

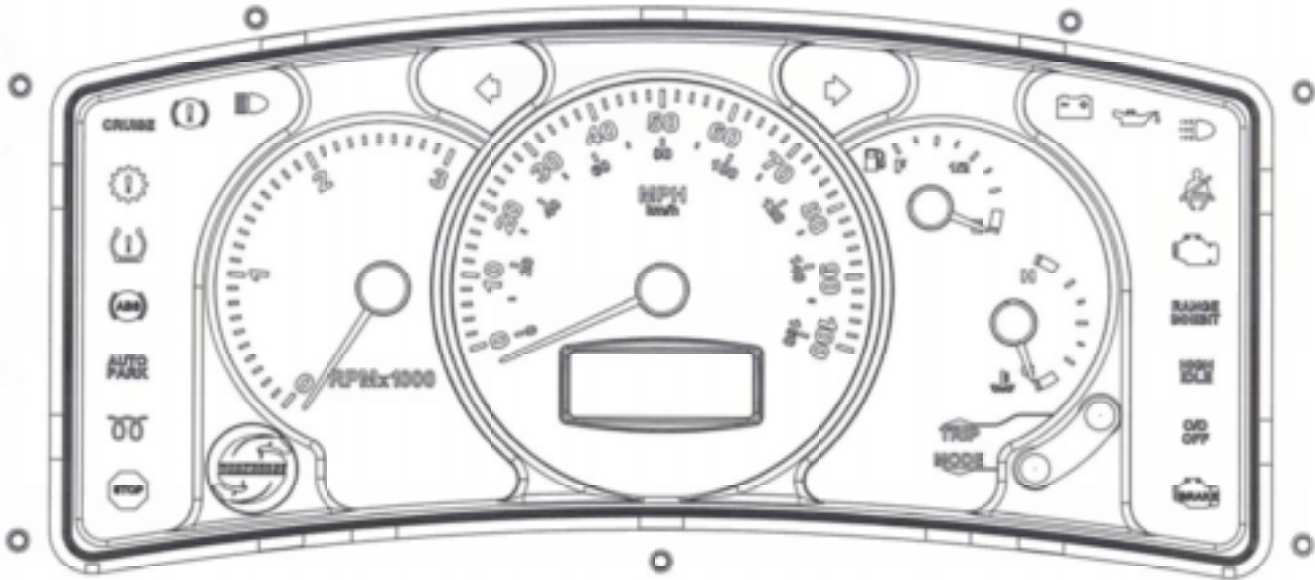
Section 8

Actia Cluster (S3) 7-1

ACTIA CLUSTER



SERVICE MANUAL



MODEL YEAR 2004i Gas and Diesel Clusters

	By Date		Workhorse Custom Chassis Gas and Diesel Cluster Service Information	ACTIA Ref.	Revision
Written	Russell Jones	03-02-04		103388 B	
Reviewed					
Approved					
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1. CLUSTER PART NUMBERS AND FEATURES

Table 1 identifies WCC and Actia cluster part numbers as they relate to chassis, model year and software options.

New part numbers for MY03i replaced the Model Year 2003 cluster part numbers effective 11-1-02 with VIN breakpoint 5B4MP67G533363924. The new part numbers reflect a software change only.

New part numbers for Model Year 2004 superseded Model Year 2003 part numbers. The new part numbers are not backward compatible. MY03 clusters cannot be replaced with MY04 clusters.

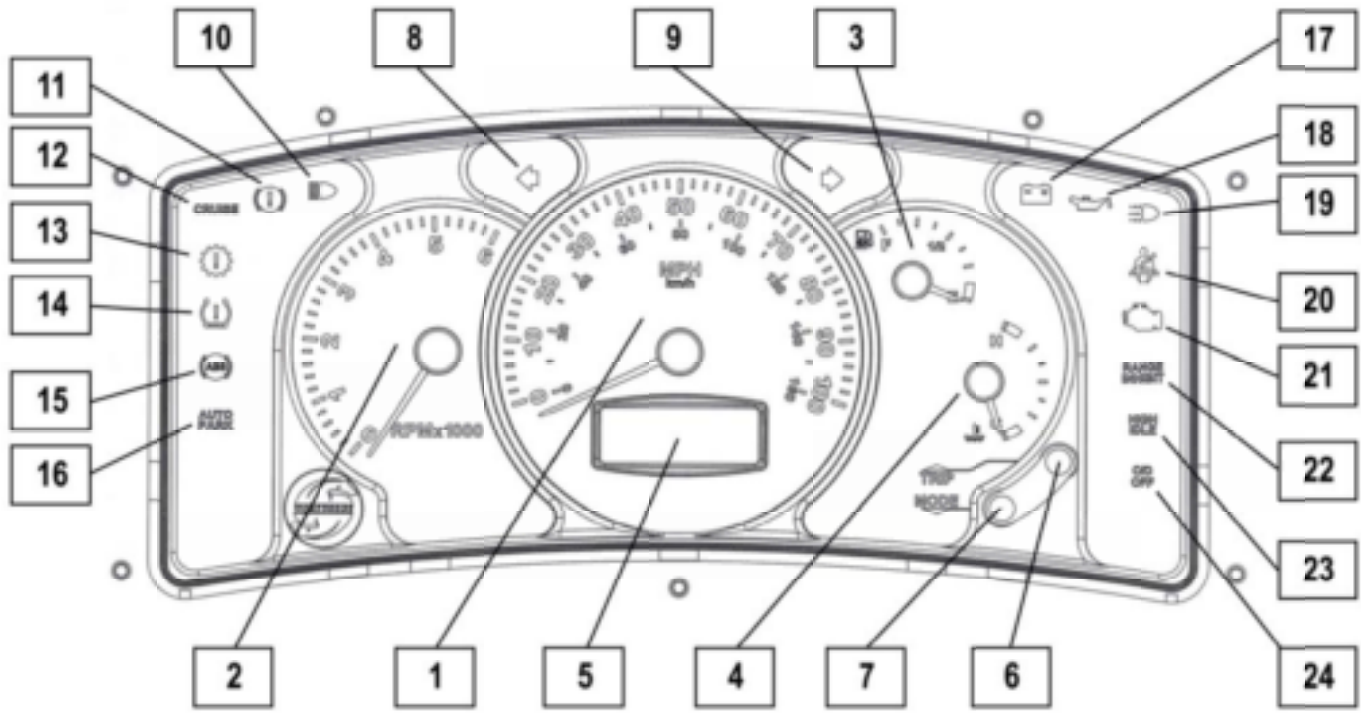
New part numbers for MY04i replaced the Model Year 2004 cluster part numbers. The new part numbers reflect a software change only.

Table 1: Workhorse (Actia) cluster part numbers

CLUSTER OPTION	MODEL YEAR	BOOT-LOAD SOFTWARE	APPLI-CATION SOFTWARE	FEATURE	VEHICLE						
					ENGINE	Gas L18	Gas L18	Gas L18	GasLQ4/LR4	Diesel 4be	DieselISB6
					PRND321	Yes	No	No	No	No	Yes
					CHASSIS	(W22)	(P32)	(W52)	(P42)	(L4B)	(W82)
Base Cluster	MY03	102035 v01_01	101615 v01_38	W0003520	(101730)	(101733)	(101733)	(101733)			
	MY03i	102035 v01_02	101615 v01_39	Replaced by W0004985	(102699)	Replaced by W0004984	(102700)	Replaced by W0004984	(102700)		
	MY04	102035 v01_02	101615 v01_56			W0005142 (103294)	W0005142 (103294)	W0005142 (103294)	W0005138 (103297)	W0005139 (103298)	
	MY04i	102035 v01_06	104348 v01_01			Replaced by W0006237 (104349)	Replaced by W0006237 (104349)	Replaced by W0006237 (104349)			
Trip Computer Option (CTC)	MY03	102035 v01_01	101615 v01_38	W0003614	(101731)	W0003612 (101734)					
	MY03i	102035 v01_02	101615 v01_39	Replaced by W0004987	(102701)	Replaced by W0004986 (102703)					
	MY04	102035 v01_02	101615 v01_56	W0005145	(103296)	W0005143 (103295)					
	MY04i	102035 v01_06	104348 v01_01	Replaced by W0006239	(104350)	Replaced by W0006238 (104351)					

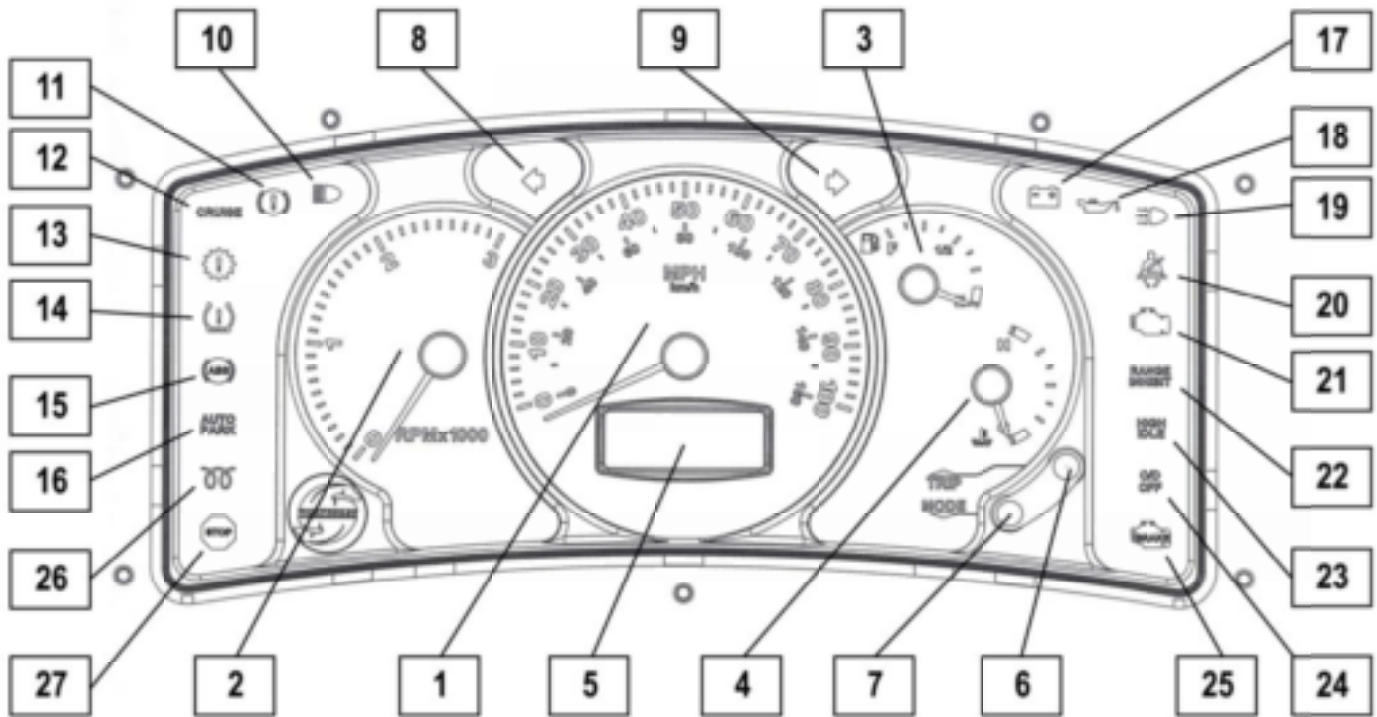
2. CLUSTER ELEMENTS

Figure 1: MY04 CLUSTER – GAS



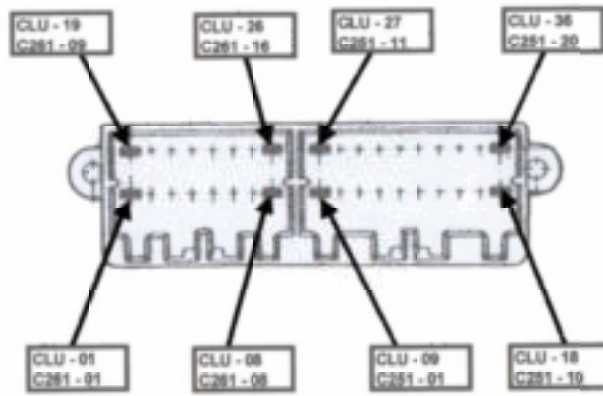
1	Speedometer Gauge	13	Transmission Fail Warning Light
2	Tachometer Gauge	14	Tire pressure monitoring telltale
3	Fuel Gauge	15	Anti-lock Brake System Warning Light
4	Engine Coolant Temperature Gauge	16	Auto Park Brake Engaged Warning Light
5	LCD Screen	17	Battery Charging System Warning Light
6	Trip Button	18	Engine Oil Pressure Warning Light
7	Mode Button	19	Daytime Running Lamps On Warning Light
8	Turn signal LH turn active	20	Seat Belt Reminder Warning Light
9	Turn signal RH turn active	21	Service Engine Warning Light
10	Headlight High Beam On Warning Light	22	Transmission Range Inhibit On Warning Light
11	Brake fail and Park Brake Warning Light	23	High Idle Enabled On Warning Light
12	Cruise Control Active Warning Light	24	Overdrive Off Warning Light

Figure 2: MY04 CLUSTER – DIESEL



1	Speedometer Gauge	15	Anti-lock Brake System Warning Light
2	Tachometer Gauge	16	Auto Park Brake Engaged Warning Light (not used at this time)
3	Fuel Gauge	17	Battery Charging System Warning Light
4	Engine Coolant Temperature Gauge	18	Engine Oil Pressure Warning Light
5	LCD Screen	19	Daytime Running Lamps On Warning Light
6	Trip Button	20	Seat Belt Reminder Warning Light
7	Mode Button	21	Service Engine Warning Light
8	Turn signal LH turn active	22	Trans Range Inhibit On Warning Light
9	Turn signal RH turn active	23	High Idle Enabled On Warning Light
10	Headlight High Beam On Warning Light	24	Overdrive Off Warning Light
11	Brake fail and Park Brake Warning Light	25	Engine Brake Warning Light
12	Cruise Control Active Warning Light	26	Wait to Start Warning Light
13	Transmission Fail Warning Light	27	Engine Stop Warning Light
14	Tire pressure monitoring telltale		

3. CLUSTER CONNECTOR INPUTS AND OUTPUTS



CLU Pin	Description	Input Output		Diesel	Ga s
1	Diesel fuel sender -	45Ω	Fuel gauge indicates Empty.	X	
2	Diesel fuel sender +	220Ω	Fuel gauge indicates Full.		
3	Outside temperature sender	29 kΩ	Message center displays -20 °C (-4 °F).	X X	
		2.9 kΩ	Message center displays 25 °C (77 °F).		
		980 Ω	Message center displays 50 °C (122 °F).		
4	Backlighting (dimming)	0 volts	Backlighting is off.	X X	
		13.8 volts	Backlighting is on full bright.		
5	Water in Fuel	ON (Low)	Warning light "Water in Fuel" is on.	X	
		OFF (High)	Warning light "Water in Fuel" is off.		
6	Ignition voltage	13.8 volts	Powers up cluster when ignition is on.	X	X
7	Signal Ground	Ground		X	X
8	Not used				
9	Battery Charge Indicator	ON (Low)	Warning light "Battery Charge Indicator" is on.	X	
		OFF (High)	Warning light "Battery Charge Indicator" is off.		
10	J1939 +	Data bus	If the data bus is not active in the vehicle, the message center will display "No J1939 Activity".	X X	
11	J1939 -	Data bus			

12	J1850	Data bus	If the data bus is not active in the vehicle, the message center will display “No J1850 Activity”.	X	
13	Tachometer	Frequency	1 Hz = 30 RPM (gas) or 15 RPM (diesel)	X	X
14	Speedometer	Frequency	1.11 Hz = 1 mph (gas only)		X
15	Door ajar	ON (Low) OFF (High)	Door open. Door closed.	X X	
16	Overdrive off	ON (Low) OFF (High)	Warning light “Overdrive off” is on. Warning light “Overdrive off” is off.	X X	
17	Remote Trip Reset switch	Low High	Switch open. Switch closed.	X X	
18	Remote Mode switch	Low High	Switch open. Switch closed.	X X	
19	Left turn	OFF (Low) ON (High)	Warning light “Left turn” is off. Warning light “Left turn” is on.	X X	
20	Right turn	OFF (Low) ON (High)	Warning light “Right turn” is off. Warning light “Right turn” is on.	X X	
21	High beam	OFF (Low) ON (High)	Warning light “High beam” is off. Warning light “High beam” is on.	X X	
22	Headlights on	OFF (Low) ON (High)	Headlights are off. Headlights are on.	X X	
23	ABS	≤ 1.4 volts ≥ 4.6 volts	Warning light “ABS” is on. Warning light “ABS” is off.	X X	
24	Park Brake on	ON (Low) OFF (High)	Park Brake is set. Warning light “Brake” is on. Park Brake is not set. Warning light “Brake” is off.	X X	
25	Brake system failure	< 3.0 volts ≥ 4.0 volts	Warning light “Brake” is on. Warning light “Brake” is off.	X X	
26	Seat belt	OFF (Low) ON (High)	Seat belt is unfastened. Warning light “Seat Belt” is on. Seat belt is fastened. Warning light “Seat Belt” is off.	X X	
27	Service engine soon	ON (Low) OFF (High)	Warning light “Service engine soon” is on. Warning light “Service engine soon” is off.	X X	
28	Key in ignition	ON (Low) OFF (High)	Ignition key is in. Ignition key is out.	X X	
29	Not used				
30	High Idle	ON (Low) OFF (High)	Warning light “High Idle” is on. Warning light “High Idle” is off.	X X	

31	Check Tires	ON (Low) OFF (High)	Warning light "Check Tires" is on. Warning light "Check Tires" is off.	X X	
32	Buzzer enable MY03	Low High	Buzzer active with warning messages on message center. Buzzer inactive with warning messages on message center.	X	
	Buzzer enable MY04	ON (Low) OFF (High)	Buzzer on. Buzzer off.	X X	
33	Daylight Running Lamps	ON (Low) OFF (High)	Warning light "Daylight Running Lamps" is on. Warning light "Daylight Running Lamps" is off.	X X	
34	Auto park	OFF (Low) ON (High)	Warning light "Auto park" is off. Warning light "Auto park" is on	X X	
35	Chassis Ground	Ground		X	X
36	Direct battery input	13.8 volts	Always connected directly to battery.	X	X

4. CLUSTER DIAGNOSTICS

4.1. Test at Turn On

When ignition voltage is first applied to the cluster, all the tell-tales, except turn signals, turn on for 2 seconds, then, turned off. Simultaneously, all the gauges reference themselves and then go to the position corresponding to their current reading.

4.2. Access to diagnostic menus and menu operation

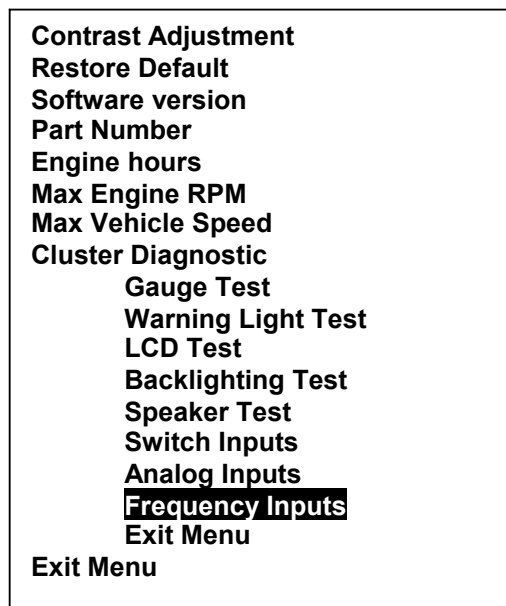
4.2.1. Access to diagnostic menus

On-board diagnostic functions are displayed in the message center. They can be accessed if the vehicle transmission is in PARK or if the vehicle PARK BRAKE is set and the MODE switch is pressed and held for at least 5 seconds. To exit diagnostics, select "EXIT MENU" or turn the vehicle ignition off then back on.

4.2.2. Menu Operation

Menus have 4 lines. To make a selection, a line must first be highlighted. To highlight a line, the trip switch is used to scroll up and the mode switch is used to scroll down. The highlighted line is shown in **reverse video**. Once highlighted, the line can be selected in either of two ways. Depressing and then releasing both the trip and mode switches at the same time chooses the line. Or, after 3 seconds of inactivity, the line shown in reverse video is automatically chosen.

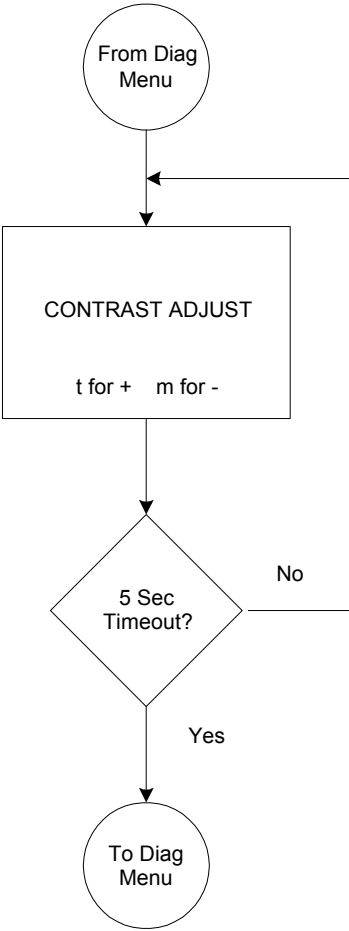
A summary of all menu lines available in self-diagnostic mode is shown below.



Contrast Adjustment
Restore Default
Software version
Part Number
Engine hours
Max Engine RPM
Max Vehicle Speed
Cluster Diagnostic
 Gauge Test
 Warning Light Test
 LCD Test
 Backlighting Test
 Speaker Test
 Switch Inputs
 Analog Inputs
 Frequency Inputs
 Exit Menu
Exit Menu

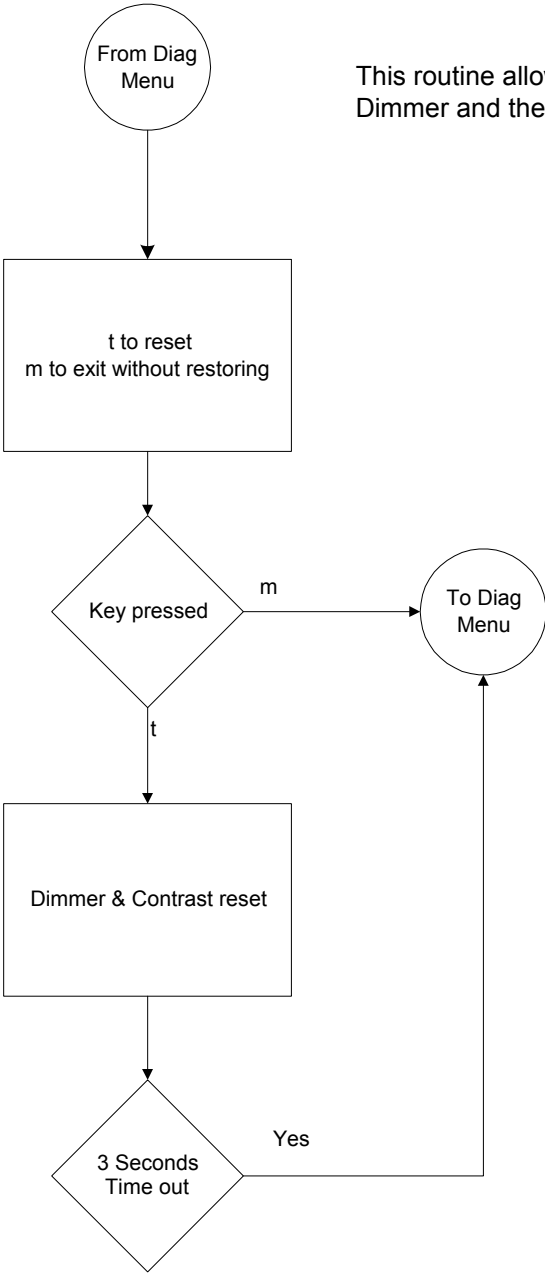
4.3. Contrast Adjustment

This routine adjusts the contrast of the LCD display. The new setting is stored in non volatile memory



4.4. Restore Default

This routine allows the user to restore the settings of the Dimmer and the Contrast to the original factory values.



4.5. Software version

Displays the software part number and version programmed into the micro controller.

Pressing the mode switch exits to the diagnostic menu. (The message "m to exit" appears on the screen).

Note: The software version can also be seen by holding in either the Trip or Mode buttons while turning the ignition switch to the "ON" position.

4.6. Part Number

Displays the hardware part number.

Pressing the mode switch exits to the diagnostic menu. (The message "m to exit" appears on the screen).

Note: The part number can also be seen by holding in either the Trip or Mode buttons while turning the ignition switch to the "ON" position.

4.7. Engine hours

Displays the engine hours that are accumulated in the cluster.

Pressing the mode switch exits to the diagnostic menu. (The message "m to exit" appears on the screen).

4.8. Max Engine RPM

Displays the maximum engine RPM that was sustained for > 3 seconds.

Pressing the mode switch exits to the diagnostic menu. (The message "m to exit" appears on the screen).

4.9. Max Vehicle Speed

Displays the maximum vehicle speed that was sustained for > 5 seconds.

Pressing the mode switch exits to the diagnostic menu. (The message "m to exit" appears on the screen).

4.10. Cluster Diagnostic

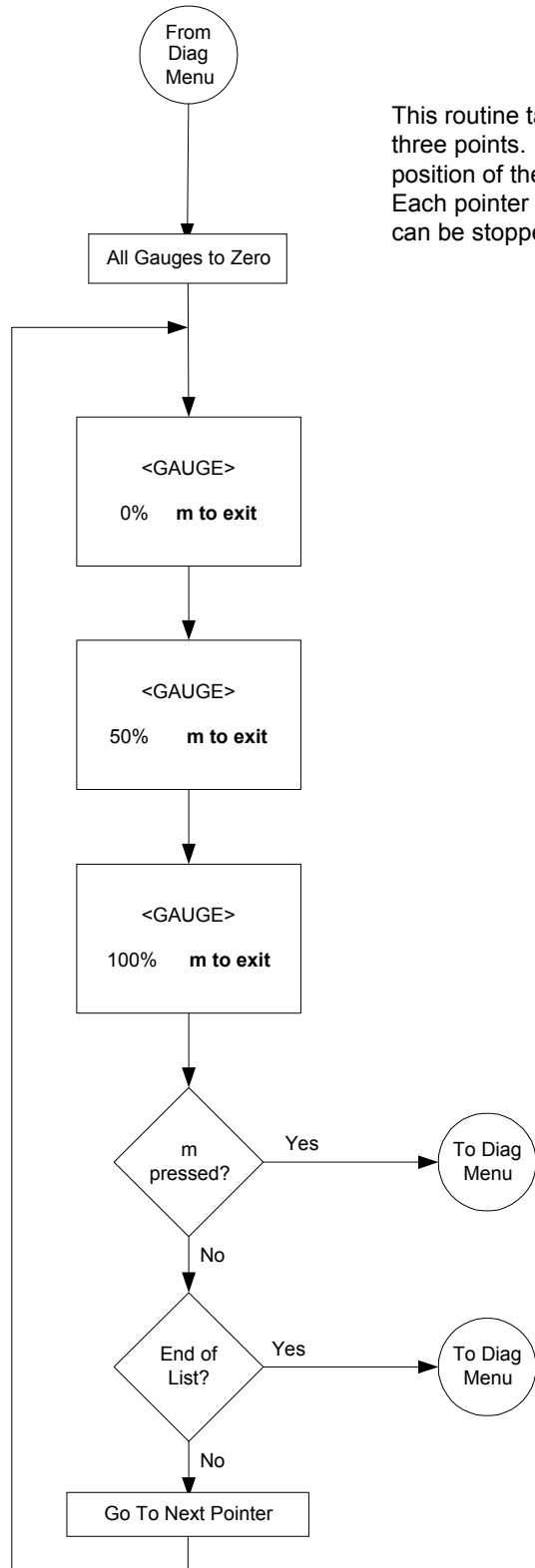
Cluster diagnostic gives the technician two powerful tools for determining whether or not a cluster is defective and needs replacement.

The first tool, Master Mode, gives the technician control over the outputs of the cluster. The technician can individually test all four gauges, all 17 gas or 20 diesel warning lights, the LCD pixels, backlighting and speaker.

The second tool, Current Value Monitor, shows the technician in real time the status of the cluster inputs. The technician can test switch inputs, analog inputs and frequency inputs.

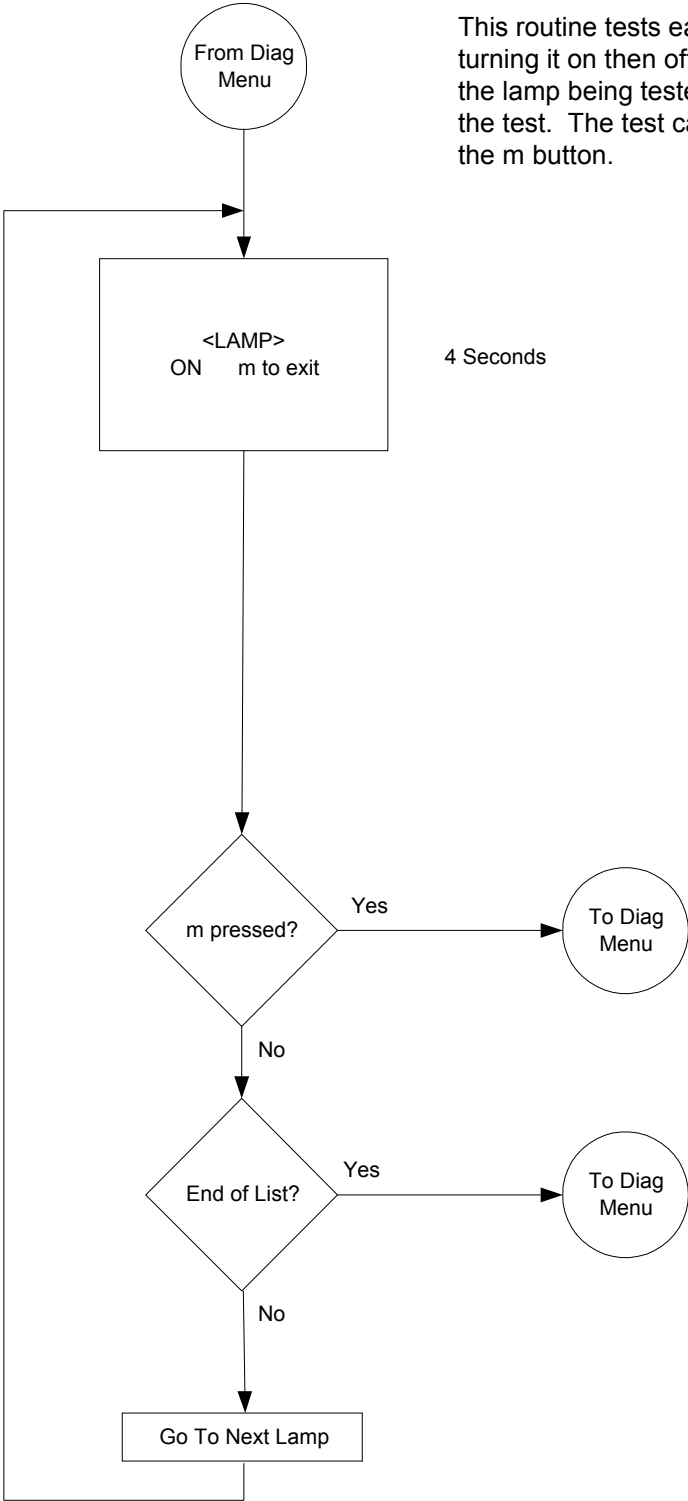
4.10.1. Gauge Test

This routine takes each pointer through three points. The display indicates the position of the pointer during the test. Each pointer will be checked. The test can be stopped by pressing the m button.



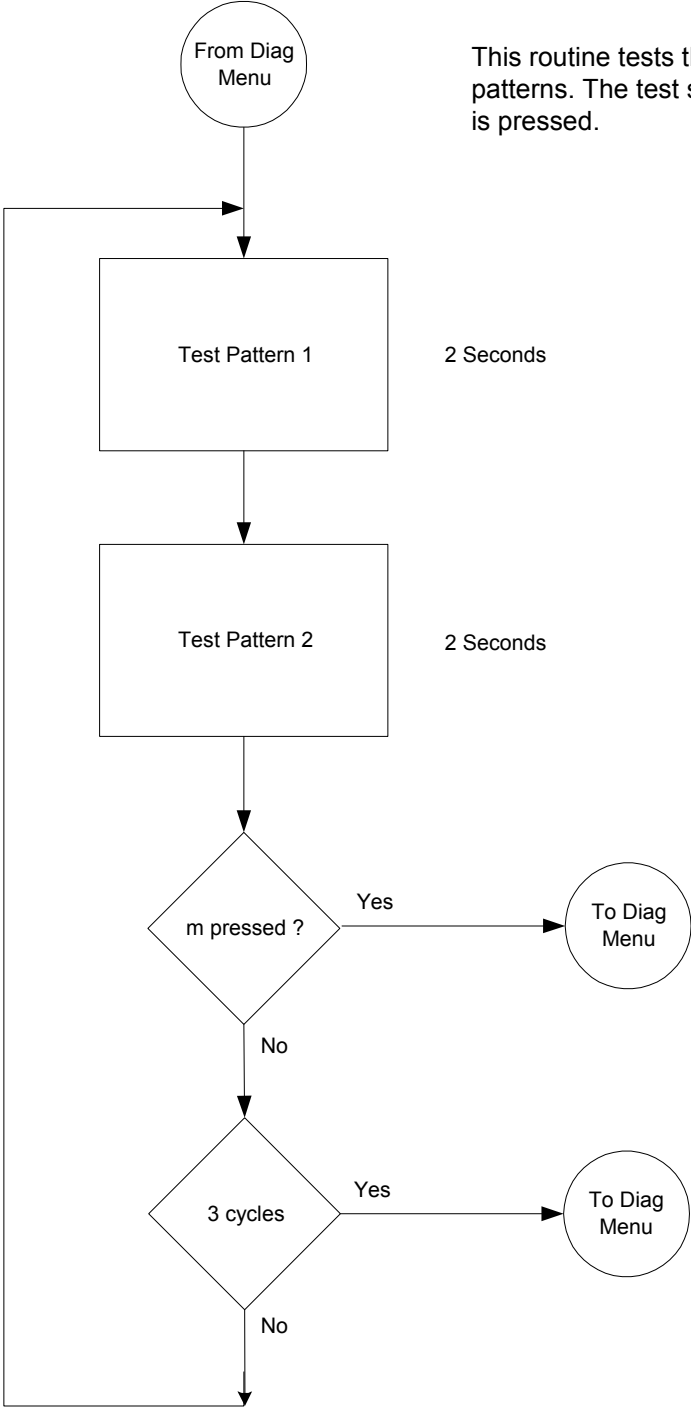
4.10.2. Warning Lamps Test

This routine tests each warning lamp by turning it on then off. The display indicates the lamp being tested and its status during the test. The test can be stopped by pressing the m button.



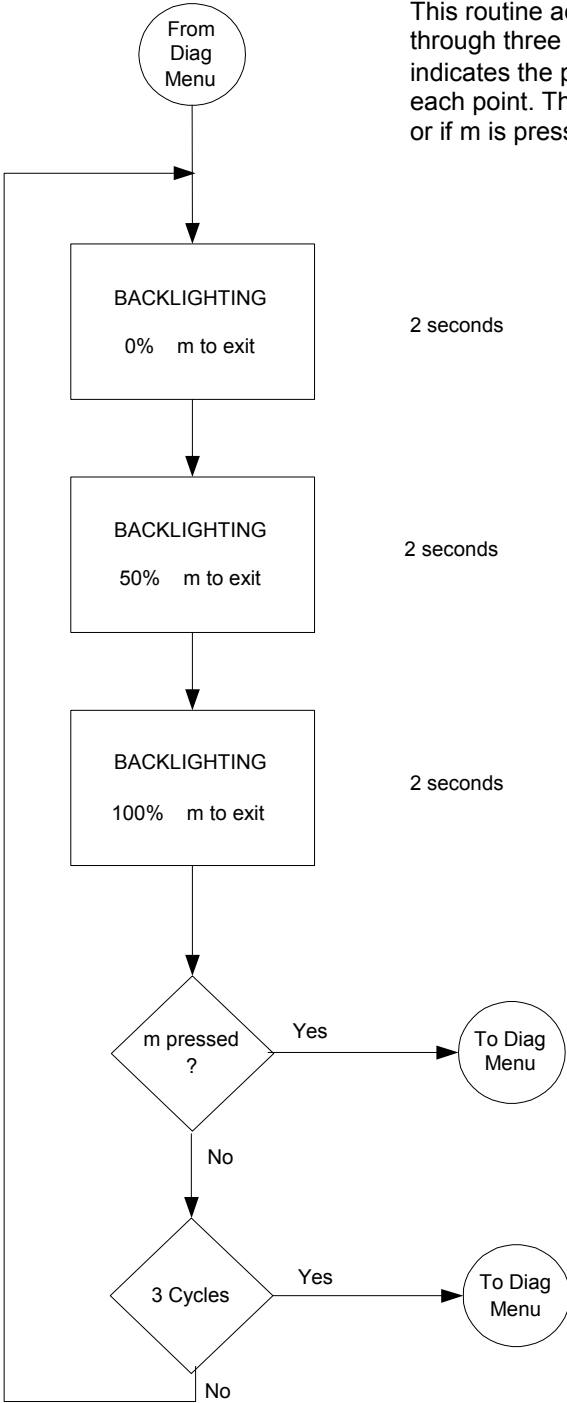
4.10.3. LCD Test

This routine tests the LC Display using test patterns. The test stops after 3 cycles or if m is pressed.

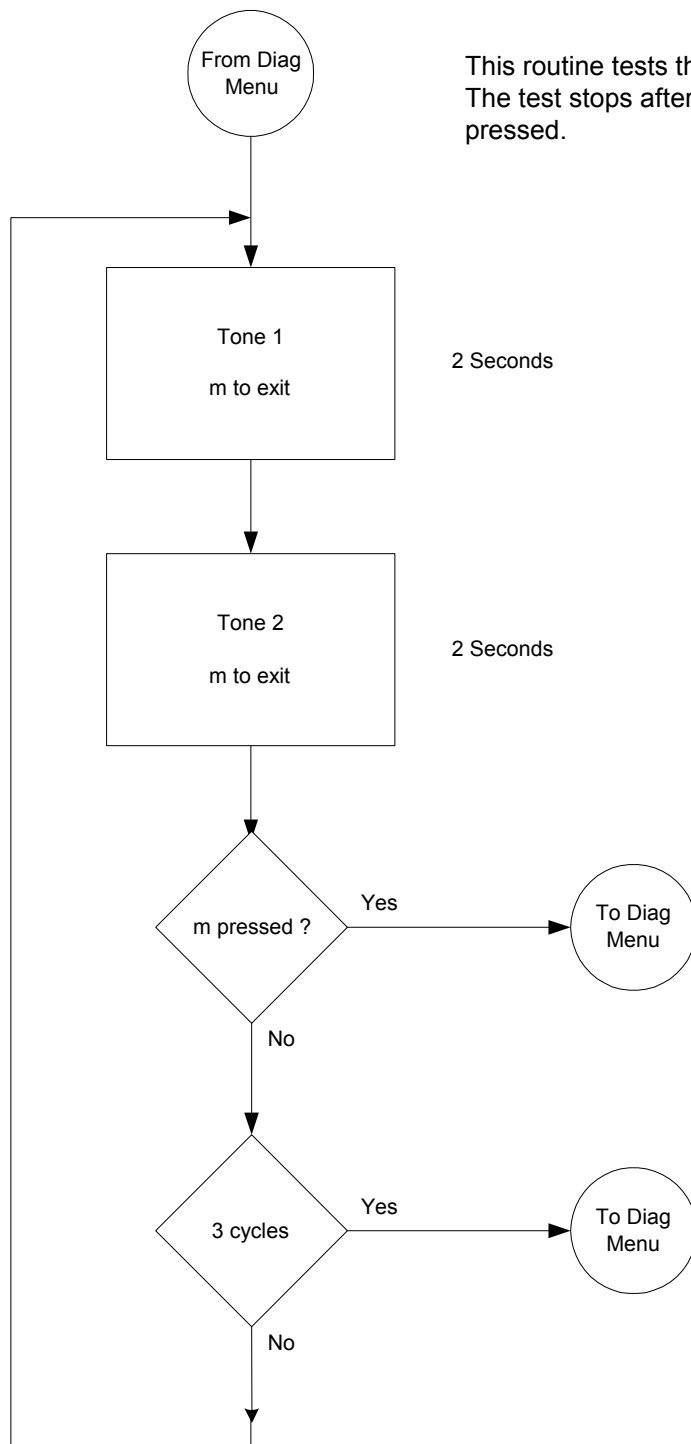


4.10.4. Backlighting Test

This routine adjusts the backlighting through three points. The display indicates the percentage of backlighting at each point. The test stops after 3 cycles or if m is pressed.

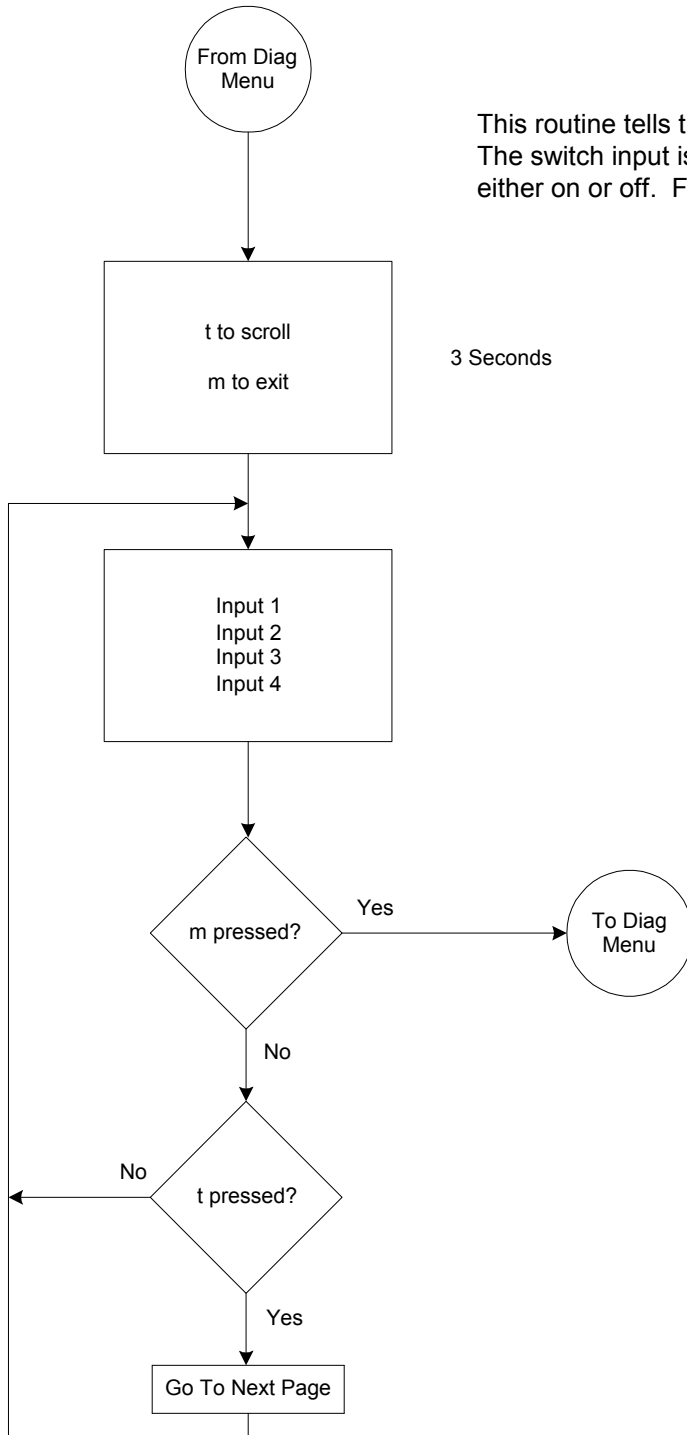


4.10.5. Speaker Test



This routine tests the speaker using 2 tones. The test stops after 3 cycles or if m is pressed.

4.10.6. Switch Inputs



This routine tells the operator the status of each switch input. The switch input is identified by name and its status is shown as either on or off. Four inputs are shown per screen page.

Inputs List (gas engine)

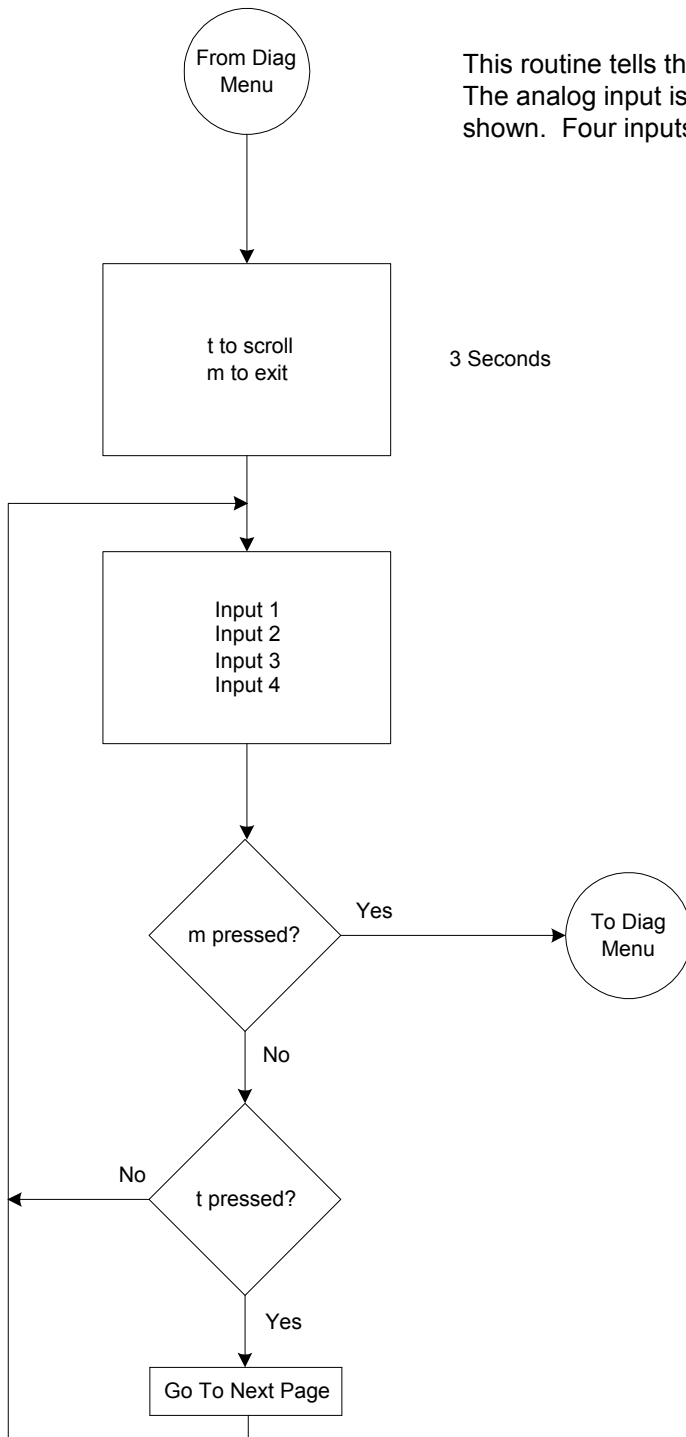
- Day Light
- Buzzer Enable
- Check Tires
- Auto Park
- High Idle
- Service
- Seat Belt
- Park Brake
- Head Light
- Right Turn
- Left Turn
- High Beam
- Key in Ign
- Door Ajar
- OverDrive off

Inputs List (diesel engine):

- DayLight
- Buzzer Enable
- Check Tires
- Service
- Seat Belt
- Park Brake
- Head Light
- Right Turn
- Left Turn
- High Beam
- Key in Ign
- Door Ajar
- OverDrive off
- Charge Ind
- Water in Fuel

4.10.7. Analog Inputs

This routine tells the operator the status of each analog input. The analog input is identified by name and its voltage level is shown. Four inputs are shown per screen page.



3 Seconds

Inputs List (gas engines):

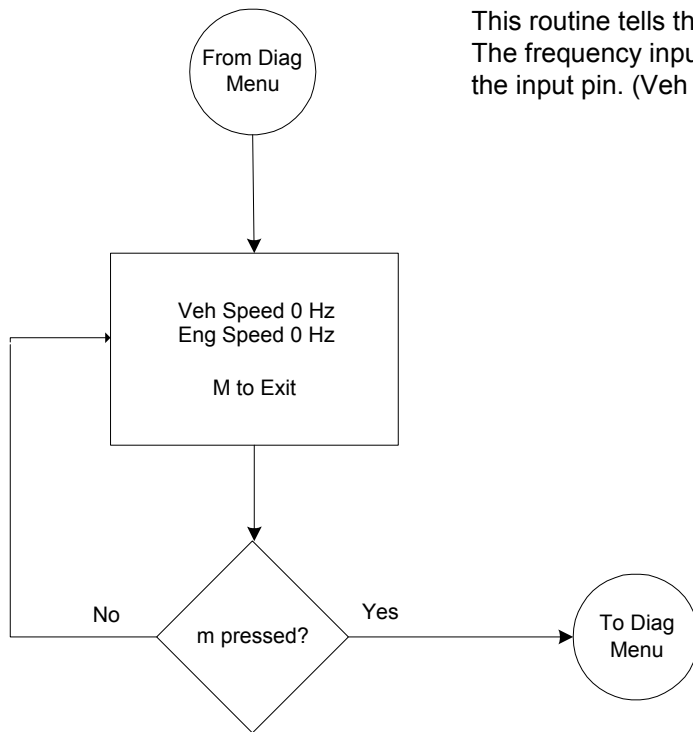
Dimmer	0.0 V
Ignition	13.7 V
Brake Fail	5.0 V
External T	0.0 V
ABS	5.0 V

Inputs List (diesel engine):

Fuel Level	5.030V
Dimmer	13.7 V
Ignition	14.0 V
Brake Fail	5.0 V
External T	5.030 V
ABS	5.0 V

4.10.8. Frequency Inputs

This routine tells the operator the status of each frequency input. The frequency input is identified by name and the frequency at the input pin. (Veh Speed frequency not used on diesel).



5. TROUBLE SHOOTING GUIDE

5.1. Gauges

5.1.1. Tachometer

Gas Engines

Engine speed is read from a frequency input (pin 13). On board diagnostics can report the tachometer frequency input where 1 Hz = 30 RPM. If the frequency input to the cluster is missing, the cluster will display engine speed by reading it from the J1850 data bus. In this case, the needle movement can be jumpy due to the slow rate of transmission on the bus.

Diesel Engines

Engine speed is read from a frequency input (pin 13). On board diagnostics can report the tachometer frequency input where 1 Hz = 15 RPM. If the frequency input to the cluster is missing, engine speed is read from the J1939 data bus.

5.1.2. Speedometer

Gas Engines

Vehicle speed is read from a frequency input (pin 14) at the rate of 4000 pulses/mile. On board diagnostics can report the speedometer frequency input where 1.11 Hz = 1 MPH. If the frequency input to the cluster is missing, the cluster will display vehicle speed by reading it from the J1850 data bus. In this case, the needle movement can be jumpy due to the slow rate of transmission on the bus.

Diesel Engines

Vehicle speed is read from the J1939 data bus.

5.1.3. Fuel

Gas Engines, fuel levels are read from the J1850 data bus.

Diesel Engines, fuel levels are read from the sender input on pins 1 and 2.

Fuel Tank Volume	Diesel Sender Resistance	Fuel Gauge Pointer Indication	Cluster Diagnostics Fuel Level Analog Input
0%	$\leq 40 \Omega \pm 5\% -3$	° below E	$\leq 0.501 \text{ V}$
10%	$45 \Omega \pm 5\%$	E 0.540	V
20%	$66 \Omega \pm 5\%$	Low fuel warning	0.806 V
25%	$80 \Omega \pm 5\%$	1/4 0.978	V
45%	$127 \Omega \pm 5\%$	1/2 1.563	V
70%	$180 \Omega \pm 5\%$	3/4 2.217	V
90%	$225 \Omega \pm 5\%$	F 2.768	V
100%	$\geq 235 \Omega \pm 5\% +3$	° above F	$\geq 2.881 \text{ V}$

5.1.4. Coolant Temperature

Gas Engines Temperature is read from the J1850 data bus.



White line at top = 150 degrees Celsius

Start of amber = 127 degrees Celsius

Centerline = 87 to 107 degrees Celsius

Bottom line = 40 degrees Celsius

Diesel Engines Temperature is read from the J1939 data bus.



White line at top = 120 degrees Celsius

Start of amber = 100 degrees Celsius

Centerline = 79 to 94 degrees Celsius

Bottom line = 40 degrees Celsius

5.2. Warning lights

5.2.1. Battery charge indicator

Gas Engines

The warning light is turned on from a J1850 data bus message.

Diesel Engines

On board diagnostics can report the status of the switch input at pin 9:

ON (low) = warning light is on.

OFF (high) = warning light is off.

5.2.2. Low oil pressure

Gas Engines - The warning light is turned on from a J1850 data bus message.

Diesel Engines - The warning light is turned on from a J1939 data bus message.

5.2.3. Check transmission

Gas Engines - The warning light is turned on from a J1850 (MY03) or J1939 (MY04) data bus message.

Diesel Engines - The warning light is turned on from a J1939 data bus message.

5.2.4. Cruise control

Gas Engines - The warning light is turned on from a J1850 data bus message.

Diesel Engines - The warning light is turned on from a J1939 data bus message.

5.2.5. Left turn

On board diagnostics can report the status of the switch input at pin 19:

OFF (low) = warning light is off.

ON (high) = warning light is on.

5.2.6. Right turn

On board diagnostics can report the status of the switch input at pin 20:

OFF (low) = warning light is off.

ON (high) = warning light is on.

5.2.7. High beam

On board diagnostics can report the status of the switch input at pin 21:

OFF (low) = warning light is off.

ON (high) = warning light is on.

5.2.8. Check tires

On board diagnostics can report the status of the switch input at pin 31:

ON (low) = warning light is on.

OFF (high) = warning light is off.

5.2.9. ABS

On board diagnostics can report the status of the analog input at pin 23:

$\leq 1.4V$ = warning light is on.

$\geq 4.6V$ = warning light is off.

5.2.10. Brake

The brake warning light can be turned on from two different sources: the Park Brake input or Brake Failure input.

On board diagnostics can report the status of the switch input for Park Brake at pin 24:

ON (low) = warning light is on.

OFF (high) = warning light is off.

On board diagnostics can report the status of the analog input for Brake Failure at pin 25:

$< 5.0V$ (MY03 & MY03i), $< 0.5V$ (MY04), $< 3.0V$ (MY04i) = warning light is on.

$\geq 5.0V$ (MY03 & MY03i), $\geq 4.6V$ (MY04), $\geq 4.0V$ (MY04i) = warning light is off.

5.2.11. Seat belt

On board diagnostics can report the status of the switch input at pin 26:

OFF (low) = seat belt is unfastened (warning light is on)

ON (high) = seat belt is fastened (warning light is off)

5.2.12. Service engine soon

On board diagnostics can report the status of the switch input at pin 27:

ON (low) = warning light is on.

OFF (high) = warning light is off.

5.2.13. Daylight running lamp

On board diagnostics can report the status of the switch input at pin 33:

ON (low) = warning light is on.

OFF (high) = warning light is off.

5.2.14. High idle

Gas Engines

On board diagnostics can report the status of the switch input at pin 30:

ON (low) = warning light is on.

OFF (high) = warning light is off..

Diesel Engines

The warning light is turned on from a J1939 data bus message.

5.2.15. Range inhibit

Gas Engines - The warning light is turned on from a J1850 (MY03) or J1939 (MY04) data bus message.

Diesel Engines - The warning light is turned on from a J1939 data bus message.

5.2.16. Auto park

On board diagnostics can report the status of the switch input at pin 34:

OFF (low) = warning light is off.

ON (high) = warning light is on.

Not used on Diesel.

5.2.17. Overdrive off

On board diagnostics can report the status of the switch input at pin 16:

ON (low) = warning light is on.

OFF (high) = warning light is off.

5.2.18. Wait to Start

Diesel Engines - The warning light is turned on from a J1939 data bus message.

Not used on gas.

5.2.19. Engine Stop

Diesel Engines - The warning light is turned on from a J1939 data bus message.

Not used on gas.

5.2.20. Engine Brake

Diesel Engines - The warning light is turned on from a J1939 data bus message.

Not used on gas.

5.3. Backlighting

5.3.1. Backlight LCD & display odometer (Headlights On input, Trip or Mode inputs)

The odometer is readable with the ignition off if the vehicle headlights are on or if the trip or mode buttons are pressed. If the headlight switch is used, the odometer turns on and off with the switch without a delay. If the trip or mode switches are used, the odometer will be visible for 15 seconds.

On board diagnostics can report the status of the switch input for Headlights On at pin 22:

OFF (low) = headlights are off.

ON (high) = headlights are on.

(Note: The MY03 clusters will also display the odometer when the key is inserted into the ignition if the vehicle is equipped with a “key-in” switch connected to cluster pin 28).

5.3.2. Backlight gauges (Headlights On input, Dimmer input)

When the headlights are on, the gauges, gauge pointers and LCD dim together in accordance with the dimmer input. (Note: If the headlights are off, then the LCD backlighting will be on full bright.)

On board diagnostics can report the status of the switch input for Headlights On at pin 22:

OFF (low) = headlights are off.

ON (high) = headlights are on.

On board diagnostics can report the status of the analog input for Dimmer at pin 4:

0 V = backlighting is off.

13.8 V = backlighting is on full bright

5.4. Misc.

5.4.1. Key in Ignition Reminder Mode

When the ignition goes from on to off and the key is left in the ignition switch, for a 60 second period the chime will sound if the door ajar input is low (door open). The chime will continue to sound until either the driver's door is closed or the key is removed from the ignition or the 60-second period has elapsed.

During the 60-second period the odometer is visible.

On board diagnostics can report the status of the switch input for Key in Ignition at pin 28:

ON (low) = key is in ignition.

OFF (high) = key is out of ignition.

(Note: For the MY03 clusters, the 60-second time out period does not apply).

5.4.2. Outside temperature

The message center will display outside temperature if the vehicle is equipped with a temperature sender. This menu selection is unavailable if the temperature sender is not installed. (MY03 clusters display -35°C when the temperature sender is not installed).

On board diagnostics can report the status of the analog input at pin 3. The table below shows the relationship between temperature, sender resistance and the voltage displayed on pin 3.

Outside Temperature	Temperature Sender Resistance	Cluster Diagnostics Temperature Analog Input
N/A OPEN		5.030 V
0°C (-32°F) 9400	Ω	2.674 V
10°C (50°F) 5660	Ω	2.035 V
20°C (68°F) 3500	Ω	1.475 V
30°C (86°F) 2300	Ω	1.066 V
40°C (104°F) 1500	Ω	0.742 V
51°C (124°F) 1000	Ω	0.506 V

5.4.3. Door ajar

The message center will display Door Ajar if the vehicle is so equipped.

On board diagnostics can report the status of the switch input at pin 15:

ON (low) = door open.

OFF (high) = door closed.

5.4.4. Buzzer enable

MY03 clusters: A continuous buzzer alerts a driver to specific warning conditions. Activation requires the “buzzer enable” input grounded and appropriate message input. The buzzer is normally associated with an activated warning message or warning lamp.

On board diagnostics can report the status of the switch input at pin 32:

Low = buzzer enabled.

High = buzzer disabled.

MY04 clusters: Activation requires the “buzzer enable” input grounded.

On board diagnostics can report the status of the switch input at pin 32:

ON (low) = buzzer on

OFF (high) = buzzer off

5.4.5. Change Units, Metric or U.S.

Any time the user is in normal operating mode, the units displayed in the message center can be toggled back and forth from Metric to U.S. by pressing and releasing both the TRIP and MODE buttons.

5.4.6. No Bus Activity

Gas Engines

If the cluster cannot detect J1850 data bus activity, the message “No J1850 Activity” is displayed on the message center. J1850 enters the cluster on pin 12.

Gas & Diesel Engines

If the cluster cannot detect J1939 data bus activity, the message “No J1939 Activity” is displayed on the message center. J1939 enters the cluster on pins 10 and 11.

5.4.7. Engine Oil Change Reminder (Gas engines only)

Resetting the engine oil change reminder message:

Perform oil change as normal.

Turn ignition switch to “ON” position, but do not start engine.

Fully press and release the accelerator pedal three times within 5 seconds, and turn ignition “OFF” for at least 10 seconds.

The oil life counter on the engine controller will be reset to start a new cycle.

5.4.8. Current Draw

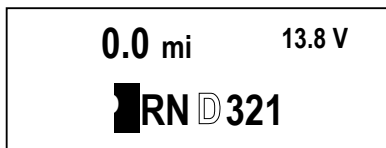
Nominal current draw at 13.8 V:

Cluster asleep < 3 mA

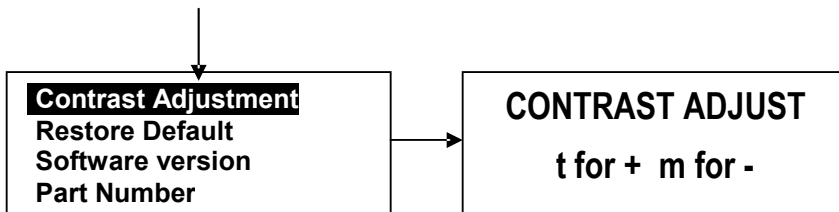
Cluster awake ≈ 250 mA

6. CLUSTER DIAGNOSTIC MENU TREE

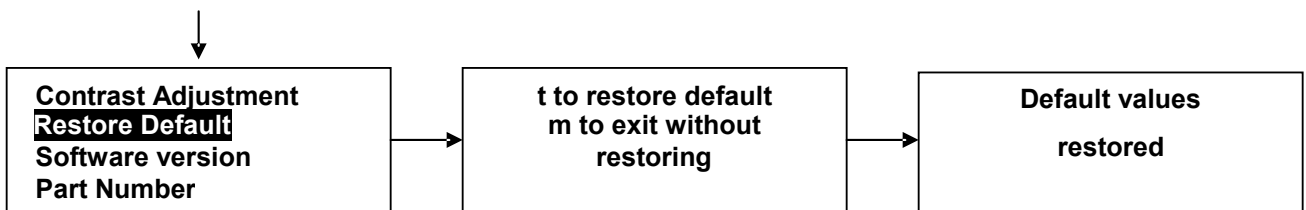
Default message center screen.



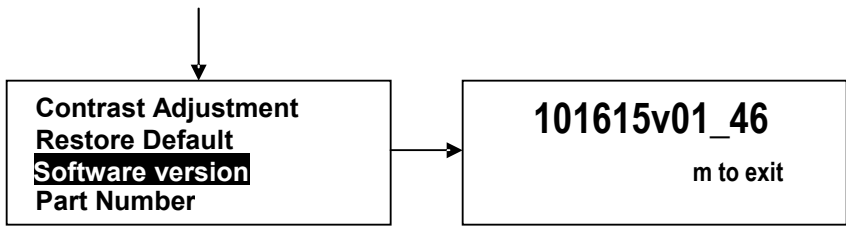
Press and hold MODE for > 5 seconds with transmission in PARK or PARK BRAKE set.



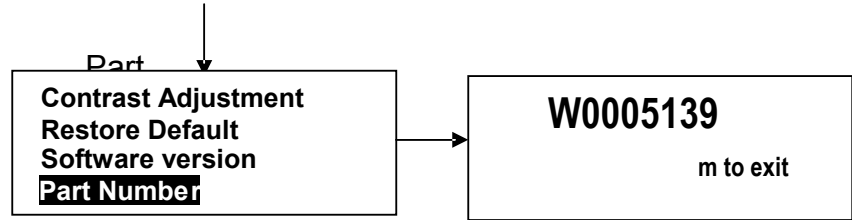
Press MODE to scroll down.



Press MODE to scroll down.

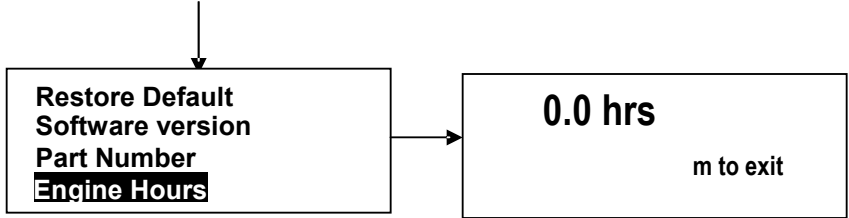


Press MODE to scroll down.

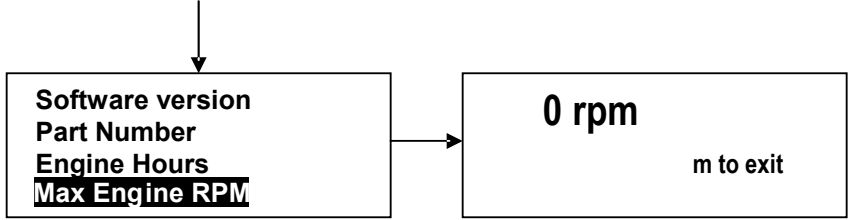


number is not available in MYC

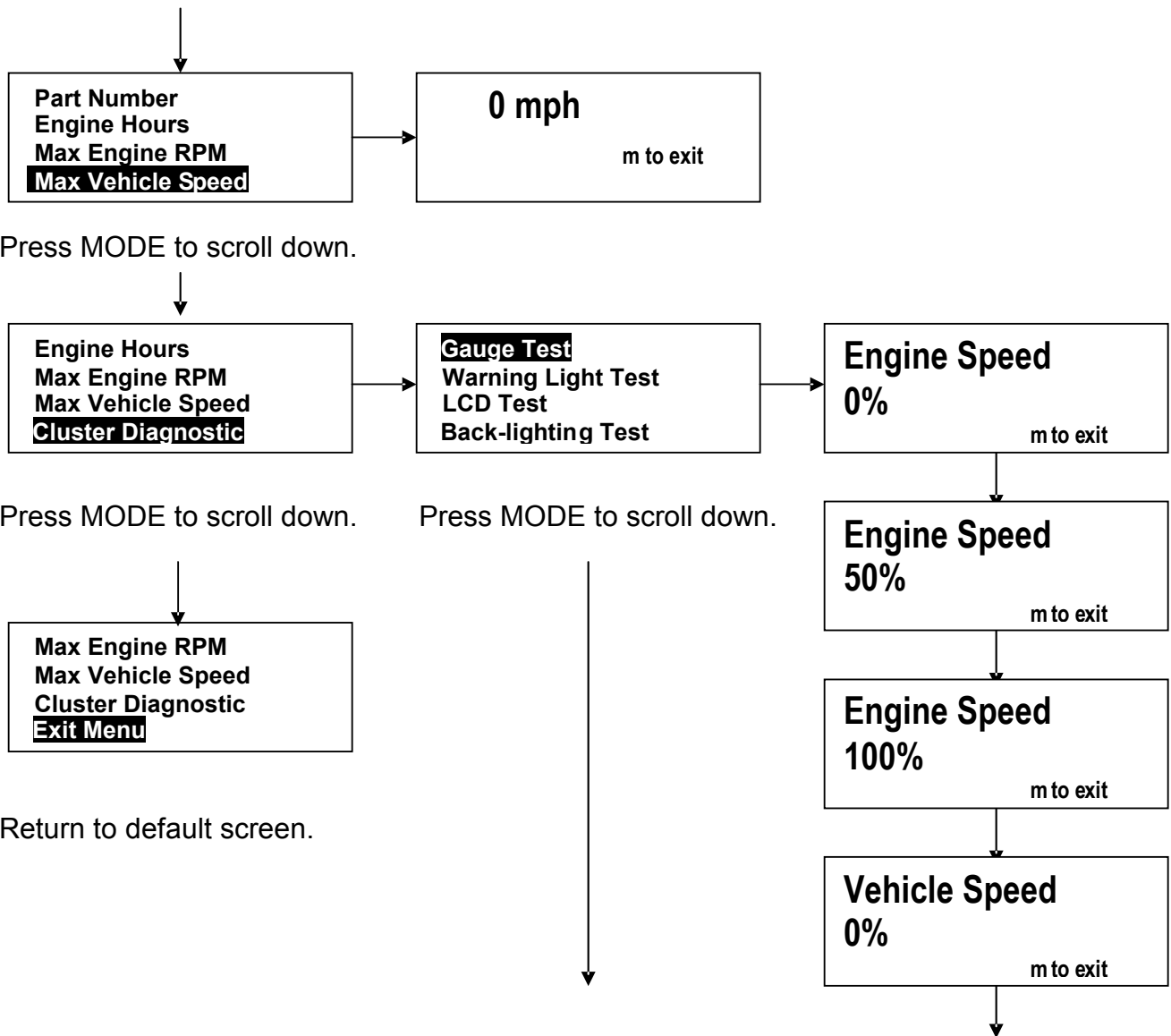
Press MODE to scroll down.

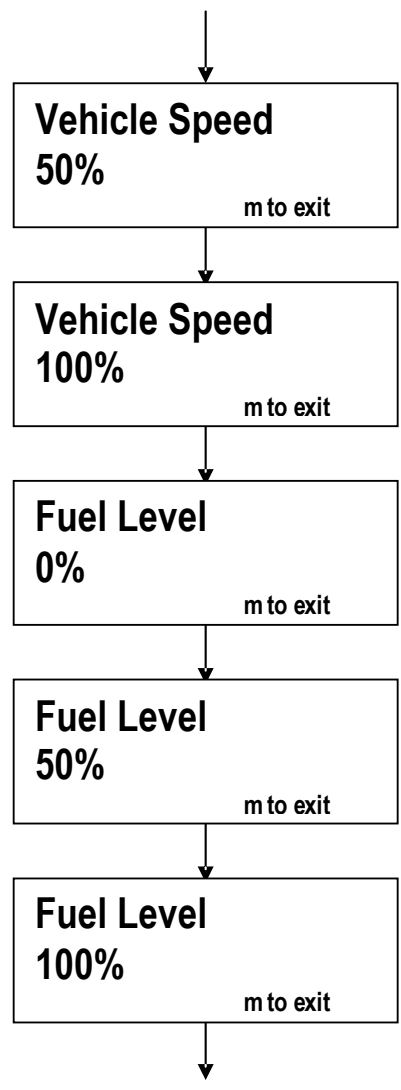


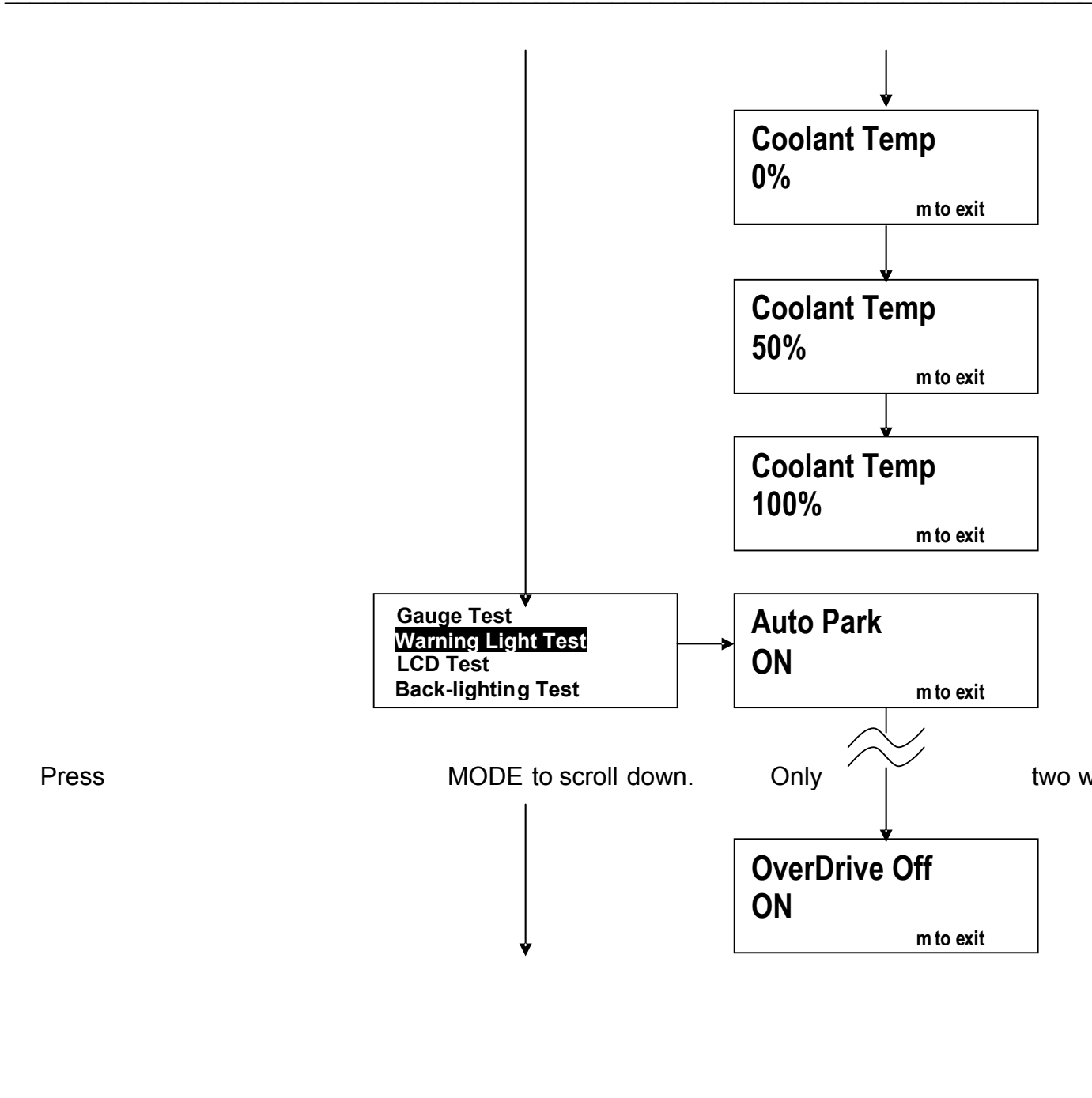
Press MODE to scroll down.



Press MODE to scroll down.







Press

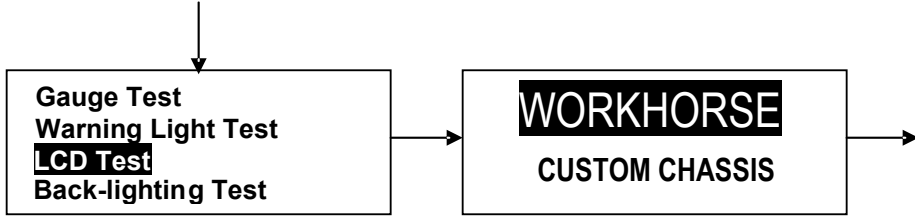
MODE to scroll down.

Only

two warnin

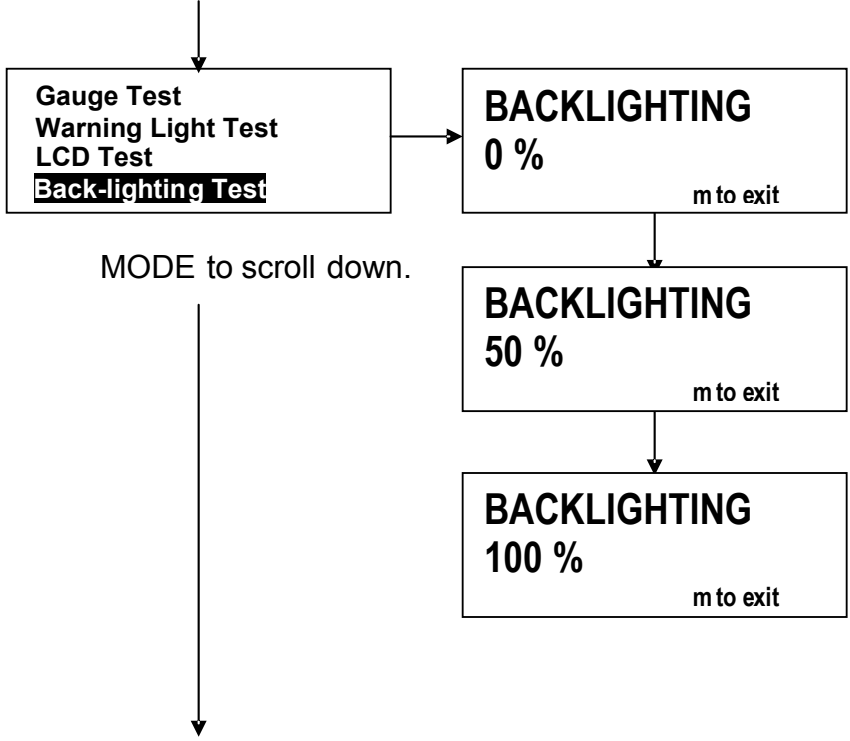


Press



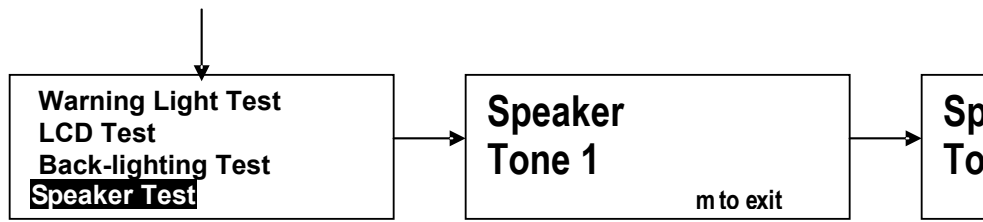
MODE to scroll down.

Press

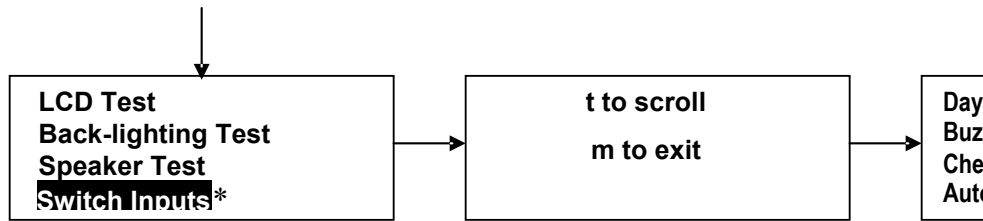


MODE to scroll down.





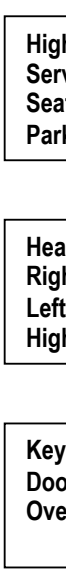
Press MODE to scroll down.

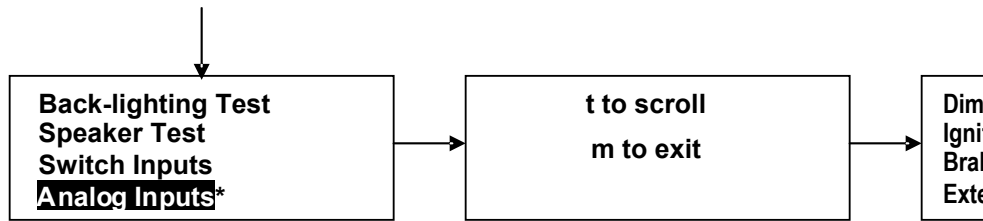


Press MODE to scroll down.

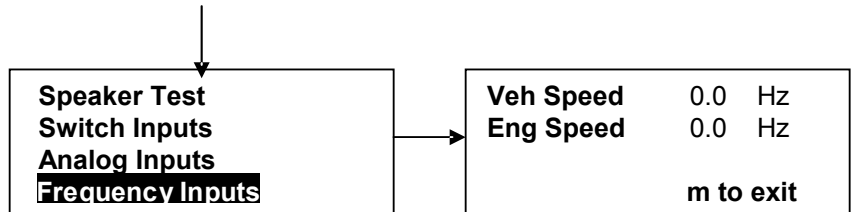
*Switch

inputs for gas engines shown.
 Diesel engines include
 additional switch inputs:
Service Engine, Charge Indicator
 and **Water in Fuel.**

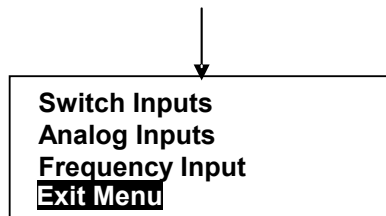




Press MODE to scroll down.



Press MODE to scroll down.



Return to default screen.

*Analog

inputs for gas engine
Diesel engines include Fuel I

2005 P&W CHASSIS SERVICE UPDATE

INTRODUCTION

This supplement contains information specific to the 2005 model year chassis. Unless specific service procedures are indicated, refer to the previous Service Manual or Service Manual Supplements for information on testing and R&R of components.

ENGINE

Calibration Information

Annual emission re-certification with all applicable emission labels changed for all GM engines. WCC is certified as both a "Small Vehicle Manufacturer" with Enhanced Evap Status. WCC will file for LEVII certification in MY'06.

PCM Software and Hardware changed.

Throttle Actuator Control System

A new TAC Module is now incorporated in all TAC equipped chassis. The operation of the TAC has been refined to offer enhanced throttle control.

EXHAUST

Catalytic Converter

The catalytic converters on both W22 and W24 were repositioned 27.5" further forward to further improve their effectiveness to meet the current compliance regulations.

TRANSMISSION

PTO Option

The Allison PTO option (Option Code TPC) has been eliminated due to the insignificant sales history.

Grade Braking

The W20, W22, and W24 chassis are equipped with the "Grade Braking" feature with the Allison LCT 1000 and 2100MH transmissions. This feature aids in maintaining speed down significant grades. Switching the "Grade Brake" switch to the "on" position and depressing the brake pedal enables this feature.

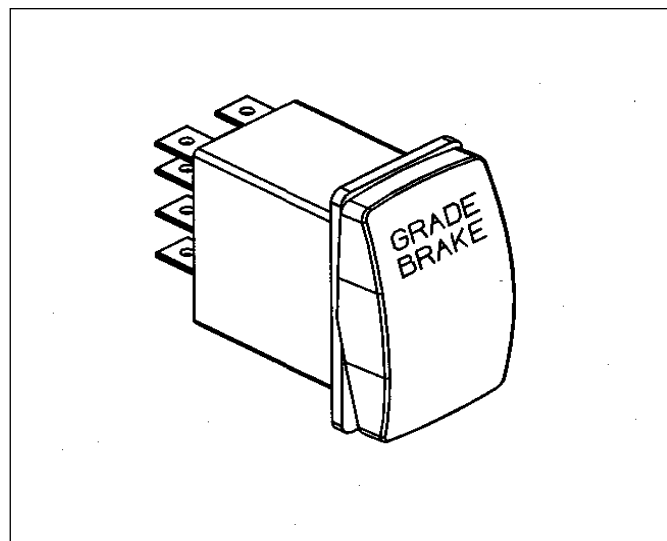
The grade-braking feature's primary purpose is to utilize engine braking to slow a heavy vehicle on steep grades in order to reduce wear on the traditional braking system. The method used to slow the vehicle is by overriding the PRNDL position, effectively pre-selecting the next lower

gear range automatically. Because the transmission is electronically controlled and there is no mechanical linkage that needs to be moved for a pre-select downshift, implementation of this feature can be done completely in software with no hardware modifications.

This control feature takes into consideration several factors before commanding a pre-select downshift. These are the primary inputs to the Transmission Control Module (TCM):

- Throttle position
- Service brake state
- Vehicle acceleration/deceleration
- Grade/Load
- Vehicle speed

These factors are continually calculated to determine when a preselect downshift is commanded.

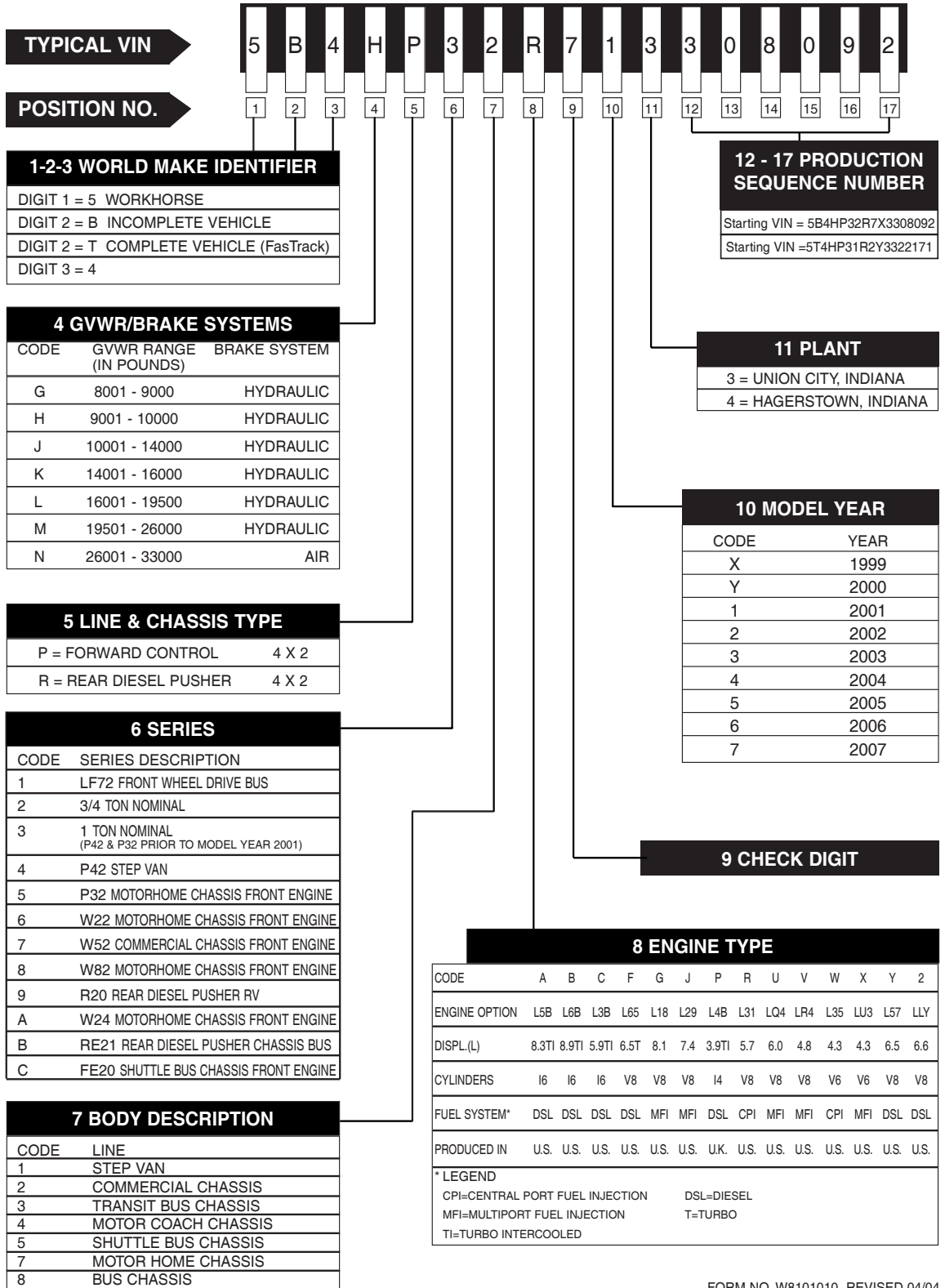


Grade Brake Control Switch

The downshift will always be to the next lower range, it will not 'skip' ranges. In Tow/Haul mode, grade braking can command downshifts to 2nd range, while in Normal mode, grade braking will not command downshifts below 4th range.

There is no 'fixed' shift point for a 'grade braking downshift', however, the shift will never occur such that the engine speed following the shift exceeds guidelines. Also, the shift will never occur without depressing the brake pedal.

WORKHORSE 2005 COMMERCIAL CHASSIS, MOTOR HOME CHASSIS AND INTEGRATED VEHICLE, VEHICLE IDENTIFICATION NUMBERING SYSTEM



004	REAR AXLE 4.78 RATIO	C7E	GVW RATING 11,000 LBS.
005	REAR AXLE 4.56 RATIO	C7L	GVW RATING 12,000 LBS.
006	REAR AXLE 4.63 RATIO	C7M	GVW RATING 14,100 LBS.
007	REAR AXLE 5.38 RATIO	C7N	GVW RATING 12,300 LBS.
058	REAR AXLE 5.13 RATIO	C7P	GVW RATING 16,000 LBS.
066	REAR AXLE 4.10 RATIO	C7R	GVW RATING 16,500 LBS.
17P	WHEEL COLOR SILVER	C7V	GVW 20,700 LBS.
2EC	TIRE FRONT-LT215/85R 16/E	C7W	GVW RATING 15,000 LBS.
2HI	TIRE FRONT-LT225/75R 16/E	C7X	GVW RATING 22,000 LBS.
2HS	TIRE FRONT-LT225/75R 16/D	CD4	WIPER SYSTEM WINDSHIELD, PULSE
2TN	TIRE FRONT-225/70R 19.5/F	CW8	MEXICO BASE EQUIPMENT
2TU	TIRE FRONT-8.00R-19.5/F	DR1	VEHICLE DERATING C7L TO C7A
2TX	TIRE FRONT-8.00R-19.5/F	DR3	VEHICLE DERATING C7E TO C7A
3EC	TIRE REAR-LT215/85R 16/E	DR5	VEHICLE DERATING C7M TO C7L
3ED	TIRE REAR-LT215/85R 16/E	EF1	ELECTRONIC FUEL INJECTOR
3HI	TIRE REAR-LT225/75R 16/E	EJ0	SHIPPED LOOSE PARTS (UTILIMASTER)
3HS	TIRE REAR-LT225/75R 16/D	EJ1	SHIPPED LOOSE PARTS (BLUEBIRD)
3TA	TIRE REAR-225/70R 19.5/F	EJ2	SHIPPED LOOSE PARTS (FLEETWOOD)
3TN	TIRE REAR-225/70R 19.5/F	EJ4	SHIPPED LOOSE PARTS (GRUMMAN-OLSON)
3TU	TIRE REAR-8.00R-19.5/F	EJ6	SHIPPED LOOSE PARTS (HOLIDAY RAMBLER)
3TW	TIRE REAR-8.00R-19.5/F BL	EJ7	SHIPPED LOOSE PARTS (UCBC)
3TX	TIRE REAR-8.00R-19.5/F BL	EK0	SHIPPED LOOSE PARTS (FOUR WINDS)
40P	WHEEL COLOR WHITE	EK3	SHIPPED LOOSE PARTS (COMPLETE)
41P	WHEEL COLOR BLACK	EL6	SHIPPED LOOSE PARTS (CARPENTER / CROWN)
4EC	TIRE SPARE-LT215/85R 16/E	EMY	ENGINE MODEL YEAR FLAG
4ED	TIRE SPARE-LT215/85R 16/E	EN2	HVAC SYSTEM PROVISIONS - DELETE
4HI	TIRE SPARE-LT225/75R 16/E	ENV	HVAC SYS PROVISIONS
4HS	TIRE SPARE-LT225/75R 16/D	EXP	EXPORT I.E.S.
4K1	STEERING WHEEL 18" [457.2]	FA1	FRONT SUSPENSION 5500 LBS.
4TA	TIRE SPARE-225/70R 19.5/F	FE9	CERTIFICATION EMISSION, FEDERAL
4TN	TIRE SPARE-225/70R 19.5/F	FK4	SUSPENSION FRONT 4400 LB, I-BEAM
4TU	TIRE SPARE-8.00R-19.5/F	FK5	SUSPENSION FRONT 5000 LB, I-BEAM
4TW	TIRE SPARE-8.00R-19.5/F	FL5	SUSPENSION FRONT 3650 LB, INDEPENDENT- LOW
4TX	TIRE SPARE-8.00R-19.5/F	FL6	SUSPENSION FRONT 4400 LB, INDEPENDENT
5D2	COOLING SYSTEM ENG OIL AUX	FL7	SUSPENSION FRONT 5000 LB, INDEPENDENT
5D7	BUMPER, FRT, FINISH PAINT DELETE	FL9	SUSPENSION FRONT 5500 LB, INDEPENDENT
5H0	PROVISION CLEAN POWER SOURCE	FM5	AXLE FRONT 4,400 LBS.
5J0	EQUIPMENT R-134A A/C SYS W/O PRECHARGE	FN3	AXLE FRONT 4,000 LBS.
5K0	DAYTIME RUNNING LIGHT-DELETE	FN5	AXLE FRONT 4,500 LBS.
5K1	DAYTIME RUNNING LAMPS	FN6	AXLE FRONT 5,000 LBS.
5K2	EQUIPMENT SCHOOL BUS, HEAVY DUTY	FN8	AXLE FRONT 5,500 LBS.
5K6	BUMPER FRT EXTRA WIDE, BLACK	FN9	AXLE FRONT 6,000 LBS.
5N0	LEVER PARKING BRAKE (HAND APPLY)	FP5	AXLE FRONT 8,500 LBS.
5N7	CABLE BATTERY POSITIVE (EXTENDED LENGTH)	FPA	FLOOR PLAN A-COMMERCIAL
7Y8	BATTERY 1250 CCA	FPB	FLOOR PLAN B-COMMERCIAL
84P	WHEEL COLOR GRAY	FST	FASTRACK PROCESSING OPTION
8B6	HOSE RADIATOR (SPECIAL)	FSW	FRONT SUSPENSION 6,000 LBS.
8D5	HEADLAMPS SINGLE RECTANGULAR	FTY	FRONT AXLE WIDE TRACK
8H5	BUMPER FRT DELETE	FV4	FRONT SUSPENSION 7,500 LBS.
8K2	GENERATOR 200 AMP	FV5	FRONT SUSPENSION 8,000 LBS.
8R2	VALVE LONG STEM 3 3/8"	GL1	AXLE REAR 7900 LBS. CAPACITY
8R3	VALVE METAL	GL2	AXLE REAR 10000 LBS. CAPACITY
8R4	VALVE ASM FLOW THROUGH	GL4	AXLE REAR 11000 LBS. CAPACITY
8T2	HEADLAMPS DUAL, RECTANGULAR	GL6	AXLE REAR 12,000 LBS. CAPACITY
8T8	SHIELD FUEL TANK, DELETE (SEO)	GL7	AXLE REAR 13,500 LBS. CAPACITY
8W0	HVAC SYSTEM PROVISIONS ENGINE DRESS & COMPRESSOR	GL8	AXLE REAR 15,500 LBS. CAPACITY
8W1	EVER TRANS. SHIFTER (REMOTE DA MT)	GN5	SUSPENSION REAR 6,200 LBS.
8W2	DASH MOUNTED TRANS. SHIFT SELE	GN6	SUSPENSION REAR 7,500 LBS.
8Y1	ALARM ENGINE W/ LIGHT	GN7	SUSPENSION REAR 8,000 LBS.
8Y2	BATTERY 690 CCA (DUAL) (SEO)	GP4	SUSPENSION REAR 11,000 LBS.
9H4	FUEL TANK 151L, 40 G,W/AUX FUEL DRAW C/MNT	GP5	SUSPENSION REAR 11,800 LBS.
9Q6	HEAVY DUTY REAR SPRING LH. SIDE	GQ4	REAR SUSPENSION 12,000 LBS.
B3D	EQUIPMENT SCHOOL BUS	GQ5	REAR SUSPENSION 13,500 LBS.
B3M	EQUIPMENT SCHOOL BUS, DELUXE	GQ6	REAR SUSPENSION 14,500 LBS.
C3D	GVW RATING 14,800 LBS.	GR1	REAR SUSPENSION 5,300 LBS., STANDARD
C6E	VW RATING 9,400 LBS.	GSA	GENERAL SERVICES ADMIN
C7A	GVW RATING 10,000 LBS.	GTM	GTM AXLE INTERMEDIATE TRACK
C7B	GVW RATING 17,000 LBS.	GTY A	AXLE WIDE TRACK
C7D	GVW RATING 18,000 LBS.	HPR	HEADLAMPS DUAL, RECTANGULAR

J71	PARKING BRAKE POWER OPERATED	U02752	74"ROLL UP REAR DOORS
JB8	BRAKE POWER, DISC/DRUM, 10000 LBS	U02753	LH SEALED DRIVERS DOOR
JF9	BRAKE HYD POWER, 4 WHEEL DISC	U02754	AM/FM RADIO
JL9	PWR, FRT&RR DISC, ANTILOCK, 4SEN	U02755	AIR CONDITIONING
K05	HEATER ENG BLOCK	U02756	ALUM PRTN W/ CENTER DOOR
K34	CRUISE CONTROL AUTOMATIC ELECTRONIC	U02757	3/4" PLWD PRTN W/ CENTER DOOR
K55	FUEL SENDER LOW LUBRICITY	U02758	83" SWING REAR DOORS
K68	GENERATOR 105 AMP	U02759	83"ROLL UP REAR DOORS
KC4	COOLING SYSTEM ENG OIL	U18	SPEEDOMETER INST KILO
KG8	ALTERNATOR 130 AMP	UA1	BATTERY HIGH CAPACITY WET
KL5	MODIFICATION ENGINE, NATURAL GAS	UC2	SPEEDOMETER INST, KILO & MILES,
KYR	65 MPH CALIBRATION	KILO	ODOMETER
KYV	80 MPH CALIBRATION	UC3	SPEEDOMETER MILES
KYW	75 MPH CALIBRATION	UJ1	INDICATOR SYSTEM, BRAKE WARNING
L18	ENGINE GAS, 8 CYL, 8.1L, MFI	V14	COOLER OIL TRANSMISSION AUX
L29	ENGINE GAS, 8 CYL, 7.4L, MFI	V70	HOOK TOW, FRAME MOUNTED
L31	ENGINE GAS, 8 CYL, 5.7L, CPI	V97	VEHICLE PREPERATION EXPORT
L35	ENGINE GAS, 6 CYL, 4.3L, CPI	VCL	CERTIFICATION EMISSION, CLEANFUEL FLEET
L3B	ENGINE DIESEL, 6 CYL, 5.9L, TURBO	VD1	PROVISION OPTIONS EUROPE
L4B	ENGINE DIESEL, 4 CYL, 3.9L, TURBO, HO	VD2	EUROPEAN WARRANTY PROVISION
L5B	ENGINE DIESEL, 6 CYL, 8.3L, TURBO	VE4	LABEL,EXPORT DIESEL ENGINE SMOKE
L57	ENGINE DIESEL, 8 CYL, 6.5L, HO		STANDARD
L6B	ENGINE DIESEL, 6 CYL, 8.9L, TURBO	VG8	VEHICLE BUYER NOTICE LABEL
L65	ENGINE DIESEL, 8 CYL, 6.5L, TURBO, HO	VH6	BUMPER FRT BLACK
LQ4	ENGINE GAS, 8 CYL, 6.0L MFI	VJ3	LABEL, PLATE ECE APPROVAL & VEHICLE
LR4	ENGINE GAS, 4.8L MFI	VKL	BUMPER FRT EXTRA WIDE WHITE
LU3	ENGINE GAS, 4.3L MFI	W88	EQUIPMENT NON SCHOOL BUS
M74	TRANSMISSION AUTO 5 SPD, SERIES 1000	W90	EQUIPMENT SCHOOL BUS MANDATORY
MN8	TRANSMISSION AUTO 4 SPD, HMD, 4L85-E	WEX	MOTORHOME MANUFACTURERS OPTION
MT1	TRANSMISSION AUTO 4 SPD, HMD, 4L80-E	WX7	WIRING PROVISIONS-EUROPEAN
MW3	TRANSMISSION MAN 5 SPD, NVG, 109MM, 5.6 1ST, O/D	WX8	WIRING PROVISIONS-SXL WIRE
NA7	EMISSION SYSTEM EUROPEAN	XEC	TIRE FRONT LT215/85R16/E
NA9	EVAPORATIVE SYSTEM EMISSION	XHF	TIRE FRONT LT225/75R16/E
NB6	EMISSION SYSTEM CALIFORNIA, TIER 1	XHH	TIRE FRONT LT245/75R16/E
NB8	EMISSION OVERRIDE CALIFORNIA SYSTEM	XRL	TIRE FRONT 235/80R22.5/G
NC7	EMISSION OVERRIDE FEDERAL SYSTEM	XTH	TIRE FRONT 245/70R 19.5/F
NF2	EMISSION SYSTEM FEDERAL, TIER 1	XTI	TIRE FRONT 245/70R 19.5/G
NF4	EMISSION SYSTEM CLEAN FUEL FLEET	XTN	TIRE FRONT 225/70R 19.5/F
NG1	CERTIFICATION EMISSION, GEOGRAPHICALLY RESTRICTED	XTV	TIRE FRONT 8.00R19.5/E
NG5	REGISTRATION EMISSION, CERTIFICATION, FIFTY STATE	XWG	TIRE FRONT 7.50R16/D
NJ3	FUEL TANK, 113.5L, 30 GAL C/MNT	XYK	TIRE FRONT LT215/85R16/D
NJ8	FUEL TANK, 151L, 40 GAL C/MNT	YEC	TIRE REAR-LT215/85R16/E
NJ9	FUEL TANK, 294L, 75 GAL, LH OR RH FILL C/MNT	YF5	CERTIFICATION EMISSION CALIFORNIA
NN4	FUEL TANK, 227L, 60 GAL C/MNT	YHF	TIRE REAR LT225/75R16/E
NN6	EMISSION OVERRIDE DIESEL FUEL, EXPORT	YHH	TIRE REAR LT245/75R16/E
Q34	WHEEL SPARE 19.5 X 6	YRL	TIRE REAR 235/80R22.5/G
RV1	ENGINE UPCHARGE 8100 VORTEC	YTH	TIRE REAR 245/70R19.5/F
S2S	TIRE BRAND REAR-UNIROYAL LAREDO	YTI	TIRE REAR 245/70R19.5/G
S3S	TIRE BRAND REAR-MICHELIN XRV	YTN	TIRE REAR 225/70R19.5/F
S4A	TIRE BRAND REAR GOODYEAR	YTV	TIRE REAR 8.00R19.5/E
S4N	TIRE BRAND REAR BRIDGESTONE	YWG	TIRE REAR 7.50R16/D
S5N	TIRE BRAND REAR-GOODYEAR	YYK	TIRE REAR LT215/85R16/D
SDI	DRIVERS ISLAND PROVISIONS	YYL	TIRE REAR LT215/85R16/D
T98	STAMPING VEHICLE IDENTIFICATION NUMBER	Z49	EXPORT CANADIAN MANDATORY BASE EQUIPMENT
TAM	FLEET SALES ARAMARK	ZEC	TIRE SPARE LT215/85R16/E
TCT	FLEET SALES CORNWALL TOOLS	ZHF	TIRE SPARE LT225/75R16/E
TET	FLEET SALES CINCINNATI MILACRON	ZHH	TIRE SPARE LT245/75R16/E
TFL	FLEET SALES FRITO LAY	ZRL	TIRE SPARE 235/80R22.5/G
TMT	FLEET SALES MAC TOOL	ZTH	TIRE SPARE 245/70R19.5/F
TST	FLEET SALES SNAP ON TOOLS	ZTI	TIRE SPARE 245/70R19.5/G
TUS	FLEET SALES USPS	ZTN	TIRE SPARE 225/70R19.5/F
U02749	PASSENGER SEAT	ZTV	TIRE SPARE 8.00R19.5/E
U02750	60" SWING REAR DOORS	ZWG	TIRE SPARE 7.50R16/D
U02751	74" SWING REAR DOORS	ZYK	TIRE SPARE LT215/85R16/D
		ZYL	TIRE SPARE LT215/85R16/D