Energy Auditors Guide to the PowerMate

The PowerMate is a very useful energy-auditing tool, and is one of the key components of the Energy Auditing Toolkits that are available through Energy SA's Energy Friends Program. As an auditing tool, the PowerMate is particularly useful for measuring the amount of power drawn (wattage) by an electrical appliance; recording its electricity consumption, running costs & greenhouse gas emissions; and estimating its hourly, quarterly and yearly electricity consumption, running costs and greenhouse gas emissions.

This guide has been developed to assist Home Energy Auditors to understand the Power-Mate and to use it effectively. It is not intended to replace the PowerMate User Manual. You should read the PowerMate User Manual before using the Power-Mate. The Guide consists of 3 sections:

* Summary of PowerMate modes.
* Correctly estimating energy consumption, running costs and greenhouse gas emissions.
* Scrolling through the features for the first time.

SUMMARY OF POWERMATE MODES

Mode	Units	When in "default mode"	After you press "+"	After you press "-"	After you press "ENTER"	Display Range
Power	Watts (W)	Instantaneous power draw (W)	Maximum power recorded during "run-time" (W)	Minimum power recorded during "run-time" (W)	N/A	0 – 2,500.0
Cost	Dollars ($)	Cost of electricity consumed over "run-time" ($)	Estimated yearly running cost ($/year)	Estimated quarterly running cost ($/quarter)	Estimated hourly running cost ($/hour)	0 – 99.9999 (accumulated & hourly cost) 0 – 9999.99 (quarterly & yearly cost)
Energy	Kilowatt-hours (kWh)	Accumulated electricity consumption over run-time (kWh)	Estimated yearly energy consumption (kWh/year)	Estimated quarterly (kWh/quarter)	Estimated hourly (kWh/hour)	0 – 999.999
G-Gas	Kilograms of Carbon Dioxide equivalents (kg CO_2-e)	Estimated greenhouse gas emissions resulting from electricity consumed over run-time (kg CO_2-e)	Estimated yearly greenhouse emissions (kg CO_2-e/year)	Estimated quarterly greenhouse emissions (kg CO_2-e/ quarter)	Estimated hourly greenhouse emissions (kg CO_2-e/hour)	0 – 999.999
Volts	Volts (V)	Instantaneous voltage of incoming electricity (V)	Maximum voltage recorded during "run-time" (V)	Minimum voltage recorded during "run-time" (V)	N/A	170.0 – 270.0
Current	Amps (A)	Instantaneous current (A)	Maximum current recorded during "run-time" (A)	Minimum current recorded during "run-time" (A)	N/A	00.000 – 10.000
Hours	Hours:Minutes: Seconds	The "run-time" (Hr:Min:Sec)	N/A	N/A	N/A	00:00:01 – 99:59:59
Clear	N/A	N/A	N/A	N/A	Clears the meter	N/A
Setup Rate	N/A	N/A	N/A	N/A	Allows you to edit electricity tariff & greenhouse coefficient	N/A

THE MANY USES OF THE POWERMATE

The PowerMate can be used to measure many things, some examples include the…

Energy consumption of a fridge

Standby wattage of a microwave

Operating wattage of a TV

ESTIMATING ENERGY CONSUMPTION, RUNNING COSTS AND GREENHOUSE GAS EMISSIONS

Understanding how estimates are made

The Power-Mate measures the amount of electricity consumed in kilowatt-hours ("kWh") over the time it has been measuring a particular appliance (the "run-time").

This figure is then;
- extrapolated to estimate hourly, quarterly or yearly electricity consumption (in kWh), or
- multiplied by the inbuilt electricity tariff & then extrapolated to provide estimates of hourly, quarterly or yearly running costs in ($), or
- multiplied by the inbuilt greenhouse coefficient & then extrapolated to provide estimates of hourly, quarterly or yearly greenhouse gas emissions.

Note: The PowerMate does not estimate energy consumption, cost or greenhouse gas emissions based on the instantaneous wattage drawn by an appliance as some other appliance meters do.

Things to bear in mind when making estimates

It is important to understand how the PowerMate estimates these figures because it affects how you use it on certain appliances and in certain situations. In particular;
- in order to get an accurate consumption/cost/greenhouse estimate for appliances with a **variable power-draw** (such as fridges, air-conditioners and other thermostatically controlled devices), the PowerMate must be connected to the appliance long enough for it to record several on-off cycles. In the case of a fridge, 24 hours or more is ideal to account for daily variation, but 6 hours would give a rough estimate. Please note that this doesn't take into account seasonal variations (i.e. summer to winter).
- Accurate estimates for appliances with a **constant power-draw** (such a TV in standby mode, a table lamp, a fan-heater or a bar-radiator) can usually be made within a few seconds.
- You need to 'clear' the Power-Mate if you want to **estimate consumption for the same appliance in different operating modes**. E.g. If you install

the meter on a television, and want to measure the annual running cost in standby mode and then the hourly running cost in operating mode, you need take the measurements whilst on standby, then turn the TV on, then clear the meter, and then take the measurements in operating mode. If you don't clear the meter, the energy, cost and greenhouse estimates will combine the time spent in operating mode and the time spent in standby mode.

Setting the electricity tariff?

The Power-Mate is set to a default electricity tariff of 18.00 cents/kWh. Please refer to the 'Setting the Rate or Greenhouse Gas Values' section of the manufacturer's User Guide for instructions on how to check and change the settings.

Many SA households are on the AGL default contract, so you may wish to change the electricity tariff to 19.00 cents/kWh, which is the average tariff across the whole year. However, when measuring air-conditioners and other 'summer' appliances, you may want to use the summer tariff of 20.59 cents/kWh, and similarly for heaters and other 'winter' appliances, you may want to use the standard tariff of 18.54 cents/kWh.

For households purchasing electricity from other retailers, you may need to find out the current tariff from their electricity bill. Note: Don't forget to include GST in order to get an accurate reflection of the real cost.

Setting the greenhouse coefficient?

The Power-Mate is set to a default greenhouse co-efficient of 1.000kg CO_2e/kWh. Please refer to the 'Setting the Rate or Greenhouse Gas Values' section of the manufacturer's User Guide for instructions on how to check and change the settings.

The greenhouse coefficient for mains electricity in South Australia as of September 2004 is 0.960kg CO_2e/kWh (Source: Australian Greenhouse Office).

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SCROLLING THROUGH THE FEATURES FOR THE FIRST TIME

Scrolling through the basic modes

1. Plug the appliance into the Power-Mate socket and turn the appliance on.
   The screen will show the power drawn by the appliance at that moment, measured in watts (W). The meter can measure appliances up to 2400 watts. The word "POUEr" flashes up on the display every 5 or so seconds to indicate the meter is in the **Power** mode. The values will change as the appliance draws more or less power.

2. Press
   "COSt" will flash across the screen to indicate the meter is in **Cost** mode.
   The screen shows the cost of electricity consumed over the run-time in dollars ($). This is automatically calculated by multiplying the amount of electricity consumed (kWh) by the electricity rate or tariff ($/kWh) that the meter is set at. This is an accumulative figure and will increase the longer the meter is left running on the appliance.

3. Press
   You are now in **Energy** mode and "EnErGY" will flash across the screen to indicate so.
   The screen shows the actual amount of electricity consumed over the run-time, in kilowatt-hours (kWh). Similar to the cost function, this is an accumulative figure.

4. Press
   You are now in **Greenhouse Gas** mode and "G GAS" will flash across the screen.
   The screen shows the estimated volume of greenhouse gas produced at our local power stations in order to generate the electricity consumed by the appliance. It is shown in kilograms of carbon dioxide equivalent (kg CO_2e). Like Energy and Cost, it is an accumulative figure. The calculation is based on the amount of electricity consumed and the greenhouse co-efficient that has been set into the meter.

5. Press
   The display now shows **Voltage** in volts (V) and "VoltS" should flash across the screen.
   Mains electricity is typically around 240V (AS60038 specifies 216V–253V as acceptable voltage range). This is an instantaneous value and so can vary over time.

6. Press
   The display now shows **Current** in Amps (A), and "Curr" should flash across the screen.
   Like power and voltage, this is an instantaneous value.

7. Press
   "HourS" will flash up to indicate that the meter is in **Time** mode.
   The display now shows the how long the meter has been recording in **hours: minutes: seconds**, and is referred to as the "run-time". The run-time commences as soon as the meter is installed on an appliance, or as soon as it is cleared. During the run-time, the meter records accumulated **cost**, **energy** and also the **greenhouse gas** values, **minimum and maximum power**, **voltage** and **current** values.
   The meter can record for a total of 99 hrs: 59 mins: 59 secs.

8. Press
   The word "CLEAr?" will appear and stay on the screen (**Reset** mode).
   Pressing   will reset the meter so that it starts recording again.
   The time will restart from 00:00:00, and all recorded values will be cleared.

9. If you cleared the meter, the meter will have automatically scrolled to **Set-up** mode and the word "SEtUP?" will be displayed. If not, press
   When in set-up mode, the electricity tariff and the greenhouse co-efficient can be changed.
   Please refer to the manufacturers User Guide for instructions on how to do so.
   Press   to return you to **Power** mode.

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Viewing figures for Minimum/Maximum Power, Voltage and Current

In **Power**, **Voltage** and **Current** modes, the Power-Mate stores the maximum and minimum value recorded during the run-time. Follow the instructions below to view the minimum and maximum value in **Power** mode, and simply repeat Steps 1 and 2 when in **Voltage** mode or **Current** mode to display maximum and minimum values.

1. In **Power** mode, press

   The term "P Hi" will flash up, followed by the **Maximum Power** recorded during the run-time.

   After 3 or so seconds, the term "POUEr" will flash up and the screen will return to instantaneous **Power** mode.

2. Similarly, press

   The term "P Lo" will flash up followed by the **Minimum Power** recorded during run time.

   The screen will return to instantaneous **Power** mode after 3 or so seconds.

Viewing Yearly, Quarterly and Hourly Estimates for Cost, Energy and Greenhouse Gas Emissions

In **Energy**, **Cost** and **Greenhouse Gas** modes the Power-Mate can estimate yearly, quarterly and hourly amounts. Follow the instructions below to view the yearly, quarterly and hourly value in **Cost** mode, and then repeat steps 1 to 3 when in **Energy** and **Greenhouse Gas** modes:

1. When in **Cost** mode, press

   The term "C YEAr" will flash up, followed by an estimated **Annual Running Cost** (in $/year).

   After 3 or so seconds "COSt" will flash up and the PowerMate will return to accumulated **Cost** mode.

2. Press

   "C 9tr" will flash up, followed by estimated **Quarterly Running Cost** (in $/quarter).

   After 3 or so seconds "COSt" will flash up and the PowerMate will return to accumulated **Cost** mode.

3. Press

   "C Hour" will flash up, followed by estimated **Hourly Running Cost** (in $/hour).

   After 3 or so seconds "COSt" will flash up and the PowerMate will return to accumulated **Cost** mode.

<<< WARNING >>>

Please read the manufacturers User Guide before use. This guide is not intended to replace these instructions.

Please take care to avoid injury or damage when using the Power-Mate.

Turn power off at the wall before connecting or disconnecting the meter. Do not touch any damaged appliance plugs or frayed leads: advise the householder that they should be disposed of or repaired by a qualified electrician. Take care if moving appliances to access the plug and remember to turn the fridge back on!

<<< DISCLAIMER >>>

Energy SA accepts no responsibility for the safety or accuracy of the Power-Mate or of any estimates of savings of electricity for the use of appliances derived from readings of the Power-Mate. Any such savings may vary depending on circumstances, including the level of use of particular appliances.

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