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BBA3 Instrument Panel Service Manual

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REVISION TRACKING SHEET

Rev	Modified	Date	Comment
A	R. Parks	11-16-04	Original Release
B	R. Parks	06-28-05	Updated to current software functionality
C	R. Parks	07-07-05	Updated for changes in the functionality of the speed detect output
D	R. Parks	07-19-05	Updated for changes in the functionality of the alternator and engine door messages.

Table of Content

1. PART NUMBERS AND FEATURES.....	6
1.1. DASH PANEL:.....	6
1.2. SERVICE PARTS:	6
2. ELEMENTS	7
3. INPUTS AND OUTPUTS	8
3.1.1. Connectors:.....	8
3.1.2. J1 - Speedometer power/communication connector	8
3.1.3. J2 - Speedometer I/O connector (inputs & outputs).....	9
3.1.4. J3 - Speedometer Slave connector (communication, power supply).....	9
3.1.5. Warning Module Binary Input connector	10
3.1.6. Switch Harness Connections.....	10
OPERATION	11
3.2. DISPLAY ODOMETER & CLOCK.....	11
3.3. TURN SIGNAL/HAZARD WARNING LIGHTS	11
3.4. START-UP MODE	11
3.4.1. Gauges	11
3.4.2. LCD.....	11
3.4.3. Warning Lights	11
3.4.4. Communication.....	11
3.4.5. Audible Alarm.....	11
3.5. TURN-OFF	12
3.6. SELF-DIAGNOSTIC MODE.....	12
4. IGNITION MODE.....	12
4.1. GAUGE DISPLAY	12
4.1.1. Master Gauge – Speedometer.....	12
4.1.2. Tachometer / Clock.....	12
4.1.3. Coolant temperature	12
4.1.4. Oil Pressure	12
4.1.4.1. Cummins.....	12
4.1.4.2. John Deere & CAT	12
4.1.5. Fuel gauge	13
4.1.5.1. Cummins & CAT.....	13
4.1.5.2. John Deere	13
4.1.6. Voltmeter.....	13
4.1.6.1. Cummins & CAT.....	13
4.1.6.2. John Deere	13
4.1.7. Ammeter	13
4.1.8. Front Air Gauge.....	13
4.1.9. Rear Air Gauge.....	13
4.1.10. Transmission temperature.....	13
4.2. APPLIED AIR FEATURE.....	13
4.2.1. Applied Front Air Gauge	14
4.2.2. Applied rear Air Gauge	14
4.3. BACKLIGHTING	14
4.4. GAUGES INTERNAL WARNING INDICATORS	14
4.4.1. Low Oil Pressure	14
4.4.2. High Coolant Temperature	14

4.4.3. High Transmission Temperature	14
4.4.4. Low Fuel Level.....	14
4.4.5. Low Air Pressure - Front.....	14
4.4.6. Low Air Pressure - rear	15
4.4.7. Low/High Battery voltage.....	15
4.4.8. Low Applied Air Pressure - Front.....	15
4.4.9. Low Applied Air Pressure - rear.....	15
4.5. WARNING BANK INDICATORS	15
4.5.1. Left Turn	15
4.5.2. Right Turn.....	15
4.5.3. Park Brake.....	15
4.5.4. High Beam.....	15
4.5.5. Stop Engine.....	15
4.5.6. Wait to Start.....	15
4.5.6.1. CAT	15
4.5.6.2. Cummins.....	16
4.5.7. Check Transmission.....	16
4.5.8. Range Inhibit	16
4.5.9. ABS	16
4.5.10. High Hydraulic oil temperature.....	16
4.5.11. Retarder.....	16
4.5.12. Stop Light.....	16
4.5.13. Hydraulic brake failure.....	16
4.5.14. Low coolant level.....	16
4.5.15. High Transmission Temperature	16
4.5.16. Sanders Refill.....	16
4.5.17. Engine Warning.....	17
4.5.18. Maintenance Indicator Lamp.....	17
4.6. AUDIBLE ALARM	17
4.7. BINARY OUTPUTS	18
4.7.1. Speed Detect	18
4.7.2. Lift Authorization.....	19
5. COMMUNICATION	20
5.1. PLUG AND PLAY FUNCTION	20
5.2. COMMUNICATION ERRORS.....	20
5.3. MESSAGES SENT.....	20
5.3.1. Service Brake.....	20
5.3.2. Throttle Interlock.....	20
5.3.3. Brake Interlock	21
5.4. J1939 TABLE OF MESSAGES	22
6. MESSAGE DISPLAY CENTER.....	23
6.1. DRIVE MODE SCREEN.....	23
6.2. ODOMETER.....	23
6.2.1. Accuracy.....	24
6.2.2. Normal Shutdown	24
6.2.3. Abnormal shutdown.....	24
6.2.4. Durability.....	25
6.2.5. Error Recovery	25
6.2.6. Maximum Reading.....	25
6.2.7. Service Programming	25
6.2.8. Service Gauges	25
6.3. TRIP ODOMETER.....	25
6.4. PRIORITY MESSAGES	26

6.4.1. Eng Comm Failure.....	26
6.4.2. Trans Comm Failure.....	26
6.4.3. Alternator.....	26
6.4.4. Lift Not Stowed.....	26
6.4.5. Battery Voltage Error.....	26
6.4.6. Vehicle speed Error.....	26
6.4.7. Turn signal ON.....	26
6.4.8. Water in Fuel.....	26
6.4.9. Headlight Alert.....	27
6.4.10. Engine Door Open.....	27
6.5. SECOND LINE DISPLAY SELECTION.....	27
6.5.1. Cummins & CAT.....	27
6.5.2. John Deere.....	28
6.6. SETTINGS AND DIAGNOSTIC.....	29
6.6.1. Set Units.....	29
6.6.2. Contrast.....	29
6.6.3. Read Parameters.....	30
6.6.3.1. Cummins & CAT.....	30
6.6.3.2. John Deere.....	31
6.6.4. Instrument Diagnostics.....	31
6.6.4.1. Gauge Test.....	32
6.6.4.2. Lamp Test.....	32
6.6.4.3. LCD Test.....	32
6.6.4.4. Binary Inputs.....	33
6.6.4.5. Analog Inputs (Cummins).....	33
6.6.4.6. Analog Inputs (CAT).....	34
6.6.4.7. Analog Inputs (John Deere).....	34
6.6.4.8. Data Link.....	35
6.6.4.9. Engine Diagnostic.....	35
6.6.4.10. Trans Diagnostic.....	35
6.7. SETUP MENU.....	36
6.7.1. Trip.....	36
6.7.2. Default Parameter.....	36
6.7.3. Self Test.....	36
6.7.4. Transmission Diagnostics.....	37
6.7.5. Test Panel.....	37
6.7.6. Manual Transmission.....	37
6.7.7. Turn Signal Click.....	38
6.7.8. Stop Light Inhibit.....	38
6.7.9. Diesel Engine.....	38
6.7.10. Diesel Engine Type.....	39
6.7.11. Sanders Refill Warning light.....	39
6.7.12. Brake Interlock.....	39
6.7.13. Lift Authorization.....	39
6.7.14. Engine Door Open.....	40
7. GLOSSARY/ABBREVIATIONS.....	40
8. TROUBLESHOOTING.....	41

1. PART NUMBERS AND FEATURES

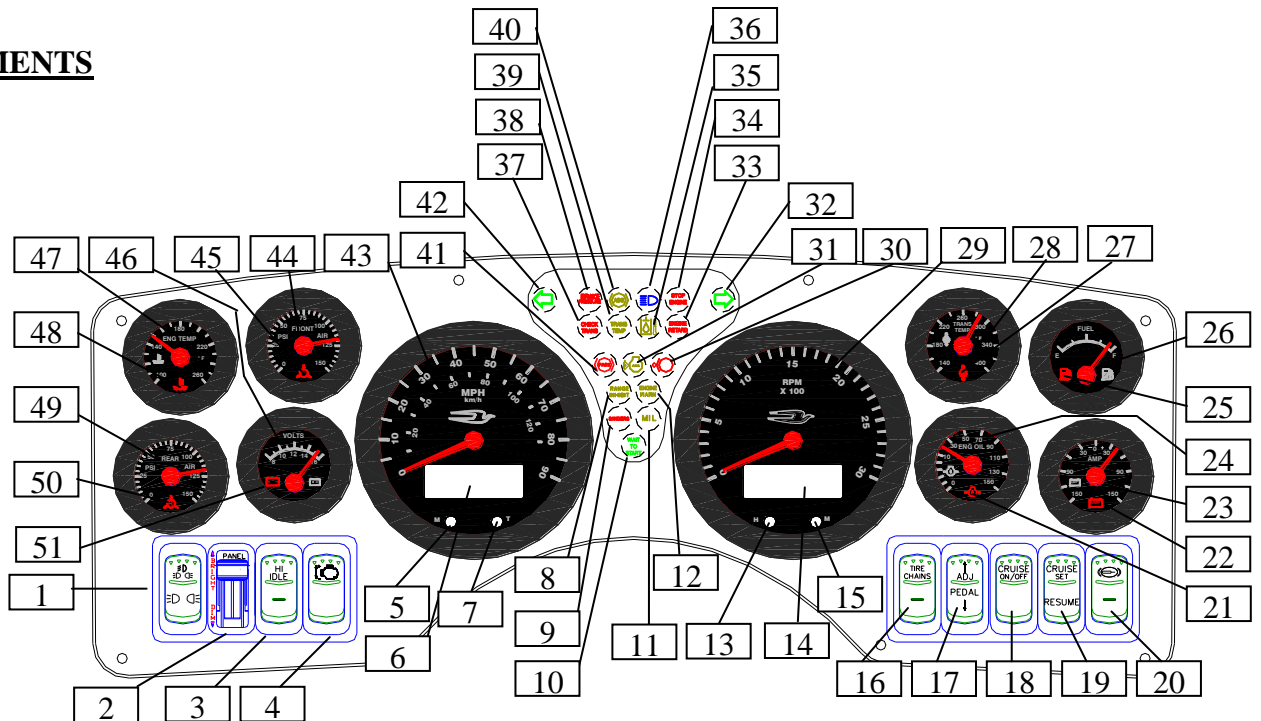
1.1. Dash Panel:

Assembly #	Panel #	BB Service Panel #	Description
0077816	104474	0079104	Instrument Panel Assembly - BBA3
0086105	0085244	0085244	Instrument Panel Assembly - BBA3 - AC

1.2. Service Parts:

Actia #	BBB #	Description
104496	0079091	Master Gauge Speedo – 90 MPH
104497	0079092	Master Gauge Speedo – 140 KMH
102081	0057500	Tach / Clock Slave Gauge
102060	0057505	Voltmeter Slave Gauge
102072	0057503	Oil Pressure Slave Gauge
102084	0057504	Coolant Temp Slave Gauge
102063	0057501	Fuel Level Slave Gauge
102066	0057506	Front Air Pressure Slave Gauge
102078	0057507	Rear Air Pressure Slave Gauge
102087	0057509	Trans Temp Slave Gauge
102075	0057511	Ammeter Slave Gauge
105819	0079106	Warning Bank Module w/ Air
104500	0079105	18 position telltale LED PWA
106516		18 position telltale overlay

2. ELEMENTS



1	Headlight Switch	27	High Trans Temp WL (In Gauge)
2	Panel Dimmer	28	Transmission Temp Gauge
3	Hi Idle Switch	29	Tachometer Gauge
4	Low Idle Switch	30	Stop Light Warning Light
5	m (Mode) Button	31	Low Coolant Level Warning Light
6	Message Display Center	32	Right Turn Signal
7	t (toggle) Button	33	Engine Retarder Warning Light
8	Range Inhibit Warning Light	34	Stop Engine Warning Light
9	Sanders Warning Light	35	Hi Hydraulic Temp Warning Light
10	Wait to Start Warning Light	36	Hi Beam Warning Light
11	MIL Warning Light	37	Check Trans Warning Light
12	Engine Warning Light	38	Hydraulic Brake Failure
13	H (Hour) Button	39	High Trans Temp Warning Light
14	Clock	40	ABS Warning Light
15	M (Minute) Button	41	Park Brake Warning Light
16	Tire Chains Switch	42	Left Turn Signal
17	Adjust Pedals Switch	43	Speedometer
18	Cruise On/Off Switch	44	Front Air Gauge
19	Cruise Set/Resume Switch	45	Front Air Warning Light
20	Exhaust Brake Switch	46	Voltmeter gauge
21	Low Oil Pressure Warning Light	47	Coolant Temperature Gauge
22	Ammeter Warning Light	48	High Coolant Temp Warning
23	Ammeter Gauge	49	Rear Air Gauge
24	Oil Pressure Gauge	50	Rear Air Warning Light
25	Low Fuel Warning Light	51	High / Low Voltage Warning Light
26	Fuel Gauge		

3. INPUTS AND OUTPUTS

3.1.1. 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 16 position for input and output connections, and

J3 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.

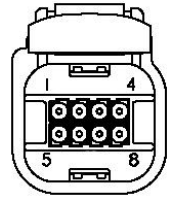
The Mating Terminals (Sockets) used with the connector housings are Tyco P/N: 1393366-1 (Actia P/N 100952)

3.1.2. J1 - SPEEDOMETER POWER/COMMUNICATION CONNECTOR

8 positions (2 X 4) (Actia P/N 100950)

Tyco US Part Number: 1411001-1

Terminal	Designation	Description	Bluebird Harness Pin Out	Wire Mrkg
1	Battery	Unswitched positive (+) 14V	P26-R	1185
2	Ground	Chassis ground	P26-C	1206S
3	CAN+	SAE J1939 Databus	P29-11	J1939 +
4	CAN-	SAE J1939 Databus	P29-12	J1939 -
5	J1708+	SAE J1708/J1587 Databus	N/A	N/A
6	J1708-	SAE J1708/J1587 Databus	N/A	N/A
7	Not used		N/A	N/A
8	CAN Res	CAN Termination Resistor	N/A	N/A



3.1.3. J2 - SPEEDOMETER I/O CONNECTOR (INPUTS & OUTPUTS)

16 Positions (Actia P/N 100951)
Tyco US Part Number: 1438031-1



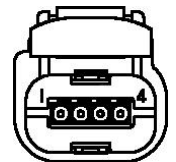
Terminal	Designation	Description	Bluebird Pin Out	Wire Mrkg
1	Fuel level sender	See Chart	P26-J	1403B
2	Wait to Start	Active low – Wait to Start	P27-11	1436
3	Hyd. Brake Sys. Failure	Active low – Hydraulic Brake set	P27-8	2431B
4	Dimmer	PWM voltage input from dimmer –Wake up input	P26-A	1333A
5	Oil pressure sender	See Chart	P26-N	1417
6	Headlight Alert	Internal Harness connection to Parking lights	N/A	N/A
7	Ammeter +	Ammeter (Hall Effect Output)	P26-E	1440A
8	Engine Door Open	Active low – Engine Door Open	P26-G	Engine Door
9	Speed detect out	Vehicle speed \leq 3 mph = output low	P26-S	VEH SPEED
10	Lift Authorization	See Flow Chart	P26-L	LIFT AUTH
11	Ignition	Switched high for ignition on –Wake up input	P26-H	11136G
12	Left Turn	Switched high (ign) parallel with turn signal –Wake up input	P29-4	1313A
13	Right Turn	Switched high (ign) parallel with turn signal – Wake up input	P29-5	1323A
14	Park brake switch	Switched high = Park Brake set and icon on	P29-2	1521E
15	Stop Light	Switched high = Service Brake engaged and icon on	P27-7	1316D
16	Hi Beam	Switched high = Headlight Hi Beam engaged and icon on	P27-10	1334A

Signal low = Chassis Ground (0.0V – 1.5V)

Signal high = 4.0V up to Ignition Voltage

3.1.4. J3 - SPEEDOMETER SLAVE CONNECTOR (COMMUNICATION, POWER SUPPLY)

4 Positions (Actia P/N 100949)
Tyco US Part Number: 9-1419167-0

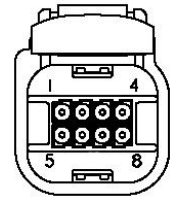


Terminal	Designation	Description	Bluebird Harness Pin Out
1	+7.6V Power	Slave device power output	N/A
2	Ground	Slave device ground	N/A
3	LIN	LIN Databus	N/A
4	Open		N/A

3.1.5. WARNING MODULE BINARY INPUT CONNECTOR

8 positions (2 X 4) (Actia P/N 100950)

Tyco US Part Number: 1411001-1



Terminal	Designation	Description	Bluebird Harness Pin Out	Wire Mrkg
1	Hi Hyd. Oil Temp	Active low – Hi Hyd. Oil Temp	P27-1	2220
2	Alternator	Active low – Alternator Failure	P27-3	1460
3	Sanders Refill	Active low – Sanders Box Empty	P27-6	1445
4	ABS	Active low – ABS System Warning	P29-3	1710
5	Water In Fuel	Active low – Water in Fuel	P27-9	WIF
6	Lift Not Stowed	Active low – Lift Not Stowed	P27-2	LNS SIG
7	Retarder	Active low – Engine Retarder Engaged	P27-4	Retard Lgt
8	Door Open	Active low – Door Open	P26-D	1262C

Signal low = Chassis Ground (0.0V – 1.5V)

Signal high = 4.0V up to Ignition Voltage

3.1.6. SWITCH HARNESS CONNECTIONS

Description	Bluebird Harness Pin Out	Wire Mrkg	Eaton Pin#
Head Lights In	P28-E	1160	2B
Head Lights Out	P28-F	1301	3
Park Lights In	P28-G	1167	5B
Park Lights Out	P28-H / P28-J	1315A / 1335	4 / 6
High Idle In	P28-B	1521C	2B
High Idle Out	P28-A	15106	3
Switch Input (GND)	P28-N	1206X	2B
Low Idle Inc. Output	P28-C	1442	3
Low Idle Dec. Output	P28-D	1443	1
Cruise Set Output	P28-M	1529	3
Cruise Res Output	P28-L	1528	1
Cruise On/Off Output	P28-K	1504	3
Switch lights (GND)	P26-B	1212D	7&8

Note:

Sanders, Pedal Adjust and Transmission Retarder switches are wired with an optional harness at Bluebird.

OPERATION

3.2. Display Odometer & Clock

The odometer & clock value will be displayed with the ignition off when the vehicle lights are turned on as long as the panel dimmer level is greater than approximately 10%.

3.3. Turn signal/Hazard warning lights

The right and left turn icons are operational with the ignition off when their respective binary input becomes high. Hazard lights normally turn both the right and left turn binary inputs high.

3.4. Start-Up Mode

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

The start up self-test is an option enabled through the setup menu. The factory setting for this option is enabled.

3.4.1. GAUGES

Gauge pointers will drive to zero position. The pointers will then drive up scale, pausing at ½ scale, before completing the sweep to full scale. The pointers will then return to zero position before moving to the commanded position.

3.4.2. LCD

During the up scale sweep of the pointers, the LCD will turn all its segments on for one second, off for one second and then display the opening message. The opening message is the Bluebird logo followed by the software ID, complete with revision level.

3.4.3. WARNING LIGHTS

Starting at the up scale pointer sweep, all warning lights will turn on for 5 seconds and then go out. Active warning lights will turn on when the gauges go to their commanded position.

3.4.4. COMMUNICATION

The speedometer 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.

3.4.5. AUDIBLE ALARM

The audible alarm will sound its three different tones for one second each during the up scale swing of the pointers.

3.5. Turn-off

When the ignition line goes low all gauges will zero, except the fuel gauge, and the odometer value will be stored to the EEPROM before the IP turns itself off. This will take up to 4 seconds. While off, the instrument panel will consume less than 1mA from the hot battery power input.

3.6. Self-Diagnostic Mode

The self-diagnostic mode is entered through a menu selection using the LCD. Diagnostics is only available when the Park Brake is set.

Detail specifications are found in the Message Display Center section.

The self-diagnostic includes the following tests:

- Gauges
- Warning Lights
- LCD
- Binary Inputs
- Analog Inputs
- Data Links

4. IGNITION MODE

4.1. Gauge Display

4.1.1. MASTER GAUGE – SPEEDOMETER

The speedometer is a standard gauge for the Instrument Panel and is the master gauge in the system. The speedometer data source will be J1939 ([PGN65265](#)).

4.1.2. TACHOMETER / CLOCK

The tachometer gauge is a standard slave gauge used to display engine RPM. The tachometer data source will be J1939 ([PGN61444](#)).

4.1.3. COOLANT TEMPERATURE

The coolant temperature gauge is a standard slave gauge used to display engine coolant temperature. The coolant temperature data source will be J1939 ([PGN65262](#)).

4.1.4. OIL PRESSURE

4.1.4.1. Cummins

The oil pressure gauge is a standard slave gauge used to display engine oil pressure. The oil pressure is driven by the oil pressure sender analog input.

4.1.4.2. John Deere & CAT

The oil pressure gauge is a standard slave gauge used to display engine oil pressure. The oil pressure data source will be J1939 ([PGN65263](#)).

4.1.5. FUEL GAUGE

4.1.5.1. Cummins & CAT

The fuel gauge is a standard slave gauge used to display fuel tank level. The Fuel Level is driven by the fuel level sender analog input. Fuel level will be sampled over a one-minute period to prevent fuel slosh.

4.1.5.2. John Deere

The fuel gauge is a standard slave gauge used to display fuel tank level. The fuel level data source will be J1939 ([PGN65276](#).) The data range is between 5% (empty) and 95% (full).

4.1.6. VOLTMETER

4.1.6.1. Cummins & CAT

The voltmeter gauge is a standard slave gauge used to display chassis voltage. The voltmeter data source will be J1939 ([PGN65271](#)).

4.1.6.2. John Deere

The voltmeter gauge is a standard slave gauge used to display chassis voltage. The voltmeter data source will be J1939 ([PGN65271JD](#)).

4.1.7. AMMETER

The ammeter gauge is an optional slave gauge used to display battery charging / discharging conditions. The ammeter is driven by Hall effect sender into an analog input.

4.1.8. FRONT AIR GAUGE

The front air gauge is an optional gauge used when air pressure is required. The gauge displays Front Air Pressure. The warning bank transducer drives the Front Air Pressure Gauge.

4.1.9. REAR AIR GAUGE

The rear air gauge is an optional gauge used when air pressure is required. The gauge displays Rear Air Pressure. The warning bank transducer drives the Rear Air Pressure Gauge.

4.1.10. TRANSMISSION TEMPERATURE

The transmission temperature gauge is a optional slave gauge used to display transmission oil temperature. The transmission temperature data source will be J1939 ([PGN65272](#)).

4.2. Applied Air Feature

The applied air feature is used to monitor front and rear brake line pressure. This feature is activated when the master gauge detects the presence of one or all of the applied air kit.

4.2.1. APPLIED FRONT AIR GAUGE

The applied front air gauge is an optional gauge used when applied air pressure is required. The gauge displays Applied Front Air Pressure. The warning bank transducer # 2 drives the Applied Front Air Pressure Gauge.

4.2.2. APPLIED REAR AIR GAUGE

The applied rear air gauge is an optional gauge used when applied air pressure is required. The gauge displays Applied Rear Air Pressure. The warning bank transducer # 2 drives the Applied Rear Air Pressure Gauge.

4.3. Backlighting

The PWM dimmer for panel illumination feeds into the master gauge so that the gauge components can match the dimming of other panel components. The master gauge interprets this input as indicated in the table below:

Dimmer Input	LCD Backlight	Gauge Backlight
0% -9%	Maximum brightness	Off
10-100% Ignition V	Linearly go from min to max brightness	Linearly go from min to max brightness

4.4. Gauges Internal Warning Indicators

4.4.1. LOW OIL PRESSURE

The data source of the Low Oil Pressure warning light indicator is J1939 ([DM1SPN100](#)).

4.4.2. HIGH COOLANT TEMPERATURE

The data source of the High Coolant Temperature indicator is J1939 ([DM1SPN110](#)).

4.4.3. HIGH TRANSMISSION TEMPERATURE

The data source of the High Transmission Temperature indicator is J1939 ([PGN65272](#)) with a threshold of 250°F calculated by the master gauge. The alternate data source of the high transmission temperature is J1939 ([DM1HighTransTempLamp](#)). The logic is programmed to alarm on either conditions.

4.4.4. LOW FUEL LEVEL

Low Fuel Level icon turns on when the fuel level is less than 12.5% and turns off when the level is above 18%.

4.4.5. LOW AIR PRESSURE - FRONT

Low Air Pressure - Front indicator turns on when the front air pressure is less than or equal to 65 PSI. The indicator will turn off at 72 PSI.

4.4.6. LOW AIR PRESSURE - REAR

Low Air Pressure - Rear indicator turns on when the rear air pressure is less than or equal to 65 PSI. The indicator will turn off at 72 PSI.

4.4.7. LOW/HIGH BATTERY VOLTAGE

Low/High battery voltage icon turns on when the battery voltage is less than 12v or is more than 15.4v.

4.4.8. LOW APPLIED AIR PRESSURE - FRONT

Low Air Pressure – Due to system operation parameters, this warning light does not turn on.

4.4.9. LOW APPLIED AIR PRESSURE - REAR

Low Air Pressure – Due to system operation parameters, this warning light does not turn on.

4.5. Warning Bank Indicators

4.5.1. LEFT TURN

Left Turn indicator turns on when the left turn binary input is switched high. If the left turn indicator is left on for a measured distance of 1 mile, then the alert tone will be activated and the message center will display “Left Turn”.

4.5.2. RIGHT TURN

Right Turn indicator turns on when the right turn binary input is switched high. If the right turn indicator is left on for a measured distance of 1 mile, then the alert tone will be activated and the message center will display “Right Turn”.

4.5.3. PARK BRAKE

Park Brake indicator is turned on when the park brake is set (park brake input is high).

4.5.4. HIGH BEAM

High Beam indicator is turned on when the high beam binary input is switched high.

4.5.5. STOP ENGINE

Stop Engine indicator is J1939 driven ([DM1RedStopLamp](#)).

4.5.6. WAIT TO START

4.5.6.1. CAT

Wait to Start indicator is turned on when the wait to start binary input is switched low (analog input used as binary input).

4.5.6.2. Cummins

Wait to Start indicator is J1939 driven ([PGN65252](#)).

4.5.7. CHECK TRANSMISSION

Check Transmission indicator is J1939 driven ([Allison DM1 CheckTransLamp](#)).

4.5.8. RANGE INHIBIT

The Range Inhibit indicator is J1939 driven by the Transmission ([PGN65098](#)).

4.5.9. ABS

The ABS indicator is turned on when the ABS binary input is switched low.

4.5.10. HIGH HYDRAULIC OIL TEMPERATURE

High hydraulic oil temperature indicator is turned on when the high hydraulic oil temperature binary input is switched low.

4.5.11. RETARDER

Retarder indicator is turned on when the retarder binary input is switched low.

4.5.12. STOP LIGHT

Stop Light indicator is turned on when the stop light binary input is switched high.

4.5.13. HYDRAULIC BRAKE FAILURE

Hydraulic brake failure indicator is turned on when the hydraulic brake failure input is switched low (analog input used as binary input).

4.5.14. LOW COOLANT LEVEL

The data source of the Coolant level is J1939 ([DM1LowCoolantLamp](#)).

4.5.15. HIGH TRANSMISSION TEMPERATURE

The data source of the High Transmission Temperature indicator is J1939 ([PGN65272](#)) with a threshold of 250°F calculated by the master gauge. The alternate data source of the high transmission temperature is J1939 ([DM1HighTransTempLamp](#)). The logic is programmed to alarm on either conditions.

4.5.16. SANDERS REFILL

Sanders refill indicator is turned on when the sanders refill binary input is switched low. This warning lights operation will be selectable through a configuration bit and can be set through the set up menu.

4.5.17. ENGINE WARNING

The data source of the engine warning is J1939 ([DM1CheckEngLamp](#)).

4.5.18. MAINTENANCE INDICATOR LAMP

The data source of the maintenance indicator is J1939 ([DM1EngMaintLamp](#)).

4.6. Audible Alarm

The audible alarm is used in the following conditions:

Audible Alarm	Designation	Criteria	Priority
Continuous 1	High Hydraulic Temperature	Binary input	1
Continuous 1	Stop engine	PGN 65226 DM1 Red Stop Lamp	1
Continuous 1	Low coolant level	PGN 65,226 SPN 111 FMI 1 & 18	1
Continuous 1	Low Oil Pressure	PGN 65,226 SPN 100 FMI 1 or 18	1
Continuous 1	High Coolant Temperature	PGN 65,226 SPN 110 FMI 0 or 16	1
Continuous 1	High Transmission Temp	PGN 65272 SPN 177 FMI 15 Or hi Trans temp	1
Continuous 1	Hydraulic Brake Failure	Analog input	1
Continuous 1	Engine Warning	PGN 65226 DM1 Check Engine Lamp	2
Continuous 1	Low/High chassis voltage	PGN 65271 When $\leq 11.9V$ or $\geq 15.4V$	2
Continuous 1	Front low air pressure	Analog input - When ≤ 62 PSI (448 kPa)	2
Continuous 1	Rear low air pressure	Analog input - When ≤ 62 PSI (448 kPa)	2
Continuous 1	Alternator	Binary input & Engine Speed ≥ 400 RPM	2
Continuous 1	Engine Door Open	Binary input	2
Beep 1	ABS	Binary input	2
Beep 1	Wait to start	PGN 65252 Byte 4 – Bits 2-1 / Binary input (CAT)	2
Beep 1	Range inhibit	PGN 65098 Byte 2 – Bits 8-7	5
Beep 1	Sanders refill	Binary input	5
Beep 1	Low Fuel Level	When $< 13\%$	4
Beep 1	Turn signal reminder	(1)	8
Beep 1	Water in Fuel	Binary input	4
Beep 2	Headlight Alert reminder	(3)	(6)
Beep 3	Turn signals		(4)

(1) Turn signal reminder is ON if the right or the left turn signal indicator is left ON for a distance of 1 mile.

(2) The click for the turn signals are always generated but might not be heard (for example if the buzzer is also ON)

(3) Headlight Alert reminder is ON

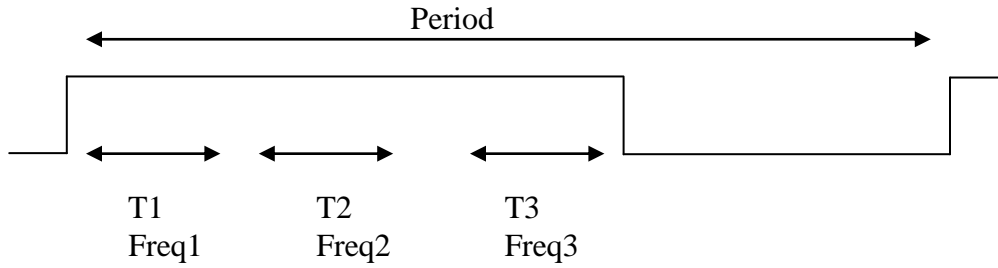
- If the headlights / parking lights are on when ignition is turned OFF (during 2 minutes or until headlights / parking lights are turned off)

(4) Headlight Alert reminder has a lower priority than a buzzer (continuous 1) but a higher priority than an alert (Beep 1).

The audible tone are defined in the table below:

Audible Alarm	Freq 1	T1	Freq 2	T2	Freq 3	T3	Period	Priority
Continuous 1	2900	160ms					Continuous	
Beep 1	2000	160ms	0	160ms			320ms	
Beep 2	2900	160ms	0	160ms			320ms	
Beep 3	2000	40ms	0	160ms			Once	

Example:



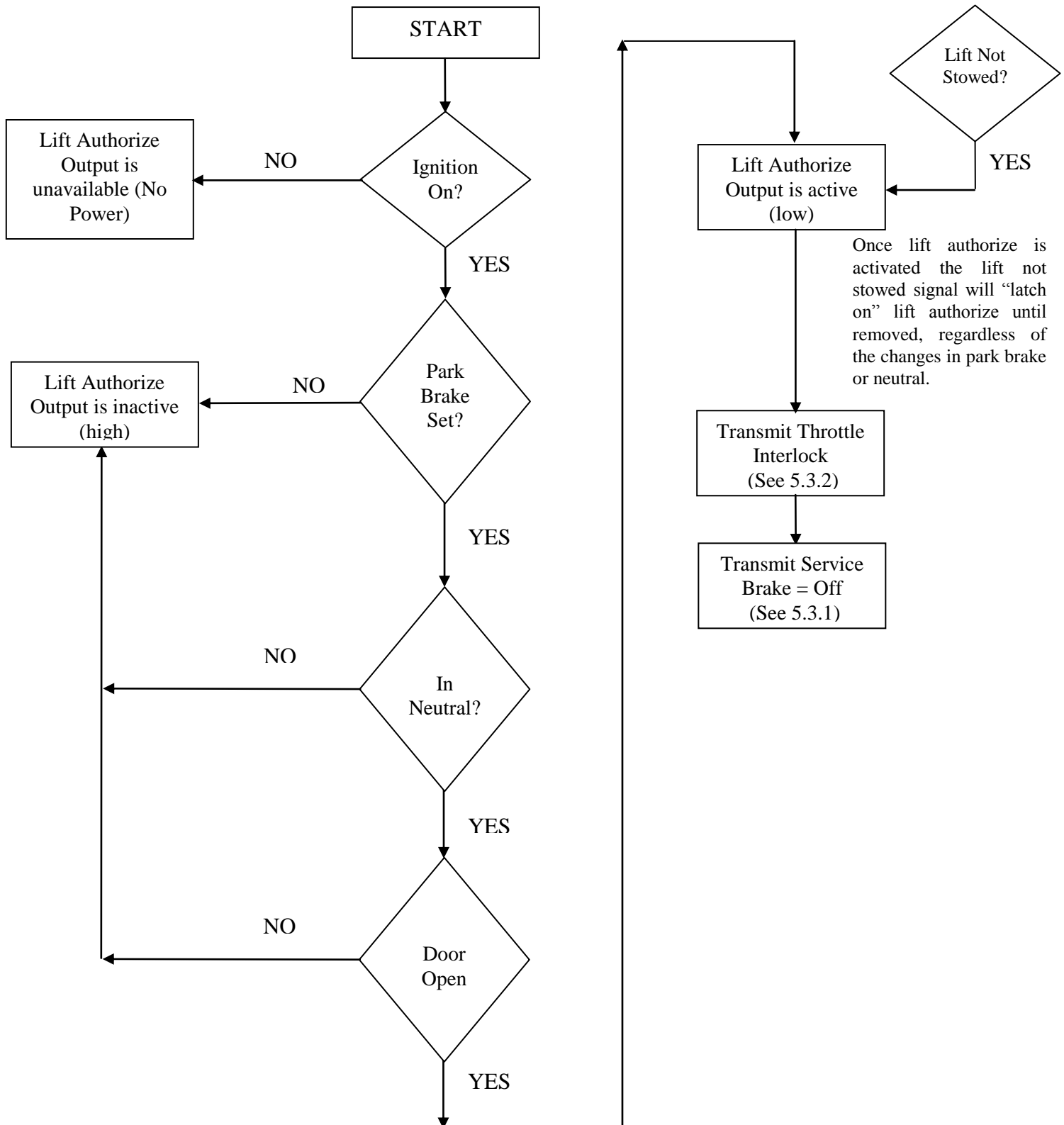
4.7. Binary Outputs

4.7.1. SPEED DETECT

This binary output is active (low side drive) when vehicle speed ≥ 3 MPH is detected.

4.7.2. LIFT AUTHORIZATION

This binary output is active when the requirements are met, shown in the flow chart below:



5. COMMUNICATION

There are two communication channels for data transfer between the vehicle and the speedometer. One channel for SAE J1708/J1587 and a second channel for CAN 2.0B/SAE J1939 (Controller Area Network).

All frames transmitted by the speedometer on J1939 are continuously sent at the standard broadcast rate for the frame using source address (SA) 23dec (17h).

The speedometer communicates via the LIN bus to slave devices. The slave gauges are updated every 400mSec except for the tachometer which is updated every 80mSec.

5.1. Plug and Play Function

The master keeps a “roll call” list and verifies that all devices are present during start up. The master listens for devices on each communication bus and remembers which devices are present during initialization. When a new device is found it is added to the roll call list. If a device is found missing, a message will be sent to the LCD but the roll call list is not updated. Devices can only be removed from the list through the diagnostic menu

5.2. 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.

If a LIN parameter is missing for 5 seconds the gauge will wag the pointer from dial end to dial end and flash the warning LED.

5.3. Messages Sent

5.3.1. SERVICE BRAKE

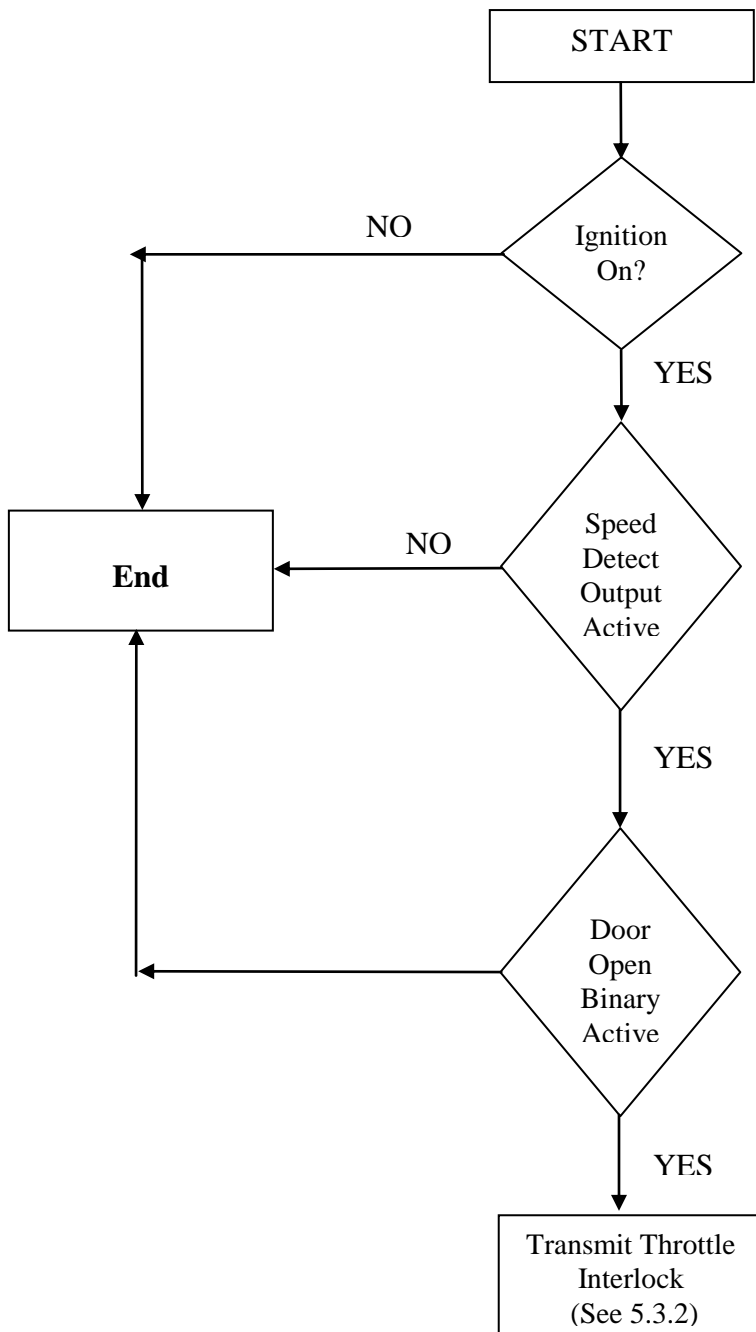
The service brake message is sent to the engine via J1939 ([PGN65265SB](#)) when the brake pedal is depressed.

5.3.2. THROTTLE INTERLOCK

The throttle interlock message is sent to the engine via J1939 (CAT - [PGN65264](#)) or (Cummins - [PGN61441](#)) when the proper lift safety conditions are met (see 4.7.2) or when the proper brake interlock conditions are met (see 5.3.3).

5.3.3. BRAKE INTERLOCK

The function of the brake interlock (when activated) is shown in the flow chart below:



5.4. J1939 Table of Messages

Applies to: Cummins ISC03, CAT C7, John Deere CNG, Allison 2000 and Allison WT (MD380)						
Frame	PGN	Name	Byte	TX/RX	English Units	Metric Units
Engine Hours	65,253 (00FEE5)	Total engine hours	1,2,3,4	RQ	H	H
Cruise Control/Vehicle Speed	65,265 (00FEF1)	Wheel-based vehicle speed	2,3	RX	MPH	km/H
Cruise Control/Vehicle Speed	65,265 (00FEF1)	Service Brake	4 b 6&5	TX		
PTO	65,264 (00FEF0)	Throttle Interlock	6 b 2&1	TX		
EBC1	61,441 (00F001)	Throttle Interlock	4 b 2&1	TX		
Shutdown	65,252 (00FEE4)	Wait to Start	4 b 2&1	RX		
DM1	65,226 (00FECA)	Active DTC	3-6	RX		
DM1	65,226 (00FECA)	Amber warning lamp	1 b 4&3	RX		
DM1	65,226 (00FECA)	Red Stop lamp	1 b 6&5	RX		
EEC1	61,444 (00F004)	Engine speed	4,5	RX	RPM	RPM
EEC2	61,443 (00F003)	Percent load	3	RX	%	%
Engine Fluid Level/Pressure	65,263 (00FEEF)	Engine oil pressure	4	RX	PSI	KPa
Engine Temperature	65,262 (00FEEE)	Engine coolant temp.	1	RX	°F	°C
ETC1	61,442 (00F002)	Electronic Trans. Controller	N/A	RX		
ETC7	65,098 (00FE4A)	Shift inhibit	2 b 8&7	RX		
Fuel Economy	65,266 (00FEF2)	Instantaneous fuel econ	3,4	RX	MPG	L/100Km
Fuel Economy	65,266 (00FEF2)	Average fuel economy	5,6	RX	MPG	L/100Km
Inlet/Exhaust Conditions	65,270 (00FEF6)	Boost pressure	2	RX	PSI	KPa
Inlet/Exhaust Conditions	65,270 (00FEF6)	Intake manifold temperature	3	RX	°F	°C
Transmission Fluids	65,272 (00FEF8)	Transmission oil temp.	5,6	RX	°F	°C
Vehicle Electrical Power	65,271 (00FEF7)	Electrical potential (volts)	5,6	RX	V	V
Vehicle Electrical Power	65,271 (00FEF7)	Battery potential (volts) Switched	7,8	RX	V	V
Dash Display	65276 (00FEFC)	Fuel Level	2	RX	%	%
Defined Faults	PGN	Name	Byte	SPN	FMI	Source Address
DM1	65,226 (00FECA)	High Coolant Temp	3-6	110	0, 11 and 16	0
DM1	65,226 (00FECA)	Low Oil Pressure	3-6	100	1, 11 and 18	0
DM1	65,226 (00FECA)	Amber warning light/Check Transmission	1 b 4&3 3-6	2003	31	3
DM1	65,226 (00FECA)	High Trans Temperature	1 b 4&3 3-6	177	15	3
DM1	65,226 (00FECA)	Low Coolant Level	3-6	111	1, 11 and 18	0

Note:

In the table bytes are numbered 1 to n and bits are numbered 1 to 8. 1 is LSB.

6. MESSAGE DISPLAY CENTER

The message display is a graphical, backlit, LCD that displays information to the vehicle operator.

The messages that are displayed include:

1. Odometer
2. Trip Odometer (optional)
3. Boost Pressure (Cummins / CAT)
4. Percent Engine Load
5. Instantaneous Fuel Rate (Cummins / CAT)
6. Average Fuel Rate (Cummins / CAT)
7. Engine hours
8. Engine RPM
9. Coolant Temperature
10. Engine Oil Pressure
11. Fuel Level
12. Transmission Temperature
13. Primary Air Pressure
14. Secondary Air Pressure
15. Dimmer %
16. Intake Manifold Temperature
17. Vehicle Speed
18. Battery Voltage
19. Ammeter
20. Instrument Panel Diagnostic Information

6.1. Drive Mode Screen

During normal operation the LCD displays the odometer or trip value on the top line and a selected parameter on the second line. (Boost Pressure shown in the following example)

1234.5 mi
0 PSI Boost

6.2. Odometer

The odometer function is in the speedometer. The season odometer displays 0.0 - 9,999,999.9 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 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 odometer reading will be displayed when the ignition switch is off by activating the gauge backlight.

6.2.1. ACCURACY

Accuracy of the odometer value is dependant on two (2) main variables. 1) The algorithm in the speedometer for calculating distance, and 2) the speed value transmitted by the ECM. The algorithm has been designed and written to calculate the distance with the accuracy and resolution necessary to exceed SAE recommendations. The distance is calculated every 80 msec. to reduce error during any rapid speed change the vehicle might make. The speed data is dependant on the calibration parameters for tire size and axle ratio being properly entered into the ECM. These are the same parameters necessary to have the ECM properly calculate the vehicle speed and distance value. Testing has indicated that the algorithm will calculate mileage within $\pm 0.07\%$ of actual based on the speed received. This far exceeds the SAE recommended $\pm 0.3\%$ found in SAE J1226.

6.2.2. NORMAL SHUTDOWN

The odometer value is stored to the EEPROM at each 1-kilometer increment (0.62 mi) and when the ignition switch is turned off. The value is stored to 1/100 of a kilometer resolution (33 ft) using a 4-byte memory location within an array. Each store is made sequentially to one (1) of eight (8) locations in the array so at any point in time the last eight (8) values are maintained. Each value stored is verified at the time it is saved. Multiple store attempts to a location will be made if necessary, and if not successful, the memory location will be tagged as bad. The "precount" that is used to increment the odometer every 1/100th km is also saved. The "precount value is 115200. Therefore, our internal resolution is 1/11520000th of a km or 0.003385827 inches. This value is stored on power down and recovered on power up.

Odometer Value Array									
Value n	Byte 1	Byte 2	Byte 3	Byte 4	Value n+4	Byte 1	Byte 2	Byte 3	Byte 4
Value n+1	Byte 1	Byte 2	Byte 3	Byte 4	Value n+5	Byte 1	Byte 2	Byte 3	Byte 4
Value n+2	Byte 1	Byte 2	Byte 3	Byte 4	Value n+6	Byte 1	Byte 2	Byte 3	Byte 4
Value n+3	Byte 1	Byte 2	Byte 3	Byte 4	Value n+7	Byte 1	Byte 2	Byte 3	Byte 4

6.2.3. ABNORMAL SHUTDOWN

If there is battery power loss at the speedometer prior to turning the ignition off, an abnormal shut down will occur. The odometer value, when power is restored, will return to the last kilometer increment value saved; i.e. the last XXX.0 kilometer rollover. Therefore, the **maximum** distance lost by an abnormal shutdown will be 0.9 km (0.56 mi). Battery loss that occurs >4 seconds after turning the ignition off will NOT result in an abnormal shutdown. The occurrence of an abnormal shutdown during the life of a vehicle should be rare.

6.2.4. DURABILITY

The EEPROM store routine will allow for a minimum of 4 million store cycles. The design will accommodate 200 key-offs per day, 260 days per year, for 20 years plus 1.609344 million kilometers (1,000,000 mi) which could be seen if the vehicle is used on a delivery route, with a 50% safety factor $(200 * 260 * 20 + 1,609,334) = 2,649,334 + 51\% = 4,000,494$ store cycles. An error recovery scheme is implemented that will allow the odometer value to be recovered should a hardware failure in one of the EEPROM memory cells occur.

6.2.5. ERROR RECOVERY

The error recovery algorithm will check each stored value to determine if the values are in sequence (low to high) and 1 km or less apart. If this condition is found no errors are present and no further action is required. If a value is found to be out of order or greater than 1 km from the others, the software will identify the largest value in the group with the proper sequence and use that value.

In the unlikely event the speedometer fails in such a way that the odometer value cannot be displayed, the factory, in most instances, will be able to recover the stored value.

6.2.6. MAXIMUM READING

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

6.2.7. SERVICE PROGRAMMING

If replacement of the speedometer becomes necessary, the actual vehicle mileage may be programmed into the odometer using Actia proprietary software. The mileage may be incremented, but not decremented, using this software.

6.2.8. SERVICE GAUGES

Replacement speedometers will be shipped in a mode that allows the installer to preset actual vehicle distance, thus eliminating the need to “tag” the vehicle. Documentation on how this mode works can be found in Actia document # 104426.

6.3. Trip Odometer

The trip odometer may be displayed by pressing the **t** button. This will toggle you between the Odometer and the Trip Odometer. You will know the trip odometer is being displayed by the **T1** symbol in the top right corner of the message center display. To reset trip odometer press and hold the “M” button until it clears.

1234.5 mi	T1
0 PSI	Boost

6.4. Priority Messages

Priority messages are displayed in the LCD due to various inputs or data messages.

When a new fault appears, associated priority message is displayed, overwriting the odometer/trip display. After 5s, the exit command will appear, allowing the return to the normal display by pressing the *m* button. If several faults are defined, the more command will be displayed.

It will then be possible to scroll thru the list of faults by pressing the *t* button.

6.4.1. ENG COMM FAILURE

This message is displayed when the master gauge does not receive the J1939 data from the engine. This is accomplished by monitoring for the presence of the engine speed message ([PGN61444](#)).

6.4.2. TRANS COMM FAILURE

This message is displayed when the master gauge does not receive the J1939 data from the transmission. This is accomplished by monitoring for the presence of the ETC #1 message ([PGN61442](#)).

6.4.3. ALTERNATOR

This message is displayed when the associated binary input is switched low and engine speed is \geq 400 RPM ([PGN61444](#)).

6.4.4. LIFT NOT STOWED

This message is displayed when the associated binary input is switched low.

6.4.5. BATTERY VOLTAGE ERROR

This message is displayed if the voltage message received from the ECM via the J1939 contains a wrong value (error or not available or underrange or overrange) ([PGN65271](#)).

6.4.6. VEHICLE SPEED ERROR

This message is displayed if the vehicle speed received from the ECM via the J1939 contains a wrong value (error or not available) during a certain time ([PGN65265](#)).

6.4.7. TURN SIGNAL ON

This message is displayed if the right or the left turn signal indicator is left ON for a distance of 1 mile

6.4.8. WATER IN FUEL

This message is displayed when the associated binary input is switched low.

6.4.9. HEADLIGHT ALERT

The headlight alert message is displayed on the message center when the headlights / parking lights are on (input is high) and ignition is turned off. The headlight alert message will flash on & off at a 1 sec interval for a period of 2 minutes, or until the headlights / parking lights is turned off.


6.4.10. ENGINE DOOR OPEN

“Engine Door” should be displayed when the associated binary input is switched low.

6.5. Second Line Display Selection

6.5.1. CUMMINS & CAT

Pressing the *m* button for < 5 seconds allows the selection of the parameter to be displayed on the second line. The parameter will highlight in **reverse video** indicating it is selected. Pressing the *m* or *t* button will display a different parameter from the list. To select the highlighted parameter simply do nothing and the highlight will disappear leaving the parameter displayed. Parameters that can be displayed are:

Intake Manifold Temperature	<div style="border: 1px solid black; padding: 5px;"> <p>1234.5 mi</p> <p>180° F IMT</p> </div>
Engine Load	<div style="border: 1px solid black; padding: 5px;"> <p>1234.5 mi</p> <p>70 % Eng L</p> </div>
Hourmeter	<div style="border: 1px solid black; padding: 5px;"> <p>1234.5 mi</p> <p> 67.8 hr</p> </div>
Boost Pressure	<div style="border: 1px solid black; padding: 5px;"> <p>1234.5 mi</p> <p>70 PSI Boost</p> </div>
Instantaneous Fuel Economy	<div style="border: 1px solid black; padding: 5px;"> <p>1234.5 mi</p> <p>20.3 mpg Inst F</p> </div>

Average Fuel Economy

1234.5 mi
20.3 mpg Avg F

6.5.2. JOHN DEERE

Pressing the *m* button for < 5 seconds allows the selection of the parameter to be displayed on the second line. The parameter will highlight in **reverse video** indicating it is selected. Pressing the *m* or *t* button will display a different parameter from the list. To select the highlighted parameter simply do nothing and the highlight will disappear leaving the parameter displayed. Parameters that can be displayed are:

Intake Manifold Temperature

1234.5 mi
180° F IMT

Engine Load

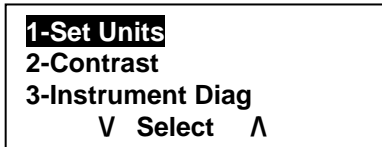
1234.5 mi
70 % Eng L

Hourmeter

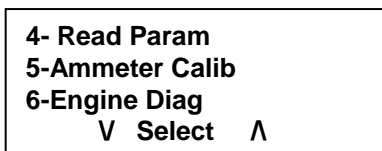
1234.5 mi
⌘ 67.8 hr

6.6. Settings and Diagnostic

With the park brake set and in the Drive Mode Screen, pressing the *m* button for >5 seconds brings up the following screen:

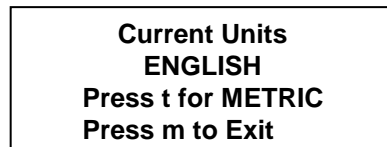


The item highlighted in **reverse video** will be selected when both the *m* and *t* buttons are pressed together. Pressing the *m* or *t* button separately will move the highlight through the list, as indicated by the arrow, so other items can be selected. There are 6 items in this menu as follows:



6.6.1. 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.



6.6.2. CONTRAST

Selecting menu item 2 display a screen to allow setting the LCD contrast. Pressing the *m* (+) button will increase contrast while pressing the *t* (-) button will decrease contrast.



6.6.3. READ PARAMETERS

6.6.3.1. Cummins & CAT

Item 4-Read Param – This screen displays various parameter received by the master gauge. The main use for these screens is in troubleshooting the system.

Eng RPM	775 RPM
Coolant T	160°F
Oil Press	54 PSI
V	EXIT
Λ	

Fuel Level	100%
Trans Temp	160°F
Dimmer %	0%
V	EXIT
Λ	

Boost Pr	5 PSI
Engine Load	25%
Inst Fuel	0 mpg
V	EXIT
Λ	

Avg Fuel	5 mpg
Man Temp	100°F
Hrs	67.80
V	EXIT
Λ	

V Speed	0 mph
Battery	13V
Ammeter	50 A
V	EXIT
Λ	

Air Rear	124 PSI
Air Front	124 PSI
V	EXIT
Λ	

6.6.3.2. John Deere

Item 4-Read Param – This screen displays various parameter received by the master gauge. The main use for these screens is in troubleshooting the system.

Eng RPM	775 RPM
Coolant T	160°F
Oil Press	54 PSI
V	EXIT Λ

Fuel Level	100%
Trans Temp	160°F
Dimmer %	0%
V	EXIT Λ

Engine Load	25%
Man Temp	100°F
Hrs	67.80
V	EXIT Λ

V Speed	0 mph
Battery	13V
Ammeter	50 A
V	EXIT Λ

Air Rear	124 PSI
Air Front	124 PSI
V	EXIT Λ

6.6.4. INSTRUMENT DIAGNOSTICS

Selecting menu item 3 in the Settings and Diagnostic Menu will display the instrument diagnostic menu. There are 6 items in this menu and is navigated the same as the previous menu.

1-Gauge Test
2-Lamp Test
3-LCD Test
V Select Λ

4-Binary Inputs
5-Analog Inputs
6-Data Links
V Select Λ

6.6.4.1. Gauge Test

The selected gauge will be driven through three positions pausing at each position for 500 mSec. as shown in the LCD as a percentage of scale. This test will proceed through all gauges and return to the menu. Pressing the *m* button (Exit) will end the test and return to the menu.

Fuel Level	
EXIT	0%

Fuel Level	
EXIT	50%

Fuel Level	
EXIT	100%

6.6.4.2. Lamp Test

Item 2-Lamp Test – Turns each IP warning lamp (not the vehicle load) on then off displaying the lamp name and status in the LCD. This test goes through all warning lamps and then returns to the menu. Pressing the *m* button (Exit) will end the test and return to the menu. (High beam test shown as an example)

High Beam	
EXIT	ON

High Beam	
EXIT	OFF

6.6.4.3. LCD Test

Item 3 – Displays the Bluebird logo in normal and reverse video three times and then returns to the menu.

6.6.4.4. Binary Inputs

Item 4 – Displays the module, pin number, and status of each binary input defined in the system. Pressing the *m* button exits the test and returns to the menu. Pressing the *t* button scrolls the display to the next 4 inputs. The value “high” and “low” refers to the voltage level at the connector pin. This information will be continuously updated to assist in troubleshooting.

**Press t to Scroll
Press m to Exit**

S-1 Hydr Temp	Low
S-2 Alternator	Low
S-3 Sanders R	Low
S-4 ABS	Low

S-5 Water in Fuel	Low
S-6 LNS	Low
S-7 Retarder	Low
S-8 Door Open	Low

M-11 Ign ON	High
M-12 Left turn	High
M-13 Right turn	High
M-14 Park Brake	High

M-15 Stop Light	High
M-16 High Beam	High

6.6.4.5. Analog Inputs (Cummins)

Item 5 – Displays the module, pin number, and status “Out of Range High”, “Out of Range Low”, or the actual value of each analog input defined in the system. Pressing the *m* button exits the test and returns to the menu. Pressing the *t* button scrolls the display to the next 4 inputs.

**Press t to Scroll
Press m to Exit**

M-1 Fuel	100%
M-3 Hydr F	Off
M-4 Dimmer	0%
M-5 Oil Press	100%

M-6 Headlights	0V
M-7 Amp	12A
M-8 Eng. Door	On

6.6.4.6. Analog Inputs (CAT)

Item 5 – Displays the module, pin number, and status “Out of Range High”, “Out of Range Low”, or the actual value of each analog input defined in the system. Pressing the **m** button exits the test and returns to the menu. Pressing the **t** button scrolls the display to the next 4 inputs.

Press t to Scroll
Press m to Exit

M-1 Fuel	100%
M-2 Wait	Off
M-3 Hydr F	Off
M-4 Dimmer	0%

M-6 Headlights	0V
M-7 Amp	12A
M-8 Eng. Door	On

6.6.4.7. Analog Inputs (John Deere)

Item 5 – Displays the module, pin number, and status “Out of Range High”, “Out of Range Low”, or the actual value of each analog input defined in the system. Pressing the **m** button exits the test and returns to the menu. Pressing the **t** button scrolls the display to the next 4 inputs.

Press t to Scroll
Press m to Exit

M-3 Hydr F	Off
M-4 Dimmer	0%
M-6 Headlights	0V
M-7 Amp	12A
M-8 Eng. Door	On

6.6.4.8. Data Link

Item 6– The LIN will be checked and each device found on that data bus would be displayed. The roll call for the LIN bus may be updated using the appropriate menu selection. **Devices may only be deleted if they are designated inactive.**

1-<LIN>	
V	Select Λ

Fuel Level	Active
Battery Volt	Active
Ammeter	Active
V	Delete Λ

Oil Pressure	Active
Coolant Temp	Active
Trans Temp	Active
V	Delete Λ

Engine Speed	Active
Front Air	Active
Rear Air	Active
V	Delete Λ

Warning Bank	Active
V	Delete Λ

6.6.4.9. Engine Diagnostic

Item 6-Engine Diagnostics – This screen displays the Suspect Parameter Number (SPN) and Failure mode Identifier (FMI) as received from the engine for active faults via J1939 ([DM1SPN100](#)) (Two active faults shown below as an example)

SPN 100	FMI 1
SPN 110	FMI 0
End of list	
V	Exit Λ

6.6.4.10. Trans Diagnostic

Item 7-Trans Diagnostics – This screen displays the Suspect Parameter Number (SPN) and Failure mode Identifier (FMI) as received from the transmission for active faults via J1939 ([DM1HighTransTempLamp](#)). (Two active faults shown below as an example)

SPN 2003	FMI 31
SPN 177	FMI 15
End of list	
V	Exit Λ

6.7. Setup Menu

Holding *m* and *t* pressed while turning the ignition on enters the setup menu. Trip, Default Parameter, Self-Test and can be enabled and disabled by the user.

6.7.1. TRIP

Shows if the Trip Odometer is present (YES). Pressing *m* (OK) will go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

Trip Odometer		
YES		NO
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

6.7.2. DEFAULT PARAMETER

Shows if the default parameter line is present (YES). Pressing *m* (OK) will go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

Default Parameter		
YES		NO
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

6.7.3. SELF TEST

When **YES** is selected, the start up self test will zero the pointers, sound three tones from the speaker, sweep the gauge pointers through 50%, 100%, then back to zero, and turn all warning lights on for 5 seconds. When **NO** is selected the pointers will zero and all warning lights will be turned on for 5 seconds

SELF TEST		
YES		NO
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

6.7.4. TRANSMISSION DIAGNOSTICS

When **YES** is selected, the active transmission SPN and FMI faults are displayed. When **NO** is selected the transmission diagnostics functions are deactivated.

TRANSMISSION DIAG	
YES	NO
OK	Exit

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen. The toggle function is not active on this menu and will be activated upon future implementation.

6.7.5. TEST PANEL

When **YES** is selected, the software is configured as a production chassis test fixture. When **NO** is selected the production chassis test fixture are deactivated. This feature can only be activated through Actia provided software.

TEST PANEL	
YES	NO
OK	Exit

Pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen. The toggle function is not active on this menu

6.7.6. MANUAL TRANSMISSION

When **YES** is selected, the configure the software to ignore the loss of transmission communications and not display a “TRANS COMM” message as listed in paragraph 7.4.3. When **NO** is selected the manual transmission functions are deactivated.

MANUAL TRANSMISSION	
YES	NO
OK	Exit

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen. The toggle function is not active on this menu and will be activated upon future implementation.

6.7.7. TURN SIGNAL CLICK

When **YES** is selected, the software is configured to enable the turn signal “click”. When **NO** is selected the turn signal “click”, the turn signal “ON” (see 6.4.7) and the turn signal “reminder audible alarm” (see 4.6 (1)) will be disabled.

TURN SIGNAL CLICK		
YES NO		
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

6.7.8. STOP LIGHT INHIBIT

When **YES** is selected, the software is configured to disable the “stop light” warning indicator, unless in a warning condition created from the brake interlock circuit (see 4.5.12). When **NO** is selected the “stop light” warning indicator will be enabled (see 4.5.12).

STOP LIGHT INHIBIT		
YES NO		
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

6.7.9. DIESEL ENGINE

When **YES** is selected, the software is configured to select the Cummins/CAT option for the second line display (see 6.5.1). When **NO** is selected, the software will select the John Deere option for the second line display (see 6.5.2).

DIESEL ENGINE		
YES NO		
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

6.7.10. DIESEL ENGINE TYPE

When **Cummins** is selected, the software is configured to select the Cummins Engine package option. When **CAT** is selected, the software will select the CAT Engine option.

DIESEL ENGINE TYPE		
Cummins	CAT	
OK	Exit	TOGGLE

Pressing **t** (TOGGLE) will toggle between YES and NO, while pressing **m** (OK) will save the selection and go to the next selection. Pressing both **m** and **t** will exit to the start up screen.

6.7.11. SANDERS REFILL WARNING LIGHT

When **YES** is selected, the software is configured to disable the “Sanders” warning indicator (see 5.5.16). When **NO** is selected the “Sanders” warning indicator will be enabled (see 4.5.16).

SANDERS LIGHT INHIBIT		
YES	NO	
OK	Exit	TOGGLE

Pressing **t** (TOGGLE) will toggle between YES and NO, while pressing **m** (OK) will save the selection and go to the next selection. Pressing both **m** and **t** will exit to the start up screen.

6.7.12. BRAKE INTERLOCK

When **YES** is selected, the software is configured to enable the brake interlock function (see 5.3.3). When **NO** is selected the brake interlock function will be disabled (see 5.3.3).

BRAKE INTERLOCK		
YES	NO	
OK	Exit	TOGGLE

Pressing **t** (TOGGLE) will toggle between YES and NO, while pressing **m** (OK) will save the selection and go to the next selection. Pressing both **m** and **t** will exit to the start up screen.

6.7.13. LIFT AUTHORIZATION

When **YES** is selected, the software is configured to enable the lift authorization function (see 5.7.2). When **NO** is selected the lift authorization function will be disabled (see 4.7.2).

LIFT AUTHORIZE		
YES	NO	
OK	Exit	TOGGLE

Pressing **t** (TOGGLE) will toggle between YES and NO, while pressing **m** (OK) will save the selection and go to the next selection. Pressing both **m** and **t** will exit to the start up screen.

6.7.14. ENGINE DOOR OPEN

When **YES** is selected, the software is configured to enable the engine door open function (see 6.4.10). When **NO** is selected the lift authorization function will be disabled (see 6.4.10).

ENGINE DOOR OPEN		
YES		NO
OK	Exit	TOGGLE

Pressing *t* (TOGGLE) will toggle between YES and NO, while pressing *m* (OK) will save the selection and go to the next selection. Pressing both *m* and *t* will exit to the start up screen.

7. 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)

ECM – Electronic Control Module

TVD – Total Vehicle Distance

8. TROUBLESHOOTING

	Observation (Symptom)	Problem	Things to check
1	All gauge pointers wagging end to end; LCD message "Eng Comm Failure" or "Trans Comm Failure"; Various warning lights may be on or off but are not flashing	No J1939 Databus being received by the speedometer	1) Wiring at speedometer 8 position connector pins 3, 4, & 8 2) IP J1939 stub disconnected from backbone harness 3) Bus termination resistor missing (speedometer 8 position connector pins 4 & 8 must be connected together 4) Engine or Transmission controllers not configured for J1939 communication
2	All gauge pointers, except speedometer, wagging end to end; All warning lights are flashing	No LIN Databus between the speedometer and the other gauges and warning modules	1) Check the 3-wire harness between the speedometer, other gauges, and warning modules 2) Remove one gauges at a time from the LIN bus harness and observe if LIN communications is restored.
3	Instrument panel does not power up; No activity on any gauge or warning lights		1) 9-16V power at speedometer J1 pin 1 2) 9-16V power at speedometer J2 pin 11 3) Ground at speedometer J1 pin 2
4	Speedometer indicating 0; Read parameter Speed = 0	Engine controller sending speed data as zero (0) on J1939	1) Transmission not sending tail shaft speed to engine 2) Broken data link between engine and transmission
5	Speedometer pointer wagging; Read parameter Speed = NA	No engine speed data on J1939	Engine controller not sending vehicle speed information
6	Tachometer pointer wagging; Read parameter Eng RPM = NA	No engine speed data on J1939	Engine controller not sending engine speed information
7	Tachometer pointer wagging; Read parameter Eng RPM = a value	No LIN Databus going to tachometer	Check the 3-wire harness between the speedometer, other gauges, and warning modules
8	Coolant temp gauge pointer wagging; Coolant temp warning light OFF or ON; Read parameter coolant temp = NA	No coolant temp data on J1939	Engine controller not sending engine coolant temperature information
9	Coolant temp gauge pointer wagging; Coolant temp warning light flashing	No LIN Databus going to coolant temp gauge	Check the 3-wire harness between the speedometer, other gauges, and warning modules
10	Oil pressure gauge pointer wagging; Oil pressure warning light OFF or ON; Read parameter oil psi = NA	No oil pressure data on J1939	Engine controller not sending engine oil pressure information
11	Oil pressure gauge pointer wagging; Oil pressure warning light flashing	No LIN Databus going to oil pressure gauge	Check the 3-wire harness between the speedometer, other gauges, and warning modules
12	Oil pressure gauge pointer stuck at maximum	Wrong engine selected	Change engine type in master gauge from Cummins to Cat.
13	Oil pressure gauge pointer stuck at maximum	Oil pressure sender open circuit	Check sender or for an open sender wire to master gauge (Cummins Only)
14	Oil pressure gauge pointer stuck at minimum	Oil pressure sender shorted	Check sender or for a shorted sender wire to master gauge (Cummins Only)

	Observation (Symptom)	Problem	Things to check
15	Trans temp gauge pointer wagging; Trans temp warning light OFF or ON; Read parameter trans temp = NA	No trans temp data on J1939	Transmission controller not sending trans temperature information
16	Trans temp gauge pointer wagging; Trans temp warning light flashing	No LIN Databus going to trans temp gauge	Check the 3-wire harness between the speedometer, other gauges, and warning modules
17	Voltmeter pointer wagging; Voltmeter warning light OFF or ON; Read parameter Voltmeter = NA	No voltmeter data on J1939	Transmission controller not sending trans temperature information
18	Voltmeter pointer wagging; Voltmeter warning light flashing	No LIN Databus going to voltmeter	Check the 3-wire harness between the Speedo, other gauges, and WB modules
18	Fuel gauge pointer stuck at EMPTY; Low fuel warning light ON	Fuel sender wire shorted to ground	Wire to speedometer pin 1 shorted to chassis
20	Fuel gauge pointer stuck at FULL; Low fuel warning light OFF	Fuel sender wire open circuit	Wire to speedometer pin 1 open
21	Fuel gauge pointer wagging; Low Fuel warning light flashing	No LIN Databus going to fuel level gauge	Check the 3-wire harness between the speedometer, other gauges, and warning modules
22	Front Air pressure gauge pointer wagging; Read parameter air = NA	Warning module does not have air transducers programmed	Contact Actia Corp.
23	Front Air pressure gauge pointer wagging; Low air warning light flashing	No LIN databus between the right warning module and the speedometer	Check the 3-wire harness between the speedometer, other gauges, and warning modules
24	Rear Air pressure gauge pointer wagging; Read parameter air = NA	Warning module does not have air transducers programmed	Contact Actia Corp.
25	Rear Air pressure gauge pointer wagging; Low air warning light flashing	No LIN databus between the right warning module and the speedometer	Check the 3-wire harness between the speedometer, other gauges, and warning modules
26	Ammeter reading seem low / high	Ammeter not calibrated	Check Sender output voltage
27	Ammeter pointer stuck at +150 / -150	Ammeter wires open / short circuit	Wire to speedometer pin 7 open / shorted to chassis
28	Warning modules do not perform lamp test on turn on; Icons not flashing	No power to the warning module	Check the 3-wire harness between the speedometer, other gauges, and warning modules
29	Left Turn icon stuck off; Left turn binary input reads low	Left turn binary input will not go high	Wire to Speedo J2 pin 12 broken or shorted to chassis
30	Left Turn icon stuck on; Left turn binary input reads high	Left turn binary input shorted high	1) Bad turn signal switch 2) Wire to Speedo J2 pin 12 shorted to ignition voltage
31	Right Turn icon stuck off; Binary input reads low	Right turn binary input will not go high	Wire to Speedo J2 pin 13 broken or shorted to chassis
32	Right Turn icon stuck on; Binary input reads high	Right turn binary input shorted high	1) Bad turn signal switch 2) Wire to Speedo J2 pin 13 shorted to ignition voltage
33	Hi Beam icon is stuck OFF; Hi Beam binary Input reads low	Input is not switching high	Wire to Speedo J2 pin 16 broken or shorted to chassis

	Observation (Symptom)	Problem	Things to check
34	Hi Beam icon is stuck ON; High Beam binary input reads high	Input shorted high	1) Bad headlight or dimmer switch 2) Wire to Speedo J2 pin 16 shorted to ignition voltage
35	Park Brake icon is stuck OFF; Park Brake binary Input reads low	Input is not switching high	Wire to Speedo J2 pin 14 broken or shorted to chassis
36	Park Brake icon is stuck ON; Park Brake binary input reads high	Input shorted high	1) Bad park brake switch 2) Wire to Speedo J2 pin 14 shorted to ignition voltage
37	Stop Light icon is stuck OFF; Stop Light binary Input reads low	Input is not switching high	Wire to Speedo J2 pin 15 broken or shorted to chassis
38	Stop Light icon is stuck ON; Stop Light binary input reads high	Input shorted high	1) Service Brake switch 2) Wire to Speedo J2 pin 15 shorted to ignition voltage
39	Hydraulic Brake Failure icon stuck off; Hydraulic Brake Failure binary input reads high	Hydraulic Brake Failure binary input will not switch low	Wire to Speedo J2 pin 3 broken or shorted to ignition voltage
40	Hydraulic Brake Failure icon stuck on; Hydraulic Brake Failure binary input reads low	Hydraulic Brake Failure binary input shorted low	Wire to Speedo J2 pin 3 shorted to chassis
41	Wait to Start icon stuck off; Wait to Start binary input reads high	Wait to Start binary input will not switch low	Wire to Speedo J2 pin 2 broken or shorted to ignition voltage
42	Wait to Start icon stuck on; Wait to Start binary input reads low	Wait to Start binary input shorted low	Wire to Speedo J2 pin 2 shorted to chassis
43	High Hyd. Oil Temp icon stuck off; High Hyd. Oil binary input reads high	High Hyd. Oil binary input will not switch low	Wire to warning bank module pin 1 broken or shorted to ignition voltage
44	High Hyd. Oil icon stuck on; High Hyd. Oil binary input reads low	High Hyd. Oil binary input shorted low	Wire to warning bank module pin 1 shorted to chassis
45	Alternator message will not display; Alternator message binary input reads high	Alternator message binary input will not switch low	Wire to warning bank module pin 2 broken or shorted to ignition voltage
46	Alternator message stuck on; Alternator message binary input reads low	Alternator message binary input shorted low	Wire to warning bank module pin 2 shorted to chassis
47	Sanders Refill message will not display; Sanders Refill message binary input reads high	Sanders Refill message binary input will not switch low	Wire to warning bank module pin 3 broken or shorted to ignition voltage
48	Sanders Refill message stuck on; Sanders Refill message binary input reads low	Sanders Refill message binary input shorted low	Wire to warning bank module pin 3 shorted to chassis
49	ABS icon stuck off; ABS binary input reads high	ABS binary input will not switch low	Wire to warning bank module pin 4 broken or shorted to ignition voltage
50	ABS icon stuck on; ABS binary input reads low	ABS binary input shorted low	Wire to warning bank module pin 4 shorted to chassis
51	WIF message will not display; WIF message binary input reads high	WIF message binary input will not switch low	Wire to warning bank module pin 5 broken or shorted to ignition voltage
52	WIF message stuck on; WIF message binary input reads low	WIF message binary input shorted low	Wire to warning bank module pin 5 shorted to chassis

	Observation (Symptom)	Problem	Things to check
53	Lift not stowed message will not display; Lift not stowed message binary input reads high	Lift not stowed message binary input will not switch low	Wire to warning bank module pin 6 broken or shorted to ignition voltage
54	Lift not stowed message stuck on; Lift not stowed message binary input reads low	Lift not stowed message binary input shorted low	Wire to warning bank module pin 6 shorted to chassis
55	Retarder icon stuck off; Retarder binary input reads high	Retarder binary input will not switch low	Wire to warning bank module pin 7 broken or shorted to ignition voltage
56	Retarder icon stuck on; Retarder binary input reads low	Retarder binary input shorted low	Wire to warning bank module pin 7 shorted to chassis
57	Engine Door message will not display; Engine Door message binary input reads high	Engine Door message binary input will not switch low	Wire to warning bank module pin 8 broken or shorted to ignition voltage
58	Engine Door message stuck on; Engine Door message binary input reads low	Engine Door message binary input shorted low	Wire to warning bank module pin 8 shorted to chassis
59	Stop Engine icon stuck off; Stop Engine FMI not Active in Eng. Diag. Menu	No stop engine data on J1939	Engine controller not sending stop engine information
60	Stop Engine icon stuck on; Stop Engine FMI Active in Eng. Diag. Menu	Engine controller sending stop engine FMI on J1939	1) Engine controller Error 2) Broken sender wire between engine sender
61	Low Coolant Level icon stuck off;	No coolant level data on J1939	Engine controller not sending Low Coolant Level information
62	Low Coolant Level icon stuck on;	Engine controller sending Low Coolant Level data on J1939	1) Engine controller Error 2) Coolant level sender error
63	Check Trans icon stuck off; Check Trans FMI not Active on transmission diagnostic tool	No Check Trans FMI on J1939	Transmission controller not sending check trans information
64	Check Trans icon stuck on; Check Trans FMI Active on transmission diagnostic tool	Transmission controller sending check trans FMI on J1939	1) Transmission controller Error 2) Transmission sender error
65	Trans Temp icon stuck off; Trans Temp data not Active in read parameters menu	No Trans Temp Data on J1939	Transmission controller not sending trans temp information
66	Trans Temp icon stuck on; Trans Temp reading higher than set point in read parameters menu	Transmission controller sending erroneous data on J1939	1) Transmission controller Error 2) Transmission sender error
67	Engine Warning icon stuck off; Engine Warning FMI not Active in Eng. Diag. Menu	No Engine Warning data on J1939	Engine controller not sending Engine Warning information
68	Engine Warning icon stuck on; Engine Warning FMI Active in Eng. Diag. Menu	Engine controller sending Engine Warning FMI on J1939	1) Engine controller Error 2) Broken sender wire between engine sender

	Observation (Symptom)	Problem	Things to check
69	MIL icon stuck off; MIL FMI not Active in Eng. Diag. Menu	No stop engine data on J1939	Engine controller not sending stop engine information
70	MIL icon stuck on; MIL FMI Active in Eng. Diag. Menu	Engine controller sending MIL FMI on J1939	1) Engine controller Error 2) Broken sender wire between engine sender