

## 08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
<b>Wheel Speed Sensors</b>								
Left Front Wheel Speed Sensor Circuit Low	C1232	The left front wheel speed sensor (WSS) is open.	WSS feedback voltage < Threshold  Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1207	> 100ms	two trips
Right Front Wheel Speed Sensor Circuit Low	C1233	The right front wheel speed sensor is open.	WSS feedback voltage < Threshold  Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1208	> 100ms	two trips
Left Rear Wheel Speed Sensor Circuit Low	C1234	The left rear wheel speed sensor is open.	WSS feedback voltage < Threshold  Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1209	> 100ms	two trips
Right Rear Wheel Speed Sensor Circuit Low	C1235	The right rear wheel speed sensor is open.	WSS feedback voltage < Threshold  Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1210	> 100ms	two trips
Left Front Wheel Speed Sensor Circuit High	C1207	The left front wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2  Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	one trip
Right Front Wheel Speed Sensor Circuit High	C1208	The right front wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2  Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	one trip
Left Rear Wheel Speed Sensor Circuit High	C1209	The left rear wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2  Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal Range: 0.20v < WSS voltage range < 2.20v	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	one trip

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Right Rear Wheel Speed Sensor Circuit High	C1210	The right rear wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2  Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	one trip
Left Front Wheel Speed Sensor Circuit	C1221	The left front WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1207	20ms	one trip
		Missing signal. The left front wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels  Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels)  Veh Vel (smallest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s  > 12.8kph True (Note 1) C1207	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15 ms	one trip
Right Front Wheel Speed Sensor Circuit	C1222	The right front WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1208	20ms	one trip
		Missing signal. The right front wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels  Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels)  Veh Vel (smallest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s  > 12.8kph True (Note 1) C1208	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15 ms	one trip
Left Rear Wheel Speed Sensor Circuit	C1223	The left rear WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1209	20ms	one trip

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		Missing signal. The left rear wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels  Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels)  Veh Vel (smallest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s  > 12.8kph True (Note 1) C1209	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15 ms	one trip
Right Rear Wheel Speed Sensor Circuit	C1224	The right rear WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1210	20ms	one trip
		Missing signal. The right rear wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels  Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels)  Veh Vel (smallest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s  > 12.8kph True (Note 1) C1210	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15ms	one trip
Left Front Wheel Speed Sensor Circuit Range/Performance	C1225	Erratic signal. The left front WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold  Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1207	280ms Pass >30s	one trip
Right Front Wheel Speed Sensor Circuit Range/Performance	C1226	Erratic signal. The right front WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold  Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1208	280ms Pass >30s	one trip
Left Rear Wheel Speed Sensor Circuit Range/Performance	C1227	Erratic signal. The left rear WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold  Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1209	280ms Pass >30s	one trip

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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
Right Rear Wheel Speed Sensor Circuit Range/Performance	C1228	Erratic signal. The right rear WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold  Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1210	280ms Pass >30s	one trip
Tire Size Mismatch	C122E	This detects that there may be mismatched sized tires on the vehicle	WSS (one wheel) – WSS(other 3)  / Wheel Vel(other 3) > Threshold	25% Nominal Range: N/A	Vehicle Velocity Cornering Wheel Slip  Brake Pedal Apply Detected Processing_Enabled No Active DTCs	>4m/s < 3% (Note 10) Not Detected (Note 10) True (Note 2) True (Note 1) C1207 C1208 C1209 C1210	500ms Pass = 60s	one trip
<b>Input Sensors</b>								
Brake Pedal Position Sensor 3 Circuit Low	C129A	Brake pedal position 3 input signal voltage is low.	Brake Ped Pos 3 Voltage < Threshold  Pass Threshold > 5% of sensor supply voltage	5% of sensor supply voltage (0.25v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F	75ms	one trip
Brake Pedal Position Sensor 3 Circuit High	C129B	Brake pedal position 3 input signal voltage is high.	Brake Ped Pos 3 Voltage > Threshold  Pass Threshold > 95% of sensor supply voltage	95% of sensor supply voltage (4.75v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F	75ms	one trip
Brake Pedal Position Sensor 4 Circuit Low	C129D	Brake pedal position 4 input signal voltage is low.	Brake Ped Pos 4 Voltage < Threshold  Pass Threshold >5% of sensor voltage	5% of sensor supply voltage (0.25v typically) Nominal Range: (4.75v - 5.25v - Supply 4.5 - 0.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F	75ms	one trip

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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
Brake Pedal Position Sensor 4 Circuit High	C129E	Brake pedal position 4 input signal voltage is high.	Brake Ped Pos 4 Voltage > Threshold  Pass Threshold <95% of sensor supply voltage	95% of sensor supply voltage (4.75v typically) Nominal Range: (4.75v - 5.25v - Supply 4.5 - 0.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F	75ms	one trip
Brake Pedal Position Sensor 3 Circuit Offset Error	C129C	The brake pedal position 3 input signal offset voltage is out of range	Brake Ped Pos 3 input offset > Threshold  Pass Threshold Brake Ped Pos 3 input offset < Threshold	5 mm (>1.07v typical) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Pedal Apply Detected OR Pressure Zeroing Enable AND Processing_Enabled No Active DTCs	True (Note 2)  True (Note 3)  True (Note 1) C120F C127D C129A C129B C12E5 C12F8	15ms	one trip
Brake Pedal Position Sensor 4 Circuit Offset Error	C129F	The brake pedal position 2 input signal offset voltage is out of range	Brake Ped Pos 4 input offset > Threshold  Pass Thresold Brake Ped Pos 4 input offset <Threshold	5 mm (>1.07v typical) Nominal Range: 4.75v - 5.25v - Supply 4.5v - 0.5v - Sensor	Brake Pedal Apply Detected OR Pressure Zeroing Enable AND Processing_Enabled No Active DTCs	True (Note 2)  True (Note 3)  True (Note 1) C120F C127D C129D C129E C12E5 C120C	15ms	one trip
Brake Pedal Position Sensor 3 Plausibility	C12F8	The brake pedal position 3 input signal does not correlate with the brake pedal position 4 signal or with the MC Pressure signal.	ABS{(Brake Ped Pos 3 input + Brake Ped Pos 4 input) - Sensor_Supply_Voltage} < Threshold  Brake Ped Pos 3 input outside correlation table with M/C pressure input  Pass Threshold conditions within thresholds	0.5v  Outside acceptance table (Note 4) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage  Processing_Enabled No Active DTCs	> 4.75v < 5.25  True (Note 1) C120F C127D C129A C129B C129C C12E5	30ms (condition 1)  150ms (condition 2)	one trip

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Brake Pedal Position Sensor 4 Plausibility	C120C	The brake pedal position 4 input signal does not correlate with the brake pedal position 3 signal or with the MC Pressure signal.	ABS{(Brake Ped Pos 3 input + Brake Ped Pos 4 input) - Sensor_Supply_Voltage} < Threshold  Brake Ped Pos 4 input outside correlation table with M/C pressure input  Pass Threshold conditins within thresholds	0.5v  Outside acceptance table (Note 4) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage  Processing_Enabled No Active DTCs	> 4.75v < 5.25  True (Note 1) C120F C127D C129D C129E C129F C12E5	30ms (condition 1)  150ms (condition 2)	one trip
ABS Master Cylinder Pressure Sensor Circuit Open or Shorted Low	C12B2	Out of range Low The MCP sensor is either open or shorted to ground.	MCP Voltage < Threshold  Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	one trip
ABS Master Cylinder Pressure Sensor Circuit Shorted High	C12B3	The MCP sensor signal is shorted high.	MCP Voltage > Supply Threshold  Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	one trip
ABS Master Cylinder Pressure Sensor and Brake Pedal Position Sensor Correlation	C12B1	The Master Cylinder Pressure sensor reading does not correlate with the pedal travel sensor readings.	M/C pressure input outside correlation table with Brake Ped Pos x inputs  M/C Pressure has not changed by more than Threshold 1 while pedal travel inputs have changed more than Threshold 2	Outside acceptance table (Note 4)  Threshold 1 = 3.49 kPa Threshold 2 =2.0 mm (rod)	Processing_Enabled M/C Pressure signal stable No Active DTCs	True (Note 1) True (Note 5) C120C C120F C12B2 C12B3 C12B4 C128B C128E C127D C129A C129B C129C C129D C129E C129F C12E5 C12F8	150ms (condition 1)  100ms (condition 2)	one trip

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ABS Master Cylinder Pressure Sensor Performance	C12B4	An MCP erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed.	Transitions from Valid to Open/Shorted State  Pass Threshold: Transitions do not occur.	Successive Loops Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled No active DTCs:	True (Note 1) C12B2 C12B3	100ms Pass =150ms	one trip
ABS Master Cylinder Pressure Sensor Offset Error	C128B	The MCP sensor's input signal offset is out of range.	MCP Offset > Threshold	55.9 kPa (0.7v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	(Brake Switch Veh Accel Pump Motor) or Brake Pedal Apply Detected AND Processing_Enabled No active DTCs:	False > 0.4m/s <sup>2</sup> Not Active  True (Note 2)  True (Note 1) C12B2 C12B3 C128E	20ms	one trip
ABS Master Cylinder Pressure Sensor Raw Offset Error	C128E	The MCP sensor's raw offset is out of range.	MCP Raw Offset > Threshold	349 kPa (1.64v typical) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Control Vehicle Acceleration Vehicle Velocity Accelerator Pedal Position Brake Switch Processing_Enabled No active DTCs:	False (Note 6) > -0.5m/s/s > 2.0m/s < 10% False True (Note 1) C12B2 C12B3 C128E	1s	one trip
Brake Pedal Position Sensor Power Circuit Low	C120F	The supply to the pedal position sensor is shorted to ground.	Pedal supply voltage < Threshold  Pass Threshold > 0.5v	0.5v	Processing_Enabled	True (Note 1)	30ms	one trip
Brake Pedal Position Sensor Reference Circuit	C12E5	Determines if the voltage supply to the pedal sensor is out of range.	Pedal supply voltage < Threshold Low  Pedal supply voltage > Threshold High  Pass Threshold 4.75 < Volt <5.25	Low = 4.75v  High = 5.25v Nominal Range: (N/A)	Processing_Enabled	True (Note 1)	30ms	one trip
Internal Pressure Sensors								

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ABS Sensor Reference Output Circuit	C12E4	Determines if the internal 5v voltage supply is out of range.	Internal supply voltage < Threshold Low  Internal supply voltage > Threshold High  Pass Threshold 4.75 < Volt <5.25	Low = 4.75v  High = 5.25v Nominal Range: (N/A)	Processing_Enabled	True (Note 1)	30ms	one trip
ABS HPA Pressure Sensor Circuit Open or Shorted Low	C12B6	Out of range low. The HPA pressure sensor is either open or shorted to ground.	HPA Voltage < Threshold  Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	one trip
ABS HPA Pressure Sensor Circuit Shorted High	C12B7	The HPA pressure sensor signal is shorted high.	HPA Voltage > Supply Threshold  Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	one trip
ABS HPA Pressure Sensor Erratic	C12B8	An HPA pressure sensor erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed	Transitions from Valid to Open/Shorted State  Pass Threshold: Transitions do not occur.	Successive Loops Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled No active DTCs:	True (Note 1) C12B6 C12B7	100ms Pass = 150ms	one trip
ABS Regenerative Axle Pressure Sensor Circuit Open or Shorted Low	C12B9	The regen axle pressure sensor is either open or shorted to ground.	Regen Axle Voltage < Threshold  Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	two trips
ABS Regenerative Axle Pressure Sensor Circuit Shorted High	C12BA	The regen axle pressure sensor signal is shorted high.	Regen Axle Voltage > Supply Threshold  Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	two trips
ABS Regenerative Axle Pressure Sensor Erratic	C12BB	A regen axle pressure sensor erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed	Transitions from Valid to Open/Shorted State  Pass Threshold: Transitions do not occur.	Successive Loops Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled No active DTCs:	True (Note 1) C12B9 C12BA	100ms Pass = 150ms	two trips



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ABS Regenerative Axle Pressure Sensor Raw Offset Error	C128F	The regen axle pressure sensor's raw offset is out of range.	Regen Axle Signal Raw Offset > Threshold	349 kPa (1.64v typical) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Control Vehicle Acceleration Vehicle Velocity Accelerator Pedal Position Brake Switch Processing_Enabled No active DTCs:	False (Note 6) > -0.5m/s/s > 2.0m/s < 10% False True (Note 1) C12B9 C12BA C12BB	1s	two trips
ABS Regenerative Axle Pressure Sensor Offset Error	C128C	The regen axle pressure sensor's input signal offset is out of range.	Regen Axle Signal Offset > Threshold  Pass Threshold: < 55.9 kPa	55.9 kPa (0.7v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Switch Vehicle Acceleration Pump Motor Processing_Enabled No active DTCs:	False > 0.4m/s <sup>2</sup> Not Active True (Note 1) C12B9 C12BA C12BB	20ms	two trips
ABS Regenerative Axle Pressure Performance	C121A	Determines if the regen axle pressure being commanded is being achieved or not.	ABS(Regen Pres(filtered) – Regen Pressure Command) > Threshold	69.9 kPa Nominal Range: (N/A)	Regen is in active mode Processing_Enabled No active DTCs:	True (Note 1) C12B9 C12BA C12BB C128F C128C	250ms	one trip
ABS Boost Pressure Sensor Circuit Open or Shorted Low	C12BC	The boost pressure sensor is either open or shorted to ground.	Boost Voltage < Threshold  Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	one trip
ABS Boost Pressure Sensor Circuit Shorted High	C12BD	The boost pressure sensor signal is shorted high.	Boost Voltage > Supply Threshold  Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled	True (Note 1)	100ms	one trip
ABS Boost Pressure Sensor Erratic	C12BE	A boost pressure sensor erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed	Transitions from Valid to Open/Shorted State  Pass Threshold: Transitions do not occur.	Successive Loops Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled No active DTCs:	True (Note 1) C12BC C12BD	100ms Pass = 150ms	one trip

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ABS Boost Pressure Sensor Raw Offset Error	C128D	The boost pressure sensor's raw offset is out of range.	Boost Signal Raw Offset > Threshold	349 kPa (1.64v typical) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Control Vehicle Acceleration Vehicle Velocity Accelerator Pedal Position Brake Switch Processing_Enabled No active DTCs:	False (Note 6) > -0.5m/s/s > 2.0m/s < 10% False True (Note 1) C12BC C12BD C12BE	1s	one trip
ABS Boost Pressure Sensor Offset Error	C128A	The boost pressure sensor's input signal offset is out of range.	Boost Signal Offset > Threshold  Pass Threshold: < 55.9 kPa	55.9 kPa (0.7v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Switch Vehicle Acceleration Pump Motor Processing_Enabled No active DTCs:	False > 0.4m/s <sup>2</sup> Not Active True (Note 1) C12BC C12BD C12BE	20ms	one trip
ABS Boost Pressure Performance	C120A	Determines if the boost pressure being commanded is being achieved or not.	Boost Pres Diff(BPD) =  Boost Pres(filtered, zeroed) – test command   With VSC or TC or ABS active: BPD > Thrshld1  Without VSC and TC and ABS active: BPD > Thrshld2	Thrshld1 = 210 kPa  Thrshld2 = 105 kPa Nominal Range: (N/A)	Processing_Enabled No active DTCs:	True (Note 1) C12B6 C12B7 C12B8 C12BC C12BD C12BE C128A C128D C127D C12E4	500ms	two trips

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
ABS Boost Pressure Sensor and Regenerative Axle Pressure Sensor Correlation	C12F7	The regen axle pressure sensor is checked with the boost pressure sensor by equalizing pressure at the two sensors and comparing their difference to a trimmed threshold. The pressures are equalized by controlling the regen axle valves during the test.	(Regen axle pressure – Boost pressure) > Threshold  Pass Threshold: < 34.9 kPa	34.9 kPa	All Wheel Speeds = 0 Brake Pedal Apply Detected Boost Pressure Processing_Enabled No active DTCs:	> 1s True (Note 2) > 104.7 kPa True (Note 1) C127D C128A C128C C128D C128F C12B9 C12BA C12BB C12BC C12BD C12BE C12E4 C12F7	100 ms	two trips
ABS Boost Pressure Loss	C12FE	This allows the boost control function to keep operating amongst conditions that cause the boost pressure to be limited to less than commanded. The boost control continues to apply until the boost pressure available is no greater than the MC pressure the driver is applying.	Boost Pressure Command  AND  MC Pressure	> Boost Pres + 105kPa  > Boost Pres - 14kPa  Nominal Range: (N/A)	Boost Pressure PRNDL_State Processing_Enabled No active DTCs:	< 488.6 kPa != PARK True (Note 1) C12BC C12BD C12BE C128A C128D C127D C12E4	250ms Pass = 30ms	one trip
<b>Hydraulic Control Unit</b>								
ABS Left Front Isolation Solenoid Driver Shorted	C12C2	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold: > 30%	30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
ABS Right Front Isolation Solenoid Driver Shorted	C12C5	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold: > 30%	30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Left Front Dump Solenoid Driver Shorted	C12CC	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold: > 30%	30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Right Front Dump Solenoid Driver Shorted	C12CF	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold: > 30%	30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Right Rear Dump Solenoid Driver Shorted	C12D5	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold >30%	30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Left Rear Dump Solenoid Driver Shorted	C12D2	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold: > 30%	30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
ABS Base Brake Open Solenoid Driver Shorted	C12D8	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold >30%	30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	one trip
ABS Base Brake Closed Solenoid Driver Shorted	C12DB	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold  Pass Threshold >30%	30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	one trip
ABS Left Rear Dump Solenoid Circuit Shorted	C12D1	Whenever the Power Switch Slip Control is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold  Pass Threshold: < Threshold	30% of battery (Solenoid in ON/OFF Mode)  85% of battery (Solenoid in PWM Mode) Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	15ms (Solenoid in ON/OFF Mode) 20ms (Solenoid in PWM Mode) Pass = 35ms	one trip
ABS Right Rear Dump Solenoid Circuit Shorted	C12D4	Whenever the Power Switch Slip Control is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold  Pass Threshold: < Threshold	30% of battery (Solenoid in ON/OFF Mode)  85% of battery (Solenoid in PWM Mode) Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	15ms (Solenoid in ON/OFF Mode) 20ms (Solenoid in PWM Mode) Pass = 35ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
ABS Base Brake Open Solenoid Circuit Shorted	C12D7	Whenever the Power Switch Base Brake is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold  Pass Threshold: < Threshold	30% of battery (Solenoid in ON/OFF Mode)  85% of battery (Solenoid in PWM Mode) Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	15ms (Solenoid in ON/OFF Mode) 20ms (Solenoid in PWM Mode) Pass = 35ms	one trip
ABS Base Brake Closed Solenoid Circuit Shorted	C12DA	Whenever the Power Switch Base Brake is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold  Pass Threshold: < Threshold	30% of battery (Solenoid in ON/OFF Mode)  85% of battery (Solenoid in PWM Mode) Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	15ms (Solenoid in ON/OFF Mode) 20ms (Solenoid in PWM Mode) Pass = 35ms	one trip
ABS Left Rear Dump Solenoid Circuit Open	C12D0	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold  Pass Threshold: > 80% Pass Threshold: < 30%	80% battery 30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Right Rear Dump Solenoid Circuit Open	C12D3	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold  Pass Threshold: > 80% Pass Threshold: < 30%	80% battery 30% battery Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
ABS Base Brake Open Solenoid Circuit Open	C12D6	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold  Pass Threshold >80% Pass Threshold <30%	80% battery 30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	one trip
ABS Base Brake Closed Solenoid Circuit Open	C12D9	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold  Pass Threshold >80% Pass Threshold <30%	80% battery 30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	one trip
ABS Left Rear Isolation Solenoid Circuit Failure	C12C6	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback current should be 0 amps.	Current feedback > Threshold  Pass Threshold: < 0.10amp	0.10amp Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Left Rear Isolation Solenoid Circuit Shorted	C12F2	This failsafe performs the shorted coil detection for HW CLC (Closed Loop Current) coils	Current Feedback > Threshold  Pass Threshold: < 150% of requested current	150% of requested current Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	15ms	one trip
ABS Right Rear Isolation Solenoid Circuit Failure	C12C8	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback current should be 0 amps.	Current feedback > Threshold  Pass Threshold: < 0.10amp	0.10amp Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
ABS Right Rear Isolation Solenoid Circuit Shorted	C12F5	This failsafe performs the shorted coil detection for HW CLC coils	Current Feedback > Threshold Pass Threshold: < 150% of requested current	150% of requested current Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 7) > 8v < 16v > 0.25a < 0.35a	15ms	one trip
ABS Boost Valve Solenoid Circuit Failure	C12DC	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback current should be 0 amps.	Current feedback > Threshold Pass Threshold < 0.10amp	0.10amp Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	one trip
ABS Boost Valve Solenoid Circuit Shorted	C12DD	This failsafe is for shorted coil detection for HW CLC coils	Current Feedback > Threshold Pass Threshold: < 150% of requested current	150% of requested current Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 8) > 8v < 16v > 0.25a < 0.35a	15ms	one trip
ABS Proportioning Valve Solenoid Circuit Failure	C12DE	Whenever the Power Switch Slip Control is closed and the driver transistor is not turned on (solenoid commanded off) the feedback current should be 0 amps.	Current feedback > Threshold Pass Threshold < 0.10amp	0.10amp Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v Off	30ms	one trip
ABS Proportioning Valve Solenoid Circuit Shorted	C12DF	This failsafe is for shorted coil detection for HW CLC coils	Current Feedback > Threshold Pass Threshold: < 150% of requested current	150% of requested current Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 7) > 8v < 16v > 0.25a < 0.35a	15ms	one trip



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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
ABS Left Rear Isolation Solenoid Performance	C12F3	The current from the closed loop current controlled valve coil is diagnosed by checking if the difference of the measured current feedback and the commanded current is within a tolerance range.	Coil Feedback Current > Threshold  Pass Threshold: < 25% of commanded current	25% of Commanded Current Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 7) > 8v < 16v > 0.0a < 2.5a	100ms	one trip
ABS Right Rear Isolation Solenoid Performance	C12F6	The current from the closed loop current controlled valve coil is diagnosed by checking if the difference of the measured current feedback and the commanded current is within a tolerance range.	Coil Feedback Current > Threshold  Pass Threshold: <25% of Commanded Current	25% of Commanded Current Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 7) > 8v < 16v > 0.0a < 2.5a	100ms	one trip
ABS Boost Valve Solenoid Circuit Performance	C12A7	The current from the closed loop current controlled valve coil is diagnosed by checking if the difference of the measured current feedback and the commanded current is within a tolerance range.	Coil Feedback Current > Threshold  Pass Threshold: < 25% of commanded current	25% of Commanded Current Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 8) > 8v < 16v > 0.44a < 1.5a	100ms	one trip

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
ABS Proportioning Valve Solenoid Performance	C12F4	The current from the closed loop current controlled valve coil is diagnosed by checking if the difference of the measured current feedback and the commanded current is within a tolerance range.	Coil Feedback Current > Threshold  Pass Threshold <25% of Commanded Current	25% of Commanded Current Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 7) > 8v < 16v > 0.0a < 2.5a	100ms	one trip
ABS Pump Motor Run On	C12E9	This fault occurs if the Motor is continuously on for greater than 60s for 5 consecutive run times during an ignition cycle.	FSM Run-On Fault counter > Threshold  Pass Threshold < 5	5 Nominal Range: (10v > 16v)	Motor_Enabled Motor_ON	True (Note 9) > 60s	15 ms	one trip
ABS Pump Motor Locked	C12E8	This fault is set when the motor control micro communicates to the system micro that the motor is unable or will not rotate.	FS_Motor_No_Edge_Counter < Threshold	50 Nominal Range: (10v > 16v)	Motor_Enabled	True (Note 9)	15 ms	one trip
ABS Pump Motor Performance	C12E0	This fault checks to see if a condition exists in which the accumulator is not charging	Accumulator Pressure < Threshold  Pass Threshold > 839 kPa	769 kPa Nominal Range: (10v > 16v)	Brake Pedal Apply Detected Motor_Enabled Boost_Pressure < Command + 105 kPa No active DTCs:	True (Note 2) True (Note 9) True  C12B6 C12B7 C12B8 C127D C12E4	100ms	one trip
<b>Controller</b>								
EBCM Device Voltage Low	C12E1	System voltage is too low for certain operations.	System voltage < Threshold  Pass Threshold Volt >9v	9v Nominal Range: (N/A)	Ignition	!= Crank	100ms	two trips
EBCM Device Voltage High	C12E2	System voltage is too high for certain operations.	System voltage > Threshold  Pass Threshold Volt <16v	16v Nominal Range: (N/A)	Ignition	!= Crank	100ms	two trips

## 08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
ABS Power Switch Circuit Open	C12E6	When the power switch has been commanded on the voltage level is monitored for proper operation.	Voltage Level (switched battery) < Threshold  Pass Threshold > 80% bat volt	80% bat voltage Nominal Range: (N/A)	Power Switch Base Brake Enabled  Power Switch Command	True (Note 8)  On	50ms	one trip
ABS Power Switch Circuit Shorted	C12E7	The Base Brake Power switch voltage decay is monitored after the power switch is turned off. Voltage too high indicates a shorted switch. Voltage too low indicates a missing filter capacitor.	Power Switch Short Fault: Power switch feedback > Threshold1  Power Switch Short FSM Capacitor Fault: Power switch feedback < Threshold2  Pass Threshold 80% < fdbk <50%	Threshold1 = 80% bat volt  Threshold2 = 50% bat volt Nominal Range: (N/A)	Power Switch Command  Motor	Off  != Running	50ms	one trip
Traction Control Power Switch Circuit Open	C120D	When the power switch has been commanded on the voltage level is monitored for proper operation.	Voltage Level < Threshold  Pass Threshold volt > 80% voltage	80% voltage Nominal Range: (N/A)	Power Switch Slip Control Enabled  Power Switch Command	True (Note 7)  On	50ms	one trip
Traction Control Power Switch Circuit Shorted	C120E	When the power switch has been commanded off the voltage level should be at or near zero volts.	Voltage Level > Threshold  Pass Threshold volt < 80% voltage	80% voltage Nominal Range: (N/A)	Power Switch Command	Off	50ms	one trip
<b>Controller</b>								
EBCM Self Test Failed	C127C	The Built In Self Test (BIST) is responsible for testing the internal functionality of the core within the main microprocessor	Fail Consecutive Times = Threshold	2 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip

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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
EBCM Processor Performance	C127B	<p><b>Normal Operation:</b> The micro sends a watchdog enable command(WEC) via the SPI to the Orion ASIC every schedule loop. If the ASIC does not receive this message, the external watchdog circuit inhibits the power switches.</p> <p><b>Ignition Self-Test:</b> The external watchdog circuit is tested by not sending the WEC via the SPI to the ASIC so that the external watchdog is off and then commanding the power switch to on.</p>	<p>Power Switch Slip Control Voltage Feedback &gt; Threshold</p> <p>Pass Threshold &lt; 80% bat volt</p>	<p>80% bat volt Nominal Range: (N/A)</p>		Run during Start-up	30ms	one trip

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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM Random Access Memory (RAM)	C1255	The following tests are continuously ran: 1. Read/write of the micro's RAM registers. 2. Address check of the RAM address lines. 3. Verify that the RAM location used to store the persistent address line test address (offset) advances to the next address line address. 4. Perform data check on a RAM address that includes a dependency check against another RAM location that is address adjacent to the RAM location being tested. 5. Verify that the RAM location used to store the persistent data test address advances to the next test	If any of the tests fail, the system is forced into a reset by writing an invalid watchdog key to the system registers. If the RAM failure is NOT detected by the bootloader static RAM check algorithm then a fault code is set and the exact type of RAM failure is written to NVRAM.	See Malfunction Criteria Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM Read Only Memory (ROM)	C1256	This check is called from the scheduler each loop. Each ROM section is check-summed by byte. Each byte will be added to the current checksum for a section. If the byte being checked is the last byte of a section, then the section is verified for a correct checksum.	ROM Section's Checksum != Threshold	0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	Immediate	one trip
EBCM Stack Overrun	C126E	To detect underflow and overflow of the system stacks, a word of RAM is reserved at the end of each of the system stacks. A word of RAM is also reserved at the upper-most address of the stack section. The contents of these reserved words will be monitored periodically to determine if they have been modified. To detect cases where the application could be pushing a value onto the stack that matches the test value, the test value that is stored at these reserved addresses will be changed each update.	End of Stack != Threshold	Set value changed every software release Nominal Range: (N/A)		Upon Starting Scheduler in the Application	Immediate	one trip

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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM Processor Overrun	C121D	Processor did not perform a proper shutdown. NVRAM blocks written at shutdown do not match expected values upon startup. Processing interrupt occurred.	The contents of the two NVRAM blocks are compared upon start-up with expected values from shutdown process.	Blocks do not compare		Upon Starting Scheduler in the Application	15ms	one trip
EBCM Unimplemented Interrupt	C121E	This fault is set if an interrupt occurs that has no explicit interrupt handler defined.	Interrupt Set = Threshold	Not Defined Interrupt Handler Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM Unexpected Exception	C121F	This fault is set if an exception that is not supported in our system has been generated.	Exception Not Supported = Condition	N/A Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM A/D Conversion Timeout	C127D	If the Analog to digital converter does not complete its conversion in a set amount of time then this fault is set.	A/D Conversion Counter = Threshold	0 (Counts down from 100) Nominal Range: (N/A)		Upon Starting Scheduler in the Application	100 clock cycles	one trip
EBCM Non-Volatile Random Access Memory (NVRAM) / Non-volatile RAM	C12FF	Checksum Error Fault	NVRAM status bit sent out by core software reports a failed NVRAM	NVRAMDiagstat > 0 Fault Counts > 0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM Non-Volatile Random Access Memory (NVRAM) / Software Learn ID	C12FF	Software ID held in NVRAM does not match ID hard coded in software	BB NVRAM SW BLOCK ID ~=Software ID	SwVerIDStat > 0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer Performance	C127A	Execution of the High End Timer (HET) program is limited to the actual instructions of the HET program. Execution of default instructions indicates program execution error.	Default Instructions = Threshold	Executed Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip

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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM High End Timer Program Overflow	C123B	If the HET program does not complete execution time within one HET loop time, the current HET program is aborted and the next program execution is started and a fault code is set.	HET Program Execution Time > Threshold	HET Loop Time Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer (HET) RAM Fault	C123C	The following tests are continuously ran: 1. Read/write of the micro's HET RAM registers. 2. Address check of the HET RAM address lines. 3. Verify that the HET RAM location used to store the persistent address line test address (offset) advances to the next address line address. 4. Perform data check on a HET RAM address that includes a dependency check against another HET RAM location that is address adjacent to the HET RAM location being tested. 5. Verify that the HET RAM location used to store the persistent data test address advances to	If any of the tests fail, the system is forced into a reset by writing an invalid watchdog key to the system registers. If the RAM failure is NOT detected by the bootloader static RAM check algorithm then a fault code is set and the exact type of RAM failure is written to NVRAM.	See Malfunction Criteria Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip



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<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM High End Timer (HET) Watchdog	C123A	If the HET monitor task is not executed within the allowed time frame, a counter is decremented. When the counter decrements to zero, an interrupt is generated and this fault is set.	Counter = Threshold	0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer Periodic Interrupt	C123E	This failsafe verifies that a solenoid feedback interrupt generates a high end timer(HET) interrupt every loop cycle.	Solenoid Feedback Interrupt from the HET = Threshold	Calculated based on Solenoid activity Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM Solenoid Timeout	C123D	Each solenoid in the system should generate a HET interrupt. At the completion of the System Self-Test, the number of valid HET interrupts is expected to be equal to the number of solenoids in the system.	Number of Valid HET Interrupts != Number	12 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
<b>CAN / Communications</b>								

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM Internal Communication Error	C121C	<p>The periodic Internal Processor Communication (IPC) packet transmission service checks for previous transmission request completion before the new request is made.</p> <p>If the previous transmission was not completed, then the IPC handler declares an IPC packet transmission overrun failure and disables all IPC communications to introduce the same failure in the other micro. When both nodes are reset then they will re-synchronize.</p> <p>This fault is set when the attempt to recover from an IPC Transmit Overrun failure was not</p>	Secondary micro-processor communication packet does not re-synchronize with expected start-up sequence.	N/A Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	one trip
EBCM Serial Peripheral Interface Performance	C126F	2 data bytes are sent to the Orion ASIC. The Orion sends back the first byte.	Received Data != Sent Data for Threshold # of attempts	3 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	20 ms	one trip

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM Serial Peripheral Interface Inoperative	C123F	Each time data is sent out from the SPI port, a counter is loaded. The counter is decremented each check that the micro polls the SPI status to see if the data transfer is complete. The counter should never reach zero before the data transfer is complete. If the counter reaches zero, it means that the peripheral, NVRAM, appears to be non-functional.	Counter = Threshold	0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	one trip
EBCM CAN Hardware Initialization	C12E3	The hardware confirmation timeout condition is monitored every time the CAN driver initialization service is called. The CAN driver init service is called after power up, in Bus Off, or in transmit acknowledgement recovery. The number of counts the CAN driver is allowed to wait for hardware confirmation is 11. If the confirmation is not received by this number then the fault is set.	# of initialization attempts > threshold	11		Upon Starting Scheduler in the Application	15 ms	two trips

**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
Control Module Communication Bus B Off	U180F	The CAN peripheral monitors CAN bus activity and increments an error counter if the following errors are present: 1) BIT ERROR: If the bit sent does not match what was expected to be sent, increment the counter. 2) STUFF ERROR: This error has to be detected at the bit time of the 6th consecutive equal bit level in a message field that should be coded by the method of bit stuffing. 3) CRC ERROR: This error is detected if the calculated result of the receiver is not the same as that received from the transmitter. 4) FORM ERROR: This error is	CAN Hardware Transmit Error Counter > Threshold	256 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	two trips
EBCM Communication Bus "B" RAM Error	C126D	The first CAN device does not pass RAM check on the mailbox area. The CAN mailbox RAM check is executed once after power up or reset of the microprocessor.	RAM Read value != RAM Written value	0 Nominal Range: (N/A)		Executed once upon startup	15 ms	one trip

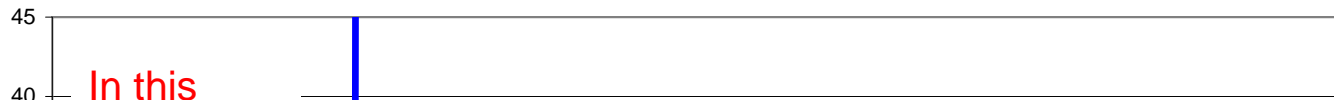
**08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)**

<b>Component/ System</b>	<b>Fault Code</b>	<b>Monitor Strategy Description</b>	<b>Malfunction Criteria</b>	<b>Threshold Value</b>	<b>Secondary Parameters</b>	<b>Enable Conditions</b>	<b>Time Required</b>	<b>MIL illum.</b>
EBCM Communication Bus "B" Performance	C126C	The CAN frame does not receive acknowledgement for predefined amount of time. If this fault is enabled in the node supervisor then transmit confirmation is expected within 200 ms. Transmit request sets the timeout timer and successful transmission resets the timeout timer.	CAN Frame acknowledgement not received	Not Received Nominal Range: (N/A)		Upon Starting Scheduler in the Application	200ms	two trips
Antilock Brake System Control Module Lost Communication With Hybrid Powertrain Control Module on Bus B	U1843	One or more of the Communication messages (3) with the Hybrid Powertrain Control Module are missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips
Antilock Brake System Control Module Lost Communication With Engine Control Module on Bus B	U1842	Communication message with the Engine Control Module is missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.			Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips

## 08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
Antilock Brake System Control Module Lost Communication With Engine Control Module	U186A	Communication message with the Engine Control Module is missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips
Antilock Brake System Control Module Lost Communication With Transmission Control Module	U186B	Communication message with the Transmission Control Module is missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips
<p>Note #1 - Processing_Enable is set to FALSE when the following DTCs are set to 'Fault': C1255, C1256, C126E, C123C, C127C</p> <p>Note #2 - Brake Pedal Apply Detected is the determination that the driver has applied the brake pedal. It is a combination of indications from the 4 driver inputs: Brake Switch, Master Cylinder Pressure, Brake Pedal Position 3 and Brake</p> <p>Note #3 - Pressure Zeroing Enable. When the vehicle is in a known state that the driver brake pedal should be released, the Pressure Zeroing Enable is set. Typical vehicle conditions are:</p> <p>Note #4 - See Correlation Table below</p> <p>Note #5 - M/C Pressure Sensor stable is a comparison of the raw M/C pressure reading against 2 filtered versions of the reading (0.5 Hz and 5 Hz.) If all 3 values are within a small tolerance ( 7 kpa) then the driver's input is considered</p> <p>Note #6 - Brake Control is considered 'False' when there is no activity being performed by the hydraulic modulator - no wheel control valves are being commanded and the motor is not being commanded.</p> <p>Note #7 - Power Switch Slip Control Enable is used to open the power control FET in the electronics as a safety mechanism for the brake controller. It is set to FALSE when the following DTCs are set to 'Fault': C12C2, C12C5, C12D2,</p> <p>Note #8 - Power Switch Base Brake Control Enable is used to open the Base Brake power control FET in the electronics as a safety mechanism for the brake controller. It is set to FALSE when the following DTCs are set to 'Fault':</p> <p>Note #9 - Motor_Enable is used to indicate when the motor is allowed to be commanded on. Motor_Enable is set to FALSE when the following DTCs are set to 'Fault': C12B7, C12B6, C12B8, C12D8, C12DB, C12DC, C12E9, C12E8,</p> <p>Note #10 - Cornering determination is a comparison of the 4 wheel speeds to estimate the percentage of road wheel angle of the drive wheels relative to their full amount of articulation. Wheel slip is the calculated ratio of individual wheel</p>								

### Note 4: Correlation Table



### 08 GRP11 Two - Mode Hybrid Electrohydraulic Brake Control Module (EBCM)

Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL illum.
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