# PMC-D961MD

## DC Multifunction Meter
## User Manual
## Version: V1.0

**January 20, 2025**

**DANGER**

This symbol indicates the presence of danger that may result in severe injury or death and permanent equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

**CAUTION**

This symbol indicates the potential of personal injury or equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

## DANGER

**Failure to observe the following instructions may result in severe injury or death and/or equipment damage.**

- Installation, operation and maintenance of the meter should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.
- Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the meter.
- Before connecting the meter to the power source, check the label on top of the meter to ensure that it is equipped with the appropriate power supply, and the correct voltage and current input specifications for your application.
- During normal operation of the meter, hazardous voltages are present on its terminal strips and throughout the connected potential transformers (PT) and current transformers (CT). PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuits energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries…etc).
- Do not use the meter for primary protection functions where failure of the device can cause fire, injury or death. The meter should only be used for shadow protection if needed.
- Under no circumstances should the meter be connected to a power source if it is damaged.
- To prevent potential fire or shock hazard, do not expose the meter to rain or moisture.
- Setup procedures must be performed only by qualified personnel familiar with the instrument and its associated electrical equipment.
- DO NOT open the instrument under any circumstances.

## Limited warranty

- CET offers the customer a minimum of 12-month functional warranty on the meter for faulty parts or workmanship from the date of dispatch from the distributor. This warranty is on a return to factory for repair basis.
- CET does not accept liability for any damage caused by meter malfunctions. CET accepts no responsibility for the suitability of the meter to the application for which it was purchased.
- Failure to install, set up or operate the meter according to the instructions herein will void the warranty.
- Only CET's duly authorized representative may open your meter. The unit should only be opened in a fully anti-static environment. Failure to do so may damage the electronic components and will void the warranty.

# Table of Contents

# Chapter 1 Introduction

This manual explains how to use the PMC-D961MD DC Multifunction Meter. Throughout the manual the term “meter” generally refers to all models. Differences between the models are indicated with the appropriate model number.

This chapter provides an overview of the PMC-D961MD meter and summarizes many of its key features.

## 1.1 Overview

The PMC-D961MD DC Multifunction Meter is CET’s latest offer for the low-cost DC metering market. Housed in an industry standard DIN form factor measuring 96x96x87.2mm, it is perfectly suited for industrial, commercial and utility DC metering applications. The PMC-D961MD complies with Class 0.5 kWh Accuracy Standard and features quality construction, multifunction measurements and a bright, easy to read LCD display. The PMC-D961MD comes standard with two Front Panel LED indicators for Energy Pulsing and Communication. It provides 4xDI for status monitoring, 2xDO for Control and Alarming, and 1xSS Pulse Output for kWh Energy Pulsing applications. The standard SOE Log records meter events such as power-off, Setpoints, setup changes and DI operations in 1ms resolution. With a standard RS-485 port and an optional 10/100BaseT Ethernet Port support, the PMC-D961MD becomes a vital component of an intelligent, multifunction monitoring solution for any DC Power and Energy Management systems.

You can set up the meter through its Front Panel or via our free software. The meter is also supported by our PecStar® iEMS Integrated Energy Management System.

Following is a list of typical applications for the PMC-D961MD:

- DC Inverter, DC Panel Metering and DC Charging Station
- Industrial and commercial DC metering
- DC Distribution Monitoring

Contact CET Technical Support should you require further assistance with your application.

## 1.2 Features

**Ease of use**

- Large, Backlit Dot-Matrix LCD display with wide viewing angle
- Intuitive user interface
- LED indicators for Energy Pulsing and Communication activities
- Password protected setup via Front Panel or free setup software
- Easy installation with mounting clips, no tools required

**Measurements**

- Voltage, Bi-directional Current and P Import/Export
- Bi-directional kWh measurements

**Demands**

- Present Demands for Current and P
- Max. Demands with Timestamp for This Month & Last Month

**Setpoints**

- 6 user programmable Setpoints with extensive list of monitoring parameters including Voltage, Current, Power and P Demand, etc.
- Configurable thresholds, time delays and DO triggers

**SOE Log**

- 32 events time-stamped to ±1ms resolution
- Setup changes, Power On/Off, Setpoints and DI status changes as well as DO operations

**Max./Min. Log**

- Max./Min. Log with Timestamp for Current and P
- Configurable for This Month & Last Month

**Monthly Freeze Log**
- Monthly Log with Timestamps for kWh Import/Export
- Available through Modbus communication for 24 Monthly Freeze records

**Inputs and Outputs**
- 2xFront Panel LED indicator for Energy Pulsing and Communication
- 4xDigital Input for Status Monitoring
- 2xDigital Output for Control and Alarming
- 1xSS Pulse Output

**Communications**
- Standard with one RS-485 port with baud rate from 1.2kbps to 38.4kbps
- One optional 10/100BaseT Ethernet Port with RJ45 connector
- Modbus RTU and Modbus TCP support

**Real-Time Clock**
- Battery-backed Real-time Clock with with 6ppm accuracy (<0.5s per day)

**System Integration**
- Supported by CET's PecStar® iEMS
- Easy integration into other Automation, SCADA or BMS systems via Modbus RTU

## 1.3 Getting more information

Additional information is available from CET via the following sources:

- Visit www.cet-global.com
- Contact your local representative
- Contact CET directly via support@cet-global.com

# Chapter 2 Installation

## Caution

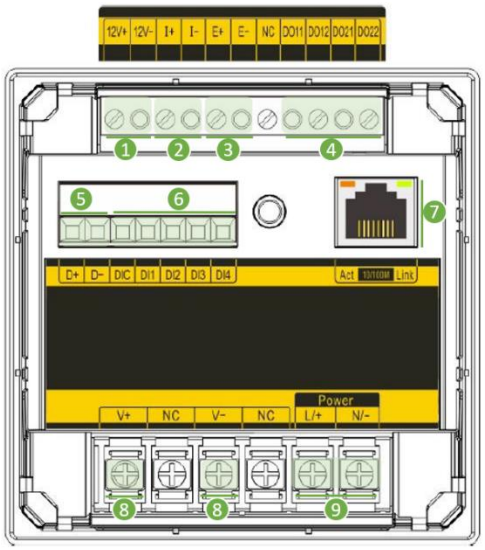
Installation of the PMC-D961MD should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

During the operation of the meter, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

## 2.1 Appearance


1 LED Pulse Output
2 Enclosure
3 Front Panel
4 Comm. Indicator
5 Units
6 Measurements
7 Buttons

**Figure 2-1 Appearance**




1 ±12V DC Power supply for Hall-Effect Sensor
2 Current Input via Hall-Effect Sensor
3 1xSS Pulse Output
4 2xDigital Output
5 1xRS-485 Port
6 4xDigital Input
7 Ethernet Port (Optional)
8 Voltage Input
9 Power Supply

**Figure 2-2 Rear Panel**

## 2.2 Mounting and Dimensions

The PMC-D961MD meter should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise source.

Installation steps:

- Remove the installation clips from the meter
- Fit the meter through a 92mmx92mm cutout as shown in Figure 2-3
- Re-install the installation clips and push the clips tightly against the panel to secure the meter

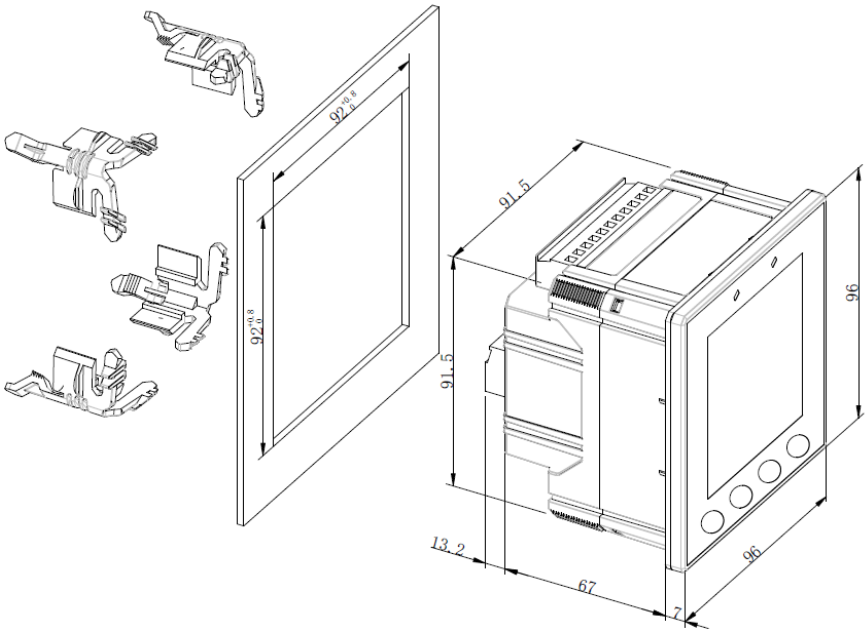



**Figure 2-3 Panel Cutout**

## 2.3 Input Wiring

Please consult the serial number label to ensure that the voltage and current input is less than or equal to the meter's input specification.

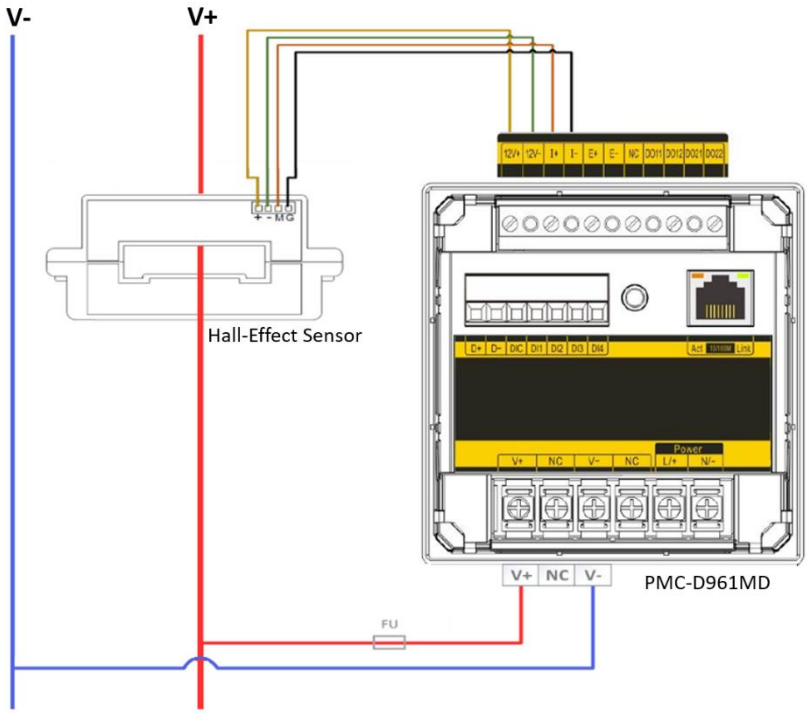



**Figure 2-4 Input Wiring**

## 2.4 Communications Wiring

### 2.4.1 Ethernet Port (10/100BaseT)

The following table illustrates the pin definition for the RJ45 Ethernet connector.

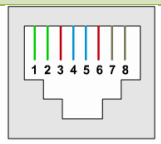
| RJ45 Connector | Pin | Meaning |
|---|---|---|
|  | 1 | Transmit Data+ |
| | 2 | Transmit Data- |
| | 3 | Receive Data+ |
| | 4,5,7,8 | NC |
| | 6 | Receive Data- |



**Table 2-11 RJ45 Connector Pin Description for 10/100BaseT Applications**

### 2.4.2 RS-485 Port

The PMC-D961MD provides one RS-485 port and supports the Modbus RTU protocol. Up to 32 devices can be connected on a RS-485 bus. The overall length of the RS-485 cable connecting all devices should not exceed 1200m. If the master station does not have a RS-485 communications port, a RS232/RS-485 or USB/RS-485 converter with optically isolated output and surge protection should be used.

The following figure illustrates the RS-485 communications connections on the PMC-D961MD:

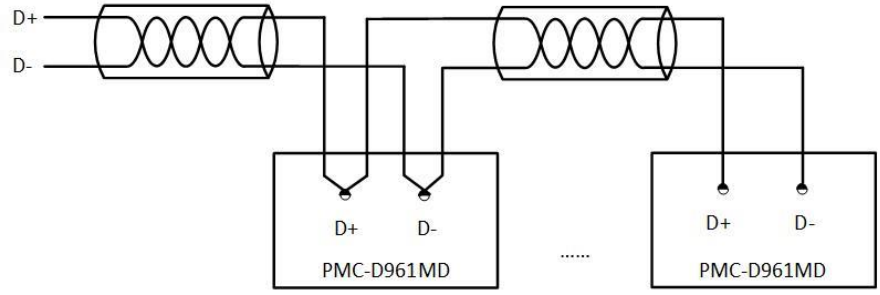



**Figure 2-5 Communications Connections**

## 2.5 Digital Input Wiring

The following figure illustrates the Digital Input connections on the PMC-D961MD:

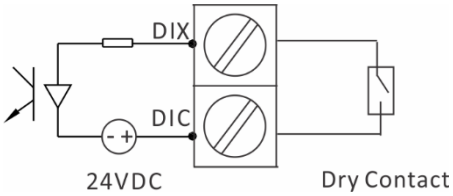



**Figure 2-6 DI Connections**

## 2.6 Digital Output Wiring

The following figure illustrates the Digital Output connections on the PMC-D961MD:

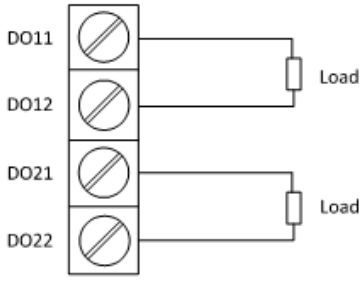



**Figure 2-7 DO Connections**

The following figure illustrates the Digital Output connections when the DO is used for controlling circuit breaker.

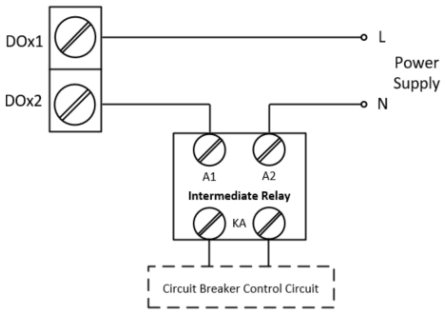



**Figure 2-8 DO Connections for Controlling Circuit Breaker**

## 2.7 Pulse Output Wiring

The following figure illustrates the Solid-State Pulse Output connections on the PMC-D961MD:

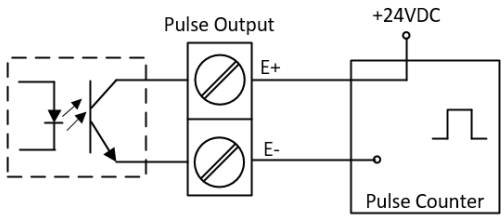



**Figure 2-9 Solid-State Pulse Output Connections**

## 2.8 Power Supply Wiring

For AC supply, connect the live wire to the L/+ terminal and the neutral wire to the N/- terminal.

For DC supply, connect the positive wire to the L/+ terminal and the negative wire to the N/- terminal.

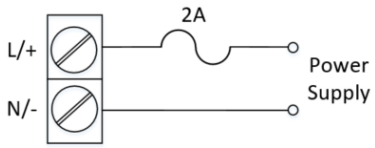



**Figure 2-10 Power Supply Connections**

# Chapter 3 Front Panel

The PMC-D961MD meter has a large, bright, backlit LCD display and four buttons for data display and meter configuration. This chapter introduces the front panel operations.


**Figure 3-1 Front Panel**

## 3.1 Using the Front Panel Buttons

The PMC-D961MD's Front Panel has been designed with a menu-driven interface that is extremely user friendly such that all one has to do is to simply follow the menu at the bottom of the screen. The button definitions for F1 to F4 under **Display Mode** and **Setup Mode** are explained in the following table. **The default password is 0000 (four zeros).**

| Mode | Menu/Page/Parameter | Buttons | | | |
|---|---|---|---|---|---|
| | | F1 | F2 | F3 | F4 |
| Display Mode | Main Menu | ← (Menu Left) | Select Option | Select Option | → (Menu Right) |
| | Sub Menus | Esc (Exit) | ↑ (Page Up) or Select Option | ↓ (Page Down) or Select Option | → (Menu Right) or Select Option or Null (Not Used) |
| Setup Mode | Password Page | Esc (Exit) | Browse (View Only) | Null (Not Used) | Enter (Confirm) |
| | Enter Password | Cancel (Exit) | ← (Shift Left) | ↑ (Increment) | OK (Confirm) |
| | Browse/Setup Menu (Until a parameter is selected) | Esc (Exit) | ↑ (Cursor Up) | ↓ (Cursor Down) | Enter (Select Parameter) |
| | Enumerated Parameter | Cancel (Exit) | ← (Previous) | ↑ (Next) | OK (Confirm) |
| | Numeric Parameter | Cancel (Exit) | ← (Shift Left) | ↑ (Increment) | OK (Confirm) |

**Table 3-1 Buttons Description**

## 3.2 LED Pulse Outputs

The PMC-D961MD comes standard with one LED indicator for Energy Pulse Output which can be used for kWh energy pulsing if the **LED EN Pulse** is enabled (see **Section 4.1.2 Energy Pulse Output** for more information) and a second LED indicator for Communication Status.

## 3.3 Data Display

### 3.3.1 Default Display

The figure below illustrated the **Default Display** for the PMC-D961MD, which displays U, I, P and communication status. Pressing **<←>/<F1>** or **<→>/<F4>** to scroll the main menu at the bottom, and press **<F2>/<Energy>** or **<F3>/<DMD>** to select **Energy** or **DMD** to display corresponding information.

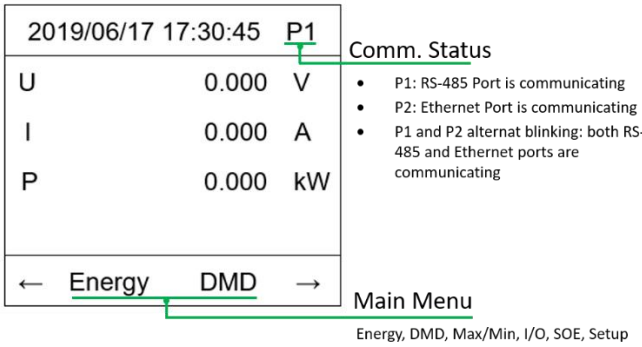



**Figure 3-2 Default Display**

### 3.3.2 Data Display

The following table illustrates the data display screens for the PMC-D961MD model.

| Menu | Display Screens | 1st Row | 2nd Row | 3rd Row | 4th Row |
|---|---|---|---|---|---|
| **<Energy>** | Display 1 (kWh) | Imp | Exp | | |
| **<DMD>** | Display 1 (Max Demand) | I | P | | |
| | | Timestamp | Timestamp | | |
| | Display 2 (Pres Demand) | I | P | | |
| **<Max/Min>** | Display 1 (Max) | I | P | | |
| | | Timestamp | Timestamp | | |
| | Display 2 (Min) | I | P | | |
| | | Timestamp | Timestamp | | |
| **<I/O>** | Display 1 (DI Status) | DI1 | DI2 | DI3 | DI4 |
| | Display 2 (DO Status) | DO1 | DO2 | | |

**Table 3-2 PMC-D961MD Data Display Screens**

### 3.3.3 SOE Log

The PMC-D961MD supports the display of the SOE Log with up to 32 Events (2 Events per page) such as I/O Changes, Setpoint, …etc, on the Front Panel. In addition, the SOE Log can be reset from the Front Panel or through the communications. Examples of Event Log Display:

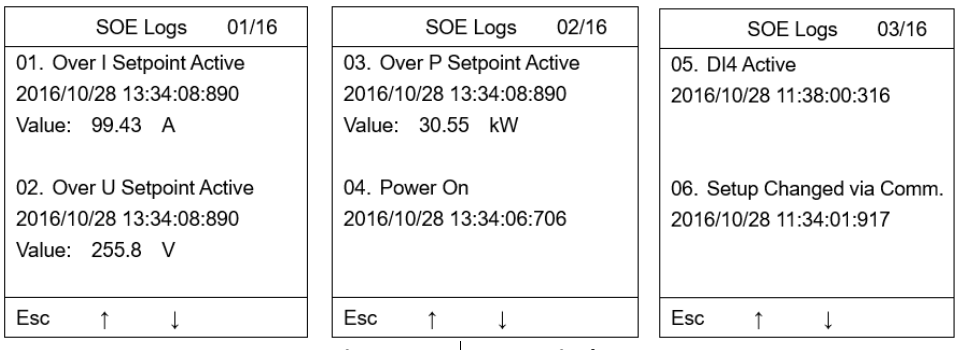



**Figure 3-3 SOE Log Displays**

## 3.4 Setup Configuration via the Front Panel

Pressing **<←>/<F1>** or **<→>/<F4>** to scroll the menu at the bottom until **<Setup>** appears and then press the button associated with **<Setup>** to browse or change the setup parameters.

### 3.4.1 Making Setup Changes

**1) Entering the Password:**

- Press **<Setup>** to enter the **Setup Mode**.
- Press **<F4>/<Enter>** to advance to the **Password** page.
- A correct password must be entered before changes are allowed. The factory default password is "0000".
- Press **<F2>/<←>** to shift the cursor to the left or **<F3>/<↑>** to increment the numeric value for the password.
- When the password has been entered, pressing **<F4>/<OK>** will advance to the setup menu if the password is correct.

**2) Selecting a parameter to change:**

- Press **<F2>/<↑>** or **<F3>/<↓>** to scroll to the desired sub-menu or parameter.
- Press **<F4>/<Enter>** to select the sub-menu or parameter.
- Repeat the step 2 until a setup parameter has been selected.

**3) Changing and saving a setup parameter:**

- For a Numeric parameter, press **<F2>/<←>** to shift the cursor to the left or **<F3>/<↑>** to increment the numeric value
- For an Enumerated parameter, press **<F2>/<←>** or **<F3>/<↑>** to scroll backward and forward in the selection list.
- After modification, press **<F4>/<OK>** to save the change into memory or **<Cancel>** to exit the currently selected parameter without change.
- Repeat step 3) until all setup parameters have been changed.

**4) Exiting the Setup Mode**

- Press **<F1>/<Esc>** to return to the **Display Mode**.
- Also, the **Setup Mode** will be automatically exited if there is a period of inactivity of 1 minute or longer.

### 3.4.2 Setup Menu

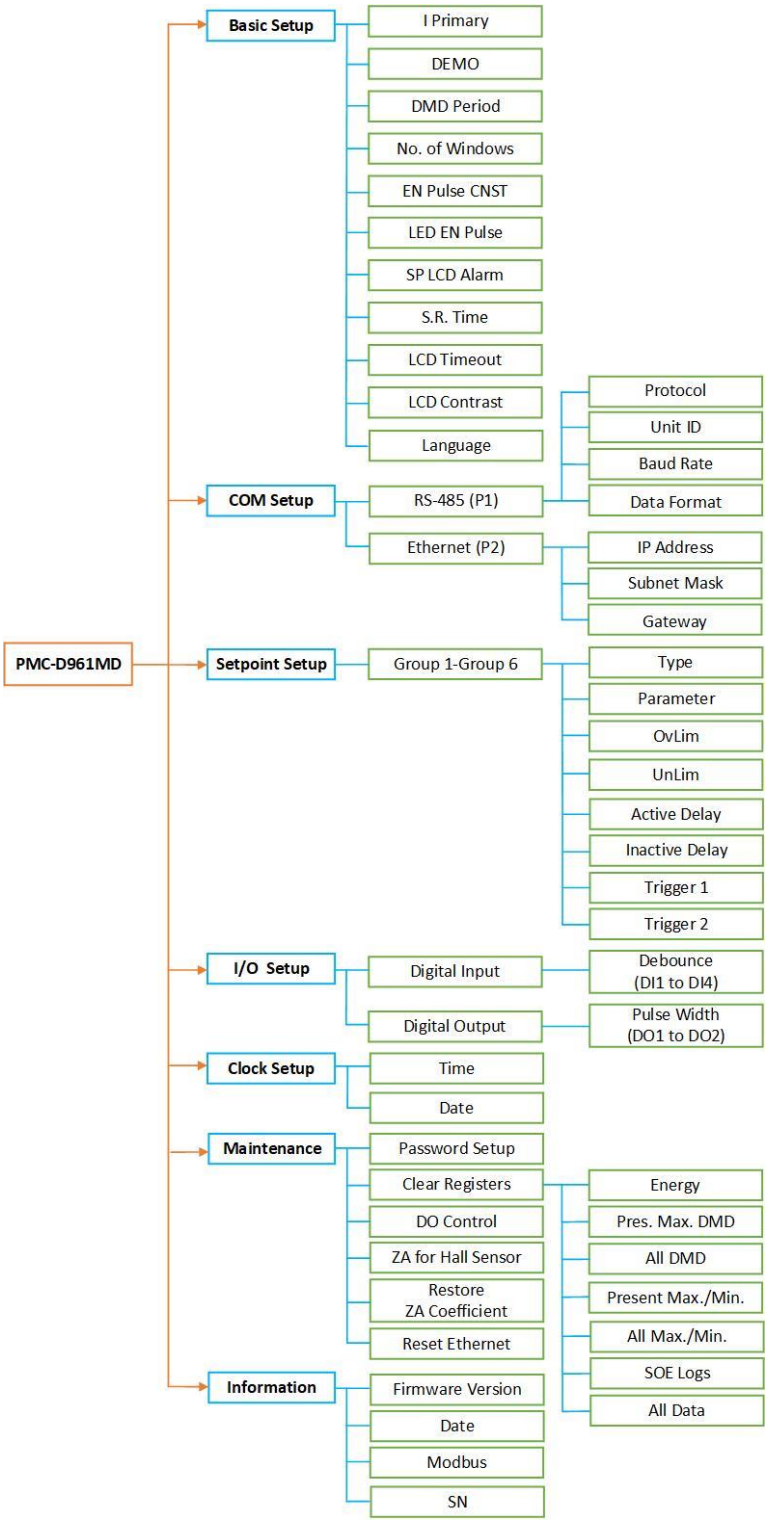



**Figure 3-4 Setup Menu**

### 3.4.3 Configuration

The Setup Configuration mode provides access to the following setup parameters:

| Label<br>Menu<br>1st 2nd 3rd | Description | Range | Default |
|---|---|---|---|
| Password | Enter Password | 0000 to 9999 | 0000 |
| **Basic** | | | |
| I Primary | I Primary Ratio | 1 to 10000A | 100 |
| DEMO | DEMO mode | ON/OFF | OFF |
| DMD Period | Demand Interval | 1 to 60 min | 15 |
| No. of Windows | Number of Sliding Windows | 1 to 15 | 1 |
| EN Pulse CNST | Pulse Constant | 1/10/100/400 | 100 |
| LED EN Pulse | Enable kWh Energy Pulsing | ON/OFF | ON |
| SP LCD Alarm | Enable Flashing LCD Alarm | ON/OFF | ON |
| S.R. Time | Self-Read Mode to both Max. Demand and Max./Min. Log | 1D00H to 28D23H | 1D00H |
| LCD Timeout | Backlight Timeout | 0 to 60 min | 5 |
| LCD Contrast | Display Contrast | 0 to 9 | 5 |
| Language | System Language | Chinese/English | English |
| **Comm.** | | | |
| RS-485 (P1) | | | |
| Protocol | Protocol | Modbus | Modbus |
| Unit ID | Modbus Address | 1 to 247 | 100 |
| Baud Rate | Data rate in bits per second | 1200/2400/4800/ 9600/19200/38400 | 9600 |
| Data Format | Data Format | 8N2/8O1/8E1/ 8N1/8O2/8E2 | 8E1 |
| Ethernet (P2) | | | |
| IP Address | IP Address | Ethernet IP Address | 192.168.0.100 |
| Subnet Mask | Subnet Mask | Ethernet Subnet Mask | 255.255.255.0 |
| Gateway | Gateway | Ethernet Gateway | 192.168.0.1 |
| **Setpoint Param** | | | |
| Group 1 | | | |
| Type | Setpoint Type | Disable, Over, Under | Disable |
| Parameter | Setpoint Source | None/U/I/P/P DMD | U |
| OvLim | Over Limit | | 290.0V |
| UnLim | Under Limit | | 275.0V |
| Active Delay | Active Delay | 0 to 9999s | 0 |
| Inactive Delay | Inactive Delay | 0 to 9999s | 0 |
| Trigger 1 | Setpoint Trigger 1 | None/DO1/DO2 | None |
| Trigger 2 | Setpoint Trigger 2 | | None |
| Group 2 | | | |
| Type | Setpoint Type | Disable, Over, Under | Disable |
| Parameter | Setpoint Source | None/U/I/P/P DMD | U |
| OvLim | Over Limit | | 236.0V |
| UnLim | Under Limit | | 225.0V |
| Active Delay | Active Delay | 0 to 9999s | 0 |
| Inactive Delay | Inactive Delay | 0 to 9999s | 0 |
| Trigger 1 | Setpoint Trigger 1 | None/DO1/DO2 | None |
| Trigger 2 | Setpoint Trigger 2 | | None |
| Group 3 | | | |
| Type | Setpoint Type | Disable, Over, Under | Disable |
| Parameter | Setpoint Source | None/U/I/P/P DMD | None |
| OvLim | Over Limit | | 0 |
| UnLim | Under Limit | | 0 |
| Active Delay | Active Delay | 0 to 9999s | 0 |
| Inactive Delay | Inactive Delay | 0 to 9999s | 0 |
| Trigger 1 | Setpoint Trigger 1 | None/DO1/DO2 | None |
| Trigger 2 | Setpoint Trigger 2 | | None |
| … | | | |
| Group 6 | | | |

| | | | |
|---|---|---|---|
| Type | Setpoint Type | Disable, Over, Under | Disable |
| Parameter | Setpoint Source | None/U/I/P/P DMD | None |
| OvLim | Over Limit | | 0 |
| UnLim | Under Limit | | 0 |
| Active Delay | Active Delay | 0 to 9999s | 0 |
| Inactive Delay | Inactive Delay | 0 to 9999s | 0 |
| Trigger 1 | Setpoint Trigger 1 | None/DO1/DO2 | None |
| Trigger 2 | Setpoint Trigger 2 | | None |
| **I/O** | | | |
| Digital Input | | | |
| Debounce | Specifies the minimum duration the **DI** must remain in the Active or Inactive state before a state change is considered to be valid. | | |
| DI1 | Debounce for DI1 to DI4 | 1 to 9999 ms | 20 ms |
| DI2 | | | |
| DI3 | | | |
| DI4 | | | |
| Digital Output | | | |
| Pulse Width | Specifies the duration for which the relay output will be active when a remote control command is received to activate it. | | |
| DO1 | Pulse Width for DO1 to DO2 | 0 to 600 (x0.1s) (0=Latch Mode) | 10 (x0.1s) |
| DO2 | | | |
| **Clock** | | | |
| Time | Time | HH:MM:SS | |
| Date | Date | YYYY-MM-DD | |
| **Maintenance** | | | |
| Password Setup | | | |
| New Password | Enter new password | 0 to 9999 | |
| Confirm Password | Confirm new password | Confirm Password | |
| Clear Registers | | | |
| Energy | Clear Pres. Energy | YES/NO | NO |
| Pres. Max. DMD | Clear Pres. Max. DMD | YES/NO | NO |
| All Demand | Clear All Demand | YES/NO | NO |
| Present Max./Min. | Clear Present Max./Min. Log | YES/NO | NO |
| All Max./Min. | Clear All Max./Min. Logs | YES/NO | NO |
| SOE Logs | Clear All SOE Logs | YES/NO | NO |
| Clear All Data | Clear All of the above | YES/NO | NO |
| DO Control | | | |
| DO1 | DOx Manual Control | Normal/ON/OFF | Normal |
| DO2 | | | |
| ZA for Hall Sensor | Zero I for Hall Sensor | YES/NO | NO |
| Restore ZA Coefficient | I Zero Adjustment Coefficient | YES/NO | NO |
| Reset Ethernet | Restart Ethernet Module | YES/NO | NO |
| **Information** | Check meter information | | |
| Firmware | Firmware Version | e.g. V1.00.01 | |
| Date | Date of the latest firmware update | e.g. 20240701 | |
| Modbus | Modbus Protocol Version | e.g. V1.4 | |
| SN | Serial Number | e.g. 2406005094 | |

**Table 3-3 Setup Parameters**

# Chapter 4 Applications

## 4.1 Inputs and Outputs

### 4.1.1 Digital Inputs

The PMC-D961MD comes standard with four self-excited Digital Inputs that are internally wetted at 24 VDC with a sampling frequency of 1000Hz and programmable debounce. The Digital Inputs on the PMC-D961MD are typically used for status monitoring which can help prevent equipment damage, improve maintenance, and track security breaches. The real-time statuses of the Digital Inputs are available on the Front Panel as well as through communications. Changes in Digital Input status are stored as events in the SOE Log in 1 ms resolution.

The DI parameter **DIx Debounce** specifies the minimum duration the **DI** must remain in the Active or Inactive state before a state change is considered to be valid. The **DIx Debounce** can be programmed via the Front Panel or through communications.

### 4.1.2 Digital Outputs

The PMC-D961MD comes standard with two Form A Electrometrical Relays. Digital Outputs are normally used for setpoint alarming, load control, or remote control applications.

Digital Outputs on the PMC-D961MD can be used in the following applications:

1) **Front Panel Control** Manually operated from the Front Panel. Please refer to the **DO Control** setup parameter in Section 3.4.3 for a detailed description.
2) **Remote Control** Remotely operated over communications via our free PMC EasyConfig software or PecStar® iEMS Integrated Energy Management System.
3) **Control Setpoint** Control Setpoints can be programmed to trigger DO action upon becoming active. Please refer to **Section 4.4** for a detailed description.

The DO parameter **DOx Pulse Width** specifies the duration for which the relay output will be active when a Remote Operate or Setpoint Trigger command is received to operate it. The **DOx Pulse Width** can be programmed via the Front Panel or through communications.

Since there are multiple ways to trigger the Digital Outputs on the PMC-D961MD, a prioritized scheme has been developed to avoid conflicts between different applications. In general, Front Panel Control has the highest priority and can override other control schemes. Remote Control and Control Setpoint share the same priority, meaning that they can all be programmed to control the same Digital Output. This scheme is equivalent to having an implicit Logical OR operation for the control of a Digital Output and may be useful in providing a generic alarm output signal. However, the sharing of a Digital Output is not recommended if the user intends to generate a control signal in response to a specific setpoint condition.

### 4.1.3 Energy Pulse Output

The PMC-D961MD comes standard with one Front Panel LED Pulse Output and one Solid-State Relay Output for energy pulsing. Energy Pulse Outputs are typically used for accuracy testing. The LED Pulse Output on the PMC-D961MD can be enabled via the Front Panel or through communications, and the Solid-State Pulse Output is enabled by default.

## 4.2 Basic Measurement

The PMC-D961MD provides following basic measurements which are available through the Front Panel or communication:

- Voltage, Current and P Import/Export
- kWh Import and kWh Export

## 4.3 Demand Measurements

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes) based on the sliding window method. The PMC-D961MD provides Present Demand for Current and P Total which can be retrieved through the Front Panel or communications.

The PMC-D961MD provides the following setup parameters:

| Setup Parameter | Definition | Options/Default* |
|---|---|---|
| **Demand Period** | 1 to 60 minutes. For example, if the **# of Sliding Windows** is set as 1 and the **Demand Period** is 15, the demand cycle will be 1×15=15min. | 1 to 60 min<br>15* |
| **# of Sliding Windows** | Number of Sliding Windows. | 1* to 15 |
| **Self-Read Time** | The **Self-Read Time** allows the user to specify the time and day of the month for the Max. Demand Self-Read operation. A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day * 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month. | 100* |

**Table 4-1 Demand Setup**

## 4.4 Setpoints

The PMC-D961MD comes standard with 6 user programmable setpoints which provide extensive control by allowing a user to initiate an action in response to a specific condition. Typical setpoint applications include alarming and fault detection monitoring.

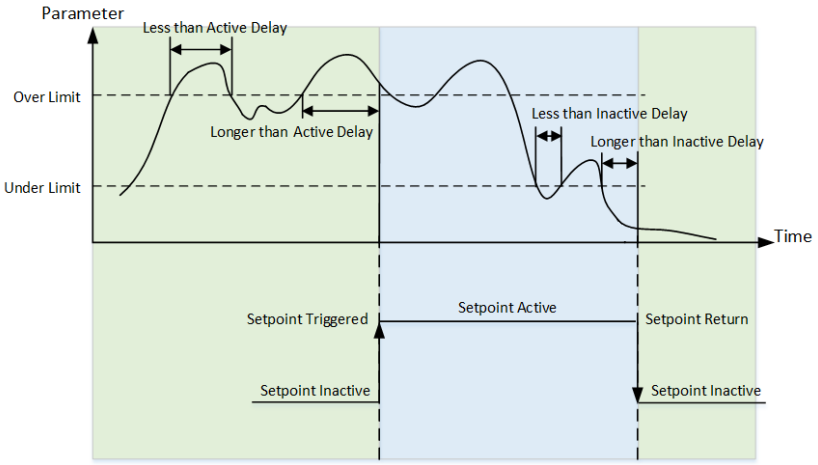



**Figure 4-1 Over Setpoint**

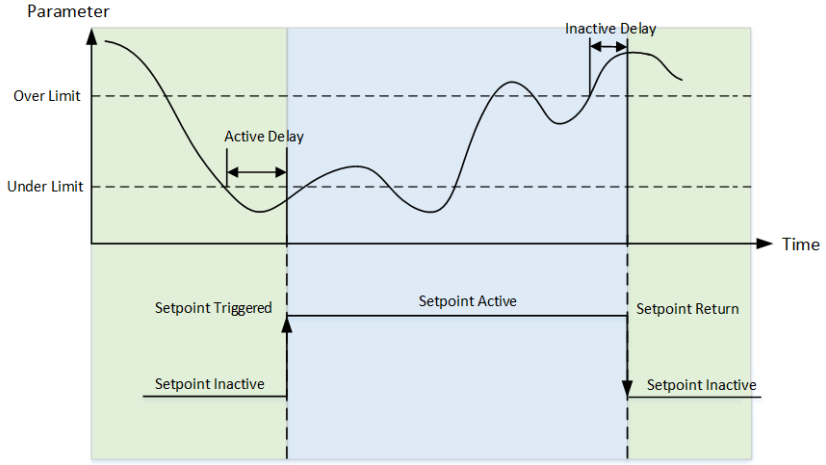



**Figure 4-2 Under Setpoint**

The Setpoints can be programmed through communications and have the following setup parameters:

| Setup Parameter | Definition | Options/Default* |
|---|---|---|
| **Setpoint Type** | Over or Under Setpoint. | 0=Disabled*<br>1=Over Setpoint<br>2=Under Setpoint |
| **Setpoint Parameter** | Specify the parameter to be monitored. | See Table 4-3<br>Setpoint 1-2: 1*<br>Setpoint 3-6: 0* |
| **Over Limit** | Specify the value that the setpoint parameter must exceed for Over Setpoint to become active or for Under Setpoint to become inactive. | Setpoint 1: 290.0*<br>Setpoint 2: 236.0*<br>Setpoint 3-6: 0* |
| **Under Limit** | Specify the value that the setpoint parameter must go below for Over Setpoint to become inactive or for Under Setpoint to become active. | Setpoint 1: 275.0*<br>Setpoint 2: 225.0*<br>Setpoint 3-6: 0* |
| **Active Delay** | Specify the minimum duration that the setpoint condition must be met before the setpoint becomes active. An event will be generated and stored in the SOE Log. The range of the **Active Delay** is between 0 and 9999 seconds. | 0* to 9999s |
| **Inactive Delay** | Specify the minimum duration that the setpoint return condition must be met before the setpoint becomes inactive. An event will be generated and stored in the SOE Log. The range of the **Inactive Delay** is between 0 and 9999 seconds. | 0* to 9999s |
| **Setpoint Trigger** | Specify what action a setpoint would take when it becomes active. | None (0), DO1, DO2<br>0* |

**Table 4-2 Description for Setpoint Parameters**

| Key | Parameter | Scale | Unit |
|---|---|---|---|
| 0 | None | - | |
| 1 | U | x1 | V |
| 2 | I | | A |
| 3 | P | | W |
| 4 | P Demand | | W |

**Table 4-3 Setpoint Parameters**

## 4.5 Logging

### 4.5.1 Max./Min. Log

The PMC-D961MD records the **Max. Log** and **Min. Log** of **This Month** and **Last Month** with timestamp for Current and P. Each log includes the relevant parameter value and its timestamp. The recorded data is stored in non-volatile memory and will not suffer any loss in the event of a power failure.

The same **Self-Read Time** for the Max. Demand Log is used to specify the time and day of the month for the Max./Min. Self-Read operation. Please refer to **Section 4.3** for a complete description of the **Self-Read Time** and its operation. The Max./Min. Log of This Month can be reset manually via front panel or through communications.

### 4.5.2 Max. Demand Log

The PMC-D961MD records the **Max. Demand** of **This Month** and **Last Month** with timestamp for Current and P Total. All Max. Demand information can be accessed through the front panel as well as communications. Please refer to **Section 4.3** for a complete description of the **Self-Read Time** and its operation.

### 4.5.3 SOE Log

The PMC-D961MD's SOE Log can store up to 32 events such as Power-on, Power-off, Digital Input status changes, Digital Output status changes, Setup changes and Setpoint events in its non-volatile memory. Each event record includes the event classification, its relevant parameter values and a timestamp in ±1 ms resolution. All events can be retrieved via Front Panel or through communications. If there are more than 32 events, the newest event will replace the oldest event on a First-In-First-Out basis. The SOE Log can be reset via front panel or through communications.

### 4.5.4 Monthly Freeze Log

The PMC-D961MD provides a **Monthly Freeze Log** for kWh Import/Export and can store up to 24 monthly freeze records (2 years). The **Self-Read Time** setup parameter allows the user to specify the time and day of the month for the Monthly Freeze Log Self-Read operation and it can be setup via Front Panel or through communications. Please refer to **Section 4.3** for a complete description of the **Self-Read Time** and its operation.

# Chapter 5 Modbus Register Map

This chapter provides a complete description of the Modbus register map (**Protocol Versions 1.1** and above) for the PMC-D961MD DC Multifunction Meter to facilitate the development of 3rd party communications driver for accessing information on the PMC-D961MD.

The PMC-D961MD supports the following Modbus functions:

1) Read Holding Registers (Function Code 0x03)
2) Force Single Coil (Function Code 0x05)
3) Preset Multiple Registers (Function Code 0x10)

The following table provides a description of the different data formats used for the Modbus registers. The PMC-D961MD uses the Big Endian byte ordering system.

| Format | Description |
|---|---|
| UINT16/INT16 | Unsigned/Signed 16-bit Integer |
| UINT32/INT32 | Unsigned/Signed 32-bit Integer |
| Float | IEEE 754 32-bit<br>Single Precision Floating Point Number |

For a complete Modbus Protocol Specification, please visit www.modbus.org.

## 5.1 Basic Measurements

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 0000 | RO | SOE Pointer[1] | UINT32 | x1 | |
| 0002 | RO | DI Status[2] | UINT16 | x1 | |
| 0003 | RO | DO Status[3] | UINT16 | x1 | |
| 0004 | RO | Global Setpoint Status[4] | UINT16 | | |
| 0005~0009 | RO | Reserved | UINT16 | | |
| 0010 | RO | U | Float | x1 | V |
| 0012 | RO | I | Float | x1 | A |
| 0014 | RO | P | Float | x1 | W |
| 0016 | RO | kWh Import[5] | INT32 | x0.01 | kWh |
| 0018 | RO | kWh Export[5] | INT32 | x0.01 | kWh |
| 0020 | RO | I Demand | Float | x1 | A |
| 0022 | RO | P Demand | Float | x1 | W |

**Table 5-1 Basic Measurements**

**Notes:**

1) The PMC-D961MD has one SOE Log. The log has a Log Pointer that indicates its current logging position. The range of the Log Pointer is between 0 and 0xFFFFFFFF, and it is incremented by one for every new log generated and will roll over to 0 if its current value is 0xFFFFFFFF. If a Clear Log is performed via Front Panel or through communications, its Log Pointer will be reset to zero, and the SOE Log Pointer will be immediately incremented by one with a new "Clear SOE" event. When the number of events is larger than the respective Log Depth, the latest 32 SOE logs is stored on a FIFO basis.
2) For the **DI Status** register, the bit values of B0 to B3 represent the states of DI1 to DI4, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open).
3) For the **DO Status** register, the bit values of B0 to B1 represent the states of DO1 to DO2, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open).
4) For the **Setpoint Status** register, the bit values of B0 to B5 represent the states of Setpoint 1 to Setpoint 6, respectively, with "1" meaning Active and "0" meaning Inactive.
5) The **kWh Import/Export** registers have a maximum value of 1,000,000,000 and will roll over to zero automatically when it is reached. The actual energy value is 0.01 times of the register value.

## 5.2 Energy Measurements

The Energy registers have a maximum value of 1,000,000,000 and will roll over to zero automatically when it is reached. The actual energy value is 0.01 times of the register value.

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 0500 | RW | kWh Import | INT32 | x0.01 | kWh |
| 0502 | RW | kWh Export | INT32 | | |

**Table 5-2 Energy Measurements**

## 5.3 Demands

### 5.3.1 Present Demands

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 3000 | RO | I | Float | x1 | A |
| 3002 | RO | P | Float | | W |

**Table 5-3 Present Demand Measurements**

### 5.3.2 Max. Demand Log of This Month

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 3400~3405 | RO | I | See Section 5.3.4 Demand Data Structure | x1 | A |
| 3406~3411 | RO | P | | | W |

**Table 5-4 Max. Demand Log of This Month**

### 5.3.3 Max. Demand Log of Last Month

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 3600~3605 | RO | I | See Section 5.3.4 Demand Data Structure | x1 | A |
| 3606~3611 | RO | P | | | W |

**Table 5-5 Demand Log of Last Month**

### 5.3.4 Demand Data Structure

| Offset | | Description |
|---|---|---|
| +0 | High | Year - 2000 |
| | Low | Month |
| +1 | High | Day |
| | Low | Hour |
| +2 | High | Minute |
| | Low | Second |
| +3 | - | Millisecond |
| +4~+5 | - | Max. Demand Value (Float) |

**Table 5-6 Demand Data Structure**

## 5.4 Max./Min. Log

### 5.4.1 Max. Log of This Month

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 4000~4005 | RO | I | See Section 5.4.5 Demand Data Structure | x1 | A |
| 4006~4011 | RO | P | | | W |

**Table 5-7 Max. Log of This Month**

### 5.4.2 Min. Log of This Month

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 4300~4305 | RO | I | See Section 5.4.5 Demand Data Structure | x1 | A |
| 4306~4311 | RO | P | | | W |

**Table 5-8 Min. Log of This Month**

### 5.4.3 Max. Log of Last Month

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 4600~4605 | RO | I | See Section 5.4.5 Demand Data Structure | x1 | A |
| 4606~4611 | RO | P | | | W |

**Table 5-9 Max. Log of Last Month**

### 5.4.4 Min. Log of Last Month

| Register | Property | Description | Format | Scale | Unit |
|---|---|---|---|---|---|
| 4900~4905 | RO | I | See Section 5.5.5 Demand Data Structure | x1 | A |
| 4906~4911 | RO | P | | | W |

**Table 5-10 Min. Log of Last Month**

### 5.4.5 Max./Min. Log Structure

| Offset | | Description |
|---|---|---|
| +0 | High | Year - 2000 |
| | Low | Month |
| +1 | High | Day |
| | Low | Hour |
| +2 | High | Minute |
| | Low | Second |
| +3 | - | Millisecond |
| +4~+5 | - | Max./Min. Value (Float) |

**Table 5-11 Max./Min. Data Structure**

## 5.5 SOE Log

The SOE Log Pointer points to the register address within the SOE Log where the next event will be stored. The following formula is used to determine the register address of the most recent SOE event referenced by the SOE Log Pointer value:

Register Address = 10000 + Modulo(SOE Log Pointer-1/32)*8

| Register | Property | Description | Format |
|---|---|---|---|
| 10000~10007 | RO | Event 1 | See Table 5-13 SOE Log Data Structure |
| 10008~10015 | RO | Event 2 | |
| 10016~10023 | RO | Event 3 | |
| 10024~10031 | RO | Event 4 | |
| 10032~10039 | RO | Event 5 | |
| 10040~10047 | RO | Event 6 | |
| 10048~10055 | RO | Event 7 | |
| 10056~10063 | RO | Event 8 | |
| 10064~10071 | RO | Event 9 | |
| 10072~10079 | RO | Event 10 | |
| 10080~10087 | RO | Event 11 | |
| 10088~10095 | RO | Event 12 | |
| … | | … | |
| 10248~10255 | RO | Event 32 | |

**Table 5-12 SOE Log**

**Notes:**

1) SOE LOG Data Structure

| Offset | Property | Description | Unit |
|---|---|---|---|
| +0 | RO | High-order Byte: Event Classification[2] | - |
| | RO | Low-order Byte: Sub-Classification[2] | - |
| +1 | RO | Record Time: Year | 0-99 (Year-2000) |
| | RO | Record Time: Month | 1 to 12 |
| +2 | RO | Record Time: Day | 1 to 31 |
| | RO | Record Time: Hour | 0 to 23 |
| +3 | RO | Record Time: Minute | 0 to 59 |
| | RO | Record Time: Second | 0 to 59 |
| +4 | RO | Record Time: Millisecond | 0 to 999 |
| +5 | RO | High-order Byte: Reserved | - |
| | RO | Low-order Byte: Status[2] | - |
| +6 to +7 | RO | Event Value[2] | - |

**Table 5-13 SOE LOG Data Structure**

2) SOE Event Classification

| Event Classification | Sub-Classification | Status | Event Value | Description |
|---|---|---|---|---|
| 1=DI Changes | 1 | 2 / 1 | 0 | DI1 Active/DI1 Inactive |
| | 2 | 2 / 1 | 0 | DI2 Active/DI2 Inactive |
| | 3 | 2 / 1 | 0 | DI3 Active/DI3 Inactive |
| | 4 | 2 / 1 | 0 | DI4 Active/DI4 Inactive |
| 2=DO Changes | 1 | 2 / 1 | 0 | DO1 Operated/Released by Remote Control |
| | 2 | 2 / 1 | 0 | DO2 Operated/Released by Remote Control |

| | | | | |
|---|---|---|---|---|
| | 3~10 | | | Reserved |
| | 11 | 2 / 1 | 0 | DO1 Operated/Released by Setpoint |
| | 12 | 2 / 1 | 0 | DO2 Operated/Released by Setpoint |
| | 13~20 | | | Reserved |
| | 21 | 2 / 1 | 0 | DO1 Operated/Released by Front Panel |
| | 22 | 2 / 1 | 0 | DO2 Operated/Released by Front Panel |
| | 23~30 | | | Reserved |
| | 31 | 1 | 0 | DO1 Released by Pulse Width |
| | 32 | 1 | 0 | DO2 Released by Pulse Width |
| 3=Setpoint | 1 | 2 / 1 | Trigger Value / Return Value | Over U Setpoint Active/Return |
| | 2 | 2 / 1 | | Over I Setpoint Active/Return |
| | 3 | 2 / 1 | | Over P Setpoint Active/Return |
| | 4 | 2 / 1 | | Over P DMD Setpoint Active/Return |
| | 5~40 | 2 / 1 | | Reserved |
| | 41 | 2 / 1 | | Under U Setpoint Active/Return |
| | 42 | 2 / 1 | | Under I Setpoint Active/Return |
| | 43 | 2 / 1 | | Under P Setpoint Active/Return |
| | 44 | 2 / 1 | | Under P DMD Setpoint Active/Return |
| 4=Self-diagnosis | 1 | 2 | 0 | System Parameter Fault |
| | 2 | 2 | | Internal Parameter Fault |
| | 3 | 2 | | Reserved |
| | 4 | 2 | | Memory Fault |
| 5=Operations | 1 | 1 | | Power On |
| | 2 | 1 | | Power Off |
| | 3 | 1 | | Clear Pres. Energy via Front Panel |
| | 4 | 1 | | Clear Pres. Max. DMD via Panel |
| | 5 | 1 | | Clear All DMD via Panel |
| | 6 | 1 | | Clear Present Max./Min. via Panel |
| | 7 | 1 | | Clear All Max./Min. via Panel |
| | 8 | 1 | | Clear All Data via Panel |
| | 9 | 1 | | Clear SOE Logs via Panel |
| | 10 | 1 | | Set Clock via Panel |
| | 11 | 1 | | Setup Changed via Panel |
| | 12 | 1 | | Restore Factory Default via Panel |
| | 13~19 | - | | Reserved |
| | 20 | 1 | | Clear Pres. Energy via Comm. |
| | 21 | 1 | | Clear Pres. Max. DMD via Comm. |
| | 22 | 1 | | Clear All DMD via Panel |
| | 23 | 1 | | Clear Present Max./Min. via Comm. |
| | 24 | 1 | | Clear All Max./Min. via Comm. |
| | 25 | 1 | | Clear All Data via Comm. |
| | 26 | 1 | | Clear SOE Logs via Comm. |
| | 27 | 1 | | Restore Factory Default via Comm. |
| | 28 | 1 | | Setup Changed via Comm. |
| | 29 | 1 | | Preset Energy Values via Comm. |
| | 30 | 1 | | Clear Monthly Freeze Logs via Comm. |
| | 31~26 | | | Reserved |
| | 37 | 1 | | I Zero Adjustment |
| | 38 | 1 | | Restore I Zero Adjustment Coefficient |

**Table 5-14 SOE Event Classification**

## 5.6 Device Setup

### 5.6.1 Basic Setup Parameters

| Register | Property | Description | Format | Range/Default* |
|---|---|---|---|---|
| 6000 | RW | I Primary | UINT16 | 1 to 10,000A, 100A* |
| 6001 | RW | Reserved | UINT16 | |
| 6002 | RW | DEMO Enable | UINT16 | 0=Disabled*, 1=Enabled |
| 6003 | RW | Demand Period | UINT16 | 1 to 60 (minutes), 15* |
| 6004 | RW | Number of Sliding Windows | UINT16 | 1* to 15 |
| 6005 | RW | Max. Demand or Max./Min. Log Self-Read Time[1] | UINT16 | 100* |
| 6006 | RW | Monthly Freeze Log Self-Read Time[1] | UINT16 | 100* |
| 6007 | RW | Energy Pulse Constant | UINT16 | 0=1 imp/kWh |

| | | | | |
|---|---|---|---|---|
| | | | | 1=10 imp/kWh<br>2=100 imp/kWh*<br>3=400 imp/kWh |
| 6008 | RW | LED Energy Pulse Enable | UINT16 | 0=Disabled, 1=Enabled* |
| 6009 | RW | Backlight Timeout | UINT16 | 0 to 60 (mins), 5* |
| 6010 | RW | Setpoint LCD Flash Alarm | UINT16 | 0=Disabled*, 1=Enabled |
| 6010 | RW | Time Zone[2] | UINT16 | 0-32, 26* |

**Table 5-15 Setup Parameters**

**Notes:**

1) For the **Max. Demand/ Max./Min. Self-Read Time** and **Monthly Freeze Log Self-Read Time**:

   A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = (Day x 100 + Hour) where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.

2) The following table lists the Codes for different Time Zones.

| Code | Time Zone | Offset (min) | Code | Time Zone | Offset (min) |
|---|---|---|---|---|---|
| 0 | GMT-12:00 | -720 | 17 | GMT+3:30 | 210 |
| 1 | GMT-11:00 | -660 | 18 | GMT+4:00 | 240 |
| 2 | GMT-10:00 | -600 | 19 | GMT+4:30 | 270 |
| 3 | GMT-9:00 | -540 | 20 | GMT+5:00 | 300 |
| 4 | GMT-8:00 | -480 | 21 | GMT+5:30 | 330 |
| 5 | GMT-7:00 | -420 | 22 | GMT+5:45 | 345 |
| 6 | GMT-6:00 | -360 | 23 | GMT+6:00 | 360 |
| 7 | GMT-5:00 | -300 | 24 | GMT+6:30 | 390 |
| 8 | GMT-4:00 | -240 | 25 | GMT+7:00 | 420 |
| 9 | GMT-3:30 | -210 | 26 | GMT+8:00 | 480 |
| 10 | GMT-3:00 | -180 | 27 | GMT+9:00 | 540 |
| 11 | GMT-2:00 | -120 | 28 | GMT+9:30 | 570 |
| 12 | GMT-1:00 | -60 | 29 | GMT+10:00 | 600 |
| 13 | GMT-0:00 | 0 | 30 | GMT+11:00 | 660 |
| 14 | GMT+1:00 | 60 | 31 | GMT+12:00 | 720 |
| 15 | GMT+2:00 | 120 | 32 | GMT+13:00 | 780 |
| 16 | GMT+3:00 | 180 | | | |

**Table 5-16 Time Zones**

### 5.6.2 I/O Setup Parameters

| Register | Property | Description | Format | Range/Default* |
|---|---|---|---|---|
| 6200 | RW | DI1 Debounce | UINT16 | 1 to 9999ms, 20* |
| 6201 | RW | DI2 Debounce | UINT16 | 1 to 9999ms, 20* |
| 6202 | RW | DI3 Debounce | UINT16 | 1 to 9999ms, 20* |
| 6203 | RW | DI4 Debounce | UINT16 | 1 to 9999ms, 20* |
| 6204 | RW | DO1 Pulse Width | UINT16 | 0 to 6000 (x0.1s), 10* |
| 6205 | RW | DO2 Pulse Width | UINT16 | (0 = Latch Mode) |

**Table 5-17 I/O Setup**

### 5.6.3 Communication Setup Parameters

| Register | Property | Description | Format | Range/Default* |
|---|---|---|---|---|
| 6400 | RW | RS-485 Port Function | UINT16 | 0* (Modbus) |
| 6401 | RW | Unit ID | UINT16 | 1 to 247, 100* |
| 6402 | RW | Baud Rate | UINT16 | 0=1200, 1=2400, 2=4800<br>3=9600*, 4=19200,<br>5=38400 |
| 6403 | RW | Comm. Config. | UINT16 | 0=8N2, 1=8O1, 2=8E1*<br>3=8N1, 4=8O2, 5=8E2 |
| 6404 | RW | Ethernet IP Address | UINT32 | 192.168.0.100* |
| 6405 | RW | Ethernet Subnet Mask | UINT32 | 255.255.255.0* |
| 6406 | RW | Ethernet Gateway | UINT32 | 192.168.0.1* |

**Table 5-18 Communication Setup**

### 5.6.4 Setpoints Setup

| Register | Property | Description | | Format | Range, Default* |
|---|---|---|---|---|---|
| 6500 | RW | Setpoint #1 | Setpoint Type | UINT16 | 0=Disabled*<br>1=Over Setpoint<br>2=Under Setpoint |

| | | | | | |
|---|---|---|---|---|---|
| 6501 | RW | | Parameters[1] | UINT16 | 0 to 4, 1* |
| 6502 | RW | | Over Limit[2] | Float | 290.0* |
| 6504 | RW | | Under Limit[2] | Float | 275.0* |
| 6506 | RW | | Active Delay | UINT16 | 0* to 9999 s |
| 6507 | RW | | Inactive Delay | UINT16 | 0* to 9999 s |
| 6508 | RW | | Trigger Action 1[3] | UINT16 | 0* to 2 |
| 6509 | RW | | Trigger Action 2[3] | UINT16 | |
| 6510 | RW | Setpoint #2 | Setpoint Type | UINT32 | 0=Disabled*<br>1=Over Setpoint<br>2=Under Setpoint |
| 6511 | RW | | Parameter[1] | UINT16 | 0 to 4, 1* |
| 6512 | RW | | Over Limit[2] | Float | 236.0* |
| 6514 | RW | | Under Limit[2] | Float | 225.0* |
| 6516 | RW | | Active Delay | UINT16 | 0* to 9999 s |
| 6517 | RW | | Inactive Delay | UINT16 | 0* to 9999 s |
| 6518 | RW | | Trigger Action 1[3] | UINT16 | 0* to 2 |
| 6519 | RW | | Trigger Action 2[3] | UINT16 | |
| 6520 | RW | Setpoint #3 | Setpoint Type | UINT32 | 0=Disabled*<br>1=Over Setpoint<br>2=Under Setpoint |
| 6521 | RW | | Parameter[1] | UINT16 | 0* to 4 |
| 6522 | RW | | Over Limit[2] | Float | 0* |
| 6524 | RW | | Under Limit[2] | Float | 0* |
| 6526 | RW | | Active Delay | UINT16 | 0* to 9999 s |
| 6527 | RW | | Inactive Delay | UINT16 | 0* to 9999 s |
| 6528 | RW | | Trigger Action 1[3] | UINT16 | 0* to 2 |
| 6529 | RW | | Trigger Action 2[3] | UINT16 | |
| … | | | … | | |
| 6650 | RW | Setpoint #6 | Setpoint Type | UINT32 | 0=Disabled*<br>1=Over Setpoint<br>2=Under Setpoint |
| 6551 | RW | | Parameter[1] | UINT16 | 0* to 4 |
| 6552 | RW | | Over Limit[2] | Float | 0* |
| 6554 | RW | | Under Limit[2] | Float | 0* |
| 6556 | RW | | Active Delay | UINT16 | 0* to 9999 s |
| 6557 | RW | | Inactive Delay | UINT16 | 0* to 9999 s |
| 6558 | RW | | Trigger Action 1[3] | UINT16 | 0* to 2 |
| 6559 | RW | | Trigger Action 2[3] | UINT16 | |

**Table 5-19 Setpoint Setup Parameters**

**Notes:**

1) The PMC-D961MD provides the following setpoint parameters:

| Key | Parameter | Scale | Unit |
|---|---|---|---|
| 0 | None | - | |
| 1 | U | x1 | V |
| 2 | I | | A |
| 3 | P | | W |
| 4 | P Demand | | W |

**Table 5-20 Setpoint Parameters**

2) For Over Setpoint, the setpoint parameter must exceed the **Over Limit** to become active and go below the **Under Limit** to become inactive.

   For Under Setpoint, the setpoint parameter must go below the **Under Limit** to become active and exceed the **Over Limit** to become inactive.

3) The PMC-D961MD provides the following Setpoint Triggers:

| Key | Action |
|---|---|
| **0** | None |
| **1** | DO1 Closed |
| **2** | DO2 Closed |

**Table 5-21 Setpoint Triggers**

## 5.7 Remote Control

The DO Control registers are implemented as both “Write-Only” Modbus Coil Registers (0XXXXX) and Modbus Holding Registers (4XXXXX), which can be controlled with the Force Single Coil command (Function Code 0x05) or the Preset Multiple Hold Registers (Function Code 0x10). The PMC-D961MD

does not support the Read Coils command (Function Code 0x01) because DO Control registers are "Write-Only". The DO Status register 0003 should be read instead to determine the current DO status. The Remote Control registers are valid only if the device is equipped with the appropriate option.

| Register | Property | Description | Format | Note |
|---|---|---|---|---|
| 9100 | WO | Execute DO1 Close | UINT16 | Writing "0xFF00" to the register to perform the described action. |
| 9101 | WO | Execute DO1 Open | UINT16 | |
| 9102 | WO | Execute DO2 Close | UINT16 | |
| 9103 | WO | Execute DO2 Open | UINT16 | |

**Table 5-22 DO Control**

## 5.8 Clear/Reset Control

| Register | Property | Description | Format | Note |
|---|---|---|---|---|
| 9600 | WO | Clear All Data[1] | UINT16 | Writing "0xFF00" to the register to execute the described action. |
| 9601 | WO | Clear Present Energy | UINT16 | |
| 9602 | WO | Clear Present Max. Demand | UINT16 | |
| 9603 | WO | Clear All Demand[2] | UINT16 | |
| 9604 | WO | Clear Present Max./Min. Logs | UINT16 | |
| 9605 | WO | Clear All Max./Min. Log[3] | UINT16 | |
| 9606 | WO | Clear Monthly Freeze Logs | UINT16 | |
| 9607 | WO | Clear SOE Logs | UINT16 | |
| 9608~9609 | WO | Reserved | UINT16 | |

**Table 5-23 Clear Control**

**Notes:**

1) Writing 0xFF00 to the **Clear All Data** register to perform the Clear operation for the actions specified in registers # 9601 to # 9607.
2) Writing 0xFF00 to the **Clear All Demand** register to clear all Demand registers and logs, including Present Demand, Max. Demand Log of This Month and Last Month.
3) Writing 0xFF00 to the **Clear All Max./Min. Log** register to clear both the Max./Min Log of This Month and the Max./Min. Log of Last Month.

## 5.9 Time

There are two sets of Time registers supported by the PMC-D961MD - Year / Month / Day / Hour / Minute / Second (Registers # 60000 to 60002) and UNIX Time (Register # 60004). When sending time to the PMC-D961MD over Modbus communications, care should be taken to only write one of the two Time register sets. All registers within a Time register set must be written in a single transaction. If one of Time register sets is being written, another Time register set will be updated to reflect the new time. The Millisecond register (60003) must be written during the Time Set operation. When broadcasting time, the function code must be set to 0x10 (Pre-set Multiple Registers). Incorrect date or time values will be rejected by the meter. In addition, attempting to write a Time value less than Jan 1, 2000 00:00:00 will be rejected.

| Register | | Property | Description | Format | Note |
|---|---|---|---|---|---|
| 60000 | 9000 | RW | High-order Byte: Year | UINT16 | 10-90 (Year-2000) |
| | | | Low-order Byte: Month | | 1 to 12 |
| 60001 | 9001 | RW | High-order Byte: Day | UINT16 | 1 to 31 |
| | | | Low-order Byte: Hour | | 0 to 23 |
| 60002 | 9002 | RW | High-order Byte: Minute | UINT16 | 0 to 59 |
| | | | Low-order Byte: Second | | 0 to 59 |
| 60003 | 9003 | RW | Millisecond | UINT16 | 0 to 999 |
| 60004 ~ 60005 | 9004 ~ 9005 | RW | UNIX Time | UINT32 | 0x4B3D3B00 to 0xE398E47F the corresponding time is 2010.01.01 00:00:00 to 2090.12.31 23:59:59 (GMT 0:00 Time Zone) |

**Table 5-24 Time Registers**

## 5.10 Meter Information

| Register | | Property | Description | Format | Note |
|---|---|---|---|---|---|
| 9800 ~ 9819 | 60200 ~ 60219 | RO | Meter Model[1] | UINT16 | See Note 1 |
| 9820 | 60220 | RO | Firmware Version | UINT16 | e.g. 10000 shows the version is V1.00.00 |
| 9821 | 60221 | RO | Protocol Version | UINT16 | e.g. 10 means V1.0 |
| 9822 | 60222 | RO | Firmware Update Date: Year-2000 | UINT16 | e.g. 240110 means January 10, 2024 |
| 9823 | 60223 | RO | Firmware Update Date: Month | UINT16 | |
| 9824 | 60224 | RO | Firmware Update Date: Day | UINT16 | |
| 9825 | 60225 | RO | Serial Number | UINT32 | |
| 9827 ~ 9828 | 60027 ~ 60228 | RO | Reserved | UINT16 | |
| 9829 | 60229 | RO | Feature Number | Bitmap | **B6: Ethernet**<br>0: 1x 10/100 BaseT Ethernet Port<br>1: None |
| | | | | | **B5B4: I/O**<br>00: 4xDI + 2xDO + 1xPulse Output<br>Others: Reserved |
| | | | | | **B3B2: Input Voltage**<br>00: 10~1500V DC<br>Others: Reserved |
| | | | | | **B1B0: Input Current**<br>00: ±4V Input via Hall-Effect Sensor<br>Others: Reserved |

**Table 5-25 Meter Information**

**Notes:**

1) The Meter Model appears from registers 9800-9819 and contains the ASCII encoding of the string "PMC-D961MD" as shown in the following table.

| Register | Value (Hex) | ASCII |
|---|---|---|
| 9800 | 0x50 | P |
| 9801 | 0x4D | M |
| 9802 | 0x43 | C |
| 9803 | 0x2D | - |
| 9804 | 0x44 | D |
| 9805 | 0x39 | 9 |
| 9806 | 0x36 | 6 |
| 9807 | 0x31 | 1 |
| 9808 | 0x4D | M |
| 9809 | 0x44 | D |
| 9810~9819 | 0x20 | Null |

**Table 5-26 ASCII Encoding of "PMC-D961MD"**

## Appendix A Technical Specifications

| | |
|---|---|
| **DC Inputs** | |
| **Voltage Input** | |
| Standard (Un) | 1000V DC |
| Measurement Range | 10-1500V DC |
| Overload | 1.5xUn continuous |
| **Current Input** | |
| Nominal Input (In) | ±4V (via Hall-Effect Sensor) |
| Measurement Range | 0.8% to 120% In |
| Burden | <0.001 VA |
| Overload | 1.2xIn continuous |
| **Power Supply (L/+, N/-)** | |
| Standard | 95-250VAC, ±10%, 47-440Hz<br>88-400VDC |
| Burden | <2VA |
| **Digital Inputs (DIC, DI1, DI2,DI3, DI4)** | |
| Type | Dry contact, 24VDC internally wetted |
| Hysteresis | 20ms minimum |
| **Digital Outputs (DO11, DO12, DO21, DO22)** | |
| Type | Form A Mechanical Relay |
| Loading | 5A @ 250VAC or 30VDC |
| **Pulse Output (E+, E-)** | |
| Type | Solid-State Pulse Output |
| Pulse Constant | 1/10/100/400 Imp/kWh |
| Pulse Width | 80ms±20ms |
| **Communications** | |
| **RS-485 Port** | |
| Baud Rate | 1200/2400/4800/9600/19200/38400bps |
| Protocol | Modbus RTU |
| **Ethernet Port (Optional)** | |
| Speed | 10/100 Mbps |
| Protocol | Modbus TCP |
| **Environmental Conditions** | |
| Operating Temp. | -25°C to 70°C |
| Storage Temp. | -40°C to 85°C |
| Humidity | 5% to 95% non-condensing |
| Atmospheric Pressure | 70 kPa to 106 kPa |
| **Mechanical Characteristics** | |
| Panel Cutout | 92x92 mm |
| Unit Dimensions | 96x96x87.2 mm |
| IP Rating | IP65 |

### Accuracy

| Parameters | Accuracy | Resolution |
|---|---|---|
| Voltage | ±0.2% | 0.001V |
| Current | ±0.5% | 0.001A |
| P | ±0.5% | 0.001W |
| kWh | Class 0.5 | 0.01kWh |

## Appendix B Standards Compliance

| Safety Requirements | |
|---|---|
| CE LVD 2014 / 35 / EU | EN 61010-1: 2010<br>EN 61010-2-030: 2010 |
| Electrical Safety in Low Voltage Distribution Systems up to 1000Vac and 1500 Vdc | IEC 61557-12: 2018 (PMD) |
| Insulation<br><br>Dielectric test:<br>Insulation resistance:<br>Impulse voltage: | IEC 62052-11: 2003<br>IEC 62053-22: 2003<br>1.5kV @ 1 minute<br>>100MΩ<br>6kV, 1.2/50μs |
| **Electromagnetic Compatibility<br>CE EMC Directive 2014 / 30 / EC (EN 61326: 2013)** | |
| **Immunity Tests** | |
| Electrostatic Discharge | EN 61000-4-2: 2009 |
| Radiated Fields | EN 61000-4-3: 2006+A1: 2008+A2: 2010 |
| Fast Transients | EN 61000-4-4: 2012 |
| Surges | EN 61000-4-5: 2014+A1: 2017 |
| Conducted Disturbances | EN 61000-4-6: 2014 |
| Magnetic Fields | EN 61000-4-8: 2010 |
| Voltage Dips and Interruptions | EN 61000-4-11: 2004+A1: 2017 |
| Ring Wave | EN 61000-4-12: 2017 |
| **Emission Tests** | |
| Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment | EN 55011: 2016 |
| Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements | EN 55032: 2015 |
| Limits for Harmonic Current Emissions for Equipment with Rated Current ≤16 A | EN 61000-3-2: 2014 |
| Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current ≤16 A | EN 61000-3-3: 2013 |
| Emission Standard for Industrial Environments | EN 61000-6-4: 2007+A1: 2011 |
| **Mechanical Tests** | |
| Spring Hammer Test | IEC 62052-11: 2003 |
| Shock Test | IEC 62052-11: 2003 |
| Vibration Test | IEC 62052-11: 2003 |

## Appendix C Ordering Guide

*Version 20241120*

| Product Code | Description |
|---|---|
| **PMC-D961MD DC Multifunction Meter** | |
| **Basic Function** | |
| L | DIN96 Panel Mounting, Dot-Matrix LCD display, 1xDC Voltage Input, 1xDC Current Input and Bi-directional kWh measurements, Demands, Max./Min. Logs, Monthly Freeze Logs, Setpoints and SOE Logs |
| **Input Current** | |
| 2 | 1 x ±4V Input via Hall-Effect Sensor |
| **Input Voltage** | |
| 5 | 10-1500V DC |
| **Power Supply** | |
| 2 | 95-250V AC, 47-440Hz<br>88-400V DC |
| **I/O** | |
| A | 4xDI + 2xDO + 1xPulse Output |
| **Communications** | |
| A | 1xRS-485 Port |
| E* | 1xRS-485 Port + 1x10/100BaseT Ethernet Port |
| **Display Language** | |
| E | English |

| PMC-D961MD | - | L | 2 | 5 | 2 | A | A | E | PMC-D961MD-L252AAE (Standard Model) |
|---|---|---|---|---|---|---|---|---|---|

*Additional charges apply.

1) Please refer to Accessories sheet for Hall-Effect sensors' order information.

2) ±12V DC Power supply required for Hall-Effect Sensors will be supplied by PMC-D961MD device. No additional power supply is required.

*Version 20241205*

**PMC-D961MD Accessories**

**Split-Core Hall-Effect Sensor**

| Model # | Specification | Accuracy | Dimension (mm) | Burden (W) | Cable Length |
|---|---|---|---|---|---|
| PMC-DCT-200A-4V-A | 200(300)A | Class 1 | Round hole, ϕ35 | 0.3 | Not included |
| PMC-DCT-400A-4V-A | 400(600)A | Class 1 | Square hole, 42x15 | 0.3 | Not included |
| PMC-DCT-600A-4V-A | 600(900)A | Class 1 | Square hole, 42x15 | 0.3 | Not included |
| PMC-DCT-800A-4V-A | 800(1200)A | Class 1 | Square hole, 64x16 | 0.3 | Not included |
| PMC-DCT-1000A-4V-A | 1000(1500)A | Class 1 | Square hole, 104x36 | 0.3 | Not included |
| PMC-DCT-2000A-4V-A | 2000(3000)A | Class 1 | Square hole, 104x36 | 0.3 | Not included |

The cables for connecting PMC-D961MD to Hall-Effect Sensors are not included. The recommended wire size is 0.5 - 1.0 mm².

## Contact us

**CET Electric Technology Inc.**
Email: sales@cet-global.com
Web: www.cet-global.com