Demands

In electricity measurement, the phrase "Demand" is used to express average value over a period. For ease of use, the demand period is an integer dividing of an hour, meaning 1, 2, 5, 10, 15, 30 or 60-minute interval. The most common demand interval is 15 minute while 30 and 10 are also widely used.

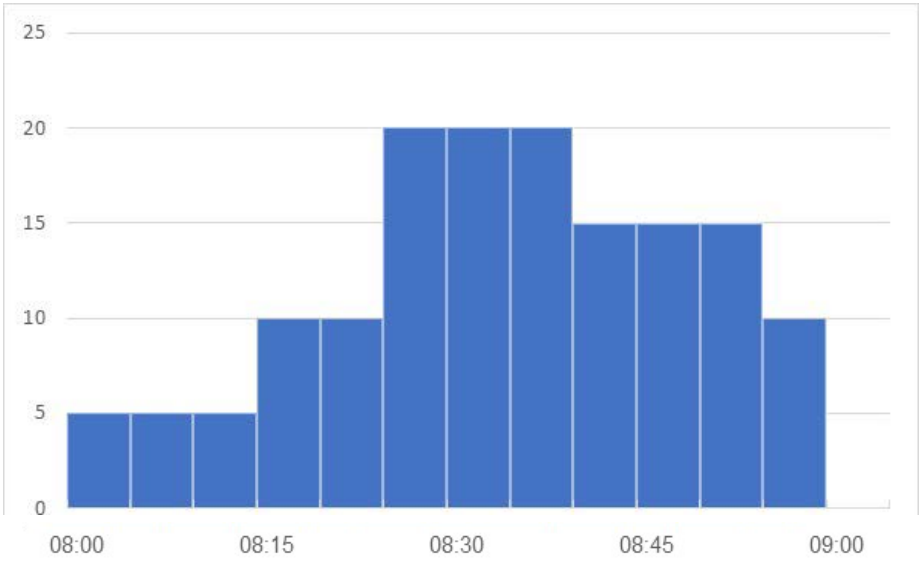
Normally demand measurements are provided for volts, amps, total harmonics and powers.

Demand Periods

Block Interval

The simplest way to calculate demand is to calculate the average over a period based on the meter built-in clock, which is called "Block Interval".

For example, in the chart below the values of demand are 5 (from 08:00 to 08:15), 13.3 ($\frac{10+10+20}{3}$ from 08:15 to 08:30), 18.3 (08:30-08:45) and 13.3 (08:45-09:00).



The advantage of this method is its simplicity of calculation and no requirement for external synchronization while the disadvantage is that the results will vary between devices. For example, if another meter will have 5-minute offset in its internal clock the demand in the example above will be 6.6 rather than 5 (from 08:05 to 08:10 and 08:10 to 08:15 the value is 5 and from 08:15 to 08:20 the value is 10, which result $\frac{5+5+10}{3} = 6.6$).

Synchronized Block Interval

To get comparable results from different meters, it is possible to synchronize their clocks. The easiest way to synchronize the clocks are using digital signal – one device provides digital output on each minute change and the second device adjusts its clock on digital input change. Typically, the fiscal meter generates the signal and the check meter synchronizes, or using GPS signal to synchronize all meters.

The advantage of this method is the consistency between devices and the disadvantages is its failure to detect the highest value. For example, in the chart above, the demand between 08:25 to 08:40 is 20, but the highest calculated demand is only 18.3.

Sliding Windows Interval

To detect the maximum demand, calculation is performed for any window over time (the window "slides" over the time). In this way, demand from 08:00 to 08:15 is 5, from 08:05 to 08:20 is 6.7, from 08:10 to 08:25 is 8.3 etc. Using this technique, the peak demand of 20 that occurs from 08:25 to 08:40 is detected.

This technique is the best to detect peak demands and its only disadvantage is that not all meters support it.

Peak Demand

The most usable parameter for demands is the peak demand – the highest recorded demand over time (using the selected period). It is useful for monitoring the loading, by monitoring either kVA or Current demands, harmonic pollution by monitoring the THD demand or consumption peaks by monitoring kW demand. Some utilities imply a charge to the peak demand as it affects its network loading, as well as to monitor the service utilization.

Accumulated and Predicted Demands

To minimize utility demand charges, it is useful to perform load shedding using power meters. It is done by disconnecting non-critical loads during the peak demand period as described below.

Accumulated demand is the accumulator of demand parameter (typically kVA) from the beginning of the present demand interval and expressed. It grows from zero at the beginning and up to the final block demand at the end of the demand interval. Predicted demand shows the expected sliding window demand value at the end of the present demand interval, if the load does not change. For load shedding the predicted demand is compared to the desired limit and if it is higher – a digital output is used to disconnect a load.

Demands in SATEC Devices

All SATEC devices include all options of demand calculations.

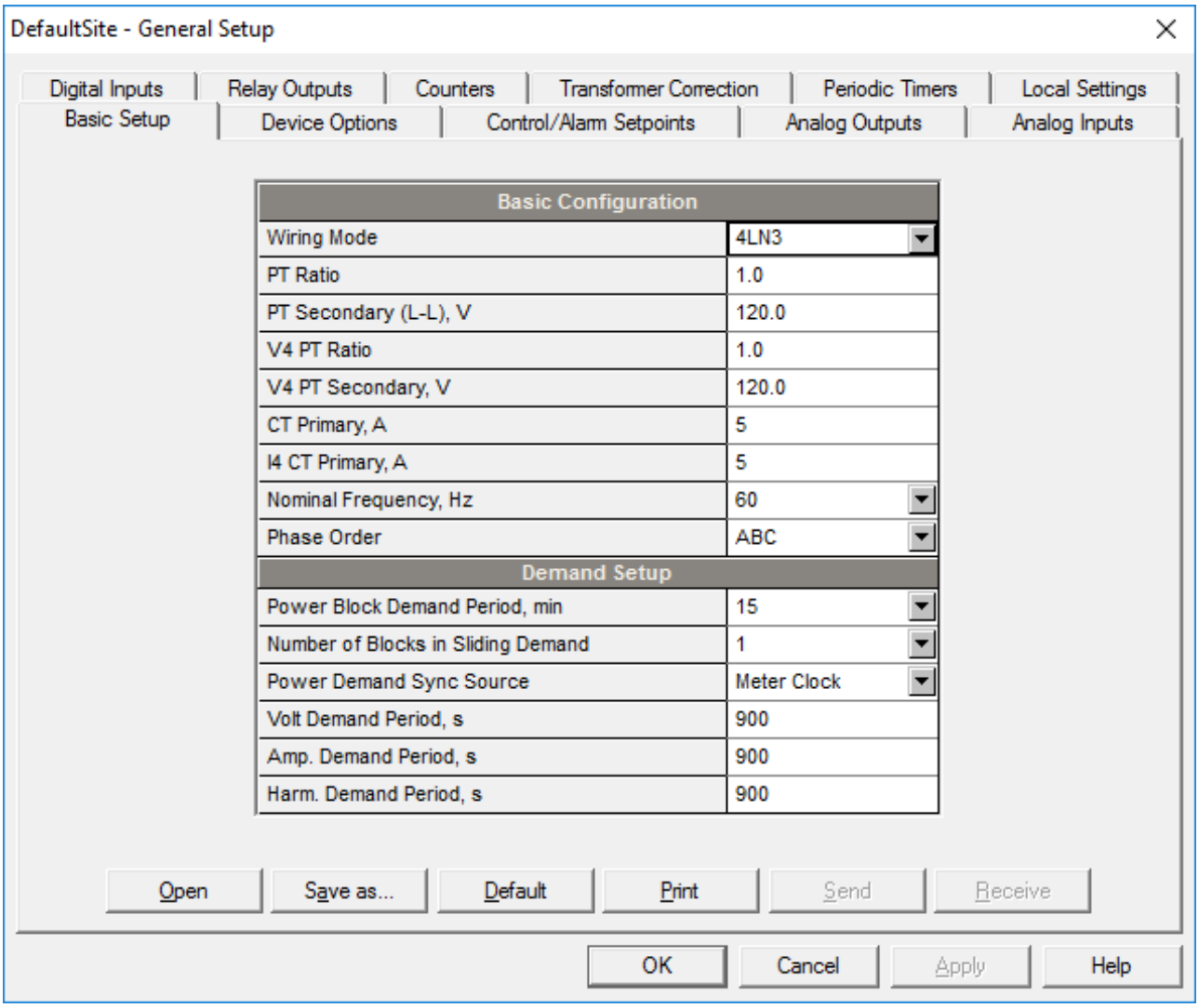
The fundamental demand measurement period is calculated at a minimum of 128 samples per cycle aggregated with 1 second updates which is used for all other calculations. SATEC devices include power demands for all device energy accumulators, including the Summary and TOU energy registers, as well as volts, amps and total harmonic demands.

The power demand is selectable from 1, 2, 5, 10, 15, 30 or 60 minutes (default = 15) which is divided to blocks for sliding window demand. For Block Interval – user should select 1 block.

For volt, ampere and total harmonic demands, the demand period time is programmed in seconds from 1 second to 900 seconds (15 minute) in power meters or up to 9,000 seconds (2.5 hours) in high end devices. The default period is the same as for power demand - 15 minutes. In SATEC PM180, it is possible to set different demand period for different parameters. The averaging is performed over the 1 second values of each parameter.

Each parameter has demand and peak demand with time stamp. Demands can be logged and TOU demand registers the device allows automatic recording (profiling) of the daily and monthly maximum demands to the data log together with the TOU energy readings.

Peak demand can be cleared using automatic criteria using the set-point mechanism – each set of demands can be cleared separately.


DefaultSite - General Setup
Digital Inputs
Relay Outputs
Counters
Transformer Correction
Periodic Timers
Local Settings
Basic Setup
Device Options
Control/Alarm Setpoints
Analog Outputs
Analog Inputs
Basic Configuration
Wiring Mode
4LN3
PT Ratio
1.0
PT Secondary (L-L), V
120.0
V4 PT Ratio
1.0
V4 PT Secondary, V
120.0
CT Primary, A
5
I4 CT Primary, A
5
Nominal Frequency, Hz
60
Phase Order
ABC
Demand Setup
Power Block Demand Period, min
15
Number of Blocks in Sliding Demand
1
Power Demand Sync Source
Meter Clock
Volt Demand Period, s
900
Amp. Demand Period, s
900
Harm. Demand Period, s
900
Open
Save as...
Default
Print
Send
Receive
OK
Cancel
Apply
Help