modbus ID's' input field containing '1,2,3,4,5,6,7'.
- 2**: Points to the 'Retries' input field containing '3'.
- 3**: Points to the 'Start Test' button.
- 4**: Points to the '%Health' column in the table.
- 5**: Points to the 'Over Network' status indicator.
- 6**: Points to the 'Disable timeout to Runmode' checkbox, which is checked.

Below the configuration fields is a table with the following columns: Unit ID, Test Count, Errors, %Health, Status, mmH2O, and Temp(C). The table has 5 rows, with the first row containing the number '1' in the 'Unit ID' column.

At the bottom of the screen, there is a progress bar showing '0%' and several status indicators: 'Total Test messages', 'Total Comms Error', 'Over Network', 'Message Response time (ms)', and 'Network scan time (secs)'. A circular button with a left-pointing arrow is located in the bottom right corner.

11.1.1 The top level diagnostics menu provides access to two lower level functions (10.2 & 10.3)

11.3 ICT 1000 Network Test - diagnose problems with the Modbus network. Allows testing of the complete Modbus network



This tool is based on testing the send & receive responses from the transmitters connected to the network.

11.3.1

[1] ICT Modbus ID - set by the user

Can be set to test a number of transmitter over the Modbus range 1 ... 255. Define each by a “,” separator

11.3.2

[2] Configure timings for the test messages - set by the user

We recommend that these are set to 500, 500 & 3 respectively, otherwise reduced timings may lead to false errors being reported.

11.3.3

[3] Start / stop test button

Will continuously cycle the test message routine until stopped.

11.3.4

&5

[4 & 5] Test results - read only

Displays the results from test messages sent to individual transmitters defined in the test range (10.3.1). A % Health of >90% successful test messages will return a result of Excellent.

The Overall Network Health is the average of all the individual transmitter tests above

Both these test results are reset each time a new test is cycled.

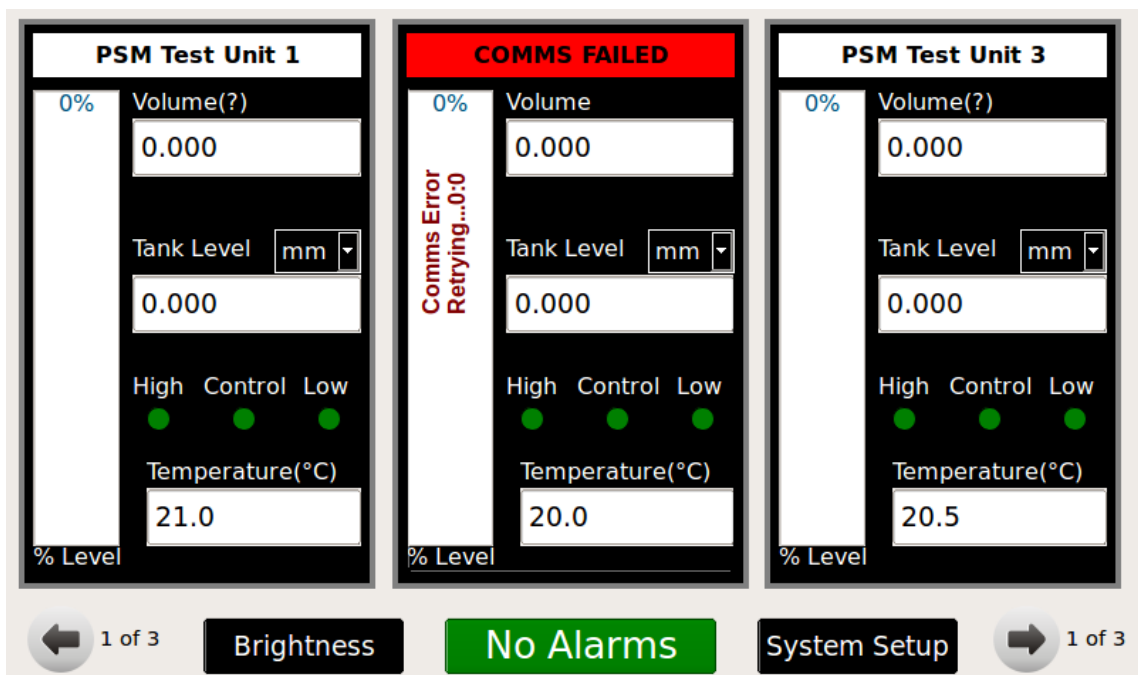
11.3.6

[5] Timeout return to Run Mode - set by user

Locks the display to show this diagnostic tool. Otherwise unit will return to Run Mode after a period of approximately 2 minutes.

12. Fault finding

12.2 Comms Failed error message



12.1 System status LED's (viewed left to right)

| | Function | Colour |
|-----------|---------------------------|-------------------|
| D5 | Main power supply | Green OK |
| D6 | CPU power supply | Green OK |
| D2 | RS-485 Channel 1 | Green RX / Red TX |
| D3 | RS-485 Channel 2 | Green RX / Red TX |
| D7 | Ethernet cable connection | Green connected |
| D8 | Ethernet activity | Yellow RX / TX OK |
| D9 | Not used | Not used |

12.2.1 Comms Failed message displayed on a Tank Object

Is displayed only after a 5 minute continuous period in which there is no communication with the level transmitter associated with the tank object. A count-down can be seen during this period

If this occurs on only ONE Tank Object, then use the ICT 1000 Single Display diagnostic tool (9.2) and also the check the connection to this specific level transmitter.

If this occurs on MULTIPLE Tank Objects, then use the ICT 1000 Network Test diagnostic tool (9.3) and also the check the connections to this group of level transmitters.

PSM WEEE Producer Registration No WEE HC0106WW

Burrell Road Industrial Estate
Haywards Heath, West Sussex RH16 1TW, UK
Tel: +44 (0)1444 410040 Fax: +44 (0)1444 410121
www.psmmarine.com E-mail: sales@psmmarine.com