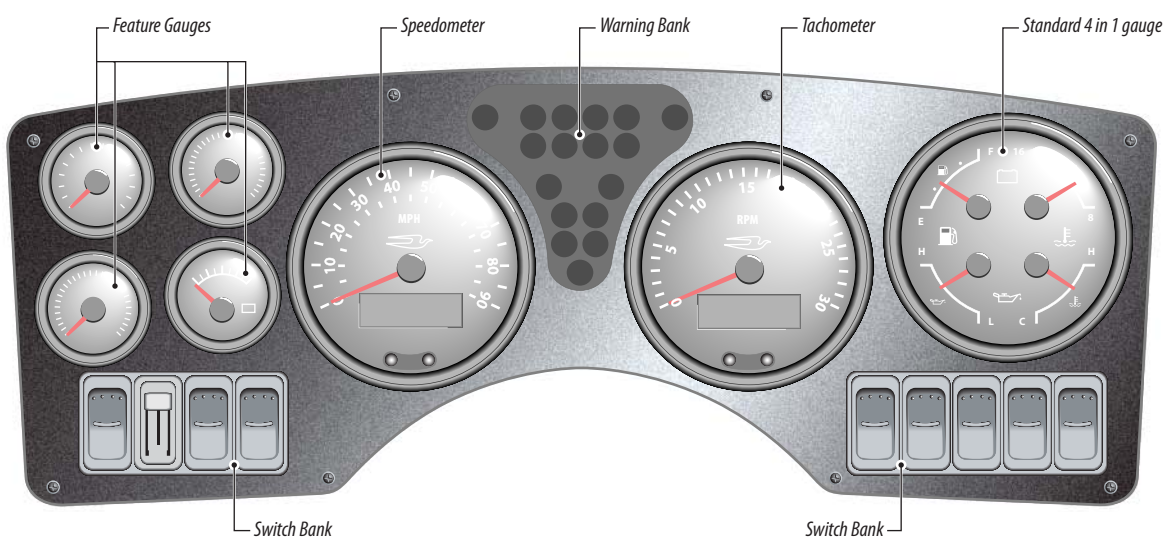
Overview

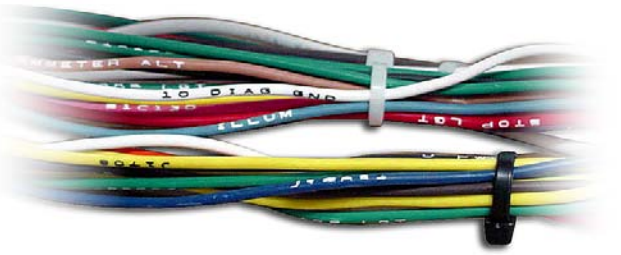
The Blue Bird All American instrument panel uses all electronic analog guages manufactured by ACTIA®. In addition to gauges, the instrument panel includes an LED display panel and gauge warning indicators which provide illuminated visual alerts to the Driver.

The instrument assembly receives both analog inputs from such components as the fuel tank sender and instrument panel dimmer switch; binary inputs from brake and directional signal switches; and digital signals from components such as the engine and transmission control modules, via the J1939 and J1587 data buses. The Warning Module also has ports to a built in transducer for primary and secondary air pressure signal lines on units equipped with air brakes.

The speedometer is the "master" gauge and serves as the central processor for the instruments' communication system. All of the other gauges are "slave" gauges connected to the speedometer on a common data bus. All gauges receive the same data stream. Each guage responds to its appropriate information within that data stream and "ignores" the rest. Therefore, data connectors on the backs of the various slave guages are interchangeable, and the proper operation of an individual guage is not dependent upon its being located in any particular position on the harness. The two four-pin connectors on the back of each slave gauge or panel are identical. This characteristic provides for a convenient and simple troubleshooting technique: Swapping the connector on a suspect guage with one on a properly performing guage, or jumpering between the connectors on the gauges, can help quickly determine whether a problem is in the gauge, harness, or in the data it is receiving.



The speedometer also incorporates a backlit LCD Message Display Center, which can be used by the Driver or Service Technician to view vehicle statistics and fault alerts, and to perform self-diagnostics on the instrument system. The data to be displayed is selected by navigating a menu system controlled by two buttons on the face of the speedometer. (The tachometer incorporates a clock display similar in appearance to the speedometer's Message Display Center.)



Color coded and labeled wires

The instrument panel also incorporates two switch panels to control such things as the high idol, lights and dimmer. These switches may vary depending on which options are on your bus. For troubleshooting convenience, the wires of the instrument panel harness are both color-coded and labeled.

Appendixes In This Chapter

Appendix 1. BBA3 Instrument Panel Service Manual. This ACTIA publication was created especially for Blue Bird and details the operation of the instrument system including a detailed explanation of the Message Display Center's menus and diagnostic capabilities.

Instrument Panel Removal

The instrument panel is designed for easily removed from its housing by means of ten screws around the perimeter of its face plate. Individual gauges are fastened to the panel by a hand-tightened threaded ring around the back side of the meter's body.

1. Ensure the engine is not running and the ignition switch is in the "OFF" position.

2. Remove the ten machine screws from around instrument panel's perimeter.

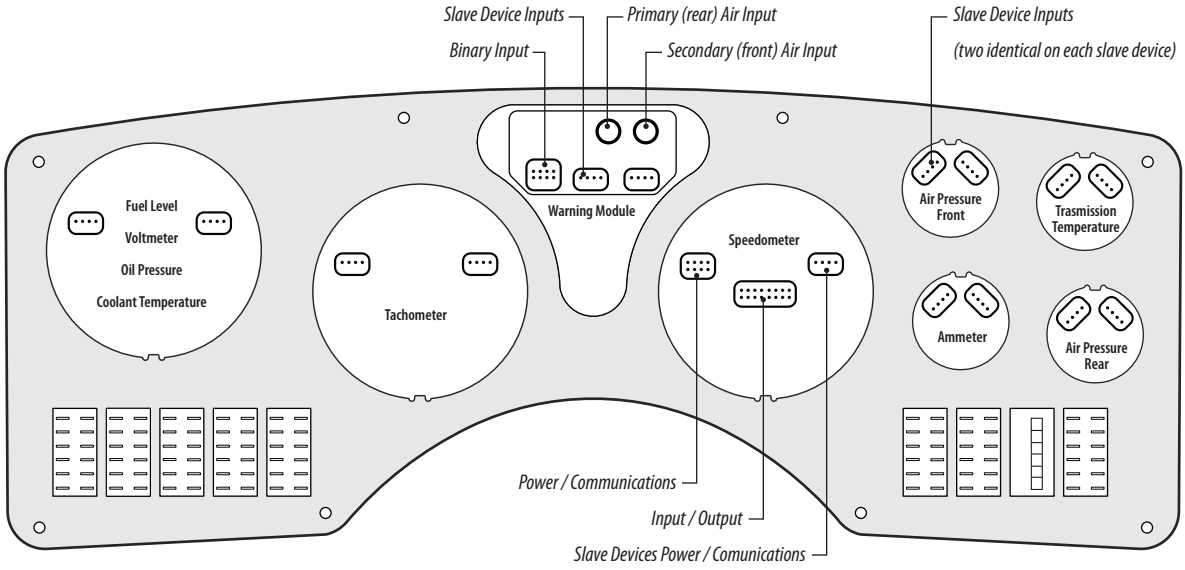
3. Carefully pull the top edge of the instrument cluster away from the housing.

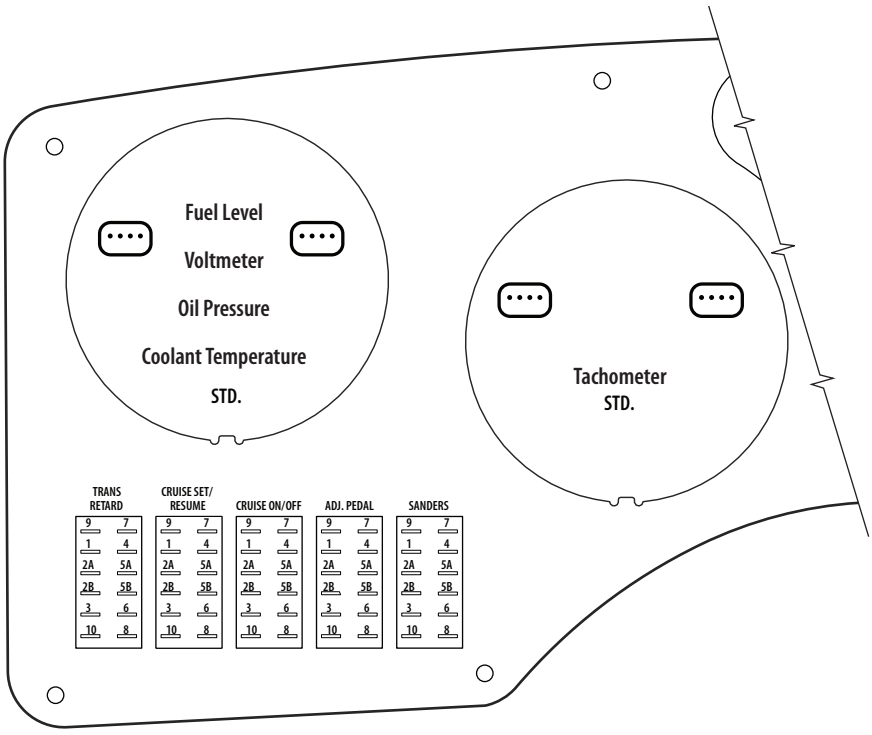
4. To remove a gauge, unplug its harness connector(s) and unscrew the threaded ring around its body.

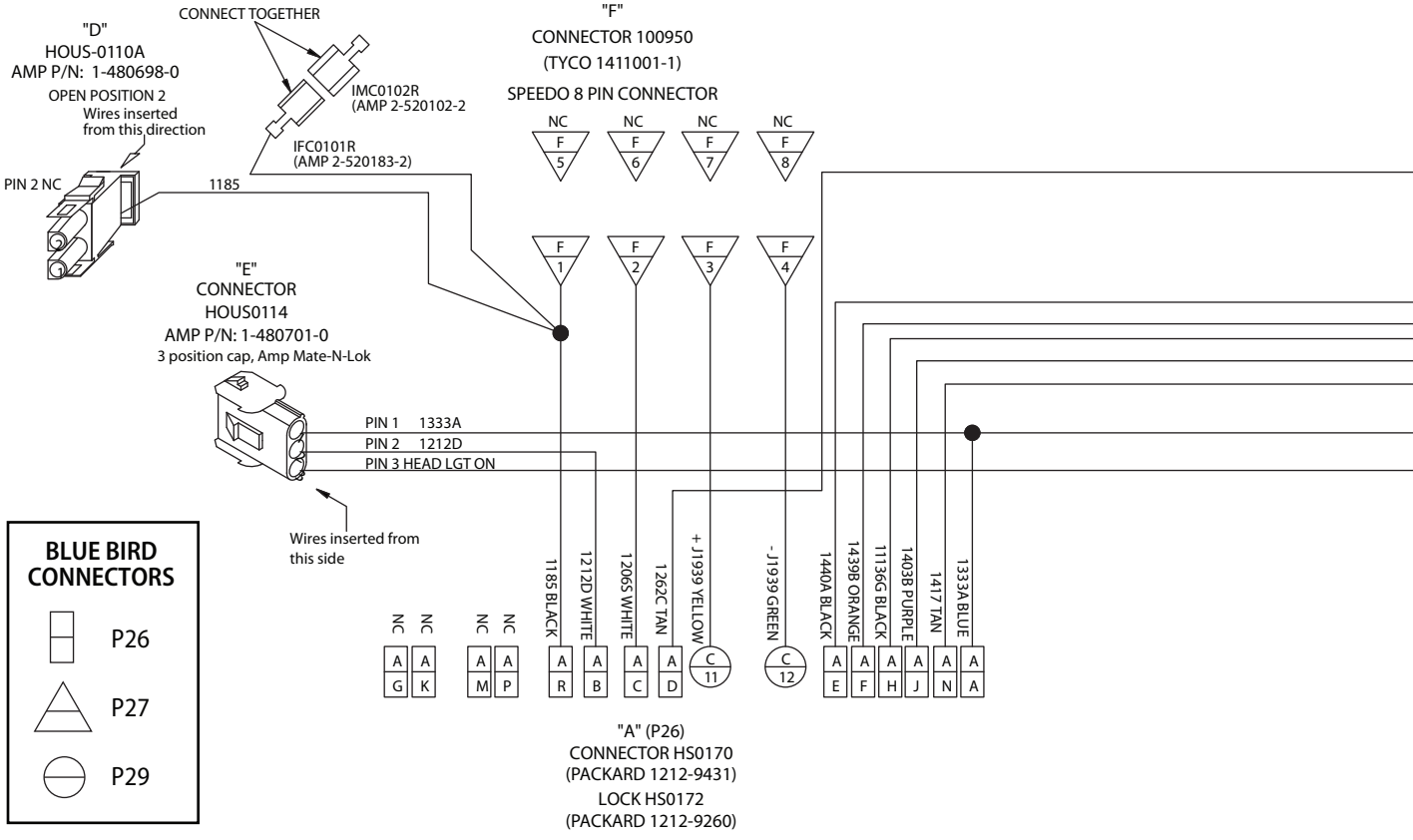
Testing a Gauge By Substitution

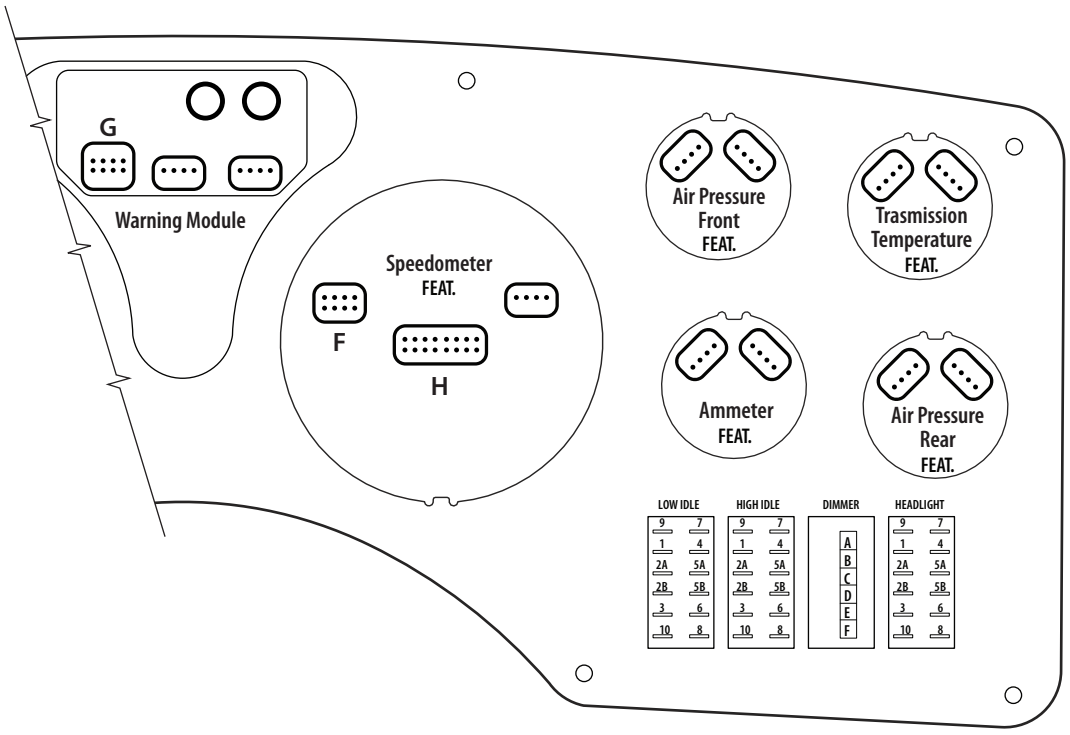
To help quickly determine if a suspected gauge is faulty, the harness connnector from an adjacent gauge can be temporarily substituted.

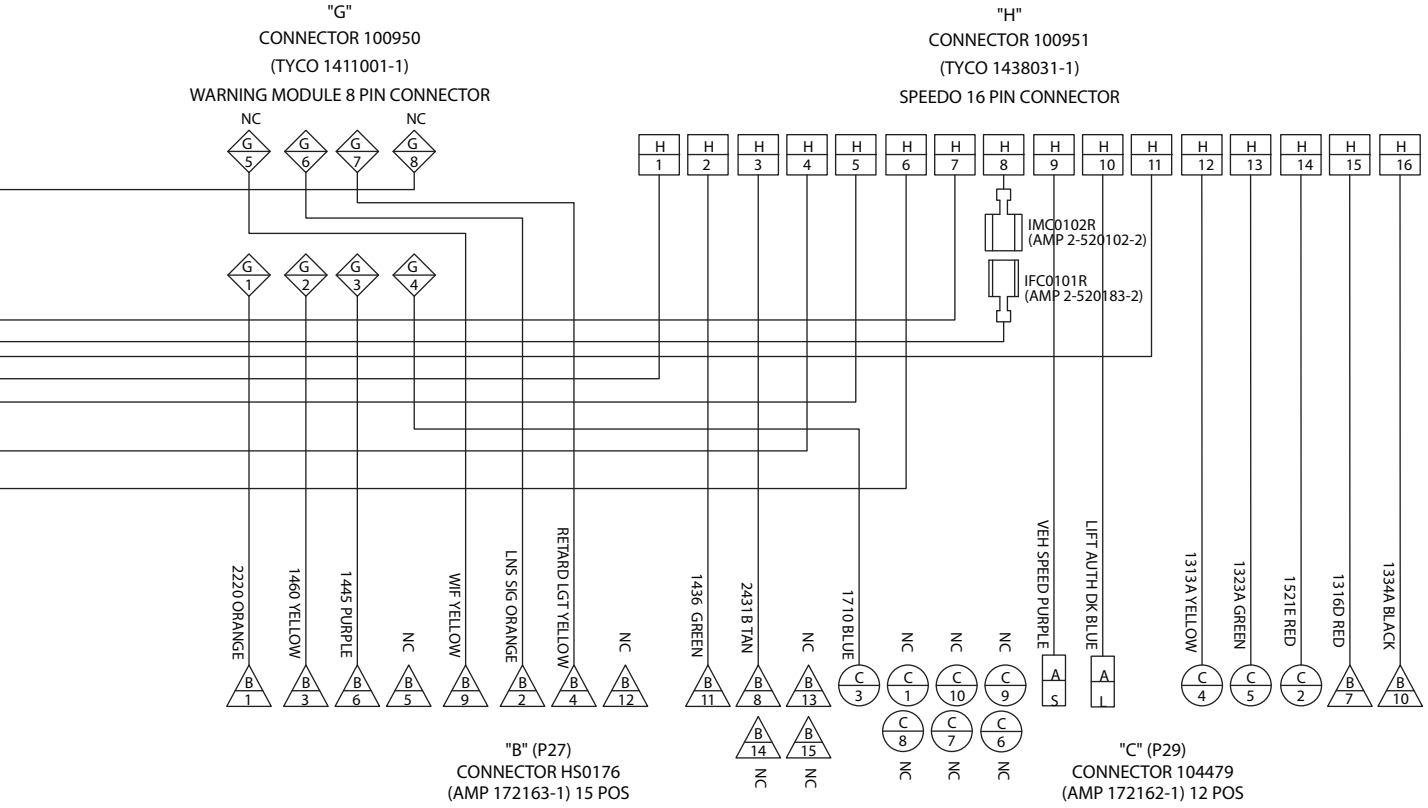
1. Label and remove the wiring harness from the gauge in question.
2. Label and remove the wiring harness from an adjacent gauge.
3. Plug the connector from the known "good" gauge into the suspect gauge.
4. Support the instrument cluster in a safe position.
5. Turn the ignition switch to the "ON" position. Start the engine if necessary.
6. Check whether the suspect gauge now indicates a value. If it does not, the gauge may be faulty. If the gauge indicator needle now indicates a reading, the original malfunction is probably not due to a faulty instrument panel harness. A gauge test can determine if the gauge itself needs to be replaced. There are other test and troubleshooting techniques available in Appendix 1. Refer to the manufacturer's service manual for instructions regarding signals originating from the engine ECM or transmission TCU. Electrical diagrams can also be found in this manual to aid in troubleshooting the entire circuit..



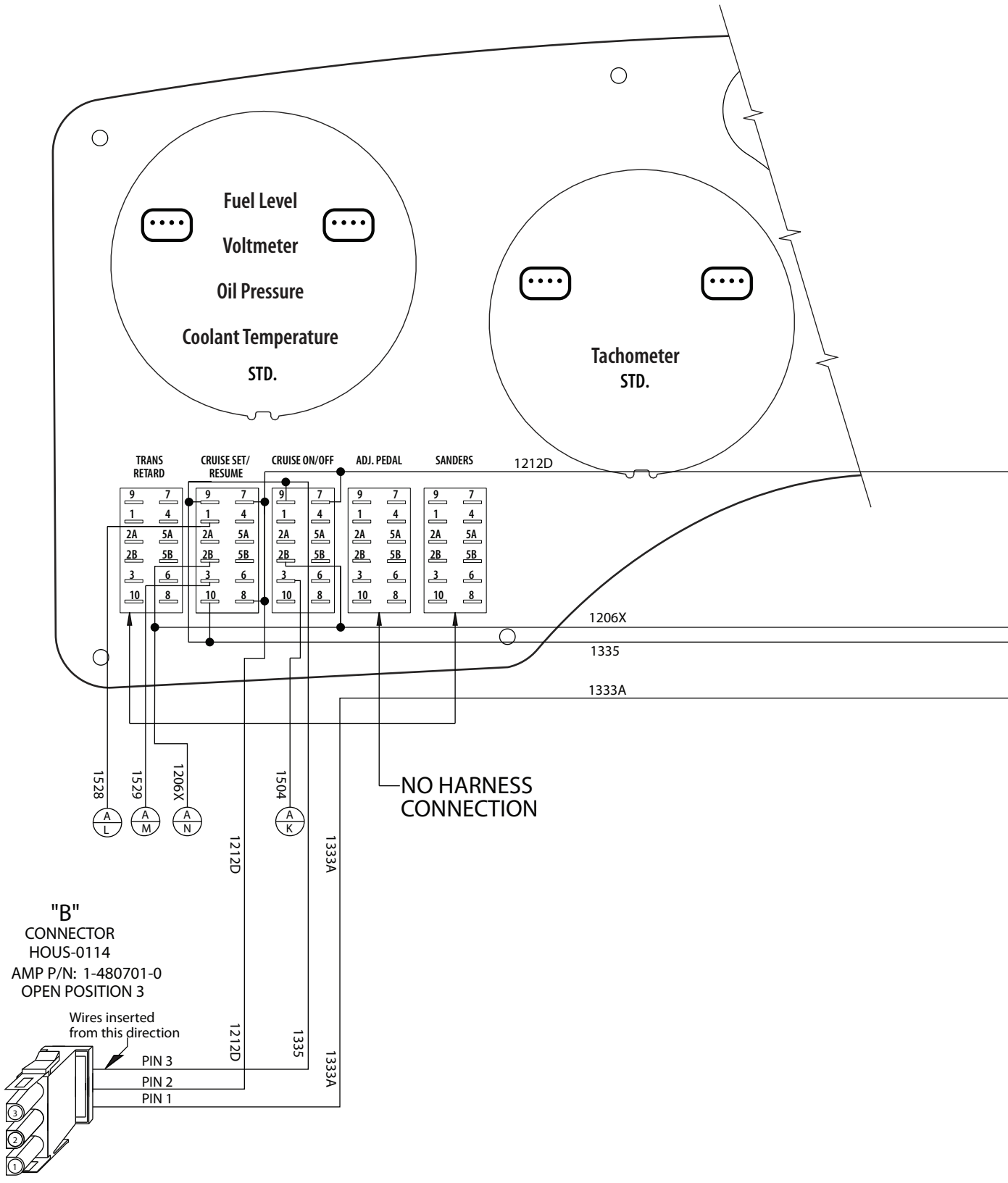

Fuel Level
Voltmeter
Oil Pressure
Coolant Temperature
STD.
Tachometer
STD.
TRANS RETARD
CRUISE SET/ RESUME
CRUISE ON/OFF
ADJ. PEDAL
SANDERS
9 7
1 4
2A 5A
2B 5B
3 6
10 8

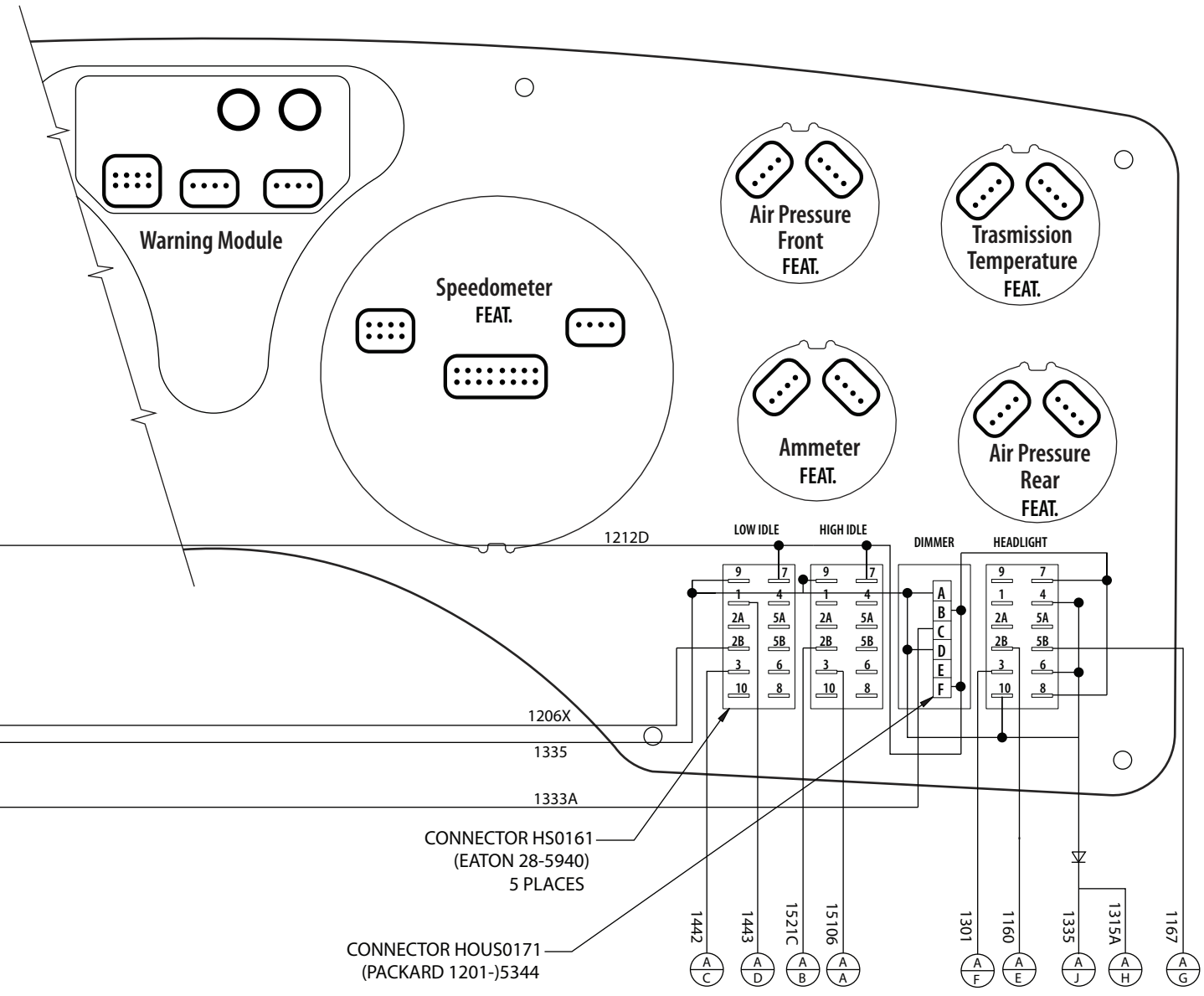

"D"
HOUS-0110A
AMP P/N: 1-480698-0
OPEN POSITION 2
Wires inserted from this direction
CONNECT TOGETHER
IMC0102R (AMP 2-520102-2
IFC0101R (AMP 2-520183-2)
PIN 2 NC
1185
"F"
CONNECTOR 100950
(TYCO 1411001-1)
SPEEDO 8 PIN CONNECTOR
NC F 5
NC F 6
NC F 7
NC F 8
F 1
F 2
F 3
F 4
"E"
CONNECTOR
HOUS0114
AMP P/N: 1-480701-0
3 position cap, Amp Mate-N-Lok
PIN 1 1333A
PIN 2 1212D
PIN 3 HEAD LGT ON
Wires inserted from this side
1185 BLACK
1212D WHITE
1206S WHITE
1262C TAN
+ J1939 YELLOW
- J1939 GREEN
1440A BLACK
1439B ORANGE
11136G BLACK
1403B PURPLE
1417 TAN
1333A BLUE
NC A G
NC A K
NC A M
NC A P
A R
A B
A C
A D
C 11
C 12
A E
A F
A H
A J
A N
A A
"A" (P26)
CONNECTOR HS0170
(PACKARD 1212-9431)
LOCK HS0172
(PACKARD 1212-9260)
BLUE BIRD CONNECTORS
P26
P27
P29





Instrument Gauge, Schematic


Fuel Level
Voltmeter
Oil Pressure
Coolant Temperature
STD.
Tachometer
STD.
TRANS RETARD
CRUISE SET/ RESUME
CRUISE ON/OFF
ADJ. PEDAL
SANDERS
1212D
1206X
1335
1333A
1528
1529
1206X
1504
NO HARNESS CONNECTION
"B"
CONNECTOR
HOUS-0114
AMP P/N: 1-480701-0
OPEN POSITION 3
Wires inserted from this direction
PIN 3
PIN 2
PIN 1
1212D
1335
1333A



"A"
CONNECTOR HS0171
(PACKARD 1212-9427)
LOCK HS0172
(PACKARD 1212-9260)
(BLUE BIRD CONNECTOR P28)

Instrument Switch, Schematic

ACTIA®

52765 Bridger Court
Elkhart, IN 46514
USA

Phone: 574 264 2373

www.actia.com

BBA3 Instrument Panel Service Manual

Classification
☐ *No*
☒ *Confidential. ACTIA*
☐ *Confidential. client*
☐

	By	*Date*		*ACTIA Ref.*	*Revision*
Written	Rick Greenlee	2/27/07	**BBA3 Instrument Service Manual**	**109891**	**C**
Reviewed					
Approved	*KLD*	*July 31 2007*			
				Page 1	*Format US Letter*

REVISION TRACKING SHEET

Rev	Modified	Date	Comment
A	*R.Greenlee*	*2/27/07*	*Write Service Manual*
B	*R Parks*	*7/19/07*	*Update for buzzer disable (8.19 / 11.1)*
C	*R Parks*	*7/27/07*	*Revision for buzzer disable (8.2 / 11.1)*

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1. PART NUMBERS AND FEATURES

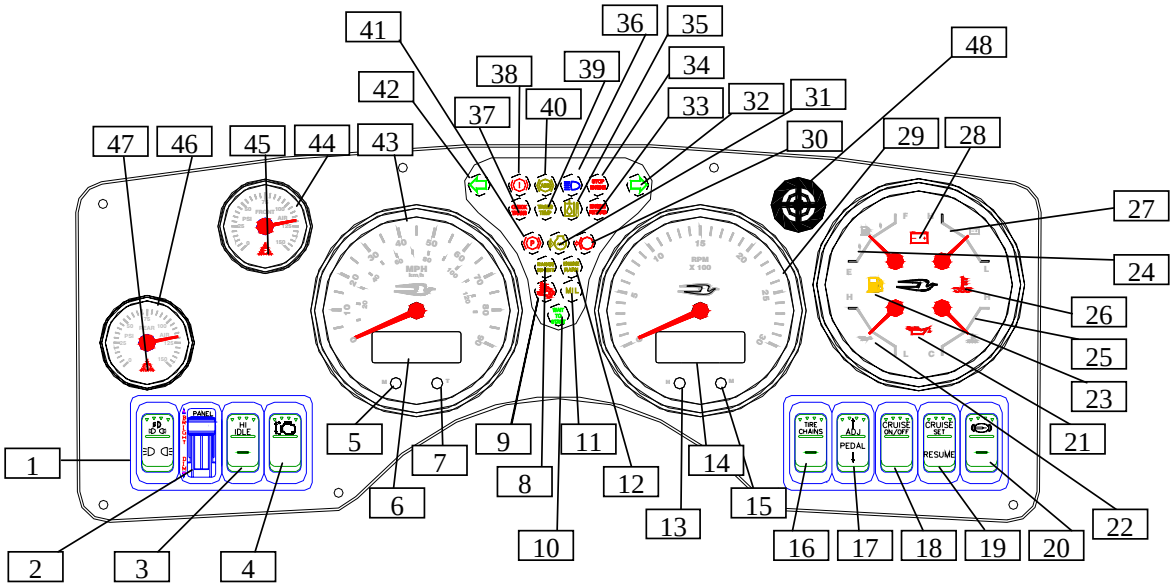
1.1. Dash Panel:

Assembly #	*Panel #*	*BB Service Panel #*	*Description*
0109788	*0109789*	*0109789*	*Instrument Panel Assembly-Dash,A3,4in1*
0109783	*0109786*	*0109786*	*Instrument Panel Assembly - BBA3 - AC*
0109774	*0109784*	*0109784*	*Instrument Panel Assembly - BBA3 – AC – ECC*

1.2. Service Parts:

Actia #	*BBB #*	*Description*
108990 English	*0110408*	*Master Gauge Speedo –140KM/H*
109000 Metric	*0110407*	*Master Gauge Speedo –90 MPH*
108991	*0110409*	*Master Gauge Tach / Clock*
108996	*0109790*	*Slave Gauge 4in1 Fuel,Volt,Oil Pressure,Coolant Temp*
108992	*0110410*	*Front Air Pressure Slave Gauge,A3,BB*
108993	*0110411*	*Rear Air Pressure Slave Gauge,A3,BBB*
106489	*N/A*	*Warning Bank,Config 4 Module w/o Air,*
105819	*0079106*	*Warning Bank Config 4 Module W/Air*
104500	*N/A*	*18 position telltale A3,LED PWA*
109125 English	*N/A*	*18 position telltale overlay*
109126 Metric	*N/A*	*18 position telltale overlay*

2. ***ELEMENTS***



1	*Headlight Switch*	*27*	*Volt Meter Gauge*
2	*Panel Dimmer*	*28*	*High/Low Voltage Warning*
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	*High Exhaust Temp*	*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*	*Rear Air Gauge*
21	*Low Oil Pressure Warning Light*	*47*	*Rear Air Warning Light*
22	*Oil Pressure Gauge*	*48*	*External Warning Alarm*
23	*Low Fuel Warning Light*		
24	*Fuel Gauge*		
25	*Coolant Temperature Gauge*		
26	*High Coolant Temp Warning*		

3. PANEL INTERCONNECTIONS

3.1. Connectors

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

The speedometer has three connectors associated with it:

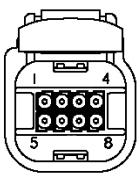
J1 – an eight (8) position for power/communication,
J2 – a 16 position for input and output connections, and
J3 for slave device power and communications

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)

3.1.1. 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*

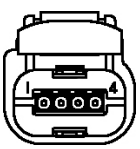
3.1.2. J2 - SPEEDOMETER I/O CONNECTOR (INPUTS & OUTPUTS)

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	*Open*	*Active low – Spare*	*N/A*	*N/A*
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 ≤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

3.1.3. 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*

3.1.4. 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	*Spare*	*Active low – Spare*	*P27-6*	*N/A*
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*

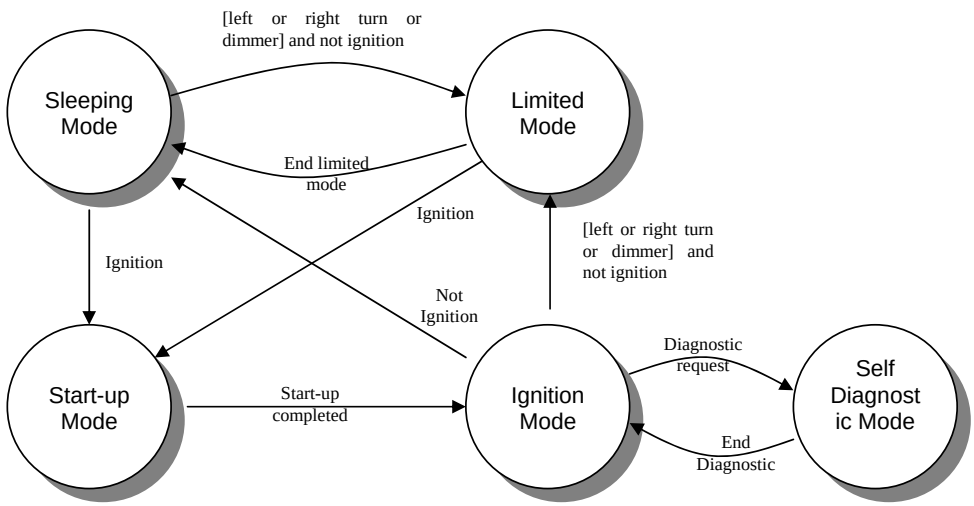
Signal Low = Chassis Ground (0.0V-1.5V) Signal High = 4.0V up to ignition Voltage

3.1.5. 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:
Tire Chains, Pedal Adjust and Transmission Retarder switches are wired with an optional harness at Bluebird.

4. MODES OF OPERATION



4.1. Limited Mode

The Master runs in limited mode when the ignition is off but other input signals are requiring the Master to operate. The Master exits limited mode when the ignition becomes active or the signals that caused the Master to wake-up become inactive.

4.1.1. DISPLAY ODOMETER & CLOCK

The odometer and Clock is readable with the ignition off when the vehicle dimmer input level is greater than approximately 10% of the ignition voltage.

4.1.2. HAZARD WARNING LIGHTS

The right and left turn icons are operational with the ignition off when the hazard lights are turned on (right and/or left turn binary inputs high).

4.2. 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.

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

4.2.1. 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.

4.2.2. 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.

4.2.3. 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.

4.2.4. 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.

4.2.5. AUDIBLE ALARM

The audible alarm will sound its three different tones for one second each during the up scale swing of the pointers.The external buzzer will chirp with the lighting of the warning lights.

4.3. 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 micro will zero all gauges (master and slave), except the fuel gauge, and store any data to the EEPROM before turning the supply off.

After storing the data, the system goes to sleep mode after a delay of approximately 4 seconds.

4.4. 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.

4.5. 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.

The self-diagnostic includes the following tests:

- *Gauges*
- *LCD*
- *Warning Lights*
- *Binary Inputs*
- *Analog Inputs*
- *Binary Outputs*

Detail specifications are found in the Message Display Center section.

4.6. Test Panel Mode

The test panel mode can only be activated through Actia provided software. When selected, the software is configured as a production chassis test fixture. The functions below describe the difference in operation for this mode:

1) *The presence of front and rear air gauges is controlled through binary inputs and not roll call. (Warning Bank # 2 - Pin 5)*
2) *The presence of applied air gauges is controlled through binary inputs and not roll call. (Warning Bank # 2 - Pin 8)*

5. IGNITION MODE

5.1. Gauge Display

5.1.1. 117MM MASTER GAUGES – SPEEDOMETER

Data Source	Range	Movement	Scale English	Scale Metric
PGN65265	230°	CW	Linear 0° = 0 MPH 230° = 90 MPH	Linear 0° = 0 KMH 230° = 140KMH

5.1.2. 117MM SINGLE GAUGE – TACHOMETER / CLOCK

Data Source	LIN ID	Range	Movement	Scale	Warning Light	WL Trigger	WL Alarm
PGN61444	0x64	230°	CW	Linear 0° = 0 RPM 230° = 3000 RPM	None	None	None

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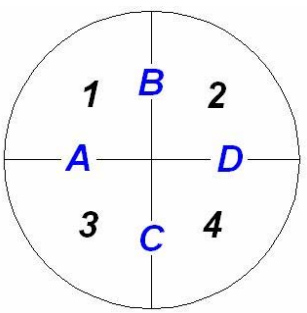
5.1.3. 117MM 4-IN-1 GAUGE

The 4-in-1 gauge is laid out in the following format. The number in the description of each gauge corresponds with its placement on the dial face. Gauges are listed 1 / 2 / 3 / 4 in the heading of each section.

The letter described in the warning lights section corresponds with the location of the LED on the PWA. All warning lights in the 4-in-1 gauges are red, except the low fuel warning, which is amber.



5.1.3.1. Fuel Level / 12V Voltmeter / Oil Pressure / Coolant Temp CUMMINS BBA3 FE

Gauge Number	Data Source	LIN ID	Range	Movement	Scale	Warning Light	WL Trigger	WL Alarm
1	M16, Pin 1, AN3	0xC4	90°	CW	Linear 0° = Empty 90° = Full	A	On if fuel ≤ 13 % Then off if fuel ≥ 18%	Beep 1
2	PGN65271	0xA3	90°	CCW	Linear 0° = 8 Volts 90° = 16 Volts	D	On ≤ 11.0V (then off at 12.1V) On ≥ 15.5V (then off at 15.3V)	Continuous 1
3	PGN65263	0x42	90°	CW	Piece wise Linear 0° = 0 PSI 90 °= 150 PSI	C	DM1SPN100	Continuous 1
4	PGN65262	0xC1	90°	CCW	Linear 0° = 100°F 90° = 260°F	B	DM1SPN110	Continuous 1

5.1.3.2. Fuel Level / 12V Voltmeter / Oil Pressure / Coolant Temp CUMMINS BBA3 RE

Gauge Number	Data Source	LIN ID	Range	Movement	Scale	Warning Light	WL Trigger	WL Alarm
1	M16, Pin 1, AN3	0xC4	90°	CW	Linear 0° = Empty 90° = Full	A	On if fuel ≤ 13 % Then off if fuel ≥ 18%	Beep 1
2	PGN65271	0xA3	90°	CCW	Linear 0° = 8 Volts 90° = 16 Volts	D	On ≤ 11.0V (then off at 12.1V) On ≥ 15.5V (then off at 15.3V)	Continuous 1
3	M16, Pin 6, AN5	0x42	90°	CW	Piece wise Linear 0° = 0 PSI 90 °= 150 PSI	C	DM1SPN100	Continuous 1
4	PGN65262	0xC1	90°	CCW	Linear 0° = 100°F 90° = 260°F	B	DM1SPN110	Continuous 1

5.1.3.3. Fuel Level / 12V Voltmeter / Oil Pressure / Coolant Temp CAT

Gauge Number	Data Source	LIN ID	Range	Movement	Scale	Warning Light	WL Trigger	WL Alarm
1	M16, Pin 1, AN3	0xC4	90°	CW	Linear 0° = Empty 90° = Full	A	On if fuel ≤ 13 % Then off if fuel ≥ 18%	Beep 1
2	PGN65271	0xA3	90°	CCW	Linear 0° = 8 Volts 90° = 16 Volts	D	On ≤ 11.0V (then off at 12.1V) On ≥ 15.5V (then off at 15.3V)	Continuous 1
3	PGN65263	0x42	90°	CW	Piece wise Linear 0° = 0 PSI 90 °= 150 PSI	C	DM1SPN100	Continuous 1
4	PGN65262	0xC1	90°	CCW	Linear 0° = 100°F 90° = 260°F	B	DM1SPN110	Continuous 1

5.1.3.4. Fuel Level / 12V Voltmeter / Oil Pressure / Coolant Temp JOHN DEERE

Gauge Number	Data Source	LIN ID	Range	Movement	Scale	Warning Light	WL Trigger	WL Alarm
1	PGN65276	0xC4	90°	CW	Linear 0° = Empty (5% of the sender) 90° = Full (95% of the sender)	A	On if fuel ≤ 13 % Then off if fuel ≥ 18%	Beep 1
2	PGN65271JD	0xA3	90°	CCW	Linear 0° = 8 Volts 90° = 16 Volts	D	On ≤ 11.0V (then off at 12.1V) On ≥ 15.5V (then off at 15.3V)	Continuous 1
3	PGN65263	0x42	90°	CW	Piece wise Linear 0° = 0 PSI 90 °= 150 PSI	C	DM1SPN100	Continuous 1
4	PGN65262	0xC1	90°	CCW	Linear 0° = 100°F 90° = 260°F	B	DM1SPN110	Continuous 1

5.1.4. OIL PRESSURE

5.1.4.1.Cummins BBA3 FE

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

5.1.4.2.Cummins BBA3 RE

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.

5.1.4.3.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).

Note: For Cummins engines only, a bit is used in the setup menu (see 8.3.1) to determine if the oil pressure value is received from J1939 (PGN65263) or from an oil pressure sender (M16,Pin6,AN5).

5.1.5. FUEL

5.1.5.1.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.

5.1.5.2.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).

5.1.6.VOLT

5.1.6.1.Cummins & CAT

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

5.1.6.2.John Deere

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

5.1.7.52MM GAUGES, 270 DEGREE SWEEP

5.1.7.1.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.

5.1.7.2.Front Air

Data Source	LIN ID	Range	Movement	Scale	WL Trigger	WL Alarm
Warning Bank Transducer	*0x85*	*270°*	*CW*	*Linear 0° = 0 PSI 270° = 150 PSI*	*On when front air ≤ 65 PSI Then off when ≥ 72 PSI*	*Continuous 1*

5.1.7.3.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.

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5.1.7.4.Rear Air

Data Source	LIN ID	Range	Movement	Scale	WL Trigger	WL Alarm
Warning Bank Transducer	*0x06*	*270°*	*CW*	*Linear 0° = 0 PSI 270° = 150 PSI*	*On when front air ≤ 65 PSI Then off when ≥ 72 PSI*	*Continuous 1*

5.2. 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.

5.2.1. 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.

Applied Front Air (Optional)

Data Source	LIN ID	Range	Movement	Scale	WL Trigger	WL Alarm
Warning Bank Transducer	*0xCA*	*270°*	*CW*	*Linear 0° = 0 PSI 270° = 150 PSI*	*None*	*None*

5.2.2. 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.

Applied Rear Air (optional)

Data Source	LIN ID	Range	Movement	Scale	WL Trigger	WL Alarm
Warning Bank Transducer	*0x8B*	*270°*	*CW*	*Linear 0° = 0 PSI 270° = 150 PSI*	*None*	*None*

5.3. 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*

5.4. Gauges Internal Warning Indicators

5.4.1. LOW OIL PRESSURE

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

5.4.2. HIGH COOLANT TEMPERATURE

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

5.4.3. 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.

5.4.4. 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%.

5.4.5. 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.

5.4.6. 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.

5.4.7. LOW/HIGH BATTERY VOLTAGE

Low/High battery voltage icon turns on when the battery voltage is less than 11.0v or is more than 15.4v.

5.4.8. LOW APPLIED AIR PRESSURE - FRONT

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

5.4.9. LOW APPLIED AIR PRESSURE - REAR

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

5.5. Warning Bank Indicators

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5.5.1. 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".

5.5.2. 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".

5.5.3. PARK BRAKE

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

5.5.4. HIGH BEAM

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

5.5.5. STOP ENGINE

Stop Engine indicator is J1939 driven (DM1RedStopLamp).

5.5.6. WAIT TO START

Wait to Start indicator is J1939 driven (PGN65252).

5.5.7. CHECK TRANSMISSION

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

5.5.8. RANGE INHIBIT

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

5.5.9. ABS

The ABS indicator is turned on when the ABS binary input is either switched low or by J1939 depending on the application as listed below:

Bendix air ABS Systems: J1939 (PGN61441ABS) or binary input based on setup menu selection.
Wabco hydraulic ABS Systems: Active Low

The plug & play function will determine if Air gauges are present in the panel. This will determine that a Bendix air ABS system is present.

5.5.10. HIGH HYDRAULIC OIL TEMPERATURE

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

5.5.11. RETARDER

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

5.5.12. STOP LIGHT

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

5.5.13. 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).

5.5.14. LOW COOLANT LEVEL

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

5.5.15. 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.

5.5.16. HIGH EXHAUST TEMPERATURE

The data source of the high exhaust temperature indicator is J1939 (PGN64892_SPN3698). This light can be solid or flashing depending on the severity level.

5.5.17. ENGINE WARNING

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

5.5.18. MAINTENANCE INDICATOR LAMP

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

5.6. Audible Alarm

The audible alarm is used in the following conditions:

Audible Alarm	*Designation*	*Criteria*	*Acknowledge*	*Device*	*Priority*
Continuous 1	*High Hydraulic Temperature*	*Binary input*	*Yes*	*External*	*1*
Continuous 1	*Stop engine*	*PGN 65226 DM1 Red Stop Lamp*	*No*	*External*	*1*
Continuous 1	*Low coolant level*	*PGN 65,226 SPN 111 FMI 1 & 18*	*Yes*	*External*	*1*
Continuous 1	*Low Oil Pressure*	*PGN 65,226 SPN 100 FMI 1 or 18*	*Yes*	*External*	*1*
Continuous 1	*High Coolant Temperature*	*PGN 65,226 SPN 110 FMI 0 or 16*	*Yes*	*External*	*1*
Continuous 1	*High Transmission Temp*	*PGN 65272 SPN 177 FMI 15 Or hi Trans temp*	*Yes*	*External*	*1*
Continuous 1	*Hydraulic Brake Failure*	*Analog input*	*No*	*External*	*1*
Continuous 1	*Engine Warning*	*PGN 65226 DM1 Check Engine Lamp*	*Yes*	*External*	*2*
Continuous 1	*Low/High chassis voltage*	*PGN 65271 When ≤ 11.0V or ≥ 15.4V*	*Yes*	*External*	*2*
Continuous 1	*Front low air pressure*	*Analog input – When ≤ 65 PSI (447 kPa)*	*No*	*External*	*2*
Continuous 1	*Rear low air pressure*	*Analog input – When ≤ 65 PSI (447 kPa)*	*No*	*External*	*2*
Continuous 1	*Alternator*	*Binary input & Engine Speed ≥ 400 RPM*	*Yes*	*External*	*2*
Continuous 1	*Engine Door Open*	*Binary input*	*No*	*External*	*2*
Continuous 1	*Diesel Particle Filter (On fast blink)*	*PGN 64,892 byte 1 bits 3-1 (100)*	*Yes*	*External*	*2*
Continuous 1	*High Exhaust Temp Filter (On fast blink)*	*PGN 64,892 byte 7 bits5-3 (100)*	*Yes*	*External*	*2*
Continuous 1	*Idle Shutdown Active SPN 594*	*PGN 65,252 1 b 4&3*	*Yes*	*External*	*2*
Beep 1	*ABS*	*Binary input or PGN 61,441 Byte 6 bits 6-5*	*N/A*	*Internal*	*2*
Beep 1	*Range inhibit*	*PGN 65098 Byte 2 – Bits8-7*	*N/A*	*Internal*	*5*
Beep 1	*Low Fuel Level*	*When < 13%*	*N/A*	*Internal*	*4*
Beep 1	*Turn signal reminder*	*(1)*	*N/A*	*Internal*	*8*
Beep 1	*Water in Fuel*	*Binary input*	*N/A*	*Internal*	*4*
Beep 1	*ATC*	*PGN 61,441 Byte 6 bits 8-7*	*N/A*	*Internal*	*4*
Beep 1	*Diesel Particle Filter (On Solid)*	*PGN 64,892 byte 1 bits 3-1 (001)*	*N/A*	*Internal*	*4*
Beep 1	*High Exhaust Temp Filter (On Solid)*	*PGN 64,892 byte 7 bits5-3 (001)*	*N/A*	*Internal*	*4*
Beep 2	*Headlight Alert reminder*	*(3)*	*N/A*	*Internal*	*(6)*
Beep 3	*Turn signals*		*N/A*	*Internal*	*(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)*

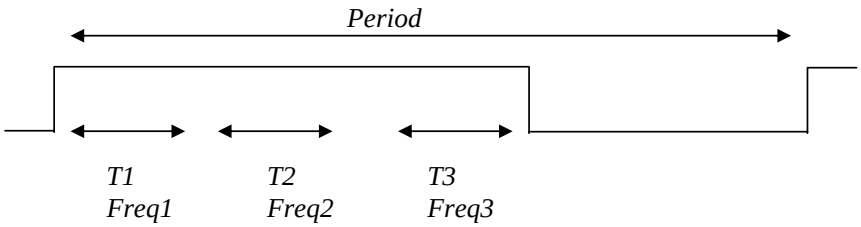
(4) Headlight Alert reminder has a lower priority than a buzzer (continuous 1) but a higher priority than an alert (Beep 1).

(5) The continuous 1 tone will timeout after 30 seconds if the engine speed (PGN61444) is ≤ 400 rpm. Any new alarm condition will retrigger the continuous 1 tone for an additional 30 seconds.

The audible tone are defined in the table below:

Audible Alarm	***Freq 1***	***T1***	***Freq 2***	***T2***	***Freq 3***	***T3***	***Period***	***Priority***
Continuous 1	*2700*	*160ms*					*Continuous*	
Beep 1	*2000*	*160ms*	*0*	*160ms*			*320ms*	
Beep 2	*2700*	*160ms*	*0*	*160ms*			*320ms*	
Beep 3	*2000*	*40ms*	*0*	*160ms*			*Once*	

Example:



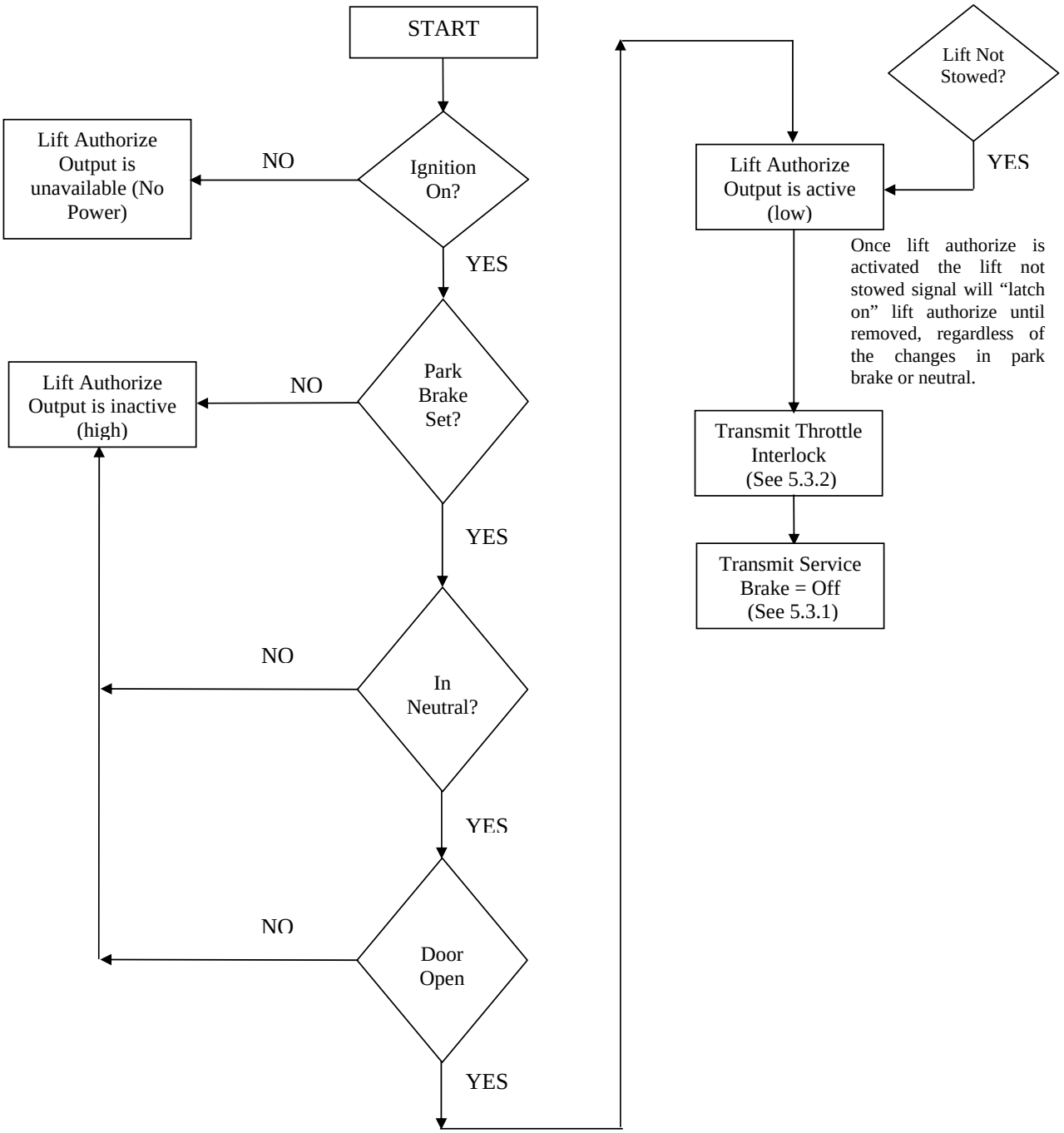
5.7. Binary Outputs

5.7.1. SPEED DETECT

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

5.7.2. LIFT AUTHORIZATION

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



6. 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.

6.1. 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

6.2. 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.

6.3. Messages Sent

6.3.1. SERVICE BRAKE

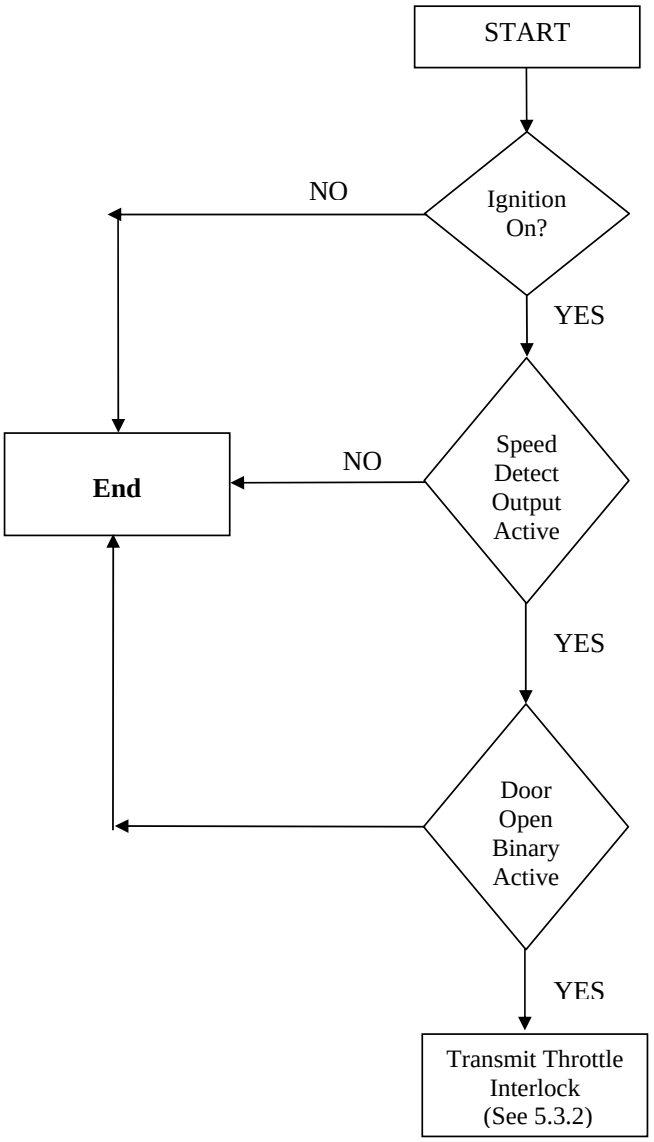
The service brake message is sent to the engine via J1939 (PGN65265SB) when the brake pedal is depressed.

6.3.2. 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 5.7.2) or when the proper brake interlock conditions are met (see 6.3.3).

6.3.3. BRAKE INTERLOCK

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



6.3.4. WATER IN FUEL

The water in fuel message is sent to the engine via J1939 (PGN65279) when the appropriate binary input is active.

6.3.5. PARK BRAKE

The park brake message is sent to the engine via J1939 (PGN65265PB) when the appropriate binary input is active.

6.4. 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 / Metric Units**	**Source Address**
Engine Hours	65,253 (00FEE5)	Total engine hours	1,2,3,4	RQ	H	0
Cruise Control/Vehicle Speed	65,265 (00FEF1)	Wheel-based vehicle speed	2,3	RX	MPH/ km/h	0
Cruise Control/Vehicle Speed	65,265 (00FEF1)	Service Brake	4 b 6&5	TX		23
Cruise Control/Vehicle Speed	65,265 (00FEF1)	Park Brake	1 b 4&3	TX		23
PTO	65,264 (00FEF0)	Throttle Interlock	6 b 2&1	TX		23
EBC1	61,441 (00F001)	Throttle Interlock	4 b 2&1	TX		23
EBC1	61,441 (00F001)	ABS	6 b 6&5	RX		11
EBC1	61,441 (00F001)	ATC	6 b 8&7	RX		11
Shutdown	65,252 (00FEE4)	Wait to Start	4 b 2&1	RX		0
DM1	65,226 (00FECA)	Active DTC	3-6	RX		0
DM1	65,226 (00FECA)	Protect lamp	1 b 2&1	RX		0
DM1	65,226 (00FECA)	Amber warning lamp	1 b 4&3	RX		0
DM1	65,226 (00FECA)	Red Stop lamp	1 b 6&5	RX		0
Shutdown	65,252 (00FEE4)	Idle Shutdown Active (SPN 594)	1 b 4&3	RX		0
EEC1	61,444 (00F004)	Engine speed	4,5	RX	RPM	0
EEC2	61,443 (00F003)	Percent load	3	RX	%	0
Engine Fluid Level/Pressure	65,263 (00FEEF)	Engine oil pressure	4	RX	PSI/ KPa	0
Engine Temperature	65,262 (00FEEE)	Engine coolant temp.	1	RX	°F / °C	0
ETC1	61,442 (00F002)	Electronic Trans. Controller	N/A	RX		3
ETC7	65,098 (00FE4A)	Shift inhibit	2 b 8&7	RX		3
Fuel Economy	65,266 (00FEF2)	Instantaneous fuel econ	3,4	RX	MPG/ L/100Km	0
Fuel Economy	65,266 (00FEF2)	Average fuel economy	5,6	RX	MPG/ L/100Km	0
Inlet/Exhaust Conditions	65,270 (00FEF6)	Boost pressure	2	RX	PSI/ KPa	0
Inlet/Exhaust Conditions	65,270 (00FEF6)	Intake manifold temperature	3	RX	°F / °C	0
Transmission Fluids	65,272 (00FEF8)	Transmission oil temp.	5,6	RX	°F / °C	3
Vehicle Electrical Power	65,271 (00FEF7)	Electrical potential (volts)	5,6	RX	V	0
Vehicle Electrical Power	65,271 (00FEF7)	Battery potential (volts) Switched	7,8	RX	V	0
Dash Display	65,276 (00FEFC)	Fuel Level	2	RX	%	0
Water in Fuel	65,279 (00FEFF)	Water in fuel	1 b 2&1	TX		23
PTC1	64,892 (00FD7C)	Particulate Trap Lamp Command	1 b 1-3	RX		0
PTC1	64,892 (00FD7C)	Exhaust System High Temp	7 b 3-5	RX		0
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.

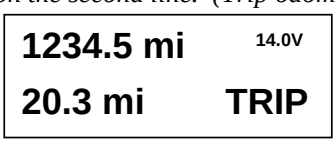
7. MESSAGE DISPLAY CENTER

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*

7.1. Drive Mode Screen

During normal operation the LCD displays the odometer value and system voltage on the top line and a selected parameter on the second line. (Trip odometer shown in the following example)



7.2. Battery Voltage

Battery voltage is read via the J1939 bus (PGN65271) and the value is displayed to one decimal point in the upper right corner of the message display. When the battery voltage is ≤10.9V the value will be displayed in reverse video and blink. The display will return to normal when the voltage is ≥11.1V. When the battery voltage is ≥15.5V the value will be displayed in reverse video and blink. The display will return to normal when the voltage is ≤15.3V. This message is acknowledgeable and reoccurs after 5 minutes see section 5.6.

Both Electrical Potential (bytes 5 & 6) and Battery Potential, Switched (bytes 7 & 8) are read. Whichever one is found will be displayed. If both are available, Electrical Potential will be shown.

7.3. 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.

7.3.1. 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 ±0.07% of actual based on the speed received. This far exceeds the SAE recommended ±0.3% found in SAE J1226.

7.3.2. 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*

7.3.3. 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.*

7.3.4. 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.*

7.3.5. 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.

7.3.6. 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.

7.3.7. 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.

7.3.8. 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.

7.4. 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.*

7.4.1. 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 any message with source address 0x0. This message is acknowledgeable, but only reoccurs on the next ignition cycle.

7.4.2. 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 any message with source address 0x03. This message is acknowledgeable, but only reoccurs on the next ignition cycle.

7.4.3. ABS COMM FAILURE

This message is displayed when the master gauge does not receive the J1939 data from the ABS system. This is accomplished by monitoring for the presence of any message with source address 0x0B. This message is acknowledgeable, but only reoccurs on the next ignition cycle.

7.4.4. ALTERNATOR

This message is displayed when the associated binary input is switched low and engine speed is ≥ 400 RPM (PGN61444). This message is acknowledgeable and reoccurs after 5 minutes see section 5.6.

7.4.5. HIGH HYDRAULIC OIL TEMPERATURE

This message is displayed when the associated binary input is switched low. This message is acknowledgeable and reoccurs after 5 minutes se section 5.6.

7.4.6. STOP ENGINE

This message is displayed when the J1939 (DM1RedStopLamp) is present. This message is not acknowledgeable.

7.4.7. LOW COOLANT LEVEL

This message is displayed when the J1939 (DM1LowCoolantLamp) is present. This message is acknowledgeable and reoccurs after 5 minutes see section 5.6

7.4.8. HIGH TRANSMISSION TEMPERATURE

This message is displayed when the J1939 (PGN65272) with a threshold of 250°F is 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. This message is acknowledgeable and reoccurs after 5 minutes se section 5.6.

7.4.9. LOW OIL PRESSURE

This message is displayed when the J1939 (DM1SPN100) is present. This message is not acknowledgeable.

7.4.10. HIGH COOLANT TEMPERATURE

This message is displayed when the J1939 (DM1SPN110) is present. This message is not acknowledgeable.

7.4.11. HYDRAULIC BRAKE FAILURE

This message is displayed when the associated binary input is switched low (analog input used as binary input). This message is not acknowledgeable.

7.4.12. ENGINE WARNING

This message is displayed when the J1939 (DM1CheckEngLamp) is present. This message is acknowledgeable and reoccurs after 5 minutes see section 5.6.

7.4.13. LOW FRONT AIR PRESSURE

This message is displayed when the appropriate warning bank air transducer detects a pressure of < 65 PSI. The message will clear when the appropriate warning bank air transducer detects a pressure of > 72 PSI. This message is not acknowledgeable.

7.4.14. LOW REAR AIR PRESSURE

This message is displayed when the appropriate warning bank air transducer detects a pressure of < 65 PSI. The message will clear when the appropriate warning bank air transducer detects a pressure of > 72 PSI. This message is not acknowledgeable.

7.4.15. LIFT NOT STOWED

This message is displayed when the associated binary input is switched low. This message is not acknowledgeable.

7.4.16. 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). This message is acknowledgeable, but only reoccurs on the next ignition cycle.

7.4.17. 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). This message is acknowledgeable, but only reoccurs on the next ignition cycle.

7.4.18. 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. This message is not acknowledgeable.

7.4.19. ENGINE DOOR OPEN

"Engine Door" should be displayed when the associated binary input is switched low. This message is not acknowledgeable.

7.4.20. ATC

"ATC Active" should be displayed when the appropriate J1939 message is present depending on the application as listed below:

Bendix air ABS Systems: J1939 (PGN61441ATC)
Wabco hydraulic ABS Systems: Not available

The plug & play function will determine if Air gauges are present in the panel. This will determine that a Bendix air ABS system is present. This message is acknowledgeable and reoccurs after 5 minutes see section 5.6.

7.4.21. DIESEL PARTICLE FILTER

*"Regen Needed" should be displayed by a steady light or by toggling the message between normal and **reverse video** at 1 second intervals when the appropriate J1939 message is present (PGN64892_SPN3697). This message is acknowledgeable and reoccurs after 5 minutes see section 5.6.*

7.5. Second Line Display Selection

7.5.1. 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:*

Transmission temperature is the default value

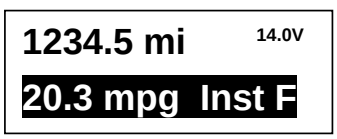
Intake Manifold Temperature

Engine Load

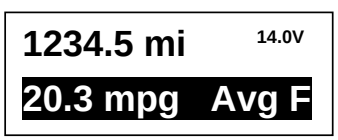
Hourmeter

Boost Pressure

Instantaneous Fuel Economy

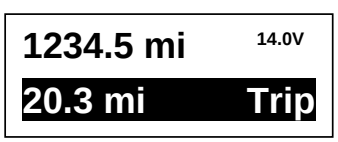


Average Fuel Economy



Ammeter (optional)

Trip Odometer



Note: To reset trip odometer press and hold the "M" button until it clears

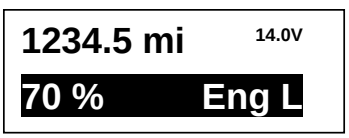
7.5.2. JOHN DEERE

*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:*

Transmission temperature is the default value

Intake Manifold Temperature

Engine Load



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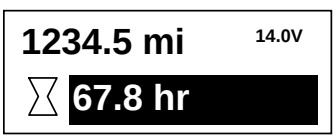
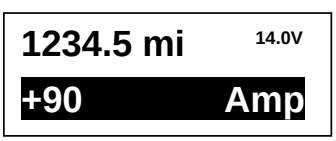
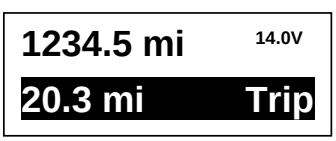
Hourmeter



Ammeter (optional)



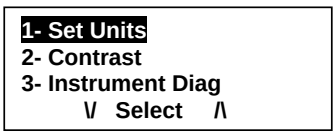
Trip Odometer



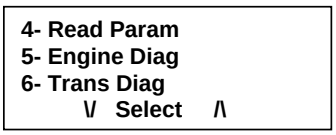
Note: To reset trip odometer press and hold the "M" button until it clears

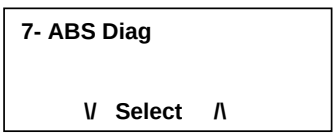
7.6. Settings and Diagnostics

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



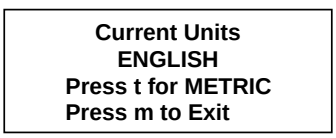
The item highlighted in ***reverse video*** *will be selected when both the* ***m*** *and* ***t*** *buttons are pressed together. Pressing the* ***m*** *or* ***t*** *button separately will move the highlight through the list, as indicated by the arrow, so other items can be selected. There are 7 items in this menu as follows:*





7.6.1. *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.



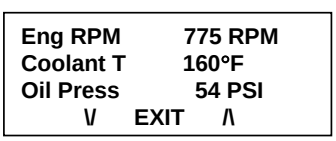
7.6.2. *CONTRAST*

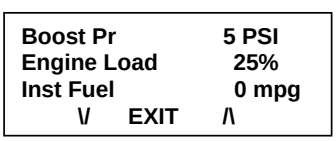
Selecting menu item 2 display a screen to allow setting the LCD contrast. Pressing the ***m*** *(+) button will increase contrast while pressing the* ***t*** *(-) button will decrease contrast.*

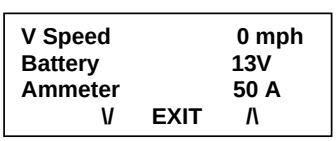
7.6.3. *READ PARAMETERS*

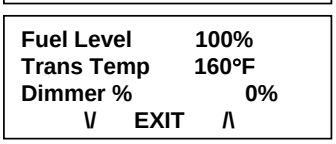
7.6.3.1. *Cummins & CAT*

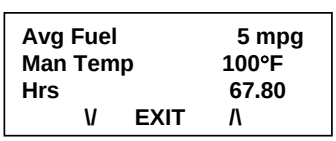
Item 4-Read Param – This screen displays various parameter received by the master gauge. The main use for these screens is in troubleshooting the system.

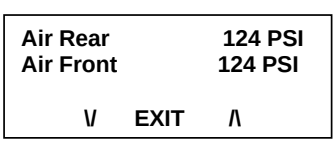






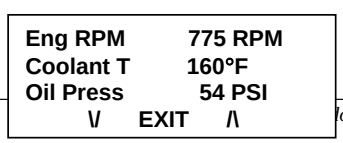


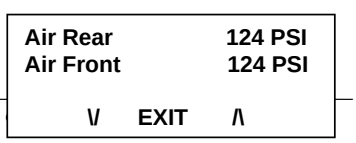




7.6.3.2. *John Deere*

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.





Engine Load	25%
Man Temp	100°F
Hrs	67.80
\/ EXIT /\	

Fuel Level	100%
Trans Temp	160°F
Dimmer %	0%
\/ EXIT /\	

V Speed	0 mph
Battery	13V
Ammeter	50 A
\/ EXIT /\	

7.6.4. INSTRUMENT DIAGNOSTICS

Selecting menu item 3 in the Settings and Diagnostic Menu will display the instrument diagnostic menu. There are 7 items in this menu and is navigated the same as the previous menu.

1-Gauge Test
2-Lamp Test
3-LCD Test
\/ Select /\

4-Binary Inputs
5-Analog Inputs
6-Data Links
\/ Select /\

7-Binary outputs
\/ Select /\

7.6.4.1. Gauge Test

*Item 1 - The selected gauge will 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 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%

7.6.4.2. Lamp Test

*Item 2 - 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

7.6.4.3. LCD Test

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

7.6.4.4. 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 Spare	**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**

7.6.4.5. 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**

7.6.4.6. 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-3 Hydr F	**Off**
M-4 Dimmer	**0%**
M-6 Headlights	**0V**

M-7 Amp	**12A**
M-8 Eng. Door	**On**

7.6.4.7. Analog Inputs (John Deere)

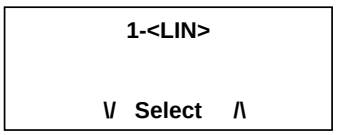
*Item 5 – Displays the module, pin number, and status "Out of Range High", "Out of Range Low", or the actual value of each analog input defined in the system. Pressing the **m** button exits the test and returns to the menu. Pressing the **t** button scrolls the display to the next 4 inputs.*

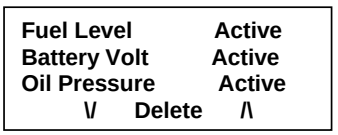
Press t to Scroll **Press m to Exit**

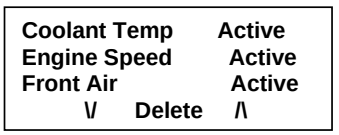
M-3 Hydr F	**Off**
M-4 Dimmer	**0%**
M-6 Headlights	**0V**
M-7 Amp	**12A**
M-8 Eng. Door	**On**

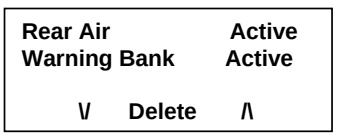
7.6.4.8. Data Link

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.***



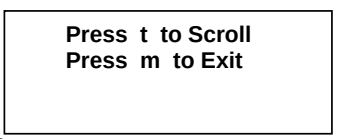


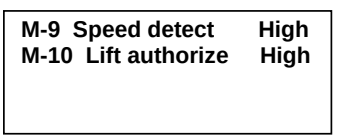




7.6.4.9. Binary Outputs

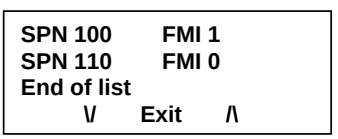
Item 7- Displays the module, pin number, and status of each binary outputs defined in the system. Pressing the ***m*** *button exits the test and returns to the menu. The value "high" and "low" refers to the voltage level at the connector pin. This information will be continuously updated to assist in troubleshooting*





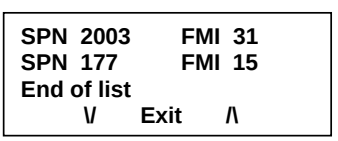
7.6.5. ENGINE DIAGNOSTIC

Item 5-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)



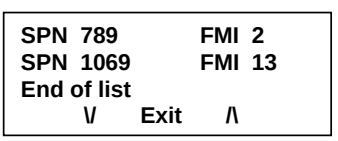
7.6.6. TRANS DIAGNOSTIC

Item 6-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)



7.6.7. ABS DIAGNOSTIC

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

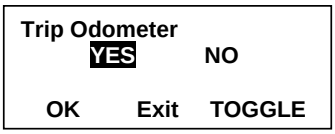


8. SETUP MENU

*Holding **m** and **t** pressed while turning the ignition on enters the setup menu.*

8.1. Trip

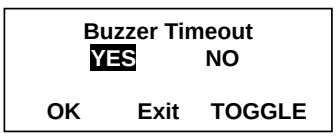
*Shows if the Trip Odometer is present (YES). Pressing **m** (OK) will go to the next selection. Pressing both **m** and **t** will exit to the start up screen.*



*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.*

8.2. Buzzer Time out Enaable

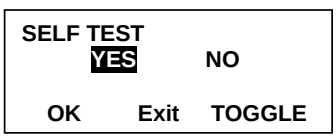
When YES is selected, the continuous audible alarm time out would be enabled (See section 5.6). When NO is selected the continuous audible alarm time out would be disabled.



*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.*

8.3. Self Test

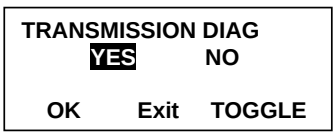
When YES is selected, the start up self test will zero the pointers, sound three tones from the speaker, sweep the gauge pointers through 50%, 100%, then back to zero, and turn all warning lights on for 5 seconds. When NO is selected the pointers will zero and all warning lights will be turned on for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



*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.*

8.4. Transmission Diagnostics

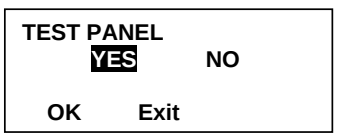
When YES is selected, the active transmission SPN and FMI faults are displayed. When NO is selected the transmission diagnostics functions are deactivated.



*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.*

8.5. 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.



*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*

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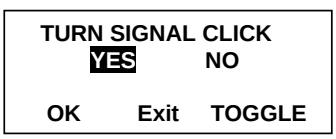
8.6. Turn Signal Click

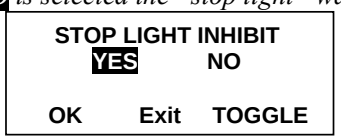
When YES is selected, the software is configured to enable the turn signal "click". When NO is selected the turn signal "click" and the turn signal "ON" (see 7.4.18.) will be disabled.



*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.*

8.7. Stop Light Inhibit

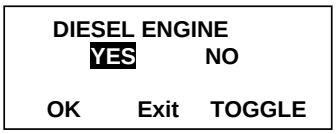
When YES is selected, the software is configured to disable the "stop light" warning indicator (see 5.3.12). When NO is selected the "stop light" warning indicator will be enabled (see 5.5.12).



*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.*

8.8. Diesel Engine

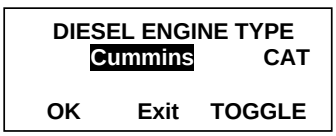
When YES is selected, the software is configured to select the Cummins/CAT option for the second line display (see 7.6.1). When NO is selected, the software will select the John Deere option for the second line display (see 7.6.2).



*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.*

8.9. Diesel Engine Type

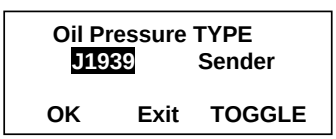
When Cummins is selected, the software is configured to select the Cummins Engine package option. When CAT is selected, the software will select the CAT Engine option.



*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.*

8.10. Oil Pressure Type

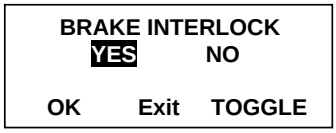
When J1939 is selected the software is configured to use the J1939 databus as the source for the oil pressure gauge (see 5.1.4). When Sender is selected, the software is configured to use the sender value as the source for the oil pressure gauge (see 5.1.4).



*Pressing **t** (TOGGLE) will toggle between J1939 and Sender, 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.*

8.11. Brake Interlock

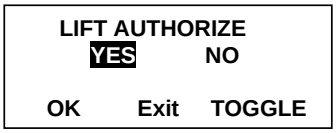
When YES is selected, the software is configured to enable the brake interlock function (see 6.3.3). When NO is selected the brake interlock function will be disabled (see 6.3.3).



*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.*

8.12. Lift Authorization

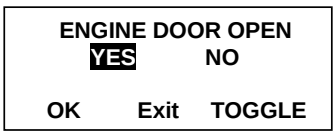
When YES is selected, the software is configured to enable the lift authorization function (see 5.7.2). When NO is selected the lift authorization function will be disabled (see 5.7.2).



*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.*

8.13. Engine Door Open

When YES is selected, the software is configured to enable the engine door open function (see 7.4.19.). When NO is selected the engine door open function will be disabled (see 7.4.19.).



*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.*

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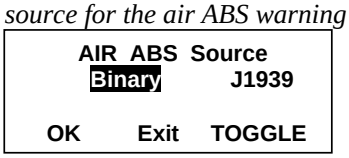
8.14. ABS Source

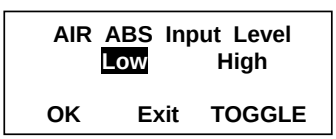
When Binary is selected, the software is configured to use the binary input as the source for the air ABS warning light (see 5.5.9). When J1939 is selected the software is configured to use the J1939 databus as the source for the air ABS warning light (see 5.5.9).



*Pressing **t** (TOGGLE) will toggle between Binary and J1939, 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.*

8.15. ABS Binary Input Level

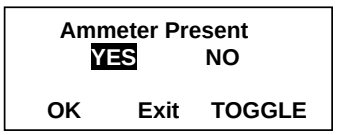
When Low is selected, the software is configured to use an active low for binary input as the source for the air ABS warning light (see 5.5.9). When High is selected, the software is configured to use an active high for binary input as the source for the air ABS warning light (see 5.5.9).



*Pressing **t** (TOGGLE) will toggle between Low and High, 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.*

8.16. Ammeter Present

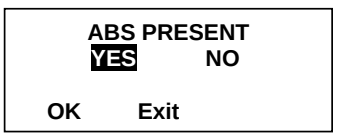
When YES is selected, the software is configured to enable the ammeter function (see 7.5). When NO is selected the ammeter function will be disabled (see 7.5).



*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.*

8.17. ABS Present

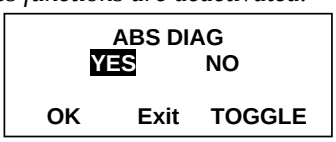
When YES is selected, the software is configured to acknowledge the loss of ABS communications and display an "ABS COMM" message as listed in paragraph 7.4.3. When NO is selected the software is configured to ignore the loss of ABS communications and not display an "ABS COMM" message as listed in paragraph 7.4.3.



*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.*

8.18. ABS Diagnostics

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



*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.*

9. 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 J1708 .....Serial Data Communications Between Microcomputer Systems
SAE J1587Joint SAE/TMC Electronic Data Interchange Between Microcomputer Systems in Heavy-Duty Vehicle Applications
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
ELECSP13 ..... Bluebird Engineering Standard - Electrical environmental specification

10. 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)

11. APPENDIX A

11.1. Master Gauge

11.1.1. FEATURE PROGRAMMING

Description	*Programmed as Standard Feature*		*Optional By Body #*	*Comments*
	Yes	*No*		
Trip	*X*			*Should be Active*
Buzzer Timeout Enable	*X*			*Should be Active*
Self Test	*X*			*Should be Active*
Transmission Diagnostics	*X*			*Should be Active*
Test Panel	*X*			*Should be Inactive*
Turn Signal Click	*X*			*Should be Active*
Stop Light Inhibit	*X*			*Should be Inactive*
Diesel Engine			*X*	*Diesel or CNG (John Deere)*
Diesel Engine Type			*X*	*Cummins or CAT*
Oil Pressure Type			*X*	*BBA3FE = J1939/BBA3RE w/ Cummins = Sender*
Brake Interlock	*X*			*Should be Inactive*
Lift Authorization	*X*			*Should be Inactive*
Engine Door Open			*X*	*BBA3FE = Inactive / BBA3RE = Active*
Air ABS Source			*X*	*Hyd. Brakes = Inactive / Air Brakes = Active*
Air ABS Binary Input Level	*X*			*Should be Inactive*
Ammeter Present			*X*	*Based on Ammeter feature*
ABS Present			*X*	*Hyd. Brakes = Inactive / Air Brakes = Active*
ABS Diagnostics			*X*	*Hyd. Brakes = Inactive / Air Brakes = Active*

11.1.2. CONNECTOR – INPUTS / OUTPUTS

Terminal	Designation	Assignement	Resistance	Voltage	Low side binary	High side binary	Wake-up	Differential	Description	Pull up	Divider	Amplification
1	AN3	Fuel level sender	X						90 (full) to 0 (empty) see chart	121		
2	AN0	Open			X				Spare	562		
3	AN2	Hyd. Brake System Failure			X				Active low – Hydraulic Brake set	562		
4	AN1	Dimmer		X			X		Input from dimmer		7.74	
5	AN4	Oil Pressure Sender	X						10-190 Oil Pressure Sender (see Chart)	121		
6	AN5	Headlight Alert		X						1.2K		
7	AN6	Ammeter		X					Ammeter (Hall Effect Sensor)			
8	AN7	Engine Door Open			X				Active low – Engine Door Open	562		
9	BIN_OUT1	Speed detect out			X							
10	BIN_OUT2	Lift Authorize			X							
11	IGNITION	Ignition				X	X		Active high for ignition on			
12	BIN0	Left Turn				X	X		Switched high (ign) parallel with turn signal –Wake up input			
13	BIN1	Right Turn				X	X		Switched high (ign) parallel with turn signal – Wake up input			
14	BIN2	Park Brake				X			Active high for Park Brake engaged			
15	BIN3	Stop Light				X			Active high for service brake engaged			
16	BIN4	Hi Beam				X			Active high for Headlight Hi Beam on			

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11.1.3. CONNECTOR – POWER / COMMUNICATIONS

Terminal	Designation	Description	Used	Int.CAN Term.
1	Battery	Unswitched positive (+)	X	
2	Ground	Chassis ground	X	
3	CAN+	SAE J1939 Databus	X	
4	CAN-	SAE J1939 Databus	X	
5	J1708+	SAE J1708 Databus		
6	J1708-	SAE J1708 Databus		
7	Reserved	Reserved for ISO9141		
8	CAN Res	CAN Termination Resistor		

11.2. Warning Bank

11.2.1. WARNING BANK

	Terminal	Designation	Assignement	English Icon Definition	Metric Icon Definition	Color	Wave length	Low side binary	High side binary	Direct Drive	Multiplex
Binary Inputs Connector	1	INPUT0	High Hydraulic Oil Temp.					X			
	2	INPUT1	Alternator					X			
	3	INPUT2	Spare					X			
	4	INPUT3	ABS					X			
	5	INPUT4	Water in Fuel					X			
	6	INPUT5	Lift Not Stowed					X			
	7	INPUT6	Retarder					X			
	8	INPUT7	Door Open					X			
Warning bank to LED Board header pins	1	+7.5V									
	2	LED0/Strobe									X
	3	LED1/Clock									X
	4	LED2/Data									X
	5	LED3/Gnd									X
	6	LED4/Vcc									X
	7	LED5	Left turn	SAE J1048 No. 4.3	SAE J1048 No. 4.3	Green	527nm			X	
	8	LED6	Right Turn	SAE J1048 No. 4.3	SAE J1048 No. 4.3	Green	527nm			X	
	9	LED7	Hi Beam	SAE J1048 No. 4.1	SAE J1048 No. 4.1	Blue	469nm			X	
		AIR0	Front Air								
		AIR1									

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Address	Assignement	English Icon Definition	Metric Icon Definition	Color	Wave length
D00	Park Brake	Customer Modified SAE J1362 No. 12.6	SAE J1362 No. 12.6	Red	610nm
D01	Stop Light	Customer Modified SAE J1362 No. 12.1	Customer Modified SAE J1362 No. 12.1	Red	610nm
D02	Hydraulic Brake Failure	Text "BRAKE SYSTEM"	SAE J1362 No. 12.8	Red	610nm
D03	ABS	SAE J1362 No. 12.11	SAE J1362 No. 12.11	Amber	590nm
D04	Engine Retarder	Text "ENGINE RETARD"	Text "ENGINE RETARD"	Red	610nm
D05	Wait to Start	Text "WAIT TO START"	Text "WAIT TO START"	Green	527nm
D06	Stop Engine	Text "STOP ENGINE"	Text "STOP ENGINE"	Red	610nm
D07	Check Transmission	Text "CHECK TRANS"	Text "CHECK TRANS"	Red	610nm
D10	High Exhaust Temp	Engine Manufacturer Defined	Engine Manufacturer Defined	Red	610nm
D11	Low Coolant Level	SAE J1362 No. 9.9	SAE J1362 No. 9.9	Amber	590nm
D12	High Hydraulic Oil Temperature	SAE J1362 No. 11.6	SAE J1362 No. 11.6	Amber	590nm
D13	Transmission Temperature	Text "TRANS TEMP"	Text "TRANS TEMP"	Amber	590nm
D14	Range Inhibit	Text "RANGE INHIBIT"	Text "RANGE INHIBIT"	Amber	590nm
D15	Engine Warning	Text "ENGINE WARN"	Text "ENGINE WARN"	Amber	590nm
D16	Maintenance Inducator	Text "MIL"	Text "MIL"	Amber	590nm
D17					
D20					
D21					
D22					
D23					
D24					
D25					
D26					
D27					

11.2.2. LED MPX DEFINITION

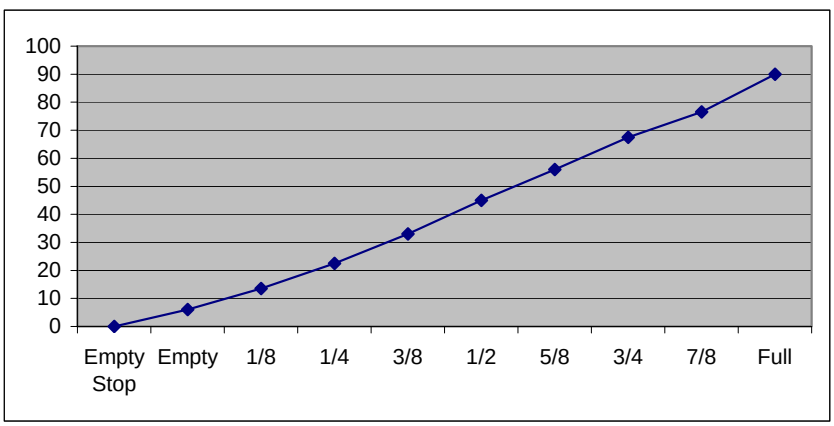
11.2.3. WARNING BANK MULTIPLEXED LED POSITIONING

	Bits	***Right Module LIN ID A8***
Byte 0	*LSB 0*	*Not Used*
	1	*Not Used*
	2	*Not Used*
	3	*Not Used*
	4	*Not Used*
	5	*Left Turn*
	6	*Right Turn*
	MSB 7	*High Beam*
Byte 1	*0*	*Park Brake*
	1	*Stop Light*
	2	*Hydraulic Brake Failure*
	3	*ABS*
	4	*Engine Retarder*
	5	*Wait to Start*
	6	*Stop Engine*
	7	*Check Transmission*
Byte 2	*0*	*High Exhaust Temp*
	1	*Low Coolant Level*
	2	*High Hydraulic Oil Temperature*
	3	*Transmission Temperature*
	4	*Range Inhibit*
	5	*Engine Warning*
	6	*Maintenance Indicator*
	7	*Buzzer Out*
Byte 3	*0*	*Not Used*
	1	*Not Used*
	2	*Not Used*
	3	*Not Used*
	4	*Not Used*
	5	*Not Used*
	6	*Not Used*
	7	*Not Used*

11.3. Fuel Sender

Type **Fuel Sender**
Manufacturer **?????????**
Mftr part#

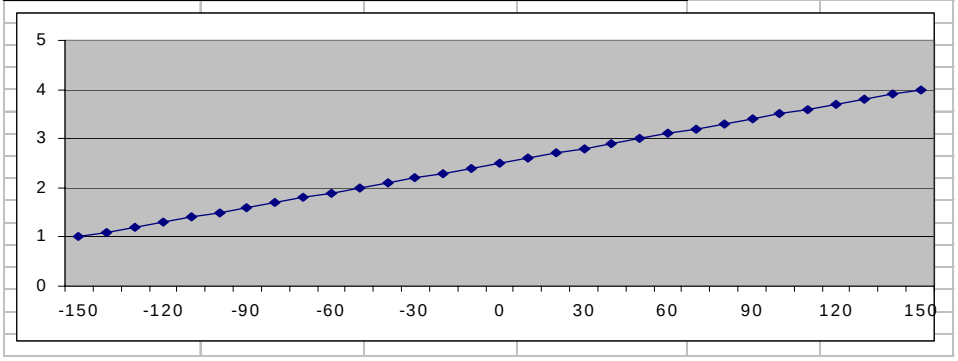
Indication	Minimum	Nominal	Maximum
Empty Stop	0	0	0
Empty	3	6	9
1/8	10.5	13.5	16.5
1/4	19.5	22.5	25.5
3/8	30	33	36
1/2	42	45	48
5/8	53	56	59
3/4	64.5	67.5	70.5
7/8	73.5	76.5	79.5
Full	87	90	93



Note:
If the sender is over 180 ohms the system will assume that it is a ***"out of tolerance"*** *sender and the fuel level gauge will display a fault by wagging.*

11.4. Ammeter

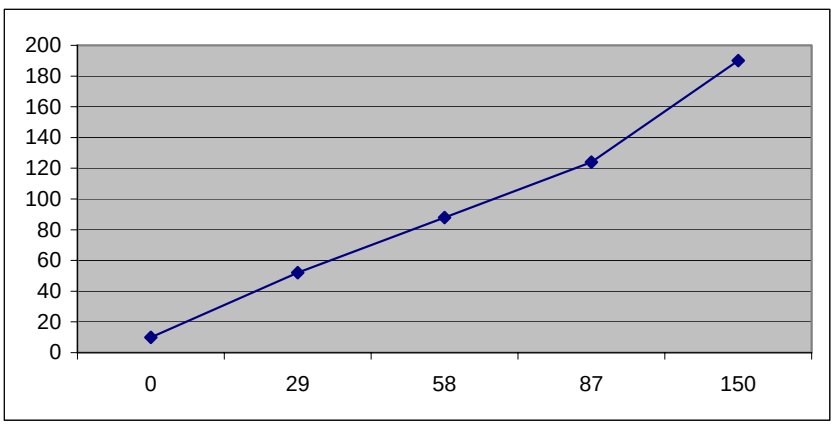
Type	Ammeter Hall Effect Sensor		
Manufacturer	Sure Power		
Mftr part#	DCCS45S-200		
Indication (Amps)	**Minimum (V)**	**Nominal (V)**	**Maximum (V)**
-150	0.9900	1	1.0100
-140	1.0890	1.1	1.1110
-130	1.1880	1.2	1.2120
-120	1.2870	1.3	1.3130
-110	1.3860	1.4	1.4140
-100	1.4850	1.5	1.5150
-90	1.5840	1.6	1.6160
-80	1.6830	1.7	1.7170
-70	1.7820	1.8	1.8180
-60	1.8810	1.9	1.9190
-50	1.9800	2	2.0200
-40	2.0790	2.1	2.1210
-30	2.1780	2.2	2.2220
-20	2.2770	2.3	2.3230
-10	2.3760	2.4	2.4240
0	2.4750	2.5	2.5250
10	2.5740	2.6	2.6260
20	2.6730	2.7	2.7270
30	2.7720	2.8	2.8280
40	2.8710	2.9	2.9290
50	2.9700	3	3.0300
60	3.0690	3.1	3.1310
70	3.1680	3.2	3.2320
80	3.2670	3.3	3.3330
90	3.3660	3.4	3.4340
100	3.4650	3.5	3.5350
110	3.5640	3.6	3.6360
120	3.6630	3.7	3.7370
130	3.7620	3.8	3.8380
140	3.8610	3.9	3.9390
150	3.9600	4	4.0400



11.5. Oil Pressure Sender

Type **Oil Pressure Sender**
Manufacturer **VDO**
Mftr part# 1 521 002 553B

Indication	Minimum	Nominal	Maximum
0	0.5	10	15.7
29	44.4	52	59.6
58	80.4	88	95.6
87	114.5	124	133.5
150	190	190	190



Note:
If the sender is over 300 ohms the system will assume that it is a ***"out of tolerance"*** *sender and the Oil pressure gauge will display a fault by wagging.*

12. APPENDIX B

12.1. Service Set Odometer Feature

Warning – U.S. Federal Law requires that the odometer accurately display the vehicle's actual mileage. It is the responsibility of the person installing the Master gauge to make sure the mileage programmed into the odometer correctly matches the vehicle's actual mileage.

The Service Set feature allows the season odometer to be set by the service technician installing a new master gauge into a vehicle. The odometer value is programmed using the front panel buttons and no other tools are necessary.

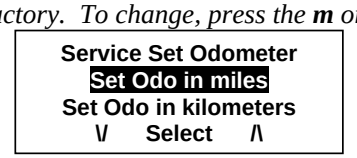
When the Master gauge is powered up the LCD will display the fact that this is a Service Set Gauge and the odometer must be set. The Master gauge will function in a limited mode until the Odometer has been set. *Access to the set feature is controlled in the EEPROM and is secured using a four-byte code that prevents accidental access to this feature.*

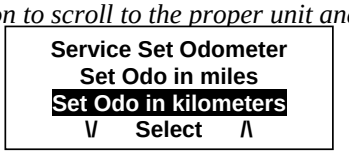
12.2. Limited Function

All gauge pointers will sit at zero position and not operate prior to setting the odometer while the LCD will only show the Service Set messages. All other parts of the system will operate. Warning icons located in the warning modules and in gauges will function normally and buzzer tones associated with the warnings will be allowed. Once set, the Service Set Gauge screen will not be seen again and the odometer value cannot be changed.

12.3. Setting the Units

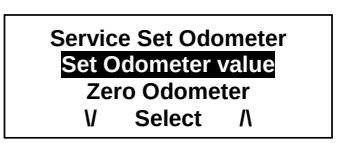
*Prior to setting the odometer value the technician must indicate to the gauge whether English (miles) or metric (kilometers) units are being set. The gauge will default to the unit that was set when the gauge left the factory. To change, press the **m** or **t** button to scroll to the proper unit and press both buttons to select.*

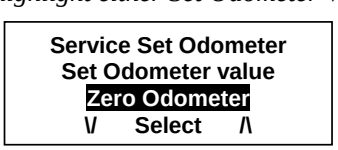




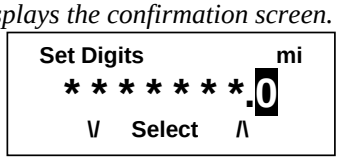
12.4. Setting the Odometer Value

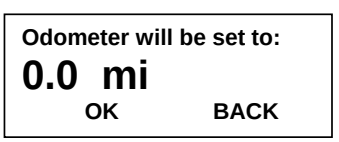
*By using the **m** or **t** button to scroll you can highlight either Set Odometer Value or Zero Odometer.*





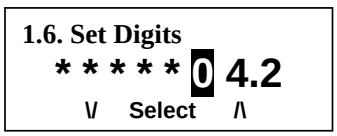
Selecting Set Odometer Value displays the Set Digits screen, while selecting Zero Odometer displays the confirmation screen.

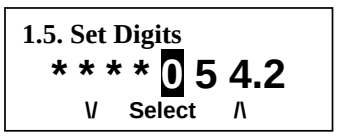


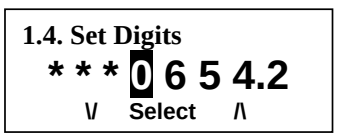


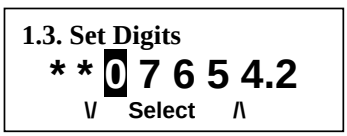
*Each digit is set by using the **m** and **t** buttons to scroll forward and backward through the digits 0 – 9. Pressing **m** and **t** together stores the digit and displays the next digit to be set. The following screens show programming 7654.2 into the odometer.*

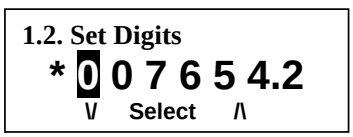
*All digits must be set, but since pressing the **m** and **t** buttons together for select brings up the next digit as zero, you can quickly set the remaining digits to zero.*

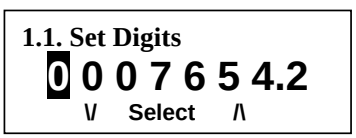




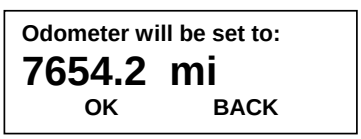








*Once all digits have been set the confirmation screen will be displayed. Pressing **m** will accept the mileage while pressing **t** will take you back to the beginning Service Set Gauge screen to start over.*



15.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 or check the oil pressure type in the setup menu.*
13	*Oil pressure gauge pointer stuck at maximum*	*Oil pressure sender open circuit*	*Check sender or for a 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 reading = NA* *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 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 reading 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*
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*

	Observation (Symptom)	***Problem***	***Things to check***
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;*	*Engine controller sending stop engine message on J1939*	*1) Engine controller Error 2) Broken sender wire between engine sender*
42	*Wait to Start icon stuck on;*	*Engine controller sending stop engine message on J1939*	*1) Engine controller Error 2) Broken sender wire between engine sender*
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	*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*
48	*ABS icon stuck on; ABS binary input reads low*	*ABS binary input shorted low*	*Wire to warning bank module pin 4 shorted to chassis*
49	*ABS icon seems to work opposite than it should; ABS binary input reads opposite than it should;*	*Master gauge is set to the wrong ABS system.*	*If an air system, verify through the datalinks menu, the presence of air gauges and verify the setup menu selections. If an hydraulic system, verify through the datalinks menu, the abscence of air gauges and verify the setup menu selections.*
50	*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 or Engine controller not sending WIF information*
51	*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*

52	***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*
	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*
54	*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*
55	*Retarder icon stuck on; Retarder binary input reads low*	*Retarder binary input shorted low*	*Wire to warning bank module pin 7 shorted to chassis*
56	*Engine Door message will not display; Engine Door message binary input reads high*	*Engine Door message binary input will not switch low*	*Wire to master gauge pin 8 broken or shorted to ignition voltage*
57	*Engine Door message stuck on; Engine Door message binary input reads low*	*Engine Door message binary input shorted low*	*Wire to master gauge pin 8 shorted to chassis*
58	*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*
59	*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*
60	*Low Coolant Level icon stuck off;*	*No coolant level data on J1939*	*Engine controller not sending Low Coolant Level information*
61	*Low Coolant Level icon stuck on;*	*Engine controller sending Low Coolant Level data on J1939*	*1) Engine controller Error 2) Coolant level sender error*
62	*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*
63	*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*
64	*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*
65	*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*
66	*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*
67	*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*
68	*MIL icon stuck off; MIL FMI not Active in Eng. Diag. Menu*	*No MIL engine data on J1939*	*Engine controller not sending MIL engine information*
69	*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*

	Observation (Symptom)	***Problem***	***Things to check***
70	*ATC message will not display*	*No ATC data on J1939*	*ABS controller not sending ATC information*
71	*ATC message stuck on*	*ABS controller sending ATC message on J1939*	*ABS controller Error*
72	*HET icon stuck off; HET FMI not Active in Eng. Diag. Menu*	*No HET engine data on J1939*	*Engine controller not sending HET engine information*
73	*HET icon stuck on; HET FMI Active in Eng. Diag. Menu*	*Engine controller sending HET FMI on J1939*	*1) Engine controller Error 2) Broken sender wire between engine sender*
74	*"Regen" message not displaying; HET FMI not Active in Eng. Diag. Menu*	*No "Regen" engine data on J1939*	*Engine controller not sending "Regen" engine information*
75	*"Regen" message not displaying n; "Regen" FMI Active in Eng. Diag. Menu*	*Engine controller sending "Regen" FMI on J1939*	*1) Engine controller Error 2) Broken sender wire between engine sender*

ACTIA®
52765 Bridger Court
Elkhart, IN 46514
USA

Phone: 574 264 2373

www.actia.com

Service Gauge Operation

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	By	Date		ACTIA Ref.	Revision
Written	David Troup	11/14/2003	**Service Gauge Operation**	**104426**	**A**
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Approved					
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REVISION TRACKING SHEET

Rev	Modified	Date	Comment
0 A	D Troup	02-12-2003 11-20-2003	Original Draft Added units set; Released under part number

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1. Service Set Odometer Feature --

Warning -- Federal Law requires that the odometer accurately display the vehicle's actual mileage. It is the responsibility of the person installing the Master gauge to make sure the mileage programmed into the odometer correctly matches the vehicle's actual mileage.

The Service Set feature allows the season odometer to be set by the service technician installing a new master gauge into a vehicle. The odometer value is programmed using the front panel buttons and no other tools are necessary.

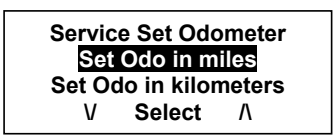
When the Master gauge is powered up the LCD will display the fact that this is a Service Set Gauge and the odometer must be set. **The Master gauge will function in a limited mode until the Odometer has been set.** Access to the set feature is controlled in the EEPROM and is secured using a four-byte code that prevents accidental access to this feature.

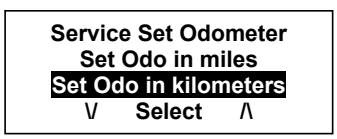
2. Limited Function

All gauge pointers will sit at zero position and not operate prior to setting the odometer while the LCD will only show the Service Set messages. All other parts of the system will operate. Warning icons located in the warning modules and in gauges will function normally and buzzer tones associated with the warnings will be allowed. Once set, the Service Set Gauge screen will not be seen again and the odometer value cannot be changed.

3. Setting the Units

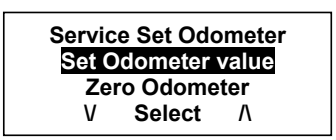
Prior to setting the odometer value the technician must indicate to the gauge whether English (miles) or metric (kilometers) units are being set. The gauge will default to the unit that was set when the gauge left the factory. To change, press the ***m*** or ***t*** button to scroll to the proper unit and press both buttons to select.

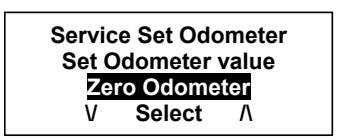




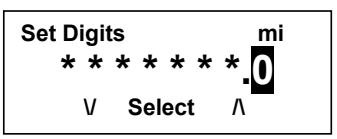
4. Setting the Odometer Value

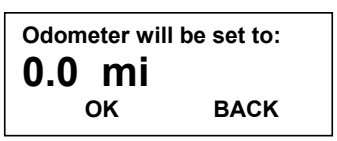
By using the ***m*** or ***t*** button to scroll you can highlight either Set Odometer Value or Zero Odometer.



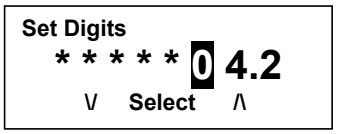


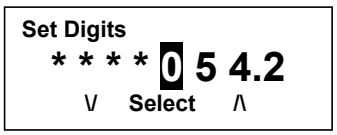
Selecting Set Odometer Value displays the Set Digits screen, while selecting Zero Odometer displays the confirmation screen.

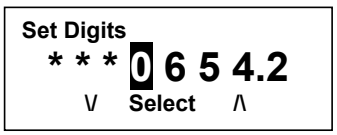




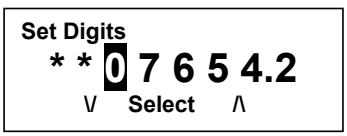
Each digit is set by using the ***m*** and ***t*** buttons to scroll forward and backward through the digits 0 – 9. Pressing ***m*** and ***t*** together stores the digit and displays the next digit to be set. The following screens show programming 7654.2 into the odometer.

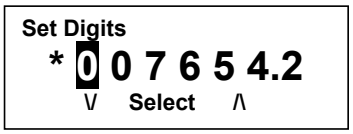


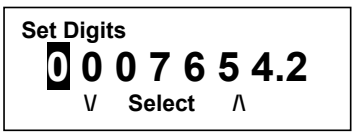




All digits must be set, but since pressing the ***m*** and ***t*** buttons together for select brings up the next digit as zero, you can quickly set the remaining digits to zero.







Once all digits have been set the confirmation screen will be displayed. Pressing ***m*** will accept the mileage while pressing ***t*** will take you back to the beginning Service Set Gauge screen to start over.