The

Killawatt

Energy Saver Kit

Users Manual and Instruction Guide

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Welcome!

Thank you for your purchase of the Killawatt Energy Saver Kit. We hope you find the Killawatt energy meter and our easy to follow instruction sheets helpful tools for managing your electric energy consumption.

Everyone would like to lower their electric bill. But where do you start? What steps do you take? Do you buy new appliances or do you change the way you use your current appliances? Do you cut back across the board? And where are the real opportunities to save money? These are the questions you have to ask, but how do you get the information that fits your unique situation?

With your Killawatt Energy Saver Kit you will be able to learn which appliances are energy misers and energy hogs, allowing you to make economic and lifestyle choices that can result in lower electric bills.

We believe the Killawatt Energy Saver Kit can be fun and educational for the whole family, while providing opportunities to save energy and lower expenses.

To assist you with a more comprehensive energy conservation effort we have included additional material and links to some outstanding resources.

We firmly believe that our hands-on approach to identifying and analyzing the energy consumption of various appliances and equipment will make finding ways of becoming more energy efficient fun and profitable for you and your household. And remember, saving energy not only saves you money, but it helps make our nation stronger and less reliant on foreign sources of energy.

Have fun with your new Killawatt Energy Saver Kit and happy hunting for savings.

Sincerely,

Your Killawatt Energy Saver Team

Your New Killawatt Energy Meter

Technical Specifications

LCD Display		
Displays Volts, Amps, Watts, Hz, VA		
0.2% Accuracy		
Operating Voltage	115 VAC	
Max Voltage	125 VAC	
Max Current	15 A	
Max Power	1875 VA	
Weight	5 oz.	
Dimensions	5 1/8" x 1 5/8" x 2 3/8"	
Function	**Normal**	**Maximum**
RMS Voltage (Vrms)	0.2%	1.0%
RMS Current (Arms)	0.3%	1.0%
Watts (W)	0.5%	2.0%
Volt-amps (VA)	0.5%	2.0%
Frequency (Hz)	+/- 0.1	+/- 1.2
Power Factor (PF)	+/- 0.01	+/-0.03
Kilowatt Hours (KWH)	0.5%	2.0%

Product Guarantee

P3 INTERNATIONAL CORPORATION LIMITED WARRANTY

P3 INTERNATIONAL CORPORATION ("P3") warrants to the original retail purchaser only, that its product is free from defects in material or workmanship under the condition of normal use and service for a period of six (6) months from the date of purchase. In the event that a defect, malfunction or failure occurs or is discovered during the warranty period, P3 will repair or replace at its option the product or component part(s) which shall appear in the reasonable judgment of P3 to be defective or not to factory specifications. A product requiring service is to be returned to P3 along with the sales receipt or other proof of purchase acceptable to P3 and a statement describing the defect or malfunction. All transportation costs shall be borne by the owner and the risk of loss shall be upon the party initiating the transportation. All items repaired or replaced thereunder shall be subjected to the same limited warranty for a period of six (6) months from the day P3 ships the repaired or replaced product. The warranty does not apply to any product that has been subject to misuse, tampering, neglect, or accident or as a result of unauthorized alterations or repairs to the product. This warranty is void if the serial number (if any) has been removed, altered, or defaced. This warranty is in lieu of all warranties expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose which are expressly excluded or disclaimed. P3 shall not be responsible for consequential, incidental or other damages, and P3 expressly excludes and disclaims liability for any damages resulting from the use, operation, improper application, malfunction or defeat of any P3 product covered by this limited warranty. P3's obligation is strictly and exclusively limited to the replacement or repair of any defective product or component part{s}. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. P3 does not assume or authorize anyone to assume for it any other obligation whatsoever. Some states do not allow limitation on how long an implied warranty lasts, so the above limitations may not apply to you, it is the owner/user's responsibility to comply with local, state, or federal regulations, if any, that may pertain to P3 products or their use. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

If you experience difficulty in the operation of your unit, or if your unit requires repair please contact:

P3 INTERNATIONAL CORPORATION
TECHNICAL SUPPORT
71 West 23rd Street
Suite 1201
New York, NY 10010-4102
Tel: 212-741-7289
Fax: 212-741-2288

Email: Techsupport@p3international.com

Definitions – Electrical

These terms are used throughout the instruction guide. It will be important that you learn these terms and their meanings.

Voltage, Volts

The volt (symbolized V or E) is the unit of electric potential or electromotive force. A potential of one volt appears across a resistance of one ohm when a current of one ampere flows through that resistance.

Voltage is the pressure which causes electrons to flow. Voltage, also called *electromotive force*, is a quantitative expression of the potential difference in charge between two points in an electrical field. The greater the voltage, the greater the flow of electrical current (that is, the quantity of charge carriers that pass a fixed point per unit of time) through a conductor for a given resistance to the flow.

Voltage can be expressed as an average value over a given time interval, as an instantaneous value at a specific moment in time, or as an effective or root-mean-square (rms) value. Average and instantaneous voltages are assigned a polarity either negative (-) or positive (+) with respect to a zero, or ground, reference potential. The rms voltage is a dimensionless quantity, always represented by a non-negative real number.

Voltage can be direct or alternating. A direct voltage maintains the same polarity at all times. In an alternating voltage, the polarity reverses direction periodically. The number of complete cycles per second is the frequency, which is measured in hertz (one cycle per second), kilohertz, megahertz, gigahertz, or terahertz. An example of direct voltage is the potential difference between the terminals of a battery. Alternating voltage exists between the terminals of a common utility outlet.

For a steady source of direct-current (DC) electric potential, such as that from a zinc-carbon or alkaline electrochemical cell, the average and instantaneous voltages are both approximately +1.5 V if the negative terminal is considered the common ground; the rms voltage is 1.5 V. For standard utility alternating current (AC), the average voltage is zero (the polarity constantly reverses); the instantaneous voltage ranges between approximately -165 V and +165 V; the rms voltage is nominally 117 V.

Voltages are sometimes expressed in units representing power-of-10 multiples or fractions of one volt. A kilovolt (symbolized kV) is equal to one thousand volts (1 kV = 10^3 V). A megavolt (symbolized MV) is equal to one million volts (1 MV = 10^6 V). A millivolt (symbolized mV) is equal to one-thousandth of a volt (1 mV = 10^{-3} V). A microvolt (symbolized µV) is equal to one-millionth of a volt (1 µV = 10^{-6} V).

Amperage, Amps, Amperes

Current is a flow of electrical charge carriers, usually electrons or electron-deficient atoms. The common symbol for current is the uppercase letter I. The standard unit is the ampere, symbolized by A. One ampere of current represents one coulomb of electrical charge (6.24 x 10^{18} charge carriers) moving past a specific point in one second. Physicists consider current to flow from relatively positive points to relatively negative points; this is called conventional current or Franklin current. Electrons, the most common charge carriers, are negatively charged. They flow from relatively negative points to relatively positive points.

Electric current can be either direct or alternating. Direct current (DC) flows in the same direction at all points in time, although the instantaneous magnitude of the current might vary. In an alternating current (AC), the flow of charge carriers reverses direction periodically. The number of complete AC cycles per second is the frequency, which is measured in hertz. An example of pure DC is the current produced by an electrochemical cell. The output of a power-supply rectifier, prior to filtering, is an example of pulsating DC. The output of common utility outlets is AC.

The ampere is named after Andre Marie Ampere, French physicist (1775-1836).

Volt-Amps

Volt-ampere (VA) is a measurement of power in a direct current (DC) electrical circuit. The VA specification is also used in alternating current (AC) circuits, but it is less precise in this application, because it represents apparent power, which often differs from true power.

In a DC circuit, 1 VA is the equivalent of one watt (1 W). The power, P (in watts) in a DC circuit is equal to the product of the voltage V (in volts) and the current I (in amperes):

$$P = VI$$

In an AC circuit, power and VA mean the same thing only when there is no reactance. Reactance is introduced when a circuit contains an inductor or capacitor. Because most AC circuits contain reactance, the VA figure is greater than the actual dissipated or delivered power in watts. This can cause confusion in specifications for power supplies. For example, a supply might be rated at 600 VA. This does not mean it can deliver 600 watts, unless the equipment is reactance-free. In real life, the true wattage rating of a power supply is 1/2 to 2/3 of the VA rating.

When purchasing a power source such as an uninterruptible power supply (UPS) for use with electronic equipment (including computers, monitors, and other peripherals), be sure the VA specifications for the equipment are used when determining the minimum ratings for the power supply. The VA figure is nominally 1.67 times (167 percent of) the power consumption in watts. Alternatively, you can multiply the VA rating of the power supply by 0.6 (60 percent) to get a good idea of its power-delivering capability in watts.

Ohm

The ohm is the standard unit of electrical resistance. The ohm is also the equivalent of a volt per ampere (V/A).

In a direct-current (DC) circuit, a component has a resistance of one ohm when a potential difference of one volt produces a current of one ampere through the component. In AC circuits, resistive ohms behave the same as they do in DC circuits, provided the root-mean-square (rms) AC voltage is specified. In AC circuits, reactance exists only when there is a net capacitance or inductance.

Resistances and reactance’s are sometimes expressed in units representing power-of-10 multiples of one ohm. A kilohm is equal to one thousand (10^3) ohms. A megohm is equal to one million (10^6) ohms. Fractional prefix multipliers are seldom used for resistance or reactance; rarely will you hear or read about a milliohm or a microhm. Extremely small resistances and reactance are usually referred to in terms of conductance.

Ohm's Law is the mathematical relationship among electric current, resistance, and voltage. The principle is named after the German scientist Georg Simon Ohm.

In direct-current (DC) circuits, Ohm's Law is simple and linear. Suppose a resistance having a value of R ohms carries a current of I amperes. Then the voltage across the resistor is equal to the product IR. There are two corollaries. If a DC power source providing E volts is placed across a resistance of R ohms, then the current through the resistance is equal to E/R amperes. Also, in a DC circuit, if E volts appear across a component that carries I amperes, then the resistance of that component is equal to E/I ohms.

Mathematically, Ohm's Law for DC circuits can be stated as three equations:

$$E = IR$$
$$I = E/R$$
$$R = E/I$$

When making calculations, compatible units must be used. If the units are other than ohms (for resistance), amperes (for current), and volts (for voltage), then unit conversions should be made before calculations are done. For example, kilohms should be converted to ohms, and microamperes should be converted to amperes.

Watts, Wattage

The watt (abbreviated W) is the standard unit of power (or energy per unit time) and is the equivalent of one joule per second. The watt is used to specify the rate at which electrical energy is dissipated.

In DC (direct-current) and low-frequency alternating current (AC) electrical circuits and systems, power is the product of the current and the voltage. Power is also proportional to the ratio of the square of the voltage to the resistance, and to the product of the resistance and the square of the current. Consider a circuit in which the current, voltage, and resistance are all constant. If the current in amperes is represented by *I*, the voltage (or potential difference) in volts is represented by *E*, and the resistance in ohms is represented by *R*, then the following equations hold for power in watts, represented by *P*:

$$P = EI$$
$$P = E^2/R$$
$$P = I^2R$$

In situations involving very high or very low power, prefix multipliers are commonly used to obtain power units. As the rate of dissipated or radiated power increases, one kilowatt (kW) is equal to 1000 W; one megawatt (MW) is equal to 10^6 W; one gigawatt (GW) is equal to 10^9 W.? As power decreases, one milliwatt (mW) is equal to 0.001 W; one microwatt (µW) is equal to 10^{-6} W; one nanowatt (nW) is equal to 10^{-9} W.

Hz, Hertz

For an oscillating or varying current, frequency is the number of complete cycles per second in alternating current direction. The standard unit of frequency is the hertz, abbreviated Hz. If a current completes one cycle per second, then the frequency is 1 Hz; 60 cycles per second equals 60 Hz (the standard alternating-current utility frequency in some countries).

Hertz is a unit of frequency (of change in state or cycle in a sound wave, alternating current, or other cyclical waveform) of one cycle per second.

For example, in the United States, common house electrical supply is at 60 hertz (meaning the current changes direction or polarity 120 times, or 60 cycles, a second). (In Europe, line frequency is 50 hertz, or 50 cycles per second.).

The unit of measure is named after Heinrich Hertz, German physicist.

Power Factor Correction

Power factor correction is a feature included in some computer and other power supply boxes that reduces the amount of reactive power generated by a computer. Reactive power operates at right angles to true power and energizes the magnetic field. Reactive power has no real value for an electronic device, but electric companies charge for both true and reactive power resulting in unnecessary charges.

In power factor correction, the power factor (represented as "k") is the ratio of true power (kwatts) divided by reactive power (kvar). The power factor value is between 0.0 and 1.00. If the power factor is above 0.8, the device is using power efficiently.

PFC is not used solely for computer power supplies. In other industries, PFC equipment is used to reduce the reactive power produced by fluorescent and high bay lighting, arc furnaces, induction welders, and equipment that uses electrical motors.

kWh, kilowatt-Hours

The kilowatt-hour (symbolized kWh) is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour (1 h) of time. The kilowatt-hour is not a standard unit in any formal system, but it is commonly used in electrical applications.

In general, energy (*E*) is equivalent to power (*P*) multiplied by time (*t*). To determine *E* in kilowatt-hours, *P* must be expressed in kilowatts and *t* must be expressed in hours. ***Suppose a 1.5-kW electric heater runs for 3 h. Then P = 1.5 and t = 3, so the energy E in kilowatt-hours is:***

$$E = Pt = 1.5 \times 3 = 4.5 \text{ kWh}$$

If P and t are not specified in kilowatts and hours respectively, then they must be converted to those units before determining E in kilowatt-hours.

The consumption of electrical energy by homes and small businesses is usually measured in kilowatt-hours. Larger businesses and institutions sometimes use the megawatt-hour (MWh), where 1 MWh = 1,000 kWh. The energy outputs of large power plants over long periods of time, or the energy consumption of states or nations, can be expressed in gigawatt hours (GWh), where 1 GWh = 1,000 MWh = 10^6 kWh.

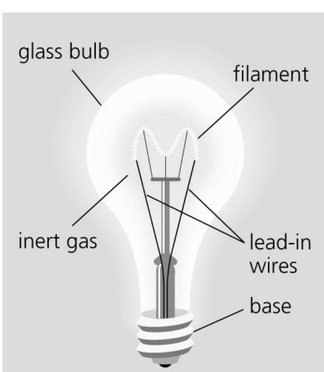
Alternating Current

In electricity, alternating current (AC) occurs when charge carriers in a conductor or semiconductor periodically reverse their direction of movement. Household utility current in most countries is AC with a frequency of 60 hertz (60 complete cycles per second); although in some countries it is 50 Hz.

An AC waveform can be sinusoidal, square, or saw tooth-shaped. Some AC waveforms are irregular or complicated. An example of sine-wave AC is common household utility current (in the ideal case). Square or saw tooth waves are produced by certain types of electronic oscillators, and by a low-end uninterruptible power supply (UPS) when it is operating from its battery. Irregular AC waves are produced by audio amplifiers that deal with analog voice signals and/or music.

The voltage of an AC power source can be easily changed by means of a power transformer. This allows the voltage to be stepped up (increased) for transmission and distribution. High-voltage transmission is more efficient than low-voltage transmission over long distances, because the loss caused by conductor resistance decreases as the voltage increases.

The voltage of an AC power source changes from instant to instant in time. The *effective voltage* of an AC utility power source is usually considered to be the DC voltage that would produce the same power dissipation as heat assuming a pure resistance. The effective voltage for a sine wave is not the same as the *peak voltage*. To obtain effective voltage from peak voltage, multiply by 0.707. To obtain peak voltage from effective voltage, multiply by 1.414. For example, if an AC power source has an effective voltage of 117 V, typical of a household in the United States, the peak voltage is 165 V.

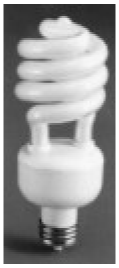


Incandescent Bulb

Electric lamp consisting of a glass bulb containing a wire filament (usually tungsten) that emits light when heated

This represents the vast majority of light bulbs used in residential settings, and most point-of-use or task lighting in commercial buildings.

Popular wattages for residential use are 50 to 75 for most reading and room lights. One hundred watts and greater are frequently used in bedroom light fixtures and living room lamps. Some living room lamps use bulbs as big as 250 watts. (Source: Precision Graphics)



Compact Fluorescent

Compact fluorescent light bulbs come in a variety of shapes and wattages. Compact fluorescent light (CF) bulbs are far more energy efficient standard incandescent light bulbs.

The standard incandescent bulbs currently lighting your home have changed very little from Thomas Edison's first light bulb in 1879. Only 10% of the energy used by these standard bulbs contributes to light; the other 90% is wasted as heat. And what about halogen lights? A typical halogen bulb burns at 1,000 degrees F. These old-fashioned light bulbs waste energy and can potentially cause burns or fires.

CFL (watts)	Incandescent (watts)
14	40
20	60
25	75
32	100
50	150

Does energy-efficient lighting provide enough light?

Yes, CF's emit the same amount of light as standard bulbs, but have lower wattage ratings because they use less energy. Use this equivalency guide when replacing standard bulbs.

CF's provide the same high-quality light as incandescent bulbs, but generally operate at temperatures of less than 100 degrees F. Why spend money heating rooms in your home with lighting?

Advanced technology enables CF's to use 66% less energy than a standard incandescent bulb and last up to 10 times longer. This means that over the life of one CF, you can avoid replacing up to 13 incandescent bulbs!

Definitions – Economic

These terms are used throughout the instruction guide. It will be important that you learn these terms and their meanings.

$/kWh

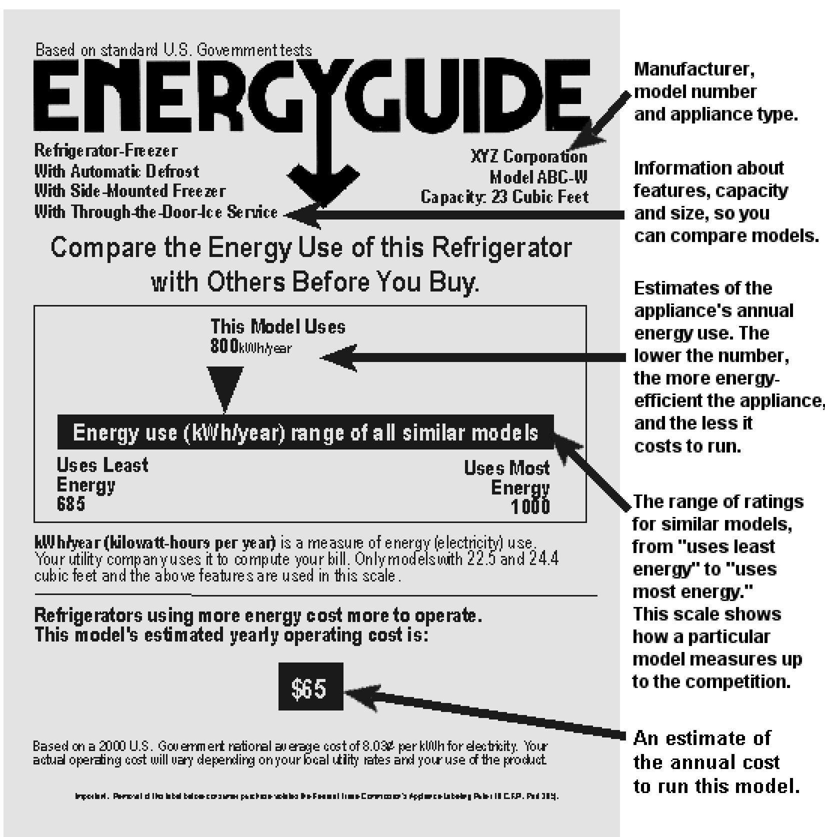
This is the basic unit of sale for electrical energy for most customers – dollars per kilowatt-hour. Electric meters measure the cumulative kilowatt-hours over a month period and the electric company produces a bill for this consumption by multiplying the consumption by the rate.

Simple Payback

By dividing the cost of a new piece of equipment ($'s) by the expected annual energy savings - the new unit is more efficient and uses less energy for the same output ($/Yr), we get payback in Years. This is called a simple payback because we don't take into effect such things as the cost of money (inflation, credit charges, etc) or future energy price changes.

Energy Guide Label

This is the definition of this term, a discussion of what is normal, what it means (and when and why) if the reading is off of normal. It should be technically correct but easy for a layman to understand and comprehend.



How to Use Your Killawatt

Basic Operating Instructions

Supplies Needed:

- Your new Killawatt Energy Meter
- 1 Lamp equipped with a 60 watt standard incandescent bulb
- Your new 20 watt Philips MARATHON compact fluorescent bulb
- 1 eight or 10 foot UL certified extension cord (optional but suggested)

Steps:

1) Plug the lamp (equipped with a 60 watt standard incandescent bulb) cord into the receptacle on the front of your Killawatt, and plug the Killawatt into a standard wall receptacle.

   NOTE: The use of an eight or ten foot extension cord can help make this test a little easier by plugging the Killawatt into the extension cord and plugging the extension cord into the standard wall receptacle. This will allow easier viewing and handling of the Killawatt device while conducting this test.

2) Turn the lamp on.

3) Your Killawatt will begin monitoring the energy consumption of the lamp and can report the instantaneous Volts, Amps, Watts, Volt-Amps, Hertz, and Power Factor.

4) Press the grey key on the left marked "Volt." The number showing on the screen is the instantaneous voltage. Standard residential electric service is rated at 120 volts. Your reading should be very close to 120 volts.

5) Press the button marker "Amp." The screen is now displaying the instantaneous amperage.

6) Press the button market "Watt." The screen is now displaying the instantaneous wattage. For your 60W bulb, your reading should be close to 60 watts. Press the "Watt" button again and the screen will display the instantaneous Volt-Amps.

7) Press the "Hz" (hertz) button and the screen will display the instantaneous Hz. Press it again and the screen displays the Power-Factor.

8) The pink "KWH" button (last button on the right-hand side) is used to display the cumulative kilowatt-hours (kWh) and the time period of measured. Press the "KHW" button once and the screen displays the total kilowatt-hours recorded since the device was plugged in. Press the button again and the display shows the total time the device has been totaling kilowatt-Hours.

Note: Refer to Definitions section for various electrical terms

OK, Let's start an experiment!

Let's calculate the annual savings – in energy and dollars – that can be achieved, ***in your home***, by swapping just one 60 watt standard incandescent light bulb with an energy saving Philips MARATHON 20 watt compact fluorescent lamp.

The annual cost of a lamp is equal to the hours it is used, times the watts/hour it uses, times the cost of electricity, or:

Annual Cost in $'s = Hours of Use **X** watts used **X** Cost of electricity ($/kWh)

Ready…

9) With your Killawatt plugged into the lamp, press all of the buttons, view and remember the measurements for volts, amps, watts and power-factor.

10) Press the Watt button and **record your watts reading in (A) below**.

11) Turn the lamp off and wait for 2 or 3 minutes for the 60 watt incandescent lamp to cool off.

12) Unplug the lamp from the Killawatt device.

13) After the lamp has cooled and is safe to touch, unscrew and remove the 60 watt bulb.

14) Install your new Philips MARATHON 20 watt compact fluorescent bulb in the lamp, re-plug the lamp into the Killawatt, and turn on the lamp.

15) Press all of the buttons. View and remember the measurements for volts, amps, watts and power-factor. Compare them with the results you found measuring the 60 watt incandescent bulb.

16) Press the Watt button and **record your watts reading in (B) below**.

If you use the lamp an average of:	Then on an annual basis you use the lamp:
1 Hour a day	**365** Hours
3 Hours a day	**1095** Hours
6 Hours a day	**2190** Hours
8 Hours a day	**2920** Hours
10 Hours a day	**3650** Hours
12 Hours a day	**4380** Hours
15 Hours a day	**5475** Hours
18 Hours a day	**6570** Hours
24 Hours a day	**8760** Hours

17) We now need to estimate how many hours a year the bulb is in use. To help, use this chart. After estimating the annual hours of use, place your answer on the appropriate line in the chart below (C) and (D).

18) Lastly we need the retail price you pay for electricity ($ per kWh). If you don't know your exact rate, use 10 cents a kilowatt-hour ($0.10 per kWh) as a guess and place this figure on line (E).

19) We now know the wattage each bulb consumes when in use, and we have an educated estimate of how many hours per year we use the lamp, and we have the rate we pay for the energy. Now we can calculate the annual cost of operating each bulb, and by comparison, we can determine if we will save any money by swapping one 60 watt standard incandescent bulb for a 20 watt compact fluorescent bulb.

20) Conduct the remaining calculations on the chart.

Testing a 60W Standard Incandescent Lamp vs. a 20W Compact Fluorescent Bulb

	______	(A) Watts for the 60 watt incandescent lamp.		______	(B) Watts for the 20 watt Compact Fluorescent (CF).	<	Enter the values you measured here
X	______	(C) Hours Used / Year	X	______	(D) Hours Used / Year	<	Estimate using the chart below
=	______	Annual Watt-Hours for the 60W incand. lamp	=	______	Annual Watt-Hours for the 20W CF lamp	<	Multiply the Hours Used per Year by the Watts measured
/	**1000**	watts per kilowatt	/	**1000**	watts per kilowatt	<	There are 1000 Watts in a Kilowatt
=	______	Annual kilowatt-Hours for the 60W incand. lamp	=	______	Annual kilowatt-Hours for the 20W CF lamp	<	Divide the Annual Watt-Hours by 1000 to calculate the Annual kilowatt-Hours.
X	______	(E) $ per kWh Electric Rate	X	______	(E) $ per kWh Electric Rate	<	Use the rate you pay for electricity. Use 10 cents/ kWh if you don't know your rate.
=	______	(F) Annual cost to run the 60W incandescent lamp	=	______	(G) Annual cost to run the 20W CF lamp	<	Multiply the total Annual Kilowatt-Hours by the electric rate ($/kWh) to calculate the annual cost of running the bulb.

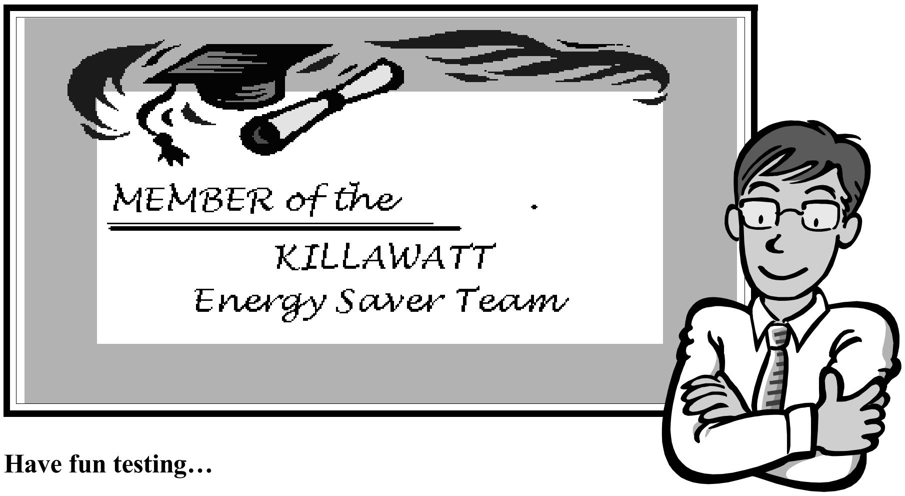
Now you have calculated the cost to run each of these lamps for one year. Does the compact fluorescent show a lower cost to operate? Why? The annual cost to run a light bulb is a product of three things, 1) how long the light is on (in hours), 2) the cost of the electricity (in $/kWh), and 3) the watts it uses (in kWh's). We can't directly change the price we pay for electricity, so the two actions which are in our control are: reduce the time the light is in use (turn out the lights), and/or use a lamp with a lower watt consumption while putting out the same level of light.

	______	(F) Annual cost to run the 60W incandescent lamp			
-	______	(G) Annual cost to run the 20W CF lamp	=	______	Annual Savings (H)

Subtract line (G) from line (F) and calculate the total Annual Savings (H) generated by switching from one 60 watt incandescent bulb to a 20 watt compact fluorescent bulb (for the same number of hours and at the same cost of electricity).

There, you made it. You completed the first experiment and you can now successfully find many places throughout your home where you can save energy and money by switching from standard incandescent light bulbs to lower wattage, energy-saving compact fluorescent lamps. You are now able to use your new Killawatt device and proceed to test other electrical equipment around your house, looking for opportunities to decrease energy use, save money and have a better feel for the energy-use decisions you make everyday.

Congratulations, you've become a member of the Killawatt Energy Savers Club.



Have fun testing…

Testing Your Equipment

<u>Disaggregating Your Appliances and Equipment</u>

Your monthly electric bill represents an aggregation of all of your individual uses of electricity over the course of 30 days… for your refrigerator, your fish tanks, your appliances, etc. To disaggregate your electric bill is to identify the specific energy costs for each of these uses.

Ultimately the cost of electricity to operate an appliance, a tool or a piece of equipment is the product of the total electricity used (measured in kWh's) and the cost of electricity from your utility ($/kWh).

Total Cost of Electricity = kWh's X $/kWh

The period can be any length of time, but we are typically billed monthly and budget utility expenses on both a monthly and annual basis.

Electricity-using devices and equipment consume electricity in different manners. Light bulbs use electricity at a fairly constant rate, that is, a 60 watt bulb will draw approximately 60 watts constantly, for a minute or an hour or as long as it is turned on. So to calculate the cost of electricity to operate the 60 watt bulb, you only need to determine the time period you wish to measure.

Refrigerators use electricity in an entirely different manner. The amount of electricity a refrigerator is using at any given moment is dependant on several environmental variables. A refrigerator uses a certain amount of electricity when the doors are closed and the interior temperature setting is met. But when the doors open, the refrigerator uses more electricity when the lights in the freezer and refrigerator come on. Then as the interior temperature rises, the refrigerator uses even more electricity when the compressor engages and the cooling system kicks in. This process removes heat from the freezer and refrigerator that was- introduced when the doors where opened.

A refrigerator consumes electricity in a sporadic manner, depending on how often it is used. For this reason, to calculate the cost of electricity for the operation of a refrigerator, it is best to monitor its use over a long period of time – in order to incorporate all levels of use. In order to get a good reading on how much electricity a refrigerator uses, the Killawatt should be connected for a period of at least 48 hours (2 days) or even a full week. Record the Killawatt readings for cumulative kWh's and Total Hours (use the pink button on the right). The average kWh is calculated by dividing the cumulated kWh's by the Total Hours of the test.

Average kWh = Cumulated kWh's / Total Hours

So if a Killawatt is connected to a refrigerator for 112 hours and the cumulative kilowatt-hours are11.67, the average kWh consumption is .1042.

To analyze other equipment, tools and appliances you will probably have to calculate the average kWh, and/or the hours used per year. Don't forget to test and measure the following electricity-users:

Refrigerators	Room Air Cleaners	TV's/Radio's	Bath Appliances	Fish Tanks
Telephones	Fans/Portable Heaters	Printers/Computers	Kitchen Appliances	Chargers
Freezers	Fountains	Window AC Units	Lighting	Room Dehumidifiers
Room Humidifiers	Alarms/Monitors	Night Lights	Ultra Sonic Pest Control	Clocks

Looking for Energy Saving Opportunities

Most new appliances, tools or pieces of equipment are more energy efficient than the units they replace. Many times the price difference between replacement appliances, tools or equipment differ because of options that relate to operational costs and energy efficiency. The most efficient unit costs a bit more but saves more money on an annual basis by using less electricity. You can compare the initial costs and energy savings by calculating a simple payback… the time in years that an investment will be returned through energy cost savings.

While some people wouldn't replace a perfectly fine - and working - appliance, tool or piece of equipment just for the energy savings, in the long run it might be worth it!. Lighting is a major exception to that rule. Savings from efficient CF lamps can make it worthwhile to replace perfectly good incandescent bulbs before they burn out.

Compare your existing appliances, tools and equipment against new equipment by comparing the annual cost of electricity as your Killawatt measures it, to the yellow Energy Guide tag or Energy Star information found on most new energy-using products.

Disaggregating Your Appliances and Equipment

Appliance (a)	Total Measured kWh's (b)	Test Period in Hours (c)	Avg kWh (d)	Annual Hours of Use (e)	kWh's per Year (f)	Cost per kWh ($/kWh's) (g)	Annual Cost (h)
Refrigerator (Example)	11.67	112	.1042	8760	912.8	$0.10	$91.28
Living Room Light (Example) 8 hours a day – Incandescent 60 watts			.06	2920	157	$0.10	$17.50
Living Room Light (Example) 8 hours a day – CF 20 watts			.02	2920	58.4	$0.10	$5.84

To use the "Disaggregating Your Appliances and Equipment" chart:

- Note the appliance, tool or equipment in (a).
- Enter the kWh reading from your Killawatt (pink button on right) in (b).
- Enter the Hours reading from your Killawatt (pink button on the right) in ©.
- Divide (b) by (c) in order to calculate the average kWh. Write the answer in (d).
- Enter the annual hours of use for this appliance, tool or equipment in (e).
- Multiply (d) by (e) in order to calculate the annual kWh's this appliance, tool or equipment uses. Write the answer in (f).
- Enter the cost of electricity ($/kWh) in (g).
- Multiply (f) by (g) to calculate the total annual cost for electricity to operate this appliance, tool or equipment. Write the answer in (h).

Now you can identify the cost for electricity for each appliance, tool or piece of equipment measured. You can identify high and low cost uses. It makes sense that larger opportunities for energy savings might come from areas of higher use. Look at your list and note the energy use decisions you make every day… the cost of electricity for the fish tank, the cost of electricity for watching TV or the cost for lighting your home or garden. The surest way of cutting energy use is to stop using that device. You can easily save money by reducing the hours you use any electricity-using device in your home.

Disaggregating Your Appliances and Equipment

Appliance (a)	Total Measured kWh's (b)	Test Period in Hours (c)	Avg kWh (d)	Annual Hours of Use (e)	kWh's per Year (f)	Cost per kWh ($/kWh's) (g)	Annual Cost (h)

Looking for Energy Saving Opportunities

Appliance (a)	Annual Cost of Electricity for Existing Unit (b)	Estimated Annual Cost of Energy on Yellow Energy Guide (c)	Energy Savings (d)	Cost of New Appliance (e)	Simple Payback Period (f)
Refrigerator (example)	$91.28	$69	$22.28	$550	24.7 Yrs
Refrigerator (example)	$91.28	$58	$33.28	$600	18.0 Yrs

To use the "Looking for Energy Saving Opportunities" chart:

- Note the appliance, tool or equipment in (a).
- Enter the Annual Cost of Electricity in (b). As measured by the Killawatt, or calculated otherwise.
- Enter the estimated Annual Cost of Energy (as found on the yellow Energy Guide tag) in (c).
- Subtract (c) from (b) in order to calculate the Annual Energy Saving of a new appliance. Write the answer in (d).
- Enter the purchase price of the new appliance. Write the answer in (e).
- Divide (e) by (d) to calculate the simple payback of buying a new appliance. Write the answer in (f).

In the example above, we look at an existing refrigerator and the possibility for energy savings through the purchase of two different replacement refrigerators. The first possibility is a refrigerator that costs $550 dollars and according to the yellow Energy Guide tag will cost $69 a year for energy. A second potential refrigerator costs a bit more at $600, but part of that cost provides more energy efficiency, as reflected by the yellow Energy Guide on the unit showing an estimate of annual energy cost of $58.

In this example the more expensive replacement refrigerator actually has the quicker simple payback.

Looking for Energy Saving Opportunities

Appliance (a)	Annual Cost of Electricity (b)	Estimated Annual Cost of Energy on Yellow Energy Guide (c)	Energy Savings (d)	Cost of New Appliance (e)	Simple Payback Period (f)