pulsar MEASUREMENT


# FlowPulse Handheld

**Instruction Manual**

## FlowPulse Handheld (THIRD EDITION REV 1)

February 2021
Part Number M-564-H-003-1P

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Pulsar Measurement guarantee for a period of 2 years* from the date of delivery that it will either exchange or repair any part of this product returned to Pulsar Process Measurement Limited if it is found to be defective in material or workmanship, subject to the defect not being due to unfair wear and tear, misuse, modification or alteration, accident, misapplication, or negligence.

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The FlowPulse Handheld shown on the cover of this manual is used for illustrative purposes only and may not be representative of the actual FlowPulse Handheld supplied.

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## CONTENTS

# CHAPTER 1: START HERE...

Congratulations on your purchase of a Pulsar FlowPulse Handheld.

It has been designed to give you years of trouble-free performance, and a few minutes spent reading this operating manual will ensure that your installation is as simple as possible.

## *About this Manual*

**It is important that this manual is referred to for correct installation and operation.** There are various parts of the manual that offer additional help or information as shown.

### *Tips*

TIP: Look for this icon throughout your Pulsar Measurement manual to find helpful information and answers to frequently asked questions.

### *Additional Information*

**Additional Information**

At various parts of the manual, you will find sections like this that explain specific things in more detail.

### *References*

**See Also**

References to other parts of the manual.

### *About the FlowPulse Handheld Controller*

The Flow Pulse Handheld is designed specifically for use with the Flow Pulse sensor. It is a complete, battery-powered, portable platform that complements the Flow Pulse, offering the ability to view traces, perform data logging, as well as to save and program parameters on the Flow Pulse.

### *Functional Description*

The Flow Pulse Handheld uses the latest Li-ion rechargeable battery technology to provide up to 5 hours of continuous use on one full charge.

The Flow Pulse Handheld uses a RS485 link for communication with the sensor, enabling the use of a long cable.

The Flow Pulse Handheld has 4 GB of on-board storage. This offers logging capacity of up to 1 year at 10 seconds interval.

Data transfer with the PC is achieved via a mini-USB connection, and logs can be converted into Excel format.

Parameter files can be saved or loaded onto Flow Pulse using the handheld, and as on the FlowPulse PC, frequently used parameters on the Flow Pulse can be easily set.

By porting all the main features available on the FlowPulse PC onto a battery-powered handheld controller, the Flow Pulse is immediately transformed into a portable flow monitoring instrument.

The Flow Pulse Handheld is compatible with any existing Flow Pulse.

## *Product Specification*

| | |
|---|---|
| **PHYSICAL** | |
| **Enclosure material/description** | Polycarbonate UL94 V2 rated, with weather-proof connectors. |
| **Outside dimensions** | 210 x 125 x 50 mm (8.27 x 4.92 x 1.97") |
| **Weight** | 0.6kg (1.3lbs) |
| **Screen** | 3.2" TFT LCD |
| **Supplied cable length** | 2 metres (9.8 ft.) minimum |
| **ENVIRONMENTAL** | |
| **Enclosure protection** | IP65 |
| **Max & min temperature (electronics)** | -20º to +60ºC (-4ºF to +140ºF) |
| **Max & Min temperature (battery charging)** | -0º to +40ºC (+32ºF to +104ºF) for charging batteries |
| **CE and Radar Approval** | See EU Declaration of Conformity |
| **DATA LOGGING** | |
| **Storage Media** | Internal Flash Memory |
| **Storage Capacity** | 3.8GB. 3.2 million entries without trace, 800,00 with trace. |
| **Storage Format** | Install at an angle of 45° in line with flow. For more information, see 'Locating the MicroFlow sensor' section of this manual. |
| **Storage access** | File transfer to PC via USB – no driver required |
| **OUTPUTS** | |
| **Analogue output** | Not available |
| **Digital output** | Half Duplex RS485 to sensor, USB connection to PC for file transfer |
| **PROGRAMMING** | |
| **Programmed data integrity** | Via non-volatile RAM |

| SUPPLY | |
|---|---|
| **Rechargeable battery** | 11.1 VDC Li-ion cells |
| **Battery duration** | 4 – 5 hours |
| **Charging methods** | Mains charger, 12 VDC@2A In-car charger |
| **Power supply** | DC 12-18V |
| **Power Consumption** | 3.5W @12V not charging<br>15W @12V when charging |

Pulsar Measurement operates a policy of constant development and improvement and reserve the right to amend technical details, as necessary.

## *EU Certificate of Conformity*

pulsar MEASUREMENT

### EU DECLARATION OF CONFORMITY

P U L S A R FLOW PULSE HANDHELD

This declaration of conformity is issued under the sole responsibility of the manufacturer

| | |
|---|---|
| Relevant Directive(s) | 2014/30/EU - EMC Directive and its amending directives<br>2014/35/EU - Low Voltage Directive and its amending directives<br>2011/65/EU - RoHS Directive and its amending directives |
| Manufacturer's Name | Pulsar Process Measurement Ltd |
| Manufacturer's Address | Cardinal Building, Enigma Business Commercial Centre, Sandy's Road, Malvern, Worcestershire, WR14 1JJ, UK |
| Apparatus | Pulsar Flow Pulse |
| Type of Equipment | Measurement and process control |
| Standards Applied | EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use<br>EN 61326-1:2013 Equipment class, industrial |

| | |
|---|---|
| Signed<br><br>Name: Dr. Andrew Foo<br>Pulsar Process Measurement Ltd | Date:<br>14/12/2020<br>Rev 2.1 |

# CHAPTER 2 CONNECTION AND SETUP

## *Unpacking*

**Important Information**

All shipping cartons should be opened carefully. When using a box cutter, do not plunge the blade deeply into the box, as it could potentially cut or scratch equipment components. Carefully remove equipment from each carton, checking it against the packing list before discarding any packing material. If there is any shortage or obvious shipping damage to the equipment, report it immediately to Pulsar Process Measurement Limited.

## *Power Supply Requirements*

The FlowPulse Handheld requires a DC 12-18V external power supply. The typical power consumption is 3.5W when not charging and 15 W when charging. The power supply should also be correctly fused at 2 A.

## *Cabling to a FlowPulse*

Connection to a Flow Pulse is via a 4-core screened cable supplied with a plug to the Flow Pulse Handheld. Cable colour code is:

| CABLE COLOUR | CABLE DETAILS |
|---|---|
| Red | +12 VDC to power FlowPulse |
| Black | Ground to the FlowPulse |
| Yellow | RS485+ to the FlowPulse |
| Green | RS485- to the FlowPulse |

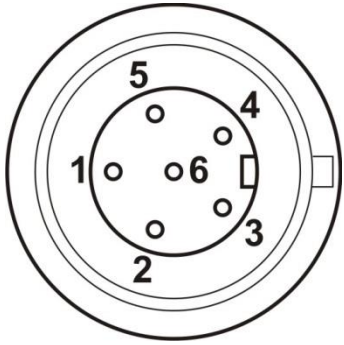
Take care not to short any of the cores during connection. Ensure that the controller is powered down while performing any cabling work.

If in doubt, isolate the 4 cores using a connector block, then plug in on the controller side. Power-up the Flow Pulse Handheld and verify each cable core by measuring its voltage.

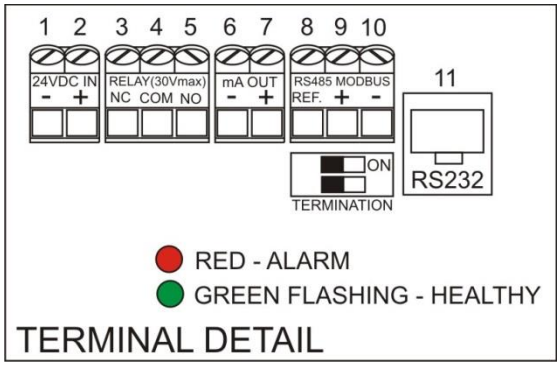
**Important Information**

Please ensure that when carrying the FlowPulse and FlowPulse Handheld that the cable is held out of the way as it is a trip hazard.

For reference when connecting the FlowPulse Handheld to the FlowPulse the connections on both the Flow Pulse and the FlowPulse Handheld are shown below. The table describes the connections between the two.

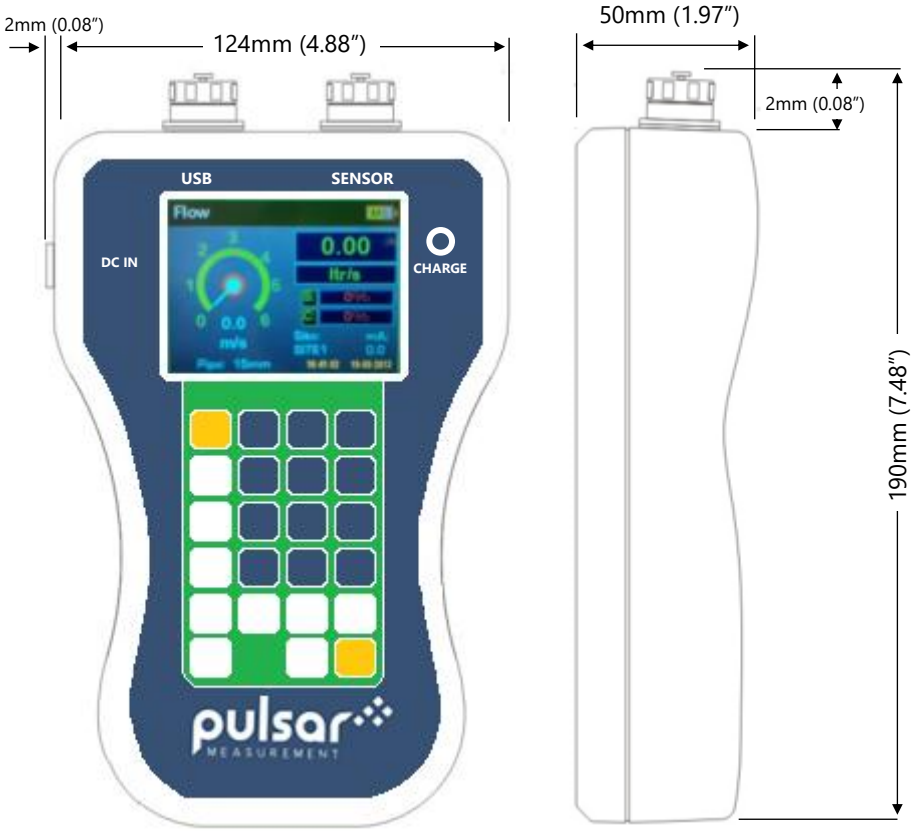



The FlowPulse connector to the FlowPulse Handheld above and the Terminal diagram to the FlowPulse below:




| FLOWPULSE CONNECTOR | | | FLOWPULSE |
|---|---|---|---|
| **Pin** | **Description** | **Cable Colour** | **Terminal No.** |
| 1 | Power (Nom. 12VDC) | Red | 2 |
| 2 | 0V | Blue | 1 |
| 3 | RS485+ | Yellow | 9 |
| 4 | RS485 - | Green | 10 |
| 5 | Cable Screen | Screen | NC |

## *Dimensions*


2mm (0.08")
124mm (4.88")
USB
SENSOR
DC IN
CHARGE
Flow
0.00
pulsar
MEASUREMENT
50mm (1.97")
2mm (0.08")
190mm (7.48")

## *Key Guide*

| KEY | DESCRIPTION |
|---|---|
|  | Hold down the power key to switch the device on or off |
| F1 | Toggle trace on/off<br>Stop file replay (only during file replay session) |
| F2 | Toggle continuous data logging on/off<br>Cancel Sleep/Wake logging (when device is awake)<br>Stop file replay (only during file replay session) |
| F3 | Jump to FlowPulse setting menu<br>Increase screen brightness (when pressed repeatedly) |
| F4 | Jump to Handheld setting menu<br>Decrease screen brightness (when pressed repeatedly)<br>Resets resettable totaliser on totaliser window |
|  | Scroll through Main > Trace > Record > Setting1 > Setting2 > Totaliser > Main screens |
|  | Scroll through menu or submenu selections |
| ENTER | Confirm selection or entry |
| CANCEL | Cancel/Backspace entry, exit menu, or back to main flow screen if pressed repeatedly. |
| **0 – 9** | Direct selection of menu item and entry of parameters or alphabets where necessary. |

### *Connecting to a Flow Pulse*

The FlowPulse Handheld can be connected to any existing Flow Pulse. Flow monitoring, diagnostic trace and normal data logging functions are supported.

However, the following features will only be supported by Flow Pulse firmware 1.2.4 and later:

1. Sending parameter file to a FlowPulse sensor using the FlowPulse Handheld.
2. Maximum power-saving during sleep/wake logging.
3. Reduced trace length for greater data storage efficiency.

For connecting to a FlowPulse:

1. Check that the Flow Pulse sensor has the appropriate connector and is correctly wired (refer to Cabling to a Flow Pulse section).
2. Secure the lead to the sensor connector and switch on the handheld
3. **If the sensor is being connected to the controller for the first time, press F4, choose Tools, then select Modbus to PC-485.**
4. Connection will be initiated automatically, and the Flow Pulse icon  will be displayed in the top bar when complete.
5. The parameters on the Flow Pulse will be uploaded to the controller upon connection.

The Flow Pulse can be unplugged from the controller at any time.

**Important Information**

Always disconnect the FlowPulse from the handheld controller before servicing the Flow Pulse.

The sensor can be switched back to Modbus mode if necessary, by going to Setting1-FlowPulse Handheld menu, select Modbus and set Mode to 1.

# CHAPTER 3 HOW TO USE THE HANDHELD CONTROLLER

## *Safety Precaution*

The device contains Li-ion rechargeable batteries that are potentially hazardous, and may pose a fire-risk when mishandled or subject to temperatures beyond the specified maximum.

Never attempt to operate, recharge, or subject the device to temperature beyond 60°C or below -20°C (-4°F - 140°F).

Never submerge the controller in liquid.

Always power-down the device, disconnect charger or any external power source and unplug sensor connector before performing any servicing to the Flow Pulse Handheld or the Flow Pulse.

## *Charging the Controller*

A charger is supplied for charging the battery on the handheld. Other chargers may be used, but the power rating must be within 12-18 VDC and fused @ 2A max.

The battery indicator icon 

provides indication of the available charge on the Flow Pulse Handheld.

During charging, the battery icon will have a blue background 

to indicate that the charger is present.

During charging, the charge LED lights up with red when the battery contains approximately 90% charge or less, and turns green when the battery has more than 90% charge. When the battery level falls to 0%, the Flow Pulse Handheld will be automatically powered down. This is to avoid over-discharging the battery, which may damage the batteries.

**Important Information**

Charging should only be performed within an ambient temperature range of 0 to 45°C (32 to 113°F). Never perform charging where contact with liquid is possible.

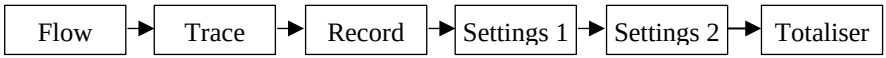
Always disconnect the charger and the Flow Pulse sensor before attempting any form of cable or wire servicing.

The FlowPulse Handheld has an internal temperature sensor that monitors board temperature and will power-down the Flow Pulse Handheld and taper charging rate when temperature rises beyond the specified threshold.

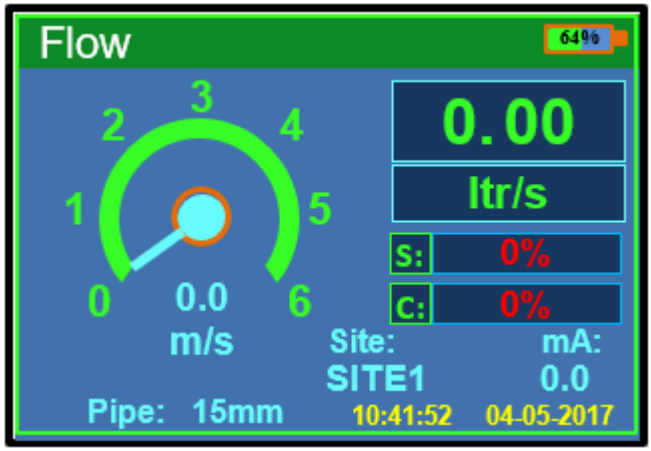
**Important Information**

Due to the risk of the batteries igniting, under no circumstances should the Flow Pulse Handheld be permanently powered from the charger or any other external power source.

### *User Interface Structure*



### *Flow Window*




The main window is the Flow window. This page displays both the flow velocity and the associated flow rate. The expected mA output on the Flow Pulse and the name of site for data logging are also shown.

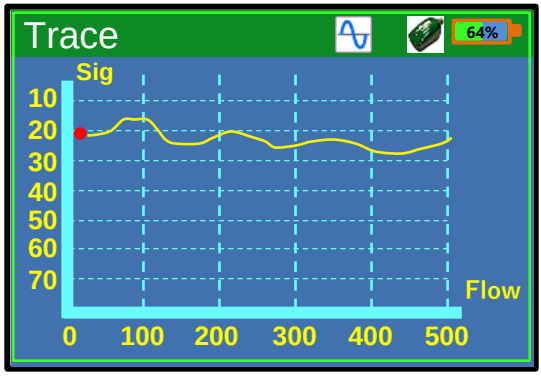
The units of flow rate can be changed in **Setting1 → FlowPulse → Setup** (F3 shortcut key).

The 'S' bar shows the strength of flow signal received on the sensor. A high value will indicate a suitable application.

The 'C' bar shows the expected stability of the flow reading from the sensor. A high value will indicate better measurement stability and is associated with increased repeatability.

Press cancel key repeatedly at any stage to return to this window.

### *Diagnostic Trace Window*

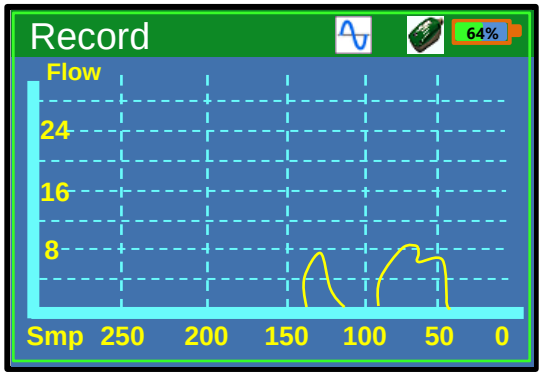



The Trace window displays the diagnostic trace from the Flow Pulse. The red dot on the trace indicates the amount of flow perceived by the sensor.

Use F1 key to enable or disable traces from the Flow Pulse. Trace function is enabled by default upon connection. The trace icon will appear to indicate when traces are being polled.

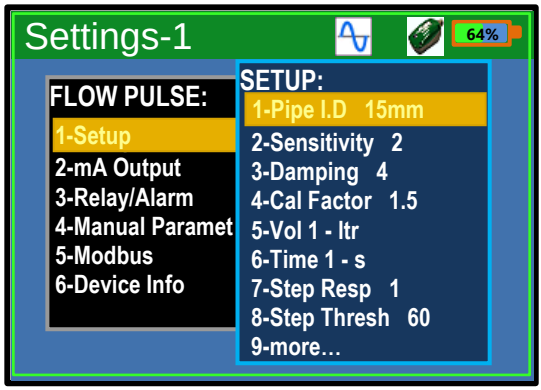
The trace function must be enabled before starting a data logging session to ensure that diagnostic traces are saved onto file.

### *Record Window*



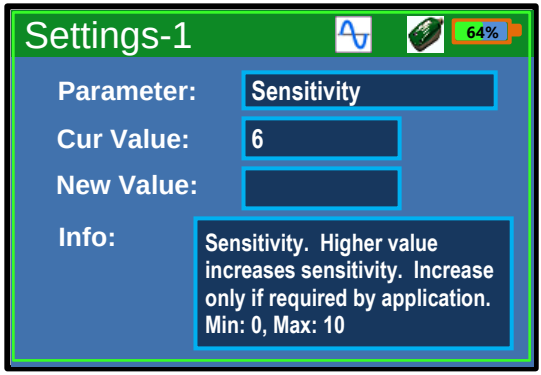

The Record window shows the recently reported flow. Only the most recent 300 flow readings are displayed. The 'Flow' axis on the chart is in units of the set volumetric flow rate, which is litres per second by default.

### *Settings 1 Screen – Flow Pulse*



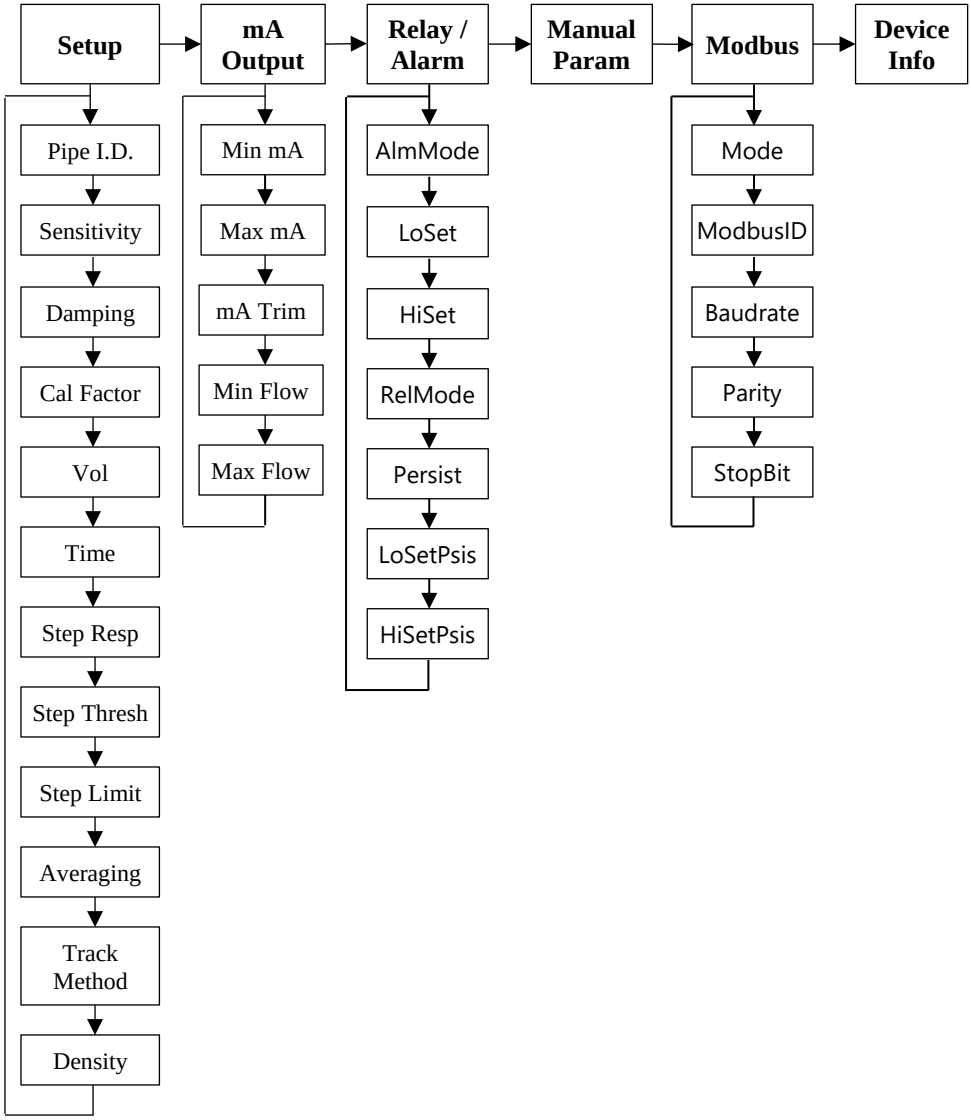

The "Settings-1" – Flow Pulse window allows setting or changing Flow Pulse parameters. Please refer to the Flow Pulse instruction manual for detailed description of the individual items.

The menu can be navigated by using the up/down arrow keys and confirming with Enter, or directly choosing the menu item by pressing the associated number key.

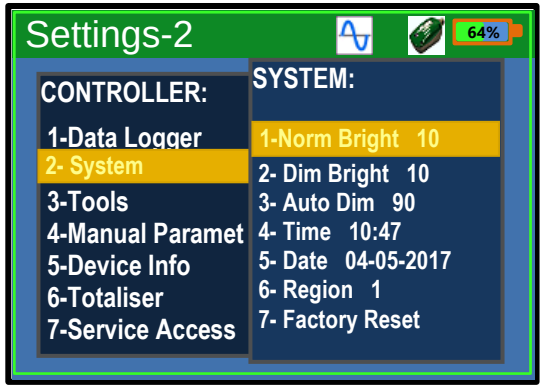



The “Manual Param” function (illustration of “Manual Param” screen above) allows the setting of parameters using parameter addresses. This is useful for setting less frequently used parameters or any parameters that are not listed on the menu.

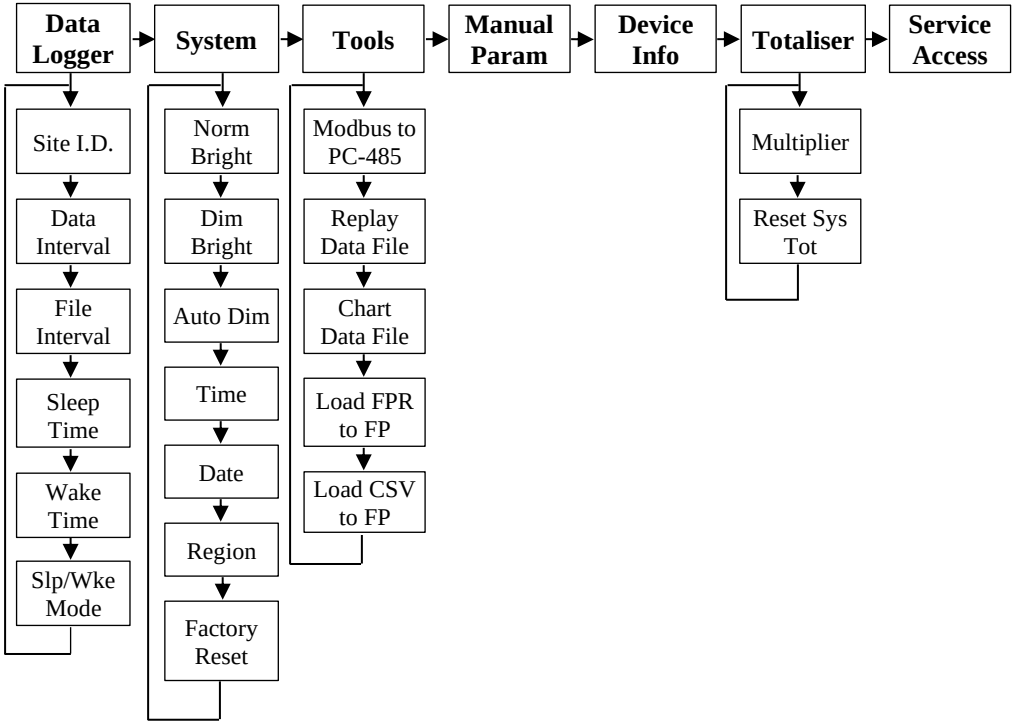
## *Settings 1 – FlowPulse*



### *Settings 2 Screen – Handheld Controller*




The "Setting-2" menu allows for the modification of Controller specific parameters. This menu is navigated in the same way as "Settings-1" menu.



### *Connecting to a Computer*

The Flow Pulse Handheld can be connected to a Windows, Linux or Mac OS based PC via a standard mini-USB cable for accessing the internal storage. This is like connecting a USB drive, and therefore no additional software installation is required.

Upon connection, a 'Pulsar 4GB' drive will appear as a USB drive on the PC. The user may transfer any saved data file directly to the PC.

The Flow Pulse-PC software, which is available for download, can be used to replay the transferred data files or to convert the files to Excel format. Technical support is provided for Win 7, Win 8 and Win 10 OS system.

While connected to the computer, all other functions that require access to the internal storage, such as data logging and log file replay, will be disabled.

The controller is not rechargeable via USB.

### *System Settings*

The "Norm Bright" setting determines the screen brightness when the controller's keypad is being used, ranging from 1 to 10 with 10 being the brightest.

The "Dim Bright" setting determines the screen brightness when the Flow Pulse Handheld's keypad is not being used after the period of time set by the "Auto Dim" parameter (see below). This feature helps reduce power consumption.

The "Auto Dim" is the amount of time since the last key press, in seconds, after which the screen will switch to the "Dim Bright" level. Setting Auto Dim to 0 will deactivate the screen dimming mechanism.

The "Time" should be set using HHMM format only, where HH must be in 24-hour format.

The "Date" should be set using the format specified by the region.

| REGION | DATE FORMAT |
|---|---|
| UK | DDMMYY |
| US | MMDDYY |
| EU | DDMMYY |
| CN | YYMMDD |

The "Region" setting influences the decimal symbol, date display format, and default volumetric units. This only affects user interface and has no impact on sensor operation.

The "Factory Reset" function will default user and service parameters on the controller. Enter 4 to confirm reset. This does not affect Flow Pulse parameters.

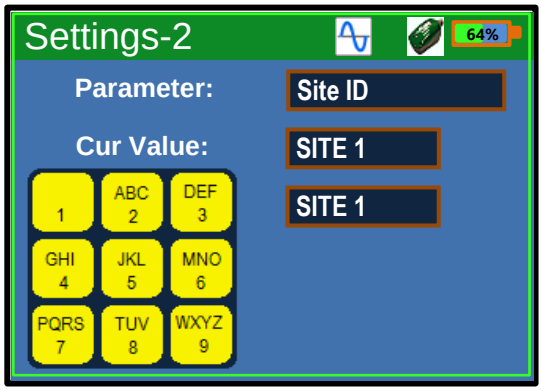
### *Data Logging*

Data logging saves the flow information with timestamps onto a file. This function is only available when a sensor is connected.

The default logging interval is one log per 4 seconds. This can be changed from 2 to 3600 seconds interval between logs in **Settings-2 → Data Logger → Logging Interval menu**.

A new log file is always generated when logging is started or restarted. During logging, a new file is also generated upon a new day as determined by the File Interval setting (1 day by default).

A short data logging session can be activated by using the "F2" key. A prompt will appear to confirm or change the site name. Use the "Cancel" key to delete existing characters, and alphabets can be selected by repeated pressing on a numeric key to switch to the relevant alphabets as shown by the alphanumeric diagram. Use Enter to confirm the site name.




The site name determines the folder in which the log files will be stored, allowing organisation of log files by site name.

The data logging icon is displayed whenever data logging is in progress. Pressing the F2 key again will disable the function.

All log files are named in Flow Pulse-dd-mm-yy-hh-mm. flg format by default, the date and time corresponding to the start of data logging. The log files can be freely renamed if the. flg extension is retained.

### *Sleep/Wake Logging*

The Sleep/Wake logging function is used for longer term, unattended, data logging. This feature is setup via the **Setting-2 → Data Logger menu**:

1. Change site name if required.
2. Check logging interval, default is 4 seconds between logs.
3. Check the file interval, default is 1 day before a new log file is created. This is set to ensure that the number of log files and file-size are kept relatively small. A new file is always created when logging is started or restarted.
4. Set the "Sleep Time". This is the time duration in which both the controller and the sensor will be put into low-power or power off mode to reduce power consumption. This is set in units of second.

5. Set the "Wake Time". This is the time duration in which both the controller and the sensor will be fully powered to perform logging according to the set logging interval. This is set in units of second.

   ***Example 1:*** Wake up for 30 seconds every 1 minute to perform logging. Set Sleep Time to 30 seconds and Wake Time to 30 seconds.
   ***Example 2:*** Wake up for 30 seconds every 5 minutes to perform logging. Set Sleep Time to 270 seconds (5 min x 60 seconds less 30 seconds wake time), and Wake Time to 30 seconds.

   If the Sleep Time is less than 10 seconds, or the Wake Time is less than 20 seconds, the FlowPulse sensor will not be powered down during sleep, resulting in higher power consumption. Instead, the FlowPulse will be put into low-power mode (only supported on FlowPulse firmware 1.2.4 or later, otherwise the FlowPulse sensor remains on full-power).

   If the "Sleep Time" is more than 10 seconds and the "Wake Time" is more than 20 seconds, the FlowPulse Handheld will be powered down during sleep mode. However, if these two requirements are not met, neither unit will be powered off during sleep mode.

**Important Information**

Due to the possibility of power-off while using sleep/wake logging, the mA output on the FlowPulse may be interrupted. This may be an issue in cases where the FlowPulse is permanently installed, and its mA output is separately monitored for flow. Use the normal data logging function instead. Alternatively, only connect the RS 485 between the controller and FlowPulse, allowing the installed FlowPulse to be powered independently. This will avoid mA output interruption when the handheld controller goes into Sleep. Unplug from controller before cabling work, and isolate power supply wires from controller to prevent short or contact with any other terminals on the FlowPulse.

6. To activate "Slp/Wke Mode" set the "Slp/Wke Mode" to 1.
7. Diagnostic traces will be activated and saved. If this is not required, press the F1 key to disable traces.

When sleep/wake logging is in use, the icon will appear. The data logging icon is also shown to indicate that logging is active.

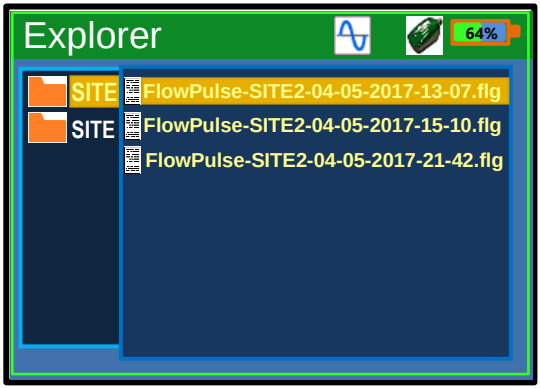
To cancel sleep/wake mode, press the F2 key. If there is no response, the FlowPulse Handheld may have been powered down. In such cases, power-on the FlowPulse Handheld and press the F2 key to cancel.

### *Replaying Log Files*

The log files can be replayed on the FlowPulse Handheld, or transferred to a computer via USB for replay using FlowPulse-PC (version 1.2.4 or later required).

The log files have a. flg (FlowPulse Log) file extension.

To replay a log file using the controller, go to **Settings-2→Tools→Replay Data File**, this will bring up a File Explorer window. The folder icon indicates available data folders, which correspond to site names that were set when data was logged. Select the folder to view a list of available log files. Select a file to start replaying.




During replay, the FlowPulse will be powered down to save power. The replay icon is displayed in place of the sensor icon to indicate replay in progress.

Connection to FlowPulse will automatically resume upon completion or cancellation of replay. During replay, press the F2 key at any time to cancel.

### *Charting Log Files*

Charting the log files is a quick method of viewing the whole log file at once. The charting function displays an entire length of "Record" at a time before giving the option to either cancel the display or display the next "Record" lengths worth of flow data.

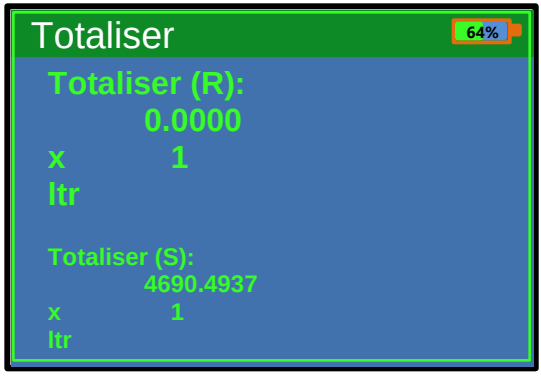
To display the chart of a log file using the controller, navigate to **Settings-2→Tools→Chart Data File**. This will bring up a File Explorer window. The folder icon indicates available data folders, which correspond to site names that were set when data were logged. Select the folder to view a list of available log files. Select a file to display.

During charting, the FlowPulse will be powered down. The replay icon is displayed in place of the sensor icon to indicate charting in progress. Connection to FlowPulse will resume upon completion.

Due to the limited size of the chart in the Record window, up to 300 samples will be charted before pausing.

To chart any remaining log in the file, press the F1 key. You may cancel the charting process at any time by pressing the F2 key.

### *Totaliser Window*




This window displays the current value of the resettable and system totaliser. The totaliser will appear during Run mode when the totaliser screen is selected. Pressing the left-hand arrow key from the Flow window will display the Totaliser window.

### *Totaliser (R)*

This displays the current value of the resettable totaliser which appears during run mode. The resettable totaliser can be reset whilst in Run mode by pressing the F4 key when you are in the totaliser screen. The below pop-up window will appear:


Press Enter to reset or cancel to reject the request.

### *Totaliser (S)*

Displays the current value of the non-resettable totaliser. During run mode, the system totaliser is viewed at the bottom of the Totaliser screen. Unlike the resettable totaliser this can only be reset by accessing the "Settings 2-Controller'" menu and choosing "option 6". Press enter on the option Reset 'sys' totaliser and enter the value '1' to confirm reset.

### *Accessing the totaliser options*

Pressing the F4 key will take you to the "Settings 2-Controller" menu options where you will need to select "6-Totaliser". You are now given the opportunity to choose different totaliser options.

### *Totaliser Multiplier*

This can be used if the totaliser increments by too large or too small amount, enter the factor by which the actual flow rate is multiplied by before incrementing the totaliser.

E.g., if flow rate is being calculated and displayed in litres /second and it is desired to increment the totaliser in cubic metres select 13 = *1000. When viewing the totaliser display will state; "x 1000 ltr", and the totaliser will be incremented every 1000 litres.

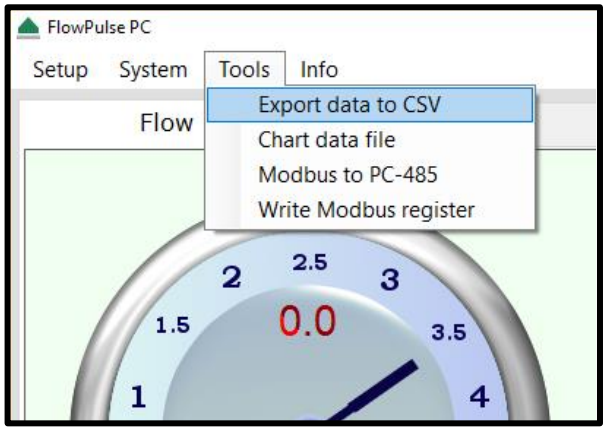
Options are:

| TOTALISER OPTION | DESCRIPTION |
|---|---|
| 1 / 1,000,000 | Totaliser will increment every 1 / 1,000,000$^{th}$ units of flow |
| 1 / 100,000 | Totaliser will increment every 1 / 100,000$^{th}$ units of flow |
| 1 / 10,000 | Totaliser will increment every 1 / 10,000$^{th}$ units of flow |
| 1 / 1,000 | Totaliser will increment every 1 / 1,000$^{th}$ units of flow |
| 1 / 100 | Totaliser will increment every 1 / 100$^{th}$ units of flow |
| 1 / 10 | Totaliser will increment every 1 / 10$^{th}$ units of flow |
| *1 | Totaliser will increment every 1 unit of flow |
| *10 | Totaliser will increment every 10 units of flow |
| *100 | Totaliser will increment every 100 units of flow |
| *1,000 | Totaliser will increment every 1,000 units of flow |
| *10,000 | Totaliser will increment every 10,000 units of flow |
| *100,000 | Totaliser will increment every 100,000 units of flow |
| *1,000,000 | Totaliser will increment every 1,000,000 units of flow |

### *Exporting Log Files to Excel*

Log files can be transported to a computer via USB, they can then be displayed on Flow Pulse-PC 1.2.4 or later.

From "Tools" menu, select "Export Data to CSV", then choose the .flg files to convert.




The new files will be generated within the same folder. Open the csv files in Excel.

### *Flow Pulse Parameter Files*

There are two types of parameter file: fpr (Flow Pulse parameter) and csv (parameter list in Excel format).

*fpr parameter:* Whenever a Flow Pulse is connected, parameters will be automatically retrieved from the sensor and stored in an. fpr file. Older parameters from the same day are overwritten onto the same. fpr file to keep the number of parameter files small. All. fpr files are named as ParamFlowPulse-dd-mm-yy. fpr format by default.

*csv parameter:* Whenever data logging is manually initiated (using the F2 key), parameters will be retrieved from the sensor again to account for any changes made, and stored in a csv parameter file. There will be one unique csv parameter file corresponding to each data logging session. All csv parameter files are named as ParamFlowPulse-dd-mm-yy-hh-mm.csv format by default. A csv parameter file can be viewed in Excel.

To specifically generate a parameter file for the sensor, press the F2 key to start a data logging session. This will generate a csv parameter file within the site folder.

When using Sleep/Wake logging, no new parameter file is generated upon waking.

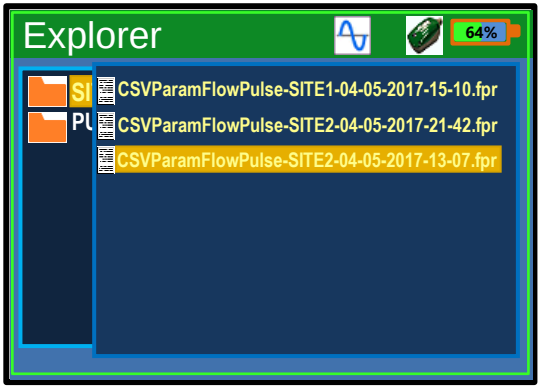
Parameter files should be renamed while retaining the file extension (csv or fpr).

**Important Information**

Care should be taken while renaming csv files to avoid confusion between parameter csv file and log files converted into csv, as both would have the same csv extension.

### *Loading a Parameter File onto Flow Pulse*

A parameter file previously saved from a FlowPulse, or transferred from a computer, can be loaded back onto a FlowPulse. The parameter file must be in the fpr or csv format. If in doubt, connect to a computer and open the csv parameter file in Excel or any text editor to confirm. Press F4 to Settings-2 menu and select "Tools". Choose option "Load FPR to FPlse" to load an fpr parameter file, or "Load CSV to FPlse" to load a csv parameter file.



### *System Information*

Press F4 to Settings2-Controller menu and select "Device Info". This will display the serial number, firmware and hardware versions, on-board temperature, and internal storage information for the controller.

### *Internal Storage*

The internal storage comprises of a 4 GB flash memory, with approximately 3.8 GB available.

It is therefore recommended that files on the internal storage are transferred onto a computer via USB when possible, and deleted from the internal storage. The internal storage should not be used as the main storage location for critical log or parameter files.

### *Upgrading Firmware on the Flow Pulse Handheld*

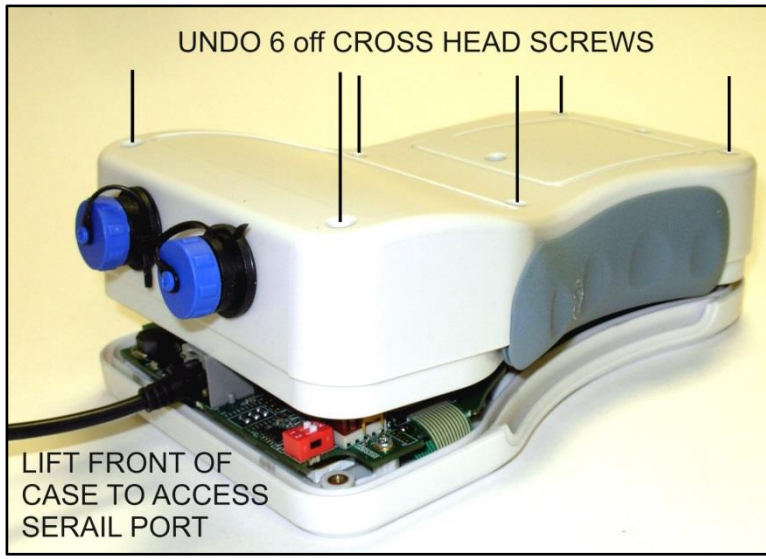
Before starting this procedure, the following are required:

- A PC with FlowPulse PC installed, which can be found on the FlowPulse PC CD or downloaded from the Pulsar website using the following link: https://pulsarmeasurement.com/downloads/software/
- The firmware file you wish to install on to the Flow Pulse Handheld
- A USB to serial converter with RJ11 lead (Pulsar programming lead)
- A Philips screwdriver for removing the screws on the back of the FlowPulse Handheld

Follow these procedures carefully to upgrade the firmware on the handheld controller:

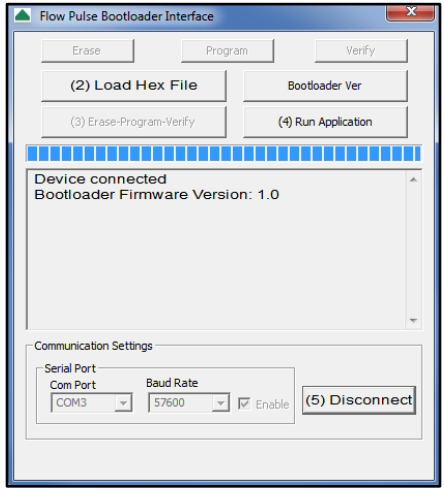
1. Ensure the FlowPulse Handheld has more than 50% battery charge or that the power cable is plugged in and the Flow Pulse Handheld is charging
2. Power-down FlowPulse Handheld, disconnect FlowPulse and charger or any external power source
3. While holding down the Enter key, press the power button to turn on, and release when the screen lights up. The screen will flash in half second interval to indicate "Bootloader Mode

4. Remove the 6 screws from the back using a number 1 Phillips screwdriver, taking care to avoid damaging the attached rubber washers




5. Lift the back slightly – avoid sudden force as critical cables are connected between the front and back plates
6. Connect the serial to USB cable to the RJ11 socket located on the top end of the internal Flow Pulse Handheld and the USB socket on the computer
7. Identify the Com Port number for the USB to serial converter that is connected from the Flow Pulse Handheld to the computer

8. Run FlowPulse PC (do not click connect), go to System menu and select Bootloader Control




9. On the FlowPulse Bootloader window, select the Com Port number and click Connect
10. Click "**Load Hex File**" and choose the relevant firmware file for the Handheld.
11. Click "**Erase-Program-Verify**", and wait for completion when a "**Verification Successful**" message will be displayed, then click "**Run Firmware**"
12. Disconnect serial lead and then reassemble the unit and screws ensuring that all rubber washers or seals are in place
13. Power-up the unit and press **F4→Device Info** to verify the new firmware version number is correct.

**Important Information**

If the upgrade procedure is no longer required, press, and hold the Power button to power-down. Never leave the unit in Bootloader mode as this will over-discharge the battery.

# CHAPTER 4 PARAMETER LISTING AND DESCRIPTIONS

## *Parameter System*

Configuration parameters can be queried and set. With each parameter, there is a factory default value, an associated access level which is required for setting, and a valid range of values for each parameter.

The parameters are always stored and entered as whole numbers, and the absolute range is from 0 to 65535, please refer to individual parameter for individual range.

The terms "parameter" and "register" are used interchangeably as the parameter number is the actual address of the storage register.

## *Parameter Access*

Frequently used parameters are accessible via the Setting-2 menu.

All parameters for the FlowPulse Handheld are accessible via the "Manual Param" option on the Setting-2 menu.

For service access, select "Manual Param" on the Setting-2 menu, and set p88 to the access code. If a valid code is entered, a "Parameter saved" message will be shown, otherwise an error message is shown.

## *Configuration Parameters*

### *Data Logger*

| PARAMETER | ADDR | OPTIONS | DEF. | NOTES |
|---|---|---|---|---|
| Data Interval | 76 | 2 – 3600 | 4 | Time duration between logs, in seconds. |
| File Interval | 78 | 1 – 7 | 1 | Time duration before a new file is created during logging, in hours.<br>*Note: A new file is always created when logging is started, including when logging was stopped and restarted.* |
| Sleep Duration | 79 | 5 – 28800 | 30 | Sleep duration (either low-power or power-down) in seconds when sleep/wake logging is used. |
| Wake Duration | 80 | 5 – 28800 | 10 | Wake duration in seconds when logging can take place. |
| Slp / Wke Mode | 83 | 0 =Off<br>1 = On | 1 | Turn Sleep/Wake logging On or Off. |

## *System*

| PARAMETER | ADDR | OPTIONS | DEF. | NOTES |
|---|---|---|---|---|
| Norm Bright | 71 | 1 – 10 | 9 | Brightness level when a key is pressed. Higher is brighter |
| Dim Bright | 72 | 0 – 7 | 4 | Brightness level when the screen is dimmed. Higher is brighter. Set to 0 to turn off screen when dimming is activated. |
| Auto Dim | 73 | 0 – 2400 | 60 | Time duration after a key press before screen is dimmed. Set to 0 to deactivate dimming. |
| Time | - | HHMM | | HH – hour in 24-hour format<br>MM – minute |
| Date | - | DDMMYY | | DD – day<br>MM – month<br>YY – year |
| Region | 77 | 1 -4 | 1 | **1** – UK<br>**2** – US<br>**3** – EU<br>**4** – China<br>This setting influences the decimal symbol, date display format and volumetric units. There is no impact on the operation of the sensor. |
| Factory Reset | 94 | Set to 4 to reset | | Reset handheld controller parameters to factory default. |

| | | | | |
|---|---|---|---|---|
| | | | | *Note: This does not affect FlowPulse.* |

### *Device Info*

These parameters are read only, and are usually only updated by the device.

| PARAMETER | ADDR | DEF. | NOTES |
|---|---|---|---|
| Controller Serial Number | 96 - 97 | | The serial number is equal to: p96*65535 + p97 |
| Controller Type | 95 | 1 | 1 = Controller for FlowPulse |
| Firmware Version | 98 | | A 4-digit firmware version number, larger is newer. |
| Hardware Version | 99 | | A 4-digit hardware version number, larger is newer. |
| Board Temperature | - | | Displays the internal battery/electronics temperature in Celsius. |
| Storage Capacity | - | | Capacity of data storage. |
| Available Storage | - | | Unused storage space. |

### *Service Parameters*

These parameters are service only parameters, and should only be changed with specific advice from a Pulsar engineer.

| PARAMETER | ADDR | DEF. | NOTES |
|---|---|---|---|
| USB Function | 70 | 2 | **0** – USB off<br>**1** – SD card only<br>**2** – SD + Serial port<br>**3** - Serial port only |
| Low Power Warning Threshold | 81 | 7 | Battery level below which a low power warning is shown |
| Temperature Warning Threshold | 82 | 60 | Temperature level above which a warning is shown, and power-down sequence is activated. (in Celsius). |
| RS485 Baud Rate | 84 | 4 | **0** – 1200<br>**1** – 2400<br>**2** – 4800<br>**3** – 9600<br>**4** – 19200<br>**5** – 38400<br>**6** – 57600<br>**7** – 115200 |

# CHAPTER 5 TROUBLESHOOTING

## *Flow Pulse Diagnostic*

Please refer to the Flow Pulse Instruction Manual regarding information on using and interpreting the diagnostic trace.

## *Troubleshooting the Handheld Controller*

*Sensor not connected*

| POSSIBLE CAUSES | ACTION |
|---|---|
| Sensor power an RS485 connection | Ensure that the Flow Pulse sensor is powered, either independently or by the controller.<br>Check that the RS-485 +ve and –ve wires are correctly connected. |
| RS485 mode | If the sensor is being connected to a handheld controller for the first time, the RS-485 needs to be set to PC-485 mode.<br>This can be done via the handheld controller, check that all wires are connected, press F4, select Tools, select Modbus to PC-485, enter 126 (default Modbus ID on Flow Pulse sensor) then press Enter. |

*Controller does not switch on*

| POSSIBLE CAUSES | ACTION |
|---|---|
| Low or damaged battery | Ensure that the Flow Pulse sensor is powered, either independently or by the controller.<br>Check that the RS-485 +ve and –ve wires are correctly connected. |
| Tripped thermal or current fuse | If the device has recently been subjected to:<br>**a)** rewiring on sensor side, or<br>**b)** temperature beyond specified range<br>the thermal or current fuses may have tripped. |
| SD card removed | Re-install the SD card if it was removed. |
| SD card error | Rule out low or damaged battery before replacing the SD card. |

*Battery level drops too quickly*

The drop-in battery level is not necessarily linear across time. The battery level may also fluctuate when a sensor is connected or disconnected. However, the operating duration should still be more than 4 hours on a single full charge under normal use (i.e., with screen dimming and no USB connection).

| POSSIBLE CAUSES | ACTION |
|---|---|
| Low ambient temperature | If the device is left or operated for prolonged period under an ambient temperature of below 0 degree Celsius, the total operating duration may be reduced. |
| Damaged battery | If the battery is less than 6 months old and the normal operating duration is significantly shorter than 4 hours at room temperature, then pre-mature battery damage is indicated. |
| Abnormal power consumption | The sensor draws majority of its power during operation. Verify that there is no abnormal power consumption caused by a faulty sensor. |

**Important Information**

If you experience any issues with our equipment, then please contact your local Pulsar Distributor for assistance.

# CHAPTER 6 DISPOSAL

Incorrect disposal can cause adverse effects to the environment.

Dispose of the device components and packaging material in accordance with regional environmental regulations including regulations for electrical \ electronic products.

**Transducers**

Remove power, disconnect the Transducer, cut off the electrical cable and dispose of cable and Transducer in accordance with regional environmental regulations for electrical \ electronic products.

**Controllers**

Remove power, disconnect the Controller, and remove battery (if fitted). Dispose of Controller in accordance with regional environmental regulations for electrical \ electronic products.

Dispose of batteries in accordance with regional environmental regulations for batteries.

EU WEEE Directive Logo

This symbol indicates the requirements of Directive 2012/19/EU regarding the treatment and disposal of waste from electric and electronic equipment.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