

# ESENSORS

Specializing in Network Sensors

# **PM31** *3 Phase Digital Power Meter*

# **Instruction Manual**

Version 2.0

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## Introduction

The Esensors, Inc. 3 phase Digital Power Meter **PM31** is an electronic device *classified* as a *Smart Sensor*. The PM31 is designed to utilize the Internet to transmit 3 phase voltage, current and power information, and optionally temperature, relative humidity, and illumination data, from a remote acquisition point to a host computer or hosted database.

The PM31 offers built-in sensors for monitoring/ measuring for power line parameters such as Voltage, Current, Power factor, etc, and an embedded mini-webserver. Users are able to access the sensor data using Hypertext Transfer Protocol (HTTP) based commands.



Figure 1 – PM31 HTTP: Request/Response

Figure 1 (above) shows the PM31 returning data via a HTTP: response.

Simply, the PM31's function is to send a response (by a HTTP: message containing sensor data) upon request from a web client like a browser or send data to a central web server.

The PM31 supports a user configurable *IP address*. Its IP address gives it uniqueness on the network which it is attached to. It is through the IP address, that the PM31 is able to take its place on the Internet, becoming fully accessible to queries by the user.

The PM31 consists of a base unit with one Ethernet communication port. Within the base unit are microcomputers, which handle the Internet protocol, the communication ports, sensors, and sensor signal conditioning. The PM31 has no keyboard or display because it functions as a sensor, not as a computer.



Figure 2 – How the PM31 works.

# PM31 Hook-up

# a. Powering up the PM31

The PM31 can be powered by a regular 120V/240V 60Hz/50Hz AC supply (on the terminal block) or through a 9V or 12V DC adapter. Either option may be used.

# b. PM31 Connections.

The PM31 comes with two sets of terminal blocks as shown in the figure 3 below. There are two on the top side. The First set has connections for the current channel inputs, and the second set consists of voltage channel inputs.



Figure 3 – PM31 Connections.

The third set on the bottom side has inputs for AC power, which can also be used to power loads controlled by two relays. For each relay, there is a Common line, C and two outputs marked as Normally Open (NO) and Normally Closed (NC).

The device has RJ45 socket for Ethernet and a DC jack for 9V DC power input as well.

# c. PM31 Electrical Wiring Diagram

A three phase power meter may be connected to a power distribution system in multiple ways. The ANSI C12.10 standard lists 23 configurations (e.g. 1S). See: http://www.uomschool.org/Meter\_Book/Table%20of%20Contents/Self-Contained%20 Diagrams/2S%20-%20240V%20-%203W.htm. Many of the configurations differ only by voltage or by slight variations. The major configurations are shown in the table below.

The current measurement section of the meter has four pairs of inputs, a pair for each phase (A, B, C) plus an optional one for the neutral (Fig. 4). The low sides of the input leads are connected to circuit ground (Neutral) within the meter. Each input should be connected to a Current Transformer (CT) (with built in burden) which is isolated from the others. Use only CTs with voltage output (i.e, with built in burden such that voltage output does not exceed 350mV RMS). For existing current output CTs, use the voltage output CT to measure the current at the output of the current output CT. This process might require calibration. The three voltage inputs (Va, Vb, Vc) are referred to a common ground within the meter which is also the neutral N. The phase of the voltage sources are 120° apart (A:0°, B:+120°, C:+240° or -120°).

The meter calculates the RMS values of currents Ia, Ib, Ic, In and of voltages Va, Vb, Vc plus the true power Pa=Ia\*Va\*CosVIa, Pb=Ib\*Vb\*CosVIb, Pc=Ic\*Vc\*CosVIc, averaged over a cycle and 1 second. It also accumulates the energy (W-hr) as shown in table 1. The neutral current (In) is not used for power measurements.

#	wire	phase	form	la	lb	lc	In	Va	Vb	Vc	Ν	PT/Dir	P/L
1	3	3₀ Delta	5S/13S	•		•		•		•	•	Dir	L
2	4	3∳ Wye	9S/16S	•	•	•	٠	•	•	•	•	Dir	L
3	4	3∳ Wye	6S/14S	•	•	•	٠	•		•	•	Dir	L
4	4	3₀ Delta	8S/15S	•	•	•	•	•		•	•	PT	Р
5	2	1	1S (use	•				•			•	Dir	L
			9S/16S)										
6	3	2⊕ Split	2S (use	•		•	•	•		•	•	Dir	L
			5S/13S)										

Note: For Single Phase and 3 Single Phases use 4-wire wye mode 9S/16S. For Split Phase use 3-wire delta mode 9S/16S

Table 1. Poly phase metering configurations

Configuration	Wiring	Phase A	Phase B	Phase C
3-wire delta 01	5S / 13S	VA x IA	0	VC x IC
4-wire wye 00	9S / 16S	VA x IA	VB x IB	VC x IC
4-wire wye 10	6S / 14S	VA x IA	VB x IB (VB=-VA-VC)	VC x IC
4-wire delta 11	8S / 15S	VA x IA	VB x IB (VB= -VA)	VC x IC

Table 2. Inputs to Watt-Hour Accumulation chart

In some configurations the voltages (Va, Vb, Vc) refer to line voltages (L) while for others they are the phase (P) voltages (likewise the currents). Some 3-phase configurations use 2 instead of 3 CTs in which case the power in the missing phase (here B) must be assumed as equal to the others and added to the total. Where phase voltages are used, a PT (potential transformer) must be included in each phase to provide ground isolation but line voltage inputs can be connected directly (Dir). The 3-phase meter can also be used for single phase or for split phase. Several popular configurations are shown in the following figures.

PM31 supports multiple configurations, as defined by the American ANSI C12.10 standards above. Each of these modes requires that the appropriate option be selected on the device settings page available through a web browser. This is described in 'Energy demand updates and wiring form' section of this user manual. See Figure 21.  3 Phase 3 Wire Ungrounded Delta (ANSI Meter form: 5S/13S)

No Vb or Ib is connected





2. 3 Phase 4 Wire Standard WYE (ANSI Meter form: 9S/ 16S)



Figure 5. 4 Wire Standard Wye (9S/ 16S) Wiring Diagram.

3. 3 Phase 4 Wire Reduced WYE (ANSI Meter form: 6S/ 14S)



Figure 6. 4 Wire Reduced WYE (6S/ 14S) Wiring Diagram. (Preliminary) *No Vb is connected* 



4. 3 Phase 4 Wire Delta (ANSI Meter form: 8S/ 15S)

Figure 7. 4 Wire Delta (8S/ 15S) Wiring Diagram. (Preliminary)

The PM31 can also be used to monitor a single phase (Form 1S) or split phase (Form 2S). The wiring diagram for single phase measurement is shown in figure 8.

For single phase application, Meter Wiring Form in device's Settings webpage must be 4-wire wye 9S/16S and Va,Ia of PM31 must be connected.



Figure 8. Single phase measurement.

The wiring diagram for split phase measurement is shown in figure 9.



Figure 9. Split phase measurement.

Once the PM31 is wired up for Line Voltage and Current inputs, as well as the power supply, the device is ready to be configured.

Note: For Single Phase and 3 Single Phases use 4-wire wye mode 9S/16S For Single Phases (Split Phase) use 3-wire delta mode 9S/16S

# d. Configuring the PM31

To configure and use the PM31 it must be connected to a PC via an Ethernet cable as shown in either figure below. If connecting directly to a PC, a **crossover** type Ethernet patch cable must be used. It is the gray patch cable. This is shown in figure below.

A crossover type Ethernet cable is included in the Software & Documentation Package.



User PC

Figure 10 – PM31 connected directly to the NIC in a PC

If connecting to a PC through a HUB, a **straight** type Ethernet patch cable must be used between the HUB and the PM31. A "straight" type Ethernet patch cable is also included with the PM31. it is the BLUE patch cable. Refer Figure 11.



Figure 11 – PM31 connected through a HUB to the NIC in a PC

# PM31 User Interface

**Note:** The default address for the PM31 is 192.168.254.102. This requires that the PC being used to program the Websensor has its "network interface card" (NIC) set with the same subnet address: 192.168.254.\*\*\*

Once the PM31 is powered up and connected to a PC (with the NIC subnets matching), it can be queried by typing the following command into the address line of the browser.

## http://192.168.254.102

Once the default IP address is entered, the browser screen should display the "PM31 Dashboard Page" as shown in Figure 13.

## Device Overview Page

The "Overview" screen depicts information specific to the PM31 such as the version of the firmware, build date of the firmware, device serial number, and technical specifications. This page can be accessed through the 'Home' tab on the navigation bar. See Figure 12 for the Overview screen depiction.

Web Power Meter		Home	Dashboard	Demand	Settings
	Overview				
	Device Version:	PM31ET V	1.01.525		
PM31	Build Date:	Apr 04 201	2 03:18:04		
i ilio i	Power Lost Time:	Tue Apr 03	2012 18:44:00 GM	1T-0400 (Eastern	Daylight Time
	Power On Time:	Tue Apr 03	2012 18:44:48 GM	1T-0400 (Eastern	Daylight Time
3 Phase	Current Time:	Wed Apr 0	4 2012 14:15:05 G	MT-0400 (Eastern	Daylight Time
Power Meter					
Jewice Status: OK	Voltage: 85 - 480 V     Current: 0 - 75 A (H     Power Factor: 1.0 -     True Power': 4/- 2 0     Apparent Power': 0     Reactive Power': 0     Energy: 2 - 2 GWh     Energy: 2 - 2 GWh     Energy Data lineant     Temperature readou     Built-in Web interface     Compatible with any     Standard XML /HTTI     Supports TCP/IP, D     Remote monitoring     Open Source Plug-i     Works with PRTG, 1  Options:     High accuracy Temp     +123.8 Degree Cels	igher ratings : 1.00 2.03 2	available with CTs) reading over 1000:1 d or Celsius scale) s network s NetBIOS protocols age raffic Grapher monitor or, accurate to +/- 0.2	ynamic range and other software Degree Celsius with	range from -40

Figure 12 – The OVERVIEW Screen.

# Dashboard Page

The Dashboard provides a Gauge display of the main parameters from the PM31. To view all the parameters, switch to 'Table' view by clicking on the button on the left side of the page. You can always switch back to the gauge display by clicking the Dashboard tab on navigation bar, or "Switch to Gauges" button on the Table page. The data is updated in real time on these pages.



Figure 13 – PM31 Dashboard Page display

The Left colon shows, along with Device ID and status, information on any additional sensors present. The PM31 has the ability to support temperature, humidity and illumination sensors, which are available as options at the time of ordering. Depending on whether your unit is equipped with any such sensors, the display will automatically show the readings from these sensors.

## Sensor Measurements

The Sensor Measurements are available on the Dashboard as well as the Table view pages on the PM31. The parameters displayed on this page includes

- Voltage, Current
- Power factor, True and apparent power,

#### **PM31 User Interface**

- Fundamental active, Harmonic and Reactive power
- Energy, Period Energy\*.
- Period Energy Accumulated time
- Phase Angles
- Temperature, humidity and illumination (Optional).

Web Power Mete	r			Home	Das	hboard	Den	nand	Set
	Measu	rement	ts						
Grid View	Phase	Voltage (V)	Current (A)	Active Power (W)	Funda Act. Po	imental wer (W)	Appar Power (	ent (VA)	Energy (kWhr)
	PHASE A	118.91	0.77	92.3	92.3		92.3		26.91
Data table from	PHASE B	119.20	0.76	91.4	91.5		91.5		26.42
the Power meter	PHASE C	119.18	0.77	92.7	92.6		92.7		26.91
Device ID: 702187B Device Status: OK	Quality	1							
llumination: 2176	Phase	Harmor	nic Power	(W) Read	tive Power	(VAR)	V-I Angle	Pow	er Factor
	PHASE A	A 0.0		0.0		_	0.2	0.99	9
	PHASE B	-0.1		0.0			1.0	0.99	9
Switch to Gauges	PHASE C	0.1		0.0			0.4	0.99	9
	Device								
				Devid	e Statistic	s			
				Neutral Cum	ent (A)	0.02			
				Line Frequer	icy (Hz)	60.05			
				Angle (Va-Vl	o) Deg	359.9			
				Angle (Vb-V	c) Deg	359.9			
				Angle (Va-Ve	c) Deg	359.9			
				Todal Active	Power (W)	276.4			
			1	Period Energ	y (kWhr)	0.85			
				Todal Energy	(kWhr)	80.24			

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Figure 14 – Data table from the PM31

\* Period energy is identical to a trip meter. It can be used to track/ measure the energy for a specific time period. Clicking the 'clear period energy' button resets this value to zero. IF your PM31 is equipped with Temperature and Humidity sensors, it is possible to alter the temperature units by clicking on the "Change Temperature Unit" button provided next to the temperature reading.

# **Demand Page**

The Demand page provides information on Energy Demand records accumulated over specified time periods. This time period can be set in the Settings Tab. An interval of 30 minutes means that the PM31 will calculate the average power for intervals of 30 minutes each, and will be displayed as a bar graph on the Demand page.



Figure 15 – Sample Energy Demand graph from the PM31

The graph comes with an interactive display. To zoom in to a specific time period, click and drag an approximate region by looking at the time scale on x axis. By hovering the mouse over each bar, the information on that bar will be displayed. Clicking the 'zoom out' button will bring back the original graph. To refresh the Energy demand records to see any newly available records, click the refresh page on the left side of the page.

## **Network Configuration**

The NETWORK CONFIGURATION page enables the user to set up the device IP and host name using the web interface. This page is accessible through the 'Network' Button on the left side in Settings Page.

PM31 Web Power Meter		Home	Dashboard	Demand	Settings
	Configure	your setti	ngs		
Network	CAUTION: Incorrect be provided on the	ct settings may cause e next page.	the device to lose net	work connectivity. Re	ecovery options will
	Configuration Lock	edl Please repower t	the device or push the	button once to chan	ge settings.
Power meter Network Configuration	MAC Address	00 50 C2 9A E0 0E			
Device ID: 702187B Device Status: OK	Host Name	PM31_8BITS			
Set Device Clock		Enable DHCP			
SEL DEVICE CIULK	IP Address	192,168,254,187			
	Gateway:	192.168.254.1			
	Subnet Mask	255.255.255.0			
	Primary DNS	4.2.2.1			
	Secondary DNS	192.168.254.1			
		Submit			

Figure 16 – Network Configuration screen (locked state).

From the NETWORK CONFIGURATION screen it is possible to change the various addresses involved in any IP addressable device. Once changes are made it is necessary to "left click" on the "Submit" button to have the changes take effect.

Note that in Figure 16, the "Submit" button is "grayed-out". This is because the page is "locked".

The only time data may be changed on this page is during the first five (5) minutes after a "power-up" or by pressing the rest button (See Figure 3 for reset button location). In this way the page is protected from being changed inadvertently (or maliciously).

See Figure 17 which shows a "timer window" displaying the time available to change the settings before the CONFIGURATION PAGE gets locked.

PM31 Web Power Meter		Home	Dashboard	Demand	Settings		
	Configure	your setti	ngs				
Network	CAUTION: Incorrect settings may cause the device to lose network connectivity. Recovery options will be provided on the next page.						
Device makes	Settings can be ch	anged within 586 sec	onds.				
Power meter Network Configuration Device ID: 7021858 Device Status: OK	MAC Address Host Name	00 50 C2 9A E0 20 EM08F_ETHERNE	T.				
Set Device Clock		Enable DHCP					
OULDUNCE ODER	IP Address	192.168.254.185					
	Gateway:	192.168.254.1					
	Subnet Mask	255.255.255.0					
	Primary DNS	4.2.2.1					
	Secondary DNS	192.168.254.1					
		Submit					

Figure 17 – Network Configuration screen (timer activated)

#### PM31 User Interface

When you change the IP address though the webpage interface, the next page displayed is the "Reboot in Progress" page depicted in Figure 18

PM31 Web Power Meter		Home	Dashboard	Demand	Settings		
	Reboot in P	rogress					
Reboot	Your IP settings were suc settings.	ccessfully saved, a Your device is	and the device is now r s now located at: <u>htt</u>	ebooting to configur p://PM31_V2/	e itself with the new		
Power meter Reboot	Reconnection Instructions     Wi-FI connectivity Indication     When the device is connecting to a network, the Power LED is off and Accuracy LED is blin     For adhoc mode, the device will attempt to connect to existing network. If that fails, it will st     network. For infrastructure mode, the device always thes to connect to the network. If Accurate LED is blinking forever, either the network is not exist or the settings are not correct. Once     device is connected accurate LED is blinking.						
	<ul> <li>Did you change f You should be able</li> </ul>	the hostname? le to access your (	device by clicking the I	ink above.			
	<ul> <li>Did you change the MAC address?</li> <li>The DHCP server probably assigned the device a new IP address, but your computer's networ cache has saved the wrong address. From the command prompt in Windows, enter "nbtstat -R" "arp -d" to clear old values, then try the link above.</li> </ul>						
	Did you try the IP address? Try accessing the device directly at the IP address just inputed if DHCP was turned off. (ex. enter "http://192.165.5.23" into your browser). If this fails, then the IP address you set is not reachable. Try the step below.						
	<ul> <li>Still not working You can restore the inserting a paper of device, first, the du times. Continue ho LED are solid ON</li> </ul>	? ne factory default : clip into the small i evice enters startu olding the button, in this state. You :	settings by erasing the hole on the left side pa up state, the Power LEC the device will enter re should not release the	device's flash ROM inel of the device an 0 and Activity LED storation state, powe button until both LE/	Hold the button by d repower the will flash for several r LED and Activity Ds are		

Figure 18 – "Reboot in Progress" screen

# Alternative Method to Change the PM31 IP Address

Alternately, there is a "keyboard short-cut" way of changing the IP address by using following command:

*http://192.168.254.102/index.htm?eipaaabbbcccddd* where: *aaa.bbb.ccc.ddd* is the new IP address of the PM31.

You can confirm the change by typing the new IP address on the address bar. Or, ping the new address from a command

prompt screen.

Refer to the Quick Reference section for more administrative "keyboard short-cut" commands.



Figure 19 – Error Message – CONNECTION LOST.

The reason for the "Error: Connection to PM31 device was lost" message is because the browser still points to the former IP address. When the new IP address is entered into the address bar the screen will correctly display the PM31 Dashboard Page correctly.

## Setting the device clock

The PM31 comes with a built in real time clock. The timer will be used to keep track of the time for which the period energy was accumulated. Period energy is explained later in this manual. To set the device clock, simply click the "Set device clock" button on the Network Configuration page. The device will automatically update its time registry with your PC's system time. The device is designed to synchronize its clock when Internet connection is available. So there is no need to set device clock as long as the PM31 is connected to the internet. The timer power is backed-up by a battery to hold the data even when power is lost or disconnected. If the device is locked, you may need to unlock it before being able to set the Device Time.

Energy Demand updates and Wiring form

The PM31 settings page can be used to select the Desired wiring form as well as Energy demand update interval. Simply select the values from the drop down list and click update. The settings will be saved on to the device memory.

PM31	Home	Dashboard	Demand	Settings
Configuration	Power meter Cont This page allows the configuration of ratios for Current and Voltage Transf	figuration the power meter's wiring m ormers.	nethod, energy demai	nd interval, and
Demand, Wiring, CT, PT ratios Device ID: 7021868 Device Status: OK	Energy Demand Update Interval Meter Wiring Form: Current Display Ratio: Voltage Display Ratio:	: 5 m minutes 4-wire wye 95/165 1.00 Primary/Seco 1.00 Primary/Seco Save Settings	) Indary, eg, 400A/5A : Indary, eg, 7200v/12	should be 80.0 Ov should be 60.0
Network Client Mode				

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Figure 20 – Energy Demand update and wiring form selection.

## Current and Voltage Display ratios

The Settings page also provides options to select Current and Current display ratios. This feature can be used when PTs and CTs with values other than default ratings are used.

Push Data to Remote Server.

The PM31 is able to handle both client and server modes for data transfer. In server mode, the device can be accessed through a browser or a custom application via http commands. Alternatively, It can be programmed to push data to up to two remote servers at programmable intervals. These settings are available on the Remote server configuration page. Simply click "Client Mode" on the settings page to access and configure this feature, and follow the instructions on the page. See *Appendix C* for details.

PM31 Web Power Meter	٢	lome	Dashboard	Demand	Settings
Configuration PM31 Client Mode	Remote Server This page allows the configur Example: If server URL is "w Server name is "www.essen Container path is "/pm31upl Server port number is "342	er Cor ation of rer ww.eesensi sors.com* load.php*	nfiguration note servers for the Pow ors.com:3456/pm31uplo	ver meter to Push Dal ad.php*	a.
Device ID: 702186B Device Status: OK Network Client Mode	Server 1 Name: Container 1 Path: Server 1 Port Number: Server 2 Name: Container 2 Path: Server 2 Port Number: Push Interval: Last PushOut Time: Wed Apr	192.11 Auploa 80 www.a 7html/ 80 5 5 Save	58 254 2 d2.php varachan.com Jppm31.php minutes, must be <16 & Push Data Now! 3 25 32 GMT-0400 (Ear	38 min.	

# Figure 21 – Remote Server configuration.

# Custom applications using simple Http Request

The PM31 can output a data string when it receives http request. This feature can be used to develop custom applications to tap into the various features offered by the device. See appendix B for details.

# Basic Troubleshooting Instructions

# 1. Did you change the IP address?

The DHCP server probably assigned the device a new IP address, but your computer's network cache has saved the wrong address. From the command prompt in Windows, enter "nbtstat -R" or "arp -d" to clear old values and try again. Make sure to launch the command prompt as administrator.

# 2. Did you try the IP address?

Try accessing the device directly at the IP address just inputted if DHCP was turned off. (Example: enter "http://192.168.5.23/" into your browser). If this fails, then the IP address you set is not reachable. Accessing the device via IP address is more reliable than using host name since some networks may have trouble dealing with host name. If you forgot the IP address and the host name of PM31 device, try Step 3 below.

# 3. Use Ethernet Discoverer to hunt PM31 devices

Microchip's Ethernet Discoverer is a very nice tool to list all PM31 devices on the same subnet. Double click *Microchip Ethernet Discoverer.exe*, Click "Discover Devices" button, the IP address, Host name and MAC address of all PM31 devices will be listed. The default host name is PM31\_ETHERNET. This is what will be displayed until you change the host name. It is also helpful to check PM31's IP address when it is automatically assigned by DHCP server. *Microchip Ethernet Discoverer.exe* does not need to be installed; it can be copied to and executed from any location. (This utility program can be found on the supplied CD in the "Manual" Folder within the "PM31" Folder).

Discover Devices	vice Discoverer		لا ال
IP Address         Host Nam           192.168.254.189         PM31_ETI           192.168.254.187         PM31_ETI           192.168.254.102         PM31_ETI           192.168.254.200         EM08_EM           20.168.254.137         PM21_VII           192.168.254.137         PM21_VII           192.168.254.137         PM21_VII           192.168.254.137         PM21_VII           192.168.254.201         PM21F_W	e MAC Address IERNET2 00-50-C2:9A-E0-4 IERNET 00-50-C2:9A-E0-0 IERNET 00-50-C2:9A-E0-5 AIL_SSL 00-50-C2:9A-E3-4 1 00-50-C2:93-E3-4 IFI 00-50-C2:39-TE-6	Other Info E 8 8 9 4	

Figure 22 – Microchip Ethernet Device Discover screen

## 4. Still not working? Device Reset

You can restore the factory default settings by erasing the device's flash ROM.

#### Resetting the PM31

- Hold the button by inserting a paper clip into the small hole on the left side panel of the device and then re-power the device.
- The device enters boot loading state which will last for four seconds, both Power LED and Activity LED are

#### **Resetting the PM31**

extinguished in this state, then they will flash for three times and enter startup state.

- Continue holding the button, the device will enter restoration state, In this state you will notice the Power LED and Activity LED remain ON.
- You should not release the button until both LEDs are extinguished, which means restoration is done.
- The whole procedure takes about eight to ten seconds. The factory default IP address is "192.168.254.102".

Factory Default settings.

PM31 Settings

Energy Demand Update interval	: 5 minutes
Meter Wiring Form	: 4-wire Wye (9S/ 16S)
Current Display Ratio	: 1
Voltage Display Ratio	: 1

Network Settings:

IP Address	: 192.168.254.102
Gateway	: 192.168.254.1
Subnet Mask	: 255.255.255.0
Primary DNS	: 192.168.254.1
Secondary DNS	: 192.168.254.1

Remote Server Settings:

Server 1	: Null (Empty)
Server 2	: Null (Empty)
Port	: 80

# Appendix A

# PM31 Keyboard Short-cuts:

Note: Features such as temperature sensor readings are available only If your device supports it.

# Display Temp/ humidity sensor measurements, using PM31\_ETHERNET as the host name:

http://PM31\_ETHERNET/index.htm/?em

# Change Temp unit to C:

http://192.168.254.102/index.htm?etpC

# Change Temp unit to F:

http://192.168.254.102/index.htm?etpF

# Change Temp unit from C to F or F to C:

http://192.168.254.102/index.htm?etpX

# Change IP to aaa.bbb.ccc.ddd:

http://192.168.254.102/index.htm?eipaaabbbcccddd (NOTE: no "octet-points" are required

## **Clear Period Energy:**

http://192.168.254.102/index.htm?ecEP

# Appendix B:

The PM31 can output a data string when it receives http request. The string can be obtained by typing the device IP followed by specific commands in the address bar of your browser.

For Power Parameters in xml format, use

```
http://192.168.254.102/status.xml
```

```
sample:
<response>
    <sid0>702185B</sid0> // Device ID
    <stu0>OK</stu0> // Device Status
    <tm0>0</tm0> // Temperature if supported
    <hu0>0</hu0> // Humidity if supported
    <ilo>0</ilo> // Illumination if supported
    <pot0>0</pot0>
    <pm300>114.74</pm300> // See table on page 36 for details
    <pm301>0.07</pm301>
    <pm302>276.7</pm302>
    <pm303>0.116</pm303>
    ...
    <pm339>0.000</pm339>
    <pm340>1304372151</pm340> // UNIX time stamp
    <tun0>F</tun0> // Temparature unit (C/ F)
    <led0>1</led0>
    <led1>1</led1>
    <btn0>up</btn0>
    <dvc>2</dvc> // Device Control Byte
    <esc>64</esc>// Device Config Flag
</response>
```

## Appendix B

For Energy Demand data in xml format, use

http://192.168.254.102/EnergyDM.xml

sample:

<response>

<energyDM> <edNum>400</edNum> // Number of records <TMF>UTC</TMF> // Time format <pm339>1.271</pm339> // Max Energy Demand <pm340>1325033716</pm340> // Max Demand Time <ed0000>0.275</ed0000> <!-- Most recent Energy Demand record --> <et0000>1326140721</et0000> <!—Time stamp for most recent Energy Demand record --> <ed0001>0.276</ed0001> <et0001>1326140421</et0001> ...

```
<ed0399>0.280</ed0399> // Oldest Demand record
<et0399>1326020880</et0399>
</energyDM>
```

</response>

Phase	Voltage	Current	Active Power	Apparent Power	Fundamental Active power	Power factor	Reactive Power	Harmonic Power
Phase A	pm300	pm301	pm304	pm305	pm308	pm303	pm307	pm306
Phase B	pm309	pm310	pm313	pm314	pm317	pm312	pm316	pm315
Phase C	pm318	pm319	pm322	pm323	pm326	pm321	pm325	pm324

AIVIL par	ameters co	nunueu
Phase	V-I Angle	Energy
Phase A	pm302	pm333
Phase B	pm311	pm334
Phase C	pm320	pm335

Device Parame	eters	
Neutral Current	pm327	
Frequency	pm328	
Total Active Power	pm332	
Total Energy	pm336	

Table 3. XML parameter listings

Device Parameters Angle (Va-Vb) Deg pm331 Angle (Vb-Vc) Deg pm330 Angle (Va-Vc) Deg pm329

# Appendix C:

PM31 can push measurements to up to two servers at configurable interval. The length of server name and container path should be less than 70 bytes, the total length of URL should be less than 140 bytes. The server URL and report interval are configurable, which means they can be changed by customers. If only one server is required, leave the second server name blank. PM31 will not push data if the server field is left blank or if the server name cannot be resolved by DNS service. One also can set push interval to zero to disable pushing data out. PM31 will be time out in 30 seconds in case of connection getting lost.

PM31 uses POST method to send out the measurements, the payload of the POST message is a xml file (string). Once xml file is received, the application can parse all measurements. The definition of xml tags can be found in Appendix B of this manual.

# Appendix C

The tag of device serial number is "<sid0>", every device has a unique serial number, one can use it to identify the message is from which device.

A sample POST message sent by PM31 device is:

```
POST /html/Uppm31.php HTTP/1.0
Host: www.eesensors.com
Sensor-ID: 123456
Content-Type: application/x-www-form-urlencoded
Content-Length: xxxxxx
Connection: close
sensor payload=<response>
   <sid0>123456</sid0>
   <dvc> device control byte </dvc>
   <esc> device config flag byte </esc>
   <tm0>temp value</tm0>
   <hu0>humidity value</hu0>
   <il0>illum value </il0>
   . . .
   <pm300> value </pm300>
   <pm340> value </pm340>
```

</response>

"sensor\_payload" is the variable in the POST message which carries the measurements in xml file (string) format. All measurements provided by PM31 are available in this string. The device serial number is put into both http header, "Sensor-ID: 123456", and xml file, "<sid0>123456</sid0>". When the application wants to do a quick check without looking into

# Appendix C

the POST message body, it can check with "Sensor-ID" to identify the device.

The device control byte, xml tag for which is <dvc>, indicates optional light sensor and temperature/humidity sensor on/off status. The illumination measurement, with xml tag <il0>, should be ignored if the light sensor is off, similarly, the temperature and humidity measurement should be ignored if the sensor is off.

device control byte:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved						Light Sensor ON/ OFF	T/H Sensor ON/ OFF

For all sensor on/off bits, "1" means on, "0" means off.

The Device config flag, xml tag for which is <esc>, indicates the on/off status for relays 1 and 2.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved				Relay 2 ON/ OFF	Relay 1 ON/ OFF	0	0

For all relay on/off bits, "1" means on, "0" means off.

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