HEAVY DUTY ISOLATORS

GENERAL TYPE BATTERY ISOLATORS REPLACEMENT INSTRUCTIONS

ALL 33 SERIES WITH TERMINALS "B1" BATTERY, "A1" ALTERNATOR, "B2" BATTERY (MAY ALSO HAVE ADDITIONAL "B3" BATTERY AND "A2" ALTERNATOR TERMINALS)

COMPATIBLE WITH ALL EXTERNALLY REGULATED AND SOME INTERNALLY REGULATED ALTERNATORS WITH A WIRING MODIFICATION TO SUPPLY POWER AND SENSING VOLTAGE FROM THE "B1" ISOLATOR TERMINAL TO THE REGULATOR POSITIVE TERMINAL.

(Isolators With An "E" (Excitation) Post Are For Use With Delco "CS" 4 Terminal Regulator Alternators
(See Separate **POWERLINE** "CS" Installation Instructions Guide For Details On These Isolators)

(Isolators With An "R" Terminal Are Used Only With Motorola Isolation Diode Alternators)
(See Page 8 Of This Guide For Installation Instructions)

POWERLINE Isolators are designed to handle the total current through either battery leg.

ALL **POWERLINE** isolators are designed to work in Negative ground systems, up to 48 Volts. Please contact the factory if you need a Positive ground isolator or your system requires a custom designed Battery Isolator.

THE ISOLATOR MUST BE EQUAL OR GREATER THAN THE ALTERNATOR AMPERAGE!

Thank you for choosing this high quality *POWERLINE* product.
The attached instructions are provided to assist you with typical installations. Test procedures are also provided and should be kept with your equipment if future reference is desired.
Every effort has been made to use the finest materials and workmanship. In the event that service is needed or if you have questions regarding either the product, installation or the performance, please give us a call.

9am to 5pm Central Time
1-800-443-9394 or 817-535-0284
Email: sales@hdpsi.com Web: hdpsi.com

INSTALLATION INSTRUCTIONS

(These Instructions Are For Replacement ONLY. If Your Installing An Isolator For The First Time, See Our New Install Instructions At *HDPSI.COM)*

SAFETY FIRST! When working near lead acid batteries, always wear approved safety glasses and protective clothing to prevent acid contact with your skin. Wash immediately with large amounts of water if acid gets on your skin. Batteries can produce hydrogen gas, **NEVER SMOKE NEAR THE BATTERIES**! Make certain that all **NEGATIVE** power cables are removed from the batteries before you began the isolator installation. Also **ALL** of the new **POSITIVE** cables you are adding should be protected by split tubing and tied securely away from all high heat sources and sharp edges to prevent any short circuits.

IMPORTANT: Prior to starting the isolator installation, start the engine and let it run at a fast idle (approximately 1000 to 1500 RPM.) With a volt meter, measure the voltage at the battery terminal which should be approximately 14 volts. Record your readings, then begin with the install. After the installation has been completed, perform this test again to confirm that the voltage is the same as before the isolator was installed.

1. Disconnect the **NEGATIVE** cable from all the batteries on the vehicle.
2. **LABEL EACH OF THE POWER CABLES TO IDENTIFY THEIR CORRESPONDING TERMINAL LOCATIONS BEFORE REMOVING THEM!** Carefully remove the cables from the **"B1"**, **"A1",** and **"B2"** terminals (May also have a **"B3"** or **"A2"** terminal) Remove the old and mount the new isolator.
3. Replace all of the cables to their corresponding terminals and install the lock washers and nuts. **Finish by tightening the 5/16" "B1", "A1", and "B2" terminal nuts to 8 to 10 FOOT POUNDS or 96 TO 120 INCH POUNDS**

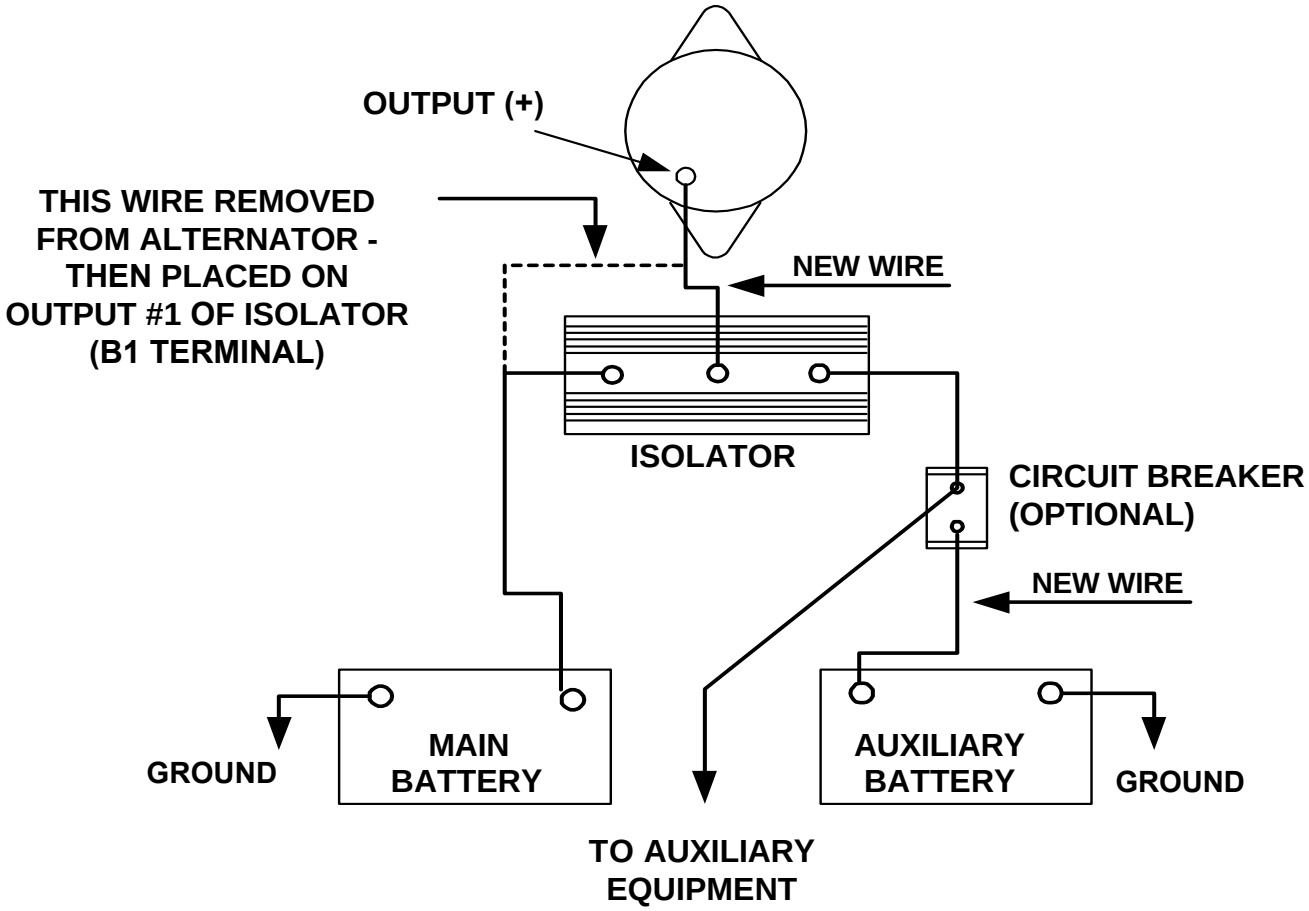
   BE CAREFUL! DO NOT OVER TIGHTEN THE NUTS AND STRIP THE THREADS!
4. Reconnect the **NEGATIVE** cable to the **STARTING BATTERY** and **AUXILIARY BATTERY POSTS**.
5. Start the engine and set the RPM at a fast idle. Using a voltmeter set to DC volts, check for the proper operating voltages as stated on the chart below.

PROPER CHARGING VOLTAGE AT ISOLATOR TERMINALS WITH THE ENGINE RUNNING AT A FAST IDLE (900 to 1000 RPM)		
12 VOLT SYSTEM USING STANDARD FLOODED CELL BATTERIES		
"B1" TERMINAL RANGE OF 13.8V TO 14.2V	** "A" TERMINAL RANGE OF 14.8V TO 15.2V	* B2" TERMINAL RANGE OF13.8V TO 14.2V
* N ISOLATORS WITH A "B3" TERMINAL, THE VOLTAGE WILL BE THE APPROXIMATELY THE SAME AS "B1 & B2".		
** ON ISOLATORS WITH A "A2" TERMINAL, THE VOLTAGE WILL BE APPROXIMATELY THE SAME AS "A1" WHEN BOTH ALTERNATORS ARE MOUNTED AND OPERATING ON THE SAME ENGINE.		
** WHEN THE ALTERNATORS ARE MOUNTED ON SEPARATE ENGINES, SUCH AS A TWIN ENGINE YACHT, THE VOLTAGE WILL BE AT EITHER "A" TERMINAL DEPENDING ON WHICH ENGINE IS RUNNING, OR BOTH.		

FLOODED CELL LEAD ACID BATTERIES - CHARGING VOLTAGE RANGES						
(A FULLY CHARGED FLOODED CELL LEAD ACID BATTERY AT REST WILL READ 2.1 VOLTS PER CELL)						
FULLY CHARGED BATTERY VOLTAGE: 12.6 VOLTS (AFTER 8 HOURS REST)						
BATTERY VOLTAGE	FLOAT RANGE		NORMAL RANGE		MAXIMUM RANGE	
12 VOLT	LOWEST	HIGHEST	LOWEST	HIGHEST	LOWEST	HIGHEST
VOLTAGE	13.4 V	13.6 V	13.9 V	14.2 V	14.4 V	14.6 V

TYPICAL WIRING DIAGRAM

DIAGRAM FOR ISOLATOR INSTALLATION WITH ORIGINAL EQUIPMENT ALTERNATOR



BATTERY CABLE SIZING CHART

	RATED OUTPUT AMPS	UP TO 5 FEET	5 TO 10 FEET	10 TO 15 FEET	15 TO 20 FEET	20 TO 25 FEET	25 TO 30 FEET
12 VOLT SYSTEM	1 TO 60	8 AWG	4 AWG	2 AWG	2 AWG	1 AWG	0 AWG
	61 TO 100	6 AWG	4 AWG	1 AWG	0 AWG	0 AWG	2/0 AWG
	101 TO 150	4 AWG	2 AWG	0 AWG	2/0 AWG	2/0 AWG	3/0 AWG
	151 TO 190	4 AWG	1 AWG	2/0 AWG	3/0 AWG	4/0 AWG	4/0 AWG
	191 TO 250	2 AWG	0 AWG	2/0 AWG	4/0 AWG	4/0 AWG	4/0 AWG
	251 TO 300	0 AWG	2/0 AWG	3/0 AWG	4/0 AWG	4/0 AWG	4/0 AWG

Cable length shown is for a **POSITIVE (+)** lead or a **NEGATIVE (-)** lead and **NOT THE TOTAL LENGTH.** **Maximum** acceptable voltage drop is **0.5** volts in the positive and negative cables in a **12** volt system.

12 VOLT SYSTEM EXAMPLE: If you find **0.2** volts drop in the **POSITIVE** cable and **0.8** volts in the **NEGATIVE** cable, technically you are still within the acceptable range, **BUT FOR MAXIMUM CHARGING PERFORMANCE** you will need to focus on lowering the loss in the **NEGATIVE** cable. **THE IDEAL CHARGING CABLE VOLTAGE LOSS IS 0.25 VOLTS IN THE POSITIVE AND 0.25 VOLTS IN THE NEGATIVE CABLE.**

Example: A **120 amp** alternator operating in a heavy cable circuit with a normal resistance of **0.10 ohms** is working great giving you the full output power of the alternator. Now increase that cable resistance to **0.17 ohms** from either an under size cable or corroded connections, and the alternators maximum amperage reaching the load is now only **70 amps**! An increase of only **.07 ohms**! **This loss of output is critical when both batteries are demanding a maximum recharge!** It is always better to invest up front in larger copper cables to take full advantage of your high output alternator's charging amperage rather than down the road having to continuously replace expensive batteries from being under charged! It only takes a very small increase in cable resistance to lose the full output capability of your high amp alternator!!!

SIMPLE METHOD TO MEASURE FOR VOLTAGE DROP IN THE CHARGING SYSTEM

You will only need a digital voltmeter. (For RV's and busses, you will need a length of wire and a clip, to extend one of the meters leads so it can reach from the alternator to the batteries location.) Set the digital voltmeter to the lowest reading DC voltage position. Hold the red meter lead to the positive output terminal of the alternator and the black lead to the positive post of the battery. (Not to the terminal or cable end.) Start the vehicle and set the engine to 1000 to 1200 RPM and turn on the loads you intend to operate. The reading on the voltmeter will be the total voltage loss in the positive cable. Now hold the red meter lead to the case of the alternator and the black lead to the negative post of the battery. (Not to the terminal or cable end.) With the engine still set to 1000 to 1200 rpm and the loads you intend to operate turned on; the reading on the voltmeter will be the total voltage loss in the negative cable. Total voltage loss in either cable should not be greater than **0.5** volts. If you find a greater amount, you will need to check for bad connections or under size cables.

TESTING THE POWER DIODES IN ALL GENERAL ISOLATORS

Using a digital or analog ohm meter, *BATTERY CABLES DISCONNECTED!*

IMPORTANT: If using a digital meter, **set it on the diode test position** →|—; if using a needle movement meter, **set it on the R x 1 Ω ohms scale**. Diodes are 1 way valves. They allow current flow only in 1 direction and block the flow when reversed. This is what you will be observing when conducting the test setup below.

1. **FOR SAFETY**, First remove the **NEGATIVE BATTERY CABLE** at the main and auxiliary batteries. Mark all the isolator cables so you will be able to replace them onto the proper terminals.
2. Remove all cables from the isolator terminals. On some ohm meters, the **RED** and **BLACK** probes are **reversed polarity**, so the test results below will be the **opposite** from the instructions. Regardless, you should see current flow only in one direction through the diodes.
3. Hold the **RED** probe on the "**A**" terminal and touch the "**B1**" and "**B2**" (Also **"B3"** if present) terminals with the **BLACK** probe. A good isolator **WILL** show current flow. Hold the **BLACK** probe on the "**A**" terminal and touch the "**B1**" and "**B2**" (also **"B3"** if present) terminals with the **RED** probe. A good isolator **WILL NOT** show current flow.
4. Hold the **BLACK** probe on the aluminum heat sink. You will need to scratch through the powder coating to make sure that there is a good contact to the bare aluminum. Now touch the **RED** probe to each terminal; **"B1"** then **"A"** then **"B2"**. A good isolator **WILL NOT** show continuity from any terminal to the aluminum heat sink. (If Isolator is removed you may find a spot of bare aluminum on the mounting holes)

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TESTING THE POWER DIODES IN ALL GENERAL ISOLATORS

Using a digital or analog ohm meter, *BATTERY CABLES CONNECTED!*

IMPORTANT: All operational tests should be performed with the batteries fully charged. **Set the digital or analog meter to the DC voltage position.**

1. With the **ENGINE NOT RUNNING**, the **"B1"** terminal should read the same voltage as when measured directly at the **ENGINE STARTING BATTERY** terminals. The **"B2"** terminal should read the same voltage as when measured directly at the **AUXILIARY BATTERY** terminals. (**"B3"** will read the same as at the **2ND AUX. BAT**.)
2. The "**A**" terminal may read from **1** to **10** volts if you are using a digital meter. This variation is normally due to the alternators internal capacitor holding a static charge and the **DVM** does not draw enough power to discharge it. Carefully momentarily **GROUND** only the **"A"** terminal and retest. The voltage reading should now be very close to 0. **If you get a spark when you GROUND the "A" terminal and the voltage returns to 10 to 12 volts, it indicates that the "B1", "B2" or BOTH of the power diodes are defective and leaking reverse voltage!**

IF SO, STOP TESTING! THE ISOLATOR SHOULD BE REPLACED!

IF VOLTAGE DOES NOT RISE, CONTINUE TESTING.

3. **WITH THE ENGINE RUNNING** at a fast idle, the **"A"** terminal should read approximately **14.8** to **15.2** volts. The **"B1"** and **"B2"** terminals should read between **13.8** to **14.2** volts. (Also "B3" if present.)
4. If the **"A"** terminal reads **13.8** to **14.2** volts, the regulator is sensing the alternator output instead of the **ENGINE STARTING BATTERY,** and the modification to the internal regulator's power connection has not been made!
5. If everything checks out ok, your isolator is working properly! If you need further help, call **1-800-443-9394**

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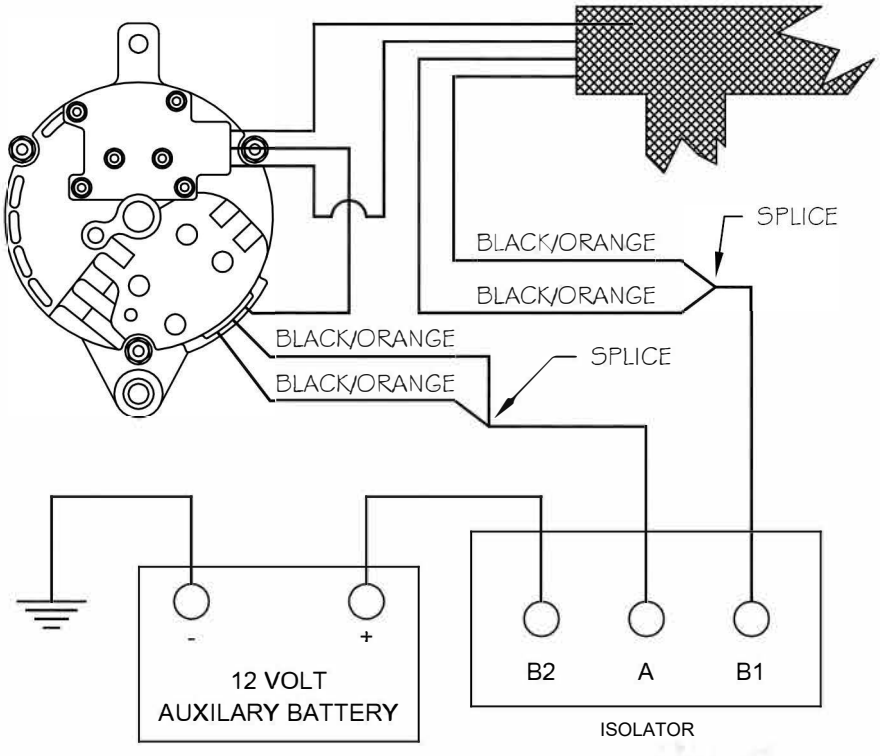
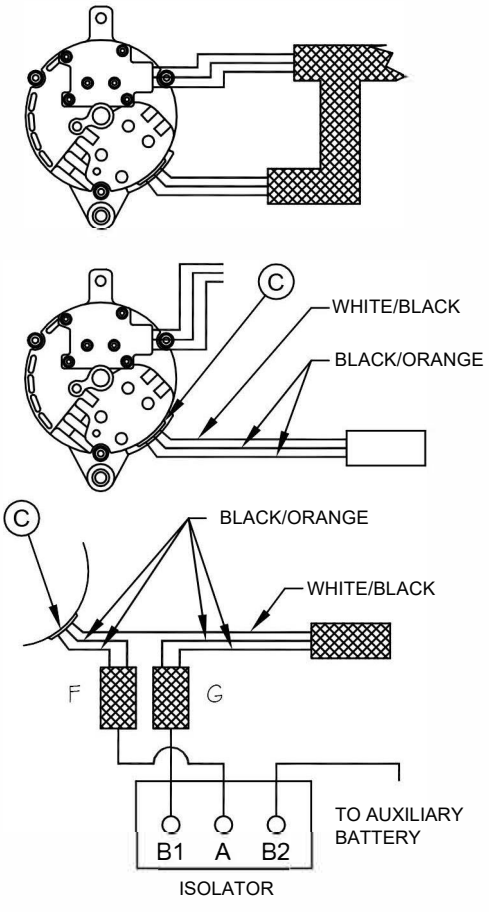
FIGURE 1

1985 THRU 1989
FORD (IAR) ALTERNATOR ISOLATOR WIRING



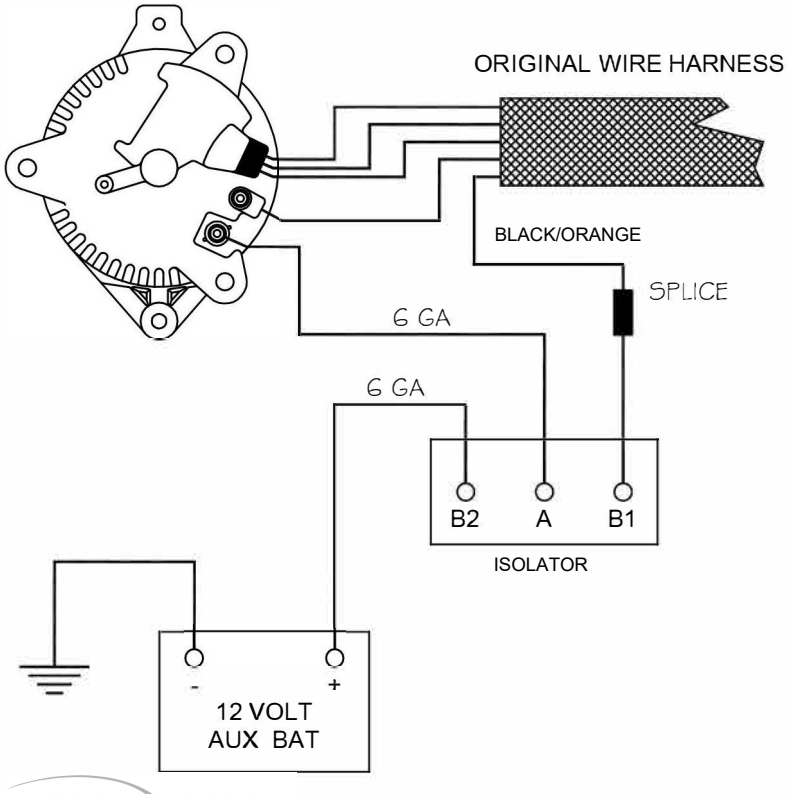
ORIGINAL WIRING HARNESS



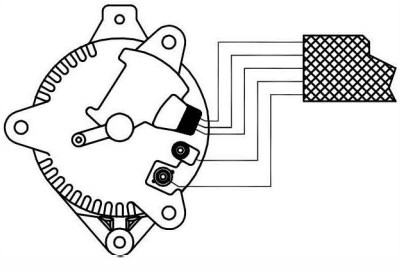
(SEE INSTRUCTIONS)

FIGURE 2

1990 THRU 1998
FORD "3G" ALTERNATOR ISOLATOR INSTALLATION



ORIGINAL WIRING HARNESS INSTALLATION



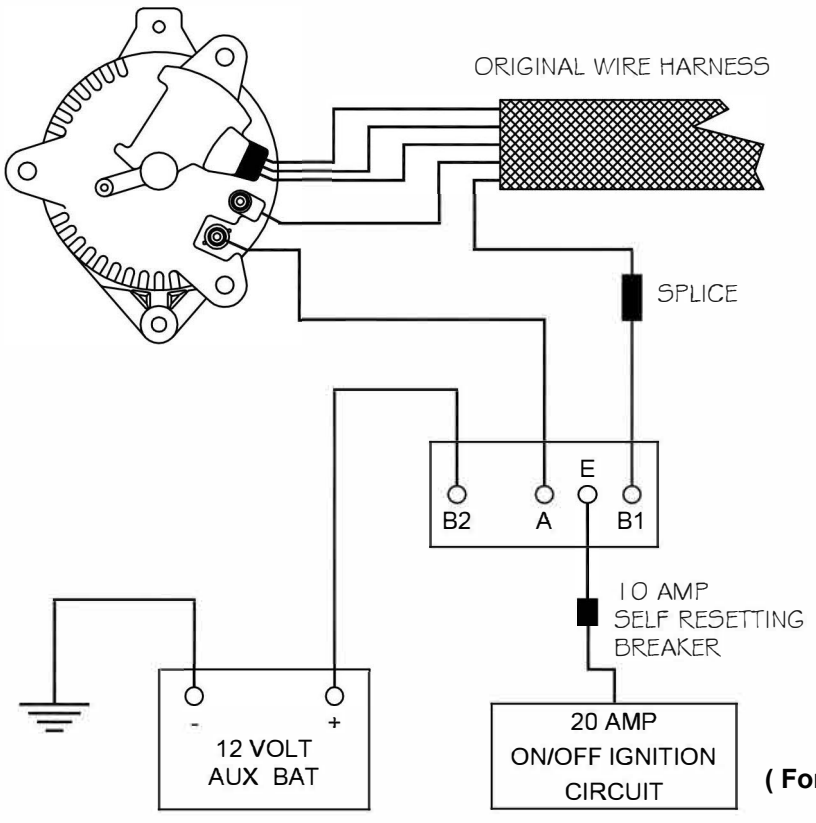
INSTRUCTIONS

1. Disconnect the battery
2. Remove the BLACK/ORANGE lead from the alternator output stud
3. Splice a wire onto the BLACK/ORAGNE lead. Connect the other end to the "B1" (MAIN BATTERY) stud on the isolator.
4. Make up a new wire lead. Connect one end to the alternator output stud where the BLACK/ORANGE wire was removed from. Connect the other end of the lead to the "A" (CENTER) stud of the isolator.
5. Connect a lead from "B2" stud of the isolator to the (+) positive post of the auxiliary battery.
6. Reconnect the battery & test the charging system.

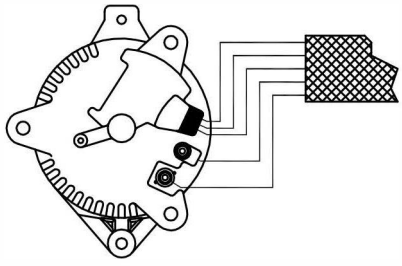
FIGURE 3

1999 THRU 2004
FORD "4G" ALTERNATOR CS TYPE ISOLATOR INSTALLATION

(See separate instructions on CS Isolators for more info)



ORIGINAL WIRING HARNESS INSTALLATION

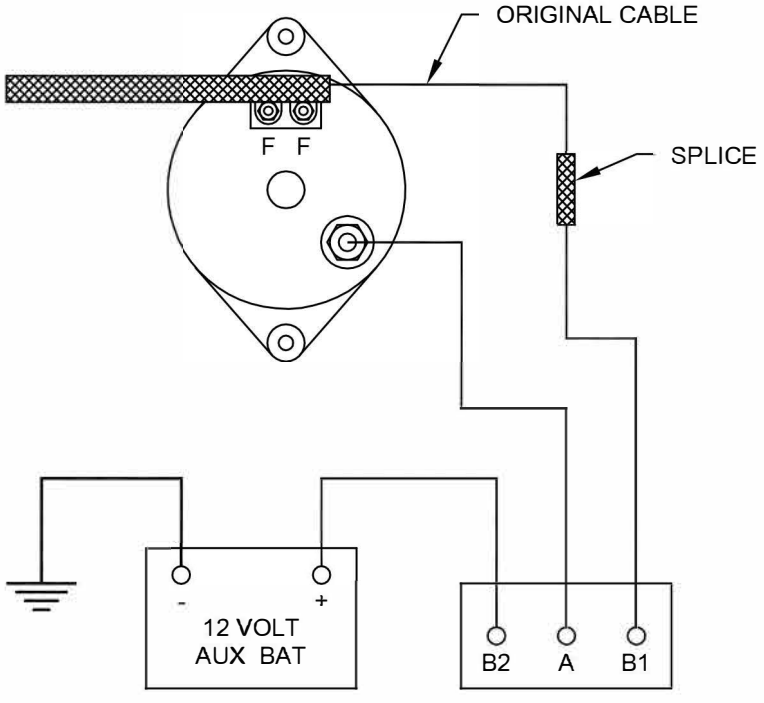


INSTRUCTIONS

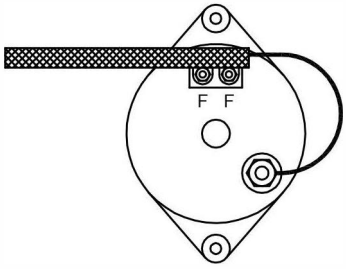
1. Disconnect the battery
2. Remove the BLACK/ORANGE lead from the alternator output stud.
3. Splice a wire onto the BLACK/ORANGE lead. Connect the other end to the "B1" (MAIN BATTERY) stud on the isolator.
4. Make up a new wire lead (Reference the chart on page 2 for the correct wire size). Connect one end to the alternator output stud where the BLACK/ORANGE wire was removed from. Connect the other end of the lead to the "A" (CENTER) stud of the isolator.
5. Connect a lead from "B2" stud of the isolator to the (+) positive post of the auxiliary battery.
6. Connect terminal "E" to a 10 amp self resetting breaker. Connect the breaker to a 20 amp on/off or higher ignition circuit.
7. Reconnect the battery & test the charging system.

(For Isolator Models w/ Excitation (E) Post *ONLY*)

FIGURE 4



ORIGINAL OEM WIRING



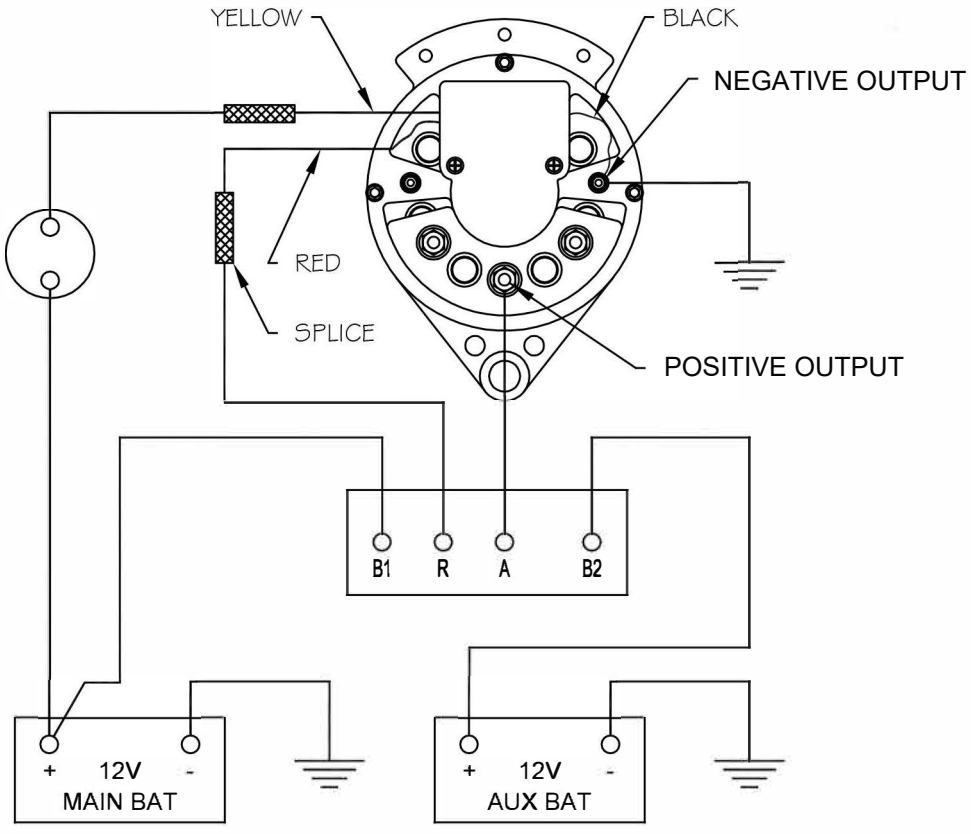
1. Disconnect the battery.
2. Remove the original lead from the alternator output stud.
3. Splice a new wire onto the original OEM lead. Connect the other end to the "B1" (MAIN BATTERY) stud on the isolator.
4. Make up a new wire lead (Reference the chart on page 2 for correct wire size). Connect one end to the alternator output stud where the original OEM wire was removed from. Connect the other end of the lead to the "A" (CENTER) stud of the isolator.
5. Make up a new wire lead (Reference the chart on page 2 for the correct wire size). Connect one end to the B2 stud on the isolator and the other end to the (+) positive post on the auxiliary battery.
6. Reconnect the battery & test the charging system.

NOTE:

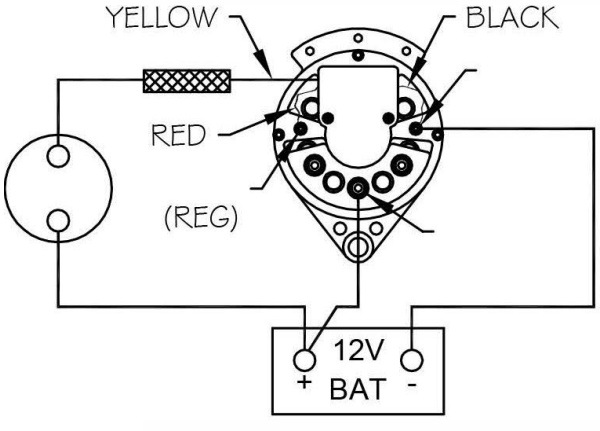
- The auxiliary battery cable must be sized as to not allow any voltage drop to the battery. The ground cable from the body or frame to the engine will require a large gauge cable if the auxiliary battery is grounded to the body or frame.

ISOLATOR INSTALLATION FOR A CHRYSLER/DODGE WITH A NIPPON-DENSO ALTERNATOR

FOR MOTOROLA, (SEV) ALTERNATORS with ISOLATION DIODE ON THE ALTERNATOR & A REGULATOR (R) STUD ON THE ISOLATOR



ORIGINAL WIRING



ISOLATOR WITH REGULATOR TERMINAL INSTALLATIONS & TEST INSTRUCTIONS

1. Use the general installation instructions to hook-up the battery(s) and alternator
2. Remove the RED lead from the regulator where it is connected to the alternator. Splice on a new wire and connect it to the "R" stud on the isolator.

TESTING INSTRUCTIONS

1. Use an ohm meter & connect the RED lead to the "A" stud and the BLACK lead to the "R" stud on the isolator which SHOULD show current flow. Reverse the leads & touch the RED lead to the "R" stud & the BLACK lead to the "A" stud which should NOT show current flow.

2. Measure the voltage from the "A" stud to a good ground and note the voltage. Measure the voltage from the "R" stud to a ground and note the voltage. The voltage reading between the "A" stud & the "R" stud should be about 0.6 volts lower on the "R" stud.