Smith Newton™ - Owner's Manual
Series 2000
North American Market
CD-0650-0018r0 November 1, 2012

Smith Newton™ - Owner's Manual

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SECTION **PAGE**

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1. Introduction

To ensure you are fully aware of safety and operational information, the following symbols are used throughout this manual.

NOTICE
Indicates a situation not related to personal injury.

WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice. No part of this publication may be reproduced or transmitted, in any form by any means, including electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher. This includes text, pictures and tables.

This manual has been produced and is intended as a complement to the Avia Ashok Leyland Motors Original Owners Manual (Avia Manual). To become familiar with the vehicle, it is necessary to read and understand this manual, the Avia Manual and all additional literature that is part of your vehicle's documentation pack (e.g. Owner's manuals for Tail lift, Radio and Back-Up camera, etc.).

It is your responsibility to ensure that all the documentation stays with the vehicle and is fully read and understood by anyone operating or otherwise maintaining the vehicle.

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2. Safety Notices and Instructions

WARNING
Never attempt to open a battery pack. This vehicle uses a battery pack that operates at 320 volts DC.

WARNING
Never attempt to remove, unplug or cut any of the ORANGE marked cables or conduit. Orange marked cables carry high voltage.

WARNING
Only authorized personnel are allowed to work on the electrical power and/or control systems.

CAUTION
DO NOT perform any welding work on the vehicle without permission from* Smith Electric Vehicles. *Serious damage can be caused to the drive train and the electronic control systems.

CAUTION
Hazardous Location Warning: It may not be appropriate to operate this electric vehicle in special occupancies, classified locations, or hazardous locations as defined by the National Electrical Code, Section 1.

CAUTION
EMF/EMR WARNING: Potential electromagnetic field or electromagnetic charge around this electrical vehicle may impact medical electronic devices.

Refer to Smith Electric Vehicles Process Document CD-0650-0010 for detailed First Responder Instructions.

The vehicle is fitted with a High Voltage Isolator that removes the power to the controller. This isolator, located between the seats on the control panel (Figure 2.1), should be activated in the event of a vehicular accident.

Do not reset the High Voltage Isolator until the emergency situation has passed. The High Voltage Isolator is 'reset' by returning the red switch cover to the **RUN** position i.e. covering the switch, and re-starting the vehicle in the normal manner.

Do not operate the High Voltage Isolator while the vehicle is in motion! If the High Voltage Isolator is activated when the vehicle is in motion, the steering will become stiff and the vehicle will continue to roll. The regenerative braking system will not assist braking. The service brake will operate until air is depleted, then a safety mechanism will automatically apply the rear brakes. This automatic braking cannot be driver controlled **and the brake will remain on until air system is charged.**

Figure 2.1

CAUTION
Do not activate the isolator switch in the cabin while vehicle is in motion. This will result in total loss of power steering and significant increase in effort to control the vehicle when moving.

CAUTION
Always switch off ignition before operating High Voltage Isolator.

If this vehicle is involved in an accident:

1. Activate High Voltage Isolator. (Figure 2.1)
2. Remove the ignition key.
3. Exit cab and turn the 24V System Isolator Switch to the **ISOLATED** (VERTICAL) position. This switch is located on the driver's side of the vehicle behind the cabin on the 2x12V battery tray. (Figure 2.2)

Figure 2.2

First Responders should remove **ALL** High Voltage Manual Service Disconnects (MSDs) located on the Traction Battery Pods. (Figure 3.1)

NOTE: There is one High Voltage MSD for each 20kW of Traction Battery power (e.g., 60kW, 3 MSDs; 80kW, 4 MSDs; etc.).

1. Push the small black tab down while pulling the Locking Lever up. (Figure 2.3)
2. A secondary catch will engage at about the 45° point and you will need to fully depress the small black tab once more and continue to pull the Locking Lever to the 90° position. (Figure 2.4)
3. Pull the plug free and secure it in accordance with the Lock Out/Tag Out procedures. (Figure 2.5)

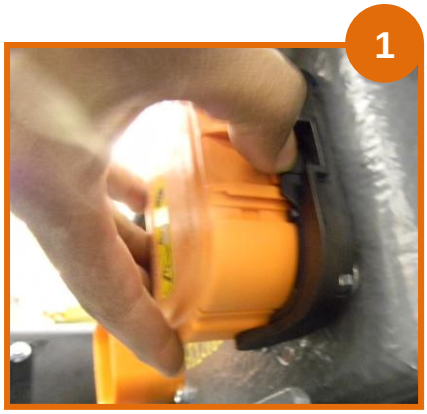

Figure 2.3

Figure 2.4

Figure 2.5

4. The High Voltage Battery system is now isolated.

CAUTION
The high voltage battery pods will remain live even when isolated. The leads and connectors on the pods will not be live if the pods are isolated.

3. Vehicle Layout

Motor	Up to 120kW, AC Permanent Magnet, Water Cooled
Controller	Vector control AC system providing variable speed regenerative braking
Batteries	Lithium Ion Iron Phosphate (Li Fe PH_4)
Charger	Fully automatic, onboard 208V to 240V
Steering	Hydraulic, power-assisted mono-block type
Suspension	Front & Rear: Parabolic springs with transverse torsion bar stabilizer, hydraulic double acting shock absorbers
Brakes	4-Wheel ABS, Full air system with air dryer Front Brakes: Disc brakes Rear Brakes: Disc brakes with load sensing device Parking Brake: Fail safe spring operated park brakes acting on rear axle
Chassis	Ladder type, cold riveted and bolted construction with U-section side members and open profile cross members
Wheels	17.5 x 6.0 steel rims, 6 lug (7.5t & 10t std.) 19.5 x 6.75 steel rims, 6 lug (7.5t & 10t opt.) 17.5 x 6.75 steel rims, 8 lug (12t std.) 19.5 x 6.75 steel rims, 8 lug (12t opt.)
Tires	Goodyear 225/75R17.5 (7.5 & 10t std.) Goodyear 225/70R19.5 (7.5 & 10t opt.) Goodyear 245/70R17.5 (12t std.) Goodyear 245/70R19.5 (12t opt.) All tire pressures should be maintained to pressure indicated on door frame placard
Control Voltage	24 Volt negative ground system
Cab	All steel, forward control, two door cab with hydraulic tilt Double zinc coated pressed steel panels with wax injected cavities Plastic cladding panels on front Noise and thermal insulation
Cab Suspension	Front mounting points on rubber bushings. Two point rear cab system with coil springs and hydraulic shock absorbers and automatic hydraulic lock down device.
Interior	Adjustable driver seat, dual passenger seat Storage shelf above windshield Storage bin on rear wall Door pockets Hinge out document bin 12V Outlet Clock Stereo CD

Main Drive Components

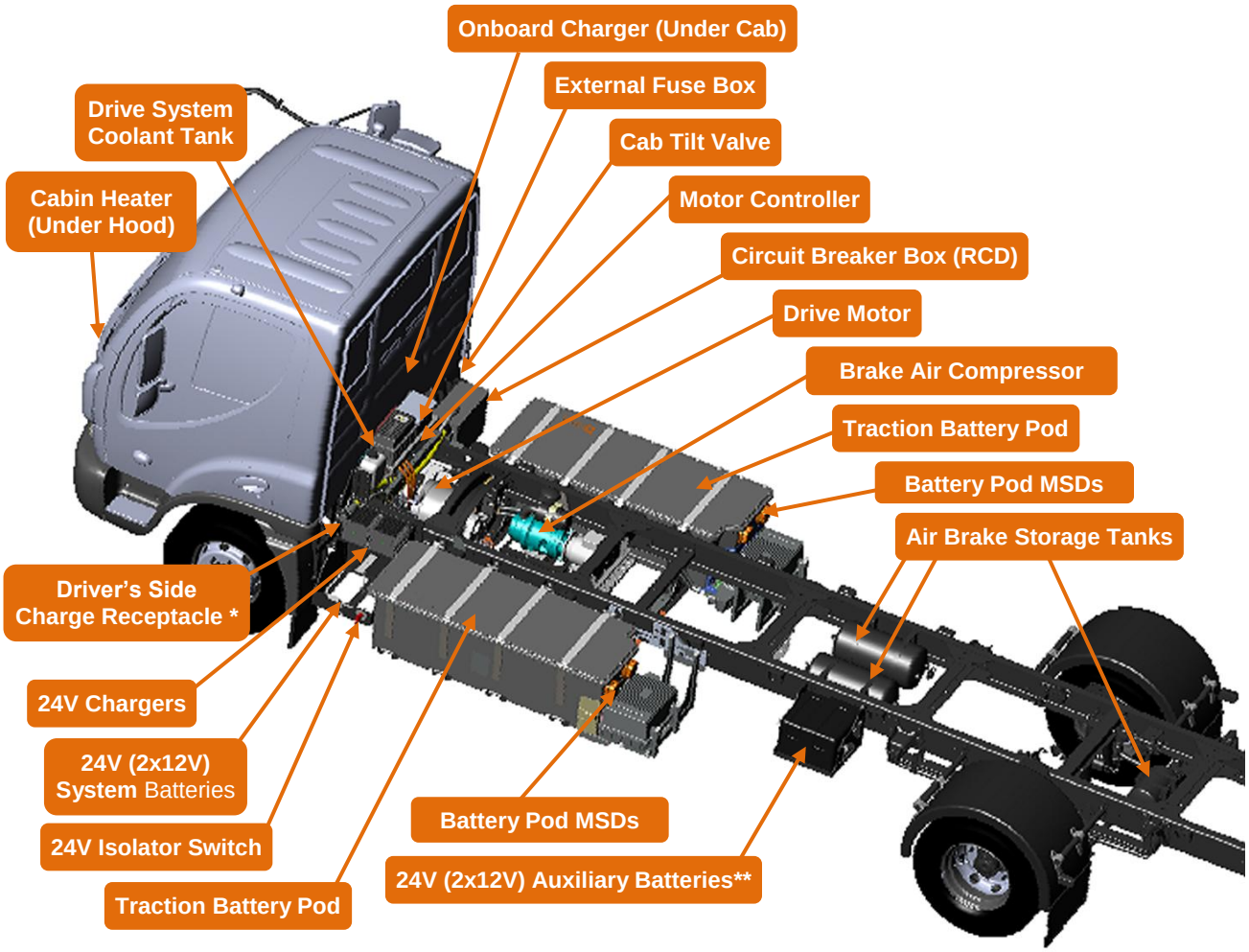

Figure 3.1

* **Charge receptacle location and connection type varies by vehicle**
** **Location of 12V Auxiliary Batteries varies by vehicle**

4. Controls and Display

The controls on the dashboard and steering column are outlined in the Avia Ashok Leyland owner's manual. Different to a conventional vehicle, this vehicle is equipped with an electric cabin heater. See **Section 8**.

The vehicle Drive Controls are located next to the driver's seat in the middle console. (Figure 4.1)

Figure 4.1

EVIS (Electrical Vehicle Information System)
The EVIS Display is mounted above the front windshield on the driver's side.

EVIS Display – Start-Up
When the vehicle is started or placed on charge, the **Start-Up** screen (Figure 4.2) with the **SMITH™** logo will display. It may take up to 45 seconds for the **Drive Mode** screen (Figure 4.3) or the **Charge Mode** screen (Figure 5.5) to display.

Figure 4.2

EVIS Display – Drive Mode (Figure 4.3)

Figure 4.3

1. ***Economy***
   This displays instantaneous power
   - The **Gray Line** is zero (no current in or out)
   - Above the **Gray Line** = throttle applied / accelerating (current out of battery)
   - Below the **Gray Line** = re-gen is occurring, either coast or braking (current being given back to battery)

2. ***Battery Status***
   BATTERY STATUS LIGHTS, one for each string, independently colorized as shown
   - **Green** String Status = **OK**
   - **Amber** String Status = **WARNING**
   - **Red** String Status = **FAULT (See Faults/Warnings)**
   - Blank String Status = **OFFLINE**

3. ***Battery Temp***
   Battery Temperature Gauge has 3 needle positions; Center (Vertical), Right (Amber) and Left (Blue).
   - **Vertical Center Position** = within normal operational range
   - **Amber Section** = battery is above first high thermal limit and depowered (limited)
   - **Blue Section** = battery is below first low thermal limit and depowered (limited)

4. ***Motor Temp***
   Motor Temperature Gauge has 3 needle positions; Center (Vertical), Right (Amber) and Left (Blue).
   - **Vertical Center Position** = within normal operational range
   - **Amber Section** = motor or controller is above first high thermal limit and depowering (limited)
   - **Blue Section** = Motor or controller is below first low thermal limit and depowered (limited)

5. ***SOC (State of Charge)***
   - Each **Green** light in the column represents approximately 10% of the total **SOC**
   - Fully charged will display all lights solid **Green**
   - Starting with the top light, as energy is taken, each light will go out
   - As the **SOC** drops below 50% the lights will turn **Amber**
   - As the **SOC** drops below 20% the lights will turn **Red (See Faults/Warnings)**

EVIS Display – Drive Mode – Faults/Warnings (Figure 4.4)

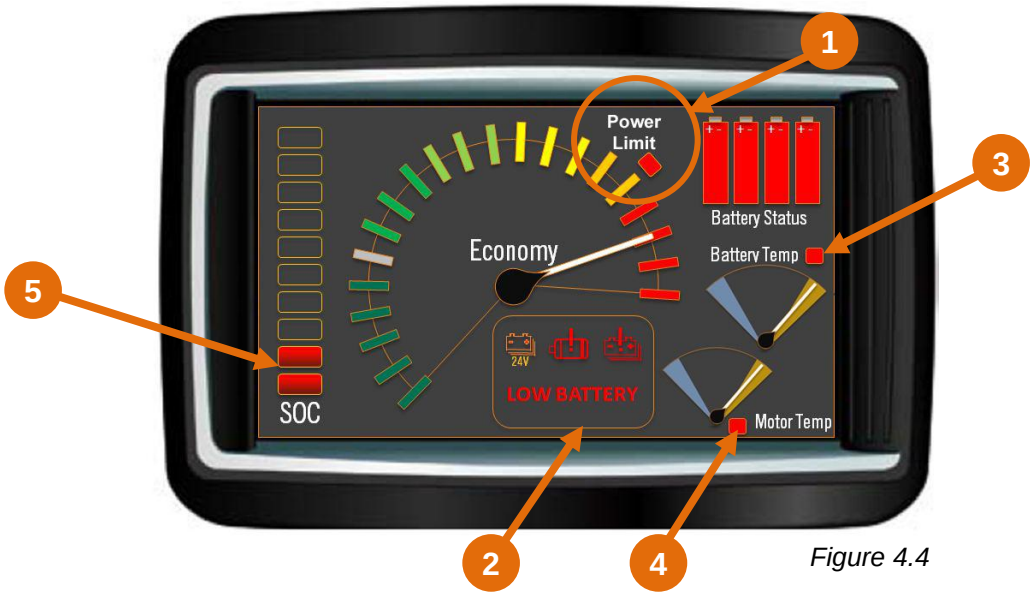

Figure 4.4

1. ***Power Limit***
   - **Red** light and the **Power Limit** text illuminate when max available discharge current is less than 250A or the SOC is less than 20%
   - Invisible if inactive

2. ***Fault Window***
   - 24V **WARNING** appears if there are low voltage system faults
   - **Power Train Fault Light** appears if there are Controller or Traction Motor Faults
   - **Battery Fault Light** appears for all Traction Battery Faults
   - **LOW BATTERY** appears in the when **SOC** drops below 10%

3. ***Battery Temp***
   - **Red Warning Light** = Battery has reached maximum thermal limit and shut down. Light visible only when illuminated (hidden tell-tale)

4. ***Motor Temp***
   - **Red Warning Light** = Motor or controller has reached maximum thermal limit and shut down. Light visible only when illuminated (hidden tell-tale)

5. ***SOC (State of Charge)***
   - As the **SOC** drops below 20% the lights will turn **Red**

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5. Charging HV and 24V Systems

	Specification of Charge Facility	
	A. AC Power service shall be in accordance with the latest edition of the National Electric Code. **B. Service requirement is dependent on vehicle configuration.** **C. Refer to the truck's configuration specification for battery pod and phase arrangement.**	
	Single Phase J1772, 75A **See Figure 5.3**	**3-Phase Pin & Sleeve, 63A** **See Figure 5.4**
	Due to the emerging EV market, UL listed components may not be available. However, components are available to meet the intent of the code. See SMITH Document CD-0650-0016, AC Charging Connectivity. SMITH recommends user to consult with local inspector for compliance or deviation as necessary.	

- Locate and park the vehicle in a position that the charging receptacle is within 20 feet of the AC charge point (EVSE), free of standing water and obstructions.
- Place the vehicle in **NEUTRAL**, set the parking brake, and turn the ignition key to the **LOCK** position.
- The High Voltage Isolator Switch in the truck cab must be in the **RUN** position with the red protective cover closed. (Figure 4.1)
- The 24V Isolator Switch, located immediately behind the driver side of the cab, must be in the **RUN** (HORIZONTAL) position. (Figure 5.1)
- The High Voltage MSDs must be installed on each battery pod. (Figure 5.2)

Figure 5.1

Figure 5.2

- Verify there is no damage to charging cable, cable ends, or charging connections. If any damage is found, do not continue until replaced or repaired.
- Remove the protective cover or cap from the vehicle connection.
- Make cable connection to the vehicle end of the cable first. (Figures 5.3 & 5.4)
- If applicable, lift the protective cover on the vehicle end of the cable and hold it open, connecting the cable by aligning the index slot and push straight into the plug.
- If applicable, re-engage the twist locking device.

Single Phase

Figure 5.3

3 - Phase

Figure 5.4

- Refer to charge point (EVSE) station manufacturer's procedure to verify the AC power charging source is OFF.
- If so equipped, remove protective cover from the AC power socket.
- Plug the cable into the AC power charging source.
- Refer to charge point (EVSE) station manufacturer's procedure to switch the AC power charging source ON.

- **The EVIS Display – Start-Up**

When the vehicle is placed on charge, the **Start-Up** screen (Figure 4.2) with the **SMITH™** logo will display. It may take up to 45 seconds for the **Charge Mode** screen (Figure 5.5) to display.

- **The EVIS Display in Charge Mode – No Faults/Warnings (Figure 5.5)**
  - **Battery Temp**
    - ***Vertical Position:*** Within normal operational range. Needle is not truly analog and does not swing around.
    - ***Amber Section:*** Battery Temp is above first high thermal limit and depowered (limited).
    - ***Blue Section:*** Battery Temp is below first high thermal limit and depowered (limited).
  - **State of Charge, Green Column Lights**
    - Each column of **Green** lights displays the **SOC** for each battery string. Column one is for String 1, etc.
    - While charging, each column lights up solid **Green** progressively from the bottom. Each light represents approximately 10% of the **SOC**.
    - When charge is complete, the EVIS Display will show **CHARGE COMPLETE** with the **SMITH™** logo. (Figure 5.7)
  - **Charge Current**
    - Each **Red** column displays the Charge Current being taken by each string. Column one is for String 1, etc.
    - Mid point on this scale is full charge when all strings are being charged at the same rate. The full scale is restricted to when one string is being charged on its own (when in catch-up mode).
    - When charge is almost complete, the current will be limited to the bottom light.

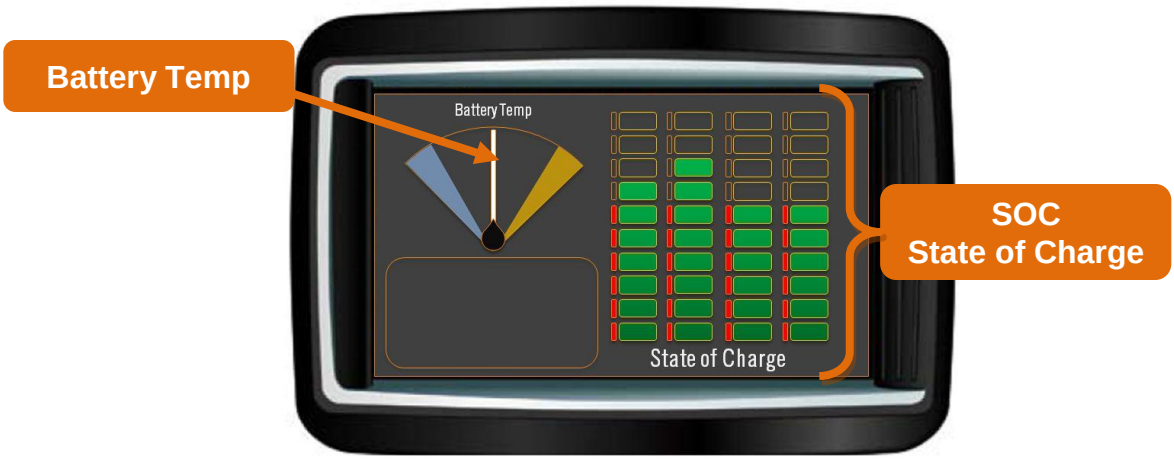

Figure 5.5

- **The EVIS Display in Charge Mode – Faults/Warnings (Figure 5.6)**
  - **Battery Temp**
    - ***Amber* Section:** Battery Temp is above first high thermal limit and depowered (limited).
    - ***Fault Window:*** Battery Fault light for all battery reported faults.

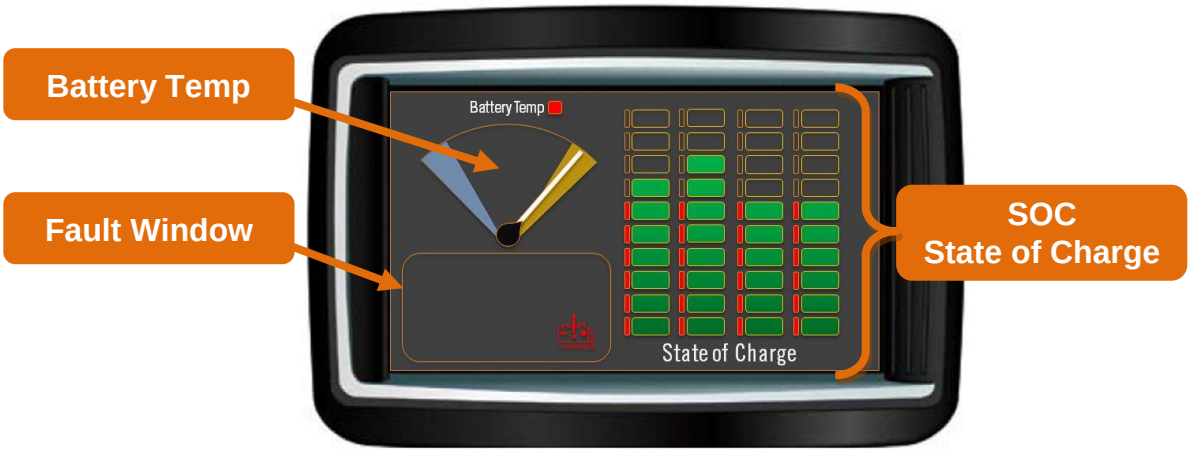

Figure 5.6

- The traction batteries are fully charged when the **EVIS** Display shows **CHARGE COMPLETE.** (Figure 5.7)

Figure 5.7

- Charging progress of the 24V (2x12V) System batteries is displayed by the 50%, 75%, and 100% **Green** LED lights on the 24V charger. (Figure 5.8)

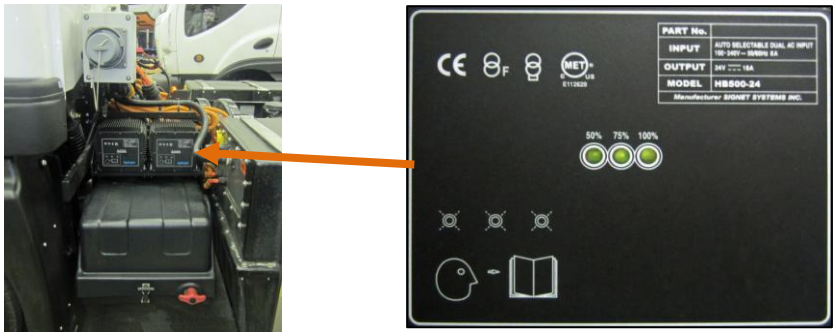

Figure 5.8

WARNING
Only authorized personnel are allowed to work on the High Voltage electrical power and/or control systems.

- If there are any indications that the traction batteries or the 24V System batteries are not receiving charge, or if there are any lights not illuminated on the **Circuit Breaker Box** (RCD) (Figure 3.1), remove the circuit breaker box cover and check to make sure all of the circuit breakers are in the **ON** (UP) position. (Figure 5.9)

Figure 5.9

NOTE:
The HV charger is liquid cooled, so after a short time, the coolant pump and fans under the cab will begin to run.

✓ The 24V batteries are fully charged when the 50%, 75%, and 100% **Green** LED lights on the chargers are all fully illuminated. (Figure 5.8)

After charging is complete:

- Refer to charge point (EVSE) manufacturer's procedure to switch the AC power charging source OFF.
- Remove the AC power cable plug from the AC power service socket.
- Disengage locking device and remove the AC power cable from the charging receptacle.
- Inspect the charging cable, cable ends, and charging connections for damage and replace and/or repair as necessary.
- Coil AC power cable and store in an appropriate and dry location safe from damage.

EVERY MONTH the batteries MUST be run down below 20% SOC (State of Charge) and then fully recharged until EVIS Display shows CHARGE COMPLETE. (Figure 5.7)

Charging DOs and DON'Ts	
DO...	**DON'T...**
Charge until the **CHARGE COMPLETE** screen displays on the EVIS Display.	Plug in and unplug with the vehicle switched ON.
Opportunistic charging; charge if near a charge point (EVSE) for a short period of time	Plug in and unplug with wall socket switched ON.
Remove from charge and isolate the 24V Battery System If the vehicle will not be used for more than 3 days.	Leave the vehicle on charge if not used for 3 days or longer.
Leave the vehicle connected to the charge point (EVSE), when in daily operation, until it is ready to be driven. This will ensure maximum battery power.	Use damaged charging cables or connectors.
Run the batteries down below 20% SOC (State Of Charge) and then charged until the EVIS Display shows **CHARGE COMPLETE** every month.	

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6. Pre-Start Checks

CAUTION
Do not attempt to drive if defects are found during this initial inspection. Report any defects found to your supervisor / manager.

CAUTION
Before attempting to drive the vehicle, ensure that the charger cable is disconnected and stowed.

Before driving the vehicle, carry out the following service and safety checks:

- Take the vehicle off charge as described in **Section 5** and make sure the 24V System Isolators are in their **RUN** (HORIZONTAL) positions (Figure 5.1) and all MSDs (Master Service Disconnects) are properly installed.(Figure 5.2)
- Check the **State Of Charge** on the **EVIS** Display (Figure 4.3) in relation to the planned journey.
- General vehicle checks:
  - ✓ Check Parking Brake to make sure it is in the Parking Position (Figure 6.1)

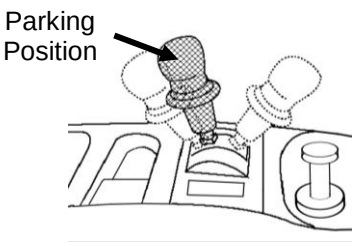

Figure 6.1

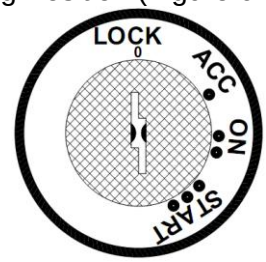

Figure 6.2

  - ✓ With key in **ON** position (Figure 6.2), make sure Cab Tilt warning light is not illuminated on the dash panel (Figure 6.3).
  - ✓ If Cab Tilt warning light is illuminated, locate cab tilting valves located directly behind the cab on the passenger side (Figure 3.1). Lower the cab until locks. (You will hear distinct **"CLICKS"** as the locking mechanisms engage).
  - ✓ Re-check Cab Tilt warning light on the dash panel.
  - ✓ Position the cab tilt valve in the **NEUTRAL** position. (Early model cab tilting valve Figure 6.4, later model Figure 6.5).

NOTE: Failure to position valve in **NEUTRAL** position will lock cab suspension.

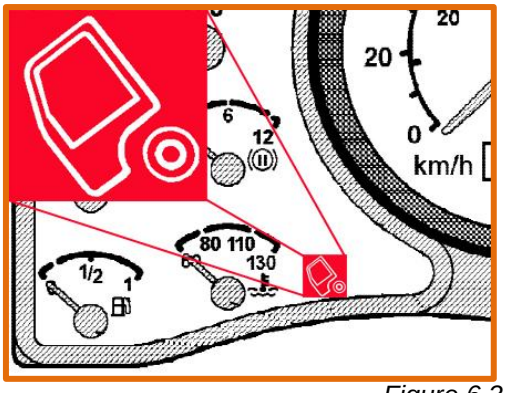

Figure 6.3

Figure 6.4

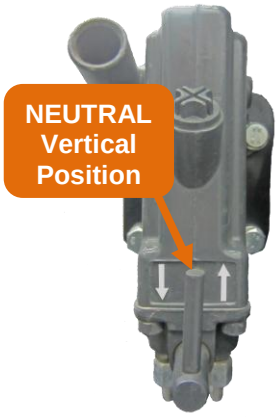

Figure 6.5

- ✓ Latch and secure hood.
- ✓ Check tire pressure in accordance with requirements printed on Vehicle Identification Placard located on the driver's side door post.
- ✓ Check condition, operation and cleanliness of vehicle lights and mirrors.
- ✓ Check security of removable body panels and cover.

7. Driving the Vehicle

CAUTION

1. ***Switch or leave the Drive Selector (Figure 4.1) in the neutral position.***
2. ***Do not depress the accelerator or brake pedal when attempting to start the vehicle.***
3. ***Never drive the vehicle with the park brake engaged (Figure 7.3).***

CAUTION
Switch off Regenerative Braking (Figure 4.1) when driving in snow or ice.

- **Perform all Pre-Start Checks in Section 6.**
- Make sure Cabin Heater and Air Conditioner switches are switch **OFF**.
- Turn the key from the **"LOCK"** to the **"ON"** position (second notch) (Figure 7.1). The dashboard indicator lamps will illuminate for a few seconds. Only the park brake indicator on the dashboard should remain illuminated.
- Turn the key to the **"START"** position, and hold until the **EVIS** Display illuminates (Figure 7.2).
- Let the key return to the **"ON"** position.

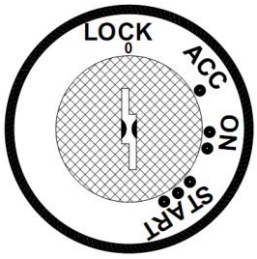

Figure 7.1

EVIS Display – Start-Up

When the vehicle is started, the **Start-Up** screen (Figure 7.2) with the **SMITH™** logo will display. It may take up to 45 seconds for the **Drive Mode** screen to display SOC, Economy, Battery Status, Battery Temperature and Motor Temperature (Figure 7.3).

Figure 7.2

Figure 7.3

- Depress brake (left) pedal.
- Set the Drive Selector to the desired drive direction (Figure 4.1).
- Release the park brake (Figure 7.3) and gently depress the accelerator pedal (right pedal).

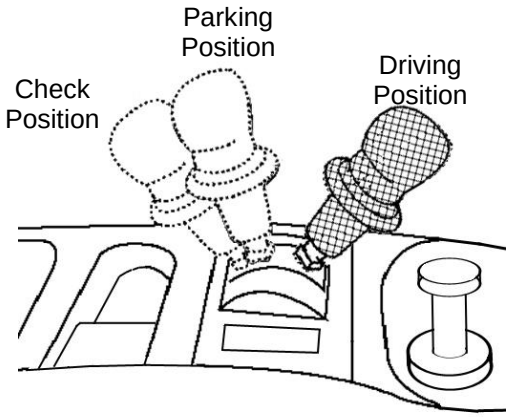

Figure 7.3

NOTE:
There is no need to change gears in this vehicle. The vehicle is equipped with a gear reduction box with one fixed ratio.

- Gently depress the brake pedal (left pedal) to slow down the vehicle.

NOTE:
Regenerative Braking recaptures energy that normally would be lost when only using friction brakes. This feature enhances the drive range of the vehicle. Regenerative Braking is applied first by releasing the accelerator pedal and then increases proportionately as the service brake is applied. The brake force is electronically adjusted.

- Deactivate Regenerative Braking when driving in snow or ice using the switch next to the driver seat in the middle console (Figure 4.1).

8. Cabin Temperature Control

The electric cabin heater and optional air conditioner consume energy supplied by the traction batteries.
Minimizing the use of these functions maximizes the range.

This vehicle is equipped with an electric cabin heater and an optional electric cabin air conditioner. Both utilize the vehicle vent system in the dashboard and consume electric energy supplied by the traction batteries. Be sure both the heater and air conditioner switches are in the OFF position before starting the vehicle. Once the vehicle is running, you may operate either system.

NOTE: If both the heater and the air conditioner switches are ON, neither system will function.

Cabin Heater (Figure 8.1)

1. Depress the **Heater Switch** (blank switch with LED next to the Air Conditioner switch) on the dash.
2. Set the **Fan Blower Speed** to the second position, the lowest fan setting. **NOTE:** It may take a few minutes for the heater to warm up. Heater will reach full operating temperature quicker if you do not increase the blower speed past the second position until warm air is felt coming through the vents.
3. Adjust **Mode Control** to regulate where the warm air is delivered.
4. To increase heater efficiency, push the **Recirculation** button so the warm cab air is re-circulated. When humidity is high, recirculating cab air may cause windows to fog, and **Recirculation** button should be off.
5. As the cab warms up, adjust **Fan Blower Speed**, **Temperature**, disable **Recirculation,** or turn Heater off with dash switch to control cab temperature. Turning the heater off is the preferred, most energy efficient method, to regulate the temperature.

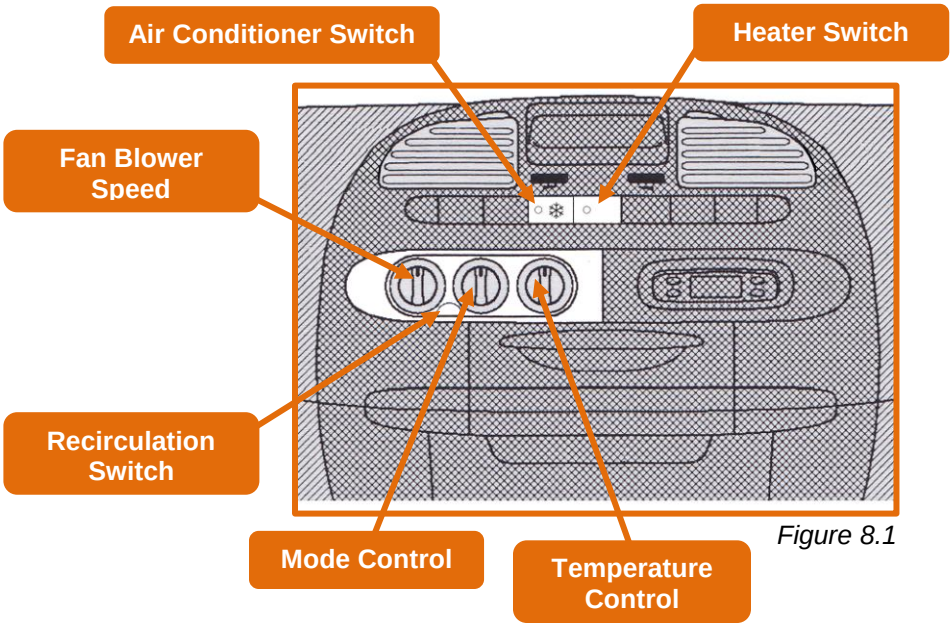

Figure 8.1

Cabin Air Conditioner (Figure 8.1)

6. Depress the **Air Conditioner Switch** (switch with snowflake and LED) on the dash.
7. Set the **Fan Blower Speed** to the desired position.
8. Adjust **Mode Control** to regulate where the cooled air is delivered.
9. To increase air conditioner efficiency, push the **Recirculation** button so the cooled cab air is re-circulated. When humidity is high, recirculating cab air may cause windows to fog, and **Recirculation** button should be off.
10. As the cab temperature cools, adjust **Fan Blower Speed**, **Temperature**, or disable **Recirculation,** to control cab temperature.

9. Parking the Vehicle

- Park the vehicle in a safe suitable area.
- Engage park brake, red lever next to seat (Figure 9.1). Some models are equipped with an alarm that will sound if parking brake is not engaged and the ignition is turned off.
- Select "**N**" (neutral) gear with the drive selector (Figure 4.1)
- Turn the ignition key to the "**LOCK**" position. (Figure 7.1)
- Switch off all lights and radio, when safe to do so.

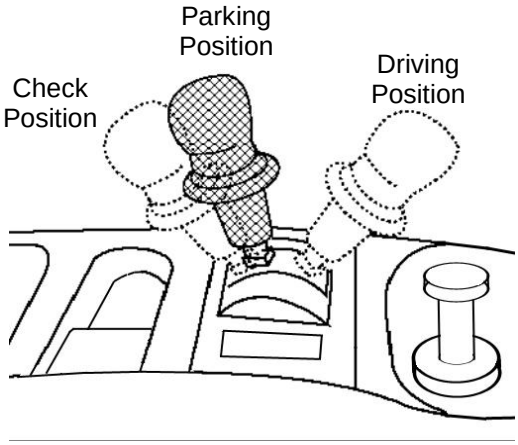

Figure 9.1

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10. Maintenance

In addition to the maintenance checks recommended by the base vehicle manufacturer (Avia Ashok Leyland Motors), the following additional checks should be carried out.

WEEKLY

- ***Motor / Charger /Inverter Coolant***
  - ✓ Check that the coolant level for the drive system meets the "Max Level" mark (Figure 10.1).
  - ✓ Top up if required with a 50/50 mix of ethylene glycol and distilled water.

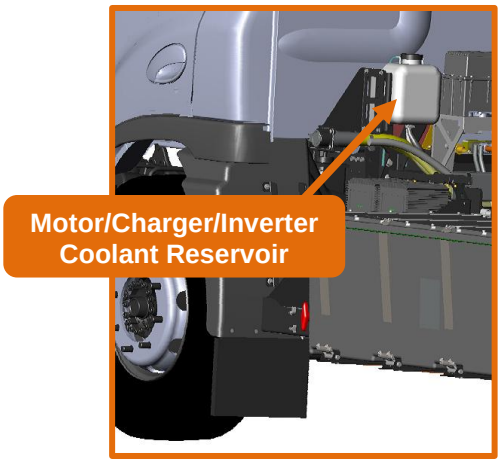

Figure 10.1

- ***Cabin Heater***
  - ✓ Open the hood as outlined in this section (Figure 10.12).
  - ✓ Check fluid level in reservoir (Figure 10.2).
  - ✓ If the level in the reservoir is low, unscrew the cap of the reservoir.
  - ✓ Fill the reservoir with a 50/50 mixture of ethylene glycol and distilled water up to the "MINIMAL LEVEL" mark.

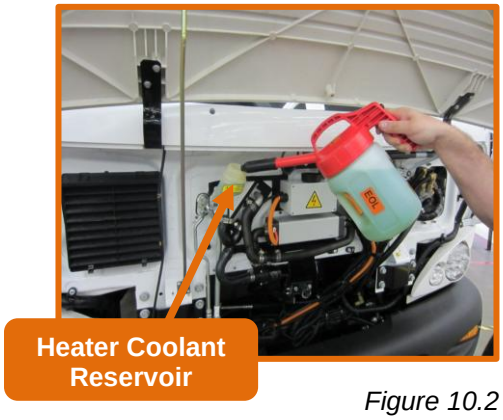

Figure 10.2

CAUTION
Running the heater with an empty reservoir will damage the heater.

CAUTION
The liquid inside the heater will get hot. Allow the heating system to cool down before attempting any maintenance on it.

- ***Air Brake Storage Tanks***

  ✓ Locate the (3) Air Brake Storage Tanks (Figure 3.1).
  ✓ Pull laterally on the drain valve tethers on the (3) air brake storage tanks (Figures 10.3 & 10.4) to check for excessive moisture and replace air brake system filter/drier if necessary.

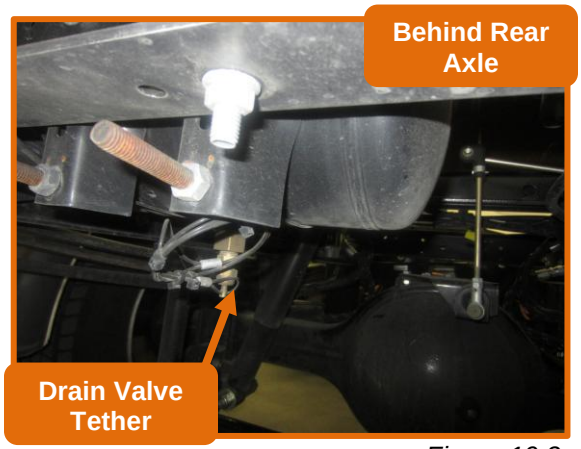

Figure 10.3

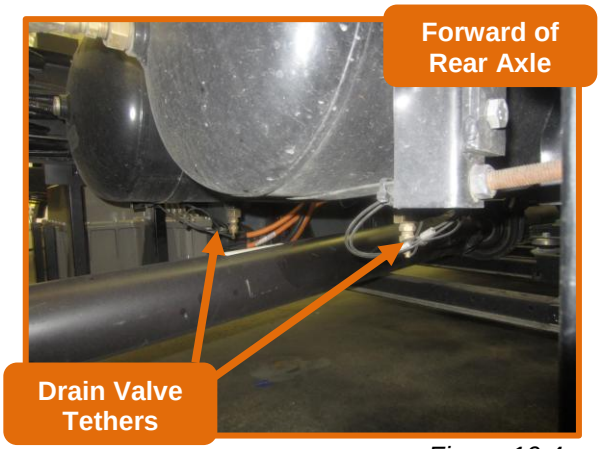

Figure 10.4

MONTHLY

- ***Traction Batteries***

  ✓ The Li-Ion traction batteries need to be discharged to 20% or below state of charge once a month, followed by a complete recharge until **CHARGE COMPLETE** displays on the Vehicle Information Display (Figure 5.7). This ensures that the voltage has fallen enough to calculate a correct State of Charge (SOC).

Discharge the traction batteries 20% or below monthly.

- ***Power Steering***

  ✓ Check fluid level in power steering reservoir and maintain level to **FULL** mark with Dexron/Mercon. Accessible under cab (Figure 10.5).

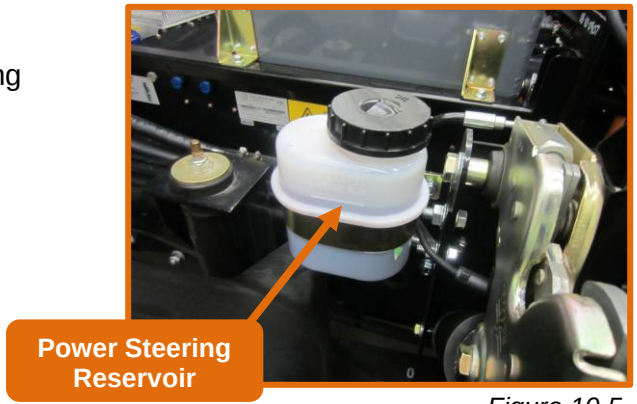

Figure 10.5

- ***24V System Batteries:*** The 24V system is powered with two (2) 12V lead acid batteries. These batteries provide the energy to start the vehicle. If the voltage in these batteries is **below 23V** the vehicle will not be able to start.
- ***24V Auxiliary Batteries (Optional):*** The vehicle may also be equipped with two (2) additional 12V batteries to power 24V auxiliary equipment such as a tail lift or a hydraulic power pack. Location of auxiliary batteries varies by vehicle.

All 12V batteries need to be checked and, if necessary, topped off with distilled water.

- ✓ Remove protective covers on all system and auxiliary batteries (Figure 10.6).
- ✓ Remove filler caps from all 12V batteries.
- ✓ Fill batteries with distilled water until level of electrolyte stands minimal ¼ " above the plates.
- ✓ Re-fit filler caps on all 12V batteries
- ✓ Re-fit the protective covers over the batteries.
- ✓ Check connections for looseness or corrosion.

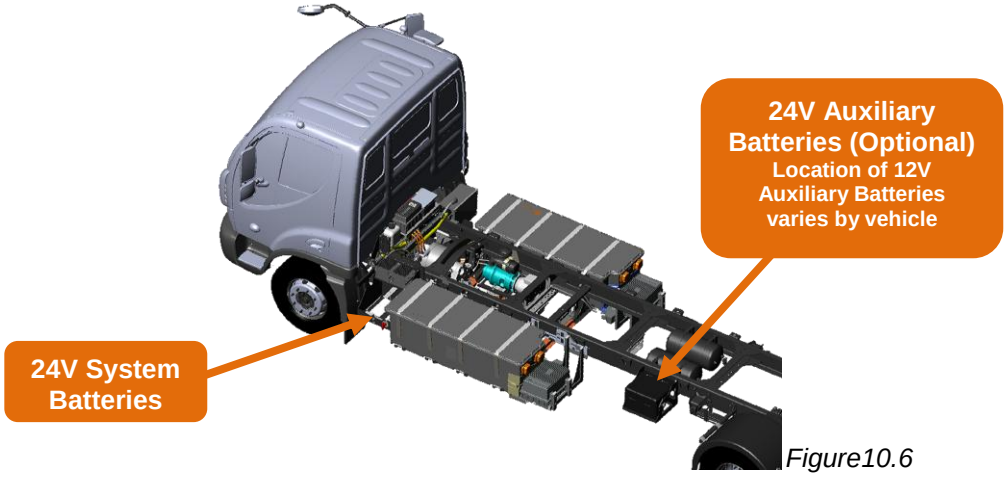

Figure10.6

- ***Air Brake Compressor - Hydrovane©***
  - ✓ Accessible through the hatch in body floor (Figure 10.7), check Air Intake Filter Monitor mounted on compressor. If monitor indicates GREEN, Air Intake Filter is functioning correctly. If monitor indicates RED, replace Air Intake Filter (Figure 10.8).

Figure10.7

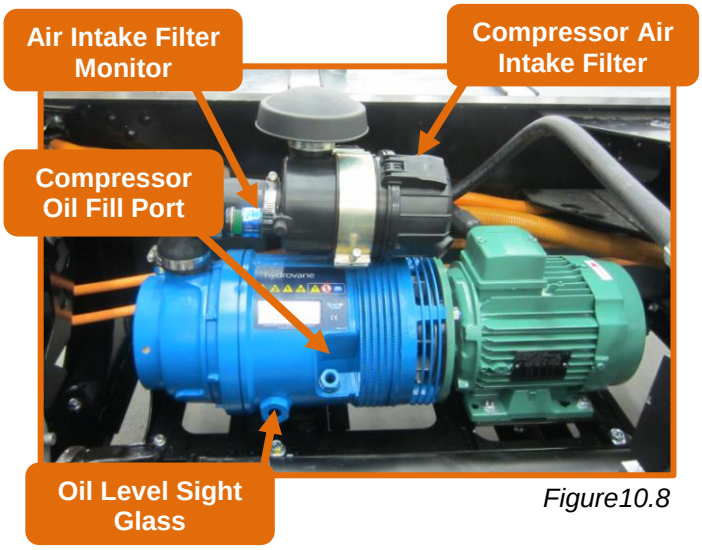

Figure10.8

- ***Air Brake Compressor - Mattei®***
  - ✓ Check Air Intake Filter Monitor located behind the passenger side of the cab (Figure 10.9). If monitor indicates GREEN, Air Intake Filter is functioning correctly. If monitor indicates RED, replace Air Intake Filter (Figure 10.10) accessible through hatch in body floor (Figure 10.7).

Figure10.9

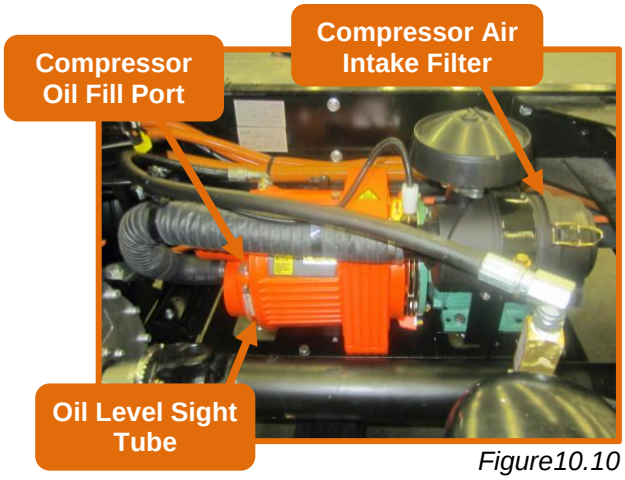

Figure10.10

90 DAYS

- ***Air Brake Compressor Oil***
  - ✓ **Hydrovane©:** Check Oil Level through sight glass in brake compressor. Fill to show level at least ½ full if needed (Figure 10.8).
  - ✓ **Mattei®:** Check oil level through Oil Level Site Tube in brake compressor. Fill to level indicated on tube if needed (Figure 10.10).

- ***Traction Motor Gear Box***
  - ✓ Check oil level in Traction Motor Gear box. Oil level should be approximately ½ inch below bottom of fill port (Figure 10.11).

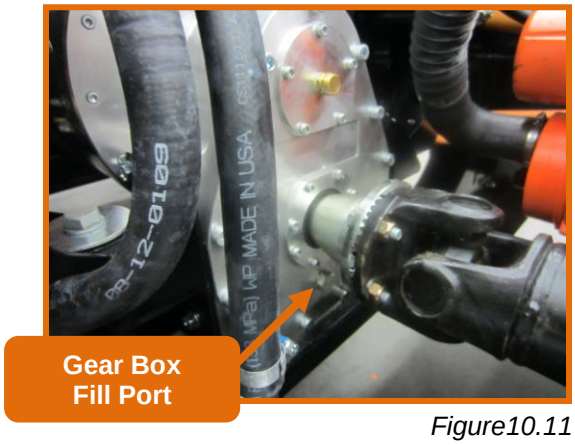

Figure10.11

EXTENDED MAINTENANCE

- ***Power Steering***
  - ✓ Change filter in Power Steering reservoir every 12 months.
  - ✓ Grease (do not over lubricate) fitting on Power Steering Pump every 12 months.
- ***Air Brake Compressor***
  - ✓ Change oil in Air Brake Compressor every 12 months.
  - ✓ Replace Air Brake System Filter/Dryer and Air Intake Filter every 12 months or more frequently if weekly, monthly, or 90 day maintenance checks warrant.
- ***Traction Motor Gear Box***
  - ✓ Change oil in Traction Motor Gear Box every 24 months or 50,000 miles.
- ***Differential***
  - ✓ Consult AVIA Manual

FLUID SPECIFICATIONS

- ***Antifreeze:*** 50/50 mix ethylene glycol and distilled water
- ***Gearbox Oil:*** EP80w 90 GL4 Gear Oil (Capacity .75 liter flat bottom, .8 liter round bottom.
- ***Power Steering Fluid:*** Dexron/Mercon
- ***Air Brake Compressor:***
  - HPOUSA-1 **Hydrovane©** (approx. 1.1 qt.) ***-or-***
  - ROTOROIL 8000 F4 **Mattei®** (2.5 liter)
- ***Differential:*** GL-5 rated 85-140

WHEEL TORQUE SPECIFICATIONS

- Class 5 & Light Duty Class 6: (6) M18 Lug Nuts, 272 ± 22 ft. lb.
- Heavy Duty Class 6 & 7: (8) M20 Lug Nuts, 357 ± 26 ft. lb.

HOOD OPENING/CLOSING

- The hood Release Lever is located behind the bottom edge center of the hood. Lightly push in on the bottom edge of the hood and press the Release Lever to the left. The hood will rise slightly and stop as the Secondary Safety Latch engages.
- Release the Secondary Safety Latch by reaching up under the hood and press the secondary latch to the right. (Figure 10.12)

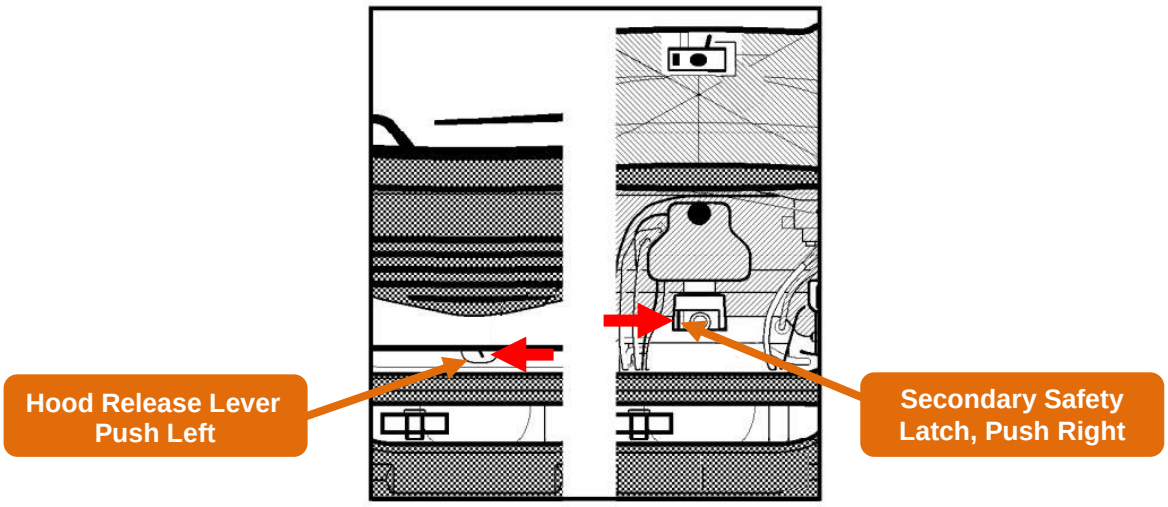

Figure 10.12

- Raise the hood completely.
- Remove the Support Rod from the holding clip and insert the free end into the Support Rod hole in the frame of the hood. Check to make sure Rod is secure. (Figure 10.13)

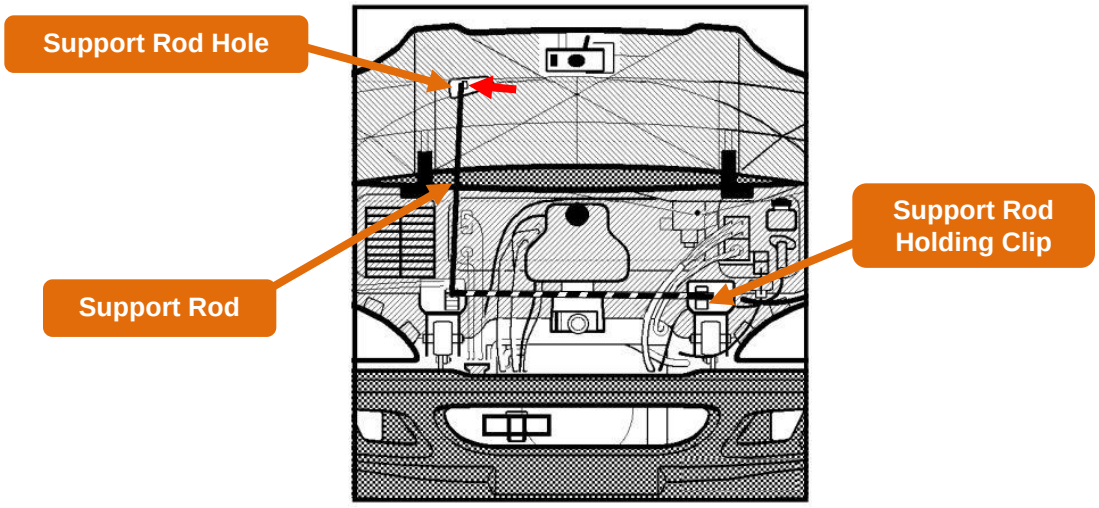

Figure 10.13

- To close hood, replace Support Rod into the Holding Clip
- Lower hood and push closed. Make sure both the secondary and main latches engage.

11. Towing Procedure

Refer to Smith Electric Vehicles Process Document CD-0650-0003 for detailed Towing Instructions.

REAR LIFT (Preferred Method)

- Rear lift (rear wheels up), with the steering wheel locked, is the preferred method of recovery.

FRONT LIFT (Alternate)

CAUTION
The drive shaft must be disconnected from the differential and removed if the vehicle is towed or pushed by front lift (rear wheels down). Failure to remove the drive shaft could also result in severe electrical damage.

NOTE:
While removing an axle shaft will prevent the drive shaft from turning, this may cause damage to the differential assembly and allow fluid to leak from the hub, which **is unacceptable.**

BRAKES

- The vehicle will not have air brakes when not powered up.
- To enable the air brakes, air can be supplied through the air line coupling in the front bumper, commonly referred to as a "glad-hand".
- The brake cylinders on the rear wheels can be released by turning the center release bolts to cage the brake springs. Ensure appropriate measures are taken to prevent the vehicle from rolling prior to releasing the brakes.

CAUTION
Use wheel chocks to prevent vehicle from rolling when brakes are inoperable.

CAUTION
The vehicle's power steering is disabled when vehicle is not powered up.

WARNING
If towing is a result of an accident that may have compromised the high voltage battery pods or any orange high voltage cabling, the high voltage system must be isolated prior to towing as described in Section 2, Safety Notices and Instructions.

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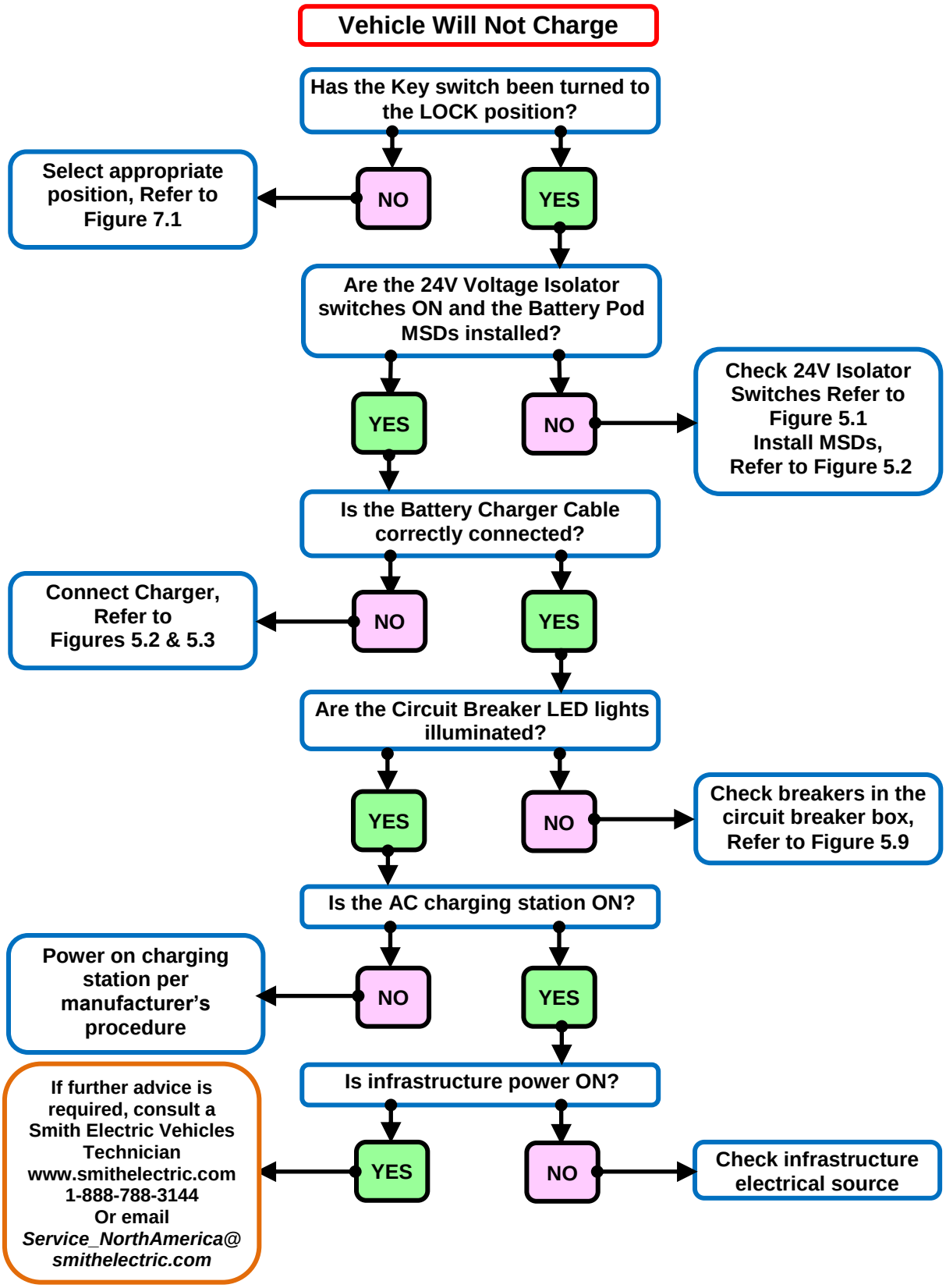
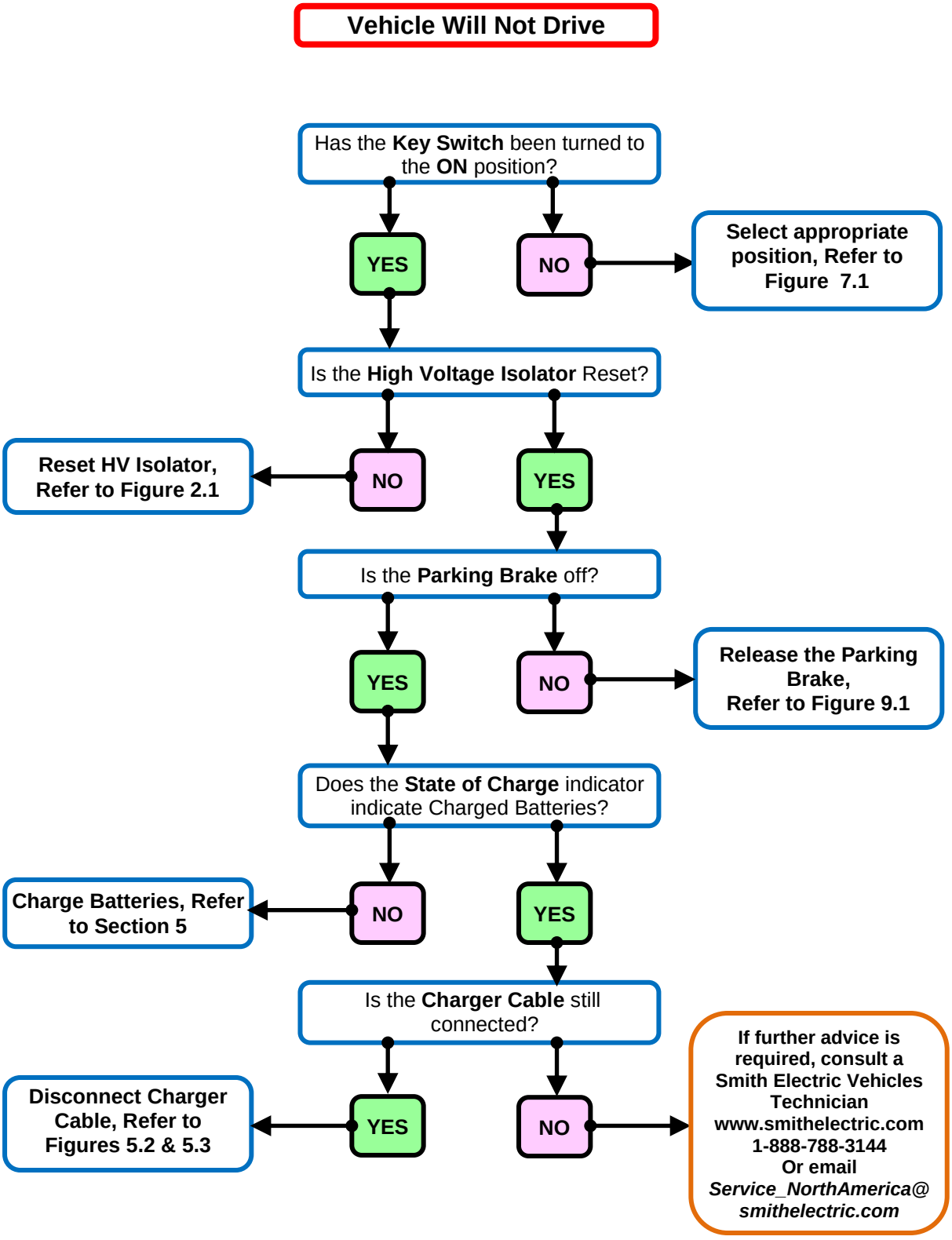
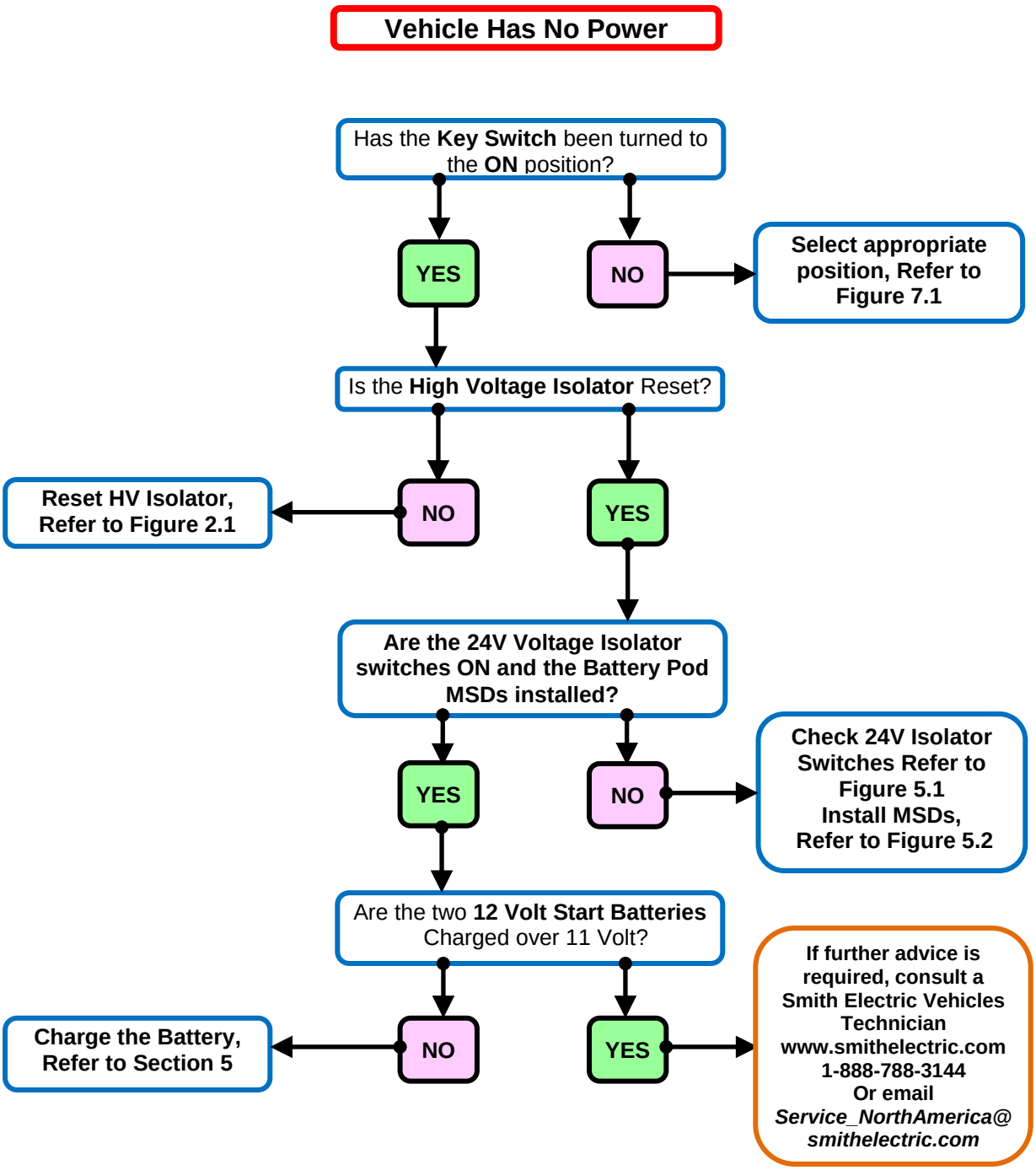
12. Fault Finding Matrix







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