

Switch Hub Module

54.11

General Information

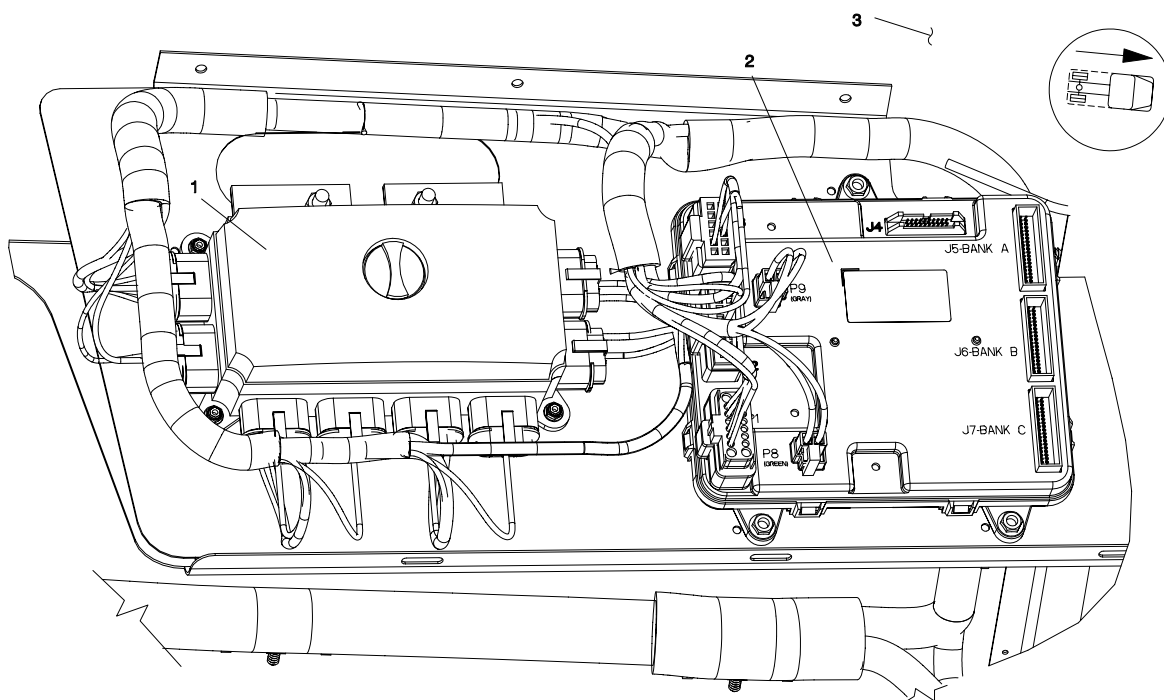
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General Information

The Switch Hub Module (SHM) is a required module of the vehicle electrical system, and acts as a slave to the Bulkhead Module (see **Section 54.01**). The SHM is used to connect up to 24 Smart Switches to the electrical system, and to control specific inputs and outputs.

The Switch Hub Module is mounted on a panel in the sealed compartment to the left of the driver that is accessible from inside the vehicle. It has nine harness connections, though all may not be used. See **Fig. 1**.

Smart Switches are connected to the Switch Hub Module (SHM) via intermediate modules called 8-Switch Banks (8SB). Up to 8 Smart Switches can be plugged directly into each bank, and up to three banks can be connected to the SHM, via J5-BANK A, J6-BANK B and J7-BANK C.



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1. Cab PDM
2. Switch Hub Module
3. Cab Sidewall, Driver-Side

Figure 1 Driver-Side Cab Electronics

Switch Hub Module Replacement

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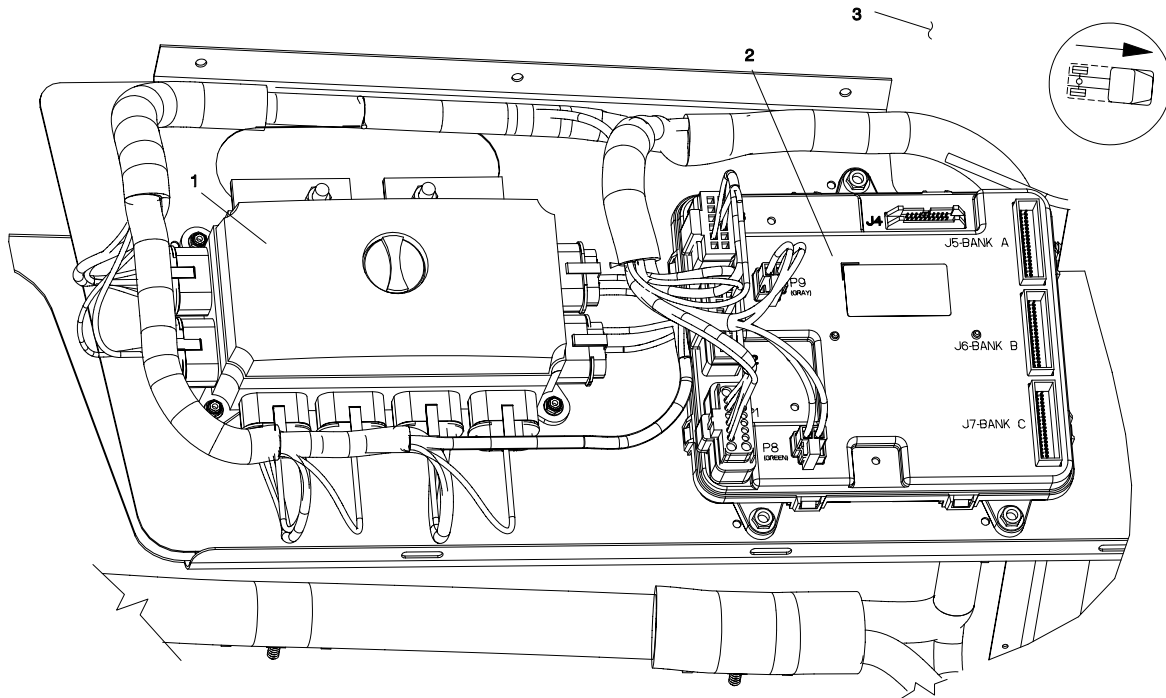
Replacement

See **Section 54.00**, Electrical System, for more information about the vehicle electrical system in general, and **Troubleshooting 300** in that section for help in troubleshooting the entire electrical system.

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NOTE: The SHM is mounted on a panel in the compartment beneath the switch panel, next to the PDM. See **Fig. 2**.

- Thomas Built Buses Service Literature: Workshop Manual, Saf-T-Liner C2 School Bus Page 2

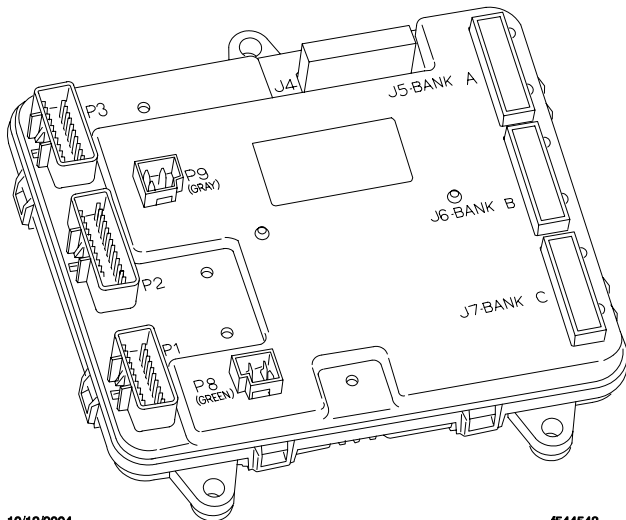


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1. Cab PDM
2. Switch Hub Module
3. Cab Sidewall, Driver's Side

Figure 2 Driver's Side Cab Electronics



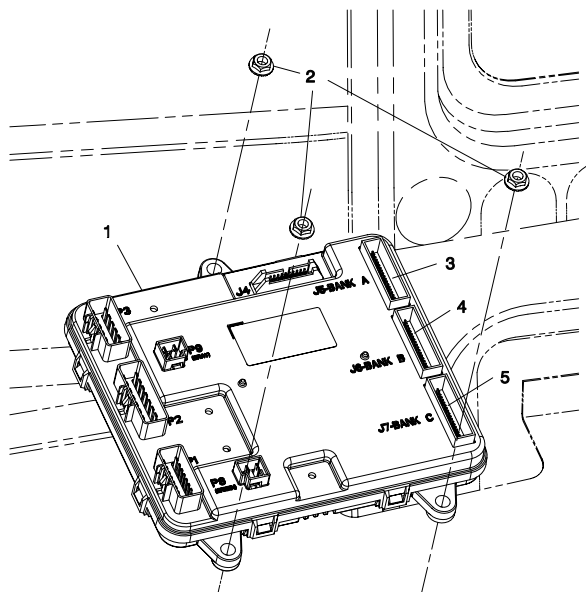
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Figure 3 Switch Hub Module

4. Before removing the Switch Hub Module from its mounting plate, take note of its orientation; 8SB connectors A, B, and C should be toward the front of the vehicle.

Remove the mounting nuts that secure the SHM to the mounting plate and remove the SHM. See **Fig. 4**.



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1. Switch Hub Module
2. Mounting Nuts
3. 8SB Bank A Connection
4. 8SB Bank B Connection
5. 8SB Bank C Connection

Figure 4 Switch Hub Module Installation

5. Properly orient the SHM on its mounting plate. See **Fig. 2**. Install the module on the mounting plate by securing the mounting nuts.

NOTE: The module may not have harnesses for all connectors.

6. Plug all electrical wiring harnesses into the SHM connectors from which they were disconnected.
7. Place the switch panel over the compartment opening and attach the fasteners that secure the panel.
8. Connect the batteries.
9. Check to make sure electrical components work.

Eight-Switch Bank (8SB) Replacement

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General Information

The 8-Switch Bank (8SB) is an optional module of the vehicle electrical system. Its only purpose is to connect Smart Switches to the Switch Hub Module (SHM). The 8SB does not control any outputs.

There may be up to three 8SBs, for a total of up to 24 switches, connected to a SHM.

The 8SB is mounted directly under the switch panel located to the left of the driver. Smart Switches plug directly into the 8SB through the switch panel. Each 8SB has one harness connection, which connects it to the SHM.

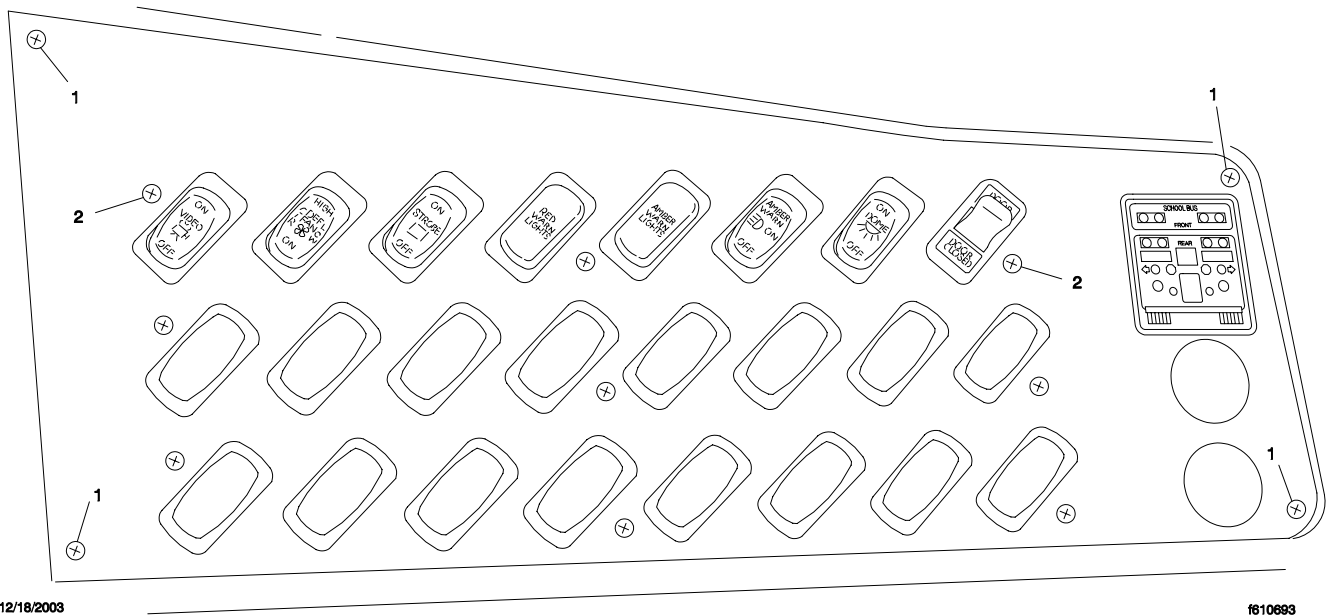
The 8SB does not communicate on a data bus, therefore, it is not viewable as an Electrical Control Unit (ECU) icon from within ServiceLink. However, it is possible to use ServiceLink to see exactly which Smart Switches are connected to any 8SB. In ServiceLink, go to the "Smart Switches" tab located under either the SHM icon, or any Switch Expansion Module

(SEM) icon. In the "Smart Switches" screen, a table lists which Smart Switches are connected to which 8SB (or to which SEM).

Replacement

IMPORTANT: It is normally not necessary to replace the 8-Switch Bank. Removing and installing an electronic component should be a last resort to solving electrical problems, unless a unit needs replacing due to physical damage. Before replacing an 8SB or any of the electrical control modules, try reflashing the parameters on the Bulkhead Module (BHM), or the software on the BHM and the Switch Hub Module. Also check external wiring.

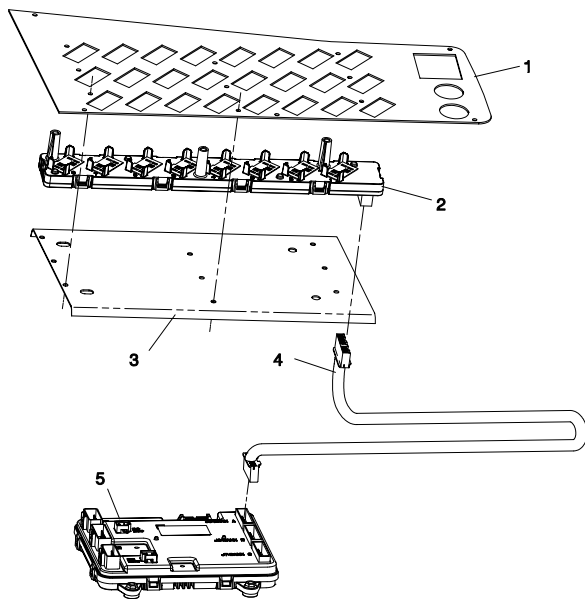
1. Disconnect the negative leads from the batteries.
2. Remove the fasteners that secure the switch panel on the driver's left side against the cab wall, then lift the switch panel away from the opening. See **Fig. 1**.



1. Switch Panel Mounting Fastener
2. 8-Switch Bank Mounting Fastener

Figure 1 Switch Panel Mounting Fastener Locations

3. Unplug the electrical harness connector from the 8SB. See **Fig. 2**.



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1. Switch Panel
2. Eight-Switch Bank (8SB)
3. Lower Mounting Panel
4. 8SB Electrical Harness
5. Switch Hub Module

Figure 2 Switch Panel Assembly Installation

NOTE: Smart Switches will operate correctly regardless of their particular position on the 8SB. It is suggested that they be installed in the same positions from which they were removed, for the convenience of the vehicle operator.

4. Note the location of the Smart Switches plugged in to the 8SB to be removed, then remove all connected switches (up to eight). To remove a switch, squeeze the locking tabs from the back of the switch, then pry out the switch from the front using a flat blade.
5. Note the orientation of the 8SB and remove the three mounting capscrews that secure the 8SB to the switch panel, then remove the 8SB.
6. Properly orient the new 8SB and install the three mounting capscrews that secure the 8SB to the switch panel.
7. Install all switches on the 8SB in the locations from which they were removed. To install a switch, push it through the switch panel opening until it is flush with the panel and the tabs lock.
8. Connect the electrical harness connector to the 8SB.
9. Place the switch panel in its opening and install the fasteners that secure the panel.
10. Connect the batteries.
11. Check to make sure electrical components work.

Fault Code Information

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General Information

This subject contains information on all proprietary Switch Hub Module (SHM) fault codes for J1587 and J1939 data bus protocols. See **Table 1** and **Table 2**.

Also included is a reference table of all FMIs for both data bus protocols. See **Table 3**.

NOTE: In ServiceLink, J1587 fault codes are shown under J1708. J1587 and J1708 are essentially the same data bus protocol.

J1587 SIDs for Switch Hub Module (SHM) MID 221		
SID	Description	Possible FMI
221	Smart Switch VBatt Short to Ground	4
231	No CAN Communication from BHM	9

Table 1 J1587 SIDs for Switch Hub Module (SHM) MID 221

J1939 SPNs for Switch Hub Module (SHM) SA 49		
SPN	Description	Possible FMI
2033	No CAN communication from BHM	19
6914	Smart Switch VBatt Short to Ground	4

Table 2 J1939 SPNs for Switch Hub Module (SHM) SA 49

Failure Mode Identifiers		
FMI	J1939 Description	J1587 Description
00	Data valid but above normal operational range — Most severe level	Data valid but above normal operational range (engine overheating)
01	Data valid but below normal operational range — Most severe level	Data valid but below normal operational range (engine oil pressure too low)
31	Not available or condition exists	—

Table 3 Failure Mode Identifiers

Specifications

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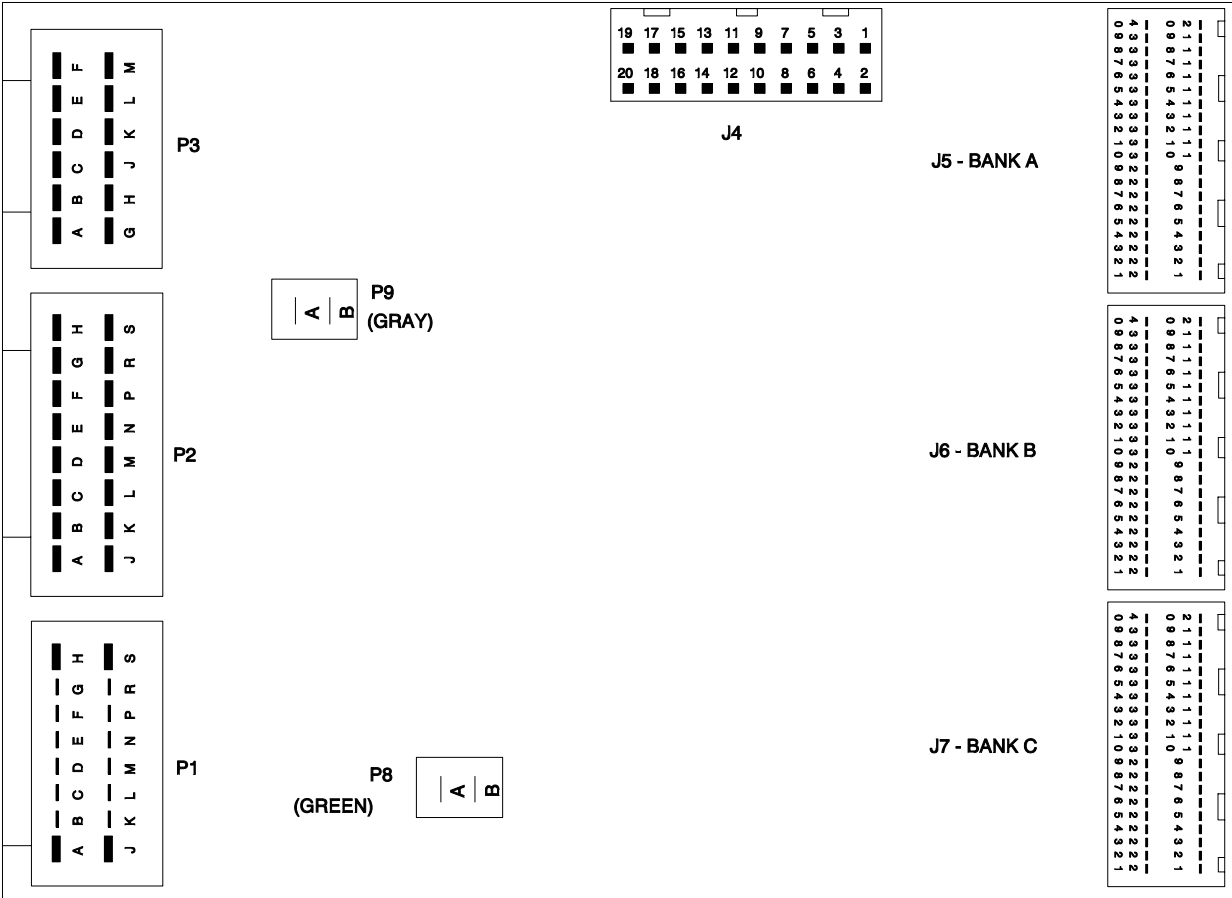
Specifications

NOTE: Check ServiceLink for vehicle-specific pinout information.

For a plan view of the switch hub module pinouts, see **Fig.1**.

For switch hub module pinout information, see **Table1**, **Table2**, **Table3**, **Table4**, **Table5**, **Table6**, **Table7**, **Table8**, and **Table9**.

For switch hub module power supply fuses and associated outputs, see **Table10**.



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Figure 1 Switch Hub Module Circuit Layout

Pinouts at SHM Connector P1		
Connector Pin	Signal Name	Signal Type
P1-A	Air/Electric Door Open	0.5A HSD Output #12
P1-B	Ignition	Switch to Battery with Wakeup
P1-C	Module Wake-Up Signal	Digital Input

P1-D	Buzzer 1—Switch Panel	0.5A HSD Output #1
P1-E	Air/Electric Door Close	0.5A HSD Output #11
P1-F	J1939— Data Bus Connection	Data Bus Connection
P1-G	J1939+ Data Bus Connection	Data Bus Connection
P1-H	Right Front Amber Warning	6.7A HSD Output #7 with Current Sense
P1-J	Unused	—
P1-K	Buzzer 2—Switch Panel (Warning System)	0.5A HSD Output #2
P1-L	Right Rear Red Warning	6.7A HSD Output #12 with Current Sense
P1-M	Right Front Red Warning	6.7A HSD Output #11 with Current Sense
P1-N [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Entrance Service Door Closed	Spare Digital Input #4
P1-P	Right Rear Amber Warning	6.7A HSD Output #8 with Current Sense
P1-R	Service Brakes	Switch to GND with Wakeup and Hardware-based Output Control
P1-S [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Entrance Service Door Open	Spare Digital Input #5

Table 1 Pinouts at SHM Connector P1

Pinouts at SHM Connector P2		
Connector Pin	Signal Name	Signal Type
P2-A [FOOTNOTE: The	Heater 1—Driver-Side Front, Low-Speed Relay	0.5A HSD Output #6

function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]		
P2-B [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Heater 1—Driver-Side Front, High-Speed Relay	0.5A HSD Output #5
P2-C	Entrance Service Door Status	Spare Digital Input #1 Switch to GND Input
P2-D [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Strobe Light Relay	0.5A HSD Output #8
P2-E	Lower Left Taillight	3.0A HSD Output #1
P2-F	Lower Right Taillight	3.0A HSD Output #2
P2-G	Escape Hatch Open	Spare Digital Input #3
P2-H	Unused	—
P2-J [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Air-Operated Stop Arm Control	0.5A HSD Output #10
P2-K	Left Rear Red Warning	6.7A HSD Output #10 with Current Sense
P2-L	Passenger Window Sash	Spare Digital Input #2 Switch to GND Input
P2-M	Left Front Red Warning	6.7A HSD Output #9 with Current Sense
P2-N [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Video Camera Box LED	0.5A HSD Output #7
P2-P	Left Rear Amber Warning	6.7A HSD Output #6 with Current Sense
P2-R	Lower Right Brake Light	6.7A HSD Output #3

		with Current Sense
P2-S [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	—	0.5A HSD Output #9

Table 2 Pinouts at SHM Connector P2

Pinouts at SHM Connector P3		
Connector Pin	Signal Name	Signal Type
P3-A	Left Front Amber Warning	6.7A HSD Output #5 with Current Sense
P3-B	J1708– Data Bus Connection	Data Bus Connection
P3-C	Lower Right Backup Light	6.7A PWM HSD Output #1 with Current Sense
P3-D [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be used for another function.]	Heater 2—Driver-Side Rear, Low-Speed Relay	0.5A HSD Output #3
P3-E	Lower Left Backup Light	6.7A HSD Output #2 with Current Sense
P3-F	Upper Left Taillight	3.0A HSD Output #4 with Hardware Control
P3-G	Front Dome Light	13A PWM LSD Output #1
P3-H	Lower Left Brake Light	6.7A HSD Output #4 with Current Sense
P3-J	J1708+ Data Bus Connection	Data Bus Connection
P3-K	Upper Right Taillight	3.0A HSD Output #3 with Hardware Control
P3-L [FOOTNOTE: The function listed for this pin is the highest priority. If this function is not present, the output may be	Heater 2—Driver-Side Rear, High-Speed Relay	0.5A HSD Output #4

used for another function.]		
P3-M	Rear Dome Light	13A PWM LSD Output #2

Table 3 Pinouts at SHM Connector P3

Pinouts at SHM Connector J4		
Connector Pin	Signal Name	Signal Type
J4-1	Right Backup	BOD Low-side LED #1 Drive
J4-2	Left Backup	BOD Low-side LED #2 Drive
J4-3	Right Tail	BOD Low-side LED #3 Drive
J4-4	Left Tail	BOD Low-side LED #4 Drive
J4-5	Right Turn	BOD Low-side LED #5 Drive
J4-6	Left Turn	BOD Low-side LED #6 Drive
J4-7	Right Stop	BOD Low-side LED #7 Drive
J4-8	Left Stop	BOD Low-side LED #8 Drive
J4-9	Battery Power	SS and BOD Power
J4-10	Battery Power	SS and BOD Power
J4-11	No Connect (Battery on Display)	—
J4-12	No Connect (Battery on Display)	—
J4-13	Right Rear Red	BOD Low-side LED #9 Drive
J4-14	Left Rear Red	BOD Low-side LED #10 Drive
J4-15	Right Rear Amber	BOD Low-side LED #11 Drive
J4-16	Left Rear Amber	BOD Low-side LED #12 Drive
J4-17	Right Front Red	BOD Low-side LED #13 Drive
J4-18	Left Front Red	BOD Low-side LED #14 Drive
J4-19	Right Front Amber	BOD Low-side LED #15 Drive
J4-20	Left Front Amber	BOD Low-side LED #16 Drive

Table 4 Pinouts at SHM Connector J4

Pinouts at SHM Connector J5—Bank A

Connector Pin	Signal Name	Signal Type
J5-1	Smart Switch Ground	Signal Ground
J5-2	SSA6 Indicator	Smart Switch LED Drive
J5-3	SSA4 Indicator	Smart Switch LED Drive
J5-4	SSA3 Indicator	Smart Switch LED Drive
J5-5	SSA1 Indicator	Smart Switch LED Drive
J5-6	Smart Switch Backlight	Smart Switch Backlight
J5-7	SSA2 Switch Position	Smart Switch Analog Input
J5-8	Smart Switch Ground	Signal Ground
J5-9	SSA4 Switch Position	Smart Switch Analog Input
J5-10	SSA3 ID1	Smart Switch Analog Input
J5-11	SSA2 ID1	Smart Switch Analog Input
J5-12	SSA1 ID2	Smart Switch Analog Input
J5-13	SSA4 ID1	Smart Switch Analog Input
J5-14	SSA5 ID2	Smart Switch Analog Input
J5-15	Smart Switch Ground	Signal Ground
J5-16	SSA6 Switch Position	Smart Switch Analog Input
J5-17	SSA6 ID1	Smart Switch Analog Input
J5-18	SSA7 ID1	Smart Switch Analog Input
J5-19	SSA8 ID2	Smart Switch Analog Input
J5-20	Smart Switch Ground	Signal Ground
J5-21	SSA8 Indicator	Smart Switch LED Drive
J5-22	SSA7 Indicator	Smart Switch LED Drive
J5-23	SSA5 Indicator	Smart Switch LED Drive
J5-24	Smart Switch Ground	Signal Ground
J5-25	SSA2 Indicator	Smart Switch LED Drive
J5-26	Smart Switch Power	SS and BOD Power
J5-27	SSA1 Switch Position	Smart Switch Analog Input
J5-28	SSA3 Switch Position	Smart Switch Analog Input
J5-29	SSA4 ID2	Smart Switch Analog Input
J5-30	SSA3 ID2	Smart Switch Analog Input
J5-31	SSA2 ID2	Smart Switch Analog Input
J5-32	Smart Switch Ground	Signal Ground
J5-33	SSA1 ID1	Smart Switch Analog Input

J5-34	SSA5 Switch Position	Smart Switch Analog Input
J5-35	SSA5 ID1	Smart Switch Analog Input
J5-36	SSA6 ID2	Smart Switch Analog Input
J5-37	SSA7 Switch Position	Smart Switch Analog Input
J5-38	SSA7 ID2	Smart Switch Analog Input
J5-39	SSA8 Switch Position	Smart Switch Analog Input
J5-40	SSA8 ID1	Smart Switch Analog Input

Table 5 Pinouts at SHM Connector J5—Bank A

Pinouts at SHM Connector J6—Bank B		
Connector Pin	Signal Name	Signal Type
J6-1	Smart Switch Ground	Signal Ground
J6-2	SSB6 Indicator	Smart Switch LED Drive
J6-3	SSB4 Indicator	Smart Switch LED Drive
J6-4	SSB3 Indicator	Smart Switch LED Drive
J6-5	SSB1 Indicator	Smart Switch LED Drive
J6-6	Smart Switch Backlight	Smart Switch Backlight
J6-7	SSB2 Switch Position	Smart Switch Analog Input
J6-8	Smart Switch Ground	Signal Ground
J6-9	SSB4 Switch Position	Smart Switch Analog Input
J6-10	SSB3 ID1	Smart Switch Analog Input
J6-11	SSB2 ID1	Smart Switch Analog Input
J6-12	SSB1 ID2	Smart Switch Analog Input
J6-13	SSB4 ID1	Smart Switch Analog Input
J6-14	SSB5 ID2	Smart Switch Analog Input
J6-15	Smart Switch Ground	Signal Ground
J6-16	SSB6 Switch Position	Smart Switch Analog Input
J6-17	SSB6 ID1	Smart Switch Analog Input
J6-18	SSB7 ID1	Smart Switch Analog Input
J6-19	SSB8 ID2	Smart Switch Analog Input
J6-20	Smart Switch Ground	Signal Ground
J6-21	SSB8 Indicator	Smart Switch LED Drive

J6-22	SSB7 Indicator	Smart Switch LED Drive
J6-23	SSB5 Indicator	Smart Switch LED Drive
J6-24	Smart Switch Ground	Signal Ground
J6-25	SSB2 Indicator	Smart Switch LED Drive
J6-26	Smart Switch Power	SS and BOD Power
J6-27	SSB1 Switch Position	Smart Switch Analog Input
J6-28	SSB3 Switch Position	Smart Switch Analog Input
J6-29	SSB4 ID2	Smart Switch Analog Input
J6-30	SSB3 ID2	Smart Switch Analog Input
J6-31	SSB2 ID2	Smart Switch Analog Input
J6-32	Smart Switch Ground	Signal Ground
J6-33	SSB1 ID1	Smart Switch Analog Input
J6-34	SSB5 Switch Position	Smart Switch Analog Input
J6-35	SSB5 ID1	Smart Switch Analog Input
J6-36	SSB6 ID2	Smart Switch Analog Input
J6-37	SSB7 Switch Position	Smart Switch Analog Input
J6-38	SSB7 ID2	Smart Switch Analog Input
J6-39	SSB8 Switch Position	Smart Switch Analog Input
J6-40	SSB8 ID1	Smart Switch Analog Input

Table 6 Pinouts at SHM Connector J6—Bank B

Pinouts at SHM Connector J7—Bank C		
Connector Pin	Signal Name	Signal Type
J7-1	Smart Switch Ground	Signal Ground
J7-2	SSC6 Indicator	Smart Switch LED Drive
J7-3	SSC4 Indicator	Smart Switch LED Drive
J7-4	SSC3 Indicator	Smart Switch LED Drive
J7-5	SSC1 Indicator	Smart Switch LED Drive
J7-6	Smart Switch Backlight	Smart Switch Backlight
J7-7	SSC2 Switch Position	Smart Switch Analog Input
J7-8	Smart Switch Ground	Signal Ground
J7-9	SSC4 Switch Position	Smart Switch Analog Input

J7-10	SSC3 ID1	Smart Switch Analog Input
J7-11	SSC2 ID1	Smart Switch Analog Input
J7-12	SSC1 ID2	Smart Switch Analog Input
J7-13	SSC4 ID1	Smart Switch Analog Input
J7-14	SSC5 ID2	Smart Switch Analog Input
J7-15	Smart Switch Ground	Signal Ground
J7-16	SSC6 Switch Position	Smart Switch Analog Input
J7-17	SSC6 ID1	Smart Switch Analog Input
J7-18	SSC7 ID1	Smart Switch Analog Input
J7-19	SSC8 ID2	Smart Switch Analog Input
J7-20	Smart Switch Ground	Signal Ground
J7-21	SSC8 Indicator	Smart Switch LED Drive
J7-22	SSC7 Indicator	Smart Switch LED Drive
J7-23	SSC5 Indicator	Smart Switch LED Drive
J7-24	Smart Switch Ground	Signal Ground
J7-25	SSC2 Indicator	Smart Switch LED Drive
J7-26	Smart Switch Power	SS and BOD Power
J7-27	SSC1 Switch Position	Smart Switch Analog Input
J7-28	SSC3 Switch Position	Smart Switch Analog Input
J7-29	SSC4 ID2	Smart Switch Analog Input
J7-30	SSC3 ID2	Smart Switch Analog Input
J7-31	SSC2 ID2	Smart Switch Analog Input
J7-32	Smart Switch Ground	Signal Ground
J7-33	SSC1 ID1	Smart Switch Analog Input
J7-34	SSC5 Switch Position	Smart Switch Analog Input
J7-35	SSC5 ID1	Smart Switch Analog Input
J7-36	SSC6 ID2	Smart Switch Analog Input
J7-37	SSC7 Switch Position	Smart Switch Analog Input
J7-38	SSC7 ID2	Smart Switch Analog Input
J7-39	SSC8 Switch Position	Smart Switch Analog Input
J7-40	SSC8 ID1	Smart Switch Analog Input

Table 7 Pinouts at SHM Connector J7—Bank C

Pinouts at SHM Connector P8		
Connector Pin	Signal Name	Signal Type
P8-1	Main Battery Power Feed 1	Module Power
P8-2	Main Battery Power Feed 2	Module Power

Table 8 Pinouts at SHM Connector P8

Pinouts at SHM Connector P9		
Connector Pin	Signal Name	Signal Type
P9-1	Main Battery Power Feed 3	Module Power
P9-2	Main Ground Feed	Module Ground

Table 9 Pinouts at SHM Connector P9

Switch Hub Module Power Supply Fuses and Associated Outputs					
SHM Power Input	SHM Power Input Pin	Fuse Supplying SHM Power Input	SHM Outputs Supplied	SHM Output Pin	
Power In			Power Out		
VBAT1	P8.A	Fuse: SHM_BATT_1 (30A)	0.5A HSD Output #12 (air/electric door open)	P1.A	
			0.5A HSD Output #1 (Panel Buzzer)		P1.D
			0.5A HSD Output #11 (Air/Electric Door Close)		P1.E
			0.5A HSD Output #2 (Warning System Buzzer)		P1.K
			6.7A HSD Output #10 (LH Rear Red Warning)		P2.K
			6.7A HSD Output #9 (LH Front Red Warning)		P2.M
			6.7A HSD Output #6 (LH Rear Amber Warning)		P2.P
			6.7A HSD Output #5 (LH Front Amber Warning)		P3.A
			6.7A HSD Output #1 (RH Lower Reverse Light)		P3.C
VBAT2	P8.B	Fuse: SHM_BATT_2 (30A)	6.7A HSD Output #7 (RH Front Amber Warning)	P1.H	
			6.7A HSD Output #12 (RH Rear Red Warning)		P1.L

			6.7A HSD Output #11 (RH Front Red Warning)	P1.M
			6.7A HSD Output #8 (RH Rear Amber Warning)	P1.P
			0.5A HSD Output #10 (Differential Lock)	P2.J
			0.5A HSD Output #9 (Park Brake Set)	P2.S
			0.5A HSD Output #3 (Htr #2 LH AFT Low-Speed Relay)	P3.D
			6.7A HSD Output #2 (LH Lower Reverse Light)	P3.E
			0.5A HSD Output #4 (Htr #2 LH AFT High-Speed Relay)	P3.L
VBAT3	P9.8	Fuse: SHM_BATT_3 (30A)	0.5A HSD Output #6 (Htr #1 LH FWD Low-Speed Relay)	P2.A
			0.5A HSD Output #5 (Htr #2 LH FWD High-Speed Relay)	P2.B
			0.5A HSD Output #8 (Strobe Light Relay)	P2.D
			3.0A HSD Output #1 (LH Lower Taillight)	P2.E
			3.0A HSD Output (RH Lower Taillight)	P2.F
			0.5A HSD Output #7 (Video Camera Box LED)	P2.N
			6.7A HSD Output #3 (RH Lower Brake Light)	P2.R
			3.0A HSD Output #4 (LH Upper Taillight)	P3.F
			6.7A HSD Output #4 (LH Lower Brake Light)	P3.H
			3.0A HSD Output #3 (RH Upper Taillight)	P3.K

Table 10 Switch Hub Module Power Supply Fuses and Associated Outputs