BLACK BOX®
NETWORK SERVICES

EME1PM-110V / EME1PM -220V
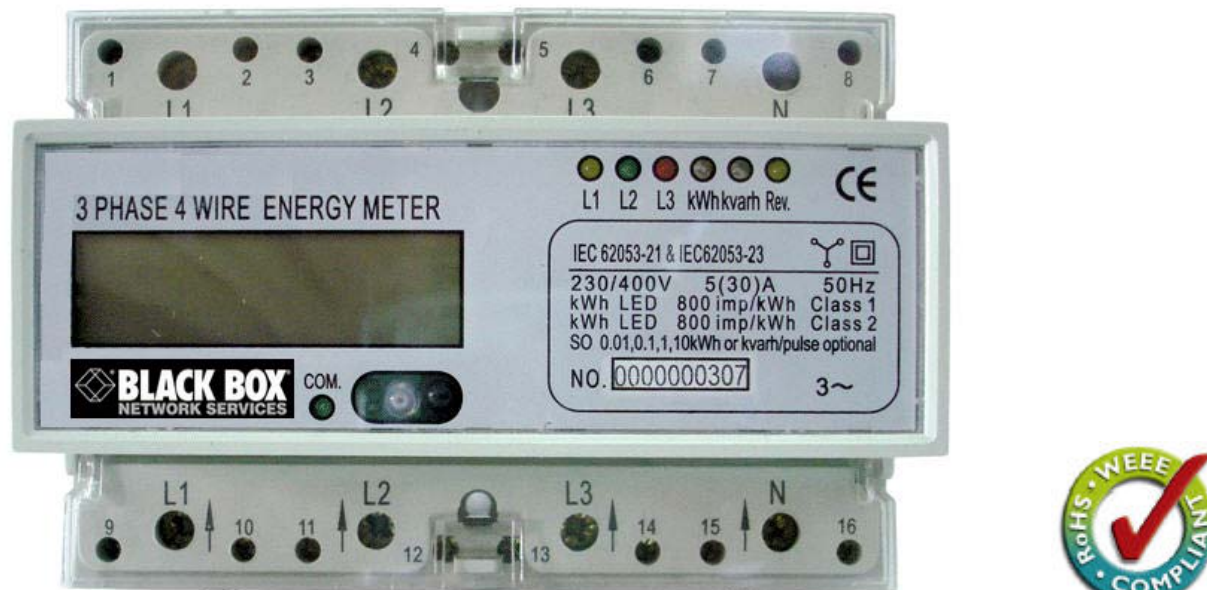
Table of contents

1. Introduction

Figure #1A

Introduction (continued) EME1PM-110/EME1PM-220

Introducing the AKCP DIN rail three phase four wire active & reactive integration energy meter as shown in figure #1A above

You can order either the EME1PM-110 (110 Volts) or the EME1PM-220 (220 Volts) depending on your local power specifications.

Both the EME1PM-110 or EME1PM-220 are designed to be installed on a 35mm DIN rail or directly onto a meter board with screws (as shown in figure #1B below) and is shipped in the protective plastic case. You can remove the meter from the case and mount it on the DIN rail if you wish. Please see step by step instructions for removing the meter from the plastic case in the "Installation" section of this manual (page #7)

Figure #1B

2. Safety Instructions – VERY IMPORTANT

Information for Your Own Safety

This manual does not contain all of the safety measures for operation of the equipment (module, device), because special operating conditions, and local code requirements or regulations may necessitate further measures. However, it does contain information which must be adhered to in the interests of your own personal safety and to avoid material damages. This information is highlighted by a warning triangle and are represented as follows, depending on the degree of potential danger.

Warning means that failure to observe the instruction can result in death, serious injury or considerable material damage.

Caution means hazard of electric shock and failure to take the necessary safety precautions will result in death, serious injury or considerable material damage.

Qualified personnel Commissioning and operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel in the sense of the safety information contained in this manual are persons who are authorized to commission, start up, ground and label devices, systems and circuits according to safety and Regulatory standards.

Proper handling

The prerequisites for perfect, reliable operation of the product are proper transport, proper storage, installation and assembly, as well as proper operation and maintenance. When operating electrical equipment, certain parts of this equipment automatically carry dangerous voltages. Improper handling can therefore result in serious injury or material damage.

- Use only isolated tools.

- Do not connect while circuit is live (hot).

- Do not connect the meter to a 3 phase - 400VAC – network.

- Place the meter only in dry surroundings.

- Do not mount the meter in an explosive area or exposed to dust, mildew and insects.

- Make sure the used wires are suitable for the maximum current of this meter.

• Make sure the AC wires are connected correctly before activating the current/voltage to the meter.

• Do not touch the meter connecting clamps directly with your bare hands, with metal, blank wire or other material as you will have the chance of an electricity shock and a possible chance for health damage.

• Make sure the protection cover is placed after installation.

• Installation, maintenance and repair should only be done by a qualified personnel.

• Never break the seals and open the front cover as this might influence the functionality of the meter, and will void any warranty.

• Do not drop, or allow physical impact to the meter as there are high precision components inside that may break or render the meter measurements inaccurate.

Exclusion of liability

We have checked the contents of this publication and every effort has been made to ensure that the descriptions are as accurate as possible. However, deviations from the description cannot be completely ruled out, so that no liability can be accepted for any errors or omissions contained in the information given. The data in this manual are checked regularly and the necessary corrections are included in subsequent editions. We are grateful for any improvements that you care to suggest.

3. Performance criteria

Operating humidity……≤ 75%
Storage humidity……≤ 95%
Operating temperature……………………………………………………………………………………… -10°C - +50°C
Storage temperature…………………………………………………………………………………………. -30°C - +70°C
International standard:
- Active energy………………………………………………………………………………………………IEC 62053-21
- Reactive energy……………………………………………………………………………………………IEC 62053-23

Accuracy class:
- Active energy………Class 1
-Reactive energy……Class 2
Protection against penetration of dust and water ………………………………………………………..IP51
Insulating encased meter of protective class……………………………………………………………………… Ⅱ

4. Specifications

Nominal voltage (Un)……………………………………………………………………………………230/400V AC (3~)
Operational voltage……………………………………………………………………. 161/279 – 300/520V AC (3~)
Insulation capabilities:
- AC voltage withstand………………………………………………………………………………2KV for 1 minute
 - Impulse voltage withstand……………………………………………………………………6KV – 1.2µS waveform
Basic current (Ib)………5 A
Maximum current (Imax)……………………………………………………………………………………………………30 A

Operational current range…………………………………………………………………………………………………….0.25 A - 30 A
Over current withstand……………………………………………………………………………………………………900A for 0.1s
Operational frequency range………………………………………………………………………………………….50Hz ±10%
Internal power consumption…………………………………………………………………………≤2W / 10VA per phase
Test output flash rate of active (kWh LED)……………………………………………………..800 impulses per kWh
Test output flash rate of reactive (kvarh LED)……………………………………………..800 impulses per kvarh
Test pulse output rate of active (kWh TEST - pins 7 & 8)………………0.01, 0.1, 1, 10 kWh per pulse optional
(Default 0.01 kWh per pulse)
Test pulse output rate of reactive (kvarh TEST - pins 3 & 4)………..0.01, 0.1, 1, 10 kvarh per pulse optional
(Default 0.01 kvarh per pulse)
Power supply indicator (L1, L2 & L3 LED)…………………………………………….. Meter is connected and working OK
Consumption indicator (kWh & kvarh LED)…………………………….Flashing at load running. Reverse indicator
Rev. LED) Lighten when load current flow is reverse
Max. demand measuring method………………………………Block demand or sliding window demand optional
(block demand for default)
Demand interval for block demand……………….1 - 99 minutes can be arbitrary set (15 minutes for default)

Recursive time for sliding window demand……. 1 - 99 minutes can be arbitrary set (1 minute for default)
Max. demand reset mode……………………………………………………………………………………Manually reset
Data display mode:
- Electric energy…………………………….. 5+2 digits or 6+1 digits for option LCD display (5+2 digits for default)
- Power……………………………………………………………………………………………………… 2+4 digits LCD display
 - Actual voltage……………………………………………………………………………………………… 3+1 digits LCD display
- Actual current……………………………………………………………………………………………… 4+2 digits LCD display
- Actual frequency……………………………………………………………………………………….. 2+2 digits LCD display
- Power factor……………………………………………………………………………………………… 1+3 digits LCD display
Data communication port…………………………………………………………………………………. RS485 port
Data communication indication (COM. LED)………………………………. Flashing during the data communication
Data transportation speed……………………………………………………………………………………. 1200bps
Data save……………………………………………………The data can be stored more than 20 years when power cut

5. Description

A………………………………………………Front panel
B………………………………………………… Protection cover
C………………………………………………Cover
D………………………………………………Base
E…………………………………………………… Security hasp
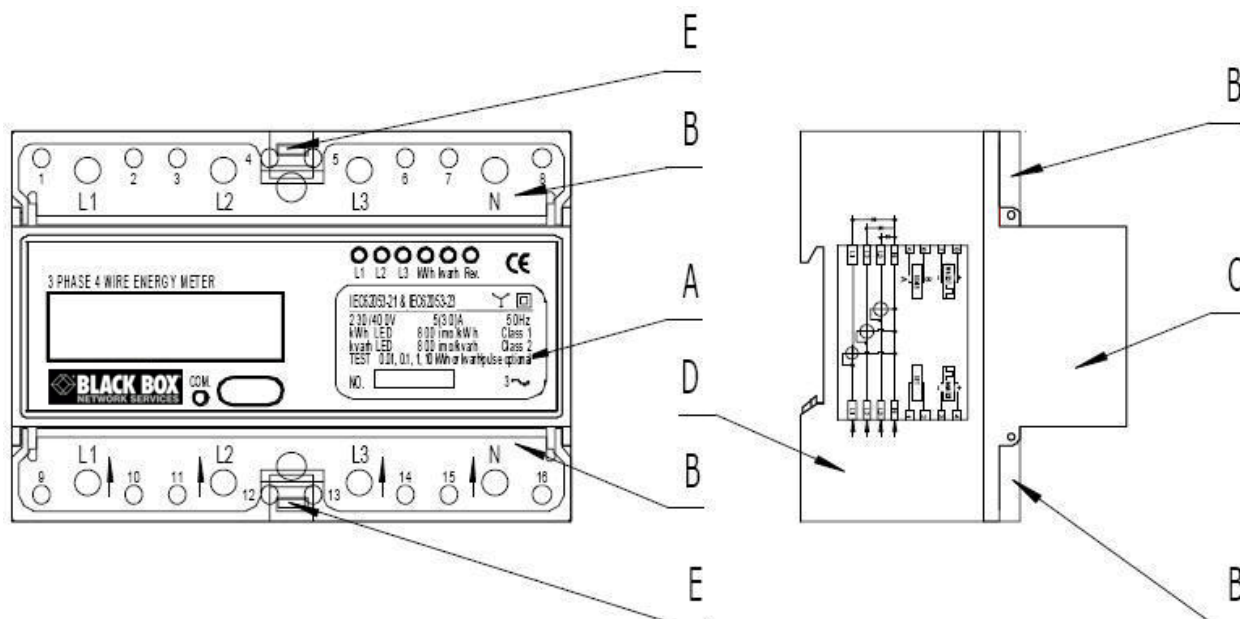
Production material

Front panel..Transparent inflaming retarding polycarbonate
Protection cover...Transparent inflaming retarding polycarbonate
Cover...Fibre-glass reinforced inflaming retarding polycarbonate
Base...Fibre-glass reinforced inflaming retarding polycarbonate

Dimensions
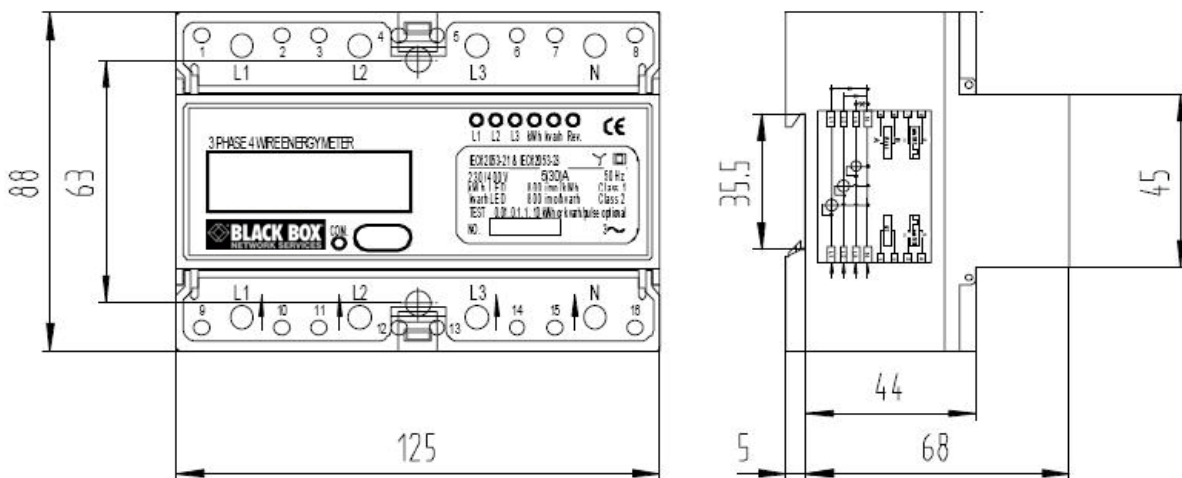
Height = 88 mm

Width = 125 mm

Depth = 68 mm

Distance between installation holes = 63 mm (installation mode in front of board)

Weight = 0.75Kg (net)

6. Installation

- Turn off and lock out all power supplying the energy meter and the equipment to which it is installed before working on it

- Always use a properly rated voltage sensing device to confirm that power is off

- Installation should be performed by qualified electricians familiar with applicable codes and regulations.

- Use isolated tools to install the meter

- Fuse or thermal cut-off or single-pole circuit breaker can't be fitted on the supply line and not the neutral line.

Removing the power meter from the case

If you wish to remove the meter from the protective plastic case and mount this on your own 35mm DIN rail you can by following these steps below:

Figure #6A

Step #1 – Remove the (4) screws from each corner of the clear plastic meter housing and remove the top cover as shown in figure #6A above
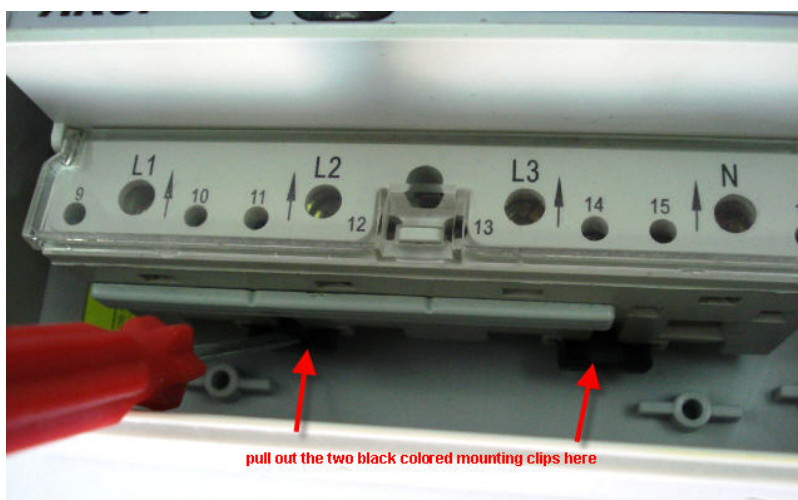
Figure #6B

Step #2 – Using a small flat bladed screw driver, pull out the two black colored clips until they snap into the out position as shown in figure #6B

Figure #6C

Figure #6D

Step #3 – Gently lift the meter up off the DIN rail then out of the housing as shown above in figure #6C and figure #6D

Connecting the power cables

We recommend that the connecting wire which is used to connect the meter to outside circuit should be sized according to local codes and regulations for the capacity of the circuit breaker, or an over current device used in the circuit
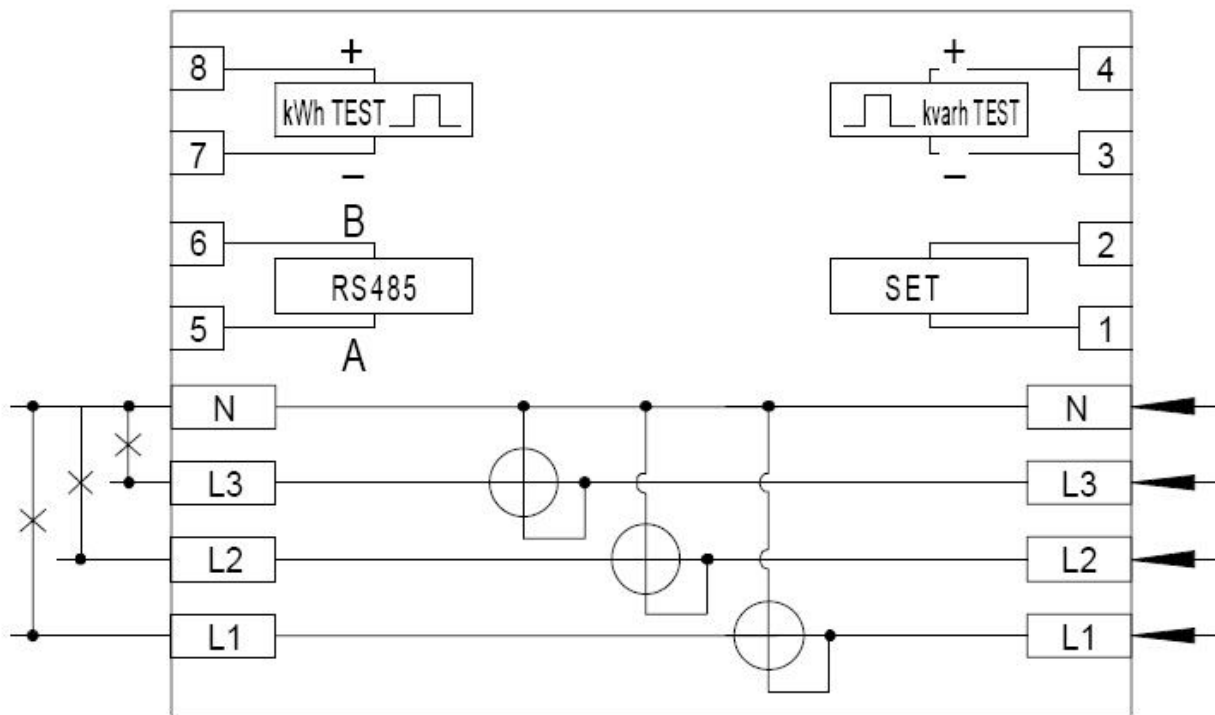
Figure #6E

L1 = L1 phase wire
L2 = L2 phase wire
L3 = L3 phase wire
N = Neutral wire
7 and 8 = Test pulse output contact of active energy
5 and 6 = RS485 communication contact
3 and 4 = Test pulse output contact of reactive energy
1 and 2 = Test pulse output rate setup and max. demand manually reset contact

Connection of the power cables should be done by a qualified electrician and in accordance with the connection diagram shown above in figure #7

Connecting the meter to the securityProbe

You will connect RS485 cable from pins 5 and 6 to the RS485 port located on the back of the securityProbe. Please see figure #6E above and #6F below

RS485 Cabling

It is recommended that you use #24 AWG (American Wire Gauge) twisted pair copper wire with 16pF/ft for cables to connect the power meter to the ServSensor V4P RS485 port (see figure # 7.5 below). The maximum cable length is determined by the combination of cable length (in meters) and data signaling rate. The data signaling rate on the power meter is 1.2K bps (bits per second), so the maximum cable run length for this cable is roughly 800 meters, or 2400 feet.

Figure #6F

7. Operation

Working indication

On the power meters front panel, there are three power indicating LED's which have a different color from each other. The yellow LED represents L1 phase; the green LED represents L2 phase; the red LED represents L3 phase. When any phase is working normally, the LED representation will on. When any phase has a failure or no power, the LED will turn off.

Consumption indication

On the power meters front panel, there are two white impulse indicating LED's (When it is on, it is red). One of them is the kwh LED, which indicates active energy consumption, another of them is the kvarh LED, which indicates reactive energy consumption. When the load is running, these LED's will flash to indicate the load is consuming power. The more quickly the LED flashes, the more consumption there is. The kWh LED's flash rate is 800 impulses per kWh. And the flash rate of kvarh LED is 800 impulses per kvarh.

Reverse indication

There is a Rev. LED on power meters front plate. When the meter load current flow is reversed, then this LED is lit.

Reading the meter

The power meter has an LCD. The LCD screen can display numerous electricity energy data and meter information. The 2 display modes are: scrolling mode and button press one by one mode. Via the meter's RS485 port, the display mode can be selected to program the meter.

• The meters default factory setting is set to the scrolling display. The scrolling period is 5 seconds. The scrolling period can be set from 1-99 seconds, via the meter's RS485 port.

• When the scrolling period is set to 0 seconds, the display mode will be changed to the press button display, one-by-one mode. You can connect a button type switch between the terminal 1 and 2. This allows you to press an actual button to display the data from the LCD.

• The meter can display up to 20 items, depending on how the display mode is setup. The display data will be displayed in the following order. The data needed can be displayed after programming via the meter's RS485 port.

a) Meter number
Indication: NNNNNNNNNNNN
12 digits will be displayed in a high and low readout as shown in figure #7A below
Example: meter number 698532364526
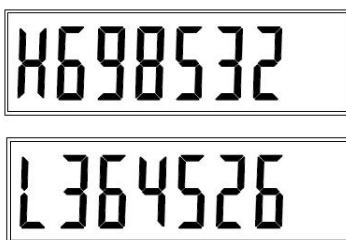
Figure #7A

b) User number
Indication: NNNNNNNNNNNN
12 digits will be displayed in a high and low readout as shown in figure #7B below
Example: meter number 260935625408

```
h260935
```

```
1625408
```
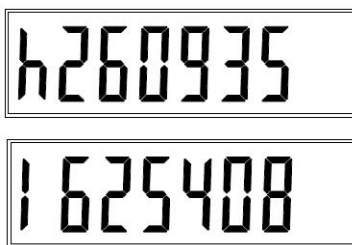
Figure #7B

c) Test pulse output rate
Indication: So: NNN
Example: meter number test pulse output rate is 0.01 kWh/pulse & 0.01 kvarh/pulse as shown in figure #7C below

```
So: 0.01
```
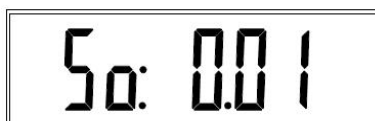
Figure #7C

d) Total active engery
Indication: NNNNN.NN kWh or NNNNNN.N kWh
This will be displayed on the LCD on two screens as shown in figure #7D below
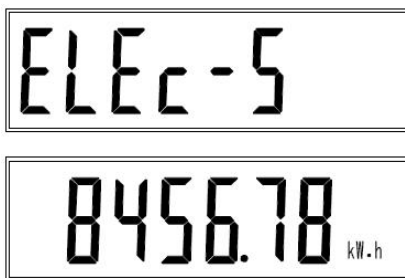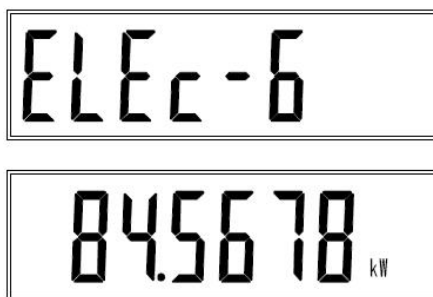Example: total active energy is 45748.91 kWh

```
ELEc- 0
```

```
45748.91 kW.h
```

Figure #7D

e) Reverse direction active energy
Indication: NNNNN.NN kWh or NNNNNN.N kWh
This will be displayed on the LCD on two screens as shown in figure #7E below
Example: reverse direction active energy is 8456.78 kWh

```
ELEc-5
```

```
8456.78 kW·h
```

Figure #7E

f) Active max. demand
Indication: NN.NNNN kW
This will be displayed on the LCD on two screens as shown in figure #7F below
Example: Active max. demand is 84.5678 kW

```
ELEc-6
```

```
84.5678 kW
```

Figure #7F

g) Total reactive energy
Indication: NNNNN.NN kvarh or NNNNNN.N kvarh
This will be displayed on the LCD on two screens as shown in figure #7G below
Example: total reactive energy is 6495.78 kvarh

```
ELEc-16
```

```
6495.78 kVAr·h
```
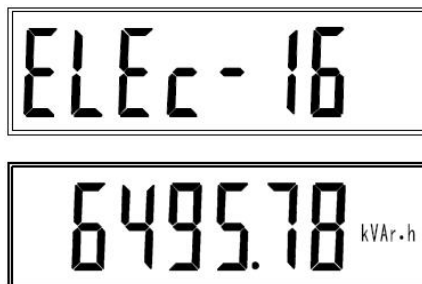
Figure #7G

h) Reverse direction reactive energy

Indication: NNNNN.NN kvarh or NNNNNN.N kvarh
This will be displayed on the LCD on two screens as shown in figure #7H below
Example: reverse direction reactive energy is 1035.72 kvarh
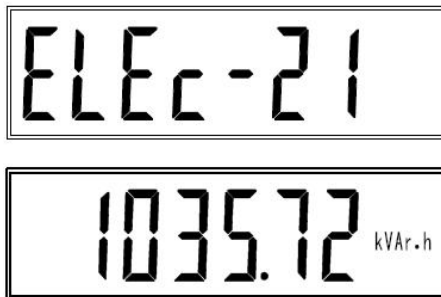
Figure #7H

i) Reactive max. demand
Indication: NN.NNNN kvar
This will be displayed on the LCD on two screens as shown in figure #7I below
Example: reactive max. demand is 10.3572 kvar
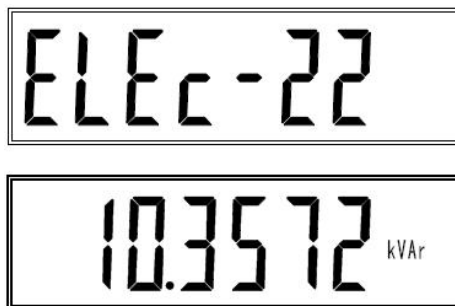
Figure #7I

j) Actual active power
Indication: NN.NNNN kW
This will be displayed on the LCD on two screens as shown in figure #7J below
Example: actual active power is 10.4891 kW
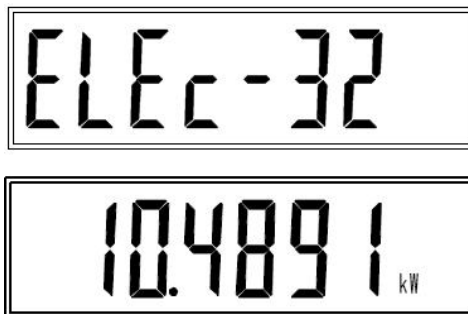
Figure #7J

k) Actual reactive power
Indication: NN.NNNN kvar
This will be displayed on the LCD on two screens as shown in figure #7K below

Example: actual reactive power is 0.5678 kvar
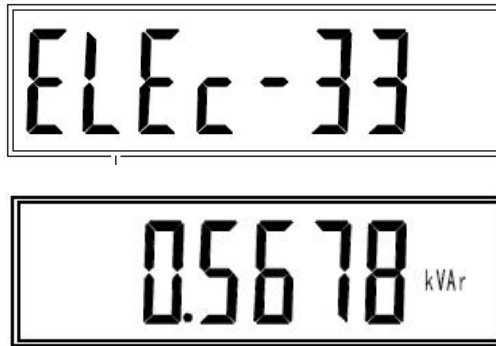
Figure #7K

l) Actual apparent power
Indication: NN.NNNN kVA
This will be displayed on the LCD on two screens as shown in figure #7L below
Example: actual apparent power is 14.5678 kVA
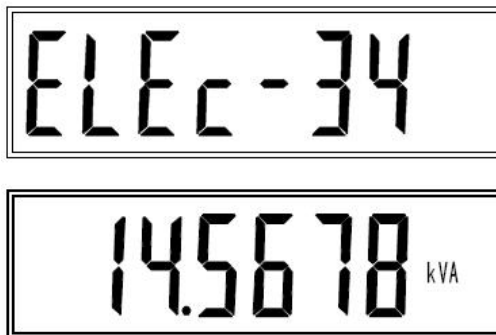
Figure #7L

m) Actual L1 phase voltage
Indication: NNN.N V
This will be displayed on the LCD on two screens as shown in figure #7M below
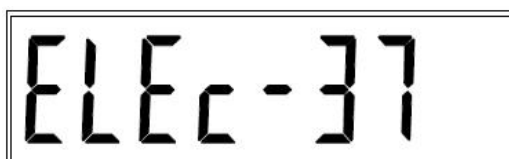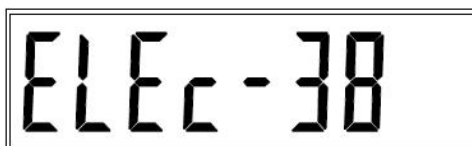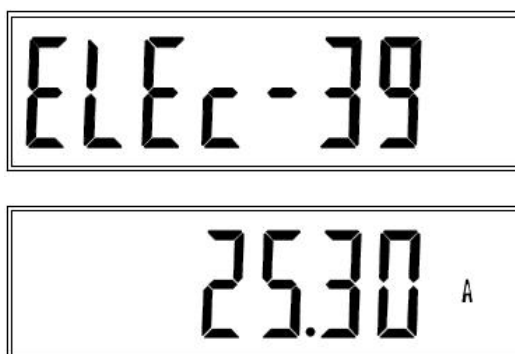Example: actual L1 phase voltage is 230.8 V
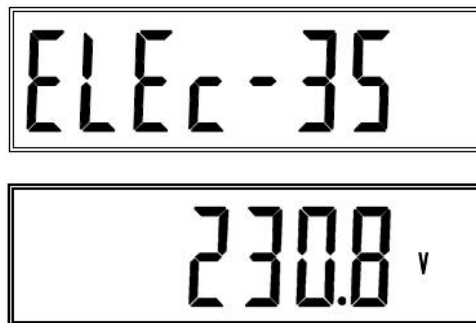
Figure #7M

n) Actual L2 phase voltage
Indication: NNN.N V
This will be displayed on the LCD on two screens as shown in figure #7N below
Example: actual L2 phase voltage is 231.2 V

ELEc-36

231.2 v
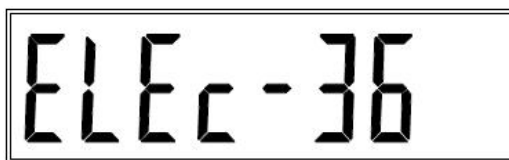
Figure #7N

o) Actual L3 phase voltage
Indication: NNN.N V
This will be displayed on the LCD on two screens as shown in figure #7O below
Example: actual L3 phase voltage is 233.2 V

ELEc-37

233.2 v

Figure #7O

p) Actual L1 phase current
Indication: NNN.N V
This will be displayed on the LCD on two screens as shown in figure #7P below
Example: actual L1 phase current is 36.78 A

ELEc-38

36.78 A

Figure #7P

q) Actual L2 phase current
Indication: NNNN.NN A
This will be displayed on the LCD on two screens as shown in figure #7Q below
Example: actual L2 phase current is 25.30 A

$$ELEc-39$$

$$25.30 \; A$$

Figure #7Q

r) Actual L3 phase current
Indication: NNNN.NN A
This will be displayed on the LCD on two screens as shown in figure #7R below
Example: actual L3 phase current is 6.78 A

$$ELEc-40$$

$$6.78 \; A$$
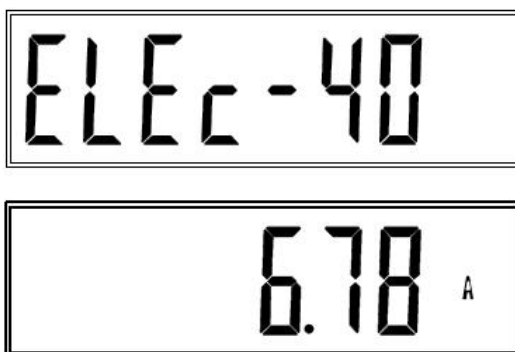
Figure #7R

s) Actual frequency
Indication: NN.NN Hz
This will be displayed on the LCD on two screens as shown in figure #7S below
Example: actual frequency is 50.06 Hz

$$ELEc-41$$

$$50.06$$
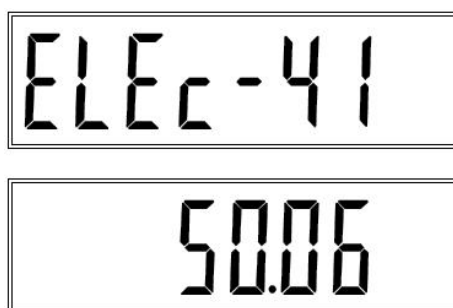
Figure #7S

t) Actual power factor
Indication: NN.NN Hz
This will be displayed on the LCD on two screens as shown in figure #7T below

Example: actual power factor is 0.567
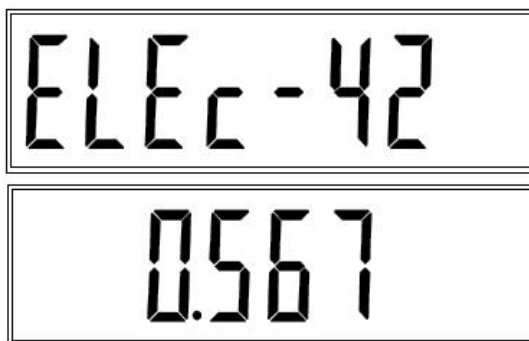
Figure #7T

Other meter functions

The LCD screen on the power meter will also display other information pertaining to its functions

- **Meter version**
  When the power is applied to the meter, it will display the meters version for 5 seconds, then it will display the other items. - Indication meter version 9.1 as shown in figure #7U below
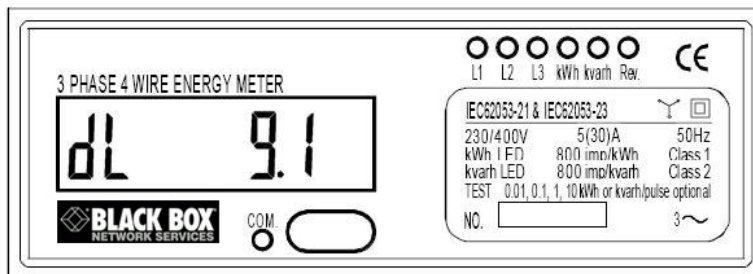

Figure #7U

- **Meter communication address (Meter ID)**
  Every meter has a 12 digit sole communication address for identification, called the Meter ID.

8. Operation using the ServSensor V4P web interface
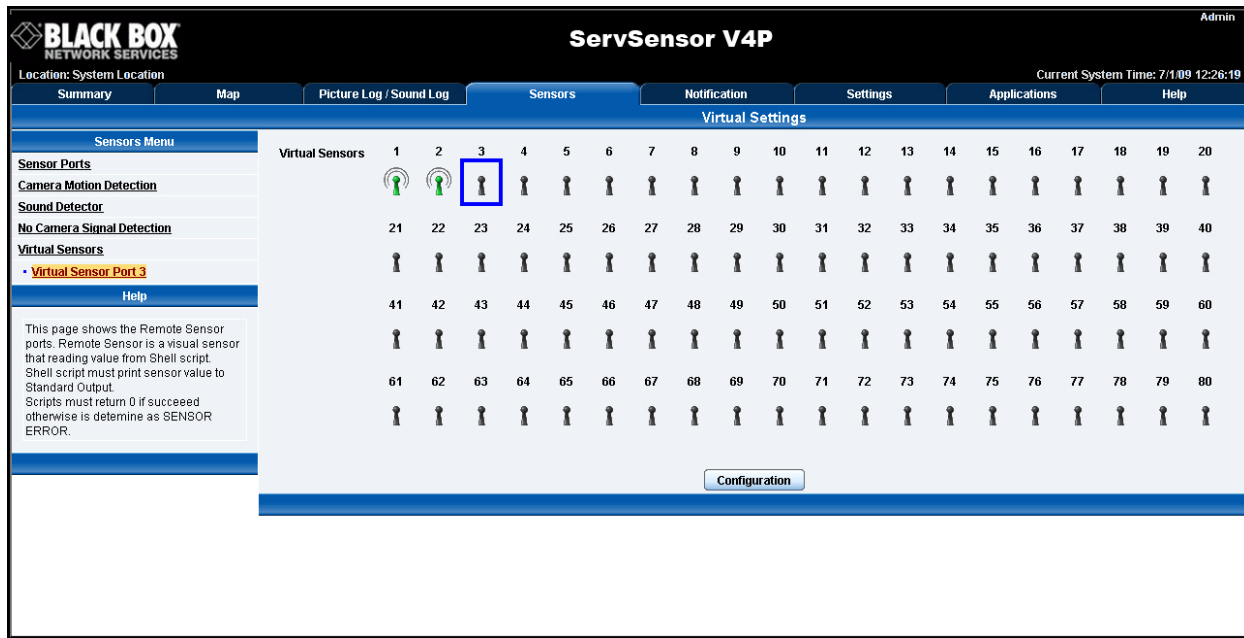
Figure #8A

After connecting the power meter to the ServSensor V4P RS485 port, click on the "Sensors" tab and then click on the "Virtual Sensors" on the features column on the left side of the page
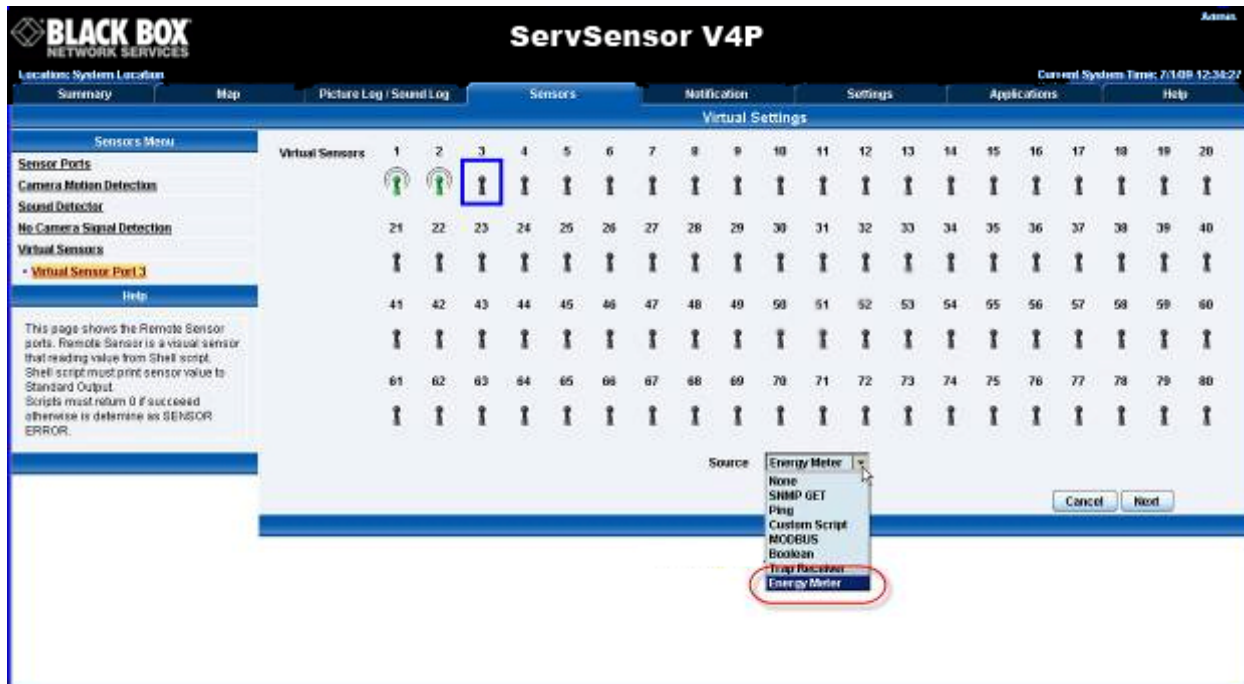

Figure #8B

Click on the configure button shown in figure #8A above, then choose "Energy Meter" from the drop down list as shown in figure #8B
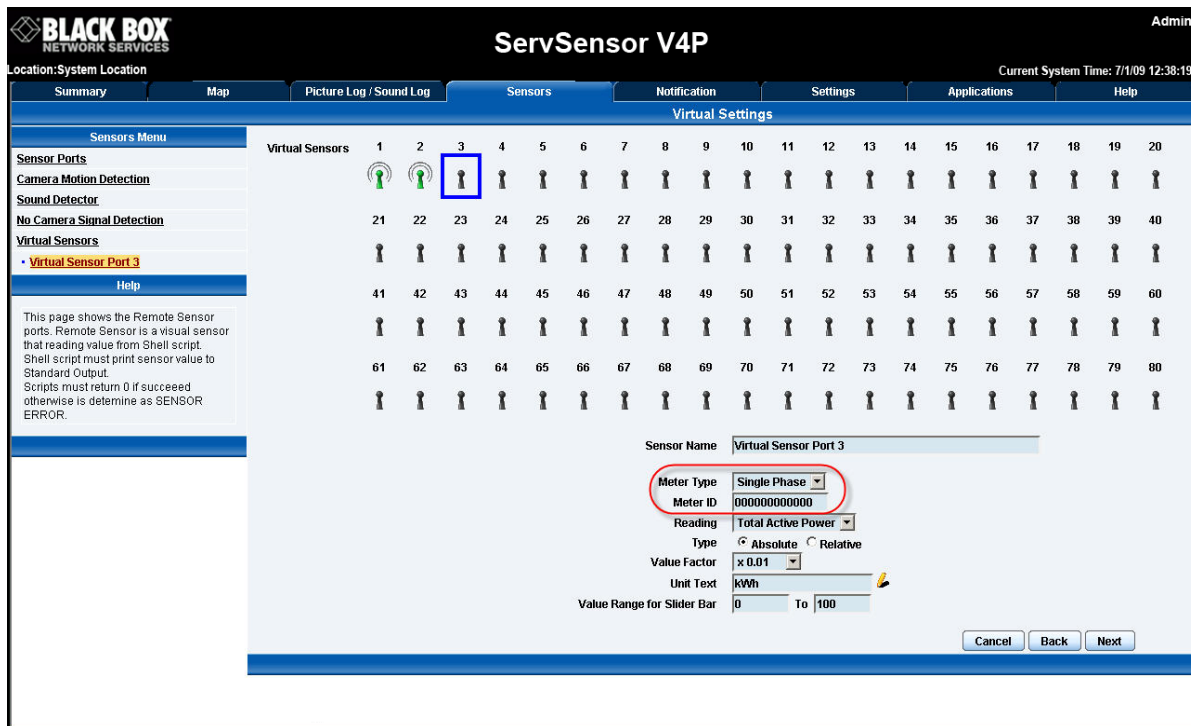

Figure #8C

You can now name your sensor by changing entering this in the "Sensor Name" field. When naming the sensor, you may want to name your sensor in reference to what you will be monitoring.

You will then select your "Meter Type" from the drop down list by clicking on the down arrow shown in figure #8C above. This will be the either the Single or Three Phase type.

At this point you will also enter the meter ID into the "Meter ID" field. You will find this on the front of the meter in the "No." field. When entering this number you need to add the extra 0 digits to the beginning of this field to make up the twelve digits for example, if the label shows 10046438, then you would add the extra zeros like this: 000010046438
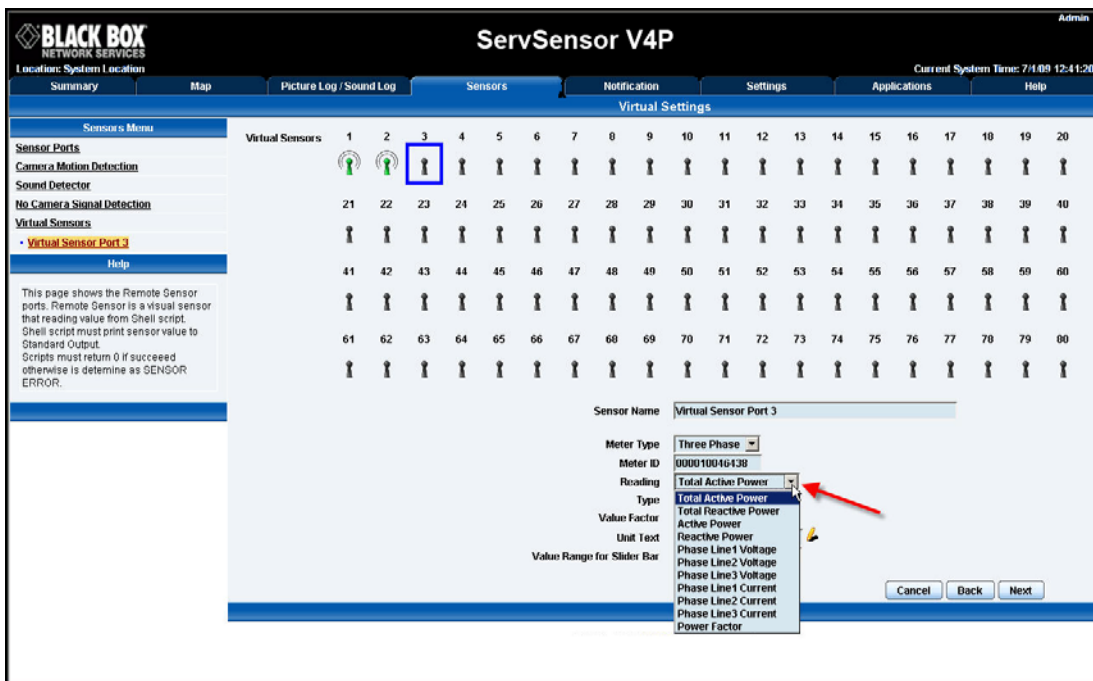
Figure #8D

As you can see now in figure #8D above that the meter ID has been entered. Now you will select what type of reading you need to monitor. You will select the reading by clicking on the drop down arrow as shown in figure #8D above

Hint: If you find these screen shots too small or out of focus you can increase the size, or zoom in on the document to enlarge the screen shots. This will make them clearer and much more readable.

We will use the "Total Active Power" as the example of the steps for setting this up in the ServSensor V4P web interface. You will use the exact same steps when setting up any other reading type from the drop down list shown above in figure #8D
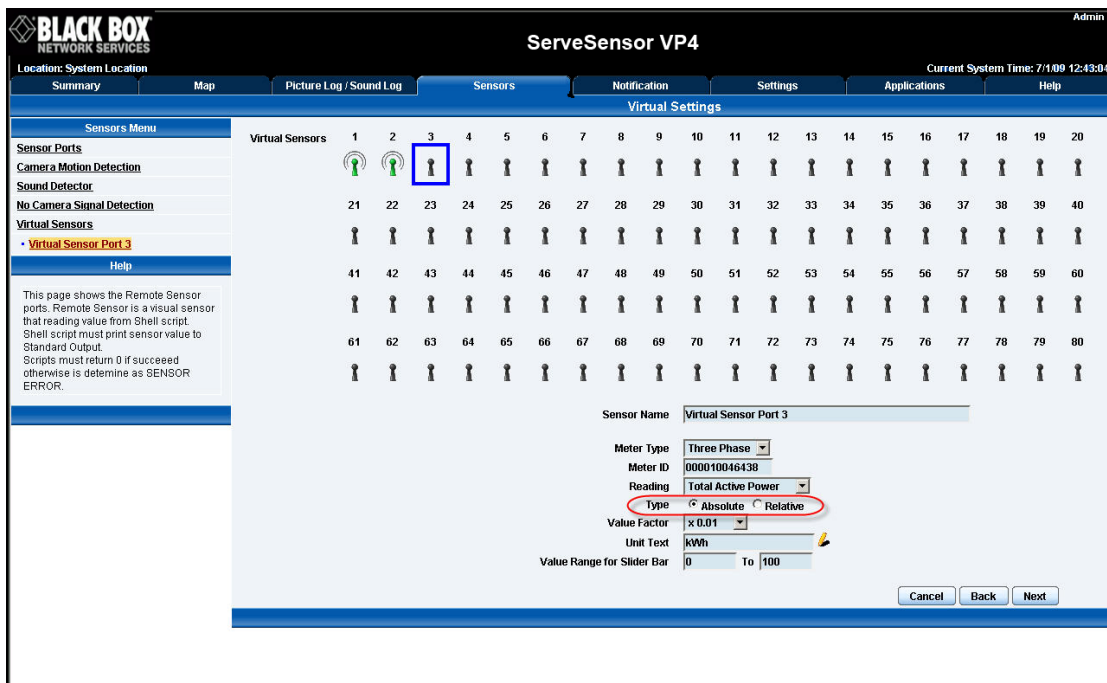
Figure #8E

Now for example as you can see above in figure #8E we have selected the first option, "Total Active Power" from the drop down list. Now we will select either "Absolute" or "Relative" as shown above in figure #8E
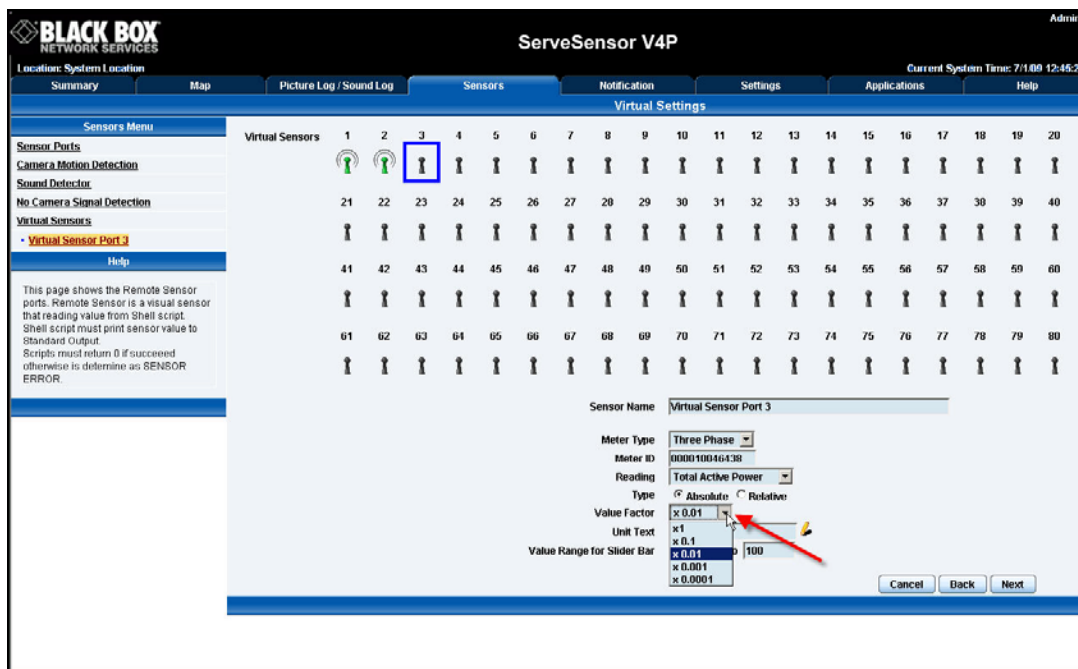

Figure #8F

Now you will set your "Value Factor" from the drop down list shown above in figure #8F
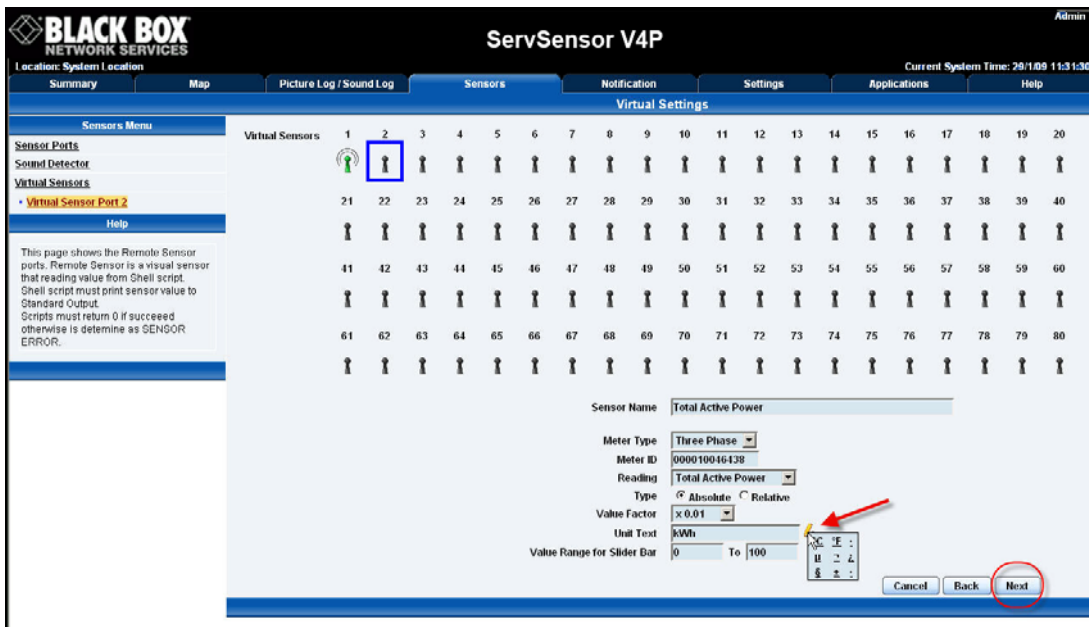

Figure #8G

Next you will set your "Unit Text" and the "Value Range" by entering these values into the fields shown above in figure #8G. Then click the "Next" button
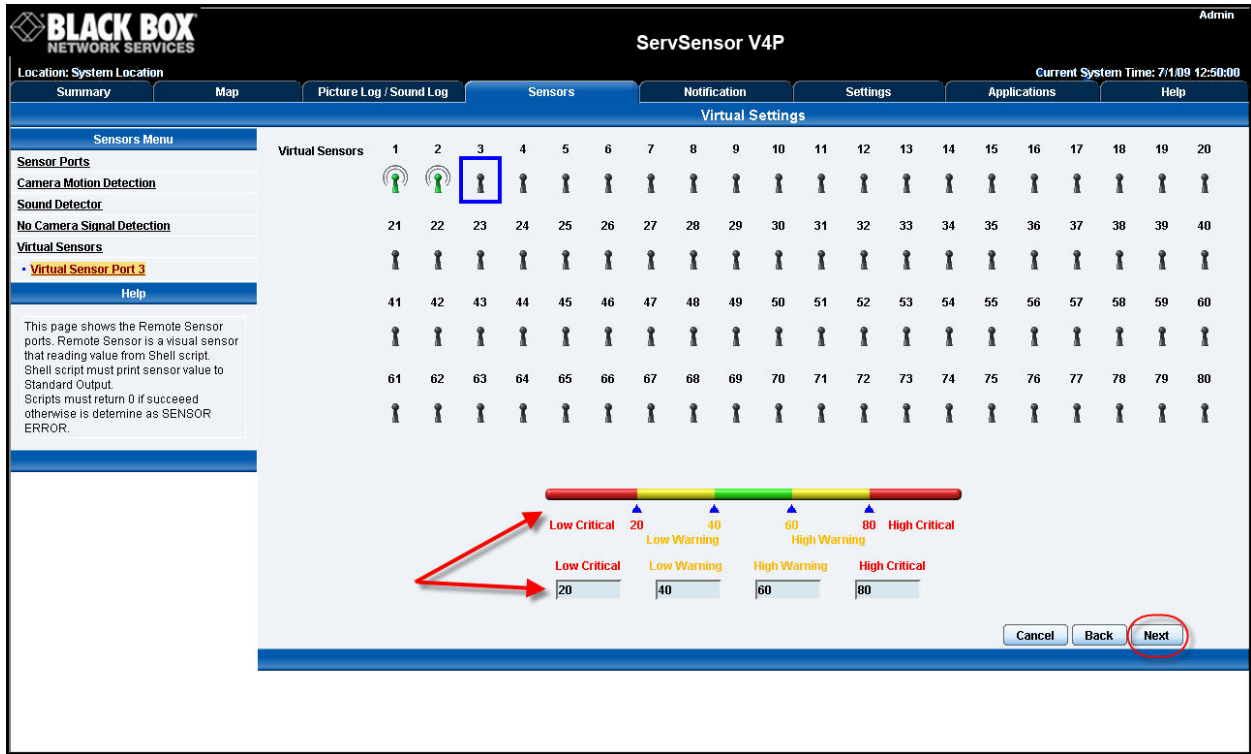
Figure #8H

Next you will set your reading thresholds for your alerts as shown in figure #8H above. Then click the "Next" button to move to the next screen in the wizard
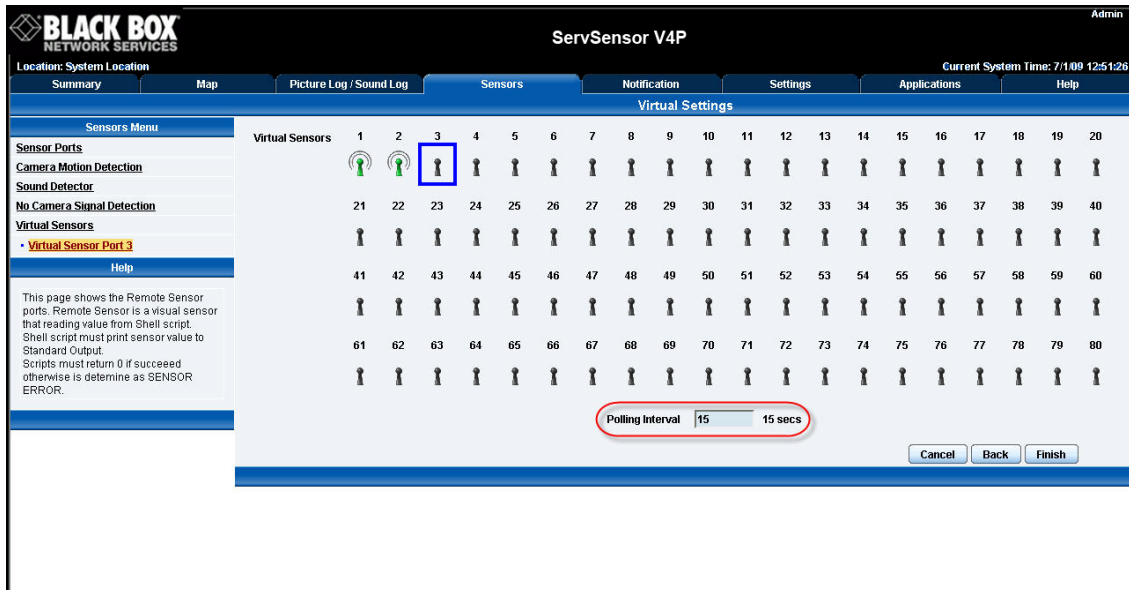

Figure #8I

Now you will set your polling interval as shown above in figure #8I and click "Finish" button to complete the setup of the move to the next screen
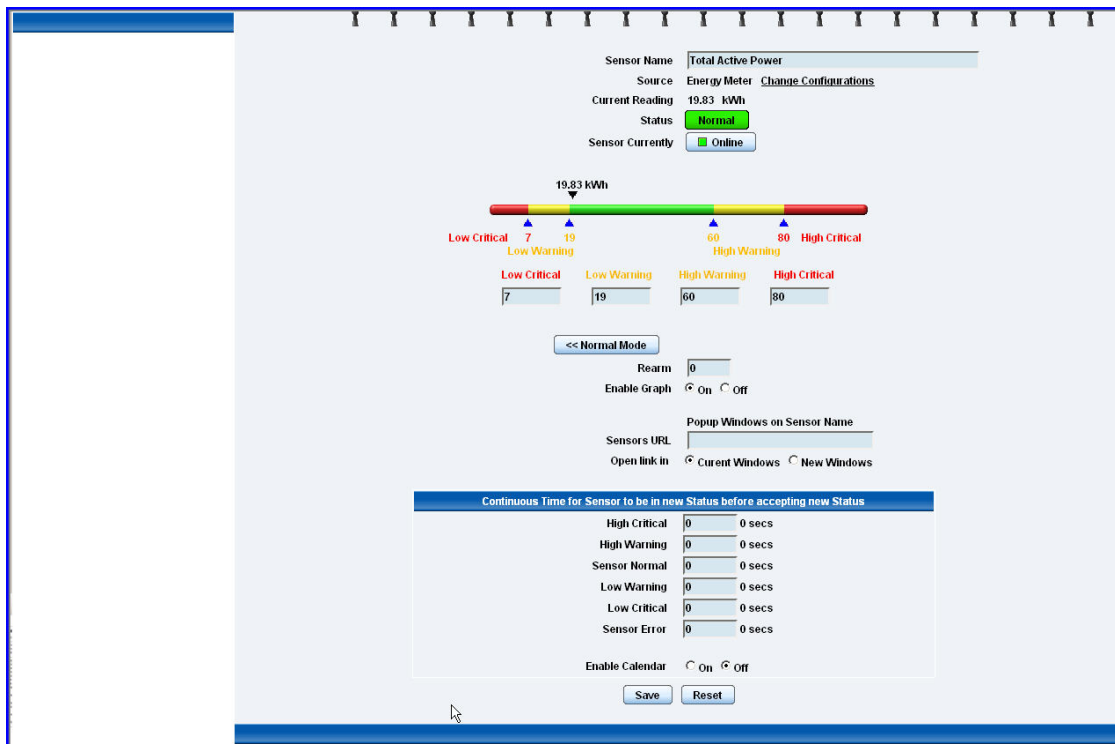

Figure #8I

After clicking the "Finish" button, this screen above in figure #8I will be displayed where you can adjust all your thresholds, enable your graphing and setting up your false warning