

## Conversion of M1008 and M1009 Electric Systems to 12 Volt

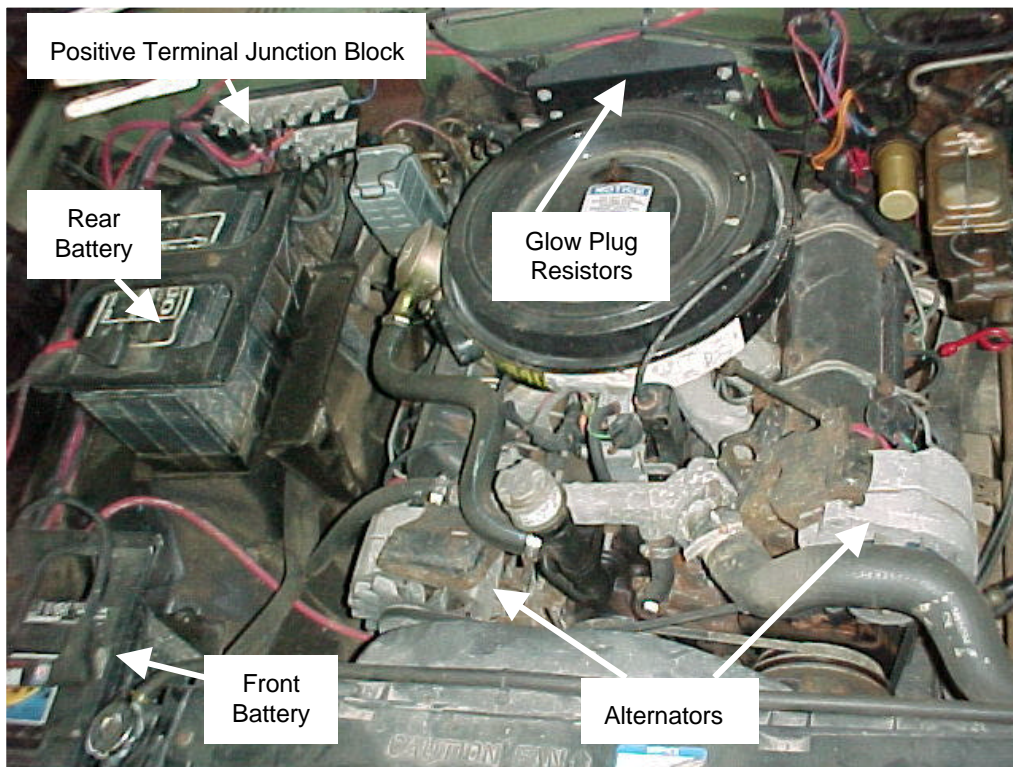
*Roscommon Equipment Center*  
**Northeast Forest Fire Supervisors**  
*in Cooperation with*  
**Michigan's Forest Fire Experiment Station**

The Commercial Utility Cargo Vehicles (CUCV) are commercial vehicles modified to meet the needs of the U.S. Military. These vehicles come in five basic configurations: Cargo, utility, ambulance, shelter carrier, and chassis versions.

In the late 70's and early 80's, Dodge Division, Chrysler Corporation produced the CUCV units. In the late 80's General Motors (GM) produced them. The GM versions are the latest of the five CUCV variants. The GM models are named, the M1008 (Cargo), M1009 (Utility), M1010 (Ambulance), M1028 (Shelter Carrier), and M1031 (Chassis). This report will concern itself with the electrical systems of the M1008, which is a diesel GM pickup truck, and the M1009, known in its civilian life as the Chevrolet Blazer/GMC Jimmy.

The M1008/M1009 were originally designed for civilian use, their heritage includes a 12-volt electric system. The military, of course, uses 24-volt electric appliances. Because of this, General Motors made some changes to the electrical systems of these military models. There are two alternators and two batteries, each of which is 12-volt. The alternators and batteries are connected in series to create 24-volts. The driver's side alternator charges the vehicle's front battery. This battery and alternator supply power for all the 12-volt components/systems. Both alternators charge the rear battery.

The electrical system of the M1008/M1009 is a civilian 12-volt system modified to allow 24-volt starting and supply 24-volts for military accessories. The only true 24-volt component is the starter motor.



**M1008/M1009 Engine Compartment**

The glow plugs and glow plug relay are 12-volt components. Their 24-volt power supply is reduced to 12-volt by the use of a resistor bank.

All running lights, interior lights, and gauges are 12-volt components

As you can see, General Motors modified what was designed as a 12-volt system into a quasi-24 volt system for the military. Converting it back to a 12-volt system is neither costly nor difficult. The M1008/M1009 electrical system can be utilized in one of three ways.

### 1. Retain the system as is.

#### Advantages:

- a) No cost or labor incurred.

#### Disadvantages:

- a) Starter motor is 24-volt. It will be costly and difficult to find a replacement.
- b) The positive terminal junction block is 24-volt and is unusable for 12-volt add on components. (On the M1009, another positive terminal junction block is mounted on the passenger's sidewall in the rear seat area. This will also be a 24-volt supply.)
- c) The bottom fuse on the vehicle's fuse panel is 24 volt and is unusable for 12-volt add on components.
- d) The alternators, although 12 volt, have a special isolated ground. These will be costly and it will be difficult to find replacements.
- e) All 12-volt components including add-ons run off the front battery only. This may cause a battery imbalance if the engine is not running or the 12-volt electrical load is higher than the alternator output.

### 2. Convert to a 12-volt system utilizing two batteries for starting power and one alternator for charging. (Note: Leaving both alternators has little or no benefit. Unless the voltage regulators' turn on points are identical, only one alternator will be utilized by the system.)

#### Advantages:

- a) Single voltage system.
- b) All electrical component replacement parts are readily available.
- c) Alternator to be removed can be used as replacement part for remaining alternator.

- d) Commercial (non-isolated ground) alternator can be used for replacement. Just remove ground wire from system.
- e) Both front and rear positive terminal junction blocks (rear available on M1009 only) and the bottom fuse of the fuse panel can be used as non-isolated 12-volt power supplies.

#### Disadvantages:

- a) Fire apparatus (i.e. hose reel rewind and pump start) work directly from starting batteries.
- b) Some cost (12-volt starter and wiring supplies) and labor occurred.

### 3. Convert to two 12-volt isolated systems. One system utilizing the two existing batteries and one alternator. The second system utilizing the other alternator and an additional battery.

#### Advantages:

- a) Single voltage system.
- b) All electrical components readily available.
- c) Alternator to be removed can be used as replacement part for remaining alternator.
- d) Commercial (non-isolated ground) alternator can be used for replacement. Just remove ground wire from system.
- e) Both front and rear positive terminal junction blocks (rear available on M1009 only) and the bottom fuse of the fuse panel can be used as non-isolated 12-volt power supplies.
- f) Fire apparatus (i.e. hose reel rewind and pump start) and accessories electrical load may be isolated from starting batteries.

#### Disadvantages:

- a) Some cost (12-volt starter, third battery, and wiring supplies) and labor occurred.

We feel that systems 2 and 3 have the most merit. System 2 is simple and suitable if large electrical accessory loads are not expected. System 3 isolates the vehicle's electrical system from the large electrical accessory loads that can be imposed by fire apparatus. This helps protect against inadvertent drainage of the vehicle's electrical power for starting.

The following directions will step through the conversion of the CUCV electric system to a single 12-volt system or two separate isolated 12-volt systems.

## M1008/M1009 Conversion to 12-Volt system

These instructions are a guide to convert the military electrical system of a M1008 or M1009 to a 12-volt system charged by a single alternator. The passenger side alternator will be used to charge both of the vehicle's batteries. The driver side alternator will be removed.

1. Disconnect the ground wire from the negative (-) terminal of the front battery.
2. Remove the jumper cable that connects the front battery's positive (+) terminal to the rear battery's negative (-) terminal. Cut the 8 gauge red wire from the rear batteries negative (-) terminal. This wire will be used in the next step (Photo 1).
3. Add a 1/4 inch ring terminal to the 8 Ga. red wire that was cut in the previous step and replace the terminal on the fusible link end with a 5/16 inch ring terminal. Reinstall the wire attaching the fusible link end to a post on the positive (+) terminal junction block the other end connects to the larger stud on the 12 volt junction block (Photo 2 and 3).
4. With the air cleaner removed, remove the resistors located on upper center of the

firewall. The resistors are mounted on the backside of black sheet metal mounting bracket. Three hex head screws mount the sheet metal bracket to the firewall. Remove these to access the resistors (Photo 2).

5. An 8 gauge wire connects the positive (+) terminal junction block to the resistors. Another 8 gauge wire connects the resistors to the glow plug relay. Disconnect these from the resistors. Remove the wire that runs from the resistors to the glow plug relay. Extend the wire that runs from the positive (+) terminal junction block to the resistors so that it is long enough to reach the glow plug relay (insulate the splice) (Photo 3).

**Caution:** *A new wire may be used to replace the existing wire but the existing wire has a fusible link at the end for short circuit protection. If a new wire is installed, short circuit protection should be installed as close as possible to the end connected to the positive (+) terminal junction block.*

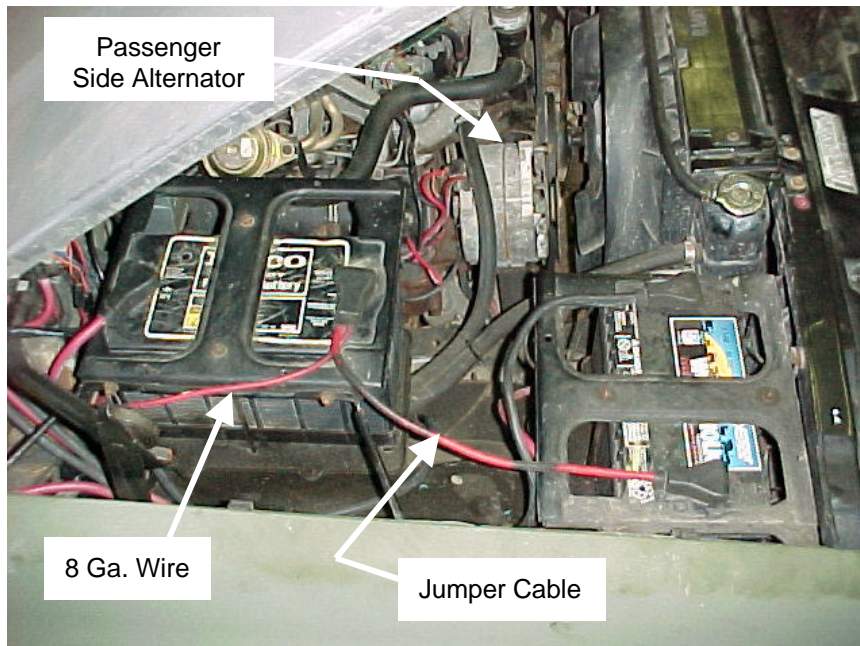
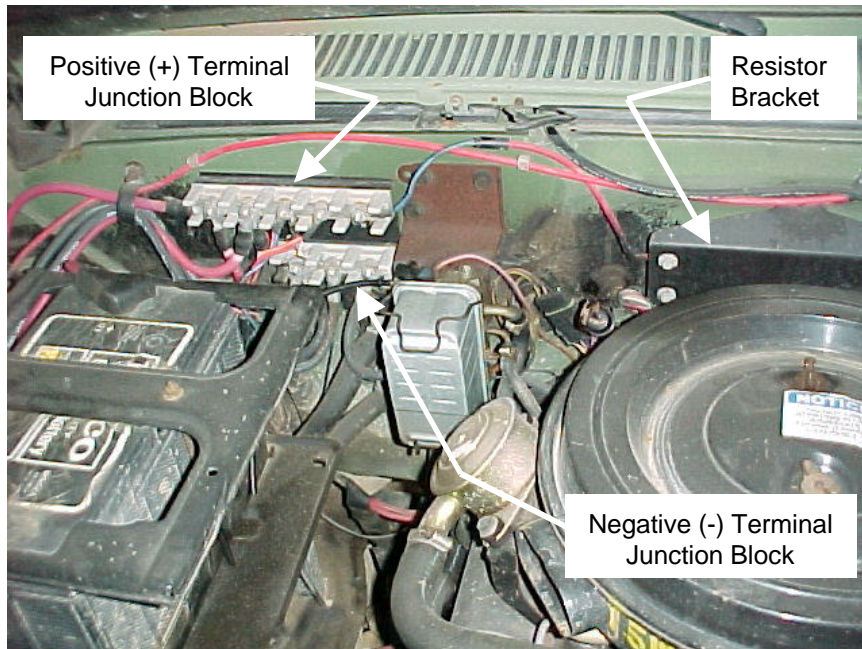
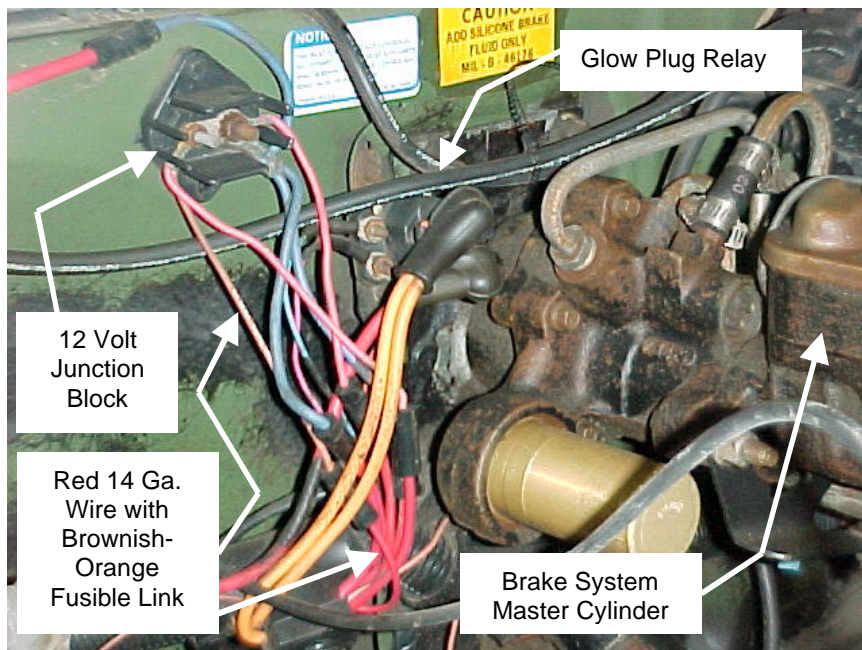


Photo 1

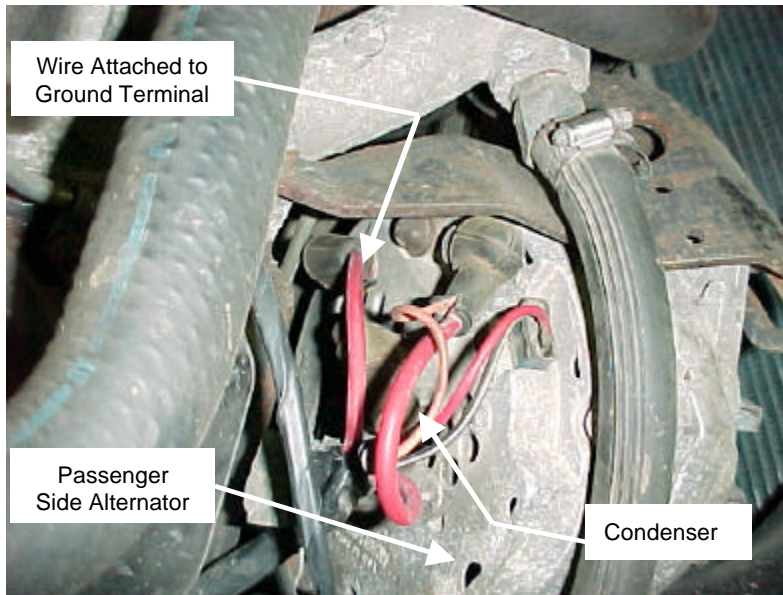


**Photo 2**

6. Disconnect the wire from the ground terminal on passenger side alternator, insulate the end, bend the wire back, and secure it to the harness. This is an 8 gauge red wire with a white tracer. (The tracer may be hard to locate.) (Photo 4).
7. Add a ground wire from the ground terminal of the passenger's side alternator to the engine. The wire removed in Step 12 can be used.
8. Remove the condenser mounted to the rear of the passenger side alternator. This is the cylindrical part with one wire (Photo 4).



**Photo 3**

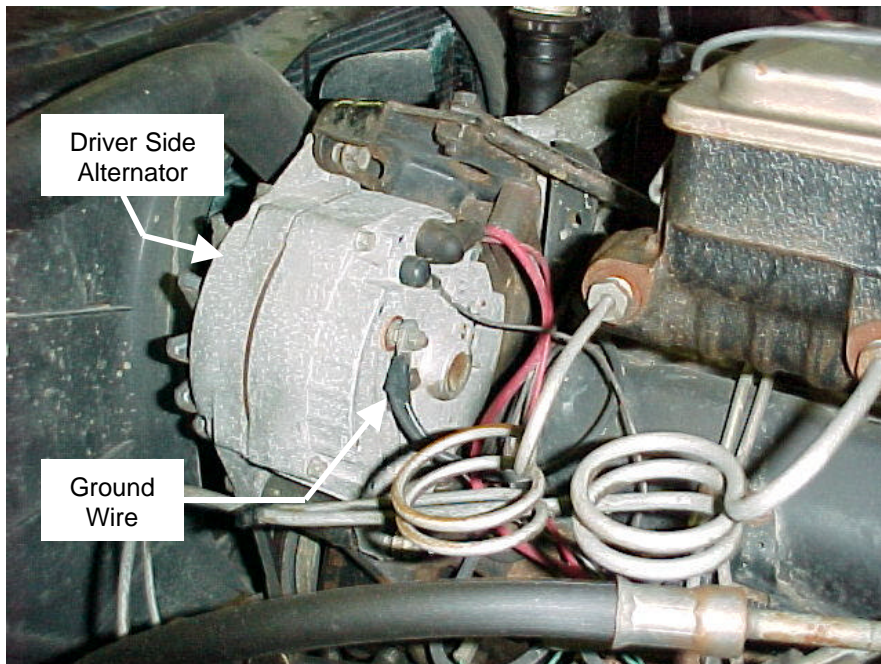


**Photo 4**

9. The two alternators are connected together at the 12-volt junction block. The two red 8 gauge wires come together into one ring terminal on the larger stud of the 12-volt junction block. (On the unit done by REC these wires had blue fusible links on the end.) Disconnect these wires from the 12-volt junction block (Photo 3).
10. On the smaller stud of the 12-volt junction block a red 14 gauge Wire is attached. (On the unit done by REC, this wire had a

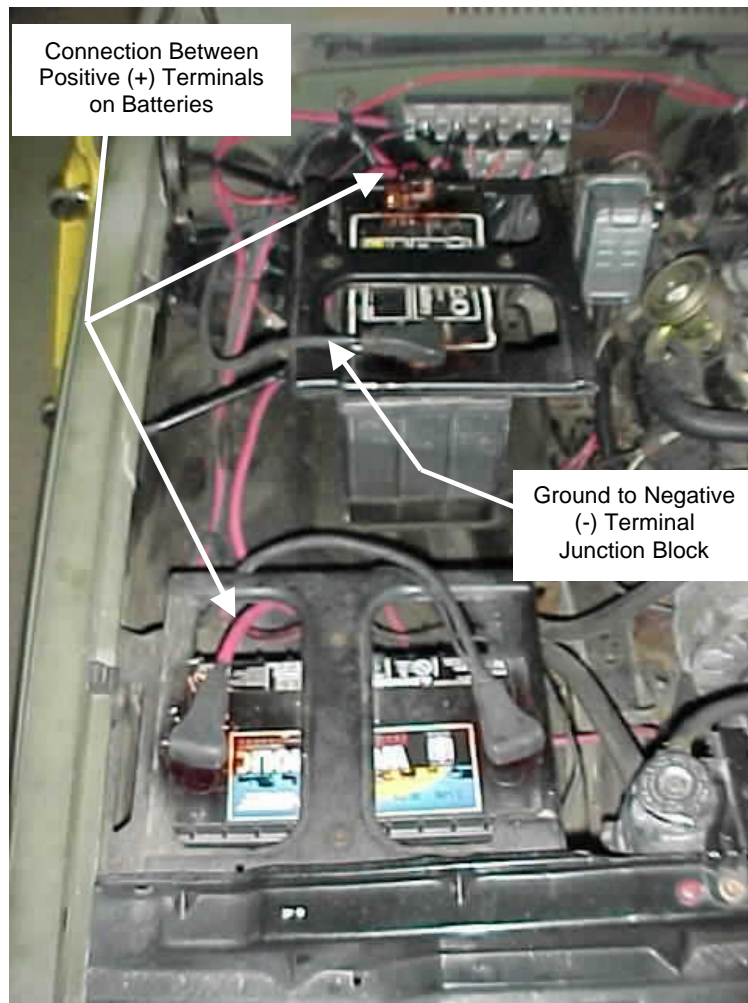
brownish-orange fusible link on the end.) Disconnect this wire from the 12-volt junction block (Photo 3).

11. Insulate the ends of the wires removed in the two previous steps, bend the wires back, and secure them to the harness.
12. Remove the ground wire that connects the driver's side alternator to the engine (Photo 5).



**Photo 5**

13. Disconnect all the remaining wires that connect to the rear of the driver's side alternator, insulate the ends of each wire, bend the wires back, and secure them to the harness.
14. Remove the driver's side alternator, its mounting bracket and hardware, and its drive belt.
15. Remove 24-volt starter and replace with 12-volt starter. The starter is shimmed for proper gear engagement the replacement starter may require different shimming.
16. Connect the positive (+) terminal of the front battery to the positive terminal of the rear battery. (Use 4 gauge wire minimum.) The positive terminal of the rear battery should still be connected to the positive junction block (Photo 6).
17. Ground the rear battery to the negative (-) terminal junction block. (Use 4 gauge wire minimum.)
18. Reconnect the ground wire to negative (-) terminal of front battery.



**Photo 6**

## M1008/M1009 Conversion to Two 12 Volt Isolated Systems

These instructions are a guide to convert the military electrical system of a M1008 or M1009 to two separate 12-volt systems each charged by a single alternator. The passenger side alternator will be used to charge both of the vehicle's batteries. The driver side alternator will be used to charge a battery on an auxiliary system.

1. Disconnect the ground wire from the negative (-) terminal of the front battery.
2. Remove the jumper cable that connects the front battery's positive (+) terminal to the

rear battery's negative (-) terminal. Cut the 8 gauge red wire from the rear batteries negative (-) terminal. This wire will be used in the next step (Photo A).

3. Add a 1/4 inch ring terminal to the 8 gauge red wire that was cut in the previous step and replace the terminal on the fusible link end with a 5/16 inch ring terminal. Reinstall the wire attaching the fusible link end to a post on the positive (+) terminal junction block the other end connects to the larger stud on the 12-volt junction block (Photo B and C).

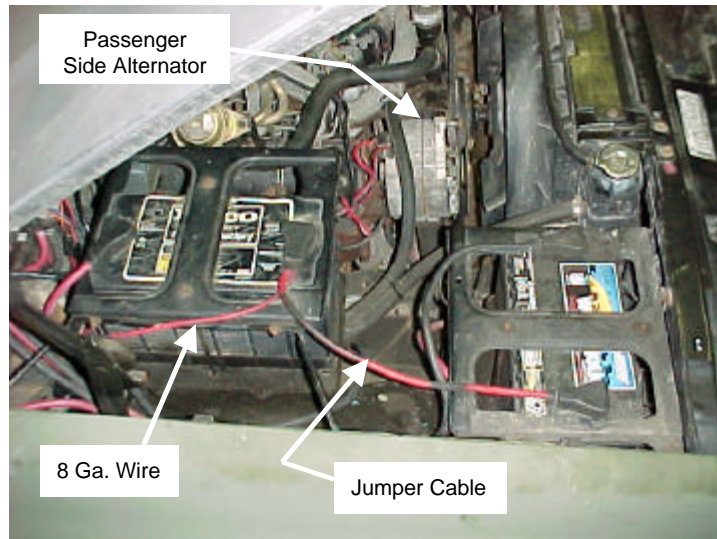


Photo A

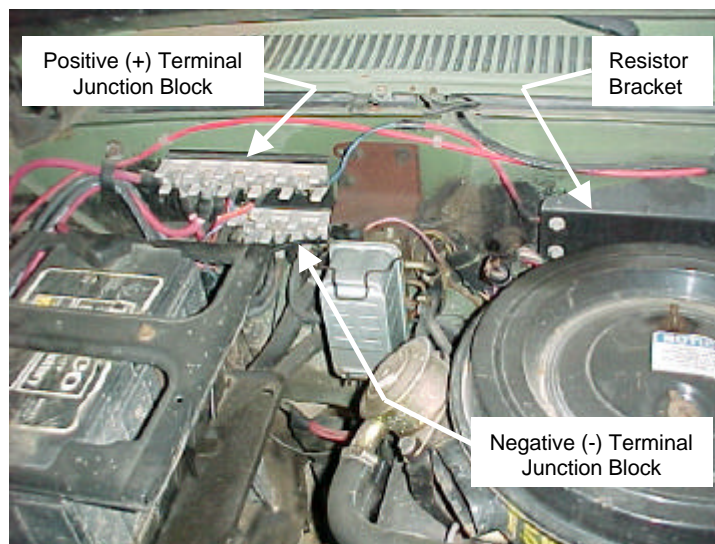
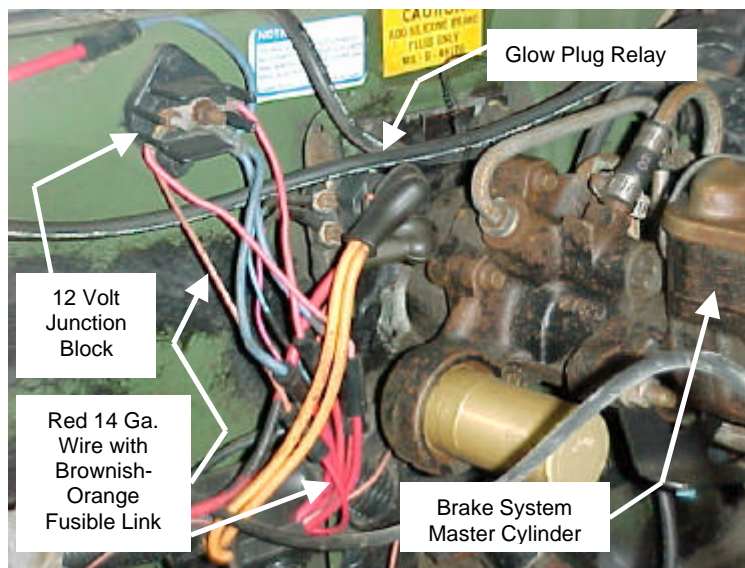


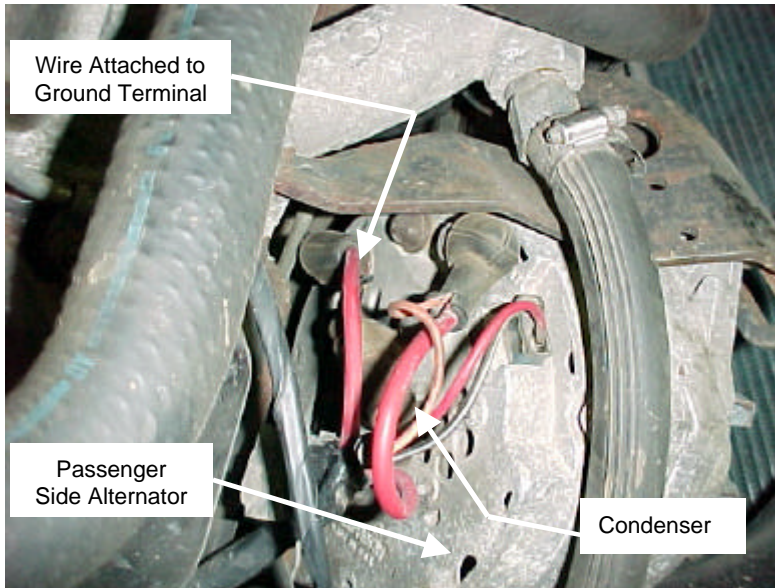
Photo B



**Photo C**

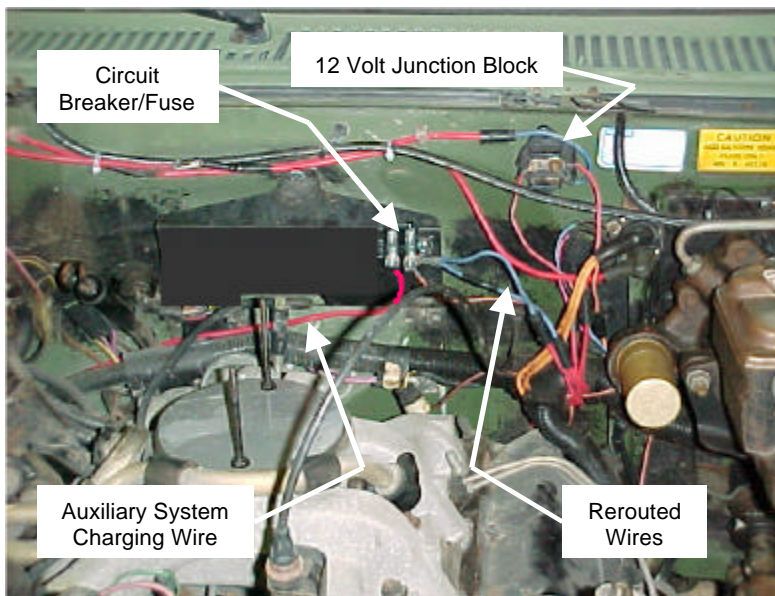
4. With the air cleaner removed, remove the resistors located on upper center of the firewall. The resistors are mounted on the backside of black sheet metal mounting bracket. Three hex head screws mount the sheet metal bracket to the firewall. Remove these to access the resistors (Photo B).
  5. An 8 gauge wire connects the positive (+) terminal junction block to the resistors. Another 8 gauge wire connects the resistors to the glow plug relay. Disconnect these from the resistors. Remove the wire that runs from the resistors to the glow plug relay. Extend the wire that runs from the positive (+) terminal junction block to the resistors so that it is long enough to reach the glow plug relay (insulate the splice) (Photo C).
- Caution:** *A new wire may be used to replace the existing wire but the existing wire has a fusible link at the end for short circuit protection. If a new wire is installed, short circuit protection should be installed as close as possible to the end connected to the positive (+) terminal junction block.*
6. Disconnect the wire from the ground terminal on passenger side alternator, insulate the end, bend the wire back, and secure it to the harness. This is an 8 gauge red wire with a white tracer. (The tracer may be hard to locate.) (Photo D).
  7. Add a ground wire from the ground terminal of the passenger's side alternator to the engine.
  8. Remove the condenser mounted to the rear of the passenger's side alternator. This is the cylindrical part with one wire (Photo D).
  9. The two alternators are connected together at the 12-volt junction block. The two red 8 gauge wires come together into one ring terminal on the larger stud of the 12-volt junction block. (On the unit done by REC, these wires had blue fusible links on the end.) Disconnect these wires from the 12-volt junction block (Photo C).
  10. On the smaller stud of the 12-volt junction block, a red 14 gauge wire is attached. (On the unit done by REC, this wire had a brownish-orange fusible link on the end.) Disconnect this wire from the 12-volt junction block (Photo C).
  11. Connect the wires removed in the two previous steps to a 50-amp circuit breaker/fuse mounted close to the 12-volt junction block. The terminals of this circuit breaker/fuse need to insulated or isolated from accidental contact when working in engine the compartment (Photo E).



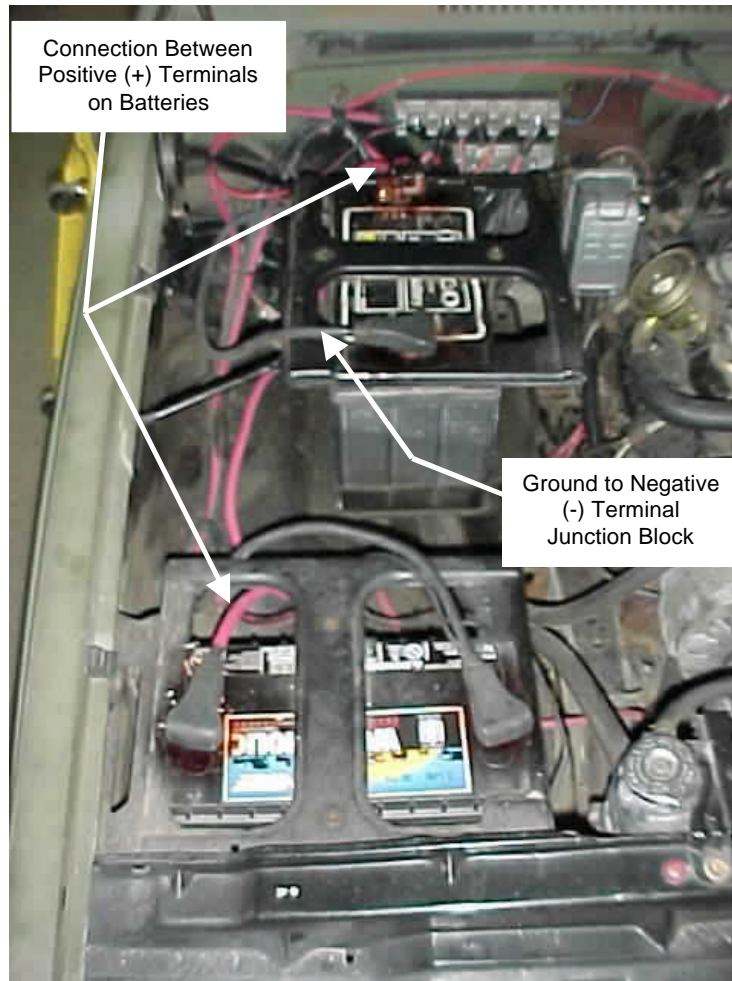


**Photo D**

12. Connect the auxiliary system charging wire (8 gauge wire minimum) to the other terminal of the circuit breaker/fuse. This wire should run back to a second 50-amp circuit breaker/fuse near where a third battery is to be mounted. The terminals of this circuit breaker/fuse need to be insulated or isolated from accidental contact.
13. A power supply wire (8 gauge minimum) to an auxiliary fuse panel can be attached to same terminal of either 50-amp circuit breaker/fuse as the auxiliary system charging wire.
14. Add a wire (8 gauge minimum) to connect the open terminal of the second circuit breaker/fuse to the positive (+) terminal of the third battery.
15. Remove 24-volt starter and replace with 12-volt starter. The starter is shimmed for proper gear engagement the replacement starter may require different shimming.



**Photo E**



**Photo F**

16. Connect the positive (+) terminal of the front battery to the positive terminal of the rear battery. (Use 4 gauge wire minimum.) The positive terminal of the rear battery should still be connected to the positive junction block (Photo F).
17. Ground the third battery to the chassis. (Use 4 gauge wire minimum.)
18. Ground the rear battery to the negative (-) terminal junction block. (Use 4 gauge wire minimum.)
19. Reconnect the ground wire to negative (-) terminal of front battery.