How to Convert Any 6-Volt Vehicle to 12-Volt

Step-by-Step Installation Instructions

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Use caution when working around your vehicle; rotating belts and pulleys are hazardous and can catch clothing and take off fingers. Always disconnect the battery when doing any electrical work, which will avoid shock hazard and burns. Use jack stands when working under vehicle. Follow instructions, use common sense, and above all have fun and be safe!

The following are step-by-step instructions for converting most any 6-volt vehicle to 12 volts. These instructions are not specific to any one vehicle and apply to most all vehicles. You may need to have a wiring diagram available for your specific vehicle.

Before starting your conversion, read all these instructions. We recommend taking pictures of the engine compartment and under the dash so you can see how the vehicle was wired. This will help when re-installing the new parts.

Start by disconnecting the battery. Remove and place it in a safe place

Note: If the vehicle is a positive grounded electrical system, and you are converting to 12 volt with the Vintage Auto Garage 12 volt kit, the vehicle will need to be converted to negative ground.

This simply means that the negative side of the battery will now be connected to the frame and engine of the vehicle. Everything in the vehicle will work the same, the starter motor (if keeping the 6 volt starter) will work fine and turn the correct direction, this also applies to heater motors and tube style radios. The wires on the back of the gauges will need to be reversed otherwise the gauges will try and read backwards. If this happens nothing bad will happen to the gauge.

Disregard if the vehicle is already negative ground.

Step 1: Locate the voltage regulator. This is usually found on the firewall. Remove the wires going to the old generator, as these are not needed. We recommend leaving the regulator on the firewall, and the other wires that go into the vehicle should also remain connected. This will keep all the wires connected correctly, as the regulator was commonly used as a connection point. You will save a lot of time and trouble by leaving the regulator in place.

The new alternator being installed has a built-in voltage regular and is wired directly to the battery and not via the old regulator.

Step 2: Now remove the old generator. In some cases, you are removing the existing generator mount; in other applications you will be using the existing mount and installing a new bracket. This depends on your specific engine application. Refer to the alternator bracket instructions for help with this step.

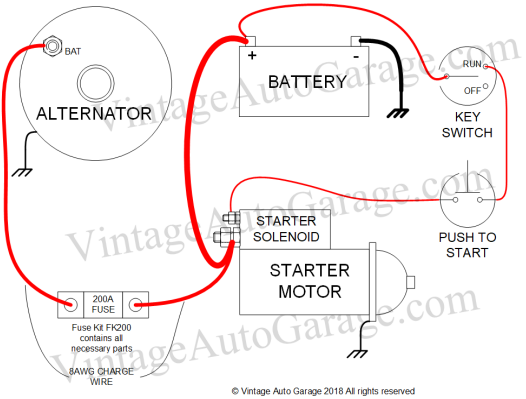
Step 3: Install the new bracket with the hardware provided, and mount the alternator to the bracket. The alternator case needs to be grounded all the way back to the negative side of the battery on a negative ground vehicle. Make sure the alternator hardware connections are free from grease and dirt to ensure the alternator is properly grounded. If not grounded, the alternator will not charge and will damage the internal regulator. If needed, install a separate 10 or 8 gage ground wire from the alternator to the engine and ensure the engine is grounded to the negative side of the battery.

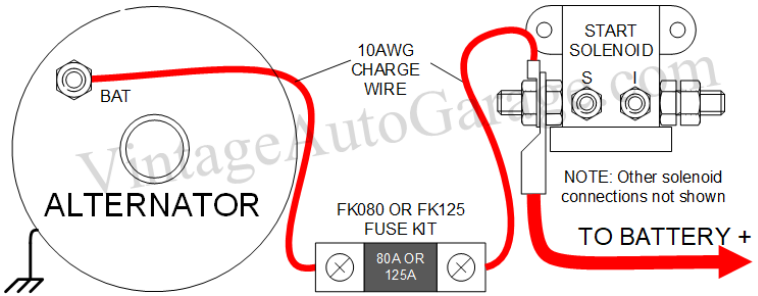
Step 4: Reinstall the belt and tighten. There should be some belt slack, about 1/2". There is no need to over-tighten the belt because it will put extra stress on the water

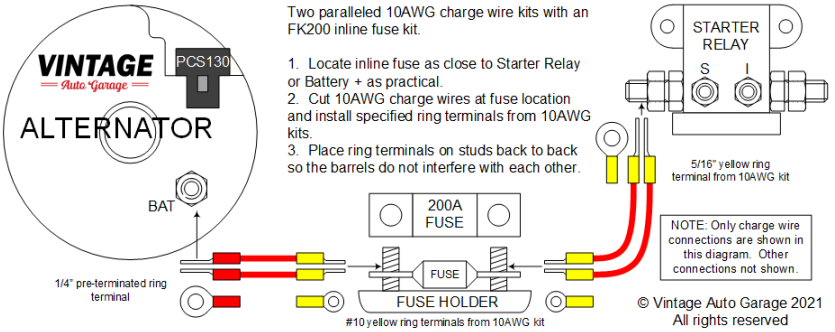
pumps. You may need to obtain a new longer or shorter belt, as the alternator set-up maybe different on some engines. The belt should be tight enough to prevent belt slippage on the pulley.

Step 5: The GM 10Si, CS121, CS130, and Ford 3G alternators require two electrical connections to operate. The first is the output heavy gage wire connected directly from the alternator output terminal to the + side of the battery (in a negative ground vehicle). See the diagrams below showing how to connect the single 10 gage, a dual 10 gage, and a single 8 gage alternator connection. Notice in these diagrams we are not recommending connecting the alternator output wire via the old dash ammeter. This is due to a possibility that the current draw from high output alternators may damage these ammeter/battery gauges and also restrict the current flow from the alternator to the battery. The dash ammeters were designed for 30-40 amp electrical systems.

Note: In place of the dash ammeter or battery gauge we recommend installing a volt meter, this will provide a more accurate monitoring of the electrical system and not interfere with the output current of the alternator to the vehicle.







The inline fuse should always be installed on the alternator output wire and as close to the battery connection as possible. This will protect the alternator and electrical system in case of a short. The fuse should be 25% larger than the rated output of the alternator. *Example:* for 63-amp alternator, use 80-amp fuse; for 100-amp alternator, use 125-amp fuse; and for 140-170-amp alternator, use 200-amp fuse.

Note: Most older vehicles did not use many fuses in their electrical systems. The inline fuse from the alternator to the battery is very important to protect the electrical system in case of shorts.

Step 6: Install the alternator excite plug into the back of the alternator. The 10Si alternators use a plug with a long white wire that connects to any switched 12-volt power. The easiest connection is the plus side of the coil, or it can be installed directly to the key switch at the same place the coil wire is connected. There is a short red wire coming from the plug. Connect this wire to the output of the alternator, in the same place the red output wire is connected. This short red wire is used by the alternators internal regulator.

CS130 and CS121 alternator excite plugs only have one long white wire and no short red wire. The white wire connects to the plus side of the ignition coil or to the key switch at same place the coil wire is connected. See images of each alternator. The lump in the white wire on both set-ups is a diode, this allows 12 volts to flow one way into the alternator, this diode, (or one-way electrical check valve), prevents voltage from the alternator to be back fed to the ignition coil when the key switch is turned off. This is a common problem on older vehicles with just on/off key switches. If the diode was not there the alternator may energize the coil with 12 volts and engine will not turn off.

Note: Remember the coil still needs the wire coming from the key switch to provide 12 volts to the + side of the coil. In most cases coils that are provided by Vintage Auto Garage do not need a ballast resistor in line with the coil wire to the key switch. If there is a ballast resistor in the vehicle this should be removed.

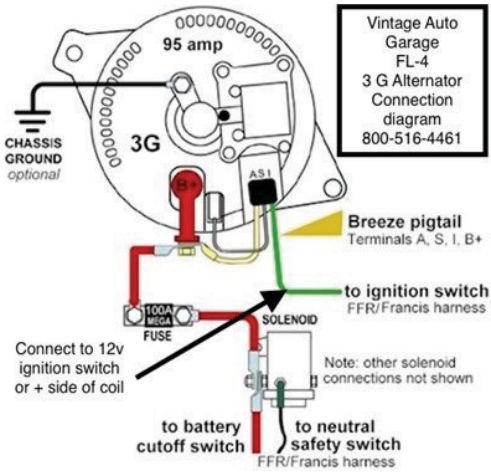
Some later model vehicles use a dash GEN indicator light versus a battery gauge. This light can be enabled by wiring the white wire directly to one side of the dash generator light, and the other side to the key switch. This applies to both the 10Si and CS alternators. However, in the CS alternators there is a different pin used to operate these lights. If you plan to operate this light with a CS alternator, you will need to obtain the correct plug: Part number DSC130L rather than a DSC130. Kits come standard with the DSC130 plug.

	10Si alternators show 2-wire alternator connection. The white wire is the one with the diode and connects to switched 12 volts. Short red wire connects to alternator output and the long red output wire goes directly to the battery positive side via the fuse.	

	CS130 alternators connection shows the white wire with the diode and this connects to switched 12 volts. The long red wire goes directly to the battery positive side via the fuse.	

If installing electronic ignition, we recommend connecting the white excite wire directly to the key switch itself and not to the coil. In some cases connecting to the plus side of the coil may cause a voltage drop to the electronic ignitor and could cause ignition problems.

Ford 3G alternators commonly found in our Thunderbird conversion kits use a different plug, See wire diagram below and the 3G excite plug



Note: Installing Powergen alternators have their own set of instructions that should be followed. These are all one-wire connection alternators. Some models have the generator light terminal to make it simple to power the dash lights. Powergen alternators are designed to deliver current at low RPM and do not require an excite wire. It is very important that these alternators, like the others, are well grounded all the way to the neg side of the battery. If not, the internal regulator will become damaged if operated and not grounded properly. Powergen recommends a tight belt to prevent belt to pulley slippage.

Step 7: Install the new ignition coil; wire positive side to the ignition key switch and the negative to the distributor. Coils are polarity sensitive. Ensure these connections are correct to obtain maximum ignition performance. The coils provided by Vintage Auto Garage are internally ballast, which means **there is no need to add ballast resistors.** If the vehicle has a ballast resistor, remove and wire straight from the ignition key switch to the positive side of the coil, these newer coils require full 12 volts and this will not damage the distributor points or condenser.

Regarding the distributor: points and condensers, these will operate on 6 or 12 volts and are not polarity sensitive, changing to negative ground has no impact on their performance. Keep in mind, condensers contain oil based film to keep the internal materials from drying

out and shorting. The life span of these condensers could be just a few years. It is always a good practice to change these out when changing the points. A shorted condenser will prevent the engine from running. We recommend keeping a spare condenser in the glove box in case of a failure on the road

Changing to electronic ignition by installing Pertronix ignitors, HEI distributors will eliminate the troublesome points and condensers, and will never need to be replaced. Also, the timing, once set, will not change. when installing any electronic ignition systems, the spark plug wires will need to be of the low RF (Radio Frequency) type - commonly called radio resisted. Solid core plug wires will cause misfires.

Step 8: Connect the headlight relay. This may require a specific wire diagram for the vehicle to find the correct wires. This relay removes the high voltage from the headlight switch. The switch itself will work fine on 12 volts once this relay is installed.

Step 9: Replace the horn relay. This can be found generally close to the steering column where the horn button wire extends from the horn button. Connect H= horn, S=horn button, and B=battery 12 volts.

Step 10: Install the start solenoid. Depending on the make and model vehicle, this could be on the firewall, wheel well or on the starter itself. If the vehicle has a foot pedal starter, no solenoid is present. Early Fords used start buttons that have one wire and, when activated, goes to ground. Later Fords changed to just key switches that used 12 volts to activate the solenoids.

Note: Early Fords solenoids require PN: 7-1013, this allows connection the same as the original ground activated dash button without the need to rewire the start button. Later Fords used 12 volt activated start buttons and used SW3 solenoids.

Dodge and Plymouth key starter use 12 volt activated solenoids PN: 7-1012, Chrysler and DeSoto used solenoids that are mounted on the starter itself and require the new solenoid and matching plunger.

Most Chevy, GM and GMC products that are key starter (not foot pedal start) will have a solenoid PN GM1202 mounted on the starter.

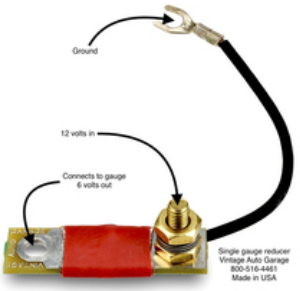
Keep in mind the new 12 volt starter mounted solenoids that are available today were designed for 1955 and later 12 volt vehicles, be ready to make a few adjustments to the linkage and solenoid mounting on the starter, not all the original plungers for these old starter solenoid will work on new GM1202 12 volt solenoids, recommend ordering the new matching plunger: PN GM1202-P.

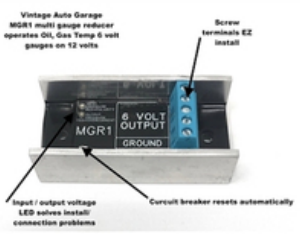
IHC, Studebaker, Packards, Hudson and a few others used combinations of Autolite and Delco starters and generators. Different years could have different components. Make sure you know what you have when ordering parts.

Step 10a: 6-volt starters will work on 12 volts and will rotate in the correct direction all the time even when changing polarity. If the starter is bad it will not work any better on 12 volts. Vintage Auto Garage is now building 12 volt starters for most all vehicles and or will custom build starters for your application.

Step 11: Install the appropriate gauge reducer provided in the kit. Vehicles like Ford and others came with three electric gauges. Chevrolet, GMC, GM Dodge and some other vehicles came with electric gas gauges and the oil and temp gauge were mainly

mechanically operated via a line directly from the engine. There are some vehicles (example GMC trucks) that have two electric gauges and one mechanical gauge. Install the gauge-specific reducer per the instructions provided with these devices. If converting from positive to negative ground, the wires on the back of the gauges will need to be swapped. If not, the gauges will read backward. The sending units do not need to be replaced because the voltage is reduced to the sending units in addition to the gauges.





Step 12: Voltage reducers for the heater, defroster, and wiper motors are installed in the wire from the switch to the motor and can be installed and wired on either end of the reducer. These reducers require mounting to a hard metal surface in a well-ventilated area under the dash for best dispersion of heat.

Voltage reducers or resistors will get warm-to-hot depending on demand. Resistors work by giving off heat while they reduce voltage. When checking voltage after installing the reducer, the motor needs to be turned on to provide a load, then check voltage on the output side of resistor. If you attempt to check voltage without the motor running, voltage will be the same reading (12 volts at both sides of the resistor.) Refer to instructions provided.

The heater motor switch like all others will work fine on 12 volts. With some multi speed motor switches, we recommend installing these reducers on the input side of the switch, this will allow both speeds to be reduced.

Step 13: Installation of the radio reducer is similar to motor reducers as they also give off heat when reducing voltage. Mount in well-ventilated area under the dash and connect per instructions provided. The radio will work fine when converting from positive to negative ground. The exception would be if the radio has an electronic vibrator, which is polarity

sensitive. Then the vibrator would need to be changed otherwise should work fine. To check voltage, turn radio on, let it warm up, then check the voltage to the radio. If the voltage is too low 3-4 volts this means the radio is in need of new tubes or more extensive work. The better condition the radio is in will draw less current and be closer to 6-8 volts.

Step 14: If the vehicle is equipped with a Borg Warner electrically operated R10 or R11 overdrive, the 6-volt solenoid and relay will need to be replaced or a solenoid reduced relay installed. See Part number VRODS1 for the reducer relay and part number ODKIT12 for new 12-volt solenoid and relay. The kick down throttle switch, governor, and lock-out switches do not need to be replaced as they will work fine on 12 volts.

Step 15: The light bulbs will need to be changed to 12-volt bulbs; 6-volt bulbs will not work on 12 volts. Most local auto parts store will carry the correct 12-volt bulbs. Vintage Auto Garage does carry new 7" halogen headlights with the same glass pattern as original along with some specialty bulbs and complete bulbs for the Ford Model A's and early Chevrolet cars.

Step 15a: if installing a 6 volt positive ground alternator and keeping the vehicle 6 volts positive ground, then the alternator output is connected to the negative side of the battery. The body of the alternator will then be connected to the positive side of the battery via the chassis and engine. Everything else will remain the same.

Step 16: Install a new 12-volt high cranking amp battery that will fit the vehicle battery tray. Install new battery cables as needed: Positive side to the starter or starter solenoid, negative to the chassis and engine. Make sure everything is well grounded with clean connections.

Step 17: Before starting the engine, check that the battery is fully charged by an external battery charger. A battery with low voltage will cause problems with the alternator, starter, and starter solenoid. Use the chart below to check your battery. We recommend using a digital volt meter when possible. ***Never try to charge a low or dead battery with your new alternator or it will cause damage to the alternator regulator. Most new batteries from parts store are not fully charged, a fully charged battery will read 12.6 volts, not 12 volts. Use this chart below:***

100%	12.6 volts
75%	12.4 volts
50%	12.2 volts
25%	12.0 volts (nearly dead battery)
Discharged	11.6 volts (this is a dead battery)

Step 18: Starting engine and testing:

Be careful to keep fingers, clothing, and hair away from the rotating pulleys …they can take off fingers!

Before starting the engine, measure the output of the alternator voltage. It should be 12.6 volt +/- (battery voltage). If not, check all the connections and grounds. If voltage is low, charge the battery.

Start the engine and allow it to warm up a few minutes. Raise the engine to 1200-1500 RPM and measure the output of the alternator with a digital volt meter. It should measure 14.1 + / - volts. This is the correct voltage to keep the battery charged at, with a desired 12.6 volts.

Let the engine return to idle, and then measure the output voltage see if it is still 14.1 volts +/-. Alternator output will depend on pulley diameters and engine RPM. If the alternator output voltage is the same as the battery voltage, stop the engine and check all connections, there could be a bad ground. If not grounded, connect a separate ground wire from the alternator to the negative side of the battery or any good ground. Also, check that the excite (white wire) is connected properly on 10Si and CS alternators and the green wire is connected on 3G alternators.

Note: Most alternator charging problems are resulting from poor ground connections. Lack of good grounds will damage alternator regulators.

If the output voltage is high say 15-18 volts, this usually means that the battery is not fully charged and the alternator regulator is trying to charge the low battery. If running this way will damage the alternator and will become very hot. Stop engine and charge the battery.

A quick way to check if the alternator is working is to take a pocket knife or screw driver and carefully place on the back of the rear alternator bearing. You should feel a slight magnetic pull, which shows alternator is working and charging, and will feel a stronger pull when more electrical load is applied. Use this method only when volt meter is not present.

The wire harness in the vehicle does not need to be changed unless it is not safe. If needed, select an aftermarket wire harness that will fit the vehicle that has the appropriate number of fuses for the vehicle electrical system. Vintage Auto Garage carries several high quality US made universal wiring harnesses.

Trouble shooting guide:

1. Question: The alternator output voltage is the same as the battery voltage when the engine in running.

Answer: This means the alternator is not charging. This can be caused by a bad ground from the alternator case to the negative side of the battery, or the output of the alternator is not connected securely to the + side of the battery or the excite wire is not connected to switched 12 volts. Alternator output voltage, when running, should read 14.1 to 14.6 volts. Don't be too quick to point to a bad alternator, in almost every case it's not the fault of the

alternator. Alternators are completely tested before shipping.

2. Question: Gas gauge is not reading correctly.

Answer: The most common cause of fuel gauge trouble is a poor ground, especially at the tank sender. Make sure all wiring connections are tight and free of dirt and corrosion. A poor ground or loose connection to a fuel gauge system is just like loose or dirty battery cables to your starting system.

3. Question: I'm going from positive to negative ground and the gauges are reading backward.

Answer: The wires on the back of the gauges need to be reversed.

4. Question: I installed voltage reducer for the heater and it gets very hot.

Answer: The resistors must be mounted on metal / aluminum to dissipate the heat. Some motors will draw more current if they are dirty. Clean the motor commutator and look for worn brushes. This is generally the situation for these reducers to get hot or fail. Remember, to reducer voltage, the byproduct is heat.

5. Question: Ford starter solenoid 7-1013 sticks in the on position.

Answer: This can be caused by a low battery and the starter having a very high amperage demand that puts undo current load on the solenoid. Charge battery, if still sticking the solenoid may need to be replaced. Also the starter may need to be replaced is this persists.

6. Question: Does the ammeter need to have a voltage reducer?

Answer: No, the ammeter reads current flow between the battery and the electrical system and these gauges are not polarity sensitive. We don't recommend wiring in these old ammeters with high output alternators, better to use an aftermarket volt meter.

7. Question: I'm having problems with lights flickering or stop lights not working correctly

Answer: Check all the grounds. Older vehicles use the chassis to run the grounds and the connections can develop rust and corrosion. Trace the ground wiring clean and replace as needed.

8. Question: How do I service vacuum wiper motors?

Answer: Remove the vacuum wiper hose from the engine manifold and hold it above the height of the dash and squirt brake fluid into the hose. The brake fluid will run down inside of the hose to the inside of the vacuum motor. Reconnect the hose. Turning on the wiper motor with the engine running will circulate the brake fluid inside the vacuum motor and soften the leathers inside of the vacuum motor. Finally, be sure the brass intake screen on top of the vacuum motor is free of dirt and dust.

9. Question: How do I solve moisture in distributor caps?

Answer: Many vehicles have a problem with moisture collecting inside the distributor cap. The solution is to drill a small, 1/16-inch, hole on the back side of the distributor cap. This will allow air to clear out the moisture. Some of the early distributor caps already came with the hole drilled in the cap.

10. Question: The coil is not producing any spark.

Answer: Check that the coil is connected properly, negative side of coil to the distributor and the positive side to the ignition switch 12 volts. It is common that this is missed when removing and re-installing the new coil.

11. Question: Do the turn signal switch and flasher need changing?

Answer: The turn signals switch will work on 12 volts. The 6-volt signal bulb and the flasher will both need to be changed,

12. Question: What if I have a Borg Warner R10-R11 Overdrive?

Answer: The Borg Warner overdrive is an electro-mechanical device and requires the solenoid and relay to be replaced with 12-volt units, or a specialized reducer and relay designed for the solenoid installed in the electrical system.

13. Question: I have 6 volt electric clock, is there a 12 to 6 volt reducer that will work?

Answer: Unfortunately, No. There is no reducer that will work correctly on clocks. The reason is that there are many different clocks - some have electric winders and others electric movements, and there is not a one size reducer that fits all. If a reducer is used, the added current draw from a resistor will run the battery down. Best to have clocks converted to 12 volts by a qualified clock company. At Vintage Auto Garage we like Clock Works located in Eagle River WI 800-398-3040 OR E-MAIL: SALES@CLOCKWKS.COM

Light Bulbs will need to be replaced to 12-volt bulbs. The following is a list of bulbs:

Bulb Location	6-Volt Number	12-Volt Replacement
Headlamp	6006 (Sealed beam)	6014 or 6015
Park w/ turn	1154	1157 or 198
Park lamp	63	67 or 1155 or 97
Tail and stop	1154	1157 or 198
Tail and turn	1154	1157 or 198
Tail lamp	63	67 or 1155 or 97
Stop lamp	1129	1141 or 1159
Tag light	63	67 or 1155 or 97
Ignition	51	53 or 53x or 1445 or 182
High beam (ind)	51	53 or 53x or 1445 or 182
T/S unit	51	53 or 53x or 1445 or 182
Dash	55	57 or 57x or 1895 or 293
Speedo	55	57 or 57x or 1895 or 293
Clock	63	67 (3 candlepower)

Glove box	55	57 or 57x or 1895 or 293
Dome lamp	88	90 or 94 (6 candlepower)
Courtesy lights	82	90 (6 candlepower)
T/S flasher	535 HD 6 volt	550 HD 12 volt

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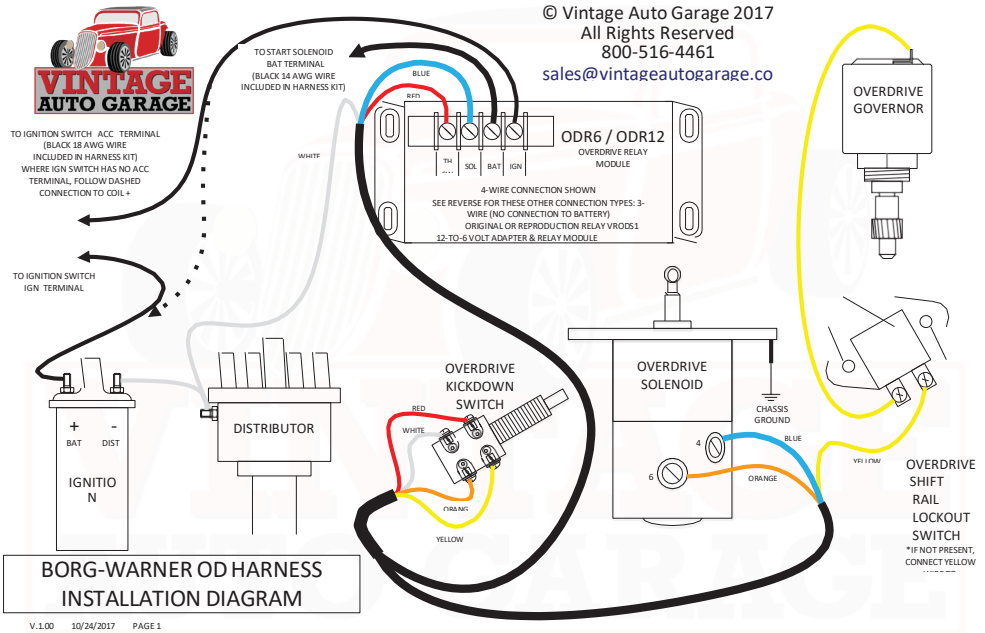
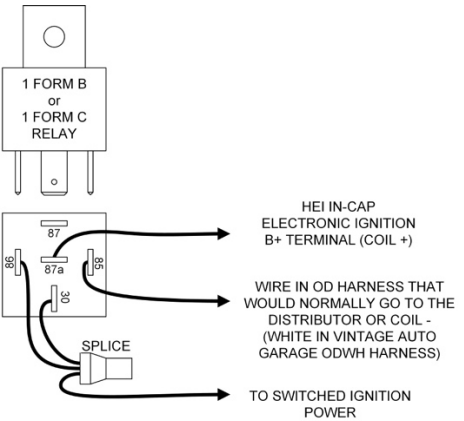
If you need assistance with your installation, call 800-516-4461 during normal business hours.

Enjoy your new 12-volt electrical system.



Borg Warner R10-R11 Typical Wiring Diagram

Below diagram shows how to wire HEI distributor when using Borg Warner Transmissions. The relay is used to momentarily cut off the input voltage to the distributor versus grounding out the coil which will cause problems with the HEI distributor.



How To Wire Alternator

12-VOLT NEGATIVE GROUND 2 WIRE INSTRUCTIONS

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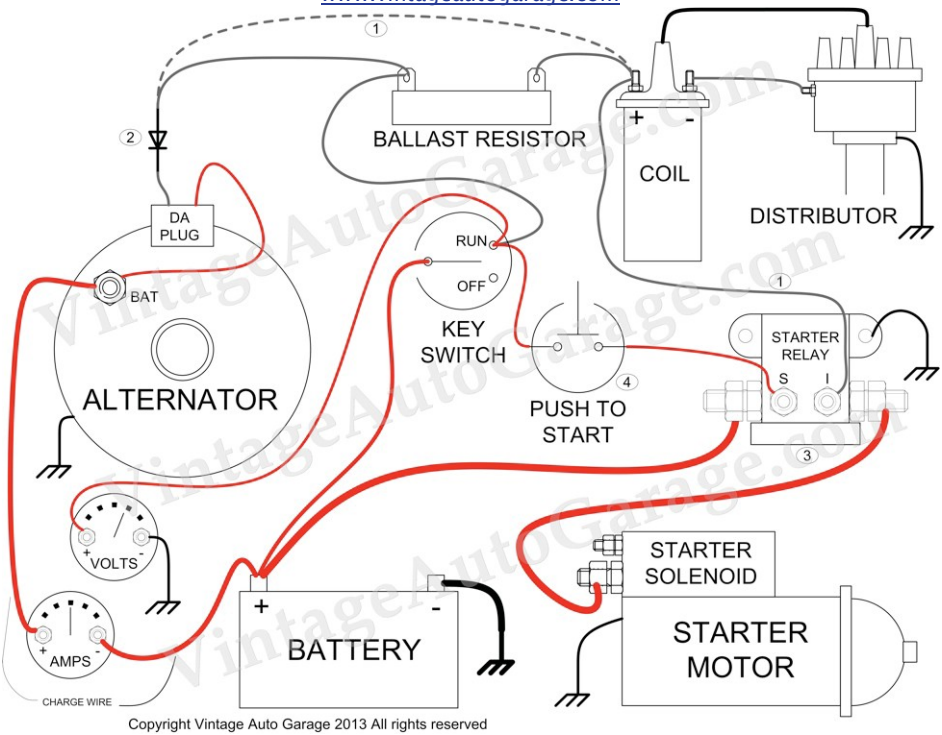

Notes:

1. Where a ballast resistor is not used, connect the Plug long wire to the Coil + terminal as indicated by the dashed line. Omit wire between Starter Relay terminal I and Coil + terminal. This connection is not needed any longer.
2. Diode is built into the white plug long wire.
3. Starter relay shown wired for Direct Drive Starter Motor.
4. If your vehicle has a foot pedal starter system without start button, starter relayand solenoid, follow all the same instructions, even though these componentswill not be in your start system. All alternator connections and instructions willremain the same as shown.
5. Not recommended to route high output alternators via the old dash ammeters, these were not made for this high current and can cause damage or restrict the current to the battery.
6. Recommend installing a volt meter to measure the voltage in the electrical system.

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