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Prévost Rear Gauge Functional Specification

Client approval:

Company:

Name:

Signature and Date:

NOTICE OF PROPRIETARY INFORMATION

Classification
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	By	Date		Doc Ref.	Revision
Written	François Lalancette (Merkur)	2013/12/16	**Prévost Rear Gauge Functional Specification**	**117169**	**A**
Reviewed					
Approved					
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REVISION TRACKING SHEET

Rev	Name	Date	Detail
1	F.Lalancette	2013-12-17	Original release
2	F.Lalancette	2013-12-20	2: Updated Prévost systems list 6.3: Updated 12V & 24V messages, moved from section 6.4.1 6.4.1: CCVS1 SPN70=> removed reference to service brake 6.4.2: Removed Low Hydraulic Fluid Pressure 7: Added note that all images for reference only 7.2: Removed High/Invalid/Fault Trans oil level messages Modified Low oil Trans oil level message Modified Low/High battery messages 12.1: Removed reference to Translink Updated software PN according to information provided by Actia Cleaned up table 13: Removed French translations whole section
3	F.Lalancette	2014-01-15	3: Removed reference to Actia documents 4.3.5: Removed section since no speaker present 6.3: Remove signals: Right/Left turn, High beam, Stop request, A/C ON 6.4.1: Completed column "Units and logic" 7.1.1.1.1: Remove reference to Actia document 104426 7.3.3.4: Removed section since no speaker present
4	F.Lalancette	2014-02-03	3: Added EMC/EMI, mechanical and electrical Volvo requirements. 6.4.2: Removed 2 last lines of table, information already present in table. 6.4.2: Updated VP45 & VP61 details. 10.1.3: Remove Prévost logo on dial face
5	F.Lalancette	2014-02-28	5.2.1: Changed LCD backlight blinking strategy. 6.2: Corrected rear gauge odometer resolution to 5m/bit. Removed "button pressed" message. 6.3: Corrected Brake wear index. Changed 24V message 6.4: Removed service brake pressures for AIR1 6.4.1: Removed Transmission Oil Level High/low. Changed odometer resolution to 5m / bit. Added 12V voltage (moved from 6.3) Source address for PGN FE56 changed to 3D. 6.4.2: Corrected FMI for Low coolant level. 7.2: Changed to IPANEL.COMM.ERROR. Corrected low coolant FMI levels 7.3: Removed **BEA Mux. State** in Main menu. 7.3.8: Changed "Service brake" air for "Acc Air". 7.3.9: Changed wheel position display
6	F.Lalancette	2014-03-04	6.4.2: Added check coolant level sensor (111 *FMI* 12) 7.1.1.1: Added main cluster odometer update feature (moved from service gauge section) Removed service gauge section (was 7.1.1.1.1) 7.2: Changed trigger conditions for alternator charging failure Corrected 12V & 24V low/high voltage triggers Changed primary/secondary pressures threshold and removed hysteresis Removed Low Trans Oil Level 7.3.8: Removed Prim.RAir & Emergency pressures from menu 7.3.9: Corrected wheel position display 10.1.1: Corrected BIN_OUT1 & BIN_OUT2 output active low when active
7	F.Lalancette	2014-03-10	Updated hyperlinks

8	F.Lalancette	2014-03-13	6.3: Removed kneeling 6.4.2: Removed DM2 Added “Check Transmission” 7.2: Added VP55-Low Coolant level as trigger Changed trigger for Check Transmission message 7.3.4, 7.3.5, 7.3.6: Removed DM2 11.1: SPN 94 FMI 0 was empty Corrected some typo errors (twice same FMI on line) 11.3: Specified SA for UDS module
9	F.Lalancette	2014-03-20	6.4.1: CM1-Blower removed 7.3: Removed Historic faults in Settings and Diagnostic screens 7.3.7: Removed whole section related to DM2
10	F.Lalancette	2014-03-21	11.1: Removed DTC SPN 520555 FMI5 App C: Reactivated bit1 configuration
11	F.Lalancette	2014-03-24	7.3: Removed “Clear XXX faults” in menu (3 places)
12	D. Troup	2014-03-24	Ownership of Specification was granted to ACTIA Corp by François Lalancette (Merkur) Added ACTIA cover page and updated formatting Revision History: Corrected year of revisions for 9, 10, & 11 (was indicating 2013) 7.1: Reworded for clarification 7.2 table: Engine running is defined as RPM >400 throughout; was ≥ in two places. 12.1: Removed English/Metric comment on Engine Hours bit.; Default for engine hours is changed to visible (seen)
13	D. Troup	2014-05-21	6.2: Deleted section transmitting proprietary odometer value. 6.4.1: Changed CCVS1 SPN 84 from SA 0 to SA 11h 6.4.1: Changed TSC1 SPN 518 from SA 27h to SA E6h 7.1.1.1: Removed sending the odometer value using proprietary message 65,408 7.2: Added 10 second delay after startup before displaying any priority message 7.2 Message Table: Added clarification to Alternator Charging Error trigger
14	D. Troup	2014-05-22	6.4.1: Changed TSC1 SPN 518 from SA E6h to SA 03h and DST from 10h to 00 per customer request. 6.4.1: Changed CCVS1 SPN 597 from SA 0 to SA 11h; was missed in rev 13
A	C.Glassman	2014-07-10	7.3.8: Removed TorqueReq and DEF per request.

Table of content

1. PURPOSE

This document is the design specifications for the development of a Rear Gauge Panel for Prévost car.
The instrumentation is based on gauges with stepper motor technology, married to a microcontroller that provides the necessary electrical control.

The system architecture is a standalone based system. The rear gauge will be the tachometer and will include all communications, power supply, memory, display, and associated electronics to control the system. The Rear gauge device will display multiple parameters as described later in this document.

The rear gauge will help the engine technician with controlling and verifying all the parameters used for the engine, Transmission and UDS, in the easiest manner possible. The instrument panel will provide some parameters not accessible internally, like air pressures, via proprietary messages in J1939.

2. SCOPE

This document covers the operational specifications of the instrument panel and gauge system for use in Prévost buses. Engine, transmission, and UDS systems used in this application are listed in the table below:

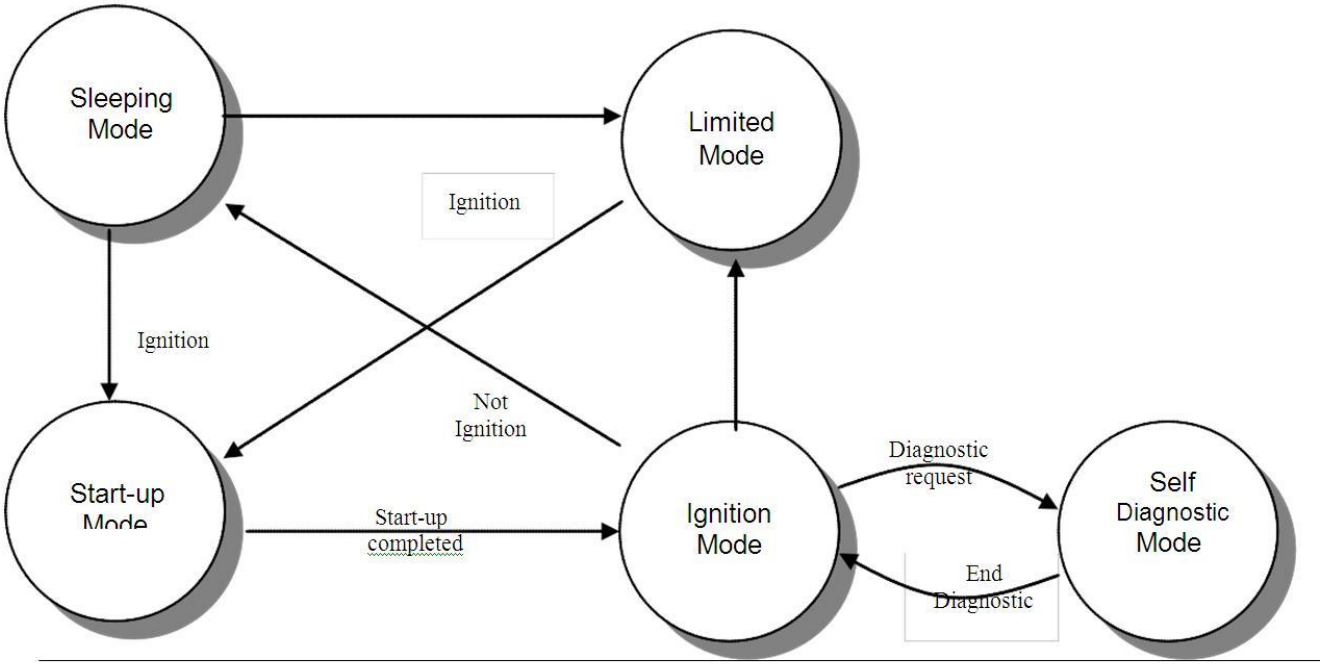
Engine	Transmission	UDS System	ABS
Volvo D13 2014 435Hp	Allison B500	Volvo ACM Sytem	Bendix ABS6

3. RELATED DOCUMENTS

The rear gauge must comply with the following Volvo specifications:

- Engineering specification no.39
- EMC Technical Regulation 1579908

4. MODES OF OPERATION



4.1 Sleep Mode

When the system is in Sleep Mode the microprocessor is stopped.

The system exits Sleep Mode when one of the wake-up inputs becomes active. When the Master wakes up, it first begins to control the power supply by activating the power supply maintain output. It then decides, depending on which wake up input is active, what mode must be entered.
When the system goes back to sleep, it simply deactivates the power supply maintain output.

4.2 Limited Mode

When either Bin0, Bin1, and or An4 are active the Odometer is displayed on the LCD.

4.3 Start-Up Mode

The Master enters start-up mode when the ignition is on. The ignition binary input is used to sense if the key switch is on or off.

By pressing on TRIP and MODE at ignition up we can display the software version.

4.3.1 GAUGES

Gauge pointers will drive to zero position. The pointers will then drive up scale, pausing at half scale, before completing the sweep to full scale. The pointers will then return to zero position before moving to the commanded position.

4.3.2 LCD

During the upscale sweep of the pointers, the LCD will turn all its segments off for one second and then display the opening message. The opening message is the Prévost Car logo.

4.3.3 WARNING LIGHTS

No warning lights

4.3.4 COMMUNICATION

The master gauge will determine which data buses are connected and which devices are present. Error messages will display if a data bus is missing or a device that had been previously found is now missing.

4.4 Ignition Mode

The ignition mode is active as long as the ignition switch is on. The ignition is the normal operational mode of the system. If the ignition line goes low the system goes to sleep mode after a delay of approximately 2 seconds.

4.5 Sleep Mode

When the system is in sleep mode the master gauge microprocessor is stopped. The clock microprocessor goes into low power mode and draws less than 3 mA.

The system exits sleep mode when one of the wake-up inputs become active. When the Master wakes up, it first begins to control the power supply by activating the power supply maintain output. It then decides, depending on which wake up input is active, what mode must be entered.

When the system goes back to sleep, it simply deactivates the power supply maintain output.

4.6 Self-Diagnostic Mode

The self-diagnostic mode is entered through a menu selection using the LCD.

The self-diagnostic includes the following tests:

- Gauges
- LCD
- Binary Inputs
- Analog Inputs
- Communications
- Error codes on Engine, Transmission or UDS

Detail specifications are found in the Message Display Center section.

5. IGNITION MODE

5.1 Gauge Display

5.1.1 REAR GAUGE – 117MM TACHOMETER

Data Source	Range	Movement	Scale
PGN 61,444	230°	CW	Linear 0° = 0 RPM 230° = 3000 RPM

5.2 Backlighting

No PWM dimmer input is wired to the Rear gage. When one wake up condition is present the Backlight is set to the maximum depending on the following conditions.

5.2.1 LCD BACKLIGHT

If both DM1 SPN 111 *FMI* 1 and DM1 SPN 111 *FMI* 18 are inactive, the backlight is set to the maximum value.
When the low coolant level flag received from DM1 SPN 111 *FMI* 1 is active the backlight will blink 320ms on and 320ms off.

5.2.2 GAUGE BACKLIGHT

If no active fault is received the backlight is set to the maximum value, otherwise if a DTC is present, the backlight is blinking 1.28s on and 1.28 second off.

5.3 Audible Alarm

No buzzer or alarms are generated by the rear gage.

5.4 Binary Outputs

5.4.1 PRIMARY AIR PRESSURE OK

This binary output is active when the Primary Air Pressure is not in error and engine is running.

5.4.2 SECONDARY AIR PRESSURE OK

This binary output is active when the Secondary Air Pressure is not in error and engine is running.

6. COMMUNICATION

The only communication channel for data transfer between the vehicle and the tachometer is CAN 2.0B/SAE J1939 (Controller Area Network).

All frames transmitted by the Tachometer on J1939 are continuously sent at the standard broadcast rate for the frame using source address (SA) 247dec (F7h).

6.1 Communication Errors

If a parameter is not received by J1939 for 5 seconds it will be flagged as missing. Missing LCD information will display a "-"and missing gauge information will be signaled by wagging the pointer from dial end to dial end. A missing J1939 data bus will be announced in the LCD.

6.2 Messages Sent

Section Deleted

6.3 Proprietary Messages

Frame	PGN	Name	Byte	Logic	Units	SA (HEX)
VP55	65,335 FF37	Brake Wear / Lining Measure	2	Brake position	0 = front right 1 = front left 2 = drive right 3 = drive left 4 = tag right 5 = tag left	E6
VP55	65,335 FF37	Brake Wear / Lining Measure	3	1 bit per mm Offset: 0 Range: 50-150	mm	E6
VP53	65333 FF35	Alternator Status	8 b8&7	00: Abnormal operations 01: Normal operations 10: error 11: N/A		E6
VP53	65333 FF35	Network Failed	8 b2&1	00:No faults 01: troubles MUX CAN 10: Error 11: N/A		E6
VP53	65333 FF35	Fire Alarm Detect	7 b8&7	00: Alarm OFF 01: Alarm ON 10: error 11: N/A		E6
VP55	65,335 FF37	24V Battery Voltage	4,5	0.05V/bit	V	E6

6.4 J1939 Table of Messages

6.4.1 J1939 STANDARD RECEPTION MESSAGES

Frame	PGN / SPN	Name	Byte	RX/R	Units and logic		SA (HEX)
HOURS	65,253 FEE5 / 247	Total engine hours	1,2,3,4	RQ	H		00
CCVS1	65,265 FEF1 / 84	Wheel-based vehicle speed	2,3	RX	MPH / KMH		11
CCVS1	65,265 FEF1 / 597	Brake Pedal Depressed	4 b 6&5	RX	00 - Brake pedal released 01 - Brake pedal depressed 10 - Error 11 - Not Available		11
EEC1	61,444 F004 / 190	Engine speed	4,5	RX	RPM		00
EEC2	61,443 F003 / 92	Percent load	3	RX	%		00
EFLP1	65,263 FEEF / 100	Engine oil pressure	4	RX	PSI / Kpa		00
ET1	65,262 FEEE / 110	Engine coolant temp.	1	RX	°F / °C		00
ERC1	61,440 F000 / 571	Retarder On/Brake Assist Switch	1 b 6&5	RX	00 Retarder-brake ass OFF 01 Retarder-brake ass ON 10 Error 11 Not available		10
ERC1	61,440 F000 / 520	Actual Retarder: percent Torque	2	RX	%		10
EBC1	61,441 F001 / 1793	EBC1 Status (ATC)	6 b 8&7	RX	00 Off 01 On 10 Reserved 11 Take no action		0B
EBC1	61,441 F001 / 1438	ABS/EBS Warning State	6 b 6&5	RX	00 Off 01 On 10 Reserved 11 Take no action		0B
ETC2	61,445 F005	Electronic Trans. Controller #2	N/A	RX	N/A		03
LFE	65,266 FEF2 / 184	Instantaneous fuel econ	3,4	RX	MPG / L/100Km		00
LFE	65,266 FEF2 / 185	Average fuel economy	5,6	RX	MPG / L/100Km		00
LFE	65,266 FEF2 / 183	Fuel Rate	1,2	RX	MPG / L/100Km		00
IC1	65,270 FEF6 / 102	Boost pressure	2	RX	PSI / Kpa		00
IC1	65,270 FEF6 / 105	Intake manifold temperature	3	RX	°F / °C		00
TRF1	65,272 FEF8 / 177	Transmission oil temp.	5,6	RX	°F / °C		03
PTC1	64,892 FD7C / 3697	Particulate Trap Lamp Command	1 b 1-3	RX	100=check 001=Warning		00
TSC1	0 (0000) / 518 (see Note)	Requested Torque	4	RX	%		SA = 0x03 DST = 0x00
DD	65276 FEFC / 96	Fuel Level	2	RX	%		17
RC	65249 FEE1 / 557	Retarder Disable	2	RX	1 step / bit	steps	0F
Brakes	65274 FEFA / 117	Primary Air Pressure	2	RX	4kPa/bit	Psi / Kpa	17
Brakes	65274 FEFA / 118	Secondary Air Pressure	3	RX	4kPa/bit	Psi / Kpa	17
AIR1	65198 FEAE	Accessory Air Pressure	5	RX	8kPa/bit	Psi / Kpa	17
VDHR	65,217 FEC1 / 917	Odometer	1,2,3,4	RX	5m / bit	Mi / Km	17
VEP1	65271 FEF7 / SPN 168	12V voltage	5-6	RX	0.05V/bit	V	17

Note: In the table bytes are numbered 1 to n and bits are numbered 1 to 8. 1 is LSb.
Note: This is a destination specific pgn so the second byte of the pgn will be replaced by the destination. Example with destination 10 the pgn changes to 0010.

6.4.2 DEFINED FAULTS RECEIVED

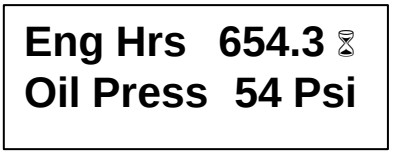
Defined Faults	PGN	Name	Byte	Logic		SA (HEX)
				SPN	FMI	
DM1	65,226 FECA	Amber Warning Light	1 b 4&3	Sa 0B		00, 03, 0B
DM1	65,226 FECA	Red Stop Lamp	1 b 6&5			00, 03
DM1	65,226 FECA	Yellow Maintenance Lamp	1 b 2&1			00, 03, 0B
DM1	65,226 FECA	Water In Fuel	3-6	97	0	00
DM1	65,226 FECA	Oil Pressure	3-6	100	1, 18	00
DM1	65,226 FECA	Coolant Temp	3-6	110	0, 16	00
DM1	65,226 FECA	Low Coolant Level	3-6	111 / red lamp	1	00
DM1	65,226 FECA	Warning Low Coolant Level	3-6	111/ maintenance lamp	18	00
DM1	65,226 FECA	Check coolant level sensor	3-6	111	12	00
DM1	65,226 FECA	Transmission Temperature	3-6	177	15	03
DM1	65,226 FECA	Check Transmission	3-6	2003	31	03
BEA Reception Frame	VP53, VP55, VP37, VP45	Multiplex Flags	All			E6
DPFC1	64892 FD7C SPN 3697	Diesel Particles Filter Warning	1 b3-1	000 OFF 100 ON (Solid)		00
VP55	65335 FF37	Warning Low coolant Level	1 b6&5	00 OFF 01 ON 10 ERR 11 N/A		E6
VP61	65341 FF3D	Wait to Start	8 b6&5	00 OFF 01 ON 10 ERR 11 N/A		00
VP45	65325 FF2D	Approaching shutdown	1 b6&5	0 Not requested 1 Requested 2 Error indicator 3 Not available/ installed		E6
VP61	65341 FF3D	Shutdown	3 b8&7	0 Inactive 1 In progress 2 Active		00

7. MESSAGE DISPLAY CENTER

The message display is a graphical, backlit, LCD that displays information to the vehicle operator.
In addition to basic odometer functions, a variety of customer-defined options will be displayed. Fault codes will also be displayed as they are received. Instrumentation diagnostics can be viewed on the LCD as well.
Note: All images in this section are for reference only; final message display is to be agreed between ACTIA and Prévost.

7.1 Drive Mode Screen

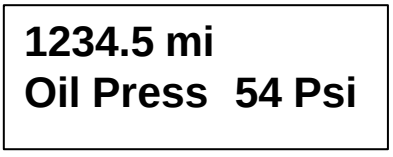
At startup the default drive mode screen is coolant temperature and oil pressure. When the display of engine hours is enabled, then engine hours and oil pressure is displayed on startup.



7.1.1 LCD DISPLAY SELECTION

Pressing the ***T*** button changes the LCD display parameters. Pressing and holding ***T*** button while trip odometer is displayed resets trip odometer. Pressing ***M*** and ***T*** together toggles units between English and Metric.

7.1.1.1 Odometer



The odometer value comes from the J1939 message VDHR 65,217 FEC1 / 917 sent from the main Instrument Panel SA 17.

The season odometer displays 0.0 – 9,999,999.9 km and the trip odometer, when offered, will display 0.0 – 9999.9. Both have a resolution of 0.1 mi & km. Leading zeros are only displayed in the 1's position. The vehicle Trip distance is calculated every 80 msec from the vehicle speed transmitted on the J1939 data bus by the engine ECM and stored within the speedometer in kilometers. It can be displayed on the LCD in miles or kilometers. The value is saved at shutdown.

7.1.1.1.1 Accuracy

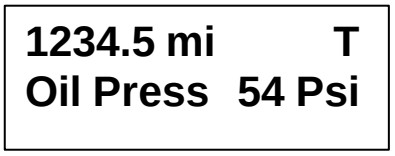
The accuracy is set by the main gauge in the main instrument panel.

7.1.1.1.2 Maximum Reading

The odometer will stop incrementing when the maximum display count of 9,999,999.9 is reached. The value does not rollover to zero and continue incrementing.

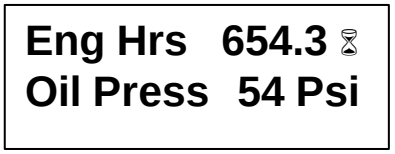
7.1.1.2 Trip Odometer

The trip odometer is based off of the speed sent over J1939 versus time. Pressing and holding ***T*** while trip odometer is displayed will reset trip odometer.



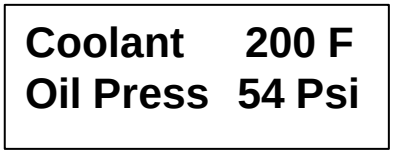
7.1.1.3 Hours

This screen's availability is based on the configuration bit describe in section 12.1. When enabled using external software, hours are based on J1939 PGN 65,253 SPN 247 SA 00. If, when this message is requested there is no response, the data will be displayed with a "-".



7.1.1.4 Coolant Temp and Oil Pressure

Engine Coolant Temperature and Engine Oil Pressure parameters are received from the engine SA 0 using SPN110 and SPN 100.



7.2 Priority Messages

No Priority Message will be displayed during the first 10 seconds after ignition ON.

Priority messages can be generated by the engine, transmission or UDS controllers or binary inputs and are available on all instrument panels where applicable.

Priority interrupt messages will interrupt the bottom line of the LCD in order to provide the vehicle operator with priority information.

A priority message is removed from the display only if its source expires or if the Trip Switch acknowledges it. Some messages can be acknowledged. If acknowledged, it remains removed from the display and will only reappear if the source expires and reoccurs. If the ignition is turned off and then back on and a priority message is still active, it will display again.

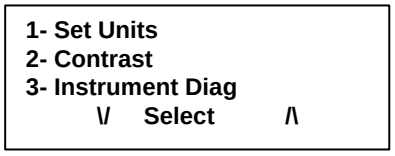
If more than one priority message is active, each message will be displayed one after the other for three seconds each.

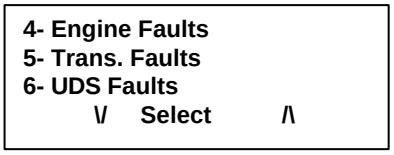
Assignment	Trigger	Exact Text	Ack?	Recur?	Turns off if
Engine Comm. Failure	No messages from SA 00	ENG. COMM. ERROR	Yes	No	Communication is reestablished
Trans Comm. Failure	PGN61445ETC2 not received	TRANS. COM. ERROR	Yes	No	Communication is reestablished
ABS Comm. Failure	PGN65441EBC1 not received	ABS. COMM. ERROR	Yes	No	Communication is reestablished
Inst Panel Comm Failure	No messages received from sa 17	IPANEL.COMM.ERROR	Yes	No	Communication is reestablished
High Coolant Temp Alert	DM1_SPN110 FMI16	CHECK COOL TEMP	Yes	No	DM1 Clears
Low Coolant Level	DM1 111 *FMI* 18	LOW COOLANT LEVEL	Yes	No	message clears after 30 sec
	DMI 111 *FMI* 1 or VP55 Warning Low coolant level	LOW COOLANT LEVEL	Yes	No	Flag Clears
Check Coolant SNS	DM1 111 *FMI* 12	CHECK COOLANT SNS	Yes	No	Flag Clears
Low Oil Pressure Alert	DM1 Low Oil Pressure	LOW OIL PRESSURE	Yes	No	DM1 clears
High Trans Temp Alert	DM1 High Trans Temp	CHECK TRANS TEMP	Yes	No	DM1 clears
Wait to Start	VP61	WAIT TO START	Yes	No	Msg clears
Water in Fuel	DM1 Water In Fuel	WATER IN FUEL	Yes	No	Msg clears
Engine Maintenance	Maintenance Lamp SA 00	ENG. MAINTENANCE	Yes	No	DM1 clears
+ Stop Engine	DM1RedStopLamp SA 00 or DM1 low coolant level or VP45 Approaching shutdown or VP61shutdown	STOP ENGINE !!	No	No	Msg clears
Check Engine	DM1 Check Eng Lamp SA 00	CHECK ENGINE !	Yes	No	Msg clears
Transmission Maintenance	Maintenance Lamp SA 03	TRANsMAINTENANCE	Yes	No	DM1 clears
Network Fail	VP53 Network Failed OR No message received from SA E6	NETWORK FAILURE	Yes	No	Input clears
Check Transmission	DM12003 FM1 31	CHECK TRANSMIS.	Yes	No	Msg clears
Stop Transmission	DM1 Tran Stop Lamp SA 03	STOP TRANSMIS.!!	No	No	DM1 clears
Fire Alarm Detect	VP53 Fire alarm detect	FIRE ALARM	No	No	Input Clears
ABS Maintenance	Maintenance Lamp Source 0B	ABS.MAINTENANCE	Yes	No	DM1 clears
Check ABS	DM1 Amber SA 0B or PGN 61441 SPN1438	CHECK ABS!	Yes	No	Msg clears
Alternator charging failure	If VP53 alternator status = 00 with rpm > 400 for 2 sec	CHARGING FAILURE	Yes	No	Binary input or flag = 01
Low Battery	PGN65271 SPN168 <12V for 30sec Or VP55 24V batt volt<24V for 30sec	LOW BATTERY VOLT.	Yes	No	12V voltage > 12V for 30sec or 24V voltage > 24V for 30sec
High Battery	PGN65271 SPN168 >17V for 30sec Or VP55 24V batt volt >30V for 30sec	HIGH BATTERY VOLT	Yes	No	12V voltage < 17V for 30sec Or 24V voltage < 30V for 30sec
Check Diesel Particle Filter	PGN64892_SPN3697= 100	DIESEL.PART.FILT..	Yes	No	Message clears
Change Diesel Particle Filter	PGN64892_SPN3697 = 001	DIESEL.PART.FILT.	Yes	No	Message clears
Low Primary Air Pressure	Primary Air Press ≤ 74 psi & engine is > 400 rpm	LOW.PRIMARY AIR	No	No	Air pressure ≥ 75 psi
Low Secondary Air Pressure	Secondary Air Press ≤ 74 psi & engine is > 400 rpm	LOW.SECONDARY.AIR	No	No	Air pressure ≥ 75 psi

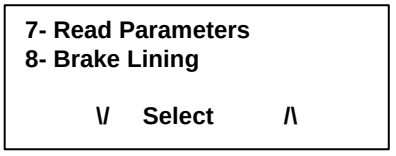
7.3 Settings and Diagnostic Screens

The Settings and Diagnostic screens can be accessed when the drive mode screen is displayed and the ***M*** button is pressed for longer than 5 seconds or if no CAN messages are seen then holding the ***M*** button will enter the menu.

Once in the Settings and Diagnostics menu, pressing the ***M*** or ***T*** buttons separately moves the reverse video highlight (**example**) up or down through the list, as indicated by the arrows. The highlighted item is selected when both ***M*** and ***T*** buttons are pressed at the same time. If no button is pressed for 5 seconds, the LCD will go back to the standard Drive Screen. The items available in the menu are:



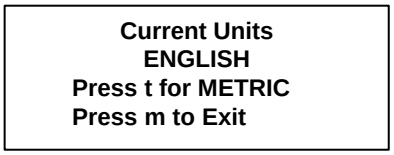




This menu exits to the drive mode screen when there has been inactivity for 5 seconds.

7.3.1 SET UNITS

Selecting menu item 1 brings up the following screen that is used to select if values are to be displayed in metric units or English units. Pressing ***M*** or waiting 5 seconds exits to settings and diagnostics menu

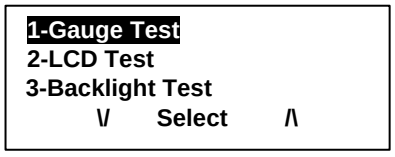


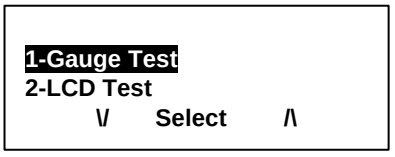
7.3.2 CONTRAST

Selecting menu item 2 displays a screen to allow setting the LCD contrast. Pressing the ***M*** (+) button will increase contrast while pressing the ***T*** (-) button will decrease contrast. After inactivity for 5 seconds this menu exits to the settings and diagnostics menu

7.3.3 INSTRUMENT DIAGNOSTICS

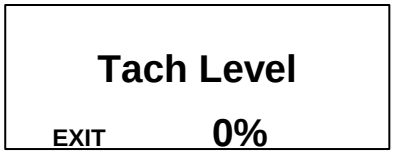
Selecting menu item 3 in the Settings and Diagnostic Menu will display the instrument diagnostic menu. There are 4 items in this menu and is navigated the same as the previous menu. This menu exits to the settings and diagnostics screen when there has been inactivity for 5 seconds.

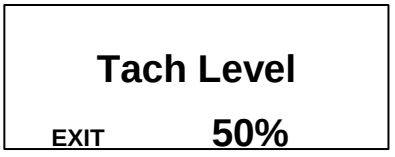




7.3.3.1 Gauge Test

Item 1 – Each gauge present will individually be driven through three positions pausing at each position as shown in the LCD as a percentage of scale. This test will proceed through all gauges present and return to the Instrument Diagnostic menu. Pressing the ***M*** button (Exit) will end the test and return to the Instrument diagnostic menu.





7.3.3.2 LCD Test

Item 2 – Displays the Prévost Bus logo in normal then reverse video three times and then returns to the Instrument diagnostics menu.

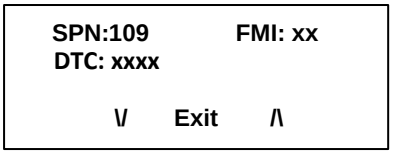
7.3.3.3 Backlight Test

Item 3 – Cycles the gauge and LCD backlight through 3 brightness levels twice displaying the corresponding intensity on the LCD. Pressing m during the test or allowing the test to complete returns the gauge to the Instrument Diagnostics menu

7.3.4 ENGINE FAULTS

For all ECU, an array is defined containing DTC, SPN & Specific FMI. See Appendix B. If the SPN is not known, the value is displayed in decimal. For active faults, the array is filled with information obtained from DM1.

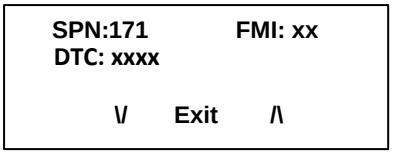
This screen displays DTC, SPN & associated FMI, otherwise, the Suspect Parameter Number (SPN) and Failure mode Identifier (FMI) as received from the engine for active faults via J1939 (DM1SPN100)



7.3.5 TRANS FAULTS

For all ECU, an array is defined containing DTC, SPN & Specific FMI. See Appendix B. If the SPN is not known, the value is displayed in decimal. For active faults, the array is filled with information obtained from DM1.

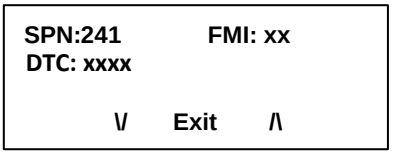
This screen displays DTC, SPN & associated FMI, otherwise, otherwise the Suspect Parameter Number (SPN) and Failure mode Identifier (FMI) as received from the transmission for active faults via J1939 (DM1HighTransTempLamp).



7.3.6 UDS FAULTS

For all ECU, an array is defined containing DTC, SPN & Specific FMI. See Appendix B. If the SPN is not known, the value is displayed in decimal. For active faults, the array is filled with information obtained from DM1

This screen displays DTC, SPN & associated FMI, otherwise the Suspect Parameter Number (SPN) and Failure mode Identifier (FMI) as received from the UDS for active faults via J1939.



7.3.7 CLEARING PREVIOUS FAULTS **(Section removed)**

No DM2-DM3 supported.

7.3.8 READ PARAMETERS

Selecting menu item 13 displays various parameters received by the master gauge. The main use for these screens is in troubleshooting the system.

Eng RPM 775 RPM	Trans T 195 °F	Prim.Air 115Psi
Boost Pr 5 Psi	Coolant T 180 °F	SecondAir 115Psi
Eng Load 23 %	Oil Press 40 Psi	Acc Air 115Psi
\/ Exit /\	\/ Exit /\	\/ Exit /\
Fuel Level 74 %	Hrs 123.45 hrs	24V Batt. 23.1V
Inst Fuel 15.4 mpg	Speed 31.1 mph	12V Batt. 13.2V
Avg Fuel 12.6 mpg	Gear Neutral	Eng RPM 775 RPM
\/ Exit /\	\/ Exit /\	\/ Exit /\

7.3.9 READ BRAKE LINING STATE

Item 15- A sub menu is displayed to choose between 3 types of displaying:

- in 1/32 of inches
- in millimeters
- in %

Brake Lining in 1/32 inch
Brake Lining in mm
Brake Lining in %

The displaying in 1/32 of inches and millimeters requires two parameters:

- Corresponding value in 1/10 of millimeters for 100%
- Offset value in 1/10 of millimeters for 0%

The hardcoded value for these two parameters are:

Parameters	Default value (1/10mm)
100% value	150
0% value	50

In 1/32 of inches (0.793mm) and millimeters the value is rounded without decimal.

- This brake lining status is sent for one wheel every 100ms from the BEA Multiplex system with the identifier VP55 SA E6:

The following message is displayed on the screen for showing the brake Lining State, for a % displaying:

The Front Wheels are displayed on the left side of the screen, right side on the top. The value is expressed in % for each Brake lining, only four wheels are displayed.

FR DR TR
FL DL TL

Brake Lining %
100 53 43
98 55 42
<- FL Wheel Press m to Exit

Position of wheel information received

8. RELATED STANDARDS

SAE J1455	*Joint SAE/TMC Recommended Environmental Practices for Electronic Equipment Design (Heavy-Duty Trucks)*
SAE J1211	*Recommended Environmental Practices for Electronic Equipment Design*
*SAE J1113/**	*Electromagnetic Compatibility Measurement Procedures and Limits for Vehicle Components*
SAE J1812	*Function Performance Status Classification for EMC Immunity Testing*
SAE J2217	*Photometric Guidelines for Instrument Panel Displays that Accommodate Older Drivers*
SAE J1939	*Recommended Practice for Truck and Bus Control and Communications Network*
SAE J1226	*Electric Speedometer Specification – On Road*
SAE J1399	*Electric Tachometer Specification*
SAE J1810	*Electrical Indicating System Specification*
SAE J1048	*Symbols for Motor Vehicles Controls, Indicators and Tell-Tales*
SAE J1362	*Graphical Symbols for Operator Controls and Displays on Off-Road Self-Propelled Work Machines*
FMVSS 302	*Flammability of interior materials*

LIN Specification Package Revision 1.2

9. GLOSSARY/ABBREVIATIONS

TBD – To be determined
EEPROM – Electrically Erasable Programmable Read Only Memory
SAE – Society of Automotive Engineers
PGN – Parameter Group Number (J1939)
SPN – Suspect Parameter Number (J1939)
FMI – Failure Mode Identifier (J1939)

10. APPENDIX A

10.1 Master Gauge

10.1.1 CONNECTOR – INPUTS AND OUTPUTS

Terminal	Designation	Assignment	Pull up	Pull down	Voltage Divider	Series Resistor	Filter Cap	Amplification	Wake-Up	Description
1	AN3		121			12K	0.1uF			
2	AN0		562			12K	0.1uF			
3	AN2		562			47K	0.1uF			
4	AN1	Wake Up		1.78K	0.129	12K	4.7uF		X	Unused
5	AN4		121			47K	0.1uF			
6	AN5			1.2k		12K	0.1uF			
7	AN6			100K	0.893	12K	4.7uF			
8	AN7		562			12K	0.1uF			
9	BIN_OUT1	Primary Pressure Switch Ok	Low Side Binary Out							Active low when Pressure is correct
10	BIN_OUT2	Secondary Pressure Switch Ok	Low Side Binary Out							Active low when Pressure is correct
11	IGNITION	Ignition	High Side Binary							Switched high for ignition on –Wake up input
12	BIN0	Wake Up		1.2K		47K	0.1uF		X	Unused
13	BIN1	Wake Up		1.2K		47K	0.1uF		X	Unused
14	BIN2			1.2K		47K	0.1uF			
15	BIN3			1.2K		47K	0.1uF			
16	BIN4			1.2K		47K	0.1uF			

Signal low = Chassis Ground (0.0V – 1.5V)
Signal high = 4.0V up to Ignition Voltage

10.1.2 CONNECTOR – POWER AND COMMUNICATION

Terminal	Designation	Description	Used	CAN term
1	Battery	Un-Switched positive (+)	X	
2	Ground	Chassis ground	X	
3	CAN+	SAE J1939 Data bus	X	
4	CAN-	SAE J1939 Data bus	X	
5	J1708+	SAE J1708 Data bus		
6	J1708-	SAE J1708 Data bus		
7	Reserved	Reserved for ISO9141		
8	CAN Res	CAN Termination Resistor		

10.1.3 MASTER GAUGE APPEARANCE AND LIGHTING

Color	Wave length	Part
Blue	TDB	Dial face Backlighting
Red-Amber	617nm	Pointer
White		Background
Black		Characters
Amber	617nm	LCD Backlighting

10.2 Panel Interconnections

10.2.1 CONNECTORS

Mating Connectors for the gauges and warning modules are TYCO GET .64 sealed connectors.

The speedometer has three connectors associated with it:

J1 – an eight (8) position for power/communication,
J2 – a sixteen (16) position for input and output connections, and
J3 – a four (4) position for slave device power and communications

The figures below show the connector pin numbering from the wire entry side with the latch on top. This numbering can also be found on the connector housing.

The Mating Terminals (Sockets) used with the connector housings are Tyco P/N: 1393366-1 (Actia P/N 100952)

10.2.2 J1 – SPEEDOMETER POWER/COMMUNICATION CONNECTOR/BINARY INPUT CONNECTOR

8 positions (Actia P/N 100950)

Tyco US Part Number: 1411001-1

10.2.3 J2 – SPEEDOMETER I/O CONNECTOR (INPUTS & OUTPUTS)

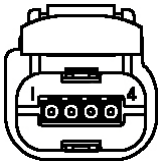
16 Positions (Actia P/N 100951)

Tyco US Part Number: 1438031-1

10.2.4 J3 – SPEEDOMETER SLAVE CONNECTOR (COMMUNICATION, POWER SUPPLY)

4 Positions (Actia P/N 100949)

Tyco US Part Number: 9-1419167-0



11. APPENDIX B

11.1 ENGINE EXPLICIT DTC LIST

(DTC description not to be displayed)

Description	SPN J1939	FMI	DTC J2012
Engine Throttle Position	51	2, 3, 4, 5, 7, 12, 13	P02E6
Engine Throttle Position	51	15, 17	P3FFF
Parking Brake Switch	70	2, 14, 20, 21	P05E3
Wheel-Based Vehicle Speed	84	5, 6, 10	P0500
Wheel-Based Vehicle Speed	84	2, 14	P215A
Wheel-Based Vehicle Speed	84	13, 19	P3FFF
Accelerator Pedal Position 1	91	3, 4, 13, 19	P0120
Accelerator Pedal Position 1	91	14	P0641
Accelerator Pedal Position 1	91	5	P2109
Accelerator Pedal Position 1	91	2	P2135
Accelerator Pedal Position 1	91	6	P2163
Engine Fuel Delivery Pressure	94	18	P008A
Engine Fuel Delivery Pressure	94	16	P008B
Engine Fuel Delivery Pressure	94	3, 4, 5, 12	P2539
Engine Fuel Delivery Pressure	94	1	P3FFF
Engine Fuel Delivery Pressure	94	0	P008A
Water In Fuel Indicator	97	4, 5, 12, 14	P2264
Water In Fuel Indicator 1	97	0	P2269
Engine Oil Level	98	18	P1086
Engine Oil Level	98	4, 5	P250A
Engine Oil Level	98	1	P250F
Engine Oil Pressure	100	2, 3, 4, 5, 12	P0520
Engine Oil Pressure	100	1	P0524
Engine Oil Pressure	100	17	P055F
Engine Oil Pressure	100	7	P06DA
Engine Oil Pressure	100	18	P1093
Engine Crankcase Pressure	101	2, 3, 4, 5, 12	P051A
Engine Crankcase Pressure	101	0	P053E
Engine Crankcase Pressure	101	16	P111F
Engine Crankcase Pressure	101	14	P1135
Engine Intake Manifold #1 Pressure	102	2	P0069
Engine Intake Manifold #1 Pressure	102	3, 4, 5, 7, 12	P0105
Engine Intake Manifold #1 Pressure	102	16	P1116
Engine Intake Manifold #1 Pressure	102	0	P1118
Engine Intake Manifold #1 Pressure	102	9	P3FFF
Engine Turbocharger 1 Speed	103	2, 9	P2578
Engine Turbocharger 1 Speed	103	15, 17	P3FFF
Engine Intake Manifold 1 Temperature	105	2	P009A
Engine Intake Manifold 1 Temperature	105	3, 4, 5, 12, 14	P0110
Engine Intake Manifold 1 Temperature	105	16	P1119
Engine Intake Manifold 1 Temperature	105	0	P111A
Engine Air Filter 1 Differential Pressure	107	3, 4, 5, 12	P1007
Engine Air Filter 1 Differential Pressure	107	0	P10F8
Barometric Pressure	108	2, 3, 5, 12	P2226
Engine Coolant Temperature	110	3, 4, 5, 10, 12	P0115
Engine Coolant Temperature	110	0	P0217
Engine Coolant Temperature	110	1	P04D8
Engine Coolant Temperature	110	16	P111E
Engine Coolant Temperature	110	7, 14	P3FFF
Engine Coolant Level	111	18	P111D
Engine Coolant Level	111	3, 4, 5, 12	P2556
Engine Coolant Level	111	1	P2560
Engine Injector Metering Rail 2 Pressure	129	2, 3, 5, 12	P01A3
Engine Injector Metering Rail 2 Pressure	129	7	P1171
Engine Injector Metering Rail 2 Pressure	129	1	P3FFF
Engine Exhaust Back Pressure	131	2, 3, 5, 12	P0470
Engine Exhaust Back Pressure	131	7	P0475
Engine High Resolution Crankcase Pressure	153	15, 17	P3FFF
Engine Injector Metering Rail 1 Pressure	157	1	P0087
Engine Injector Metering Rail 1 Pressure	157	0	P0088
Engine Injector Metering Rail 1 Pressure	157	14	P00C6
Engine Injector Metering Rail 1 Pressure	157	2, 3, 4, 5, 7, 12	P0190
Engine Injector Metering Rail 1 Pressure	157	16	P1147
Keyswitch Battery Potential	158	1	P0560
Engine Gas Supply Pressure	159	18	P2A6E
Range Request	162	3, 4, 12	P1174
Transmission Requested Range	162	31	P117C
Ambient Air Temperature	171	2, 5, 6	P0070

Description	SPN J1939	FMI	DTC J2012
Ambient Air Temperature	171	14	P3FFF
Engine Air Inlet Temperature	172	4, 5	P00D9
Engine Exhaust Gas Temperature	173	16	P112E
Engine Exhaust Gas Temperature	173	0	P2428
Engine Fuel Temperature 1	174	2	P008F
Engine Fuel Temperature 1	174	0	P0168
Engine Fuel Temperature 1	174	4, 5, 14	P0180
Engine Oil Temperature 1	175	2, 3, 4, 5, 12	P0195
Engine Oil Temperature 1	175	0	P0298
Engine Oil Temperature 1	175	16	P1125
Transmission Oil Temperature	177	0	P0218
Transmission Oil Temperature	177	16	P1129
Engine Speed At Idle, Point 1	188	1	P0506
Engine Speed At Idle, Point 1	188	0	P0507
Engine Speed	190	0	P0219
Transmission Output Shaft Speed	191	5, 6	P0720
Vehicle Identification Number	237	2	U3002
Time	251	10	U3017
Engine Exhaust Gas Recirculation Differential Pressure	411	2, 3, 5, 12, 16, 18	P0409
Engine Exhaust Gas Recirculation Temperature	412	2, 4, 5, 12	P040A
Engine Exhaust Gas Recirculation Temperature	412	0, 15	P1121
Engine Exhaust Gas Recirculation Temperature	412	14, 16	P1122
Transmission Requested Gear	525	31	P117D
Accelerator Pedal 1 Low Idle Switch	558	6	P0651
Accelerator Pedal 1 Low Idle Switch	558	3, 4	P113F
Accelerator Pedal 1 Low Idle Switch	558	5, 12, 20, 21	P1141
Accelerator Pedal 1 Low Idle Switch	558	7	P2136
Engine Start Enable Device 1	626	3, 4, 5	P1002
Program Memory	628	12	P0630
Program Memory	628	0, 11	P3FFF
Program Memory	628	14	U1FFF
Program Memory	628	2	P0607
Engine Position Sensor	636	7	P0016
Engine Position Sensor	636	8, 9	P0340
Engine Timing Sensor	637	2, 8, 9	P0335
J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	639	2	U0010
Engine External Protection Input	640	0, 16	P20FF
Engine Variable Geometry Turbocharger Actuator #1	641	7	P003A P0045
Engine Variable Geometry Turbocharger Actuator #1	641	0, 5, 6, 8, 11, 14	P0045
Engine Variable Geometry Turbocharger Actuator #1	641	3, 4	P006E
Engine Variable Geometry Turbocharger Actuator #1	641	12	P00AF
Engine Variable Geometry Turbocharger Actuator #1	641	16	P112A
Engine Variable Geometry Turbocharger Actuator #1	641	0, 17	P112B
Engine Variable Geometry Turbocharger Actuator #1	641	2, 9	P1148
Engine Variable Geometry Turbocharger Actuator #1	641	18	P114B
Engine Variable Geometry Turbocharger Actuator #1	641	2	P2562
Engine Variable Geometry Turbocharger Actuator #1	641	13	P0045 P259C
Engine Variable Geometry Turbocharger Actuator #1	641	9	P3FFF U010C
Engine Fan Clutch Output Device Driver	647	3, 4, 5	P0480
Engine Injector Cylinder #01	651	3, 4, 5, 7, 11	P0201
Engine Injector Cylinder #01	651	10	P020A P3FFF
Engine Injector Cylinder #01	651	1, 2	P0251
Engine Injector Cylinder #01	651	17	P02CC
Engine Injector Cylinder #01	651	15	P02CD
Engine Injector Cylinder #01	651	9	P3FFF
Engine Injector Cylinder #02	652	3, 4, 5, 7, 11	P0202
Engine Injector Cylinder #02	652	10	P020B P3FFF
Engine Injector Cylinder #02	652	1, 2, 18	P0256
Engine Injector Cylinder #02	652	17	P02CE
Engine Injector Cylinder #02	652	15	P02CF
Engine Injector Cylinder #02	652	9	P3FFF
Engine Injector Cylinder #03	653	3, 4, 5, 7, 11	P0203
Engine Injector Cylinder #03	653	10	P020C P3FFF
Engine Injector Cylinder #03	653	17	P02D0

Description	SPN J1939	FMI	DTC J2012
Engine Injector Cylinder #03	653	15	P02D1
Engine Injector Cylinder #03	653	1, 2	P2A12
Engine Injector Cylinder #03	653	9	P3FFF
Engine Injector Cylinder #04	654	3, 4, 5, 7, 11	P0204
Engine Injector Cylinder #04	654	10	P020D
Engine Injector Cylinder #04	654	17	P02D2
Engine Injector Cylinder #04	654	15	P02D3
Engine Injector Cylinder #04	654	1, 2, 18	P2A16
Engine Injector Cylinder #04	654	9, 10	P3FFF
Engine Injector Cylinder #05	655	3, 4, 5, 7, 11	P0205
Engine Injector Cylinder #05	655	10	P020E P3FFF
Engine Injector Cylinder #05	655	17	P02D4
Engine Injector Cylinder #05	655	15	P02D5
Engine Injector Cylinder #05	655	1, 2	P2A1A
Engine Injector Cylinder #05	655	9	P3FFF
Engine Injector Cylinder #06	656	3, 4, 5, 7, 11	P0206
Engine Injector Cylinder #06	656	10	P020F P3FFF
Engine Injector Cylinder #06	656	17	P02D6
Engine Injector Cylinder #06	656	15	P02D7
Engine Injector Cylinder #06	656	1, 2, 18	P2A1E
Engine Injector Cylinder #06	656	9	P3FFF
Engine Starter Motor Relay	677	3, 4, 5	P0615
Engine Injection Control Pressure Regulator	679	3, 4, 5	P0090
Engine Injection Control Pressure Regulator	679	7	P228D
Engine Inlet Air Heater Driver #1	729	3, 4, 5, 6, 7, 12, 14	P0540
Engine Inlet Air Heater Driver #2	730	4, 5, 6, 7	P2605
Engine Gas Metering Valve	732	7	P2294
Engine Gas Metering Valve	732	15	P229A
Engine Gas Metering Valve	732	17	P229B
Engine Auxiliary Shutdown Switch	970	3, 4, 5, 11, 12, 14	P1001
Fan Drive State	977	0, 1, 3, 5, 12, 13	P028A
Cooling Fan Drive Output	1071	0, 1, 13	P0480
Cooling Fan Drive Output	1071	3, 5, 12	P0483
Engine (Compression) Brake Output #1	1072	3, 4, 5	P1021
Engine (Compression) Brake Output #1	1072	1	P1140
Engine (Compression) Brake Output #2	1073	3, 4, 5	P10C0
Engine (Exhaust) Brake Output	1074	3, 4, 5	P0475
Engine (Compression) Brake Output #3	1112	3, 4, 6, 9	P04D3
Engine Turbocharger 1 Boost Pressure	1127	7	P0045
Engine Turbocharger 1 Boost Pressure	1127	16	P0234
Engine Turbocharger 1 Boost Pressure	1127	18	P0299
Engine Turbocharger 1 Boost Pressure	1127	1	P04D8
Engine Turbocharger 1 Boost Pressure	1127	11	P056E
Engine Turbocharger 1 Boost Pressure	1127	12	P2562
Engine Oil Temperature 2	1135	4, 5, 12	P01B9
Engine ECU Temperature	1136	0, 4, 5, 12	P0666
Engine ECU Temperature	1136	16	P1120
Engine Turbocharger 1 Wastegate Drive	1188	3, 4, 5	P0243
Anti-theft Random Number	1198	9	U0167
Anti-theft Random Number	1198	2	U0426
J1939 Network #2	1231	2	U0001
J1939 Network #3	1235	2	U1178
Engine Fuel Leakage 1	1239	14	P0094
Engine Misfire for Multiple Cylinders	1322	31	P0300
Engine Misfire Cylinder #1	1323	31	P0301
Engine Misfire Cylinder #2	1324	31	P0302
Engine Misfire Cylinder #3	1325	31	P0303
Engine Misfire Cylinder #4	1326	31	P0304
Engine Misfire Cylinder #5	1327	31	P0305
Engine Misfire Cylinder #6	1328	31	P0306
Engine Fuel Pump Pressurizing Assembly #1	1347	7	P0627
Engine Fuel Pump Pressurizing Assembly #2	1348	7	P2632
Auxiliary Pressure #1	1387	0	P3FFF
ECM Main Relay	1485	3, 4, 5	P0685
Fan Speed	1639	3, 7	P0526
Engine Coolant System Thermostat	1659	12	P0128
J1939 Network #4	1668	2	U0080
Engine Starter Mode	1675	0	P1176
Engine Starter Mode	1675	7	P1177
Engine Starter Mode	1675	10	P1178
Engine Starter Mode	1675	14	P1179

Description	SPN J1939	FMI	DTC J2012
Aftertreatment 1 SCR Catalyst Tank Level	1761	17	P1145
Aftertreatment 1 SCR Catalyst Tank Level	1761	12	P203A
Aftertreatment 1 SCR Catalyst Tank Level	1761	18	P203F
Source Address 3	2003	9	P3FFF
Source Address 3	2003	9	U0101
Source Address 16	2016	9	U0129
Source Address 17	2017	9	U0141
Source Address 17	2017	19	U0331
Source Address 23	2023	9	U0155
Source Address 23	2023	19	U0323
Source Address 29	2029	9	P3FFF
Source Address 36	2036	9	U1171
Source Address 47 (Suspension - System Controller #1)	2047	9	U0132
Source Address 55 (Lighting - Operator Controls)	2055	9	U0182
Source Address 61	2061	9	P3FFF
Source Address 61	2061	9	U010E
Source Address 232	2232	9	U0142
Source Address 251	2251	9	U117A
Accelerator Pedal #1 Channel 2	2623	3, 4	P0641
Engine Turbocharger 1 Compressor Outlet Temperature	2629	2, 4, 5	P0110
Engine Turbocharger 1 Compressor Outlet Temperature	2629	16	P111B
Engine Turbocharger 1 Compressor Outlet Temperature	2629	0	P111C
Engine Charge Air Cooler Outlet Temperature	2630	4, 5, 12	P0110
Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate	2659	10, 16, 18	P0400
Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate	2659	17	P04D9
Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate	2659	15	P04DA
Engine Exhaust Gas Recirculation (EGR) Mass Flow Rate	2659	11	P04DD
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	3, 5, 6, 7, 11, 12, 14	P0403
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	3, 4	P041A
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	2	P0486
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	1	P049D
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	17	P114E
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	1, 7, 11, 12	P3FFF
Engine Exhaust Gas Recirculation (EGR) Valve Control	2791	9	U010A
Accelerator Pedal 2 Low Idle Switch	2970	7	P1150
Engine Coolant Diverter Valve	2988	3, 4, 5	P2681
Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	3031	2, 12	P205A
Aftertreatment Diesel Particulate Filter System Monitor	3064	11	P10FE
Aftertreatment Diesel Particulate Filter System Monitor	3064	1	P2002
Aftertreatment Diesel Particulate Filter System Monitor	3064	0	P2463
Aftertreatment Diesel Particulate Filter System Monitor	3064	16	P24A4
Aftertreatment 1 Intake NOx	3216	2, 3, 5, 13, 14	P2200
Aftertreatment 1 Selective Catalytic Reduction Intake Nox	3216	31	P221A
Aftertreatment 1 Selective Catalytic Reduction Intake Nox	3216	20	P225C
Aftertreatment 1 Intake NOx	3216	11	P225D
Aftertreatment 1 Intake NOx	3216	10	P22F9
Aftertreatment 1 Intake NOx	3216	12	P22FB
Aftertreatment 1 Intake NOx	3216	9	P3FFF U029D
Aftertreatment 1 Outlet NOx	3226	31	P1136
Aftertreatment 1 Outlet NOx	3226	10	P2200
Aftertreatment 1 Outlet NOx	3226	20	P225E
Aftertreatment 1 Outlet NOx	3226	7	P225F
Aftertreatment 1 Outlet NOx	3226	2, 3, 5, 13, 14	P229E
Aftertreatment 1 Outlet NOx	3226	12	P22FE
Aftertreatment 1 Outlet NOx	3226	9	P3FFF U029E
Aftertreatment 1 Exhaust Gas Temperature 1	3241	1	P050E
Aftertreatment 1 Exhaust Gas Temperature 1	3241	2, 19	P0544
Aftertreatment 1 Exhaust Gas Temperature 1	3241	0, 16	P2428
Aftertreatment 1 Exhaust Gas Temperature 3	3245	1	P05EB
Aftertreatment 1 Exhaust Gas Temperature 3	3245	2, 19	P242A
Aftertreatment 1 Exhaust Gas Temperature 2	3249	19	P1112
Aftertreatment 1 Exhaust Gas Temperature 2	3249	2	P2031
Aftertreatment 1 Diesel Particulate Filter Differential Pressure	3251	0	P10E1
Aftertreatment 1 Diesel Particulate Filter Differential Pressure	3251	16	P10E2
Aftertreatment 1 Diesel Particulate Filter Differential Pressure	3251	2, 4, 5	P2452
Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	3361	12	P204F P208A
Aftertreatment 1 SCR Catalyst Tank Reagent Quality	3364	2, 12	P206A
Aftertreatment 1 Diesel Exhaust Fluid Tank Quality	3364	17	P207F
Engine Throttle Actuator 1 Control Command	3464	3, 4, 5, 7, 10, 12	P02E0
Engine Throttle Actuator 1 Control Command	3464	11, 14	P3FFF

Description	SPN J1939	FMI	DTC J2012
Engine Fuel Temperature 2	3468	16	P0168
Engine Fuel Temperature 2	3468	2, 4, 5, 12	P0185
Aftertreatment 1 Fuel Pressure 1	3480	3, 5, 12, 2	P20DD
Aftertreatment 1 Fuel Rate	3481	1	P24A0
Aftertreatment 1 Fuel Rate	3481	0	P24A1
Aftertreatment 1 Fuel Enable Actuator	3482	4, 5, 7	P20D7
Aftertreatment 1 Purge Air Actuator	3490	4, 5, 7, 12	P1134
Aftertreatment 1 Purge Air Actuator	3490	3	P3FFF
Sensor supply voltage 1	3509	3, 4	P06B0
Sensor supply voltage 2	3510	3, 4	P06B3
Sensor supply voltage 3	3511	3, 4	P06E6
Aftertreatment 1 Total Fuel Used	3522	18	P20F4
Aftertreatment 1 Total Fuel Used	3522	16	P20F5
Aftertreatment Fuel Injector 1	3556	13	P20CB
Aftertreatment Fuel Injector 1	3556	1, 4, 5, 7, 12	P2697
Engine Injector Cylinder #1 Actuator 2	3659	3, 5	P22D9
Engine Injector Cylinder #2 Actuator 2	3660	3, 5	P22DD
Engine Injector Cylinder #3 Actuator 2	3661	3, 5	P22E1
Engine Injector Cylinder #4 Actuator 2	3662	3, 5	P22E5
Engine Injector Cylinder #5 Actuator 2	3663	3, 5	P22E9
Engine Injector Cylinder #6 Actuator 2	3664	3, 5	P22ED
Engine Turbocharger Compressor Bypass Actuator Position	3675	3, 4, 5, 7	P3FFF
Aftertreatment Diesel Particulate Filter Regeneration Inhibit	3695	9	P1155
Diesel Particulate Filter Regeneration Inhibit Switch	3695	0	P3FFF
Diesel Particulate Filter Active Regeneration Inhibited Due to Low	3711	31	P244C
Diesel Particulate Filter Active Regeneration Inhibited Due to	3713	31	P249F
Aftertreatment Diesel Particulate Filter System	3936	1	P244A
Aftertreatment Diesel Particulate Filter System	3936	0	P244B
Engine Remote Start	4002	4, 5, 7	P1105
Engine Remote Start	4002	3, 12	P1143 P1105
NOx limits exceeded, root cause unknown	4090	31	P2BAD
NOx limits exceeded due to Deactivation of EGR	4091	31	P2BAC
NOx limits exceeded due to Incorrect EGR flow	4092	31	P2BAB
NOx limits exceeded due to Low Reagent Consumption	4093	31	P2BAA
NOx limits exceeded due to Insufficient Reagent Quality	4094	1	P2062 P207F
NOx limits exceeded due to Insufficient Reagent Quality	4094	31	P2BA9
NOx limits exceeded due to Interrupted Reagent Dosing	4095	31	P2BA8
NOx limits exceeded due to Interrupted Reagent Dosing	4095	7	P3FFF
NOx limits exceeded due to Empty Reagent Tank	4096	31	P2BA7
Fan Drive Bypass Command Status	4212	3, 4, 5	P117F
NOx limits exceeded due to error in the NOx control system	4225	31	P2BAE
Transmission Requested Launch Gear	4255	31	P117E
Aftertreatment 1 SCR Feedback Control Status	4339	0	P249D
Aftertreatment 1 SCR Feedback Control Status	4339	1	P249E
Aftertreatment 1 SCR Conversion Efficiency	4364	1	P117A
Aftertreatment 1 SCR Conversion Efficiency	4364	17	P20EE
Engine Exhaust Gas Recirculation (EGR) Cooler Efficiency	4752	7	P2457
Engine Oil Pressure in Piston Cooling Gallery	4811	2, 3, 5, 12	P055A
Engine Oil Pressure in Piston Cooling Gallery	4811	18	P1128
Engine Oil Pressure in Piston Cooling Gallery	4811	1	P25AE
Engine Piston Cooling Oil Supply Valve Command	4812	3, 4, 5, 7	P25A9
Engine Oil Thermostat Bypass Valve Opening	4813	3, 4, 5	P1137
Engine Coolant Pump command	4814	3, 4, 5	P2600
Engine Cooling Fan Thermal Switch	4815	3, 5	P1142
Aftertreatment 1 Diesel Oxidation Catalyst System	5018	1	P0420
Not available in J1939 Rev. 2Q2008	5246	0, 15, 16	P10C1
Engine Charge Air Cooler 1 Efficiency	5285	18	P026A
Aftertreatment 1 Diesel Particulate Filter NMHC Conversion	5310	1	P3FFF
Aftertreatment 1 Diesel Particulate Filter	5319	31	P24A2
Engine Fuel Injection Quantity Error for Multiple Cylinders	5357	17	P026C
Engine Fuel Injection Quantity Error for Multiple Cylinders	5357	15	P026D
Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve	5394	12	P2047
Engine Idle Fuel Quantity	5395	1	P054E
Engine Idle Fuel Quantity	5395	0	P054F
Engine Crankcase Ventilation Hose Disconnected	5396	7	P04DB
Aftertreatment 1 Diesel Particulate Filter Regeneration too	5397	31	P2459
Engine Exhaust Gas Recirculation 1 Actuator 1 Temperature	5765	10	P041A
Fuel Pressure Relief Valve	520244	14	P000F
Fuel Pressure Relief Valve	520244	3, 4, 5, 7	P009B
Fuel Pressure Relief Valve	520244	12	P018F
Fuel Pressure Regulator Closed Loop Operation	520245	0	P016E

Description	SPN J1939	FMI	DTC J2012
Fuel Pressure Regulator Closed Loop Operation	520245	1	P016F
Fuel Pressure Regulator Closed Loop Operation	520245	18	P228E
Fuel Pressure Regulator Closed Loop Operation	520245	16	P228F
Body Control Module "A" Lost Communication With Instrument	520298	9	P1154
Aftertreatment System Temperature	520330	0	P1151
Water In Fuel Drainage Valve	520331	3, 4, 5	P1017
Fuel Priming Pump	520332	3, 4, 5	P1152
Diesel Rail Drain Valve	520333	3, 4, 5, 7, 12	P1184
Engine Control Module Internal Battery Potential Sensor	520335	5	U3000
Starter Relay Circuit High Side	520395	3, 4, 5	P1144
Engine Compartment Thermal Switch	520408	3, 4, 5	P117B
Turbo Compound Buffer Air Pressure Sensor	520409	2, 3, 5, 12	P113B
Turbo Compound Buffer Air Valve Control	520410	4, 5	P113E
Lost Communication with TCM on High Speed CAN	520414	9	U116B
Lost Communication with TCM on Powertrain CAN	520415	9	U116C
Lost Communication with Reductant Control Module on Engine	520416	9	U116F
Lost Communication with Body Control Module on High Speed	520417	9	U1171
Lost Communication with IPC Control Module on High Speed CAN	520419	9	U1173
Lost Communication With Hybrid/EV Powertrain Control Module	520430	9	U0293
Lost Communication With Hybrid/EV Motor Control Module on	520431	9	U1176
Lost Communication With Cruise Control Module on High Speed	520433	9	U1169
Lost Communication With Cab I/O Module on High Speed CAN	520434	9	U1166
Low Range Authorization Valve	520551	3, 4, 5	P1173
Gate Interlock Valve	520552	3, 4, 5	P101E
Return Diesel Pressure Sensor	520553	0	P2A40
Engine Gaseous Fuel Shut off valve	520555	3, 4, 7	P2665
Gas Vent System - Diesel Evacuation Pump	520556	3, 4, 5, 7	P1188
Gas Vent System - Diesel Level Sensor	520557	3, 4, 5, 12	P118A
	520999	9	P3FFF
	520999	9	U1179
	520999	9	U117B
Return Diesel Pressure Sensor	520553	2, 3, 5, 12	P018A
Engine Compartment Thermal Switch	520408	12	P117B
Turbo Compound Buffer Air Valve Control	520410	3	P113E
Lost Communication with Reductant Control Module on	520436	9	U117C
Excessive Time to Enter Alternative Fuel Control	520554	11	P2A3F
Maximum of Engine Restarts Requested from Electrical Vehicle	520563	31	P06EF
Aftertreatment 1 Particulate Sensor	5835	2, 3, 5	P24AE
Aftertreatment 1 Particulate Sensor	5835	9	U02A3

11.2 TRANSMISSION EXPLICIT DTC LIST

(DTC description not to be displayed)

Allison DTC Description	SPN J1939	FMI	DTC J2012
Unexpected Mechanical Gear Disengagement	36	7	P0894
Shift Fork Position Circuit Performance	60	2	P2832
Shift Fork Position Circuit High	60	3	P2834
Shift Fork Position Circuit Low	60	4	P2833
Pedal Position Sensor Circuit High Voltage	91	3	P0123
Pedal Position Sensor Circuit Low Voltage	91	4	P0122
Throttle Position Sensor PWM Signal High	91	8	P1892
Throttle Position Sensor PWM Signal Low	91	8	P1891
Engine Coolant Temperature Sensor 2 Circuit High	110	3	P2185
Engine Coolant Temperature Sensor 2 Circuit Low	110	4	P2184
RELS Input Failed On	116	21	P071A
Retarder Pressure Sensor Circuit High	119	3	P0990
Retarder Pressure Sensor Circuit Low	119	4	P0989
Retarder Oil Temperature Sensor Circuit High	120	3	P2743
Retarder Oil Temperature Sensor Circuit Low	120	4	P2742
Retarder Oil Temperature Sensor Over Temperature Condition	120	15	P273F
System Voltage Low	158	4	P0562
Countershaft Speed Sensor Performance	160	2	P1902
Countershaft Speed Sensor Circuit	160	4	P1901
Countershaft Speed Sensor No Activity	160	21	P1903
TCM Power Input Signal Performance	168	2	P0881
TCM Power Input Signal High	168	3	P0883
TCM Power Input Signal Low	168	4	P0882
TCM Power Input Signal	168	14	P0880
Transmission Fluid Temperature Sensor Circuit Performance	177	2	P0711
Transmission Fluid Temperature Sensor Circuit High	177	3	P0713
Transmission Fluid Temperature Sensor Circuit Low	177	4	P0712
Transmission Fluid Over Temperature Condition	177	15	P0218
Engine Speed Sensor Circuit Performance	190	2	P0726
Engine Speed Sensor Circuit	190	14	P0725
Engine Speed Sensor Circuit No Signal	190	21	P0727
Output Shaft Speed Sensor Circuit Performance	191	2	P0721
Output Shaft Speed Sensor Circuit	191	14	P0720
Output Shaft Speed Sensor Circuit No Signal	191	21	P0722
Torque Management Feedback Signal A	513	7	P2637
Torque Management Feedback Signal B	513	7	P2641
Torque Converter Clutch (TCC) System Stuck Off	573	21	P0741
Brake Switch Circuit	597	2	P0703
Control Module Random Access Memory (RAM)	628	31	P0604
TCM Not Programmed	630	13	P0602
Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High	740	3	P2763
Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low	740	4	P2764
Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit/Open	740	5	P2761
Torque Control Data Mismatch - ECM/TCM	747	31	P0614
Turbine Shaft Speed Sensor Circuit Performance	750	2	P0716
Turbine Shaft Speed Sensor Circuit	750	14	P0715
Turbine Shaft Speed Sensor Circuit No Signal	750	21	P0717
Gear Shift Module 1 Invalid Data	751	2	U0404
Gear Shift Direction Circuit	751	8	P2793
Lost Communication with Gear Shift Module 1	751	9	U0103
Gear Shift Module 1 Calibration Invalid	751	13	P1790
Transmission Range Sensor Circuit High	751	14	P0708
Gear Shift Module 1 Incompatible	751	31	U0304
Gear Shift Module 2 Invalid Data	752	2	U0592
Lost Communication with Gear Shift Module 2	752	9	U0291
Gear Shift Module 2 Calibration Invalid	752	13	P1791
Gear Shift Module 2 Incompatible	752	31	U0333
General Purpose Input Fault	753	2	P071D
Transmission Control System Performance	785	14	P0701
Conditioned Output Shaft Speed Circuit	837	2	P1870
Retarder Request Sensor Circuit High	1716	3	C1313
Retarder Request Sensor Circuit Low	1716	4	C1312

Allison DTC Description	SPN J1939	FMI	DTC J2012
Lost Communications with ECM A	2000	9	U0100
Transmission Range Sensor Circuit Performance	2003	11	P0706
Four Wheel Drive (4WD) Switch Circuit Range/Performance	2796	2	P0837
Crank Enable Circuit High	2900	3	P081B
Main Pressure Modulation Solenoid System Performance	2908	2	P0961
Main Pressure Modulation Solenoid Control Circuit High	2908	3	P0963
Main Pressure Modulation Solenoid Control Circuit Low	2908	4	P0962
Main Pressure Modulation Solenoid Control Circuit Open	2908	5	P0960
Transmission Fluid Level Sensor Circuit High	3027	3	P070D
Transmission Fluid Level Sensor Circuit Low	3027	4	P070C
Transmission Filter Maintenance Required	3359	1	P088B
Transmission Filter Maintenance Alert	3359	16	P088A
Sensor Reference Voltage "A" Circuit High	3509	3	P0643
Sensor Reference Voltage "A" Circuit Low	3509	4	P0642
Sensor Reference Voltage "B" Circuit High	3510	3	P0653
Sensor Reference Voltage "B" Circuit Low	3510	4	P0652
Transmission Fluid Deteriorated	4177	1	P0897
Trans. Clutch Life Expired (Clutch Adaptive Learning At Limit)	4178	31	P2789
Incorrect Low Gear Ratio	5876	2	P1739
Incorrect 1st Gear Ratio	5877	2	P0731
Incorrect 2nd Gear Ratio	5878	2	P0732
Incorrect 3rd Gear Ratio	5879	2	P0733
Incorrect 4th Gear Ratio	5880	2	P0734
Incorrect 5th Gear Ratio	5881	2	P0735
Incorrect 6th Gear Ratio	5882	2	P0729
Incorrect 7th Gear Ratio	5883	2	P076F
Incorrect 8th Gear Ratio	5884	2	P07D9
Incorrect 9th Gear Ratio	5885	2	P07F6
Incorrect 10th Gear Ratio	5886	2	P07F7
Incorrect Reverse Ratio	5887	2	P0736
Incorrect Reverse 2 Ratio	5888	2	P077F
Transmission Fluid Pressure Switch 1 Circuit High	5891	3	P0843
Transmission Fluid Pressure Switch 1 Circuit Low	5891	4	P0842
Transmission Fluid Pressure Switch 2 Circuit High	5892	3	P0848
Transmission Fluid Pressure Switch 2 Circuit Low	5892	4	P0847
Transmission Fluid Pressure Switch 3 Circuit High	5893	3	P0873
Transmission Fluid Pressure Switch 3 Circuit Low	5893	4	P0872
Transmission Fluid Pressure Switch 4 Circuit High	5894	3	P0878
Transmission Fluid Pressure Switch 4 Circuit Low	5894	4	P0877
Transmission Fluid Pressure Switch 5 Circuit High	5895	3	P0995
Transmission Fluid Pressure Switch 5 Circuit Low	5895	4	P0994
Transmission Fluid Pressure Switch 6 Circuit High	5896	3	P083D
Transmission Fluid Pressure Switch 6 Circuit Low	5896	4	P083C
Transmission Fluid Pressure Switch A Circuit High	5897	3	P1923
Transmission Fluid Pressure Switch A Circuit Low	5897	4	P1922
Transmission Fluid Pressure Switch B Circuit High	5898	3	P1928
Transmission Fluid Pressure Switch B Circuit Low	5898	4	P1927
Transmission Fluid Pressure Switch C Circuit High	5899	3	P192D
Transmission Fluid Pressure Switch C Circuit Low	5899	4	P192C
Pressure Control Solenoid (PCS) 1 Control Circuit High	5900	3	P2730
Pressure Control Solenoid (PCS) 1 Control Circuit Low	5900	4	P2729
Pressure Control Solenoid (PCS) 1 Control Circuit Open	5900	5	P2727
Pressure Control Solenoid (PCS) 1 Stuck On	5900	20	P2724
Pressure Control Solenoid (PCS) 1 Stuck Off	5900	21	P2723
Pressure Control Solenoid (PCS) 2 Control Circuit High	5901	3	P0967
Pressure Control Solenoid (PCS) 2 Control Circuit Low	5901	4	P0966
Pressure Control Solenoid (PCS) 2 Control Circuit Open	5901	5	P0964
Pressure Control Solenoid (PCS) 2 Stuck On	5901	20	P0777
Pressure Control Solenoid (PCS) 2 Stuck Off	5901	21	P0776
Pressure Control Solenoid (PCS) 3 Control Circuit High	5902	3	P0971
Pressure Control Solenoid (PCS) 3 Control Circuit Low	5902	4	P0970
Pressure Control Solenoid (PCS) 3 Control Circuit Open	5902	5	P0968
Pressure Control Solenoid (PCS) 3 Stuck On	5902	20	P0797
Pressure Control Solenoid (PCS) 3 Stuck Off	5902	21	P0796
Pressure Control Solenoid (PCS) 4 Control Circuit High	5903	3	P2721
Pressure Control Solenoid (PCS) 4 Control Circuit Low	5903	4	P2720
Pressure Control Solenoid (PCS) 4 Control Circuit Open	5903	5	P2718

Allison DTC Description	SPN J1939	FMI	DTC J2012
Pressure Control Solenoid (PCS) 4 Stuck On	5903	20	P2715
Pressure Control Solenoid (PCS) 4 Stuck Off	5903	21	P2714
Pressure Control Solenoid (PCS) 5 Control Circuit High	5904	3	P2739
Pressure Control Solenoid (PCS) 5 Control Circuit Low	5904	4	P2738
Pressure Control Solenoid (PCS) 5 Control Circuit Open	5904	5	P2736
Pressure Control Solenoid (PCS) 5 Stuck On	5904	20	P2733
Pressure Control Solenoid (PCS) 5 Stuck Off	5904	21	P2732
Pressure Control Solenoid (PCS) 6 Control Circuit High	5905	3	P2815
Pressure Control Solenoid (PCS) 6 Control Circuit Low	5905	4	P2814
Pressure Control Solenoid (PCS) 6 Control Circuit Open	5905	5	P2812
Pressure Control Solenoid (PCS) 6 Stuck On	5905	20	P2809
Pressure Control Solenoid (PCS) 6 Stuck Off	5905	21	P2808
Shift Solenoid 1 Control Circuit High	5908	3	P0974
Shift Solenoid 1 Control Circuit Low	5908	4	P0973
Shift Solenoid 1 Control Circuit Open	5908	5	P097A
Shift Solenoid 1 Valve Performance - Stuck On	5908	20	P0752
Shift Solenoid 1 Valve Performance - Stuck Off	5908	21	P0751
Shift Solenoid 2 Control Circuit High	5909	3	P0977
Shift Solenoid 2 Control Circuit Low	5909	4	P0976
Shift Solenoid 2 Control Circuit Open	5909	5	P097B
Shift Solenoid 2 Valve Performance - Stuck On	5909	20	P0757
Shift Solenoid 2 Valve Performance - Stuck Off	5909	21	P0756
Shift Solenoid 3 Control Circuit High	5910	3	P0980
Shift Solenoid 3 Control Circuit Low	5910	4	P0979
Shift Solenoid 3 Control Circuit Open	5910	5	P097C
Shift Solenoid 3 Valve Performance - Stuck On	5910	20	P0762
Shift Solenoid 3 Valve Performance - Stuck Off	5910	21	P0761
TCM Internal Temperature Too High	5912	0	P0634
CAN Communication Bus 1 Off	6597	9	U0073
CAN Communication Bus 2 Off	6598	9	U0074
Actuator Supply Circuit Voltage 4 High (HSD 4)	521216	3	P26E9
Actuator Supply Circuit Voltage 4 Low (HSD 4)	521216	4	P26E8
Actuator Supply Circuit Voltage 4 Open (HSD 4)	521216	5	P26E7
Shift Fork Stuck Moving to Forward Position	521217	3	P2849
Shift Fork Stuck Moving to Reverse Position	521217	4	P1907
Shift Fork Unrequested Movement	521217	5	P284D
Transmission Fluid Pressure Switch TCC Circuit High	521218	5	P084D
Transmission Fluid Pressure Switch TCC Circuit Low	521218	3	P084C
Control Module Performance	521218	4	P0607
Actuator Supply Circuit Voltage 1 High (HSD 1)	521219	3	P0659
Actuator Supply Circuit Voltage 1 Low (HSD 1)	521219	4	P0658
Actuator Supply Circuit Voltage 1 Open (HSD 1)	521219	5	P0657
Actuator Supply Circuit Voltage 2 High (HSD 2)	521220	12	P2671
Actuator Supply Circuit Voltage 2 Low (HSD 2)	521221	7	P2670
Actuator Supply Circuit Voltage 2 Open (HSD 2)	521222	7	P2669
Actuator Supply Circuit Voltage 3 Open (HSD 3)	521223	7	P2684
Actuator Supply Circuit Voltage 3 High (HSD 3)	521224	3	P2686
Actuator Supply Circuit Voltage 3 Low (HSD 3)	521224	4	P2685

11.3 UDS EXPLICIT DTC LIST

(DTC description not to be displayed) **SA for UDS is 61 (3D)**

Description	SPN J1939	FMI	DTC J2012
Fuel Level 2	38	1, 2	P3FFF
Fuel Level 1	96	1, 2	P3FFF
Hydraulic Retarder Pressure	119	0, 2, 3, 5, 12	P107E
Hydraulic Retarder Oil Temperature	120	0, 4, 5, 12	P107C
Keyswitch Battery Potential	158	16, 18	P0560
Engine Gas Supply Pressure	159	2, 3, 5, 12, 18	P3FFF
Engine Fuel Temperature 1	174	3, 4, 5	P3FFF
Auxiliary Temperature 1	441	3, 4, 5, 7, 12	P3FFF
Controller #2	609	2, 3, 4, 8, 9, 10, 11, 12, 13, 14	P3FFF
Program Memory	628	0, 13, 14	P0607
Program Memory	628	12	P0630 P0607
Program Memory	628	14	P1097
Controller #1	629	2, 3, 4, 8, 9, 10, 11, 12, 13, 14	P3FFF
Calibration Module	631	2, 3, 8	P0607
Calibration Module	631	11	U0301
Engine Fuel Shutoff 1 Control	632	7	P3FFF
J1939 Network #1, Primary Vehicle	639	2, 9	U0010
Auxiliary I/O #01	701	3, 4, 5	P3FFF
Retarder Modulation Solenoid Valve	744	3, 4, 5	P107D
Internal Sensor Voltage Supply	1043	3, 4	P06E6
Engine ECU Temperature	1136	4, 5, 12	P0666
Engine Exhaust Gas Port 6	1142	3, 4, 5, 7	P3FFF
Engine Exhaust Gas Port 7	1143	3, 4, 5, 7	P3FFF
J1939 Network #2	1231	2	P3FFF U0001
J1939 Network #3	1235	9	P3FFF
J1939 Network #3	1235	2	U0028
Engine Fuel Pump Pressurizing	1347	3, 4, 5, 7, 8, 11, 14	P3FFF
Engine Fuel Pump Pressurizing	1348	3, 4, 5, 7, 8, 11, 14	P3FFF
Engine Torque Limit Feature	1632	14	P3FFF
J1939 Network #4	1668	2	U0037 U0080
Aftertreatment 1 Diesel Exhaust Fluid	1761	3, 4, 5, 12	P203A
Aftertreatment 1 Diesel Exhaust Fluid	1761	15, 16, 17, 18	P3FFF
Hydraulic Pressure	1762	2, 3, 5, 11, 12, 14	P3FFF
Source Address 0	2000	9	U0100
Source Address 17	2017	9	U0141
Source Address 23	2023	9	U0155
Source Address 28	2028	9	U0122
Source Address 74	2074	9	U012A
Engine Fuel Shutoff 2 Control	2807	7	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	3031	1, 2, 4, 5, 8, 12, 15, 17	P205A
Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	3031	0	P24FF P205A
Aftertreatment Diesel Particulate	3064	14	P3FFF
Aftertreatment 1 Selective Catalytic	3216	0, 1	P2200
Aftertreatment 1 Exhaust Gas	3241	5, 12	P0544
Aftertreatment 1 Exhaust Gas Temperature 1	3241	0, 1, 4	P0544 P3FFF
Aftertreatment 1 Exhaust Gas	3241	2, 3, 14, 15, 16, 17, 18	P3FFF
Aftertreatment 1 Diesel Particulate	3242	0, 1, 2, 3, 4, 16, 18	P3FFF
Aftertreatment 1 Exhaust Gas	3245	4, 5, 12	P242A
Aftertreatment 1 Exhaust Gas	3247	4, 5	P3FFF
Aftertreatment 1 Exhaust Gas	3249	4, 5, 12	P2031
Aftertreatment 1 Diesel Particulate	3251	3, 4, 5	P2452
Aftertreatment 1 Diesel Particulate	3251	0, 1, 2, 13, 16, 18	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	3360	9	U02A2
Aftertreatment 1 Diesel Exhaust Fluid	3363	3, 4, 5, 7, 11, 14	P20B1
Engine Fuel Temperature 2	3468	3, 4, 5	P3FFF
Aftertreatment 1 Air Pressure Control	3472	3, 4, 5, 7, 14	P20A6

Description	SPN J1939	FMI	DTC J2012
Aftertreatment 1 Supply Air Pressure	3485	2, 3, 4, 5, 12	P2037
Aftertreatment 1 Supply Air Pressure	3485	14	P20CA
Aftertreatment 1 Supply Air Pressure	3485	7	P20E7
Aftertreatment 1 Air Enable Actuator	3489	11	P3FFF
Sensor supply voltage 1	3509	3, 4	P06B0
Sensor supply voltage 2	3510	3, 4	P06B3
Sensor supply voltage 3	3511	3, 4	P06B0
Sensor supply voltage 4	3512	3, 4	P06B3
Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	3515	0, 1	P2042 P24D2
Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	3515	15, 16, 17, 18	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	3519	4, 5	P205A
Aftertreatment 1 Diesel Exhaust Fluid	3520	2, 4, 5, 9, 12, 13, 19	P206A
Aftertreatment 1 Diesel Exhaust Fluid	3521	14	P207F
Aftertreatment 1 Diesel Exhaust Fluid	3532	4, 5	P203A
ECU Power Output Supply Voltage #1	3597	3, 4, 5	P0657
ECU Power Output Supply Voltage #2	3598	3, 4, 5	P2669
ECU Power Output Supply Voltage #3	3599	3, 4, 5	P2684
Aftertreatment Diesel Particulate	3695	12	P2458
Aftertreatment Diesel Particulate	3695	9	P2533
Aftertreatment 1 Diesel Particulate	3719	0, 16, 17	P3FFF
Aftertreatment Diesel Particulate	3936	13	P3FFF
NOx limits exceeded due to	4094	18	P207F
NOx limits exceeded due to	4094	1	P2BA9
Aftertreatment 1 Diesel Exhaust Fluid	4331	13	P20E9
Aftertreatment 1 Diesel Exhaust Fluid	4334	0, 1, 2, 3, 4, 5, 11, 12	P204A
Aftertreatment 1 Diesel Exhaust Fluid	4334	15, 17	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	4337	2, 4, 5, 8	P2042
Aftertreatment 1 Diesel Exhaust Fluid	4342	0, 1	P0429
Aftertreatment 1 Diesel Exhaust Fluid	4342	2, 3, 4, 5, 15, 16, 17, 18	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	4346	3, 4, 5	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	4354	3, 4, 5	P20B9
Aftertreatment 1 Diesel Exhaust Fluid	4355	3, 4, 5	P20BD
Aftertreatment 1 Diesel Exhaust Fluid	4356	3, 4, 5	P20C1
Aftertreatment 1 Diesel Exhaust Fluid	4357	3, 4, 5	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	4366	14	P20B9
Aftertreatment 1 Diesel Exhaust Fluid	4374	0	P202D
Aftertreatment 1 Diesel Exhaust Fluid	4374	1	P208A
Aftertreatment 1 Diesel Exhaust Fluid	4375	0, 1, 12	P10AD
Aftertreatment 1 Diesel Exhaust Fluid	4375	3, 4, 5	P208A
Aftertreatment 1 Diesel Exhaust Fluid	4375	14	P21CA
Aftertreatment 1 Diesel Exhaust Fluid	4376	7, 11, 14	P20A0
Aftertreatment 1 Diesel Exhaust Fluid Return Valve	4376	3, 4, 5	P3FFF P20A0
Aftertreatment 1 Diesel Oxidation	4766	2, 11, 13, 14, 16	P3FFF
ECU Power Output Supply Voltage #4	5016	3, 4, 5	P26E7
Aftertreatment SCR Operator	5246	11, 14	P20EE
Aftertreatment 1 Diesel Particulate	5319	12	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	5392	31	P20E8
Aftertreatment 1 Diesel Exhaust Fluid	5392	14	P218F
Aftertreatment 1 Diesel Exhaust Fluid	5394	3, 4, 5, 14	P2047
Aftertreatment 1 Diesel Exhaust Fluid	5435	14	P204F
Engine Fuel Valve 1 Operation Status	5447	3, 4, 5, 7	P3FFF
Aftertreatment 1 Diesel Exhaust Fluid	5485	14	P10CE
Retarder Coolant Outlet Temperature	5656	4, 5, 12	P107B
Retarder Coolant Outlet Temperature	5656	16	P109A
Retarder Coolant Outlet Temperature	5656	0	P109B
	64831	0, 1	P047A
	64831	3, 4	P3FFF
	520343	2	P3FFF
	520381	12	P3FFF
Lost Communication With EECU on	520413	9	U1146
Aftertreatment 1 Diesel Exhaust Fluid	1761	0, 1	P203A
Aftertreatment 1 Diesel Exhaust Fluid	1761	13, 14	P204F
Aftertreatment 1 Outlet NOx	3226	20	P229E
Aftertreatment 1 Air System Relay	3492	12, 7	P3FFF

Description	SPN J1939	FMI	DTC J2012
	520343	3, 4, 5, 12	P3FFF
	520344	4, 5	P1094
	520381	2, 13, 12	P3FFF

12. APPENDIX C

12.1 System Configuration:

The system contains in EEPROM memory flags on an integer for selecting parameters in the following table :

- Software Part Numbers Breakdown as follows :
  - 117170 : English Version

Bits of the integer (Bit0 = LSB)	Designation (On when bit is set to 1)	Default value after EEPROM Reset
Bit0	Available	Available
Bit1	Engine Hours Seen on Main Screen	Seen (1)
Bit2	Available	Available
Bit3	Available	Available
Bit4	Available	Available
Bit5	Available	Available
Bit6	Available	Available
Bit7	Available	Available
Bit8	Available	Available
Bit9	Available	Available
Bit10	Metric (1) English (0) Units	English (0)
Bit11	Available	Available
Bit12	Available	Available
Bit13	Available	Available
Bit14	Available	Available
Bit15	Available	Available