FORD 6.0L Alternator Parts List:
F3/4/550 Utility Body (Primary Alternator Replacement)
For Dual Alternator Configurations

Powergain has custom designed a HDP (high density power) alternator for the Pre-2008 FORD vehicle using the 6.0L diesel engine. Powergain's patented technology combines our unique brushless permanent magnet alternator and a remotely-mounted control box. The control box removes heat from under the hood and controls voltage and current output through our exclusive rectifier and microprocessor. Alternator may be used as primary or dedicated power source separate from the chassis main electrical system.

Parts List

Kit Contents

Description	Part Number	Quantity	On-Hand
• HDP Alternator With Pulley	7201-0035	1	☐
• Mounting Kit	7201-0035	1	☐
• Controller Box	7202-0013	1	☐
• Controller Box Mtg Hdw Kit	9905-0001	1	☐
• Interface Cable (25')	2905-0009	1	☐
• Serpentine Belt	3806-0001	1	☐
• Fuse (500A)	1905-0002	1	☐
• Fuse Holder	1906-0001	1	☐
• Fuses (350A) for Power Cables	1905-0003	2	☐
• Fan Assy, 400A Controller	5406-0001	1	☐
• SHCS,M10 x 1.5 x 25mm Lg	3001-0064	6	☐
• Red (Positive) Terminal Cover	2002-0001	1	☐
• Black (Negative) Terminal Cover	2002-0002	4	☐
• Installation Instruction Manual	9900-0001	1	☐
• Warranty registration card	9901-0001	1	☐
• Warning decal kit	9902-0005	1	☐

Optional (Ordered as required)

• 2/0 Super Vu-Tron Org Weld Cable	1910-0012	3 @ 20'	☐
• Ring Lug, 5/16" x 2/0	2000-0010	6	☐
• Serpentine belt tool	9507-0001	1	☐

Powergain HDP Alternator Installation:

The following instructions apply to the installation of a Powergain alternator on a FORD 6.0 L V8 Turbo diesel engine.

1. Preparation:

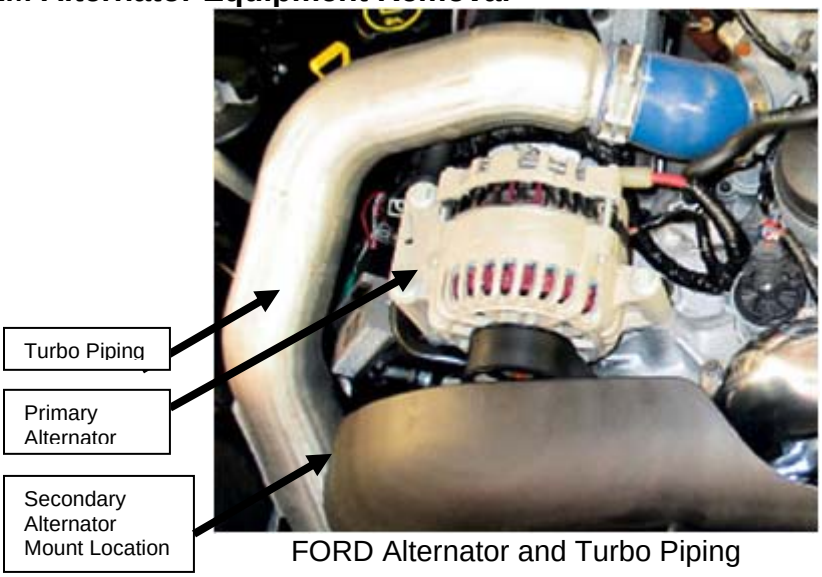
1.1. Prior to beginning installation, carefully check all parts against the parts inventory list to assure all parts are available. If any parts are missing, contact Powergain at (260) 723-5051 to obtain missing parts before beginning.

1.2. Required Tools:

1.2.1. Standard Mechanics Tools
1.2.2. Powergain Serpentine Belt Tool. Required to release spring pressure and remove the belt and tensioner pulley.

1.3. Be sure transmission in PARK, the parking brake is engaged, and engine is off.

2. OEM Alternator Equipment Removal



FORD Alternator and Turbo Piping

2.1. Disconnect vehicle batteries, both primary and secondary.

2.2. Remove all OEM panels necessary to gain unrestricted access to the serpentine belts and idlers.

2.3. Using Serpentine Belt Tool, Release the tension on the Serpentine Belt Idler.

2.4. Remove OEM serpentine belt. This will require temporary removal of several OEM panels over the radiator.

2.4.1. Dual alternators:

2.4.2. If the engine is equipped with dual alternators, remove and retain the serpentine belt to provide access to primary serpentine belt.

2.4.3. If engine is equipped with dual alternators, the secondary alternator will become the primary vehicle alternator (position remains the same) and the Powergain alternator will be operated in parallel system to the truck system.

2.5. Retain bolts and mounting bracket for parts and service usage.

2.6. Disconnect and remove turbo piping and hoses that pass behind the primary alternator mounting location. Retain tubing and hose for use in re-routing of turbo hoses.

3. Powergain Alternator Installation

Powergain Alternator

3.1. The Powergain alternator mounts in the primary alternator mounting location.

3.1.1. Note: Unlike the OEM alternator, the Powergain alternator permanent magnets design requires about 17 ft# of torque to rotate.

3.1.2. Apply Loctite® Threadlocker Blue, or equal, to threads of mounting bolts as necessary.

3.2. Dual Alternator Applications

3.2.1. ***If the vehicle is equipped with OEM dual alternators, then the secondary position alternator will be come the primary vehicle alternator. Ford QVM Bulletin Q-91 must be implemented when this is done. This must be done prior to starting the engine!***

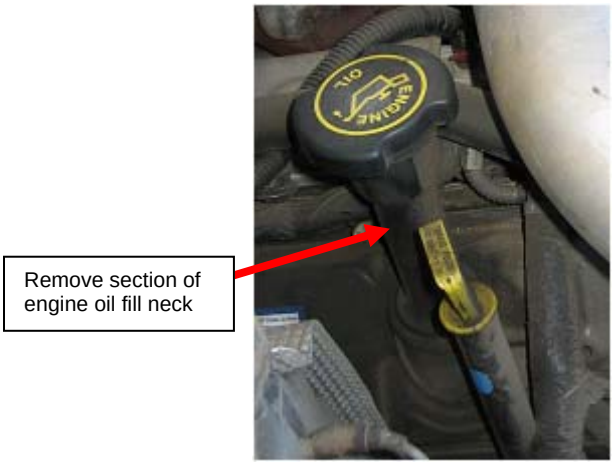
3.2.2. Once the primary alternator is removed, the battery connections must be relocated to the secondary alternator for vehicle battery charging.

4. Turbo Piping Rerouting and Oil Fill Neck Modification

4.1. To avoid interference with the cooling fan on the Powergain alternator, the turbo piping must be rerouted. Additionally, the oil fill neck must be lowered.

4.2. Shorten Oil Fill Neck

4.2.1. To provide clearance for rerouting the turbo tubing, the engine oil fill neck must be shortened.

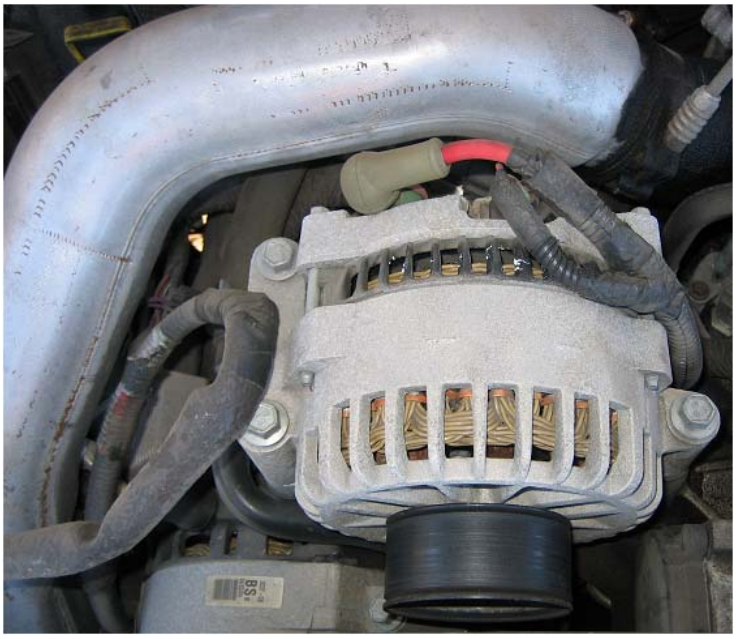


Oil Fill Prior to Shortening

4.2.2. Remove fill cap assembly. Remove fill neck extension and reinstall

Shortened Engine Oil Fill

4.3. After modifying the engine oil fill, the turbo piping must modified. The final routing must allow the piping to clear the Powergain alternator and to provide a clear intake air flow path for cooling fan. Rerouted piping must be adequately supported to prevent separation of joints and rubbing contact with movable components. (See photos below showing before and after rerouting.)



OEM Alternator and Turbo Pipe Routing

Powergain Alternator and Turbo Piping Rerouting

5. PowerGain Serpentine Belt Pulley Installation:

5.1. Because of the larger diameter of the Powergain alternator, a longer serpentine belt is required.

5.1.1. Prior to installing the new serpentine belt, use a straight edge or other appropriate alignment device, and check for alignment with sheaves on either side of alternator sheave. If misalignment is found, this must be addressed prior to proceeding. (Contact Powergain.)

5.2. Install PowerGain serpentine belt using installation tool. Mount belt on alternator and slip over alternator idler pulley last.

5.3. Dual Alternator Installations

5.3.1.1. Install OEM secondary alternator belt.

5.4. Replace all OEM panels at that were removed during alternator installation.

5.4.1. Reconnect OEM batteries in engine compartment.

5.5. DO NOT RUN ENGINE UNTIL CONNECTIONS TO CONTROL BOX ARE COMPLETE!

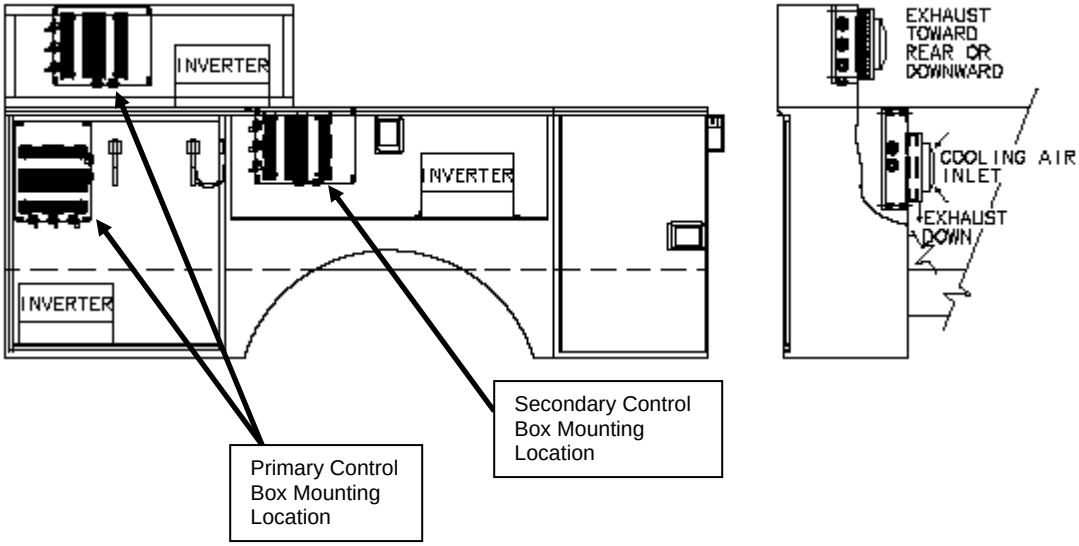
6. Powergain Controller Installation

6.1. The primary mounting location for the PowerGain Control Box is the front street side cabinet of the utility body. The Control Box can also be mounted in an auxiliary cabinet mounted over the street side front utility cabinet. (If these mounting locations are unavailable, a secondary mounting location in the street side horizontal cabinet on a 60” CA body may be used. Recommended to not have cables exceed 22’ length for optimum performance. If your installation requires longer cables, contact Powergain for guidance.

6.1.1. The three (3) phase cables are to be kept as short as possible between the PowerGain alternator and control box.

6.1.2. **DO NOT** bundle the phase cables together. Bundling should only be done at supports point as necessary.

6.1.3. The following illustrates the Primary and Secondary mounting locations for a 60” CA body.



6.1.4. The Control Box may be oriented in any orientation without functional issues.

6.1.5. Cable Connections

6.1.5.1. Phase cable (orange color sheathing SAE Std. J1673) connections MUST be protected from inadvertent contact. (High voltage danger.) Be sure cable connection boots are properly installed to protect these connections.

6.1.5.1.1. The Phase cables must be protected from damage inside the cabinets. Cables carry high voltage and amperage loads!

6.1.5.2. All other cable connections must be protected from inadvertent contact. This may be done using flexible cable lug covers.

6.1.5.2.1. All other cables must be protected from damage inside the cabinets. It is suggested that a removable metal “hat section” be used to protect cable routing.

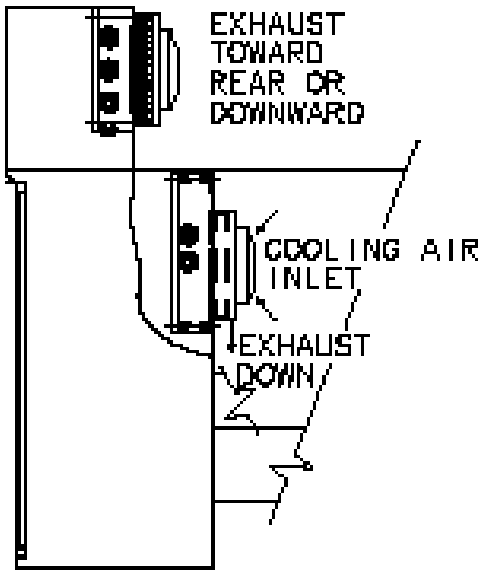
6.1.5.3. To facilitate routing, 90 degree cable lugs may be used. (See Thomas and Betts P/N 54142UB 90 degree lug for #2 AWG cables or equal.)

6.1.6. The Control Box may be mounted in two different methods.

6.1.6.1. METHOD 1. The easiest method is to cut an opening in the cabinet to allow the heat sink on the control box to fit through. The back wall of the control box can then be mounted to the cabinet wall using drilled and tapped holes in the bottom of the control box housing. The interface between the control box and the cabinet wall must be sealed using a high temperature silicone gasket material. (See figure below)

6.1.6.2. Once the control box has been mounted, the “hat section” supporting the cooling fan is to be mounted to the outside of the cabinet. This ‘hat section” covers the top and all but one side of the heat sink. The open exhaust side should be facing downward and be align with the heat sink fins. The cooling fan is mounted over the round opening on the top of the heat sink.

6.1.6.3. The cooling fan must be protected from damage by installing a protective metal ring around the outside of the fan. The ring should be covered with expanded metal. This ring assembly must be easily removable for servicing fan.



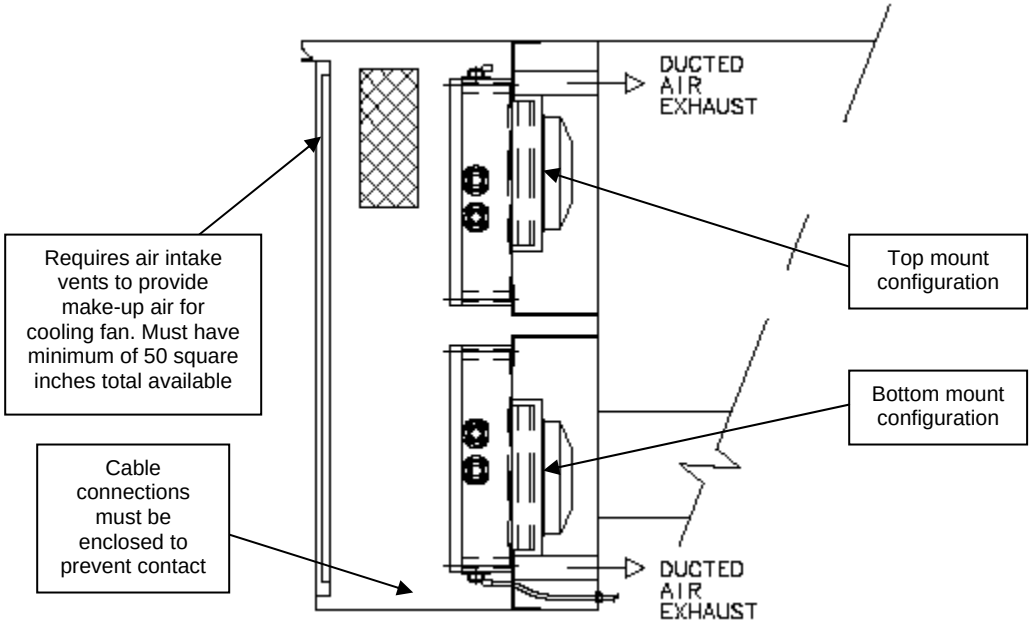
“Thru the Wall” Control Box Mounting

6.1.6.3.1. The control box fan power cable must be routed through the body wall. Use a properly sized grommet to protect the cable as it passes through the cabinet wall.

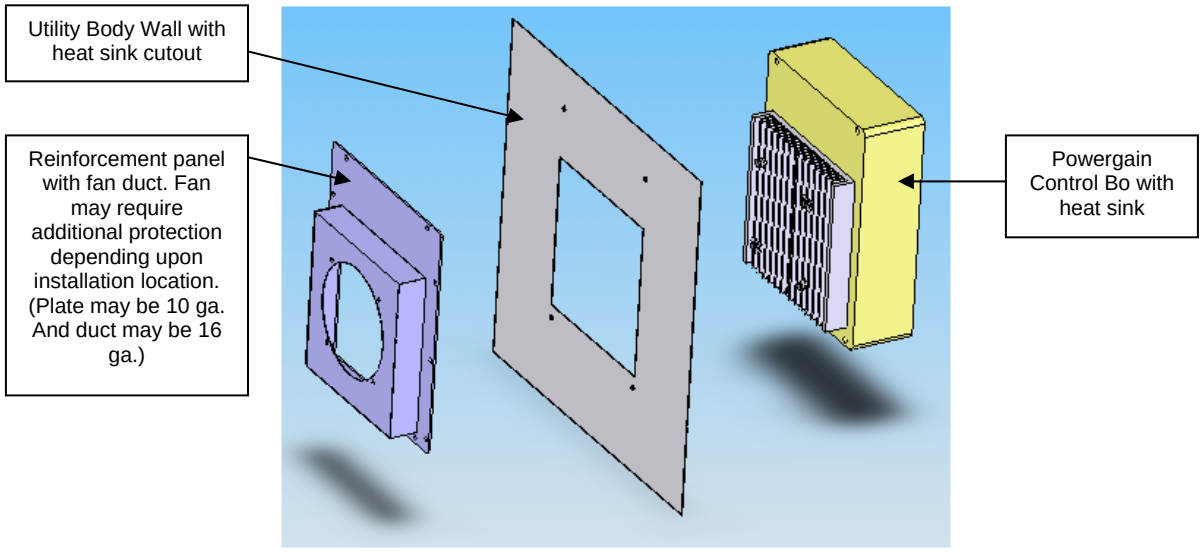
6.1.6.4. METHOD 2. This involves mounting the control box completely inside the cabinet and ducting the heated exhaust air away from the cabinet. This can be done anywhere there is sufficient space. The following illustration shows a top and bottom configuration in the front cabinet. The critical factor is to have enough internal clearance in ducting to prevent air flow restriction.

6.1.6.4.1. The cabinet must be vented to allow sufficient make-up air for the cooling fan inside the cabinet. A minimum of 50 square inches open area must be available.

6.1.6.4.2. The control box cables must be protected from damage inside the cabinet. The Phase cable connections, orange colored, and the 12 VDC cables must be protected by rubber cable boots.



Internal Control Box mounting configurations



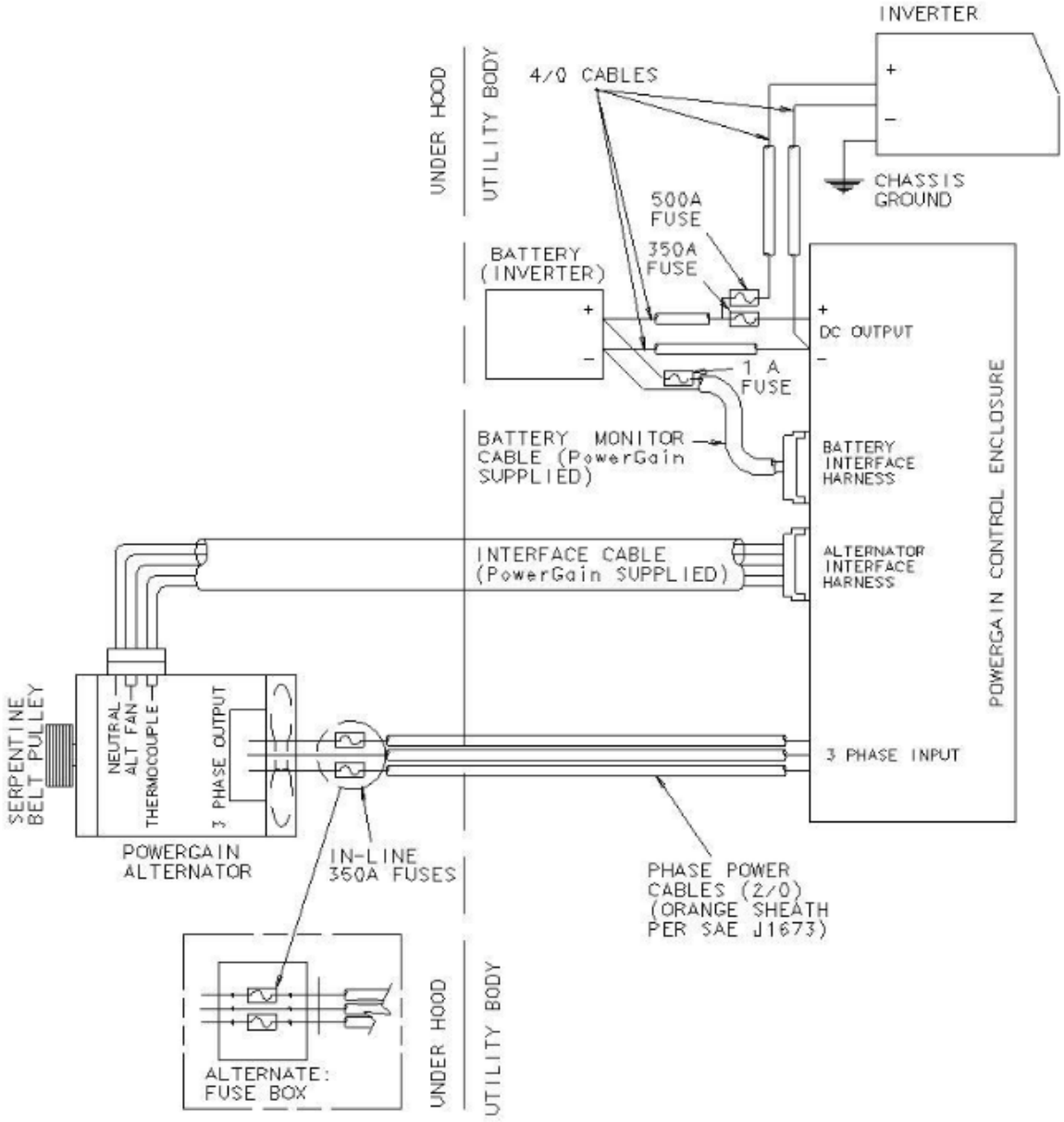
Typical Thru-Wall Body Mounting Configuration

6.1.6.5. All cables entering the cabinet must be protected by grommets as they pass through the cabinet walls.

7. Wiring Installation

The following diagram illustrates the overall component arrangement of the Powergain electrical components for an installation with an inverter. This diagram will be referenced throughout the electrical system installation process.

Powergain Parallel System Overall Wiring Arrangement for Utility Body Installation with Inverter



If the Powergain alternator is the primary alternator, the 2/0 cables must be routed from the control box back to the vehicle batteries.

7.1. Prior to final electrical wiring installation, the wiring routing must be determined.

7.1.1. Cable Routing Considerations:

Cable Routing

Give careful consideration to the routing of cabling such that the cabling is not damaged due to heat, vibration, moving parts or is susceptible to snagging by road debris. Consider the following during cable installation:

- Route wires inside channels where possible. Utilize the inside of the frame rails and chassis cross members for routing and protecting cables.
- Do not route wires near moving parts. Care must be taken routing cables over or near the driveshaft. If routing requires crossing the chassis centerline, either route the cables over the transmission housing or route through a structure that will shield the cables in the event of driveline failure.
- Cabling should be protected from abrasion.
- Cabling should not be bent to a radius tighter than four times the diameter of the cable.
- Do not route wires near heat producing devices or exhaust system.
- DC cables should run close together their entire lengths between the inverter and the battery. As the distance between the wires increases, the performance of the inverter decreases and the electromagnetic interference (EMI) increases. Run these cables directly in parallel.
- Phase cables should not be bundled over their entire length. Only bundle cables at support attachment points. Bundling increases the heat generated by the cables and must be avoided.
- Protect wiring with tubing or sleeves.
- Use black nylon wire ties to secure wiring. Select size and configuration based on wire or harness weight and size.

7.2. Phase power cables are recommended to be no more than 22 feet.

7.3. Required Cables:

7.3.1. DC Output Cables (Customer supplied)

7.3.1.1. Cable material is to be 4/0 flexible, stranded power cord such as SO, SOJ or SOW type.

7.3.1.2. Cable length as required.

7.3.1.3. Connectors: Molex BCL-40516-PL heavy duty connector for 5/16” stud or equal.

7.3.1.4. All connectors must be hydraulically crimped for proper function.

7.3.2. Interface Harness (Supplied by Powergain.)

7.3.3. 3 Phase Input/Output Cables (Orange)

7.3.3.1. Cable material: 2/0 flexible stranded cables with orange outer sheathing per SAE J1673. (Note: Carol Super Vu-tron welding cable (orange) 2/0 AWG - extra flex 600v oil resistant -50/+90C)

7.3.3.1.1. Cables include the short jumper cables between the alternator terminal connections and the inline 350A fuses. Fuses are connected using 5/16” hex head cap screws. (An alternative method is to locate a junction box as close as possible to the alternator and connect to mounted fuses inside the box. Box must be labeled for high voltage as on the alternator and control box.)

7.3.3.2. Cable length 20 feet each. If used, jumper cables are 6” long.

7.3.3.3. Connectors: Molex BCL-20516-PL heavy duty connector with 5/16” mounting hole or equal. Based upon routing requirements, a Thomas and Betts P/N 54142UB 90 degree lug for #2 AWG cables or equal lug may be used.)

7.3.3.3.1. Connectors must be hydraulically crimped for proper function.

7.3.4. Inverter Connections: See inverter manufactures instructions.

7.3.4.1. Cable material is to be 4/0 flexible stranded power cord such as SO, SOJ or SOW type.

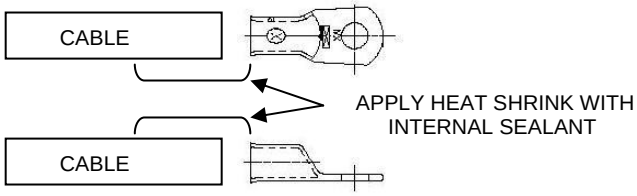
7.3.4.2. Connectors, wiring and installation: Per inverter manufactures instructions. (DO NOT MOUNT INVERTER AND POWERGAIN CONTROL BOX IN COMPARTMENT WITH BATTERY OR ANY FLAMABLE GAS STORAGE.)

7.3.5. Battery monitor wiring: 16 gauge sheaved wire cut to length.

7.3.6. Battery Cables: 2/0 cables connected with crimp battery terminals and

Molex BCL-40516-PL heavy duty connector for 5/16” stud or equal for connections to fuse box and control box.

7.4. Due to the high amperage, lugs must be ‘hydraulically crimped’. It is critical to the successful operation of the Powergain system that this operation is to be done correctly.

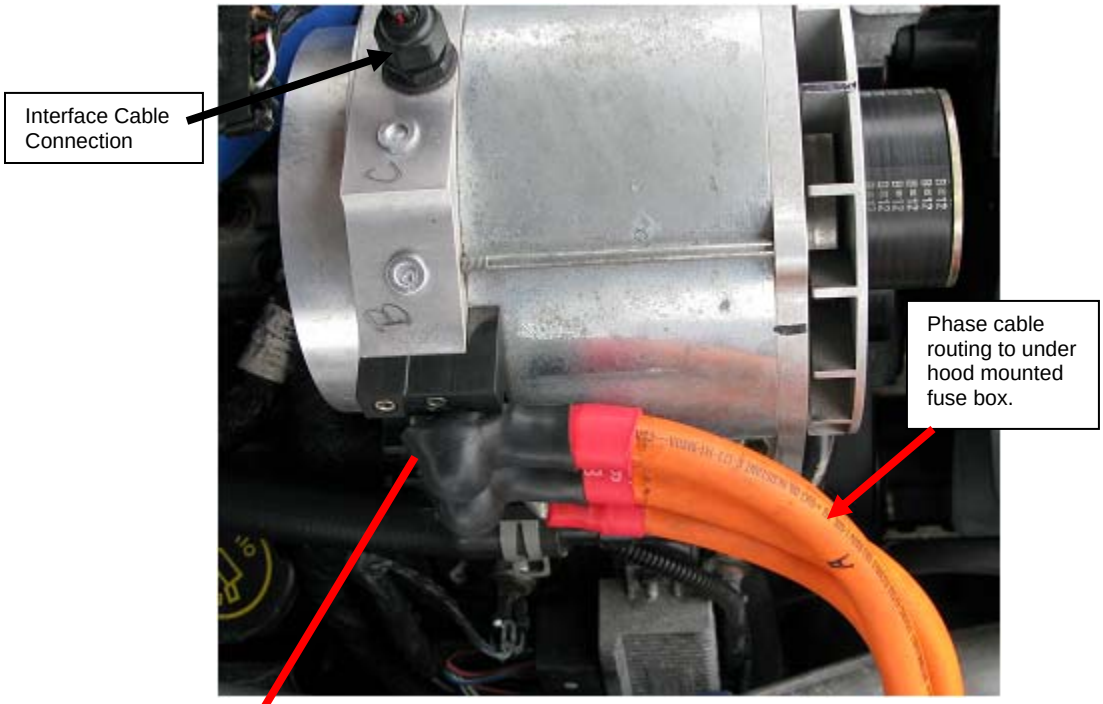


7.5. After crimping, apply heat shrink to the cable ends. Cover all exposed metal surfaces to prevent inadvertent contact. Heat shrink material must be “double shrink” configuration to encapsulate end or fuses.

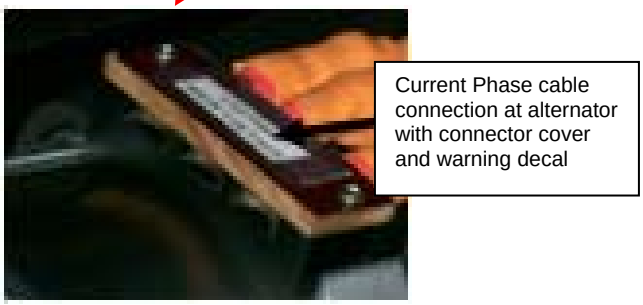
7.5.1. Polish all connection lugs and fuse connection surfaces with 1000 grit abrasive to produce smooth interface surface. Coat connections with “Cool-Amp” Silver plating power prior to assembly. (Cool-Amp Conducto-Lube Company)

7.6. Apply loom to phase power cable as required to protect from abrasion or heat where necessary. Do not bundle or loom except for specific problem areas. If possible, use orange colored loom.

7.7. Connect the 3 phase input cables and Powergain Interface Harness to the alternator. Cover connectors with cover plate to prevent inadvertent contact with terminals. Install high voltage warning label on cover.



Powergain Alternator Electrical Connections



Phase Cable Connection at Alternator

7.8. Final tighten all cable clamps. Double check cable routing to avoid sharp corners and edges, heat sources and verify that enough cable slack is available for engine torque and movement.

7.9. Connect Phase cables, battery cables and Powergain interface cable to the control box in the utility cabinet.

7.9.1. Be sure that terminals are properly tightened and that connectors are protected from inadvertent contact.

7.9.2. Check that all cables are strain relieved.

8. Start up of PowerGain system.

8.1. Check all wiring connections for proper installation.

8.1.1. All threaded connections must be tight

8.1.2. All connecting lugs must either be covered with heat shrink or boots.

8.1.3. All Inverter connections are made according to manufactures instructions.

8.1.4. Check for routing and possible abrasion. Cables must have slack to accommodate movement.

8.2. Check serpentine belt alignment.

8.3. Check all idler sheave attachments.

8.4. With an observer watching the engine compartment from a safe angle, bump the engine several times to verify belt alignment and alternator operation.

8.4.1. Correct problems as required.

8.5. With inverter turned off, start the engine and run at idle. (Operator in chassis cab must control engine operation until proper operation is confirmed.)

8.6. Check for proper operation of Powergain alternator system per attached testing instructions.

8.6.1. Correct problems as required.

9. Installation is complete and ready for operation.