Installing, Using, and Adjusting the model WC.VR ZENA™ universal voltage and charging current regulator

The ZENA universal voltage and charging current regulator **is not a standard automotive voltage regulator**, but rather a sophisticated electronic control device which works with your **existing** ZENA welding power control module to control one, or more, ZENA welding power generators when they are being used for external battery charging, or for automotive or marine alternator replacement. Unlike normal voltage regulators, maximum charging current can also be adjusted -- allowing you to adjust output current to prevent generator over current and/or to best match the needs of the batteries to be charged and/or your specific electrical system.

NOTE: The current control is separate from regulator circuits and it can be adjusted independently.

CAUTION: When charging AGM type batteries, maximum charging current should be adjusted no higher than 80%.

CAUTION: Make sure that charging leads are large enough to handle whatever charging current is utilized. For 150A or 200A power generators, we recommend that charging leads be made from #4 AWG (or larger) welding cable.

The ZENA universal voltage and charging current regulator is powered by the ZENA welding power control module. When properly installed, the resulting power generator charging system should be **ignition excited** (turned on ONLY when engine is running). Unless you specifically requested a regulator for something other than a 12 V electrical system, your regulator has been factory adjusted for operation in a 12V DC electrical system. If you ordered your regulator for another voltage, it will have been factory adjusted to that voltage.

NOTE: When using the ZENA power generator for remote charging, batteries in a 24V system can be charged individually without need for re adjustment of the voltage regulator to 24V specifications. And, because the ZENA power generator is an electrically isolated device, without need to remove or disconnect the batteries from the remote vehicle.

CAUTION: It is very important that your welding power control module be installed so that it receives power ONLY WHEN THE ENGINE IS RUNNING (i.e., it should receive its power from vehicle's engine "ignition" circuit) -- OR that a small ignition circuit switched relay be used to break the Yellow wire connection between the voltage regulator and the control module . This must be done even if you have chosen to install a separate a ON/OFF switch for your welder. Failure to do this will result in a undesirable continuous current drain (from 2-7A) on the vehicle's battery, overheating of the power generator, and possible power generator failure.

Installation is very easy. The thick gray wire (with square black connector) is attached to the mating connector on the welding cable input on the control module. The yellow wire connects to the yellow wire which comes out of the control module. The red (+) and black (-) wires are sense wires (not power wires) and are usually connected to the positive (red) and negative (black) power output terminals on the power generator. Optionally, the sense wires can be connected directly to the battery which is being charged.

Unless otherwise specified, your regulator has been adjusted to a "turn on" (charge start) voltage setting of:

13.8 VDC

and a "turn off" (charge off) voltage setting of:

14.1 VDC

The voltage/charging current regulator has also been factory adjusted to limit maximum charging current to approximately 50% of rated current output (approx. 75A for 150A units -- 100A for 200A units).

In most cases, this setting will be proper for most vehicles if charging leads are properly sized, all connections/terminals are properly crimped, and cable to battery connections are not corroded.

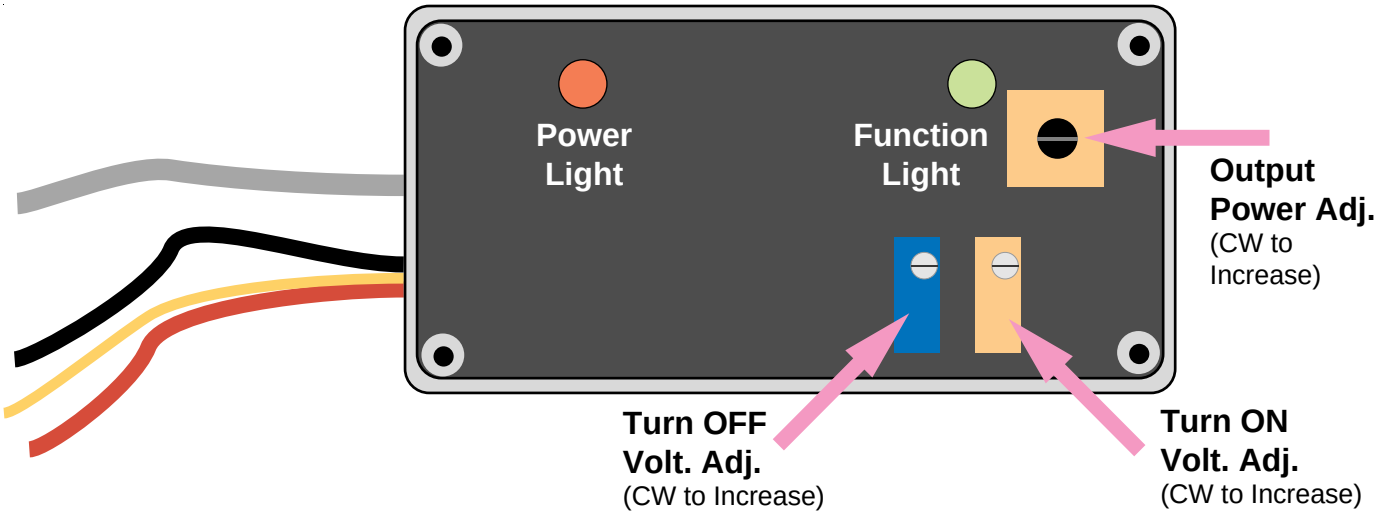
CAUTION: It the owner's responsibility to check factory specification for the vehicle in question AND the type of battery (or batteries) to be charged and to insure that the voltage regulator is working properly in the vehicle in which it is to be installed.

To check voltage regulator operation: First, properly connect the voltage regulator to the ZENA power control module and to the battery (or batteries) which is (are) to be charged. Second, insure that the ZENA power generator (or generators) which are being controlled by the voltage regulator are properly connected to the battery (or batteries) to be charged. Third, start the vehicle engine and check the voltage present at the battery terminals (do not check voltage at the power generator) with a sensitive and properly calibrated volt meter.

If adjustment is determined to be necessary, in the field, follow the following steps:

CAUTION: The vehicle's battery should be fully charged, and in good condition, before adjusting. (A charged 12V battery will show between 12.5 to 12.7V DC across its terminals -- 25 to 25.4V DC for a 24V.)

1. Using a small Phillips screwdriver, carefully remove the four screws which hold the voltage regulator's service cover in place. Then remove the cover.
2. The diagram below, identifies the points of adjustment and indicator lights that are present under the service cover of your ZENA voltage regulator.



3. With a small straight-slot screwdriver, rotate the screwdriver adjustments on the multi-turn, **turn on** and **turn off** controls fully **counter clock wise** (CCW) 20 full turns.

   Then rotate the **turn off** control clockwise (CW) two and one half (2-1/2) turns.
4. Make sure that the power generator output terminal are properly connected to a **fully charged battery**. Attach a sensitive, and properly calibrated, volt meter to the battery terminals, and turn on the vehicle's ignition switch -- but **do not** start the engine at this time.
5. Observe the indicator lights. The red **power** should be illuminated. The **function light** should be dark.
6. Adjust the **turn on adjustment** control slowly, and **carefully,** CW until the **function light** illuminates (working the control CCW, to turn the light off, and CW to illuminate it again will help insure that you are at the correct point here -- and indicate correct regulator operation). Multiple turns will be required.
7. Start the engine and increase engine speed to about 1500 rpm. Adjust the **turn on adjustment** control slowly CW (or CCW) until the battery voltage meets the vehicle (and/or battery) manufacturer's charging voltage specification. The **function light** will be illuminated (likely dim, flickering, and/or pulsating).
8. The **turn off** voltage point may now be adjusted (if necessary). If the **function light** is flickering and/or pulsating **noticeably and/or** if your meter shows a noticeably varying voltage, slowly rotate the **turn off** adjustment CW. The **function light** will brighten and/or become more steady as you adjust. **Stop when the light becomes steady and/or if the brightness peaks**. Then, with a steady **function light**, slowly rotate the control CCW, stopping when the light becomes less steady, and/or just begins flickering slightly, and/or dims a bit. This is the proper adjustment for most vehicle electrical systems. In other applications, further increasing the difference between TURN ON/TURN OFF points may be desirable**. NOTE: If this control is turned too far CW the regulator can "lock up" and seriously overcharge the battery.**

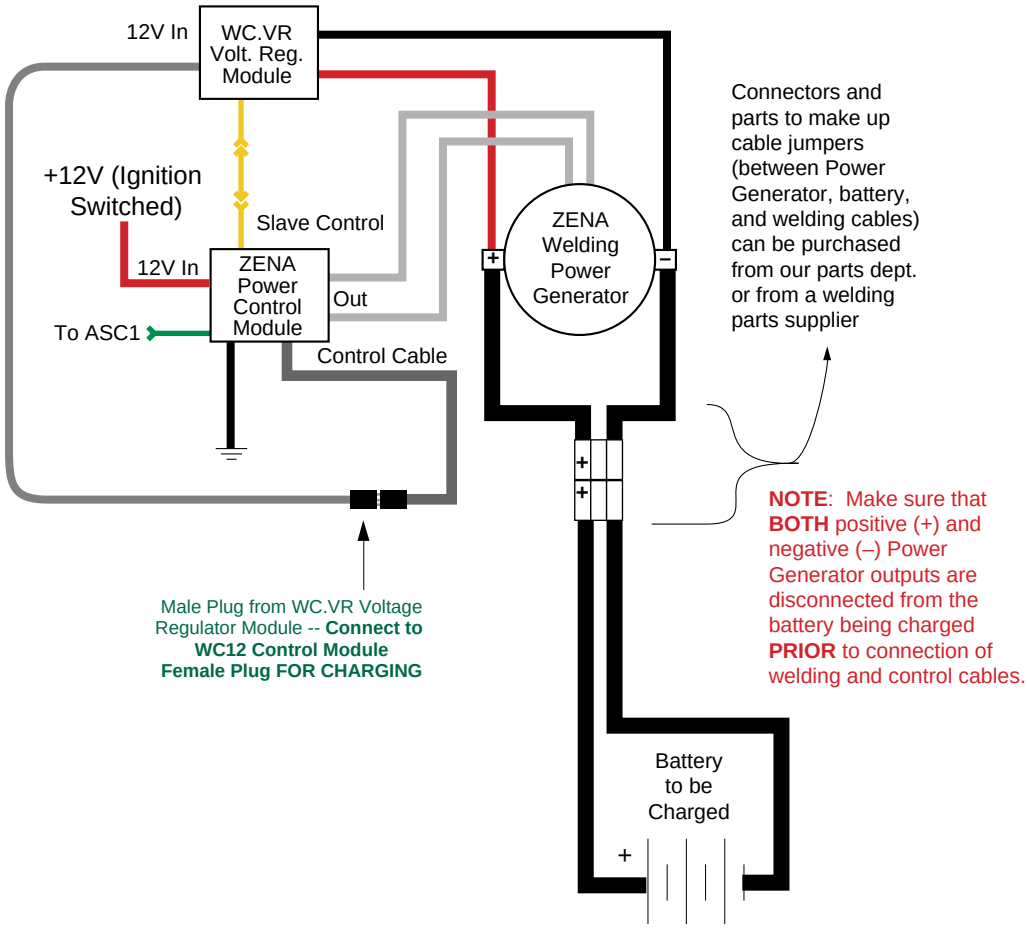
12. Maximum output power may be adjusted, **at any time**, to suit your individual requirement. Turn the **output power control** CW to increase charging current -- CCW to decrease. For small batteries (under 150 AH), or small engines, reducing power can prevent high charging currents and/or reduce engine loading. For large battery banks (over 200 AH), reducing maximum output power can prevent alternator overheating.

CAUTION: To insure that overcharging of your battery, and/or possible damage to your vehicle's electrical system does not inadvertently occur, monitor charging voltage at all times. Most vehicles are factory equipped. If you do not have a meter, one can be added easily for little expense.

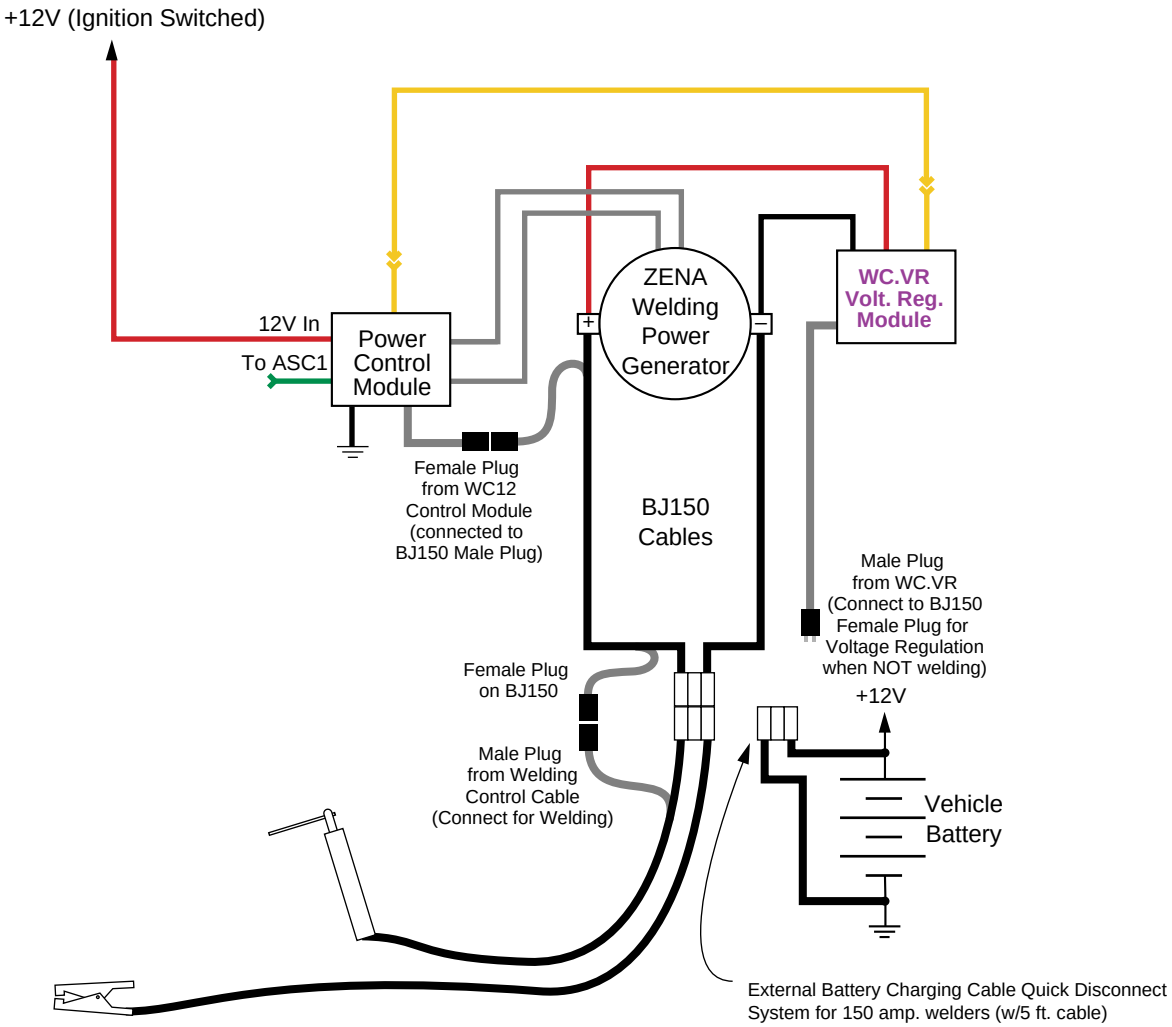
NOTE: If operating in wet or high vibration applications, a small "dab" of automotive grade silicone sealer should be applied on each adjustment point. (The silicone is easily removed for future adjustment.)

Basic Battery Charger

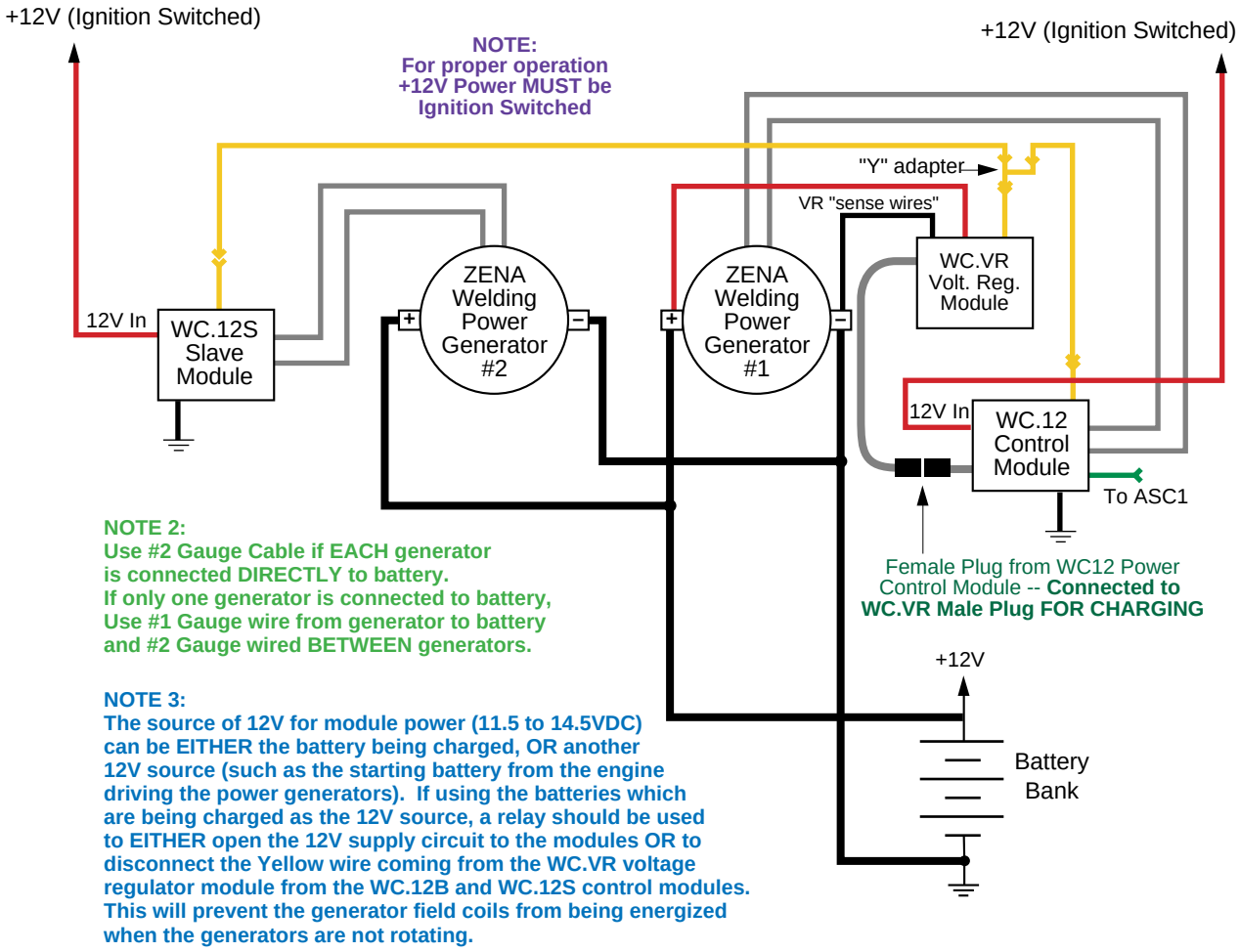
Connecting a ZENA WC.VR external voltage regulator and WC.12 Series Control Module to a ZENA Power Generator to enable battery charging and/or to supply power for an inverter connected to a supply battery.



Using an WC.VR Voltage Regulator with a ZENA™ power generator



Using a WC.VR Voltage Regulator in a dual generator 150A/300A (or 200A/400A) charging system



NOTE 2:
Use #2 Gauge Cable if EACH generator is connected DIRECTLY to battery.
If only one generator is connected to battery, Use #1 Gauge wire from generator to battery and #2 Gauge wired BETWEEN generators.

NOTE 3:
The source of 12V for module power (11.5 to 14.5VDC) can be EITHER the battery being charged, OR another 12V source (such as the starting battery from the engine driving the power generators). If using the batteries which are being charged as the 12V source, a relay should be used to EITHER open the 12V supply circuit to the modules OR to disconnect the Yellow wire coming from the WC.VR voltage regulator module from the WC.12B and WC.12S control modules. This will prevent the generator field coils from being energized when the generators are not rotating.

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Wiring for an automatic switching 150/200A welding system (standard ZENA welding controls OR a WC.VR voltage regulator)