Installation, Operation, and Maintenance

Variable Refrigerant Flow (VRF) System

Power Meter Interface Module (PIM)

Model Number: TVCTRLTIMB16A0

⚠SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

March 2014

VRF-SVX039A-EN

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE Indicates a situation that could result in equipment or property-damage only.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling recommendations.**
- **If there is a risk of arc or flash, technicians MUST put on all PPE in accordance with NFPA 70E or other country-specific requirements for arc flash protection, PRIOR to servicing the unit.**

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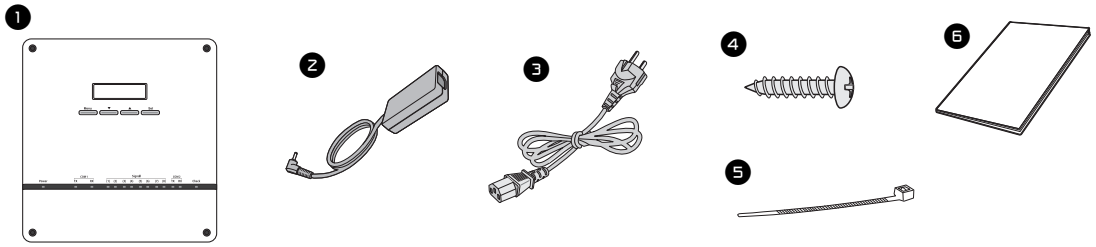
Table of Contents

Components

Use the illustrations below to identify the components in your installation kit.

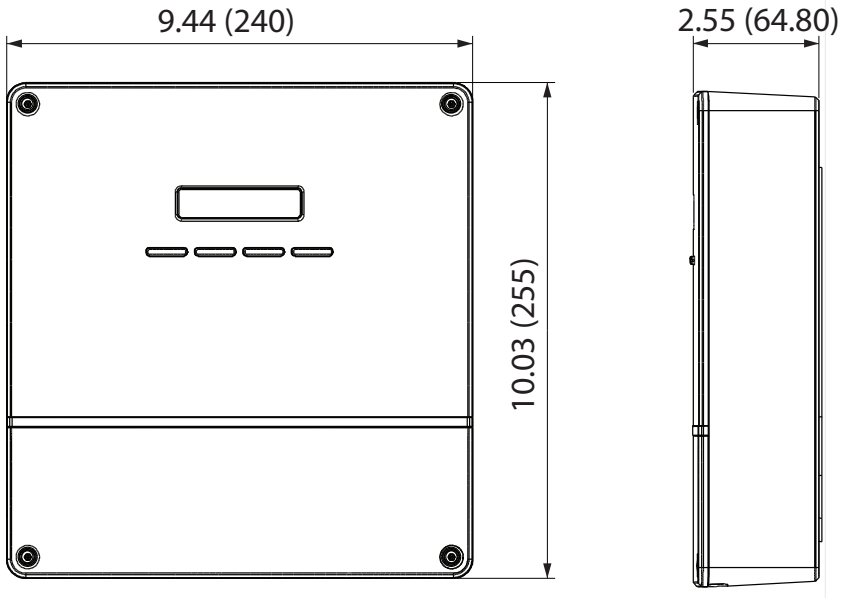


1	Power meter interface module (PIM)	4	M4 x 16 screw (6)
2	Adapter	5	Cable tie
3	Power cable	6	Manual

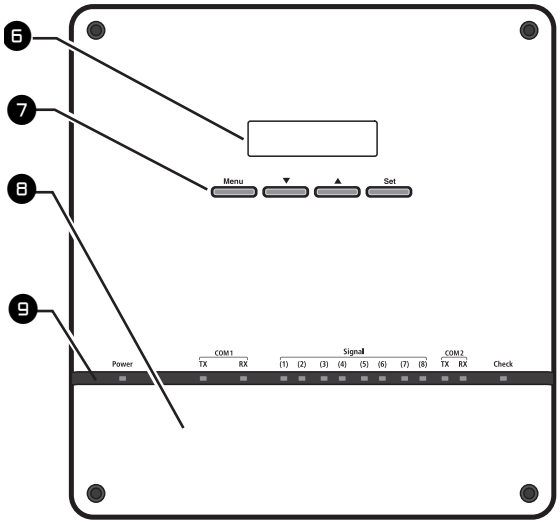
Important: *Use only the adapter and power cable provided.*

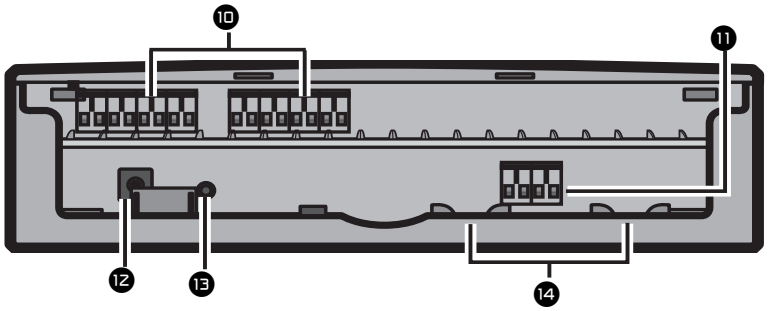
Dimensions

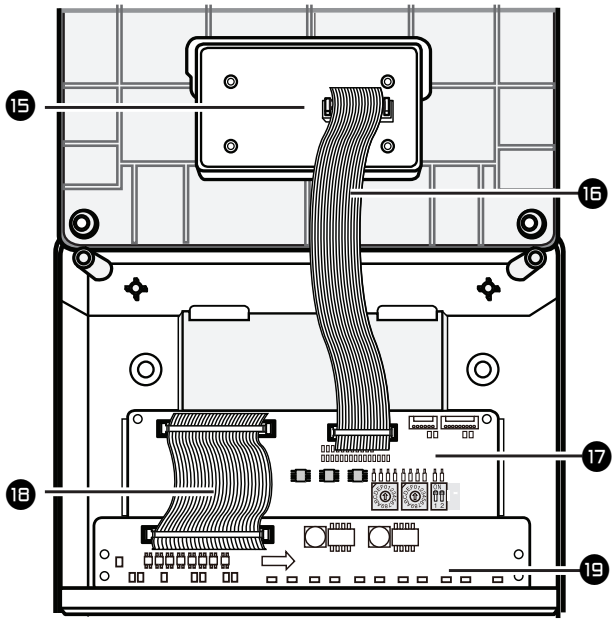
Unit: inch (mm)



Product Description

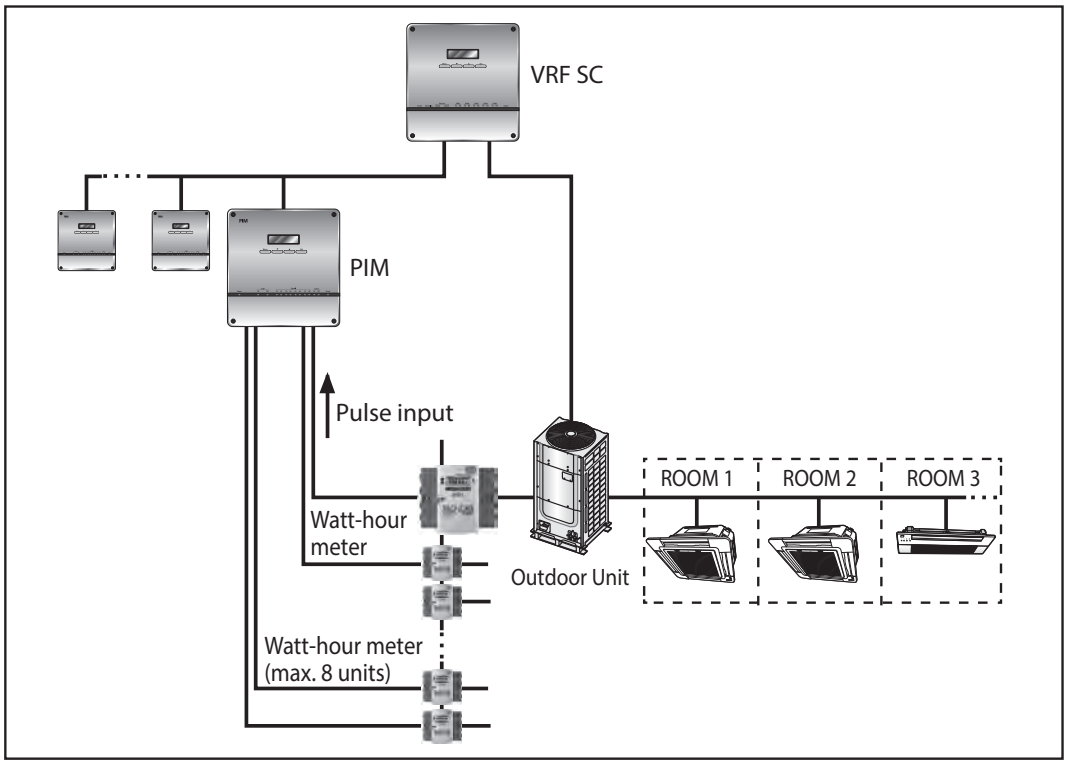






6	LCD display	11	COM1: RS-485 communication with VRF system. COM 2: Reserved.
7	LCD operation buttons: **Menu**, down arrow ▼, up arrow ▲, **Set**	12	Power terminal
8	Bottom cover: To remove, remove screws and slide down	13	Reset button
9	LED indicators: Visible when top cover is removed. **Power**: Steady blue when power is on. **COM1 TX/RX:** Blinks orange when communicating. **COM2 TX/RC:** reserved. **Signal (1-8):** Blinks orange when the normal pulse is input from the watt-hour meter. **Check:** Blinks orange when an error occurs; off when the error is cleared.	14	Cable tie grooves
		15	Display board
		16	20-pin cable
		17	Main board
		18	40-pin cable
10	Pulse input terminals (channels 1-8) for the watt-hour meter.	19	Sub-board

VRF System Architecture with PIM

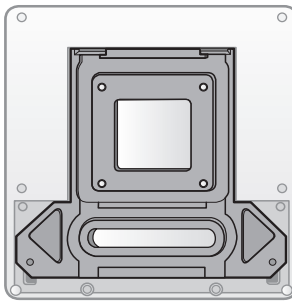


A maximum of 8 PIMs can be connected to a VRF system controller.
A maximum 8 watt-hour meters can be connected to a PIM.

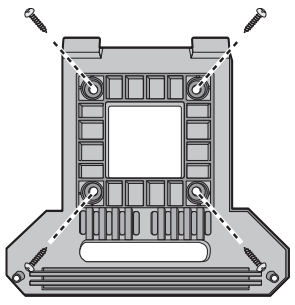
Mounting the PIM

Note: *To prevent damage to the unit, wall mounting is recommended.*

1. Remove the installation plate from the back of the PIM.

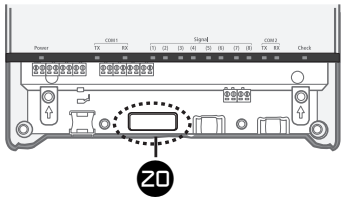


2. Mount the installation plate on the wall using four of the provided screws.

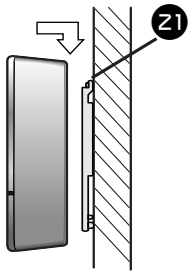


3. Remove the bottom cover (remove the two corner screws and slide the cover down).

   Note: *If you need to install wiring through the back of the unit, remove the knock-out at the bottom of the unit.* ⓴

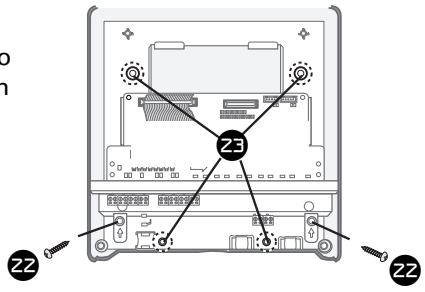


4. Hang the PIM from the installation plate by sliding the tabs ㉑ at the top of the installation plate into the slots in the back of the PIM.



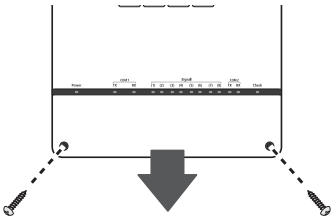
5. Use two screws in the holes provided ㉒ to attach the PIM to the installation plate.

   If the unit needs more than the support provided by the two included screws, remove knock-outs ㉓ as needed (up to 4) for additional field-supplied screws. (To access the two top knock-outs, remove the top cover by removing two screws in the top corners.)



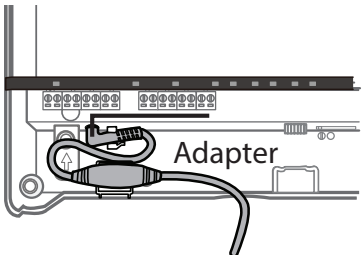
Wiring the PIM

To access the wiring terminals, remove the bottom cover (remove the two corner screws and slide down to open). Follow the instructions for making wiring connections.



Connecting Power

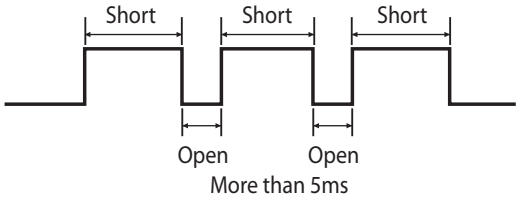
Connect the adapter to the power terminal. Arrange the adapter as shown in the figure.



Connecting a Watt-hour Meter to the PIM

Watt-meter specifications and compatibility details:

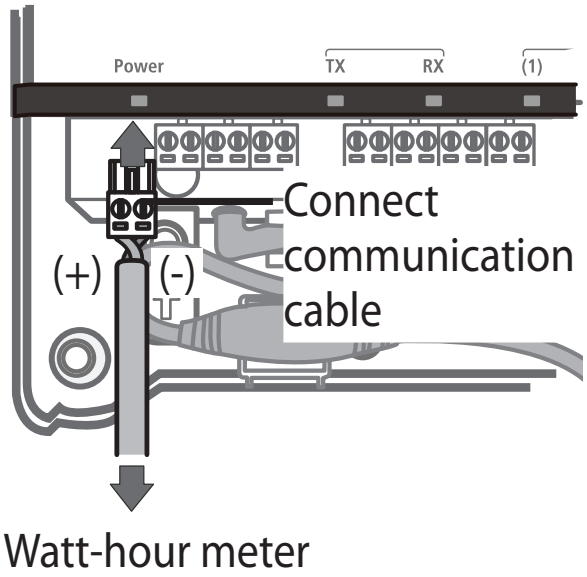
- Range: 1–10,000 Wh/pulse
- Pulse width: 20–1000 ms
- Watt-hour meters with a separate external output can be used. Connect them according to the pulse output specification.
- Watt-hour meters without a separate external output can be used if they convert the value of pulses to an integer (for example, 1 Wh/pulse). Those that convert the value of pulses to a non-integer (for example, 0.1 Wh/pulse) cannot be used.
- Watt-meters must have more than 5 ms delay between pulses.



Using 18 AWG (25 pF/ft nominal) communication wire (Trane purple wire), connect the watt-hour meter to the PIM at one of the pulse input terminals (channels 1-8).

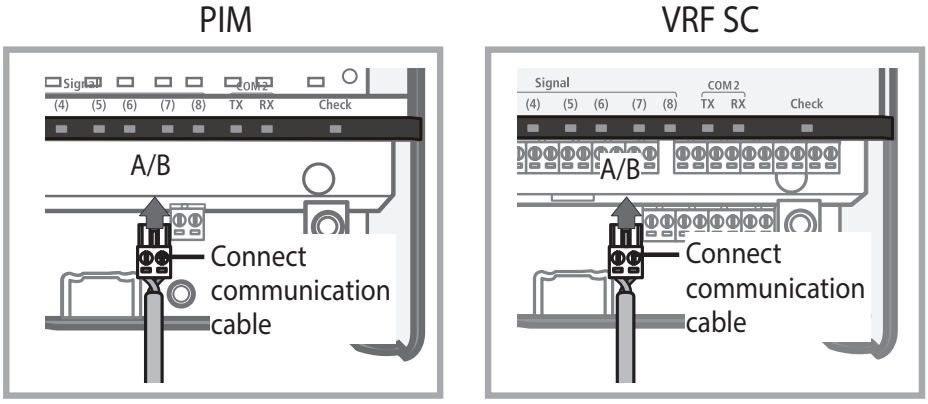
Note: *For more details regarding the communication cable connection between the watt-hour meter and the PIM, refer to the watt-hour meter installation instructions.*

Important: *Maintain polarity between A,B terminals of PIM and meter.*



Connecting the PIM to the VRF SC

Connect the COM1–C1,C2 terminal on the PIM to the COM 1–A,B terminal on the VRF SC.
Maintain polarity between PIM and VRF SC: (C1–>A, C2–>B).



Notes:

- During tracking (device discovery) the number and name of connected PIMs are displayed.
- You can view and change settings for a PIM using the VRF SC user interface.

Addressing the PIM

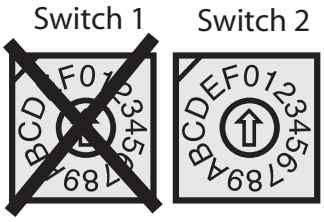
Each connected PIM must have a unique address. The default PIM address setting is 30h.

Note: *Addresses use hexadecimal numbering:*

Number	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Corresponding hexadecimal address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

To set the address:

1. Remove the top cover of the PIM by removing the two screws in the top corners.
2. Locate rotary switch 2 (right switch) on the PIM main board and set the PIM address: 0 – F (30h–3Fh).



Switch 2	Address	VRF SC address
0	30h	16
1	31h	17
2	32h	18
3	33h	19
4	34h	20
5	35h	21
6	36h	22
7	37h	23
8	38h	Do not use PIM addresses 8–F. They are reserved for future use.
9	39h	
A	3Ah	
B	3Bh	
C	3Ch	
D	3Dh	
E	3Eh	
F	3Fh	

The LCD Display

This section of the manual contains the following categories:

- LCD display basics
- Normal display
- Initial configuration
- Monitoring menu
- Configuration menu
- Check menu

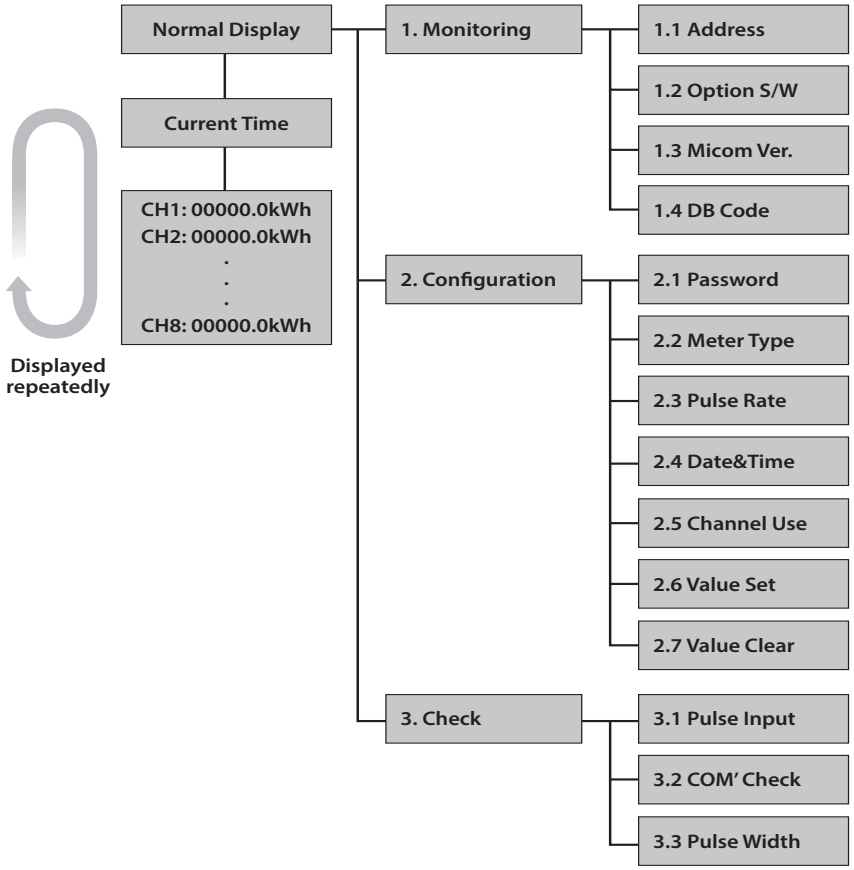
LCD Display Basics

The location of the LCD display and operation buttons is illustrated in "Product Description" p. 6 (see #6 and #7).

- The **Menu** button is used to return the display to the main menu or, if a setting is in progress and the setting has not yet been saved, to cancel the setting.
- The arrow buttons, ▲ and ▼, are used to navigate through the menu items.
- The **Set** button is used to save the selected setting.

LCD display navigation is illustrated in Figure 1.

Figure 1. LCD display navigation

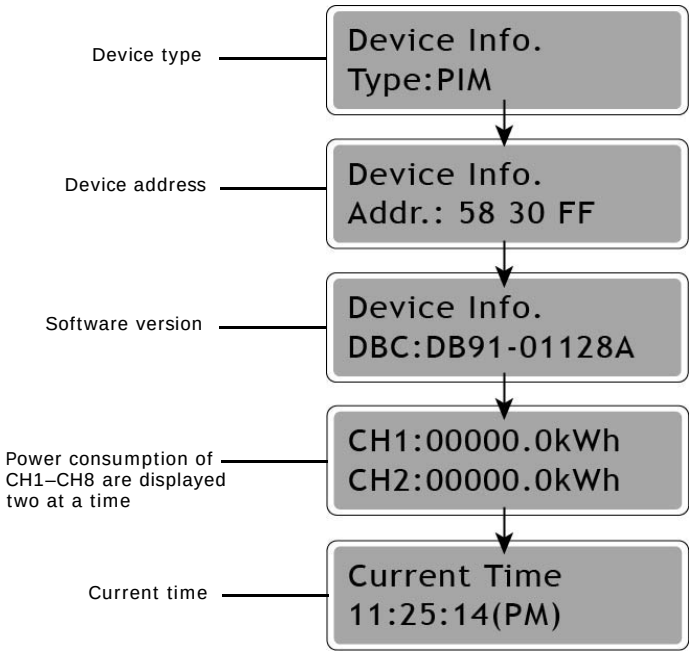


Normal Display

When power is connected to the PIM, the LCD display continually scrolls through the information shown in Figure 2. This scrolling information is referred to as the "normal display."

- You can stop the display from scrolling at any time by pressing the **Set** button.
- If the LCD display receives no input for 1 minute, it will return to the normal display.
- Power consumption for each of the eight channels is displayed two at a time. You can manually scroll to view the power consumption of a specific channel by pressing the ▲ and ▼ buttons.

Figure 2. Example of normal display



Initial Configuration

After the watt-meter is connected to the PIM, complete the following configurations on the PIM:

- "Setting the Password" p. 14
- "Setting the Time" p. 16
- "Setting the Date" p. 15
- "Setting the Meter Type" p. 16
- "Setting the Pulse Rate" p. 17

Monitoring Menu

Viewing the Address

1. To access the main menu, press **Menu**.
2. Press **Set** to select **1. Monitoring**.

```
Main Menu
1.Monitoring
```

3. Press **Set** to select **1.1 Address.**

```
1.Monitoring
1.1 Address
```

4. Press **Set** to view the address. The screen below shows an example.

```
1.1 Address
58 30 FF
```

Viewing the Option Switch

1. Press **Menu** to access the main menu.
2. Press **Set** to select **1. Monitoring.**

```
Main Menu
1.Monitoring
```

3. Use the ▲, ▼ buttons to select **1.2 Option S/W.**

```
1.Monitoring
1.2 Option S/W
```

4. Press **Set** to view the option setting for DIP switches 1 and 2. The screen below shows an example.

```
1.2 Option S/W
1X
```

In the example, the setting is IX.
DIP switch 1 is On.
DIP switch 2 is Off.

Viewing the Circuit Board Version

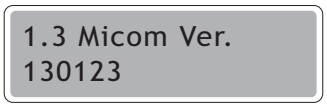
1. Press **Menu** to access the main menu.
2. Press **Set** to select **1. Monitoring.**

```
Main Menu
1.Monitoring
```

3. Press **Set**. Then press the ▲, ▼ buttons to select **1.3 Micom Ver.**

```
1.Monitoring
1.3 Micom Ver.
```

4. Press **Set** to view the circuit board version. The screen below shows an example.



Viewing the Software Version

1. Press **Menu** to access the main menu.
2. Press **Set** to select **1. Monitoring**.

3. Press **Set**. Then press the ▲, ▼ buttons to select **1.4 DB Code.**

4. Press **Set** to view the software version. The screen below shows an example.

5. Press **Set** to save the setting.

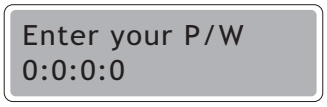
Configuration Menu

You must enter a password to enter the configuration menu.

Setting the Password

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the default password, **0000**, one digit at a time. Press **Set** after each digit.



4. Press **Set** to select **2.1 Password**.

5. Press **Set** to select **Password Set**.

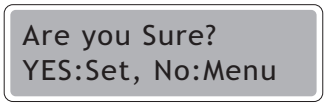
6. Select the password, pressing **Set** after each digit to advance to the next digit and to save the setting.

7. Press **Set** to save the setting.

Resetting the Default Password

1. Follow Steps 1-4 for "Setting the Password" p. 14.
2. Press **Set** to select **Password Reset**.

3. Press **Set**. The following confirmation screen will appear.



4. Press **Set** to reset the password to the default password: **0000**. Press **Set** to save the setting.

Setting the Date

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time. Press **Set** after each digit.
4. Press the ▲, ▼ buttons to select **2.4 Date & Time.**

5. Press **Set**. Then press the ▲, ▼ buttons to select **Current Date.** A date setting will appear.

6. Press **Set**. Then press the ▲, ▼ buttons to change the date setting to the current date in the order of year, month, day, pressing **Set** after each selection.

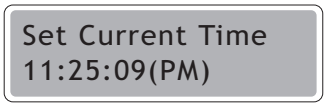
7. Press **Set** to save the setting.

Setting the Time

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time. Press **Set** after each digit.
4. Press the ▲, ▼ buttons to select **2.4 Date & Time.**

5. Press **Set**. Then press the ▲, ▼ buttons to select **Current Time**. A time setting will appear.



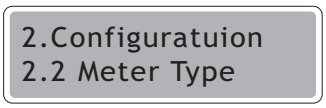
6. Press **Set**. Then press the ▲, ▼ buttons to change the time setting to the current time in the order or hour, minutes, seconds, pressing **Set** after each selection.

7. Press **Set** to save the setting.

Setting the Meter Type

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time. Press **Set** after each digit.
4. Press the ▲, ▼ buttons to select **2.2 Meter Type.**



5. Press **Set**. Then press the ▲, ▼ buttons to select a specific channel, or select **All Channels** to change the meter to the same type at once for all channels.

6. Press **Set**. Then press the ▲, ▼ buttons to select a meter type:
   - Power Meter (default)
   - Gas Meter
   - Water Meter
7. Press **Set** to save the setting.

Setting the Pulse Rate

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time. Press **Set** after each digit.
4. Press the ▲, ▼ buttons to select **2.3 Pulse Rate.**

5. Press **Set**. Then press the ▲, ▼ buttons to select a specific channel, or select **All Channels** to change the pulse rate to the same rate for all channels.
6. Press **Set**. In the example, below, Ch 1 was selected. 1 Wh/P is the default pulse rate.

7. Press the ▲, ▼ buttons to enter the pulse rate (valid range: 1–10,000 Wh/pulse), one digit at a time. Press **Set** after each digit.
8. Press **Set** to save the setting.

Enable/Disabling the Channel Status

By default, every channel is enabled and will appear in the scrolling list of channels. If a channel is disabled, it will not appear in the scrolling list unless it is enabled again.

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time. Press **Set** after each digit.
4. Press ▲, ▼ to select **2.5 Channel Use**.

5. Press **Set**. Then press the ▲, ▼ buttons to select a specific channel, or to select **All Channels** which enables you change the status of all channels at once. (In the example, Channel 1 was selected. The screen indicates that it is enabled.)

6. Press **Set**.
   - If the selected channel is currently disabled, the screen will appear as in this example:

   - If the selected channel is currently enabled, the screen will appear as in this example:

7. Press **Set** to change the status of the selected channel(s).

Setting the Initial Value/Changing the Value for Each Channel

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration**.

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time.
4. Press ▲, ▼ to select **2.6 Value Set**.

5. Press ▲, ▼ to select a specific channel, or to select **All Channels** if you want to change the value of all channels at once. (In the example, Channel 1 was selected.)

6. Press **Set**. Then press the ▲, ▼ buttons to modify the digit, one digit at a time. Press **Set** after each digit.
7. Press **Set** to save the setting.

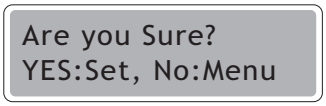
Initializing the Usage Value for Each Channel

1. To access the main menu, press **Menu**.
2. Press the ▲, ▼ buttons to select **2. Configuration.**

3. Press **Set**. Then press the ▲, ▼ buttons to enter the password, one digit at a time.
4. Press ▲, ▼ to select **2.7 Value Clear**.

5. Press ▲, ▼ to select a specific channel, or to select **All Channels** if you want to change the value of all channels at once. (In the example, Channel 1 was selected.)

6. Press **Set**. The following confirmation screen will appear.



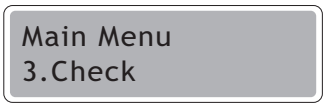
7. Press **Set** to initialize the selected channel(s).

8. Press **Set** to save the setting.

Check Menu

Checking the Status of the Pulse Input to Each Channel

1. Press **Menu** to access the main menu.
2. Press **Set** to select **3. Check.**



3. Use the ▲, ▼ buttons to select **3.1 Pulse Input.**

4. Press **Set.** Then press ▲, ▼ to select a specific channel, or to select **All Check OK** to select all channels. (In the example, Channel 1 was selected.)

5. Press **Set**. The display will show that checking is in progress.

   After checking has concluded, **Check End** will appear after the selected channel number. The result will appear on the second line. See the example below:

NG is displayed if there is no input within 10 seconds after selecting the channel.

   If all channels were checked, **All Check End** will appear on the first line, and the result on the second line as a sequence of digits. The example, below, indicates that channels 2, 5, and 7 are **OK**, but channels 1, 3, 4, 6, and 8 have no pulse input.

If the channel number is displayed, the channel input is OK.
If **X** is displayed, there is no input for that channel.

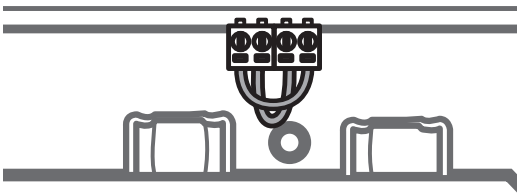
Notes:

- *If there is no pulse width limit and a high-level signal is input, the result will be calculated and displayed as* **OK** *or* **NG**.
- *The PIM does not calculate the power consumption during the check. Calculation will start after the check is procedure is finished and* **Menu** *is pressed.*

Checking the RS-485 Communication Status of the PIM

To check the status of RS-485 communication:

1. Connect jumpers to COM1 and COM2 terminals as shown below:



1. To access the main menu, press **Menu**.
2. Press ▲, ▼ to select **3. Check.**

3. Press **Set**. Then press the ▲, ▼ buttons to select **3.2 COM' Check.**

4. Press **Set**. The display will show that checking is in progress.

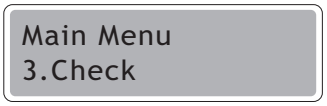
   The PIM will check the transmission/reception status with the VRF System Controller. The result will be displayed as either:

   - **OK,** indicating the signal is normal (as in the example).
   - **NG**, indicating the signal is faulty.

Checking the Pulse Width Setting Error

This check compares the pulse width setting for each channel to the pulse width of the connected watt-hour meter.

1. To access the main menu, press **Menu**.
2. Press ▲, ▼ to select **3. Check.**

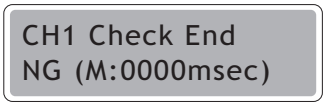


3. Press **Set**. Then press ▲, ▼ to select **3.3 Pulse Width**.

4. Press **Set**. Then press ▲, ▼ to select the channel that you want to check. Press **Set**.

The result will be displayed as either:

- **OK,** indicating that the pulse is valid. Valid pulse is between 20–1000 ms. (M:####msec): represents the duration of the high pulse.
- **NG**, indicating the signal is faulty (as in the example). The pulse is invalid if it is not between 20–1000 ms or when there is no pulse input for 10 seconds: (M:0000msec).



Note: *The PIM does not calculate the power consumption during the check. Calculation will start after the check is procedure is finished and* **Menu** *is pressed.*

Error Codes

Error code	Description
E613	VRF SC/PIM communication has been lost for more than 15 minutes.
E632	At least 15 consecutive pulses have been received that are out of range/ High pulses have been received for more than 3 minutes.
E654	EEPROM error.
E108	The same address was assigned to multiple devices.

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