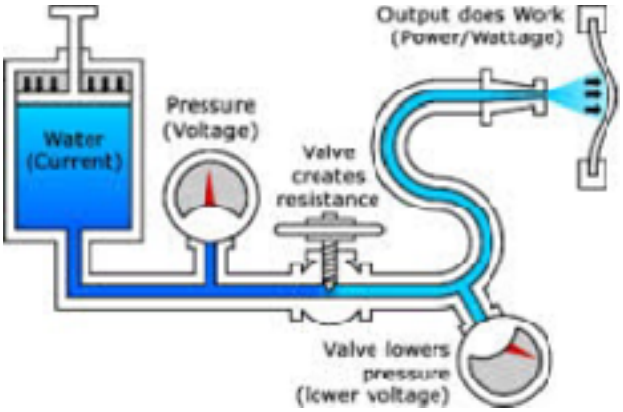
Learn how to convert any vehicle from 6 volts to 12 volts

Hello: The following is the step by step 6 volt to 12 volt conversion report you requested from us.

Before we get into how to convert your car or truck to 12 volts, like to discuss basic electricity, as this will help in the understanding of your vehicles electrical system.

You can think of electricity like water.
The battery is the reservoir and provides pressure and volume.
The wiring is the hose and the nozzle is the resistance.



Electricity Works like this. When increasing the voltage or in the case of water the capacity of the water tank you decrease the pressure or amperage needed to drive an electrical device.

In the case of changing to 12 volts, you are doubling the voltage thus decreasing the amperage in half.
This is why you can use the same wiring and mechanical switches in a 12 volt system as you have in your 6 volt system because the 6 volt wire is essentially twice the size or gage as needed in a 12 volt electrical system.
This means you don't need to rewire your vehicle when converting to 12 volts. This of course, assumes your wiring is in good shape and not a hazard.

If your vehicle needs a fresh new wire harness you can check out this link for an aftermarket harness. Click here

Electrical terms to help:

DC Direct Current
AC Alternating Current

Series Wiring: Like a sting of old Christmas tree lights, one bulb goes out they all go out.

Parallel: Wired similar to your home lighting system each light is powered individually.

Volts: Pressure of electricity

Amps: Volume of electricity

Watts: Amount of electricity used or needed to power a device

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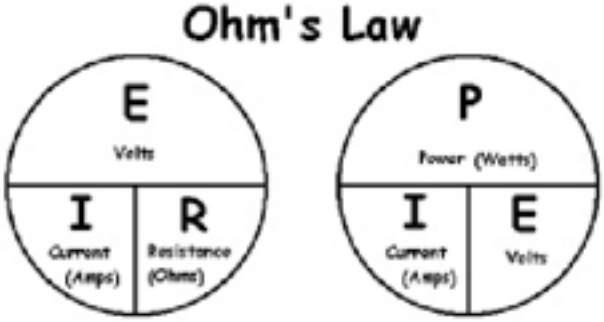
Resistor: *Device that controls the volume of electricity, acts like a hose nozzle*

Polarity: *Defines the direction current flows*

Capacitor: *Device that stores electricity for short periods of time (not voltage sensitive)*

Diode: *allows current to flow in one direction only.*

Those that are interested below is Ohms Law.



Ohm's Law defines the relationships between (P) power, (E) voltage, (I) current, and resistance. One ohm is the resistance value through which one volt will maintain a current of one ampere.

Knowing this formula and applying your high school algebra you will be able to figure the various loads and power required in your vehicle.

Now, lets talk about safety, your safety. You can become injured working around electricity; you may not think 6 or 12 volts can hurt you, but a 6 or 12 volt battery can pull lots of current if you get in between the positive and negative and the situation are right.

You can get badly burned or even worse.

Anytime you work around your vehicle electrical system ***<u>always un-hook the battery terminals</u>*** and be careful when removing the terminals too.

Positive versus negative grounded electrical systems:

Ford, Dodge, Chrysler, Plymouth, Studebaker, Cadillac, Kaiser and some others wired there earlier automobiles with the positive terminal of the battery to ground or frame and the negative to the starter solenoid and electrical system. Chevrolet and most GM (except Cadillac) wired there vehicles with negative grounds.

After the late 50's early 60's most every manufacture went to negative grounded electric systems and this is the standard today. *Note modern solid state electronics are based on negative grounded systems and will to work on Pos ground systems.*

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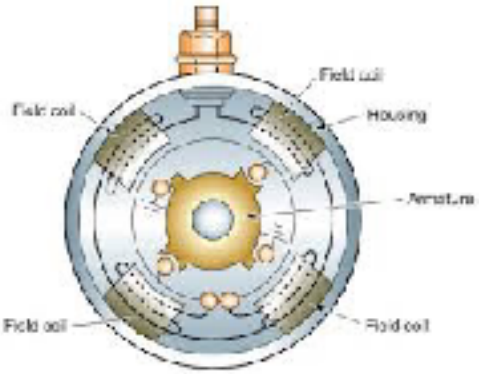
When performing your conversion to 12 volts if your vehicle is pos ground you will want to switch your systems to negative ground by simply changing the terminals on the battery, the negative to the chassis or engine and the positive is going direct to the starter solenoid and electrical system.

All modern auto electrical systems are negative ground and all solid state radios and other solid state accessories are designed for negative ground systems. If you want to plug in your smart phone, GPS or music player you will need a negative grounded system.

SPECIAL NOTE
You will damage a solid state radio or most any solid state component if you run positive ground unless you are running a converter which we will cover later.

For the positive ground vehicles going to negative ground, everything in your vehicle will work as it does today. I will remove the myth about starters turning backwards when changing from pos to neg. ground as I get this question all the time.

When you change polarity your starter will NOT turn backwards.



You may ask why is this? We all had these little DC motors when we were kids and to reverse the direction you the battery, correct?

The difference is, in those little electric motors, they have permanent magnets motors and you indeed can change direction the motor turns when polarity is reversed.

The starter and also most heater motors in your vehicle do not uses permanent magnets. Instead they use field coils to energize and create the magnetic force and these type motors are designed to turn in one direction only regardless of polarity. (See image)

Your 6 volt starter has heavier gage wire in the field and armature windings than will be found in a 12 volt starter and that is the reason most of the 6 volt starters will work on 12 volts. We recommend using your 6 volt starter until it wares out then change to a new 12 volt starter.

Yes, the starter will turn faster (about 2X faster with 12 volts) and will start your engine quickly when hot or cold.

Click this link to see starters

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Lets get started:
Start by disconnecting the 6 volt battery and removing from the vehicle, remove the old voltage regulator and generator. The wires from the generator to the regulator can either be removed completely or kept and taped back in case the next person want to convert back to 6 volts. Some folks like to keep the regulator on the firewall and use purely as a connection point for the wires connected to the Battery post of the regulator. Field and Armature wires should be disconnected and taped back to the wire harness.

Generator or alternator?
You have the option to either convert your generator to 12 volts or install a modern alternator with built-in voltage regulator.
.
Staying with a generator and converting it to 12 volts is a personal decision, if you want the original look under the hood and can live with around 35-42 amp generator output then this could be a good option.

If your vehicle requires more than about 40 amps then a modern alternator is a better solution. Alternators come in 63, 90,100 or177 amps. 63-90 amps is plenty if you will be running a stock vehicle, if you plan to install electric cooling fans or AC then 90 + amp alternator is required.

The big disadvantage of a generator is the inability for the generator to produce current at low engine speeds, you may need to be driving at 20 MPH or so before your generator kicks in, this means at idle speed the electrical system is running off the battery and maybe why your engine is hard to start after driving short distances.

The advantage of an alternator is the ability to generate higher amperage output at a wide range of engine speeds.
The disadvantage if there is one, an alternator will not charge a dead battery.

Why is this?

Because alternators unlike generators require a fully charged battery to excite the field coils within the alternator to generate current. This is why you need to completely charge your battery when installing an alternator.

The good news is, the battery will stay charged with an alternator at most all engine speeds. (Will expand on this a little latter)

Modern alternators come in 1, 2 or 3 wire configurations, Let's explain the difference between these alternators.

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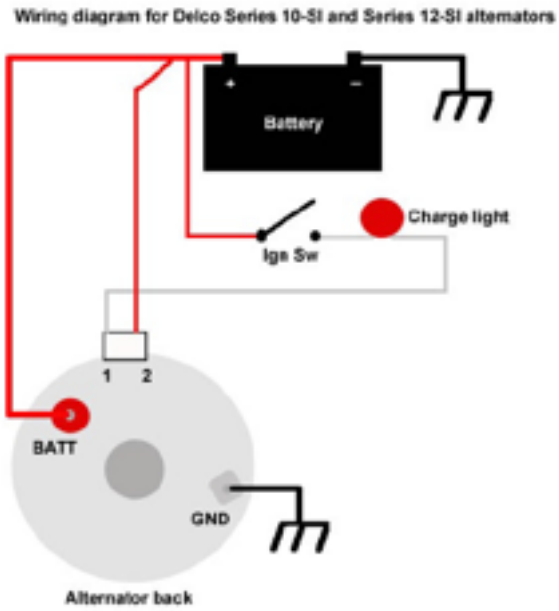
The main difference is the type of internal components that are installed in the alternator. One wire alternators only have an output connection on the alternator and typically no other connection points. Yes this is simple for sure, but you give up the ability to activate a dash (no charge light) and more important for older engines is the ability to excite the alternator at low engine idle speeds to keep your battery charged.

If you are familiar with generator cut off switches that turns the generator off at low speeds, the alternator has a similar feature. Both have what is referred to as turn on speeds. Alternators are set somewhere around 1200 to 1400 alternator RPM. Generators turn on at engine speeds that would equate to 15-20 miles per hour. The reason these cut out and turn on switches exist is to take the generator or alternator out of the electrical circuit when the vehicle is turned off and prevents back draining of the battery or potentially turning the generator into a motor.

So What does all this mean?

Without getting into too much detail, older engines with generators were not designed for alternators and the pulleys sizes are such that will only turn the generator so fast, if you turn a generator too fast it will overspeed, overheat and melt the solder in the armature, this was referred to as “throwing the solder”.

Now install an alternator onto an older and generally slow idling engines, sometimes the alternator will not turn fast enough to reach the internal turn on speed to charge the battery. You can rev the engine up and the regulator will turn on, but there is no guarantee the alternator will stay on when the engine reaches idle speed again. You can see this when older car headlights dim at a stop light and brighten up when the engine revs up.



Ideally you want your alternator to stay on all the time to charge the battery similar to your modern car, to achieve this, best to install a 2 or 3 wire alternator and I will show you how simple this really is.

Take a look at the Delco 10Si and 12 Si diagram to the right, this shows a typical 3 wire connection with a charge light.
Note light is wired in series with the ignition switch. When the alternator starts to charge the Voltage becomes equal across the light and goes Out.

You will see there is 12 volts going directly into the regulator via pin #2 and 12 volts into pin #1 via the ignition switch and the output is wired directly to the positive side of the battery.

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If this was a 1 wire alternator no regulator pins 1 & 2 would exist there would be just “1 wire” from the output of the alternator to the battery.

The 2 or 3 wire alternator regulator is accessed via 2 pins that sometimes is located under a dust cover. Remove this cover and insert the excite wire plug which is designed to snap into the alternator regulator and comes with a long white wire that goes to the ignition switch or (+ side of coil) which is the same electrical connection. On 10 and 12SI alternators there is another short red wire that connects to the output of the alternator.

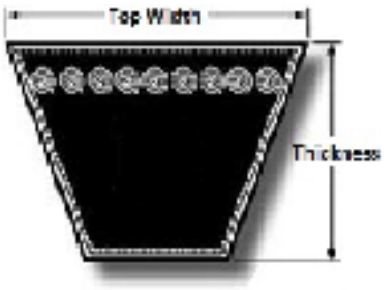
Special note: Make sure that the wire from the ignition switch has a diode (one way electrical check valve) to allow current to flow only from the switch to the alternator, if not, there is a good chance with older ignition switches without a neutral you will not be able to turn off your engine and your battery maybe dead in the morning.

10 and 12 SI Shows 3 wire alternator connection, the white wire is the one with the diode and connects to switched 12 volts. Short red wire connects to alt output and the Long Red 10 AWG wire goes direct connects directly to the battery positive side.

Shows 2 wire alternator connection, the white wire is the one with the diode and connects to switched 12 volts. Long Red 10 AWG wire connects directly to the battery positive side.

10 or 12 Si alternator plug **click here**

CS130 alternator plug **click here**



Early engines came with different width generator V belts depending on make model and year, these pulleys range from 3/8” 1/2” 5/8” 3/4”, to select the correct pulley for your alternator measure the top width of the belt. All these size pulleys are available for alternators.

Click to take closer look at pulleys

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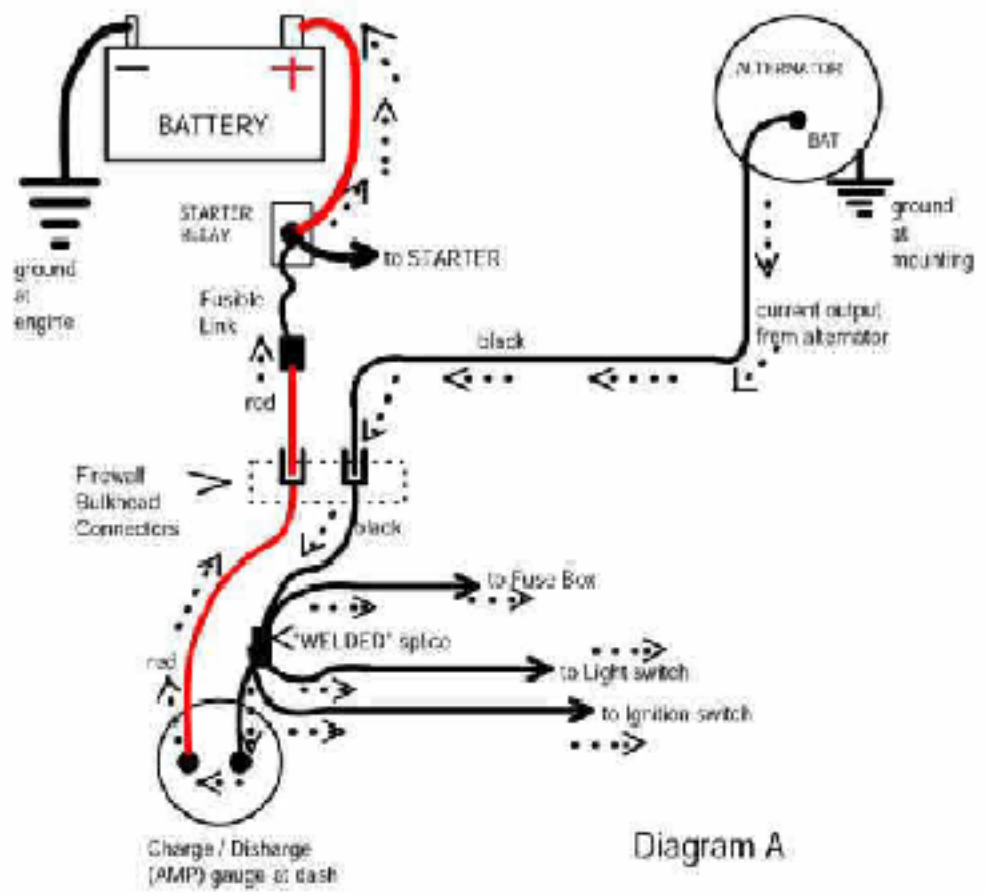

Diagram A will help you connect the alternator to the battery via a dash ammeter. Make sure to connect the alternator to the battery with correct size wire 10 AWG or larger is recommended.

Click to see connection wire here

Most of these older vehicles only have a few circuit breakers under the dash, these will work ok on 12 volts. Due to the lack of fuses and breakers recommend installing in-line fuse that is 25% larger in value than what the alternator amperage. Example 63 amp alternator would use 80 amp fuse, 100 amp 125 amp fuse. Here is an example of the type of fuse to use. **Click here to view**

Note: If you plan to keep your original ammeter in place, there is no need to install a reducer as ammeters read current flow and not voltage. If you have a volt meter rather than ammeter you may need to add a resistor or recommend adding an aftermarket ammeter.

Note: here is simple way of testing an alternator after install, with the engine running take a pocket knife or screw driver and touch the back of the alternator external bearing surface. if the alternator is working you will feel magnetic pull, if not then your alternator is not producing current make sure your battery is fully charged.

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Next choose an alternator bracket to attach the alternator the engine. There are several types of brackets to choose from:

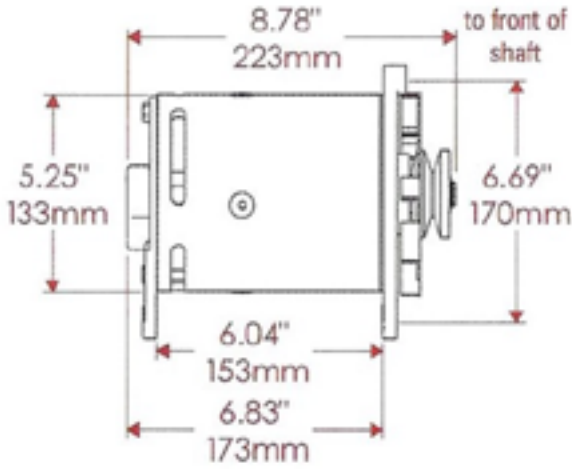
Ford Flathead V8's use a slingshot style bracket that mounts the alternator in the same place as the original generator and there are different Flathead V8 brackets to fit different year engines. You can see some by clicking this link

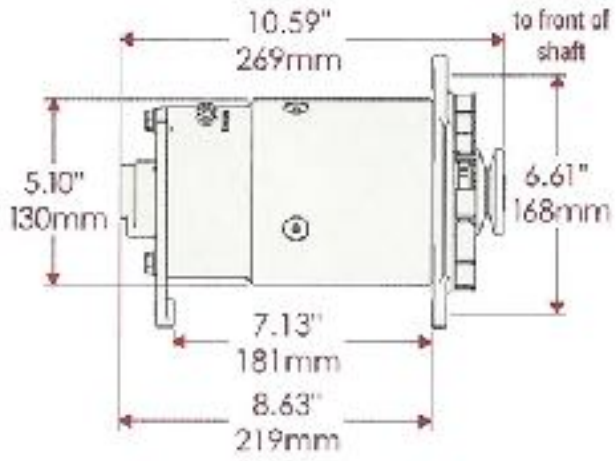
Chevrolet 1937-1955 1st series straight six 216,235,261 cu inch engines:
Take a look here

Chevrolet 1955 2nd series-1962 straight six 215 235,261 cu inch engines pulleys
Take a look here

If you have a long or short case GM Delco generators on any vehicle other than a Chevy 216, 235, 261. You will need a long or short case alternator bracket.
See examples below to determine what generator you have and what bracket to use

Click this link Short case GM 6.04" Click this link Long case GM 7.13"





Dodge Plymouth Chrysler Studebaker and Packard typically use autolite generators, there is a bracket that mounts the alternator in the same location as the generator for these generators.
See this bracket here

Ford 1954-64 Y block 292 engines use different types of alternator brackets depending on what vehicle they are installed in. Ford, Mercury cars and trucks use one type, while Lincoln use another and 1955-1956 T-Bird use yet another configuration depending on the alternator selected. Here are some links to see the different brackets.

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Ford, Mercury Y block bracket

Lincoln Y block bracket

T-Bird Y block bracket with Ford alternator
There are also a few other alternator mounting hardware configurations.

1948 1953 6 CYLINDER H SERIES FLATHEAD ENGINE **Take a look here**

1938-1948 Cadillac with Flathead V8 requires as specific mounting ring and alternator to fit. **Take a look here**

If none of these brackets work for your application there is a universal bracket that you construct like an erector set.
Take a look here

If you prefer to use your original generator here are some tips how to convert to 12 volts.

You will need to change the field coils to 12 volts and change the voltage regulator. Start by disassembling the generator which is straight forward. The most difficult area is the removal of the square headed screws (2 of them) that hold the field coils. You will need a special wrench to remove these, if hard to remove carefully heat the area around the screws; this will loosen the years of dirt and varnish that has built up. After you get the coils out you can clean and paint the housing. Now install the new 12 volt field coils and brushes and bushing is needed.

Next use 400-500m grit zinc oxide paper to clean the commentator segments on the armature.
These are the copper segments that the brushes ride on. Also clean between the segments, us a small square file or a small blade to clean in between the segments. To check that your generator armature is not shorted, use an ohm meter to check from the commentator to the armature, touch the copper segments to the end of the bearing shaft, you should not get a reading. If you do, there may be a short in the armature and you will need to replace it. If your generator worked when removed, then it should work after you convert the field coils.

The next tricky area is replacing the bushing on the back of the generator housing. This is the bushing that the armature shaft bearing rides in. If it looks good go ahead and reuse. If worn you will need to press in new bearings. Same with the front housing bearings. If the armature was not dragging on the field coil segments then chances are the bearing are still good.
Clean them and when assembling use as small amount of white

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grease on the rear bearing. Replace the graphite brushes and reassemble the generator rear housing.

You will need to hold the brushes back carefully while installing the rear housing, be careful not to get any grease or oil in the area where the brushes ride on the armature. Your generator is now ready to go.

Here is a link to see generator and regulator conversion kit: Click here

You will need to POLARIZE your generator after conversion. (No need if installing an alternator). (most fords use a B circuit) and (most GM cars use an A circuit). This is for an B circuit. Disconnect the field wire from the regulator and strike it to the battery terminal of the regulator until you see a spark. Do not try to use a jumper wire for this, you need to actually remove the wire to do this correctly. Once you see a spark, reconnect the field wire to the regulator and you have completed this step.

Now check the voltage coming from your generator by connecting a volt meter to the regulator battery connection and ground. Low RPM will read around 12 volts which is the battery voltage at higher engine speeds when the cut off switch kicks in your should read in the area of 14.5 volts.

You are done here and can reinstall the generator and other conversion parts to complete your project.

There is another alternator option for those that want to keep the original look under the hood yet have all the advantages of an alternator. Click here to see more

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Changing ignition coils:

There are 2 types of ignition coils, one with internal ballast resistors and one with external resistor. Chances are you have an older 6 volt coil with external ballast resistor.

When changing to a new 12 volt coil we recommend getting an internally resisted coil, this eliminates the need for the external resistor.

Keep in mind if coils are polarity sensitive meaning the - side goes to the distributor and + side to the key switch. This is opposite on a positive ground electrical system.
Click here

Special note: Distributor points and condensers will work fine on 6 or 12 volts, no need to change provided they are good.

Note: a shorted condenser will keep your engine from starting or will shut it down if it goes bad. Always keep a spare condenser in the glove box in case you get stuck somewhere with this problem.

If you want to eliminate the points and condenser and keep the original look of your distributor you can install Electronic Ignition System these are available for most make and model distributors and will make a difference in engine performance.

For the early Ford Flathead V8 guys with the distributor and coil mounted on top of distributor you will need to convert and and mount an external coil.

Ford flathead years 1933-1936

Ford flathead years 1937-1941

Lincoln Zephyr 1939-1948 V12

You are now ready to tackle the conversion of your Oil, Gas and Temp gauges. Remember the original gauges were meant to work on 6 volts. If you apply 12 volts to any 6 volt gauge they will burn up! Recommend the use of a solid state voltage regulator versus any type of resistor as these work the best and protect your gauges. The problem with resistors as they heat up the values change and the gauge will not read correctly. We recommend the **VREG**

When installing the correct type of 12 to 6 volt gauge regulator you do not need to change the oil, gas, temp sending units as the gauge and sending units will continue to operate on 6 volts, this will save you time and expense by keeping your original sending units and gauges. If you only have a single **gas gauge to reducer.**

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If you are changing the polarity of your electrical system you will need to switch the wires on the back of the gauges, if you don't the gauge will try and read backwards, nothing bad will happen, just reverse the polarity on the back of the gauge.
Special note, you don't need to put any reducer on the ammeter as stated earlier the ammeter reads current flow and not voltage sensitive.

If your vehicle has a start solenoid mounted to either the fire wall or starter itself we highly recommend you replace with a 12 volt solenoid. Your 6 volt solenoid might work ok on 12 volts for awhile but, you don't want to get stuck somewhere with a failed solenoid and can't find one at the local parts store.

There are several types of solenoids, on the early and even latter model Fords the solenoid is located on the firewall and is activated via a ground circuit from the start button, while others require 12 volts to activate, you will need to make sure you select the correct solenoid for your application.

GM, Chryslers and some others use a solenoid mounted to the starter these are large cylinders with a plunger that activates the starter gear.

You may have a mechanical foot type starter that are found in early Chevy and Dodge cars and trucks. There is no need to make any changes to this mechanical system, will work fine on 12 volts. **Here is link** to solenoids

If you have a heater with a 6 volt blower motor there is an simple way to keep your existing heater by installing a reducer for the motor. This link to see will show you what these look like.
Click this link to learn more

If you have of post war era 6 volt tube radio that you want to use, there is a 12 volt to 6 volt reducer that you can use. More info on radio reducer here
These reducers work well provided your radio works already on 6 volts.

6 volt horns will work on 12 volts because the winding in these old horns are heavy gage wire and seem to hold up with the short duty cycle horns are used but you can also install a reducer for the horns is you like.
You will need to change the horn relay with a 12 volt relay. Check out horn relay here

Many older vehicles used vacuum wipers and nothing to do when converting. Several companies installed electric wipers, when converting to 12 volts use a wiper reducer is the simplest solution. Wiper reducer

Power seats, window and convertible top motors will run too fast on 12 volts and will burn up overtime. There are two solutions when converting. Rewind the motors, there are several companies that will do this work. There is a reducer solution for windows and seats. Unfortunately there is not a reducer currently made to handle the current needed to work in these top motors. The problem is top motors take a very high current draw when raising the top. Here is link to seat and window motor reducer

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Next replace all the light bulbs, many of these can be found at the local auto parts store or there are light bulb kits that will have all the bulbs for your make model vehicle.

Recommend you install a headlight relay to remove the current from the dash light switch, as these old light switches can cause dim headlights as the contacts become dirty. The relay works like your modern vehicle electrical system and simple to install. Here is example of headlight relay.

You will need to find a suitable 12 volt battery that will fit your battery tray, we recommend a high cracking amp battery that can be found at any local parts store. Check your battery cable to make sure they are in good condition, you may need to replace with longer cable when changing from positive to negative ground systems. **Here is link to battery cables**

Borg Warner Overdrive installed in your vehicle will require to make some upgrades to the electrical components, **Here is a handy link**

If your vehicle has an electric clock, you will need to have converted to 12 volts, there a no 12 to 6 volt reducers for electric clocks. We like the folks at The Clock Works to rebuild and convert clocks. Link to their site. The Clock Works

The Battery: Is one of the most important component in your vehicles electrical system and we take for granted the battery will always start our engine. This is generally the case provided the battery has been properly maintained and charged.

We think of the 12 volt battery to be fully charged at 12 volts, right?.....Wrong, at 12 volts the battery is only 25% charged. In fact, most starters and start solenoids will not work if the battery is below 12.4 volts (75% charged). Also a low battery can destroy a starter and in many cases fuse the contacts in the starter solenoid. A fully charged battery must be 12.6 volts or higher

Replace the battery if it has been discharged three or more times or if the battery case is bulging.

Use the chart to figure battery charge state

Battery voltage State of charge

12.6 volts 100% charged

12.4 volts 75% charged

12.2 volts 50% charged

12.0 volts 25% charged

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11.6 volts Discharged

Batteries should always be charged with an external battery charger and not use the alternator to charge a low or dead battery this will overheat and damage the alternators rectifiers and regulator.

Alternator regulators are set at 14.1 to 14.4 volts, this is the correct voltage to keep the battery fully charged. You can protect your battery with the **battery brain click here**

The best way to check your battery is to use a digital volt meter as shown.

Special General Note: *Older vehicles use the chassis as a means to ground and complete the electrical circuit. Make sure all your grounds are tight and have a good ground between the engine and the chassis. This by fare is is the most common electrical problem found in all older vehicles.*

Here is a link *to our 12 volt conversion kits for most all American Classics*

If you would like to a custom list of conversion parts for your project, you can sent request via this link. Please allow a few days for us to reply.

Enjoy your newly converted vehicle, have fun and be safe!

Jay Johnson

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