SERVICE MANUAL

SOLECTRIA

USPS

CITIVAN

Electric Step Van With Lead Acid Batteries

Nominal System Voltage: 312V DC

First Edition August 2001

FOREWORD

Caution

This manual has been prepared to provide service information to maintenance technicians. Information contained in this manual is based on the latest product information available at the time of publication. Solectria Corporation reserves the right to make changes at any time without notice.

How To Report Errors

If, while reading through this manual, you discover an error in the technical information provided, Solectria asks that you notify its Customer Service Department at the phone number provided in your warranty. Please be prepared to provide the following information:

- Your name
- Name and edition of your manual
- Page number(s) where the error(s) appear
- Serial number of your unit

Please feel free to call with any suggestions that you may have regarding the content of your manual.

SOLECTRIA DOCUMENTS

- Operator's Manual, 2nd Edition, 2001 United States Postal Service CitiVan, 312V Lead Acid. Available from Solectria Corp.

UCBC DOCUMENTS

- Union City Body Company (UCBC) Service Parts Manual, Revision #1, 03-01-99. Available from Solectria Corp. or UCBC, 350 Deerfield Road, P.O. Box 190, Union City, Indiana, 47390-0190. (765) 964-3121, (800) 588-6264
- UCBC Forward Control Vehicle Owners Guide. Included with vehicle purchase or available from UCBC, (See address and phone #'s above).
- UCBC, Warranties and Related Provisions. Included with vehicle purchase or available from UCBC, (See address and phone #'s above).

GENERAL MOTORS DOCUMENTS

- 1998 GM (Chevrolet & GMC) P32/42 Chassis Front Engine Motorhome and Commercial Service Manual Volumes 1 & 2 of 4 (Volumes 3 & 4 are not applicable). GMT/98-P32-1 and GMT/98-P32-2 dated 05/07/97. Available from Helm Inc., 14310 Hamilton Avenue, Highland Park, MI 48203. (800) 782-4356
- 1997 GM (Chevrolet & GMC) P32/42 Chassis Front Engine Motorhome and Commercial Service Manual Book 1 of 2 (Book 2 is not applicable). GMT/97-P3-1 dated 07/08/96. Available from Helm Inc., (See address and phone # above).
- GM Body Builders Manual, Light Duty 1500, 2500, 3500 Series, Chevrolet - GMC Intro Rev. 12/98. Available from GM Truck Group, 1996 Technology Drive, Mail Code: 483-619-241, Troy, MI 48083-4247. (800) 875-4742

Table of Contents

Vehicle Layout

DESCRIPTION

This section contains a description of the major features included in the 1999 Solectria CitiVan. For operating information, refer to the 2001 United States Postal Servive CitiVan Owner's Manual.

Please read the section entitled **Guidelines For Working On or Near High Voltage Systems**, on page 11 before servicing any vehicle.

SAFETY

- All major components are electrically connected to the high voltage battery pack. Use EXTREME caution when servicing.
- The battery pack must be charged from a 208-240V AC 60 Hz outlet rated at 30 or more amps using the BC3KW battery charger. A high-amperage fuse is located in each battery box. 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 pack. When the vehicle is charging, the chassis is grounded to the AC ground.

Caution

The possibility that a closed circuit could be formed, as a result of a short circuit to the vehicle chassis, remains, regardless of the safety systems.

Information Regarding Battery Chemistry

The batteries used in Solectria vehicles are sealed, gel, maintenance-free lead acid. Even if the modules are broken in two, the batteries will not spill significant amounts of electrolyte. However, any clear fluid leaking from a Solectria vehicle should be treated as electrolyte, with the potential to corrode surfaces.

- Avoid battery electrolyte contact with the skin or the inhalation of fumes. Wear acid/base resistant rubber gloves, rubber boots, and protective clothing and stay up-wind. Dilute the spill with large amounts of water. Sodium bicarbonate (baking soda) can also be used to neutralize any electrolyte spills.

Caution

To prevent a short circuit to the vehicle chassis or other live wires USE EXTREME CAUTION when handling any high voltage components. Please contact the Solectria Customer Service Department if you have any questions.

BATTERIES

The battery system is made up of two parallel strings, the front and rear. The front string is made up of two battery boxes, one under the hood (See Photo 9) and one under the floor in the driver's compartment (See Figures 13 & 14). The rear string is made up of the two rear battery boxes in the cargo compartment (See Photo 22)

MOTOR

The Solectria electric drive system includes a 3-phase AC induction drive motor and the DMOC motor controller that receives electric power from the battery pack.

MOTOR CONTROLLER

The DMOC is located under the hood, on top of the front battery box (See Photo 10). The DMOC converts direct current (DC) electricity to 3 phases of alternating current (AC) electric energy to operate the drive motor.

OTHER COMPONENTS

The under hood compartment (See Photo 9) also contains:

- Fuel Fired Heating System (Optional) (See Photo 23);
- Power Steering / Braking System (See Photo 6, 9 & 25);
- AC Fuse Box (See Photos 3 & 10);
- DC Fuse Box (See Photo 10);
- Battery Charger (See Photos 1 & 13);
- DC/DC Converter (See Photos 7 & 9) which supplies 12V DC to the vehicle's accessories
- Front Battery Box.

HIGH VOLTAGE, DC COMPONENTS AND CONNECTORS (NOMINAL 312V DC)

DESCRIPTION

The following lists the High Voltage DC components and high voltage DC connectors for the CitiVan.

High Voltage DC Components

- Battery Pack (2 parallel strings each containing (26) 12V batteries in series)
- Battery Charger (BC3KW)
- DC Fuse Box including Amp Hour Counter Shunt
- Battery Charging, DC-DC Converter
- Power Steering / Brake Motor (BPM3 216v)
- Power Steering / Brake Motor Controller (DC30-312V-BPM3)
- Drive Motor Controller (DMOC 645)
- Electric Heat including heater relay

High voltage DC Connectors

- 2-pin gray Deutsch connector (Power Steering Motor Input)
- 3-pin gray Deutsch connector (Battery Charging DC-DC Converter Input, at unit)
- 3-pin gray Deutsch connector (Electric Heater Input from DC Fuse Box)
- 3-pin gray Deutsch connector (Power Steering/Brake Motor Controller Input from DC Fuse Box)
- 3-pin gray Deutsch connector (Battery Charging, DC-DC Converter Input from DC Fuse Box)
- 2-pin white Molex connector (Heater Relay Input)
- 2-pin white Molex heavy connector (Heater Relay Output)
- 1-pin red Crouse-Hinds waterproof connector (DMOC Input, Bat Pos)
- 1-pin black Crouse-Hinds waterproof connector (DMOC Input, Bat Neg)
- 2-pin black Yazaki connector (BC3KW Charger Output)

LOW VOLTAGE DC COMPONENTS AND CONNECTORS (12V DC)

DESCRIPTION

The following is a list the low voltage, DC components and a partial list of low voltage DC connectors for the CitiVan.

Low Voltage DC Components

- Battery Thermal Management (Cooling Fans)
- Driver Console
- Accelerator/Brake Controller
- Amp Hour Counter Display (AHC-2)
- Battery Charging DC-DC Converter (Output Side)
- UCBC Fuse Panel
- Regenerative Braking harness (including regen relay)
- Reverse Light / Beeper Wiring
- 12V Standby Battery

Low Voltage DC Connectors

- 2-pin gray Anderson SB-50 connector (Battery Charging, DC-DC Converter)
- 2-pin black Packard connector (Kilovac Emergency Shutoff at switch)
- 2-pin black Packard connector (Kilovac Emergency Shutoff at DC Fuse Box)
- (2) 3-pin black Packard connectors (Charger Temp Sensor)
- (2) 8-pin Deutsch connectors (AHC-2)
- 2-pin white Amp connector (Battery Box Cooling Fans)
- 3-pin white Amp connector (Battery Box Cooling Fans)
- 5-pin Regen Relay connector (Regen Brake light Relay)
- 1-pin black Packard connector (DC-30, Power Steering/Brake Motor Controller “keyed” 12V)

HIGH VOLTAGE AC COMPONENTS AND CONNECTORS

DESCRIPTION

The following provides a list of high voltage (200-300VAC) components and connectors for the CitiVan Drive System and Charging System

High Voltage AC Components

- Battery Charger (BC3KW Input side)
- Charge Port (inlet, 250V/30A flanged)
- Battery Thermal Management (heating)
- AC Fuse Box (Van AC fuse box 3KW, rev 4)
- Drive Motor Controller (DMOC 645 Output Side)
- Charge Extension Cord

240V AC Connectors

- 3-pin white Marinco connector (Charge Port) (Input)
- 4-pin black square Packard connector (Battery Thermal Management)
- 2-pin white International Molex connector (BTM Heater Pad)
- 3-pin white International Molex connector (BTM Heater Pad)
- 3-pin yellow Waterproof Marinco connector (BC3KW Battery Charger)
- Ground wire (AC Fuse Box)
- 3-pin yellow LG-30 Marinco connector (Charge Cord Output)
- 3-pin black and white NEMA 10-50P Hubbell (Charge Cord Input)

300V AC, DMOC Connectors

- 1-pin blue Crouse-Hind waterproof connector (DMOC to Motor)
- 1-pin green Crouse-Hind waterproof connector (DMOC to Motor)
- 1-pin white Crouse-Hind waterproof connector (DMOC to Motor)

Vehicle Safety Systems and Emergency Response Procedures

DESCRIPTION

For operators and service personnel, the CitiVan is equipped with various safety systems. These include:

- The van will not drive if it is plugged in.
- The van will not drive if the Tri-Power Selector Switch is set to Forward or Reverse before the ignition key is turned on (for safety, Tri-Power Selector Switch must be set to OFF position BEFORE the ignition key is turned on).
- Except for the DMOC, all high voltage DC components are fused at the main DC fuse box. The DMOC is fused internally. The DC30 and the DC-DC converter have external fuses at the units.
- Battery thermal management heating operates on 220VAC and is fused at the AC Fuse Box, under the hood.
- Each battery box is independently fused to disable the high voltage DC circuit in the event of an over-current condition. These high-current fuses are located inside each of the battery boxes, but are not user serviceable.
- The batteries in the CitiVan are completely isolated from the van chassis to prevent the possibility of electrical shock or current leakage to the van. However, as a result of short-circuiting to the van chassis, or other conductors during a severe accident, there is still a possibility that a closed circuit could be formed by a subset of battery modules.

Extreme care must be taken when handling any high voltage wires so as not to short circuit the battery to the vehicle chassis, or other potentially live wires or terminals.

Note re: exposed electrical wires

AC systems are “live” when vehicle is plugged in, or when DMOC is energized.

Unless two separate and isolated locations of the high voltage system at different electrical potentials are touched simultaneously, there is no hazard for shock. **Nevertheless, exposed electrical wires should be treated with caution, and assumed to carry high voltage regardless of the wire gauge.**

GUIDELINES FOR WORKING ON OR NEAR HIGH VOLTAGE SYSTEMS

DESCRIPTION

Use the following guidelines when working on, or near, the high voltage systems of the Solectria CitiVan.

GUIDELINES FOR WORKING ON HIGH VOLTAGE SYSTEMS

- Always wear safety glasses.
- Remove all jewelry, such as watches, rings, bracelets, earrings and necklaces.
- No tools with exposed metal over 1" long are allowed in work area.
- Apply heat shrink to metal tools over 1" long.
- Keep all tools away from, or below, high voltage areas.
- Safely store tools when they are not in use. **Do not place or leave tools on vehicle surfaces**.
- 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.
- Use a voltmeter to check voltages and polarity before making any connection of components. **(Make sure the voltmeter is not set to measure current, and leads are connected to correct positive and negative jacks on meter.)**
- Push in the Emergency Stop Button, located above and to the left of the driver's seat.

Note: Emergency Stop Button

Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

- Disconnect a live device before removing it.
- Always unplug vehicle from wall outlet while servicing.

Guidelines (Continued)

- Do not use fuses to connect or disconnect accessories. If you are installing a power steering controller or fuse, follow these steps:

1. Turn ignition key off
2. Disconnect 220VAC charging cord
3. Push in the Emergency Stop Button, located above and to the left of the driver's seat.

Note: Emergency Stop Button

Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

4. Install the controller or fuse
5. Pull out the Emergency Stop Button, located above and to the left of the driver's seat, and check that the Amp-Hour meter reads 00.00
6. Plug charger cord into wall outlet

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 UNAPPROVED VEHICLE OR COMPONENT TESTING PROCEDURES OR DEVICES BE USED.**

EMERGENCY RESPONSE INFORMATION

DESCRIPTION

The following procedures outline the steps that are to be taken in the event of a vehicle accident and/or fire.

IN CASE OF ACCIDENT

Safety

- If this vehicle is involved in a serious accident, a system of internal fuses is designed to protect personnel and prevent damage to vehicle components.

WARNING!

- DO NOT USE WATER ON ANY FIRE IN AN ELECTRIC VEHICLE WITH LEAD-ACID BATTERIES! SEE FIRE PROCEDURES BELOW.

Procedures

If the vehicle has been in an accident and the cabin can be entered safely

- Unplug the vehicle at Charger Port (See Photo 15)
- Push in the Emergency Stop Button, located above and to the left of the driver's seat.

Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

If the vehicle appears dormant

No further action is required to stabilize the vehicle other than turning off the ignition key.

Note

When the ignition key is turned off, 12V battery power to the motor controller is shut off, but the DC-DC converter, battery charger, power steering / braking controller and electric heat continue to remain at the full pack voltage.

DESCRIPTION

Use the following procedures in the event of fire or electrical arcing in the either of the vehicle's battery boxes.

BATTERY BOX

Safety

- Immediately call Solectria's Customer Service Department at 978-658-2231, to receive detailed instructions.

Procedures

If the battery boxes are on fire, or if there is arcing between them:

1. Follow the disconnect sequence described in the section "**In Case of Accident**". IF THE VEHICLE IS CHARGING, UNPLUG IT OR TURN OFF THE CIRCUIT BREAKER TO THE CHARGING CIRCUIT AND PUSH IN THE EMERGENCY STOP BUTTON, LOCATED ABOVE AND TO THE LEFT OF THE DRIVER'S SEAT.

NOTE: NEVER PUSH IN, THEN IMMEDIATELY PULL OUT THE EMERGENCY STOP BUTTON. ALWAYS WAIT 5 SECONDS BEFORE PULLING THE BUTTON OUT AGAIN.

2. DO NOT USE WATER TO EXTINGUISH LEAD-ACID BATTERY FIRES!
3. USE CLASS BC FIRE EXTINGUISHERS. Class ABC fire extinguishers may also be used.
4. Direct the extinguishers into any of the battery box openings exhibiting arcing or fire. If the battery boxes are ruptured, direct the extinguishers into the ruptured hole.

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5. **DO NOT ATTEMPT TO OPEN OR VENTILATE THE BATTERY BOXES WITH AXES.** This is extremely dangerous and may initiate new arcing and fire.
6. Once the arcing has stopped, **clean, dry, salt-free sand** may continue to be placed on the battery. **WATER, INCLUDING RAIN, SHOULD NOT COME IN CONTACT WITH LEAD-ACID BATTERIES, EVEN AFTER ANY FIRE AND/OR ARCING STOPS.**

Securing Vehicle Accessories and Components

DESCRIPTION

The following procedure describes the steps required for securing the CitiVan, which make the vehicle "safe" while servicing it.

SAFETY

CAUTION

- Solectria electronic components are not user serviceable. Any attempt to actually service components will void all component warranties.
- When changing out electronic components, unplug the vehicle from the wall outlet.
- Do not replace any Solectria components with components of any other brand. Doing so will void all Component and Vehicle Warranties.

WARNING!

- DO NOT attempt to lift vehicle from any point on the battery box or battery box hangers!
- DO NOT position jack near battery boxes! Doing so could puncture the box and cause a fire.
- For operator safety, **never open battery boxes or cut electrical wires**. Cutting wires presents additional safety problems, and is not recommended by Solectria. Failure to follow these guidelines could lead to serious injury.

PROCEDURE

1. Apply the parking brake firmly by pushing on the standard, foot-operated parking brake pedal to the left of the brake pedal. (An alarm will sound if the parking brake is not applied adequately when the driver leaves the seat)

2. To prevent the vehicle from being driven, turn the Tri-Power Selector Switch, located on the driver console (See Photo 16), to the "Neutral / Start" position.

3. Turn the key off and remove it as you would in a conventional vehicle.

The drive motor controller (DMOC), power steering / braking system and cabin heating system are now shut down. This will disable the Drive Motor and most vehicle accessories.

Note re: steering wheel lock

When the ignition key is turned to the "off" position and removed, the steering wheel will lock. To unlock the steering wheel, the key must be inserted and turned to the first *accessory* position

DESCRIPTION

The following describes procedures for isolating the electrical power of the CitiVan from the battery boxes and all vehicle systems and components.

SAFETY

CAUTION

- All electronic components store energy in their capacitors, even after being isolated or disconnected from power. Always treat exposed conductors with caution.

PROCEDURE

1. Secure the CitiVan, as stated at the beginning of this section.
2. If connected to AC power, unplug the charge port
3. Push in the Emergency Stop Button, located above and to the left of the driver's seat. This will disconnect high voltage electricity from the auxiliary systems (such as electric heat, DC-DC converter, DMOC, BC3kW and DC30).

Note:

Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

After all the steps have been completed, the electrical power of the van is isolated to the battery boxes and all other systems and components are isolated from electrical power.

Any of these components may now be removed from the vehicle for service or repair. No systems or components on the vehicle will operate if this condition remains.

ISOLATING THE DRIVE MOTOR CONTROLLER (DMOC)

DESCRIPTION

The following describes procedures for isolating the DMOC from electrical power, so that the unit may be removed for servicing.

SAFETY

WARNING!

- All electronic components store energy in their capacitors, even after being isolated or disconnected from power. Always treat exposed conductors with caution.
- The 400A waterproof connectors carry the full potential of the battery pack. Special care should be taken with the battery side of the connector.

PROCEDURE

- Secure the van, as described at the beginning of this section.
- To access the unit, detach and remove the compartment cover that sits between the driver and passenger's seat.

To detach the compartment cover from the floor of the cabin

1. Release the lever, located at the front, right corner of the compartment cover.
2. Release the 2 rubber pull-catches, located at the bottom, rear face of the compartment cover.
3. Lift the compartment cover away from the dash of the vehicle.

Continued on next page

Isolating the DMOC

Although turning the key to the "off" position disables the DMOC, the controller must be isolated from the battery pack and the other high voltage components.

To isolate the DMOC from the battery pack, push in the Emergency Stop Button, located above and to the left of the driver's seat.

Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

To isolate the DMOC from all other high voltage accessories, disconnect the red and black, Crouse-Hinds, waterproof connectors to the DMOC from the high voltage fuse box.

The DMOC is now isolated and can be removed for servicing.

ISOLATING THE BATTERIES

DESCRIPTION

The following describes procedures for isolating the batteries from electrical power, so that they may be removed for servicing.

SAFETY

WARNING!

1. All electronic components may store energy in capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.

2. Special care should be taken with the battery side of the waterproof connector to the DMOC. The connector contains the full potential of the battery pack.

PROCEDURE

- Secure the van as described in the section: “Securing the CitiVan”.

- Isolate the accessories, as described in the section: “Isolating CitiVan Accessories”.

The batteries are now isolated from all high voltage components.

RECONNECTING CITIVAN ACCESSORIES

DESCRIPTION

The following describes procedures for reconnecting the CitiVan's accessories to electrical power.

SAFETY

CAUTION

- All electronic components store energy in their capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.

PROCEDURE

Reconnection is the opposite of the isolation procedure. To avoid shock hazards and damage to equipment, be sure to follow the steps in the exact reverse order.

Additional Service Information

LIFTING THE VEHICLE

Apply parking brake and chock wheels. If using a lift, use factory recommended lifting points specified in the Chevrolet P32/42 Chassis Service Manual. Lift vehicle, position jack stands safely under vehicle at reinforced sections of frame or axles.

TOWING INSTRUCTIONS

DESCRIPTION

Solectria recommends that the CitiVan be transported on a low-profile, flatbed trailer. If this is not possible and the vehicle must be towed, follow the directions below.

SAFETY

WARNING!

- **Maximum speed under tow is 45 MPH!** Motor damage will occur at higher speeds if the rear wheels are on the ground.
- Towing with only the front wheels on the ground is **NOT** recommended. Solectria prefers that you tow with only the rear wheels on the ground
- Be aware of the maximum height of the towed vehicle!

PROCEDURE

1. Lock the steering column (ie turn ignition to "off" position and remove key), with the front wheels centered.
2. Set tri-power selector switch to **Neutral / Start.**
3. Set regenerative braking switch to **Slippery**.

To tow with all four wheels on the ground: "flat towing".

1. Turn the ignition key to the first position to unlock the steering column.
2. Set tri-power selector switch to **Neutral / Start.**
3. Set regenerative braking switch to **Slippery.**

Tow dollies may be used if they are of the proper weight rating (the Curb Weight of the CitiVan is 8,500 pounds and the Gross Vehicle Weight (GVR) is 12,000 pounds.)

WASHING

Solectria does not recommend washing the CitiVan in an automatic carwash. Hand-wash the vehicle, only.

Removing and Installing Components for Servicing

The following outlines the estimated times for removing and reinstalling the Solectria components contained in the USPS CitiVan. Please note that some of the items listed are not included in this manual, but are included in the assembly instructions for the vehicle.

Item	Factory Time, hours (Will pay under warranty)	Shop Time, hours (All other work)	Notes
AC Drive Motor - Replace	4.0	5.0	
AC Drive Motor Controller (DMOC) - Replace	0.5	0.7	
AC Drive Motor Speed Sensor - Adjust	0.5	0.7	
AC Drive Motor Speed Sensor - Replace	1.0	1.4	
Accelerator & Brake Control Pot Box- Replace	0.3	0.4	
Power strg. / Power Brake Controller (DC30) - Replace	0.3	0.4	
Power strg. / Power Brake Motor (BPM3) - Replace	0.8	1.2	
Amp-Hour Counter display - Replace	0.6	0.8	
Amp-Hour Counter circuit board - Replace	0.8	1.2	
Back-up alarm-Replace	0.2	0.3	
Batteries - Accessing Front	0.7	1.0	
Batteries - Accessing Middle	0.4	0.6	
Batteries - Accessing Rear	0.2	0.3	
Batteries, All (Full Pack) - Replace	5.0	7.0	does not include accessing, discharge test, and cycling.
Batteries, First - Replace	0.3	0.3	does not include accessing, discharge test, and cycling.
Battery Charger - Replace	0.4	0.6	
Battery Charger LED box - Replace	0.2	0.3	
Battery Charger Temperature Sensor - Replace	0.2	0.3	does not include accessing.
Battery Discharge Test using a discharger	2.2	3.3	includes charger performance evaluation and accessing batteries
Battery Discharge Test without using a discharger	3.2	4.8	includes charger performance evaluation and accessing batteries

Item	Factory Time, hours (Will pay under warranty)	Shop Time, hours (All other work)	Notes
Battery Thermal Management System Sensor, Front - Replace	0.9	1.3	includes accessing batteries
Battery Thermal Management System Sensor, Middle - Replace	0.6	0.9	includes accessing batteries
Battery Thermal Management System Sensor, Rear - Replace	0.4	0.6	includes accessing batteries
DC-DC Converter - Replace	0.2	0.3	
High Voltage Fuse Box - Replace	1.8	2.6	Requires opening one rear and middle battery box
Fuse, Battery Box (front)- Replace	0.9	1.3	includes accessing batteries
Fuse, Battery Box (middle) - Replace	0.6	0.9	includes accessing batteries
Fuse, Battery Box (rear - each) - Replace	0.4	0.6	includes accessing batteries
Fuses in Fuse Box, Each - Replace	0.1	0.2	
Heater Element Assembly - Replace	0.4	0.6	
Heater Relay - Replace	0.2	0.3	
Heater Switch - Replace	0.3	0.4	
Parking Brake - Adjust alarm	0.2	0.3	
Parking Brake - Replace alarm	0.2	0.3	
Range-Power Selector Assembly - Replace	0.2	0.3	

Estimated labor does not include diagnostic time.
Typical diagnostic time is 0.3 - 1.0 hours.

Examples of battery replacement scenarios

Discharge test (w/discharger)	2.2	3.3	includes accessing batteries
Change batteries	5.0	7.0	
Cycle 2 times	0.8	1.0	
Total	**8.0**	**11.3**	

DRIVE MOTOR ASSEMBLY

DESCRIPTION

The drive motor is a 3-phase AC induction motor, located under the cargo area at the rear of the vehicle. There are no user serviceable parts in the drive motor.

SAFETY

CAUTION

- Secure the vehicle, as described in the section: “Securing the CitiVan”.
- Apply parking brake, turn tri-power selector switch to the “Neutral / Start” position and turn off the ignition key and remove.

REMOVAL

Use the following procedure to remove the Drive Motor Assembly

1. Open the driver access cover to the under hood compartment (See Photo 11).
2. Remove EMI sock from the motor power wires at the DMOC.
3. Disconnect the Green/White/Blue waterproof connectors. (See Photo 10).
4. Cut the zip-ties that hold the wire loom covering the drive motor, speed sensor wire with the 14-pin, AMP-connector. The connector is located near the back of the front battery box. Save this loom for reassembly.
5. Disconnect drive motor speed sensor wire from the 14-pin, AMP motor sensor port of the DMOC.

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6. Remove the 3-Phase drive motor wire conduit from the bracket near the DMOC
7. Remove any zip ties that hold sensor wire and conduit in place. Feed both back out.
8. Remove bolts from both ends of drive shaft and remove shaft.
9. Support the drive motor under the support brackets.
10. Using a jack with attached platform:
    a. Remove bolts that secure brackets to the frame rails.
    b. Slowly lower the drive train down.

    Caution: The drive motor is heavy and the motor fins bend easily.

INSTALLATION

Use the following procedure to install the Drive Motor Assembly

1. With brackets attached to the Drive system unit, raise the assembly into position, until all the holes line up to the vehicle.
    a. The driver's side hangers use the four inner holes.
    b. The curbside hangers use the four inner holes.
    c. The two curb side rear holes use 1/2 X 20 X 1 ¼ grade 8 bolts with flat washers and lock nuts. Make the nuts snug, but do not tighten.
    d. The other six holes use, ½ X 20 X 1 ¼ grade 8 bolts, flat washers and lock nuts. Make the nuts snug, but do not tighten.
2. Remove the jack and tighten the 8 bolts securing hangers to frame.
3. Check to be sure that the four rubber mount bolts are very tight.
4. Using four grade 8, 7/16 X 20 X 1-1/4 bolts, 7/16 X 20 nuts, and lock washers, attach drive shaft to drive motor and four 7/16" U-joint bolts with a U-clamp to connect the drive shaft to the differential.
5. Run the flexible conduit, that holds the three phase drive motor wiring, forward along the driver side frame rail and attach the end to the mounting bracket on the rear of the front battery box driver side (See Photo 10).

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6. Zip-tie the flexible conduit to the frame rail.
7. Run speed sensor wire along flexible conduit and zip tie to it. Connect speed sensor wire to DMOC.
8. Cover the speed sensor connector with loom and zip ties. (It should be isolated from other metal surfaces).
9. Connect the blue/white/green Crouse-Hinds connectors and zip tie together.
10. Place the EMI sock over the connections and zip tie each end to the EMI shielding.

To test that the installation was successful, simply drive the vehicle. Be sure to drive the vehicle in forward and in reverse. If there are any jerks or shuddering in either forward or reverse the drive motor speed sensor may need to be adjusted or replaced. *See the Installation instructions in the "Motor Speed Sensor" section of this manual.*

WARNING

Do not test the drive system with the vehicle's drive wheels off of the driving surface. If operated without being placed under load and spinning freely, damage to the motor and the drive shaft may result.

MOTOR SPEED SENSOR

DESCRIPTION

The motor speed sensor is located on the end-bell of the drive motor, toward the front of the van and under the motor speed sensor cover (See Photo 12). The motor speed sensor provides the DMOC feedback on the direction and speed of the drive motor.

SAFETY

CAUTION

- Secure the vehicle, as described in the section: “Securing the CitiVan”.
- Apply parking brake, turn tri-power selector switch to the “Neutral / Start” position, turn off ignition key and remove.

PROCEDURE

Removing the Motor Speed Sensor

1. Disconnect the high voltage DC input to DMOC (Red and black, Crouse-Hind waterproof connectors).
2. Remove the (4) nuts securing the motor speed sensor cover on the drive motor (See Photo 12) and remove the cover.
3. Remove the (2) button-head, socket cap screws and washers that retain the yellow mag-sensor, bracket and insulator.
4. Remove the (2) Phillips-head screws to separate the yellow mag-sensor from the mounting/adjustment bracket.
5. Remove the bolt at the cushioned, strain relief to separate the speed sensor harness from the motor
6. If you need to remove the 60-toothed sensor disc, remove the bolt at the center of the disc and separate the disc from the motor.
7. To remove the bolt from the strain relief fittings, follow the speed sensor harness along the top of the battery box.
8. Remove the electronics hatch cover from the inside of the driver’s compartment and unplug the speed sensor from the DMOC and remove the harness from the van.

Installing the Motor Speed Sensor

ORIENTATION OF THE YELLOW MAGNETIC PICK-UP IS IMPORTANT!

1. Orient the yellow pick-up so that the wires are facing towards you. The red wire should be on your left.
2. Place a small amount of a removable thread-locking compound on the threads of the (2) #8 Phillips screws.
3. Attach the yellow pick-up to the bracket with the (2) #8 Phillips screws, the D-shaped washers under the #8 screw heads and the (2) slotted holes in the bracket closest to you.
4. Place the insulator under the magnetic pick-up bracket and then place the button socket cap screws, with the beveled washer, through the slotted holes in the bracket.
5. Attach to the motor by threading the button-socket cap-screws into place. Leave the screws loose for adjusting.
6. Adjust the air-gap between the sensor disc and pick-up with a 0.025-inch, non-magnetic feeler gauge.
7. Place the feeler gauge between the pick-up and the sensor disc.
8. Slide the pick-up toward the sensor disc until it contacts the feeler gauge. Make sure that there is no gap between the pick-up, feeler gauge and the sensor disc.
9. Tighten the button-socket cap screws until they bottom against the Bellville washer.

To complete the remainder of the installation procedure, simply reverse the procedure used for removing the unit.

TESTING MOTOR SPEED SENSOR

PROCEDURE

Use the following procedure to test the Motor Speed Sensor for the vehicle.

1. With the wheels off the ground, insert key and turn on the ignition.
2. Select the “normal” driving mode, and slowly accelerate the vehicle to maximum speed.
3. Listen for drive motor vibrations or shudders. If the motor sensor is malfunctioning, it can shudder sharply at high speeds.
4. DO NOT CONFUSE THIS WITH OUT-OF-BALANCE TIRES.
5. The drive motor may also turn very slowly or “growl”. Do not confuse this symptom with an out-of-phase controller. If you believe that your DMOC is out-of-phase, contact Solectria for instructions.

If the test drive produces any of the symptoms discussed here, call Solectria for further information and instruction.

DESCRIPTION

The Solectria CitiVan is equipped with a 3kW Battery Charger (See Photos 1 & 13), located in the under hood compartment on the front of the front battery box (See Photo 9). This Charger is rated at 3 kW using 220VAC and is programmed with software for an optimum charge profile for a CitiVan with sealed, gel, lead acid batteries.

The Battery Charger LED Box (See Photos 2 & 14) connects to the charger.

The Battery Charger collects temperature data from the battery boxes, displays what state the charge profile is in, and carries the charger ignition disable signal to the drive system. To reduce the risk of driving away with the charge cord (See Photo 15) still plugged into the vehicle, the Charger Ignition Disable is a safety mechanism that disables the drive system when AC power is coming into the Charger.

The main DC output of the Charger uses a black, 2-pin Yazaki connector. This connector (See Photo 10) feeds power into the DC Fuse Box where it is distributed to the battery boxes. The main AC input to the charger comes from the AC Fuse Box. The AC Fuse Box connects to the charger using a yellow, 3-pin Marinco connector (See Photos 1 & 3).

The battery charger itself has no user serviceable parts. Any attempt to open or service the charger unit will void all applicable warranties. The charger is mounted to the front battery box, mounting tray.

The mounting tray holds the DMOC, DC Fuse Box, DC 30 Power Steering motor controller, battery charger, AC fuse box and DC-DC converter. The mounting tray is attached to the vehicle with 4 rubber mounts and the components are also mounted to the tray with 4 rubber mounts.

Any addition, or removal, of components on the tray will affect vibration-dampening, causing excess vibration that will lead to accelerated fatiguing of electronic components. This is not considered normal wear and tear by Solectria and will not be covered under warranty. Solectria is not responsible or liable for any damages, equipment or other, for the misuse of any supplied components or mounts.

SAFETY

WARNING!

- Secure the van, as described in the section: “Securing the CitiVan”.
- Unplug vehicle from the wall outlet (See Photo 15).
- Push in the Emergency Stop Button, located above and to the left of the driver’s seat.

  Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.
- All electronic components store energy in their capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.
- Disconnect all Solectria components that are connected to the batteries. If you attempt to fast charge the batteries damage to the motor may result.

FAILURE TO DO SO WILL VOID ALL WARRANTIES.

Solectria must be contacted before any vehicle modification.

PROCEDURE

Removing the Battery Charger

1. Disconnect the leads to the charger LED Box, the (2) Battery Temp Sensors and the Drive-Disable Switch. (See Photos 2 & 14).
2. Disconnect the AC input connector to the AC Fuse Box (See Photos 1 & 3).
3. Disconnect the DC output, high voltage, Yazaki connector. (See Photo 1).
4. Remove the four ¼" - 20 nuts, gently pull charger up and out of the Van.

Installing the Battery Charger

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

CHARGER LED BOX

DESCRIPTION

The Charger LED Box's main purpose (See Photos 2 & 14) is to display what state the charge cycle is in, whether or not there was a problem with the charge cycle and when the charger has completed the charging cycle.

The LED Box does this through lighting the LEDs on the box. On the box there are 4 LEDs in a column, 3 red then 1 green, and one yellow LED off by itself. In the first stage of charging, only the first red LED is illuminated. During the second stage, only the second red LED is illuminated. During the third stage, only the third, red LED is illuminated. When the third stage is over, all of the red LEDs go out and the green LED is lit. This tells the user the charge is complete and that the charger is in "*Float*" mode.

Float mode describes the state of the batteries when they are getting a trickle charge to keep up with any small electrical loads on the vehicle and to combat **self-discharging**. Self-discharging is the phenomenon where charged batteries lose their charge over time, even though they have not been used.

If the charger detects a problem during the charge cycle, it will terminate the cycle and illuminate the amber LED. The yellow LED indicates a fault during the charge cycle. The Charger LED Box is not user serviceable, and should only be opened by Solectria.

SAFETY

- Unplug vehicle from the wall outlet (See Photo 15).

PROCEDURE

Removing the Charger LED Box

Use the following procedure to remove the Charger LED box:

1. Unplug vehicle from the wall outlet (See Photo 15).
2. Detach the 8-pin, black Packard connector, located in the under-hood compartment.
3. Push the wires and connector through the compartment's access hole, into the passenger's cabin.
4. Remove the LED box from the Velcro™ mounts.

Installing the Charger LED Box

Installation of the Charger LED Box is the reverse of removal. Be sure the vehicle is unplugged from the wall during this procedure.

AC FUSE BOX

DESCRIPTION

The AC Fuse Box (See Photo 3) receives 220VAC from the charge port and distributes it to the charger and thermal management heating system for the batteries.

The AC Fuse Box is not user serviceable and should only be opened by a Solectria trained Technician. Fuses may be checked or changed by the user. Fuse values are listed on the cover of the Fuse Box.

SAFETY

DANGER!

- When plugged into a live circuit, the AC Fuse Box contains high voltage AC. Do not attempt to remove any fuses until the charge port is disconnected from the AC wall outlet.

  Solectria is not responsible or liable for any damages to equipment caused by the misuse of any supplied components.

- Secure the vehicle as described in the section: “Securing the CitiVan”.

PROCEDURE

Removing the AC Fuse Box

Use the following procedures to remove the AC Fuse Box from the under-hood compartment of the vehicle:

1. Detach the 4-pin Packard connector, used for the 220VAC output to the Thermal Management heating system.

2. Remove the wires from the Marinco 250V 30A male, flanged outlet of the 220VAC charge port (See Photos 15 & 17).

Continued on next page

3. Remove the mounting clips that hold the charger port wire to the hood and under-hood compartment of the vehicle.

4. Unplug the yellow Marinco connector attached to the Charger

5. Remove the nut attaching the end of ground wire to the mounting bracket, located underneath the AC Fuse Box.

6. Remove the two ¼" - 20 nuts used to mount the AC Fuse Box to the mounting plate (See Photo 10).

Installing the AC Fuse Box

Procedures for installing the Fuse Box are the opposite of removal.

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DC FUSE BOX

SEE PHOTO 10

WARNING!

Do not attempt to service the DC Fuse Box!

Due to safety issues regarding the removal, installation and servicing of the DC Fuse Box, only trained Solectria Technicians are permitted to work on the unit. If you have any questions, or if your unit needs servicing, please contact the Solectria Customer Service Department.

DESCRIPTION

The Driver Console is located on the dash to the right of the steering wheel (See Photo 16). It is made up of:

- The Tri-Power Selector Switch,
- The regen brake disable switch and
- The heater switch.

The Tri-Power Selector Switch has five positions:

- 3-forward power levels
- 1-Neutral
- 1-Reverse

The regen brake disable switch allows the driver to turn off the regen braking, providing an advantage in slippery road conditions. The heater switch is used to control the cabin heat.

The Driver console is not user serviceable, and any attempt to open or service will void all applicable warranties.

SAFETY

- Secure the vehicle, as described in the section: “Securing the CitiVan” on page 18.
- Apply parking brake, turn tri-power selector switch to the “Neutral / Start” position, turn off ignition key and remove.

PROCEDURE

Removing the Driver Console

1. Remove the two screws securing the console cover and then remove the cover itself.
2. Disconnect the following under the dash:
    a. 3-pin International Molex Connector (Forward/Reverse)
    b. 3-pin Amp Connector (Power Selector)
    c. 2-pin Amp Connector (Regen Disable)
    d. 2-pin mini Molex Connector (Heater)
    e. Gray ground wire (Heater)
3. Remove the three screws under the cover and remove console.

Installing the Driver Console

Installation is the reverse of removal. Also follow these guidelines:

- Be sure the ignition key is in the "off" position and the parking brake is applied.
- Be sure to include all the wires that were under the same ground screw as the gray heater switch wire.

ACCELERATOR / BRAKE CONTROLLER

DESCRIPTION

Located under the dashboard on the driver's side (See Photo 18), the accelerator/brake controller is actuated by the accelerator linkage. The Accelerator / Brake Controller is not user serviceable, and any attempt to open or service will void all applicable warranties.

SAFETY

CAUTION

- Secure the vehicle, as described in the section: "Securing the CitiVan" on page 18.
- Apply parking brake, turn tri-power selector switch to the "Neutral / Start" position, turn off ignition key and remove.

PROCEDURE

Removing the Accelerator/Brake Controller

1. Locate the Accelerator / Brake Controller Box by looking underneath and inside the dash on the right side. Unplug the Accelerator / Brake Controller connector and remove any zip ties that hold the wire in place so removal of the wire is possible.
2. Remove the quick release ball joint rod from the accelerator pedal.
3. Remove the 4 Phillips screws that holds the Accelerator / Brake Controller to the lower right corner of the dash.
4. Pull the wire out of the dash and remove the Accelerator / Brake Controller unit.
5. Remove the ball joint from the Accelerator / Brake Controller with a 7/16" and a 8m wrench and install on new unit if necessary.

Installing the Accelerator/Brake Controller

1. Put Accelerator / Brake Controller in place and screw all 4 screws into dash. Make sure wire that came out of the Accelerator / Brake Controller is closest to the drivers seat rather than the front of the vehicle.
2. Connect the ball joint
3. Zip-tie any and all wires away from the ball joint rod so that the wires do not interfere with the movement of the rod.
4. Test the movement of the rod; it should come within 1/16" from the stop post on the controller when the accelerator pedal is fully depressed. If it hits or is too far away, adjust rod length and retest.

Testing the Accelerator/Brake Controller

Drive the vehicle in forward and reverse.

DESCRIPTION

The Amp-Hour Counter (See Photo 16) measures and integrates the current and time when discharging and charging the battery pack. The Amp-Hour Counter Display is built into the instrument panel / speedometer assembly (See Photos 8 and 8A). The Amp-Hour Counter, driver circuit board and shunt are located in the DC Fuse Box and are not user serviceable.

The main purpose of the Amp Hour Counter is to count the number of amp hours used and to allow the operator of the vehicle to approximate the state of charge of the batteries. On the CitiVan, the Amp Hour Counter is offset by a factor of 2, e.g. when the Amp Hour Counter reads 1.00, it really means 2.00 Amp Hours have been used. This is because the CitiVan's battery pack consists of two, parallel stings of batteries. The capacity of the batteries is approximately 90 Ah total, the Amp Hour Counter will read 45.00 at this time.

During charging and regen-braking, the Amp Hour Counter will count backward toward 0.00, and the state of current arrow, located on the left-hand side of the display, will point down. The normal charge cycle will slightly overcharge the battery. This will cause the Amp Hour Counter to enter into the negative numbers. This is normal; the Amp Hour Counter will reset to 0.00 Ah as soon as energy is taken out of the batteries, when the vehicle uses power. While current is flowing out of the batteries, the Amp Hour Counter will count forward toward 45.00, and the state of current arrow will point upwards.

The Amp Hour Counter Display connects to the DC Fuse Box using a 8-pin, gray, Deutsch connector. The Amp Hour Counter is not user serviceable. Any attempt to open or service the Amp Hour Counter unit will void all applicable warranties.

SAFETY

WARNING!

- Secure the vehicle, as described in the section: "Securing the CitiVan on page 18".

PROCEDURE

Removing the AMP hour Counter Display

Be sure to follow this disconnect sequence to prevent damage to the Amp-Hour Counter.

1. Disconnect the AC power from the charge port of the vehicle.

2. Make a note of the Amp-Hour Counter reading and post it near the Amp-Hour Counter display In this way, when the counter is re-connected, the vehicle operator can approximate the battery state of charge (i.e., meter may reset to 0.00, so without a note, the operator has no way of knowing the true battery state of charge - see below for more details).

3. Before unplugging the amp-hr counter or the harness, push in the Emergency Stop Button, located above and to the left of the driver's seat. Doing so will protect the Amp-Hour Counter from a power surge when the Amp-Hour counter is unplugged and plugged back in.

4. Remove the screws holding the instrument panel to the dashboard. Pull the panel away just enough so as to gain access to the to the rear of the panel.

5. Unclip the plastic fascia from the panel.

6. Unplug the Amp Hour-Counter Display (8-pin Deutsch connector and 4-pin, gray Deutsch connector).

7. Disconnect the display from the back of the panel and pull it out through the front.

Installing the AMP Hour Counter Display

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

Note re: "State of Charge"

The Amp Hour-Counter may reset to zero when the unit is reinstalled. 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.

DESCRIPTION

The DC-DC Converter's main function is to take high voltage (312V) DC and convert it to 12VDC (See Photo 7). It is located in the under hood compartment (See Photo 10), is and is mounted to the main component tray. Other than the external fuse there are no user serviceable parts.

SAFETY

CAUTION

- Secure the vehicle, as described in the section: "Securing the CitiVan" on page 18.
- Turn the ignition key off, apply parking brake and turn off all 12V DC loads.
- Push in the Emergency Stop Button, located above and to the left of the driver's seat.

  Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.
- All electronic components store energy in their capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.

WARNING!

- Never use standard DC-DC Converters in parallel. Never parallel DC-DC Converters of different input or output voltages. Never connect any DC-DC converters in series. Failure to comply with the above can result in injury and/or equipment damage, and will void all applicable warranties. The DC-DC Converter is not user serviceable. Any attempt to open or service the DC-DC Converter unit will void all applicable warranties.
- The DC-DC Converter's input connects to the DC Fuse Box using a 3-pin Deutsch connector (2 wires, one white & one green). The output of the DC-DC Converter terminates with a 2-pin Anderson SB-50 Gray (12V DC output)

PROCEDURE

Removing the DC-DC Converter

1. Disconnect the 2-pin gray Anderson connector (12 volt).
2. Disconnect 3-pin, 2-wire Deutsch connector from the high voltage DC input.
3. Remove the (4) 7/16" mounting nuts and washers.

Installing the DC-DC Converter

Installation of the DC-DC Converter is the reverse of removal. Be sure the vehicle is unplugged from the wall during this procedure. Also be sure replacement unit is correct voltage for vehicle.

Replacing the DC-DC Converter Fuse

WARNING!

- Push in the Emergency Stop Button, located above and to the left of the driver's seat.

  Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

- All electronic components store energy in their capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.

1. Disconnect the 2-pin gray Anderson connector (12 volt).
2. Disconnect 3-pin, 2-wire Deutsch connector from the high voltage DC input.
3. Remove and replace 5 Amp fuse.
4. Reconnect DC-DC Converter by reversing the instructions in steps 1,2 & 3 above.

DESCRIPTION

The USPS CitiVan has a 12V Standby Battery System. This battery system serves as a back-up, 12V power source if another system on the vehicle fails and 12V cannot be produced. Such scenarios include depleted battery pack, damaged battery pack, blown battery pack fuse, inoperative DC-DC Converter, or activated red Emergency Stop Button. The main purpose of this battery is safety. It provides power to emergency flashers and other lights in the case of a breakdown of the primary system, while driving. The other function is to supply power to the red Emergency Stop Button when it is released in order to re-enable the vehicle.

This battery is located under the hood, next to the Power Steering / Power Brake Motor. It is a Deka Dominator Group 22 deep cycle, gel lead-acid battery with T881 style terminal posts.

The Battery Charging DC-DC Converter maintains this auxiliary battery at 13.5 volts even when the ignition key is off, which for this battery type corresponds to a nearly fully charged battery. Additionally, the Battery Charging DC-DC Converter supplies power to all 12V accessories at the same time. Under normal operating circumstances the Standby Battery does not contribute power to accessory loads. This battery is rated to 33.5 amp-hours at a discharge rate of one hour. This means the Standby Battery will power all of the 12V systems for a significant time, depending on the load. The following table shows estimated Standby Battery capacity.

Table: Estimated Standby Battery capacity

Emergency flashers alone	**Minimum 2 hours**
Emergency flasher and headlights (low-beams)	**Approximately 1 hour**
All 12V accessories	**Less than ½ hour**
Vehicle driving, no accessories	**Approximately 1 hour**
Emergency Stop Button activated, no accessories and vehicle off:	**Approximately 1 week**

PROCEDURE

Standby Battery Discharge Test

Use the following procedures to perform a discharge test of the Standby Battery.

1. Charge the battery to 13.5 volts by letting it sit in the vehicle overnight. This allows the Battery Charging DC-DC Converter to give it a long, slow charge.

2. Disconnect the input to the Battery Charging DC-DC Converter**.** This is the 3-pin Deutsch connector.

3. Start a stopwatch.

4. Turn on the headlights (low-beams) and emergency flashers. Monitor the voltage of this battery. When the battery voltage reaches 10.5 volts the test is done. If the battery maintained voltage for one hour or more the battery is ok. Otherwise it should be replaced.

Note re: charging Standby Battery

The Standby Battery may be charged using a standard automotive 12V battery charger. *The battery must be removed or disconnected from the vehicle before doing this. Otherwise the Battery Charging DC-DC Converter may be internally damaged. This is not covered by warranty.*

POWER STEERING / BRAKE MOTOR ASSEMBLY

DESCRIPTION

The Power Steering / Brake Motor (BPM3) (See Photo 6) is a small motor that mechanically powers the Power Steering / Brake Pump. The BPM3 is located in the under hood compartment in front of the driver side front wheel well (See Photos 9 & 25).

SAFETY

CAUTION

- Secure the vehicle, as described in the section: "Securing the CitiVan" on page 18.

PROCEDURE

Removing the Power Steering / Brake Motor Assembly

Use the following procedures to remove the Power Steering/Brake Motor Assembly from the under-hood compartment of the vehicle:

1. Disconnect the 2-pin, gray, Deutsch connector that connects the BPM-3 to the DC-30.
2. Disconnect the 2-pin Packard connector from the wiper washer fluid reservoir.
3. Unbolt the green, grounding wire located on the left side of the unit, from the floor of the under-hood compartment.
4. Loosen the (4) bolts that attach the face of the motor to the pulley guard bracket.
5. Unbolt the washer fluid reservoir from the two mounting brackets.

Continued on Next Page

6. Loosen the tensioner bolt and remove the belt.

7. Remove the (1) nut and (2) bolts that mount the assembly to the vehicle.

8. To gain access to the bolts behind the pump pulley, pull the assembly away from the battery box.

9. Remove the (2) bolts located behind the pump pulley.

10. Slide the pump off of the belt guard bracket and remove the motor and belt guard assemblies.

Installing the Power Steering/Brake Motor Assembly

Procedures for installing the BPM-3 are the opposite of removal.

POWER STEERING / BRAKE MOTOR CONTROLLER

DESCRIPTION

The Power Steering / Brake Controller (See Photo 5) is both a switching device and a voltage converter for the Power Steering / Brake Motor. It is located in the under hood compartment on the driver side front of the front battery box (See Photos 9 & 25).

SAFETY

CAUTION

- Secure the vehicle, as described in the section: “Securing the CitiVan” on page 18.
- Turn the ignition key off, apply parking brake and turn off all 12V DC loads.
- Push in the Emergency Stop Button, located above and to the left of the driver’s seat.

Note Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

- All electronic components store energy in their capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.

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PROCEDURE

Removing the DC-30

Use the following procedures to remove the DC-30 from the under-hood compartment of the vehicle:

1. Disconnect the 2-pin, gray, Deutsch connector that connects the BPM-3 to the DC-30.
2. Disconnect the 1-pin, black, Packard connector for the "keyed" 12V circuit.
3. Disconnect the black grounding wire from the frame of the vehicle.
4. Disconnect the 3-pin, gray Deutsch input connector
5. Remove the (2) stainless steel screws that attach the unit to the component's mounting bracket.

Installing the DC-30

Procedures for installing the DC-30 are the opposite of removal.

DRIVE MOTOR CONTROLLER (DMOC)

DESCRIPTION

The drive motor controller (DMOC) (See Photos 4 and 10) serves as the interface between the battery pack and the drive motor in your vehicle. It does this by changing the DC power coming from the battery pack to AC power to run the drive motor, and it regulates the energy flow to the drive motor based on input received from the accelerator brake controller pot-box, the drive motor speed sensor and the gear selector switch.

The DMOC is located in the under hood compartment on top of the front battery box. There are no user serviceable parts in the DMOC. The DMOC is air cooled, so the cooling fans should be kept free of debris.

The DMOC645 takes high voltage DC from the DC Fuse Box and converts it to three-phase AC to run the Drive System Motor. The DMOC is wired to the DC Fuse Box via (1) red and (1) black, Crouse-Hind connectors.

The DMOC interfaces with all of the drive input signals, including the Accelerator Pedal, Gear Selector, Regen Disable, Charger Interlock, Regen Brake Light, Speedometer and "Keyed" 12V system, via the 35-pin AMP vehicle interface port.

The DMOC is wired to the Drive Motor using three Crouse-Hind connectors: (1) Green, (1) White & (1) Blue. The second 2-pin Packard connector goes to the cooling fans on the top of the DMOC unit

The DMOC is wired to the Drive Motor Speed Sensor 14-pin AMP Motor Sensor Port. Next to this connector is the 8-pin AMP Communication Port that, with an adapter, can be used to troubleshoot and monitor the unit with a computer.

The DMOC installed in the Van should never need adjustment, if it does, contact the Solectria Service Department for help.

The DMOC is not user serviceable. Any attempt to open or service the DMOC unit will void all applicable warranties.

Special Note re: rubber mounts

Failure to use rubber mounts under the component tray can cause accelerated aging and fatiguing of electronic components. This is not considered normal wear and tear and will not be covered under warranty. Solectria is not responsible or liable for any damages, equipment or other, for the misuse of any supplied components or mounts.

SAFETY

CAUTION

- Secure the vehicle, as described in the section: "Securing the CitiVan" on page 18.
- All electronic components may store energy in capacitors for some time after being isolated or disconnected from power. Always treat exposed conductors with caution.
- Turn the ignition key off, apply parking brake and turn off all 12V DC loads.
- Push in the Emergency Stop Button, located above and to the left of the driver's seat.

Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

WARNING!

The DMOC's capacitors retain high voltage power for several hours after the unit has been removed from the vehicle. Do not touch the red or black input connectors, even if the unit has been removed form the vehicle.

Removing the Drive Motor Controller (DMOC)

1. Disconnect the high voltage input to DMOC (Red and Black Crouse-Hind connectors) by twisting the connectors, until the tabs on the connectors line up and then pull the two ends apart.
2. Drain the DMOC's internal capacitors by turning the ignition key to the "on" position for five minutes. Once completed, turn the ignition back to the "off" position.
3. Snip the two zip ties on metal mesh over drive motor power connectors (green, white and blue, Crouse-Hind) and unzip mesh.
4. Disconnect green, white and blue, Crouse-Hind connectors by twisting each of them, until the tabs on the connectors line up and then pulling the two ends apart.
5. To disconnect the 35-pin and 8-pin AMP connectors at the DMOC, pull up on the release tab, located on the top side of the connector housing.
6. Disconnect the ground wire that is screwed to the DMOC case.
7. Remove the 1/4 - 20 nuts and washers that secure controller to the components tray.
8. Remove the DMOC from the components tray.

Installing the Drive Motor Controller (DMOC)

Procedures for installing the Drive Motor Controller are the reverse of removal.

- Be sure to replace any zip ties that were cut off.
- Be sure the ignition key is still off and park brake is applied.

Special Note re: 14 and 35 pin connectors

Make sure that the 14 and 35-pin connectors "click" into place when reconnected.

ELECTRIC HEAT

DESCRIPTION

The Electric Heat is made up of a heater element assembly (See Photo 19) and a heater relay assembly (See Photo 20). The heater element assembly is located in the drivers' compartment on the curb-side of the firewall (See Photo 11). The assembly is enclosed inside the cabin heat distribution box (heater box). The heater relay assembly is located between the heater box and the firewall.

SAFETY

CAUTION

- Secure the vehicle, as described in the section: "Securing the CitiVan" on page 18.
- Push in the Emergency Stop Button, located above and to the left of the driver's seat.

Note: Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again.

PROCEDURE

Removing the Electric Heat

1. Disconnect the red wire going to the heater relay assembly.
2. Disconnect all of the wires in the small loomed harness connecting the heater relay assembly and the heater element assembly.
3. Remove the four Phillips screws that hold the access panel onto the heater box. Remove the heater box access panel.
4. Slide the heater element assembly out of the heater box.
5. The system may be tested at this time, but care must be taken to eliminate shock and burn hazards.

Installing the Electric Heat

Installing the Electric Heat is the reverse of removal. Be sure to reconnect all of the wires properly.

The Battery Pack

DESCRIPTION

The battery pack is made up of two battery strings in parallel. Each of the battery strings consists of twenty-six, 12-volt, deep-cycle, sealed gel lead acid batteries, in two battery boxes. The entire battery pack consists of 52 batteries, distributed in four battery boxes, making up two parallel strings. The first battery string is made up of the front battery box, located in the under hood compartment (See Photo 9) and the middle box located under the floor of the drivers compartment (See Photo 21). The second string is made up of the two rear boxes located in the cargo bay (See Photo 22).

SAFETY

WARNING!

- THE CITIVAN BATTERY PACK CONTAINS NO USER SERVICABLE PARTS!

  ANY ATTEMPT TO SERVICE THE BATTERIES OR OPEN THE BATTERY PACK WILL VOID ALL VEHICLE WARRANTIES, AND **CAN BE HAZARDOUS**!

  WE RECOMMEND THAT ONLY SOLECTRIA TECHNICIANS OPEN VEHICLE BATTERY PACKS!

- Batteries are connected in series for a total pack voltage of 312V DC nominal, a potentially lethal source of electricity.

- The battery electrolyte is a sulfuric acid gel. Even though the vehicle is equipped with sealed batteries, safety goggles or a face shield and rubber gloves should be worn when batteries are exposed. This will help to protect against electrical shock and chemical burns. Batteries may carry acid on their external surface that will damage clothing. Solectria recommends wearing a chemical apron.

Definition of "Fully Charged"

Once the Battery Charger has supplied the batteries with a 10% overcharge, a Solectria CitiVan, equipped with lead acid batteries, are at a full state of charge (S.O.C.). This means that when the batteries are finished re-charging, the Amp-Hour Meter (See Photo 8) should read a negative value corresponding to 10% of the Amp-Hours obtained in the discharge test, or drive.

For example, if the Amp Hour meter of a discharged vehicle reads 43.00Ah, then the Amp Hour meter, after a full recharge, should read: -04.3 Ah

Calculation: 43.00 x (-0.10) = -4.30aH

Note re: overcharge percentages

These numbers are approximate. The actual overcharge percentage will vary, but should be about 10%. The time needed to achieve a fully charged condition is dependent on the age of the battery pack and the temperature of both the batteries and the battery charger.

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HOW TO CYCLE A NEW BATTERY PACK

DESCRIPTION

For long life and optimal performance, new batteries must be cycled *gently* for proper conditioning.

SAFETY

CAUTION

- **DO NOT** allow pack to discharge more than 45 amp-hours during its first few cycles. **Discharging the batteries more than 45 amp-hours when they are new could cause permanent harm to the pack.**

PROCEDURE

Gradually Discharging the Battery Pack

Running the electric heater can be used as a means of gradually discharging the battery pack. Using this method will take approximately 10 hours to reach 45.00 Amp-Hours. Using a Solectria discharger, discharging time will be approximately 6 to 8 hours.

It is not necessary to monitor the vehicle continuously during the battery discharge procedure, however, **remember to check back after 4 or 4 ½ hours to see how the batteries are doing**. Battery Pack Voltage should never get below 295V DC measured at the DMOC 312V DC input.

Note re: cycling of pack

Service personnel should cycle (fully charge and discharge) the pack **three times** to assure proper initial conditioning of the pack. However, the vehicle operator can complete the battery conditioning process while driving. Follow the procedure "How to Condition a New Battery Pack".

HOW TO CONDITION A NEW BATTERY PACK

DESCRIPTION

The following procedure describes the steps in conditioning new, lead-acid batteries. Since not all new batteries have been charged to their full capacity, conditioning the batteries helps them to reach a uniform state of charge.

SAFETY

WARNING!

- NEVER LEAVE A DISCHARGED VAN UNPLUGGED!
- To insure long battery life, Solectria recommends the van be plugged in at all times when not in use.
- Solectria recommends new batteries be fully charged once every 24 hours.

PROCEDURE

Conditioning a New Battery Pack

1. Drive the van gently with the Tri-Power Selector Switch in "MAX RANGE" at all times and consume less than 20 Amp-Hours total.
2. Plug the vehicle in to complete a full charging cycle.
3. To condition the batteries, repeat this procedure 10 times. Pack is now conditioned. You may notice an additional improvement in performance as time goes on.

Discharge Testing a Battery Pack

If the range performance of the van, following a full re-charge, has been declining, perform a discharge test. A battery discharge tester unit and a discharge test procedure are available from Solectria Corporation. Please contact the Customer Service Department for pricing and availability.

DESCRIPTION

The Fuel Fired Heat (FFH) (See Photo 23) is an optional feature on the CitiVan. FFH runs only when the temperature is less than 40 Deg. F (See Photo 24). The FFH runs on diesel fuel and uses antifreeze and the vehicle heater core to transfer heat to the cabin. This system is located on the curbside firewall in the under hood compartment (See Photo 9). If any problems are experienced with the FFH system, contact Solectria Service Department for trouble shooting tips, and if needed, instructions for removal.

Appendix

APPENDIX A – TROUBLESHOOTING GUIDE

SYMPTOM	CHECK FOR	PROCEDURE
Vehicle does not drive.	Vehicle is plugged in.	Unplug the vehicle.
	Tri-Power Selector Switch (See Photo 16) is set to one of the forward or reverse settings when the ignition key is turned on, or foot on accelerator pedal.	Take foot off of accelerator pedal, set the Tri-Power Selector Switch to the "Neutral / Start" setting and turn the ignition key off then on again (2 clicks). Now set the Tri-Power Selector Switch to one of the forward settings, or to the reverse setting, and try driving the vehicle again. You must push accelerator pedal down at least half way before van will start to move. (When the ignition key is turned on, the vehicle will power up only if the Tri-Power Selector Switch is at the "Neutral / Start" setting.)
	12V system is not working. ie. Head lights and Horn not working.	*See "12V accessories are not operating".*
The vehicle does not move or stops abruptly while driving	DMOC: (See Photos 4 and 10). Does controller "clunk" on? (Clunk sound is normal.)	*See "Checking Drive motor and Controller" in Appendix B..*
	Drive motor speed sensor out of adjustment or failed.	*See "Checking Drive motor and Controller" in Appendix B, first, then see "Motor Speed Sensor Adjustment" in text.*

SYMPTOM	CHECK FOR	PROCEDURE
Vehicle is sluggish	Is Amp-hour counter (See Photo 16) reading over 40.00-50.00 Ah? If so, batteries are running low on energy and need to be recharged.	The van may not drive if amp-hour meter reads over 40.00-50.00 Ah and its operation is sluggish. The battery pack should be fully recharged at this time (until the "Charge Complete" Green LED on the BC LED Box (See Photo 2) comes on). If necessary, the vehicle may be driven following a partial recharge, but it should be fully charged at the earliest opportunity for optimum battery performance and life.
	Is Tri-Power Selector Switch set to MAX RANGE?	Select to NORMAL or MAX POWER setting for more power (and less range).
	Is vehicle operation sluggish due to low, weak, or damaged battery pack, or faulty battery interconnects?	Set the Tri-Power Selector Switch to NORMAL and push the accelerator pedal all the way down. Using a voltmeter (*See "How to Measure Voltage" section in text*), check to see that the voltage does not drop under 280V when the amp-hour meter reads between 00.00 and 35.00 amp-hours. If it does fall under 280V, perform a battery discharge test. *See "Battery Discharge Test" section in text.* It is necessary to fully charge the battery pack immediately. If vehicle has been left unplugged in the cold for some time, then plug it in until the batteries have reached 60°F before driving. If the vehicle <u>has</u> been plugged in, then check that the thermal management system is functioning properly.
DMOC cooling fans are not operating	Is DMOC heat-sink hot?	1. Check that the DMOC cooling fans are operating 2. Check the 12V power to the DMOC cooling fans.
	Motor too hot to touch?	Allow motor to cool and then call the Solectria Customer Service Department for assistance.

SYMPTOM	CHECK FOR	PROCEDURE
Vehicle is jerking on acceleration	Faulty controller or faulty 35-pin cable or vehicle wiring.	*See "Checking Drive motor and Controller" in Appendix B..*
	Drive motor speed sensor is faulty or out of adjustment.	See *"Motor Speed Sensor" in text.*
	Faulty accelerator / brake controller signal.	If hesitation occurs at a particular point in the accelerator pedal travel, or seems to be affected by bumps, then the problem may be in the pot-box. Call Solectria for details on checking pot box resistance.

SYMPTOM	CHECK FOR	PROCEDURE
12-volt accessories are not operating Note: 12V is a generic term. Your actual voltage may vary between 12V and 14V	Ignition key is not in "ON" position	Turn the ignition key until the position is reached where the key can be removed. Remove the key, then reinsert it and turn to the "Ignition" position (2-clicks clockwise)
	DC-DC Converter is in brownout or blackout mode and 12V standby battery is dead.	Turn off the ignition key and disconnect input wires to the DC-DC converter (the small, gray Deutsch connector with green and white wires), then reconnect input wires to the DC-DC. Check the output on the 2-pin gray Anderson connector for 13.5V (red and black wires), or turn the key on and turn on the headlights. (See also "Checking 12V Stand By Battery" in Appendix B.
	Blown fuse at DC fuse box (See Photo 7) or at DC-DC converter and/or 12V standby battery is dead.	Check the fuses at the DC fuse box and the DC-DC converter as follows: Push the Emergency Stop Button. 1. Turn ignition key to the "Off" position. 2. Disconnect the gray Deutsch connector with the green and white wires. 3. Take out the fuse from on top of the DC-DC converter and test with a continuity meter. 4. If the fuse is damaged or blown, replace with another fuse that has the same value and type. If not damaged or blown, reinstall the old fuse. 5. Take out the DC-DC converter fuse from the High Voltage fuse box and test it with a continuity meter. 6. Same as step 4. 7. Re-connect the small gray Deutsch connector. 8. Try turning headlights on. 9. For further details, See "*Checking DC -DC Converter" and "Checking the12V Standby Battery" in Appendix B*

SYMPTOM	CHECK FOR	PROCEDURE
12-volt accessories are not operating (Cont)	Red, "Emergency Shut Off" button has been engaged and 12V Standby battery is dead.	Pull the red "Emergency Shut Off" button, out.
	Main fuses in front or rear battery box are blown, or battery module is open and 12V standby battery is dead.	Check for approximately 312V at the DMOC motor controller. See "*Vehicle does not drive*" and *"Checking the12V Standby Battery" in Appendix B.*
Power Steering, Power Brakes not working.	No 12V signal to Power Steering / Brake controller (DC-30) (See Photo 9 & 25).	**WARNING! KEEP HANDS, HAIR, LOOSE CLOTHING AND JEWLERY CLEAR OF POWER STEERING / BRAKE MOTOR BELT WHEN DIAGNOSING.** 1. Unplug single, red wire from DC-30 controller. Turn on ignition and check for +12V DC between harness wire and chassis ground. 2. If no +12V DC is present, reconnect the wire and check the 12V system *See "12V accessories are not operating".*

SYMPTOM	CHECK FOR	PROCEDURE
Power Steering / Brakes not working. (cont.)	Blown fuses and/or blown DC-30 controller	1. Turn ignition key off and unplug 312V input to DC-30 controller. 2. Push in the Emergency Stop Button, located above and to the left of the driver's seat. **Note:** Never push in, then immediately pull out the Emergency Stop Button. Always wait 5 seconds before pulling the button out again. 3 Check fuses in the DC 30 controller and High Voltage DC fuse box. If the fuses are good, the unit may need replacement. Call Solectria's Customer Service Department for more information.
	Faulty 12V Ground	Inspect the black, 12V ground wire from the DC30.
	Burnt brushes and/or BPM-3 motor.	Turn ignition key off and disconnect BPM-3 motor to controller wires. Turn ignition key back on and check for minimum 48V DC at Power Steering / Braking controller output to motor. If voltage is present, turn key off. Remove motor brushes (Call Solectria's Customer Service Department for instructions) and inspect commutator for wear and discoloration. Clean commutator with cotton swab and alcohol, and reinstall brushes. Replace brush if carbon section is less than ¼" in length. Otherwise, replace motor.
Power steering is making "growling" noises and operation is difficult.	Power steering fluid may be low.	Check power steering fluid level. If low, add Automatic Transmission Fluid (ATF) as needed.

SYMPTOM	CHECK FOR	PROCEDURE
Vehicle trips GFI (Ground Fault Interrupt) Circuit	Water and salt in AC Charge Port (See Photo 15) or extension cord	**With charging cord unplugged at both ends**, wash the two ends in hot soapy water. Rinse and dry. Wash off AC charge port on vehicle with a toothbrush and toothpaste. Rinse with distilled water and let dry. Also, inspect the entire charge cord for damage.
	GFI Circuit faulty.	Have GFI circuit checked by licensed electrician. Alternate models or makes may work more reliably with Solectria chargers. Call Solectria for more details.
	Short in battery thermal management system.	Locate AC Fuse Box under hood (See Photo 10). Unplug the four-pin square Packard connector with two sets of (black and clear) wires and test for continuity. **Note**: The batteries must be below 60°F or the thermal sensors will be "open" and this test will be invalid.
Vehicle is not charging: Numbers on Amp-Hour Counter are not counting down.	No power from wall outlet.	Check that extension cord has 220V AC at the vehicle end. Reset circuit breaker or GFI.
	No LED lights come on at the firewall mounted BC LED box (See Photo 14). No AC voltage input to charger.	With vehicle plugged in: check for the AC voltage at the end of the charger input cord under the hood. (Yellow, waterproof Marinco connector) If no voltage present: check for voltage at the AC Fuse Box. If fuse is blown, replace it. If voltage is present to the charger and the charger doesn't operate, contact Solectria Corporation. The charger may have to be replaced.

SYMPTOM	CHECK FOR	PROCEDURE
Vehicle is not charging: - Yellow LED is illuminated on BC LED Box (signifying "Fault Mode")	Charger is in fault mode (Yellow LED): Problem with battery pack voltage to charger.	With vehicle unplugged, disconnect two-pin, black Yazaki charger output connector and check for DC high-voltage at vehicle harness. If no voltage or very low voltage is present, check the battery-charging fuse in the High Voltage DC fuse box. If the fuse is operational, contact Solectria to check battery pack fusing. The battery pack fuse may be blown in such a way that full pack voltage can be measured at the output. Reconnect the charger output hooked up to the van harness. Carefully back probe the connector and be sure the van is unplugged from the wall. If no, or low, voltage is present, then contact Solectria for further instructions..
	Charger is in fault mode: Bad signal from temperature sensor.	Unplug vehicle. Disconnect temperature sensors (black Packard 3-pin, 2-wire connectors with clear and black wires) from BC LED Box and measure the resistance at the vehicle side of the harness. Resistance should measure anywhere from 15k ohm to 45k ohm depending on battery temperature. If no resistance is measured or if out of specification, call Solectria for a chart that shows correct resistance values at various temperatures. (It's possible the batteries may be too hot or too cold.) Otherwise, call Solectria to replace sensor.

SYMPTOM	CHECK FOR	PROCEDURE
Cont'd: Vehicle is not charging - Yellow LED is illuminated on BC LED Box (signifying "Fault Mode")	Charger is in fault mode: Batteries are too hot (over 130°F)	Unplug vehicle. Disconnect the temperature sensors from the BC LED Box. Check for resistance on both front and back temperature sensor connectors. If resistance is lower than 10k ohms, plug the temperature sensors back in and park the van in shade to let batteries cool. The charger will re-start on its own when the batteries have cooled if the yellow LED was not on when the van was plugged in. If the batteries were VERY hot and the yellow fault LED was on, then re-set the charger by unplugging the vehicle, wait Ten seconds, and plug it back in again.
	Batteries are too cold (under 32°F)	With vehicle unplugged and temperature sensors unplugged from the BC LED Box, measure resistance at temperature sensor harness. If the batteries are cold the resistance will be higher than 50k ohms. The van is equipped with automatic battery thermal management system, so leave the vehicle plugged in for at least eight (8) hours. The charger should re-start on its-own. If the batteries are still below 32°F the following day, then move vehicle indoors and check thermal management system operation. Call Solectria for test instructions.

APPENDIX B – SYSTEMS DIAGNOSIS

PROCEDURE	STEPS
Checking the Battery Charging, DC-DC Converter (See Photo 7) Note: 12V is a generic term for the voltage of the battery. The actual voltage can vary from 12-14 volts	With key off and van unplugged from wall, use a voltmeter to back-probe the output side of the DC-DC converter by measuring the voltage across the terminals of the stand-by battery. • **If full 13.5V is present**: The DC-DC Converter is OK. Check Van fuses located on the dashboard to the left of the instruments. • **If voltage is considerably lower than 12V**: The Battery Charging DC-DC Converter is not operational and the 12V battery is discharged. If the voltage measures less than 10V, the stand-by battery has also been damaged. (See also, "Checking 12V Stand-By Battery") Unplug the 312V DC input to the DC-DC converter (gray Deutsch connector with green and white wires) and check the fuse in the DC-DC converter. If the DC-DC Converter's fuse is blown, replace it with a fuse of the same current and voltage rating (KLKD: 5A). Re-install good fuse; re-connect 312V DC input (be certain the key is off and 12V output is connected). Check for 12V DC output at the battery. If the fuse blows again soon after being replaced, there is likely a fault in either the vehicle or the unit. Please call Solectria Customer Service for assistance. If there still is no 13.5V, unplug the 312V input and check the van harness for 312V input to the DC-DC Converter. If full voltage is present and the fuse in the DC-DC is good and there still is no 13.5V output, then the DC-DC converter must be replaced. If there is no voltage or very low voltage present at the DC-DC input, check the DC-DC fuse in the main DC fuse box with the DC-DC input still unplugged. If the DC-DC fuse in the main fuse box has continuity, check the main battery pack voltage at the high voltage DC connector to the controller. See "Vehicle does not drive" section.

PROCEDURE	STEPS
Checking Ignition Circuit	Sit in the vehicle with the windows closed (it must be quiet to hear the DMOC relay). Set the Tri-Power Selector Switch (See Photo 16) to any forward setting. <u>Make sure the van is unplugged from wall outlet and the Parking Brake is applied.</u> Turn the ignition key ON. Wait until the seatbelt reminder chime stops. Put seat belt on. Slowly turn the Tri-Power Selector Switch back towards the OFF setting. (Don't let the spring detent in the Tri-Power Selector Switch affect turning the handle). Listen for the relay in the DMOC to 'clunk', being careful not to confuse the DMOC 'clunk' with the mechanical detent in the Tri-Power Selector Switch that 'clicks' first. The DMOC 'clunk' indicates that the ignition circuit, the Tri-Power Selector Switch, and the neutral interlock circuit are working properly.
Checking Drive Motor and DMOC (See Photos 9, 10 & 12)	<u>Make sure the vehicle is unplugged and the parking brake is securely applied.</u> Make sure that the ignition circuit is working by listening for the DMOC 'clunk'. *Refer to "Checking Ignition Circuit" in previous section*. Turn the ignition switch off and on with the Tri-Power Selector Switch in the "Neutral / Start" position. Listen and/or feel for the controller to 'clunk' when the key is turned on. If the controller does not clunk, check battery pack voltage at red and black waterproof connectors. If approximately 312V is present, check the integrity of the 35-pin connector at the controller. If it appears operational, then call Solectria for further testing. If the controller 'clunks', but the drive motor does not turn, check the 14-pin connector from the drive motor speed sensor. It may also be necessary to perform a pot-box resistance test (call Solectria for details), or a drive motor speed sensor replacement.

PROCEDURE	STEPS
Checking the 12V Standby Battery. (12V is a generic term for the nominal voltage of the battery. The actual voltage can vary between 10.5V and 15V during normal use.)	Turn off ignition key and all accessory loads. Disable the high voltage by pushing the red Emergency Stop Button. Disconnect the cable from the negative terminal of the battery. Measure the voltage of the battery (This is referred to as the open circuit voltage, the voltage with no loads on the battery). **0V to 10V:** Battery must be replaced. The root cause of the battery being allowed to reach this state of charge must be determined. The Battery Charging DC-DC Converter and the cables from it to the battery must be diagnosed. See “Checking the Battery Charging, DC-DC Converter”. **10 to12.0V:** Battery is depleted and should probably be replaced. Normally the Battery Charging DC-DC Converter should maintain this battery at 13.5V. Depending on how long it has been in this depleted state it may be salvageable if recharged. Perform a discharge test on this battery- (see instructions on page 85). The root cause of the battery being allowed to reach this state of charge must be determined. The Battery Charging DC-DC Converter and the cables from it to the battery must be diagnosed. See “Checking the Battery Charging, DC-DC Converter”. **12.0V to 13.5V:** Battery may be partially depleted. Normally the Battery Charging DC-DC Converter should maintain this battery at 13.5V. However, if there have been heavy accessory loads or the red emergency button has been activated, the battery may appear lower. In this case it is best to perform a battery discharge test. See instructions in the section: “Standby Battery Discharge Test” on page 85. **13.5V:** Battery is in good condition.

Solectria Warranty for the USPS CitiVan

Solectria Corporation is providing the U.S. Postal Service with a Solectria Corporation warranty, pursuant to the requirements set forth is Paragraph 3.13 of Solicitation 102590-00-A-0114. The Solectria warranty covers the complete vehicle (chassis, body, batteries and electric drive system components). This results in a single point for warranty claims and payment and substantially reduces the administrative burden to Solectria and their customers.

WARRANTY PERIOD

Solectria will warrant the entire vehicle (chassis, body, batteries and electric drive system components) for a period of three (3) years or 36,000 miles, whichever occurs first, from the date that delivery of the vehicle is made to the Postal Service.

WARRANTY COVERAGE

The Solectria warranty applies to all vehicles purchased under Solicitation 102590-00-A-0114 and operated in New York City. The Solectria warranty covers repairs to correct defects related to materials or workmanship occurring during the warranty period for the entire vehicle (chassis, body, batteries and electric drive system components) to a level that meets or exceeds all requirements in Paragraph 3.13 of Solicitation 102590-00-A-0114 and/or the warranty advertised and provided to the general public. The coverage includes the chassis and body components, listed on the next page.

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CHASSIS COMPONENTS

- Frame
- Axle
- Motor/Gearbox
- Drive Train
- Steering
- Suspension
- Other Electric Drive System Components Supplied by Solectria

BODY COMPONENTS

- Body Framework
- Interior Panels
- Exterior Panels
- Roof
- Bumpers
- Windshield Wiper System
- Ventilation System
- Seat Assembly
- Doors and Door Hardware
- Paint
- Other Body Components Supplied by Solectria, Union City Body Company or Workhorse

Solectria warrants the vehicle, and all parts thereof (chassis, body, batteries and electric drive system components), to be free from defective material and workmanship for a period of not less than three (3) years from date of acceptance of the vehicle by the Postal Service, or 36,000 miles road travel, whichever occurs first.

Solectria will provide all materials and labor required to correct deficiencies or failures that occur during this period. If the batteries require replacement during the warranty period, it will be at the Solectria's cost.

WEAR ITEMS

Wear Items are not covered by the Solectria warranty unless these items malfunction due to poor workmanship or design. Items that are not covered on the vehicles pursuant to Solicitation 102590-00-A-0114 are as follows:

- Antenna
- Belts
- Brake Drums
- Brake Linings
- Brake Pads
- Brake Rotors
- Bulbs
- Cords
- Fuses
- Mirrors
- Plugs
- Shock Absorbers
- Springs
- Struts
- Tires
- Windows
- Windshield Wash Fluid
- Wiper blades

The Solectria *CitiVans'* warranty also does not cover any damage caused by vandalism, abuse, neglect, acts of God, etc.

MAINTENANCE

The warranty for the vehicles pursuant to Solicitation 102590-00-A-0114 does not cover the cost of regular maintenance as specified in the Solectria *CitiVan* Operator Instructions Manual and Solectria *CitiVan* Service Manual. In addition, if the maintenance is not performed as specified, the Warranty may not cover certain damage.

AUTHORIZED WARRANTY SERVICE PROVIDERS

All warranty repairs should be performed at the nearest Authorized Solectria Service Provider location. The nearest Authorized Solectria Service Provider location to the USPS facility in New York City where the vehicles pursuant to Solicitation 102590-00-A-0114 will be domiciled is:

J.C. Electronics Service Corp.

Jim Green (Contact)

Dix Hills NY 11746

T (613)-499-6406

F (631)-499-2229

M (631)-786-6229

Email: jigreen@oponline.net

No warranty claims will be processed without prior approval from Solectria.

WARRANTY CLAIM SUBMISSIONS

Any warranty claims should be directed to the Solectria Customer Service Department immediately (978-658-2231). Solectria will notify the designated service provider for immediate dispatch.

DETAILED WARRANTY COVERAGE

The Solectria Warranty information that will be supplied with, and apply to, each vehicle will be included in each vehicle, in the Owner's Manual and available upon request.