powerlet™
EQUIPPED

Welcome BMW Owners

Get to know Powerlet. We are the factory.
Learn your way around Powerlet in minutes.

HEATED CLOTHING
iCAN™
BMWCANBUS
BATTERY CHARGING

When CANbus can't, Powerlet CAN.

Now you can safely power your heated clothing or use your standard battery charger on your **2005 and later** CANbus equipped BMW motorcycle using our simple iCAN Harness.

Why you'll love Powerlet.
Your BMW factory power outlet is fully compatible with Powerlet plugs and sockets. We offer hundreds of products so you can get the most use out of your BMW power outlet. Find right angle plugs, second socket kits and lots of specialized cables.

Make simple connections.
Select from a full line of power cables for Apple **iPods**, **Garmin GPS** units, **Escort** & **Valentine** Radar Detectors, **mini-USB** devices and more. Powerlet cables plug directly into your BMW factory power outlet eliminating the need for adapters.

Cell phone home.
Cell phone batteries discharge in rural areas hunting for towers. With seven cigarette adapter cables to choose from it is easy to charge your phone or power a tire inflator. Like most of our products, these cables are proudly made in the USA.

Think green. Save green.™
New batteries not only cost money, old batteries stress the environment. Our quality charging cables allow you to plug any battery charger into your BMW stock outlet. Keeping your battery charged reduces sulfation making it last 6-8 years, saving hundreds of dollars.

Power Outlet Kits. Anyone for seconds?
Add a second or third power outlet with one of our Powerlet socket kits. These high quality kits are designed with the best materials available and are engineered to save time during installation.

Stay Warm While Riding
A heated vest for a new generation of BMW Motorcycles.
Designed to work with your stock power outlet on **2005 and later** CANbus equipped BMW motorcycles.

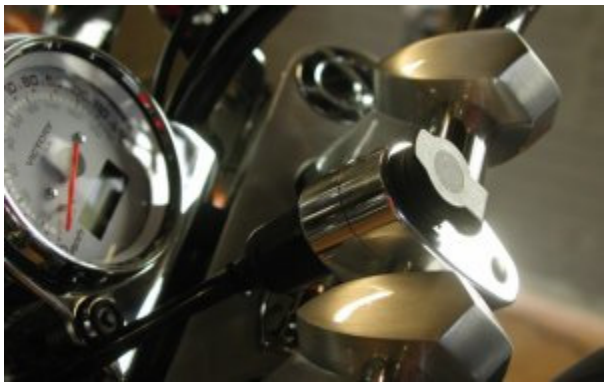
Watts your EEC?
Discover how many electrical gadgets your motorcycle can power.

Luggage Electrix Solutions
All Luggage. All Bikes. One Kit.
Simple, waterproof and versitile, Luggage Electrix kits can simplify every power need you have.

Welcome Victory Owners

Victory Vision
One outlet **does it all**.
Your Victory Vision comes equipped with several power outlets. These vibration proof, high current outlets are now being used throughout the powersport industry. The outlets can be used to power GPS units, iPods, heated clothing, charge your Vision's battery, and charge your cell phone.

Vegas - Jackpot - Hammer – Kingpin
Again, **one outlet does it all.**
Owners of these Victory motorcycles start by bolting on a power outlet. Select either an outlet on the handlebars or a outlet that is virtually hidden in the engine compartment. Both power outlet kits can be purchased and installed at your local Victory dealer, see the Pure Victory Gear catalog for details. Powerlet uses the best materials available, include vibration-proof, high-current sockets and are engineered to save time during installation.



Handlebar Outlet - Victory PN: 2858099 or
Powerlet PN: PKT-080-C

Case Mount Outlet - Victory PN: 2858103 or
Powerlet PN: PKT-065

Make simple connections.
Select from a full line of power cables for Apple **iPods**, **Garmin GPS** units, **Escort** & **Valentine** Radar Detectors, **mini-USB** devices and more. Powerlet cables plug directly into your Victory factory power outlet eliminating the need for adapters.

Cell phone home.
Cell phone batteries discharge in rural areas hunting for towers. With seven cigarette adapter cables to choose from it is easy to charge your phone or power a tire inflator. Like most of our products, these cables are proudly made in the USA.

Think green. Save green.™
New batteries not only cost money, old batteries stress the environment. Our quality charging cables allow you to plug any battery charger into any Powerlet outlet. Keeping your battery charged reduces sulfation making it last 6-8 years, saving hundreds of dollars.

Get to know Powerlet.
We offer a complete line of products so you can get the most use out of your Victory power outlet. For example, additional Powerlet plugs and sockets can be found here and heated clothing can be found here.

Power And Mount Your GPS. GPS has never been so simple.
What is easier than 1, 2, 3? Answer: One, two. Combine a handlebar power outlet Victory PN: 2858099 with the Tour Tech GPS mount Victory PN: 2858095 for optimum viewing and the ultimate in motorcycle navigation. Everything you need is included in these two part numbers, right down to the ty-wraps.

Watts your EEC?
Discover how many electrical gadgets your motorcycle can power.

Luggage Electrix Solutions
All Luggage. All Bikes. One Kit.
Simple, waterproof and versitile, Luggage Electrix kits can simplify every power need you have.

Powerlet iCAN - The BMW CANbus Solution. Solve CANbus problems

The CANbus Problem
Outlets powered by the CANbus system turn on and off with the motorcycle ignition, which does not allow the use of a standard battery charger. CANbus-driven outlets automatically shut off when the current exceeds 5 amps; prohibiting the use of most heated clothing, which can draw up to 15 amps.

The Powerlet Solution
Powerlet provides a heavy duty replacement wiring harness allowing the use of a standard battery charger and heated clothing. The replacement harness will not affect or damage the CANbus system.


PKT-042

Two BMW factory sockets have been used on the 5 amp CANbus system.
A tale of two sockets.
On vehicles built before August of 2006 the harness will plug directly onto the stock socket. These early metal (silver) sockets can be identified by opening the lid. These metal sockets are capable of 15 amps so they do not need to be replaced. For later models both the wiring harness and socket are replaced since the newer plastic socket has light-weight 5 amp terminals.

2005 to 8/06

8/06 to Present

With one outlet, iCAN do it all.
All Powerlet harnesses are UV stable and gas/oil resistant. They use 14 AWG 105C wiring with 15 amp fuses.

Some bikes need iCAN. Some bikes don't.
Models like the K1200GT, K1200R, K1200S, R1200GS, R1200RT, R1200ST, F800S, F800ST, F800GS are CANbus equiped. These bikes benifit from installing a Powerlet iCAN harness.
The following are examples of models that are not CANbus equipped so they do not require a replacement harness: R1200CL, R1150RT, K1200LT, F650GS (single cyl), F650CS, F650 X Country, X Challenge & X Moto.

Powerlet Luggage Electrix. Power Anything

Luggage Electrix Kits provide easy, waterproof power in any type of luggage.

Make the Connection
Our Universal Luggage Electrix Kit includes a waterproof connector, internal and external cables. Simplify your wiring by powering many devices from inside your luggage with our modular system. Less time wiring means more time riding!

All Luggage. All Bikes. One Kit.

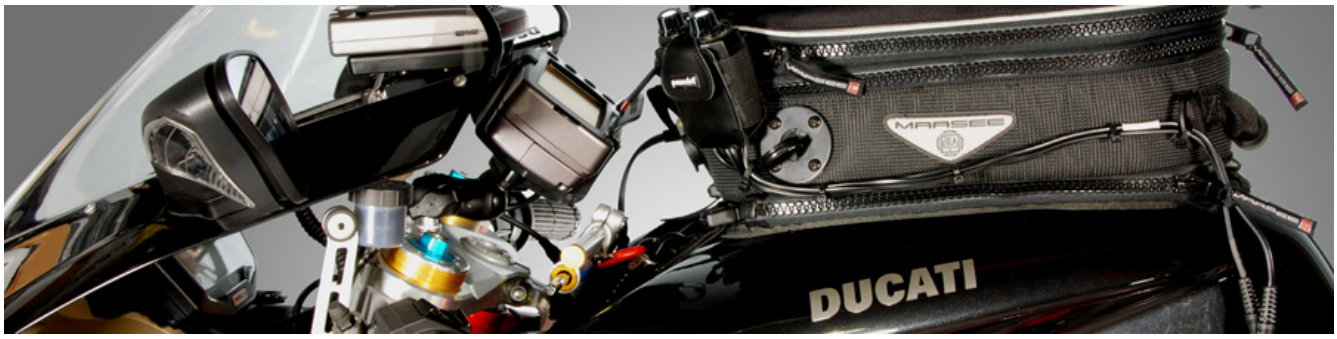
Tank Bags
Tankbags are a great place to charge your cell phone or power a GPS. Easily power a radar detector for your commute to work. The heavy-duty wiring is engineered to withstand the high current of heated clothing. Clip your heated clothing temperature controller on the outside of tankbag and power your heated clothing through our Luggage Electrix kit.

Saddle Bags

It does not matter if your saddlebags are made of leather, fabric or plastic our Luggage Electrix kit is garaunteed to be waterproof. Go ahead, charge your cell phone then power your ipod and the next morning plug in a coffee pot at the campground. When it comes time to remove the saddlebag simply unplug the sturdy Luggage Electrix connector.

Tour Packs

If you are a salesman on the road, tour packs and top boxes are a great place to charge your laptop. Enjoy the convienience of a cigarette socket safely placed inside your luggage.



Powerlet Heated Clothing Features

Heated Liners

Powerlet ProForm Jacket Liner Features

•Ultra thin design for comfort under your jacket and small storage required on bike. Packs down to 1/2 the size of the competition.
•ProForm streach panels for simple sizing.
•Finished sleeves for minimal bulk in wrist area.
•Glove connections in zipper pocket on sleeve.
•Simple dual temperature controller connection point for heated gloves.

Special Features To Keep Your Core Warm

•ProForm stretch panels for maximum heat transfer.
•Soft, heated, Polartek collar wicks away moisture providing all day riding comfort even in the rain.
•Longer Cut on lower back with heating elements down to the bottom for very, very cold riding.
•Durable Kevlar reinforced Nichrome heating elements will not leave you out in the cold after years of hard usage.

Heating Elements

While electrically heated jacket liners and heated vests are offered with a few different types of heating elements, carbon fiber cloth and nichrome wire are the most popular. Most all electrically heated gloves use a nichrome wire heating element. In the future we may all be wearing "copper fiber" heated clothing, this technology shows much promise.

For **safety** reasons, maximum **garment lifespan**, **smaller storage** on the bike and more **complete heating**, Powerlet has elected to use ultra-durable Kevlar reinforced Nichrome wire in its 2009 heated clothing products.

There are advantages and disadvantages to using either nichrome wire or carbon fiber panels.
Carbon fiber panels were originally designed for car seats and were **not required to be crumpled up and folded into a saddlebag**. Nor were the seat elements required to be washed on occasion. Carbon fiber panels tend to develop "hot spots" where they are creased, so it is difficult to have the carbon fiber panels turn corners around elbows and the neckline. Therefor most carbon fiber garments do not have heated sleeves or necklines. For these reasons carbon fiber garments tend to have a **shorter usable lifespan than Nichrome wire garments**. There is also a health concern with carbon fiber panels. Some studies show that it may be a health

concern to over-warm the blood to the heart. This excess heat can be additionally complicated by a controller that only provides "low, medium & high" settings.

On the other hand **Nichrome wire** tends to draw more power to deliver the same amount of heat. For some bikes with less excess electrical capacity (EEC) this can be a problem. Powerlet publishes the EEC for most bikes in the "shop by vehicle" section. We use a "star" system to show just how much EEC your vehicle has.

Power Requirements

Heated gloves require the least amount of power, typically between **20 and 25 watts**. For this reason they can be powered from most any small vehicle. These are almost always made with Nichrome wire. Powerlet uses special Kevlar reinforced Nichrome wire for strength and durability.

Heated vests are designed to provide around **40 or 50 watts** of heat. This translates into current draws from 2.9 to 4.2 amps at 12 volts. This includes vests from Aerostich, Eclipse, BMW, Gaili and Widder. You may notice that smaller vests of the same brand will draw more current, which actually makes sense; there is less resistive wire in the garment.

Heated jacket liners are the warmest and require the most power. Typically these draw **75 to 100 watts** depending on the manufacturer. By comparison, items like heated clothing made with nichrome wire or auxiliary lights require significantly more power than a GPS (12 watts) or cell phone (5 watts to charge).

Wiring

Battery Power vs Vehicle Power (Wires vs No Wires)

Again there are pros and cons to battery or vehicle power sources. While there is no problem riding all day using the vehicles power wource, batteries have a pesky habit of running down at inopportune times. There is a higher long term cost with using a battery pack as these will need to be replaced and can easily cost half the price of the garment.

Controllers

Most heated jacket liners or vests use a temperature controller. Some of the competitors heated clothing come with "low, medium and high" controllers. While these controllers are less expensive to manufacture and sell, they can often be to warm, leaving the rider uncomfortable.

Connectors

Most heated clothing uses either an SAE or 2.5mm x 5.5mm COAX connector. SAE's were more popular a few years ago but most manufacturers now use COAX connectors.

Maximize Heat Transfer

To maximize the heat we must:

•Transfer the heat from the garment to the rider.

•Minimize the losses delivering power to the clothing.

For heated clothing to transfer heat to the body it must have a **snug fit**. Powerlet heated vests and jacket liners use ProForm stretch panels to provide a snug fit.

Large gauge wire and quality power connectors will deliver more power to the garment. Real world losses can total up to 10W for a heated jacket liner, or about 10% of your heat. Using a minimum of sixteen gauge wire and high current connectors will reduce this loss considerably. Powerlet socket kits use expensive (lots of copper) **14 gauge wire** to further minimize the power transfer losses.

The Most Common Concern

There is no worry of being electrocuted in the rain by Powerlet heated clothing.

STAY WARM WHILE RIDING

To Ride Warm Is To *Ride Safe*

Sixty, Sixty, Thirty Rule:
Traveling 60 mph in 60°F weather, the wind chill factor is 30°F.

If your fingers have ever become so cold that they could no longer work the levers you know just how dangerous riding can be when you are not comfortable. Keeping the wind off of your body is the first key to staying warm. As the 60-60-30 rule states even on a 60deg day, the wind chill can feel like 30.
Once you have figured out how to keep the wind off your body the next step is to generate some extra heat *under* your thermal layers. With today's electrically heated clothing technology you do not have to take the risks associated with cold hands or feet. The most common types of heated clothing are **heated jacket liners, heated vests** and **heated gloves**. Thin, comfortable, lightweight and easy to pack, there is no longer any problem riding all day in 30 deg (even 20 deg) temperatures using specially designed heated clothing. Forty, Fifty and Sixty degree days can be made completely comfortable when using a infinitely variable temperature controller along with Powerlet ProForm heated clothing.

Hands, Feet And The Core
Most people notice that their hands and feet are cold first. But why do your hands and feet get cold sooner than the rest of your body? It's simple - when your core body temperature drops, the body stops sending blood to your hands and feet. The solution for all day riding is to keep your core warm.

Maximize Heat Transfer
To maximize heat we must minimize the losses delivering power to the clothing and the heated clothing must have a snug fit. Small gauge wire and low power connectors will rob power from the heated clothing. Real world losses can total up to 10W for a heated jacket liner, or about 10% of your heat. Using a minimum of eighteen gauge wire and high current connectors will reduce this loss considerably. Powerlet socket kits use 14 gauge wire to further minimize the power transfer losses.

Battery Power vs Vehicle Power
Batteries have a pesky habit of running down at inopportune times. Battery operated heated clothing also has higher long term operating costs due to the need to replace the batteries over time. However being wired to the vehicle is not as convenient as running on batteries. Ultimately you must decide which system you will use more often to minimize your risk of becoming cold while riding.

The Most Common Concern
There is no worry of being electrocuted in the rain by Powerlet heated clothing.

MINI-USB AND MICRO-USB CONNECTORS

The retention mechanism for USB connectors can either be on the male (cord end) or the female (device - (gps) end). In the case of a mini-USB the retention is built into the female side (device). This has been identified as a flaw since it is more expensive to notice or replace than if it was on the male side (on the cord).

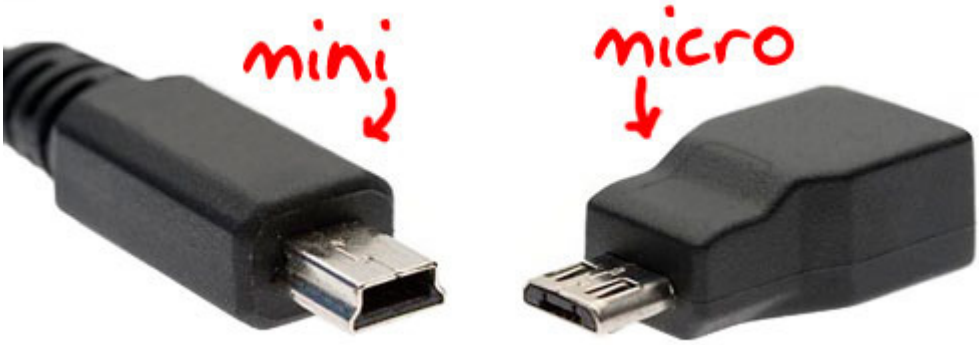
Often times the female mini-USB on the device fails due to multiple inserts and extractions. Vibration and lateral pressures seen in the powersport environment do not provide the little connector any favors either.

The newer micro-USB corrects this problem and puts the "fingers" that retain the connector in place on the male side of the cord. The female part of the micro-USB (device side) is therefore less prone to failure. This "retention failure mode" is a large reason the micro-USB (and not the mini-USB) has become the standard for most devices in Europe in 2010.

"Nokia, Sony Ericsson, Motorola, LG, NEC, Qualcomm, RIM, Samsung and Apple have all signed an agreement to make MicroUSB the standard charging/connectivity technology in Europe. This is awesome news for Euroconsumers who no longer have to worry about buying/matching proprietary cables from various manufacturers and it is surely an environmental victory as consumers frequently discard used cables that are in perfectly working condition simply because they aren't compatible with their current phone." says Rob Jackson of phandroid.com.

Another problem is often times the device manufactures (GPS, phone, etc) change the electrical specs for charging purposes. Companies like Apple, Garmin and Motorola modify the USB spec electrically so they can sense that a cable is used for charging only - no data transfers.

Powerlet USB, mini-USB and our soon to be released micro-USB connectors conform to all USB electrical and mechanical specs. Powerlet often supplies low cost adapters which are necessary to convert a standard USB connector to one that works with a specific appliance. For instance see our mini-USB adapter for Garmin GPS units. This adapter allows all Garmin units to charge from any standard mini-USB charger.



Powering Heated Clothing in Long-Term Stationary Positions

Why Suffer Through the Cold?
Whether sitting out in the bleachers at your favorite sporting event or waiting for a buck to stroll into sight from your tree stand, extended periods of outdoor exposure can be uncomfortable. The cold weather makes long waits or metal seats hard to suffer through.

The answer is heated clothing.

These portable sources of heat keep your body warm so you can sit by the ice fishing hole or take in an outdoor concert. Read on for more information and products that will help you tough our the winter chill.

Using AGM Batteries
AGM stands for Absorbed Glass Mat, often referred to as Gel Cell. These batteries, theoretically, improve discharge and recharge efficiency. AGM batteries are deep-cycle, lead acid batteries different from standard cranking batteries. Cranking batteries provide better instant energy while deep-cycle batteries provide longer sustained power. AGM are also no-spill batteries, can be mounted anywhere and transported without special handling. This design makes them perfect for long, stationary heating needs.

Batteries come in all different sizes. Many have "group" sizes, which is based upon the physical size and terminal placement.

Common Battery Size Codes (ratings are approximate)

U-1	34-40 Amp hours	12 volts
Group 24	70-85 Amp hours	12 volts
Group 27	85-105 Amp hours	12 volts
Group 31	95-125 Amp hours	12 volts

Typical AGM Battery Dimensions with Associated AH Ratings

Capacity	Physical Size	Weight	Runtime
35 AH @ 20 AH rate	8" x 5" x 7" (U-1)	24 lbs	Vest = 6 Hours @ Full PowerGroup 24
50 AH @ 20 AH rate	8" x 7" x 7"	31 lbs	Vest = 10 Hours @ Full PowerGroup 27
90 AH @ 20 AH rate	12" x 7" x 9" (G 27)	60 lbs	Vest = 18 Hours @ Full PowerGroup 31

The formula to discover the number of hours you can get out of your battery is:
Amp Hours (AH) rating / Load in Amps = # Hours

Heated Vest Example
A heated vest uses 5 amps of power. Connect the vest to a 50 Amp Hour-rated battery and the result is:
50 AH ÷ 5 Amps = 10 Hours

Considering Peukert's Law

Take 10% off the AH rating for powering heated clothing

For powering heated clothing, take about 10% off of the amp-hour rating due to the Peukert Effect. The Peukert Effect is due to the internal resistance of the battery. With a higher internal resistance, the battery heats up internally while delivering current to the heated clothing. The faster a battery is discharged, the LOWER the AH capacity. Some manufacturers rate their batteries at the 100 hour rate - which makes them look a lot better than they really are.

Heated Jacket Liners

Powerlet's Premium Heated Liners are manufactured with ProForm panels, a premium collar, unique sleeves, full heat coverage, and zippered cable openings. ProForm panels stretch for maximum heat transfer, simple sizing and freedom of movement.

ProForm Heated Vest

Powerlet's ProForm(tm) vests pack down to a very small size to fit on the bike when not in use. This vest powers heated gloves with our unique hidden integrated glove cords. Fully compatible with all BMW CANBus outlets.

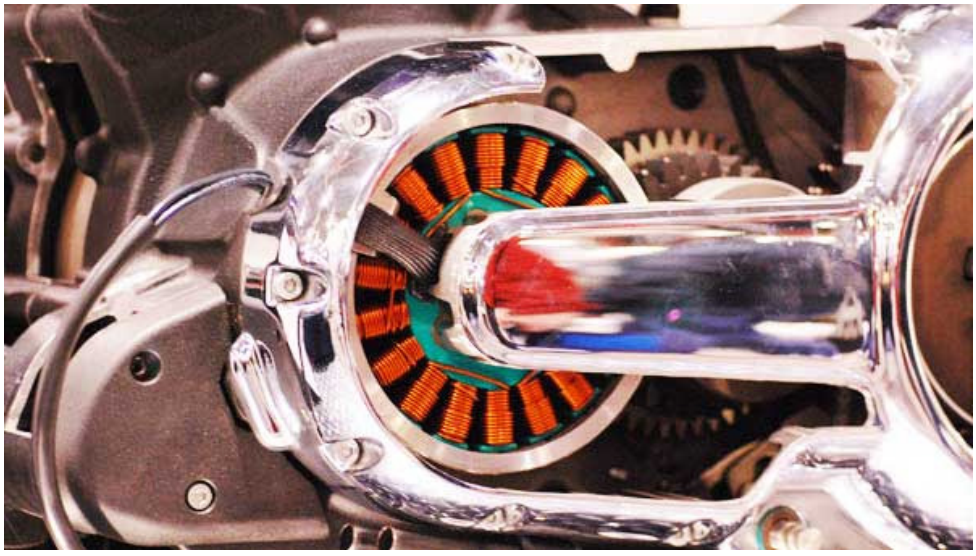
Heated Gloves

Carbon-fiber knuckles, premium leather, a curved form-fit, finger-top heat coverage, and hook and loop fasteners straps for maximum heat transfer make these gloves the perfect choice for discriminating sport-touring riders. Simple true glove sizing.

Coming Soon: Socks

Bringing warmth to the tips of your toes, one of the first places to feel the winter chill. This item isn't here yet, but it is coming. Keep an eye out for the newest products from our line of heated gear.

Excess Electrical Capacity



Alternator - a generator of alternating current.

Excess Electrical Capacity (EEC)
The amount of power produced by your bike to run electrical gadgets. You will start discharging your vehicle's battery if the Excess Electrical Capacity is exceeded. This number varies widely depending on the manufacturer, model and sometimes model year of the vehicle.

CALCULATING EXCESS ELECTRICAL CAPACITY
So exactly how many "gee-whiz" pieces of electronics will your bike power? Well that depends on a few variables. Basically, your bikes excess electrical capacity is the alternators charging output minus the common operating load. Usually these numbers are shown in "watts".
A "watt" is a unit of measure for electrical power (P). In this case, the charging power is the product of the bikes voltage (V) and peak current (I). So P = V * I. What this mean? Simple... if the bikes alternator has a peak rating of 20 amps @ 14 volts then the peak charging output is (20 * 14) or 280 watts.
A motorcycles electrical system consists of three major parts, the alternator, the regulator-rectifier and the battery. The alternator is responsible for producing the power to keep the battery charged and power all of the electrical loads. The regulator-rectifier converts the alternator output from un-useable AC power to useable 14.4 VDC. The battery is used to both start the bike and buffer the power from the alternator.
To calculate your bikes excess electrical capacity, follow these three steps:
STEP #1 – Look up the "charging output" and type of "fuel delivery" from the manufacturer's specification sheet. Typically smaller displacement bikes will have smaller peak charging output.

Table 1 – Peak Charging Output

Make	Model	Year	Fuel Delivery	Peak Charging Output
Buell	Blast	2001	Carbureted	297 watts
BMW	R1150RT	2003	Fuel injected	700 watts
BMW	K1200LT	2003	Fuel injected	840 watts
Ducati	996	2000	Fuel injected	520 watts
Ducati	ST2/ST4	2002	Fuel injected	520 watts
Harley	Heritage	1998	Carbureted	360 watts
Harley	Electra Glide	2002	Fuel injected	585 watts
Honda	Shadow 1100	2002	Carbureted	329 watts
Honda	ST1300	2003	Fuel Injected	740 watts
Honda	Valkyrie	2000	Carbureted	546 watts
Honda	GL1800	2003	Fuel Injected	1100 watts
Kawasaki	Vulcan 1500	2000	Carbureted	377 watts
Kawasaki	Vulcan 1500	2001	Fuel Injected	588 watts
Kawasaki	ZX6R	2001	Carbureted	305 watts
Suzuki	Bandit 1200	1999	Carbureted	405 watts
Suzuki	V-Strom	2002	Fuel Injection	360 watts
Yamaha	FJR1300	2003	Fuel Injected	490 watts

The bikes alternator output will change at various engine RPM's. Here is an example of how the engine RPM affects alternator output on a Harley-Davidson Ultra Classic Electra-Glide:

380W @ 1000 RPM 578W @ 3000 RPM 598W Peak

STEP #2 – Calculate the common operating load. This is the total of all the electrical devices that are part of the bike and will be in operation during normal riding. Do NOT include items like turning indicators and horns since they are only used occasionally. Exceeding the peak charging output for short periods of time is not a problem. The battery will source the extra power needed. However if the power is needed for a long time, the battery will go dead. For this calculation, do NOT include the aftermarket accessories you will be adding; only include the stock items on the bike.

Table 2 – Common Operating Loads

High Beam	55 watts
Low Beam	55 watts
Number Plate	5 watts
Brake/Tail	21 watts
Instrument Panel	2 watts
Computer	25 watts
Fuel Pump	60 watts
Cooling Fan	60 watts
Electronic Ignition	50 watts

A common operating load for a standard fuel injected bike is about 285 watts.
A common operating load for a standard carbureted bike is about 195 watts.
Some bikes leave the low beam on when the high beam is activated. To conserve power, many bikes automatically turn off the low beam when the high beam is turned on. Many larger bikes have additional lighting and miscellaneous loads like radios make sure you include all of the items that operate continuously while riding. Carbureted bikes require about 85 watts less to operate.

STEP #3 - Subtract the operating load from the charging output; this calculation will approximately predict the excess capacity. Usually the larger displacement bikes will have greater excess capacity, but this is not always true as seen in the following six examples (operating loads are approximate):

Table 3 – Excess Capacity for 2 small, 2 mid, and 2 big bikes

Example	Peak	Operating	Excess Capacity
Buell Blast	297 watts	195 watts	102 watts
Kawasaki ZX6R	305 watts	200 watts	105 watts
Ducati ST2/ST4	520 watts	285 watts	245 watts
Suzuki V-Strom	360 watts	285 watts	75 watts
Honda Valkyrie	546 watts	250 watts	296 watts
Vulcan 1500 FI	588 watts	340 watts	248 watts

What do you plan to operate?

This handy table shows how much power many common appliances draw. Only a few appliances draw high power. These are heated clothing, laptops and auxiliary lighting. Small electronics like cell phones and radar detectors draw very little. You can usually run as many of the smaller items as you wish with little or no worry. To find the total power required for all of the accessories you plan to use, add the power rating (watts) for each device. Ranges are provided based on make and model.

Table 4 – Common Appliances

Appliance	Power Usage
Heated Garments	35 – 77 watts
Aux lights	35 – 100 watts (each)
Laptop	40 – 60 watts
Cell Phone	1 – 3 watts
Radar Detector	1 – 3 watts
GPS	2 – 6 watts
Portable Music	1 – 3 watts

What if I don't have enough power?

Sometimes your favorite bike does not have much excess capacity. For example, the data in STEP #3 shows that V-Strom owners may find that powering several pieces of high power heated clothing kills the battery. There are a few things that can be done to conserve a few precious watts:

1. Replace standard lights with low power LED lighting (where possible).
2. Add a circuit that automatically turns the low beam off when the high beam is activated.
3. A dirty fuel filter can cause the fuel pump to use 120 watts, 60 more than normal. A dirty fuel filter is a common cause for a voltage regulator to fail on a fuel-injected bike.

In Conclusion:

Motorcycle manufacturers have been increasing the alternator output in response to the growing number of electrical appliances available. Most bikes can handle a few 40 watt heated garments without any problems. According to Widder Canada Inc. “Today’s motorcycles of 500cc or larger can usually handle three (heated) garments together without overtaxing the charging system. Three garments would be equivalent to turning on a 100 watt headlight. Most larger bikes would have no problem riding two-up with both rider and passenger each wearing the full set. Another aspect to consider is that the items will not necessarily be on all the time, or if the thermostat is adjusted to less than full capacity, there will be less draw.”

The Gerbing’s web site states: “…the electrical output of the typical motorcycle continued to increase as motorcycle engineers attempted to satisfy the growing demand for electrical accessories. The result is that all but the smallest bikes can now provide the power needed to generate the needed heat.”

FUSE SIZING PRIMER

This primer focuses on the fusing requirements for power outlets during typical use. I am always concerned fusing a 12V vehicle circuit above 10A. If you need more current than that it may be best to add more outlets. If you must fuse a single circuit at 15A then certain precautions must be taken.

Here is why: First, fuse ratings can be a bit misleading. A 10A ATO (automotive) fuse will conduct 11 amps for 100 hours minimum. At 13.5 Amps a 10A ATO fuse can take as long as 10 minutes to blow. It is not like once you draw 10 amps "poof" the fuse is gone.

The primary function of a fuse is to protect the wire, connectors or "load" from overheating and starting a fire. Fuses will not protect sensitive electronics from damage. Below are typical single conductors' "free-air" current capacities for various gauge wires. Current carrying capacity is defined as the amperage a conductor can carry before melting the insulation. The numbers provided are for 80C (176F). All Powerlet wiring harnesses are constructed with 14AWG 105C wire and 105C PVC sleeving for added reliability.

Wire Capacity - Data Compliments of Alpha Wire Company:

- 22awg => 8A
- 20awg => 10A
- 18awg => 15A
- 16awg => 19A
- 14awg => 25A

NOTE: The practical current rating for a wire is much lower; it is also subjective. For instance, with the same current there will be more loss in an 18awg wire than in a 14awg wire. According to the chart both may operate a couple heated vests safely, however, with 14awg wire you will "feel" warmer since there will be more power delivered to the vest (less power lost in the wiring). A practical limit for 18awg may be about 8 amps while a 14awg conductor may be practical to around 15 amps.

Keep in mind that connectors also carry a current rating. The BMW type connectors used in the Powerlet products are rated at 16 amps. The fuse should not be higher than the "weakest link".

With that said here is the main concern: if you fuse higher than 10A, lets say at 15A (the next larger size), the circuit resistance may not allow the fuse to blow during a short circuit. Keep in mind a 15A fuse can conduct 20.25A for up to 10 min. The resistance of said circuit must drop below 0.60 ohm to blow a 15A fuse, where V=12V, I=20A, and R = V/I =12/20 = 0.6 Ohms. It is not difficult to accumulate 0.60 ohm of resistance in a vehicle circuit. Add together all of the wire and connector resistances then throw in corrosion at the connection points. 20awg wire has a resistance of about 1 ohm per 100 ft. Twenty foot of wire may sound like a lot but it adds up fast (there and back).

Therefore I am always concerned fusing a 12V vehicle circuit above 10A.

BUILDING A WIRING HARNESS - DO'S AND DONT'S

1. Mount fuse close to battery +, do not cross a metal frame member before fuse (wear may cause a short). Use a secondary fuse if the primary fuse will not be close to the battery. This may happen if the primary fuse is located for easy service.
2. Do not allow the harness to touch the exhaust or motor.
3. Consider using the ground connection. If the bracket is fastened to the chassis this will provide the ground connection. If the bracket does not provide a good electrical connection, then connect a separate black wire to the nearest chassis bolt.
4. Use petroleum jelly on the connection points if you don't have electrical grease. This will help to slow down corrosion.
5. Use only automotive rated wire and sleeving to resist oil and gas.

Cables For Powerlet Equipped Vehicles

If your vehicle has a Powerlet socket, it is Powerlet Equipped. Since one Powerlet outlet can do it all, Powerlet Equipped vehicles have the largest variety of cables available. Select from the following direct power cables and adapter cables.

Powerlet Equipped Direct Power Cables
Powerlet manufactures direct power cables for Apple iPod (shown), mini-USB devices, Garmin GPS units, radar detectors and many other appliances. These cables plug directly into your Powerlet socket and directly into your appliance without using an adapter. Just another benefit of being Powerlet Equipped.

Powerlet Equipped Adapter Cables:
- to coax adapter cables for heated clothing;
- to cigarette socket adapter cables;
- to SAE adapter cable for battery charging;
- to SAE adapter cables for heated clothing;
- to SAE power cables for Luggage Electrix.

Cables For SAE, Coax and Cigarette Power Outlets
In addition to Powerlet Equipped cables, we also manufacture adapter cables for SAE, coax, and cigarette power outlets. These adapter cables improve the flexibility of the outlets by converting them from one type to another. For instance Powerlet makes Coax to SAE adapters so older heated gloves can be plugged into a newer coax heated jacket liner.

Cables For SAE Power Outlets
Powerlet makes a complete line of SAE adapter cables so you can use your SAE battery harness lead for more than just battery charging. For instance the SAE battery harness lead can be converted to a cigarette socket to charge a cell phone.

Cables For Coax Power Outlets
Our Coax cables are mostly used for heated clothing.

Cables For Cigarette Power Outlets
If the vehicle has a cigarette socket and you wish to convert it to a Powerlet socket look here. If you wish to convert to a SAE connector look here. Also see the appliance manufacturer for the correct power cable.