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1. GENERAL DESCRIPTION

These x3-45 coaches use a dual voltage system to obtain two different voltages (12 and 24 volts) for various electrical controls and accessories. The main power source incorporates four "odyssey" group 31 commercial batteries connected in parallel-series. All batteries are kept uniformly charged by means of a 100 amp battery equalizer (standard), giving a maximum possible output supply of 100 amps on the 12 volt system. Both the 12 and 24 volt systems are controlled through individual main battery relays. Two 28 volt self-regulated alternators are installed and are belt driven from the engine, and can be reached through the engine compartment doors.

1.1 WIRING DIAGRAMS

A master wiring diagram of the electric circuits, covering standard and optional accessories and systems, is located in the technical publications box. Usually, a separate wiring diagram page is provided for each major function or system. In some cases, more than one circuit may appear on one wiring diagram page; when this occurs, each circuit covered in this page is listed in the wiring diagram index. Moreover, a circuit may appear on several pages; in such case, the number(s) at the extremity of the diagram title will indicate the sheet reference number. Refer to the "wiring diagram index" to ensure that the correct diagram is being used to trace the circuit in question. In addition to the major functions page reference, the wiring diagram index contains the following information pages.

- The multiplex output / input list,
- Multiplex error message list,
- The arrangement-harness drawing showing the harness arrangement and harness numbers on the vehicle,
- Glossary,
- Circuit number listing,
- Circuit breaker code,
- Connector code,
- Diode number code,
- Resistor number code,
- Fuse code,
- Relay Code.

1.1.1 Using Wiring Diagrams

Three methods are used to "work" with electric wiring diagrams.

Situation: you have identified the defective part (breaker, diode, relay, etc.), and you wish to locate its corresponding circuit.

Problem: circuit breaker cb13 is released (open circuit) and you don't know which circuit is affected.

- a) Refer to wiring diagram index, and look for "circuit breaker code". You find that the circuit breaker list is on page f.
- b) At item cb13, you will find the location, the Prevost number, the breaker function, the breaker amp rating and the page on which to find the corresponding diagram.
- c) Refer to page 3.1.
- d) When you have located cb13, follow the wiring up to the end and find the diagram page number and function on which the circuit continues.

Situation: you have a problem with a specific system and you want to find the corresponding diagram.

Problem: the last three (3) speakers on the R.H. side of vehicle are inoperative and you must trace the electric circuit.

- a) Refer to wiring diagram index and look for "sound system".
- b) You will find on page 35.2 the components as well as the electric wiring, thus providing you with a complete understanding of this circuit.

Situation: using the driver information display (DID), you check on arrival if there are active errors in the vehicle electrical system. With the **diagnostics** menu, highlight **fault diagnostics**, highlight **electrical system** to request a diagnostic of the electrical system and then press the enter key. If applicable, the DID shows the fault messages or fault codes recorded. When more than one fault is recorded, an arrow pointing down appears on the right of the display. Use the down button to see all the fault messages.

Problem: DID displays the fault "elec. horn sw61 sw62; shorted to ground" as being active.

- a) Refer to wiring diagram index, and look for "multiplexed device index", pages b1-b8.

- b) In first column device id, look for device sw61, sw62.
- c) At device sw61,sw62, find the fault message, the minimum condition to activate, other inputs involved in logic, the multiplex module related to switch 61 and switch 62, the connector and pin number on the module and the page on which to find the corresponding diagram.
- d) Once the problem corrected, the DID still shows the fault as being active. You have to leave the **fault diagnostics** menu, wait approximately 20 to 30 seconds and then return to **fault diagnostics** to request a new diagnostic of the **electrical system** from the mcm. The DID should display the fault as being inactive.

Yellow	Multiplex Communication Can-H (Twisted With Green)	Modules
Green	Multiplex Communication Can-L (Twisted With Yellow)	Modules
Orange	Connected To Multiplex Outputs	
White	Connected To Multiplex Inputs	
Red	24 Volt System	
Yellow	12 Volt System	
Black	Grounded Wire	
Blue	110 V Ac System (Live)	
White	110 V Ac System (Neutral)	
Green	110 V Ac System (Ground)	
Orange	Speakers (+) (Coaches Only)	
Brown	Speakers (-) (Coaches Only)	
Grey	Spare Wire	

1.1.2 Testing Circuits

A careful study of the wiring diagrams should be made to determine the source and flow of current through each circuit. When a circuit is thoroughly understood, a point-to-point check can be made with the aid of the applicable wiring diagrams. Any circuit can be tested for continuity or short circuits with a multimeter or a suitable voltmeter.

All electrical connections must always be kept clean and adequately tight. Loose or corroded connections can result in discharged batteries, difficult starting, dim lights and improper functioning of other electric circuits. Inspect all wiring connections at regular intervals. Make sure knurled nuts on all Amphenol-type plugs are securely tightened. Knurled nuts on the plastic Amphenol-type connectors will click into a detent when properly tightened. Line connectors, who have the side locking tabs, must have the locks latched in place to ensure a proper electrical connection.

1.1.3 Wire Sizes And Colors

Each wire in the electrical system has a specific size as designated on the wiring diagram. When replacing a wire, the correct size must be used. Never replace a wire with one of a smaller size. The vehicle electrical system is provided with different voltages. The insulation on each wire is distinctly colored in order to determine visually the wiring voltage and to assist in making connectors. The wires are color coded as follows:

Note
Wires are identified at each 2-4 inch (5-10 cm) intervals by a printed number.

Each wire on a diagram is patterned to assist in tracing and testing circuits. The wire number identifies the voltage rating, the wire identification number and the basic wire gauge as illustrated in figure 1.

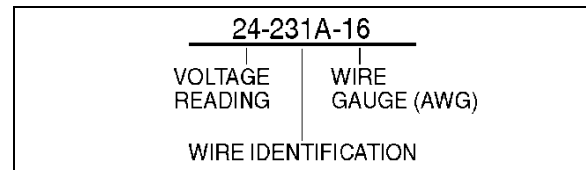


FIGURE 1: WIRE IDENTIFICATION 06048

1.1.4 Live Power Cables Color Code

Live 12v and 24V power cables are connected to a source of electrical power, so that direct contact with the conductor by some uninformed person may result in personal injury and equipment damage.

Live power cables in the battery compartment remain energized even though the ignition switch is set to the off position or the battery master switch is in the off position.

Live Power Cables Color Coded Circuits	
24-Volt	12-Volt
24VA	12VA
24VD	12VD
341	
210	

24d

The power cables are color coded as follows:

24V, larger than 12 GA: red ribbon winding around black cable with 9/16" between spires.


24V, 12 & 14 GA: pieces of red tape around black cable, no windings, 9/16" spaced.

12V, larger than 12 GA: yellow ribbon winding around black cable with 9/16" between spires.

12V, 12 & 14 GA: pieces of yellow tape around black cable, no windings, 9/16" spaced.

1.1.5 Spare Wires

When the vehicle leaves the factory, and even in the case of a fully-equipped vehicle, an important number of unconnected spare wires are routed between the junction boxes. Consequently, for any connection of an additional accessory, look in wiring diagram for "spare" wires in the circuit number listing of pages e.1 thru e.8 to determine the circuit number. Refer to page 8.1 in wiring diagram to find location of these wires.

 CAUTION
<p>Wire size is calibrated according to the breaker or fuse that protects it. When using a spare wire to replace a damaged wire, assure that the spare wire size is equal or larger than the wire being replaced. Using a wire too small for the breaker or fuse amperage might cause overheating of the wire.</p>


<p>NOTE</p> <p><i>Spare wires are identified by a wire identification number and by the letters "sp", to designate "spare".</i></p>
--

1.1.6 Cleaning Connectors

To clean electrical connections on the vehicle, a good quality aerosol contact cleaner is recommended. The use of a nonflammable product with fast evaporating qualities (that dries without leaving residue) will eliminate the possibility of having cleaning agent tapered in the connector, possibly affecting the connector seal.

To specifically clean oxidized cables, a product that offers the same qualities mentioned above

but with a moderate evaporation time may be substituted to provide deeper cleaning action into the cable.

 DANGER
<p>Contact cleaners can contain toxic base compounds and should always be used in a well-ventilated area, never in a confined space. Use outdoor whenever possible.</p> <p>Use of low hazardous (ROHS compliant) and ozone safe products is recommended.</p>

1.1.7 Circuit Breakers

Most electric circuits are protected by circuit breakers of the "manual reset" type. The main circuit breakers, as well as those protecting the a/c system, are located on the rear electrical junction panel and are accessible from the engine compartment curb-side door, on R.H. side of the vehicle.

This type of circuit breaker de-energizes the circuit without disconnecting any wire.

Circuit breakers CB2 & CB6 are different and can be used to open the circuit manually, to do so simply press down the red tab on breaker to open the circuit, repair defective circuit, and afterwards depress black button in center of breaker to close the circuit.

Smaller circuit breakers may be located in the VECF of the front service compartment.

Circuit Breakers			
CB1	Front Distribution	24VI	90 Amps
CB2	Distribution	12 VD	90 Amps
CB3	HVAC - Evaporator	24VI	90 Amps
CB5	Rear Distribution	24VI	150 Amps
CB6	Distribution	24 VD	70 Amps
CB7	HVAC - Condenser	24VI	70 Amps
CB8	Rear Distribution	12VI	40 Amps
CB9	WCL & Battery Charger	24VD	50 Amps
CB10	Front Distribution	12VI	70 Amps
CB13	Inverter	24VI	90 Amps

VD = Volts Direct. The electrical components connected to these circuit breakers are direct-connected to the battery.

VI = Volts Indirect. Electrical power is supplied via master relay R1 which engages when ignition key is in the ON or ACC position and battery master switch (master cut-out) is set to on.



Figure 2: Circuit Breaker Panel 06621

1.2 MULTIPLEX FUSES

The multiplex outputs are protected in current by an internal "soft-fuse". Each output has programmed specific maximum amperage. When an output is shorted, the current gets above the limit and the soft-fuse intervenes to turn the output off. The output stays off until the "soft-fuse" is reset.

Turn the ignition switch to the off position and turn to the on position again. This resets all "soft-fuses".

There is also hardware fuses used to protect the incoming power to the multiplex modules. These fuses are located inside the VECF (vehicle electrical center front) and VECR (vehicle electrical center rear).

1.3 RELAYS

Relays are used to automatically energize or de-energize a circuit from a remote location. The relay draws a very low current to energize its coil. Once the coil is energized, it develops a magnetic field that pulls a switch arm closed or open, to either energize or de-energize a given component. As the control current required for the coil is very low, the relay allows a remote station to control a high energy circuit without running great lengths of costly high capacity

cable, and also eliminates the need for high amperage switches and heavy connectors.

NOTE

Each relay is identified with "12v" or "24v" printed on its casing in order to identify the coil operating voltage.



CAUTION

The multiplex vehicle uses a VF4 relay designed specifically for Volvo that has different internal characteristics than the current VF4 relay. It is important to use only the new part marked Volvo as a replacement in multiplex vehicles. Regular relays have an inadequate lifespan for multiplex vehicles.

1.4 PRECAUTIONS



DANGER

Prior to working on a system inside vehicle, make sure to cut electrical power and air supply. A component could be supplied with electricity even if the ignition switch is set to the off position and/or a component could be pressurized even if air tanks are emptied. Always refer to the appropriate wiring and pneumatic diagrams prior to working on electrical and/or pneumatic systems.



CAUTION

Prior to arc welding on the vehicle, refer to "multiplex modules disconnection procedure prior to welding" in section 00 general of this manual to avoid serious damage to the vehicle components.

NOTE

When the ignition switch is set to the off position, most electrical components are not energized except for the fire suppression system (AFSS). MCM (master chassis module), ECM (engine control module), TCM (transmission control module) and specific multiplex modules will stay energized for a period of 5 minutes after the ignition switch has

been set to the off position.

Before working on one of these electrical components, set the master cut-out switch located above the rear electrical panel to the off position.

If the vehicle is out of service for a long period (more than 2 weeks), it is recommended to trip the main circuit breakers (cb2 and cb6) to prevent the batteries from discharging.

This will prevent small current drawn by the mcm memory and the instrument cluster clock from draining the battery. Note that the diagnostic codes history will be erased and the instrument cluster clock will have to be reset.

Setting the cluster clock is performed by the time/distance menu of the DID. Refer to the operator's manual for additional details.

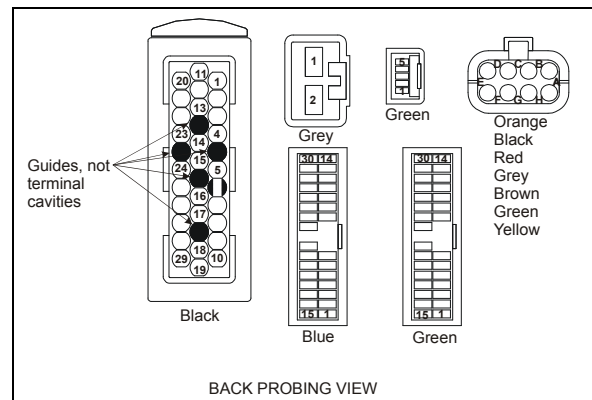
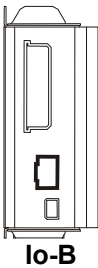
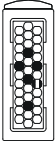
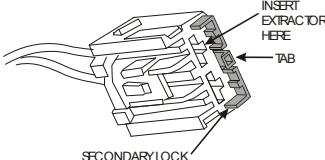

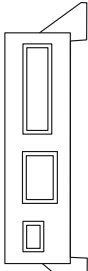
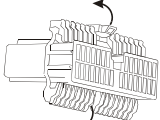
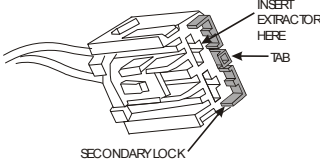
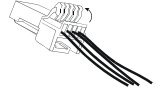
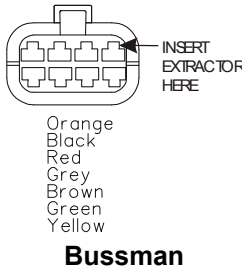
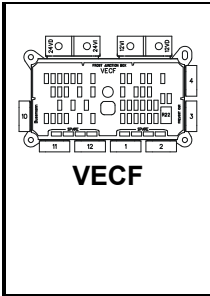


FIGURE 3: MULTIPLEX MODULE CONNECTORS PIN-OUT 06624

Multiplex Modules	Connector Type	Terminal Removal
 <p>Io-B</p>	 <p>AMP 06628</p>	<p>Extractor/Tool: Prevost #683594 Insert the extractor on the front of the connector. Remove the terminal by disengaging the flexible lock tabs on the terminal. Gently remove the terminal from the connector by pulling on the wire.</p>
	 <p>Grey Yazaki</p>	<p>Extractor/Tool: Packard #12094430 Using a small flat blade screwdriver, open the hinged secondary lock. Insert the extractor on the front of the connector, over the terminal cavity. Remove the terminal by disengaging the flexible lock tab on the terminal. Gently remove the terminal from the connector by pulling on the wire.</p>
	 <p>Green 06630 Jae</p>	<p>Extractor/Tool: Prevost #683766 Using a small flat blade screwdriver, open the hinged secondary lock. Insert the extractor on the front of the connector, over the terminal cavity. Remove the terminal by disengaging the flexible lock tab on the terminal. Gently remove the terminal from the connector by pulling on the wire.</p>
 <p>Io-A</p>	 <p>Green, Blue (Mcm) Jae</p>	<p>Extractor/Tool: Prevost #683766 Using a small flat blade screwdriver, open both hinged secondary locks. Insert the extractor on the front of the connector, over the terminal cavity. Remove the terminal by disengaging the flexible lock tab on the terminal. Gently remove the terminal from the connector by pulling on the wire.</p>
	 <p>Grey Yazaki</p>	<p>Extractor/Tool: Packard #12094430 Using a small flat blade screwdriver, open the hinged secondary lock. Insert the extractor on the front of the connector, over the terminal cavity. Remove the terminal by disengaging the flexible lock tab on the terminal. Gently remove the terminal from the connector by pulling on the wire.</p>
	 <p>Green Jae</p>	<p>Extractor/Tool: Prevost #683766 Using a small flat blade screwdriver, open the hinged secondary lock. Insert the extractor on the front of the connector, over the terminal cavity. Remove the terminal by disengaging the flexible lock tab on the terminal. Gently remove the terminal from the connector by pulling on the wire.</p>



Extractor/Tool: Previst #682256 (Packard 12094429)

Remove the terminal by disengaging the flexible lock tab on the terminal. Gently remove the terminal from the connector by pulling on the wire.

1.5 X3 SERIES COMMUTER COACH ELECTRICAL COMPARTMENT OVERVIEW

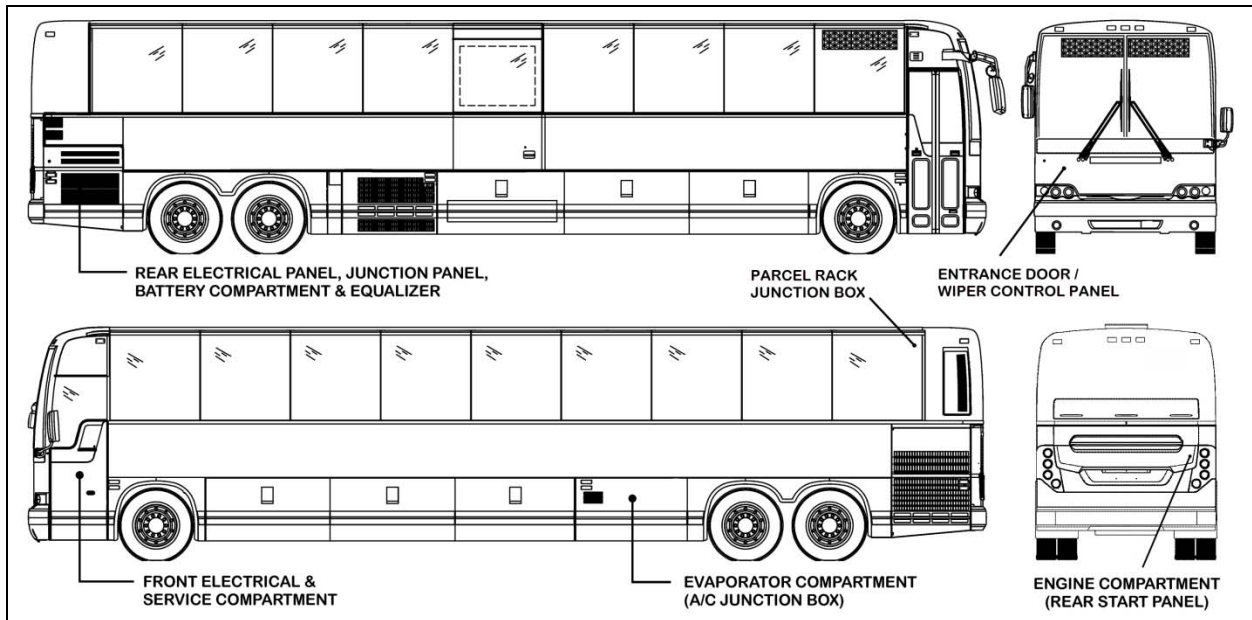


FIGURE 4: ELECTRICAL COMPARTMENTS (X3-45 COMMUTER)

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1.6 MAINTENANCE

A corrosion inhibitor has been sprayed on certain electrical components in order to protect them from corrosion. Refer to procedure sav00002e at the end of this section for recommended products and where they are used.



CAUTION

Never put grease or other product on the multiplex modules connector terminals.



DANGER

Use sprayed sealer in a well-ventilated area. Do not smoke. Avoid prolonged contact with skin and breathing of spray mist.

1.7 REAR ELECTRICAL PANEL, JUNCTION PANEL, BATTERY COMPARTMENT & EQUALIZER

The rear electrical panel, junction panel, battery compartment & battery equalizer are located on the R.H. side of the engine compartment and are accessible from the engine compartment curb-side door.

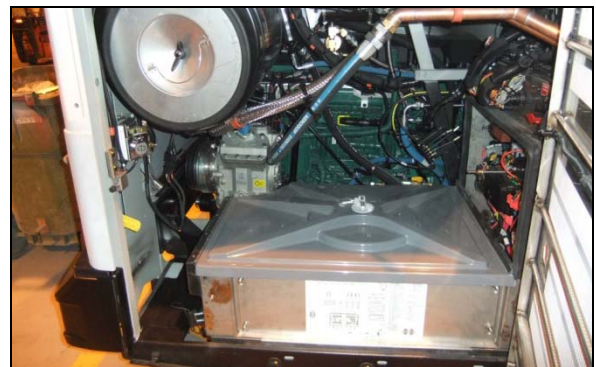


FIGURE 5: REAR ELECTRICAL PANEL, JUNCTION PANEL & BATTERY COMPARTMENT

1.7.1 Rear Electrical Panel

The rear electrical panel provides access to the following:

- Rear terminal block;
- Multiplex modules;
- Vehicle electrical center rear (VECR)
- Relays and fuses;
- Transmission control module (TCM);
- Battery master switch (master cut-out);
- OBD II diagnostic connector (refer to “other features” chapter).

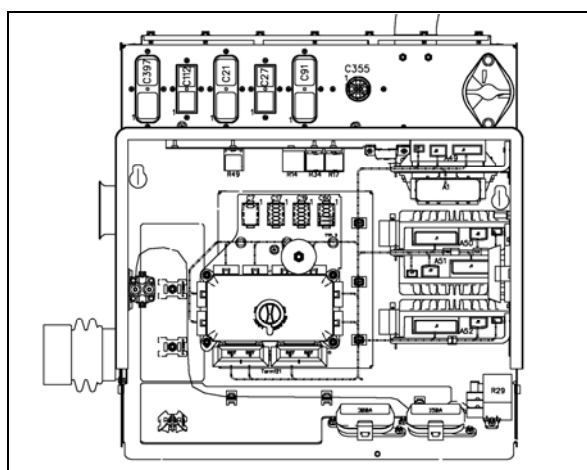


FIGURE 6: REAR ELECTRICAL PANEL

1.8 BATTERY COMPARTMENT

The battery compartment provides access to the batteries (4), battery equalizer, the master relay (r1), power relays (2) and to the prime battery monitoring components.

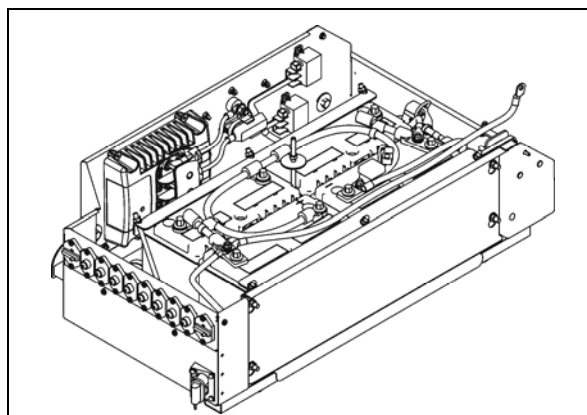


FIGURE 7: BATTERY COMPARTMENT 06773

1.9 FRONT ELECTRICAL AND SERVICE COMPARTMENT

The front electrical and service compartment is located on L.H. side of vehicle, under the driver's window. It contains the following components (Figure 8):

- Front terminal block;
- Master chassis module (MCM);
- C226 connector (MCM) type db9 for laptop diagnostic tool;
- Vehicle electrical center front (VECF) and multiplex modules;
- Relays and fuses;
- ABS electronic control unit (ECU);
- Vehicle electronic control unit (VECU);
- Master interlock cancel switch;
- Emergency door unlatch valve;
- Tag axle control valve.

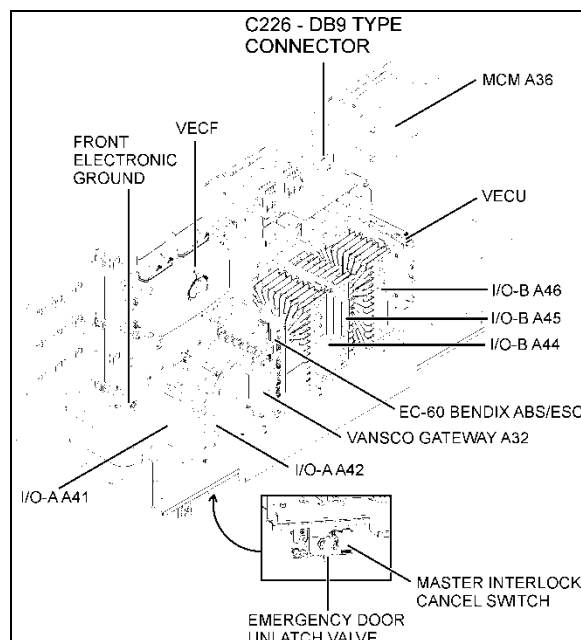


FIGURE 8: FRONT ELECTRICAL COMPARTMENT ELECTRIC PANEL

1.9.1 A/C Junction Box

The a/c junction box is located in the evaporator compartment, on the evaporator fan motor housing.

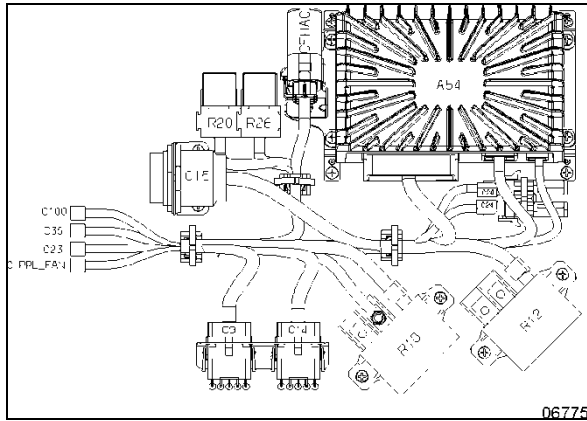


FIGURE 9: A/C JUNCTION BOX

1.10 ENGINE REAR START PANEL

This control panel is located in the R.H. side of engine compartment above the engine air filter. This control panel includes the engine starter selector switch, the rear start push button switch to start engine from engine compartment as well as the engine compartment lights switch, back-up alarm, air filter restriction indicator lamp and a multiplex connected tachometer.

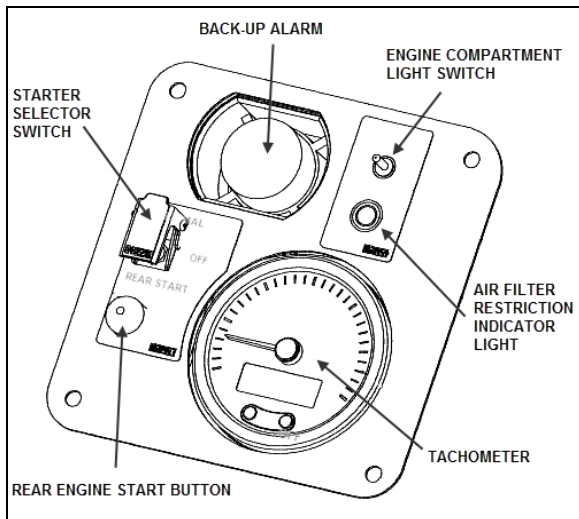


FIGURE 10: REAR START PANEL

NOTE

When the ignition switch is set to the "off" position, the electrical supply from the batteries is cut off, with the exception of the fire detection system, the engine & transmission electronic controls, the battery equalizer and the cluster digital clock.

1.11 ENTRANCE DOOR & WIPER CONTROL PANEL

To access the entrance door & wiper control panel of the right console, remove the panel under the larger utility compartment at the base of the windshield.



FIGURE 11: ENTRANCE DOOR & WIPER CONTROL

1.11.1 Parcel Rack Junction Box.

You will find a single I/O B module (a53) located at the rear end of the left (road side) parcel rack. This module controls the passenger lighting and "next stop" functions.

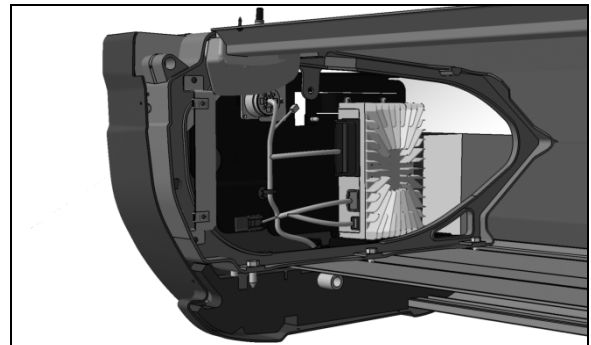


FIGURE 12: PARCEL RACK I/O B MODULE

1.11.2 NYCT Auxiliary Systems And Radio

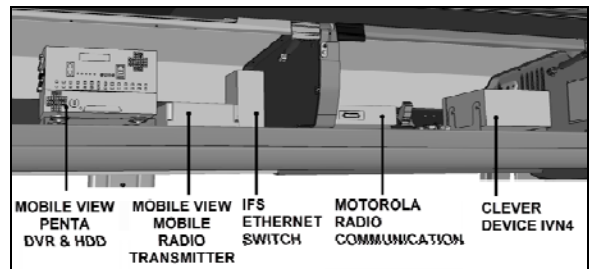


FIGURE 13: AUXILIARY SYSTEMS IDENTIFICATION

In the first road side overhead parcel rack, you will find the following systems (additional details are available in section 23, accessories):

- Clever devices' ivn4; relays and circuit breakers.
- Motorola communication radio hardware;
- IFS Ethernet managed switch;
- Mobile radio transmitter (wimax & wi-fi) ;
- Mobile View's penta c dvr & hdd

1.11.3 Motorola Radio Power Mode

The communication radio power mode can be changed to "battery direct" or "ignition". To change the power mode to "battery direct", open the first left hand (road side) overhead parcel rack and disconnect the two connectors below.

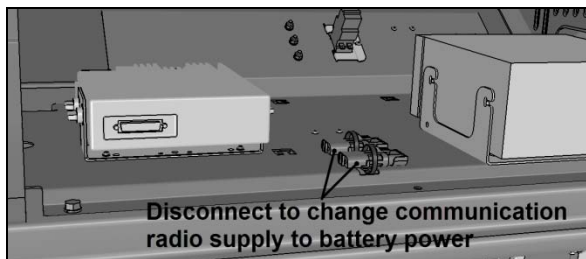


FIGURE 14: RADIO POWER MODE CHANGE

2. BATTERIES

This vehicle is provided with four (4) odyssey group 31 absorbed glass mat (agm) 12-volt batteries, model 31-pc2150s, connected in series-parallel (Figure 15).

These batteries require no maintenance for their lifetime. They can withstand deeper discharge cycles and several times the charging cycles of a standard battery.

These are sealed, valve regulated recombinant batteries which means that the oxygen created will recombine with the hydrogen in the battery, creating water and preventing water loss. Water never needs to be added to this type of battery.

The top-mounted negative and positive terminals are tightly sealed to prevent leaks.

The electrolyte in this type of battery is absorbed in micro-porous glass separators. This design prevents spills and results in greater resistance to vibration.

Always replace these batteries with identical make and model batteries as the system is balanced and optimized for this type of battery.

DANGER

Agm batteries generate hydrogen gas, which is highly flammable. If ignited by a spark or flame, the gas may explode violently, causing spraying of acid, fragmentation of the battery, which may result in severe personal injuries. Wear safety glasses and do not smoke when working near batteries. In case of contact with acid, flush immediately with water.

WARNING

Battery posts, terminals and other related accessories contain lead and lead compounds, chemical known to the state of california to cause cancer and other reproductive harm.

Batteries also contain other chemicals known to the state of california to cause cancer.

Wash hands after handling.

The battery has four (4) major functions:

1. Providing a source of current for starting the engine;
2. Stabilizing the voltage in the electrical system;
3. Supplying current for a limited time, when electrical demands of the equipment exceed the power output of the alternator;
4. Providing a limited source of power for connected accessories, when the engine is not running.

For further information regarding odyssey battery, please refer to odyssey manuals included with the technical publications.

Odyssey manuals available in pdf format:

- Odyssey battery_ technical manual us-ody-tm-001_0411_000
- Odyssey battery_spec sheet us-ody-31-003_1206
- Odyssey battery_owner's manual us-ody-om-009_0611

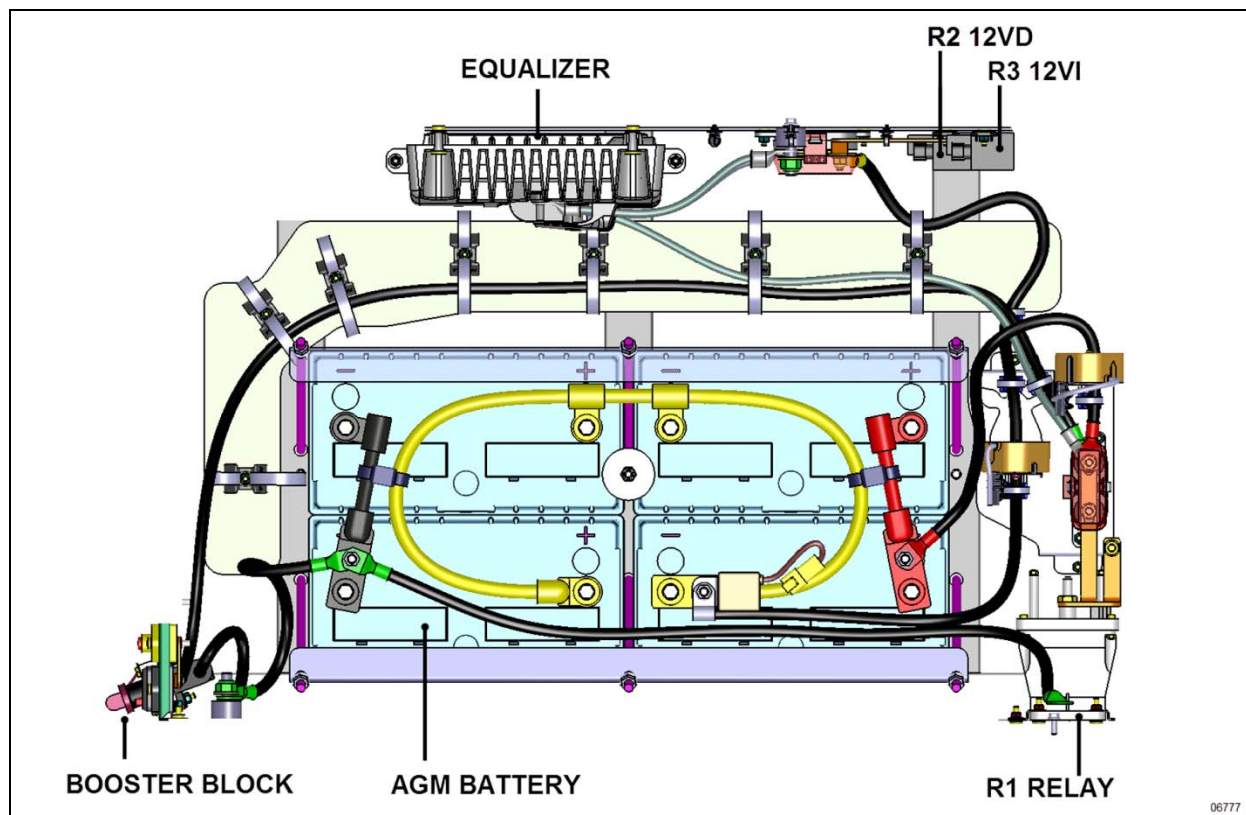


FIGURE 15: BATTERY COMPARTMENT OVERVIEW

2.1 BATTERY DISCHARGE PROTECTION

To prevent discharge of the batteries when the engine is not running, certain functions are automatically switched off if the battery voltage drops below 24 volts for more than 30 seconds. The "battery voltage warning" pictogram will show on the DID. Set the ignition key to the off position and then turn the ignition key to the on position to reactivate these functions for a period of 30 seconds before they switch off again.

If a prolonged use of the functions with the engine not running is necessary, connect the battery to a charger.

2.2 MAIN BATTERY RELAYS

Main battery (master) relays (12v and 24v) are provided for this vehicle. The relays are located in the battery compartment and in the rear electrical panel. The 24-volt battery relay (r1) engages when the ignition switch is in the on or acc position and the battery master switch (master cut-out) is turned on.

When the main battery relays (r1 & r3) are tripped to the *off* position, all electrical supply from the batteries is cut off, with the exception of the following items.

- Battery equalizer check module;
- MCM;
- TCM
- ECM (engine control module),
- Water recirculating pump;
- Bi-fold entrance door;
- Cluster memory.
- Communication radio (depending on chosen jumper configuration)

2.3 BATTERY REMOVAL AND INSTALLATION

The batteries are located in the battery compartment on the R.H. side of the engine compartment and are accessible from the engine compartment curb-side door.

AGM batteries should be replaced in pairs or four at a time.

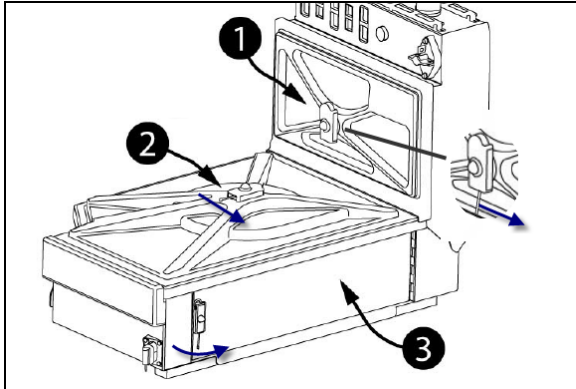


FIGURE 16: BATTERY PROTECTIVE COVER REMOVAL

1. Remove the battery compartment protective covers by pulling the rod on the spring latch to release and lift cover. Starting with (1) then (2) (Figure 16).
2. Lateral access panel (3) is hinged. Release it by pulling on the spring rod and swing open. (Figure 16 & Figure 17). Panel assembly is reverse of removal.

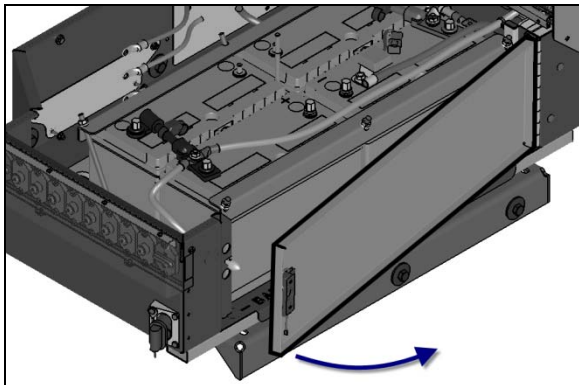


FIGURE 17: LATERAL PANEL OPENING



DANGER

To prevent possible electric shocks or sparking, the battery master switch should be in the "off" position before disconnecting cables from the batteries.



WARNING

24VD battery cable to r1 main battery relay (Figure 15) is still powered after battery master switch is set at the off position.

3. Unscrew tie-down nuts (6x) and remove clamps (2x).(Figure 18)

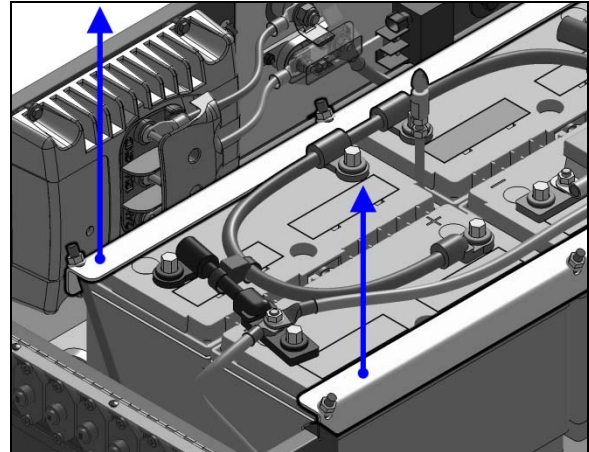


FIGURE 18: BATTERY FIXING CLAMPS REMOVAL

4. Remove battery cables from the batteries. Disconnect negative terminals first.

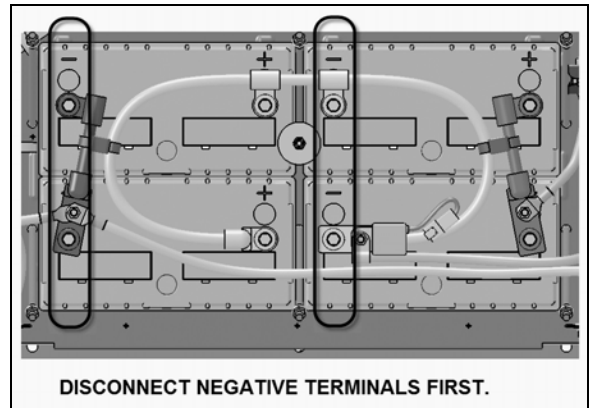


FIGURE 19: NEGATIVE TERMINALS

Note

When the battery cables have been removed from the batteries, wrap the battery terminals and cable ends with electric tape to prevent accidental grounding.

The ground (negative) cables should always be disconnected first and replaced last.

5. Remove the remainder of the connections.
6. Follow approved safe battery removal and handling procedure.



Caution

After performing battery replacement, make sure all protective covers are properly fitted and secured. This will protect battery terminals and circuit breaker bus bars against mist, dust and corrosion.

7. Installation is the reverse of removal.

**CAUTION**

AGM batteries should be replaced in pairs or four at a time.

Replace only with AGM type batteries of the same specification and capacity.

Prime system is programmed for the charging capacity of the batteries installed.

Installing a higher capacity battery will affect the battery life as the system will not fully charge the batteries, which is detrimental to battery performance.

Refer to “specifications” at the end of this section for further details.

**CAUTION**

Ensure that connections are not reversed when reinstalling batteries, since damage to electrical system components will result.

NOTE

When reinstalling batteries, battery connections must be tightened to 16 lbf-ft (200 lbf-in). A torque wrench is required to ensure an accurate tightening torque.

**DANGER**

To prevent possible electric shock or sparking, the battery master switch must be set to the “off” position before tightening an electrical connection.

NOTE

A protective coating should be applied on certain power connections that have been disconnected. Refer to procedure pr00002e included at the end of this section to know the recommended products and where they are used.

2.4 BATTERY RATING

Each of the 12 volt odyssey 31-pc2150s batteries used on the vehicle has the following rating:

Type: absorbed glass mat
Terminal type: top stud

Group size: 31
Volts: 12
Load test amperage (1/2 cca): 575
Reserve capacity (minutes): 205
Cold cranking (in amps) -at 0°f : 1150a

Maximum dimensions

Length (including flange): 13in/330mm
Width: 6.8in/173mm
Height (including top posts): 9.4in/239mm
Approximate weight: 77.8 lbs

Torque specifications

Battery post, battery terminal nut: 17 lbf-ft (200 lbf-in)

The reserve capacity is defined as the number of minutes a new, fully charged battery at 80of (26,6oc) can be discharged at 25 amperes and maintain a minimum of 1.75 volts per cell (10.5 volts total for one 12 volts battery). This rating can be used as a basis for determining how long a vehicle might run after an alternator failure. The cold cranking rating is defined as the minimum discharge current a battery will deliver in amperes for 30 seconds at 0of (-18oc) while maintaining a minimum of 1.2 volts per cell (7.2 volts total for one 12 volts battery). This rating can be used as a basis for comparing starting performance.

2.5 BATTERY MAINTENANCE

Several factors influence battery performance. The methods and inspection procedures proposed here will ensure your batteries are in good shape.

Local procedures and instructions take precedence over our proposed methods.

2.5.1 Visual Inspection


1. Check the outside of the battery for a broken or cracked cover or case that could permit loss of electrolyte. If obvious physical damage is noted, replace the battery. Also check for wet areas around the terminals.
2. Check for loose terminal posts, cable connections, damaged cables, and for evidence of corrosion. Correct conditions as required before proceeding with tests.
3. Check for damaged or loose battery tie-downs.

2.5.2 Removing surface charge

Disconnect cables from the battery and attach alligator clamps to the contact lead. Connect a load equal to half the cca (cold cranking amps) across the terminal for 5 seconds to remove surface charge from the battery.

2.5.3 Testing Battery Cables

Check all cable ring terminals and connections to determine if they are in good condition. Excessive resistance, generally caused by poor connections, produces an abnormal voltage drop which may lower voltage at the starter to such a low value that normal operation of the starter will not be obtained. An abnormal voltage drop can be detected with a low-reading voltmeter as follows:



DANGER


To prevent the engine from starting during these tests, remove circuit breakers cb91 and cb99 located in the vecr of the rear electrical compartment. Once the tests are completed, reinstall cb91 and cb99.

1. Check voltage drop between grounded (negative) battery terminal and vehicle frame by placing one prod of the voltmeter on the battery terminal and the other on a good ground (unpainted surface) on the vehicle. With the starter cranking the engine at a temperature of 70°f (21°c), voltage reading should be less than 0.3 volt. If the voltage reading exceeds 0.3 volt, there is excessive resistance in this circuit.
2. Check voltage drop between the positive battery terminal and the starter positive terminal stud while the motor is operated. If the reading is more than 2.5 volts, there is excessive resistance in this circuit.

Note

If it is necessary to extend the voltmeter lead for this test, use a #16 (awg) or larger wire.

3. Check voltage drop between the starter housing and a good ground on the vehicle. The reading should be less than 0.2 volt.




DANGER

Any procedure other than the following could cause personal injury or damages to the charging system resulting from battery explosion or electrical burns.

Wear adequate eye protection when working on or near the batteries. Ensure that metal tools or jumper cables do not contact the positive battery terminal (or a metal surface in contact with it) as a short circuit will result. Do not attempt to jump start a vehicle suspected of having a frozen battery because the battery may rupture or explode. Both the booster and discharged batteries must be treated carefully when using jumper cables. Follow exactly the procedure outlined later in this section, being careful not to cause sparks.

2.6 BATTERY CHARGING

The batteries used on this vehicle can be charged either on or off the vehicle. Use the booster block or the provided 110v receptacle to charge the batteries when they are left on vehicle and **make sure that the main battery disconnect switch is set to the “on” position.**



Caution

AGM (absorbed glass mat) batteries require a voltage-limited charger, ideally fitted with a battery temperature sensor for temperature correction of charging parameters.

Make sure your charger is multi-staged and minimally provides the following voltage values:

Charge voltage: 13.8-14.6 volt @77°f (25°c)

Float voltage: 13.4-13.6 volt @77°f (25°c)

Charging AGM battery on a typical constant current or taper current charger – even one time – may greatly shorten its life.

Please consult odyssey owner’s manual included with the OEM publications for charging tips and maintenance guidelines.

**DANGER**

During charging of the batteries, an explosive gas mixture forms in each cell. Part of this gas escapes through the vent holes and may form an explosive atmosphere around the battery itself if ventilation is poor. This explosive gas may remain in or around the battery for several hours after it has been charged. Sparks or flames can ignite this gas causing an internal explosion, which may shatter the battery.

1. Do not smoke near a battery which is being charged or which has been recently charged.
2. Do not break live circuits at battery terminals because a spark usually occurs at the point where a live circuit is broken. Care must always be taken when connecting or disconnecting booster leads or cable clamps on chargers. Poor connections are a common cause of electric arcs, which cause explosions.
3. The electrical system on this vehicle is negative ground. Installing the batteries with the positive terminals grounded or incorrect use of the booster battery and jumper cables will result in serious damage to the alternator, batteries and battery cables.

The alligator clamps of the tester or charger should make firm contact with the terminal battery adapter. **Never clamp charger or tester directly onto threaded studs or nuts.**

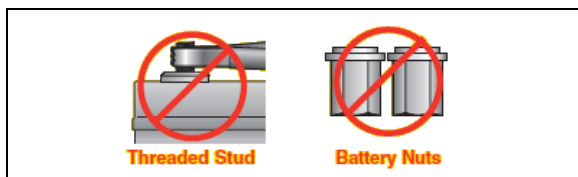


FIGURE 20: ALLIGATOR CLAMPS

**Warning**

Always turn off the charger before connecting or disconnecting to a battery.

Note

The charge rate must be doubled when the batteries are charged by the booster block, because of the series-parallel circuit.

**DANGER**

Do not use the “jump start boost” feature of an off-board battery charger to jump start the vehicle. This could damage the electrical system.

2.6.1 Booster Block

The booster block is located near the batteries in the engine compartment on the R.H. side and is accessible through the R.H. side door (Figure 21).

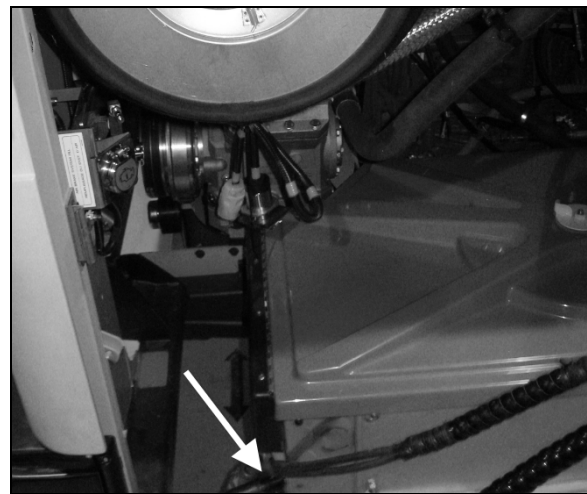


FIGURE 21: BOOSTER BLOCK


Both booster and discharged batteries should be treated carefully when using jumper cables. A vehicle with a discharged battery may be started by using energy from a booster battery or the battery from another vehicle.

**DANGER**

Jump starting may be dangerous and should be attempted only if the following conditions are met:

1. The booster battery or the battery in the other vehicle must be of the same voltage as the battery in the vehicle being started, and must be negative grounded.
2. **If the booster battery is in another vehicle, that vehicle's engine must be shut off before connecting and must remain off during jump starting.**
3. If the booster battery is a sealed-type battery without filler openings or caps, its test indicator must be dark or a green dot


must be visible. Do not attempt jump starting if the test indicator of the booster battery or the discharged battery has a light or bright center.

 **DANGER**
Follow the procedure exactly as outlined hereafter. Avoid making sparks.

Wear eye protection and remove rings, watches with metal bands and other metal jewelry.

Apply parking brake and place the transmission shift lever or push-button pads in neutral (n) position in both vehicles. Turn off lights, heater and other electrical loads.

1. Remove the protective plug from the booster block bulkhead connector located in the R.H. side engine compartment;
2. Connect to the bulkhead connector. **If the booster battery is in another vehicle, that vehicle's engine must be shut off before connecting and must remain off during jump starting;**
3. Disconnect the jumper cables in reverse order;
4. Install protective plug on the booster block terminal.

 **DANGER**
Any procedure other than the above could result in personal injury, property damage due to battery explosion, or damage to the charging system of the booster vehicle or of the boosted vehicle.

Note
Jumper cables must withstand 500 cranking amperes. If cable length is 20 feet (6m) or less, use 2/0 (awg) gauge wires. If cable length is between 20-30 feet (6-9m), use 3/0 (awg) wires.

2.7 AGM BATTERY CHARGING PRECAUTIONS

Agm (absorbed glass mat) batteries require a voltage-limited, temperature corrected charger. Make sure your charger is multi-staged and minimally provides the following voltage values:

Charge stage voltage:

13.8-14.6 @77°f (25°c)

Float stage voltage:

13.4-13.6 @77°f (25°c)

Charging agm battery on a typical constant current or taper current charger – even once – may greatly shorten its life.

2.8 BATTERY EQUALIZATION AND AGM BATTERIES

Equalization is a controlled over charge. Conventional flooded lead-acid batteries may benefit from this procedure, stirring the chemistry of the entire battery and countering stratification (layers of different concentration of electrolyte), and also countering sulfation that may have accumulated on the battery plates.

However, the "dry design" of agm batteries prevents chemical unbalance of the electrolyte. Manufacturers of this type of battery do not recommend performing equalization.

2.9 COMMON CAUSES OF BATTERY FAILURE

When a battery fails, the cause of failure may be related to something other than the battery. For this reason, when a battery failure occurs, do not be satisfied with merely recharging or replacing the battery. Locate and correct the cause of the failure to prevent recurrence. Some common external causes of battery failure are as follows:

1. A defect in charging system such as high resistance or a faulty alternator or regulator. The dashboard alternator telltale light illuminates if both alternators are defective.



Charging system warning light

2. A malfunction within the 12 volts system (equalizer).
3. Overloads caused by a defective starter or excessive use of accessories.
4. *Keep batteries clean.* Dirt and electrolyte on battery exterior shell may cause a constant drain.
5. Hardened battery plates, due to battery being in a low state of charge over a long period of time.


6. Shorted cells, loss of active material from plates.
7. Driving conditions or requirements under which the vehicle is driven for short periods of time.
8. A constant drain caused by a shorted circuit such as an exposed wire or water infiltration in junction boxes causing ground fault.
9. Failing to close disconnect switches during the night.

2.10 TROUBLESHOOTING

If a battery is known to be good and then has not performed satisfactorily in service for no apparent reason, the following factors may reveal the cause of trouble:

1. Vehicle accessories and disconnect switches inadvertently left on overnight.
2. Defects in the charging system, such as high wiring resistance, faulty alternator, regulator or battery equalizer.
3. A vehicle electrical load exceeding the alternator (or battery equalizer) capacity, with the addition of electrical devices, such as cb radio equipment, a cellular phone or additional lighting systems.
4. Defects in the electrical system, such as shorted or pinched wires.
5. Extended driving at a slow speed while using many accessories.
6. Loose or poor battery cable-to-post connections, previous improper charging of a run-down battery or loose hold-down clamp bolts.
7. High-resistance connections or defects in the cranking system.

2.11 "BATTERY VOLTAGE WARNING" PICTOGRAM

If the "battery voltage warning"  (battery voltage incorrect) pictogram shows up in the DID (driver information display), check the voltmeter gauge to determine if the battery voltage is too high or too low.

2.11.1 Voltmeter Gauge Definitions

Voltmeter drops below 24.4 volts dc

- Check alternator output.
- Check voltage regulator.
- Check battery connections.
- Check battery cells.
- Check battery equalizer connections.

Voltmeter exceeds 30 volts dc

- Check alternator output.
- Check voltage regulator.
- Check battery connections.

Battery balance

Note
<i>Allow at least 15 minutes to balance batteries after any corrective measure has been taken.</i>

1. Batteries out of balance (difference greater than 1.5 volts between the two battery banks).
 - Check battery equalizer connections.
 - Check equalizer cables for proper gauge.
 - Check battery connections.
2. Demand for 12-volt power exceeding rated amperage output of battery equalizers causing batteries to go out of balance.
 - Reduce 12-volt load or install additional battery equalizer(s).

3. PRIME ENERGY MANAGEMENT SYSTEM

The acronym “prime” stands for power recovery by intelligent management of energy.

This system focuses on eliminating parasitic loads on the engine by intelligent management of the alternators and air compressor duty cycle.

Instead of constantly charging, the alternators will use engine negative torque (braking, deceleration) to generate “free” electricity.

Depending on the compressed air requirement, prime will also trigger the production of compressed air on negative torque.

Prime also introduces maintenance-free absorbed glass mat (agm) batteries and a new vanner 80 series battery equalizer that monitors battery state of charge (soc).

Battery temperature, voltage and current are also monitored to prevent overcharging and overheating.

Maximum fuel economy is obtained on a ride when the mix of hilly and flat portions allows the batteries to be charged when the vehicle is in free wheel. It basically means that batteries are charged with free energy and that no fuel consumption is dedicated to charge the batteries.

3.1 COMPONENTS

New components includes agm batteries, an 80 series vanner battery equalizer, a temperature sensor located on the battery post and two voltage and current sensors monitoring 12v and 24 v circuits.

Refer to Figure 22 below.

The compressor duty cycle control is achieved by an electric air dryer. This is covered in section 12 of this manual.

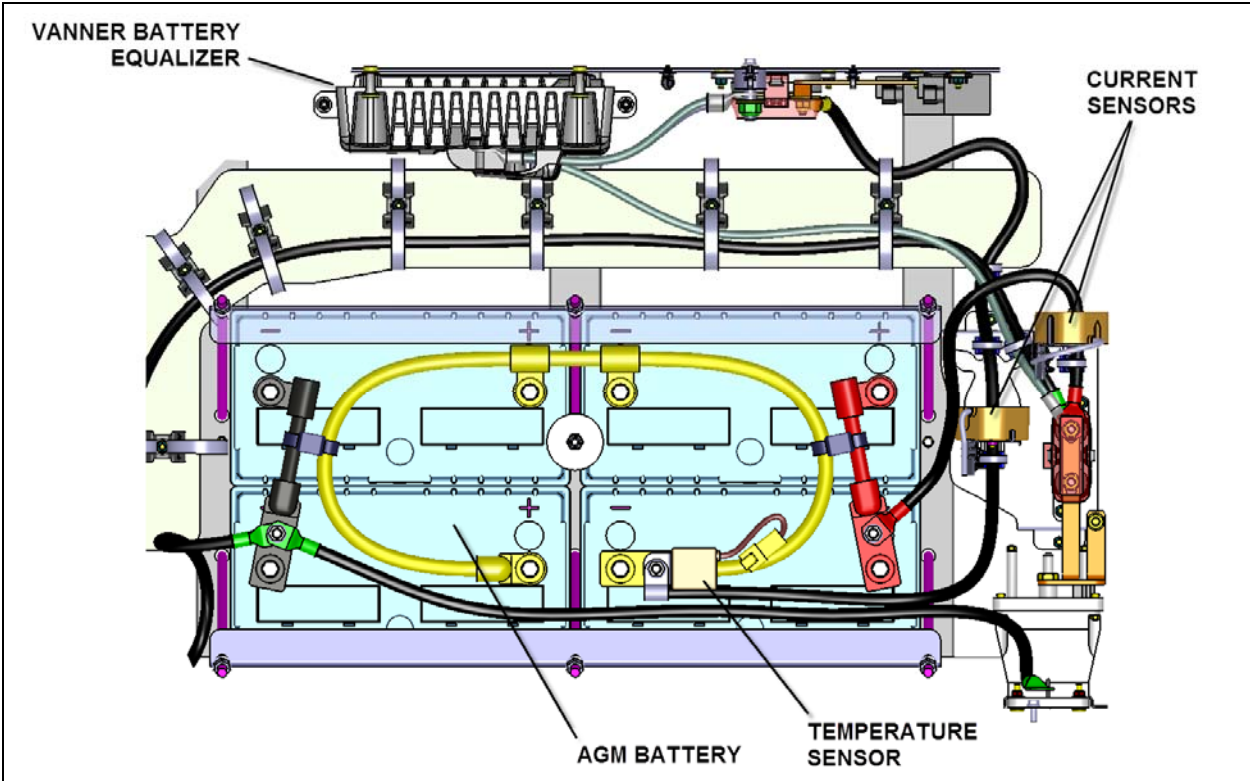


FIGURE 22: PRIME ELECTRICAL COMPONENTS

3.1.1 Vanner 80 Series Battery Equalizer Fault Codes

The 80 equalizer can bus interface supports sae j1939 diagnostic message 1 (dm1) for active diagnostic trouble codes. See list below. Refer to oem publication *Vanner Vann-guard 80 series owner's manual pdf* for additional details.

Description	Spn	Fmi
Over voltage fault (ovf)	168	0: data valid, but above normal operating range – most severe
Under voltage fault (uvf)	168	1: data valid, but below normal operating range – most severe
Imbalance (imb)	520448	0: data valid, but above normal operating range – most severe
Equalizer fault (eqflt)	520449	1: data valid, but below normal operating range – most severe
Temperature sensor fault (tsf)	520450	0: data valid, but above normal operating range
Temperature sensor fault (tsf)	520450	1: data valid, but below normal operating range
Temperature sensor fault (tsf)	520450	2: data erratic, intermittent, or incorrect – most severe
12v current sensor fault (scsf)	520451	0: data valid, but above normal operating range – most severe
12v current sensor fault (scsf)	520451	1: data valid, but below normal operating range
12v current sensor fault (scsf)	520451	2: data erratic, intermittent, or incorrect – most severe
24v current sensor fault (dcsf)	520452	0: data valid, but above normal operating range – most severe
24v current sensor fault (dcsf)	520452	1: data valid, but below normal operating range
24v current sensor fault (dcsf)	520452	2: data erratic, intermittent, or incorrect – most severe

3.2 DID DISPLAY

In the DID you will find the percentage of trip made with regenerated electricity displayed along with the instantaneous fuel consumption.

This value is reset each time the engine is restarted

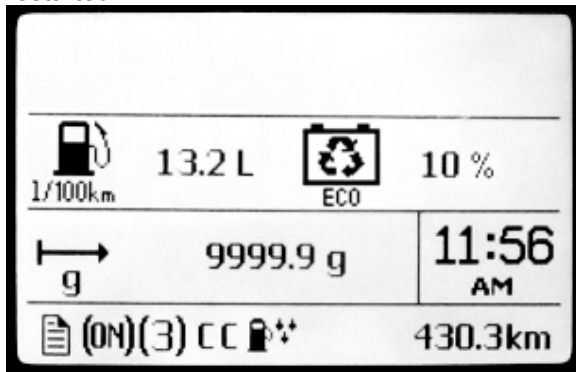


FIGURE 23: PRIME DID DISPLAY

In addition to the standard voltage gage, the DID also includes a state of charge gage for the batteries:

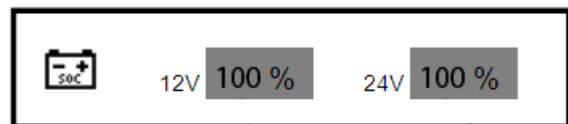


FIGURE 24: BATTERY STATE OF CHARGE

This gage displays the level of charge for the 12v and 24v battery banks in percentage.

4. TROUBLESHOOTING AND TESTING THE MULTIPLEX VEHICLES

4.1 ELECTRICAL SYSTEM DIAGNOSTIC

Using the driver information display (Figure 25), check if there are active errors in the vehicle electrical system. With the **diagnostics** menu, highlight **fault diagnostics** and then highlight **electrical system** to request a diagnostic of the electrical system from the mcm. Press the enter key. If applicable, the DID shows the multiplex device id, the fault messages or fault codes recorded. When more than one fault is recorded, an arrow pointing down appears on the right of

the display. Use the down arrow to see all the fault messages.

Once the problem corrected, the DID still shows the fault as being active. You have to leave the **fault diagnostics** menu, wait approximately 20 to 30 seconds and then return to **fault diagnostics** to request a new diagnostic of the **electrical system** from the mcm. The DID should display the fault as being inactive. The mcm can store up to 20 faults, i.e. the first 10 and the last 10. Middle faults will be erased. If cb6 breaker is tripped, the fault history will be erased from the mcm memory.

Note

It is of the utmost importance to have a DID (driver information display) in working condition because it is the most important tool to achieve troubleshooting on a multiplex vehicle.

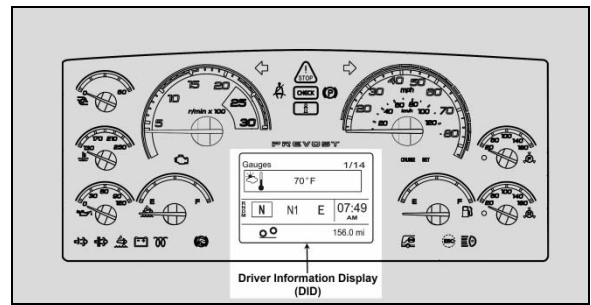


FIGURE 25: DRIVER INFORMATION DISPLAY

4.2 PROBING VOLTAGE ON THE MULTIPLEX CIRCUITS

Some multiplex modules are supplied by 12 volts while others are supplied by 24 volts. The 12-volt or 24-volt information is found on the modules symbol in the wiring diagram. Before taking voltage readings to track the source of a problem, first verify if the module is supplied by 12v or 24v, if not, residual voltage on the module inputs/outputs can draw an erroneous conclusion.

Inactive multiplex output = residual voltage of 18% to 33% of supply voltage.

Inactive multiplex input = residual voltage of 50% of supply voltage.

Note

- Verify on the wiring diagram whether the voltage is 12v or 24v,
- For a 12v module: an active voltage would be 12v or 0v but not in between. If you measure the intermediate tensions (ex. 6v, 2v, or 4v) this must be interpreted as if the input or the output is inactive.
- For a 24v module: an active voltage would be 24v or 0v but not in between. If you measure the intermediate tensions (ex. 12v, 4v, or 8v) this must be interpreted as if the input or the output is inactive.

4.3 CAN NETWORK

The can network wiring is separated in sections and uses connectors that are not shared with other circuits, with the exception of c27. This allows sections of the network to be isolated to help locate short-circuit on the can.

In case of short-circuit on the can network, this affects all the modules and they all act as “no response” in the error messages of the “**electrical system**” menu. To locate a short-circuit, proceed by disconnecting one module zone at a time while verifying if this makes inactive the errors in the modules still connected. Connector c1 (front electrical & service compartment) disconnects all the modules at the rear of the vehicle from the network. Connector c5 (front electrical & service compartment) disconnects all the modules from the entrance door & wiper control panel. Connector c3 (rear electrical panel) disconnects all the modules at the rear of the vehicle from the network.

Example: disconnect c5 and c1 and then verify the status of the errors. If the front modules (a41 to a46) now give inactive errors, which means short-circuit is elsewhere than in the front electrical & service compartment.

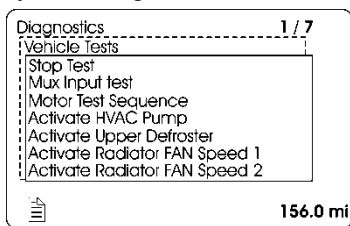
4.3.1 Spare CAN

A spare can network is installed between the front and the rear of the vehicle. It has connectors installed at each end to facilitate swapping from the regular can network to the

spare can network. Refer to the vehicle wiring diagram and section 4.6 for more information.

4.4 MULTIPLEX INPUT TEST MODE

The multiplex input test provides useful information to diagnose multiplexed inputs of switches and sensors, complimentary to the electrical system diagnosis.



To initiate the test mode, use the driver information display (DID) diagnostics menu. Select vehicle tests submenu and then mux input test. Press enter button to start the test. The DID status line will show test to confirm the test mode is active. To exit test, press escape button, select stop test submenu and then press enter button twice. Test will disappear from the DID status line.

Instrument panel audible alarm emits a *beep* each time an off/on transition is detected on a multiplex input. This allows quick verifying if the switches and sensors are detected or seen by the multiplex modules. When the vehicle is parked, the back-up alarm also emits a *beep* that allows verification of the sensors at the rear of the vehicle.

Certain inputs are doubled (door operating buttons) and also other inputs activate at the same time (ex. Kneeling switch and kneeling proximity sensor switch). For these inputs, 2 *beeps* are emitted. If only one *beep* is heard, one of the inputs is defective.

Switches and sensors supported by the switch/sensor test mode
HVAC control unit driver's section on/off
HVAC control unit driver recirculate switch
HVAC overhead compartment fan switch
Engine rear start selector switch "rear start"
Engine rear start selector switch "normal"
Engine ignition front switch
Engine ignition rear switch
Entrance door inside opening /closing switch
Entrance door outside opening /closing switch
Kneeling down switch
Electric horn button
Lh turn signal

Rh turn signal
Headlights beam toggle switch
Windshield wipers intermittent position switch
Windshield washer switch
Kneeling up switch
Interior lighting switch, 2 positions
Driver's area lighting switch
Reading lights switch
Hazard warning flashers switch
Headlights switch, 2 positions
Tag axle lever
Wheelchair lift activation switch
Windshield lower wiper

The following inputs, either certain options or sensors which are difficult to activate, are not supported by the switch/sensor test:

- Service chime enable switch,
- Horn selector switch,
- Outside rear view mirror heat,
- Mirror control switches,
- Low-buoy switch,
- Starter sensor,
- Abs warning input,
- WCL switch,
- Driver's power window switch,
- Fog lights switch,
- Alternator sensors 1 & 2,
- Retarder active signal,
- Radiator fan speed 1 & 2 signals.

In test mode, with the parking brake applied and the passenger set point set to a value higher than 64°F (18°C), the circulator pump is not set to off as it would normally do when the outside temperature gets above 50°F (10°C). This feature allows verification of the pump when inside a garage. This is also useful when working on the heating system to remove air pockets trapped in the system. Motor test sequence

4.5 MOTOR TEST SEQUENCE

This test mode allows testing of the electrical motors and electric contactors without the need to have the engine running. Note that while in test mode, the engine cannot be started. Prerequisite conditions for the motor test mode:

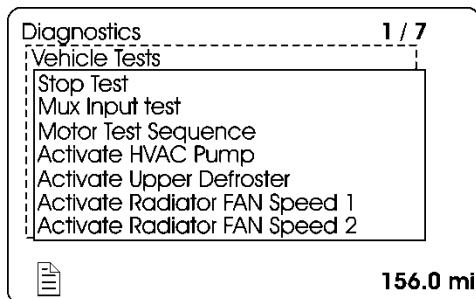
- A. The battery charger must be connected to a 110-120 volt power supply. If not, the test will be interrupted when the voltage drops below 24 volts,
- B. Engine not running,
- C. Parking brake applied,

**Danger**

Before starting the test sequence, make sure nobody is working in the evaporator or condenser compartment.

Note

The back-up alarm will beep ten (10) times prior the test starts to warn people that may be working on the vehicle.

**To enter this mode:**

1. Using the dashboard DID, select diagnostics menu and press enter button ;
2. Select vehicle test, press enter button then select motor test sequence and press enter button to initiate the test mode for electrical motors;
3. Ten (10) beeps can be heard indicating the motor test mode has started.

Using the test mode:

During the entire test, the instrument panel audible alarm gives a signal each second to remind that the motor test mode is underway.

4.5.1 Test Sequence**Go to the condenser compartment:**

- The condenser fans run at speed 1 for 3 seconds, then after a short pause, run at speed 2 for 3 seconds.

- The passenger's unit refrigerant solenoid valve activates 2 times (audible "clicks" will be heard).
- The overhead compartments a/c unit refrigerant solenoid valve activates 2 times (audible "clicks" will be heard).
- The haldex consep oil separator automatic drain valve activates 3 times (audible "clicks" will be heard).

Then 5 beeps can be heard from the back-up alarm to indicate to go to the engine compartment.

In the engine compartment, the sequence is as follows:

- The fan mounted on the engine compartment curbside door engages in speed 1 and then in speed 2.
- A/c compressor clutch activates 3 times (audible "clicks" will be heard).
- Right compressor unloader activates 3 times (audible "clicks" will be heard).
- Fan clutch is disengaged (fan can be turned freely by hand, 3 seconds delay).
- Fan clutch engages in speed 1 for 3 seconds (fan can be turned by hand but a certain strength is needed).
- Fan clutch engages in speed 2 for 3 seconds (cannot be turned but hand).

5 beeps from the back-up alarm indicate to go to the evaporator compartment.

In the evaporator compartment:

- Evaporator fan motor runs at speed 1 for 3 seconds then runs at speed 2 for 2 seconds.
- Hot water pump starts running for 5 seconds and hot water pneumatic valve cycles 3 times.

5 beeps from the back-up alarm indicate to get to the driver's area inside the vehicle.

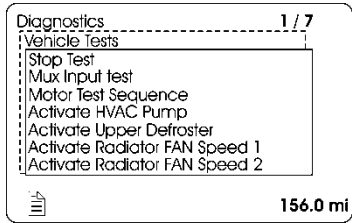
Inside the vehicle:

- The driver's HVAC unit refrigerant solenoid valve cycles 3 times and the hot water pneumatic valve cycles 3 times also (audible "clicks" will be heard).
- Left and right overhead compartment fans run one after the other for 5 seconds.

To exit the electric motors test sequence, press escape button, select stop test submenu and then press enter button twice.

4.6 FORCED ACTIVATION OF THE RADIATOR FAN CLUTCH

To prevent the engine from overheating in case of malfunction of the clutch activation system, it is possible to force activation of the clutch.



1. On the driver information display, select diagnostics menu. Select vehicle tests submenu and then activate radiator fan speed 1 or activate radiator fan speed 2 as required.
2. The DID status line will show test to confirm the forced activation of the radiator fan clutch. To cancel, turn the ignition switch to the off position or press escape button, select stop test submenu and then press enter button twice. Test will disappear from the DID status line.

If the fan clutch does not engage using this procedure then the clutch is faulty or the wiring between the multiplex module and the clutch is faulty. Mechanically lock the fan clutch as described in section 05: COOLING SYSTEM of the maintenance manual.

4.7 CAN NETWORK OVERVIEW

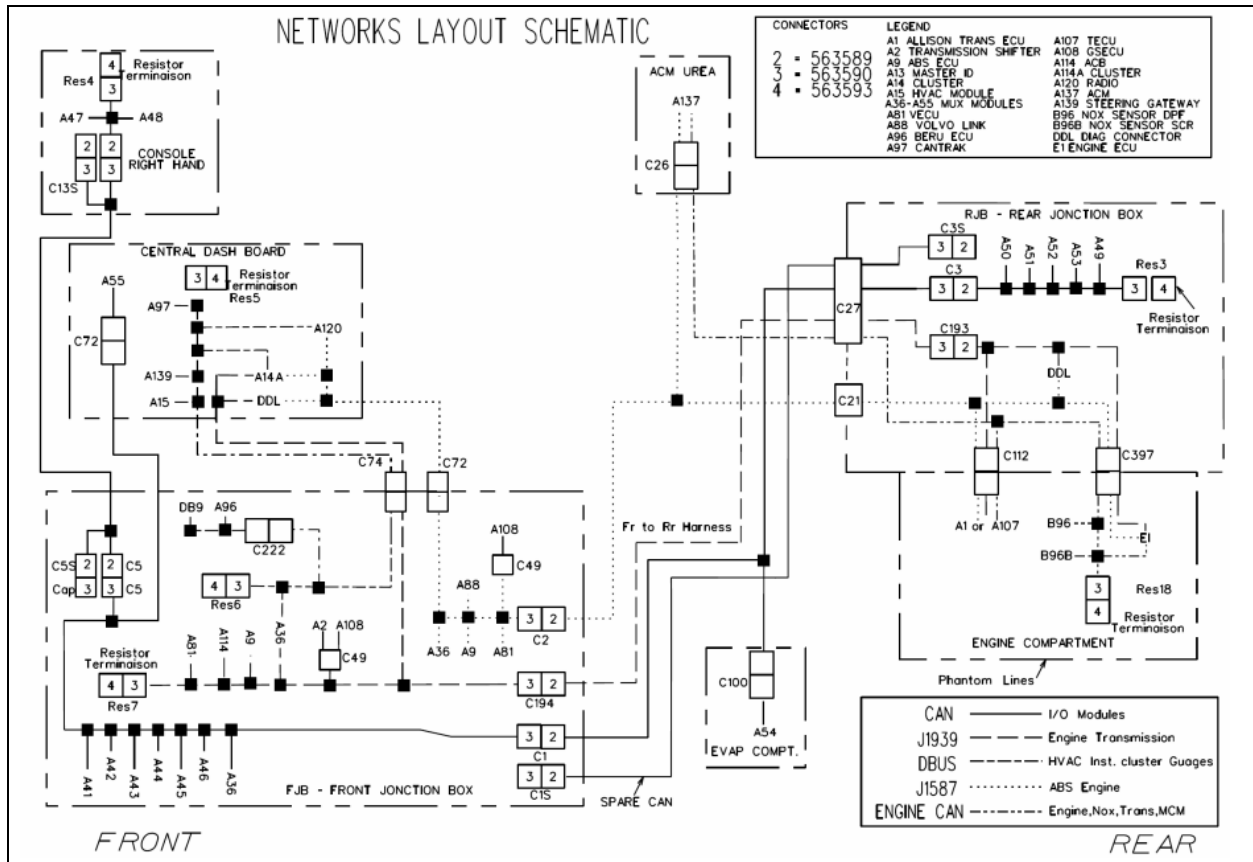


FIGURE 26: X3-45 COACH NETWORK LAYOUT

The multiplex modules are connected by a controller area network according to the layout above.

A backup spare network is pre-wired in the coach to quickly resolve any connectivity issue. Spare connectors for this network are identified by “s” e.g.: **c5s** is the spare for **c5**.

With the introduction of obd 2013 emissions standard, we now have a high speed can diagnostic and engine programming network, also known as an iso network.

Refer to the list below for cross reference between the current sae data line designation and the former designation:

- DI-0 = prevost can 1 or **b-bus**
- DI-1 = **j-1939** ecu communication, engine, abs, allison
- DI-2 = can **iso** for engine diagnostics and software download
- DI-3 = can 2 or **d-bus**
- DI-4 = **j1587** drive train information network
- DI-5 & 6 = not used

- DI-7 = power train subnet or engine can
- DI-8 = not used (eaton)
- DI-9 = not used on this vehicle (i-shift to volvo engine)

On wiring diagrams, the sae standard data link designation appears. The different networks will be identified on the data wire identification.

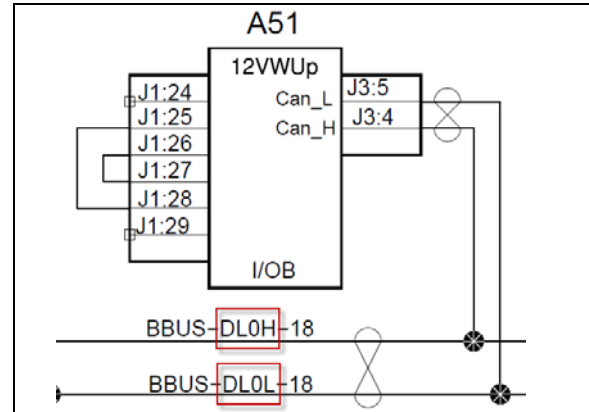


FIGURE 27: DATA WIRE IDENTIFICATION

4.8 MULTIPLEX TROUBLESHOOTING

Problem/symptom	Probable causes	Actions
Vehicle does not start	<p>Rear start selector switch is not in the normal position</p> <p>Master cut-out switch on the rear electrical panel is in the off position (down)</p>	<ol style="list-style-type: none"> 1. Check that the rear start selector switch is flipped up to normal start position and master cut-out switch is flipped up to on and retry cranking 2. Flip the rear start selector switch to “rear start” and start the vehicle from the rear

Problem/symptom	Probable causes	Actions
	<p>Can network problem (multiplex)</p> <p>Module a53 not powered or is defective</p> <p>Engine ecm does not receive the ignition signal</p> <p>Engine ecm is not powered</p>	<p>If the vehicle does not start from the rear:</p> <ol style="list-style-type: none"> 1. Verify that module a53 is powered: <ol style="list-style-type: none"> a) Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda53, active”, indicates a power problem on the module or a can network problem. b) Check / reset circuit breaker cb5 c) Check / replace fuse f65 d) Probe gray connector on module to see if it is powered. 2. Verify that the engine ecm is powered and get the ignition signal <ol style="list-style-type: none"> a) Check / reset circuit breaker cb8 check / replace fuse f74 b) Check / reset circuit breaker cb2 check / replace fuse f78
<p>None of the multiplexed functions are operating, including the basic limp-home functions (door opening, flashers, wipers in speed 1)</p> <p><i>Note: the sunshades are still functioning since these are not multiplexed</i></p>	<p>The program version in the mcm is different than the program in the i/o modules and the mcm is forcing all i/o modules to stay inactive</p>	<ol style="list-style-type: none"> 1. Engage the auto-programming of the i/o modules: turn the ignition switch to the off position, flip the master cut-out switch on the rear electrical panel to off and on and then turn the ignition switch back on. The letters can will appear in the telltale lcd panel for about 3 minutes everything shall get back to normal once the letters can are replaced with outside temperature display 2. Try disconnecting the green connector on the mcm and reconnect 3. Try disconnecting the mcm completely, leave it disconnected and see if the limp-home functions (start of the vehicle from the engine compartment, wipers speed 1, flashers, etc) are functioning

Problem/symptom	Probable causes	Actions
<p>Many secondary functions (not essential for driving) not functioning (interior lighting, driver's area lighting, wiper speed 2 and intermittent).</p> <p>Marker lights and clearance lights are turned on when setting ignition to the on position.</p>	<p>The mcm does not receive 24 v power.</p> <p>The can network is not working. It could be caused by a short on the network, an open circuit, a problem with the mcm or the mcm being disconnected from the network.</p>	<ol style="list-style-type: none"> 1. Check / reset circuit breaker cb6 (3rd from the left on the junction panel) check / replace fuse f1 2. Operate in limp-home mode by starting the vehicle from the engine compartment (rear start). All functions essential to drive are available <p>To close and lock the door, pull the door manually up to its closed position and it will lock by itself. The door opening button is still functioning</p>
<p>Entrance door does not open nor close using the control buttons</p> <p>Defroster fan not functioning</p> <p>Windshield wipers not functioning in speed 1 or intermittent</p>	<p>Module a47 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message "no response moda47, active" indicates a power problem on the module. (a can network problem would show the same message but doesn't produce these symptoms). 2. Check / reset circuit breaker cb6 3. Check / replace fuse f5 4. Check / replace relay r18 5. Probe gray connector on module to see if it is powered. 6. Use the air release valves near the entrance door and in the front service compartment to lock / unlock the door
<p>Windshield wipers not functioning in speed 1 or intermittent</p>	<p>No power on r23</p>	<p>Check / replace fuse f82</p>
<p>HVAC condenser fans not functioning in speed 1</p>	<p>Circuit breaker cb7 was manually tripped and not reset</p>	<p>Check / reset circuit breaker cb7</p>
<p>HVAC condenser fans not functioning in speed 2</p>	<p>Circuit breaker cb7 was manually tripped and not reset</p>	<p>Check / reset circuit breaker cb7</p>

SECTION 06: ELECTRICAL

Problem/symptom	Probable causes	Actions
<p>Windshield washer not functioning</p> <p>Windshield upper section de-icing system not functioning</p> <p>Defroster fan is functioning but no heat or cooling available in the driver area.</p>	<p>Module a46 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda46, active” indicates a power problem on the module. (a can network problem would show the same message but doesn't produce these symptoms). 2. Check / reset circuit breaker cb1 3. Check / replace fuse f12 or f13 4. Probe gray connector on module to see if it is powered.
<p>Low beam headlights and front flasher on left side not functioning</p> <p>Electric horn not functioning</p>	<p>Module a45 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda45, active” indicates a power problem on the module. (a can network problem would show the same message but doesn't produce these symptoms). 2. Check / reset circuit breaker cb2 3. Check / replace fuse f33 and f34 4. Check / replace relay r19 5. Probe gray connector on module to see if it is powered.
<p>Low beam headlights and flasher on right side not functioning</p>	<p>Module a48 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda48, active” indicates a power problem on the module. (a can network problem would show the same message but doesn't produce these symptoms). 2. Check / reset circuit breaker cb2 3. Check / replace fuse f33 and f34 4. Check / replace relay r19 5. Probe gray connector on module to see if it is powered.

Problem/symptom	Probable causes	Actions
<p>Rear flashers not functioning</p> <p>Stoplights and center stoplights not functioning</p>	<p>Module a51 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda51, active” indicates a power problem on the module. (a can network problem would show the same message but doesn't produce this symptom). 2. Check / reset circuit breaker cb2 3. Check / replace fuse f80 4. Probe gray connector on module to see if it is powered.
<p>Engine is overheating and radiator fan clutch does not engage</p> <p>The a/c compressor clutch does not engage</p>	<p>Module a52 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda52, active” indicates a power problem on the module. (a can network problem would show the same message but doesn't produce this symptom). 2. Check / reset circuit breaker cb5 3. Check / replace fuse f65 4. Probe gray connector on module to see if it is powered.
<p>Evaporator fan not functioning</p>	<p>Circuit breaker cb3 tripped</p> <p>Module a54 is not powered or is faulty</p>	<ol style="list-style-type: none"> 1. Check / reset circuit breaker cb3 2. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message “no response moda54, active” indicates a power problem on the module. (a can network problem would show the same message but doesn't produce this symptom). 3. Check / reset circuit breaker cb5 4. Check / replace fuse f67 , f68 5. Probe gray connector on module to see if it is powered.

Problem/symptom	Probable causes	Actions
HVAC condenser fans not functioning in speed 1	Module a54 is not powered or is faulty	<ol style="list-style-type: none"> 1. Check the diagnostics menu of driver information display (DID). Select fault diagnostics and electrical system. The message "no response moda54, active" indicates a power problem on the module. (a can network problem would show the same message but doesn't produce this symptom). 2. Check / reset circuit breaker cb5 3. Check / replace fuse f67 , f68 4. Probe gray connector on module to see if it is powered.
Fire alarm telltale light and audible alarm always on and there is no fire or high temperature in the engine compartment	Short-circuited fire sensor or defective sensor	Prior to start the vehicle, cycle the ignition key to the on position, off position and then on position again and then start the vehicle. This will deactivate the fire alarm function. This has to be repeated each time the vehicle is re-started
The vehicle is parked and the electrical horn is activated to indicate a fire in the engine compartment but there is no fire	Short-circuited fire sensor or defective sensor	Cycle the ignition switch between the on and off position twice within 3 seconds. This will deactivate the fire alarm function. This has to be repeated each time the vehicle is parked
A single light, a group of led lights or another function of the vehicle is not functioning	The multiplex outputs are protected in current by an internal "soft-fuse". When an output is shorted, it turns off and stays off until the "soft-fuse" is reset	Turn the ignition switch to the off position and turn to the on position again. This resets all "soft –fuses"
No backlighting in the instrument cluster	Circuit breaker cb10 is tripped or fuse f20 blown	<p>Check / reset circuit breaker cb10</p> <p>Check / replace fuse f20</p>

Problem/symptom	Probable causes	Actions
<p>The radiator fan clutch does not function and the engine is overheating</p>		<ol style="list-style-type: none"> 3. Set the ignition switch to the on position. 4. Activate the dashboard telltale light test switch 3 times within 4 seconds. 5. In the engine compartment, set the starter selector switch to rear start and then start the engine from the rear. <p>While in this mode, the rear start push-button can be used to manually engage the fan clutch. The multiplex system knows when the engine is already running, and it will not activate the starter.</p> <ol style="list-style-type: none"> 6. Press the push-button one time to engage the clutch in 1st speed, press a second time to engage in 2nd speed, press a third time to stop the fan, press once again to return to 1st speed. <p>If the fan clutch does not engage using this procedure then the clutch is faulty or the wiring between the multiplex module and the clutch is faulty. Mechanically lock the fan clutch as described in section 05: COOLING SYSTEM of the maintenance manual.</p>

4.9 MULTIPLEX ERROR MESSAGES TROUBLESHOOTING LIST

Multiplex error messages that can be displayed on driver information display (DID) are alphabetically listed in section 06b at the end of section 06 along with fmi description, fault condition, possible symptoms and possible causes.

4.10 MULTIPLEX MODULE “NO RESPONSE” TROUBLESHOOTING LIST

Multiplex module “no response” messages that can be displayed on driver information display (DID) are listed in section 06c at the end of section 06 along with fmi description, fault condition, possible symptoms and possible causes.

4.11 ESSENTIAL FUNCTIONS TO OPERATE THE VEHICLE

Even with a defective mcm (master chassis module) or a can network problem, essential base functions are maintained to rear start the vehicle from the engine compartment and drive in a secure manner.

However, many secondary functions are lost. In this case, the following directives must be followed.

- Never connect a battery charger when the ignition is at the on position on a vehicle with a can defective or certain functions will start up by themselves,
- Disconnect the charger before starting the vehicle, if not the default functions will not activate,
- If the default mode does not activate, try to turn the ignition off while ensuring that no

charger is connected and then restart the vehicle.

4.11.1 Available Functions

- Startup: turn on the ignition in the driver's area and rear start the vehicle from the engine compartment,
- Opening the door: functions normally,
- Closing the door: manually pull on the door panels and it will lock automatically,
- Windshield wipers: wipers functions at 1st speed only,
- Headlights: low beams only,
- Directional signals: rear and front only,
- Stoplights: 2 upper stoplights + high-mounted stoplight are functional,
- HVAC: functional with set point fixed at 68°F (20°C), evaporator and condenser fixed at speed 1, defroster fixed at speed 4.

4.12 LOWER PRIORITY MODULES FOR BREAKDOWN SERVICE

Modules A43 (I/O-A) and A44 (I/O-B) affect lower priority functions. These modules can therefore be used as spare parts for breakdown service while on the road.

Functions lost if A43 is removed and used as spare part:

- High beams,
- Ability to turn on the parking lights only,
- "watch your step" sign,
- Driver ceiling light,
- Tag axle activation,
- Courtesy flashers

Functions lost if A44 is removed and used as spare part:

- Fresh air damper mix trap control,
- Driver's area and entrance ceiling lights,
- Front clearance lights.

4.13 MULTIPLEX MODULES

4.13.1 MCM Module

The mcm plays the role of interface between the engine ECM, the transmission TCM, the telltale panel module and other IO-A, IO-B modules. When a multiplex module is being replaced, the mcm will inform the new module of its role and function accordingly to the vehicle options. The mcm keeps the back-up of the vehicle specific multiplex program.

4.13.2 IO-A Module

Io-a modules receive inputs and control outputs. Io-a's are used for all outputs of 1 amp or less.

4.13.3 IO-B Module

Io-b modules receive inputs and control outputs. Io-b's are used for outputs up to 30 amps.

4.14 MULTIPLEX MODULES REPLACEMENT

IO-A, IO-B multiplex modules can be replaced and reprogrammed without having to connect a computer to the vehicle.

The mcm must be reprogrammed using a laptop computer equipped with VPG software, connected to c226 (db9 connector) found in the front electrical compartment (see Figure 29). However, an updated vehicle multiplex program saved on a laptop computer can be uploaded into the mcm without the need of vpg software.

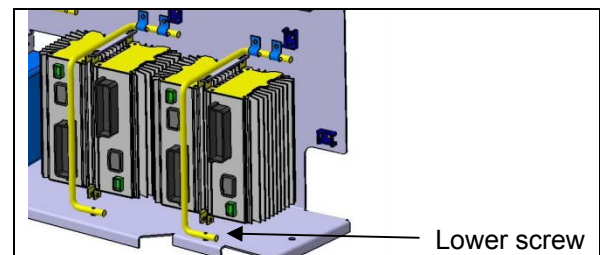


FIGURE 28: IO-B MODULE REMOVAL 06638

4.14.1 Replacing IO-A or IO-B Modules

Set the ignition switch to the on position and leave in that position at all time while performing this procedure.

1. On rear electrical junction panel, trip circuit breaker cb6.
2. Replace the module and plug connectors (*for IO-B modules, disconnect the green*

connector first, then the grey one and finish with the black connector. To disconnect the black connector, slide downwards the red latch. Remove the lower screw that holds the cable attachment rod onto the floor portion of the panel and flip the rod up, this will relieve the IO-B module, see Figure 28).

3. Reset circuit breaker cb6. Doing so will initiate the I/O reprogramming.

Note

Jb6 is a wake-up pin. Ja15 output remains active for 5 minutes after jb6 is inactive.

When initiating reprogramming:
 Switch sw83 (ignition key) remains closed, providing 24-volt on jb6, i/o modules and r18. All modules get power.

Cb6 is tripped and reset which is forcing mcm reboot.

When resetting cb6, all modules get power, mcm goes into "start mode". I/o modules needing new program will request reprogramming to mcm while in "start mode".

4. The DID indicates "mux autoprogramming i/o module please wait" until the reprogramming is complete unless a higher priority message must be displayed. If this is the case, press escape button repeatedly to acknowledge the higher priority messages.
5. Check the **diagnostics** menu of the driver information display (DID). Select **fault diagnostics** and **electrical system**. Verify the fault message to be certain the module is reprogrammed. If the module is not reprogrammed, the message "axx not responding" appears where axx is the module number (ex: a41, a42...etc).

4.14.2 Replacing The MCM

1. Set the ignition key to the on position and leave in that position at all time while performing this procedure.
2. On rear electrical junction panel, trip circuit breaker cb6.
3. Replace the module.
4. Reset circuit breaker cb6.
5. The vehicle specific multiplex program needs to be uploaded in the mcm.

4.14.3 Uploading the vehicle specific multiplex program in the mcm

A laptop computer running windows xp or windows 7 must be connected to the rs232 serial port db9 connector (identified c226) found on the front service compartment electrical panel. Please contact your Prevost service representative in order to get the vehicle specific multiplex program. Save the specific multiplex program on your computer desktop.

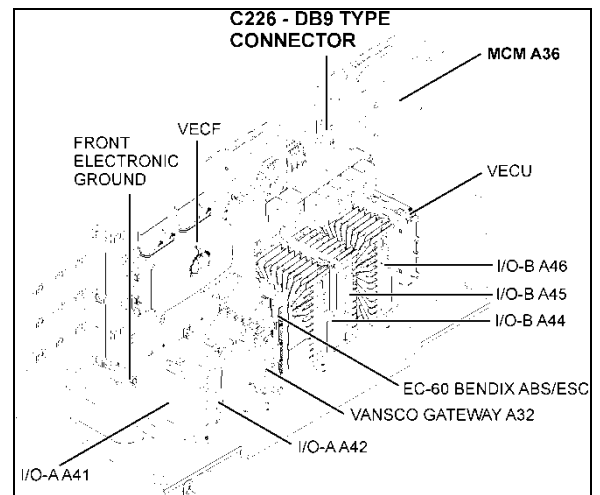


FIGURE 29: DB9 CONNECTOR AND MCM LOCATION

Set the ignition switch to the on position and leave in that position at all time while performing this procedure.

1. Assure that the vehicle battery charger is connected to 120-volt and that the laptop computer battery is fully charged.
2. Connect the laptop computer to the mcm through the db9 connector. To do so, you need (see Figure 30):

1x usb to serial db9 rs232 adapter (sold at staples);

1x prevost interface cable p/n 066009;



FIGURE 30: USB TO SERIAL DB9 RS232 ADAPTOR AND PREVOST 066009 INTERFACE CABLE

3. Identify com port number. To do so, right click on “my computer” to open “computer management”. Select “device manager” and note the com number (see Figure 31).

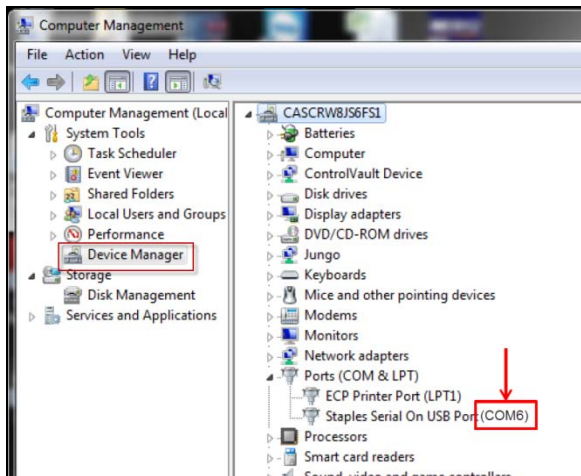


FIGURE 31: IDENTIFYING COM PORT NUMBER

4. Double-click on the com port and validate the port settings. Settings should be as shown on Figure 32.

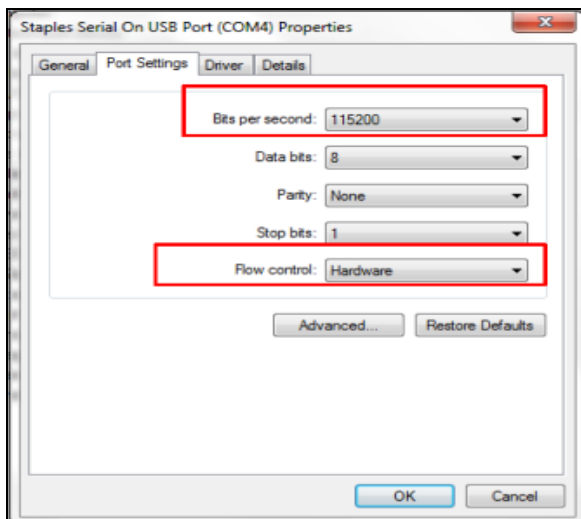


FIGURE 32: PROPER PORT SETTINGS

5. Locate the specific multiplex program file previously saved on your computer desktop. The file name should contain the vin's last 4 digits of the vehicle you are about to update (example: file mp_00125146a11 for bus #2408 which as vin 2pcg33491cc735146)
6. Double-click on the specific multiplex program file, a dialog box will open. You must enter a valid communication port to master id/mcm. Select the proper com port number previously identified and then click on “continue” (see Figure 33). The upload will begin.

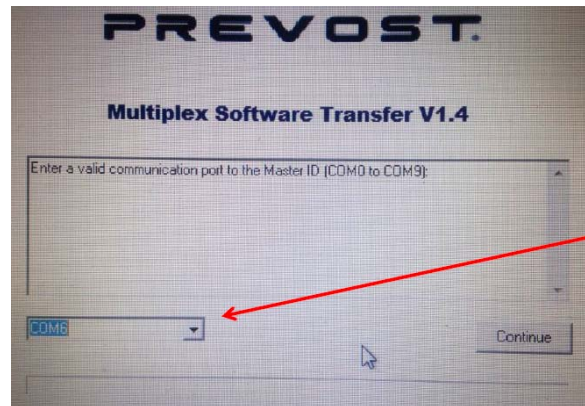


FIGURE 33: ENTER PROPER COM PORT NUMBER

7. Wait until the upload is completed. You should read: “software transfer successfully completed”.
8. Validate the program version using the DID. Look in diagnostic>part number>electrical system menus (see Figure 34). To confirm the update is has been successfully done, the last digits of the software number should match the file name (mp_00125146a11) uploaded.

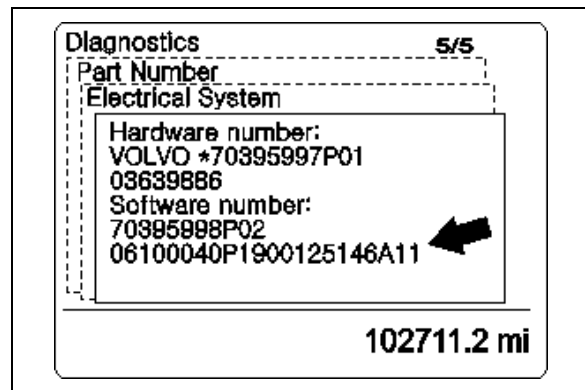


FIGURE 34: VALIDATING PROGRAM VERSION

9. On rear electrical junction panel, trip and reset circuit breaker cb6.
10. Clear all diagnostics troubleshooting codes.

5. BOSCH ALTERNATORS

Two 28 volt 150A, self-regulated, belt driven, air-cooled HD 10 Bosch alternators are used in the 24 volt electrical system.

If the alternators needed to be removed, reinstall as follows. Refer to Figure 36 for installation and to Figure 37 for tightening specifications:

1. If necessary, tighten screws (6) fixing alternators support assembly onto engine (1, Figure 36). Torque tighten to 43 lbf-ft, use some Loctite 243 blue (680038) onto the threads. Also tighten screw (1) fixing belt tensioner onto alternators support assembly (1, Figure 36). Torque tighten to 43 lbf-ft, use some Loctite 243 blue (680038) onto the threads.
2. If removed, reinstall screw (1) fixing alternators support assembly onto engine (2, Figure 36). Torque tighten to 22 lbf-ft, use some Loctite 243 blue (680038) onto the threads.

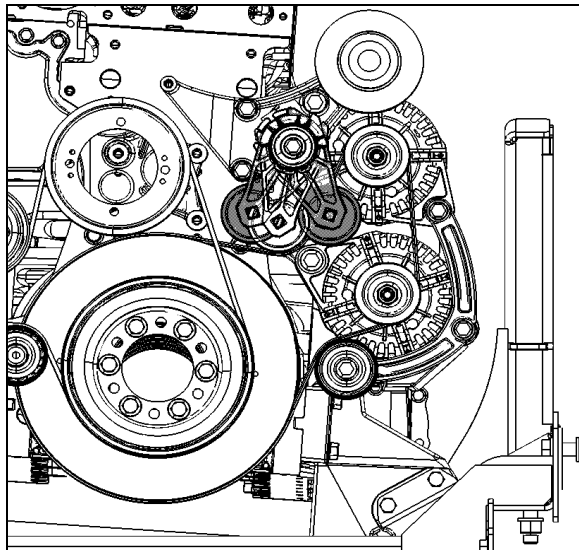


FIGURE 35: ALTERNATORS DRIVE BELT

3. Mount the a/c compressor idler pulley onto alternators support assembly (3, Figure 36). Torque tighten to 150 lb-ft, use some Loctite 243 blue (680038) onto the threads.
4. Install alternators arched support loosely onto engine. If removed, install alternators idler pulley (4, Figure 36) onto alternators arched support, torque tighten to 43 lb-ft.

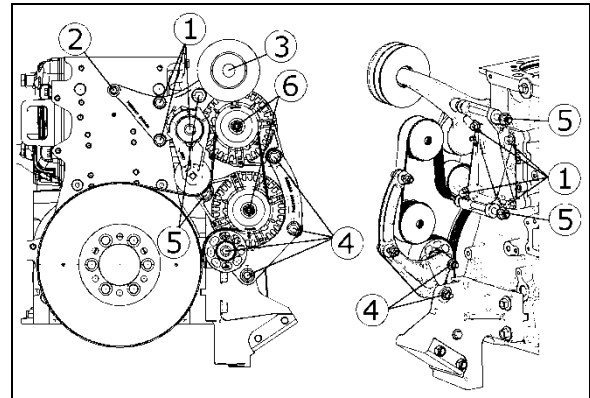


FIGURE 36: TWIN ALTERNATORS INSTALLATION

5. Fix lower and upper alternators loosely to alternators support assembly using bolts (5, Figure 36). Also, mount the lower and upper alternators onto alternators arched support. If removed install stone guard below lower alternator.
6. In order to assure installation, it is important to tighten the alternator mounting bolts in the following order (Figure 37).
 - 1st nut a, 43 lbf-ft.
 - 2nd nut b, 43 lbf-ft (2x).
 - 3rd nut c, 80 lbf-ft (2x)

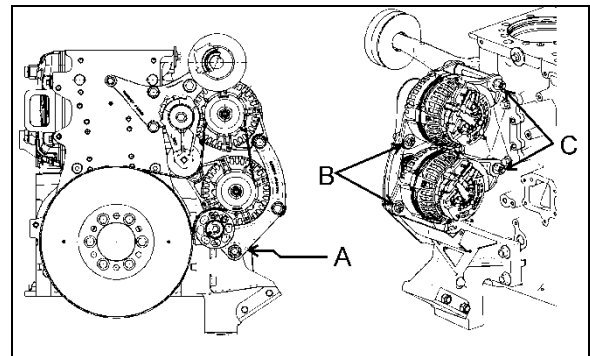


FIGURE 37: ALTERNATOR MOUNTING - TIGHTENING SEQUENCE

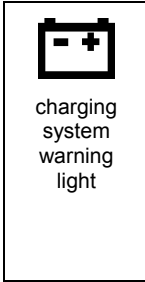
7. Mount pulleys (6, Figure 36) onto alternators. Torque tighten to 58 lb-ft.
8. Install alternators belt.

Note

Final tightening of the pulleys can be performed once the belt is installed. This will help keep the pulley from turning when tightening.

5.1 ALTERNATOR PERIODIC INSPECTION

When both alternators are not charging, the *charging system warning light* illuminates. This telltale will not illuminate if only one alternator is defective. However, a single defective alternator can be identified using the back-probing method described below.



Maintenance

Alternator Periodic Inspection

Check that both alternators operate normally using back-probing method described at paragraph 5.1.1. Perform at the intervals specified by the Lubrication And Servicing Schedule in Section 24A.

- If multimeter reads 12 volts, you have an open circuit;
- If multimeter reads 26 volts or greater, the **upper** alternator operates normally.

Note

Validation

Confirm back-probing results before removing the defective alternator. In fact, the connectors on the alternators may have been interchanged by mistake.

1. Stop the engine and then disconnect the suspected defective alternator.
2. Start the engine. Back-probe the pin on the alternator known to be in good working condition.
3. If multimeter reads 1-2 volts, then this alternator is defective. A misconnection of the alternators exists. Check the regulators connectors.

5.1.1 Identifying a Single Defective Alternator

This method consists in back-probing specific pins on J1 connector, Multiplex Module A49.

Prerequisite conditions:

- a) Engine running;
- b) Parking brake applied.

On connector J1 of multiplex module A49, back-probe pin 8 (A49 J1:8) and a good ground (use ground stud in the compartment). Repeat for pin 9 (A49 J1:9).

Lower alternator: pin 8

Upper alternator: pin 9

1. Back-probe pin 8 (A49 J1:8).
 - If multimeter reads 1-2 volts, the **lower** alternator is defective;
 - If multimeter reads 12 volts, you have an open circuit;
 - If multimeter reads 26 volts or greater, the **lower** alternator operates normally.
2. Back-probe pin 9 (A49 J1:9).
 - If multimeter reads 1-2 volts, the **upper** alternator is defective;

5.2 ALTERNATOR DRIVE BELT

Removal

1. Insert a ½" socket drive wrench into the automatic belt tensioner opening (Figure 38).
2. Twist the tensioning arm to slacken belt.
3. Remove belt.



FIGURE 38: ½" SOCKET DRIVE WRENCH

Note


Belts specifications may vary. For proper belt selection, always consult your vehicle coach final record.

Installation

Installation of the alternator drive belt is the reverse of removal.


5.3 ADJUSTMENT

Correct belt tension is required to maximize belt life. The tensioning arm maintains proper belt tension, no adjustment is required.

 Maintenance
Check for wear and proper tension every 12,000 miles, replace every 50,000 miles.

5.4 CURBSIDE DOOR FAN – ALTERNATOR COOLING

Supplemental air cooling is provided to the alternator with a fan mounted on the engine compartment curbside door. This fan is of the same type as the ones used for the HVAC condenser.

 Warning
Automatic fan drive Keep clear of curbside door cooling fan when engine is running. Fan may engage without warning.

The engine compartment curbside door fan will blow outside air toward the alternators according to the following conditions:

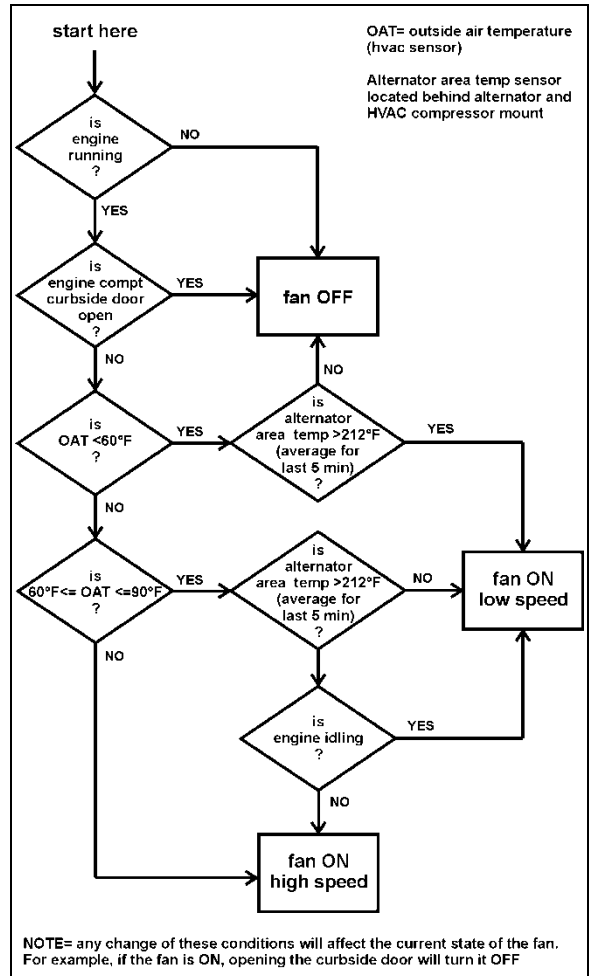


FIGURE 39: CURBSIDE DOOR FAN CONTROL LOGIC

6. BATTERY EQUALIZER

The Vanner Vann-Guard 80-series battery equalizer is located beside the batteries in battery compartment.

For further details, consult Vanner Vann-Guard 80 series owner’s manual included on your technical publications cd.

7. BATTERY CHARGER

Vanner battery charger model sp00155 is located in the battery charger and power inverter compartment; which is located at the rear of the coach, behind the last row of passenger’s seats. An access door is provided in the wall.

For further details, consult Vanner battery charger model sp00155 owner’s manual included on your technical publications cd.

8. POWER INVERTER

Xantrex power inverter is located in the battery charger and power inverter compartment; which is located at the rear of the coach, behind the last row of passenger's seats. An access door is provided in the wall.

The power inverter turns on and provides ac power to the vehicle outlets only when the engine is running.

For further details, consult Xantrex power inverter Prosine 1000-1800 owner's manual included on your technical publications cd.

9. STARTER

Refer to Mitsubishi electric corporation (Melco) service bulletin me003-p included on your technical publications cd for information and maintenance instruction on Melco 105p70 starter.



Caution

Do not engage starter for more than 15 seconds at a time. If engine does not start within 15 seconds, release ignition key and let starter cool for one minute before attempting to restart.

10. EXTERIOR LIGHTING

The circuit for exterior lights, as well as their control switches, relays and circuit breakers are shown on the applicable wiring diagrams. Wiring diagrams are located in the technical publication box.

Headlights

Each headlight assembly consists of two 90 mm (3½ inch) headlamp module, the high beam lamp is equipped with a 12-volt halogen bulb, the low beam lamp is a 12-volt led lamp. The turn/signal lamp is a 100 mm (4 inch) 12-volt led. Outer lamps have a double function (both low and high beam). Inner lamps are used for high beam or daytime running light.

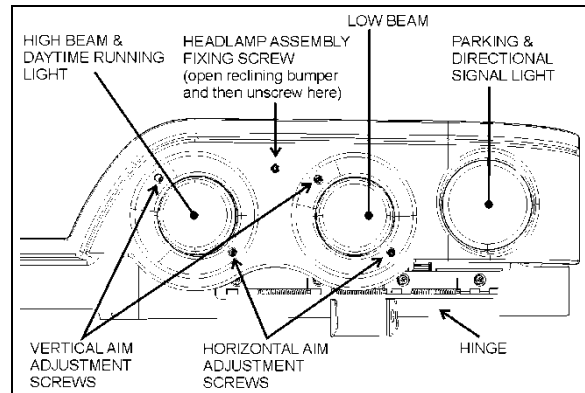


FIGURE 40: HEADLIGHT ASSEMBLY 06546

10.1.1 Maintenance

Clean headlights with soap and water. When a headlight burns out, a new bulb must be installed. Headlights must be properly aimed to provide maximum allowable road illumination. When using mechanical aiming devices, follow manufacturer's instructions.




FIGURE 41: HEADLIGHT ASSEMBLY OPENED FOR BULB REPLACEMENT 06547

Aiming can be performed without opening headlight assembly. Horizontal and vertical aiming of each module is provided by two adjusting screws that pivot the module in the housing for proper alignment (Figure 40). There is no adjustment for focus since the module is set for proper focus during manufacturing assembly.

Note

Make sure headlight assembly is properly positioned into its housing before securing using fixing screw.

 **Caution**
Use a soft cloth to clean the parking and front turn signal lamp.

10.1.2 Headlight adjustment

1. Headlight aiming and inspection can be accomplished by visual means. This is done on a screen located at a distance of 25 feet of the headlights. It should be of adequate size with a matte-white surface well shaded from extraneous light and properly adjusted to the floor area on which the vehicle stands. Provisions should be made for moving the screen or its vertical centerline so that it can be aligned with the vehicle axis. In addition to the vertical centerline, the screen should be provided with four laterally adjustable vertical tapes and two vertically adjustable horizontal tapes.
2. The four movable vertical tapes should be located on the screen at the left and right limits called for in the specification with reference to centerlines ahead of each headlight assembly.
3. The headlight centerlines shall be spaced either side of the fixed centerline on the screen by 1/2 the lateral distance between the light source centers of the pertinent headlights. The horizontal tapes should be located on the screen at the upper and lower limits called for in the specification with reference to the height of beam centers and the plane on which the vehicle rests, not the floor on which the screen rests.

Table 1 – vertical beam aim guidelines

Headlight (centerline) Mounting height	Nominal Vertical aim	Aim inspection limits for vertical aim
22 to 36 inch	0 vertical	4 inch up to 4 inch down
36 to 48 inch	2 inch down	2 inch up to 6 inch down
48 to 54 inch	4 inch down	1.5 inch up to 6.5 inch down

4. The nominal vertical aim position on lower beam headlights shall be adjusted based on the headlight mounting height, from the

ground to the light source center of the headlight, according to table 1.

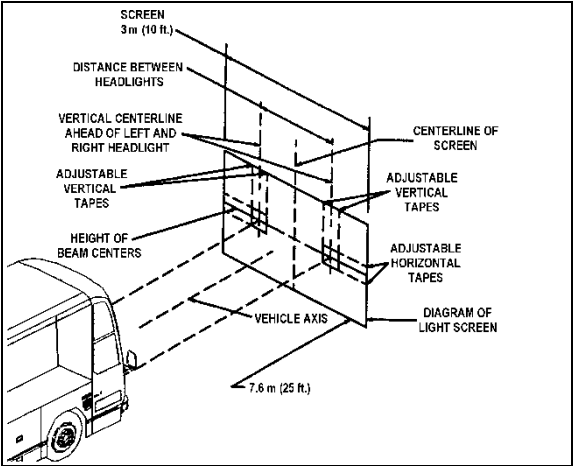


FIGURE 42: ALIGNMENT OF HEADLIGHT AIMING SCREEN 06502

5. High beam headlights are aimed so that the center of the high-intensity zone is located at the horizontal and straight ahead vertically (Figure 43).
6. Low beam headlights are aimed so that the top edge (the cutoff) of the high-intensity zone is at the vertical location as per table 1 and the left edge of the high-intensity zone is at the vertical centerline of the headlight (Figure 44).
7. The inspection limits for high-beam headlights shall be with the center of the high-intensity zone from 10 cm (4 in) up to 10 cm (4 in) down; and, from 10 cm (4 in) left to 10 cm (4 in) right on a screen at 7.6 m (25 ft) (Figure 45).

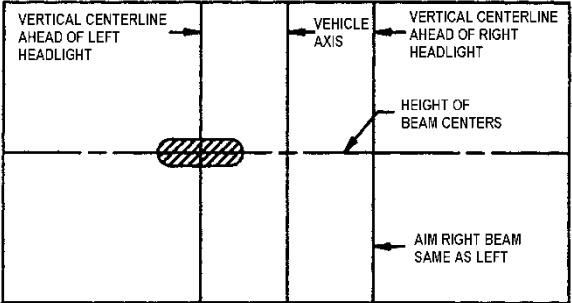


FIGURE 43: PROPER UPPER BEAM HIGH-INTENSITY ZONE AT 25FT 06503

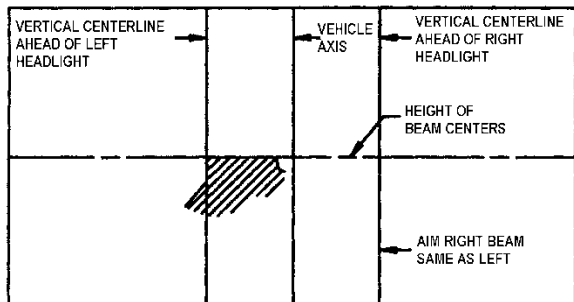


FIGURE 44: PROPER LOWER BEAM HIGH-INTENSITY ZONE AT 25FT 06504

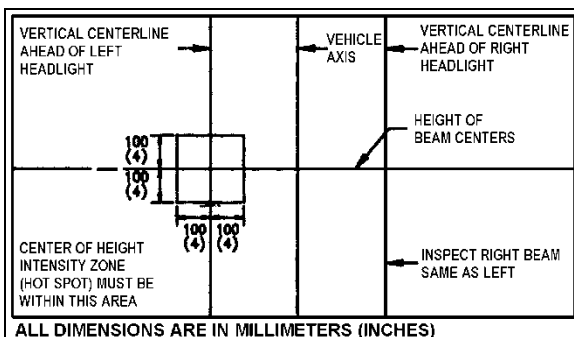


FIGURE 45: AIM INSPECTION LIMITS FOR UPPER-BEAM HEADLIGHTS 06505

7. The inspection limits in the vertical direction for low-beam headlights or the low beam of a dual-beam headlight, shall be as described in table 1. In the horizontal direction, the left edge of the high-intensity zone shall be located from 10 cm (4 in) left to 10 cm (4 in) right of the vertical centerline of the beam. The viewing screen shall be located 7.6 m (25 ft) in front of the vehicle (Figure 46).

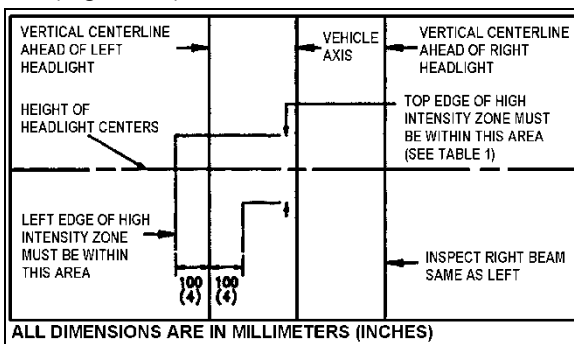


FIGURE 46: AIM INSPECTION LIMITS FOR LOWER-BEAM HEADLIGHTS 06506

10.1.3 Sealed-Beam Unit

Bulb removal and replacement

1. Pull the release handle located inside the front service compartment to tilt down the entire bumper assembly.

2. Remove the headlight screw fixing the headlight assembly, then tilt headlight assembly down (Figure 41).
3. Remove connector from headlight bulb.
4. Remove the bulb by pushing and rotating it out of the socket.
5. Install the new bulb by reversing the previous procedure.



Caution

During this step, avoid contacting the bulb with the fingers not to alter the bulb life.

Note

Do not disrupt headlight adjustment screws.

Module replacement

1. Pull the release handle located inside the front service compartment to tilt down the entire bumper assembly.
2. Remove the headlight screw fixing the headlight assembly, then tilt headlight assembly down (Figure 41).
3. Remove connector from headlight bulb.
4. Unfasten three metal clips attaching headlight unit to support.
5. Install new module and fasten metal clips.
6. Install wiring connector on back of new sealed beam unit.
7. Tilt headlight assembly up into its housing then secure using fixing screw.

Note

Make sure headlight assembly is properly positioned into its housing before securing using fixing screw.

8. Perform alignment procedure.

Note

The headlight aim must be checked and adjusted even if it was properly adjusted before the sealed beam unit was replaced.

10.1.4 Front Turn Signal

The front turn signal is part of the front headlight assembly. The turn signal is a sealed unit (led) located on each front corner and should be

replaced as an assembly. Turn signal is visible from both front and side.

Removal and replacement

1. Pull the release handle located inside the front service compartment to tilt down the entire bumper assembly.
2. Remove the headlight screw fixing the headlight assembly, then tilt headlight assembly down (Figure 41).
3. Partially unfasten back plate fixing screws, then remove signal lamp.
4. Remove socket from signal lamp.
5. Install wiring connector on back of new signal lamp then install signal lamp.
6. Fasten back plate fixing screws then tilt headlight assembly up into its housing then secure using fixing screw.

Note

Make sure headlight assembly is properly positioned into its housing before securing using fixing screw.

10.1.5 Stop, tail, directional, back-up, and hazard warning lights

A combination stoplight, taillight, directional signal light and back-up light assembly is mounted at the rear, on each side of the vehicle. Furthermore, when braking, two center stoplights (led) and a center high-mounted stop light (chsl) (led) will illuminate simultaneously with the stoplights on the sides for increased safety. The L.H. and R.H. side center stop lights are also used as directional signal and marker lights.

The stop, tail, directional signal and back-up lights consist of individual lamps, each equipped with 6 led lights, mounted on the engine rear door.

Led lights are not replaceable and each lamp is serviced individually as a complete unit.

The hazard warning flashing system uses the front, side and rear directional lights simultaneously. This system is energized by a switch on the L.H. dashboard.



FIGURE 47: REAR TAIL LAMPS

10.1.6 Lamp Removal And Replacement

1. Open engine compartment rear door.
2. Remove the lamp pod from the engine compartment door by unscrewing the Torx hold down screws (4) at the back of the door and the two (2) side retaining nuts.
3. Remove the lamp support retaining screws (2), and then from the outside, disconnect and remove the faulty lamp and its support.
4. From the outside, install the new lamp with its support then fasten the retaining screws.
5. Reinstall the lamp pod on the door and reconnect the lamp..

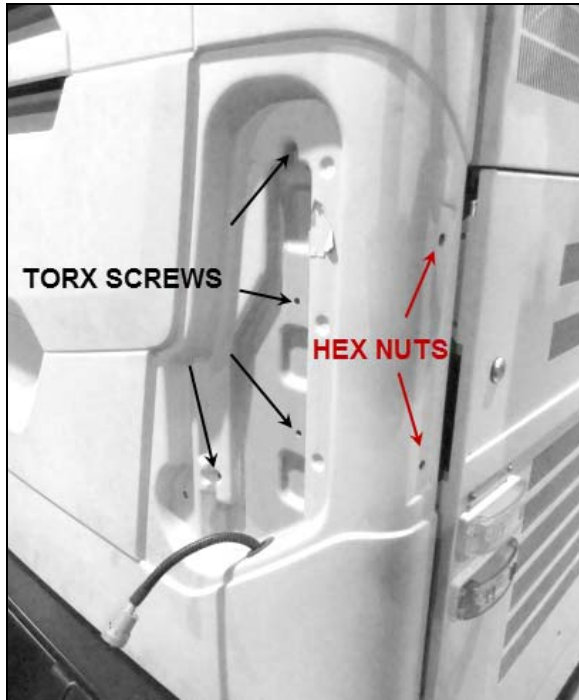


FIGURE 48: TAILLAMP POD RETAINING SCREWS & NUTS

10.1.7 Center Stoplights And Center High-Mounted Stop Light (Chsl) Removal And Replacement

These (led) lights are sealed unit and should be replaced as an assembly in accordance with the following procedure:

1. Unscrew both “Phillips” light screws then remove the light assembly.
2. Install new light assembly and secure using screws.

10.1.8 License plate light

Two led units are mounted above the rear license plate(s) of vehicle. In case of burn out, the led unit must be changed according to the following procedure.

1. Pry out the rubber seal with a small screwdriver. Pull on the led unit and disconnect it.
2. Reconnect new led unit, place rubber seal, and press on it until it is seated in position.

10.1.9 Clearance, identification and marker lights

The vehicle is equipped with marker, identification and clearance lights (led). The clearance lights are mounted at each corner of the coach near the top and the identification lights are in the upper center of rear and front sections.

The rear clearance and identification lights are red and the front ones are amber.

The amber marker lights are mounted along the sides of vehicle.

The side marker light is a sealed unit (led) and should be replaced as an assembly in accordance with the following procedure:

1. Unscrew both “phillips” light screws, and then remove the light assembly.
2. Position the new light assembly and install the “phillips” screws.

10.1.10 Clearance and identification light removal and replacement

The clearance and identification light are sealed units (led) and can be replaced in accordance with the following procedure:

1. Unscrew both “phillips” light screws, and then remove the light assembly.
2. Position the new light assembly, and then install the “phillips” screws.

11. INTERIOR LIGHTING EQUIPMENT

11.1 CONTROL PANEL LIGHTING

The instrument gauges and switches mounted on all control panels are energized whenever the exterior light switch is pushed to the first position. A control dimmer located on the dashboard is used to vary the brightness of the panel gauges, switches and indicator lights.

The gauge lights, panel lights, switch lights and indicator lights have a different bulb arrangement. Thus, the procedure to change a defective bulb can vary according to the application.

11.1.1 Switch lighting

1. Slightly pull the switch with a defective led away from the control panel.

2. Disconnect the electric cable from the switch.
3. To install a new switch, reverse the procedure (Figure 49).

Note
Switches are lighted by the use of led. When lighting on a switch fails, replace defective switch as a unit.

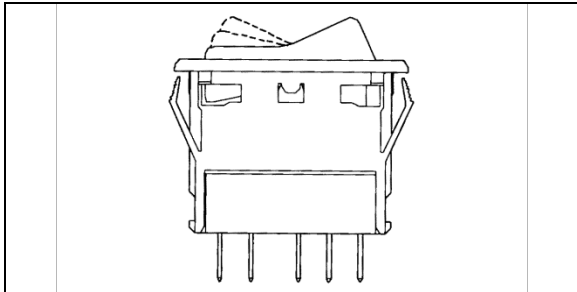


FIGURE 49: DASHBOARD ROCKER SWITCH 06321

11.1.2 Telltale light replacement

Telltale module is non-serviceable and must be replaced as a unit.

1. Unscrew and remove the top dashboard panel.
2. Remove the telltale back wire electric connectors.
3. Unscrew and remove the telltale module.
4. To replace the telltale module, reverse the procedure.

11.1.3 Gauge light bulb replacement

1. For any gauge light bulb replacement, the dashboard panel must be removed in order to have access to the rear of gauges.
2. Remove bulb socket from the gauge, turn the defective bulb counterclockwise and pull it out of the gauge.
3. Push a new bulb and socket asm and turn clockwise to lock in place.
4. Replace the rear dashboard housing.

11.2 STEPWELL LIGHTS

Two stepwell lights are illuminated when the door opening system is activated.

11.2.1 Bulb removal and replacement

Proceed as follows to replace a defective bulb:

1. Unscrew the two phillips-head screws retaining the lens to the wall, and remove it.
2. With the light lens removed, pull bulb from the lamp while applying lateral pressure.
3. Install the new bulb into the lamp.
4. Position the light lens and install it.

11.3 DRIVER'S AREA LIGHTS

Two halogen ceiling lights are installed over the stepwell and the driver's area. These lights are frequently used for night-time operation when passengers board or leave coach.

11.3.1 Bulb removal and replacement

1. Unsnap the lamp with a flat head screwdriver and remove it.
2. Pull the defective bulb out of the socket.
3. Install the new bulb by pushing it in position.
4. Replace the lamp by snapping it back in place.

	Caution
Do not touch halogen bulbs with bare hands as natural oils on skin will shorten bulb life span.	

11.3.2 Engine Compartment Lighting

A switch located on the upper right corner of the rear start panel can be used to actuate the engine compartment led lights.

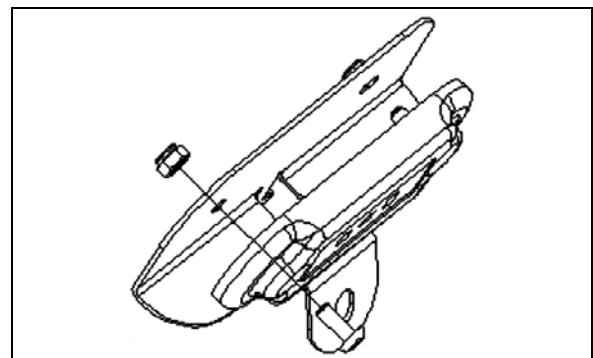


FIGURE 50: ENGINE COMPARTMENT LIGHT

SECTION 06: ELECTRICAL

Each light is sealed and can be replaced as follows:

1. Disconnect the light unit connection.
2. Unfasten the two fixing screws then remove the lamp.
3. Position and fasten new lamp.
4. Connect the light unit.

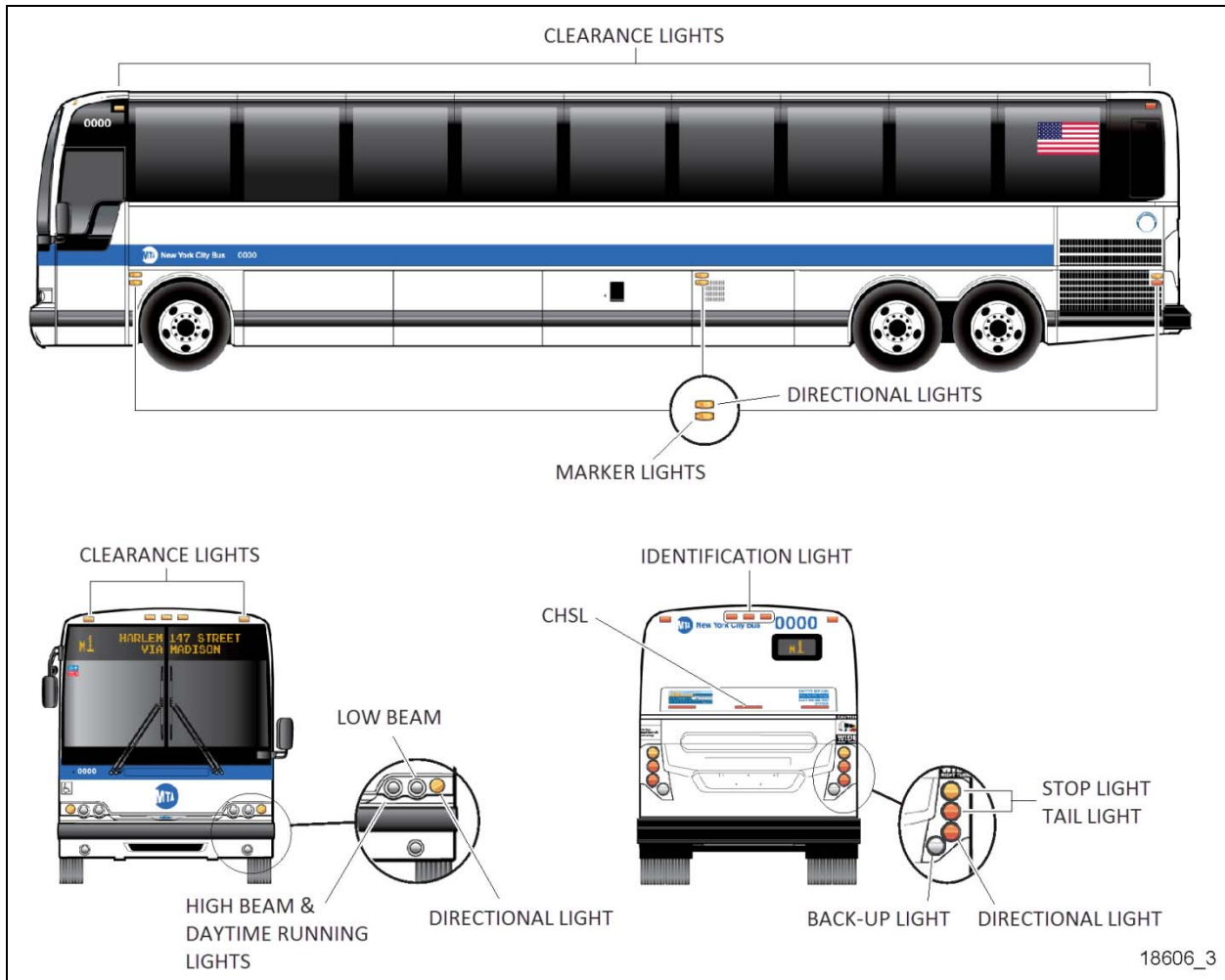


FIGURE 51: VARIOUS LIGHTS LOCATION

12. Specifications

Battery

Make.....	Odyssey
Model.....	31-Pc2150s
Type	Absorbed Glass Mat
Terminal Type	Top Stud
Group Size	31
Volts	12
Load Test Amperage (1/2 Cca).....	575
Reserve Capacity (Minutes).....	205
Cold Cranking (In Amps) -At 0°f (-18°c).....	1150a (Each Battery)
Maximum Dimensions	
-Length (Including Flange)	13in/330mm
-Width	6.8in/173mm
-Height (Including Top Posts).....	9.4in/239mm
-Approximate Weight.....	77.8 Lbs

Torque Specifications

Battery Cable To Post.....	17 Lbf-Ft (200 Lbf-In)
----------------------------	------------------------

Alternator

Make.....	Bosch
Series	Hd 10
Amperes	150
Volts	28.4
Output Power	3 Kw
Ground	Negative

Battery Equalizer

Make.....	Vanner
Model.....	Vann-Guard 80-Series
Amperes	100 Amps

Battery Charger

Make.....	Vanner
Model.....	Sp00155
Input	15 Amps @ 120 Vac
Output.....	42 Amps @ 24 Vdc
Bulk Voltage	28.6 Vdc
Float Voltage	26.6 Vdc

Inverter

Make.....	Xantrex
Model.....	Prosine 1800
Continuous Output Power	1800 W
Surge Rating (5 Seconds).....	2900 W
Peak Output Current	45 Amps
No Load Draw (Search Mode, Idle Mode)	1.5w, 20w
Input Voltage Range	20-32 Vdc
Output Voltage	120 Vac (Sine Wave)
Low Battery Cut-Out.....	20 Vdc
High Battery Cut-Out.....	32 Vdc
Protection	Automatic Overload, Short Circuit, Over-Temp, Over-Volt, Under-Volt
Transfert Relay Rating	15 Amps

Starter

SECTION 06: ELECTRICAL

Make..... Mitsubishi Electric Corporation (Melco)
 Type 105p70
 Voltage 24

No-Load Test

-Volts 23.5
 -Max. Current Draw 125 Amperes
 -Min. Rpm..... 3000 Rpm

Starter Solenoid

Make..... Mitsubishi Electric Corporation (Melco)
 Pull In Voltage 16 Volts Max.

13. SECTION CHANGE LOG

DESCRIPTION		DATE
1	Addition of "Alternator Periodic Inspection" & "Identifying a Single Defective Alternator" paragraphs. Removal of "Alternator Brush Replacement" procedure.	06/12/2017
2		
3		
4		
5		
6		