Dresser™ Measurement

Micro Corrector Model IMCW2

User Terminal Software (MCUT) Manual

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1 Information

This manual details the installation and operation of all varieties of the Dresser™ Micro Corrector, Model IMCW2. The Micro Series Corrector and Micro Series Corrector User Terminal are manufactured by Natural Gas Solutions North America, LLC (Dresser)

All printed material contained within this manual is for information only and is subject to change without notice. This manual should be read in conjunction with firmware version **1.83 and higher** and up to Micro Corrector User Terminal software version **6.0.0.0**. or higher.

This manual uses the words corrector, corrected and uncorrected throughout. The words corrector, corrected and uncorrected should be read as meaning converter, converted and unconverted as defined by the most recent standards on volume conversion.

In addition, the term *telemetry output pulse* should be read as meaning *pulse output.*

In the case of the IMCW2 T-Only and when a fixed line pressure is applied, the corrected and uncorrected volumes should be read as meaning compensated and uncompensated.

For the purpose of this document the terms PC and laptop should be considered as being interchangeable.

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2 General Overview

The Dresser™ Micro Corrector, Model IMCW2 is designed to measure live pressure and temperature, and to utilize gas composition to calculate corrected volume.

The IMCW2 is designed to install directly on to all Dresser rotary meters as well as rotary meters of other manufacturers (contact your Dresser Representative for further details). Volume is sensed from the rotation of the impellers via a magnetic pickup, therefore the input signal to the electronic counter and volume corrector is of high resolution. This translates into an extremely high level of accuracy of volume measurement and correction. Furthermore, the lack of a mechanical counter increases the rangeability of the gas meter by reducing the flow required to start the meter rotating.

Model	Live Temperature	Live Pressure	Differential Pressure
IMCW2 T-Only	Yes		
IMCW2 PTZ	Yes	Yes	
Pressure Only		Yes	
T-dp	Yes		Yes
Ptz-dp	Yes	Yes	Yes

Note: A temperature only version of the IMCW2, the IMCW2 T-Only is available. The IMCW2 T-Only measures live temperature and calculates supercompressibility. The operator is required to configure a fixed line pressure value. All functionality, with exception of the live pressure measurement is identical to that of the IMCW2-PTZ, and this manual is applicable to both.

A monitor pressure version is also available. An external pressure transducer mounted on a length of armoured cable allows for additional upstream pressure monitoring. Configurable monitoring features are available for this Micro Corrector version.

A differential pressure version is also available, the IMCW2-dp. A differential pressure (DP) transducer module is mounted onto the back of the Micro Corrector unit. This module houses a DP transducer with inlet and outlet connections. Meter diagnostic capabilities are available for this Micro Corrector version.

The Micro Series Corrector User Terminal Software (MCUT) enables the operator to configure, calibrate, download data, and audit logs and monitor alarms. The operator can specify which parameters are logged in the data log as well as the logging interval. The audit log provides a tracking facility detailing any parameter changes; only the parameter changes that will affect the billing are included within the audit log. To ensure the integrity of the billing period, the audit log cannot be deleted.

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3 Safety

The serial port may only be connected to an intrinsically safe modem as shown by the safety system approval drawing (062308-000 in the Dresser IMCW2 Hardware Manual). For commissioning and reading data the serial port may also be connected to a laptop computer under the following conditions:

1. Laptop computers, generally, are not intrinsically safe. Therefore, before using an uncertified laptop in the hazardous area, a gas test should be performed to prove that no potentially hazardous gas mixture exists in the area. If this is not possible the laptop must not be used in the hazardous area.
2. The laptop computer must be powered by batteries alone and these must be incapable of supplying more than 25 Volts. No connection is to be made to an external supply (e.g., charger) even if non-operational. (The presence of the connection can itself create a hazardous condition).1

WARNING

All IMCW2 installations must meet **Intrinsic Safety** requirements.

Ensure that the installation is carried out in an appropriate manner in accordance with any National Codes of Practice dealing with Intrinsically Safe (I.S.) installations

Connection to intrinsically safe equipment must be properly assessed by the user; the manufacturer (Dresser) will not take responsibility for the overall safety of the system.

See drawing 062308-000 in the Dresser IMCW2 Hardware Manual

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4 Installation and Getting Started

4.1 System Requirements

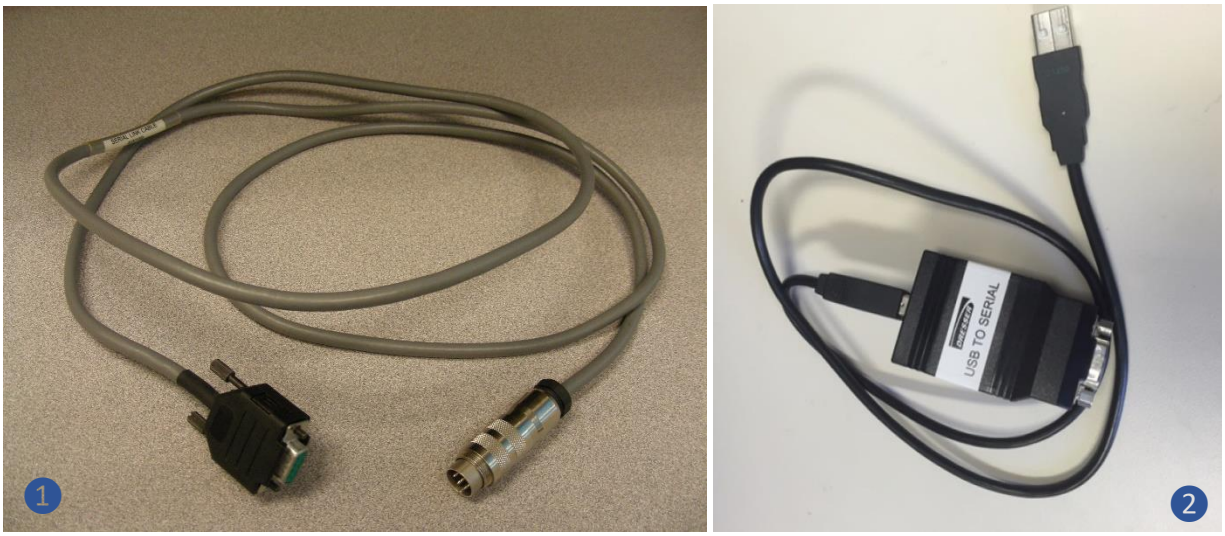
The MCUT is designed to run on Microsoft Windows® based PCs.

4.2 Required Equipment

The following equipment is needed to connect your computer to the Micro Corrector.

- Dresser Micro Corrector User Terminal Software files
- Dresser™ Serial Communications Cable
- USB to Serial Port converter (if your laptop is not equipped with a serial port)

Item	Part	Purpose
1	Serial Communications cable	Connect from your computer's serial port to the Micro Corrector Serial port
2	USB to Serial Port converter (Example shown below)	Converts the above serial cable to a USB-A connector



Communication Cable and Serial Converter

Note: The appearance of the items may differ from the ones shown here.

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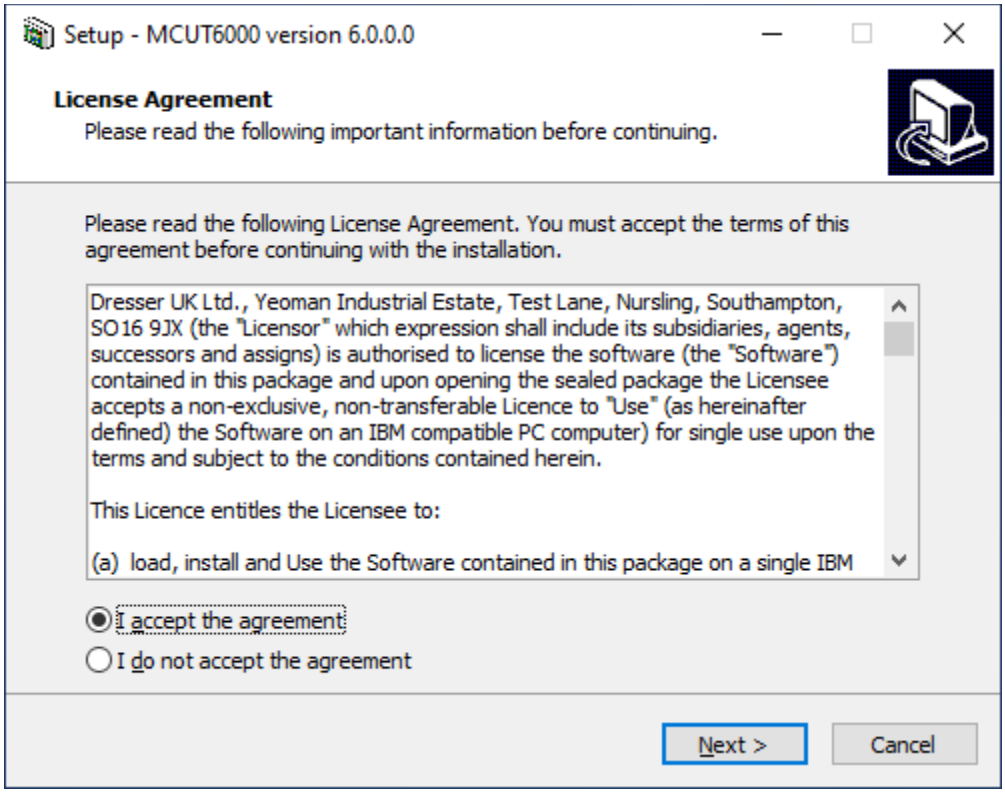
4.3 Installation

The MCUT software is supplied by your Dresser Representative either as a downloadable link or through physical media.

Insert/download the MCUT software installation onto your PC or laptop. If the auto run facility is enabled on the PC, the set-up program will start automatically.
If the installation program does not start automatically then double-click SETUP.EXE from the contents list.

Follow in installation prompts to complete the software installation.



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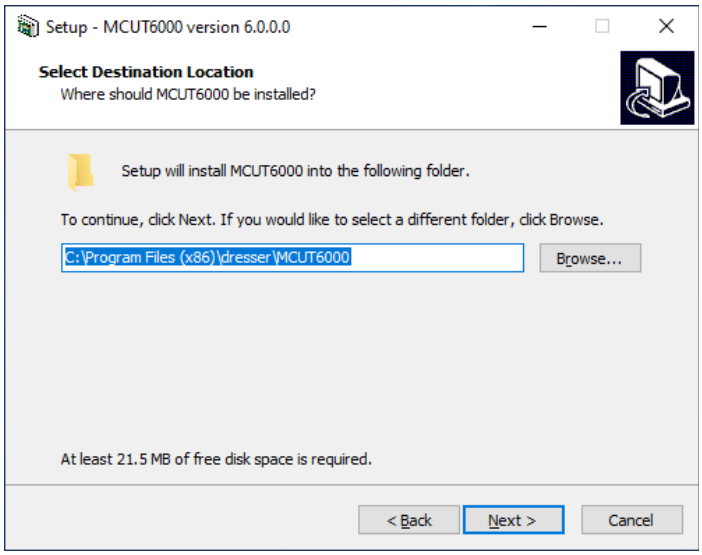

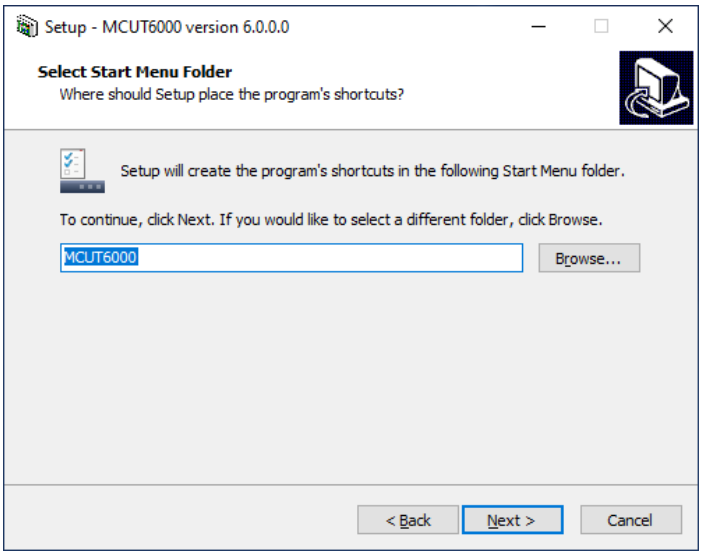

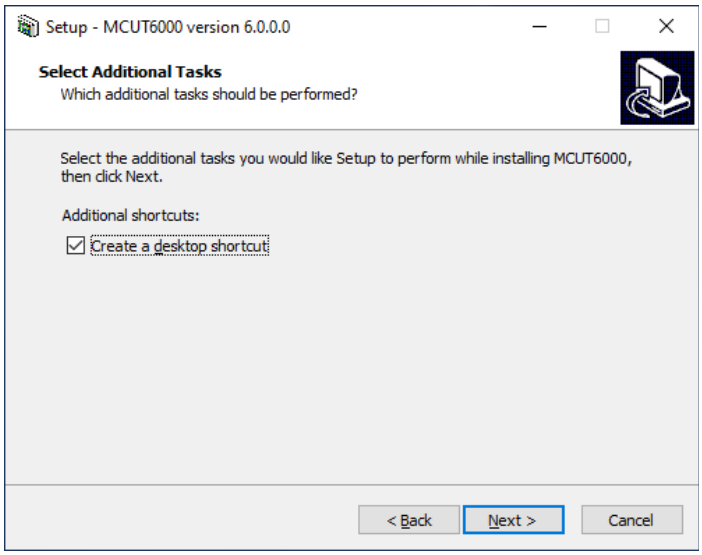

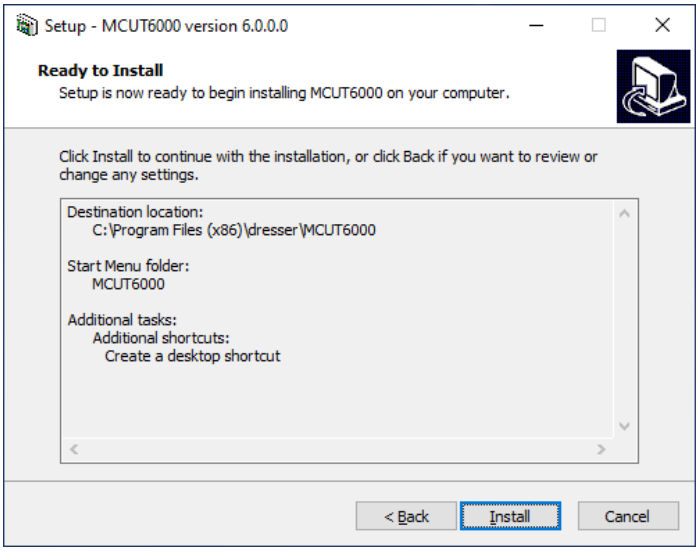

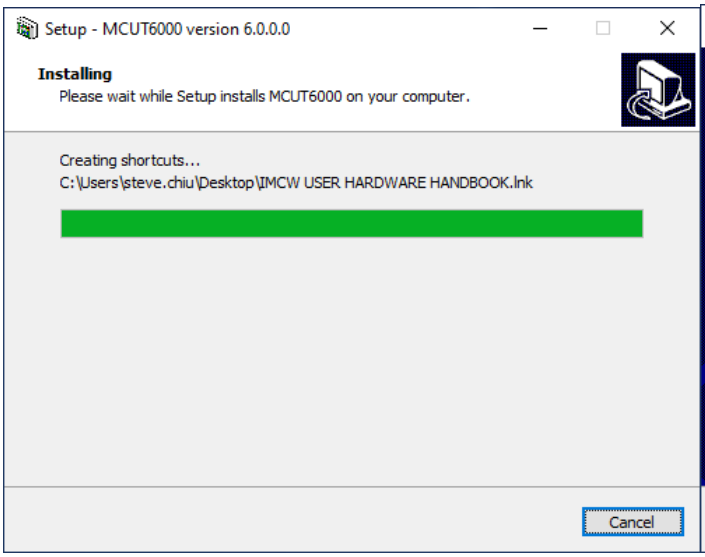

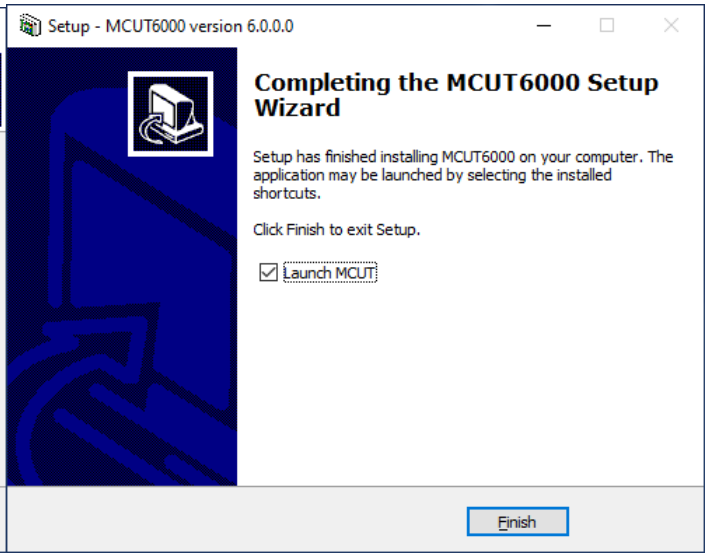

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4.4 Operating the MCUT

Communications to the IMCW2 can be carried out either directly or remotely. An intrinsically safe barrier must be installed between a PC in a non-hazardous area and the IMCW2 in the hazardous area. The procedures contained in this manual are identical regardless of whether communications to the IMCW2 are carried out directly or remotely via the modem, however the operator will be prompted to enter some additional details if remote communications are to be established.

Note: For details on setting-up and communicating via a modem contact your Dresser representative.

All the procedures outlined below are described using the direct method of communication and therefore assume that the Dresser supplied communications cable is connected between the PC and IMCW2.

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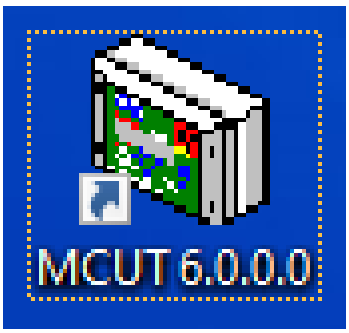
4.5 Starting MCUT (Micro Corrector User Terminal)

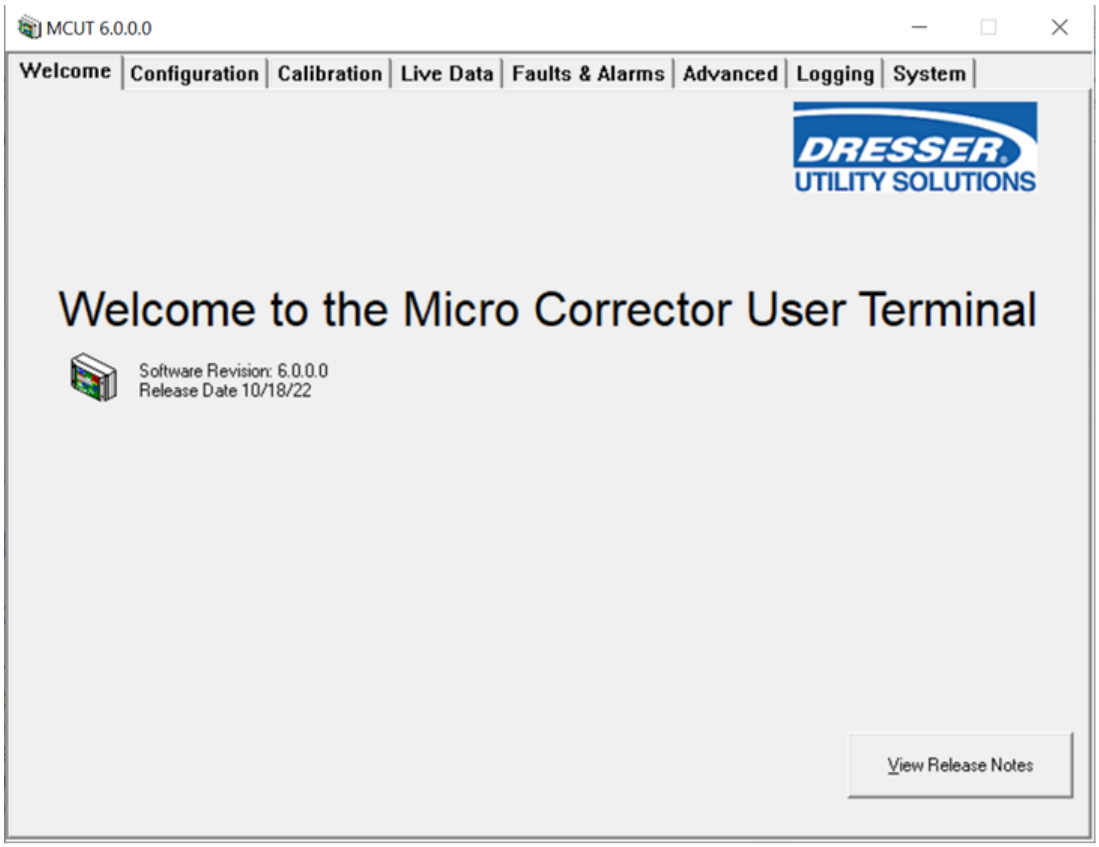
To start the MCUT:

Note: Completion of the installation process will have placed an icon onto your Windows® desktop.

1. Locate and double-click the icon created on the desktop. Alternatively select the *MC UT* icon from the *Micro Series User Terminal* folder in the *Start*, *Programs* menu.



2. A window will pop-up showing the Welcome tab



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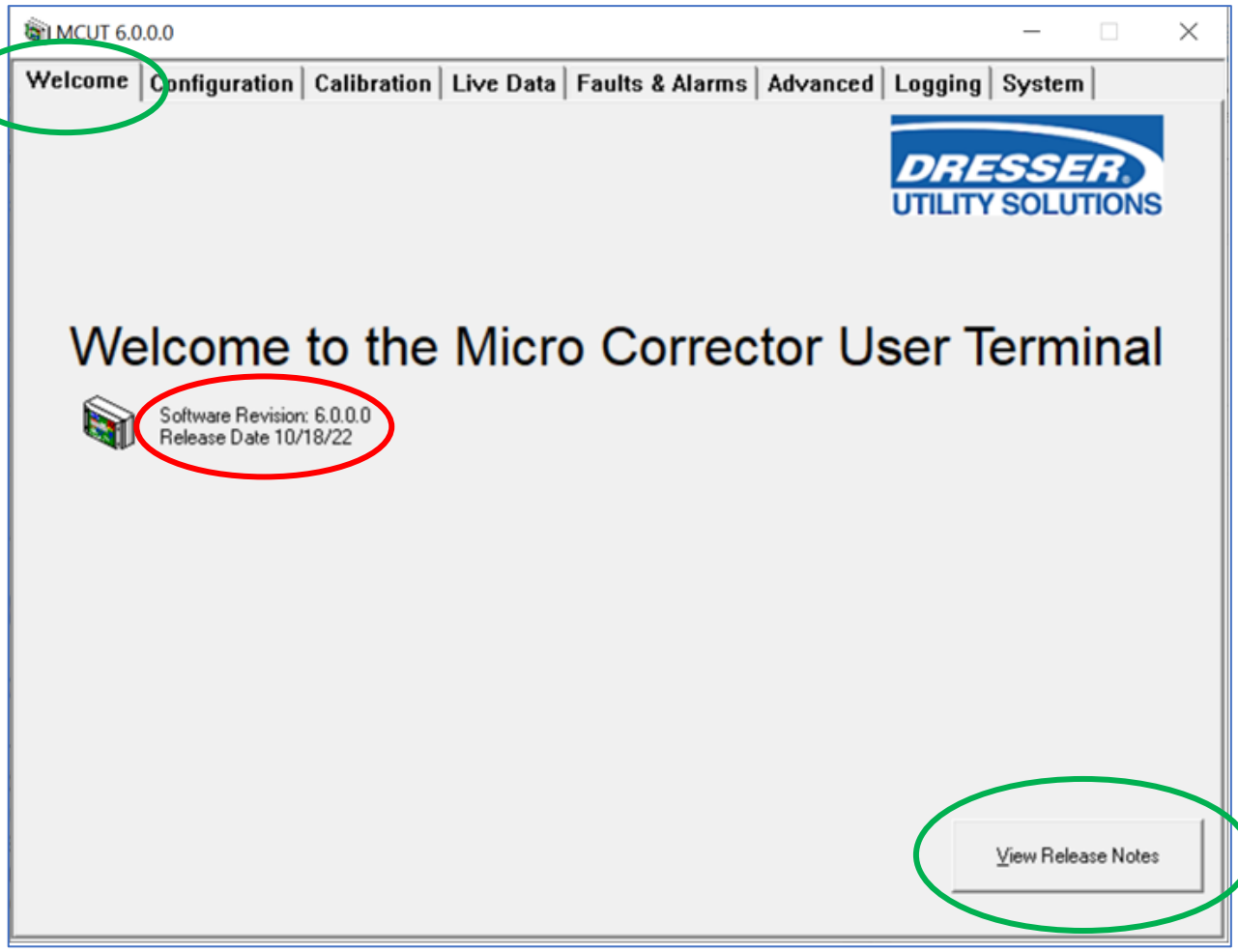
5 Welcome Tab

The software version and release date of the user terminal is displayed on the *Welcome* tab.



Welcome Screen

Note: The *Software Revision* is required if customer support is requested.

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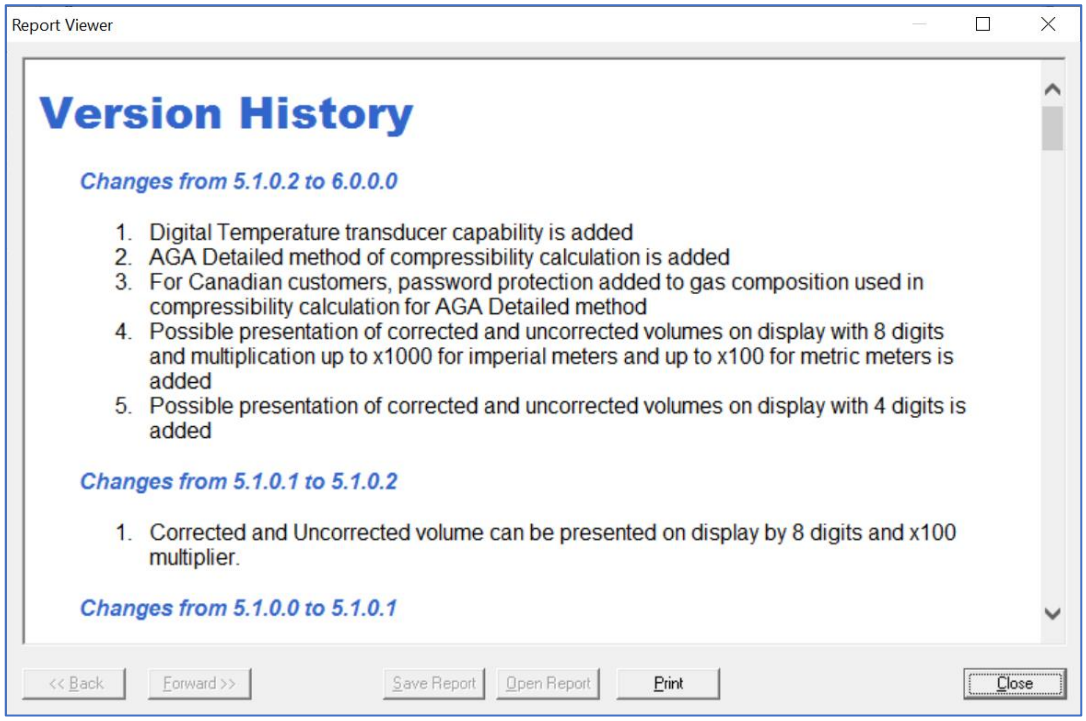
The View Release Notes button will bring up a window which states a summary of changes in the current revision.



To connect to the IMCW2 it is necessary to select the *Configuration* tab to display the *Configuration Screen*.

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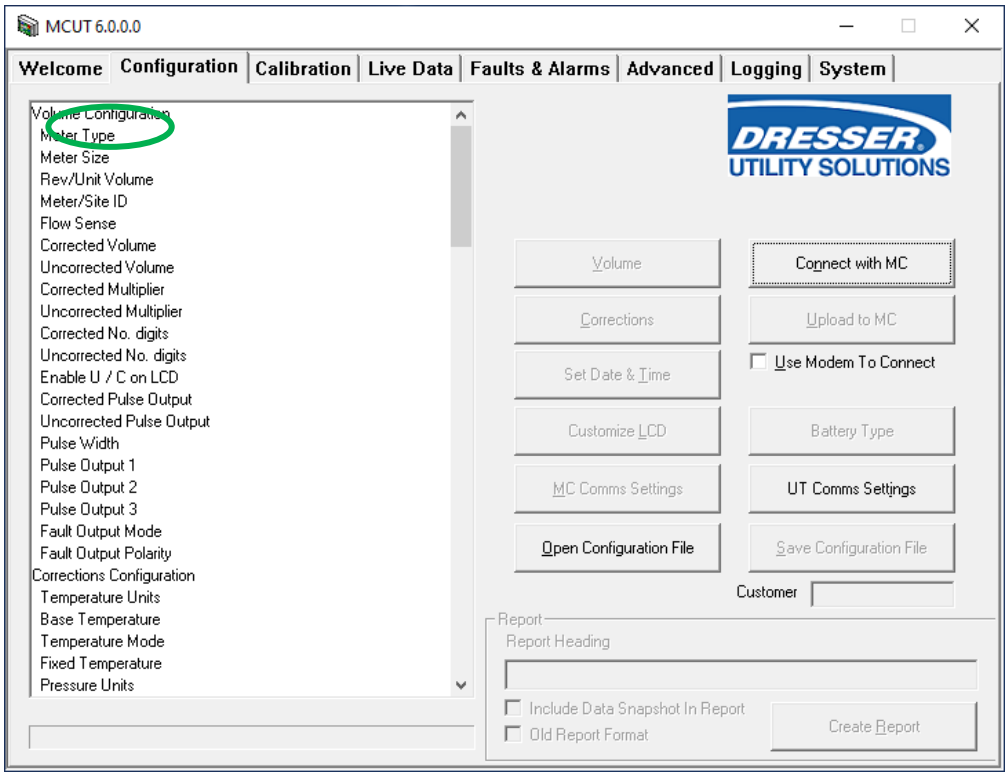
6 Configuration Tab

To display the configuration tab:

- In the MCUT select the *Configuration* tab. The *Configuration* screen will be displayed.
- The options available on this screen depend on the model and configuration of the IMCW2.
- Upon initial call up of this screen (which must be done every time the MCUT is run) it is necessary to **establish communication** with the IMCW2 so that the current settings stored within the IMCW2 are displayed in the MCUT.

The *Configuration* tab is divided into 3 main sections; the left-hand parameter summary/selection list, 9 options which allow the operator to connect and configure the IMCW2, and the report generation section.



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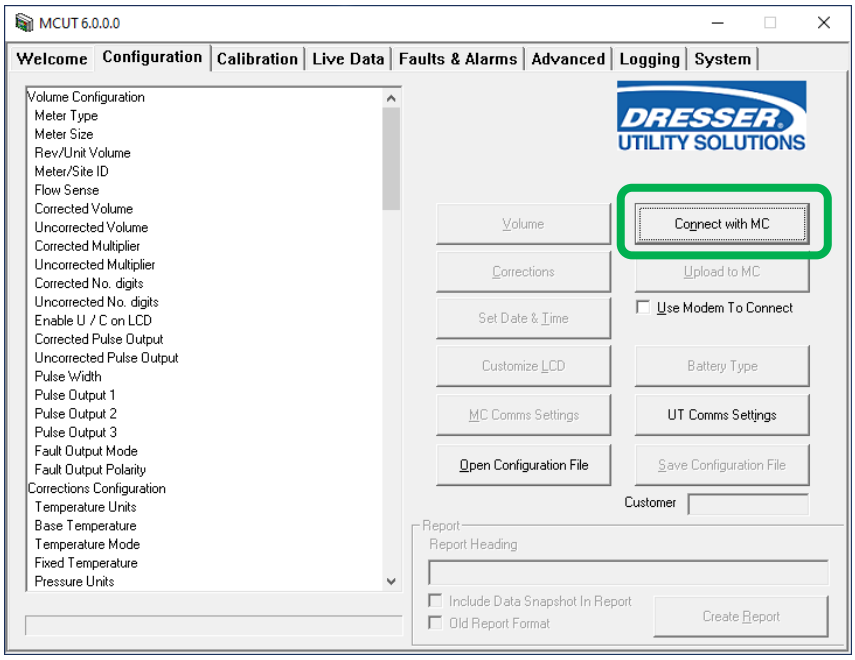
6.1 Connect to the Micro Corrector

For direct communications connect the 9 way “D” type connector of the communications cable to COM port 1 on the PC; connect the round connector to the serial port connector located in the right-hand corner on the bottom of the IMCW2. If COM port 1 is not available, it is possible to specify which COM port is to be used within the MCUT for direct communication **(COM 1 to COM 255)**. A fixed baud rate may be selected for modem communications.

To connect to the IMCW2 directly select the *Connect with MC* option (if no com port is otherwise specified COM1 will be used by default).

Note: For details on setting-up and communicating via a modem contact your Dresser representative.



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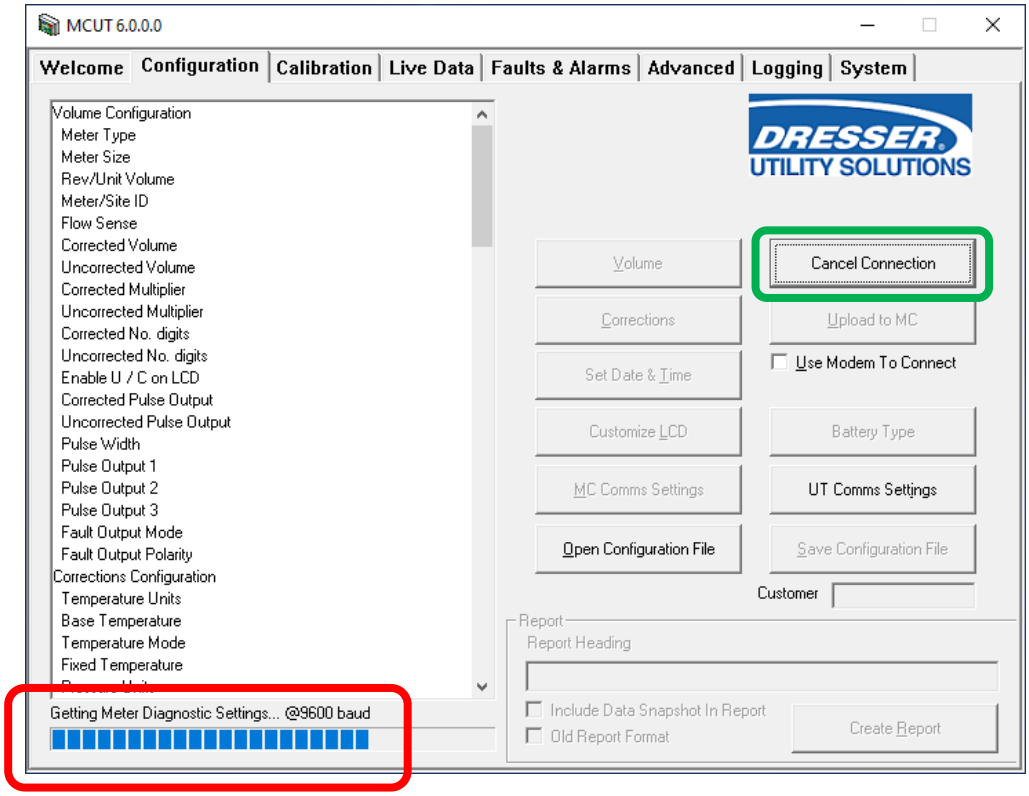
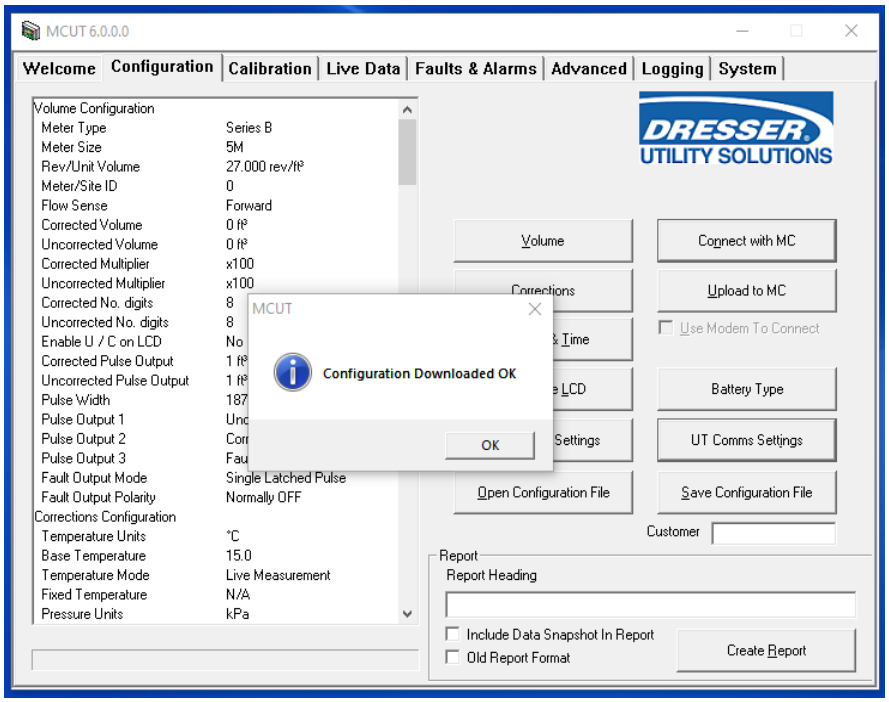
Once the download is complete a dialog will be displayed stating that *Configuration Downloaded OK,* select *OK*.



A status bar will display the connection progress.
The “Connect with MC” button will change to “Cancel Connection” during the connection time and you can abort the operation by pressing this button.



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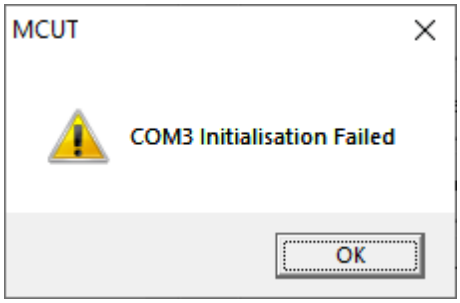
If you receive a communication error, you are able to select another communication port…

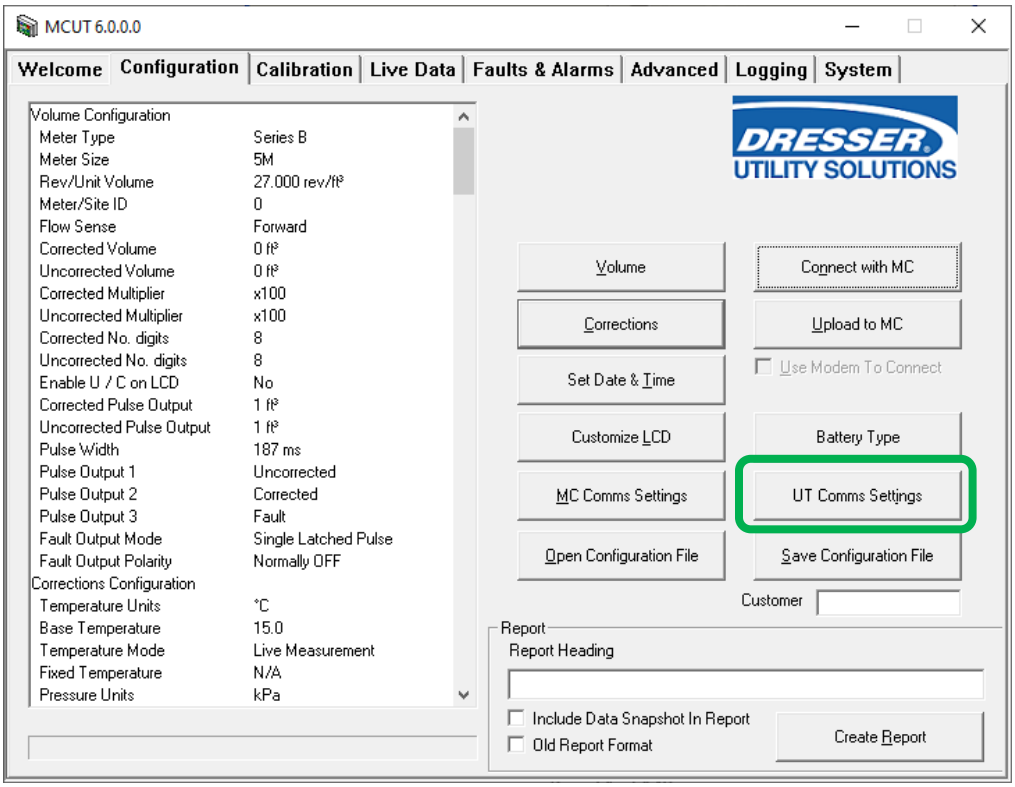


6.2 UT Comms Settings

Communications to the IMCW2 may be conducted directly or remotely, via modem.

Note: For details on setting-up and communicating via a modem contact your Dresser representative.

1. Select the *UT Comms Settings* option. The U*T Comms Settings* dialog will be displayed.



If there are no valid modem connections, then the following window will be displayed.

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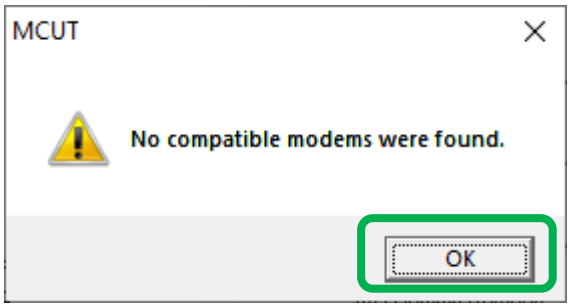
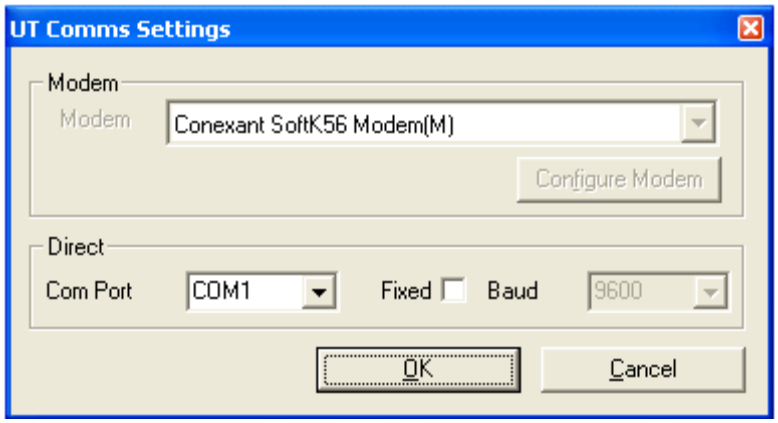


The operator can specify which communications port is to be used for direct communications **(COM1 to COM255)**, and the modem configuration for remote communications. Additionally, the user may select a fixed baud rate for direct communications.

Note: For details on setting-up and communicating via a modem contact your Dresser representative.



UT communication settings Screen

To specify the communications port for in the MCUT:

- On the *Configuration* screen select the *UT Comms Settings* option and the *UT Comms Settings* screen will be displayed.
- From the *Direct* section, select the *Com Port* drop down selection box.
- Select the appropriate com port.
- Select OK on the *UT Comms Settings* screen.

Note: If the PC is not equipped with a serial communication port, then a USB to serial port adaptor can be used. Follow the following procedure to find out Com Port assignment.

- Open Control Panel
- Select System
- Select Hardware
- Select Device Manager
- Check Ports (COM & LPT) to find out Com Port assignation for USB serial port adaptor.

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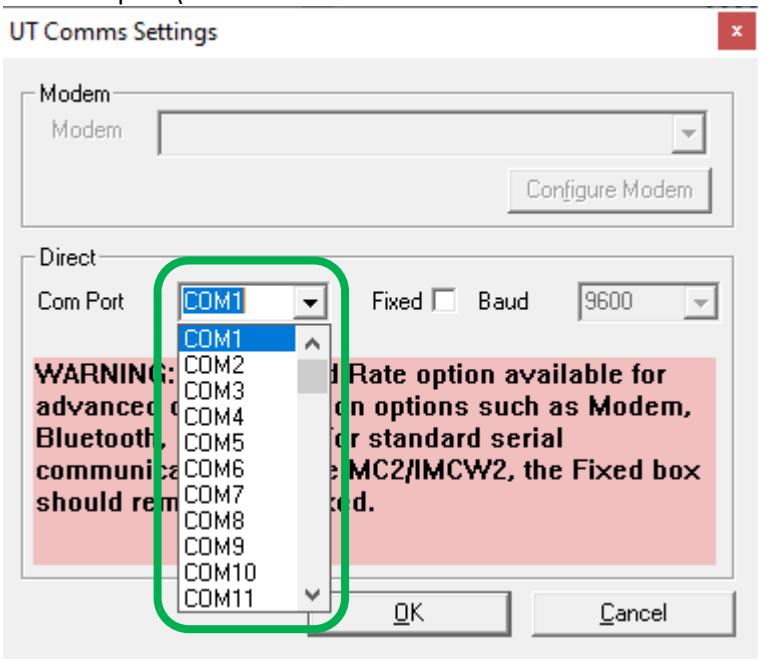
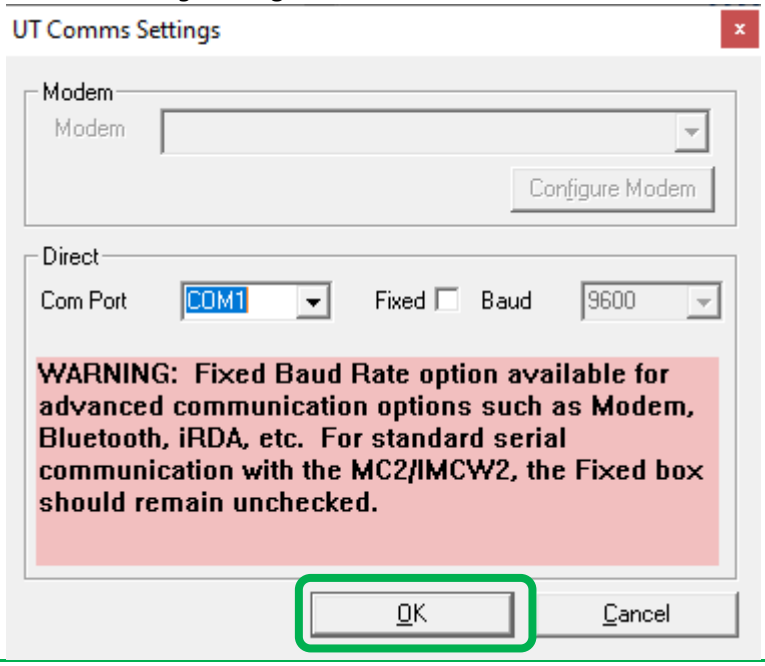
To specify the communications port for use in the MCUT:

2. In the *Direct* section select the *Com Port* drop down selection box.
   Select the appropriate COM port (*that which the communications cable is connected to*), default is COM 1.



UT communication settings Screen

3. Select *OK* in the *UT Comms Settings* dialog.



Note: If the PC is not equipped with a serial communication port, then a USB to serial port adaptor can be used

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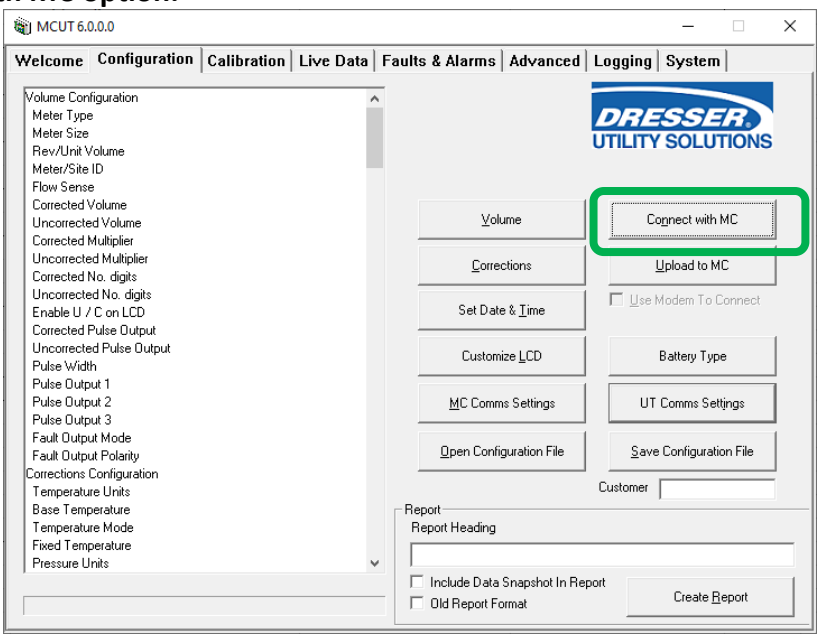
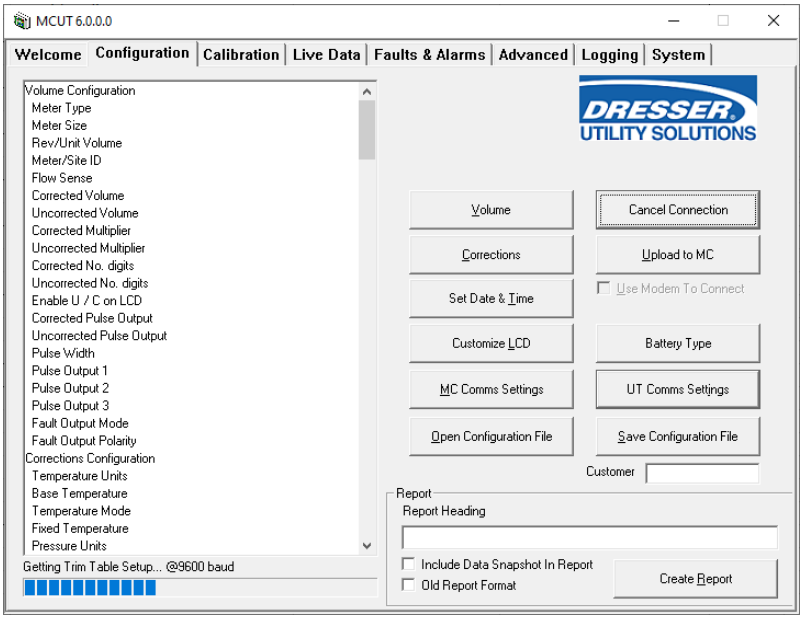
Follow the following procedure to find out Com Port assignation.

- Open Control Panel
- Select System
- Select Hardware
- Select Device Manager
- Check Ports (COM & LPT) to find out Com Port assignation for USB serial port adaptor.

Select the *Connect with MC* option.



4. Communication will be established. A *progress bar* will begin to move from left to right across the screen as the data is downloaded.



Once *OK* is selected, a summary of the current configuration is displayed on the left and all options within the *Configuration* screen will become available; it is now possible to setup and configure the unit.

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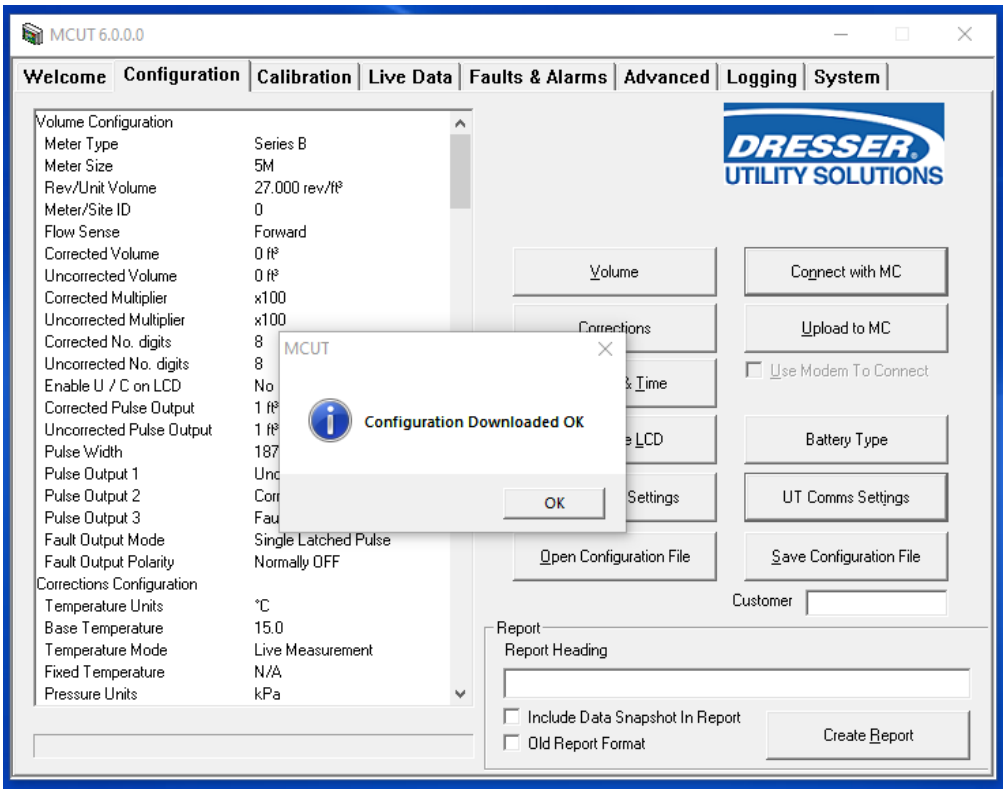

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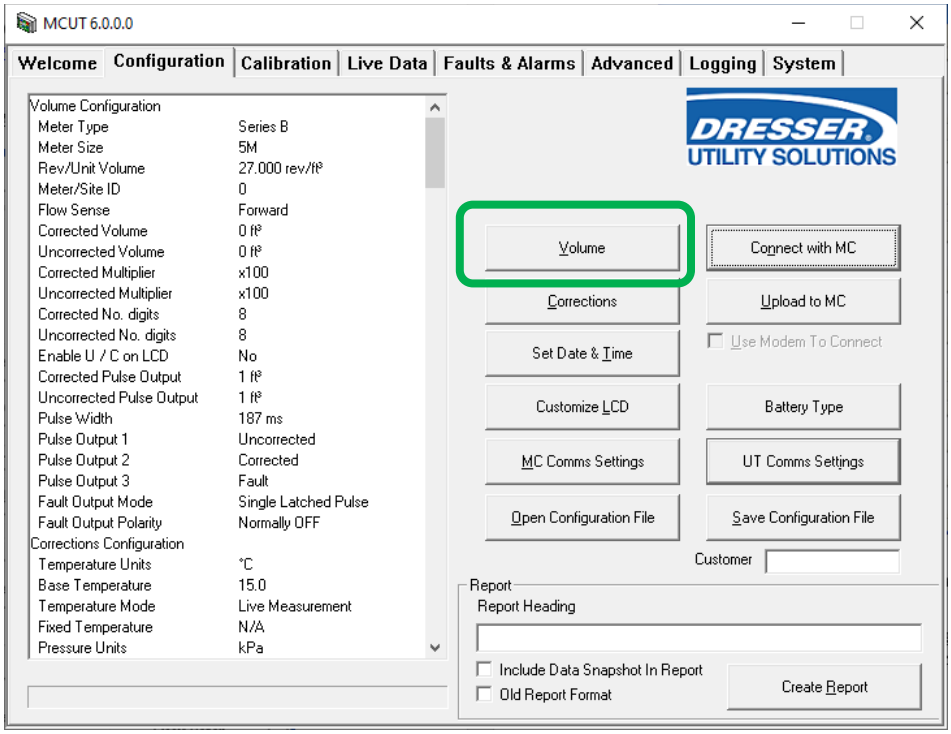
6.3 Volume Configuration



The *Volume Configuration* dialog is divided into 6 sections and the parameters that can be changed within this dialog:

- **Volumes** – enables the operator to specify corrected and uncorrected volume totals.
- **Flow** – enables the operator to specify which direction(s) of flow should be used to measure the volumes.
- **Pulse Outputs** – enables the operator to specify the value for corrected and uncorrected volume per pulse, and the pulse width of these output pulses.
- **Meter Data** – enables the operator to specify the type and size of meter that the IMCW2 is assembled to. Additionally, the operator is able to allocate a *Meter/Site ID* to each specific IMCW2. This field can be a combination of 16 alpha-numeric characters however, special characters not recognized in Microsoft™ file names, cannot be entered in this field.
- **Display** – enables the operator to specify how the corrected and uncorrected volumes are displayed.
- **Pulse Output Allocation** – enables the operator to select uncorrected, corrected or fault pulses separately for each Pulse Output i.e., 1, 2 and 3.

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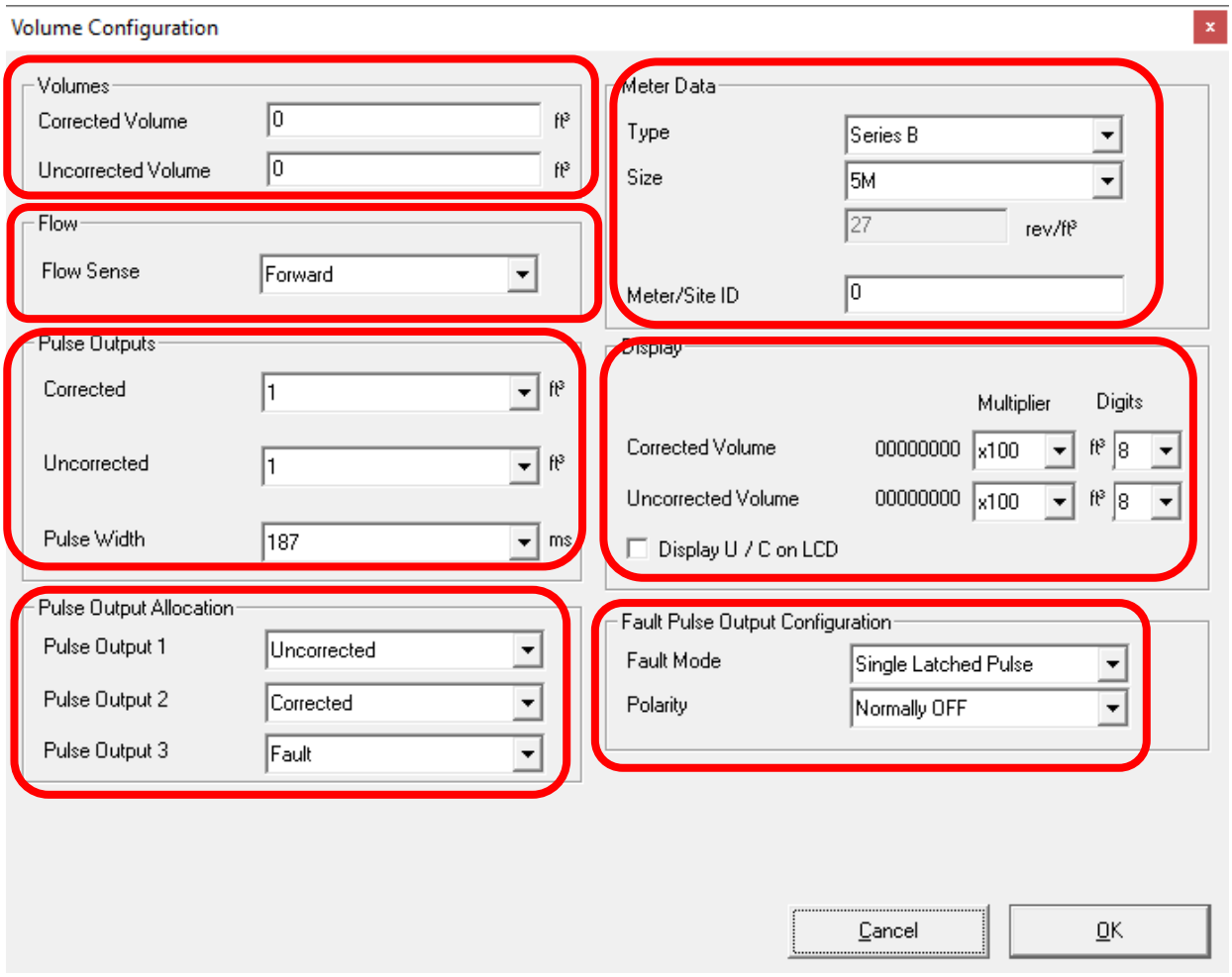

Volume Configuration Screen

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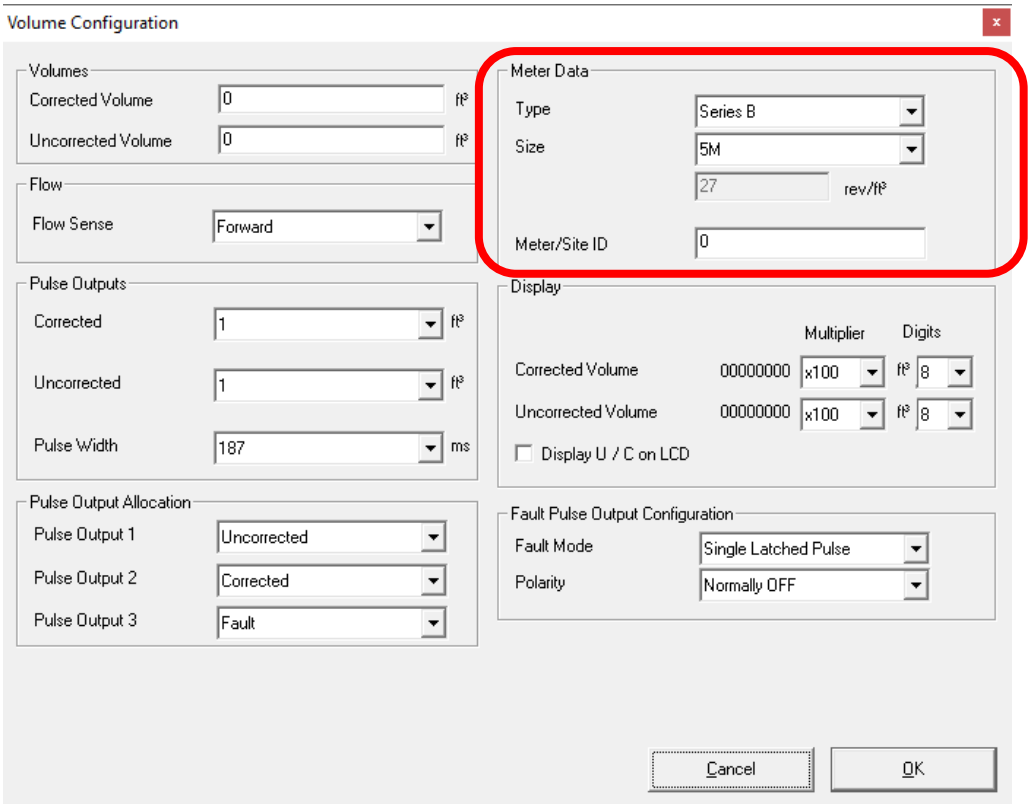
6.3.1 Meter Data



The *Meter Data* section on the *Volume Configuration* screen contains 3 editable fields; 2 drop down selection boxes labelled *Type* and *Size,* and a text box labelled *Meter/Site ID*.

The number of revolutions per ft^3 (rev/ft^3) / m^3 (rev/m^3) (dependent on meter type selected) is automatically displayed when the appropriate meter *Type* and *Size* are selected from the appropriate drop-down selection boxes, these details should reflect the meter type and size that the IMCW2 is fitted to.

If the meter configuration required is not shown in the drop-down selection boxes, the *Manual* option from within the *Size* drop down selection box should be selected.

Note: If cubic feet (cu ft) are required, ensure that an imperial meter type is selected within the *Type* drop down selection box (e.g. *Series B*); if m^3 is required a metric meter type should be selected (e.g. *Series B Metric*).

If the *Manual* option is selected within the *Size* drop down selection box the text below will be enabled, this will allow the operator to enter the desired number of revolutions per (ft^3) or (m^3).

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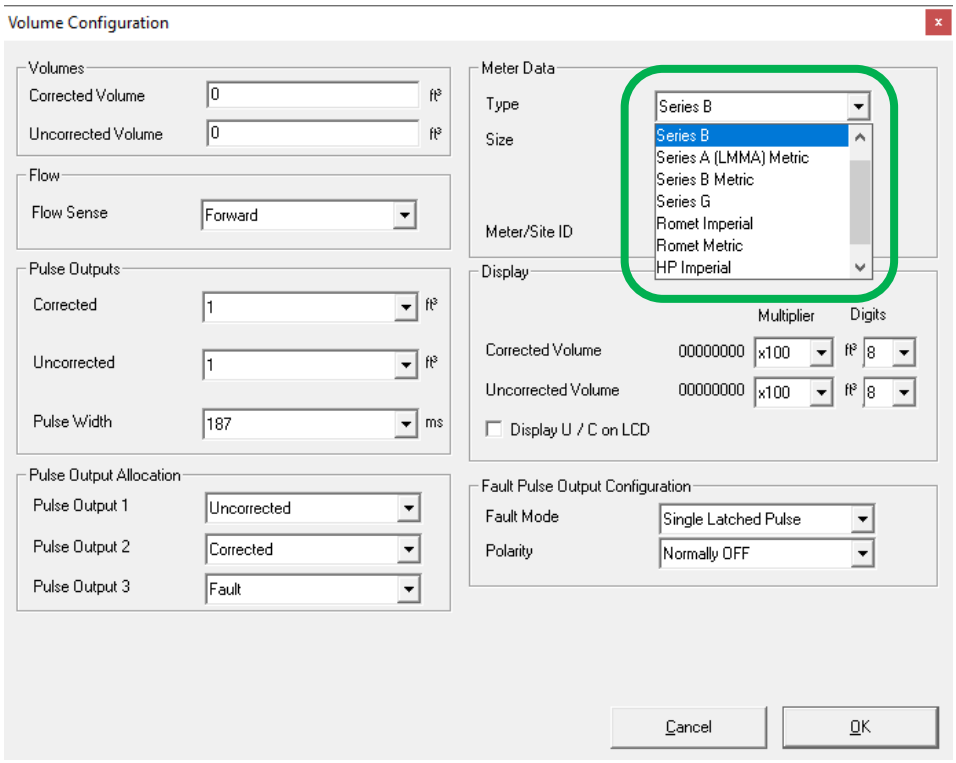
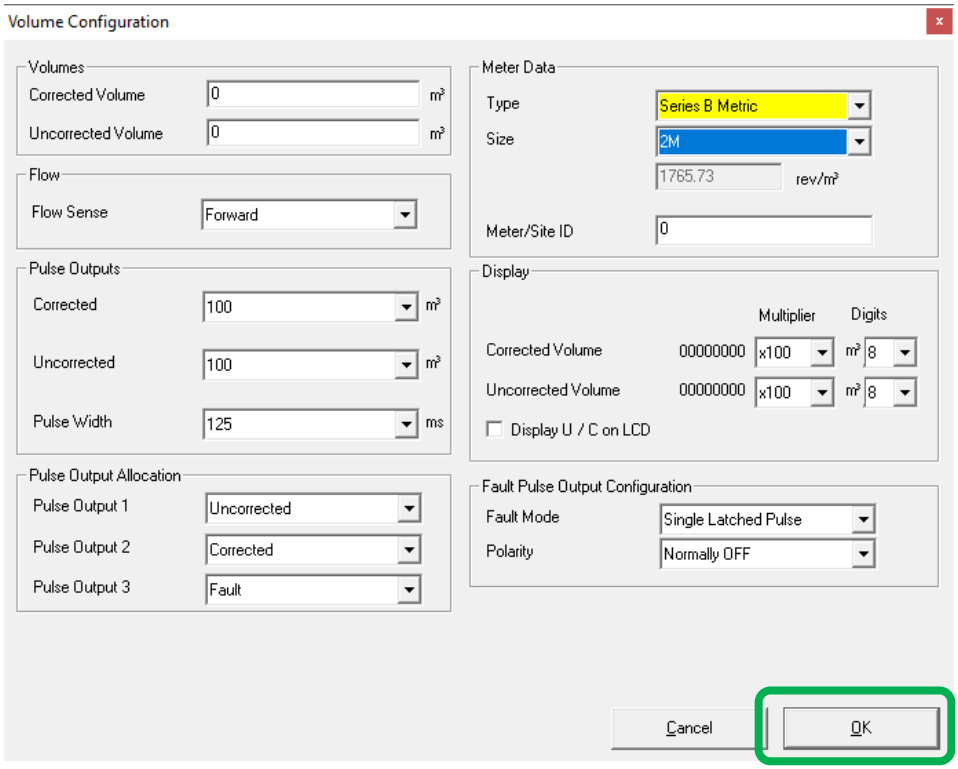
To set the meter type*:*

- In the *Meter Data* section select the *Type* drop down selection box and select the desired option. The new value will be highlighted yellow.



- Select the *OK* option on the *Volume Configuration* screen.



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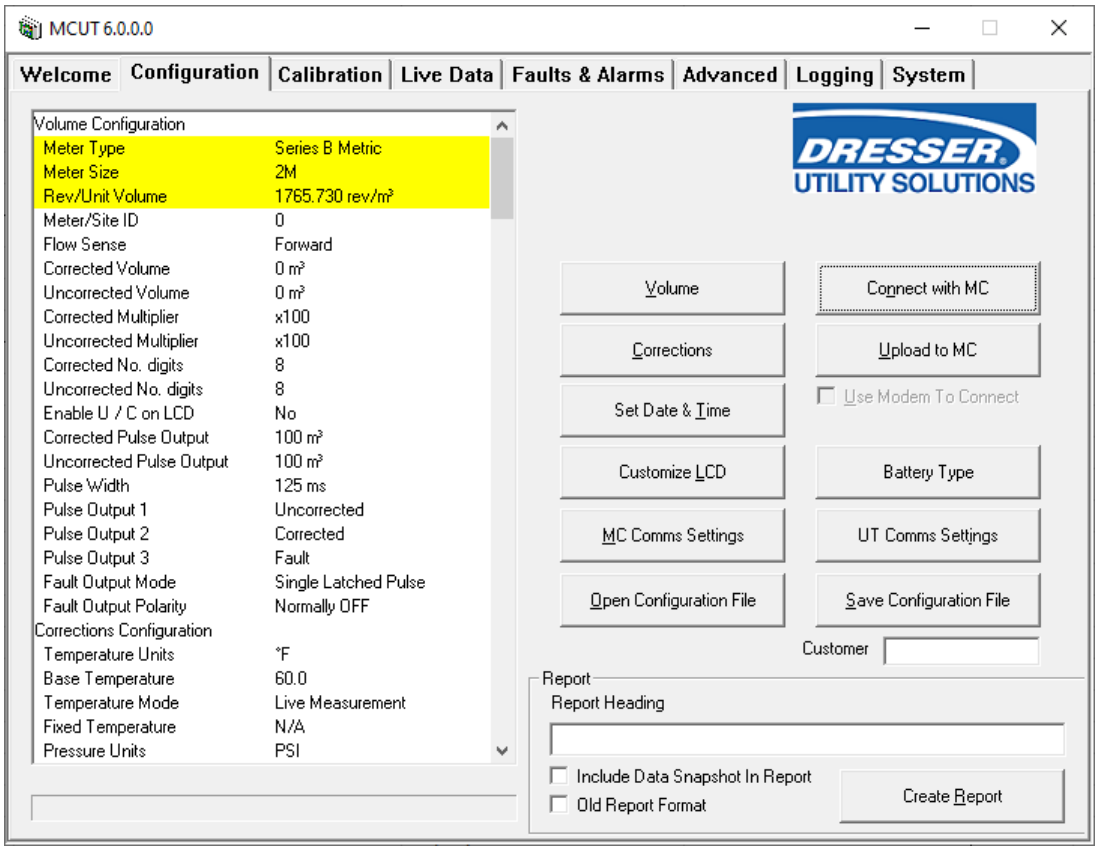
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.



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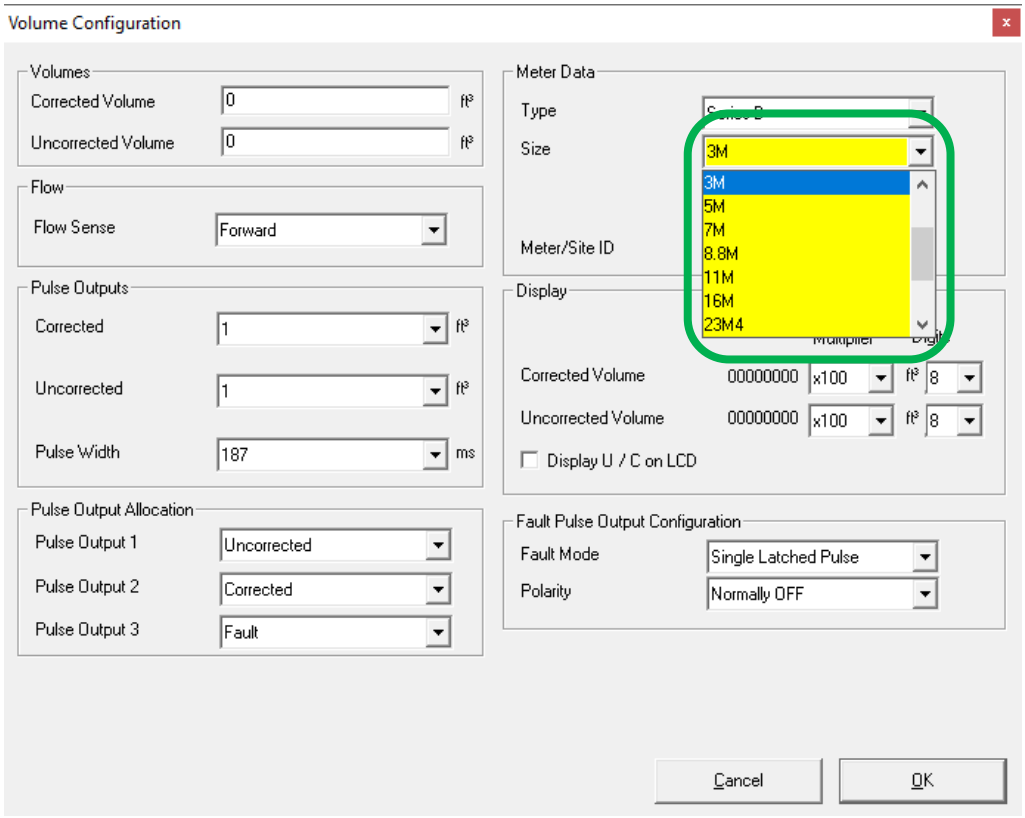
To set the meter size:

- In the *Meter Data* section select the *Size* drop down selection box and select the desired option. The new value will be highlighted yellow.



- Select the *OK* option on the *Volume Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

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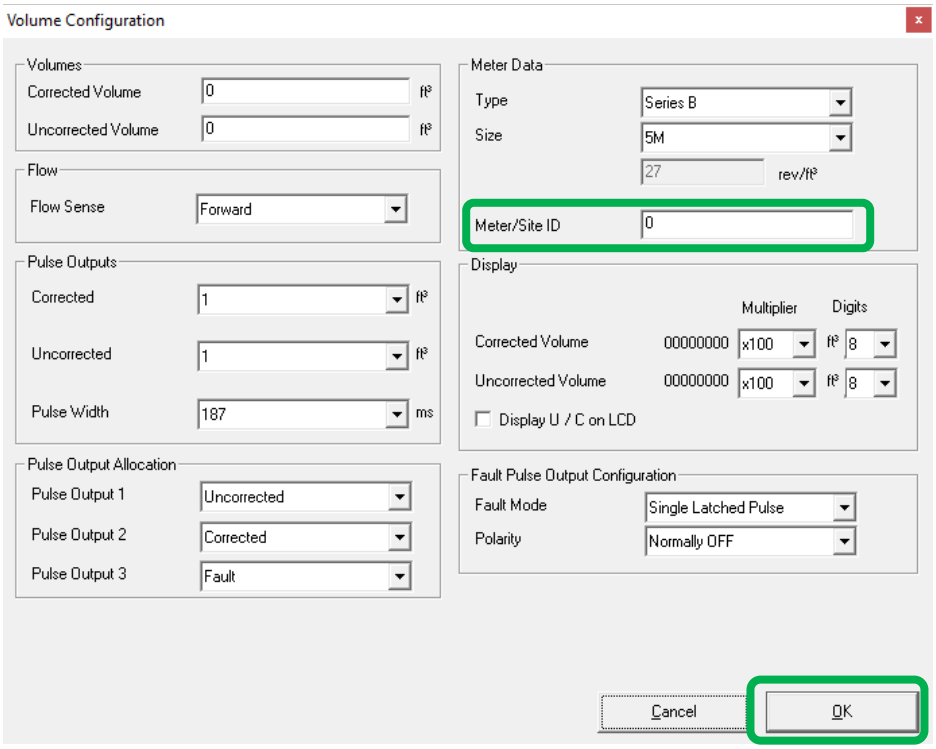
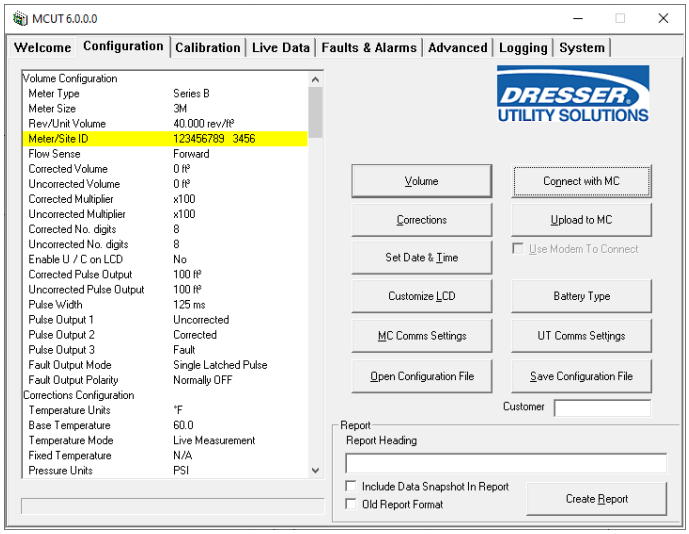
To set the Meter/Site ID:

- In the *Meter Data* section select the *Meter/Site ID* text box and enter the desired Meter/Site ID reference.
- Maximum of 16 alphanumeric characters including spaces.
- The new value will be highlighted yellow.



- Select the *OK* option on the *Volume Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.



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6.3.2 Volumes

It is possible to change the corrected and uncorrected volumes once the data in the IMCW2 has been downloaded to the MCUT.

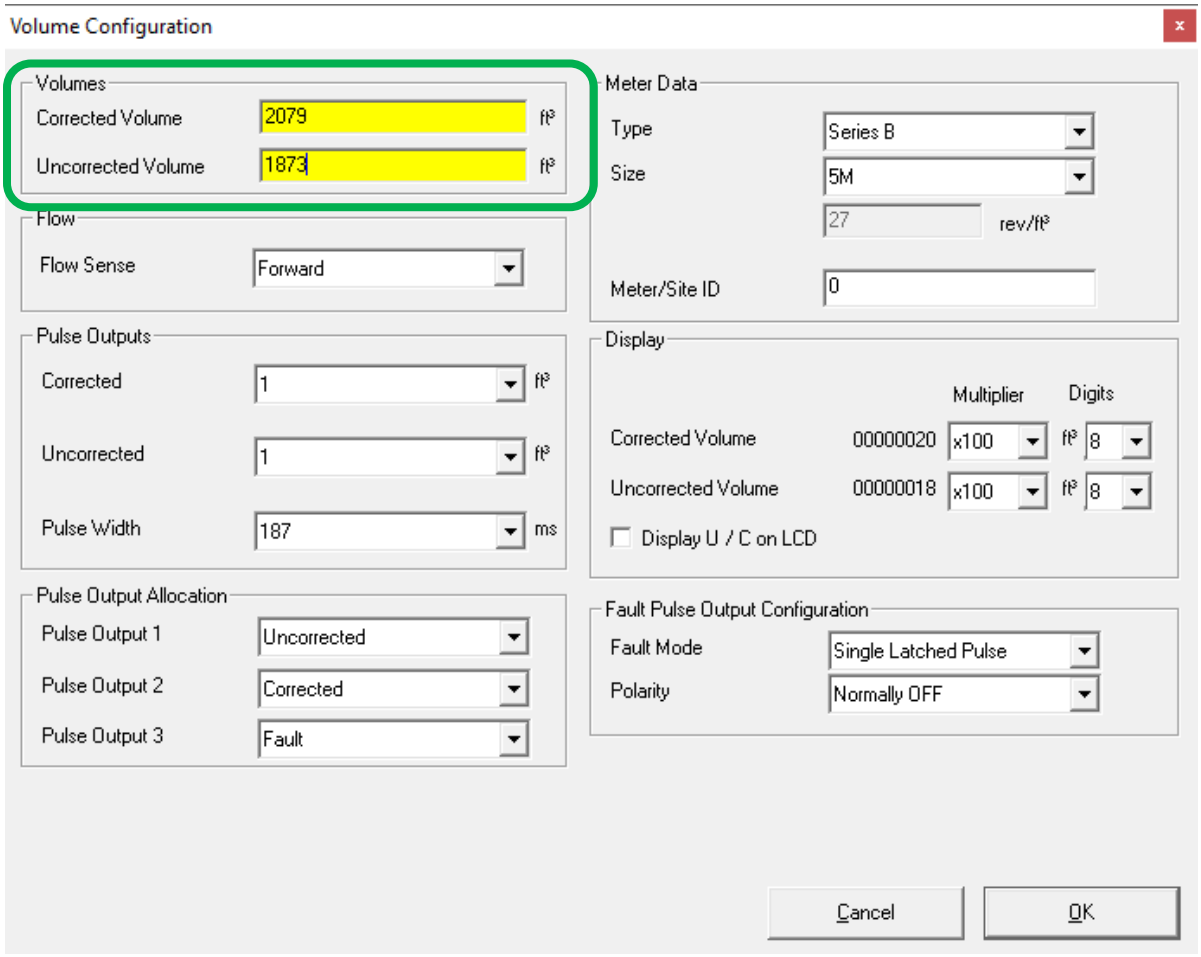
The *Volumes* section on the *Volume Configuration* screen contains 2 text boxes labelled *Corrected Volume* and *Uncorrected Volume* that enable the operator to change the values of the corrected and uncorrected volumes.

To set the Corrected and Uncorrected volumes:

- In the *Volumes* section enter the desired value in the appropriate text box. The new value will be highlighted in yellow. A maximum of 9 digits can be entered in the MCUT for the corrected and uncorrected volumes for firmware versions up to 6.0.0.0. A maximum of 11 digits can be entered for firmware version 6.0.0.0 and higher.

Note: The LCD of the IMCW2 can only display a maximum of 8 digits; the value that is to be displayed on the LCD is shown in the *Display* section of the *Volume Configuration* dialog

- Select the *OK* option in the *Volume Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted yellow in the parameters selection list.



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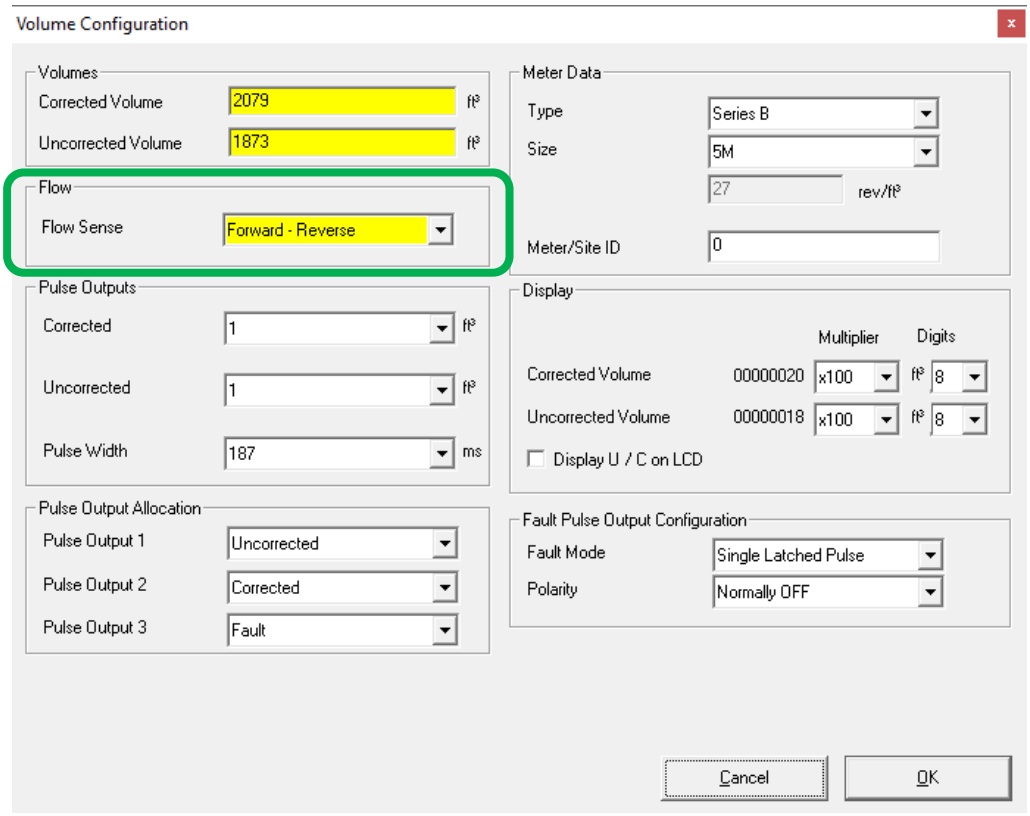
6.3.3 Flow Sense

The IMCW2 measures the flow from the meter via a magnetic pickup which is installed inside the mag well of the meter. The *Flow* section on the *Volume Configuration* screen contains a drop-down selection labeled *Flow Sense.* In this drop-down selection box, the user can specify which flow sense is identified as the positive and negative flow, along with how the flow should be calculated.



The various flow sense configurations are described in below (*Flow Sense Configurations Reference Table*).

Flow Sense Configurations Reference Table

Flow Sense	Measured Flow Source		
	Forward	Reverse	Calculated Flow
Forward – Reverse	✓	✓	Volume in Reverse flow is subtracted from the volume calculated in Forward flow. Reverse flow will be indicated with a "–" symbol.
Reverse – Forward	✓	✓	Volume in Forward flow is subtracted from the volume calculated in Reverse flow. Forward flow will be indicated with a "–" symbol.
Reverse	×	✓	Volume in Reverse flow only is calculated. All flow in the Forward direction is ignored.
Forward	✓	×	Volume in Forward flow only is calculated. All flow in the Reverse direction is ignored.
Forward + Reverse	✓	✓	Volume in Reverse and Forward flow are calculated. Calculated volume is the total of all flow in both directions.

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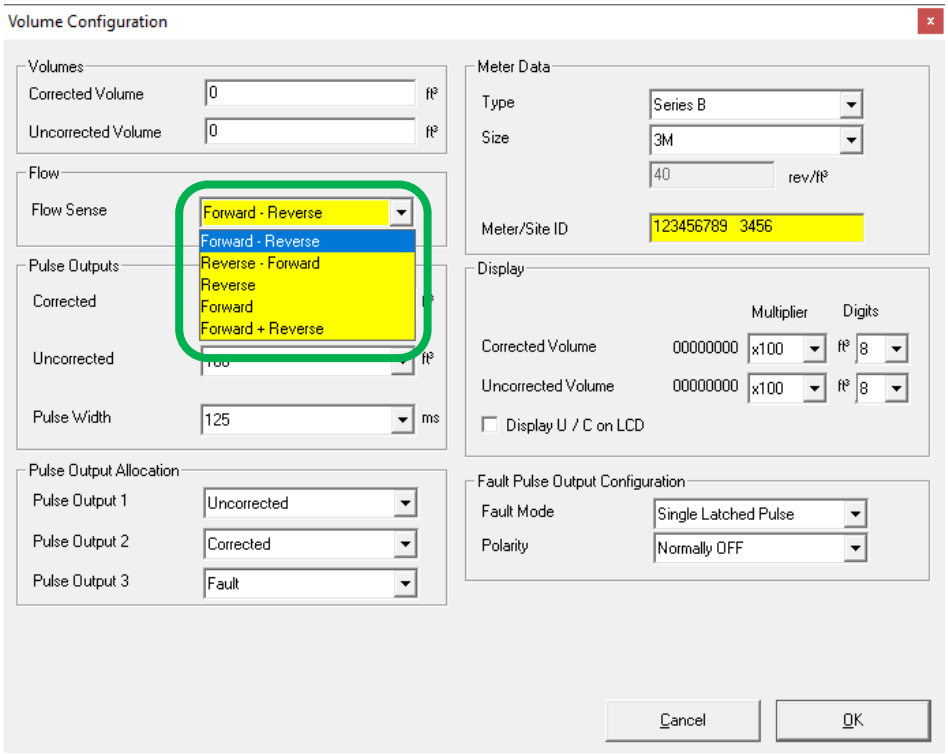
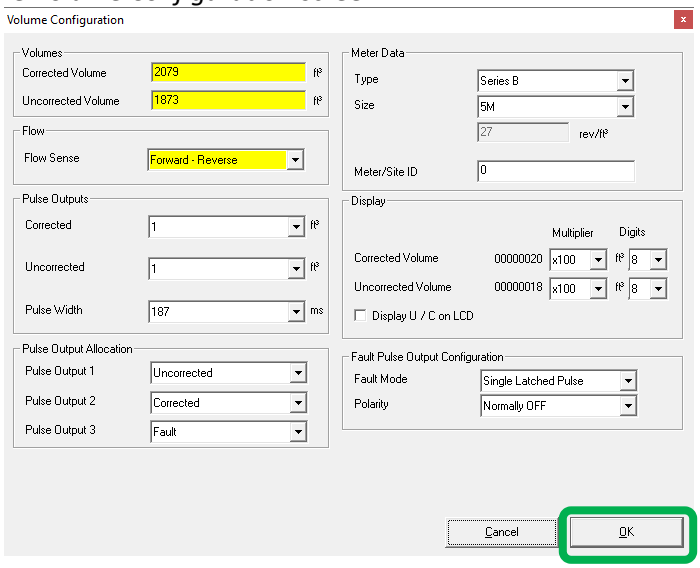
Note: For units sealed for Measurement Canada custody transfer the flow sense must be set for "Forward" only.

To set the required flow sense:

- In the *Flow* section select the desired option from the drop-down selection box labelled *Flow Sense*. Details of the options are described in table above (*Flow Sense Configuration Reference Table*). The new option selected will be highlighted yellow.



- Select the *OK* option on the *Volume Configuration* screen.



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- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Gas flow related values available in IMCW2:

- Instantaneous actual (uncorrected) flow rate
- Overspeed fault
- High flow alarm
- Low flow alarm
- Average corrected flow rate
- Peak corrected flow rate
- Peak uncorrected flow rate

Uncorrected or actual flow rate is available on the display screen. The value of this parameter should not exceed the total connected load at the metering site. The uncorrected flow rate is determined every second, and the four second average value is shown on the display screen.

A snapshot of uncorrected flow rate is available on the Live Data screen in the User Terminal (MCUT).

The operator can set the preferred minimum and maximum uncorrected flow values in the MCUT, and a *High or Low Flow Alarm* will be set if the actual flow rate is outside of the limits. Refer to the section entitled **Faults and Alarms**.

The IMCW2 will set an *Overspeed Fault* if the measured uncorrected flow rate exceeds 125% of the meter Qmax. The operator is not required to set up this fault.

6.3.4 In Firmware Version 3.01 or higher, the operator can choose to log *Peak Uncorrected Flow Rate.* The operator can also choose to log *Average Corrected Flow Rate* and *Peak Corrected Flow Rate*. Refer to the section entitled Logging Screen.

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6.3.4 Pulse Outputs

The pulse outputs can be configured as 0.1, 1, 10, 100 and 1000, and describe the volume per output pulse. These values can be either metric or Imperial. For example, if the corrected pulse output is set to 100 ft^3, 1 output pulse will be generated for every 100 ft^3 received, see table below (*Pulse Output Reference Table*) for further details.

Pulse Output Reference Table

Corrected & Uncorrected Pulse Output (ft^3)	Condition for Output Pulse Generation
1 ft^3	For every 1 ft^3 received
10 ft^3	For every 10 ft^3 received
100 ft^3	For every 100 ft^3 received
1000 ft^3	For every 1000 ft^3 received
Corrected & Uncorrected Pulse Output (m^3)	**Condition for Output Pulse Generation**
0.1 m^3	For every 0.1 m^3 received
1 m^3	For every 1 m^3received
10 m^3	For every 10 m^3received
100 m^3	For every 100 m^3received

Note: The *Corrected Pulse Outputs* and *Uncorrected Pulse Outputs* are independent of one another; therefore, the corrected and uncorrected pulse outputs may be set as different values. This is particularly useful when working with high correction factors.

The *Pulse Outputs* section on the *Volume Configuration* screen contains 3 drop-down selection boxes labeled *Corrected*, *Uncorrected* and *Pulse Width*.

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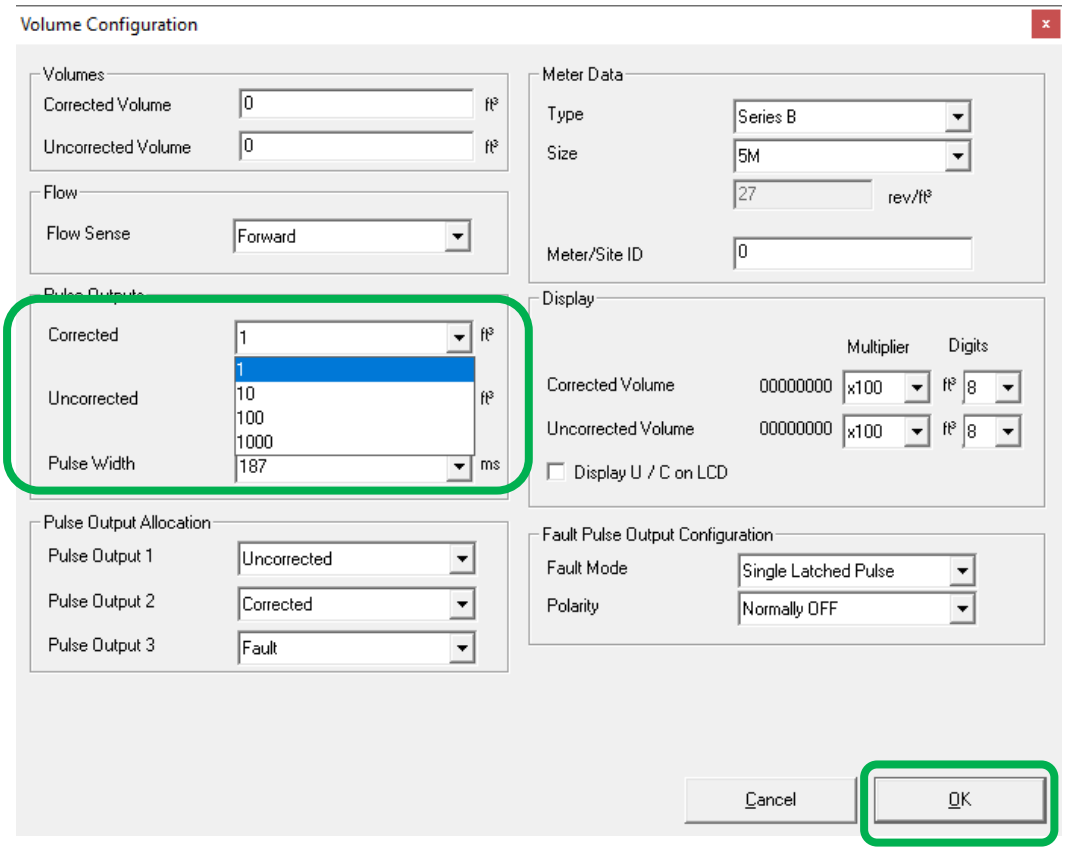
To set the pulse outputs:

- In the *Pulse Outputs* section select the appropriate (*Corrected* or *Uncorrected*) drop down selection box and select the desired option. The new value will be highlighted yellow.



- Select the *OK* option on the *Volume Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

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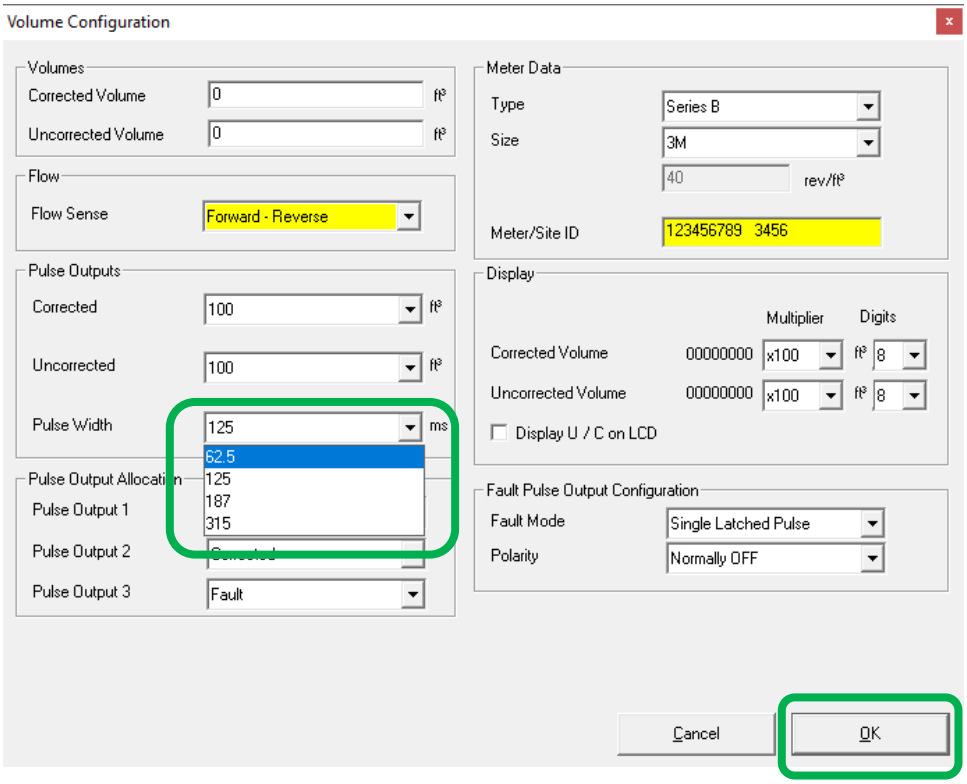
To set the pulse width:

- In the *Pulse Outputs* section select the *Pulse Width* drop down selection box and select the desired option. The pulse width of the output pulses can be set to
  - 62.5 ms (not suggested for an Itron™ ERT)
  - 125 ms
  - 187 ms
  - 315 ms

Note: If connecting an Itron™ ERT the pulse width must be set to 125 ms or greater.



- The new value will be highlighted yellow.
- Select the *OK* option on the *Volume Configuration* screen.

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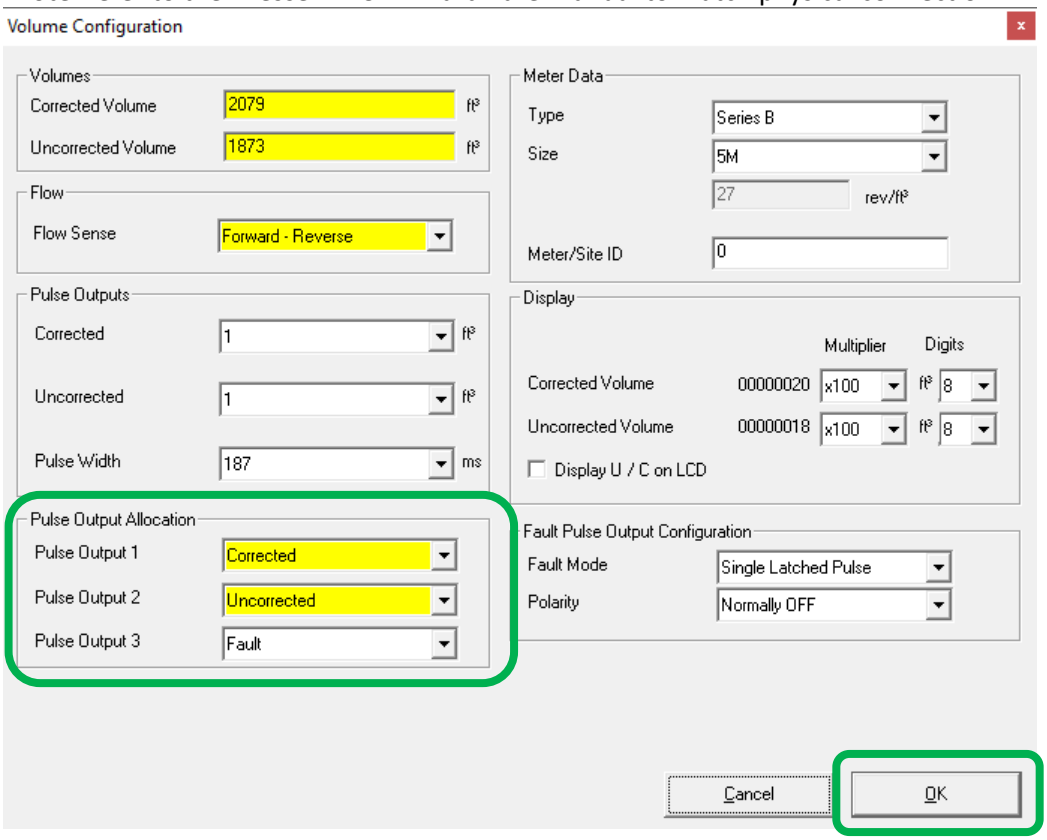
6.3.5 Pulse Output Allocation

- In the *Configuration* screen select the *Pulse Output 1, 2 or 3* option. The *Pulse Output Allocation Configuration* section will be displayed.
- In the *Pulse Output Allocation* section, select the required *Pulse Output* drop down selection box and select the desired option i.e.
    - *Uncorrected,*
    - *Corrected*
    - *Fault*

    Note: refer to the Dresser IMCW2 Hardware Manual to match physical connection



- The new value will be highlighted yellow.
- Select the *OK* option on the *Volume Configuration* screen.

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6.3.6 Display

The Display section on the Volume Configuration screen contains 4 drop down selection boxes:

- Corrected Volume Multiplier
- Corrected Volume Digits
- Uncorrected Volume Multiplier
- Uncorrected Volume Digits

The LCD can display up to 8 digits for the various volumes.

For firmware versions earlier than version 6.00:
The maximum volume value registered and stored in the volume register is 999,999,999 plus 0.99 [ft^3] or [m^3]. This means 9 digits volume value plus 2 digits residual volume. If the volume is increased by 0.01 in set volume units, then the volume stored in register becomes zero and the counting will continue.

Volume Reading	Multiplier Option	Digits Option	Volume Displayed on LCD
123456789	x0.1	8	34567890
	x1		23456789
	x10		12345678
	x100		01234567
	x1000		00123456
123456789	x0.1	7*	4567890
	x1		3456789
	x10		2345678
	x100		1234567
	x1000		0123456
123456789	x0.1	6*	567890
	x1		456789
	x10		345678
	x100		234567
	x1000		123456
123456789	x0.1	5*	67890
	x1		56789
	x10		45678
	x100		34567
	x1000		23456

* When selected the *Display U / C on LCD* check box is displayed, by selecting this option a *U* will be displayed on the uncorrected volume and a *C* on the corrected volume on the LCD.

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For firmware versions 6.00 and higher:

The maximum value stored in the volume register is 99,999,999,999 plus 0.99 [ft^3] or [m^3]. This means 11 volume digits plus 2 digits residual volume. The registered volume is shown on the Live Data screen. If the volume is increased by 0.01 in set volume units, then the volume stored in register becomes zero and the counting will continue. Refer to the following chart.

Volume Reading	Multiplier Option	Digits Option	Volume Displayed on LCD
98123456789	x0.1	8	34567890
	x1		23456789
	x10		12345678
	x100		81234567
	x1000		98123456
98123456789	x0.1	7	4567890
	x1		3456789
	x10		2345678
	x100		1234567
	x1000		8123456
98123456789	x0.1	6	567890
	x1		456789
	x10		345678
	x100		234567
	x1000		123456
98123456789	x0.1	5	67890
	x1		56789
	x10		45678
	x100		34567
	x1000		23456

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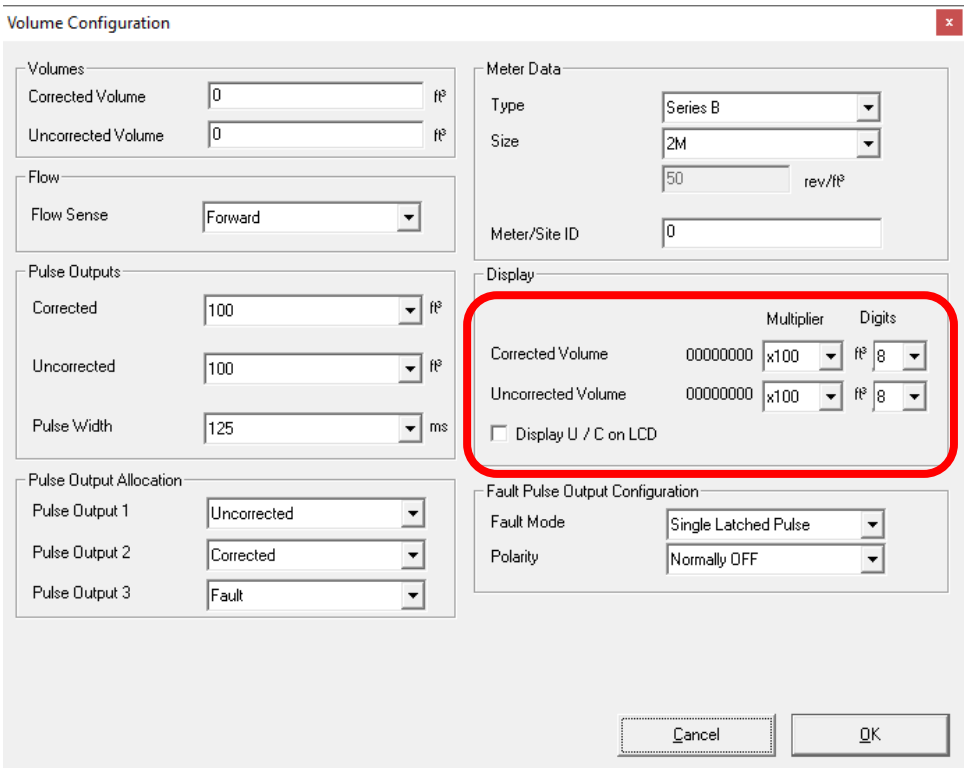
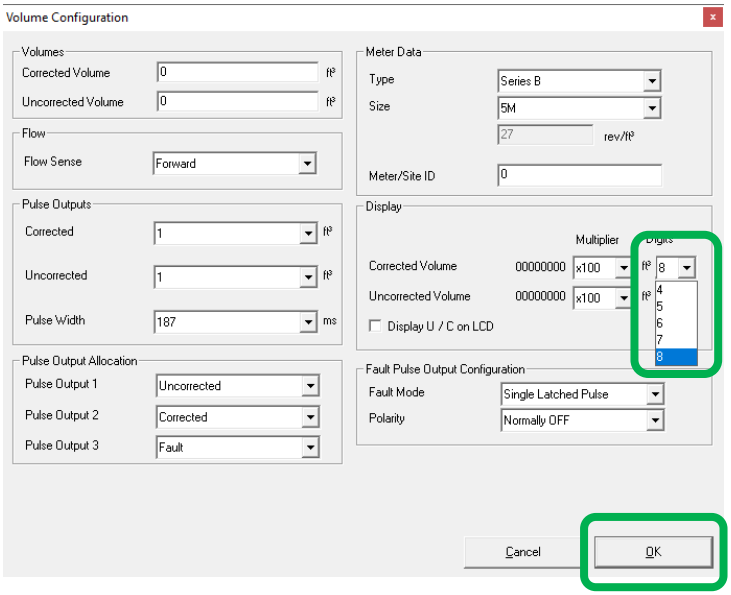


Number of volume digits to display on LCD can be selected

To set the corrected and uncorrected volume digits:

- In the *Display* section select the appropriate *Digits* drop down menu and select the desired option.



It is possible to independently configure the corrected and uncorrected volumes on the LCD; both the multipliers and number of digits displayed on the LCD:

- Between 5 and 8 up to firmware revision 6.00
- Between 4 and 8 for firmware revision 6.00 and higher

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Note: For units sealed for Measurement Canada custody transfer the number of digits must be 5-8 digits

- The new value will be highlighted yellow.
- Select the *OK* option on the *Volume Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**

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Display Multiplier

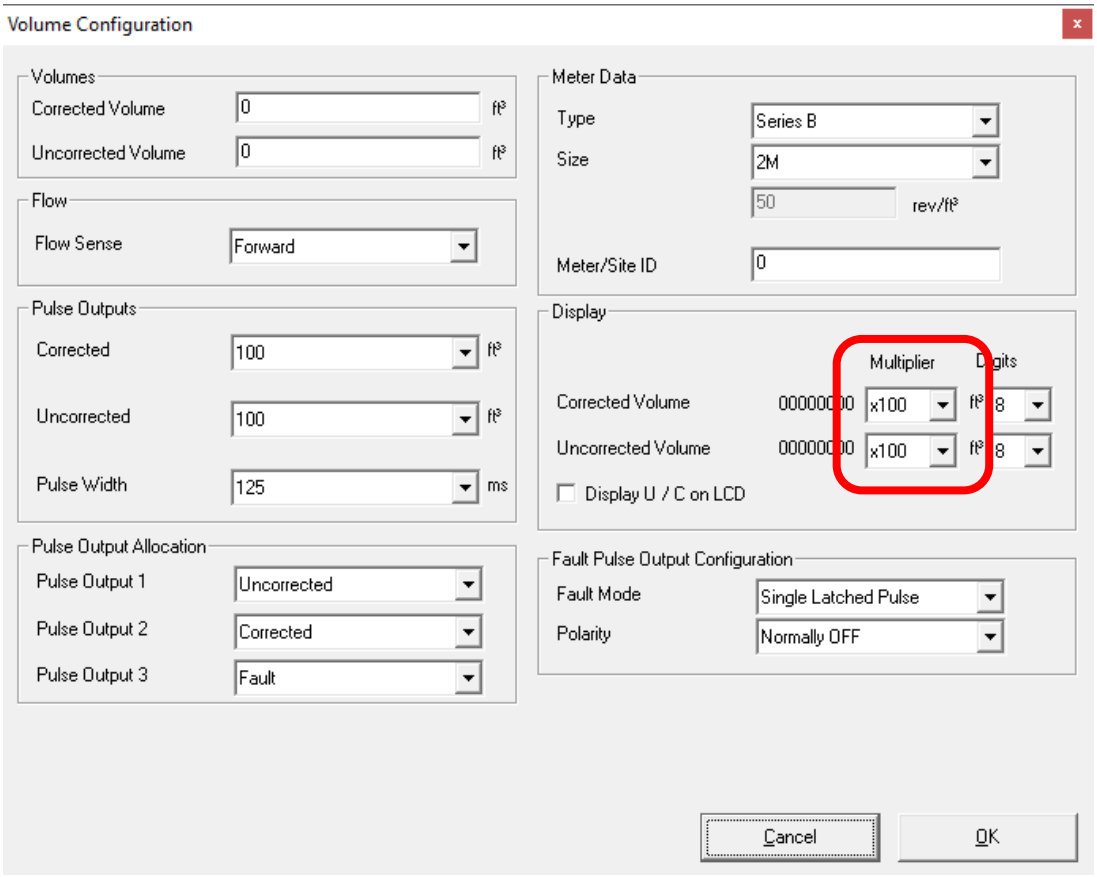
An increase to the *Multiplier* will effectively shift the appropriate volume value to the left on the LCD, revealing the most significant figure of the volumes value; if no further significant values are to be revealed a "*0"* is placed in front of the value. A decrease to the *Digits* will effectively 'remove' the most significant figure of the volumes value. The effect of the various *Multiplier* and *Digits* options is detailed in Table 3 (*Volume Multiplier and Digits Reference Table*). Additionally, a sample of a corrected and uncorrected volume value is displayed in the *Display* section on the *Volume Configuration* screen.

It is possible to independently configure the corrected and uncorrected volumes on the LCD; both the multipliers and number of digits displayed on the LCD:

- Between 5 and 8 up to firmware revision 6.0.0
- Between 4 and 8 for firmware revision 6.0.0 and later.

Display multipliers are selectable:

- x1, x10, x100, x1000 – if imperial units are selected [ft^3]
- x0.1, x1, x10, x100 – if metric units are selected [m^3]



Volume multiplier is selectable in "Display" section

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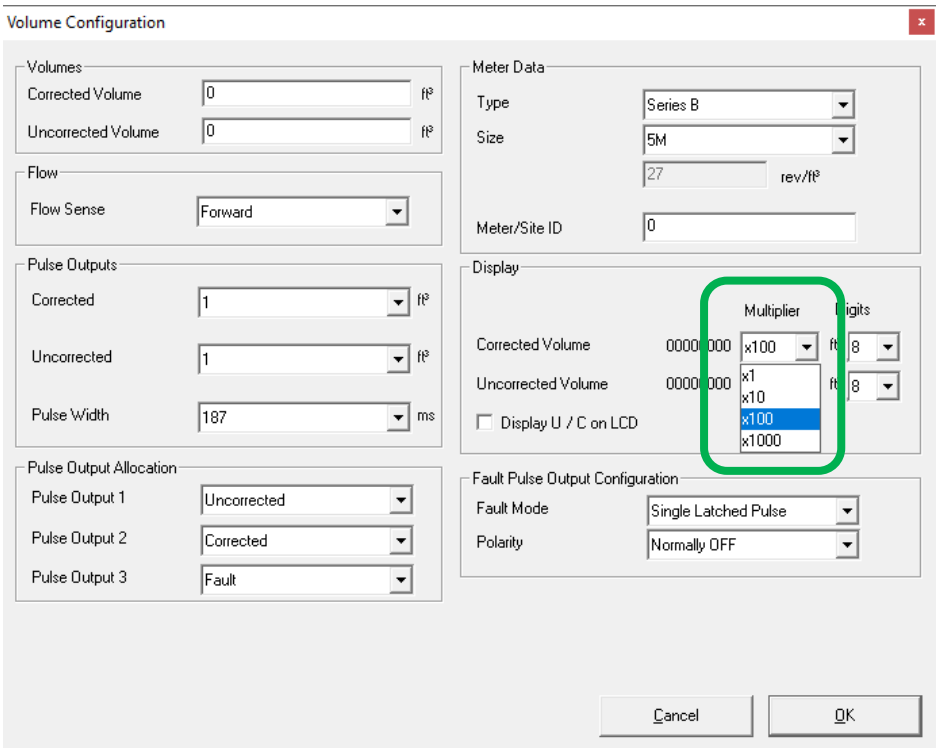
To set the corrected and uncorrected volume multiplier:

- In the *Display* section, select the appropriate *Multiplier* drop down selection box and select the desired option. The new value will be highlighted in yellow.
- Select the *OK* option in the *Volume Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see the section entitled **Upload to MC**



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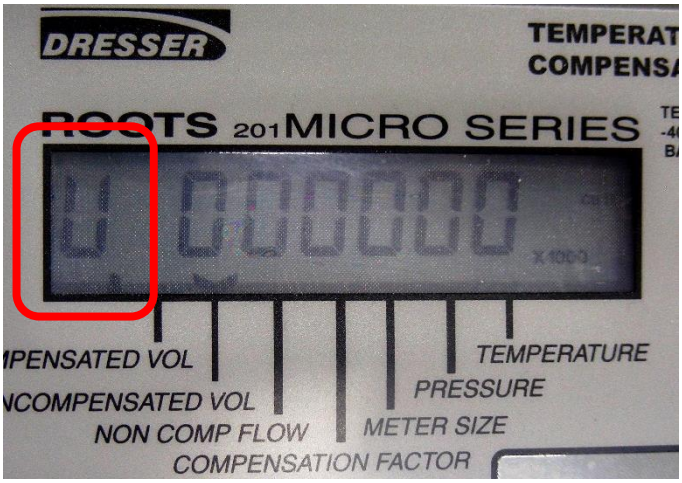
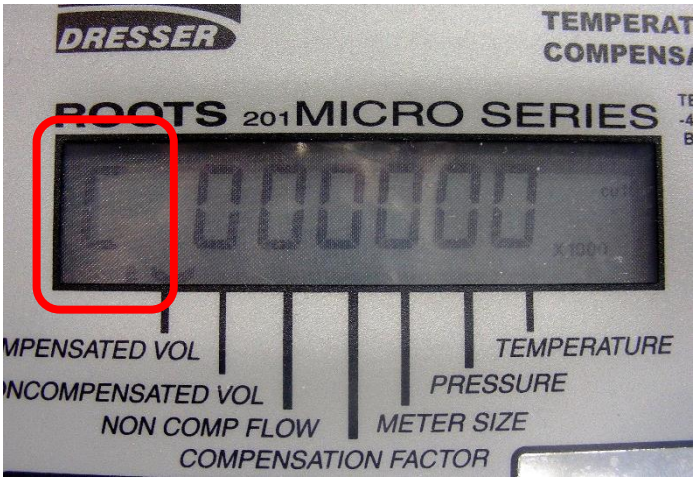
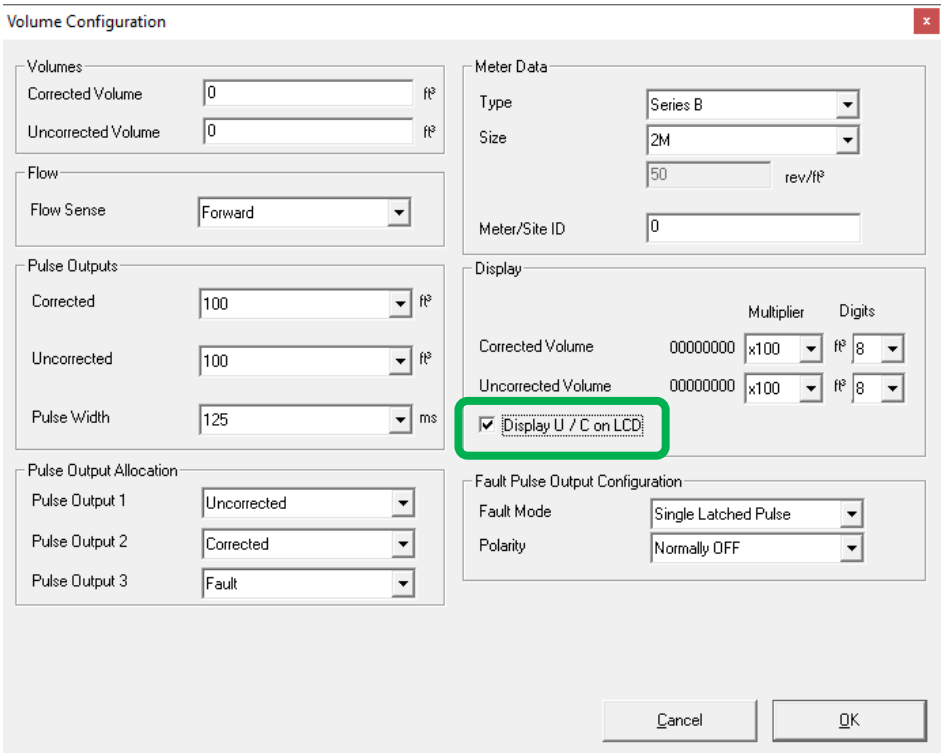
Display U/C on LCD







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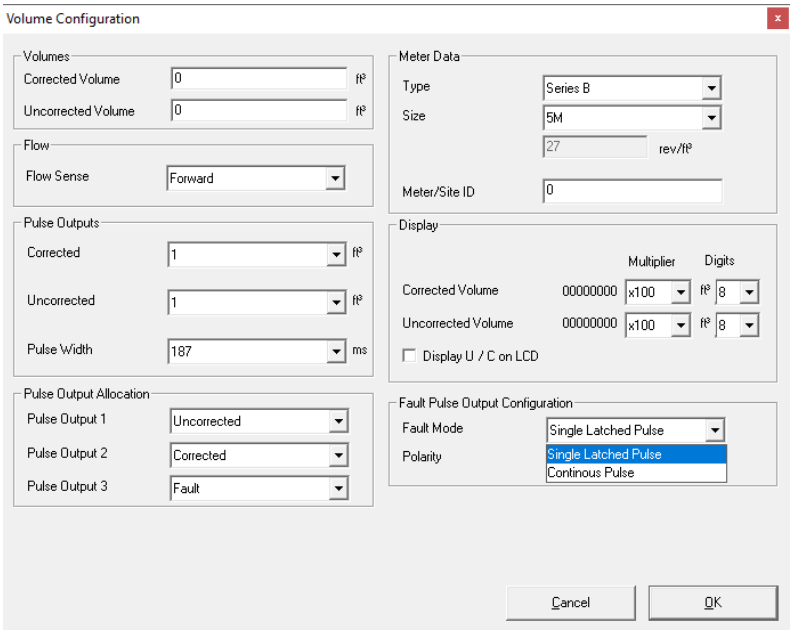
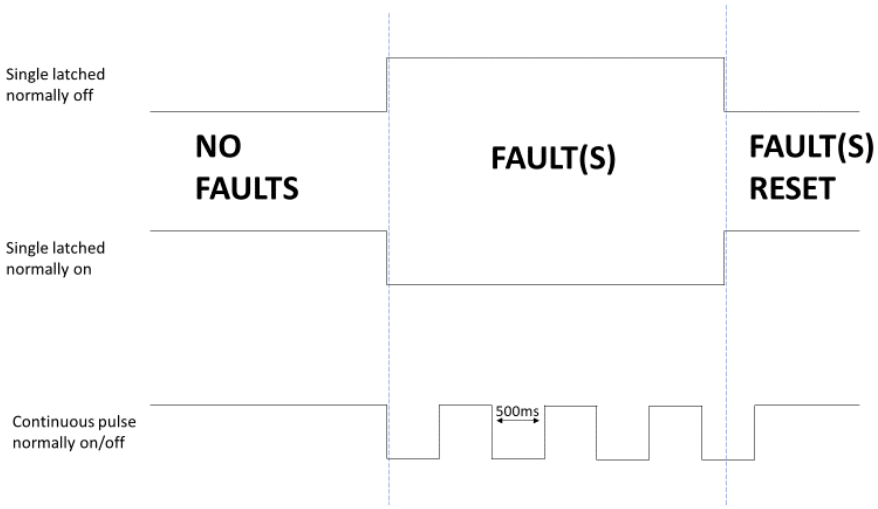
6.3.7 Fault Pulse Output Configuration



Refer to the Volume Configuration screen for Fault Pulse Output Configuration.

Fault Output Pulse forms:

- Continuous pulses
- Single Latch pulse (level)
  - Normally off
  - Normally on



Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**

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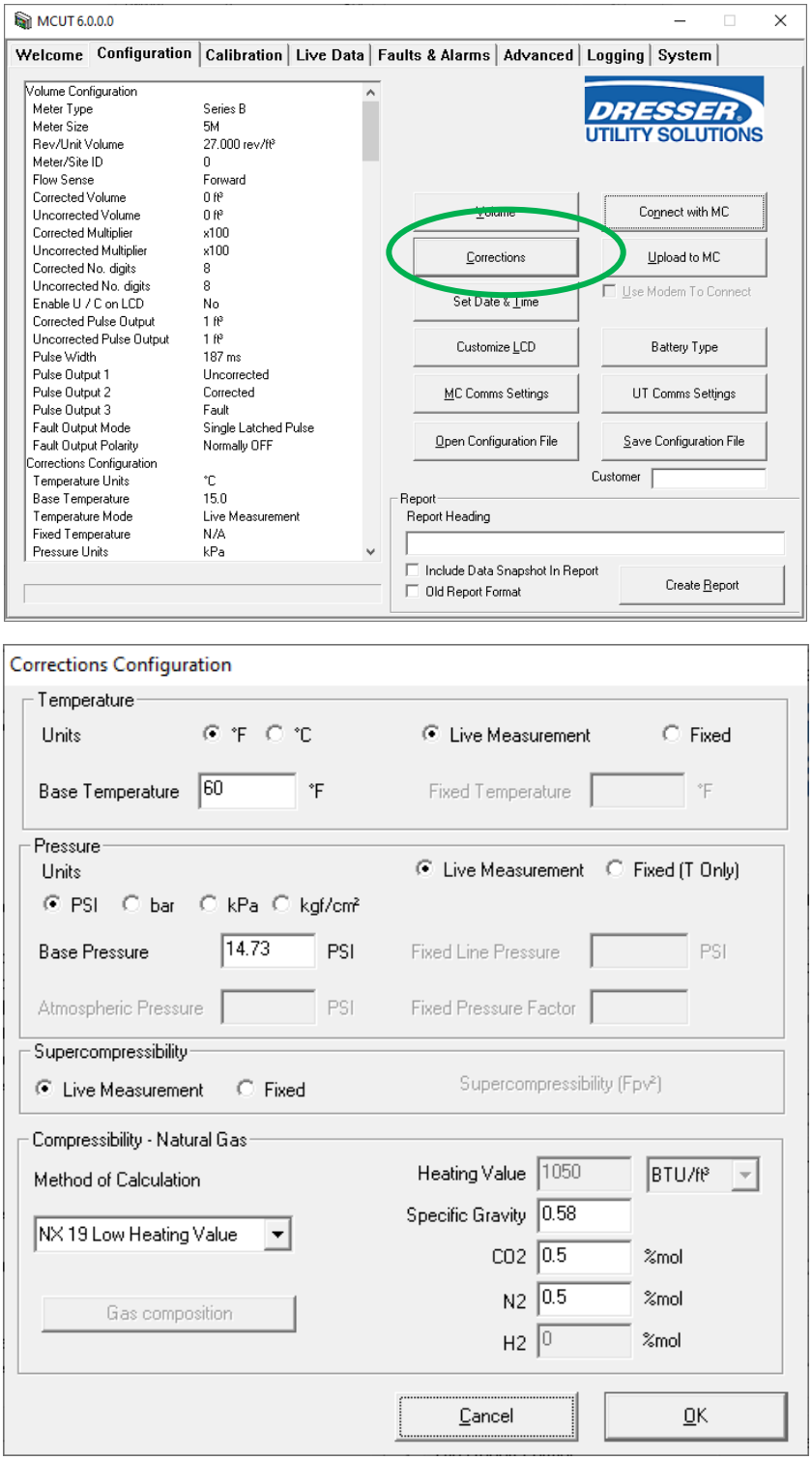
6.4 Corrections Configuration

To access the *Corrections Configuration* screen, select the *Corrections* option in the *Configuration* screen. The Correction Configuration Parameter Reference Table is provided as a quick reference indicating the accepted ranges for the correction configuration parameters.



Corrections Configuration Screen

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The *Corrections Configuration* screen is divided 3 sections and the parameters that can be changed on this screen are those associated with volume correction:

- **Temperature** – the operator can specify the temperature units, base temperature value, and whether to utilize either live temperature measurement via the temperature probe or a specified fixed temperature value.
- **Pressure** – the operator can specify the pressure units, base pressure value, and whether to utilize either live pressure measurement via the pressure transducer or values for specified fixed line pressure and fixed pressure factor values. If the fixed line pressure value option is selected, it is also necessary to specify whether the value is absolute or gauge (in the case of gauge, an atmospheric pressure value will need to be entered).
- **Supercompressibility** – the operator can specify whether a fixed Supercompressibility value is to be utilized or calculated using gas composition values supplied by the operator. Previously, if fixed factor supercompressibility was selected, the specific gravity value was not accessible. This is now configurable for DP-versions.

Correction Configuration Parameter Reference Table

Parameter	Minimum	Maximum	Minimum	Maximum
Base Temperature	32 °F	86 °F	0 °C	30 °C
Fixed Temperature	-40 °F	140 °F	40 °C	60 °C
Base Pressure	9 PSI	15 PSI	0.621 bar	1.034 bar
	-	-	62.052 kPa	103.420 kPa
	-	-	0.63293 kgf/cm^2	1.05488 kgf/cm^2
Atmospheric Pressure	8 PSI	15 PSI	0.552 bar	1.034 bar
			55.157 kPa	103.420 kPa
			0.56260 kgf/cm^2	1.05489 kgf/cm^2
Fixed Line Pressure	The acceptable ranges for *Fixed Line Pressure* are variable and depend on the pressure transducer type.			
Fixed Pressure Factor	1-148			
Supercompressibility (Fpv^2)	0.9-1.2			

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6.4.1 Temperature Measurement

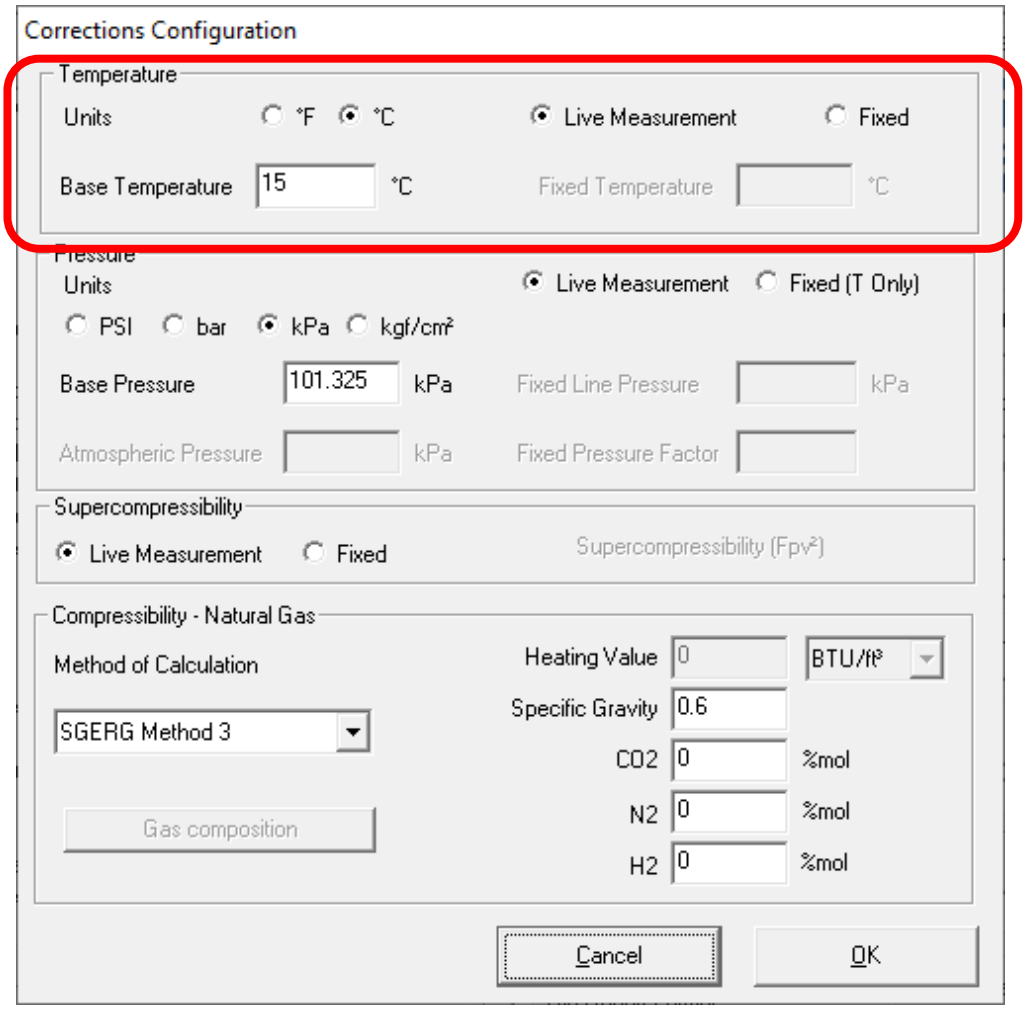
- Alternatively, if live temperature readings cannot be taken, the operator is able to specify a fixed temperature; this constant value is then used for calculating supercompressibility.

It is possible to set the temperature units to enable the display of temperature readings in either °C or °F

To set the temperature units:

- In the *Temperature* section select the desired *Units* option (°C or °F). The option described as the *Base Temperature* value will be highlighted yellow, and the new temperature units will be displayed to the right of the *Base Temperature* text box.
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**



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To set the base temperature:

- In the *Temperature* section select the *Base Temperature* text box and enter the desired value. The new value will be highlighted yellow.
  Note: *See Correction Configuration Parameter Reference Table for acceptable range.*
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

To set a fixed temperature value:

- In the *Temperature* section select the *Fixed* option. The new option described as the *Fixed Temperature* text box will be enabled.
- Select the *Fixed Temperature* text box and enter the desired value. The new value will be highlighted yellow.
  Note: *See Correction Configuration Parameter Reference Table for acceptable range.*
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

Note: When a fixed temperature value is used the temperature alarm limits and settings (accessible through the *Faults & Alarms* screen) are disabled.

To use live temperature measurement:

- In the *Temperature* section select the *Live Measurement* option. The option displayed as the *Fixed Temperature* text box will be disabled.
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

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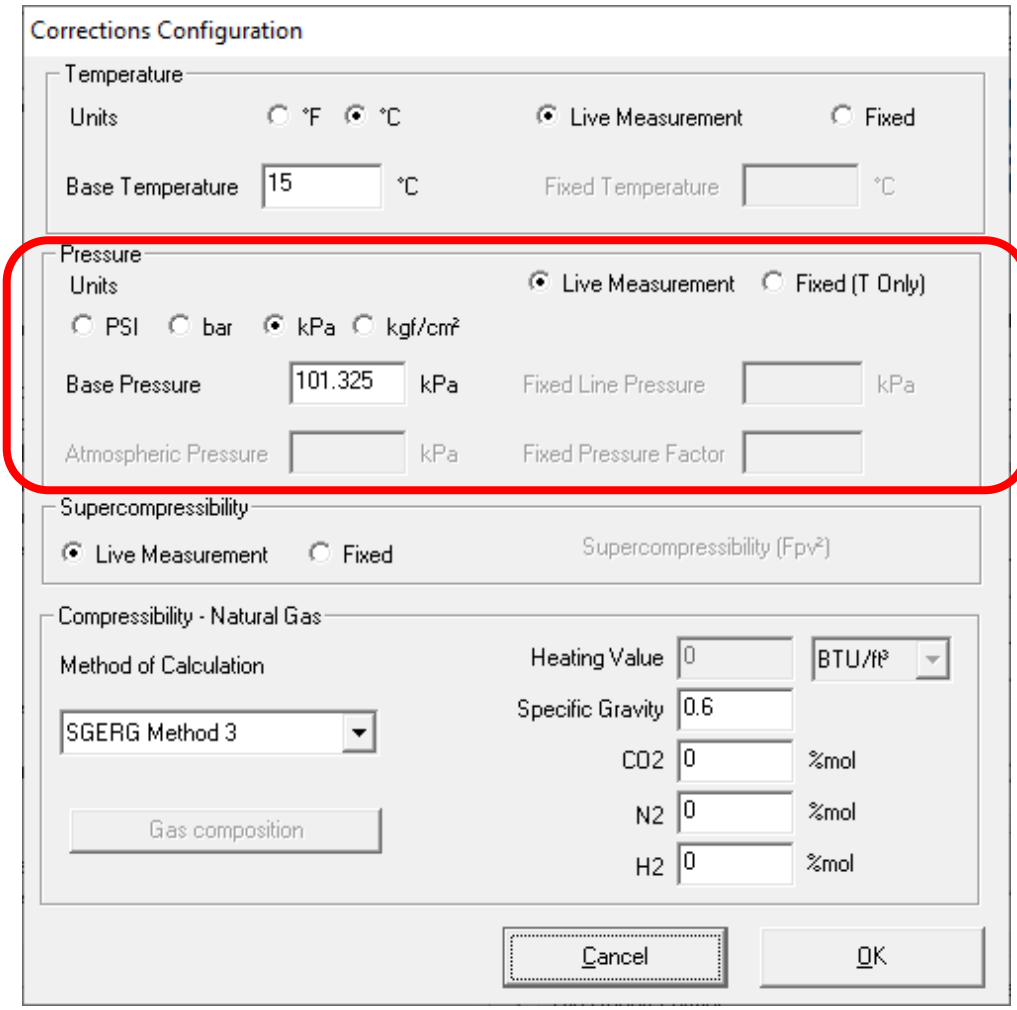
6.4.2 Pressure Measurement

Live pressure measurement is enabled via a factory installed pressure transducer (pressure transducer range is order specific). If a gauge transducer is fitted, an additional text box is enabled to allow the operator to specify the appropriate value for *Atmospheric Pressure.* Alternatively, if live pressure readings cannot be taken, the operator is able to specify a fixed line pressure value; this constant value is then used for calculating supercompressibility.

It is possible to set the pressure units to display of pressure readings in PSI, bar, kPa or kgf/cm^2.



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To set the pressure units:

- In the *Pressure* section select the desired *Units* option (bar, kgf/cm^2, kPa or PSI). The new option described as the *Base Pressure* value will be highlighted yellow, and the new pressure units will be displayed to the right of the *Base Pressure* text box.
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted in yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

To set the base pressure:

- In the *Pressure* section select the *Base Pressure* text box and enter the desired value. The new value will be highlighted yellow.
  Note: *See Correction Configuration Parameter Reference Table for acceptable range.*
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

To set a fixed line pressure value:

- The value entered for the *Fixed Line Pressure* determines the value for the *Fixed Pressure Factor* and vice versa; these values are automatically updated when either of the two parameters is changed.
- In the *Pressure* section select the *Fixed (T Only)* option. The new option described as the pressure reference (*Absolute* and *Gauge)* options will be enabled.
- Select the appropriate pressure reference option.
  Note: *If the Gauge option is selected an additional text box labelled Atmospheric Pressure will be enabled, and the appropriate value should be entered. See Correction Configuration Parameter Reference Table for acceptable range.*
- Select the *Fixed Line Pressure* text box and enter the desired value. The new value will be highlighted yellow.
- Note: The acceptable *Fixed Line Pressure* range will depend on other parameter settings; if an invalid value is entered the operator will be advised of the acceptable range.
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

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Note: When a fixed pressure value is used the pressure alarm limits and settings (accessible through the *Faults & Alarms* screen) are disabled.

To set a fixed pressure factor value:

- The value entered for the *Fixed Pressure Factor* determines the value for the *Fixed Line Pressure* and vice versa; these values are automatically updated when either of the two parameters is changed.
- In the *Pressure* section select the *Fixed (T-Only)* option. The new option described as the pressure reference (*Absolute* and *Gauge)* options will be enabled.
- Select the appropriate pressure reference option.
  Note: *If the Gauge option is selected an addition text box labelled Atmospheric Pressure will be enabled the appropriate value should be entered. See Correction Configuration Parameter Reference Table for acceptable range.*
- Select the *Fixed Pressure Factor* text box and enter the desired value. The new value will be highlighted yellow.
  Note: *The accepted Fixed Pressure Factor range will depend on other parameter settings; if an invalid value is entered the operator will be advised of the acceptable range.*
- Select the *OK* option on the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

Note: When a fixed pressure value is used the pressure alarm limits and settings (accessible through the *Faults & Alarms* screen) are disabled.

To utilize live pressure measurement:

- In the *Pressure* section select the *Live Measurement* option. The options described as the *Fixed Line Pressure* and *Fixed Pressure Factor* text boxes will be disabled.
- Select the *OK* option in the *Corrections Configuration* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted yellow in the parameters selection list.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

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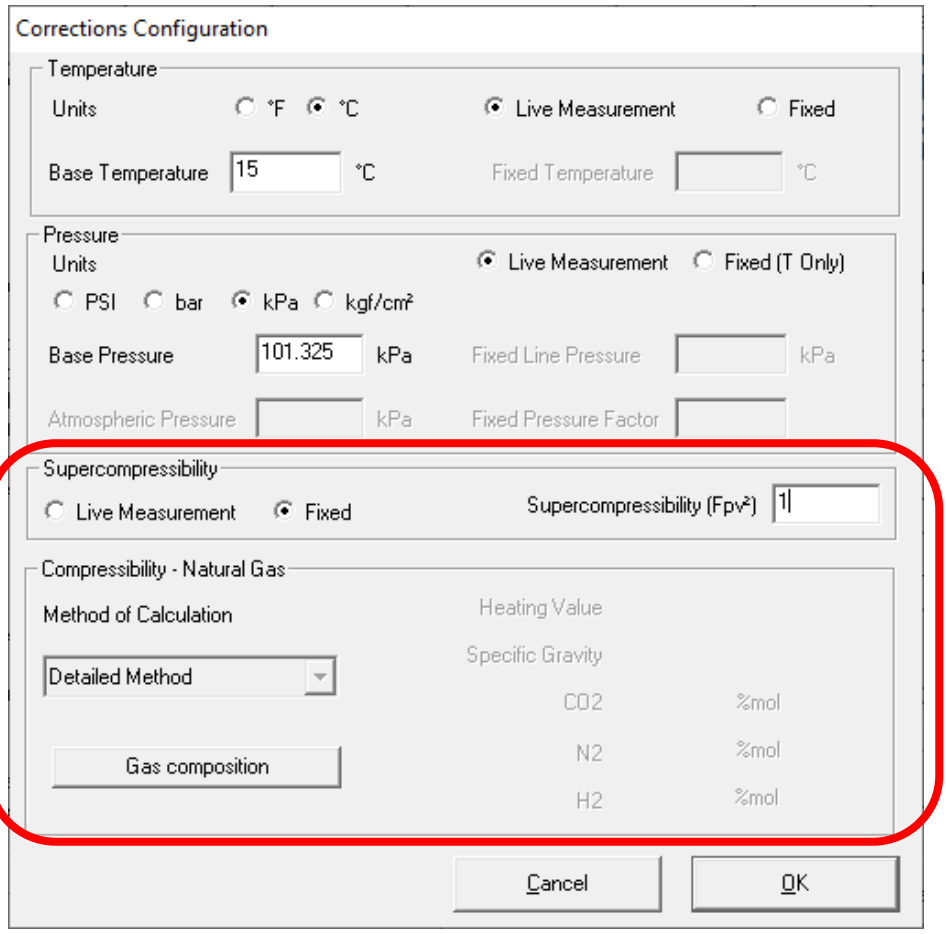
6.4.3 Supercompressibility

Volume correction is calculated based on live pressure and temperature measurement, fixed pressure and temperature measurement or any combination of fixed and/or live pressure and/or temperature measurement.



The operator can specify whether supercompressibility is to be calculated by selecting the Supercompressibility method and using gas composition inputs selected by the operator and from the live pressure and temperature readings, or if a fixed "Z" value is to be used with the pressure and temperature. The gas compressibility calculations depend on the composition of the gas; this information is entered when utilizing the *Live Measurement* method.

NOTE: Calculation of the Supercompressibility factor has an error typically better than 0.01%.

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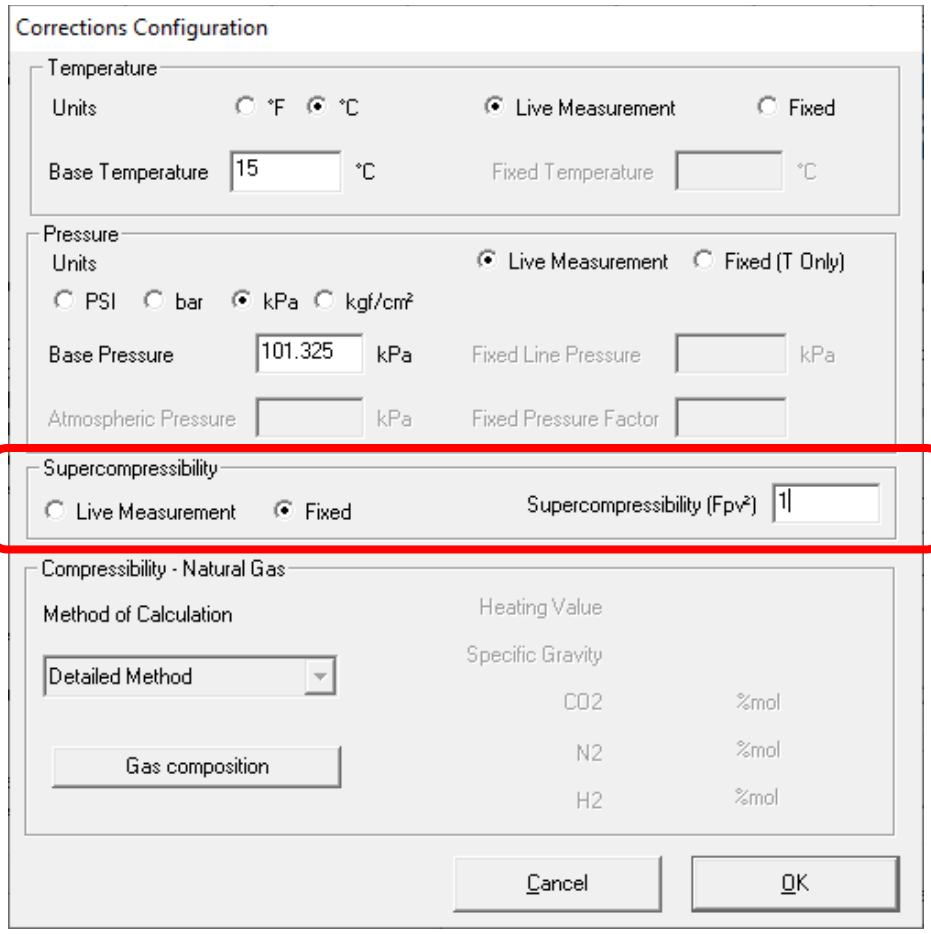
To set a fixed supercompressibility value:

- In the *Configuration* screen, select the *Corrections* option and the *Corrections Configuration* screen will be displayed.
- In the *Supercompressibility* section, select the *Fixed* option. The new option described as the *Supercompressibility (Fpv²)* text boxed will be enabled.
- Select the *Supercompressibility (Fpv²)* text box and enter the desired value. The new value will be highlighted yellow.
  Note: See *Correction Configuration Parameter Reference Table* below for acceptable range.

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**



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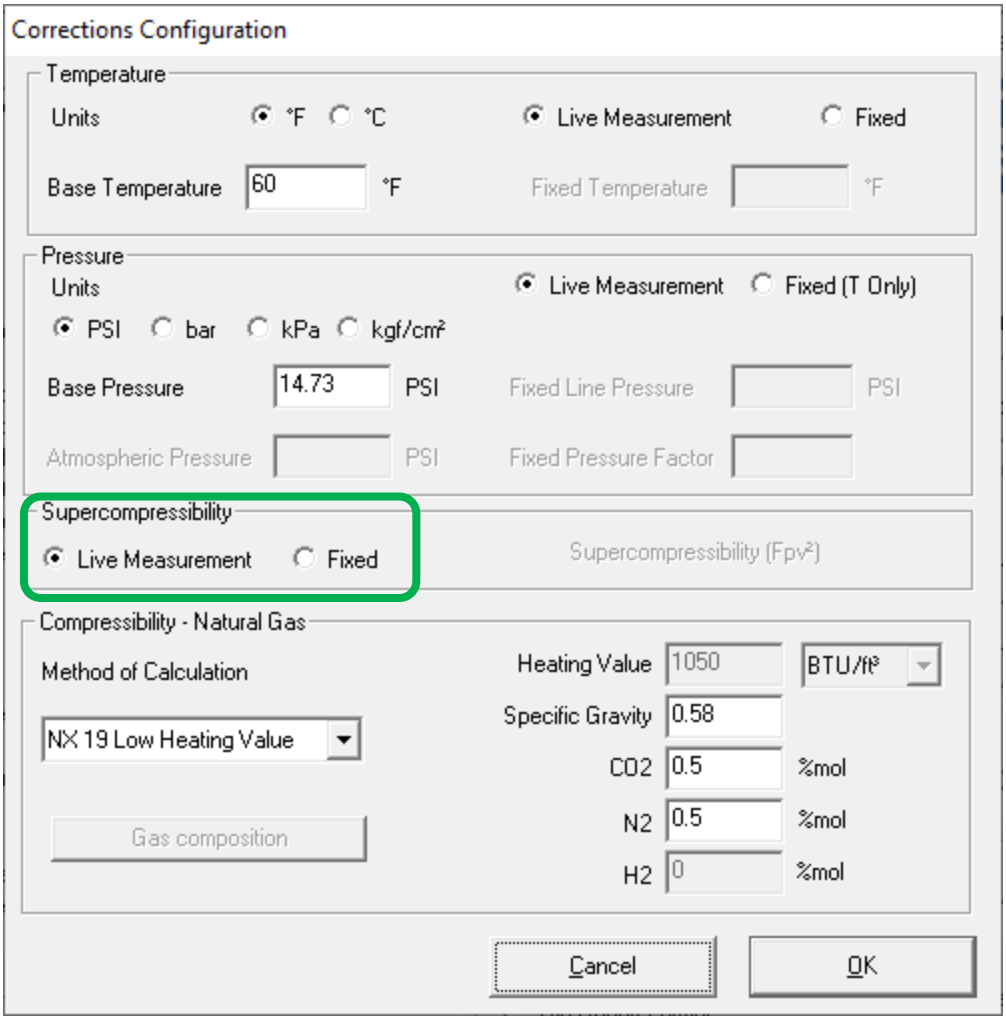
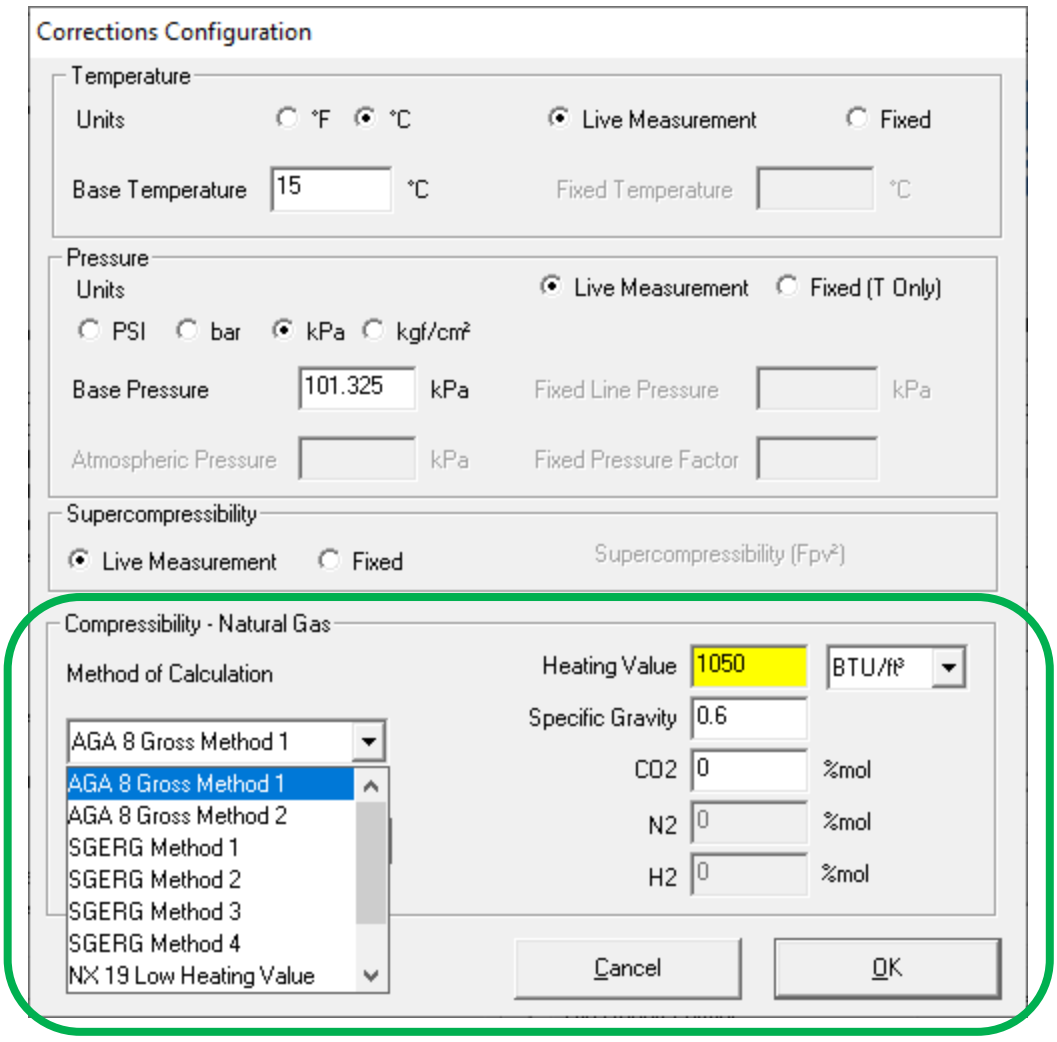
To select a Method of Calculation for Live Supercompressibility Measurement:

- From within the *Supercompressibility* section select the *Live Measurement* option. The new option will be implied various compressibility calculation methods and radio button options will be enabled.



- In the *Corrections Configuration* screen select the radio button to view the available methods
- Select one of the following methods:
    1. AGA8 Gross Method 1
    2. AGA8 Gross Method 2
    3. SGERG88 Method 1
    4. SGERG88 Method 2
    5. SGERG88 Method 3
    6. SGERG88 Method 4
    7. NX19 Low Heating Value
    8. NX19 High Heating Value
    9. AGA 8 Detailed Method – available for firmware version 6.00 and higher

Note: For units sealed for Measurement Canada custody transfer the only approved methods of compressibility are AGA Gross Method 1, AGA Gross Method 2, NX-19 Low Heating Value and AGA 8 Detailed Method.



Compressibility calculation method selection screen

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- See the Supercompressibility Configuration Parameter Reference Table for appropriate input ranges and input your values into the white fields

Method	Parameter	Minimum	Maximum
AGA 8 Methods 1 & 2	Heating Value	18.7 MJ/m^3	45.1 MJ/m^3
	Specific Gravity	0.554	0.87
	%CO2	0	30%
	%N2	0	50%
	Note: Conversion calculations are only valid if the following gas composition is maintained. Ethane: 0% to 10%. Propane: 0% to 4%. Hydrogen: 0% to 10%.		
SGERG88 Methods 1, 2, 3 & 4	Heating Value	20 MJ/m^3	48 MJ/m^3
	Specific Gravity	0.55	0.9
	%CO2	0%	30%
	%N2	0%	50%
	%H2	0%	10%
	Note: Conversion calculations are only valid if the following gas composition is maintained. Methane: 50% to 100%. Ethane: 0% to 20%. Propane: 0% to 5%.		
NX19 Low Heating Value	Specific Gravity	0.554	1.0
	%CO2	0%	15%
	%N2	0%	15%
NX19 High Heating Value	Heating Value	39 MJ/m^3	47 MJ/m^3
	Specific Gravity	0.55	0.7
	%CO2	0%	2.5%
	%N2	0%	7%
	Note: Conversion calculations are only valid if the following gas composition is maintained. H2: 0% to 4%.		

Supercompressibility Configuration Parameter Reference Table

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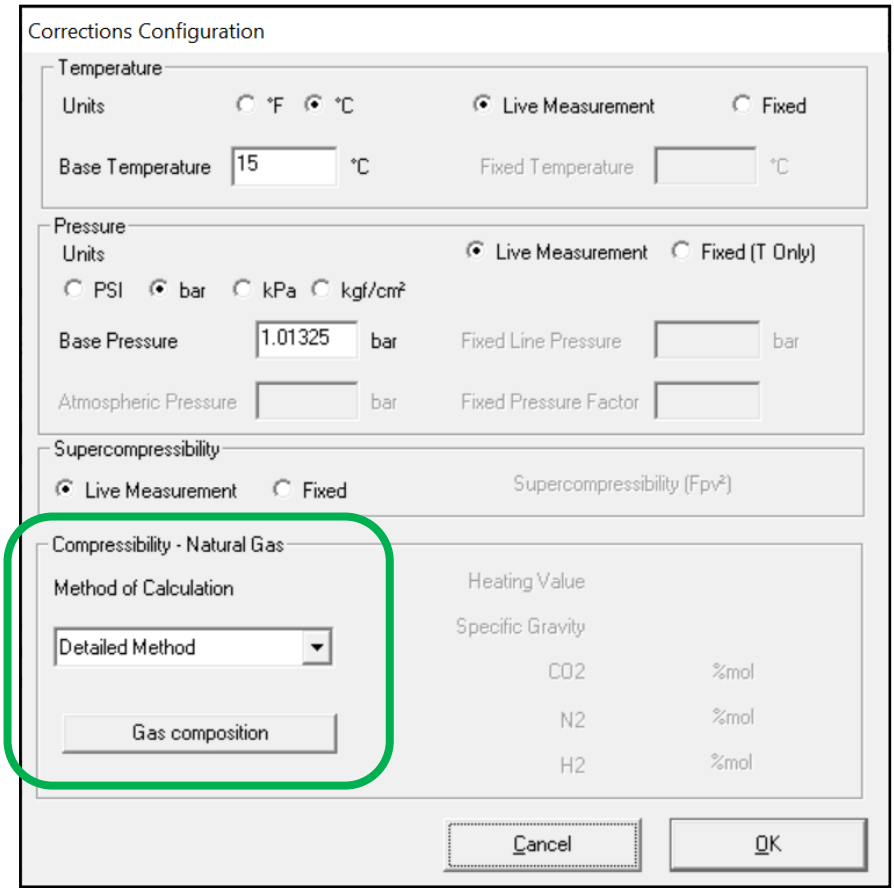
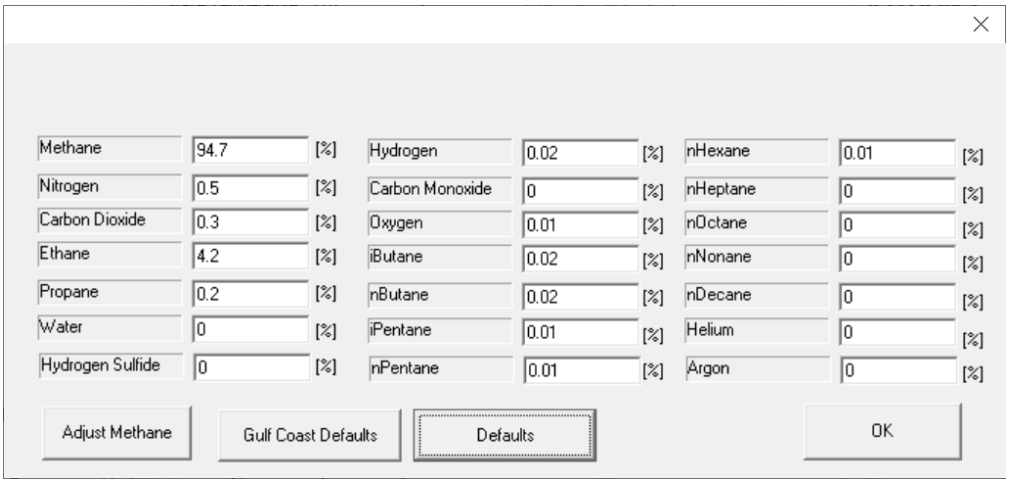
If the **Detailed Method** is selected, an additional window will appear:





Gas Composition selection screen

- Input your values for the Detailed Method.
- There are additional buttons for adjusting methane and other regional default values.

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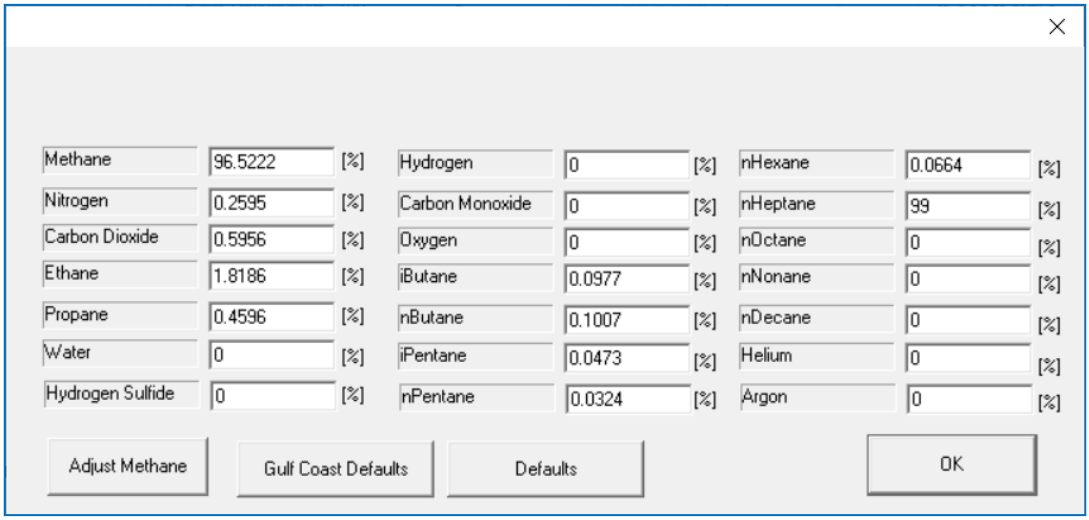
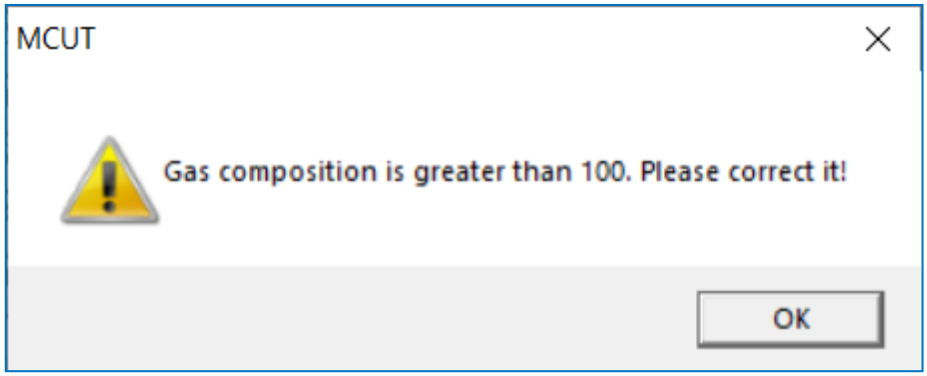
If a value entered by user total greater than 100%, a warning message pops up seen below:





- Once all the required parameter values are entered select the *OK* option on the *Conversions Configuration* screen

Note: To upload changes to the Micro Corrector see refer to the section entitled **Upload to MC**

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Abbreviations for gas compositions and gas parameters available on LCD display

Name of Component	Abbreviation
Methane	1
Nitrogen	n
Carbon Dioxide	c
Ethane	2
Propane	3
Water	4
Hydrogen Sulfide	5
Hydrogen	H
Carbon Monoxide	6
Oxygen	7
iButane	8
nButane	9
iPentane	A
nPentane	b
nHexane	C
nHeptane	d
nOctane	E
nNonane	F
nDecane	h
Helium	i
Argon	L
Specific Gravity	G
Heat Value [MJ/m3]	J
Heat Value [BTU/ft3]	U

Table 1a - Abbreviations for compressibility methods

Compressibility Method	Abbreviation
AGA8 Method 1	AGA1
AGA8 Method 2	AGA2
SGERG Method 1	SGErG1
SGERG Method 2	SGErG2
SGERG Method 3	SGErG3
SGERG Method 4	SGErG4
NX19 Low Heating Value	Lo
NX19 High Heating Value	Hi
AGA8 Detailed Method	dEtA

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6.5 Differential Pressure Monitoring

Meter site differential pressure (DP) diagnostic functionality for rotary meters is possible if the meter is equipped with a Dresser IMCW2-dp volume corrector. Meter diagnostics are based on the DP value measured between the inlet and outlet differential pressure test connections (REF: ANSI B109.3 Appendix A). The differential pressure value is measured every 30 seconds and can be viewed on the IMCW2-dp LCD. This value is accessible through the MCUT Logging function and is also recorded on the Live Data screen.

The measured DP value is used to determine:

- Average DP and related values when stable conditions provide a valid test
- Rotary meter alarm conditions
- Rotary meter fault conditions

The following 3 conditions are monitored and reported by the IMCW2-dp:

- Meter DP Alarm
- Meter DP Fault
- Meter Lock-up Fault

Meter DP Alarm

The meter DP alarm is activated if the number of measured high occurrences exceeds the meter DP alarm threshold (calculated by the learned model). The meter DP alarm is only enabled for flow rates higher than the required minimum flow rate for a valid DP sample. If this alarm occurs, **dP AL** is shown on the LCD and fault output pulses are generated if selected on the *Alarm Settings* screen.

Meter DP Fault

The meter DP fault is activated if the number of measured high occurrences exceeds the meter DP fault threshold (calculated by learned model). The meter DP fault is only evaluated for flow rates higher than the required minimum flow rate for a valid DP sample. If this fault occurs, **dP FLt** is shown on the LCD and fault output pulses are generated.

Meter Lock-up Fault

The meter lock-up fault is activated if the number of high occurrences measured exceeds the meter lock-up threshold. The lock-up threshold is defined as the theoretical DP value for particular conditions multiplied by the lock-up factor, provided there is a sufficient period of stable flow. If this fault occurs, then **dP LOC** is shown on the LCD and fault output pulses are generated.

The following parameters are required for DP measurement:

- Gas flow rate
- Line gas pressure
- Gas temperature
- Gas composition
- Gas meter size/type

Differential pressure is calculated using mathematical models, which are based on these parameters. The measured differential pressure is compared with the theoretical value calculated from the mathematical model. Flow rate, line pressure, and line temperature are all measured by the IMCW2-dp and reported into the analytical model. Gas composition and meter size/type must be entered by the operator using the MCUT software.

This is the reason that the health diagnostic of the gas meter must involve DP measurement accompanied with measurement of other parameters.

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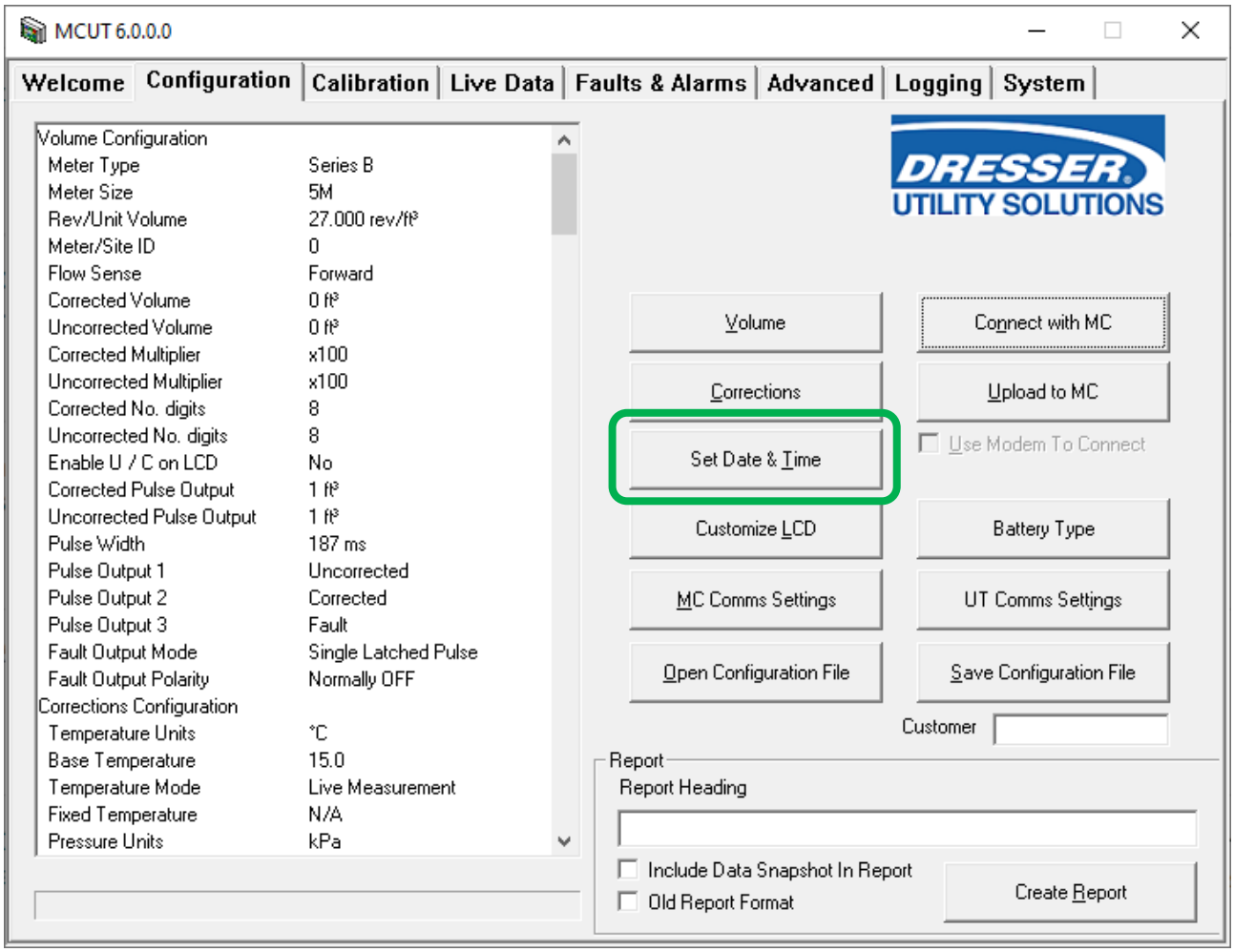
6.6 Set Date & Time

It is possible to set the date and time stored in the IMCW2 using the MCUT software. This may be required if the unit has been left in storage for a period of time without the battery connected. It is also possible to set the Date Format.



Set Date and Time Screen

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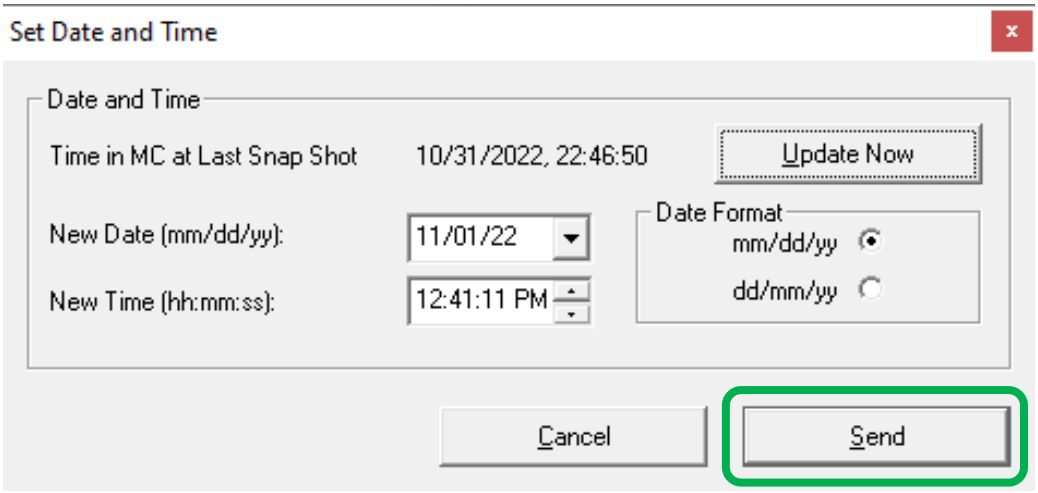
To set the date and time:



- The date and time stored in the IMCW2 is displayed and is identified as *Time in MC at Last Snapshot*.
- Select the ***Update Now*** option; the *Time in MC at Last Snapshot* value, *New Date (mm/dd/yy)** and *New Time (hh:mm:ss)* selection boxes will all be updated.
- If an update to the date is required, select the *New Date (mm/dd/yy)* drop down selection box. A calendar will be displayed. Select the appropriate date. To change the month displayed select the appropriate arrow option located at the top of the calendar. Once a date has been selected the calendar will close and the new date will be displayed in the drop-down selection box.
- If an update to the time is required select the *New Time (hh:mm:ss)* box. Each time unit (hours/minutes/seconds) is changed individually, by highlighting the relevant section then selecting either the up or down arrow located at the right-hand side of the selection box. Alternatively, the new setting for each section may be entered via the keyboard.
- Select the ***Send*** option to upload the new date and time to the IMCW2.
- If the unit has not made any data log entries the new date and time will be uploaded. If data log entries exist, the operator will be advised to download the data logs prior to updating the date and time.

Note: All data logs will be cleared when the date and/or time are updated to the IMCW2. It is therefore recommended that all data logs are downloaded from the IMCW2 before the new data and/or time settings are uploaded. For information regarding the downloading of data logs, refer to section ***Download Data Log***

*The MCUT will display the date format in the same format as configured within the PC it is operating, for example if the default PC setting is DD/MM/YY the MCUT will display the date format in DD/MM/YY.

Note: Time will not be automatically adjusted for Daylight Savings

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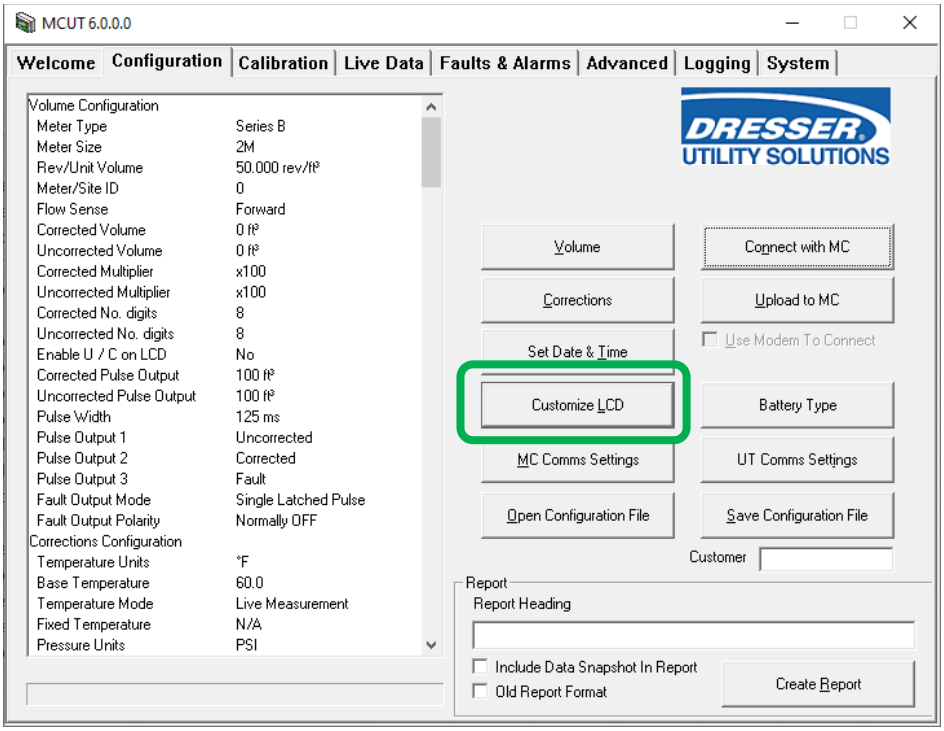
6.7 Customize LCD



Depending on the IMCW2 model, the front panel selector button of the IMCW2 will enable the following parameters to be displayed on the LCD:

- *Corrected Volume*
- *Uncorrected Volume*
- *Uncorrected Flow Rate (updated every 4 seconds on display)*
- *Correction Factor*
- *Meter Size***
- *Line Pressure*
- *Temperature*
- *Uncorrected Volume Under Fault*
- *Corrected Residual*
- *Uncorrected Residual*
- *Firmware version*
- *Atmospheric Pressure**
- *Base Pressure*
- *Pressure Factor*
- *Supercompressibility*
- *Battery Voltage*
- *Current Date*
- *Current Time*

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- *Configurable Screens* – Three additional parameters connected with Daily Consumption can be selected from 12 options:
    1. *Accumulated Corrected Volume previous day*
    2. *Accumulated Corrected Volume current day*
    3. *Accumulated Corrected Volume previous month*
    4. *Accumulated Corrected Volume current month*
    5. *Highest daily volume in the previous month*
    6. *Highest daily volume in the current month*
    7. *Date of last consumption alarm*
    8. *Maximum peak flow*
    9. *Differential pressure results****
    10. *Meter size*
    11. *Gas Composition*****
    12. *EMC Screen (Test Screen)*

*Only where applicable, i.e., if transducer fitted is gauge (*Customize LCD Dialog*) below represents an IMCW2 with an absolute transducer.

**Monitor Pressure is available instead of Meter Size if corrector is equipped with second external pressure transducer and Differential pressure is available instead of Meter Size if corrector is equipped with a DP transducer.

***Only available for IMCW2-dp.

****Only available for firmware version 6.00 and higher

It is possible to *switch* the displayed parameters *on* and *off*. Additionally, the operator should specify which parameter should be displayed on the LCD as the Default Parameter. At least one of the first 7 (M*ain Screen)* parameters must be *switched on.*

By default, all available parameters for the chosen IMCW2 model will be displayed. The *switched-on* parameter check boxes have a check placed in the associated box indicating that the parameter is to be displayed on the LCD.

To set the default screen parameter on the LCD:

- Select the desired *Default Screen* option. If the parameter was previously *switched off,* selection of that parameter as the *Default Screen* will cause the parameter to be *switched on*.
- Select the *OK* option on the *Customize LCD* screen.
- The *Configuration* screen will be displayed, and any changed parameters will be highlighted yellow in the parameters selection list.
- Select *Upload to MC*. The new details will be uploaded to the IMCW2. A dialog box will be displayed stating *Sent OK*. Select *OK.*

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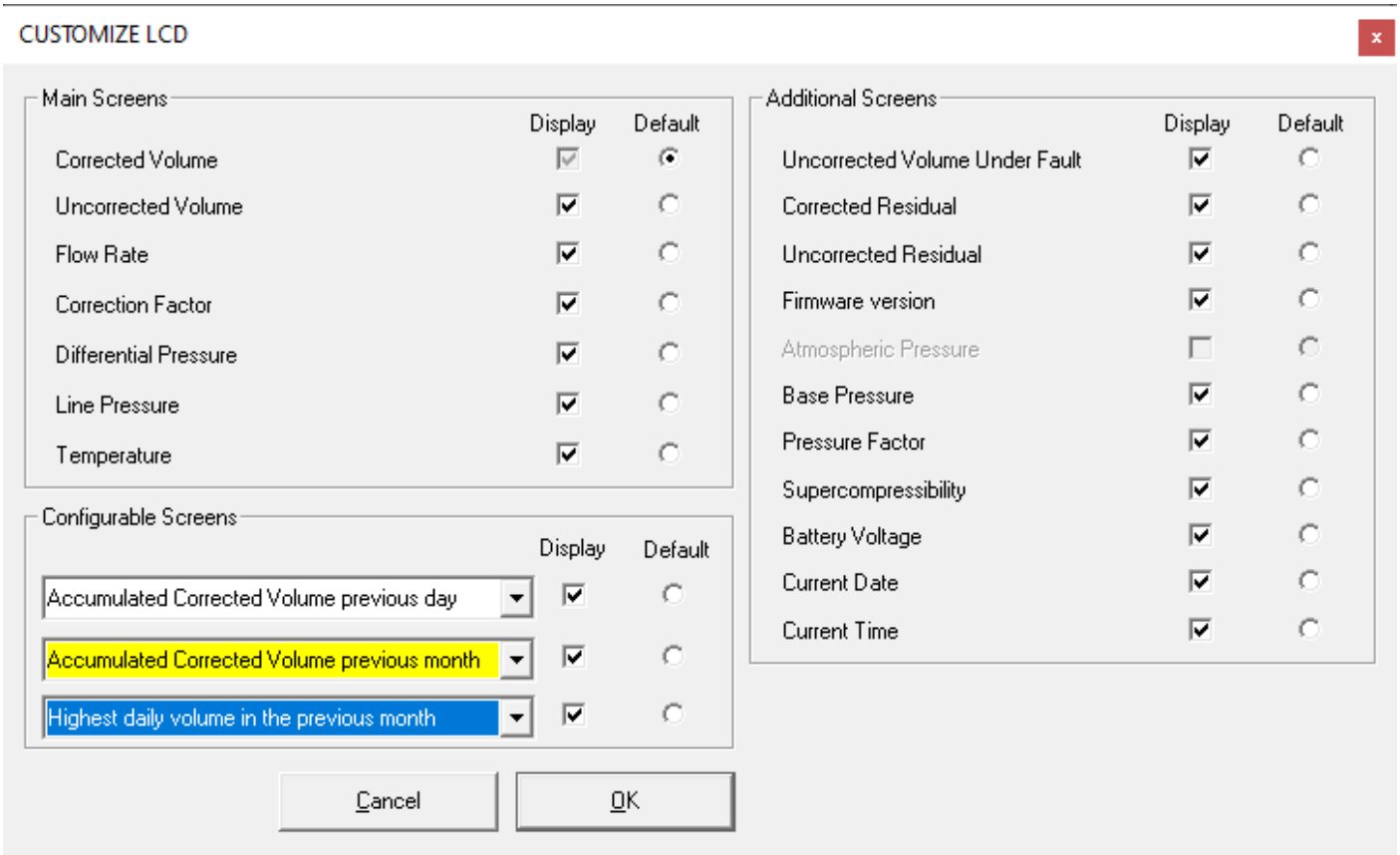

Customize LCD Screen

To switch parameters *on/off* on the LCD:

- Select the parameter(s) that are-required/not-required to be displayed on the LCD, ensure that the appropriate check box is checked/unchecked. If a parameter is disabled, it may be because it is not available on the model of IMCW2 that you have chosen.
- Select the *OK* option on the *Customize LCD* screen.

Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**

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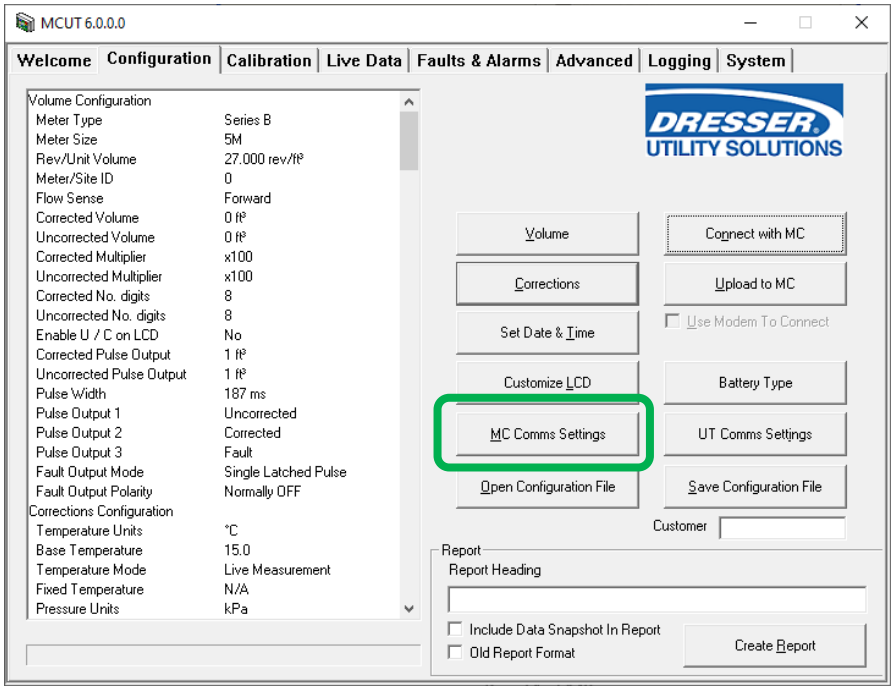
6.8 MC Comms Settings

(only for units equipped with an external modem)

Note: For details on setting-up and communicating via a modem contact your Dresser representative.



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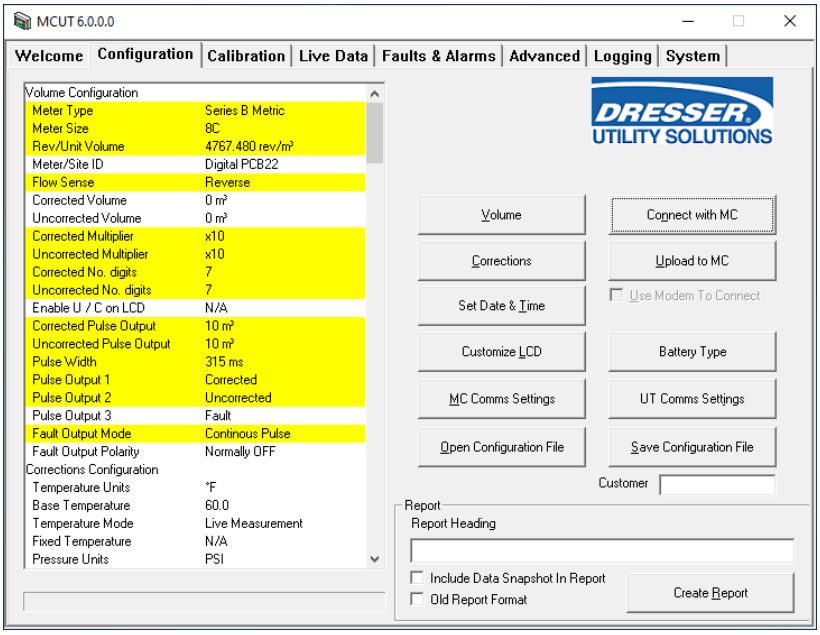
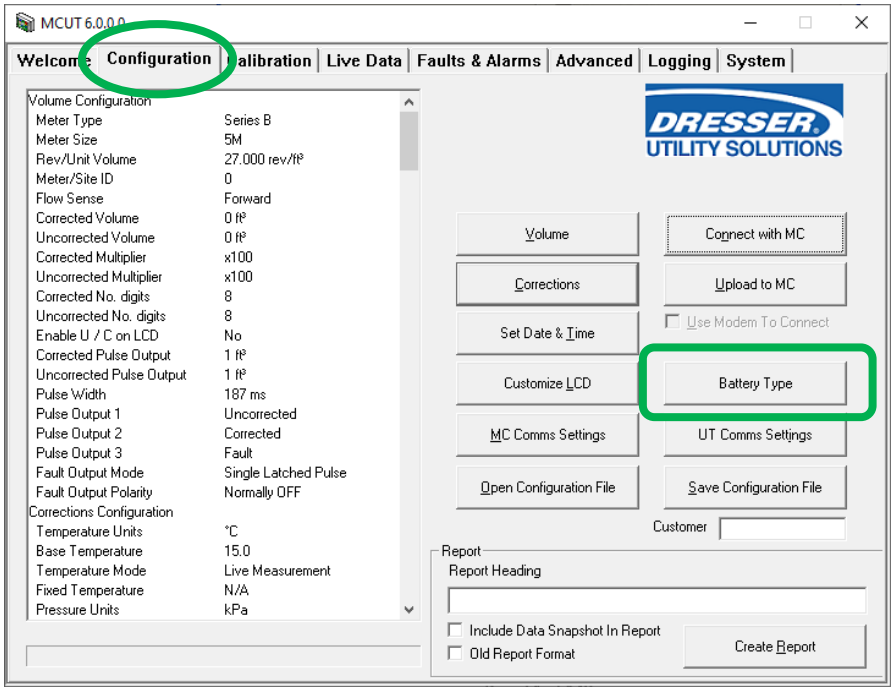
6.9 Upload to MC

After configuration data has been changed in the MCUT, you can upload the new parameter details to the IMCW2. Prior to the upload, any parameters that have been changed are highlighted yellow in the parameters selection list; after the parameters have been uploaded to the IMCW2 the yellow highlights will be removed.



If a parameter is highlighted red, this means that the value entered within that text box is out of range. If the operator attempts to proceed, a dialog box will be displayed informing them of the appropriate valid range that should be entered for that parameter.

To upload any changes made within the MCUT, select *Upload to MC.*



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6.9.1 Protection of Metrological Parameters

There are two methods of metrological parameter protection in the IMCW2:

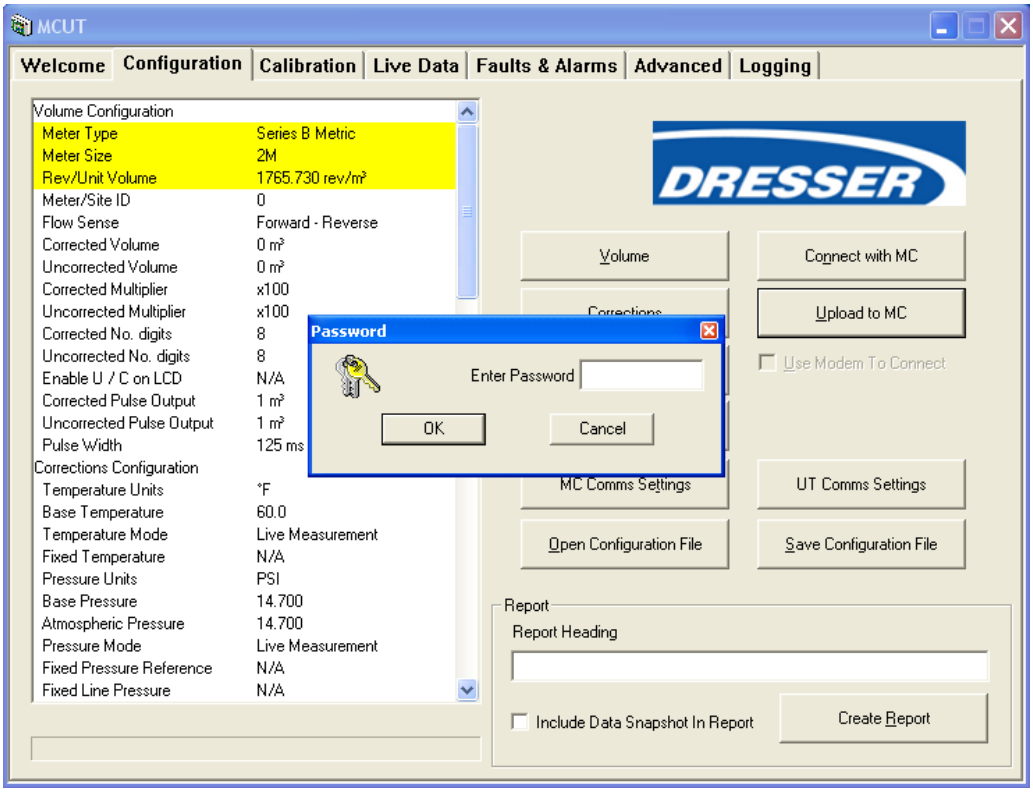
- Software seal (Password)
- Hardware seal (Link)
- Hardware and Software Protection (Beginning with firmware version 3.00)

The method of protection is set during the factory configuration process and cannot be changed.

6.9.2 Password Protection

Parameters that are password protected are detailed in the Password Protected Parameters Table. If the operator attempts to change a protected parameter, a password dialog will be displayed. The appropriate password should be entered; following a successful password entry the changed parameters will be uploaded to the IMCW2. All changes to metrological parameters are recorded in the Audit Log.

Note: If the IMCW2 is configured with password protection, it may be necessary to enter a password to upload the changes; the default password is the numerical value *0*.



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Password Protected Parameters Reference Table

Password Protected Parameter	
Volume Configuration	Meter Type
	Meter Size
	Flow Sense
	Corrected Multiplier
	Uncorrected Multiplier
	Pulse Output Allocation
	Corrected Pulse Output
	Uncorrected Pulse Output
	Corrected Volume
	Uncorrected Volume
	Clear Uncorrected Volume under Fault Register
Corrections Configuration	Temperature Units
	Base Temperature
	Temperature Mode (Fixed or Live)
	Fixed Temperature
	Pressure Units
	Base Pressure
	Atmospheric Pressure
	Fixed Pressure Factor
	Fixed Line Pressure
	Pressure Mode (Fixed or Live)
	Supercompressibility
	Supercompressibility Mode
	Fixed Pressure Type (Gauge or Absolute)
Calibration	Temperature Calibration
	Pressure Calibration
Other	Trim Table Settings*
	Test Pulse Outputs
	External Power
	Digital Input
	Digital Output
	Password Change
	Advanced Password Change

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Note: *Trim Table Settings is protected by the *Advanced Password*.

6.9.3 Hardware Protection

The hardware link protection is provided to meet various country legislative requirements.

Note: Canadian Micro Correctors are protected by hardware protection and a physical read/write jumper which must be in the Read/Write position on the PCB to upload any changes.

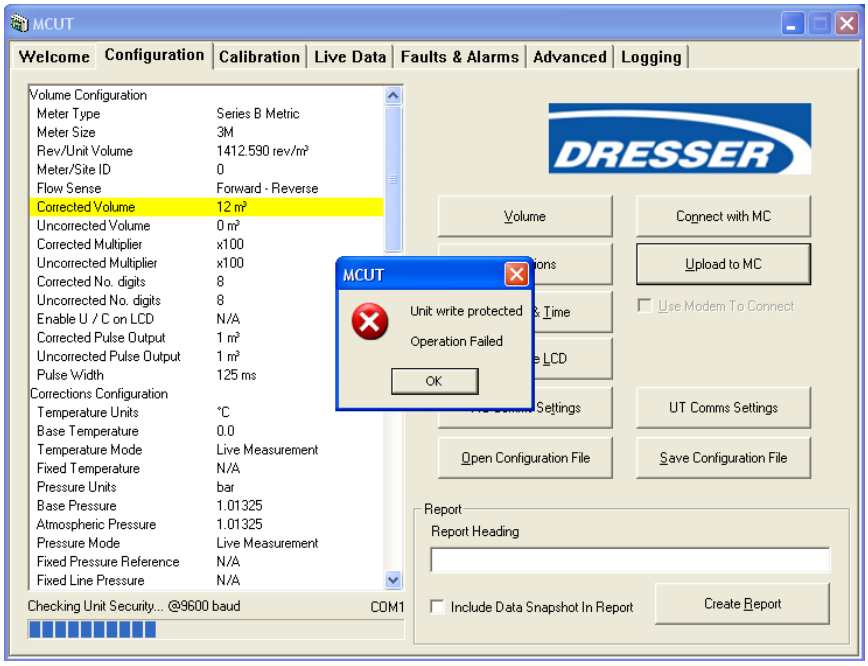
Refer to the ***Dresser Measurement IMCW2 Hardware Manual***. There are two positions for the hardware link on the main PCB board as follows:

- R/W – Read/Write
- RO – Read only

If the link is set in the RO position, the metrological parameters are protected and cannot be changed.

Note: If the hardware link is removed, the metrological parameters are protected.

If the operator attempts to change a parameter protected by hardware protection, then a dialog box will be displayed once the *Upload to MC* option is selected.



Hardware Link Protection Screen

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Hardware Link Protected Parameters Reference Table

Password Protected Parameter	
Volume Configuration	Meter Type
	Meter Size
	Flow Sense
	Corrected Multiplier
	Uncorrected Multiplier
	Corrected Pulse Output
	Uncorrected Pulse Output
	Corrected Volume
	Uncorrected Volume
	Clear Uncorrected Volume under Fault Register
Corrections Configuration	Temperature Units
	Base Temperature
	Temperature Mode (Fixed or Live)
	Fixed Temperature
	Pressure Units
	Base Pressure
	Atmospheric Pressure
	Fixed Pressure Factor
	Fixed Line Pressure
	Pressure Mode (Fixed or Live)
	Supercompressibility
	Supercompressibility Mode
	Fixed Pressure Type (Gauge or Absolute)
Calibration	Temperature Calibration
	Pressure Calibration
Advanced Options	Trim Table Settings*
	Test Pulse Outputs
	External Power
	Digital Input
	Digital Output
	Password Change
	Advanced Password Change

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6.9.4 Hardware and Software Protection

The IMCW2 can be configured so that the majority of the metrological parameters are hardware protected, but some selected metrological parameters are protected by a software password.

Firmware version 3.00 and higher allows the user to change the following supercompressibility parameters:

a. Method of calculation:

- AGA 8 Gross Method 1
- AGA 8 Gross Method 2
- NX19 Low Heating value

b. Gross method gas composition parameters:

- Heating Value from 501.9 to 1210.44 [BTU/ft3] or from 18.7 to 45.1 [MJ/m3]
- Specific Gravity from 0.56 to 0.87
- CO2 from 0 to 30 [%mol]
- Specific Gravity from 0.56 to 0.87
- CO2 from 0 to 30 [%mol]
- N2 from 0 to 50 [%mol]

Firmware version 6.00 and higher allows the user to select and change the following:

- AGA Detailed Method
- 21 gas composition values

An IMCW2 configured with both methods of metrological protection activates a *Self-Contained Event Log*. The Self-Contained Event Log that records changes made to supercompressibility parameters has a 200-event limit. Each parameter change is recorded as a separate event. When the 200 events limit is reached, no further supercompressibility parameter changes can be made or recorded and the Self-Contained Event Log must be "Reverified" to allow for more supercompressibility parameter changes. The reverification process is described in a separate section.

The Self-Contained Event Log contains the following information.

1. *Information related to the meter:*
- Unit serial number
- Meter/Site ID (location)
- Meter Type
- Meter size.
- Total number of events

2. *Information related to changes to supercompressibility parameters*:
- Auto-generated successive event number
- Date
- Time
- Description of the parameter changed
  - Old value of the parameter
  - New value of the parameter
- Operator I.D. (name)

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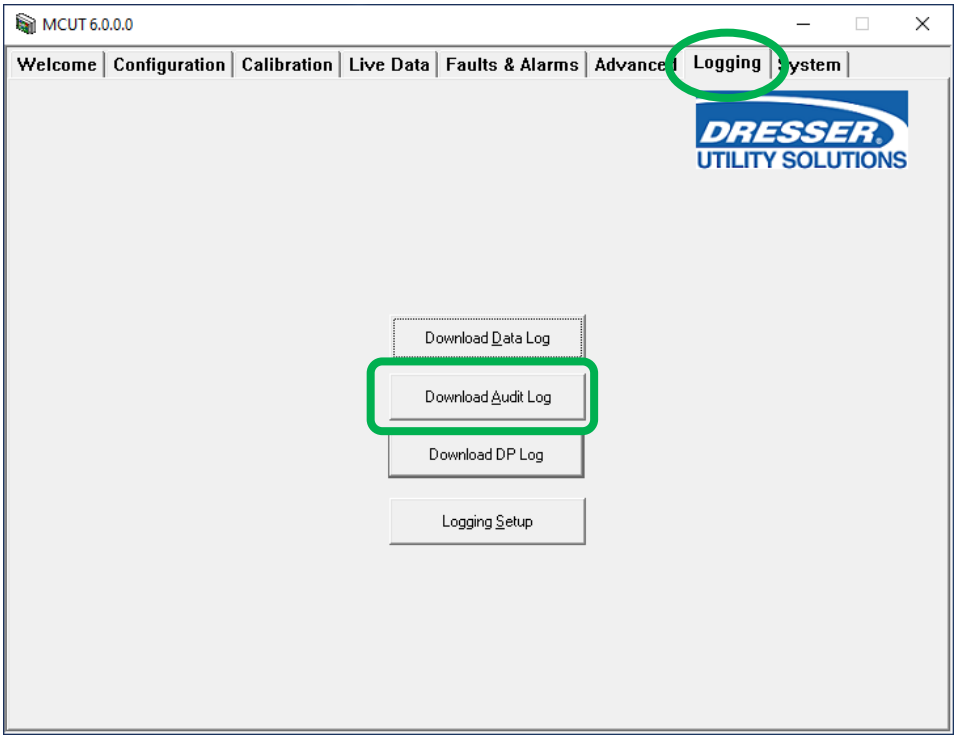
Note: Parameter values entered during the initial factory programming are not counted as a parameter change event.

3. *Information related to reverification events:*
   - Auto-generated successive event number
   - Date
   - Time
   - Event Description: e.g. “Self-contained log was reverified”

Note: The operator is not named as this procedure as must be performed by an authorized metrology authority person.

If the hardware link is set to the “Read/Write” position, all metrological parameters can be changed using a password. These changes are recorded in the Audit Log and the supercompressibility parameter changes are also recorded in the Self-Contained Event Log.

To access these event logs, select the Logging Tab on the Welcome Screen. From this screen, select Download Audit Log.



Logging screen

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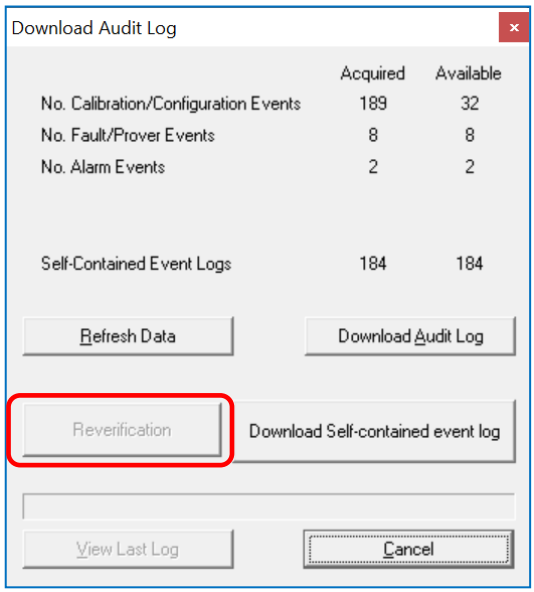
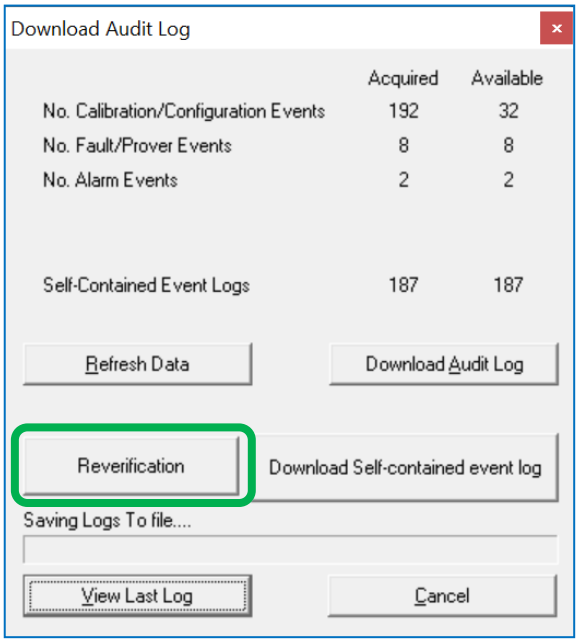
The following screen which allows downloading both the Audit Log and the Self-Contained Event Log will appear:



Audit Log download screen

Note: The "Reverification" button is grayed out. This button only becomes available when the Self-Contained Event Log reaches more than 185 recorded entries.



Audit Log download screen with "Reverification" option activated

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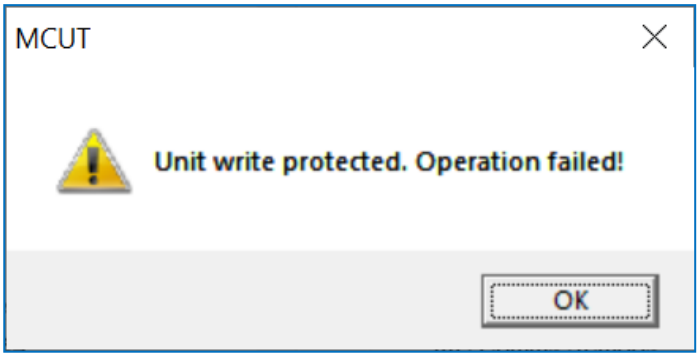
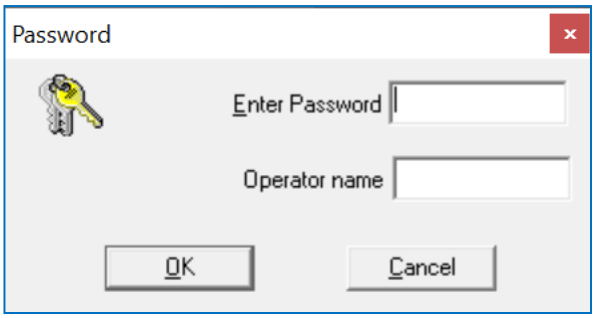
If the hard link protection switch is set to the “Read Only” position, and the operator attempts to change parameters other than selected supercompressibility parameters, the following message will appear:



Indicates failed attempt to change a parameter not available for software password protection when the hardware link is set in Read-only position

The operator must enter the password and his/her name (max seven characters).



Input Screen: Password and Operator Name

Example of the Self-Contained Event Log:

Audit Log						
Unit Serial Number	12/18/151417					
Meter/Site ID						
Meter Type	Series B Metric					
Meter Size	7M					
Number of Logs Stored	15 out of 15					
Log Number	Date	Time	Parameter changed	Old value	New value	User
1	27/03/2020	4:01:01 PM	Supercompressibility Method	SGERG Method 3	AGA 8 Gross	
2	27/03/2020	4:05:26 PM	%CO2	0	0.1	ROMA
3	27/03/2020	4:05:26 PM	Specific Gravity	0.6	0.61	ROMA
4	27/03/2020	4:05:26 PM	Supercompressibility Method	AGA 8 Gross Method 2	AGA 8 Gross	ROMA
5	27/03/2020	4:05:26 PM	Heating Value	0	1000	ROMA
6	27/03/2020	4:08:01 PM	%CO2	0.1	0.9	NICU
7	27/03/2020	4:08:01 PM	Specific Gravity	0.61	0.6	NICU
8	27/03/2020	4:08:01 PM	Heating Value	1000	1001	NICU
9	27/03/2020	4:10:46 PM	%CO2	0.9	0.93	PAUL
10	27/03/2020	4:10:46 PM	Specific Gravity	0.6	0.61	PAUL
11	27/03/2020	4:10:46 PM	Supercompressibility Method	AGA 8 Gross Method 1	AGA 8 Gross	PAUL
12	27/03/2020	4:10:46 PM	%N2	0	0.6	PAUL
13	27/03/2020	4:13:41 PM	%CO2	0.93	0.933	ANAN
14	27/03/2020	4:13:41 PM	Specific Gravity	0.61	0.614	ANAN
15	27/03/2020	4:13:41 PM	%N2	0.6	0.622	ANAN

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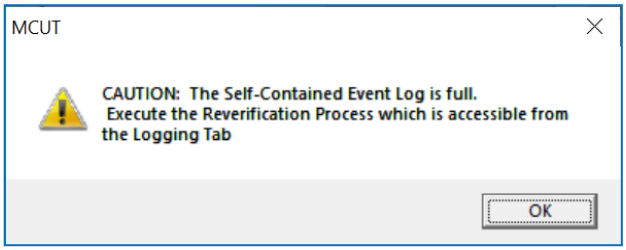
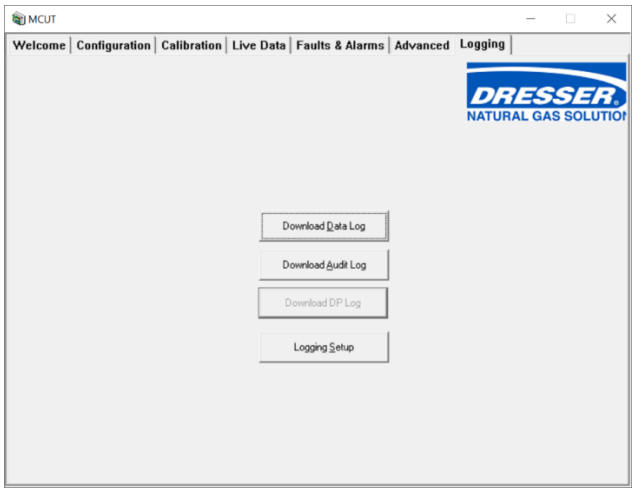
6.9.5 Reverification process

If the number of events registered in the Self-Contained Event Log reaches more than 185 events, the following message appears. This indicates the log is full and reverification is now required:

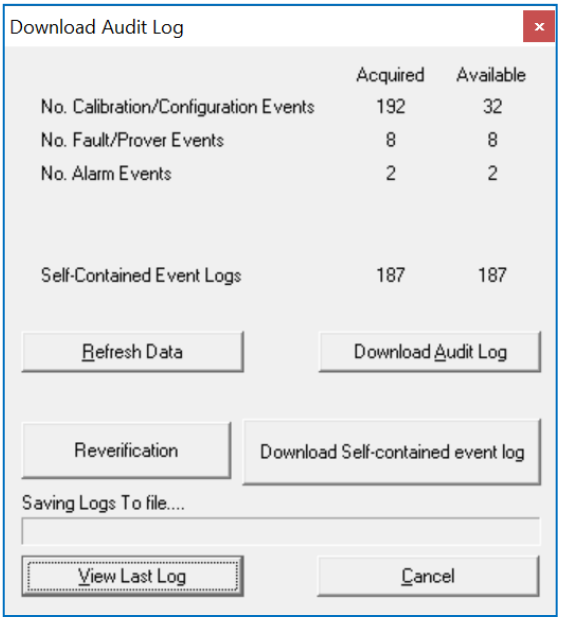


This message directs the operator to the Logging tab:



Logging screen

Select the tab named Download Audit Log:



Audit Log download screen with "Reverification" option activated

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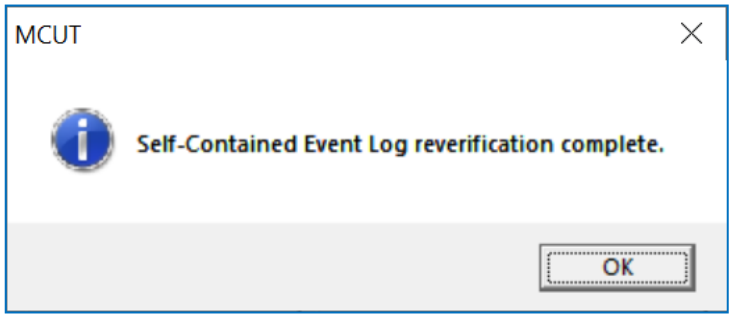
Select the “Reverification” button. The following message will appear:

Note: To perform the reverification, the operator must break the hardware metrological seal by changing the position of the hardware link to the “Read/Write” position.

After the reverification process has been successfully completed, the following message will appear:

After this operation is executed, the following message appears:



The hardware metrological seal must now be replaced on the corrector. The reverification operation has now been recorded in the Self-Contained Event Log. This allows 200 new events to be recorded in this Log. The newest recorded event will overwrite the oldest recorded event. The reverification process must be repeated every time 200 supercompressibility event changes are recorded.

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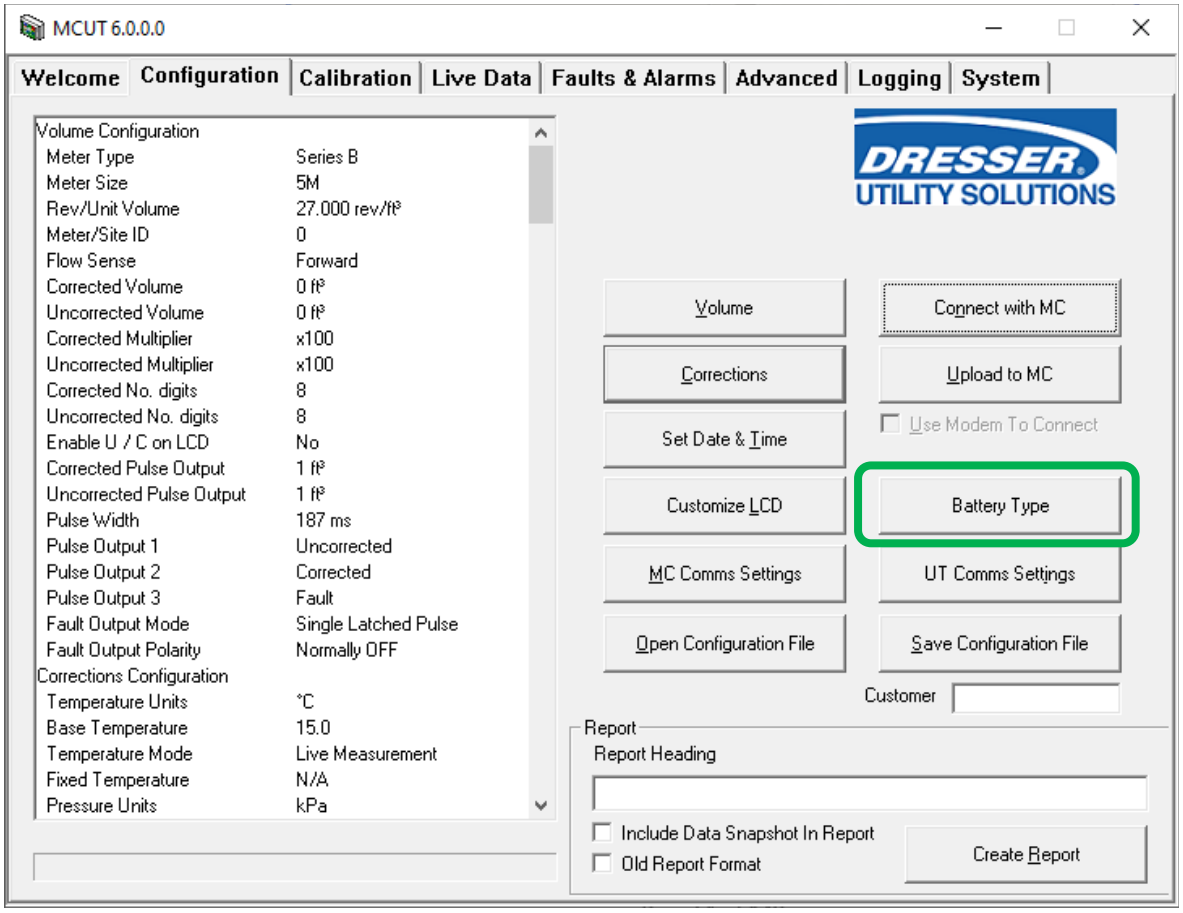
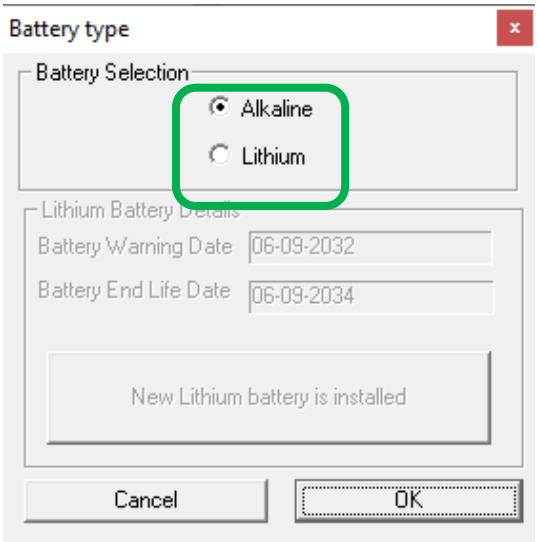
6.10 Battery Type



Once you select the Battery Type from the Configuration Tab a window will pop up allowing you to choose between Alkaline or Lithium



Selecting Lithium will activate the New Lithium battery installed button which is explained in the section entitled **Battery Replacement.**

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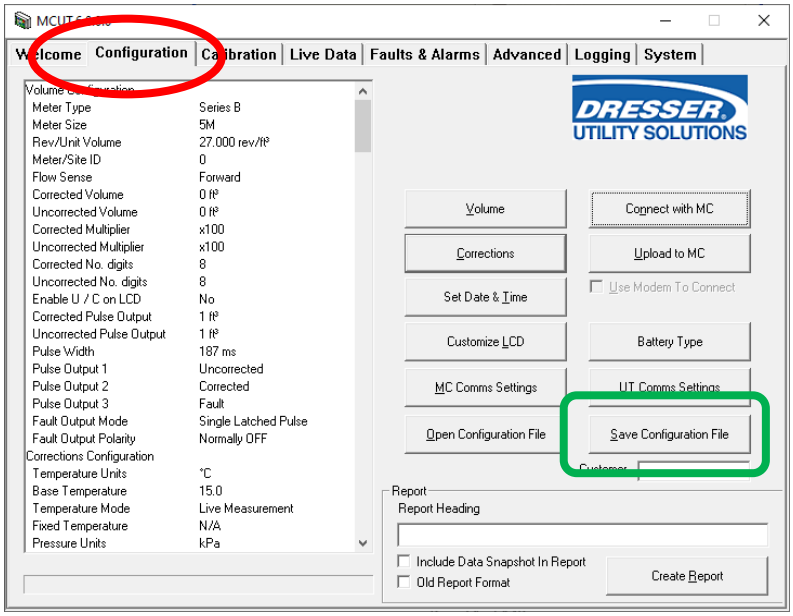
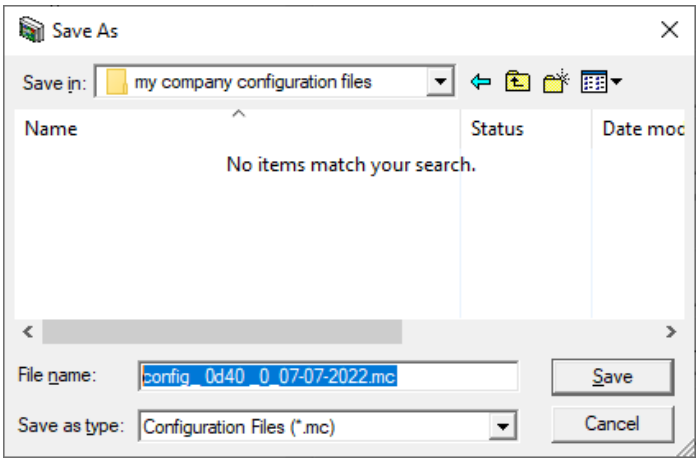
6.11 Save Configuration File

The MCUT provides the facility to save configuration files. This is beneficial when it is necessary to configure several IMCW2's with the same configuration data, as the file can be opened by the MCUT, and then uploaded to the IMCW2. It is possible to save both uploaded parameters (displayed with white background) and changed parameters (highlighted yellow).

To save a configuration to a file:

- On the *Configuration* screen select the *Save Configuration File* option and the *Save As* dialog box will be displayed.
- Determine the location on your PC where the configuration file is to be saved.
- Enter the desired file name that the configuration file is to be saved to. A default file name will be displayed which may also be used.
- Select the *Save* option.
- A dialog box will be displayed stating *Configuration Saved*, select *OK.*
- The configuration data is now saved to the file. All configuration files have an "*.mc"* file extension.





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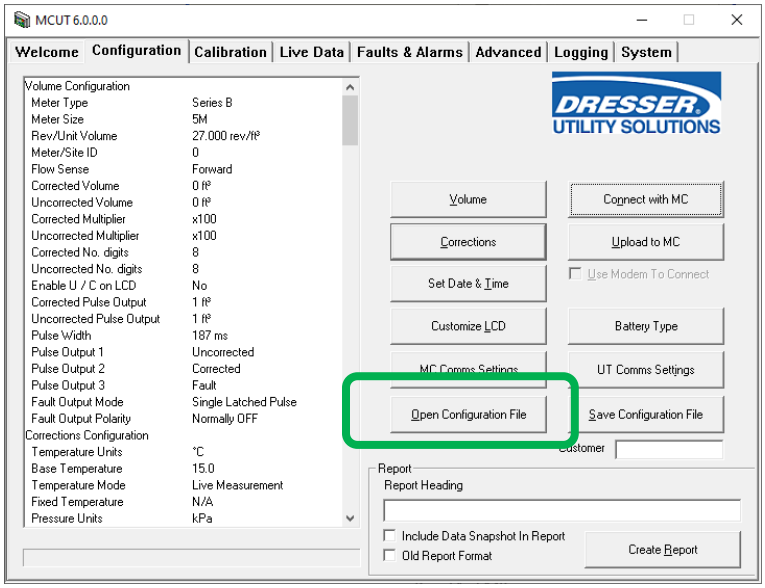
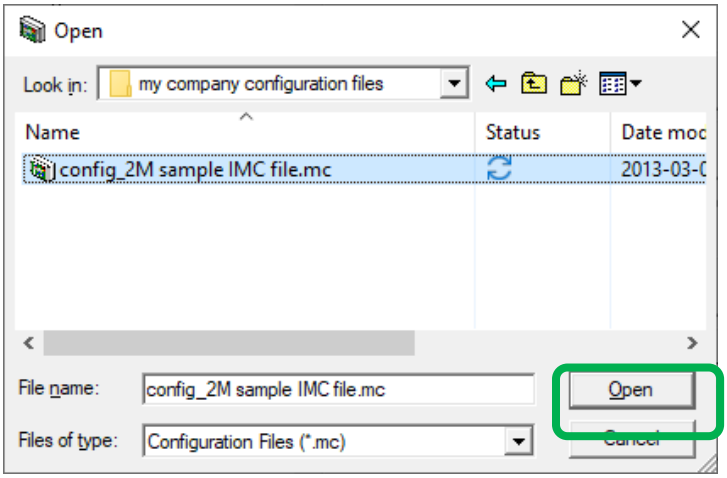
6.12 Open Configuration File

The MCUT provides the facility to open a previously saved configuration file to an IMCW2. This may be beneficial when it is necessary to configure several IMCW2's with the same configuration data.

To open a previously saved configuration file:

- On the *Configuration* screen select the *Open Configuration File* option and the *Open* dialog box will be displayed.
- Locate and select the configuration file required to be uploaded to the IMCW2. The configuration file will have the "*.mc"* file extension.
- Select *Open.*
- A dialog will be displayed stating *Configuration Restored*, select *OK.*
- The configuration details will now be restored to the MCUT. Any changed parameters will be highlighted yellow on the parameters selection list.
- To ensure that the configuration details are uploaded to the IMCW2 select the *Upload to MC* option. (Enter the password if appropriate, and select *OK*, otherwise select *Cancel*).
- The new details will be uploaded to the IMCW2. A dialog will be displayed stating *Sent OK*. Select *OK*, and the uploaded parameters will be displayed with the default white background.





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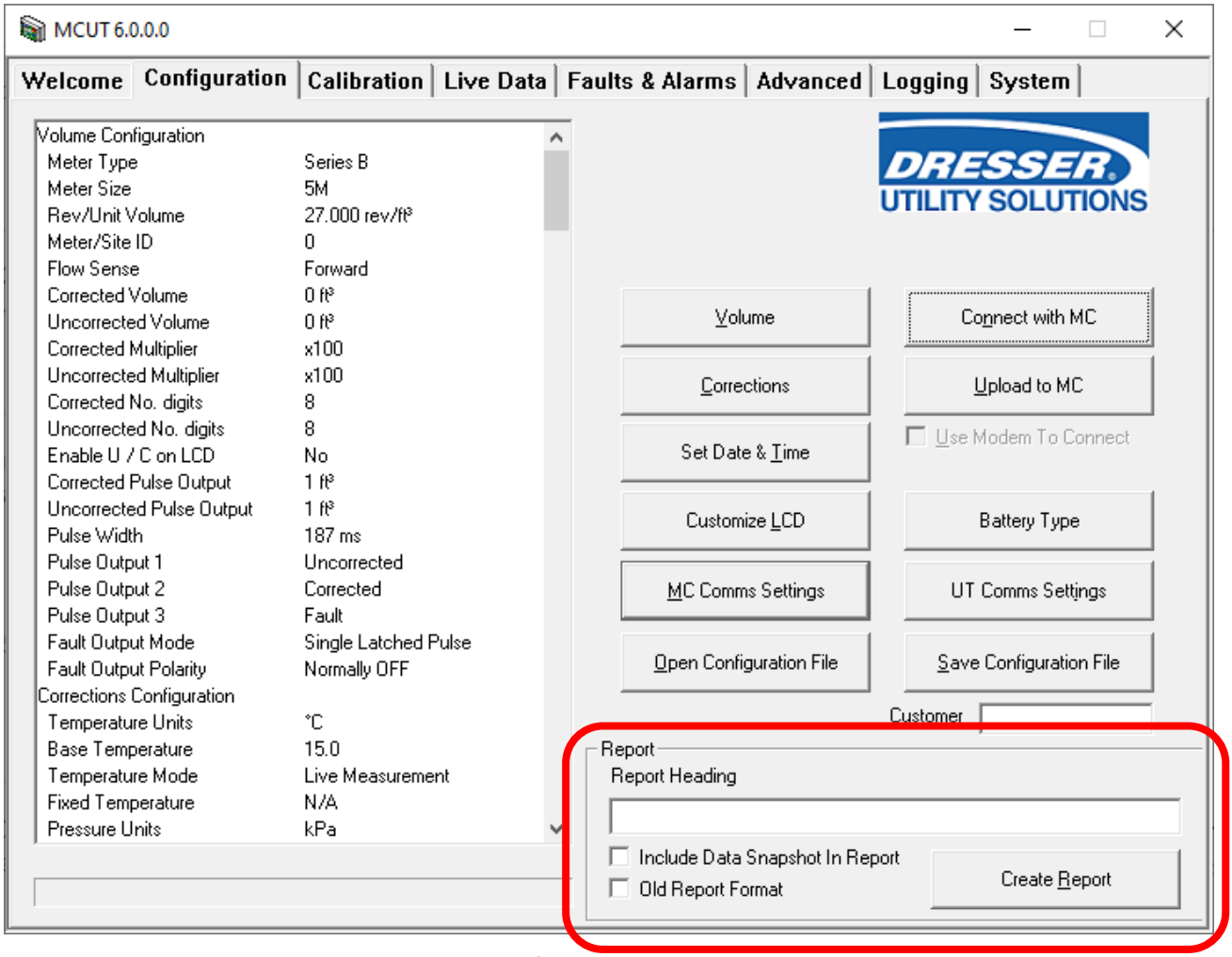
6.13 Report

The MCUT provides a *Create Report* facility. A read only report is generated which details the configuration of the IMCW2. The operator can enter a report heading via the keyboard; this could reflect the configuration type (e.g. B Series 3M meter) or meter location reference (e.g. south 1). The report can include a *data snapshot* of the data stored in the corrector. The additional information displayed in this report is listed below and includes data specific to the IMCW2 that the MCUT is communicating with.



Configuration Report

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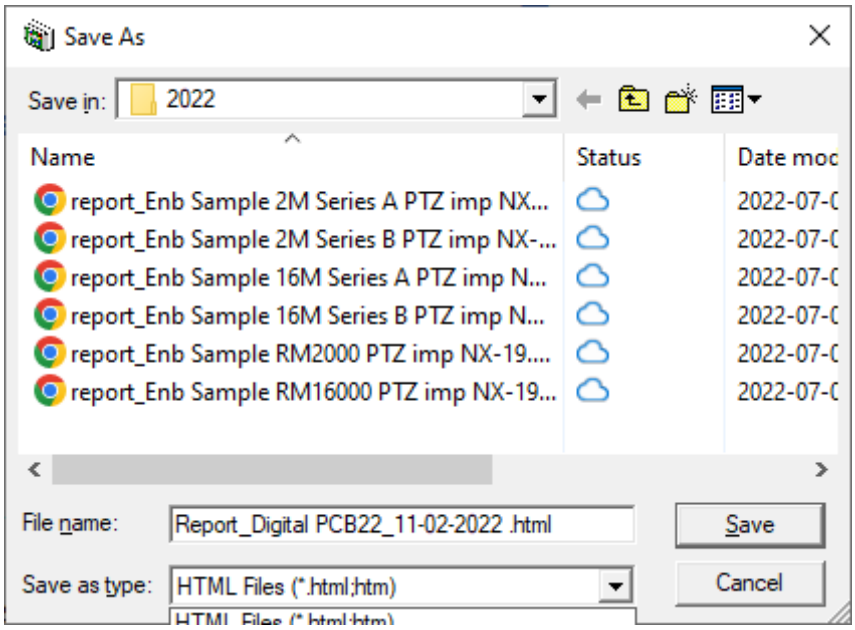

File format can be saved as either **.HTML** or **.CSV**

The information provided in the report includes (dependent on model and configuration of the IMCW2):

- Volume configuration screen parameters.
- Corrections configuration screen parameters.
- Display Configuration.
- Alarm limits.
- Fault Dial out settings.
- Alarm Dial out settings.
- Logged parameters (including details of Log 1, Log 2 and Log 3).
- DP test parameters (only for DP-versions).

When a *data snapshot* is included within the report the following additional information is displayed (dependent on model and configuration of the IMCW2):

- Unit serial number.
- Firmware revision.
- Battery voltage.
- Volumes data (including temperature, pressure, and correction factor).
- Present fault(s) details (including differential & line pressures, temperature, volume, internal operation, and low battery).
- Occurred fault(s) details (including differential & line pressures, temperature, volume, internal operation, and low battery).
- Present alarm(s) details (including meter DP, high and low pressure, temperature, and flow).
- Occurred alarm(s) details (including meter DP, high and low pressure, temperature, and flow).

To create a configuration report:

- From the Report section of the *Configuration* screen, select the *Report Heading* text box. Enter the desired heading of the report.

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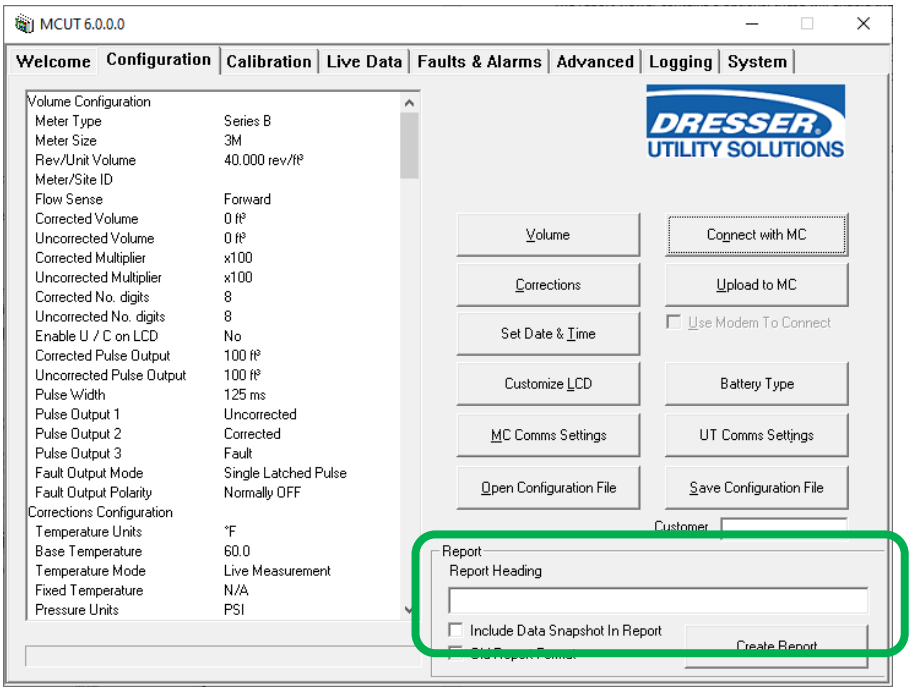
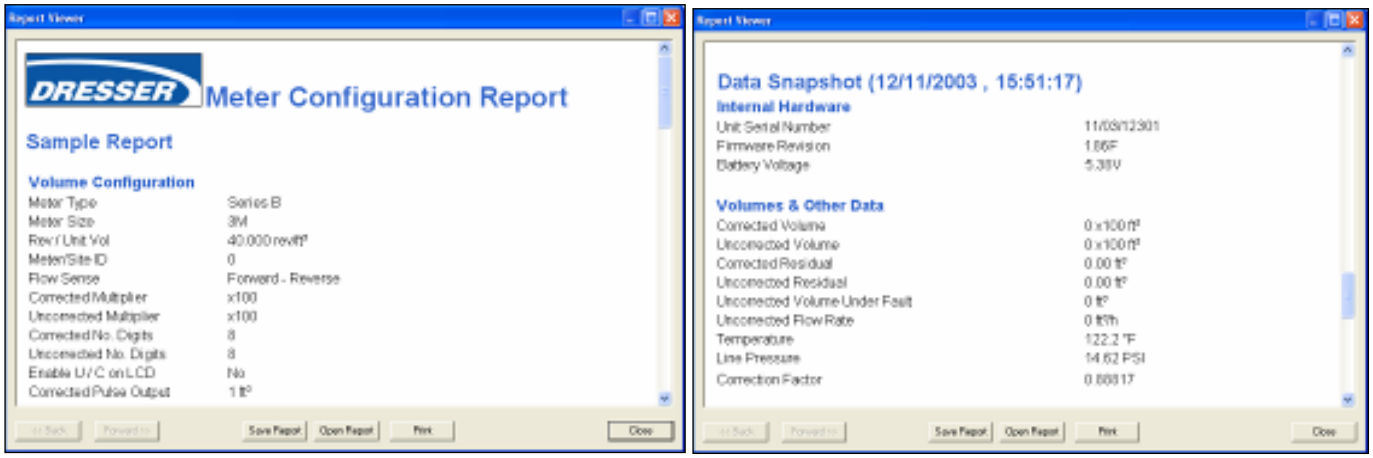


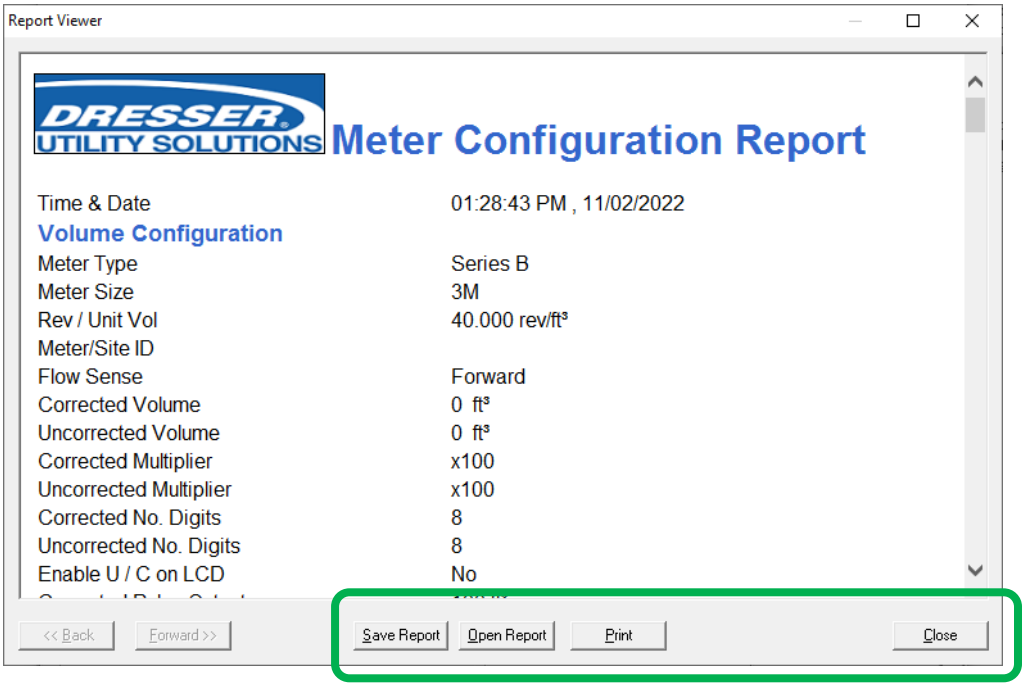
- To include a data snapshot, select the *Include Data Snapshot In Report* check box (ensure that a check is displayed in the appropriate check box).
- Select *Create Report*.
- A report viewer will be displayed, containing all the required data. If the *data snapshot* is included the details can be found in the second half of the report and will be entitled *Data Snapshot* along with the date and time that the data was retrieved.



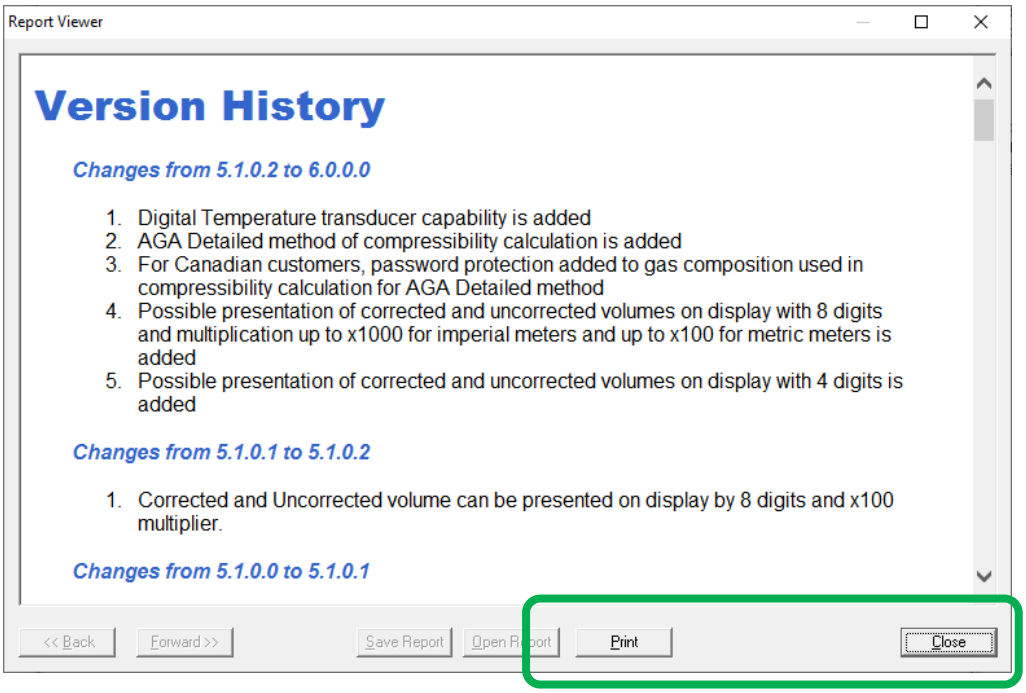
Configuration Report

6.13.1 Report Viewer / View Release Notes

The report viewer contains 6 options; these will enable the operator to *Save Report*, *Open Report* and *Print* reports. Selection of the *Save Report, Open Report,* and *Print* options will display the *Save As*, *Open* and *Print* dialogs common to the PC. If more than one report is opened in the report viewer the operator can navigate between files via the *Forward >>* and *<< Back* options. The *>> Forward* and *<< Back* options will only be enabled once more than one configuration file is displayed within the viewer.



Once selected the *View Release Notes* option on the *Welcome* screen will display a report detailing the changes/new features added to the latest release of the UT. The report is displayed within the *Report Viewer:* please note that the only options available when viewing the release notes in the *Report Viewer* are *Print* and *Close.*



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7 Calibration Tab

Temperature and pressure recalibration should not be required, however the IMCW2 may be temperature and pressure calibrated by the operator, using direct communications between the PC and IMCW2. Various methods may be used, and additional equipment is required. If there is reason to suspect that the temperature or pressure transducers are reading erroneously, or if an authorizing/regulatory requires periodic checks on the transducers.

Note: If using a modem to connect, the *Calibration* screen will be disabled.

To obtain temperature calibration points use one of the following methods:

1. Use temperature-controlled baths with the IMCW2 temperature probe and a calibrated thermometer for determining the bath temperatures. The thermometer's stated accuracy should be ±0.1 degree.

OR

2. A reference thermometer can be inserted into the differential pressure tap on the inlet of the Meter. This calibration can be performed in the field.

Note: During calibration multiple temperature readings are automatically compared over a period to ensure that the readings are stable. If stability is not obtained the calibration process will not be successful.

To obtain pressure calibration points a recognized pressure calibrator may be used to as a pressure reference.

Note: It is generally a requirement that there should be a certificate of calibration traceable to national standards, for all devices used in the calibration process.

Upon selection of the *Calibration* tab the *Calibration* screen will be displayed. This screen is divided into 2 sections: *Temperature* and *Pressure*. Assuming connection with the IMCW2 has already been established, then it is possible to calibrate both the temperature and pressure.

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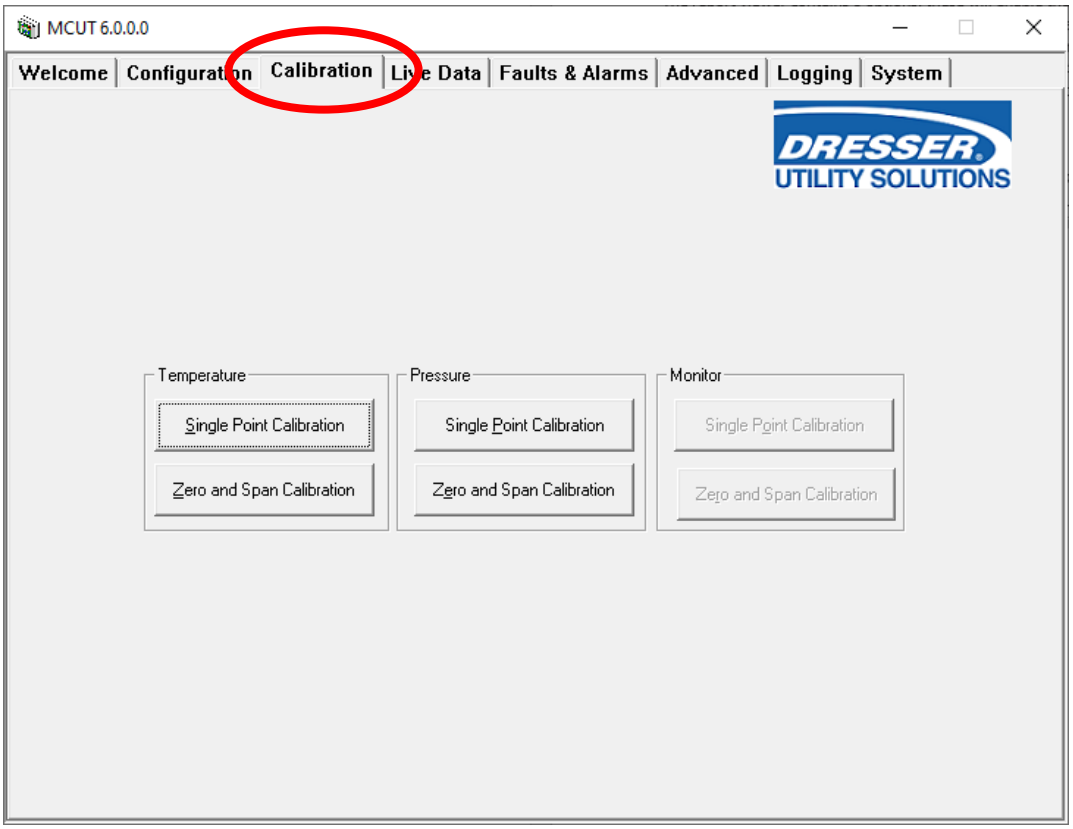

Calibration Screen

To display the Calibration screen:

- Select the *Calibration* tab. The *Calibration* screen will be displayed.
- The options available on this screen depend on the model and configuration of the IMCW2.
- Note: Pressure calibration of an IMCW2 T-Only unit is not possible as no pressure transducer is fitted. If the IMCW2 is configured to read a fixed pressure or temperature the associated calibration options will not be available. If a fixed temperature or pressure is used, the measurement modes must be set to live measurement within the MCUT for the appropriate parameter to calibrate the desired transducer.

Both *Single Point* and *Zero and Span* calibration can be done via the MCUT; this process is only possible via direct communication between the PC and IMCW2.

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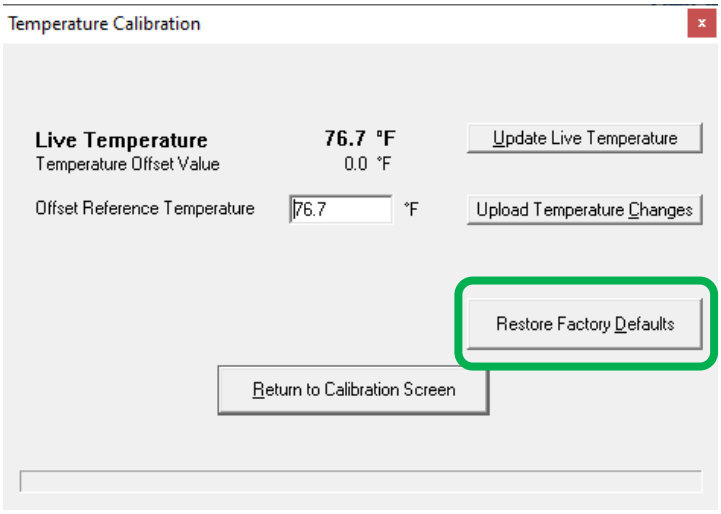
7.1 Temperature Single Point Calibration

To calibrate a single point temperature:

- Insert temperature probe into a temperature bath with a **reference** thermometer or expose temperature probe and a **reference** thermometer to the same, stable conditions.
- From within the *Calibration* screen select the temperature *Single Point Calibration* option. The *Temperature Calibration* dialog will be displayed.
- Select the *Update Live Temperature* option. The IMCW2 temperature reading will be updated, displayed as read only text and labeled on the screen as *Live Temperature*.
- Select the *Offset Reference Temperature* text box and enter the **reference** temperature value.
- Select the *Upload Temperature Changes* option. Enter the password if appropriate and select *OK*, otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Offset Calibration Successful*, select *OK.* The *Temperature Calibration* selection will be displayed.
- Note: The difference between the *Offset Reference Temperature* and *Live Temperature* reading should be ± 9°F / < ± 5°C.
- From the *Temperature Calibration* screen, select the *Return to Calibration Screen* option. The *Calibration* screen will be displayed

To restore single point temperature calibration factory defaults:

- On the *Calibration* screen select the temperature *Single Point Calibration* option. The *Temperature Calibration* dialog will be displayed.
- Select the *Restore Factory Defaults* option. Enter the password if appropriate and select *OK,* otherwise select *Cancel*.
- Once complete a message will be displayed stating *Factory temperature calibration restored*. Select *OK.*
- The *Temperature Calibration* dialog will be displayed. Select the *Return to Calibration Screen* option; the *Calibration* screen will be displayed.



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7.2 Temperature Zero and Span Calibration

To calibrate the temperature zero and span:

- Insert temperature probe into a temperature bath with a **reference** thermometer.
- Set the zero-point temperature in the bath as close as possible to -40°F/°C
- On the *Calibration* screen select the temperature *Zero and Span Calibration* option. The *Temperature Calibration* screen will be displayed.
- Select the *Update Live Temperature* option. The IMCW2 temperature reading will be updated, displayed as read only text, and labeled as *Live Temperature*.
- Select the *Zero Reference Temperature* text box and enter the zero-point **reference** temperature value. If the temperature you select is not feasible (above 50°F), a message to this effect will be displayed.

Note: The range between zero and span must be at least 90 degrees F

- Select the *Send Zero Calibration* option. Enter the password if appropriate and select *OK*, otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Zero Calibration Successful*, select *OK*.
- Set the span-point temperature in the bath as close as possible to 140°F/60°C
- The *Send Span Calibration* option will now be available.
- Select the *Span Reference Temperature* text box and enter the span-point **reference** temperature. If necessary, the operator will be informed of the accepted range.

Note: The range between zero and span must be at least 90 degrees F

- Select the *Send Span Calibration Option*. Enter the password if appropriate and select *OK*, otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Span Calibration Successful*, select *OK.* The *Temperature Calibration* screen will be displayed.
- From within the *Temperature Calibration* dialog select the *Return to Calibration Screen* option. The *Calibration* screen will be displayed.

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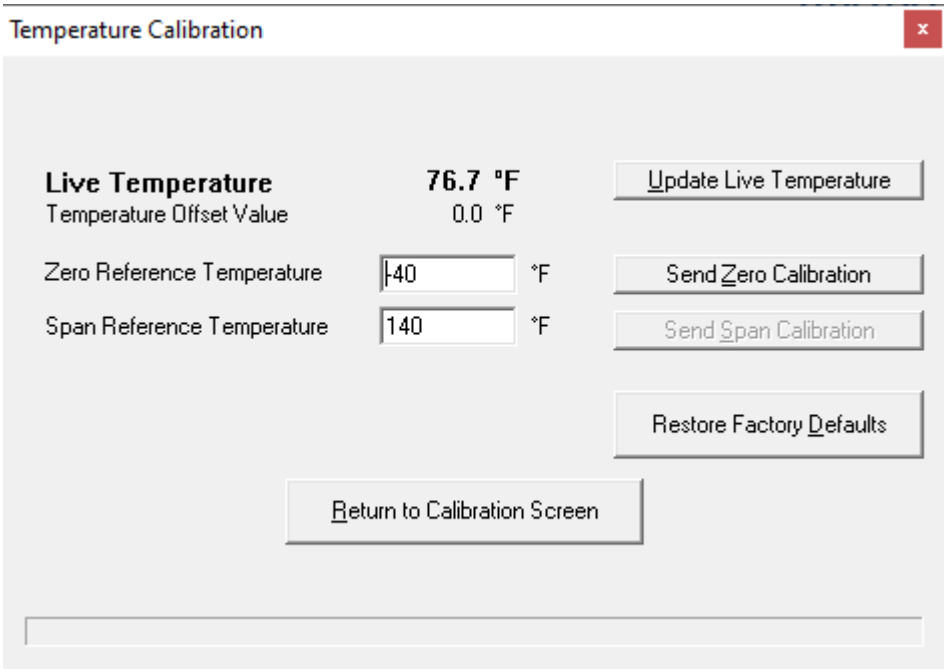
To restore temperature zero and span calibration factory defaults:

- From within the *Calibration* screen select the temperature *Zero and Span Calibration* option. The *Temperature Calibration* dialog will be displayed.
- Select the *Restore Factory Defaults* option. Enter the password if appropriate and select *OK,* otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Factory temperature calibration restored*. Select *OK.*
- The *Temperature Calibration* screen will be displayed. Select the *Return to Calibration Screen* option; the *Calibration* screen will be displayed.



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7.3 Pressure Single Point Calibration

To calibrate a single point pressure:

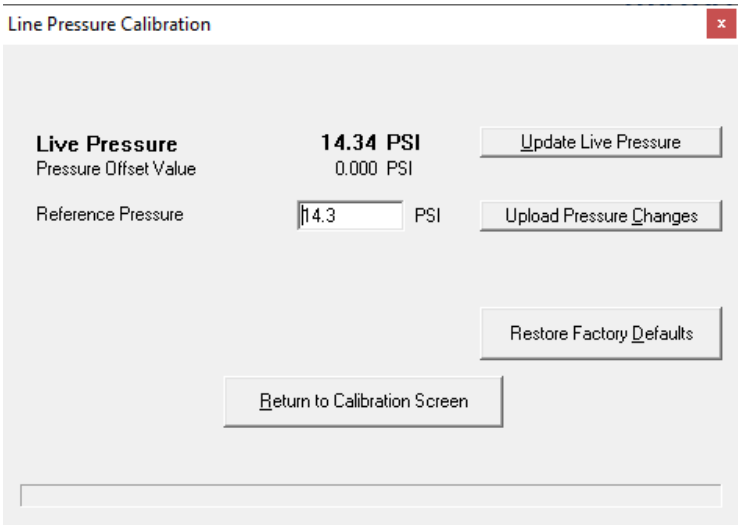
- Ensure the pressure transducer of the IMCW2 is connected to the pressure calibrator.
- Set a **reference** pressure point on the reference calibrator that is within the range of the IMCW2 pressure transducer.
- On the *Calibration* screen, select the pressure *Single Point Calibration* option. The *Pressure Calibration* screen will be displayed.
- Select the *Update Live Pressure* option. The IMCW2 pressure reading will be updated, displayed as read only text and labeled as *Live Pressure*.
- Select the *Offset Reference Pressure* text box and enter the **reference** pressure value.
- Select the *Upload Pressure Changes* option. Enter the password if appropriate and select *OK*, otherwise select *Cancel*.
- Once complete a dialog will be displayed stating *Offset Calibration Successful*, select *OK.* The *Pressure Calibration* dialog will be displayed.

Note: The difference between the *Offset Reference Pressure* and *Live Pressure* reading should be < ± 1.74 PSI / ± 0.12 bar

- On *Pressure Calibration* screen select the *Return to Calibration Screen* option. The *Calibration* screen will be displayed.

To restore single point pressure calibration factory defaults:

- On the *Calibration* screen, select the pressure *Single Point Calibration* option. The *Pressure Calibration* screen will be displayed.
- Select the *Restore Factory Defaults* option. Enter the password if appropriate and select *OK,* otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Factory temperature calibration restored*. Select *OK.*
- From The *Pressure Calibration* dialog will be displayed. Select the *Return to Calibration Screen* option; the *Calibration* screen will be displayed.



7.4 Pressure Zero and Span Calibration

To calibrate the pressure zero and span:

- Ensure the pressure transducer of the IMCW2 is connected to the pressure calibrator.
- Set a zero-**reference** pressure point on the reference calibrator as close as possible to the lower pressure range of the IMCW2 pressure transducer.
- On the *Calibration* screen select the pressure *Zero and Span Calibration* option. The *Pressure Calibration* screen will be displayed.
- Select the *Update Live Pressure* option. The IMCW2 pressure will be updated, displayed as read only text and labeled as *Live Pressure*.
- Select the *Zero Reference Pressure* text box and enter the zero-reference pressure value. If necessary, the operator will be informed of the acceptable range.

> **Note:** The difference between the zero and span pressure readings must be at least 50% of the F.S. range of the line transducer installed in the IMCW2.

- Select the *Send Zero Calibration* option. Enter the password if appropriate and select *OK*, otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Zero Calibration Successful*, select *OK*.
- Set a span-**reference** pressure point on the reference calibrator as close as possible to the higher-pressure range of the IMCW2 pressure transducer.
- The *Send Span Calibration* option will now be available.
- Select the *Span Reference Pressure* text box and enter the span-**reference** pressure. If necessary, the operator will be informed of the acceptable range.

> **Note:** The difference between the zero and span pressure readings must be at least 50% of the F.S. range of the line transducer installed in the IMCW2.

- Select the *Send Span Calibration Option*. Enter the password if appropriate and select *OK*, otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Span Calibration Successful*, select *OK.* The *Pressure Calibration* screen will be displayed.
- On the *Pressure Calibration* screen, select the *Return to Calibration Screen* option. The *Calibration* screen will be displayed.

To restore temperature zero and span calibration factory defaults:

- On the *Calibration* screen select the pressure *Zero and Span Calibration* option. The *Pressure Calibration* screen will be displayed.
- Select the *Restore Factory Defaults* option. Enter the password if appropriate and select *OK,* otherwise select *Cancel*.
- Once complete, a dialog box will be displayed stating *Factory temperature calibration restored*. Select *OK.*

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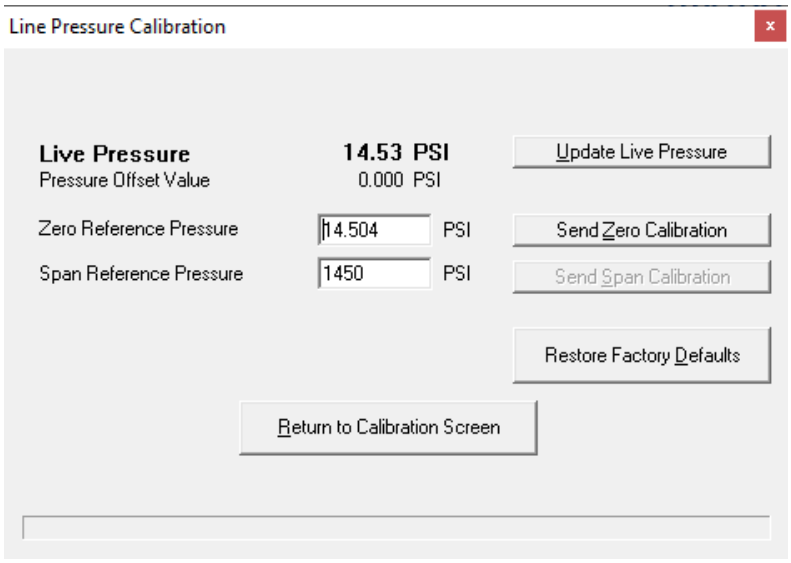
- The *Pressure Calibration* dialog will be displayed. Select the *Return to Calibration Screen* option; the *Calibration* screen will be displayed.



7.5 Monitor Pressure Calibration

If IMCW2 is equipped with a secondary line-pressure transducer (Monitor) the Monitor Pressure Calibration is the same as the primary line-pressure transducer (section 7.3 and 7.4)

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8 Live Data Tab

Select the *Live Data* screen. This read only function provides the operator with a *read only* screen from which it is possible to view a *data snapshot* (which may be updated as often as required). The information provided by the *data snapshot* includes (dependent on model selected):

- Unit serial number.
- Meter / Site ID.
- Firmware and PCB revision.
- Battery Voltage.
- Monitor Pressure.
- Corrected and uncorrected volumes.
- Corrected and uncorrected residual.
- Uncorrected flow rate volume.
- Uncorrected under fault volume.
- Temperature reading.
- Line pressure reading.
- Supercompressibility.
- Correction factor.
- Details of all present faults and alarms.
- Details of all occurred faults and alarms.
- Monitor pressure results (only for external monitor pressure versions).
- Differential pressure results (only for DP-versions).

In a fault condition, the appropriate *Present Fault* indicator is displayed as a red square with a *1.* The following *Live Data Screen* shows the *Present Faults* register as clear, i.e., there are no faults present; the appropriate indicators are displayed as a green square with a *0*. Please refer to section entitled ***Faults and Alarms*** for further details.

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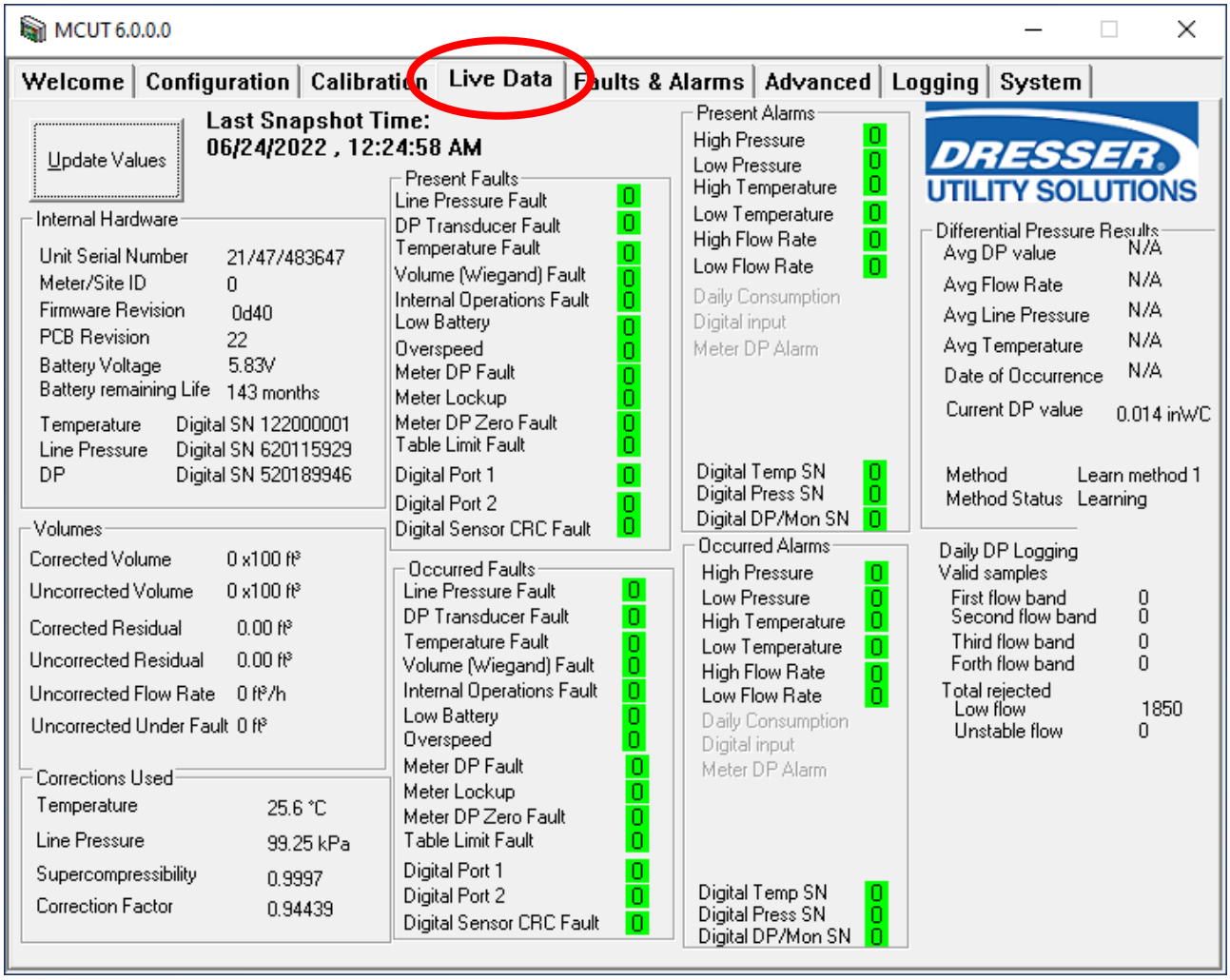

Live Data Screen (DP-version shown)

To display the live data screen:

- In the MCUT, select the *Live Data* tab. The *Live Data* screen will be displayed.
- The options available on this screen depend on the model and configuration of the IMCW2.

To update values:

- On the *Live Data* screen, select the *Update Values* option.
- The values on the screen will be updated.

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9 Faults & Alarms Tab

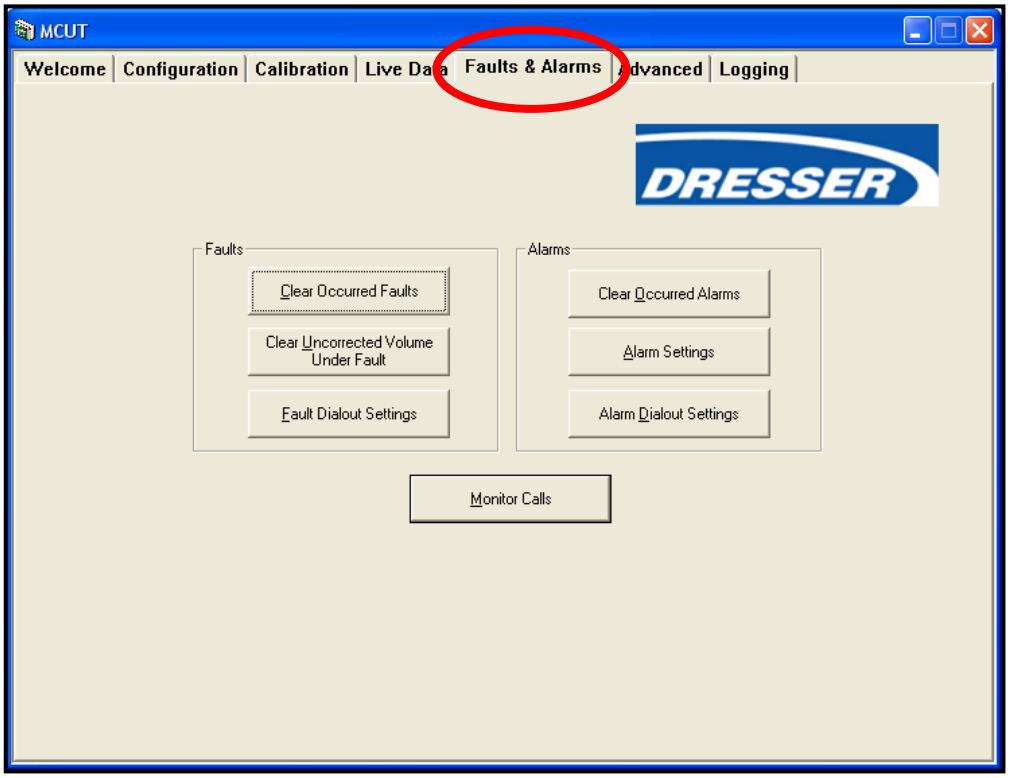
A Fault in the IMCW2 occurs if metrology functionality is obstructed. Fault conditions are defined by design; no setup is required.

An Alarm in the IMCW2 occurs if conditions defined by user are not met.

9.1 Faults Functionality

To display the faults and alarms screen:

- In the MCUT select the *Faults & Alarms* tab. The *Faults & Alarms* screen will be displayed.



If a fault occurs, then it is indicated:

- On the display
- Fault output pulses if assigned to any output pulse terminal, refer to the section entitled ***Fault Pulse Allocation***
- On the Live Data screen

The form of output pulses is configured on the Volume Configuration screen in the Fault Pulse Output Configuration section

Fault Output Pulse forms:

- Continuous pulses
- Single Latched pulse (level)
  - Normally off

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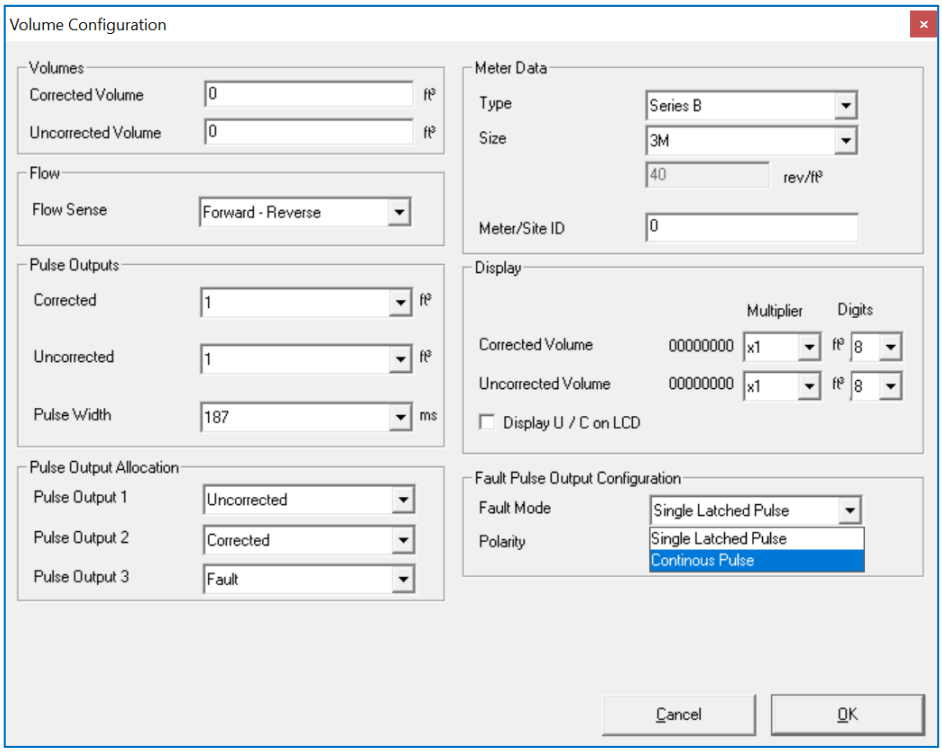
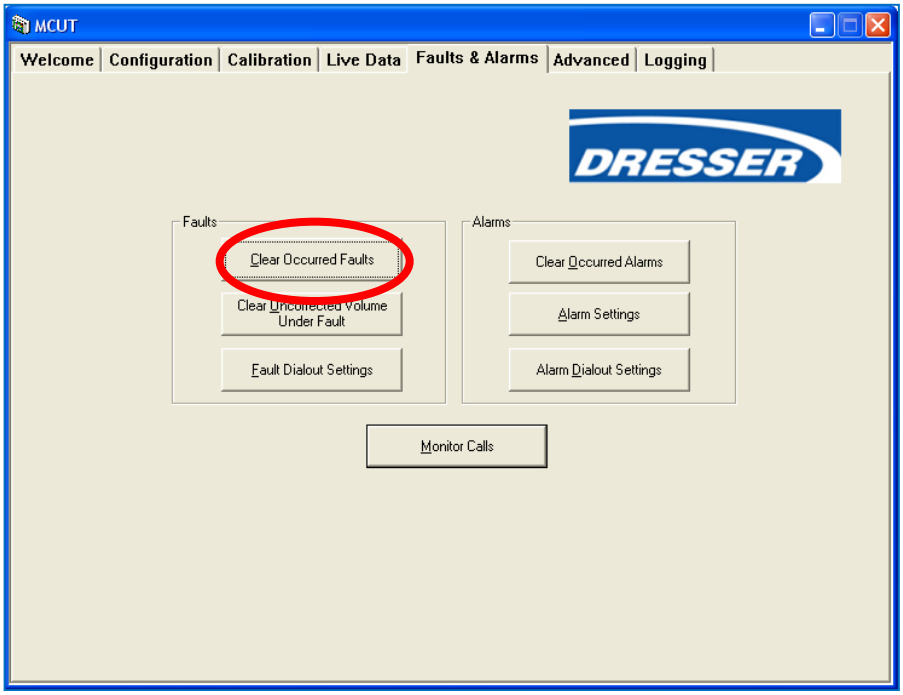
- Normally on



Configuration of Fault Pulse Output form

9.2 Clear Occurred Faults

A fault is described as a measurement reading that exceeds its acceptable range. This may be caused, for example, by exceeding the stated pressure range of the transducer. When a fault condition occurs, an intuitive indication is displayed on the LCD indicating the nature of the fault (refer to the *(Fault Code Reference Table)*. A download from the unit via the MCUT will show that the appropriate icon(s) in the *Present Faults* and *Occurred Faults* section of the *Live Data* screen are displayed with a *"1"* in a red square. When the nature of the problem is determined and resolved, the icon on the *Present Faults* section of the *Live Data* screen will return to green with a *"0"* and the fault code on the LCD will no longer be displayed. The appropriate icon on the *Occurred Faults* screen will remain red with a *"1"* until the occurred faults register has been cleared. This process can be carried out via the *Faults & Alarms* screen (refer to *(Clear Occurred Faults)*, or locally by scrolling through the LCD parameters until the test screen is displayed (*scrolling 8's*). Remain on the test screen until **CLr FLt** is displayed. Press the IMCW2 selector button and this will clear the occurred faults register. Following the selection of the *Update Values* options on the *Live Data* screen, the icon on the *Occurred Faults* section will return to green with a *"0"*.



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FAULT	DESCRIPTION/REASON	LCD	LIVE DATA for Fault Names	Volume Accumulation	NOTES
Volume Fault	Caused by open wire(s) in volume sensor. When there are one or more open wires on one of the 4 pulse input wires, this fault is set.	**Vol FLt and alarm bell icon**	Volume fault	Volume counting stops	Internal MC2 problem. Consult factory.
Line Pressure Fault	Pressure sensor fault occurs when the pressure sensor wire is crimped or cut/open, always connected to main board, or when the pressure is higher or lower than the calibration range for the pressure.	**P FLt and alarm bell icon**	Line Pressure fault	Accumulated in Volume under fault register	–
Line Temperature Fault	Temperature sensor fault occurs when the temperature sensor is removed from unit or there is an open wire, then this fault is set, or when temperature is outside of the -40 °F to 140 °F range.	**t FLt and alarm bell icon**	Line Temperature fault	Accumulated in Volume under fault register.	–
Supercompressibility Table Limit Fault	The Supercompressibility table temperature has exceeded a threshold that depends on gas method.	**tbl FLt and alarm bell icon**	Z Table Limit fault	Accumulates active volume, but with Z Supercompressibility factor set to 1.	When the AGA, SGERG Methods have a temp - 35C and 60C, NX 19 - 12C to 32C.
Low Battery Fault	Low battery voltage below 5.3 V.	**Blinking bell icon**	Low Battery Alarm warning (not on live data)	Accumulates active volume.	–
–	When the battery voltage dips below 4.9V, the low battery fault is set.	**Lo bAtt and battery icon**	Low Battery fault	Accumulates active volume.	–
–	When the battery voltage dips below 3.9V, the replace battery fault is set.	**rEP BAtt**	Replace Battery (not in live data)	Volume on LCD and ERT is locked.	Controlled shutdown volume & ERT synchronization state.
–	When the battery voltage dips below 3.4V, MC2 enters shutdown.	**Might be BLANK**	Battery Dying (not in live data)	MC2 functionality is not guaranteed.	–
Internal Operations Fault	Memory fault and watchdog reset happens or the battery power went below 3.4V and reset the device.	**Int FLt and blinking bell icon**	Internal Operations fault	Continues accumulation where it left off since the battery power was intact up until 3.9V.	This fault has occurred in the past. When the processor comes up this is a present fault.
Overspeed Fault	When a meter for a rated QMAX is over sped by 25% or more.	**OS Flt and alarm bell icon**	Overspeed fault	–	The meter is running too fast or being oversped.
Digital Port 1 Fault	When the digital sensor communication fails on port 1 of board.	**d1 Flt**	Digital Port 1	Volume accumulation stops.	–
Digital port 2 fault	When the digital sensor communication fails on port 2 of board.	**d2 Flt**	Digital Port 2	Volume accumulation stops.	–
Digital Sensor CRC Fault	When there is a CRC mismatch for digital sensor on port1 and/or port 2.	**CrC Flt**	Digital sensor CRC fault	Volume accumulation continues.	Mismatch for sensor serial number and/or calibration.
Differential Pressure Fault	defined number of DP values measured in sequence have exceeded the meter fault threshold	**DP Flt**	Meter DP Fault	Volume accumulation continues.	–
Meter Lock-up Fault	defined number of DP values measured in sequence have exceeded the meter lock-up threshold.	**DP LOC**	Meter lockup	Volume accumulation continues	–

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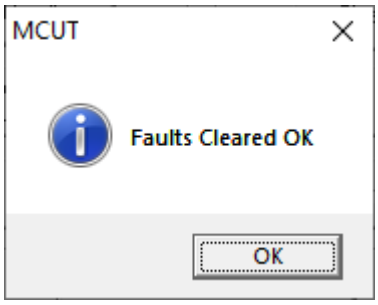
Note: When P Fault occurs outside of calibration range or T Fault occurs outside of operating range, accuracy of volume is not guaranteed even if you set extreme alarm limits for P and T.

To clear occurred faults registry:

- From the Faults & Alarms screen, select the Clear Occurred Faults option.
- The faults will be cleared. A dialog box will be displayed stating Faults Cleared OK, select OK.
- The cleared fault can be confirmed by selecting the Update Values option on the Live Data screen. Providing the fault condition has been cleared, and the occurred faults register has been cleared, all icons on the Present Faults and Occurred Faults sections will be green with a 0.
- If the problem persists, contact your Dresser Representative.



9.3 Clear Uncorrected Volume Under Fault

In all fault conditions, the *Uncorrected Under Fault* volume register will be activated showing the total number of accumulated uncorrected volume units during the period in which the fault was present. Only faults that affect the correction factor will cause the *Uncorrected Under Fault* register to be activated. Under these conditions, both the *Uncorrected Volume* and the *Uncorrected Under Fault* volume will continue to increment, however the *Corrected Volume* register will no longer be activated (this register will be re-activated once the fault condition has been cleared). This allows the operator to calculate the average correction factor for that period from the 3 readings, which can then be applied to the fault counts to give an estimated corrected volume for the fault period.

To clear uncorrected volume under fault register:

- On the Faults & Alarms screen, select the Clear Uncorrected Volume Under Fault option.
- The uncorrected volume under fault register is password protected, therefore a password must be entered to clear this log. A dialog box will be displayed stating Faults Cleared OK, select OK.
- The uncorrected volume under fault register will be cleared.
- The cleared register can be confirmed by selecting the Update Values option on the Live Data screen. The Uncorrected Under Fault register value in the Volumes section will be set to 0.

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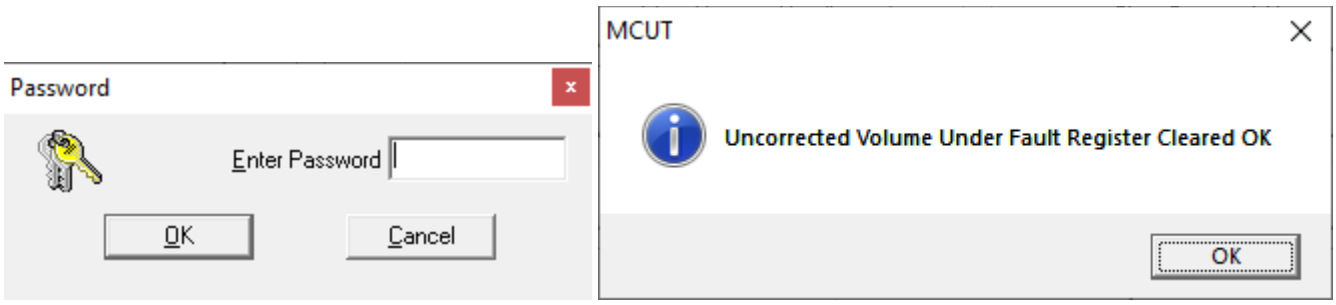


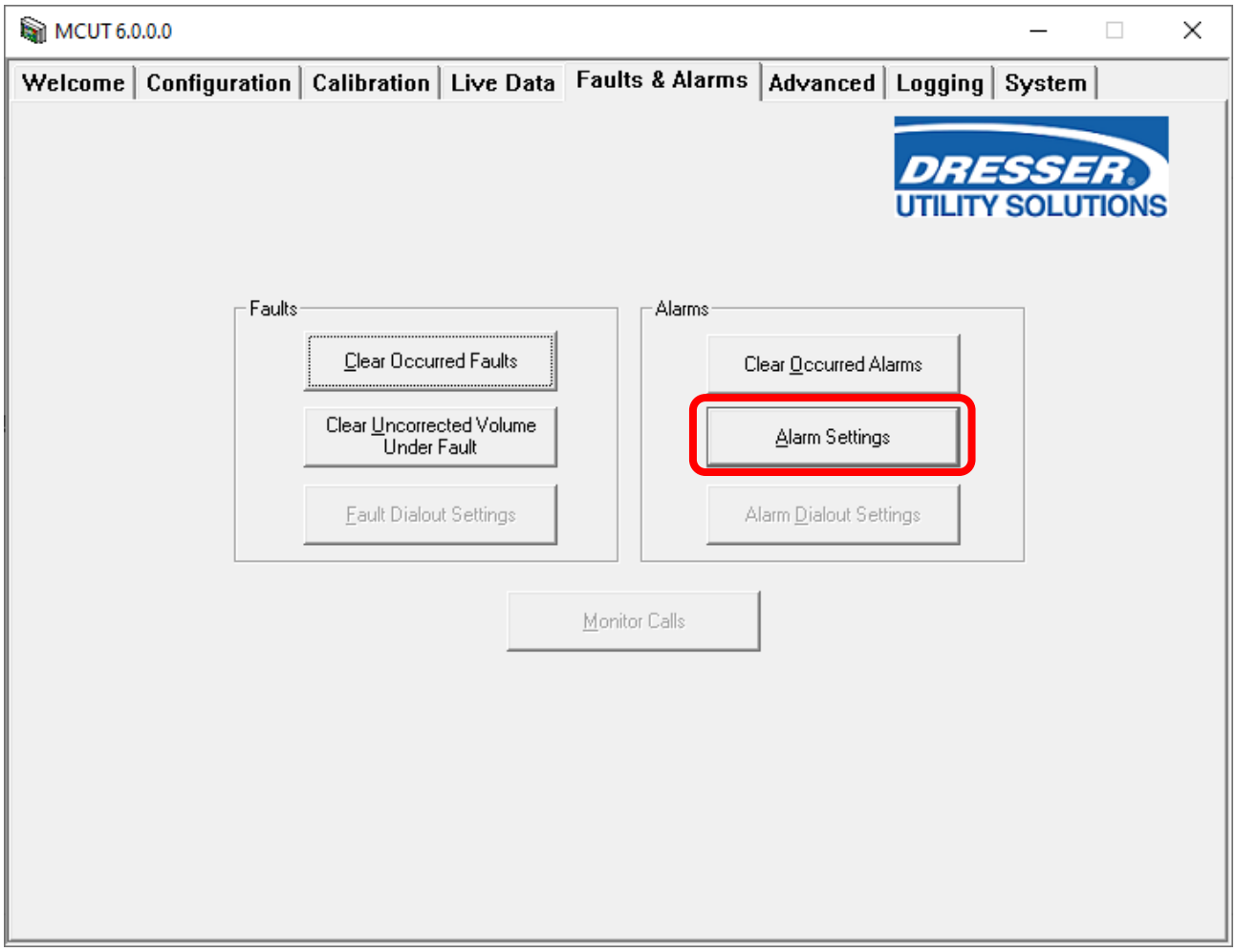
9.4 Fault Dial out Settings

Note: For details on setting-up and communicating via a modem contact your Dresser representative.

9.5 Configuration of Alarm functionality

Select the *Faults and Alarms Screen*. On this screen it is possible to set the alarm limits, specify the information to be displayed on the LCD in an alarm condition, specify whether a pulse output is to be generated in alarm conditions, clear the uncorrected volume under fault, and clear occurred alarms and faults.

9.6 Alarm Settings



The operator can specify alarm limits in the MCUT, for the following:

- High pressure.
- Low pressure.
- High temperature.
- Low temperature.
- High flow rate.
- Low flow rate.

Note: Settings for Digital Input, Digital Output (High Consumption Alarm), and Meter Lockup Output are performed on the Advanced Screen. The operator is also able to specify which alarms should be displayed on the LCD, and whether output pulses should be induced for the various alarm conditions.

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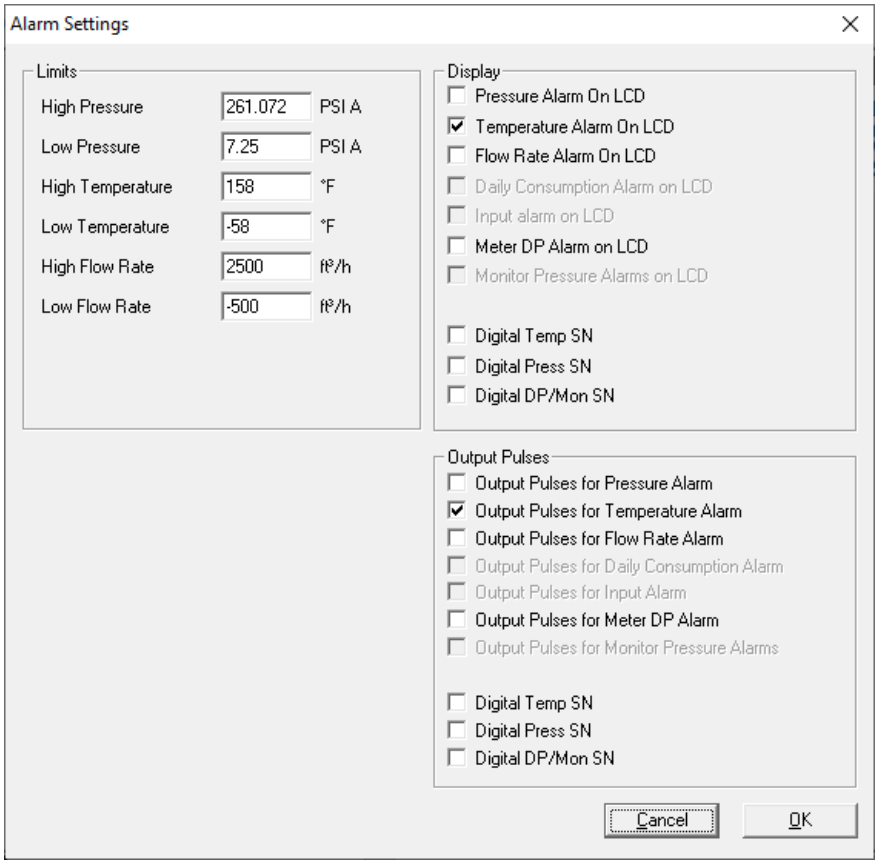
Note: Meter DP Alarm is also available on Firmware Version 1.93 and higher. However, this alarm is not configurable. It is displayed on the Live Data Screen and can be configured to display on the LCD as well. Additionally, it can be configured to be sent via a pulse output.

To set the alarm limits:

- Select the appropriate text box and enter the desired alarm limit; if an invalid value is entered the operator will be advised of the acceptable range (The new parameters will need to be uploaded to the IMCW2 via the *Configuration* screen).
- Select the *OK* option on the *Alarm Settings* screen.
- Select the *Configuration* tab; the *Configuration* screen will be displayed.
- The changed parameters will be highlighted yellow in the parameter selection list on the *Configuration* screen.

Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**



Alarm Settings Configuration (DP-version shown)

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Alarm Parameter / Alarm Limits Reference Table

Alarm Parameter	Alarm Limit	
High Pressure	1.5 x maximum pressure of transducer	
Low Pressure	0.5 bar Absolute	7.252 PSI Absolute
	-0.5 bar Gauge	-7.525 PSI Gauge
High Temperature	70°C	158°F
Low Temperature	-50°C	-58°F
High Flow Rate	+ 1.5 x Q_{max}*	
Low Flow Rate	- 1.5 x Q_{max}*	

*The high and low flow rate alarm limits will automatically update when a new meter type and size are selected.

To specify the parameters to be displayed on the LCD in alarm conditions:

- From the *Display* section, select the parameter(s) that is / are required to be displayed on the LCD; ensure that a check is displayed in the appropriate check box (The new parameters will need to be uploaded to the IMCW2 via the *Configuration* screen). If a parameter is disabled, it may be because it is not available on the IMCW2 that you have.
- Note: If the IMCW2 is set to read a fixed pressure or temperature, the respective parameters will be disabled. To enable these parameters, the measurement mode must be switched to Live Measurement.
- Select *OK* in the *Alarm Settings* dialog box.

Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**

Note: To switch an LCD displayed parameter off (so that it is not displayed in an alarm condition), select the appropriate parameter; ensure that the check is removed from the check box. Select *OK*, in the *Alarm Settings* dialog box. On the *Configuration* screen, select the *Upload to MC* option. Upon display of the *Sent OK* message, select *OK.*

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To specify output pulses for alarm conditions:

- From the *Output Pulses* section, select the parameter(s) that is/are required to invoke output pulses during an alarm condition, and ensure that a check is displayed in the appropriate check box (The new parameters will need to be uploaded to the IMCW2 via the *Configuration* screen). If a parameter is disabled, it may be because it is not available on the IMCW2 that you have.

Note: If the IMCW2 is set to read a fixed pressure or temperature, the respective parameters will be disabled. To enable these parameters, the measurement mode must be switched to Live Measurement.

- For Output Pulses of Digital Temp SN, Digital Press S/N and Digital DP/Mon S/N, refer to 13.5.2 Replacing the digital transducers - Alarms.
- Select *OK* on the *Alarm Settings* screen.

Note: To upload changes to the Micro Corrector refer to the section entitled **Upload to MC**

Note: To disable output pulse in an alarm condition, select the appropriate parameter; ensure that the check is removed from the check box. Select *OK*, within the *Alarm Settings* dialog. On the *Configuration* screen select the *Upload to MC* option. On display of the *Sent OK* message select *OK.*

9.7 Alarm Dial out Settings and Monitor Calls

(Only for units equipped with an external modem)

Note: For details on setting-up and communicating via a modem contact your Dresser representative.

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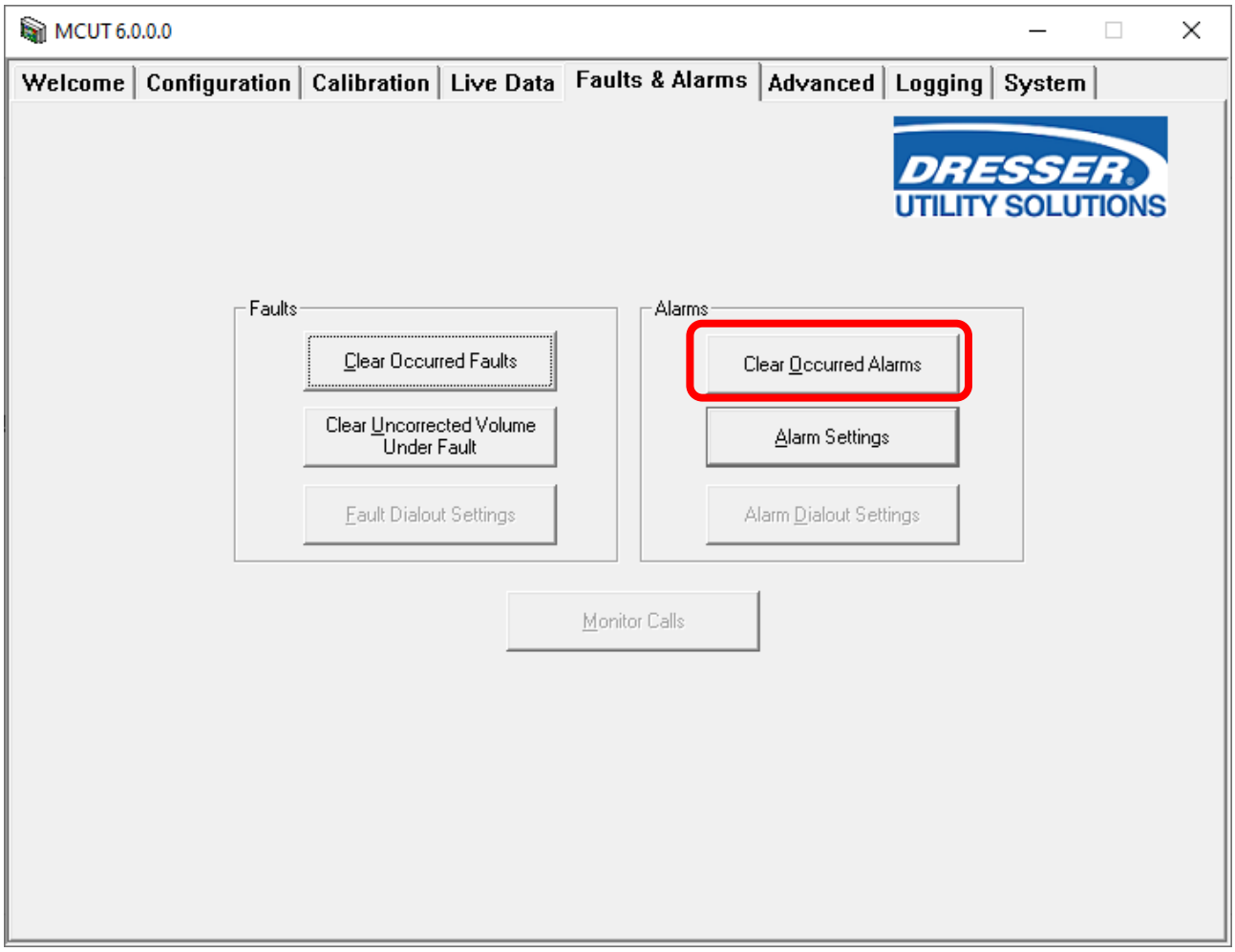
9.8 Clear Occurred Alarms

An alarm can be described as a measurement reading exceeding operator configurable limits. This is not a fault on the unit. It may be used as a means of monitoring the system remotely. When an alarm condition occurs, an appropriate alarm code is displayed on the LCD (see Alarm Code Reference Table). The appropriate icon(s) within *Present Alarms* and *Occurred Alarms* section of the *Live Data* screen are displayed with a red square with a *"1"*. When the nature of the problem is determined and resolved, the icon in the *Present Alarms* section of the *Live Data* screen will return to green with a *"0"*, and the alarm code on the LCD will no longer be displayed. The appropriate icon on the *Occurred Alarms* screen will remain red with a *"1",* until the occurred alarms register has been cleared. Following the selection of the *Update Values* options on the *Live Data* screen, and once the occurred alarms have been cleared, the icon in the *Occurred Alarms* section will return to green with a *"0".*



ALARM	DESCRIPTION/ REASON	LCD with Solid Bell Icon**	LIVE DATA for Fault Names or Voltage Levels If Battery
High Pressure Alarm	Pressure reading greater than user defined high pressure limit.	**HP AL**	High Temp alarm
Low Pressure Alarm	Pressure reading lower than user defined low pressure limit.	**LP AL**	Low Temp alarm
High Temperature Alarm	Temperature reading greater than user defined high temperature limit.	**Ht AL**	High Temp alarm

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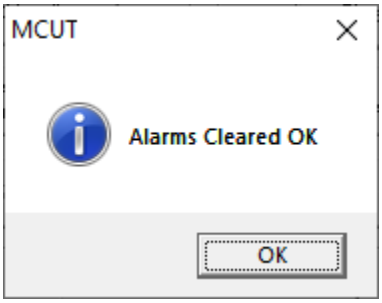
Low Temperature Alarm	Temperature reading lower than user defined low temperature limit.	**Lt AL**	Low Temp alarm
High Flow Alarm	Flow is greater than user defined high flow limit.	**HF AL**	High Flow alarm
Low Flow Alarm	Flow is lower than user defined low flow limit.	**LF AL**	Low Flow alarm
Volume/High Consumption Alarm	Volume high consumption alarm.	**Vol AL**	High Consumption alarm
Tamper Alarm	Tamper wire is cut.	**tAnnPEr**	Tamper alarm when unit is vandalized.
Digital Temp SN	New temperature sensor is connected, but not yet commissioned via MCUT.	**T Sn AL**	–
Digital Pressure SN	New line pressure sensor is connected, but not yet commissioned via MCUT.	**P Sn Al**	–
Digital DP/Monitor SN	New differential pressure sensor is just connected, but not yet commissioned via MCUT.	**DP Sn AL**	–
Digital Input and Tamper Alarm	By setting some hardware links on the board, the digital input with an external power or the device is setup for a cut wire tamper detect.	**D_In_Al/ tAnnPEr**	Digital input
Volume Alarm	By setting some hardware links on the board, the high consumption of volume for a day can be detected by this alarm	**vol AL**	Daily consumption
Differential Pressure Alarm	defined number of DP values measured in sequence have exceeded the meter DP alarm threshold	**DP AL**	Meter DP Alarm

*Digital input / Daily consumption is not used in USA.
** see IMCW2 hardware manual for actual LCD display of alarm codes

Note: The user can select which Alarms to display on the LCD. Telemetry Fault pulse outputs can be set to continuous or single-latched pulse as per the AMR connected to the IMCW2. ALL THESE ALARMS HAVE SOLID BELL ICON ON THE LCD. When the present alarm goes away, the blinking bell icon is seen on LCD.

To clear occurred alarms register:

- On the Faults & Alarms screen select the Clear Occurred Alarms option.
- The alarms will be cleared. A dialog box will be displayed stating Alarms Cleared OK, select OK.
- The cleared alarm can be confirmed by selecting the Update Values option on the Live Data screen. Providing the alarm condition has been cleared and the occurred alarms register has been cleared, all icons in the Present Alarms and Occurred Alarms sections will be green with a 0.



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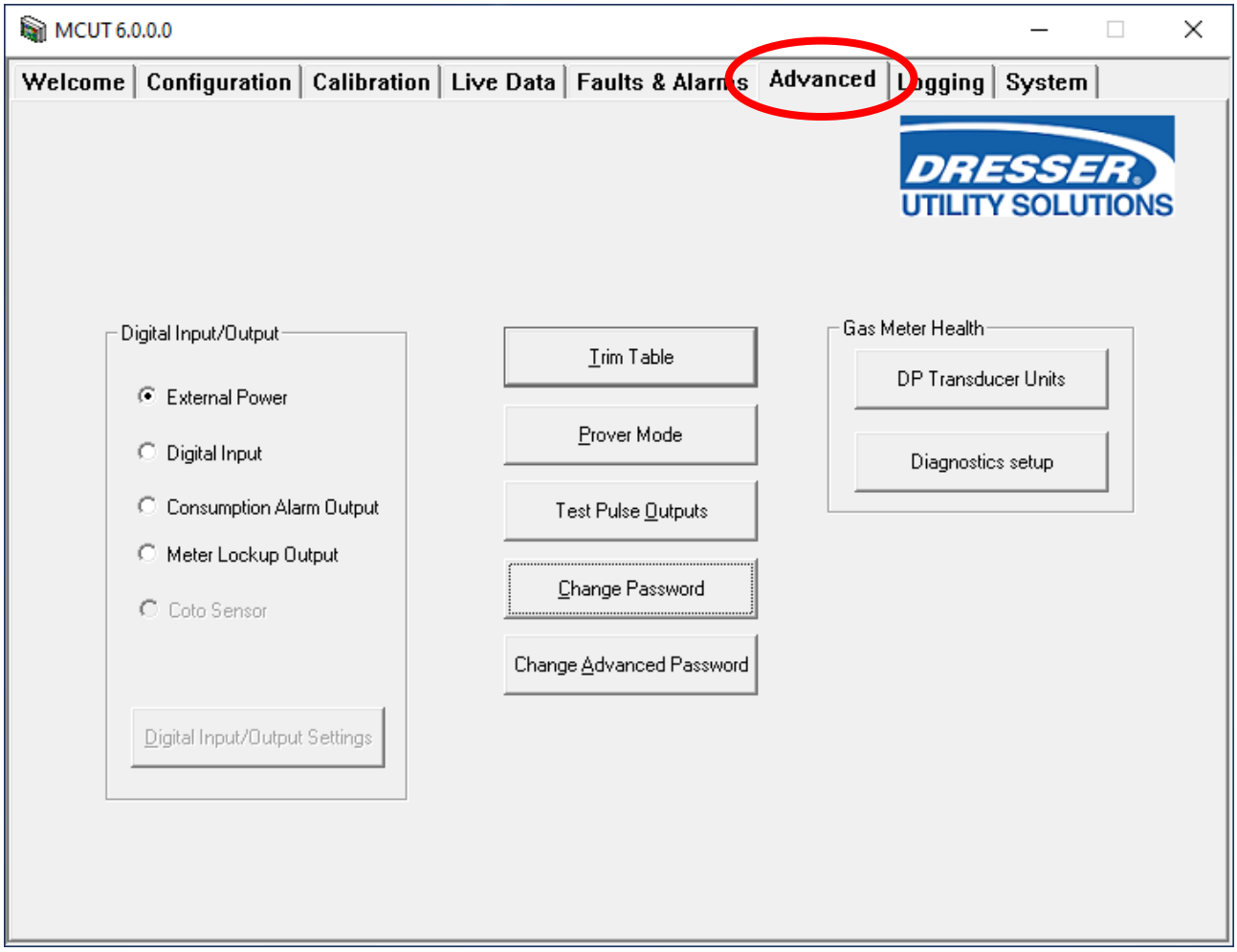
10 Advanced Tab

The *Advanced* Tab contains up to 6 options (model dependent); these are used less frequently than those shown on other screens. Note: If using the modem to connect, the *Prover Mode* option will be disabled.

It is possible to change the password and advanced password from this screen, test the pulse outputs, configure the trim table settings, test the accuracy of the meter via the *Prover Mode* option and set unit for External Power or Digital Input/Tamper or Digital Output / Volume Consumption.



Advanced Tab (DP-version shown)

To display the advanced screen:

- Note: The options available on this screen depend on the model and configuration of the IMCW2. If a required option is not available, please contact your Dresser Representative for further details.

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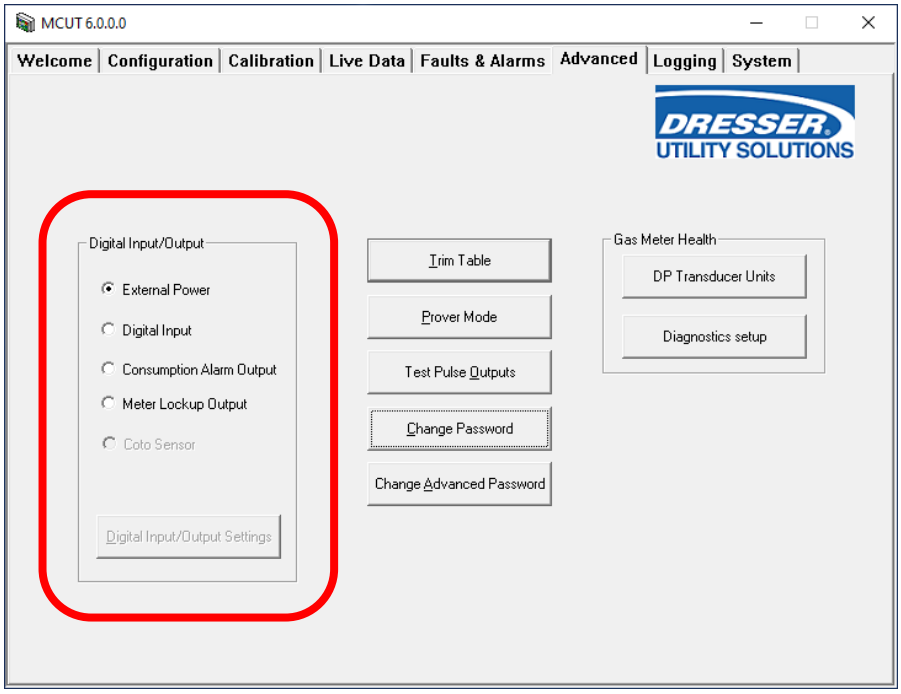
10.1 Digital Input/Output

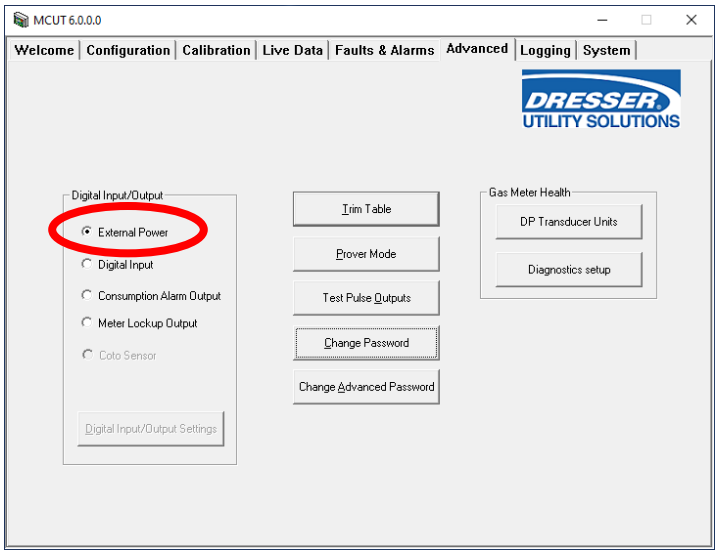
Using “Digital Input/Output” section of “Advanced” tab of User Terminal, two connectors in Terminal Block TB1 i.e. *Not marked (Multipurpose)* and *GND* could be configured as external power input/output or *Digital Input / Tamper Alarm* or *Digital Output / Volume Consumption Alarm or Meter Lockup Output*
Note: Refer to the Dresser IMCW2 Hardware Manual.



Note: For the fully digital IMCW2, the second connector is marked “Multipurpose.”

10.1.1 External Power

Two connectors in Terminal Block TB1 i.e. *Not marked (Multipurpose)* and *GND*, are configured by default for external power input. External voltage from 5V to 6V can be supplied to power the unit.
Note: Refer to the Dresser IMCW2 Hardware Manual.



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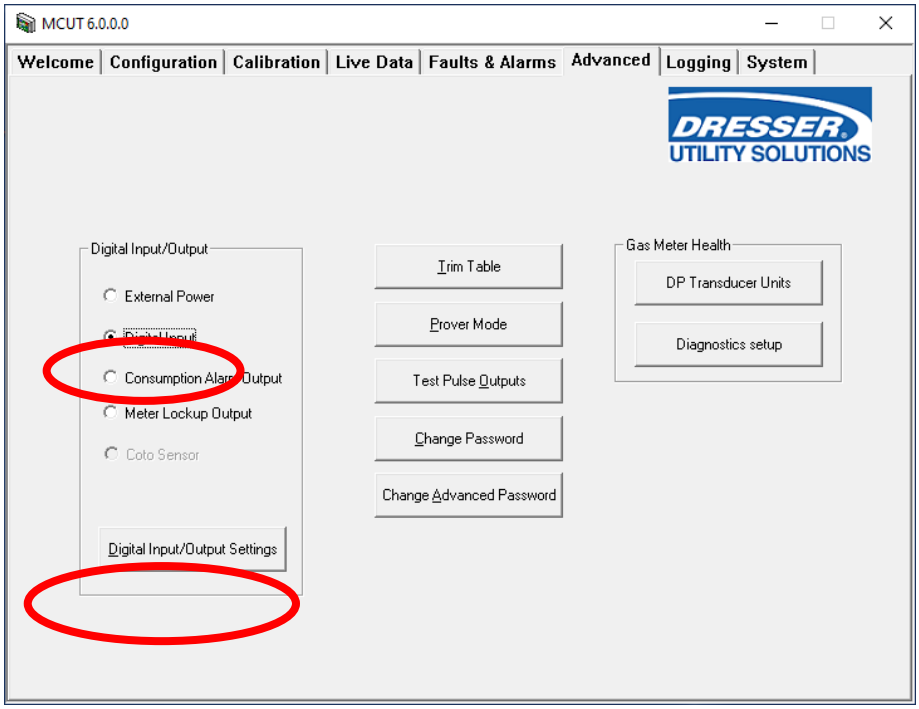
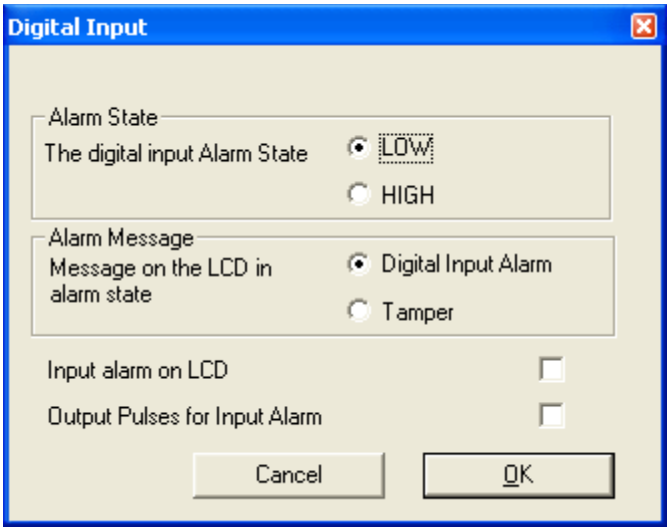
10.1.2 Digital Input



Select ***Digital Input*** on the *Advanced* tab and then click ***Digital Input/Output Settings***, this window appears:



Digital Input Screen

There are four selections:

- Voltage level for input alarm state, i.e. **LOW** or **HIGH**
- Alarm description that appears on *Live Data* screen, in *Audit Log*, *Configuration Summary* and *Report*. Depending on this selection, ***d_In_AL*** or ***tAnnPEr*** can appear on LCD.
- Select whether an alarm message will appear on LCD.
- Select whether an input alarm will generate fault pulses.

If a *Digital Input/ Tamper Alarm* occurs, it is shown on the *Live Data* screen (Present and Occurred) and is registered in the *Audit Log.*

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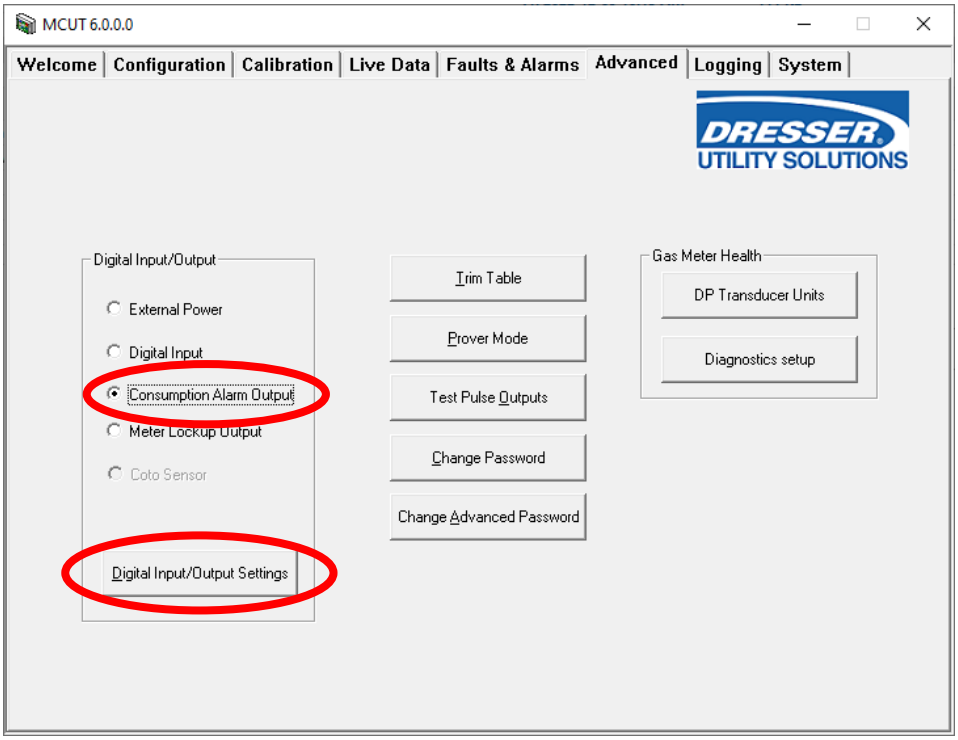
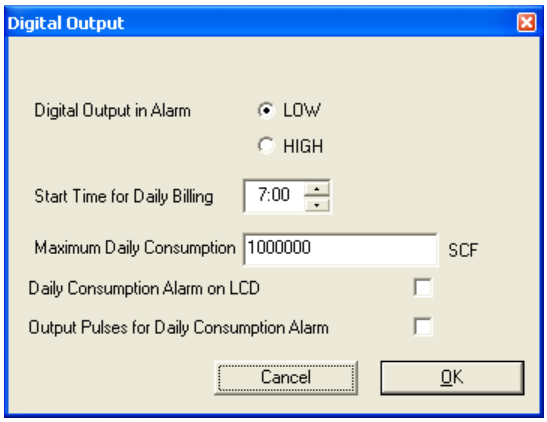
10.1.3 Consumption Alarm Output

The Consumption Alarm Output facility provides digital signal (i.e., HIGH or LOW signal level) on the digital output terminal. If Maximum Daily Consumption of gas is reached, then an Alarm State is set for the digital output. The operator can set a value of Maximum Daily Consumption, the Start Time for Daily Billing, and the signal level in Alarm State. The operator can also enable or disable the Consumption Alarm Output facility.



Select ***Consumption Alarm Output*** on the *Advanced* tab and then click ***Digital Input/Output Settings***, this window appears:



Consumption Alarm Output Screen

If *Maximum Daily Consumption* is reached, then:

- *Alarm State* is set on digital output terminal.
- Daily Consumption Alarm is set in *Live Data* screen,
- ***vol_AL*** is indicated on LCD if selected,

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- Fault Pulse is generated on Output Pulse if selected.

Daily Consumption Register is always reset for Start Time for Daily Billing.

Depending on the user selection in the Customize LCD screen, the following parameters can be displayed with an abbreviated description on the LCD:

- Accumulated Corrected Volume current day (Cd)
- Accumulated Corrected Volume previous day (Pd)
- Accumulated Corrected Volume current month (Co)
- Accumulated Corrected Volume previous month (Po)
- Highest daily volume in the current month (Ch)
- Highest daily volume in the previous month (Ph)
- Date when it happened: mm-dd-yy (blinking dot)

“Date when it happened” is the last date when Daily Maximum Consumption was reached.

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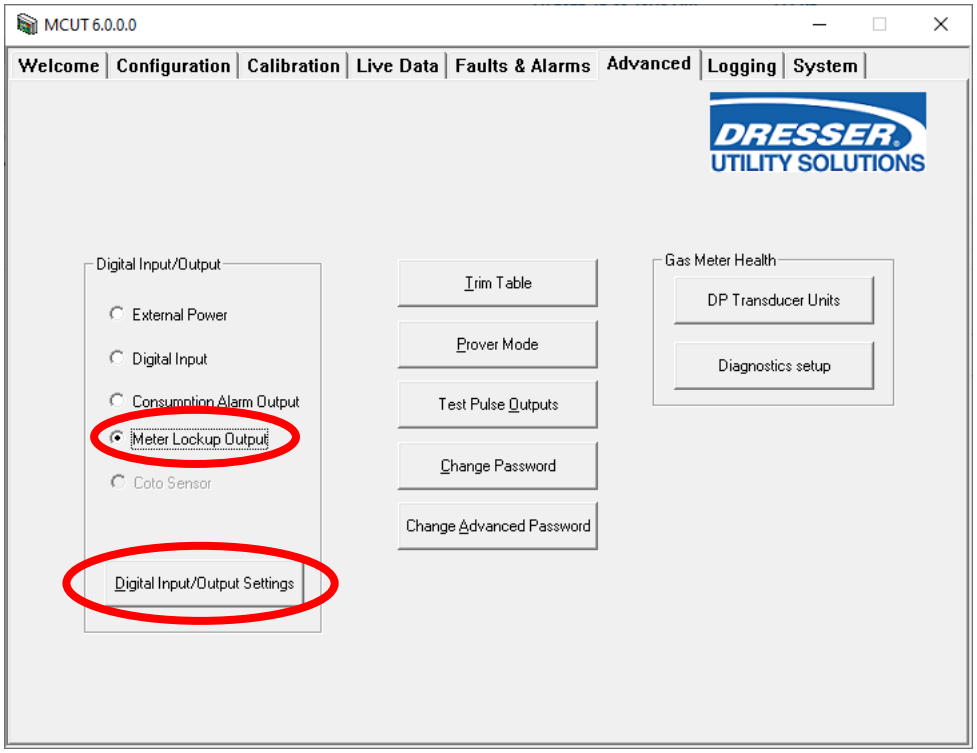
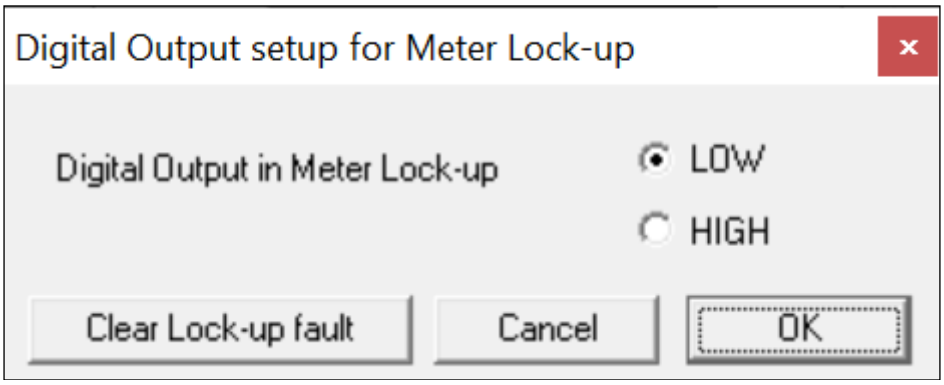
10.1.4 Meter Lockup Output

One of the most severe problems in rotary gas meter functionality is meter lockup. Lockup means that the gas meter impellers will stop rotating or rotate with high resistance. This condition usually happens if debris in the natural gas stream enters the meter and blocks impellers' motion. Consequently, natural gas delivery to the consumer is reduced or even stopped. In critical applications for uninterruptible customers, this situation can have grave consequences. Gas meter health monitoring detects this situation, and a meter lockup fault is set. The binary Meter Lockup Output signal can be used to control a bypass valve and facilitate natural gas delivery. The user can decide on the signal level in case of lockup.



Select ***Meter Lockup Output*** on the *Advanced* tab and then click ***Digital Input/Output Settings***, this window appears:



Meter Lockup Output functionality

After the gas meter lockup is cleared, the digital output signal is reset to normal state. This resetting is performed on the screen above.

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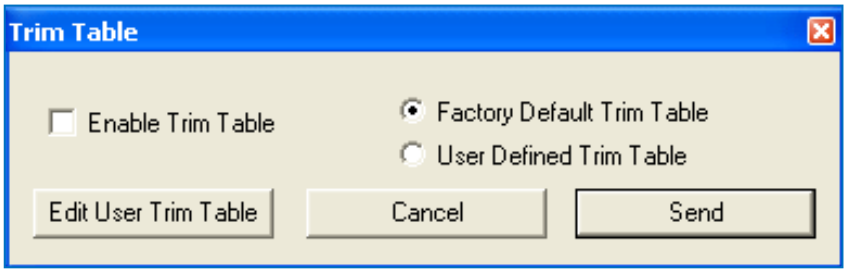
10.2 Trim Table

The *Trim Table* option provides the facility to improve the meter accuracy characteristics for low flow rates. Trim table settings are provided in accordance with manufacturer guidelines for specific meters. Additionally, the operator can configure a User Defined Trim Table. The advanced password is required if the *Trim Table* settings are to be configured.

Note: As per Measurement Canada requirements the Trim Table option is **disabled** for Canadian Micro Correctors.



Trim Table Screen

To enable the trim table facility:

- From the *Advanced* screen select the *Trim Table* option. The *Trim Table* screen will be displayed.
- Select the *Enable Trim Table* parameter; ensure that a check is displayed in the *Enable Trim Table* parameter check box.
- Select the *Send* option. Enter the advanced password and select *OK,* otherwise select *Cancel*.
- The new details will be uploaded to the IMCW2. On completion a dialog box will be displayed stating that *Trim Table Enabled and Sent*, select *OK.* The *Advanced* screen will be displayed.

To enable a user defined trim table to enable the accuracy characteristics of the meter correction as specific by the operator:

- From the *Advanced* screen select the *Trim Table* option. The *Trim Table* screen will be displayed.
- Ensure that the *Enable Trim Table* parameter is checked.
- Select the *User Defined Trim Table* option.
- Select the *Send* option. Enter the advanced password and select *OK,* otherwise select *Cancel*.
- The new details will be uploaded to the IMCW2. A dialog box will be displayed stating that *Trim Table Enabled and Sent*, select *OK.* The *Advanced* screen will be displayed.

To edit user trim table to configure the accuracy characteristics of the meter correction:

- From the *Advanced* screen select the *Trim Table* option. The *Trim Table* screen will be displayed.
- Ensure that the *Enable Trim Table* parameter is checked.

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- Ensure that the *User Defined Trim Table* option is selected.
- Select the *Edit User Trim Table* option. Enter the advanced password and select *OK*, otherwise select *Cancel*. The *Trim Table Setup* screen will be displayed.
- In the *Trim Table Setup* screen, the meter type and size are displayed. If this is different from the meter selected in the *Volume Configuration* screen (accessed via the *Configuration* screen), this should be changed.
- Note: Qmax is determined by the meter type and size selected.

  Select the *No. Entries* text box and enter the desired number of entries for the trim table. The new value will be implied as the value entered will be reflected in the number of *% of Qmax* and *Correction Factors* text boxes enabled on the *Trim Table Setup* screen. The acceptable number of entries allowed is between 1 and 16 inclusive.
- Select *% of Qmax* text box *1*, enter the desired value. The acceptable range is between 1 and 10. Subsequent entries (up to 16 allowable) must be less than the previous value, but more than the subsequent value. See the following *Trim Table Setup Screen*.
- Select the *Correction Factor* text box *1* and enter the desired value. The acceptable range is between 0.5 and 1.5 for all *Correction Factor* text boxes. The default *Correction Factor* value is equal to 1 (i.e., no correction is performed). Enter all desired values in all *Correction Factor* text boxes.
- Select the *Save As User Defined* option. Once saved, a dialog box will be displayed stating *Trim Table Saved*, select *OK*. The trim table settings need to be sent to the IMCW2 via the *Trim Table* screen.
- Note: It is possible to save *Trim Table Settings* for each meter type and size, providing the settings are saved when entered. It is then possible the recall these settings.
- From the *Trim Table* screen, ensure that the *User Defined Trim* Table option is selected and select the *Send* option. Enter the advanced password and select *OK,* otherwise select *Cancel*.
- The new details will be uploaded to the IMCW2. A dialog box will be displayed stating that *Trim Table Enabled and Sent*, select *OK.* The *Advanced* screen will be displayed.

Note: Once the *User Defined Trim Table* has been sent to the IMCW2 and the *Trim Table Enabled and Sent* dialog box has been displayed and accepted, the *Trim Table* screen will display the *Factory Default Trim Table* option as selected. It should be noted that the *User Defined Trim Table* has been sent to the IMCW2, even though the *Trim Table* screen may suggest otherwise.

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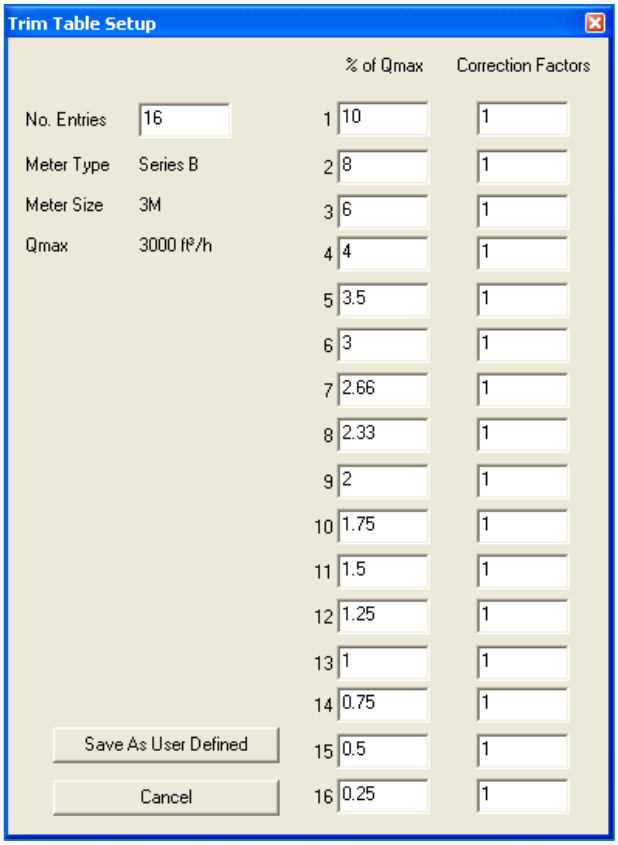

Trim Table Setup Screen

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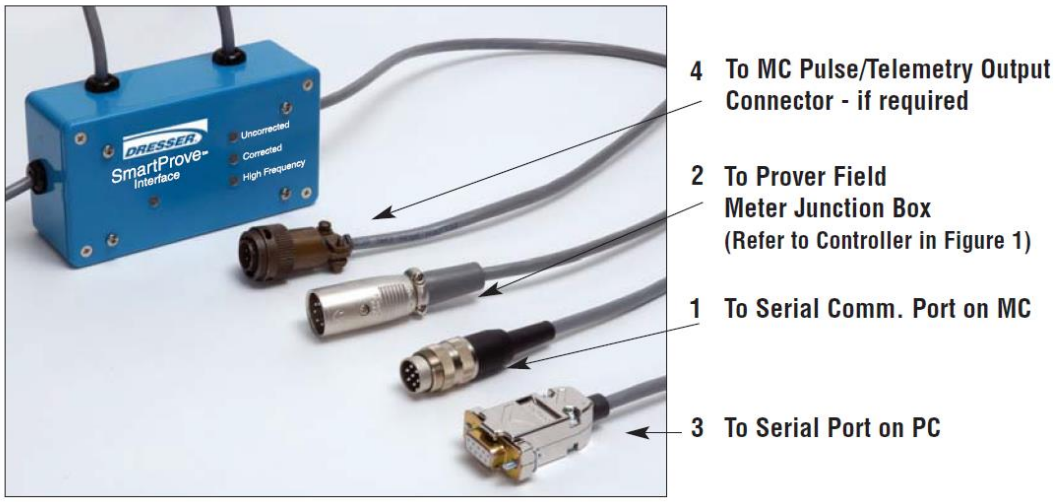
10.3 Prover Mode

The *Prover Mode* facility provides the operator a means of testing the accuracy of the output signals and verifying the volume accumulation. The real time generation of output pulses (of highest priority for the microprocessor) are at least 10 times shorter than the pulses used in *normal operation*, hence a reduced test time.

It is possible to enter Prover Mode in two ways by using:

- MCUT (process described below), or.
- Smart Prove hardware
- Smart Prove interface kit Dresser part number:
  - P/N 058860-100 (Dresser Model 5 Transfer Prover)
  - P/N 062342-000 (Dresser Model 6 Transfer Prover)



Smart Prove Interface Kit for Model 5 Transfer Prover

Testing the accuracy of the output signals and verifying the volume accumulation by using Smart Prove is described in two Dresser Documents: IOM Smart Prove Manual (for the Dresser Model 5 Prover) and in the Dresser Model 6 Prover Operation and Maintenance Manual for the Dresser Model 6 Prover.

As soon as Prover Mode is entered via the MCUT, the pressure and temperature readings are taken, and these values are used for the duration of this test. The settings in the IMCW2 (corrected and uncorrected volumes and residuals etc.) are saved; when *normal operation* is resumed these values are retrieved. In addition, the settings of the corrected and uncorrected pulse outputs and corrected and uncorrected volume display multipliers can be changed to suit the needs of the *Prover Mode* without changing the configuration used during *normal operation.*

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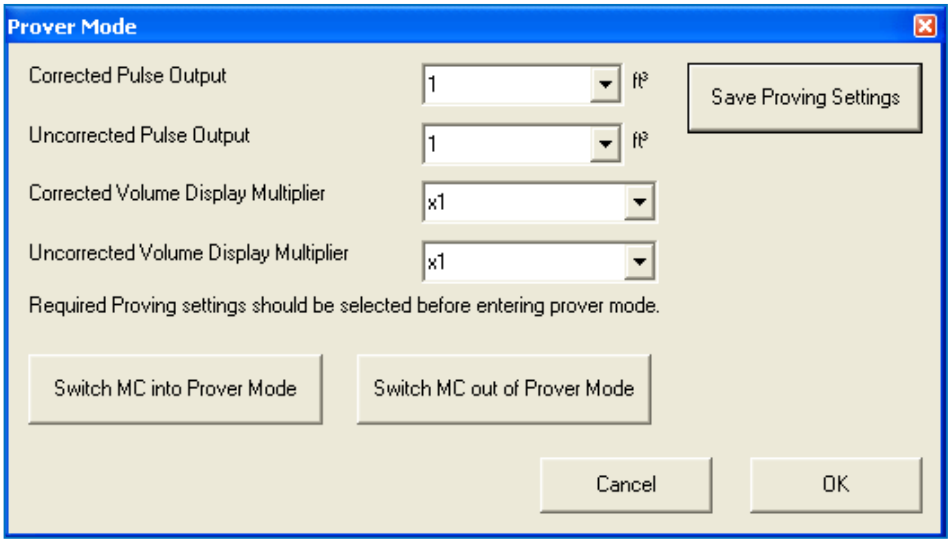

Prover Mode Screen

To set the IMCW2 into Prover mode:

- From the *Advanced* screen select the *Prover Mode* option. The *Prover Mode* screen will be displayed.

Note: The duration that the IMCW2 is set into *Prover Mode* is 60 minutes and this value is not editable. However, it is possible to switch the IMCW2 out of *Prover Mode* at any time.

- Select the *Corrected Pulse Output* drop down selection box. Select the desired value.
- Select the *Uncorrected Pulse Output* drop down selection box. Select the desired value.
- Select the *Corrected Volume Display Multiplier* drop down selection box. Select the desired value.
- Select the *Uncorrected Volume Display Multiplier* drop down selection box. Select the desired value.
- The new parameters will need to be uploaded to the IMCW2. Select the *Save Proving Settings* option.
- On completion a dialog will be displayed stating that *New Proving settings sent successfully*, select *OK*. The *Prover Mode* screen will be displayed.
- From within the *Prover Mode* screen select the *Switch MC into Prover Mode* option. A dialog will be displayed informing the operator of the duration of the (1 hour). To continue select *OK*, otherwise select *Cancel*.
- Once *Prover Mode* has been entered a dialog will be displayed stating *Prover Mode Entered OK*. Select *OK*.
- The LCD on the IMCW2 will display ***ProvE*** followed by the remaining duration (in minutes) of *Prover Mode:*

Indication on display after IMCW2 entered Proving Mode by using MCUT

- Once the test is complete, the IMCW2 will switch out of *Prover Mode* and *normal operation* will resume.

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To switch the IMCW2 out of Prover mode:

- From the *Advanced* screen select the *Prover Mode* option. The *Prover Mode* screen will be displayed.
- Select the *Switch MC out of Prover Mode* option. A dialog will be displayed stating *Prover mode successfully cancelled*, select *OK*. The Prover Mode screen will be displayed.
- Normal operation will resume, ProvE will no longer be displayed on the LCD on the IMCW2.
- From the *Prover* Mode screen, select *OK* and the *Advanced* screen will be displayed.

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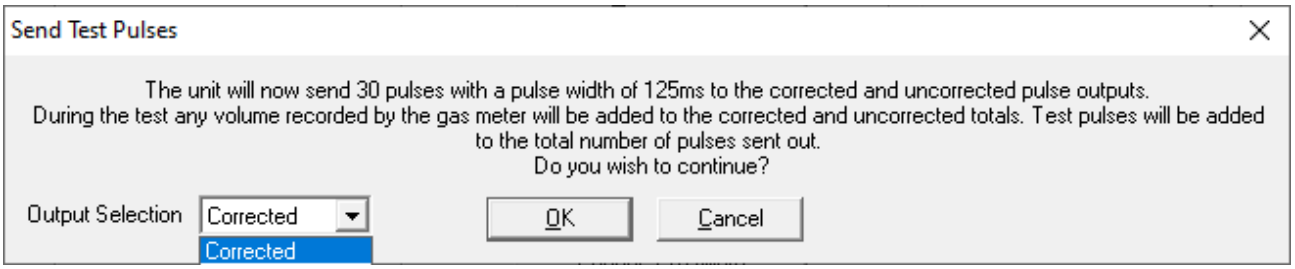
10.4 Test Pulse Outputs

The MCUT provides a *Test Pulse Outputs* function. This allows a verification of the corrected and uncorrected pulse output connections that are used for either telemetry and/or proving purposes. A total of 30 pulses are generated at the pulse width specified on the *Volume Configuration* screen (accessed via the *Configuration* screen). The activation of the test pulse outputs facility will not cause any disruption to the metered gas; volumes recorded by the meter will be added to the corrected and uncorrected totals. Additionally, the test pulses produced will be added to the total number of pulses generated. The operator is informed of the test pulse output conditions on selection of the *Test Pulse Outputs* option.



Send Test Pulses Screen

Note: Firmware versions 1.93 and higher versions allow the user to choose between corrected and uncorrected test pulse outputs.

To activate the test pulse output facility:

- From the *Advanced* screen select the *Test Pulse Outputs* option. The *Send Test Pulses* screen will be displayed.
- The operator will be asked to confirm if it is OK to continue. If appropriate select *OK,* otherwise select *Cancel*.
- Enter the advanced password and select *OK,* otherwise select *Cancel*. A dialog will be displayed stating *Test pulse mode entered successfully*. Select *OK.*
- The LCD on the IMCW2 will display PULSES. The *Advanced* screen will be displayed.
- The output pulses will be generated. On completion of the test pulse outputs facility *normal operation* will resume.

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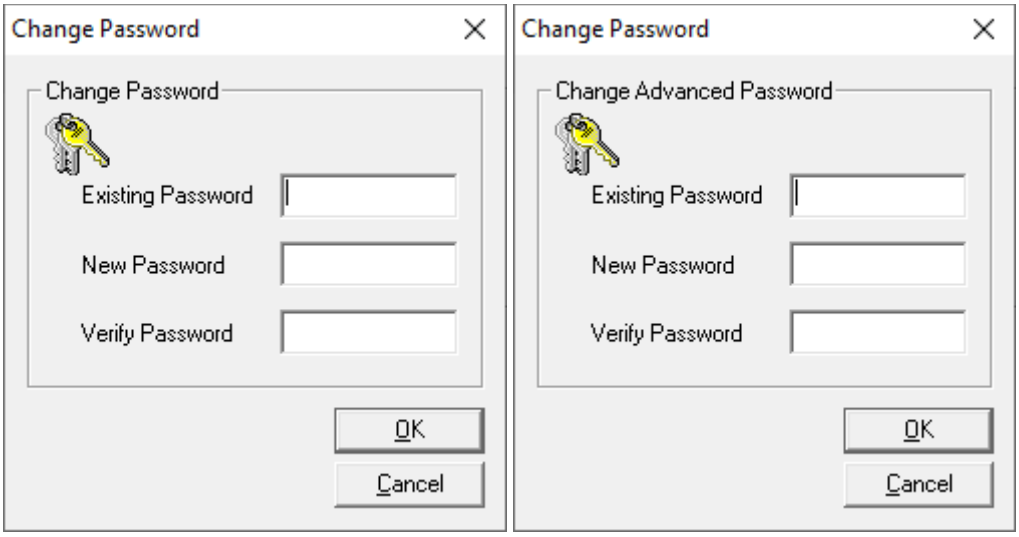
10.5 Change Basic or Advanced Password

All password protected parameters are those that, when changed, will affect the customer's bill. The default password is the number "*0*". Any new password must be numerical and between 1 and 8 digits long.

To change the password:

- From the *Advanced* screen select the *Change Password* option, the *Change Password* screen will be displayed.
- Select the *Existing Password* text box and enter the existing password. The factory default password is the number "*0*".
- Select the *New Password* text box and enter the desired new password (must be numerical and between 1 and 8 digits long).
- Select the *Verify Password* text box and verify the new password.
- Select the *OK* option. A dialog box will be displayed stating *Password changed successfully*. Select *OK*. The *Advanced* screen will be displayed.



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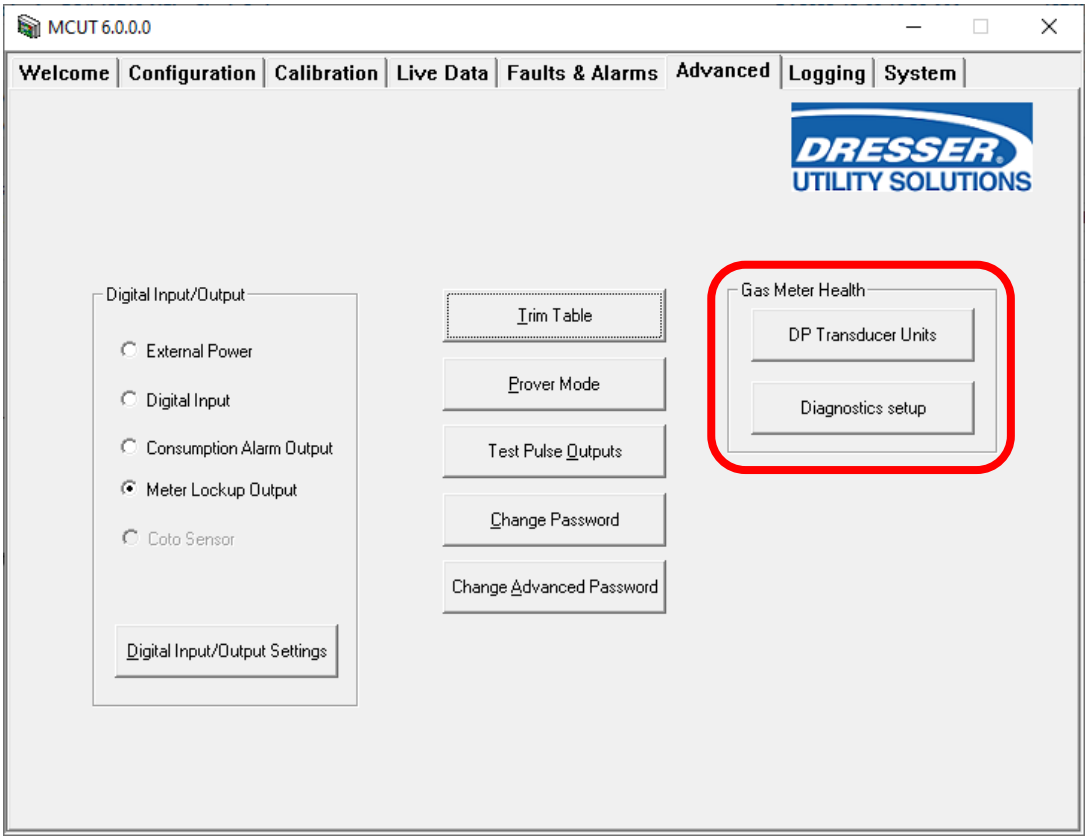
10.6 Gas Meter Health Diagnostics

'DP Measurement' units and settings are only active for IMCW2-dp version correctors. These settings will only affect differential pressure testing and results, and meter health diagnostics.



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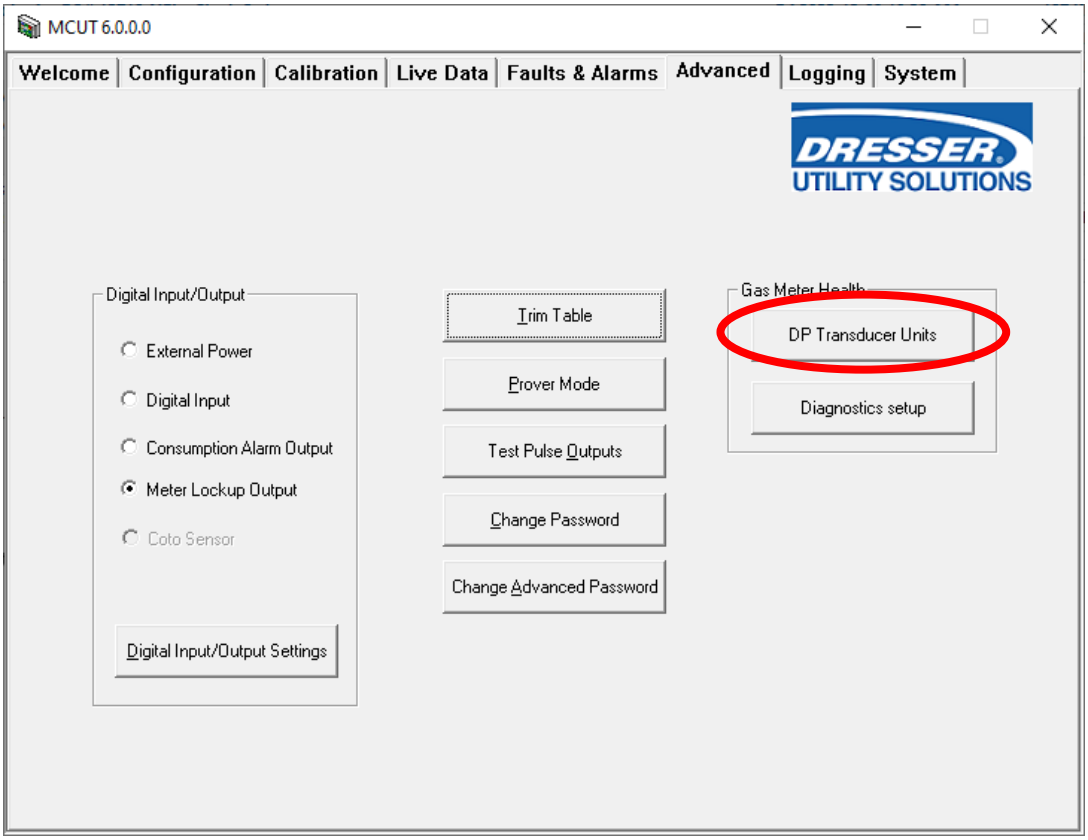
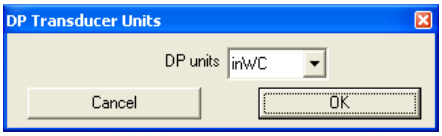
10.6.1 DP Transducer Units

Select ‘DP Transducer Units’ and the following screen appears. Use the drop-down menu to select between imperial (in WC) and metric (mbar) units. When finished press ‘OK’.

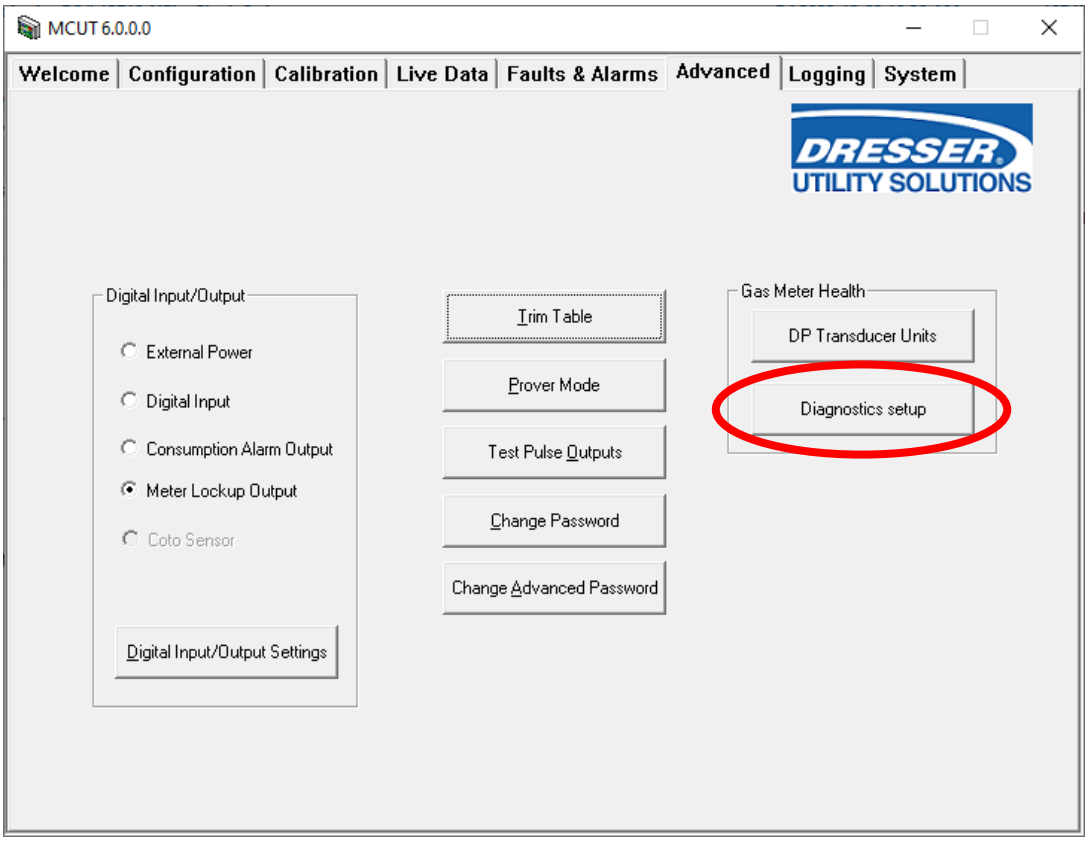




DP Transducer Units Screen

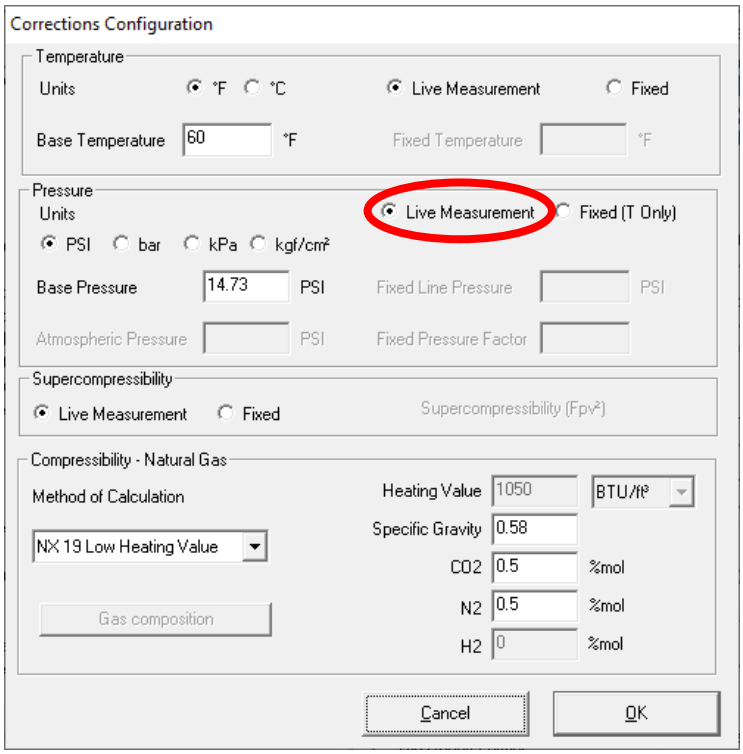
10.6.2 Gas meter Health diagnostic setup

Select ***Diagnostics setup*** and the following screen appears:

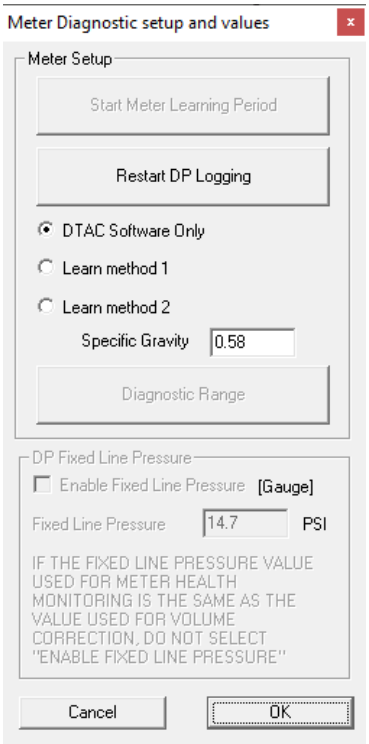


10.6.3 IMCW2 with Line-Pressure transducer

If the configuration screen has ***Live Measurement*** selected for pressure:



Then the following ***Meter Diagnostic setup and values*** screen will appear:



- Select among the three models for gas meter health diagnostics: *Dresser's Differential Test Acceptance Calculator (DTAC) software, Learn method 1, or Learn method 2.* Both learn methods achieve more accurate DP data by

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gathering reference values for a specific meter installation. These learned parameters are then used in the mathematical model.

- *DTAC Software Only* - This mathematical model will qualify the results of DP testing based on the following parameters: line pressure (measured), flow rate (measured), specific gravity (configured) and meter size/type (configured). Selection of "DTAC Software Only" immediately starts full meter diagnostics, including DP meter alarm.
- *Learn method 1* - This learning method is available for selection if the meter size and type is included in the DTAC software. During the learning period, the DTAC software is used to analyze Meter DP fault and Meter Lockup fault. If the learning period is successfully completed, then all meter diagnostics are performed based on learned mathematical model parameters. If the learning period is unsuccessful, then the DTAC software is used for full meter diagnostics (including meter DP alarm).
- *Learn method 2* - This learning method is available for selection if the meter data is not included in DTAC software, or there is a reason not to use DTAC. If the learning period is successfully completed, then all meter diagnostics are performed based on learned mathematical model parameters. If the learning period is unsuccessful, then DP diagnostics are not available.
- Once a learning method is chosen, press 'Start Meter Learning Period' to initialize the analysis model.
- Learning can be re-started at any time; however, if the previous learning period was successfully completed, the MCUT will show a warning and ask for confirmation to continue.

All mathematical models for gas meter health diagnostics used in IMCW2 characterized gas composition by its specific gravity value. Meter Diagnostic Setup/Value screen, allows entering this value. Default value is 0.6.

All mathematical models for gas meter health diagnostics used in IMCW2 requires value of line pressure of gas flowing through gas meter. If IMCW2 is equipped with line pressure transducer, then the measured value of pressure is used for diagnostics. If IMCW2 is not equipped with line pressure transducer then the user must manually enter the pressure correction factor, based on the output pressure of pressure regulator installed in the system. The value of pressure correction does not influence billing and is used only for gas meter health diagnostics, refer to Appendix A - The IMCW2 LCD Displayed Messages for details.

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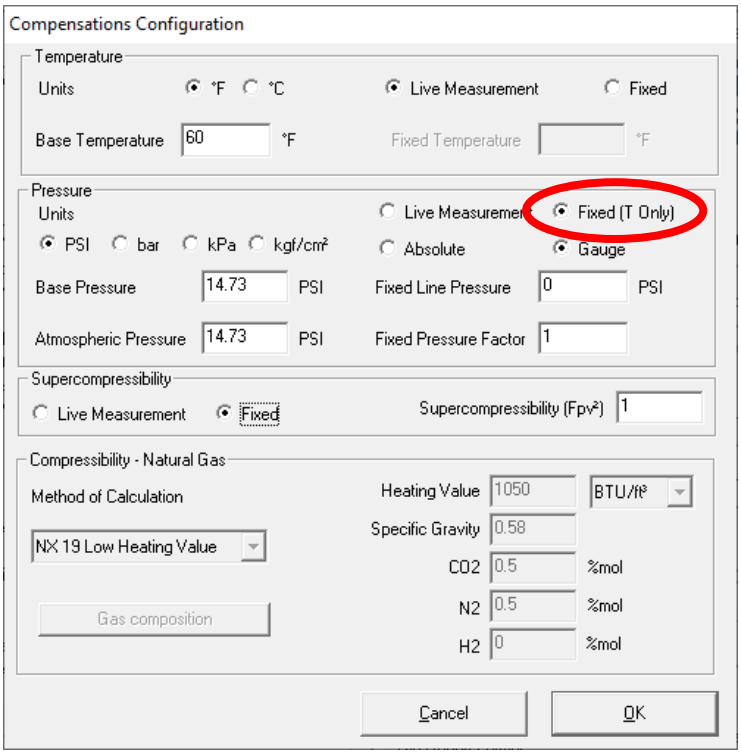
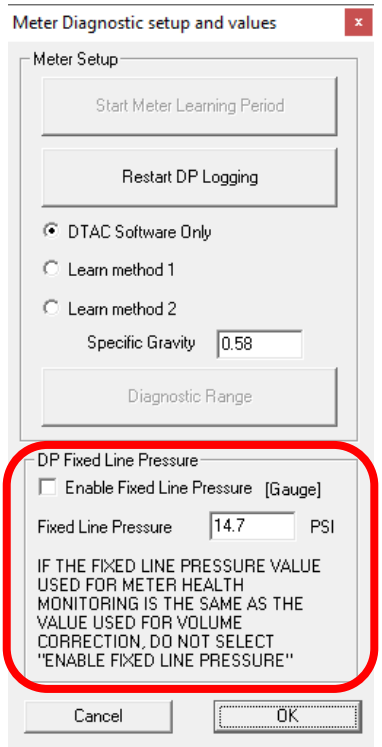
10.6.4 IMCW2 with Temperature-only (no Line-Pressure transducer)

If the configuration screen has ***Fixed (t Only)*** selected for pressure:



Then the following ***Meter Diagnostic setup and values*** screen will appear:



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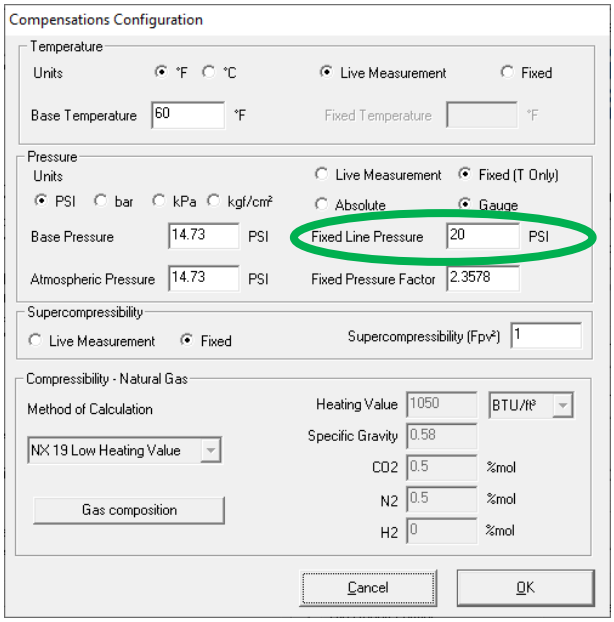
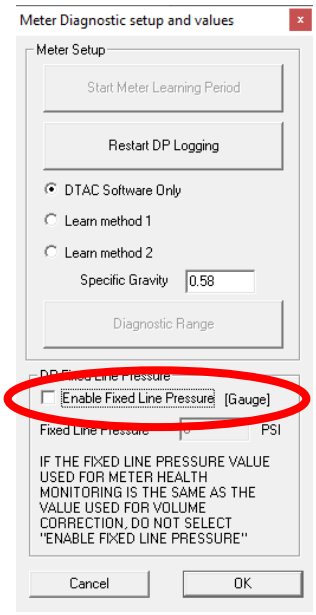
There are two scenarios that utilities use for pressure correction with Temperature-only units (without Line-pressure transducers)

First scenario:

The fixed Line-pressure value (at the pressure regulator) is entered by the operator into the correction screen. Then in this scenario the pressure correction is performed by the IMCW2. This value (example 20 psi below) is used for the Meter-Health diagnostics.

Do not select the Enable Fixed Line Pressure box in this scenario.

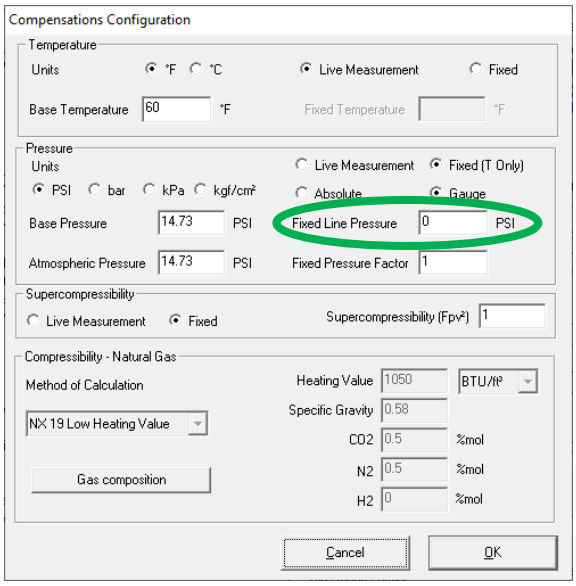


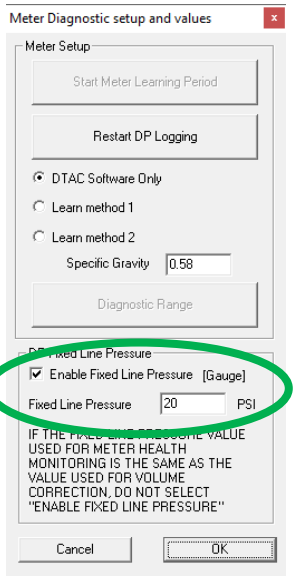


Second scenario:

The gas utility performs pressure correction at the billing center. Then the ***Fixed Pressure Factor*** correction on the screen is set to the value of "1".

In the Meter Diagnostic Setup and Values screen you must select the Enable Fixed Line Pressure box and enter a value (example below: meter is exposed to 20 psi) into the Fixed Line Pressure field:





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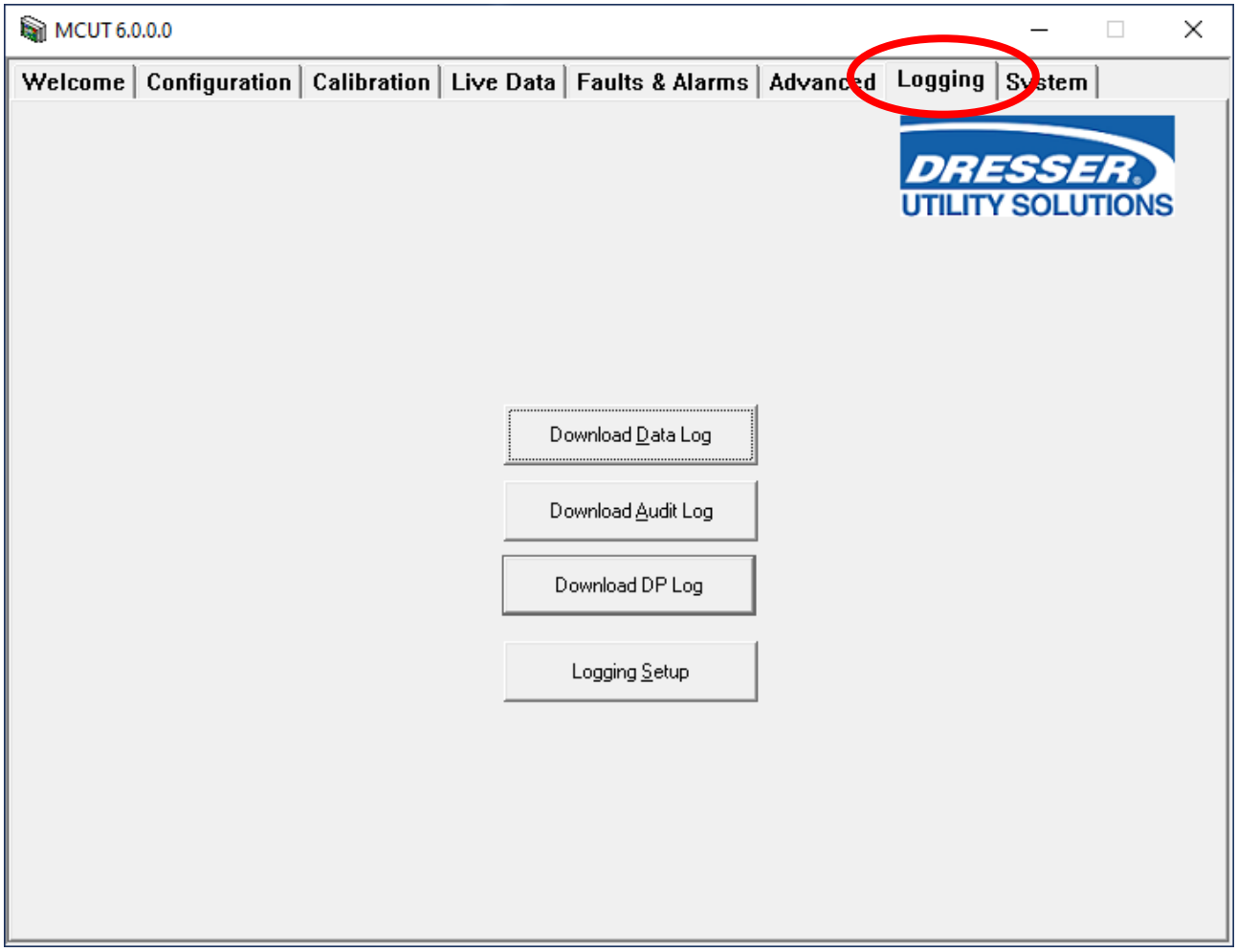
11 Logging Tab

The MCUT provides audit and data logging facilities. The audit log provides a record of 32 (maximum) changes to parameters that will affect the billing. The data log provides approximately 6000 data log records for 1.89 or newer firmware versions if logging of 10 parameters is selected. The exact number is shown on Logging Setup screen.

Both the audit and data logs are saved as CSV files (comma-delimited). This enables easy import into spreadsheets such as MS Excel®. Once imported into the spreadsheet, the data can be manipulated as required.

The *Logging* screen contains 3 options which enable the operator to configure the logging setup of the data log, download the data log and download the audit log.



Logging Screen

To display the logging screen:

- From the MCUT select the *Logging* tab. The *Logging* screen will be displayed.
- **Note:** The options available on this screen depend on the model and configuration of the IMCW2. If a required option is not available, please contact your Dresser Representative for further details.

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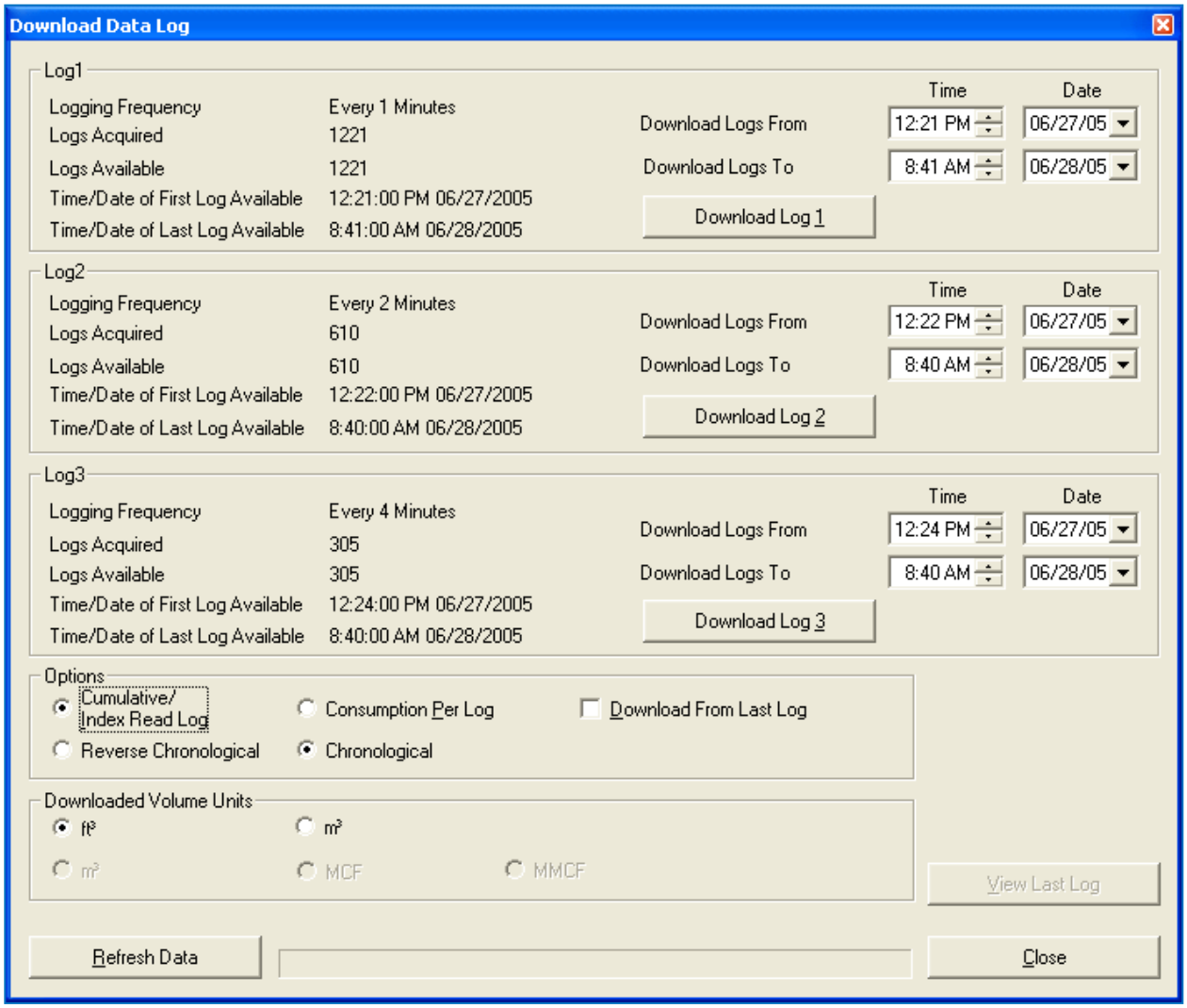
11.1 Download Data Log

When downloading the data log it is possible to select the specific data that is to be retrieved; which log to be downloaded, the range of data for that log, and the manner in which the logged data should be displayed within the log file. The *Download Data Log* dialog is divided into 5 sections; *Log1*, *Log2*, *Log3*, *Options* and *Download Volume Units* section.



Download Data Log Screen

11.1.1 Download Data Log1, Log2 and Log3

The method for downloading the data logs is the same for *Log1*, *Log2* and *Log3*; therefore, the methods described below apply to all 3 logging frequencies (Note: to download *Log1* the download options must be changed within the *Log1* section, *Log2*, the *Log2* section and *Log3*, the *Log* 3 section). A *Refresh Data* option is provided to ensure that the latest time and date of logged entries available for download are displayed to the operator. Once a data log has been downloaded the *View Last Log* option will become available.

To download all available data log entries:

- From within the *Logging* screen select the *Download Data Log* option. The *Download Data Log* screen will be displayed.
- The time and date of the first available log are displayed in the relevant section, along with the time and date of the last available log. By default, all available data logs will be downloaded.
- Select the *Refresh Data* option to ensure that the very latest available log time and date are displayed. If appropriate the read only details associated with each log period will be updated.
- From the appropriate section (*Log1*, *Log2* or *Log3*) select the *Download Log* option. The *Save As* screen will be displayed.
- Select the location where the data log file is to be saved.
- Enter the desired file name that the data log file is to be saved to. A default file name will display which may also be used. Select the *Save* option.
- Once complete a dialog box will be displayed stating *Log File Saved OK*. Select *OK.*

To view a downloaded data log:

- Once downloaded from the MCUT select the *View Last Log* option. The default spreadsheet program used to open CSV files will be launched, and the data log file will open. The data can then be manipulated as required.
- To return to the *Logging* screen select the *Close* option.

Alternatively:

- Open the appropriate data log file (all data log files saved from within the MCUT are of the type *.CSV*) from within the spreadsheet in the usual manner.

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11.1.2 Options

Various options are available within the *Download Data Log* dialog in the *Options* section. An explanation of the functionality they offer is provided below. If any of these options are required, they should be selected prior to selection of the appropriate *Download Log* option.

Cumulative / Index Read Log:

- Selection of this option will display the volumes within the data log as per the volumes displayed on the LCD of the IMCW2.

Consumption Per Log:

- Selection of this option will display the volumes logged within each logging period (i.e., the difference between the new and last volume reading)

Download From Last Log:

- Selection of this option will include only the data log entries that have been logged since the last data log was retrieved.

Chronological and Reverse Chronological:

- Selection of the *Chronological* option will ensure that the data log entries within the data log file are displayed with the oldest entry first. If the *Reverse Chronological* option is selected the data log entries within the data log file will be displayed with the oldest entry last.

11.1.3 Downloaded Volume Units

There is a possibility to present logged corrected and uncorrected volume in different units.

If the IMCW2 is configured as Imperial, then volume is logged in ft3 (CF) and can also be presented in m3.

If the IMCW2 is configured as metric, then volume is logged in m3 and can also be presented in either MCF (ft3/1000) or in MMCF (ft3/1000000).

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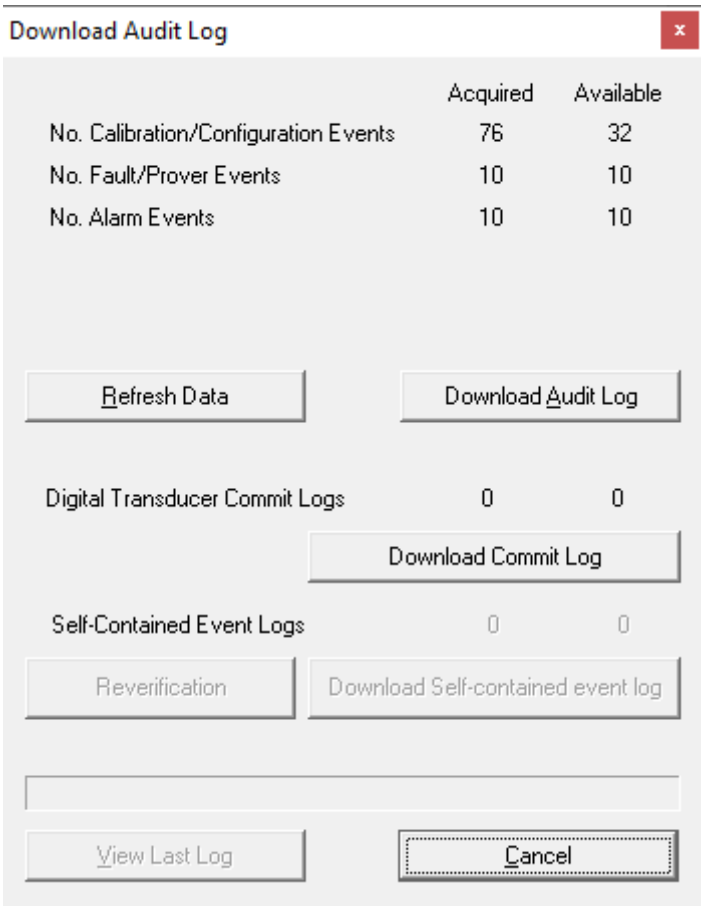
11.2 Download Audit Log

An audit log facility is provided to ensure that all changes to parameters that may affect the customer's billing are recorded. All audit log files saved in the MCUT are of the type *.CSV*. A *Refresh Data* option is provided to ensure that the latest log entry details available for download are included. Once an audit log has been downloaded the *View Last Log* option will become available.



Download Audit Log Screen

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Audit Log Parameter	
Volume Configuration	Meter Type
	Meter Size
	Flow Sense
	Corrected Multiplier
	Uncorrected Multiplier
	Corrected Pulse Output
	Uncorrected Pulse Output
	Pulse Output Allocation
	Pulse Width
	Corrected Volume
	Uncorrected Volume
	Uncorrected Volume under Fault
Corrections Configuration	Temperature Units
	Base Temperature
	Temperature Mode (Fixed or Live)
	Fixed Temperature
	Pressure Units
	Base Pressure
	Atmospheric Pressure
	Fixed Pressure Factor
	Fixed Line Pressure
	Pressure Mode (Fixed or Live)
	Supercompressibility
	Fixed Pressure Type (Gauge or Absolute)
Calibration	Temperature Calibration Offset
	Temperature Calibration Span
	Pressure Calibration Offset
	Pressure Calibration Span
Alarm Settings	High Pressure Alarm Limit
	Low Pressure Alarm Limit
	High Temperature Alarm Limit
	Low Temperature Alarm Limit
	High Flow Rate Alarm Limit
	Digital Input/Tamper

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Advanced Options	Trim Table Settings
	Prover Mode
	Test Pulses Output
	Password Change
	Advanced Password Change

Note: In addition to these configurable parameters, the audit log will also display faults and alarms that have either occurred or have occurred and been cleared, since the last logging download. The audit log also shows entries for proving activity.

To download the audit log:

- From the *Logging* screen select the *Download Audit Log* option. The *Download Audit Log* screen will be displayed.
- The number of available log entries will be displayed on the screen under the *Available* heading. For operator informational purposes, the available logs are categorized under the following headings: audit log entries, fault/Prover log entries and alarm entries.
- Select the *Refresh Data* option to ensure that the very latest available log entry details are included. If appropriate the read only details associated with each audit log category will be updated.
- Select the *Download Audit Log* option. The *Save As* dialog will be displayed.
- Select the location where the audit log file is to be saved.
- Enter the desired file name that the audit log file is to be saved to. A default file name will be displayed which may also be used. Select the *Save* option.
- Once complete a dialog box will be displayed stating *Log File Saved OK*. Select *OK.*

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To view a downloaded audit log:

- Once downloaded from the MCUT select the *View Last Log* option. The default spreadsheet program used to open CSV files will be launched and the audit log file will open. The data can then be manipulated as required.
- To return to the *Logging* screen select the *Cancel* option.

	A	B	C	D	E	F	G
1	Audit Log						
2	Unit Serial Number	21/47/483647					
3	Meter/Site ID	Digital PCB22					
4	Meter Type	Series B					
5	Meter Size	3M					
6	Number of Logs Stored	52					
7	Log Number	Date	Time	Parameter changed	Old value	New value	
8	1	03/31/2022	10:10:50 AM	Fault Register	Unknown	0 (Fault Register Cleared)	
9	2	05/16/2022	10:45:40 AM	Alarm Register	Unknown	224 (Digital Temp SN Digital Press SN Digital DP/Mon SN)	
10	3	05/16/2022	10:56:29 AM	Alarm Register	224	128 (Digital DP/Mon SN)	
11	4	05/16/2022	10:56:30 AM	Alarm Register	128	0 (Alarm Register Cleared)	
12	5	05/27/2022	3:21:08 PM	Fault Register	0	128 (Digital Port 2)	
13	6	05/27/2022	3:29:37 PM	Fault Register	128	192 (Digital Port 1 Digital Port 2)	
14	7	05/27/2022	3:29:38 PM	Alarm Register	0	64 (Digital Press SN)	
15	8	05/27/2022	3:30:15 PM	Alarm Register	64	64 (Digital Press SN)	
16	9	05/27/2022	3:30:18 PM	Alarm Register	64	0 (Alarm Register Cleared)	
17	10	06/09/2022	3:20:15 PM	Fault Register	192	0 (Fault Register Cleared)	
18	11	06/09/2022	3:21:10 PM	Alarm Register	0	32 (Digital Temp SN)	
19	12	06/09/2022	3:21:11 PM	Alarm Register	32	0 (Alarm Register Cleared)	
20	13	06/09/2022	3:24:17 PM	Fault Register	0	0 (Fault Register Cleared)	
21	14	06/09/2022	3:24:17 PM	Fault Register	0	0 (Fault Register Cleared)	
22	15	06/09/2022	3:24:18 PM	Alarm Register	0	0 (Alarm Register Cleared)	
23	16	06/09/2022	3:24:18 PM	Alarm Register	0	0 (Alarm Register Cleared)	
24	17	06/11/2022	12:00:07 PM	Fault Register	0	1 (Pressure Fault Occurred)	
25	18	06/11/2022	12:00:07 PM	Fault Register	0	64 (Digital Port 1)	
26	19	06/22/2022	11:57:26 AM	Fault Register	64	0 (Fault Register Cleared)	
27	20	06/22/2022	11:57:26 AM	Fault Register	64	0 (Fault Register Cleared)	
28	21	07/07/2022	11:21:34 AM	Qmax	16000	2000	
29	22	07/07/2022	11:21:34 AM	Low Flow Rate Alarm Limit	-4000	-500	
30	23	07/07/2022	11:21:34 AM	High Flow Rate Alarm Limit	20000	2500	
31	24	07/07/2022	11:21:34 AM	Meter Size	Romet Imperial RM16000	Series B 2M	
32	25	07/07/2022	3:52:06 PM	High Pressure Alarm Limit	2175.6	261.07	
33	26	07/07/2022	3:53:49 PM	High Pressure Alarm Limit	261.07	261.072	
34	27	07/07/2022	5:34:41 PM	Meter Type	Series B	Series A (LMMA)	
35	28	07/07/2022	5:34:41 PM	Meter Size	Series B 2M	Series A (LMMA) 2M	
36	29	07/07/2022	5:34:41 PM	High Pressure Alarm Limit	261.072	261.07	

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11.3 Download DP log

Unit SN	04/20/94168
Meter/Site ID	DP CUST
Meter Type	Series B
Meter Size	7M
Number of Logs Stored	34

Log Number	Date	Time	Avg DP Value	Avg Flow Rate	Avg Line Pressure	Avg Line Temperature
Reference DP Logs						
1	10/12/2021	11:26:50 AM	0.462	3755	8.146	87.13
2	10/13/2021	9:54:50 AM	0.315	3342	8.153	85.64
3	10/14/2021	10:26:20 AM	0.223	2516	8.145	86.07
4	10/15/2021	9:47:50 AM	0.3	3233	8.165	84.38
5	10/16/2021	10:14:50 AM	0.538	3813	8.15	84.65
6	10/17/2021	10:20:20 AM	0.477	3829	8.133	85.36
7	10/18/2021	10:27:50 AM	0.297	3211	8.128	87.09
8	10/19/2021	9:44:50 AM	0.388	3484	8.143	84.62
9	10/20/2021	9:43:20 AM	0.356	3470	8.141	84.34
10	10/21/2021	9:42:50 AM	0.427	3384	8.144	84.34
11	10/22/2021	9:50:20 AM	0.363	3528	8.14	83.05
12	10/23/2021	9:53:20 AM	0.628	4906	8.121	84.18
13	10/24/2021	10:23:20 AM	0.191	2434	8.121	85.56
14	10/25/2021	10:11:50 AM	0.287	3210	8.145	82.93
15	10/26/2021	9:53:20 AM	0.341	3382	8.119	84.38
16	10/27/2021	10:10:20 AM	0.394	3636	8.123	83.2
17	10/28/2021	9:37:50 AM	0.412	3558	8.229	81.67
18	10/29/2021	10:04:50 AM	0.443	3775	8.258	82.3
19	10/30/2021	10:14:50 AM	0.328	3345	8.263	83.16
20	10/31/2021	10:12:50 AM	0.193	2457	8.23	84.18
21	11/01/2021	9:35:50 AM	0.304	3531	8.214	82.03
22	11/02/2021	10:04:20 AM	0.397	3610	8.265	77.6
23	11/03/2021	9:54:50 AM	0.416	3510	8.246	76.34
24	11/04/2021	10:03:50 AM	0.335	3346	8.239	79.91
25	11/05/2021	9:50:20 AM	0.405	3425	8.265	77.63
Current DP Logs						
26	03/05/2022	9:49:20 AM	0.302	3599	8.35	66.12
27	03/06/2022	9:46:20 AM	0.357	3567	8.399	66.08
28	03/07/2022	10:11:50 AM	0.265	3645	8.37	68.31
29	03/08/2022	9:57:20 AM	0.273	3548	8.345	67.49

Example of DP Test log

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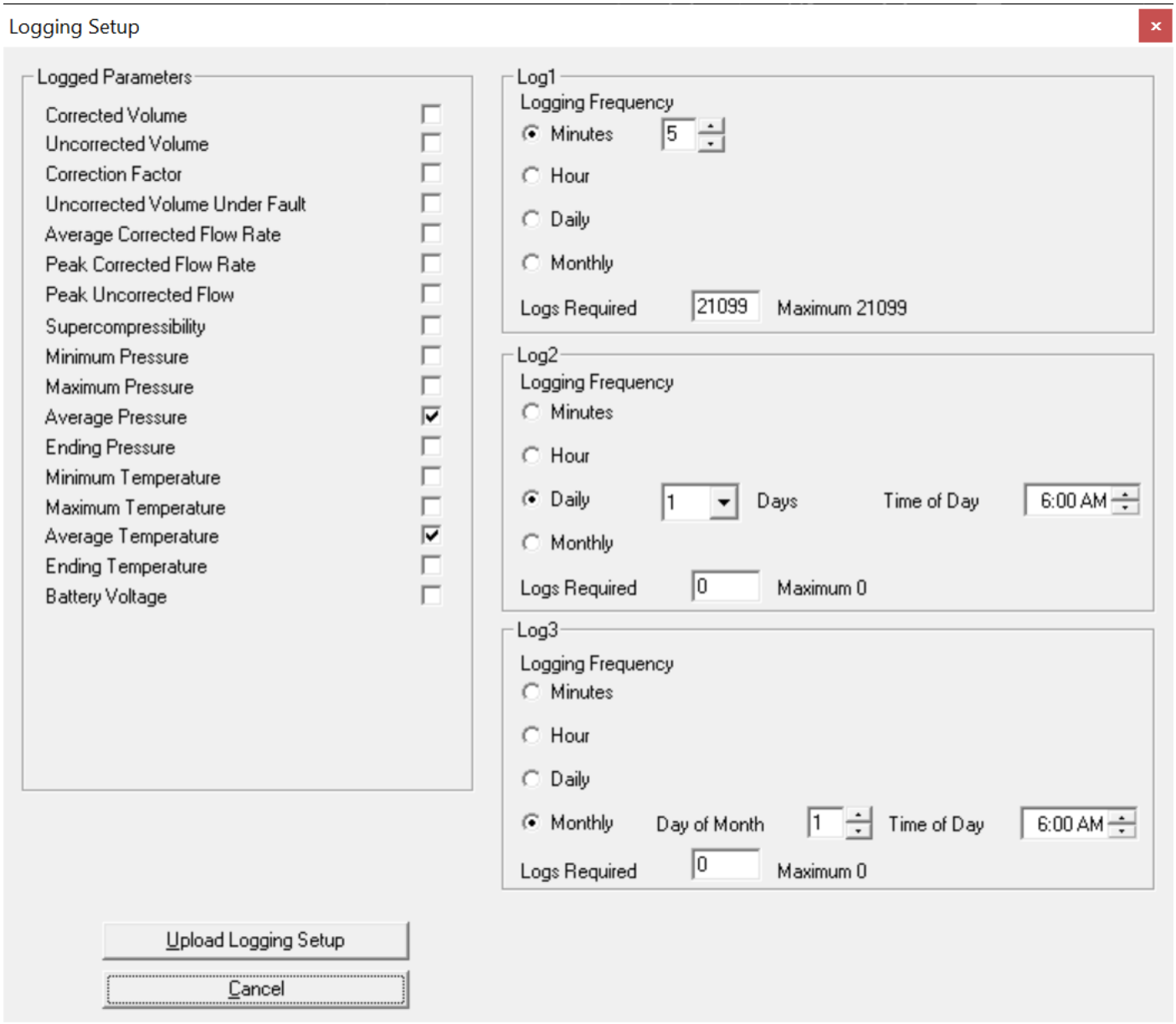
11.4 Logging Setup

The *Logging Setup* dialog is divided into 4 sections; the *Logged Parameters*, *Log1*, *Log2*, and *Log3*; from within these sections the operator can configure what data is logged and the frequency of these logs.



Logging Setup Screen

The logged parameters available for selection include:

- Corrected Volume
- Uncorrected Volume
- Correction Factor
- Uncorrected Volume Under Fault
- Average Corrected Flow Rate
- Peak Corrected Flow Rate

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- Peak Uncorrected Flow Rate
- Supercompressibility
- Minimum Pressure
- Maximum Pressure
- Average Pressure
- Ending Pressure
- Minimum Temperature
- Maximum Temperature
- Average Temperature
- Ending Temperature
- Battery Voltage

The logging frequency is distributed over a maximum of 3 different logging intervals; these are described as *Log1*, *Log2* and *Log3* within the *Logging Setup* dialog. For the monthly data log all months are assumed to have a maximum of 28 days. The default logged parameters are corrected volume, uncorrected volume, correction factor, uncorrected volume under fault, average pressure, average temperature, average corrected flow rate, peak corrected flow rate and supercompressibility.

If the configuration of *Logged Parameters* is changed the number of logs available will also change; by reducing the number of parameters to be logged the number of available logs recorded will increase. Any change to the maximum number of logs available is displayed within the relevant section(s) within the *Logging Setup* dialog e.g. *Maximum 523*.

To display the logging setup dialog:

- From the MCUT select the *Logging* tab. The *Logging* screen will be displayed.
- From the *Logging* screen select the *Logging Setup* option. The *Logging Setup* dialog will be displayed.

11.4.1 Logged Parameters

The *Logged Parameters* are operator configurable; by default, all available parameters are *switched on*, if the details of a parameter are not required within the data log, it is possible to switch it off.

To switch off unwanted logged parameters:

- From the *Logging* screen select the *Logging Setup* option. The *Logging Setup* screen will be displayed.
- From the *Logged Parameters* section, select the appropriate parameter(s) whose details are not required within the data log. Ensure that the check is removed from the appropriate check box.
- Select the *Upload Logging Setup* option.

Note: By changing the configuration of the logged parameters, any existing log entries will be cleared from the data log. Therefore, it is recommended that any existing data log is downloaded prior to any changes to the data log configuration.

- If it is not required to download the existing data log select the *Upload Logging Setup*, otherwise select *Go To Data Log Download Screen* or *Cancel.*
- On completion a dialog box will be displayed stating *New Logging Settings Successfully Uploaded*. Select *OK.* The *Logging* screen will be displayed.

To switch on/off required logged parameters:

- From the *Logging* screen select the *Logging Setup* option. The *Logging Setup* screen will be displayed.
- From the *Logged Parameters* section select the appropriate parameter(s) whose details are required within the data log. Ensure that a check is displayed in the appropriate check box.

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- Select the *Upload Logging Setup* option.

Note: By changing the configuration of the logged parameters, any existing log entries will be cleared from the data log. Therefore, it is recommended that any existing data log is downloaded prior to any changes to the data log configuration.

- If it is not required to download the existing data log select the *Upload Logging Setup*, otherwise select *Go To Data Log Download Screen* (to download the data log) or *Cancel.*
- On completion a dialog will be displayed stating *New Logging Settings Successfully Uploaded*. Select *OK.* The *Logging* screen will be displayed.

11.4.2 Log1, Log2 and Log3

The method for changing the *Logging Frequency* is the same for *Log1*, *Log2* and *Log3*; therefore, the methods described below apply to all 3 logging frequencies (Note: to change *Log1* the settings must be changed within the *Log1* section, for *Log2*, the *Log2* section and for *Log3*, the *Log* 3 section).

To specify the logging frequency:

- From the *Logging* screen select the *Logging Setup* option. The *Logging Setup* screen will be displayed.
- From the appropriate section (*Log1*, *Log2* or *Log3*) select the desired frequency (*Minutes*, *Hour*, *Daily* or *Monthly*).
- Once selected, a more specific selection is required.
  - Minutes – specify how frequent the logs should be taken, acceptable range 1 – 59 (if 2 is selected a log will be taken every 2 minutes).
  - Hour – specify how frequent the logs should be taken, acceptable range 1 – 4, 6, 8, 12. In addition the operator should also specify how many minutes after the hour the log should be taken, accepted range 0 – 59 (if 4 is selected in the first drop down selection box and 53 in the second, the logs will be taken every 4 hours at 53 minutes past the hour).
  - Daily – specify the *Time of Day* that the logs should be taken, acceptable range 0:00 – 23:00.
  - Monthly – specify the *Day of Month*, accepted range 1 – 28. In addition, the operator should specify the *Time of Day*, acceptable range 0:00 – 23:00 (if 28 is selected in the first selection box and 23:30 in the second, a log will be taken on the 28th day of every month at 23:30).
- Repeat for each *Log* as required.
- Select the *Upload Logging Setup* option.
- **Note:** By changing the configuration of the logged parameters any existing log entries will be cleared from the data log. Therefore, it is recommended that any existing data log is downloaded prior to any changes to the data log configuration.
- If it is not required to download the existing data log select the *Upload Logging Setup*, otherwise select *Go To Data Log Download Screen* (to download the data log) or *Cancel.*
- On completion a dialog will be displayed stating *New Logging Settings Successfully Uploaded*. Select *OK.* The *Logging* screen will be displayed.

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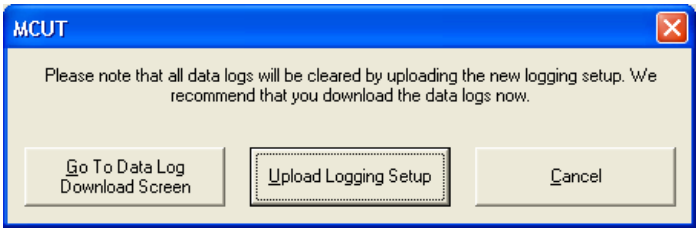
Note: If any parameters or logging frequencies are changed, the user will be prompted with the following warning screen.



1st Warning Screen

If "Upload Logging Setup" is chosen, the user will again be prompted with the following 2nd warning screen.

2nd Warning Screen

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12 Monitor Pressure

IMCW2's with firmware version 1.91 or higher, can be equipped with a second pressure transducer, a Monitor Pressure transducer, in addition to a Line Pressure transducer. This transducer can be absolute or gauge type. Pressure units selected on the Configuration screen must be the same for both the line and monitor transducers. Monitor pressure values are shown on the Live Data screen and can be logged in the Data Logs.

Logging setup allows selection of:

- Average Monitor Pressure.
- Minimum Monitor Pressure.
- Maximum Monitor Pressure.
- End Monitor Pressure.

The firmware senses if the Monitor Pressure transducer fails, and a fault is set. This set fault, occurred and present, can be seen on the Live Data screen. A Pressure Monitor fault is registered in the Audit Log – Date/Time stamped, and **Pm FLt** is displayed on the LCD.

The Monitor Pressure transducer can be recalibrated at one or two points. Refer to the Calibration Tab for more details.

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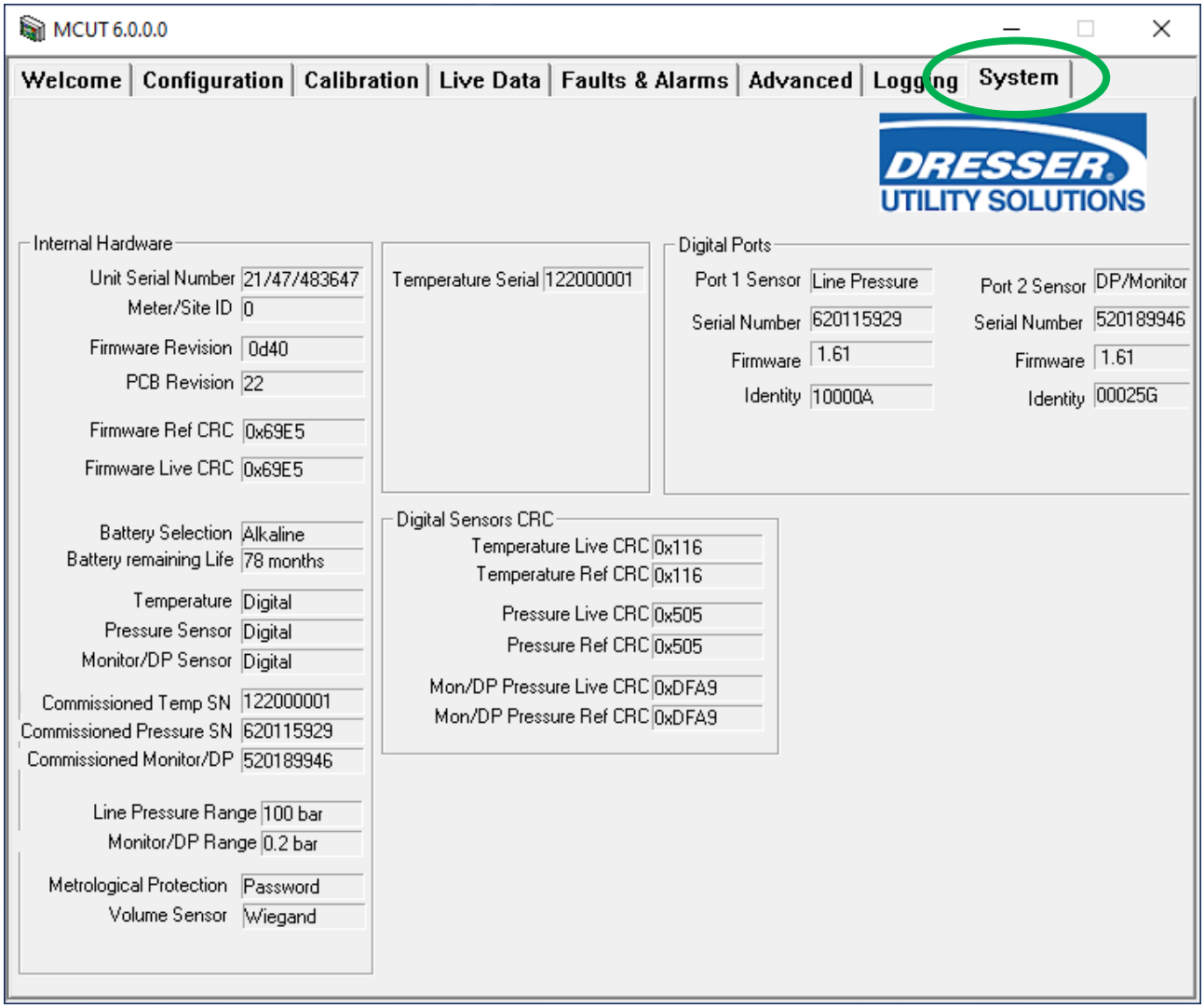
13 System tab

System Tab has been added starting from version 3.00 and MCUT version 5.0.0.0. The system screen contains information about hardware configuration, metrological protection, and integrity of the system. This screen has the following four sections:

- Internal Hardware
- Temperature
- Digital ports
- Digital Sensors CRC



System Tab

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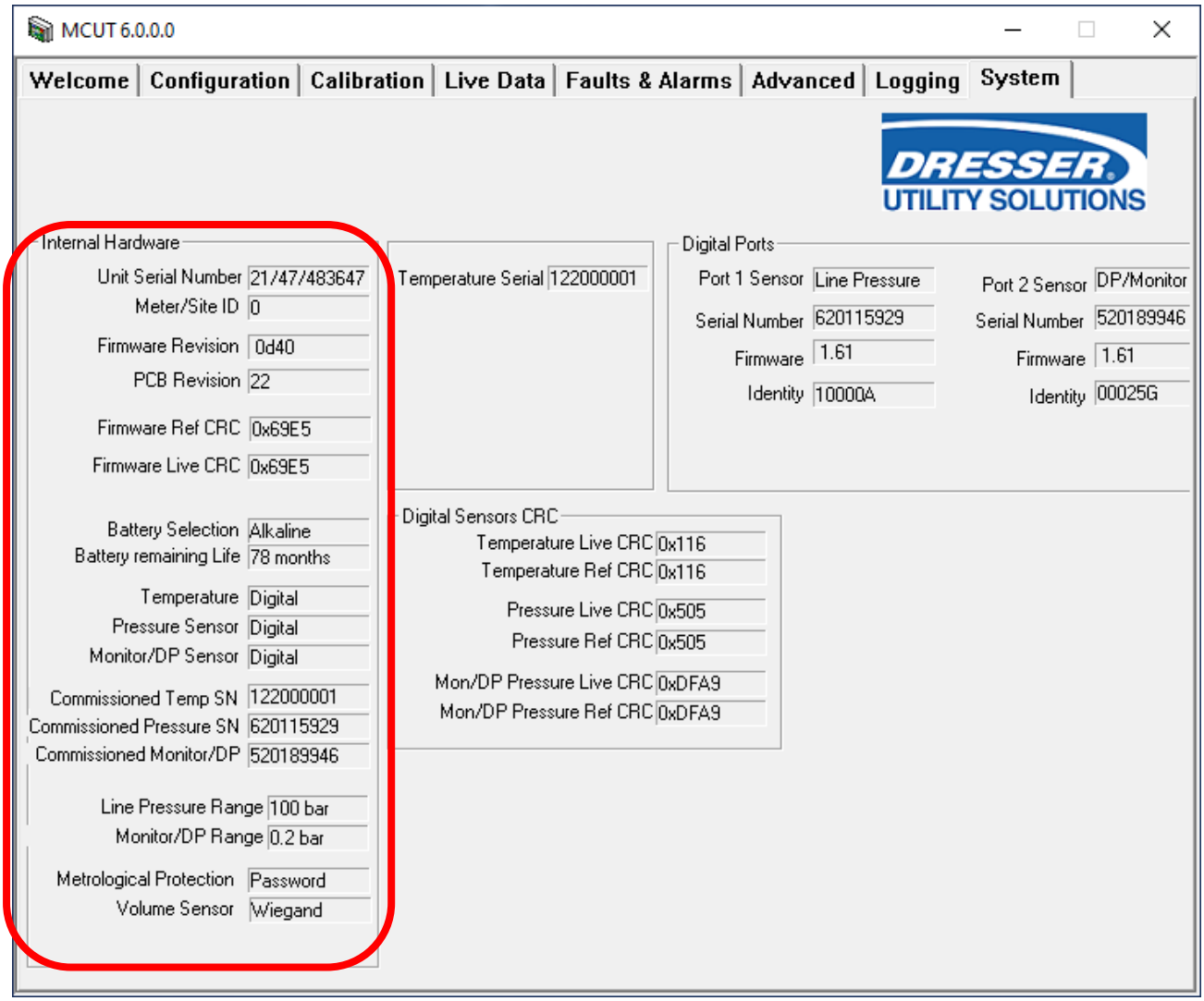
13.1 Internal Hardware section:



The Internal hardware section is divided into sub-sections that display the following details of the system:

- Unit Serial Number – Serial number allocated during factory configuration, which the operators cannot modify
- Meter/Site ID – enables the operator to allocate the ID and modify the ID, as needed
- Firmware revision – displays the firmware version in the unit
- PCB revision – displays the revision number of PCB
- Firmware Ref CRC – displays the CRC number calculated by the firmware on day released, and is saved as reference
- Firmware Live CRC – displays the CRC number automatically calculated – periodically or upon user request
- Battery type – displays the type of battery installed - either alkaline or lithium
- Battery remaining life – displays the battery life timeline
- Temperature – displays the type of temperature transducer - either analog or digital
- Pressure Sensor – displays the type of pressure transducer – either analog or digital
- Monitor/DP sensor – displays the type of Monitor/DP transducer - either analog or digital
- Commissioned Temperature S/N – displays the serial number of the digital temperature transducer that is commissioned to work in the system

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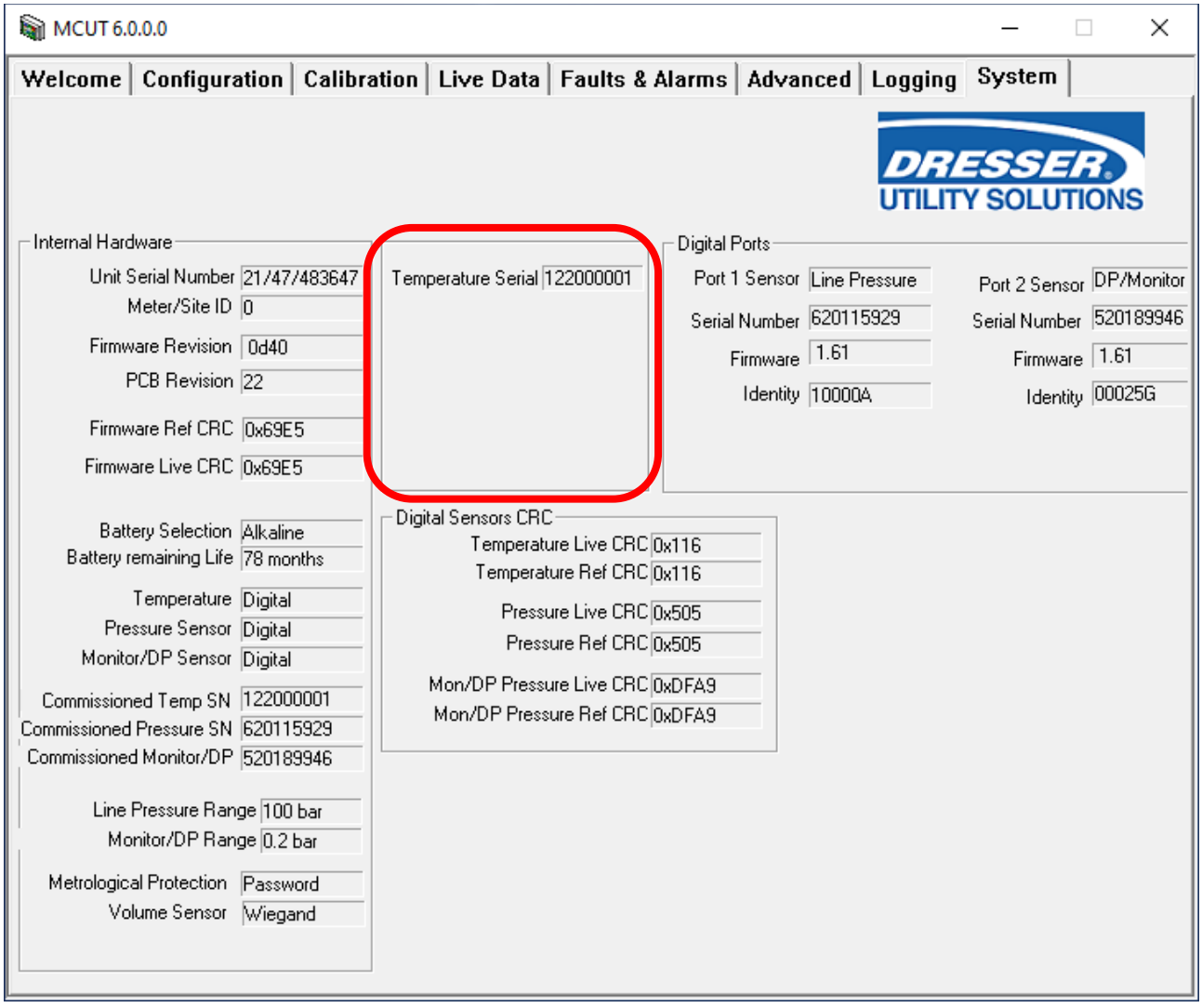
- Commissioned Pressure S/N – displays the serial number of digital pressure transducer that is commissioned to work in the system
- Commissioned Monitor/DP S/N – displays the serial number of digital monitor pressure transducer or DP transducer that is commissioned to work in the system
- Line Pressure Range – displays pressure range of line pressure transducer
- Monitor/DP Range – displays pressure range of monitor pressure transducer or DP transducer
- Metrological Protection – displays type of protection of metrological parameters: password, hardware or combination password/hardware

13.2 Temperature



This section indicates the serial number of the digital temperature transducer. This takes place during the factory configuration. The users cannot change the serial number therefore, the operator can use this number for system integrity checking.

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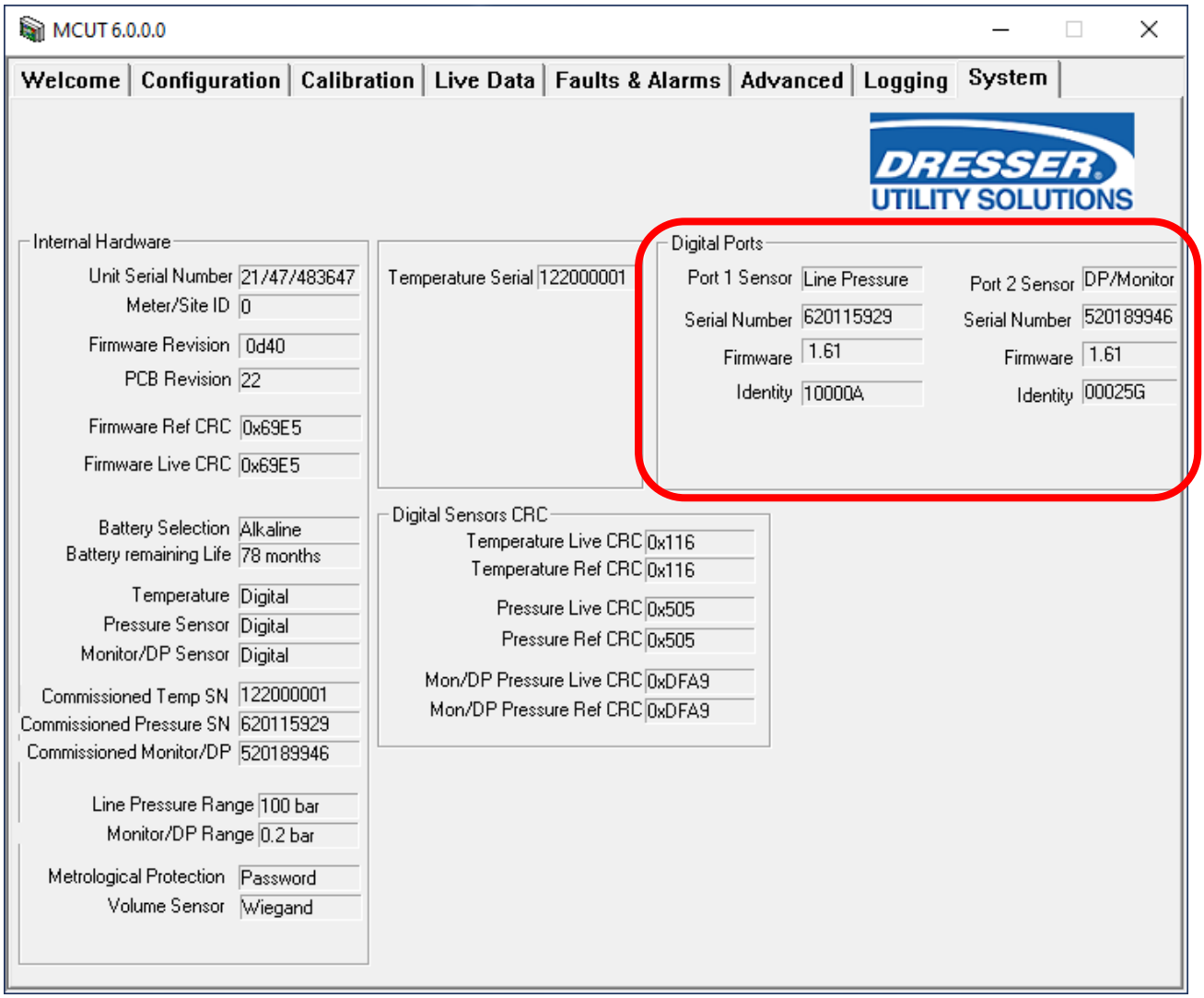
13.3 Digital Ports



There are two digital ports in the IMCW2 that connect digital line pressure, digital monitor pressure, and digital DP transducers. There is information about what type is connected to a particular digital port. Each digital transducer has the following information:

- Serial number
- Firmware version
- Identity

Above data is assigned during transducer manufacturing. The users cannot change any of the above information therefore, the operator can use all of these for system integrity checking.

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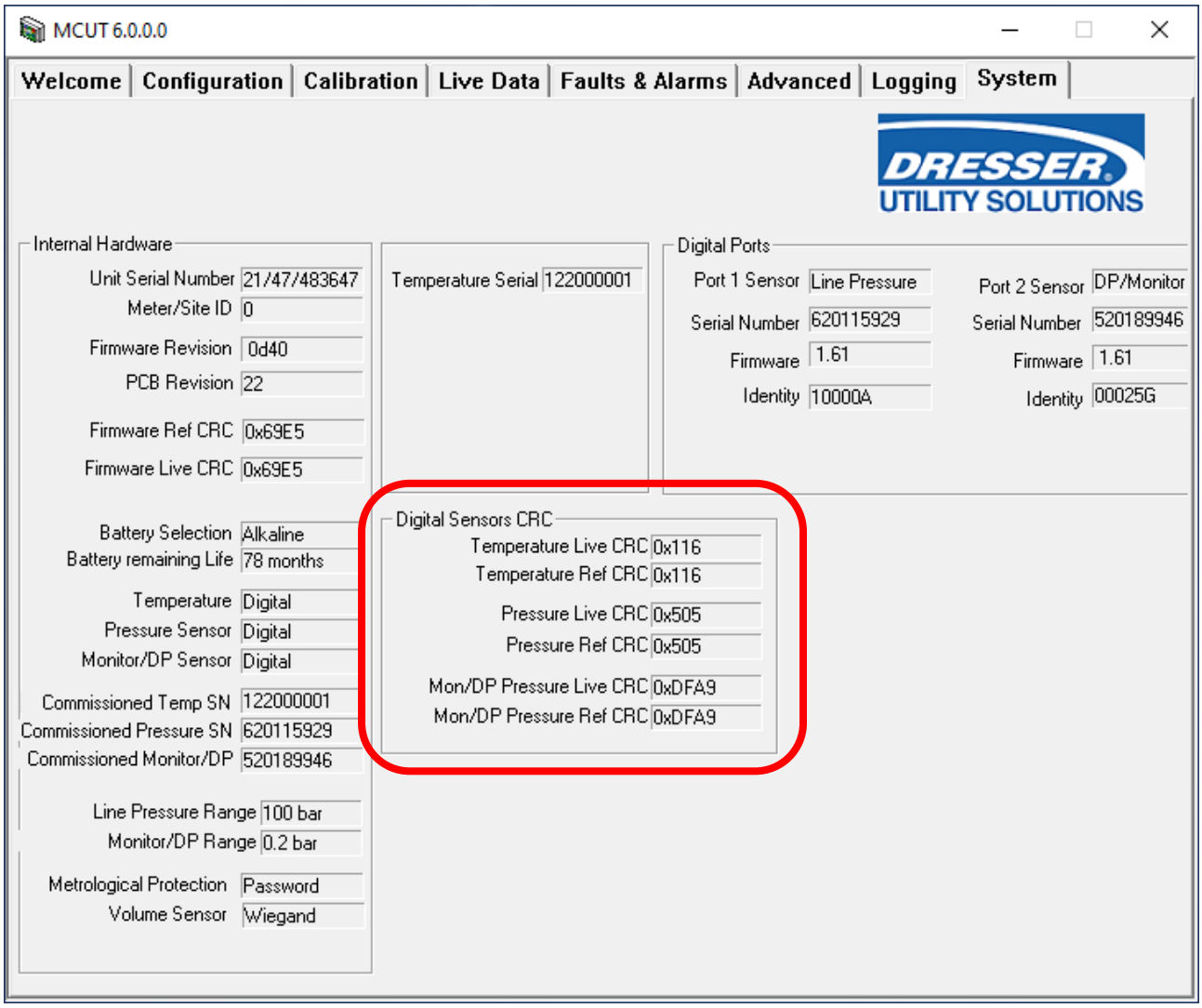
13.4 Digital Sensors CRC



There may be up to three digital transducers connected into the system. Comparing the reference CRC number with live CRC number allows for detection of firmware corruption of the digital transducer. If corruption occurs, then a fault is set.

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13.5 Pressure and Temperature Transducer replacement functionality in the fully digital IMCW2.

13.5.1 Introduction

The replacement of the digital pressure and temperature transducers and changing the values of any metrological parameter are protected in the Micro Corrector by two methods:

- Software password
- Hardware switch with two positions
    - R/W (Read/Write)
    - RO (Read-only)

During the manufacturing process, Dresser configures the method of protection and assigns a serial number (S/N) to the digital transducers. The operator cannot change either the method of protection or the serial number of the transducer. The digital pressure and temperature transducers are commissioned to work in the Micro Corrector during the factory configuration.

The operator/user can replace a digital transducer if the software password is known (in the case of metrology software protection) or if the hardware switch is set in Read/Write position.

The operator can change all metrological parameters from the default factory configuration if the hardware switch is set in the Read/Write position. The operator must follow the procedures described below to replace the digital transducers. If the hardware switch is set in Read-only position, the operation/user cannot change any design parameters. A metrological seal protects access to the switch and to the terminals.

13.5.2 Replacing the digital transducer – Alarms

After connecting a new digital transducer, a solid bell icon appears on the Micro Corrector LCD display. The solid bell icon indicates that the firmware has noticed a digital transducer with an unknown serial number and an alarm is set.

Solid bell icon on display after a new digital transducer is connected to Micro Corrector

During the configuration process, under the “Alarm Setting” tab, the operator can select checkboxes for alarm indicators to be shown on the display in addition to the bell icon.

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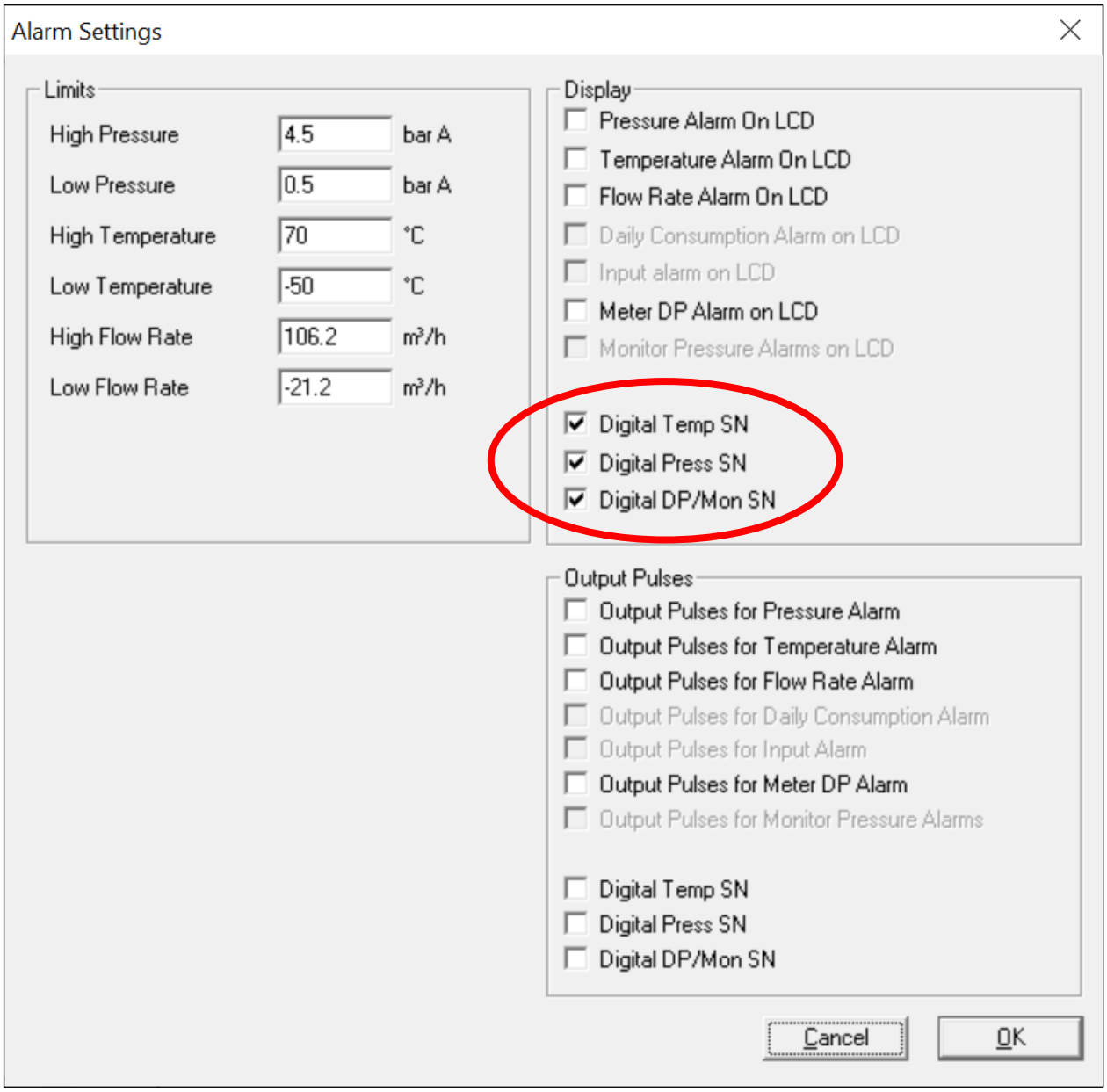

Select alarm indication on the LCD display for connection of

Digital Temperature Sensor, Line and/or DP Pressure Transducers

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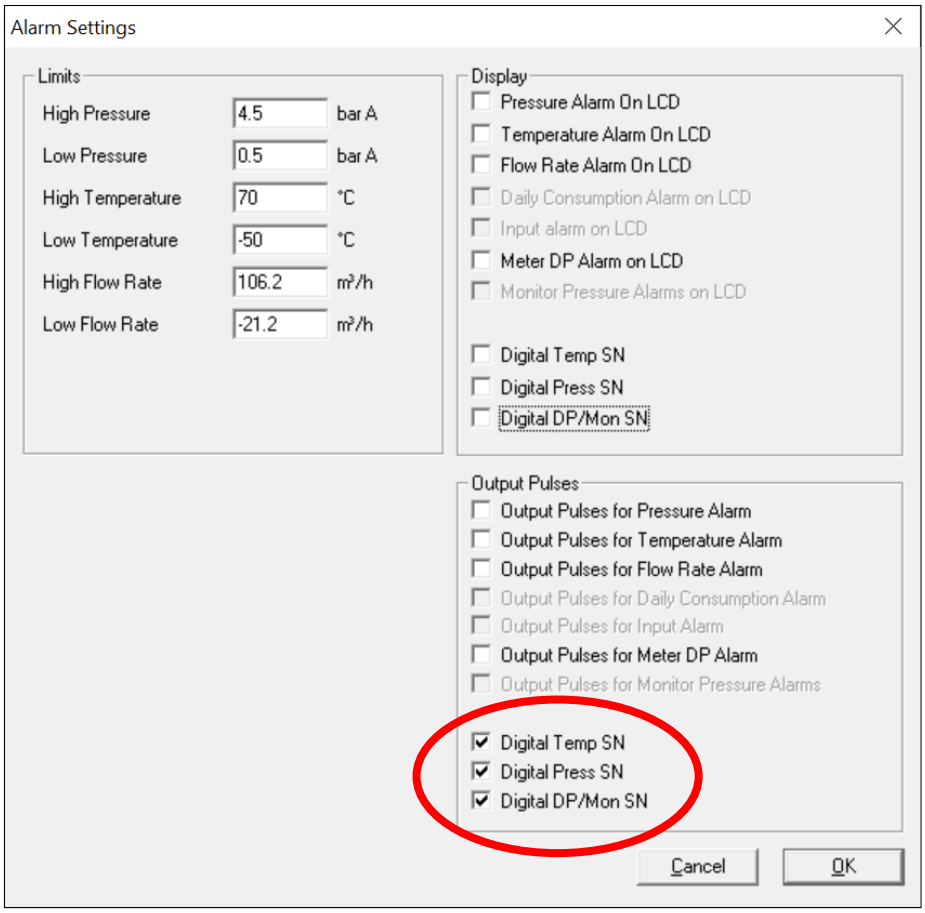
If a new transducer is connected, then the following indication is shown on the LCD display:

- **T Sn AL** – for digital temperature sensor
- **P Sn AL** – for digital line-pressure transducer
- **DP Sn AL** – for digital DP transducer

An example of the display indication for the line pressure transducer:

Alarm indication on LCD when a new line pressure transducer is connected to the IMCW2

During the configuration process, under the "Alarm Setting" tab, the operator can select checkboxes so that the fault/alarm will generate output pulses for this alarm for setup information:



Select Fault/Alarm output pulses when a new Digital Temperature Sensor, Line or DP Pressure Transducers are added

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13.5.3 Replacing a digital transducer - Logging

When the Micro Corrector detects a digital transducer with an unknown serial number, it triggers an alarm. This event is logged with a time/date stamp in the Micro Corrector Audit Log:

21	17/02/2022	11:02:08 AM	Alarm Register	32	96 (Digital Temp SN Digital Press SN)

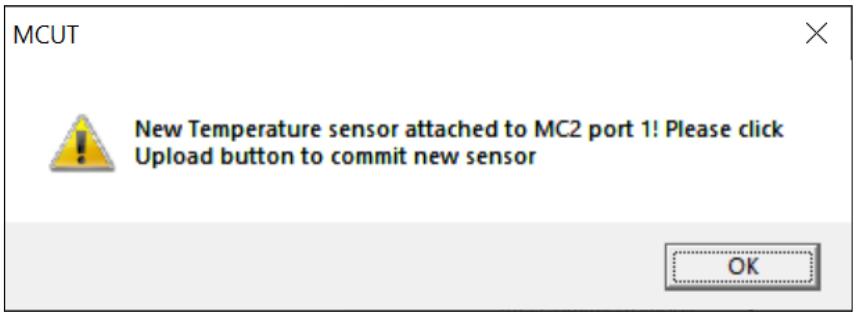
Example of an Audit Log entry when a new digital line-pressure transducer is connected to the IMCW2.

The Audit Log can be downloaded from a Micro Corrector by using the Micro Corrector User Terminal (MCUT).
The operator should always commission a new digital transducer to work with the Micro Corrector. Only after commissioning, can the operator ensure proper functioning of the measurement system. However, the metrology is also continued under the following situations:

- A transducer with the same type and range replaces the existing transducer (in special circumstances)
- Unrecognized serial numbers send an alarm, but there is no actual fault in the system.

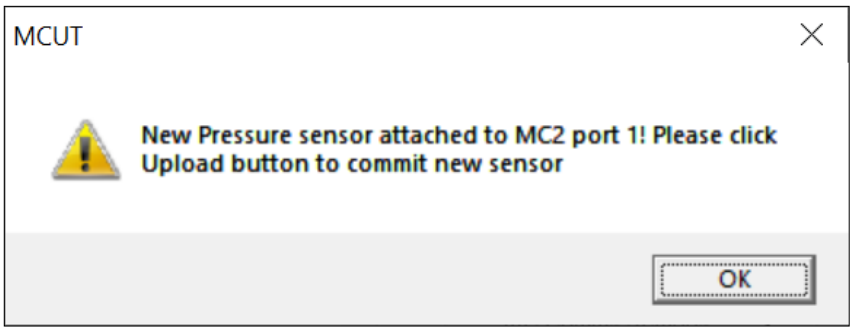
13.5.4 Commissioning a new digital transducer

The Micro Corrector sends the following messages after MCUT downloads data from the device. This message depends on the method of protection and the position of the switch. The operator should commission the transducer to work in the IMCW2.



Message in MCUT when a new temperature sensor is connected to the IMCW2

with either software password protection or metrological protection switch set in Read/Write position



Message in MCUT when a new pressure sensor is connected to the IMCW2

with either software password protection or metrological protection switch set in Read/Write position

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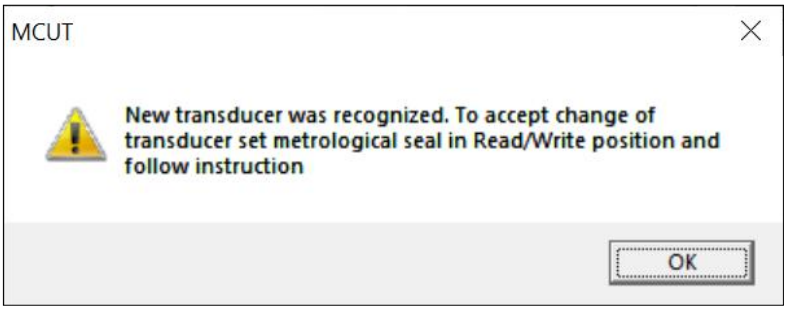
In the case of the hardware switch being in Read-only position, the operator must change the switch position to Read/Write and again communicate with the Micro Corrector. Then the following message appears on the screen:



Message in MCUT when a new temperature or pressure sensor is connected to the IMCW2 with the metrological protection switch set in Read Only position

The operator should follow this process to commission a new digital transducer:

- Press the “Upload” button on the Configuration screen.
- Enter the password if the metrology is protected by a software password.
- Execute the commissioning of the transducer if metrology is protected by the hardware switch position.
- Ensure the solid bell icon is removed from the Micro Corrector display.

The operator should check the System tab if new transducer serial number is commissioned to work with Micro Corrector. The section “Internal Hardware” shows serial numbers of commissioned digital transducers:

- Temperature (Commissioned Temp SN)
- Line pressure (Commissioned Pressure SN)
- DP or Monitor Pressure (Commissioned Monitor/DP SN)

These serial numbers **must** match serial numbers of digital transducers connected to the Micro Corrector. Pressure transducers serial numbers are shown in the section “Digital Ports”. If the serial numbers do not match, then the commissioning process must be repeated.

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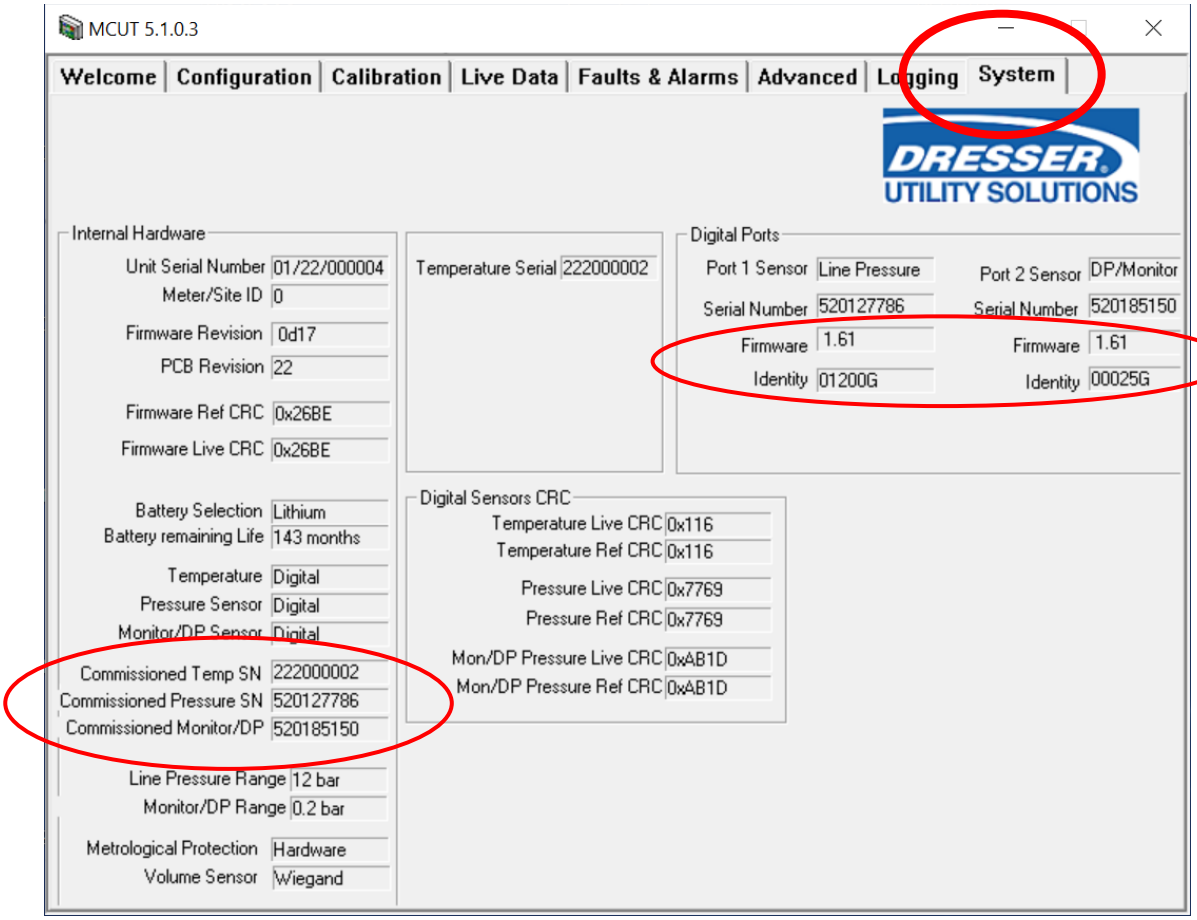

System Tab showing replaced and commissioned Pressure Transducers and Temperature Sensor

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13.5.5 Commissioning a new digital transducer – Logging

The replacement of a digital transducer, after commissioning, is recorded in the Audit Log with a Time/Date stamp.

The following information is included in the log:

- Serial number of original digital transducer
- Serial number of new digital transducer
- Original digital transducer ranges and type
- New digital transducer ranges and type

Audit Log

Unit Serial Number	01/22/000004
Meter/Site ID	0
Meter Type	Series B Metric
Meter Size	3M
Number of Logs Stored	4

Log Number	Date	Time	Parameter changed	Old value	New value
1	17/02/2022	12:43:21 PM	Pressure SN	620190108	520127786
2	17/02/2022	12:43:21 PM	Line Pressure Range	3	12
3	17/02/2022	12:43:21 PM	Line Pressure Type	Absolute	Gauge
4	17/02/2022	12:43:21 PM	Temperature SN	122000002	222000002

Audit Log with record of changing temperature sensor and line pressure transducers after commissioning

- The Audit log shows that a 3-bar absolute transducer was replaced by a 12-bar gauge transducer.
- The newly commissioned serial numbers are also shown on the “Live Data” screen in the “Internal Hardware” section.
- The operator should ensure there are no faults and alarms - indicated in “green” and “0” as shown below.

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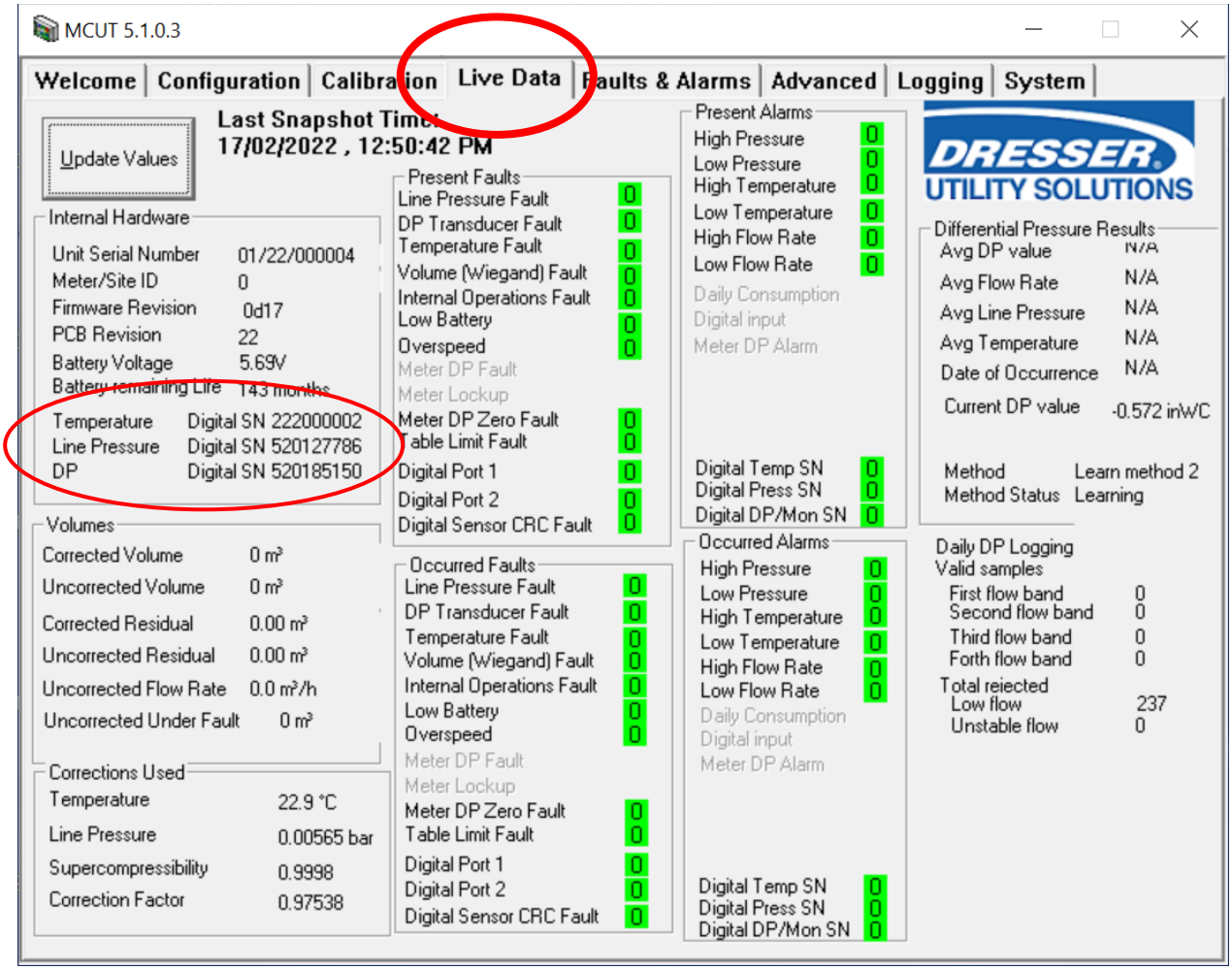

Live Data screen with fully commissioned Pressure Transducers and Temperature Sensor

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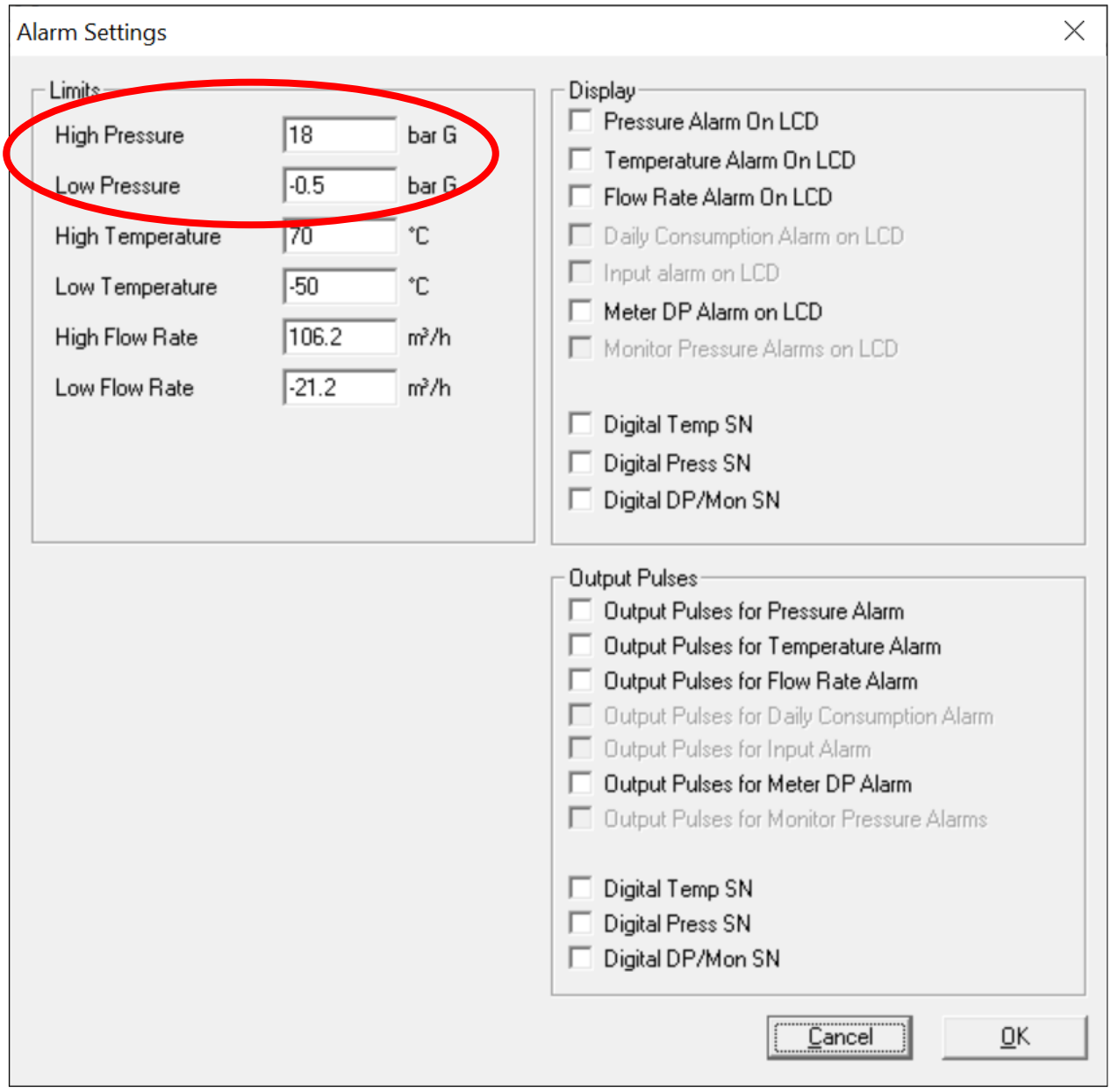
The commissioning of a new digital pressure transducer ensures correct alarm settings. Under the Alarm Settings tab, the operator must change the transducer type and set the low and high-pressure alarms limits.



Live Data screen after the replaced Pressure Transducers and Temperature Sensor are commissioned

When connecting a different type of line-pressure transducer (Absolute or Gauge pressure), the operator should verify the correction parameters on the “Corrections Configuration” screen.

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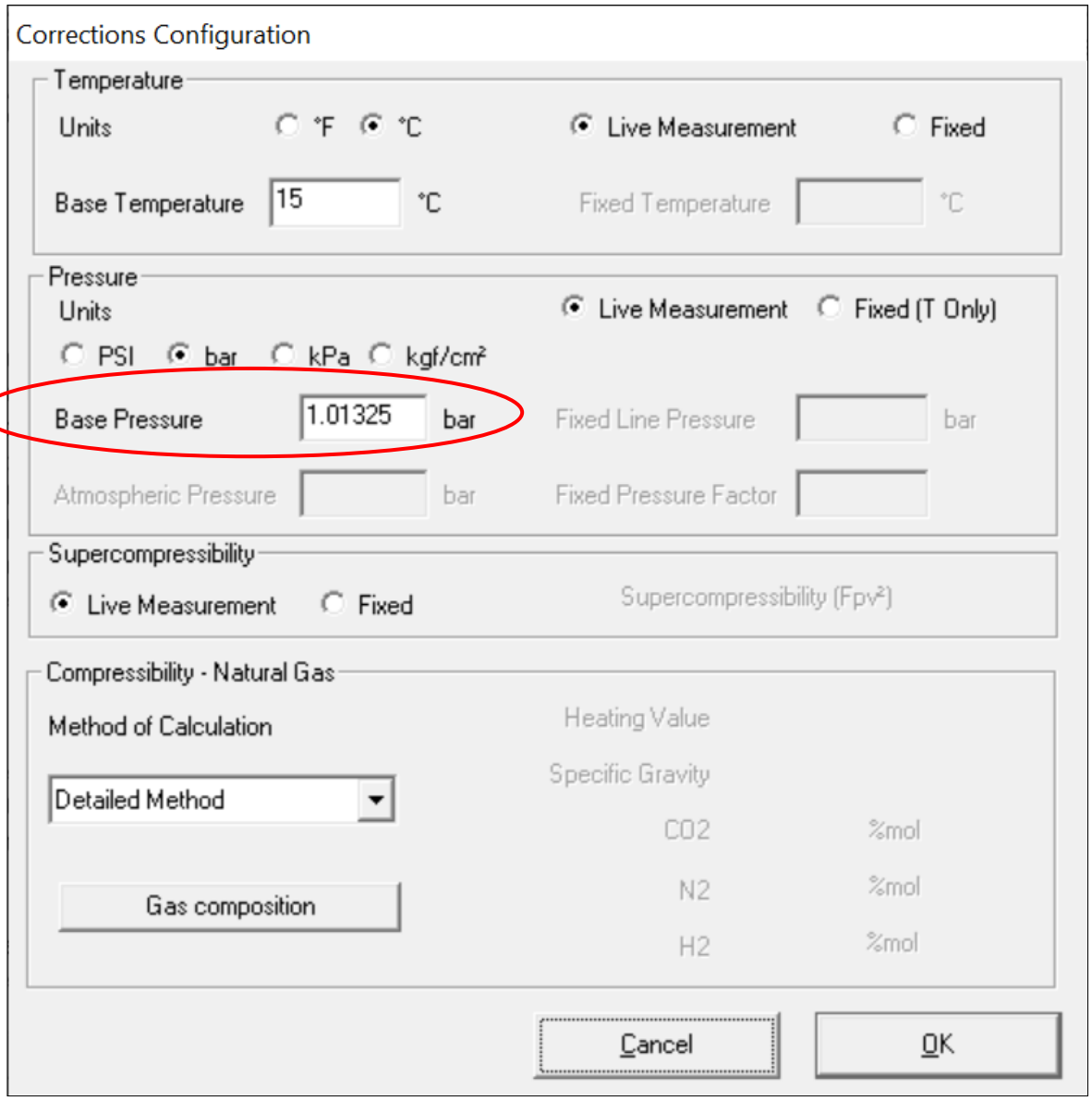

Correction Configurations screen with an absolute pressure transducer

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13.5.6 Corrector functionality if a new digital transducer is NOT commissioned to work with the corrector

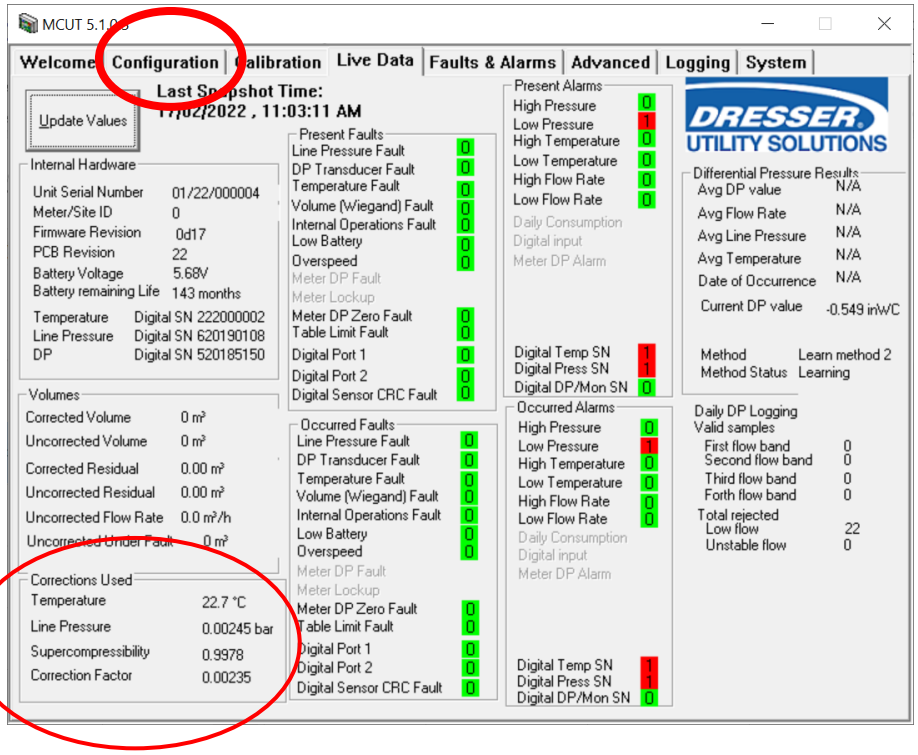
After a new digital transducer is connected to the corrector, a solid bell icon appears on the display and a S/N Alarm description is displayed (if configured). This icon and description will remain on the display until the transducer is commissioned to work in the corrector.

Connecting the MCUT and communicating with the Micro Corrector activates messages for the operator to commission the new transducer. If the operator fails to commission the new transducers, warnings appear in multiple tabs.

Serial Number (S/N) alarms are displayed on the “Live Data” screen (in RED) in the “Present and Occurred Alarms” section if new temperature and pressure sensors are connected, but not commissioned yet:

- Digital Temperature Transducer Serial Number (Digital Temp SN)
- Digital Line Pressure Transducer Serial Number (Digital Press SN)
- Digital DP/Monitor Pressure Transducer Serial (Digital DP/Mon SN)

Note: The temperature and line-pressure is measured by the newly connected transducers (section “Correction Used”).



Live Data screen with Serial Number alarms after replacement of Pressure Transducers and Temperature Sensor

If the line-pressure transducer is not commissioned to work in the system, various faults and alarms will be displayed e.g., pressure fault, pressure alarm, table limit fault.

- The “System” tab presents the current status of the Micro Corrector.
- The “Digital Ports” section shows the serial numbers of the Line pressure and DP/Monitor pressure transducers that are connected to the corrector. This section also includes information regarding the firmware version, the range, and the type of transducers.
- The “Temperature” section shows the serial number of the temperature sensor that is connected and currently

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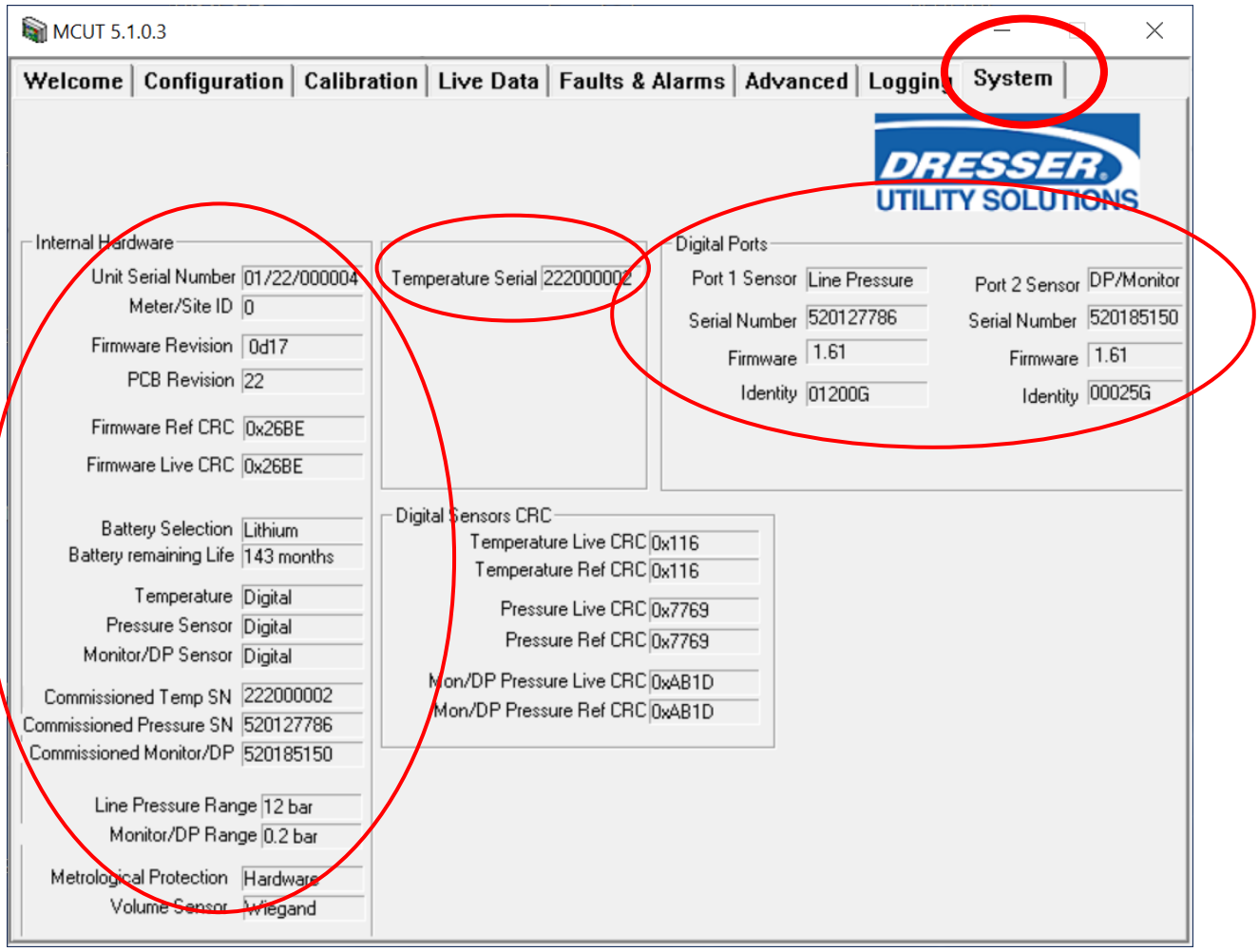
measuring temperature.

- The “Internal Hardware” section displays the following information regarding the temperature sensor and pressure transducers:
  - Temperature, Line Pressure and DP/Monitor Pressure transducer type (analog or digital)
  - Commissioned Temperature sensor serial number
  - Commissioned Line-Pressure transducer serial number
  - Commissioned DP/Monitor Pressure transducer serial number
  - Commissioned Line Pressure transducer range
  - Commissioned DP/Monitor Pressure transducer range



System Tab shown when new sensors are connected but not commissioned to the IMCW2

Note: If a new digital transducer is **NOT** commissioned to work in the Micro Corrector and, the serial number of the connected transducers does not match the serial number of those commissioned, the original transducer serial number is shown.

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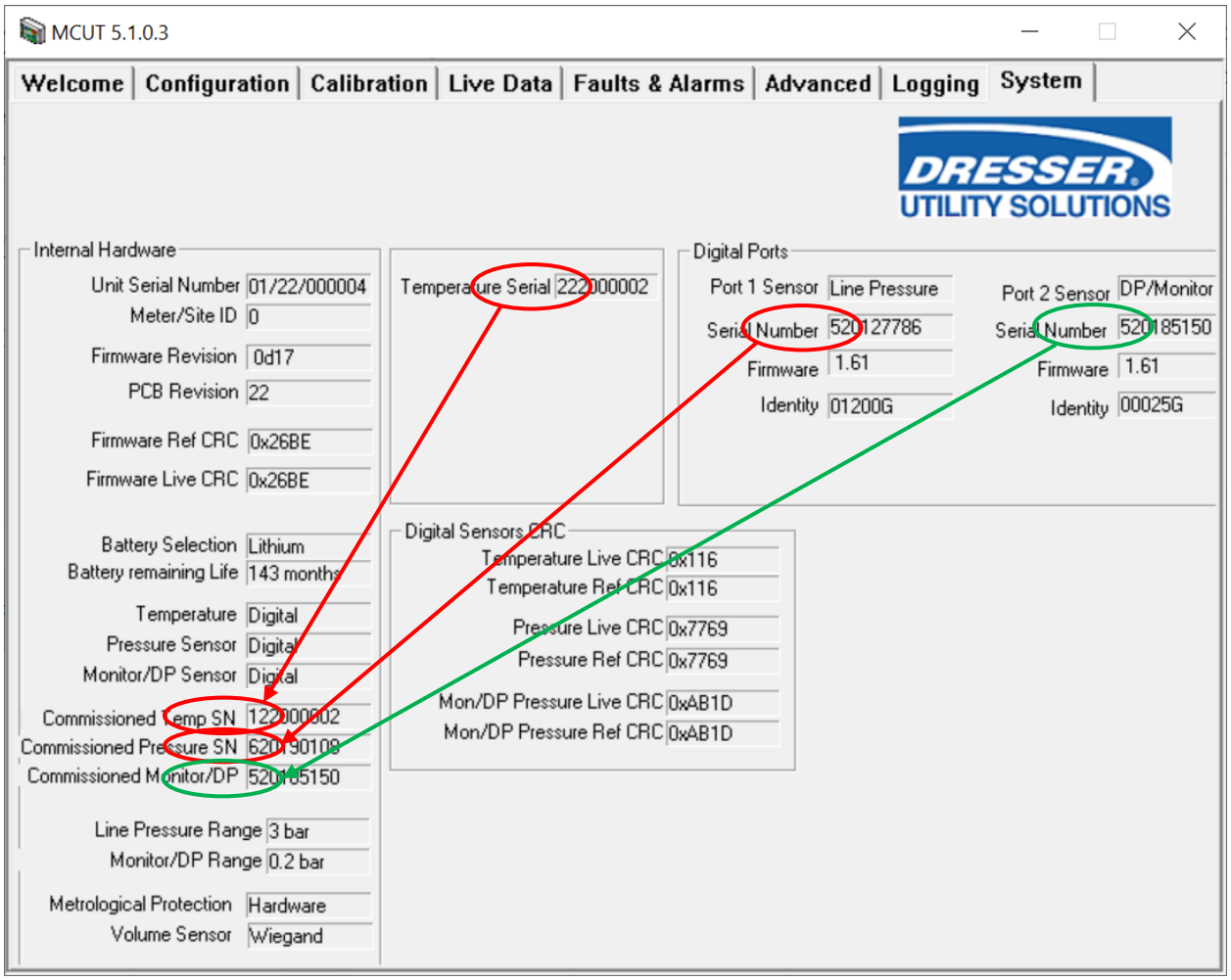
The following shows the “System” tab for the Micro Corrector in this situation:

- Commissioned (original) line pressure transducer serial number – 620190108
- Commissioned (original) line pressure transducer range – 3 bar
- Commissioned (original) temperature transducer serial number – 122000002
- New line pressure transducer serial number - 520127786
- New line pressure transducer range – 12 bar
- New temperature transducer serial number – 222000002



System Tab shown when new sensors are connected but not commissioned

WARNING

Pressure transducer alarm ranges and units are set for the original transducer - various faults and alarms need to be set (e.g., pressure fault, pressure alarm, table limit fault) using the Alarm Setting screen

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14 Battery Replacement

The Type of battery pack installed in IMCW2 is configured during factory configuration. The IMCW2 can be powered by either an alkaline or lithium battery pack. Proper procedure for replacement of the battery pack is described in the ***Dresser Measurement IMCW2 Hardware Manual***. The battery pack should be replaced when either “LOW BATTERY” or “END OF BATTERY LIFE” faults are displayed. The additional function of calculating the “Remaining battery life” is available beginning with firmware version 3.00 and MCUT version 5.0.0.0. The battery packs and their features are as follows:

Alkaline battery pack.
The firmware calculates the battery life based on the battery voltage.

Lithium battery pack.
The firmware calculates the battery life based on the date of battery pack installation. When the new battery pack is installed, then the operator must follow the process described in Section 13.3. This process enables the firmware to reset a new date for the remaining battery life.

Usually, a replacement battery pack is this same type as configured during factory configuration, however the user can elect to change of the type of battery pack.

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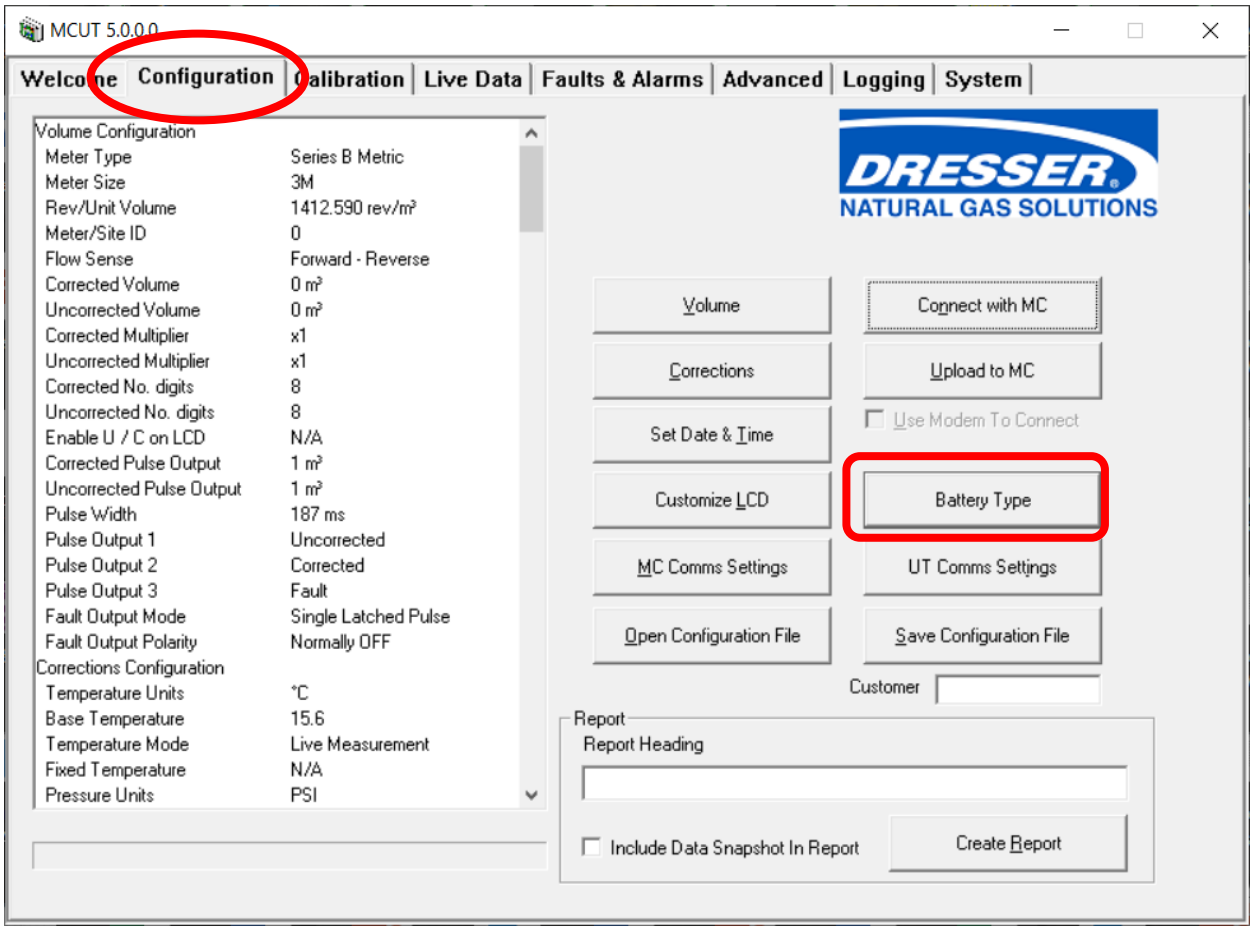
14.1 Installed battery pack information

The MCUT screen displays information on the type of battery pack installed in the corrector. To access the MCUT screen, follow these instructions:

Under *Configuration* tab, select *Battery Type* to open the Battery type window.



Selecting *Battery Type* displays information on which battery pack type is installed in the corrector. Battery type configuration is done during the factory manufacturing process, but it can be changed by the user during battery pack replacement if required.

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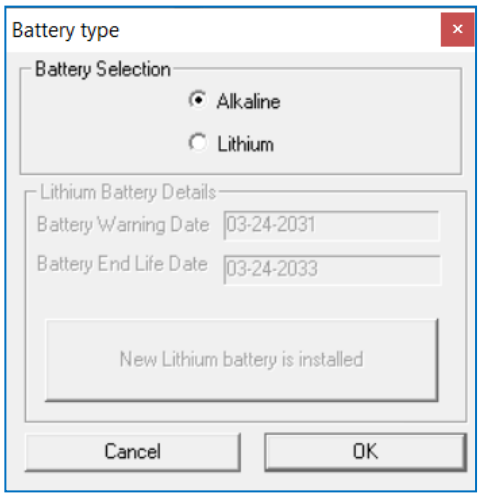
14.2 IMCW2 configured with Alkaline Battery Pack

If the IMCW2 is configured with an Alkaline Battery Pack, then the following window appears:



Battery Type Screen

Note: Options related to lithium battery pack are disabled if alkaline pack is installed.

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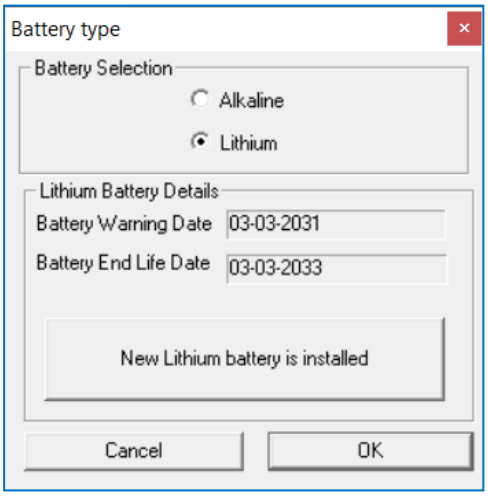
14.3 IMCW2 configured with Lithium Battery Pack

If the IMCW2 is configured with a Lithium Battery Pack, the following window appears:



Lithium Battery Pack Screen

If Lithium battery pack is installed, the following details are displayed:

- Battery Warning Date: Date when “Low Battery” warning will be set
- Battery End Life Date: Date when “End of Battery Life” warning will be set

Resetting lithium battery pack life after battery pack replacement

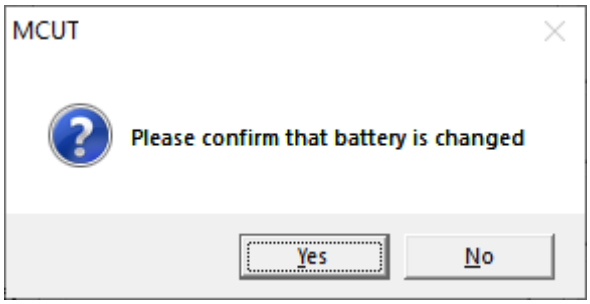
There are two options to reset the remaining lithium battery pack life:

- Using MCUT Software
- Using the Scroll Button

Instructions on using the Scroll button to reset battery life are also contained in the ***Dresser Measurement IMCW2 Hardware Manual.***

Option 1 - Procedure to reset remaining battery life using MCUT when a new lithium pack is installed:

- After the lithium battery pack has been replaced, connect the MCUT to set the new battery installation date.
- Under *Configuration* tab, select *Battery Type*.
- Press *New Lithium Battery is installed* button and select *Yes* to confirm that the battery is changed.



Battery Change Confirmation Screen

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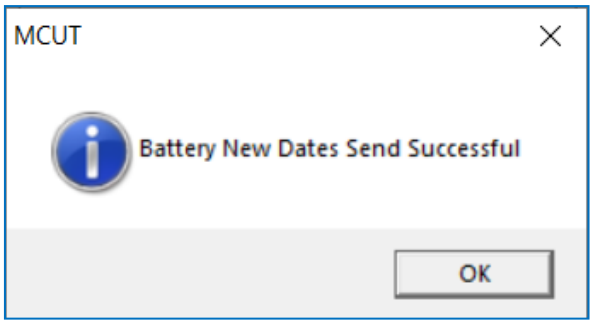
- A dialog box will be displayed stating *Battery New Dates Send Successful*. Select *OK*.



Battery Date Change Screen

Option 2 - New Lithium Battery installation – procedure to reset remaining battery life with Scroll Button

Requirement: Indication of "Battery Voltage" must be selected on display.

Condition for replacement: "Low voltage threshold" or "Critical voltage threshold" was reached.

Low voltage threshold or critical voltage threshold are reached if:

- Lithium battery to be replaced has been installed for at least 10 years.
- Battery voltage is below 5.45 [V] constantly for at least 24 hours.
- Battery voltage is below 5 [V].

All these conditions will cause two icons (battery and bell) to show on the corrector display, as follows:

Low Battery fault on display

"Low Battery Fault" is shown on the "Live Data" screen in MCUT, and "Low Battery Fault" is recorded in the Audit Log.

As battery voltage is drops further, eventually a message prompting battery replacement will appear on the display:

Message prompting user to immediately replace battery pack

Note: If the battery pack is disconnected and the corrector is powered from the super-cap, voltage constantly drops. Voltage will eventually drop below 5 [V] and two icons will start to blink on the display. When the corrector reaches "Critical voltage threshold", follow the process below for battery replacement.

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Process:

- Replace lithium battery pack
- Scroll on the display to “Battery Voltage”
- Check to determine if the battery voltage is above 5.55 Volts
- Hold the scroll button down for 10 seconds
- The following indication will appear on the display

Message indicating that remaining battery life was updated after battery pack replacement

The display now indicates that remaining battery life was successfully updated after lithium battery pack replacement. The “Low Battery” fault is automatically cleared from both the display and Live Data screen and is logged in the Audit Log – see below.

Audit Log Table

Audit Log					
Unit Serial Number	21/47/483647				
Meter/Site ID	0				
Meter Type	Series B Metric				
Meter Size	3M				
Number of Logs Stored	2				
Log Number	**Date**	**Time**	**Parameter changed**	**Old value**	**New value**
1	06/05/2021	1:35:00 PM	Fault Register	Unknown	128 (Low Battery Occurred)
2	06/05/2021	1:37:58 PM	Fault Register	128	0 (Fault Register Cleared)

Note:

1. If the new lithium battery pack installation date is not reset, then the corrector performance and functionality remain unchanged. The warning dates for “Remaining Battery Life” will relate to the old lithium battery pack.
2. For the alkaline battery pack, the installation date is not set because the “Remaining Battery Life” calculation is based on the battery voltage.
3. Password (US version) or changing the metrological seal to “Read/Write” position (Canadian version) is not required to reset lithium battery installation date.

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15 Meter Health Diagnostics

Rotary gas meter health diagnostics is provided for meters equipped with an IMCW2 that is fitted with a differential pressure (DP) transducer. The diagnostic is based on the differential pressure value measured between inlet and outlet differential pressure test connections that are installed in the rotary gas meter as cited in ANSI B109.3 Appendix A.

Two independent methods are available to diagnose health of the gas meter:

- Daily DP Logging
- Evaluation of gas meter health against learned DP base line (mathematical model)

In general, the value of differential pressure depends on:

- Gas meter type/size,
- Flow rate of gas,
- Line pressure,
- Gas composition,
- Temperature

This is the reason that the health diagnostic of gas meter must involve DP measurement accompanied with measurement of other parameters.

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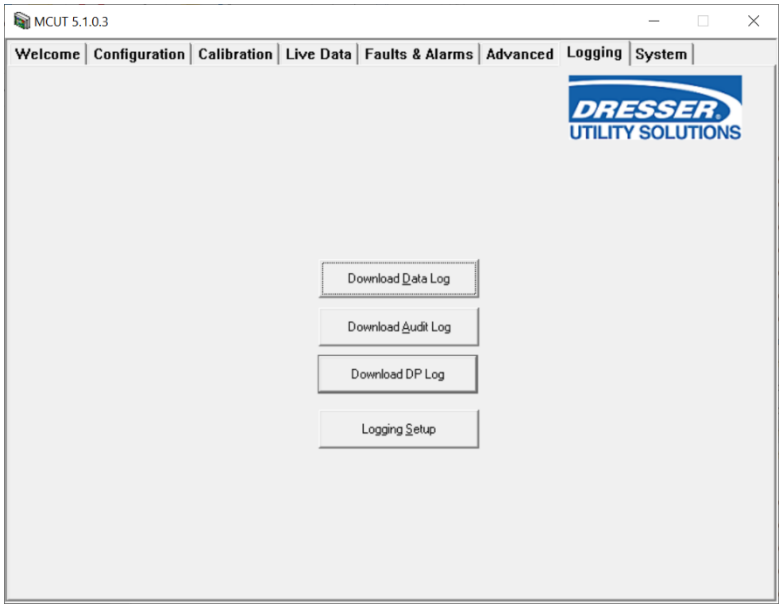
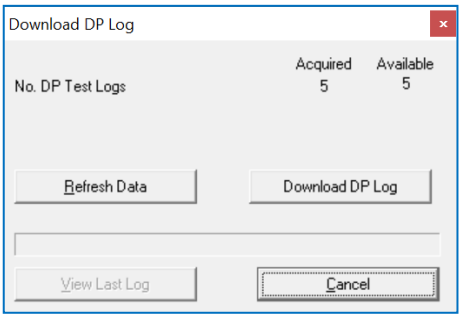
15.1 DP Daily Logging

State Public Utility Commissions (PUC's) regulate the monitoring and reporting of differential pressure test results. The IMCW2 gathers DP related parameters in a designated log that is accessible from the "Logging" tab after the "Download DP Log" button is selected:



Logging screen

The following screen appears with the information regarding number of acquired and available logs:



Download DP Log screen

The downloaded log is visible when the "View last downloaded file" button is selected.

The following parameters are recorded:

- Average DP value from valid samples
- Average flow rate corresponding to DP samples
- Average line pressure
- Average line temperature

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- Date/Time

Example of a daily DP Log:

Number of Logs Stored	5					
Log Number	Date	Time	Avg DP Value	Avg Flow Rate	Avg Line Pressure	Avg Line Temperature
			inWC	ft^3/h	PSI	°F
Reference DP Logs						
1	5/5/2022	2:44:13 PM	0.677	1048	33.967	73.1
2	5/6/2022	9:29:43 AM	0.996	1048	34.672	72.53
3	5/7/2022	9:29:43 AM	0.998	1494	34.646	73.26
4	5/8/2022	9:29:43 AM	0.997	1492	34.604	72.78
5	5/9/2022	9:29:43 AM	0.997	1494	34.639	73.29

The IMCW2 display shows values from the latest daily log if this option is selected. Five values are shown twice on display, each for 6 seconds. Chevrons blink to notify the user that DP test results are available. Refer to the ***Dresser Measurement IMCW2 Hardware Manual*** for further information.

The IMCW2 measures DP values every 30 seconds and gathers samples of valid differential pressure values in four flow bands:

- Minimum flow rate for DP logging - 40 %
- 40 – 60 %
- 60 – 80 %
- 80 – 100 % of maximum flow for gas meter (meter Qmax)

The “Daily DP logging” section on the Live Data screen allows the user to view the diagnostics of the DP Logging functionality. There is information regarding current day status of the DP data gathered. The number of valid samples in each flow range is presented, as is the number of rejected samples because of “Low flow” or “Unstable flow”.

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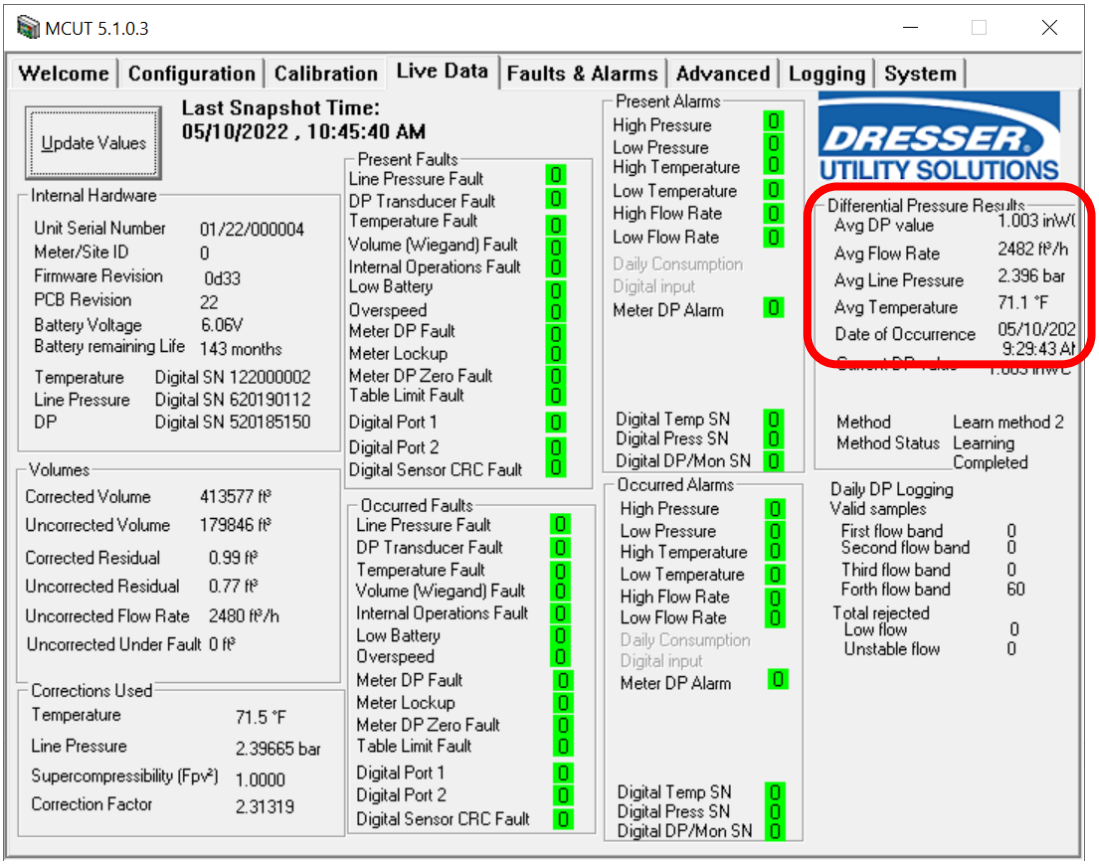

Live Data screen showing Daily DP Logging section.

Samples are gathered for a 24-hour period starting each day at 9 AM (contract start time). The default value for "DP log Sample Size" is 60.

The differential pressure sample is valid if the following conditions are met:

- Corresponding flow rate was higher than "Minimum flow" rate for DP diagnostics
- Flow rate was stable i.e., flow change was not greater than "Flow Stability Limit"
- Flowing gas conditions were within DP minimum and maximum temperature range

If a valid DP sample is registered, then corresponding values of Flow Rate, Line Pressure and Temperature are also gathered. If in any flow band, the number of samples reaches "DP log sample Size," then the average values of DP, flow, pressure, and temperature are calculated.

The size of the Daily DP log is 50 entrees. The first 25 values obtained during the learning period are never overwritten – these are considered the baseline differential for that meter. The next 25 values are overwritten by newer logs. The users can compare the most recent DP daily logs with the 25 DP daily logs acquired as the baseline.

If the IMCW2 is removed from one meter and installed on different gas meter, it is advisable to restart the Daily DP Logging function for the new meter, which can be done by pressing "Restart DP Logging" on the "Meter Diagnostics setup and values" screen.

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15.2 Meter Health Diagnostics

15.2.1 Introduction

Gas meter health is evaluated based on DP value measured over gas meter inlet and outlet. The diagnostic is performed by comparison of measured DP values with theoretical DP value for these conditions, i.e., DP base line. The theoretical value is based on the mathematical model experimentally built.

The mathematical model must include effect of:

- Gas meter type/size,
- Flow rate of gas,
- Line pressure,
- Gas composition,
- Temperature

There are two mathematical models used in IMCW2 that calculate the value of DP in function of mentioned above parameters:

- Dresser Differential Pressure Test Acceptance Calculator (DTAC) Software
- IMCW2 mathematical model with learned coefficient

Note: The DP value depends also on gas composition. Mathematical models in the IMCW2 use specific gravity of the flowing gas as gas composition characterization. The value of the specific gravity must be entered in the IMCW2. There are two linked screens provided in the MCUT to enter this value.

- DP Measurement Setup
- Compressibility calculation Gross Methods setup screen.

There are three main indicators of gas meter health, refer to section "*Gas Meter Diagnostics - Indicators*":

- Meter Alarm;
- Meter Fault;
- Meter Lockup.

15.2.2 Selection of DP baseline for gas meter diagnostics

The DP mathematical model that is used for gas meter diagnostic is selectable from two options:

- Dresser Differential Pressure Test Acceptance Calculator (DTAC) Software
- Baseline DP of the gas meter, learned after IMCW2-dp installation

There are two DP baseline learning methods:

- Learning Method 1
- Learning Method 2

The selection of the method is available on the "Advanced" tab in the "Gas Meter Health" section:

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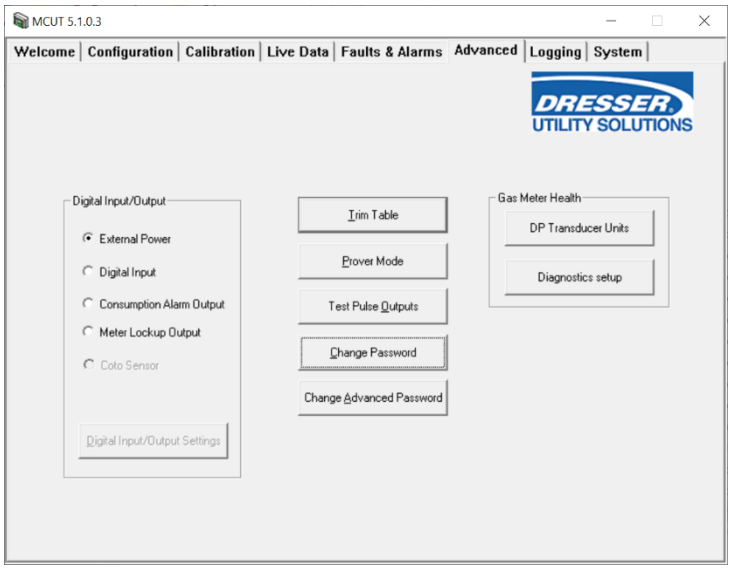
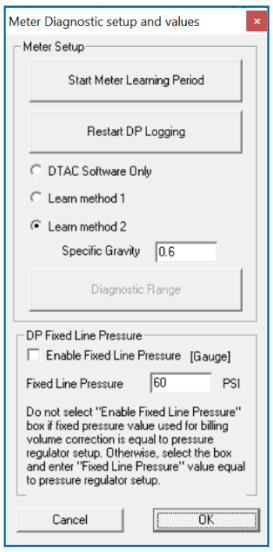


IMCW2 Advanced Tab

After “Gas Meter Health” button is pressed, then the screen with method selection is shown:



Meter Diagnostic setup and values screen

If the Dresser DTAC Software is selected for gas meter diagnostics, then the “Starting Meter Learning Period” option is not available. If Learning Method 1 or 2 is selected, then this button is available to start the DP baseline learning.

The Dresser DP calculator (DTAC software) is a released software tool that helps the user qualify results of manual DP testing. The latest revisions to this legacy software have resulted in important changes to the mathematical model. The mathematical model used in the DTAC software is used in the IMCW2. This model requires values of line pressure, flow rate, specific gravity, and meter size/type. Not all Dresser meter types are included in this software.

A rotary gas meter can show different DP values in one installation than in a different installation for this same flow, pressure, temperature, and gas conditions. Therefore, the IMCW2 uses learned parameters for the installed rotary meter based on the mathematical model for gas meter diagnostics. It is preferable if the rotary meter is either new or clean and in good working condition. The learning period is generally initiated just after meter installation into the meter set.

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During this learning period, values of DP are gathered as a function of flow rate, line pressure, line temperature, and gas composition. All these parameters are measured by the IMCW2 except for gas composition. The gas composition is determined based on its specific gravity and must be defined by the user.

After the learning period is successfully completed, parameters for the mathematical model of DP are calculated. Learned Base DP line is now defined and can be used for gas meter diagnostics. Baseline DP is stored in non-volatile memory - even if the battery is disconnected and later reconnected, DP baseline is restored. Only if the user chooses to start and successfully complete new learning, will the previous DP baseline be overwritten.

Note: If the meter size or type is changed during the learning period, then the new learning must be initiated, and a warning is displayed in MCUT

15.2.3 Fixed line pressure for T-only IMCW2

Certain applications that require temperature only live correction – for example when correction for applied pressure is made in utility billing software by using fixed pressure values from the pressure regulator. In this case, the pressure correction factor in volume corrector is set to 1. The Fixed Factor value for pressure correction does not represent live pressure and cannot be used for gas meter diagnostics. IMCW2 has separate functionality that allows for setting the fixed line pressure for gas meter diagnostics only. This value will not be used for billing purposes. The operator must make the selection “Enable Fixed Line Pressure” in the “DP Fixed Line Pressure” section of the “Meter Diagnostic setup and values” screen.

The actual value of pressure from the pressure regulator should be entered.

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15.3 Gas meter Health Diagnostics - Indicators

There are three main indicators of gas meter health:

- Meter Alarm
- Meter Fault
- Meter Lockup

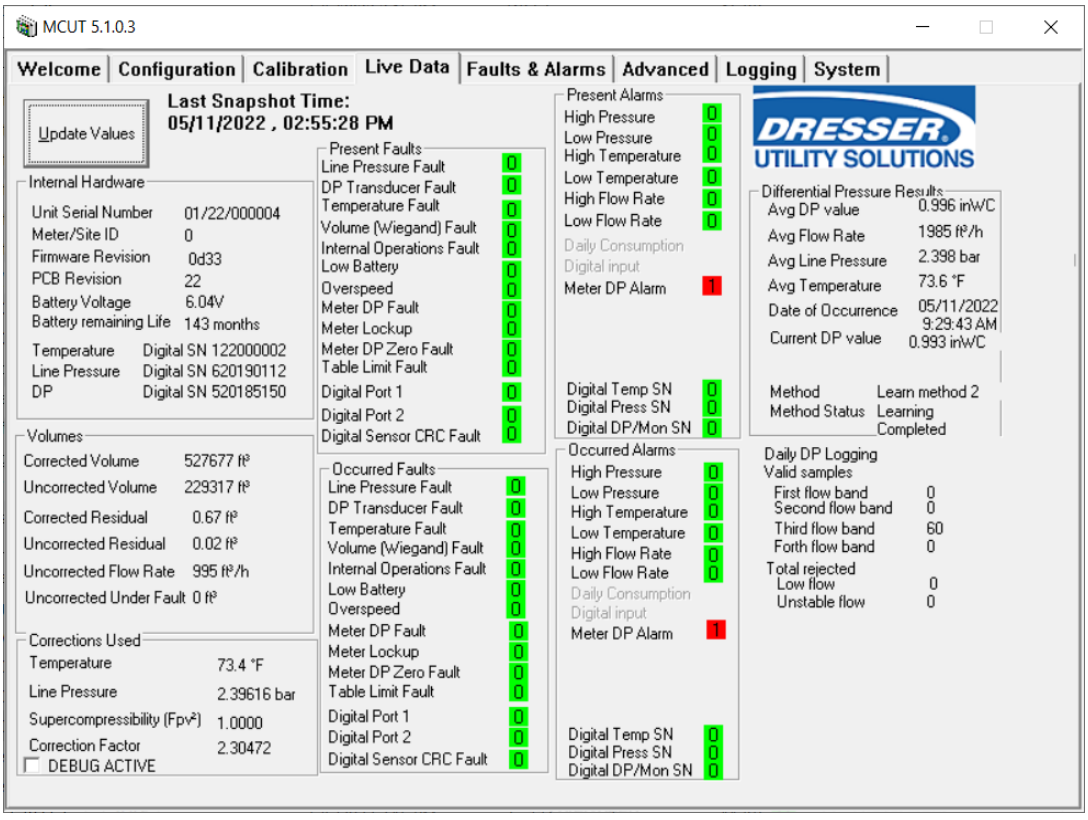
Information regarding gas meter health is available on the Live Data screen and on the IMCW2 display. In addition, fault output pulses are generated.

The Dresser DTAC software is used for meter health diagnostics as follows:

- For full meter health diagnostics (fault, lock-up & alarm) if it is selected on “Meter Diagnostic setup and values”
- For meter DP fault and meter Lockup diagnostics during Method 1 learning.
- For full meter DP diagnostic if Method 1 learning fails.

15.3.1 Meter DP Alarm

Meter DP alarm is set by the corrector if a defined number of DP values measured in sequence have exceeded the meter DP alarm threshold:



Meter DP Alarm Set

The Meter DP Alarm threshold is defined as the result of the multiplication of the theoretical DP value and an alarm factor. Only valid DP samples are used as they were defined in “DP Daily Log” paragraph.

If the number of sequential events is equal to the alarm sample size, the Meter DP Alarm is set. If the valid DP sample is below the alarm threshold value, then the counting of DP samples is reset.

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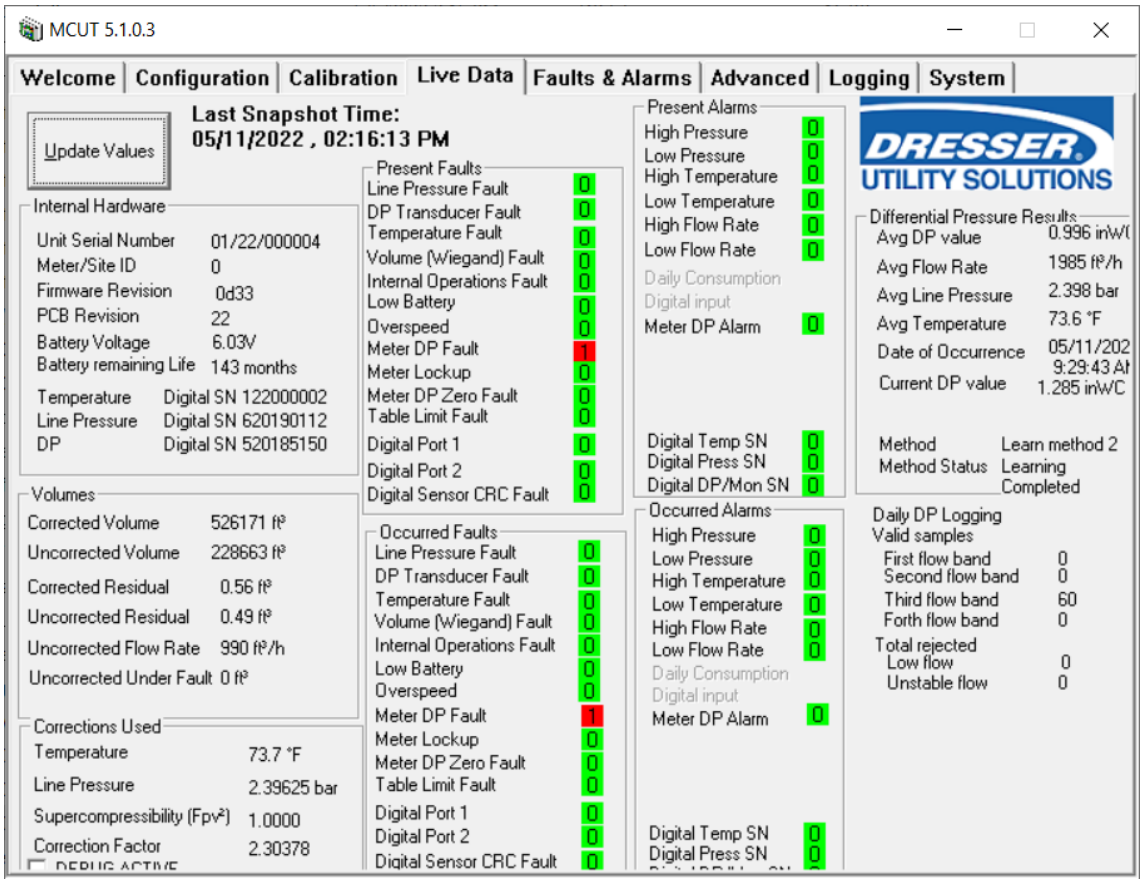
Alarm is shown on the Live Data screen and on the IMCW2 display as **Meter AL**. Fault output pulses are generated and the event is registered in the Audit Log, Date/Time stamped.

15.3.2 Meter DP Fault

The Meter DP Fault is set if the defined number of DP values measured in sequence have exceeded the meter fault threshold:



Meter DP Fault Set

The Meter DP fault threshold is defined as result of the multiplication of the theoretical DP value and a fault factor. Only valid DP samples are used as defined in the "DP Daily Log" description.

If the number of sequential events is equal to the defined fault sample size the fault is set. If a valid DP sample is below the fault threshold value, then the counting of DP samples is reset. The Meter Fault Threshold Counter is shown on the Advanced Diagnostics screen. **Meter Ft** is visible on the Live Data screen and on the IMCW2 display. Fault Pulse outputs are generated and the event is registered in Audit Log, Date/Time stamped.

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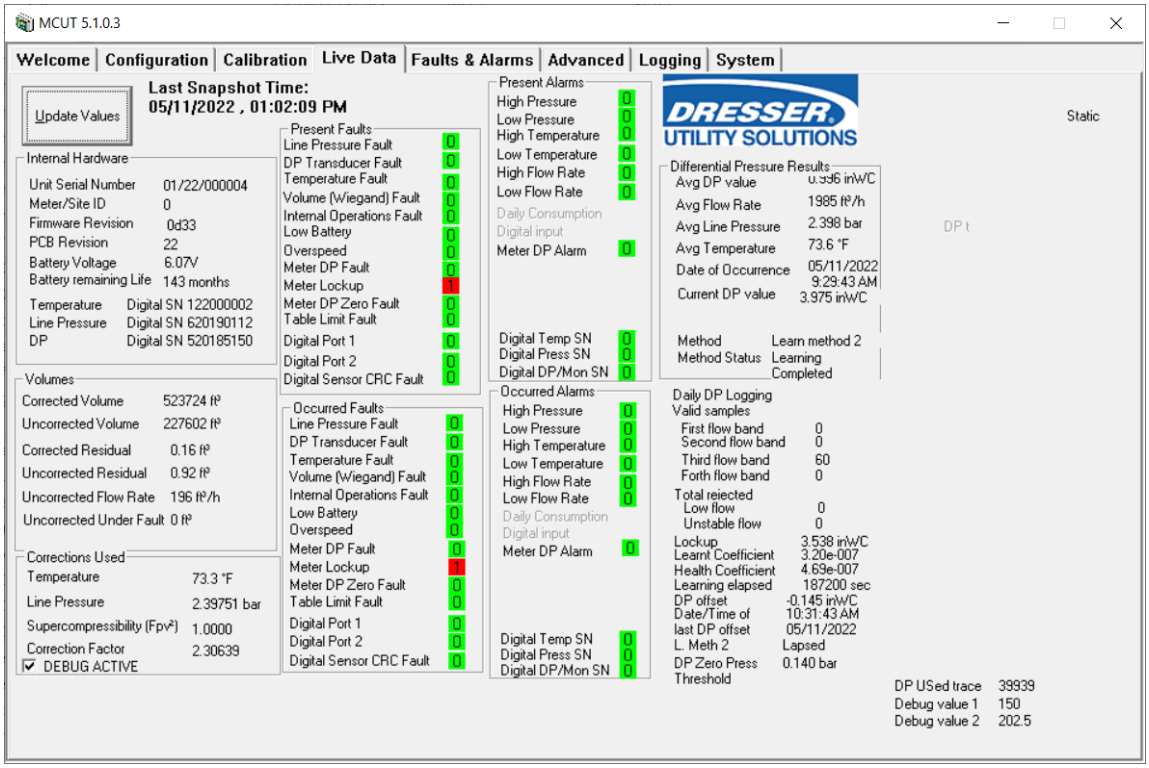
15.3.3 Meter Lockup

Meter DP Lockup is set if the defined number of DP values measured in sequence have exceeded the meter lock-up threshold. This fault is evaluated only below “Minimum Flow”.



Meter Lockup Set

The DP meter fault threshold is a result of the multiplication of a theoretical DP value for “Minimum Flow” and a lockup factor. The number of sequential events must be equal to the lockup sample size before a fault is set. If the valid DP sample is below the lockup threshold value, then the counting of DP samples is reset. **DP LOC** is displayed on the Live Data screen and on the IMCW2 display. Fault Pulse output is generated, and the event is registered in the Audit Log, Date/Time stamped.

DP ALARM/FAULTS	DESCRIPTION/ REASON	LCD with solid bell icon	LIVE DATA for fault names
Meter DP alarm	Meter DP alarm s set when the alarm limit set by Dresser is exceeded	**dP AL**	Meter DP Alarm
DP serial number Alarm	This alarm is set when a new DP sensor is connected but not yet commissioned via MCUT	**dP Sn AL**	
DP transducer fault	If the DP sensor is not connected due to wire disconnect or the DP value is out of range	**Pnn fLt**	DP transducer fault (Pressure monitor sensor shares this same fault name
DP Zero fault	This fault occurs during pipeline installation, when the natural offset of DP sensor at zero flow ,after offset is removed is higher than set value for DP zero limit by Dresser	**dP Zero**	Meter DP Zero fault
Meter DP Fault	When the flow is greater than 30% , Meter DP fault is set when the fault limit set by Dresser is exceeded	**dP fLt**	Meter DP fault
Meter DP lockup	When the flow is less than 30% and the DP value is greater than the value set by Dresser for lockup limit this fault is set	**dP LOC**	Meter lockup

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Appendix A - LCD Displayed Messages

The parameters displayed on the LCD of the IMCW2 can be accessed via the scroll button on the either the front panel or on the side of the IMCW2 enclosure. In addition to the parameters listed in *Customize LCD* screen, further *messages* are displayed for informational purposes.

Note: Some of these *messages* are dependent on the corrector model.

Reference Table - Messages Displayed on LCD

LCD Parameter	Additional Information	Example
Corrected Volume	Maximum 9 digits. The display multiplier and volume units are also displayed.	999999999 x100 cu ft
Uncorrected Volume	Maximum 9 digits. The display multiplier and volume units are also displayed	999999999 x100 cu ft
Flow Rate	In addition to the flow rate value the volume units will be displayed.	0.0 m3
Correction Factor	Value only.	
Meter Size*	Meter Series, meter size	b 3 nn
Line Pressure	Pressure reading and pressure units displayed.	1.001b
Differential Pressure	Inlet/Outlet meter differential pressure reading units displayed.	00.001 I
Temperature	Temperature reading and temperature units displayed.	50.1C
Uncorrected Volume Under Fault	Maximum 5 digits. The letters UF are displayed to signify Uncorrected volume under Fault. The display multiplier and volume units are also displayed.	99999UF x100 cu ft
Corrected Residual	Maximum 3 digits (and 2 decimal places). The letters Cr are displayed to signify Corrected Residual. The display multiplier and volume units are also displayed.	199.99Cr x100 cu ft
Uncorrected Residual	Maximum 3 digits (and 2 decimal places). The letters Ur are displayed to signify Uncorrected Residual. The display multiplier and volume units are also displayed.	199.99Ur x100 cu ft
Firmware version	Firmware version followed by Fr.	1.83Fr
Atmospheric Pressure	Atmospheric pressure reading followed by PA.	1.01 PA
Base Pressure	Base pressure reading followed by Pb.	1.01 Pb
Pressure Factor	Pressure factor value followed by PF.	1.00 PF
Supercompressibility	Supercompressibility value followed by Zb	1.002b Zb
Battery Voltage	Indication of battery voltage followed by Ub	5.39 Ub
Current Date	Date is displayed with an underscore separator. MM/DD/YY format.	05_01_03
Current Time	Time is displayed with a dash separator. HH/MM/SS	10-30-59
Test Screen	LCD will display each section (as an 8) individually and all symbols (battery icon, display multiplier and volume units)	
DP Test Screen	Last valid DP test results (Avg DP value, avg flow rate, avg line pressure, avg temp, and date of occurrence) will be displayed with all blinking chevrons on LCD. These values will cycle twice on the screen.	
Max Peak Flow Rate	Maximum peak flow rate will be displayed with all solid chevrons on LCD.	

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Units	**Description**
x0.1	0.1 Display multiplier
x1	1 Display multiplier
x10	10 Display multiplier
x100	100 Display multiplier
x1000	1000 Display multiplier
cu ft	Cubic feet
m^3	Cubic meters
b	Bar
P	PSI
|-PA	KPa/cm^2
|-9F	Kgf/cm^2
ı	Inches of Water Column
nnb	mbar
P FLt	Pressure Fault
Pm FLt	Monitor or DP Pressure Fault
t FLt	Temperature Fault
VoL FLt	Volume Fault
Int FLt	Internal Operation Fault
Lo bAtt	Low battery condition.
HP AL	High Pressure Alarm
LP AL	Low Pressure Alarm
Ht AL	High Temperature Alarm
Lt AL	Low Temperature Alarm
HF AL	High Flow Alarm
LF AL	Low Flow Alarm
d_In_AL	Digital Input Alarm
tAnnPEr	Tamper Alarm
vol AL	Volume Consumption Alarm
ProvE *XX*	IMCW2 is in Prover mode; remaining minutes will also be displayed
ProvE?	Pressing the Scroll Button will put the IMCW2 into Prover mode
dIAL Out	IMCW2 has entered modem dial out mode.
CLr Flt	Clear Fault – pressing the Scroll Button will clear any occurred fault and alarm.
PULSES	IMCW2 is in test pulse output mode.
dP FLt	Meter DP Fault
dP AL	Meter DP Alarm
dP LOC	Meter Lockup Fault
OS FLt	Overspeed Fault

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Dresser Micro Corrector IMCW2 User Terminal Manual NGS.MI.0122
12/2022

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