

# PowerGuard documents

Brochures, specifications, installation manuals, and troubleshooting guides.

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# Brochures

Brochures

# PowerOptimal PowerGuard Web Brochure

Download the PowerOptimal PowerGuard Web Brochure brochure using the attachment below.

# Product Specifications

# PowerOptimal PowerGuard CPM-3PC Mk2 specification

## *INTRODUCING THE*

*PowerGuard® CPM-3PC Mk 2*

[http://powerguard.co.za/\\_images/CPM-3PC-Mk-2.jpg](http://powerguard.co.za/_images/CPM-3PC-Mk-2.jpg)

***The PowerGuard CPM-3PC MK2 is a maximum demand controller designed to control loads where either not enough power is available or where peak demand (kVA) needs to be reduced in order to save on electricity bills.***

*This single enclosure houses power supplies, communication modem, display, control selection as well as all the required external connector terminals.*

## *SPECIFICATIONS*

### ***INPUT***

Load information is accessed from standard current transformer outputs covering the point of entry serving the area to be controlled.

### ***CONTROL***

Current or kVA-based control can be selected to regulate demand. For customers with insufficient supply, current based phase selective sheds ensure that only the transgressing overloaded phase responds to shed signals. The number of shed signals per half hour are recorded to assist with fine-tuning shed levels while line current graphs aid with phase balancing.

### ***PROGRAMMING***

All the variables associated with creating a shed instruction can be set up either on rotary numerical switches or slide selector switches. This enables all shed criteria to be viewed without the need for laptops or specialised software.

### ***DISPLAY***

An on board LCD unit displays the real time line currents and total kVA. Light emitting diodes indicate processor heartbeat; phase conscious shed requests, line quality of shed signals and total

shed demand.

## **SPECIFICATIONS**

- Current transformer ratio adjustable from 1 to 9 999 Amps. Secondary output is 1 Amp into 1 Ohm burden for full scale
- Star, delta LV and MV catered for
- Supply from standard 3-phase 230 Volt, < 20 Watts
- Shed level is adjustable from 1 to 9 999 Amps or kVA
- Two closing contact inputs are available to reduce 'time of use' sensitive accounts from 1 to 99% of selected shed level
- Single contact closure for total progressive shed/restoration of all loads, e.g. air conditioners after hours
- Shed interval delay adjustable from 4 seconds to 99 minutes
- Switch selectable shed criteria for Amps or kVA
- Two user specific selections for custom software
- 1 to 31 kVA backlash adjustment
- Screwdriver adjustable current simulation with phase selection for testing
- Remote control via cellular networks
- Clear cover to observe load, total kVA, shed activity and shed criteria
- Housing dimensions are 380H x 280W x 135H mm, Weight is 3.8 Kg.
- On board GPRS modem for remote internet based monitoring of phase currents, kVA, shed request profile, shed active report and average phase voltage
- Conforms to IEC/SANS 60669

# PowerOptimal PowerGuard CPM-SDB specification

*INTRODUCING THE*

*PowerGuard® CPM-SDB*

***PowerGuard CPM-SDB doubles as a shed control signal amplifier or shed signal restorer when coupled to a PowerGuard CPM-XC10 transceiver.***

*As an amplifier, the unit can enhance coverage of a PowerGuard load management installation by up to a further 400 receiver points per amplifier.*

*Connected to the PowerGuard CPM-XC10 transceiver, the unit will restore and echo the original shed signal to drive up to 400 PowerGuard shed receivers.*

*SPECIFICATIONS*

## ***SPECIFICATIONS***

- Power: 230Volts AC
- Consumption: < 30 Watts
- Dimensions: 200 x 120 x 75 mm less aerial
- Weight: 1 kg

# PowerOptimal PowerGuard CPM-XC10 specification

*INTRODUCING THE*

*PowerGuard® CPM-XC10*

***The PowerGuard CPM-XC10 is a dedicated transceiver designed to facilitate wireless communication between PowerGuard CPM-3PC MK2 and any PowerGuard receiver network.***

***Together with PowerGuard CPM-SDB, the CPM-XC10 can provide communication between the standard PowerGuard control signal from point of entry across roads, paving or between buildings where cabling is not feasible.***

*The unit can be used as a transmitter, repeater or receiver. Careful design ensures avoidance of RF signal collision. Up to four channels on each of the four selectable frequencies allows for multiple systems in close proximity to operate independently.*

*SPECIFICATIONS*

## ***SPECIFICATIONS***

- Power: 230Volts AC
- Consumption: < 3 Watts
- Transmission frequency: 866 MHz
- Output power: 10 milliwatt (mW)
- Range: Up to 200 m line of sight
- Dimensions: 200 x 120 x 75 mm less aerial
- Weight: < 1 kg

# PowerOptimal PowerGuard CPM16-30 specification

## *INTRODUCING THE*

*PowerGuard® CPM16-30*

CPM 16-30

***The PowerGuard CPM16-30 is a 16-channel demand regulator with 30 Amp switching capacity per channel designed to work with the PowerGuard CPM-3PC or CPM-3PC Mk2 controllers. The unit was developed primarily to reduce costs on demand sensitive electricity bills but can also be installed for customers who do not have enough power.***

*This certified unit is designed and manufactured in South Africa.*

## *SPECIFICATIONS*

### ***INPUT***

Shed requests are received via a polarity insensitive low voltage short circuit proof signal generated by the PowerGuard CPM-3PC or CPM-3PC Mk 2.

### ***CONTROL & PROGRAMMING***

Various algorithms can be selected to optimise the control of air conditioners, geysers and boiler elements thereby making intervention seamless in most installations.

Progressive load restoration assists with “cold pick up” situations following supply interruptions. All control criteria are switch programmable in order to avoid the need for laptops or specialised software.

### ***DISPLAY***

LEDs indicate shed status as well as processor heartbeat, control signal presence, over-voltage and supply activity.

## ***SPECIFICATIONS***

- An over-voltage feature protects all affected loads by disconnecting them during damaging high voltage situations.

- Current transformer ratio adjustable from 1 to 9 999 Amps. Secondary output is 1 Amp into 1 Ohm burden for full scale
- Standard single phase 230 Volt AC supply, <20 Watts
- Control input is opto-coupled to eliminate ground loops and elevated neutral spreads during faults
- Clear cover to observe shed status, control activity and programmed shed criteria
- Output is potential-free 30 Amp relay contacts
- Housing dimensions are 380L x 280W x 135H mm
- Weight is 3.5 kg
- Conforms to SANS/IEC 60669

# PowerOptimal PowerGuard CPM20-1W specification

## *INTRODUCING THE*

*PowerGuard® CPM20-1W*

***PowerGuard's CPM20-1 was developed as a modular cost effective 20 Amp load shed receiver to implement savings on demand sensitive bills as well as for installations that do not have enough power. The unit is particularly suited to control individual geysers in complexes, hotels and lodges.***

*This certified unit is designed and manufactured in South Africa.*

## *SPECIFICATIONS*

### ***INPUT***

Shed requests are received via a polarity insensitive low voltage short circuit proof signal generated by the PowerGuard CPM-3PC or CPM-3PC Mk 2.

### ***CONTROL & PROGRAMMING***

Progressive load restoration assists with "cold pick up" situations following supply interruptions. Control criteria are switch programmable in order to avoid the need for laptops or specialised software.

### ***DISPLAY***

LEDs indicate shed status as well as processor heart-beat, control signal presence and condition of incoming supply for easy monitoring.

## ***SPECIFICATIONS***

- An over- and under voltage feature protects all affected loads by disconnecting them during potentially harmful voltage situations.
- Standard single phase 230 Volt AC supply, <5 Watts

- Control input is opto-coupled to eliminate ground loops and elevated neutral spreads during faults
- Port hole in cover to observe shed status as well as control activity.
- Output is potential-free 20 Amp relay contact
- Housing dimensions are 160L x 80W x 55H mm
- Weight 0.6 Kg
- Conforms to SANS/IEC 60669

# PowerOptimal PowerGuard CPM30-1W specification

## *INTRODUCING THE*

*PowerGuard® CPM30-1W*

cpm30-1w

***The PowerGuard CPM30-1W is the result of on-going development with experience gained from our popular CPM20-1W unit which was developed primarily to reduce costs on demand sensitive electricity bills as well as for customers who do not have enough power. This unit features extended functionality and switching capacity as well as upgraded software algorithms to realise the maximum benefits associated with air conditioner load control.***

*This certified unit is designed and manufactured in South Africa.*

## *SPECIFICATIONS*

### ***INPUT***

Shed requests are received via a polarity insensitive low voltage short circuit proof signal generated by the PowerGuard CPM-3PC or CPM-3PC Mk 2.

### ***CONTROL & PROGRAMMING***

Various criteria can be selected to optimise the control of air conditioners, geyser and boiler elements thereby making intervention seamless in most installations. Progressive load restoration assists with "cold pick up" situations following supply interruptions. All control criteria are switch programmable in order to avoid the need for laptops or specialised software.

### ***DISPLAY***

LEDs indicate shed status as well as processor heart-beat, control signal presence and condition of incoming supply.

## ***SPECIFICATIONS***

- An over- or under voltage feature protects all affected loads by disconnecting them during potentially harmful voltage situations.

- Standard single phase 230 Volt AC supply, <5 Watts
- Control input is opto-coupled to eliminate ground loops and elevated neutral spreads during faults
- Port hole in cover to observe shed status as well as control activity.
- Output is potential-free 30 Amp relay change-over contacts
- Housing dimensions are 200L x 120W x 76H mm
- Weight 0.8 Kg
- Conforms to SANS/IEC 60669

# PowerOptimal PowerGuard DPM20-2 specification

*INTRODUCING THE*

*PowerGuard® DPM20-2*

***The two channel PowerGuard DPM20-2 demand manager caters for the average middle-class underpowered home with one or two geysers, pool pump and one or two air conditioners.***

*This installation is typically powered from a single phase 230 Volt AC @ 63 Amp supply.*

*This unit is designed and manufactured in South Africa.*

## **SPECIFICATIONS**

### **INPUT**

Power usage is measured by a current transformer (included) on the main incoming line.

### **CONTROL & PROGRAMMING**

PowerGuard will manage two independent loads according to a fixed hierarchy in order to avoid over-current trips during high electrical usage. External utility override input.

### **DISPLAY**

LCD display shows total current drawn as well as active switching elements.

## **SPECIFICATIONS**

- 2 x 20 Amp control contacts
- Operating voltage: 230Volts AC
- Power consumption: <3Watt
- Operating range: 180 to 280 Volts ac
- Maximum input voltage: 420 Volt ac indefinitely

- 6 kV impulse test
- Conforms to SANS 10142
- Controlled loads will be disconnected outside operating voltage range for protection
- DIN rail mounted
- Screwdriver current setting from 1 to 99 Amps

# PowerOptimal PowerGuard DPM20-8 specification

## *INTRODUCING THE*

*PowerGuard® DPM20-8*

***The eight channel PowerGuard DPM20-8 caters for larger homes, single or three phase, that suffer electrical trips because of marginal supply. Dual maximum current settings allow demand control of utility as well as standby (generator or UPS) power.***

*This unit is designed and manufactured in South Africa.*

## *SPECIFICATIONS*

### ***INPUT***

Power usage is measured by a current transformer (included) on the main incoming line.

### ***CONTROL & PROGRAMMING***

The eight switch elements (PowerGuard RL20-1) are modular and are controlled from the control unit (DPM20-8) via low voltage signals. Various hierarchies are available for loads with different requirements such as geysers and air conditioners. External input for utility override.

### ***DISPLAY***

LCD display shows total current drawn as well as active switching elements.

## ***SPECIFICATIONS***

- One to eight x 20 Amp control contacts
- Operating voltage: 230 Volts AC
- Power consumption: <5 Watt to < 15 Watt, depending on number of channels
- Operating range: 180 to 280 Volts AC
- Maximum input voltage: 420 Volt AC, indefinitely
- 6 kV impulse test
- Conforms to SANS 10142
- Controlled loads will be disconnected outside operating voltage range for protection
- DIN rail mounted

- Screwdriver current setting from 1 to 99 Amps

# PowerOptimal PowerGuard RL20-1 specification

*INTRODUCING THE*

*PowerGuard® RL20-1*

***PowerGuard RL20-1 is a DIN-rail mount relay primarily designed for use in conjunction with the PowerGuard DPM20-8 demand control unit. Contacts are activated by a DC voltage which is opto-isolated from the control circuit. The contact configuration switches the mains live circuit to the output when energised.***

*This unit is designed and manufactured in South Africa.*

*SPECIFICATIONS*

## ***SPECIFICATIONS***

- Input power: 230Vac
- Control voltage: 5 - 48 Volt DC
- Size: DIN standard, 48mm wide

# Installation & User Manuals

# PowerGuard commercial system installation instructions

PowerGuard CPM30-1W

## Installation

Remove the lid of the unit and securely fit upright against a panel or wall with Fischer or normal 4mM screws. The 4,5mM mounting holes are accessible through the rectangular apertures on the four corners of the enclosure. Drill or punch 20mM holes at the bottom of the enclosure to accommodate glands as required for wiring.

## Set Up Instructions

After powering up the system, SW1 active will inhibit its load when overall demand falls within the backlash range selected on the shed controller. This feature falls away when the backlash transgression restores and only activates again after a power interruption. This feature is essential for customers with a compromised electrical supply.

SW2 active responds to phase conscious shed requests, again essential for customers with a compromised supply. Customers with adequate supply will realise an improved random shed pattern with SW2 off.

SW3, 4 & 5 set the minimum shed period following a shed request. With these switches off,

the period is 1 minute and increases by 2,5 minutes for each additional binary bit added.

Total shed period is as follows: SW3=3,5; SW4=6; SW3+4=8,5; SW5=11; SW3+5=13,5; SW4+5=16 and SW3+4+5=18,5 minutes.

SW6, 7 & 8 control the minimum time between accepting shed requests. These switches together with switches 3,4&5 are essential for air conditioner control to ensure that the occupant's comfort levels are not compromised. With SW6,7&8 off, there is no lock-out interval. SW6=15; SW7=30; SW6+7=45; SW8=60; SW6+8=75; SW7+8= 90 and SW6+7+8=105 minutes.

SW9 & 10 decide on how many CPM30-1W receivers, on average, should respond to a shed request. For example, if 100 receivers are installed, all set to odds = 50, then approximately 2 units will shed for each shed request. With a total of 10 units, all set to odds = 10, approximately 1 unit will shed for each shed request. Odds are manipulated such that a recently shed unit will revert to maximum odds to allow other units to shed before it responds to the next shed request. With both SW9&10 off, odds= 5; SW9= 10; SW10= 25 and SW9&10= 50. Odds can be decreased within a control grid to favour higher priority loads or can be increased to protect lower priority loads.

# PowerGuard DPM20-2 installation instructions & diagram

## Powerguard Dpm20-2

### Installation Instructions

- 1) Isolate power to the distribution panel by opening the main incoming breaker associated with the relevant existing power meter and verify that the power is indeed switched off.
- 2) Retract the incoming feeder line to the distribution panel from the main breaker/isolator and reconnect after feeding the wire through the large hole in the enclosed current transformer.
- 3) Position the DPM20-2 controller so that the control wires to the two relay outputs can be routed conveniently.
- 4) If required, the Din-rail mounting clip can be removed by splitting the unit and sliding the assembly out. No tools are required for this operation as gentle hand pressure is sufficient.
- 5) Cut the white wire loop from the current transformer to a convenient length and connect to the 'CT 100:1' terminal. It is important that no current flows through the transformer before these wires are terminated as high voltages can be generated across the un-terminated output wires.

6) Referring to the enclosed 'DPM20-2 INSTALLATION' diagram, up to two 20 Amp loads not exceeding 4,4KW resistive or 1 HP inductive and can now be connected according to the diagram allowing CH2 to control the lowest priority (first to shed) load and CH1 to serve the highest priority load. Use wire with 2,5mM cross sectional area minimum for the controlled loads. Care should be taken when connecting neutral wires to pair them with the relevant earth leakage or non-earth leakage buss when connecting to the relevant controlled loads. Both relay contacts are completely isolated.

7) A maximum total current of up to 99 Amps can now be programmed on the two rotary switches marked 'SET MAX. CURRENT'. This setting would typically be the value of the main incoming isolator or circuit breaker.

8) 230 Vac can now be connected to the terminals marked '230 VAC INPUT', observing the line and neutral designation. This supply must be protected by an independent 5 Amp circuit breaker and taken from the non-earth leakage supply bus. A flashing blue LED light indicates power as well as main processor activity.

9) After four to six minutes, provided that there is sufficient power available (approximately 15 Amps), CH1 will switch on and if current reserve allows, CH2 will follow in approximately 1.5 seconds. Closed contacts are indicated by their respective green LED's.

10) As soon as the total current drawn by the distribution board exceeds the value programmed in step no 7, CH2 relay contact will open for a minimum of 15 minutes and then only restore power to its load as supply becomes available again. Should demand continue to increase during this period, CH1 will also shed, again only to restore after 15 minutes if power is available.

# POWERGUARD DPM20-8

## installation instructions & diagram

PowerGuard DPM20-8

Installation Instructions

Rev. 1.1

E [info@poweroptimal.com](mailto:info@poweroptimal.com)

W [www.poweroptimal.com](http://www.poweroptimal.com)

1. Isolate power to the distribution panel by opening the main incoming breaker associated with the relevant

existing power meter and verifying that the power is indeed switched off.

2. Retract the incoming feeder line to the distribution panel from the main breaker/isolator and reconnect

after feeding the wire through the large hole in the enclosed current transformer.

3. Position the DPM 20-8 controller so that the control wires to the RL1 relays can be routed conveniently.

4. Cut the white wire loop from the current transformer to a convenient length and connect to the 'CT 100:1'

terminals. It is important that no current flows through the transformer before these wires are terminated.

5. Referring to the enclosed 'DPM20-8 INSTALLATION' diagram, up to eight RL20-1 relays can be controlled

from one DPM20-8. The RL20-1 relays in turn can control 8 x 230 Vac line loads not exceeding 4kW resistive

or 1 HP inductive and can now be connected according to the diagram allowing no. 8 to control the lowest

priority (first to shed) load and no. 1 to serve the highest priority load. Use wire with at least 2.5mm<sup>2</sup> cross

sectional area for the controlled loads. Care should be taken when connecting neutral wires to pair them

with the relevant earth leakage or non-earth leakage buss when connecting to the RL20-1 relays.

6. A maximum total current for the board can be programmed on the two rotary switches marked 'SET MAIN

MAX. CURRENT'. This setting would typically be the value of the main incoming circuit breaker or isolator.

Also set the 'SET S/BY MAX. CURRENT' switches to a value that the standby generator can deliver continuously, de-rating for high altitude installations. These settings can be verified on the LCD display.

7. The two contacts marked 'S/BY' can be short circuited by potential-free contacts to switch from main to

standby load control setting.

8. 230 Vac can now be connected to the terminals marked '230 VAC INPUT', observing the line and neutral

designation. This supply must be protected by an independent 5-amp circuit breaker and taken from the

non-earth leakage supply busses. A flashing blue led light indicates power as well as main processor activity.

9. After four to six minutes, provided that there is enough power available (approximately 15 Amps at 230Vac),

CH1 will switch on. Again, if current reserve allows, CH2 to CH8 will switch on in approximately 1.5 second

steps.

10. The LCD display indicates active outputs as well as the total current consumption.

11. As soon as the total current drawn by the distribution board exceeds the maximum current value

programmed in step no. 6, CH8 contact will open for a minimum of 15 minutes and then restore power to

its load as supply becomes available again. Should demand continue to increase during this period, CH7 to

CH1 will also shed and after 15 minutes restore the lowest numbers, again depending on availability of

power.

12. Blue LED lights on the RL1 relays indicate power while green LED lights indicates active output to the

relevant load.

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# PowerOptimal PowerGuard Commercial Range User Manual v1.5

img-001.png

img-002.png

## **PowerGuard Commercial Range User Manual**

Version number: 1.5

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# 1. PowerGuard unit operation

The PowerGuard system is fully automated and has been designed to require no user intervention.

## 1.1 System operation

The below simplified diagram shows how the PowerGuard system is connected to a facility's electrical system.

img-003.png

The PowerGuard Controller measures the total incoming current using current transformers installed on the incoming power line(s) (either single phase or 3 phase). It also measures the average voltage on the incoming power line(s).

Based on the measured current and voltage values, the Controller calculates the power demand (in kVA) for the facility. This value (total power demand of the facility) is displayed on the LCD screen.

### ***a. Normal operation***

Based on the preset **control level**, the PowerGuard Controller will start sending out **shed requests** to all the Receivers (PG R in the diagram). Each Receiver has its own pre-set settings that determine how it will respond to the controller – specifically, how regularly it should switch off (probability of responding), for how long it should switch off, and for how long after a previous switch-off it should not switch off again (see Section 1.4).

The Controller will continue to send shed requests until the power demand stabilises at a level below the control level.

This simple configuration allows a lot of flexibility in how the facility can be managed, and effectively distributes switch-off of loads across the facility in a balanced manner. (However, it is not necessary to change ANY settings once the system has been commissioned and configured by PowerOptimal. The overall **control level** can be changed if there are substantial changes to occupancy or circumstances, but no other settings need to be changed.)

The facility can be controlled either at a maximum current value (A) or a maximum demand value (kVA). This setting is found on the Controller (see Section 1.3). Whether it is controlled at maximum current value or maximum demand value is determined by the main purpose of the system – i.e. is it to (i) alleviate power supply constraints, or (ii) reduce demand charges. **Note:** this setting is

typically only configured once (during installation) by PowerOptimal, and there is no need to change it.

*(i) Power supply constraints – control at maximum current (A)*

If the facility has power supply constraints (e.g. experiencing power trips), control at a maximum current value is more suitable, since loads will then only be shed on the phase that requires reduction in current to avoid power trips. The online monitoring system can be used to determine whether load balancing across the phases can be improved – e.g. if one notes that a specific phase is the main or only cause of shedding, loads can be moved from that phase to another phase.

*(ii) Reducing demand charges – control at maximum demand (kVA)*

When demand charge (electricity cost) reduction is the main purpose of the system, then it is better to control the facility's power use on a maximum demand (kVA) basis, since this is what demand charges are calculated on by the utility / municipality.

**b. Time of use settings**

The system can be configured to manage at three different control levels based on input from timers: 'normal', and two time of use settings. It can also be configured to completely switch off all loads at certain times. Please speak to a PowerOptimal representative if you wish to implement any of these settings. It will require installation of one or more timers.

**c. Backup power setting**

The system can be configured to automatically detect when there is a switch to backup power, and to manage at a different control level on backup power. Please speak to a PowerOptimal representative if you wish to configure the system for backup power management.

**d. Power failures**

When power returns after a power failure, the system will wait four minutes for the power to stabilise, and then it will systematically switch on the loads in a staggered manner, in order to avoid the cold pick-up power demand spike.

All controlled loads are protected against under- and overvoltage, and will be switched off should such an event occur.

## 1.2 LCD screen readout

img-004.pngimg-005.png

Current – White line (A)

Total demand (kVA)

Current - Red line (A)

Current - Blue line (A)

Average voltage (V)

## 1.3 Settings on the PowerGuard Controller

On the next page is the front face of the PowerGuard Controller.

The **only setting that should be changed by the user under normal circumstances is the Shed Level (circled in red)**. Just turn the dials with a screwdriver to select the control level. The numbers read as one would a normal number (e.g. dial settings 0 - 1 - 0 - 5 would be 105 kVA or amps).

The other settings are configured during installation & commissioning and **should not be altered**.

img-006.png

## 1.4 Settings on PowerGuard Receivers

See Annexure A for the front face of the CPM30-1W receiver and Annexure B for the front face of the CPM16-30 receiver. **No settings should be or need to be changed by the user.**

## 1.5 LED light codes / meanings

### **Controller**

The following LED lights are present on the PowerGuard Controller for monitoring and diagnostic purposes:

img-007.png

The LED lights have the following meanings:

Name	Colour	Meaning		
		On	Flashing	Off
Processor Heart Beat	Green	NA	Processor operational	Processor not operational / no power
Shedding on Red Phase	Red	NA	1 sec - in backlash range 2 sec - shed 4 sec - shed all	No shed signal being sent at specific point in time
Shedding on White Phase	Yellow	NA	1 sec - in backlash range 2 sec - shed 4 sec - shed all	No shed signal being sent at specific point in time
Shedding on Blue Phase	Blue	NA	1 sec - in backlash range 2 sec - shed 4 sec - shed all	No shed signal being sent at specific point in time
Shed Signal Quality (only indicates whilst shed signal is being sent)	Red-Green bi-colour	If both colours are visible - good signal	NA	Off or only one colour visible - poor signal / faulty condition
Shed All Request	Orange	Shed all request active	NA	NA

## Receiver

The PowerGuard Single Channel Receiver (CPM30-1W) has a single small light window on the front of the cover for diagnostic purposes. The light position is indicated below.

img-008.png

Indicator light window

The indicator light window indicates the following:

Colour & mode	Meaning
No light	No power
Red and blue lights	(a) Alternating - processor active / power on (b) Slow-down / temporary stop in speed or rhythm of alternating - receiving shed instruction
Green light	Power available to load

# 2. Online monitoring

The PowerGuard system has a built-in modem and sends measurements to the PowerOptimal database every half hour. The database is accessible via Energy Cybernetics' Powerwatch front-end.

## 2.1 How to log in

1. Go to: [www.cpowerwatch.com](http://www.cpowerwatch.com)
2. Click on the "Sign In" button at the top right of the screen.
3. Enter your username and password as provided during installation.

## 2.2 Landing page

Upon login, you should see a screen similar to the below:

img-009.png

The blue band on the left-hand side contains the functionality for your site. If you hover over the symbols, text will appear indicating the function for that button.

img-010.png

img-011.png Click on the "Graph Page" button to view near-real time graphs of your system.

img-012.png

Click on the "Personalised Dashboard - PowerOptimal" button to view a dashboard of system performance.

img-013.png

## 2.3 How to view & interpret graphs

Below is a screenshot of the graph page:

img-014.png

### 1. Select site

#### 4. Navigate graph

#### 3. Select what data to display

#### 2. Select date range

1. Select your site from the drop-down list;
2. Select the date range that you want to view;
3. Select the data that you want to display on the graph;
4. You can navigate the graph in several ways. For example, you can hover over a data point to see the values at that time. You can select a date range on the graph itself by clicking anywhere on the graph and keeping the mouse button pressed whilst moving the mouse horizontally across the graph. You can also drag the bottom date selection left and right to view other / different dates.

## 2.4 How to view & interpret the dashboard

Below is a screenshot of the dashboard page:

img-015.png

#### 2. Select date range

#### 5. Summary data on maximum demand

#### 4. Graph of peak demand and shed requests

#### 3. 24-hour (daily) demand profiles

#### 1. Select site

1. Select your site from the drop-down list;
2. Select the date range that you want to view;
3. You can see a set of 24-hour demand profiles and shed requests on the right-hand side.
4. Bottom left is the graph for the selected date range, showing the highest number of sheds in a 30-minute period for the day, as well as the highest demand (in kVA) for the day.
5. The boxes in the middle indicate the maximum kVA and estimated savings for the selected date range. (**Note:** maximum demand charge is applied once per billing period, so to see the estimated savings for a specific billing period, use the start and end date of that billing period as the date range.)

Below is a close-up of the above graph:

img-016.png

The orange columns indicate the highest number of shed requests in any 30 minute period on the specific date (with values on the right vertical axis), whilst the lines indicate the highest actual (blue) and estimated (dark red) kVA values for the specific date. The grey horizontal line indicates the control level of the PowerGuard unit.

You can hover over the graph to see specific values.

This graph and the small daily graphs on the right makes it easy to see the functioning of the PowerGuard system and provides a ready overview of the total demand of your facility. As the total demand approaches the peak demand level, the system starts to shed in order to maintain overall demand below the peak level.

The difference between the “Actual kVA” and “Estimated kVA” lines is the estimated kVA reduction achieved by the PowerGuard system on that day.

## 2.5 Estimated monthly savings

You can use the PowerOptimal Dashboard (discussed in Section 2.3) to obtain an estimate of the monthly savings achieved through the use of PowerGuard.

img-017.png

### 4. Estimated kVA & financial savings for the month / billing period

#### 3. Select date range

#### 2. Estimated kVA reduction per shed

#### 1. Site setup

1. Click on the gear icon and check that the data is correctly configured for your site:

img-018.png

### **The demand charge tariff that you are being charged by Eskom or your municipality**

### **The maximum demand level that the PowerGuard system is controlling your site at**

1. Check the estimated kVA reduction per shed request for your site. **Note:** This value is configured by PowerOptimal during the initial commissioning and calibration of the system. You don't need to change this number.
2. Set the date range that you wish to look at (**you should preferably set the date range to coincide with the billing date range on your electricity bill**).

3. Now you can read off the estimated savings in kVA and rands for the specific date range (billing period)!

# 3. Basic troubleshooting

Below is a table with basic troubleshooting tips. If you cannot resolve the problem using the below table, please contact your electrician or give us a call!

Issue	Possible causes	What to do
Water from the hot water tap is cold.	a. Geyser problem b. PowerGuard control level is set too low.	a. Call electrician to fix the geyser b. Increase PowerGuard control level on the Controller (see Section 1.3)
Air conditioner does not switch on again after a shed	The air conditioner has not been configured to switch on after a shed, or someone has changed the air conditioner settings.	See your air conditioner manual on how to change the settings to switch on automatically when power is returned.
I cannot log in on the PowerWatch online monitoring site.	Incorrect username and password.	Please check your username and password, or contact PowerOptimal for assistance.
We have unusually high activity at our facility, and I want to increase the maximum demand level.		Increase PowerGuard control level on the Controller (see Section 1.3)
Demand peak has increased – shed instructions seem not to have effect on peak demand level (loss of control)	Possible communication problem between controller and receivers	At a quiet time, reduce the PowerGuard control level on the controller to a very low level, and confirm reception of shed signal on each receiver as indicated by blue-red LED on the receiver slowing down its speed of flashing.

## *Troubleshooting the online monitoring graphs*

Issue	Possible causes	What to do
System is not on air	1. Hardware disconnected (no power to PowerGuard controller) 2. SIM card off air 3. Modem faulty 4. Software problem (database / online monitoring software)	Wait for two hours and log in again. If problem persists: 1. Check if power is on at controller, and if the controller is functioning (see Section 1.5). 2. Call PowerOptimal to remotely test the modem, check if sim card is loaded and check the back-end software.
Gaps in data	1. Cell phone network problems 2. SIM card problems	If the gaps occur repeatedly, contact PowerOptimal to check SIM card.

<p>Strange patterns / behaviour (e.g. very high shed activity for a long period; no shed activity over a few weeks / month; demand exceeds control level)</p>	<ol style="list-style-type: none"> <li>1. Change in electricity use (e.g. change in occupancy, behaviour, expansion of the facility, etc.)</li> <li>2. Someone has changed the peak demand level control setting on the controller.</li> <li>3. Communication problems between controller and receivers.</li> <li>4. Faulty controller / receiver.</li> </ol>	<ol style="list-style-type: none"> <li>1. First check whether the controller is functioning (see Section 1.5), and whether it is still set at the correct peak demand control level (see Section 1.3).</li> <li>2. Check communication between controller and receivers by (at a quiet time) reducing the PowerGuard control level on the controller to a very low level, and confirming reception of shed signal on each receiver as indicated by blue-red LED on the receiver slowing down its speed of flashing.</li> </ol>
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# Appendix A. Front face of PowerGuard CPM30-1W Single Channel Receiver

img-019.png

# Appendix B. Front face of CPM16-30 16-Channel Receiver

img-020.png

# Troubleshooting Guides