SERVICE MANUAL

1995/EARLY1996 SOLECTRIA FORCE

AUTOMATIC DRIVE LEAD ACID ELECTRIC VEHICLE
4-DOOR SEDAN

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FORWARD

This manual has been prepared as a supplement to the service information contained in the Geo® Service Manual. Information contained in this manual is based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

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If additional service information is needed or to order replacement parts, please call 508-658-2231 or fax 508-658-3224, Monday- Friday 9AM to 5PM EST.

INTRODUCTION

This manual is written specifically for the 1995/ early 1996 Force vehicle. This section contains a description of the Solectria Force vehicle and general service guidelines. Please read **Standard Practices For Working On or Near High Voltage Systems (page 6),** before servicing any vehicle. For operating information, refer to the Solectria Force Owners Manual.

Basic Vehicle Layout

The MY1995-early 1996 Solectria Force operates on 156 V nominal DC system. The exact voltage level of the battery in any Force depends on the vehicle's state-of-charge. The battery modules are split between a front and a rear battery box, located under the hood in the motor compartment and in the trunk.

A high-amperage fuse is located in both front and rear battery boxes. The high voltage system is completely isolated from the vehicle chassis. The chassis is not electrically connected to the positive or negative side of the battery. (The chassis is grounded to the AC ground whenever the vehicle is plugged in to be charged.) In spite of these safety features, there is a remote possibility that a closed circuit could be formed as a result of a short circuit to the vehicle chassis. **Therefore, extreme care must be taken when handling any high voltage cables so as not to form a short circuit to the vehicle chassis or other potentially live wires.**

The Solectria electric drive system includes a 3-phase AC induction drive motor that is coupled to an automatic transmission. An associated motor controller receives electric power from a self-contained battery pack. The motor controller is located in the motor compartment on top of the front battery box. The controller receives high current, high voltage (156V) electricity directly from the battery and delivers variable frequency AC to the motor, located behind the front battery box. The motor compartment also contains the air conditioning system (if provided) and the DC/DC converter which supplies 12VDC to the vehicle's accessories.

The battery pack is recharged from any 110-120 VAC or 208-240VAC 60 Hz outlet with the BC1000µ battery charger or 208-240VAC 60 Hz outlet with the BC3300 battery charger. The charger(s) is located in the trunk on the driver's side of the vehicle. A secondary charger may also be located on the opposite side of the trunk. **All major components are electrically connected to the battery pack and have high voltage labels. Use due caution when servicing.**

Battery Types

All batteries used in Solectria vehicles are sealed, starved-electrolyte lead acid. The starved-electrolyte batteries will not spill significant amounts of electrolyte, even if the modules are broken in two. However, any clear fluid leaking from a Solectria vehicle should be treated as electrolyte with the potential for corrosion. Avoid contact with the skin or inhaling fumes. Wear acid/base resistant rubber gloves, rubber boots, and protective clothing and stay up-wind. Dilute the spill with large amounts of water. Calcium carbonate (baking soda) may also be used cautiously to neutralize any electrolyte spills.

Disabling the Vehicle

The Force is completely silent when it is not moving. The absence of noise or motors "running" does not indicate that the vehicle is disabled.

To secure the vehicle, the parking brake must be set by lifting the standard hand-operated brake lever between the front seats. Turn the tri-power switch to the *Off* position. (This switch is located on the dash to the right of the steering column in older models, and on the floor console starting with MY95 vehicles.) This provides additional security by turning the motor controller off. Turn the key *Off*, as you would in a conventional vehicle. Turning the key *Off* shuts the motor controller off, thereby disconnecting the motor, and disables most vehicle accessories. (Note: When the key is turned off and removed, the steering wheel will lock. To unlock the steering wheel, the key must be inserted and turned to the first *accessory* position).

The battery in the Force is completely isolated from the vehicle chassis to prevent the possibility of electrical shock or current leakage to the vehicle. Unless two separate and isolated locations of the high voltage system at different electrical potential are touched simultaneously, there is no shock hazard. Nevertheless, exposed electrical cables should be treated with caution, and assumed to carry high voltage regardless of the gauge of wire.

To disconnect all high voltage electricity from all auxiliary systems (such as air conditioning, heat, and the 12-volt DC-DC converter) disconnect the small, red one-cable Anderson accessory connector located between the large grey Anderson connector to controller and the high voltage fuse box on the passenger side, front strut tower. With this connector unplugged and the motor controller turned off (using the key or the tri-power switch), the electrical power of the vehicle is isolated to the battery boxes, the controller, the charger and the connector. All high voltage and low voltage power to the vehicle is thus disabled and no systems or accessories on the vehicle will operate except the charger. The charger can be disabled by disconnecting the small black one-pin Anderson connector under the fuse box.

Although turning the key to the *Off* position will disable the motor controller, the controller can also be disconnected manually, if necessary, by disconnecting the large grey 2-pin connector located on the upper transmission support beam. Note that each Solectria component under the hood and in the trunk may store electricity in capacitors for some time even after being disconnected from the battery. Therefore, exposed conductors should always be treated with caution.

In general, battery boxes should not be opened and electrical cables should never be cut in order to make the vehicle "safe". Following the procedure above for disabling the vehicle should make the vehicle "safe" in virtually all circumstances. If there are indications that a battery module is smoldering or heating up after an accident or fire, cutting the interconnecting battery cable may eliminate the problem.

However, cutting cables presents additional safety problems, and is not recommended by Solectria. If you feel you must cut cables, always use electrically insulated cutters, cut only one cable at a time, be careful not touch any other part of the vehicle while making the cut, and always tape up both ends of the free wire after it is cut. Failure to follow these guidelines could lead to additional injuries. Vehicle fires should be sprayed with dry chemical or carbon dioxide foam (BC extinguishers).

ADDITIONAL SERVICE INFORMATION

The Geo Metro Service Manual GMP/95-M (not included with this manual but available through a local GEO dealership) should be consulted for service information on all parts of the Solectria Force, except for the following parts:

- Electric Drive Motor
- Solectria Automatic Transmission
- Batteries
- Solectria Electronic Components
- Heating and A/C system
- Solectria - installed wiring

GUIDELINES

1. The diagnostic connector for the Geo is inoperative on the Solectria Force.

2. Replacement rear coil springs must be ordered from Solectria Corporation. They are not interchangeable with the standard springs.

3. For safety, always remove the ignition key from the steering column before performing service work on the car. Unplug the vehicle from the wall outlet when changing out electronic components. **Solectria electronic components are not user serviceable. Any attempt to service components will void all warrantees.**

4. **Lifting vehicle**: If using a lift, use factory recommended lifting points (i.e. reinforced sections of rocker panel). If using a floor jack, position jack under center of reinforced section of sub-frame just forward of front battery box. **Do not position jack directly under battery box, or attempt to lift vehicle from any point on the battery box.** Using a floor jack at the rear, position floor jack under center reinforced section of sub-frame between lower control arms. Position jack stands safely under vehicle and apply emergency brake, or chock wheels

5. Disconnect all Solectria components which are connected to the batteries if you attempt any fast charging of the batteries or if using a non-Solectria battery charger unless installed by Solectria. FAILURE TO DO SO WILL VOID ALL WARRANTIES.

6. **Towing**: Solectria recommends towing the vehicle with the front wheels on a dolly or carrying it on flat bed truck. If you must tow with the front wheels on the ground, never leave the key in the ON position and the regen disable switch in the DRY position. **Regenerative breaking is enabled with the key ON and could cause the batteries to be severely overcharged**. Move the Regen switch to the SLIPPERY position.

7. **Washing**: Solectria does not recommend washing the vehicle in an automatic carwash.

STANDARD PRACTICES FOR WORKING ON OR NEAR HIGH VOLTAGE SYSTEMS

General Practices

1. Always use safety glasses. Remove all jewelry, such as watches, rings, bracelets, and necklaces.
2. No tools with exposed metal over 2" long are allowed in work area. Heat shrink metal tools over 2" long.
3. Keep all tools away from or below high voltage areas. Keep tools in a tool caddy, toolbox, pants pocket, or floor, not on vehicle surfaces.
4. Use a fender protector pad whenever working on the car.
5. Use only your right hand when working with high voltage. Put your left hand in your pocket. Never use jumper clips or touch anything to live plugs/batteries except when using a voltmeter.
6. Use a voltmeter to check voltages and polarity before making any connection of components. (Make sure voltmeter is not set to measure current, and leads are connected to correct positive and negative jacks on meter.)
7. Unplug the red, 1-pin Anderson accessory connector before removing a live device. (Leave a note on the amp-hr counter with the reading before disconnecting it, and check the meter display for power after disconnecting it. Always unplug vehicle from wall outlet.
8. Do not use fuses to connect or disconnect accessories. If you are installing an air conditioner controller or fuse, for example, follow these steps:

    - check the amp-hr counter
    - disconnect 110VAC or 220VAC charging cord (gas cap) or other charger
    - put a post-it note on the meter with the reading
    - disconnect the red 1-pin Anderson accessory connector
    - verify that the amp-hr counter has no power (no display)
    - install the controller or fuse
    - reattach the red connector

9. Always work on only one battery terminal at a time. Never allow another person to touch any other part of the battery pack while you are working on it. ONE PERSON ONLY!!
10. Do not use any piece of test equipment unless you have been trained and you fully understand and accept its operation. UNDER NO CIRCUMSTANCES SHOULD TESTING RIGS OR USE OF THEM DISOBEY ANY OF THE ABOVE 9 RULES!

DRIVE MOTOR TRANSMISSION ASSEMBLY

MOTOR AND TRANSMISSION

The drive motor is a 3-phase AC induction motor, located in the rear of the engine compartment behind the battery box, and coupled to the transmission. The motor and transmission are removed from the vehicle as a unit. There are no user serviceable parts in the motor; however the bearings should be checked every 50,000 miles. Please notify Solectria when this mileage is reached.

The automatic transmission is a single-speed, gear reduction drive with an integral differential. Check the transmission oil level at every periodic maintenance.

Checking Transmission Oil Level

1. Turn ignition key off and set emergency brake. To check oil level look at the sight glass located on the drivers side of the transmission forward of the half shaft. The oil level should be visible in the glass. The vehicle must be level to get an accurate reading.

2. If the sight glass is not half full, it is necessary to add transmission oil. To add transmission oil, remove filler plug. Filler plug is located at the top of the transmission just below the vent.

3. Using a **clean** funnel add oil until fluid level fills half the sight glass. Use Dextron III ATF oil. Reinstall filler plug.

Changing Transmission Oil

After the first 1,000 miles of operation and every two years or 15,000 miles thereafter, replace the transmission oil.

It is preferable to drive the vehicle first to warm the gearbox. Raise the vehicle following the lifting instructions under **Additional Service Information on page 5**.

1. Turn ignition key off and set emergency brake. The belly pan must be removed in order to access the transmission drain plug. Remove the two 5/16 bolts at the belly pan bracket. Snip the two tie-wraps at each forward corner. Remove the Phillips screw at the center bottom bracket on the front bumper. Slide the belly pan backward and out while pulling down on the lower bumper lip.

2. Put a drain pan under the transmission, then remove the drain plug located on the bottom of the transmission to drain the oil.

3. Clean drain plug. Solectria recommends using LOCKTITE Pneumatic Hydraulic Seal 545 then re-install the drain plug. Torque to 15ft. lbs. DO NOT OVERTIGHTEN.

4. To add transmission oil, remove filler plug. Filler plug is located at the top of the transmission just below the vent. Using a clean funnel add approximately 1 quart of Dexron III ATF.

NOTE

Disregard the instructions in the owner's manual regarding use of any other type of oil in the transmission.

6. Reinstall filler plug and check for leaks. Reinstall belly pan with new tie-wraps.

Replacement of Drive Motor Transmission Assembly

1. Turn ignition key off and apply emergency brake.

2. Loosen the axle nuts at the front wheels. Raise the front of vehicle and support on stands so that the front suspension hangs free.

3. Remove the belly pan.

4. Drain the transmission oil. **See Changing Transmission Oil on page 7.**

5. Remove ball joint pinch bolts.

6. Loosen sway bar link retaining nuts from lower control arms.

7. Pull lower ball joints from steering knuckles.

8. Pry drive axles out of transmission using a large screw driver taking care to avoid damaging the seals.

9. Pull steering knuckles away from axles, and remove the axles from the vehicle.

10. Pull back the boot from the speedometer cable end where it enters the transmission: it is above the lower support beam at the bottom of the firewall. Remove the clip and pull the cable straight out.

11. Remove the vent tube from the hole in the frame rail under the master cylinder.

12. Remove the controller from the vehicle as outlined in the motor controller removal procedure.

13. Remove the grey motor speed sensor cable from the firewall by detaching the harness clamps located along firewall. Coil the wire harness and lay it on top of motor to keep it out of the way- it will be removed with the motor. A tie-wrap or rubber band can help make this procedure easier.

14. Unplug the two 12V wire harness connectors at the firewall from the motor cooling fan and the motor temperature sensor.

16. To remove the upper support beam, remove the two 1/4 - 20 bolts holding the remaining half of the large gray Anderson connector. Remove the center through bolt at the rubber motor mount. Remove two 3/8 bolts from each end of the beam. Remove the beam and the motor mount as a unit. The motor/transmission can lean on the front battery box.

17. Remove the two Phillips screws attaching the motor cooling fan housing to the motor and carefully tilt it up and off the motor. The drivetrain will not clear the fuse box with the fan on.

18. Re-insert the through bolt at the upper motor mount bracket and attach a suitable lifting device to it. Put slight tension on it. (Lifting fixture may be made or purchased from Solectria).
19. Underneath, remove the two 1/2 x 3 3/4 bolts connecting the lower support beam to the transmission "bat wings". Now carefully lift the drive train out of the vehicle.

Motor/Transmission Installation

Installation is the reverse of removal. The spacers on each lower through bolt are 3/4 inch thick. These spacers may be a stack of 6 washers or 3/4 inch round aluminum spacers.
Be sure to clean, seal and tighten the transmission drain plug before adding fluid (1 quart capacity).

When inserting the speedometer cable, align the tab on the speedometer cable end with slot in the speedometer drive gear. Push the speedometer cable in and insert the securing clip in the slot of the cable end. Do not secure the clip over the edge of the cable end. If this occurs it will bind and break the cable.

BATTERY PACK

BATTERY PACK

The battery pack consists of 13 12-volt deep-cycle starved electrolyte lead acid batteries. The batteries are located in two boxes. There are five batteries located in the front battery box, and eight batteries located in the rear battery box. ***See Appendix B for front and rear battery box diagrams.***

IMPORTANT WARNING!

The battery electrolyte is a sulfuric acid paste. Even though the vehicle is equipped with sealed batteries, you should always wear safety goggles or a face shield and rubber gloves when servicing a battery. The batteries may carry acid on the surface of the battery which will damage clothing. Solectria recommends wearing a chemical apron.

Do not place tools in the battery box or in a place where they may fall into the battery box. A fire or explosion hazard may occur if a wrench or other metal object is placed inside a battery box. Wear safety glasses or face shield to protect eyes from flaming bits of molten metal. Maintain a set of insulated tools for battery work.

Keep casual observers and extra helping hands away from the battery terminals. If not wearing safety glasses, keep observers away from the vehicle.

****Refer to front of manual for additional safety precautions.****

To Gain Access to the Rear Battery Box

To gain access to the batteries, lower rear seat back and pull carpet and foam from the trunk floor. Remove 1/4 - 20 bolts from the rear battery box cover and lift it off.

To Gain Access to the Front Battery Box

If vehicle is equipped with A/C **the hose connections for the air conditioning unit must not be disconnected for this procedure**. The removal procedure is as follows:

1. Turn ignition key off and set emergency brake. Unplug the A/C drive motor.

2. Remove three 1/4 - 20 cap nuts from the air conditioning drive unit mounting plate.

3. Lay the A/C drive unit assembly upside down on the inner fender or front bumper. Be sure to use a piece of thick foam or heavy carpet, so as not to damage the vehicle.

4. Disconnect the main battery plug (large gray 2-wire Anderson connector) from the motor controller. Disconnect the 4-pin, 2 wire Molex connector to re-regen braking that runs along the Anderson connector.

5. If the vehicle is equipped with metal mesh over the red, white and blue motor power cable, remove it by cutting the two tie-wraps and unzipping the black zipper.

6. Disconnect the motor connector (large red, white and blue 3-wire connector) from the controller.

7. Remove the four 1/4 - 20 nuts at each corner at the motor controller.

8. Snip the tie-wraps at the harness junction near the drivers side strut tower and disconnect the 25 pin (ignition box) and 9 pin (motor speed sensor) connectors. The tie-wrap on the strut tower is a releasable and reusable tie-wrap.

9. Remove the controller and set it in a safe place. It should not be dropped or allowed to tip over.

10. Remove the 1/4 - 20 bolts on the perimeter of the battery box cover and lift it off: To remove, bend along the long dimension, then "roll" out from under hood by holding cover while it is slightly bent. The battery box cover is fairly flexible.

Checking Battery Condition

If the range performance of the car following a full recharge has been declining, perform the following check: Recharge the batteries completely **(Check that the charger is operating correctly. See definition of Fully Charged on page 12.)** and drive the vehicle at least 25 miles in *ECONOMY* mode, or until the car will not maintain 30 mph on a level road. Park the car and place selector in *OFF*, set the emergency brake, leave key on and turn on the lights, heater and fan. Quickly open the battery compartments (following above directions).* Number each battery according to the Front Battery and Rear Battery diagrams. Check each battery's voltage with a reliable voltmeter while keeping the accessories on. Record these numbers on a chart. **(See Battery Discharge Test Sheet).** Any battery that tests less than 10.5 volts before reaching 45 amp hours should be replaced. You should stop the test when 4 of the batteries are below 10.5 volts.

* Feel the batteries in each box. They should be at room temperature or slightly above room temperature. If the vehicle has been parked outside in cold weather and properly charged, yet the batteries in one or both boxes feel cold, the vehicle may have low range. The battery thermal management system must be evaluated at this point.

IMPORTANT WARNING!

FAILURE TO OBSERVE THE FOLLOWING INSTRUCTIONS MAY DAMAGE NEW BATTERIES

After locating the bad battery or batteries, mark these with a waterproof marker (to identify the bad ones you can write on the battery the mileage, date and reading on the amp-hour meter when the voltage dropped below 10.5 Volts). DO NOT REMOVE THE BATTERIES AT THIS TIME!!!

Place the insulating foam and covers back on the battery boxes to maintain a temperature that the charger will recognize as valid. Completely recharge the entire battery pack first, before removing the bad batteries. Once the whole pack has been completely recharged, you can remove the bad batteries and replace with new FULLY charged one(s). It is very important to make sure the battery pack is fully charged before removing or installing new charged batteries. This ensures that all batteries are at the same level of charge when they are used and prevents battery imbalance. PLEASE BE SURE THAT ALL SERVICE PERSONNEL RECEIVE THIS NOTICE BEFORE BEGINNING WORK ON BATTERIES!

DEFINITION

Fully charged: The time needed to achieve a fully charged condition is dependent on the type of battery charger and the age of the battery pack. Sonnenshein batteries achieve a full charge once the battery charger has supplied the batteries with 10% overcharge. This means that the Amp-hour meter should read a negative value corresponding to 10% of the Amp-hours obtained in the discharge test. For example:

Discharge test Amp-hour reading: 43Ah
The Amp-hour should display: -4.3 Ah
Calculation: 43 x (-0.10) = -4.3

Battery Removal

IMPORTANT WARNING!
ALWAYS FULLY RECHARGE BATTERY PACK BEFORE REMOVAL USING ON BOARD CHARGER

> **Batteries are connected in series for a total pack voltage of 156V. To avoid shock, use rubber insulating gloves and wear eye protection when handling battery terminals. Always work on only one terminal at a time. Never allow another person to touch a terminal at the same time as you. This will create a high voltage current through the body of the vehicle on which you are leaning. Use insulated hand tools. These can be made inexpensively using shrink wrap or electrical tape.**
>
> **The battery pack must be completely isolated from all other components BEFORE disconnecting any one battery terminal.**

1. **Unplug vehicle from wall outlet**. Disconnect 110VAC or 220VAC charging cord (gas cap).

2. **Unplug the 1-pin red Anderson accessory connector** between the fuse box and the large grey Anderson connector to the motor controller. This will cause the Amp-hour counter to go blank. **Document the reading on the Amp-hour counter (should be zero or a negative number).** It will also isolate all the auxiliary electrical components except the charger.

3. **Unplug the black one-pin Anderson connector** hidden underneath the fuse box. This will isolate the charger(s) on the negative side as they are connected directly to the battery pack on the positive side through an inline fuse in the rear battery box.

4. **Unplug the large grey Anderson connector** to the motor controller if it is still in the vehicle.

5. If any cable needs to be disconnected in order to remove any battery, it must be completely removed. Do not disconnect one end of a cable and leave the other end connected, except in the case of:

   a. the interconnect cable coming from the rear battery box to battery #5 in the front.
   b. the main cable from the fuse box to battery #1 in the front.
   c. the main positive cables to batteries #13 in the rear.
   d. the cable from the negative terminal of battery #6 in the rear.

For these wires, once they have been removed from the battery terminal, tape up the live ends carefully with electrical insulation tape.

6. For safety sake on all battery removal jobs, disconnect and remove a battery interconnect cable in rear battery pack (preferably the wires between batteries #6 and #7).

7. For protection in front battery box, first disconnect two short interconnect wires (between #1 and #2 and between #4 and #5).

8. If the car has air conditioning, be careful not to hit the condenser while removing batteries.

9. In the front battery box, to remove battery #1, battery #2 must be removed and the 'bad' battery must be slid to the position of #2 to be removed. If battery #5 is bad, battery #4 should be removed first. ***See Appendix B for front battery box diagram.***

10. Before connecting any terminals confirm the physical placement of the positive and negative terminals agree with the battery layout diagram and the polarity of each battery is correct. Once the defective batteries have been replaced, properly torque all terminals. **Proper torque is achieved by using two wrenches close together so as not to twist or apply any load to battery terminals.** Check the total pack voltage at the grey Anderson connector to the controller. Minimum voltage is 160-170 volts. Check also that the polarity is correct (the connector is stamped + and -). Make sure all tools have been removed from the battery compartment. Secure the battery box covers and reconnect the controller, charger(s) (black Anderson connector), and accessories (red Anderson connector) in that order. If the amp hour counter reads 100 instead of zero, disconnect the red Anderson connector. Wait a minute and try again. Plug the vehicle in to top off all batteries.

Note

When driving with new batteries they should be cycled gently. Draw no more than 150 Amps for 10 cycles using less than 20 Amp-hours. This can be achieved by driving the vehicle with the power selector switch in normal at all times with few exceptions. This will help condition the new batteries in the battery pack. Always plug the vehicle in to complete a full charging cycle whether it will be opportunity charged or fully charged. Solectria recommends that new batteries be fully cycled once for each 24 hour period.

Battery Box Fan Replacement

A battery box fan is located only in the rear battery box. Use the following procedure to remove and replace the battery box fan.

1. Turn ignition key off and set emergency brake. Unplug vehicle from wall outlet.

2. Fold down the car rear seat. Pull up the carpet and foam from the trunk floor.

3. Remove rear battery box cover.

4. Remove the foil tape which covers the fan at the center front of the battery box.

5. Remove the four Phillips machine screws which hold the fan in place. You can access these between battery #6 and #13.

6. Lift the fan out of the hole, snip the small harness tie, and unplug the connector.

Battery Box Fan Installation

Installation is the reserve of removal. Be sure to zip tie the harness to the fan body. Wiring of this fan is described in the rear battery box diagram. ***See Appendix B for rear battery box diagram.***

ELECTRONIC COMPONENTS

MOTOR CONTROLLER

The motor controller is located in the engine compartment on top of the front battery box. There are no user serviceable parts in the motor controller. The motor controller is air cooled therefore the cooling fans should be kept free of debris. ***See Appendix B for diagram.***

Removing Motor Controller

1. Turn ignition key off and apply emergency brake.

2. Disconnect the high voltage input to motor controller (large grey Anderson connector).

3. Disconnect regenerative braking signal connector (4 pin, 2 wire white Molex connector).

4. Snip the two tie-wraps on metal mesh over motor power connector (red, white and blue) and unzip mesh. Remove the tie-wraps at the tri-power output connector to motor and disconnect multi-colored connectors.

5. Snip the tie-wraps at the harness junctions near the drivers side strut tower and disconnect the 25 pin (ignition box) and 9 pin (motor speed sensor) connectors. The tie-wrap fixed to the side of the strut tower is reusable.

6. Remove the 1/4 - 20 nuts and washers that secure controller to rubber mounts and lift it off the mounts.

Installing Motor Controller

Installation is the reverse of removal. Be sure to replace any tie-wraps that were cut off. **Be sure the ignition key is still off and park brake is set.**

DC-DC CONVERTER

The DC-DC converter converts 156VDC to 12VDC for the vehicle's 12V accessories. It is located in the engine compartment on the drivers side behind the headlight assembly. Other than the external fuse there are no user serviceable parts. ***See Appendix B for diagram.***

DC-DC Converter Removal

1. Turn ignition key off and set emergency brake.

2. Disconnect 2 pin grey Anderson connector (12 volt).

3. Disconnect 2 pin Molex connector from the high voltage DC input.

4. Remove the 3/8" nut holding the end attached to the top cross member and the 6mm bolt attaching the bracket to the front hood panel. (If you have a different set up, please call Solectria Corporation at **(508)-658-2231** for instructions).

5. Remove component from vehicle.

DC-DC Converter Installation

Installation is the reverse of removal. Be sure replacement unit is correct voltage for vehicle.

Note: To avoid spark connect high voltage 2 pin Molex before the 12V grey Anderson connector. Be sure headlights and other 12V accessories are turned *Off*, and ignition key is *Off.*

AMP-HOUR COUNTER

The Amp-hour counter measures and integrates the current across the shunt in the high voltage fuse box when discharging and charging the battery pack. It consists of two modules connected by a 20 pin cable. The Amp-hour display is integral with the instrument cluster/speedometer assembly. The Amp-hour control box is located just left of the steering column over the lower dash panel. The control box and display may be removed from the vehicle individually. The Amp-hour control box and display are not user serviceable. ***See Appendix B for diagram.***

IMPORTANT WARNING!

Disconnect the red one-pin Anderson accessory connector which is located on the firewall between the fuse box and heater fan housing before unplugging the amp-hr counter or the harness. This will cause the Amp hour counter to go blank. It will also protect it from a power surge when plugging it back in. Make a note of the Amp hour counter reading before disconnecting. All electrical components will not operate now except for the battery charger. (110 or 220VAC charging connection should be disconnected from the vehicle.)

Upon reconnecting the 1-pin red Anderson accessory connector, the Amp-hour counter will reset to zero. Please note that this does not indicate the actual state-of-charge. When charging vehicle, the Amp-Hour counter may read negative numbers in excess of actual overcharge. The Amp-Hour counter will reset itself as soon as it senses a current draw after charging.

If the Amp-hr counter reads 100.00 or 99.99 after re-connecting the 1-pin red Anderson accessory connector, disconnect and wait at least 10 seconds before reconnecting.

Amp hour display removal

It is very unlikely that the Amp hour display will ever need replacement. Should it become necessary to remove the display, unplug 1-pin red Anderson accessory connector then follow the instructions in the GEO service manual for the instrument cluster removal. Contact Solectria for further assistance.

Amp hour box removal

1. Turn the ignition key off and set emergency brake. Unplug vehicle from the wall. **Unplug the 1-pin red Anderson accessory connector.** ***See Important Warning above.***

2. Remove three Phillips screws from the driver's side lower dash panel. Pull out on the upper left corner of the panel only, then slide it left to clear the small tab on the right.

3. Pull the white foam absorber straight out from the knee bolster plate (there are two push clips holding it). Undo the four Phillips screws and remove the plate. The Amp-hour control box is now visible to the left of the steering column (the ignition box is on the right).

4. Release the Amp hour box from its position (it is attached with Velcro) and pull it out just enough to carefully unplug the 20 pin connector which goes to the Amp-hour display and the 6 pin Molex connector which goes to the fuse box.

Installation of Amp hour Counter

Installation is the reverse of removal. Be sure the red Anderson accessory conector under the hood is still unplugged, the key is off, and the vehicle is unplugged from the wall.

BATTERY CHARGER

The vehicle is equipped with either one or two 1 kW battery charger(s) or one 3.3 kW battery charger. Each battery charger is located in the trunk.

IMPORTANT WARNING!

Disconnect all Solectria components which are connected to the batteries if you attempt any fast charging of the batteries. FAILURE TO DO SO WILL VOID ALL WARRANTIES. Contact Solectria if you are unsure which components may be affected.

1 kW Battery Charger removal

1. Turn ignition key off and set emergency brake. Unplug vehicle from the wall outlet.

2. Pull the back of rear seat forward.

3. Pull driver's side trunk carpet aside and remove foam from the side of the trunk floor.

4. Remove the two 1/4 - 20 bolts securing the charger bracket to the vehicle.

5. Move the charger out just enough to unplug the connections:
    a. AC input: large black three prong plug.
    b. DC output: 2 pin Molex (green and white wires).
    c. Temperature sensor: small 3 pin Molex (black, green and red wires at harness).
    d. Disable wires/ battery box fan: 4 pin Molex (purple and white wires at charger)

If the vehicle is equipped with two 1 kW battery chargers, follow the same procedure for both chargers. However, the passenger side charger may not have a disable wire, or it may have an additional thermal management interlock wire (2 pin international Molex black and white wires).

6. Remove the battery charger from the vehicle.

Installation of Battery Charger

Installation is reverse of removal. A small spark may occur when connecting the high voltage DC wires (green and white Molex). This is normal, but be sure the vehicle is unplugged from the wall as the spark will be even more intense and will damage the connector over time. Disconnecting the one-pin, black Anderson connector under the hood
(beneath the main high voltage fuse box) will completely eliminate the spark at the charger plugs.

3.3 kW Battery Charger Removal

1. Turn ignition key off and set emergency brake. Unplug vehicle from the wall outlet.

2. Pull back of rear seat forward.

3. Pull drivers side carpet aside and remove foam from trunk floor.

4. Remove battery charger interface box (with leds) from inner fender (it is attached with Velcro) and lay it aside. Disconnect the two temperature sensors, (2 pin mini-Molex green and black wires at harness), the disable wire (2 wire 4 pin Molex black and white wires at harness) and the charge-complete light wire (2 wire in 4 pin connector red and black wires at harness). Leave the large 18 pin cable attached to the charger.

5. Remove four 1/4 - 20 nuts at each corner of the charger, lift charger off of its rubber mounts and place it on the battery box cover. Locate and disconnect the remaining two electrical connections tucked behind the side-wall carpet:
    a. AC input: large black 3 prong plug.
    b. DC output: large red Anderson connector.

6. Remove charger and interface box as a unit.

Installation of 3.3 kW Battery Charger

Installation is the reverse of removal. Be sure the vehicle is unplugged from the wall.

Motor Speed Sensor

The motor speed sensor is located on the rear of the motor under the motor end plate. It provides the motor controller feedback on the direction and speed of the motor. To access the sensor, the motor cooling fan and shroud must be removed.

Testing Motor Sensor

1. Turn the key off and set the emergency brake.

2. Jack front of the vehicle and place it on jack stands.

3. Turn vehicle on, select the normal driving setting, and accelerate slowly up to maximum
   speed. Listen for motor vibrations or shudders: if a motor sensor is malfunctioning, it will shudder sharply at a particular speed (usually a high speed). DO NOT CONFUSE THIS WITH OUT OF BALANCE TIRES.

4. If the sensor is functioning properly, turn off the key, lower the vehicle, and test drive for the same symptoms. If adjustment or replacement is required proceed as follows:

Motor Speed Sensor Adjustment/ Replacement

1. Turn the ignition key off and set the emergency brake.

2. Disconnect the 9 pin connector between the controller and speed sensor . It is located near the driver's side strut tower.

3. Disconnect the DC input to controller (large gray Anderson Connector). Loosen the remaining half to the connector from the upper cross beam and place out of the way.

4. To remove the upper cross beam, remove the through bolt at the upper mount, then undo 2 bolts from each end of the beam and remove it from the vehicle. You will not need to support the motor, it can lean on the battery box.

5. Remove the 2 nuts holding the fuse box to the passenger side upper beam bracket and pull the fuse box down and forward out of the way.
Separate the motor cooling fan harness from the motor temperature sensor harness at the firewall.

6. Remove the 2 Philips machine screws (SAE) securing the fan housing to the motor and remove the fan and housing by tilting it up as you slide and lift it off the motor.

7. Remove the 3 small M4 (metric) screws from the motor cover plate. Carefully cut the seal between the plate and the motor with a razor blade while gently prying the plate with a small slotted screwdriver. Be extra careful near the sensor cable exit point from motor.

8. Inspect encoder wheel for dirt and sensor wear marks. Replace if damaged.

9. **To adjust:** Carefully remove silicone from inner slotted screw-head at circuit board and adjust as outlined later in this procedure.

10. **To replace:** Cut the small zip tie securing the gray harness to the holder and remove the small Phillips screw (metric) securing the holder and ground wire to the motor. Remove the silicone from the slotted screws at the circuit board. Loosen the outer screw almost all the way- there is a spacer between the board and the motor under this screw. Loosen the inner screw(metric) all the way while reaching behind the board to catch the small spring. Now, remove the outer screw all the way being careful to catch the spacer/ washer behind it. Please do not lose any hardware.

11. Snip the two black temperature sensor wires close to the board (1/8 - 1/4 inch), then undo the harness clamps at the firewall and remove the sensor from the vehicle.

Motor Speed Sensor Installation

1. Install a lock washer and a flat washer on outer shorter screw (metric) and insert through circuit board and 0.025 spacer/washer under board. Hold spacer on back of board while starting screw into motor two turns. Place spring behind board and hold it while inserting inner longer screw (metric) and flat washer through board and spring and into motor. Tighten down outer shorter screw all the way.

2. **To adjust**: Line up the speed sensor plate retaining screws parallel to the inner edge of the circuit board by turning the drive wheels slightly. Using a plastic non-abrasive feeler gauge to avoid damaging the sensor wheel, adjust inner screw so that the gap between the

center inner edge of the board itself and the sensor plate is 0.130 inches. Insert gauge only 1/4 inch from edge of board. Do not lift board with gauge.

3. Put a 1/8 inch dab of silicone sealant on each screw head and along outer edge of board to prevent movement.

4. Re-solder the temperature sensor wires if they were cut upon removal (they are not polarized). Be careful not to overheat the terminals or they may unsolder from the board. Install small harness holder and ground wire against the motor and tie-wrap harness to holder.

5. Apply a narrow bead of silicone sealant around the motor cover plate rim and install the cover plate. Be sure harness is seated in its notch.

6. The rest of the procedure is the reverse of removal. Be sure to install 2 tie-wraps at the red, white and blue connector before reinstalling metal zippon mesh. Run the test procedure and road test the vehicle to verify that the repair is complete.

AIR CONDITIONING CONTROLLER

The Air Conditioner (A/C) Controller is both a switching device and a voltage converter for the A/C compressor motor. It is located on the passenger side of the engine compartment near the fuse box. Other than the external fuse, there are no user serviceable parts. Before checking fuse, disconnect red one-pin Anderson connector near high voltage fuse box. Write down amp-hour counter number before disconnecting. When finished checking or replacing fuse, plug in red connector.

A/C Controller removal

1. Turn ignition key off and set emergency brake. Disconnect the red Anderson accessory connector between the fuse box and large grey Anderson connector to the motor controller. Make a note of the Amp-hour meter reading before disconnecting (the amp-hour meter will go blank).

2. Disconnect the high voltage input wire (2 pin Molex black and white wires), the output wire (2 pin heavy duty Molex to A/C motor green and white wires), the signal wire (red wire with male spade), and black ground wire with eyelet.

3. Remove the two Phillips machine screws which hold the controller to the passenger side upper beam bracket and remove it from the vehicle.

A/C Controller installation

Installation is the reverse of removal. Re-connect the red Anderson connector. If amp-hour counter reads 99 or 100, disconnect the red Anderson connector, wait 10 seconds and try again.

IGNITION BOX

The ignition box is an electronic device which turns the controller on with the key and provides other safety interlocks. It is located just right of the steering column over the lower dash panel. ***See Appendix B for diagram.***

Ignition Box removal

1. Turn ignition key off and set emergency brake. Unplug vehicle from the wall. Be sure parking brake is set.

2. Remove three Phillips screws from the driver's side lower dash panel. Pull out on the upper left corner of the panel only, then slide it left to clear the small tab on the right top corner.

3. Pull the white foam absorber straight out from the knee bolster plate (there are two push clips holding it). Undo the four Phillips screws and remove the plate. The ignition box is now visible to the right of the steering column (the Amp hour box is on the left).

4. Release the ignition box from its position (it's attached with Velcro) and pull it out just enough to unplug the following connections:

No particular order required

a. Regenerative Disable: 2 pin female Amp connector-2 yellow wires.
b. Charge Interlock: 4 pin female Molex connectors- 2 wires, white and blue.
c. Power Saver: 3 pin female Amp connector to tri-power switch, 3 wire- red, green and black in grey jacket.
d. Forward Reverse switch to tri-power switch: 3 pin male international Molex-3 wire red, green and black in grey jacket.
e. Neutral Interlock to tri-power switch: 2 pin female international Molex - orange and purple wires.
f. 12V ignition supply: round single pin male connector- white wire.
g. Ground wire: male spade connector, grey wire.
h. Controller cable: 25 pin male D-sub connector.
i. Pot box: 10 pin male header connector.

Ignition Box Installation

Installation is the reverse of removal.

ACCESSORIES

CABIN PREHEAT

The Preheat system is programmed to heat the cabin before the driver starts a trip. The Preheat system uses power from the battery pack, however it only works when the charger(s) are plugged into wall outlet. The charger(s) are typically able to replenish or supply enough energy used by the preheat system except for the Solectria Force sold with only one BC1000 charger. ***See Owners manual for operation and programming***.

Cabin Preheat removal

1. Turn ignition key off and set emergency brake. Unplug vehicle from wall outlet. . Remove three Phillips screws from the driver's side lower dash panel. Pull out on the upper left corner of the panel only, then slide it left to clear the small tab on the right.

2. Pull the white foam absorber straight out from the knee bolster plate (there are two push clips holding it). Undo the four Phillips screws and remove the plate.

3. Reach up and unscrew the 2 plastic thumb screws from the back of the cabin pre-heat computer.

4. Pull out the computer just enough to unplug the two connectors:
    a. 110V or 220V supply: 2 pin male international Molex(black and white wires).
    b. Signal to heater relay: 2 pin male amp connector (purple and red/white wires).

Cabin Preheat installation

Installation is the reverse of removal.

VACUUM PUMP AND RESERVOIR

Because there is no vacuum created by the electric motor, a 12V vacuum pump is utilized to supply vacuum to the brake booster. It is located beside the drivers side headlight. A vacuum reservoir is also used in the system. It is located under the hood at the passenger side inner fender.

Vacuum Pump Removal

The vacuum pump is removed complete with the bracket. To remove the vacuum pump assembly, separate the 1/4 - 20 bolt attached to the headlight housing and the 6 mm nut on the top of the assembly. Unplug the 12V wires and the vacuum hose, and slide it out over the front bumper.

Vacuum Pump Installation

Installation is the reverse of removal.

TRI-POWER SWITCH

The tri-power switch replaced the gear-shift lever. It is located on the center console.

Tri-Power Switch Removal

1. Turn key off and set emergency brake.

2. Unscrew the 6 screws securing the console. Lift out the console.

3. Remove the four 1/4" nuts holding the tri-power switch bracket to the floor and move it out in order to give yourself space to disconnect the following:

    a. 2 pin male mini-Molex (black wires) to Regen. relay (reverse lights)
    b. 3 pin female international Molex (red, black, and white with red stripe wires) to ignition box (forward/reverse signal)
    c. 2 wire, 3 pin male Amp connector (black and red wires) to ignition box (power saver signal)
    d. 2 pin male international Molex (purple wires) to ignition box (neutral interlock)

4. Unplug the 2 wire connector from the regen disable switch (yellow wires).

5. Follow the wires from the heat switch and disconnect;

    a. orange wire to heater relay
    b. grey ground eyelet under Torx screw at front of console plate
    c. red wire to heater fan "T" tap behind glove box

6. Remove unit from vehicle.

Tri-Power Switch Installation

Installation is the reverse of removal. Be sure the key is off. Also be sure to include all the wires that were under the same ground screw as the heater switch.

Appendix A

Parts List

Parts List- Force Automatic- For Maintenance Use Only
Not for Distribution

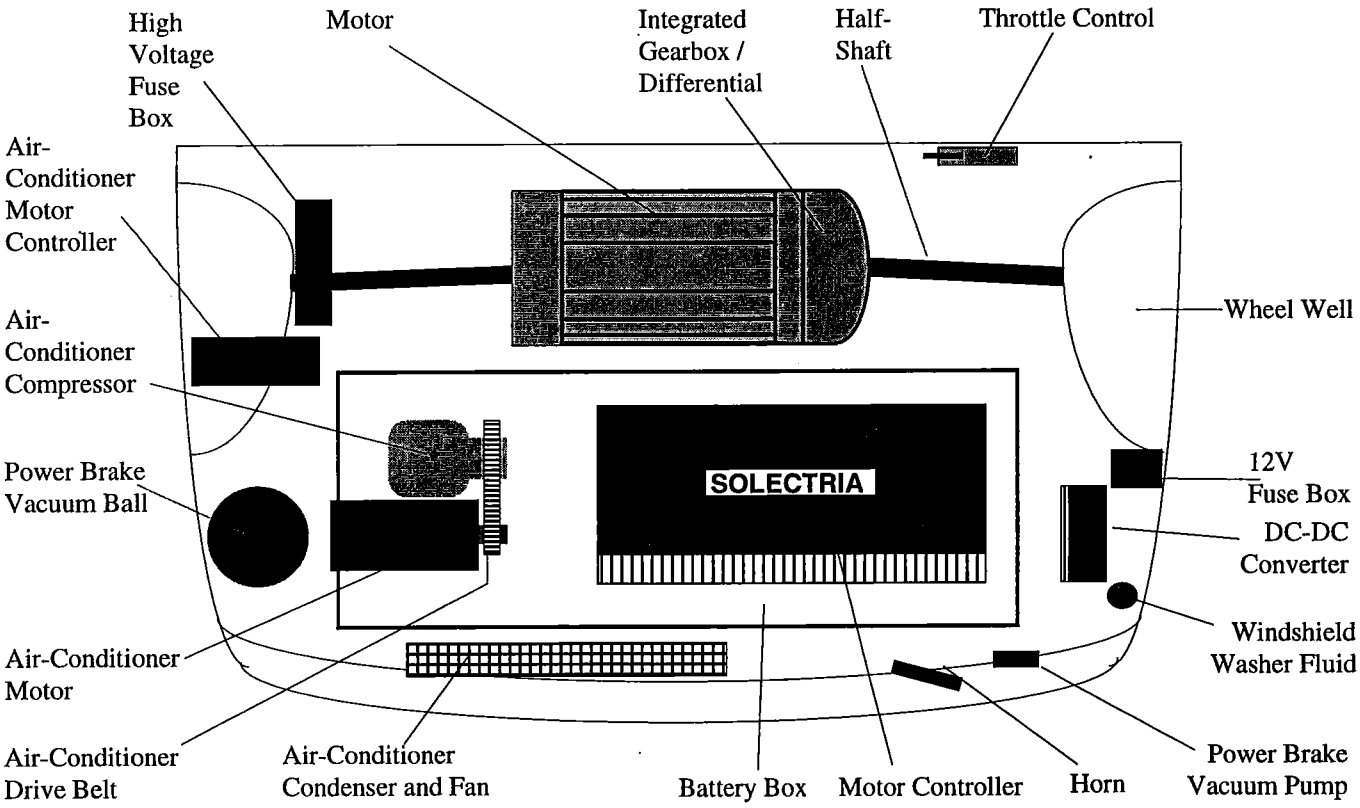
Part	Model	Supplier
Drive train		
Motor	ACgu20 Force(ACgux Jan96-Mar96)	Solectria
Controller	AC325 Force	Solectria
Transmission		
Automatic	AT1200 Force	Solectria
DC-DC Controller	DC-DC575 Force	Solectria
Heater	HSensor	Solectria
Element Relay	HRelay	Solectria
Vacuum Assist Brakes		
Canister	14078506	Solectria
Micro-Switch	Vswitch	Solectria
Pump	Vpump	Solectria
Air Conditioner		
Motor	BPM1	Solectria
Controller	DC20-156V A/C	Solectria
A/C Kit A/C Kit		Solectria
Belt	A/C Belt	Solectria
Pulley, motor side	A/C PUL-small	Solectria
Pulley, compressor	A/C PUL-large	Solectria
Accel/ Brake Control	ABC1 Force	Solectria
Amp Hour Counter	AH100	Solectria
Shunt	SH100	Solectria
Rear Exhaust Fan	RBBoxfan-4"	Solectria
Battery Charger		
Main Charger	BC1000µ, BC3300 or BC1600	Solectria
Super Charger	BC1000µ or BC1600	Solectria
Batteries	8G27	Sonnenschein
Ignition Box	IB Auto	Solectria
Cabin Preheat	PRE-2	Solectria
Tri-Power Switch	TPS-Force	Solectria

Appendix B

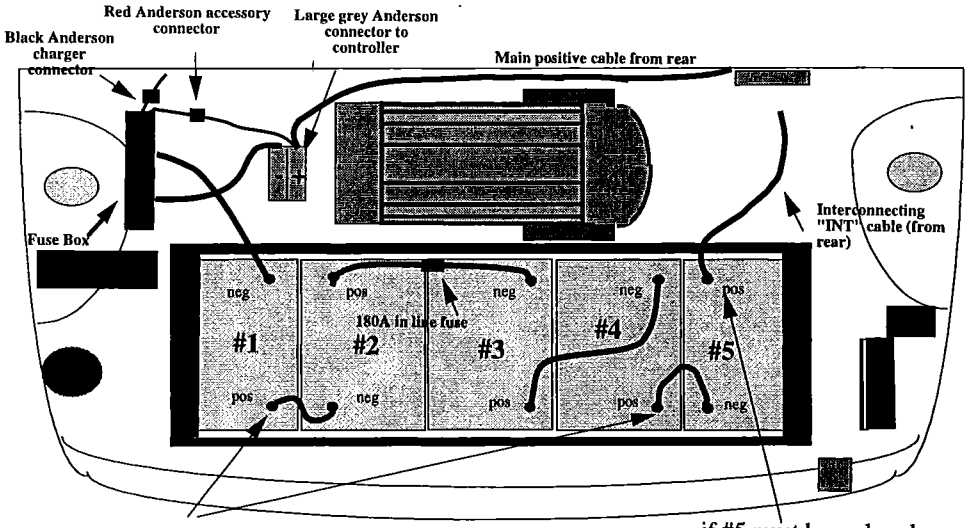
Layout and Wiring Diagrams

1995/EARLY 1996 SOLECTRIA FORCE

DIAGRAM OF EQUIPMENT UNDER THE HOOD



1995/EARLY 1996 FORCE FRONT BATTERY BOX

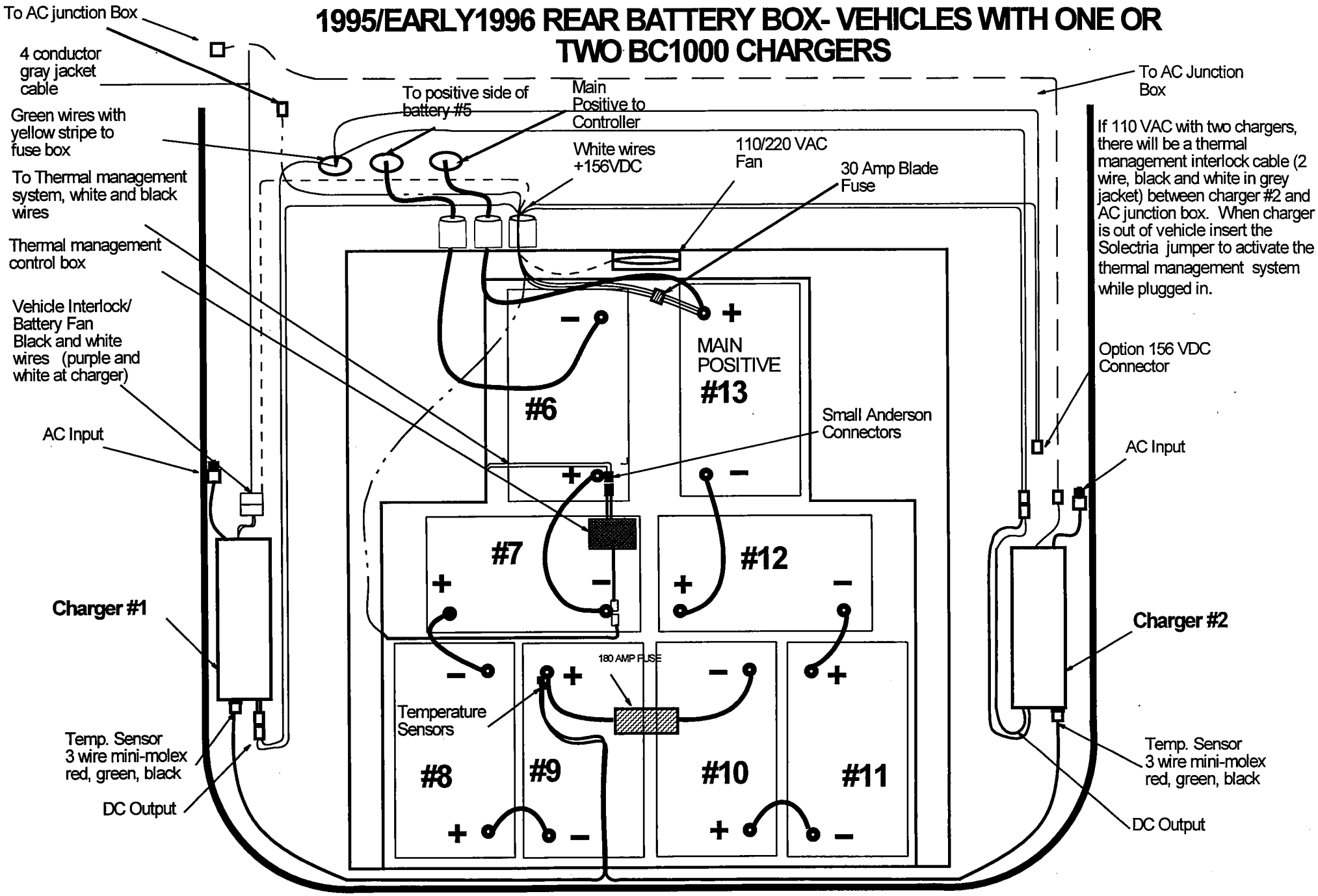


Remove these before beginning any work on front battery removal.

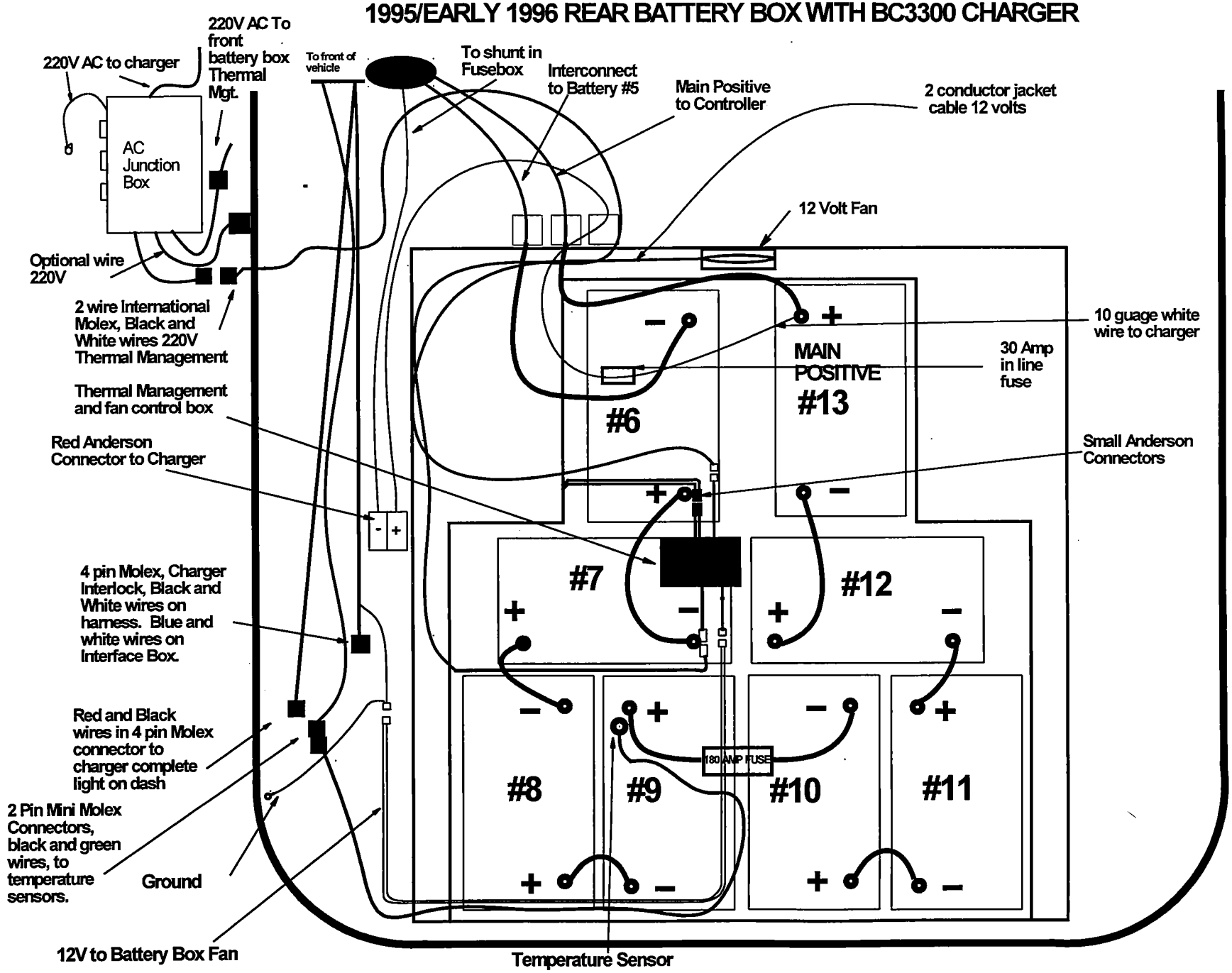
if #5 must be replaced, remove and tape up the cable on the positive terminal of #5 battery. #4 will have to be removed in order to replace #5.

WARNING: ALWAYS UNPLUG THE VEHICLE FROM 110-220VAC CHARGING SUPPLY-(GAS CAP). DISCONNECT THE RED ANDERSON ACCESSORY CONNECTOR, BLACK ANDERSON CHARGER CONNECTOR, AND THE GREY ANDERSON CONNECTOR TO CONTROLLER BEFORE REPLACING ANY BATTERY!

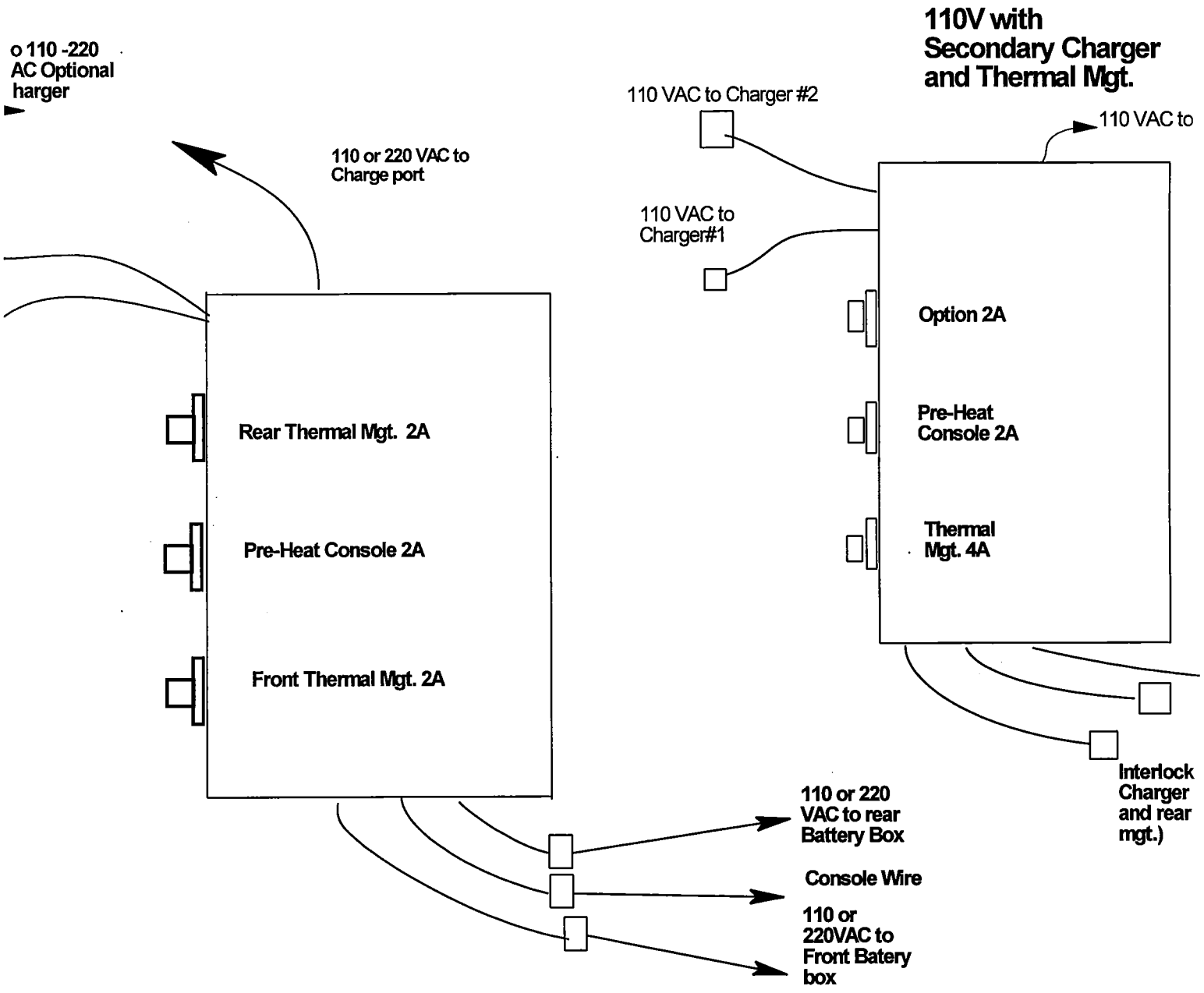
1995/EARLY1996 REAR BATTERY BOX- VEHICLES WITH ONE OR TWO BC1000 CHARGERS



1995/EARLY 1996 REAR BATTERY BOX WITH BC3300 CHARGER



1995/EARLY 1996 AC JUNCTION BOX



1995 FORCE AUTOMATIC IGNITION WIRING

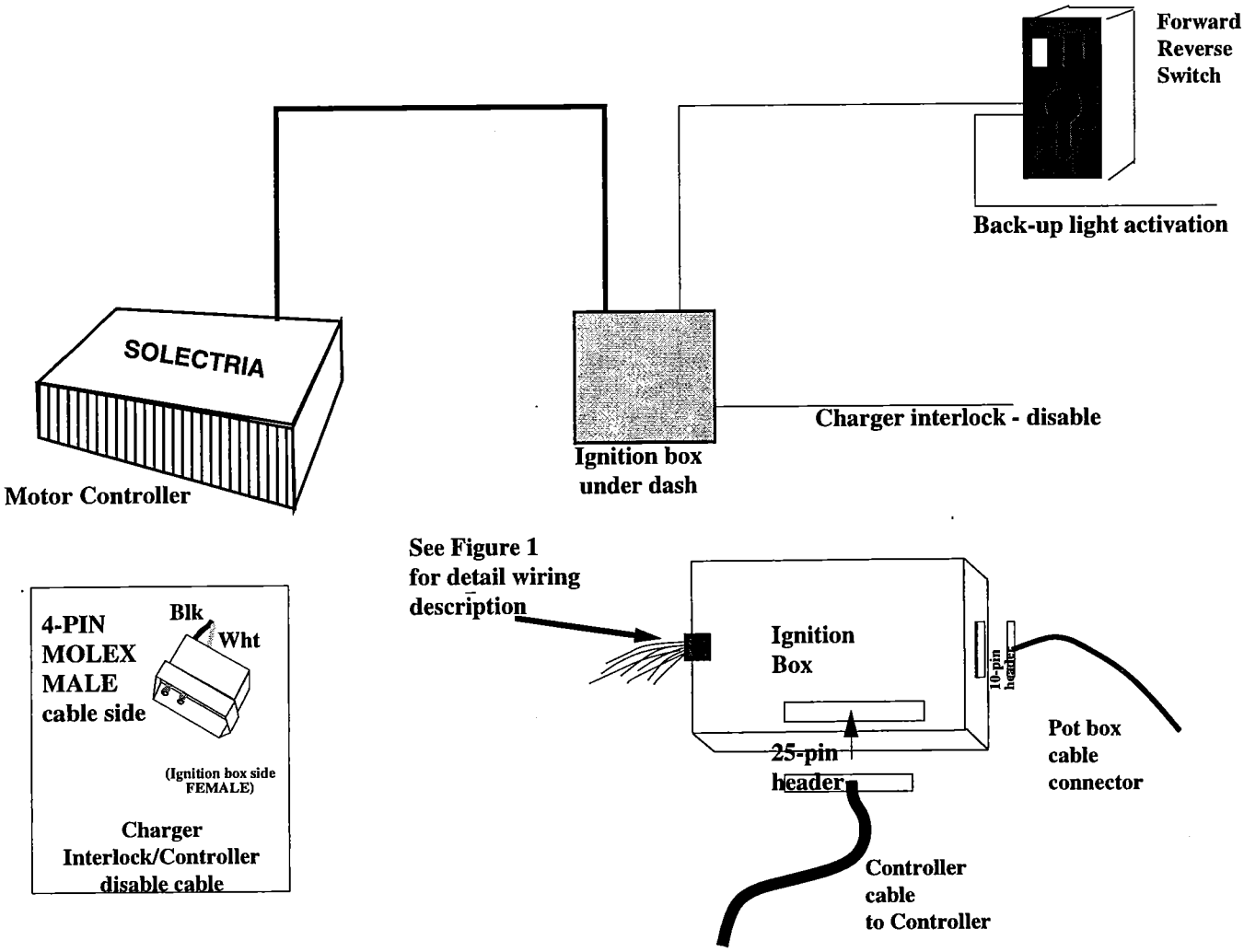
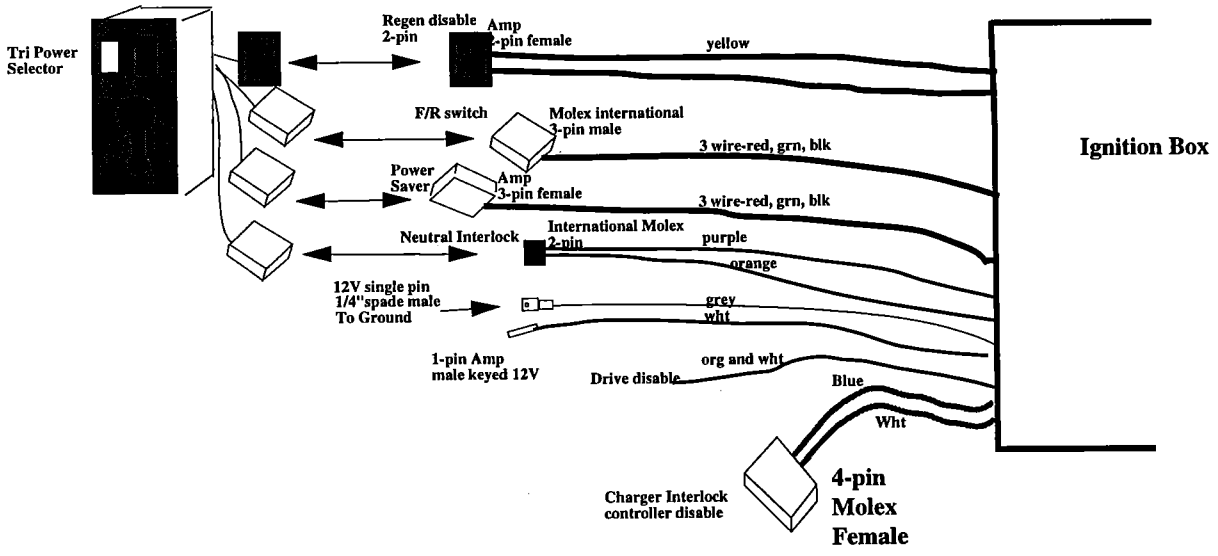
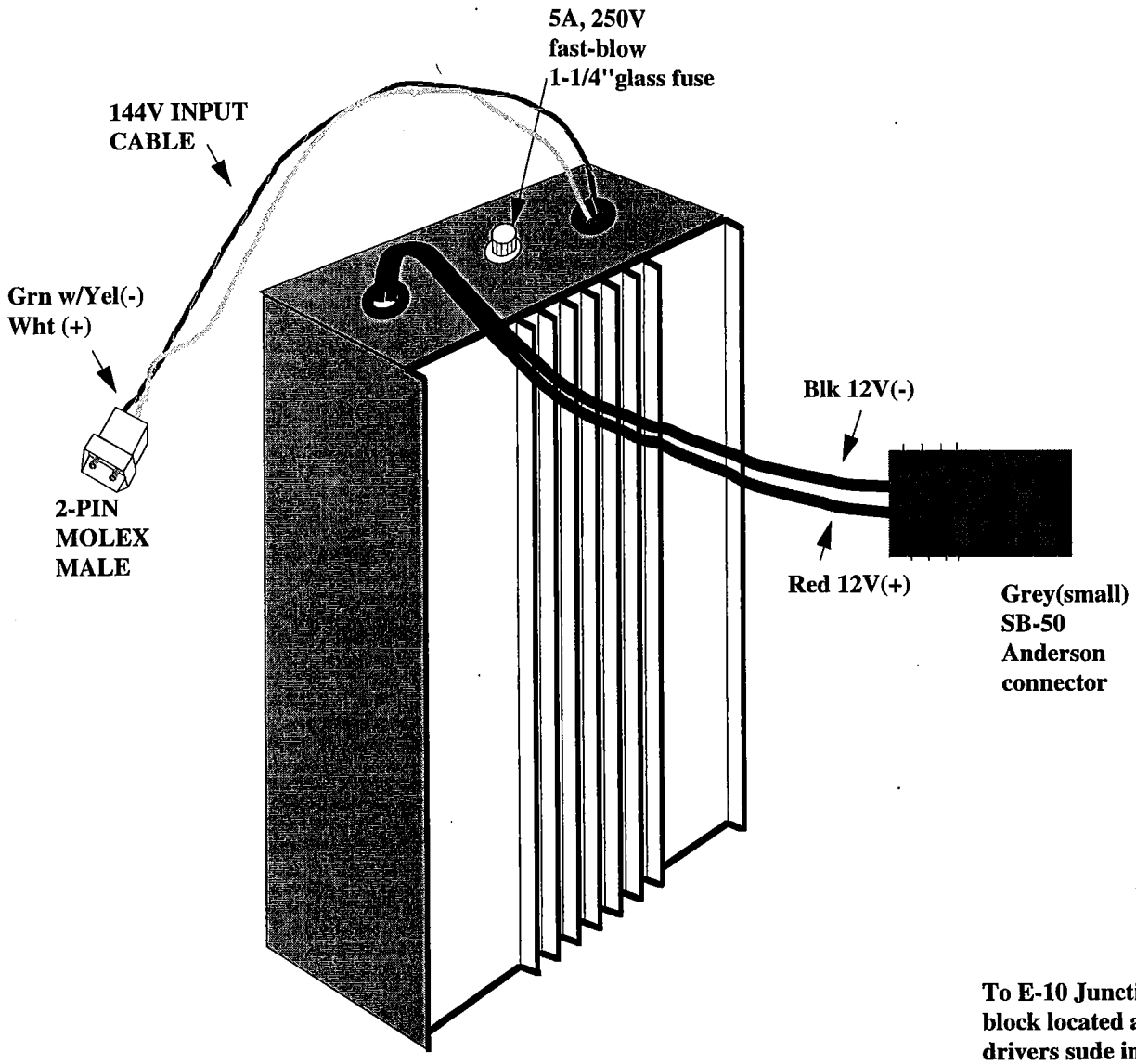
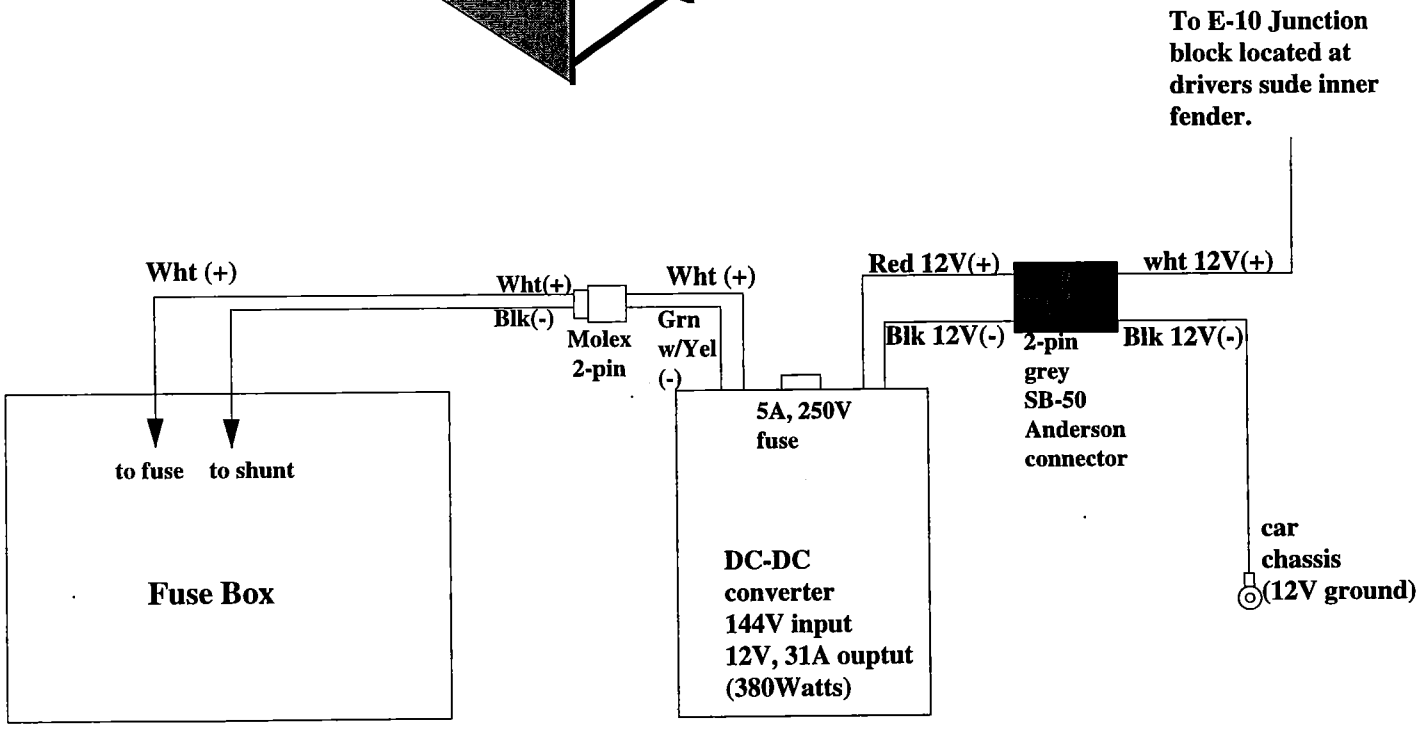


Figure 1

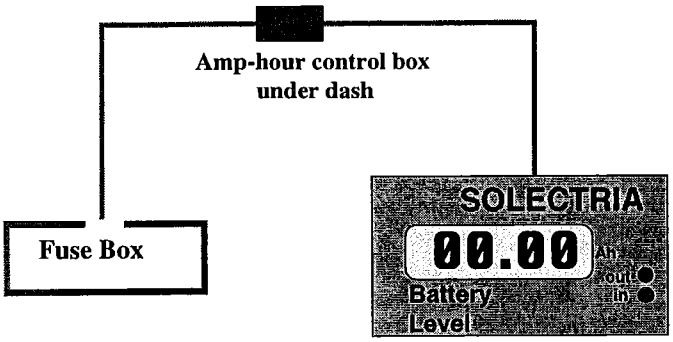


1995/ 1996 E-10 DC-DC WIRING

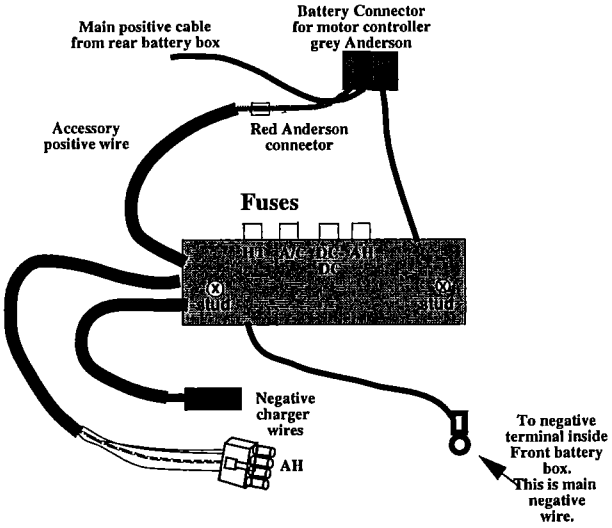


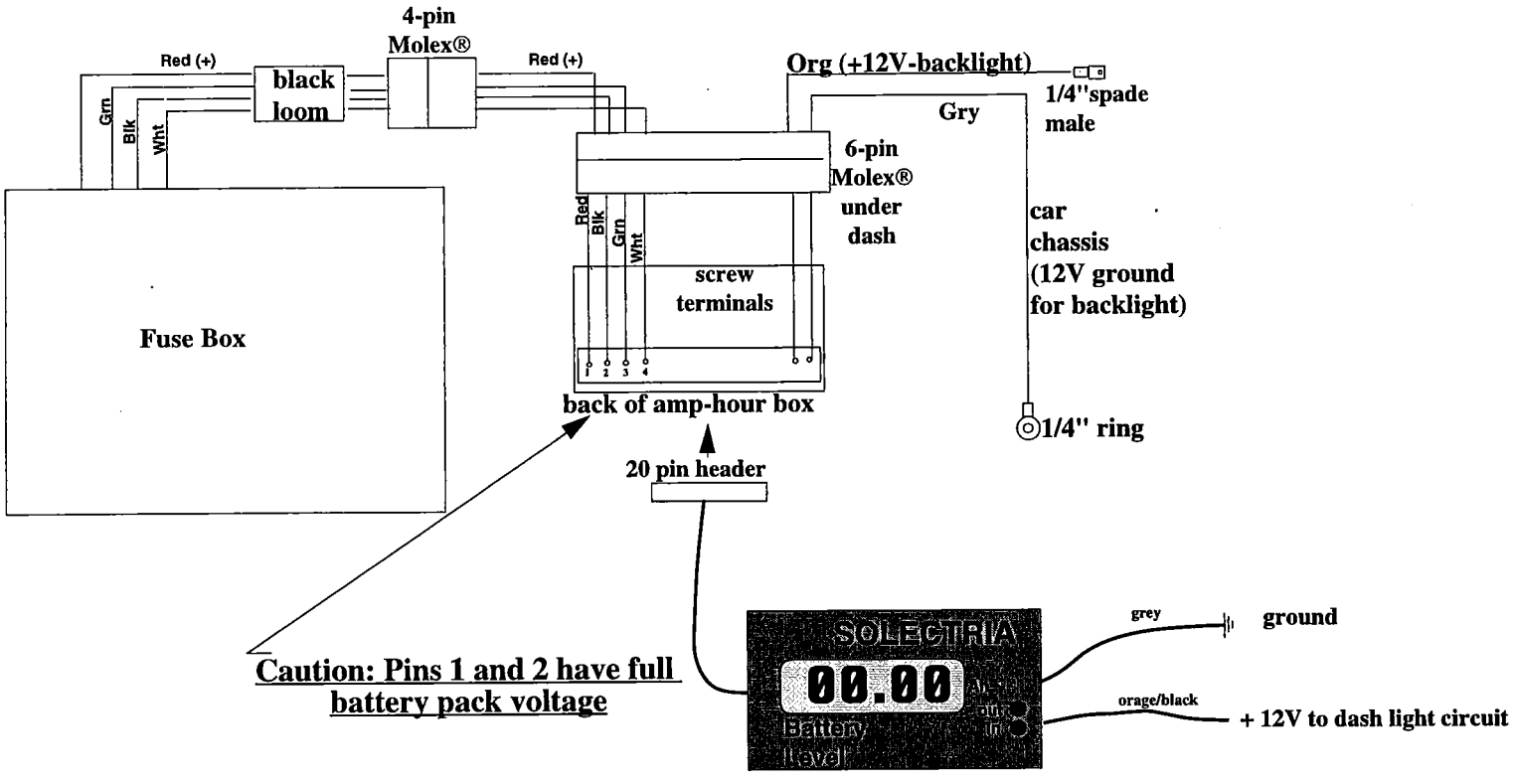


1995/ EARLY 1996 FORCE AMP-HOUR METER WIRING

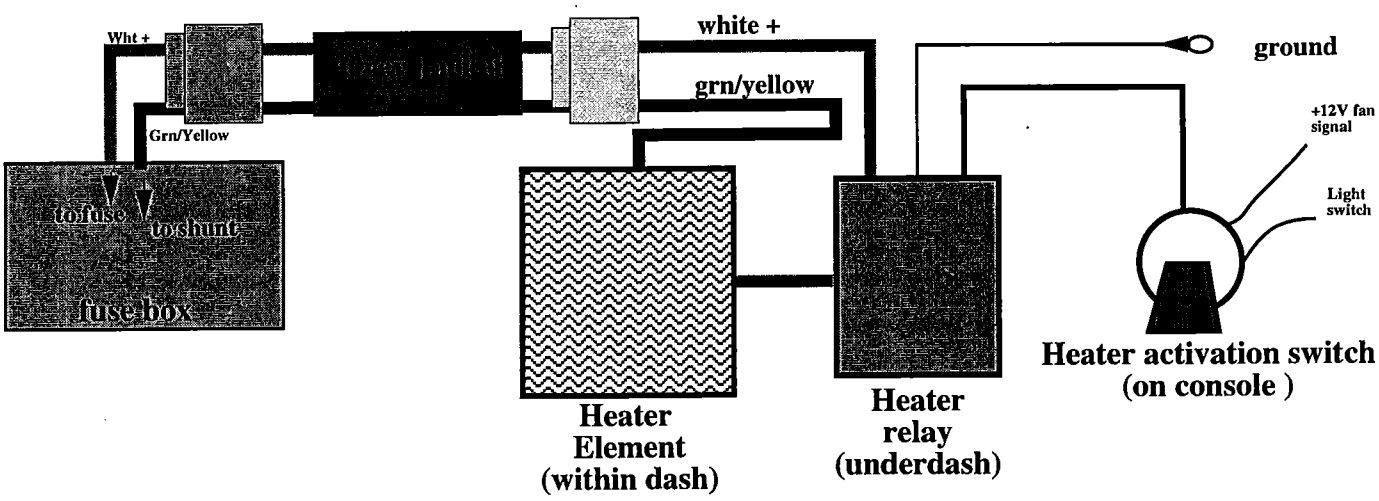


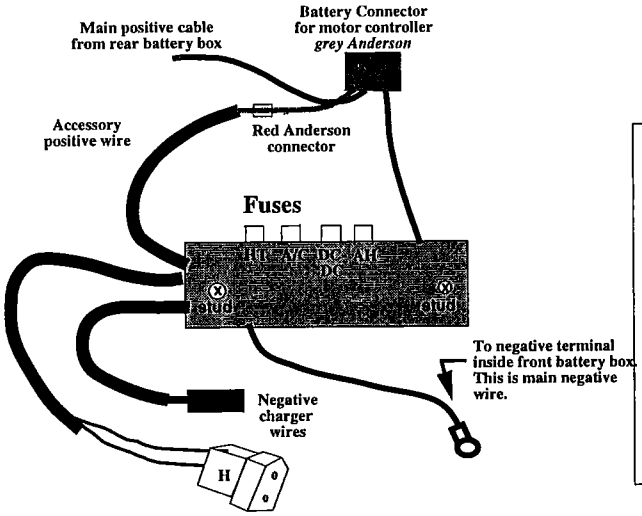
Amp-hour
display
on dashboard

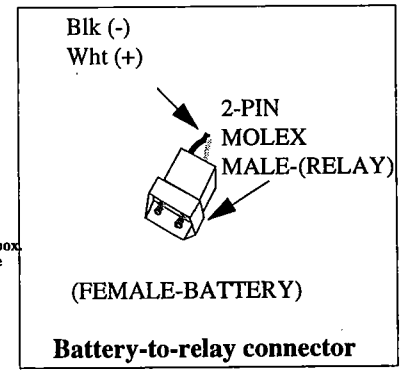


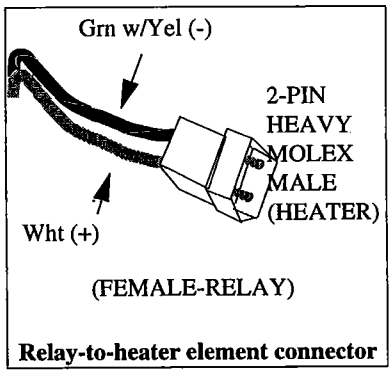


1995/ EARLY 1996 FORCE HEATER WIRING

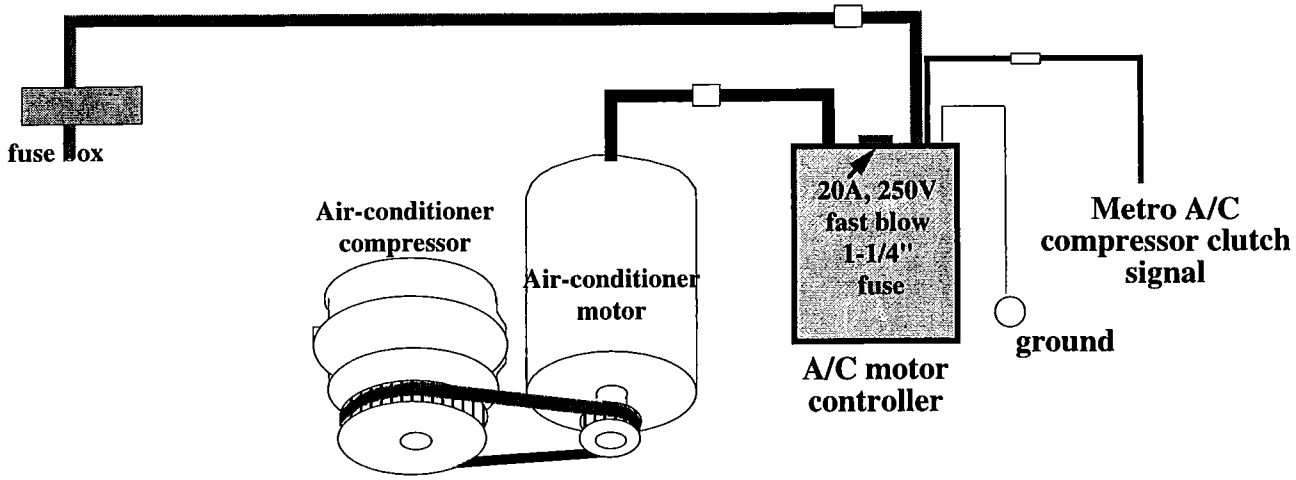


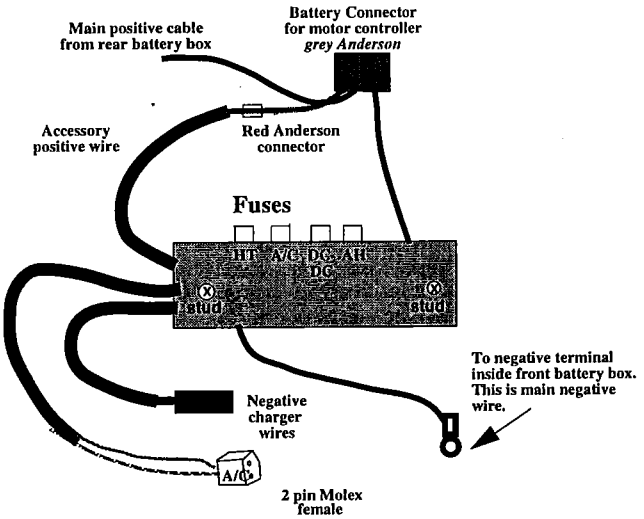




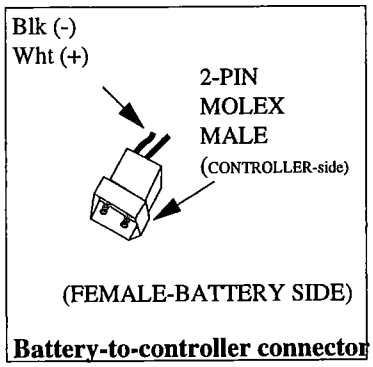


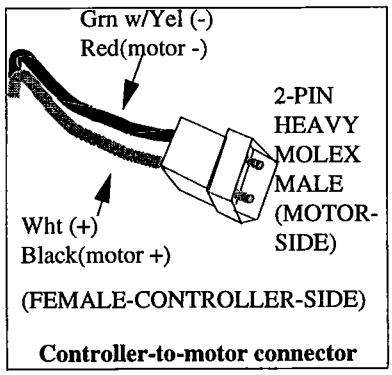
1995/EARLY 1996 FORCE AIR-CONDITIONING WIRING

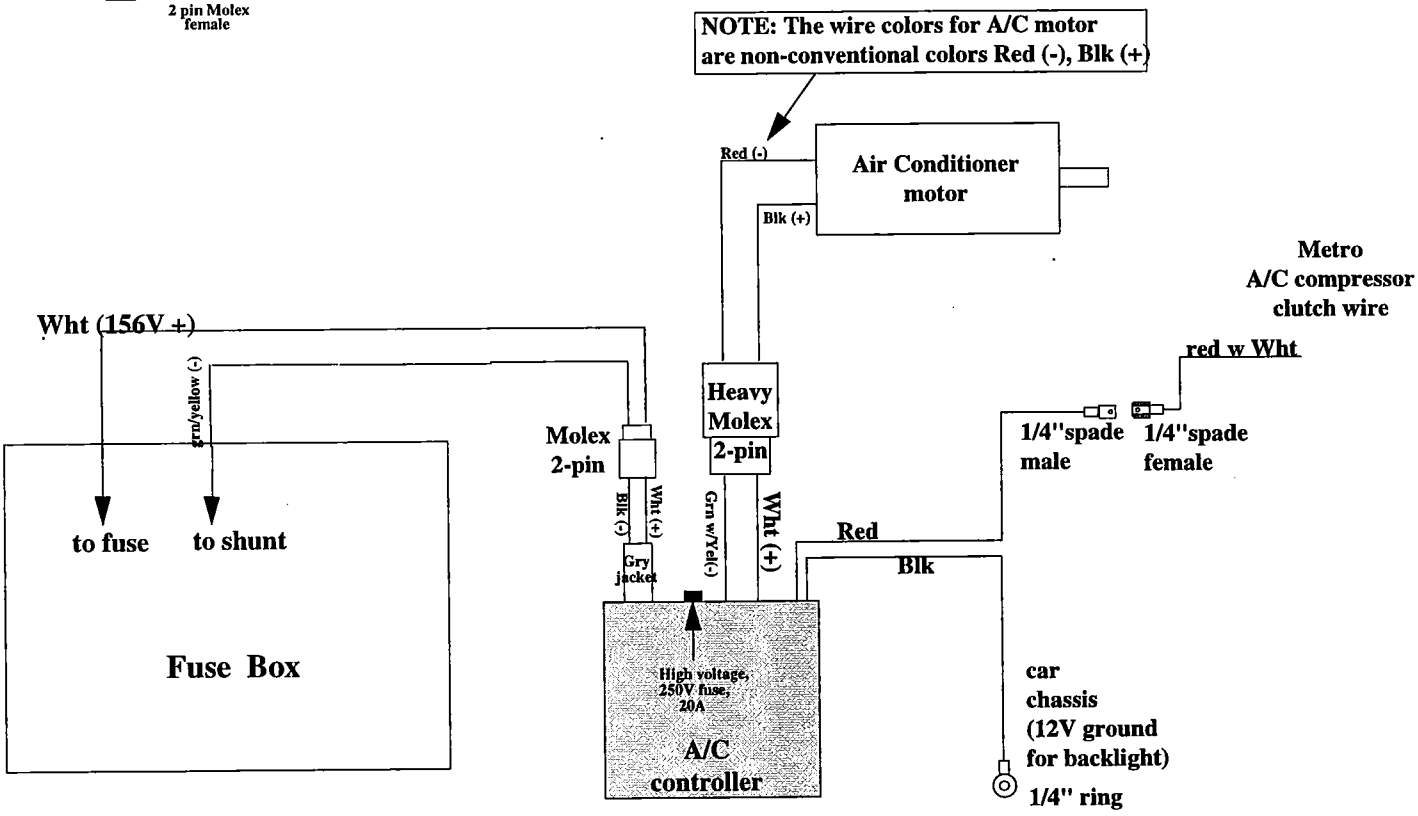




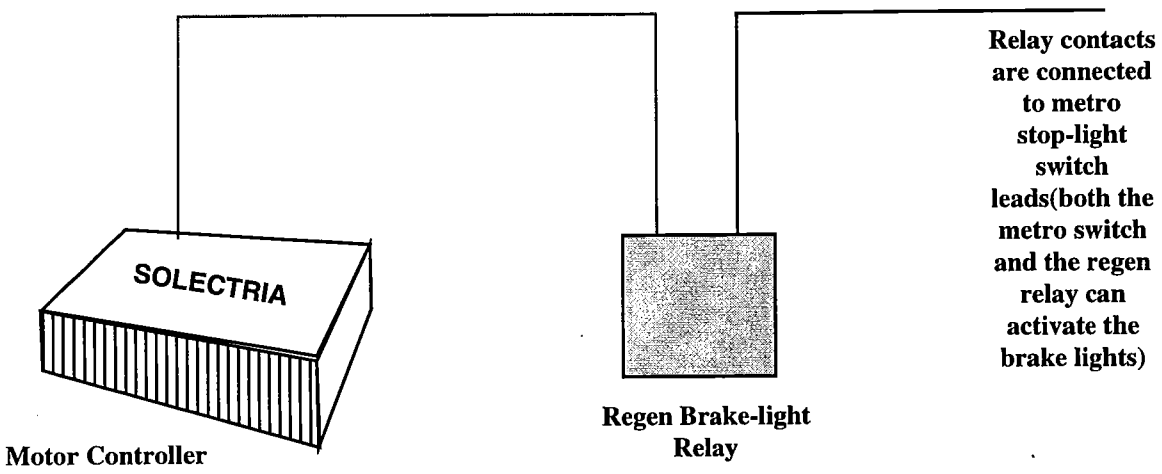
CAUTION: be careful not to confuse these two connectors and end up trying to plug one type into the wrong mate

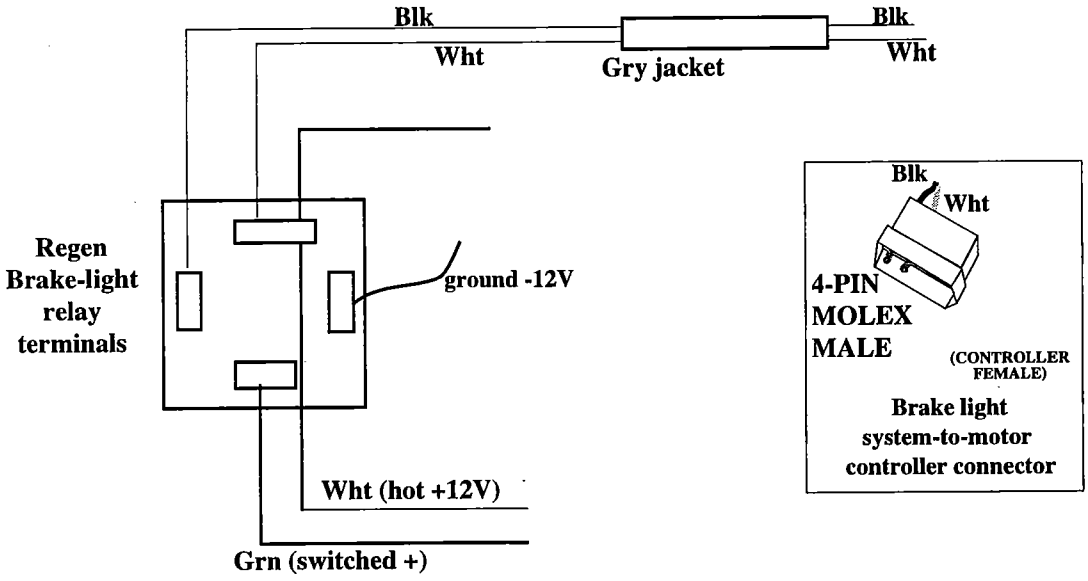


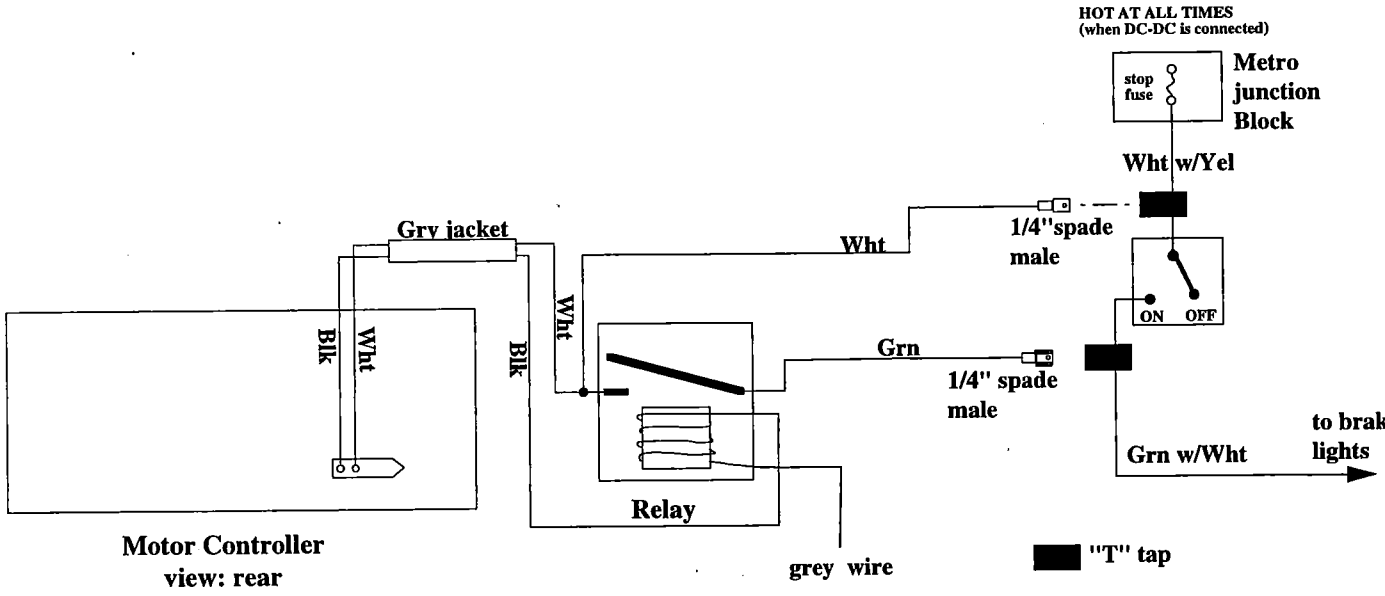




1995 FORCE REGEN BRAKE LIGHT WIRING







Solectria
Battery Discharge Test

Vehicle: _____ **Date:** _____ **Meters used:** **Time:** _____

Battery: _____ **Mileage:** _____ **Voltage:** _____

Procedure: _____ **Battery Temp:** _____ **Amperage:** _____

_____ **Charged to:** _____

Terminal Voltage

Time															Time
Amps															Amps
Amp hr counter															Amp hr
Battery #1															#1
Battery #2															#2
Battery #3															#3
Battery #4															#4
Battery #5															#5
Battery #6															#6
Battery #7															#7
Battery #8															#8
Battery #9															#9
Battery #10															#10
Battery #11															#11
Battery #12															#12
Battery #13															#13
Total Voltage															Total

Appendix C

Troubleshooting Guide

TROUBLE SHOOTING GUIDE FOR SOLECTRIA FORCE

SYMPTOM	POSSIBLE PROBLEM	CHECK FOR
Vehicle does not move in forward position	1. Vehicle is plugged in.	1. Make sure vehicle is unplugged from wall outlet.
	2. Ignition turned on when tri-power switch is on ECONOMY, NORMAL, POWER or REVERSE.	2. Check position of power selection switch. Set knob to NEUTRAL and then to FORWARD or REVERSE.
	3. DC-DC not working.	3. Check DC-DC output; try headlights or horn.
	4. Batteries overdischarged.	4. Check Amp-hour meter; it should not exceed 50 Amp-hours. Check for voltage at grey Anderson connector on top beam. Voltage should be above 136V.
	5. Controller not functioning.	5. With tri-power switch in OFF position, turn ignition on several times and listen for "clunk" sound coming from controller.
	6. Ignition box is inoperative.	6a. With Tri-power switch in OFF or NEUTRAL and key on, check 12V between white wire and grey wire at the ignition box under the dash. 6b. Disconnect +12V white wire at ignition box, then reconnect +12V wire and listen for relay "click" at box. If relay doesn't close ("click") this may denote a faulty ignition box.
Vehicle is sluggish	1. Tri-power switch is set too low.	1. Check position of tri-power switch.
	2. Vehicle is in limp-home mode.	2. Check battery voltage (under load/ when driving) and Amp-hour meter. Under load voltage is approaching 132V (limp-home mode).

SYMPTOM	POSSIBLE PROBLEM	CHECK FOR
12 Volt accessories do not work	1. DC-DC brown-out mode.	1. Disconnect input into DC-DC (2 pin Molex, green and white wires), then reconnect input wires to DC-DC (a slight spark indicates voltage is present); check output on 2-pin grey Anderson connector.
	2. Blown fuse.	2. Check fuse at DC fuse box and on DC-DC converter.
Brakes are not working adequately	1. Vacuum pump not working.	1. To check if pump is working; turn key on and listen to pump after applying brakes several times. If pump doesn't run check if +12V is present at pump on labeled connections. If not, check for +12V at switch on vacuum reservoir. Also check ground.
	2. Vacuum leak or vacuum low.	2a. Let the pump stop running, apply brakes three times and make sure pedal doesn't feel stiff. 2b. If you get less than three pumps on the brake pedal or if vacuum pump doesn't stop running within 30 seconds, you may have a vacuum leak. Check for leak or low vacuum with a vacuum gauge.
Vehicle trips GFI	1. Water and salt in AC plug or extension cord	1. **With extension cord unplugged** at both ends. Wash the two ends in a hot soapy water. Rinse and dry. Wash off AC plug at charge port (gas cap) on vehicle with distilled water .
Vehicle not charging BC1000µ equipped	1. Charger disconnected.	1. With vehicle plugged in: Check for 120VAC at black AC plug behind charger.
	2. No AC voltage at charger.	2. Check wiring between charger port (gas cap) and receptacle to battery charger including the AC junction box.
	3. AC fuse blown at charger.	3. With vehicle unplugged: Check fuse on top of charger. If blown try replacing it once with the **same** current rating. Make sure fuse is tight in the fuse holder.

SYMPTOM	POSSIBLE PROBLEM	CHECK FOR
Vehicle not charging BC1000µ equipped	4. No DC connection at charger.	4. Disconnect DC output connector and check for voltage at green and white Molex connector behind charger at the vehicle harness. If voltage is below 156V, compare the voltage noted at the motor controller. If voltage is differs by 10V or more or if no voltage is present at the vehicle harness, open battery box and replace fuse. Also check the black single-pin Anderson connector under hood for loose sensor or corroded connection.
	5. Batteries are very cold. (Below 32° F)	5. To verify temperature unplug the vehicle and locate 2 pin Amp connectors from AC junction box (black and white wires) marked front and back. Unplug connectors and measure resistance between pins on vehicle side. Resistance should read approximately 80 to 120 ohms. On vehicles with two BC1000µ chargers, the passenger side charger should be in place while conducting this test.
Vehicle not charging BC1000µ equipped	5. Batteries are very cold. (Below 32° F)	5. If the charger has been removed, connect the two pins on extension (2 pin Amp connector, black and white wires) with Solectria jumper. If the circuit is open then the batteries are above 60°to 80° F. The chargers should operate at this time. If the batteries are too cold, plug the vehicle back in and check the Amp connectors for AC voltage. If no voltage, check the fuses in the AC junction box. If there is voltage, reconnect the Amp connectors and leave the vehicle plugged in long enough to raise the battery temperature above 32° F.
Vehicle not charging BC3300 equipped	1. No LED light come on at interface box. No AC voltage input to charger.	1a. With vehicle plugged in: check for the AC voltage at the end of the extension cord. 1b. With vehicle plugged in: check for voltage at the charger plug behind the carpet wall. If voltage is present at the two points and the charger doesn't operate contact Solectria Corporation to have charger replaced.

SYMPTOM	POSSIBLE PROBLEM	CHECK FOR
Vehicle not charging BC3300 equipped	2. Charger is in fault mode (yellow light is lit on interface box).	2. With vehicle unplugged: Disconnect red Anderson connector and check for DC voltage at vehicle harness. If no voltage is present open rear battery box and replace fuse.
	3. Signal from temperature sensor.	3. Unplug vehicle. Disconnect temperature sensors from charger interface box. Using DMM set to read resistance, measure the resistance at the end of mini-Molex connector. Green and black wire at harness should measure anywhere from 25k to 45k depending on battery temperature. If no resistance is measured call Solectria Corporation for a replacement sensor.
	4. Batteries are too hot.	4. The charger will continue to charge batteries if the temperature is under 130 degrees Fahrenheit. Check for resistance on both front and back temperature sensor connectors. It should not read lower than 15k