

# Step by Step 12-Volt Conversion

*by Bob Melville*

## FARMALL "M" and "SUPER M" 12 VOLT CONVERSION

Below are step by step instructions to convert a 6 volt Farmall M or Super M with battery (not magneto) ignition to a 12 volt alternator electrical system.

### MATERIALS NEEDED

New parts you will need (details in paragraphs below):

- volt alternator (Delco 10SI)
- Alternator drive belt
- 12 volt battery
- Ignition ballast resistor
- Warning lamp holder and bulb
- Misc steel scraps (angle iron, threaded rod, nuts and bolts)
- #10, #12 and #16 stranded wire and miscellaneous crimp-on wire terminals
- 12 volt headlamp bulbs (required if your tractor has lights)

For the alternator, use a Delco type 10-SI because: 1 - The 10-SI was the "standard" alternator on most General Motors cars and on many farm tractors from the mid 70's thru the mid 80's. They are readily available and inexpensive (usually \$10 - \$20 at junkyards). 2 - The 10-SI is simple to wire - the voltage regulator is contained inside the alternator. 3 - The 10-SI is compact - will fit in the same location as the original 6 volt generator. 4 - The 10-SI is reliable and maintenance-free. 5 - It's easy to swap drive pulleys on the 10-SI.

The 12 volt battery can be anything that will fit in the box. A battery with a CCA rating of 500 amps or so is adequate. A higher CCA rating is fine, but not necessary.

For the ballast resistor (required to reduce 12 volts to 6 volts for the ignition coil), use a generic Chrysler style (NAPA #ICR13 ) or equivalent.

The alternator warning light consists of small 12 volt lamp rated at about 0.2 amps. A #1815 bulb in a suitable lampholder (purchased at Radio Shack) works fine. A #1813, #161 or #194 instrument/side marker bulb in a suitable holder will also work. Make sure the lampholder is NOT grounded - i.e. both lamp terminals are brought out. (Note: If you don't want to use a warning lamp, you can substitute a 10 ohm resistor rated at 2 watts or higher in place of the warning lamp.)

Electrical components on the tractor you can leave and reuse as is:

- Starter
- Starter switch
- Ignition coil and distributor
- Ignition switch

- Ammeter
- Battery cables
- Headlight switch and fuse.

## **MOUNTING THE ALTERNATOR**

1 - Disconnect and remove the old battery. Remove the engine hood.

2 - Remove the old 6 volt generator, fan and generator drive belts and the voltage regulator. Save the generator mounting bracket, tensioning arm, etc. - you may be able to use them in the next step.

3 - Mount the new alternator in place of the generator. Some 3/8" threaded rod and nuts (for the pivot bolt), and an alternator tensioning bracket salvaged from an old car are helpful. When designing the mount make sure of the following: 1) The alternator has at least 1/2" or so of "swing" about the pivot so you can get the drive belt on and adjust the belt tension, 2) The alternator fits within the envelope of the hood - it must not touch the hood when the hood is in place! 3) The alternator pulley must be in line with the generator drive pulley on the water pump.

4 - Obtain and install a new alternator drive belt. The belt must be the same width (1/2") as the old belt, but depending upon how you mount the alternator it will need to be an inch or two longer. (On the Super M an A34 size belt fit best.) Tighten the belt so there's about 1/2" of deflection with light thumb pressure midway between the pulleys.

## **WIRING**

Highly recommend running new wiring for the alternator rather than adapting the existing generator wiring. (Often the insulation on the factory wiring is cracked and frayed, inviting short circuits and other electrical problems down the road.)

For wire terminations at components, use crimp-on ring type wire terminals. Connections to the "1" and "2" terminals on the alternator can be made with standard crimp-on female spade terminals, or with an old Delco alternator plug from a junked car.

1 - Run a #10 wire from the "BAT" terminal on the alternator to the ammeter.

2 - Run a #16 wire from the "BAT" terminal to the "2" terminal on the alternator.

3 - Mount the warning light holder in a suitable location (I bolted it to the steering wheel bolster underneath the ammeter box).

4 - Run a #16 wire from the switched side of the ignition switch to either terminal on the warning light. Run another #16 wire from the other terminal of the warning light to the "1" terminal on the alternator.

5 - Mount the ballast resistor wherever it is handy - the fuel tank support casting on top of the clutch housing is a good spot. Just remember **THE RESISTOR GETS HOT WHEN THE ENGINE IS RUNNING** - keep it away from the gas tank and gas line! Run a #16 wire from the switched side of the ignition switch to either terminal on the ballast resistor. Run another #16 wire from the other terminal of the ballast resistor to the “+” terminal on the ignition coil. (The “-” terminal on the coil should connect to the existing pigtail wire going into the distributor).

6 - If your tractor has lights, replace all the bulbs with 12 volt bulbs.

## **TESTING**

1 - Double check your wiring to make sure it is correct.

2 - Install and connect the new 12 volt battery. BE CERTAIN the “-” terminal is connected to the grounded cable, and the “+” terminal is connected to the cable that runs to the starter! (Get it backward - even for an instant - and the alternator will be ruined!)

3 - With the battery connected and the ignition switch off, the warning light should be dark and the ammeter centered at “0”.

4 - Pull out (turn on) the ignition switch. The warning light should come on, and the ammeter should deflect a little to the left (“-” or “discharge”). If the ammeter deflects the wrong way, do the following:

- Disconnect the battery ground cable
- Swap the wires at the back of the ammeter (i.e. move all wires from the left terminal stud to the right terminal stud, and vice versa)
- Reconnect the battery ground cable

5 - If the above check out, start the engine and let it idle. The warning light may still be lit - this is normal.

6 - Now run the engine up to full speed. The warning light should go out and the ammeter should deflect to the right, indicating the alternator is charging the battery.

7 - Idle the engine back down. The warning light should remain dark, and the ammeter should still show a small amount of charge. 8 - Shut off the engine. The warning light may flicker until the engine stops turning - this is OK. When the engine stops turning, the warning light should be dark, and the ammeter again be centered on “0”.

## **SOME TIPS**

1 - Tape or otherwise insulate the exposed “BAT” stud on the back of the alternator. This terminal is connected directly to the battery - it is “hot” even with the ignition turned off. Should you accidentally bump this stud with a grounded metal tool (like when changing the #1 spark plug) you’ll get an impressive spark and possibly a fire.

2 - The new 12 volt battery will probably be smaller than the old 6 volt unit. Use wood scraps, stiff foam packaging or similar to fill the extra space between the sides of the battery and the box. This will keep the battery from rattling around and shortening it's life.

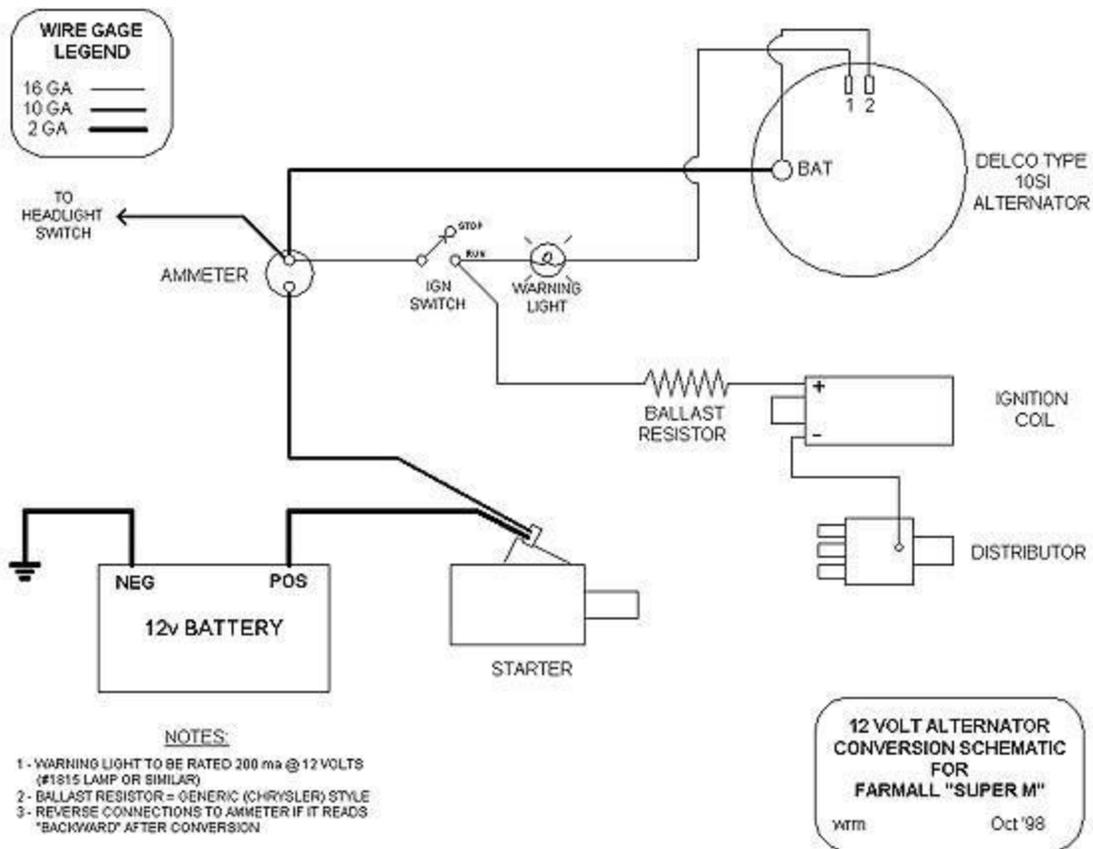
3 - Given a choice, use the smallest diameter pulley on the alternator you can find. Reason: The Farmall engine turns slowly relative to what the engines the alternator was originally designed for. And the alternator must be spun up to 2,000 RPM or so to "turn it on" at start up. The smaller the alternator pulley, the faster it gets spun by the engine. So in this case smaller is better.

4 - On 12 volts, the engine will crank (and should start) much faster. However if the engine does not start immediately, limit cranking to about 10 seconds at a time then let the starter "rest" (to cool off) for a minute. Otherwise you could overheat and ruin the starter.

5 - Should you use jumper cables to start the tractor - or use the tractor to jump another vehicle - remember the tractor is now negatively grounded, same as modern cars/trucks. Be sure to connect jumper cables accordingly. (If you hook the jumper wrong, you could ruin the alternators on both vehicles, and toast the computer in fuel injected vehicles)

6 - Save the old 6 volt generator and voltage regulator. You may be able sell these items to a collector, or at a tractor show flea market - even if the generator doesn't work.

7 - If you get an alternator at a junkyard, take it to a NAPA, Auto Zone, etc. and have them test it to be sure it works before you install it. Most larger parts stores will do this free of charge.



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