

By Jerry Bisbee – ATC Tech Trainer

## Troubleshooting Cascadia Battery-Drain Complaints

Cascadia sleeper cab trucks and some Cascadia day cab trucks are equipped with a Progressive Low Voltage Disconnect (PLVD) system. This system does not require any additional module as other Freightliner models do. The PLVD system is software programmed into the Signal Detection and Actuation Modules (SAMs) that control vehicle systems. Vehicle electrical loads are separated into three groups, **Comfort Loads**, **House Loads**, and **Basic Loads**. These loads are turned on and off by the SAMs based on battery voltage, ignition switch position and engine RPM. Table 1 illustrates the strategies used by the SAMs to determine when to turn off electrical power to these groups. Table 2 lists the various loads in each of the three groups. Most of these loads are controlled by normally closed relays mounted in the SAMs. Logic control circuits inside the SAMs control the pull-in coils of these relays. As the truck's battery voltage drops these relay coils are energized to open the power supply to the various loads even with the ignition switch in the "off" position. Each one of these relay coils pulls approximately .2 amp. When all of these relays are energized the total load of all the relay coils



is approximately 1.5 amps. This load will remain on with the vehicle shut down. This is enough load to lower the battery voltage to the point that the truck will not crank after sitting for several days. For this reason, these vehicles are equipped with a load disconnect switch as standard equipment. This load disconnect switch controls all the electrical power to the Mega Fuse Junction Block (see Figure 1). When these vehicles are parked for any length of time, the load disconnect switch should be turned off to eliminate battery drain caused by relay amperage.

### ■ Troubleshooting Battery Drain

Before troubleshooting a battery drain complaint on a Cascadia find out if the operator is turning the load disconnect switch off when the vehicle is parked. If the load disconnect switch is not being turned off the relay amperage will eventually drain the batteries. If the battery disconnect switch is being turned off, and the batteries are still being drained, check for battery drain caused by vehicle systems that are not connected to the batteries through the load disconnect switch. As you can see in Figure 1, the starter is the only vehicle component that is not connected through the load disconnect switch unless other systems have been added to the truck that are wired directly to the batteries or the positive battery cable of the starter. Check to see what systems are wired directly to the batteries or starter and check these systems for draining the batteries when the load disconnect switch is turned off.

**Table 1 – Type of Loads Turned Off Under Specific Conditions**

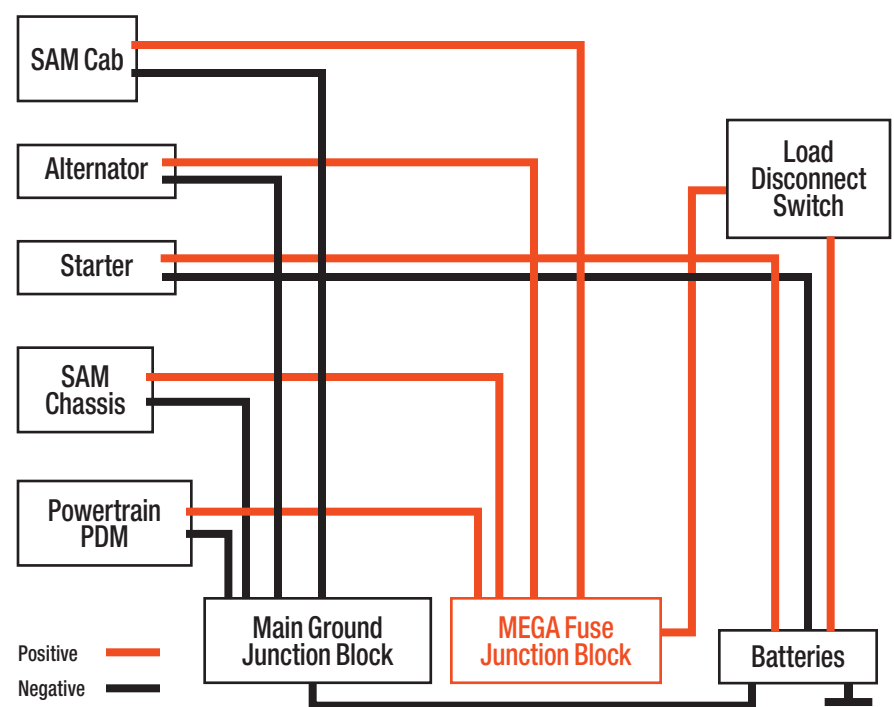
Engine State and Voltage Value	Ignition Switch Position			
	Off	Accessory	On (Ignition)	Start (Crank)
Engine On and Voltage Less Than <b>12.3 Volts</b>	<b>Comfort and House Loads</b>	<b>Comfort Loads</b>	<b>Comfort Loads</b>	<b>Not Applicable</b>
Engine Off and Voltage Less Than <b>12.3 Volts</b>	<b>Comfort and House Loads</b>	<b>Comfort Loads</b>	<b>Comfort Loads</b>	<b>Not Applicable</b>
Engine Off and Voltage Less Than <b>12.05 Volts</b>	<b>Comfort, House and Basic Loads</b>	<b>Comfort and House Loads</b>	<b>Comfort and House Loads</b>	<b>Not Applicable</b>

**Table 2 – Designated Loads**

Type of Loads	Function	
<b>Comfort Loads</b>	12V power receptacle 6 (sleeper, refrigerator)	
	Amplifier power, accessory	
	General sleeper light	
	Footwell light	
	Reading light 1 (dimnable/theater)	
	Reading light 2 (dimnable/theater)	
	Rear baggage compartment light	
	12V power receptacle 5 (sleeper, cigar), battery	
	Auxiliary circulation fan-sleeper, battery	
	12V power receptacle 4 (sleeper, cigar), battery	
	Reading light 4 (switched locally), battery	
	Heated seats, ignition	
	<b>House Loads</b>	12V Power receptacle 2 (dash, phone), battery
		12V power receptacle 1 (dash, cigar), battery
Sleeper HVAC controller, accessory		
Cabin HVAC controller, accessory		
Radio, accessory		
Power feed spare output I, battery		
Power feed spare output II, battery		
Mirror heating, passenger		
Mirror heating, driver		
Power feed spare output IV, battery		
Power feed spare output II, battery		
Fuel water separator heater element, ignition		
Air dryer (pneumatic, electrically heated), accessory		
Auxiliary heater (ESPAR) power		
Utility Light		
Dome light rear		
Area lighting (lower bunk and sleeper work surface)		
Dome light cab, battery		
Overhead compartment lights, battery		
12V power receptacle 3 (sleeper, cigar), battery		
Stand-alone HVAC, battery		
Advertising light, accessory		
Dome light passenger		
Dome light driver/forward		
Auxiliary circulation fan-windshield, accessory		

Type of Loads	Function
<b>Basic Loads</b>	CB Radio, battery
	Fleet management system, battery
	Trailer power, battery or ignition

**Figure 1 – Cascadia Battery Power Distribution**



**Editorial Committee**

**Paul Burk**  
General Manager - Fort Worth  
**Don Freeman**  
General Manager - Tulsa  
**Jim King**  
General Manager - Service  
**Doug Phillips**  
Center Manager - SelecTrucks of Dallas

**Robert Thompson**  
General Manager - Parts  
**Cassie Bowen**  
Editor in chief - T.E.A.M., Inc.  
**Shannon Evans**  
Managing Editor - T.E.A.M., Inc.  
**Paul Evans**  
EvansDesign