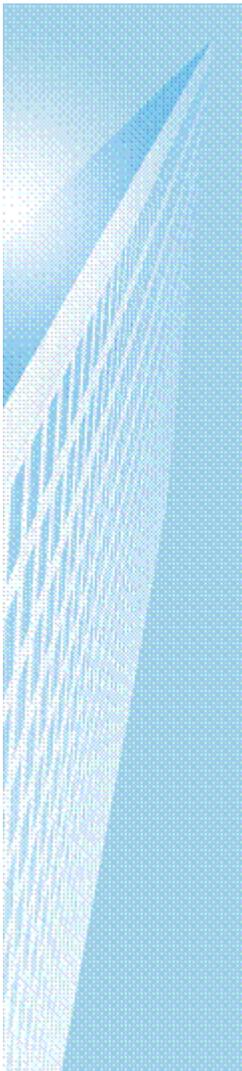


Cimetrics Inc.

B6070

BACnet/IP to Utility Meters



User Manual

Revised September 2018

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Introduction



The idea of a pulse meter is to measure Consumption and Demand and timed or aggregated measures derived from these. Consumption is known by various names in various domains - energy usage in electricity, steam usage for steam, water usage for water. Demand is known by various names in various domains – average power in electricity, average flow for steam, average flow for water.

These basic measures themselves are transformed from the basic pulse counting function of each channel input. Pulses are the rise and fall transition (full cycle) of the channel inputs. The current/voltage specification for driving the inputs is outlined elsewhere, but one can think of them as current limited LED sources which switch on/off an optically coupled transistor. They can be externally or internally excited (or both) given their passive nature. Our devices use DC-DC converters for excitation to allow one spurious reference voltage (which includes ground) to be present in the input circuit. These inputs have a natural timing limit of a few milliseconds, and are further rate limited by count software/logic which will only accept rates below 60 pulses per second.

The above being said about the inputs, they are perfectly suited to interface to dry contact form C relays or standard KYZ meter outputs (by attaching to KY or KZ).

The counting logic is designed at its core to be non-volatile. The logic under power will miss no pulses. The logic at power loss detection will store away the pulse count in a non-volatile fashion before power is completely lost. Thus the pulse count is non-volatile and changed only by incoming pulses. The pulse count cannot be reset. NOTE again the pulse count cannot be reset and will forever increment until it rolls over at the end of its 32bit range.

Given a very large 32bit count and the limits of floating point analog values and scale factors, precision loss is a concern. Precision compensation is obtained by setting the variable

Pulse-offset. Consumption is calculated from pulse-delta times the Scale Factor.

These are configurable under

So Consumption = (Pulse – Pulse-offset) * Scale Factor

The four variables in the above equation are the primary data available from a meter channel Pulse – changes only with incoming pulse

Pulse-offset – configurable (viewable but not a settable object)

Scale Factor – configurable (viewable but not a settable object)

Consumption – result

Then the other four measures are derived from the above along with timing as configured under overall meter configuration....

Demand is the rate of consumption during the demand window period (the time factor in the rate can be deduced from the units exhibited and is set in a fixed fashion to avoid mistakes). This is measured (up to jitter the cycle times of the processor and granularity of the pulses) over the Demand Window Period.

So if we get the change in Consumption value over the demand window period and divide by that period, we get Demand or going back to the basic inputs...

$$\text{Demand} = (\text{deltaPulse} * \text{Scale_factor} * \text{units_Scale}) / \text{Demand_Window}$$

where Demand_Window = "Demand window width"*60 (converted to seconds)

$$\text{deltaPulse} = \text{Current_Pulse} - \text{Pulse_Demand_window_width_Ago}$$

$$\text{units_Scale} = 3600 - \text{for KWH and LBS_MASS_PER_HOUR}$$

$$= 60 - \text{for CUBIC_FEET_PER_MINUTE and US_GALLONS_PER_MINUTE}$$

Demand is updated every "Demand window slide period".

Note that when "Demand Window Slide Period" is equal to "Demand Window" (is equal to N), then effectively we are getting what is often called "Demand on N time intervals". This is sometimes what is desired, but many consumers want more granular and timely information every "Demand Window Slide Period", so this option for more frequent Demand calculation is present.

Then we have three other derived measures for each channel which are effectively controlled by resets. Resets are initiated by the Reset command. One derived measure is a variable until a reset occurs and the other two are calculated at reset. The variable is Peak Demand since Reset. It is simply the MAX of the Demand (which is calculated every "Demand Window Slide Period"). This is a running MAX that just keeps getting larger whenever the particular Demand measurement is larger.

When a reset occurs two things happen: The last two measures are computed:

Peak Demand of past period before Reset is computed by storing away Peak Demand since Reset. This is useful in comparing current demand to previous demand peaks.

Cumulative Demand is the sum of all Peak Demand of past period before Reset and the Peak Demand since Reset. Upon a little thought, this number corresponds to no real measure of anything. However it is extremely useful as a checksum against which logs of Peak Demand since Reset and the actual number of resets can be compared. Using this number, double resets, premature resets, malicious rests and other such anomalies can be discovered in the record.

And of course, after the two measures are calculated when a reset occurs - Peak Demand since Reset is instantaneously set to zero in preparation for its next MAX recalculation at the next Demand Window Slide Period end.

Note! We strongly recommend that the power be recycled on the unit at least once every six months.

Logging to B6070

Access the B6070 configuration screen using your browser. Here is an explanation of how to do this.

Connect the B6070 Ethernet connector to an Ethernet hub, and run another Ethernet cable from that hub to your laptop or PC. Make sure that the laptop or PC is the *only* other unit in this small LAN. **NOTE:** If you do not have a hub, you can use a "crossover cable" to connect between the B6070 and your laptop.

Set your PC's IP address to **192.168.88.90** with a subnet mask of **255.255.255.252**. Open

your browser and enter the following URL: <http://192.168.88.89/admin>

You will be prompted to login:

User = admin password = admin

For improved access security, you should change your password from the default values. **Make sure you SAVE your new password!** When you click on "Save and Reboot" and "confirm" the configuration process is completed. If you lose your password, Cimetrics **DOES NOT** have a default password.

Now disconnect your laptop and connect the B6070 into your BACnet networks.

Please note that the B6070 device is always available (does not matter if you have changed the IP address in the TCP/IP and BACnet Configuration page) at the above-mentioned IP address.

The screenshot shows a web browser window with the URL 172.16.14.15/admin/. The page title is "BACnet/IP to 4 x Utility Meter (PULSE)". On the left is a navigation menu with items like Home, BACnet/IP Settings, Meter Configuration, BACnet Objects Status, Change Date&Time, Change Password, Statistics, Reset Configuration, and Activate Configuration. The main content area displays the following information:

BACnet/IP to 4 x Utility Meter (PULSE)
 MAC:
 Firmware version: 3.2

Data Snapshot

CHAN-1/CONSUMPTION	6	kWh
CHAN-1/DEMAND	NaN	kW
CHAN-1/DEMAND_PEAK	NaN	kW
CHAN-2/CONSUMPTION	1	cubic-feet
CHAN-2/DEMAND	NaN	cubic-feet/min
CHAN-2/DEMAND_PEAK	NaN	cubic-feet/min
CHAN-3/CONSUMPTION	4	kWh
CHAN-3/DEMAND	NaN	kW
CHAN-3/DEMAND_PEAK	NaN	kW
CHAN-4/CONSUMPTION	25	kWh
CHAN-4/DEMAND	NaN	kW
CHAN-4/DEMAND_PEAK	68	kW

At the bottom right of the main content area is a button labeled "Download B6070data.csv". The footer contains the text: "Boston, MA, tel: 617-350-7550; products@cimetrics.com; www.cimetrics.com" and "Copyright © 2004-2013 Cimetrics Inc. B6070 v1.1-k3-c3283-5.00".

B6070 Configuration

1. BACnet/IP Settings

BACnet/IP Settings

This page allows you view current BACnet/IP settings, change BACnet/IP settings or restore them to factory default.

Parameter	Value	Description
IP Address	172.16.14.15	IP address of the Device.
Network Mask	255.255.255.0	Subnet mask.
Default Gateway	172.16.14.1	IP address of default gateway.
BACnet UDP Port	47808	BACnet/IP UDP port number.
BACnet Device Number	1491445	Device ID. Default = 1491445 generated from MAC.
BBMD IP Address		IP address of target BBMD for the Foreign Device to register. Entering IP address of target BBMD enables Foreign Device mode.
BACnet Device Location/Application		Location/application string (0-63 characters) to help user find the Device Object Name.
<input checked="" type="checkbox"/> Disable new BACnet objects		Support only Device, Analog and Binary objects and hide any new/complex objects.

OK Advanced Restore default

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IP Address:

This unit is shipped with a factory default IP address. Please change it to suit your Network. This is something usually assigned by a Network Administrator in your company.

Network Mask:

Please change the default value to something that matches your IP address. This is also typically assigned by a Network Administrator in your Company.

Default Gateway:

Please change the default value. This is also typically assigned by a Network Administrator in your Company.

BACnet UDP Port:

The default value is 47808. This is the port number that the BACnet protocol typically uses. DO not change this unless you are sure that your BACnet Network uses something different.

BACnet Device #:

This is the BACnet Device instance number. Please provide a UNIQUE instance number for the B6070. Please note that this number has to be unique throughout the entire BACnet Network.

BBMD IP Address:

You B6070 can connect to a BBMD device on another network and be a part of it. Specify BBMD IP address in this field.

BACnet Device Location/Application

Here you can specify Device name to help to find it on a BACnet network.

In Advanced settings you specify the Foreign Device subscription time – how long B6070 will be registered with BBMD you’ve specified earlier in “BBMD IP Address” field.

The screenshot shows a web browser window with the URL 172.16.14.15/admin/?page=core. The page title is "BACnet/IP to 4 x Utility Meter (PULSE)". On the left is a navigation menu with items like Home, BACnet/IP Settings, Meter Configuration, etc. The main content area is titled "BACnet/IP Settings" and contains a table of current settings. Below the table is a checkbox for "Disable new BACnet objects" and a section for "Advanced settings" with a "FD Subscription TTL" field set to 30 minutes. At the bottom are "OK", "Basic", and "Restore default" buttons.

Parameter	Value	Description
IP Address	172.16.14.15	IP address of the Device.
Network Mask	255.255.255.0	Subnet mask.
Default Gateway	172.16.14.1	IP address of default gateway.
BACnet UDP Port	47808	BACnet/IP UDP port number.
BACnet Device Number	1491445	Device ID. Default = 1491445 generated from MAC.
BBMD IP Address		IP address of target BBMD for the Foreign Device to register. Entering IP address of target BBMD enables Foreign Device mode.
BACnet Device Location/Application		Location/application string (0-63 characters) to help user find the Device Object Name.
<input checked="" type="checkbox"/> Disable new BACnet objects		Support only Device, Analog and Binary objects and hide any new/complex objects.

Advanced settings are better kept to factory default values. Changes to these settings might negatively impact operation of the device.

FD Subscription TTL: 30 min. Effective only if BBMD address is set. It is recommended to set this number between 30 minutes and an hour.

OK:

After making changes, clicking on "**OK**" followed by "**Save and Reboot**" followed by clicking on "**Confirm**" will save your changes.

Reset to Default:

Clicking on this will result in the configuration of this page being set to factory defaults.

2. Meter Configuration

Meter Configuration

Channel 1 Configuration

Meter Type	kilowatt-hours/kilowatts meter	"None" means that objects for this channel will NOT be available for discovery and reading.
Demand window width	15	Minutes. Range: [1-120]. Default=15
Scale factor	1.00000	Units per pulse. Default=1.0
Pulse offset	0	Subtracted from, and not to exceed, the non-volatile count before scaling (6)
Description		Short description of the channel (0-63 characters).

Channel 2 Configuration

Meter Type	cubic-feet/cubic-feet-per-minute meter	"None" means that objects for this channel will NOT be available for discovery and reading.
Demand window width	15	Minutes. Range: [1-120]. Default=15
Scale factor	1.00000	Units per pulse. Default=1.0
Pulse offset	0	Subtracted from, and not to exceed, the non-volatile count before scaling (1)
Description		Short description of the channel (0-63 characters).

Channel 3 Configuration

Channel Configuration Meter Type:

Choices are:

1. kilowatt-hours/kilowatts meter
2. btus/btus-per-hour meter
3. cubic-feet/cubic-feet-per-minute meter
4. cubic-meters/cubic-meters-per-hour meter
5. us-gallons/us-gallons-per-minute meter
6. liters/liters-per-hour meter
7. pounds-mass/pounds-mass-per-hour meter
8. kilograms/kilograms-per-hour meter
9. no-units/per-second meter (this is useful for counting unitized entities like people, animals, events and such. We could have used Hertz, but this is confusing for some applications)

"None" means that objects for this channel will NOT be available for discovery and reading. The commodity measured is up to the user to describe in the description. We have chosen common units and their most commonly used/associated units/time. Metric and English units are represented.

Scale factor and Pulse Offset:

Pulse offset **O** Subtracted from, and not to exceed, the non-volatile count before scaling (x) . Because the counters are non-volatile and impossible to reset, this is used to allow a reasonable starting position in cases where a meter may already have accumulated a significant number of counts in its lifetime. This can be used as an accumulation reset if the number is is set to the current count =x (as shown in the ())
Note the pulse subtraction is done BEFORE the scaling.

Description:

Here the user describes what the meter is doing/measuring. This description is used in the BACnet Object description and helps identify location and commodity metered.

3. BACnet Objects Status

Objects Status
 Configuration: IP=172.16.14.15/255.255.255.0; Default gateway=172.16.14.1; BACnet port=47808

Name	Units	Date/Time	Value	Instance	Description
B6070-1491445	-	18/09/18,15:09:38	reboots=46	1491445	1=(kWh); 2=(cubic_f); 3=(kWh); 4=(kWh)
DEMAND_INTERVAL_SLIDE	seconds	-	60	AV-1	Demand window slide period
CHAN-1/COUNT_RAW	-	-	6	AI-100001	Magnitude of raw count
CHAN-1/COUNT_OFFSET	-	-	0	AI-100002	Magnitude of value subtracted from raw count to get delta
CHAN-1/COUNT_DELTA	-	-	6	AI-100003	Magnitude of difference between 32-bit count and 32-bit offset
CHAN-1/OVERFLOW	-	-	No	BI-100001	Whether Delta is too large (need to change Offset)
CHAN-1/SCALE	kWh	-	1	AV-100001	Units per pulse
CHAN-1/DEMAND_INTERVAL	seconds	-	900	AV-100003	Integration period for demand calculation
CHAN-1/CONSUMPTION	kWh	-	6	AI-100004	Consumption
CHAN-1/DEMAND	kW	-	NaN	AI-100005	Rate of consumption
CHAN-1/DEMAND_PEAK_TIME	-	-	No	BI-100002	Whether MAX Demand contains valid value
CHAN-1/DEMAND_PEAK	kW	-	NaN	AI-100006	MAX Demand since Reset
CHAN-1/DEMAND_PEAK_OLD	kW	-	NaN	AI-100007	MAX Demand of past period before Reset
CHAN-1/CUMULATIVE_DEMAND	kW	-	0	AV-100002	Total of maximum Demand during the preceding period

4. Show/Change Date&Time

The screenshot shows a web browser window with the URL `172.16.14.15/admin/?page=rtc`. The page title is "BACnet/IP to 4 x Utility Meter (PULSE)". On the left is a navigation menu with items: Home, BACnet/IP Settings, Meter Configuration, BACnet Objects Status, Change Date&Time, Change Password, Statistics, Reset Configuration, and Activate Configuration. The main content area is titled "Show/Change Date&Time" and includes the instruction: "Click the 'Set Date&Time' immediately after the Date&Time are specified." Below this is a table with three columns: Parameter, Value, and Description.

Parameter	Value	Description
Current Date(dd-mm-yy)	18 -09 -18	Example: 31-12-07 to set date 31-December-2007
Current Time(hh:mm:ss)	15 :10 :03	Example: 18:30:59

Below the table are three buttons: "Set Date&Time", "Refresh", and "Cancel". At the bottom of the page, there is a copyright notice: "Copyright © 2004-2013 Cimetrics Inc." and a version number: "B6070 v1.1-k3-c3263-5.00".

Users can set the Date and Time parameters for the B6070 device on this page. The Date format is DD-MM-YY

DD is for the Date, MM is for the Month and the YY is for the year. The Time format is HH-MM-SS

Please note that you will need to enter the "CURRENT" time here. HH is for the Hour, MM is for the minute and SS for the Seconds.

Once you have entered your values, click on the button "Set Date&Time" immediately. This will save your Date and Time

5. Change Password

Users can change the default username and password here.

Please keep in mind that once you change the username and password, you will need to remember it as Cimetrics does not have a backdoor password.

The screenshot shows a web browser window with the address bar displaying "172.16.14.15/admin/?page=passwd". The page title is "BACnet/IP to 4 x Utility Meter (PULSE)". On the left is a sidebar menu with items: Home, BACnet/IP Settings, Meter Configuration, BACnet Objects Status, Change Date&Time, Change Password, Statistics, Reset Configuration, and Activate Configuration. The main content area is titled "Change Administrator Login and Password" and contains a table with the following data:

Parameter	Value	Description
Login:	admin	Login to access this WebSetup (up to 15 symbols).
Current password:	<input type="text"/>	Current administrator password.
New password:	<input type="text"/>	New administrator password (up to 15 symbols).
Confirm new password:	<input type="text"/>	The same password.

Below the table is an "OK" button. At the bottom of the page, the footer contains "Copyright © 2004-2013 Cimetrics Inc." on the left and "B6070 v1.1-k3-c3263-5.00" on the right.

6. Statistics

This page shows statistics for the B6070.

The screenshot shows a web browser window with the address bar displaying `172.16.14.15/admin/?page=logstat`. The page title is "BACnet/IP to 4 x Utility Meter (PULSE)". On the left, there is a navigation menu with the following items:

- Home
- BACnet/IP Settings
- Meter Configuration
- BACnet Objects Status
- Change Date&Time
- Change Password
- Statistics
- Reset Configuration
- Activate Configuration

The main content area displays the "Statistics" section, which contains a table with the following data:

Parameter	Value	Description
Count of Reboots	46	How many times the box has restarted
Current Seconds	582	Time elapsed since power on.
FD Status	Disabled	BBMD address not configured
BACnet/IP Packets	2 sent, 0 received	

At the bottom of the page, the footer contains the text "Copyright © 2004-2013 Cimetrics Inc." on the left and "B6070 v1.1-k3-c3263-5.00" on the right.

7. Reset Configuration

The screenshot shows a web browser window with the address bar displaying `172.16.14.15/admin/?page=setdef`. The page title is "BACnet/IP to 4 x Utility Meter (PULSE)". On the left is a navigation menu with the following items:

- Home
- BACnet/IP Settings
- Meter Configuration
- BACnet Objects Status
- Change Date&Time
- Change Password
- Statistics
- Reset Configuration
- Activate Configuration

The main content area contains the following text and buttons:

Restore all settings to factory default

or

Discard all changes and revert to active configuration

At the bottom of the page, the footer contains "Copyright © 2004-2013 Cimetrics Inc." on the left and "B6070 v1.1-k3-c3263-5.00" on the right.

8. Activate Configuration

Once changes are made to any configuration on the B6070, the changes get saved only after clicking on the "Confirm" button in the Activate Configuration screen. Clicking on this will initiate a reboot of the device and will save the changes that have been made.

