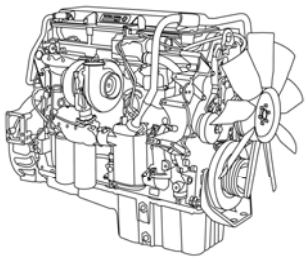
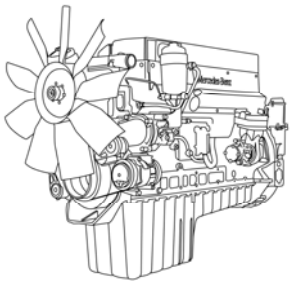
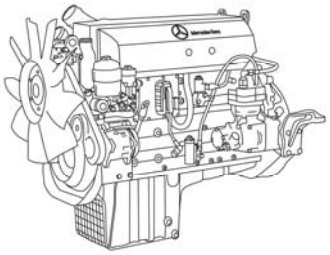
DDEC VI REFERENCE GUIDE

MOST FREQUENTLY USED FEATURES

Specifying Electronic Parameters for

2007 Detroit Diesel and Mercedes-Benz Engines

Last updated on: ***1/26/2007***

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I. FOREWORD

Detroit Diesel has developed this **DDEC VI Reference Guide** to assist you with specifying the correct engine parameters for your 2007 Series 60, MBE 4000, or MBE 900 engine.

Section One introduces the Motor Control Module (MCM) and Common Powertrain Controller (CPC) and explains their basic functionalities.

Sections Two through **Six** explain the five (5) most important features Detroit Diesel recommends be specified when ordering the engine. The sections contain a detailed explanation of each feature and its parameters, as well as guidance on how to spec and modify it.

Sections Seven through **Fifteen** explain all other features that are important to specify. As in Sections Two through Six, these sections contain a detailed explanation of each feature and its parameters, as well as guidance on how to spec and modify it.

Please feel free to contact the Detroit Diesel Customer Support Center or your local sales representative if you have any questions. Detroit Diesel Customer Support Center's phone number is 313-592-5800.

II. HOW TO READ THIS GUIDE

Parameters are broken down into three change levels and illustrated by the icons below. The icons indicate the level of possible changes and will help you better identify the parameters that can be changed either at your facility, your Detroit Diesel Distributor/Dealer or directly at the factory when you first order the truck and engine.

 = Customer Level → DDDL 7.0 Level
(Detroit Diesel Diagnostic Link)

 = Distributor/Dealer Level → DDRS Level
(Detroit Diesel Reprogramming System)

 = Factory/Plant Level → VEPS Level
(Vehicle Electronic Programming System)

The **P-Group** shown in tables is helpful when dealing with DDDL 7.0 software. It designates the group in which a certain parameter is listed.

The **Data Code** is helpful when ordering the truck and engine in SpecPro. Each programmable parameter has a designated Data Code.

Recommendations in parameter tables are based on Series 60 over-the-road applications.

Note: All parameters listed in this guide are controlled by the Common Powertrain Controller (see page 9 for more information).

1. DDEC INTRODUCTION

The Detroit Diesel Engine Controller (DDEC) is a system that monitors and determines all values required for the operation of the engine. It uses an updated and enhanced version of today's diagnostic tools. The new DDEC VI is capable of monitoring and managing all engine functions – including the Aftertreatment Systems required in 2007. DDEC VI controls are available with all Detroit Diesel engines – S60, MBE 4000, and MBE 900.

Besides the engine related sensors and the engine-resident control unit (Motor Control Module), this system has a control unit for vehicle engine management (Common Powertrain Controller).

MOTOR CONTROL MODULE

The engine-mounted Motor Control Module (MCM) includes control logic to provide overall engine management. It supports additional sensors and actuators required to meet EPA 2007 emissions standards and has an antitamper device incorporated in its back cover.

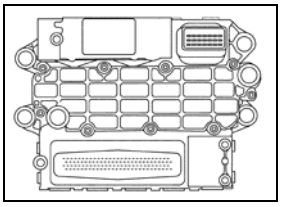


Figure 1: Motor Control Module (MCM)

COMMON POWERTRAIN CONTROLLER

The cab-mounted Common Powertrain Controller (CPC) is the interface between the MCM and the vehicle and equipment for engine control and manages other vehicle and equipment functions. It controls all engine-related vital vehicle functions like Idle Shutdown, Cruise Control and PTO. The CPC contains fleet management information and customer programmable parameters

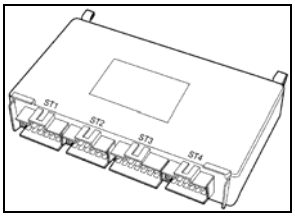


Figure 2: Common Powertrain Controller (CPC)

2. VEHICLE SPEED LIMITING

Vehicle Speed Limiting discontinues fueling above the programmed 'Max Road Speed'.

2.1. VEHICLE SPEED LIMIT PARAMETERS

Max Road Speed *Specified 'Max Road Speed' (vehicle speed). This speed cannot be exceeded.*		
Options	6 – 95 mph /	10 – 152 km/h
Default	95 mph/	152 km/h
Recommendation	68 mph	110 km/h
Access Level		
P-Group (DDDL)	3	
Data Code (SpecPro)	ED2-99D	

Table 1: Maxi Road Speed Limit

2.2. INTERACTION WITH OTHER FEATURES

The 'Max Cruise Set Speed' cannot exceed the 'Max Road Speed'. When Vehicle Speed Limiting is enabled, the engine speed in all gears will be limited for the duration of the ignition cycle. It is recommended that the vehicle speed limit not be set below a minimum of 30 mph (48 km/h) to insure smooth road speed limiting. DDC cannot guarantee smooth speed limiting for maximum speeds set below 30 mph (48 km/h).

2.3. VEHICLE SPEED LIMIT ADVANTAGES

Vehicle speed limiting helps to keep the engine operating in an efficient RPM band most of the time in top gear. Vehicle speed limiting maximizes safety, maintenance, and efficiency.

3. PROGRESSIVE SHIFT

The Progressive Shift option offers a high range maximum Vehicle Limit Speed to encourage the use of high (top) gear during cruise operation. Progressive Shift encourages the driver to upshift from a lower to a higher gear prior to reaching the engine's governed speed. The resulting lower engine speed in high range should result in improved fuel economy. Progressive shifting techniques should be practiced by every driver, but can be forced if fleet management considers it necessary. The benefits from progressive shifting are best realized during stop-and-go driving cycles.

The rate of acceleration will be limited below the programmed mph to encourage upshifting. As the driver accelerates beyond a specified mph speed, the rate of engine acceleration is limited in higher RPM, to encourage (force) the operator to select the top gear.

Progressive Shift should be used with 2100 RPM rated engines in fleet applications where the reduced drivability will not impede trip times or productivity. Progressive Shift is not compatible with Allison or any automatic transmissions.

NOTE: It is highly recommended that a Progressive Shift pattern is developed with Spec Manager before changing values to any other than the default or recommended settings. Incorrect selections could result in mismatched equipment, poor fuel economy and poor performance.

3.1. PROGRESSIVE SHIFT OPERATION

The Progressive Shift option has two sets of Low Range and one set of High Range parameters which are programmable with DDDL 7.0, DDRS, or VEPS. The example shift pattern (**Figure 3**) reflects default values when the Progressive Shift option is chosen and the low and high gear parameters are not modified.

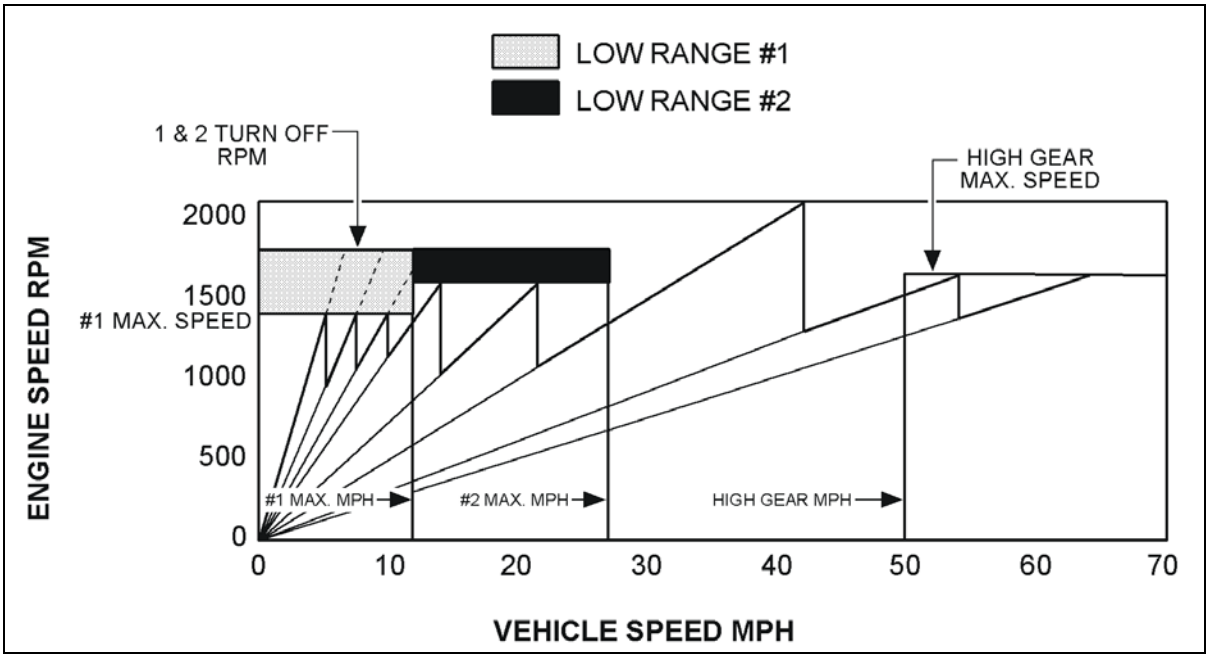


Figure 3: Progressive Shift Default

An alternate use for the Progressive Shift option would be to encourage (force) a driver into top gear. Normally this condition exists when the gearing selected at the time of order allows a Vehicle Limit Speed to be reached in a gear lower than top gear (**Figure 4**).

3.1.1. LOW RANGE #1

The Low Range #1 area of operation is bound by a maximum vehicle speed ('PS Low Gear 1 Max Vehicle Spd'), a maximum engine speed ('PS Low Gear 1 RPM Limit') and a maximum engine turn-off speed ('PS Low Gear 1 Max RPM Limit'). In the first illustration (**Figure 3**) the default values are 12 mph (19 km/h), 1400 RPM, and 1800 RPM respectively. During vehicle acceleration, when the vehicle speed is below the selected maximum vehicle speed for range #1, the maximum rate the engine can be accelerated to is reduced to 33 RPM/sec.

During light load operation, the driver will feel this and will be encouraged to upshift to regain his/her rate of acceleration. If the engine continues to be operated above the 'PS Low Gear 1 RPM Limit'', it may eventually reach the 'PS Low Gear 1 Max RPM Limit'. When the 'PS Low Gear 1 Max RPM Limit' is obtained, no additional increase in engine speed will be allowed. At this point, the transmission must be upshifted if the vehicle is to continue accelerating.

3.1.2. LOW RANGE #2

The Low Range #2 area of operation is bounded by a maximum vehicle speed ('PS Low Gear 2 Max Vehicle Spd'), a maximum engine speed ('PS Low Gear 2 RPM Limit') and a maximum engine turn-off speed ('PS Low Gear 2 RPM Limit'). **Figure 3** shows the default values to be (27 mph / 44 km/h), 1600 RPM, and 1800 RPM respectively. The lower vehicle speed boundary is the Low Range #1 maximum speed value. The engine acceleration rate for Low Range #2 is 25 RPM/sec.

3.1.3. HIGH RANGE

Two High Range parameters should be selected – 'PS High Gear On Vehicle Spd' and 'PS High Gear RPM Limit'. The default values shown in the first illustration (**Figure 3**) are 50 mph (81 km/h) and 1650 RPM respectively. Once the 'PS High Gear On Vehicle Spd' is attained, the engine will not be allowed to operate above the 'PS High Gear RPM Limit'. This is meant to encourage upshifting to high gear in order to increase vehicle speed (**Figure 4**).

NOTE: The 'PS High Gear RPM Limit' could change the maximum vehicle speed limit if the 'PS High Gear RPM Limit' (RPM) limits the max road speed. With Progressive Shift enabled, the 'PS High Gear RPM Limit' overrides the rated speed of the engine.

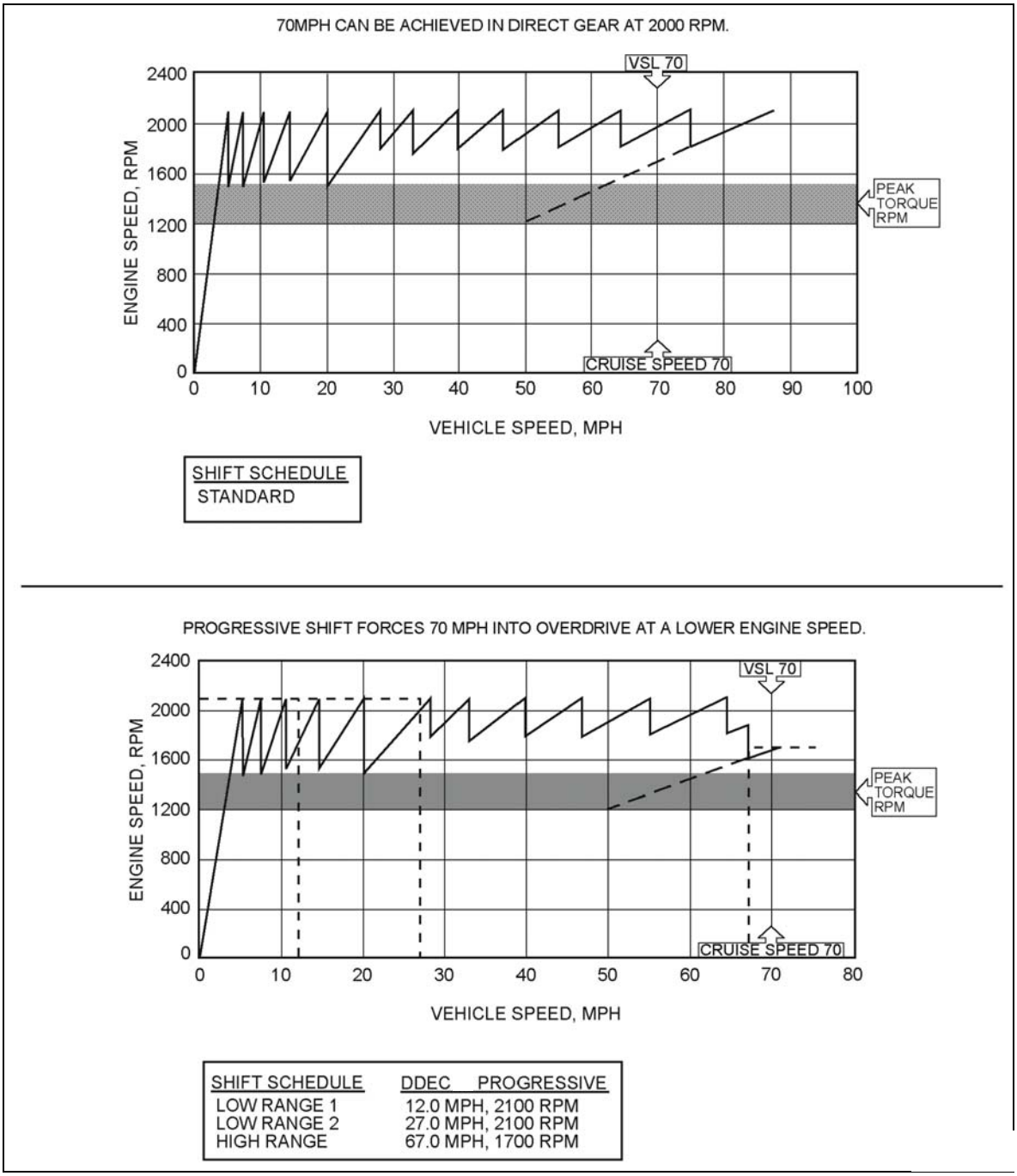


Figure 4: Progressive Shift Corrects Problem with High and Low Gears Modified

3.2. INSTALLATION INFORMATION

It is highly recommended that the Spec Manager program be utilized to determine maximum vehicle speed for Low Range #1 and #2 ('PS Low Gear 1 Max Vehicle Spd' and 'PS Low Gear 2 Max Vehicle Spd'). If the maximum engine speed and maximum vehicle speed coincide, the Progressive Shift logic may not correctly compensate faster or slower on either side of the maximum vehicle speed. Spec Manager can alert the programmer to this dilemma and advise accordingly on maximum vehicle speed set points.

Example: If the 'PS Low Gear 1 Max Vehicle Spd' was 12 mph (20 km/h), the Progressive Shift logic may not determine if the maximum engine speed is 1400 or 1600 RPM. Spec Manager would advise moving the 'PS Low Gear 1 Max Vehicle Speed' plus or minus 2 mph (3 km/h) to eliminate any possible confusion.

3.3. PROGRESSIVE SHIFT PARAMETERS

Progressive Shift Enable *Enables/disables 'Progressive Shift' feature.*	
Options	0 – Disabled 1 – Enabled
Default	0 – Disabled
Recommendation	1 – Enabled
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	0 – EH1-002 1 – EH1-001

Table 2: Progressive Shift Enable

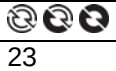
PS Low Gear 1 Max Vehicle Spd *Sets the 'Low Gear 1 Max Vehicle Speed' (turn-off speed).*		
Options	0 – 155 mph	0 – 250 km/h
Default	12 mph	19 km/h
Recommendation	18 mph	29 km/h
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	EH4-99D	

Table 3: Progressive Shift Low Gear 1 Max Vehicle Speed

PS Low Gear 1 RPM Limit *Sets the 'Low Gear 1 RPM Limit'.*	
Options	0 – 4000 RPM
Default	1400 RPM
Recommendation	1600 RPM
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EH2-99D

Table 4: Progressive Shift Low Gear 1 RPM Limit

PS Low Gear 1 Max RPM Limit *Sets the 'Low Gear 1 Max RPM Limit'.*	
Options	0 – 4000 RPM
Default	1800 RPM
Recommendation	1800 RPM
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EH3-99D

Table 5: Progressive Shift Low Gear 1 Max RPM Limit

PS Low Gear 2 Max Vehicle Spd *Sets the 'Low Gear 2 Max Vehicle Speed' (turn-off speed).*		
Options	0 – 155 mph	0 – 250 km/h
Default	27 mph	44 km/h
Recommendation	44	71 km/h
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	EH7-99D	

Table 6: Progressive Shift Low Gear 2 Max Vehicle Speed

PS Low Gear 2 RPM Limit *Sets the 'Low Gear 2 RPM Limit'.*	
Options	0 – 4000 RPM
Default	1600 RPM
Recommendation	1700 RPM
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EH5-99D

Table 7: Progressive Shift Low Gear 2 RPM Limit

PS Low Gear 2 Max RPM Limit *Sets the 'Low Gear 2 Max RPM Limit'.*	
Options	0 – 4000 RPM
Default	1800 RPM
Recommendation	1800 RPM
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EH6-99D

Table 8: Progressive Shift Low Gear 2 Max RPM Limit

PS High Gear On Vehicle Spd *Sets the High Gear Turn-on Speed.*		
Options	0 – 155 mph	0 – 250 km/h
Default	50 mph	81 km/h
Recommendation	45 mph	72 km/h
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	EH9-99D	

Table 9: Progressive Shift High Gear On Vehicle Speed

PS High Gear RPM Limit *Sets the 'High Gear RPM Limit'.*	
Options	0 – 4000 RPM
Default	1650 RPM
Recommendation	1800 RPM
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EH8-99D

Table 10: Progressive Shift High Gear RPM Limit

3.4. INTERACTION WITH OTHER FEATURES

When Progressive Shift is enabled DDEC VI will treat the 'PS High Gear RPM Limit' as the rated speed of the engine. 'Max Road Speed' or 'Max Cruise Set Speed' parameters should not be set higher than engine speed will allow.

3.5. PROGRESSIVE SHIFT ADVANTAGES

Progressive Shift can be used to encourage drivers to be as efficient as possible in a majority of accelerating situations. It also allows maximum engine governed speeds when required.

4. CRUISE CONTROL

Cruise Control maintains a targeted speed (mph) by increasing or decreasing fueling. The targeted speed can be selected and adjusted with dash-mounted switches.

Engine speed and power are varied under Cruise Control to maintain the set vehicle speed. The vehicle speed must be above 'Min Cruise Set Speed' and below 'Max Cruise Set Speed'. It is recommended that 'Max Cruise Set Speed' be set to the default to allow proper operation of other features such as Fuel Economy Incentive and PasSmart. The 'Max Road Speed' should be used to limit vehicle throttle speed.

Cruise Control can be overridden at any time with the throttle pedal if the vehicle is operating at less than the programmed 'Max Road Speed'. Clutch pedal and service brake pedal, if configured, are monitored to abort fueling the engine in Cruise Control Active Mode if there is driver action.

NOTE: DDEC must see a change of state of the Cruise Master Switch, clutch switch (if configured), and service brake switch before Cruise Control can become active upon every ignition cycle.

4.1. CRUISE CONTROL MODES

Mode	Condition	Set Speed
OFF	The Cruise Control ON/OFF switch is in OFF position or Cruise Control ON/OFF is switched to ON position although Cruise Control is not initiated.	0 mph
ACTIVE	The Cruise Control ON/OFF switch in ON position and Cruise Control is initiated and set speed has already been set. The set speed can be increased or decreased by using the Resume/Accel and Set/Coast switches.	Set Speed (+/-)
STANDBY	Cruise Control ON/OFF switch in ON position and Cruise Control was formerly active but not allowed anymore or no set speed has been set after switching Cruise Control ON.	Last Set Speed on hold in memory

Table 11: Three Cruise Control Operation Modes

4.2. CRUISE CONTROL SETTINGS

4.2.1. CRUISE ENABLE

Cruise Control is in standby, but not active, when the Cruise Control Enable Switch is ON.

4.2.2. SET/COAST

SET:
Cruise speed is set by toggling the switch ON. Cruise Control will become active and maintain the vehicle speed present at the time.

COAST:
When Cruise Control is active, the Set/Coast input can be used to reduce power and speed by toggling the switch. Momentarily toggling and releasing the Set/Coast switch will decrease the set point by 1 mph (2 km/h) increments for Cruise Control. Holding the Set/Coast will decrease the set point by 1 mph (2 km/h) per second. When released the Cruise Control set point will be at the current speed.

4.2.3. RESUME/ACCEL

RESUME:
If Cruise Control has been disabled with the service brake or the clutch switch, toggling the switch into ON position will restore the previously set cruise speed.

ACCEL:
When Cruise Control is active, the Resume/Accel input can be used to increase power and speed by toggling the switch. Momentarily toggling and releasing the Resume/Accel switch will increase the set point by 1 mph (2 km/h) increments for Cruise Control. Holding the Resume/Accel will increase the set point by 1 mph (2 km/h) per second. When released the Cruise Control set point will be at the current speed.

4.2.4. CLUTCH RELEASED

This input indicates that the clutch is released and is used for suspending Cruise Control and Auto Resume. This feature applies to manual transmissions only.

4.2.5. SERVICE BRAKE RELEASED

This input indicates that the brake is released. If the brake is activated, then Cruise Control is suspended. Cruise Control is resumed by using the Resume/Accel switch. This feature applies to automatic and manual transmissions.

4.2.6. SMART CRUISE

This is an optional feature. The Eaton Smart Cruise® system will send a heart-beat message on the SAE J1939 Data Link. Manual Cruise Control and Smart Cruise will be disabled if the message is not received over the data link or the message indicates that there is a failure in Smart Cruise. To regain manual control, the driver must toggle the cruise master switch twice within 10 seconds. The Amber Warning Light (AWL) will not illuminate for Smart Cruise faults. Smart Cruise must be configured at the factory through VEPS or at your local Distributor or Dealer. For additional information on Smart Cruise, contact Eaton Corporation.

4.2.7. CRUISE POWER

Cruise Power is an optional engine rating which operates on a higher horsepower curve during Cruise Control operation. The ECM provides the higher horsepower when Cruise Control is ON and not being overridden with the foot pedal. The additional power provides an incentive for the driver to operate in Cruise Control.

4.2.8. ENGINE BRAKES IN CRUISE CONTROL

If driving conditions cause the vehicle speed to exceed the ‘Max Cruise Set Speed’, Engine Brakes (if configured) are activated to keep the desired road speed based on engine brake dash switches. This is an optional feature.

4.2.9. CRUISE AUTO RESUME

Cruise Control is resumed if the clutch has been pushed twice and released within three (3) seconds. This is an optional feature.

4.3. CRUISE CONTROL PARAMETERS

Min Cruise Set Speed *Min Road Speed for Cruise Control.*		
Options	10 – 95 mph	16 – 152 km/h
Default	20 mph	32 km/h
Recommendation	20 mph	32 km/h
Access Level		
P-Group (DDDL)	15	
Data Code (SpecPro)	EC2-99D	

Table 12: Min Cruise Set Speed

Max Cruise Set Speed *Max Road Speed for Cruise Control.*		
Options	30 – 95 mph	16 – 152 km/h
Default	95 mph	152 km/h
Recommendation	65 mph	105 km/h
Access Level		
P-Group (DDDL)	15	
Data Code (SpecPro)	EC3-99D	

Table 13: Max Cruise Set Speed

Increment Cruise Set Speed *Set speed increment for every Resume/Accel switch momentary press.*		
Options	0 – 6 mph	0 – 10 km/h
Default	1 mph	2 km/h
Access Level		
P-Group (DDDL)	15	
Data Code (SpecPro)	Increment – ESM-99D	

Table 14: Increment Cruise Set Speed

Decrement Cruise Set Speed *Set speed decrement for every Set/Coast switch momentary press.*		
Options	0 – 6 mph	0 – 10 km/h
Default	1 mph	2 km/h
Access Level		
P-Group (DDDL)	15	
Data Code (SpecPro)	Decrement – ESL-99D	

Table 15: Decrement Cruise Set Speed

Enable Cruise Auto Resume *Enables or disables the Auto Resume feature.*	
Options	0 – Disabled 2 – Enable after clutch pushed twice and released within three (3) seconds
Default	0 – Disabled
Access Level	
P-Group (DDDL)	15
Data Code (SpecPro)	0 – EC4-002 2 – EC4-005

Table 16: Enable Cruise Auto Resume

Cruise Control Enable Engine Brk *Enables or disables the engine brakes during Cruise Control.*	
Options	0 – Disabled 1 – Enable automatic engine brake operation with Cruise Control
Default	0 – Disabled
Access Level	
P-Group (DDDL)	10
Data Code (SpecPro)	0 – EJ1-002 1 – EJ1-001

Table 17: Cruise Control Enable Engine Brake

Cruise Power *Enables Cruise Power function.*	
Options	0 – High Power 1 – Low Power Only 2 – Cruise Power Enabled
Default	0 – High Power
Access Level	
P-Group (DDDL)	15
Data Code (SpecPro)	0 – EA1-342 1 – EA1-343 2 – EA1-344

Table 18: Cruise Power

4.4. ADVANTAGES

Cruise Control minimizes driver fatigue. DDEC VI controls road speed within a certain mph, allowing the engine to optimally throttle itself in hill terrain, during accelerations (RESUME) and to maintain a steady speed in rolling terrain. Using Cruise Control also improves fuel economy when used correctly.

5. ENGINE PROTECTION

The DDEC VI Engine Protection system monitors all engine sensors and electronic components to recognize system malfunctions.

Standard parameters which are monitored for Engine Protection are:

- Low Coolant Level
- High Coolant Temperature
- Low Oil Pressure
- High Oil Temperature
- High Soot Level (DPF)
- Uncontrolled DPF Regeneration

5.1. ENGINE PROTECTION OPERATION

Engine Protection is a vital part of the MCM/CPC programming and software. DDEC VI monitors coolant level, various pressures and temperatures, and compares these parameters against the allowable limits to determine when a critical fault is reached. The Amber Warning Lamp (AWL) is illuminated and a code logged if there is an electronic system fault. This indicates the problem should be diagnosed as soon as possible.

The CPC illuminates the AWL and RSL (Red Stop Lamp) and stores a malfunction code if a potentially engine damaging fault is detected. Once a critical fault is reached, the AWL and RSL are illuminated and a 60-second (coolant temp, coolant level, oil level) or 30-second timer (oil pressure) starts a countdown to the desired level of protection. The AWL will flash for 20 seconds and the RSL will flash for 10 seconds before the engine shuts down. The flashing will occur only if Protection Shutdown is enabled. Temperature and pressure limits are established in the engine calibration and may differ slightly from one engine model to another.

5.1.1. PROTECTION LEVELS

Engine Protection consists of different protection levels:

- Warning
- Shutdown

WARNING:
The AWL illuminates when the parameter value falls below the prewarning level. Speed and/or torque may be limited based on the engine protection parameter.

SHUTDOWN:

The AWL and RSL are illuminated if shutdown is enabled. The engine shuts down 60 seconds after the RSL is illuminated for coolant level or coolant temperature. The engine shuts down 30 seconds after the RSL is illuminated for oil pressure or DPF shutdown. The Stop Engine Override Switch (SEO Switch) is available to prevent engine shutdown at the operator's discretion.

5.1.2. STOP ENGINE OVERRIDE OPTION

The Stop Engine Override Switch is used for a momentary override. DDEC VI records the number of times the override is activated after a fault occurs.

5.1.3. MOMENTARY OVERRIDE

A SEO switch is used to override the shutdown sequence. This override resets the 60-second shutdown timer (30-second shutdown timer for oil pressure). The switch must be recycled after five (5) seconds to obtain a subsequent override.

NOTE: The operator has the responsibility to take action to avoid engine damage. An additional override will occur when a DPF soot load or diagnostic shutdown is in progress and the CPC is requesting a DPF regeneration. This will give a soot-loaded DPF the chance to be cleaned (regenerated) before determining whether to shut down the engine.

5.2. ENGINE PROTECTION PARAMETERS

Coolant Temp Eng Protect Shtdn *Enables or disables shutdown for 'High Coolant Temperature'.*	
Options	0 – Warning 1 – Engine Shutdown
Default	1 – Engine Shutdown
Access Level	
P-Group (DDDL)	18
Data Code (SpecPro)	0 – EA6-007 1 – EA6-008

Table 19: Coolant Temperature Engine Protection Shutdown

Coolant Level Eng Protect Shtdn *Enables or disables shutdown for 'Low Coolant Level'.*	
Options	0 – Warning 1 – Engine Shutdown
Default	0 – Warning
Access Level	
P-Group (DDDL)	18
Data Code (SpecPro)	0 – EA8-009 1 – EA8-010

Table 20: Coolant Level Engine Protection Shutdown

Oil Press Eng Protect Shtdn *Enables or disables shutdown for 'Low Oil Pressure'.*	
Options	0 – Warning 1 – Engine Shutdown
Default	1 – Engine Shutdown
Access Level	
P-Group (DDDL)	18
Data Code (SpecPro)	0 – EA7-005 1 – EA7-006

Table 21: Oil Pressure Engine Protection Shutdown

Oil Level Eng Protect Shtdn *Enables or disables shutdown for 'Low Oil Level'.*	
Options	0 – Warning 1 – Engine Shutdown
Default	0 – Warning
Access Level	
P-Group (DDDL)	18
Data Code (SpecPro)	0 – EA9-005 1 – EA9-004

Table 22: Oil Level Engine Protection Shutdown

5.3. ENGINE PROTECTION ADVANTAGES

Engine Protection watches critical engine parameters with respect to engine "health" and warns the driver of situations that require immediate attention.

6. IDLE SHUTDOWN TIMER AND PTO SHUTDOWN

The Idle Shutdown Timer will shut down the engine if it remains idling for a specified period of time. The options that can operate with Idle Shutdown Timer are Idle Shutdown Override, Vehicle Power Shutdown' or Shutdown on Power Take-off (PTO).

6.1. IDLE/PTO SHUTDOWN OPERATION

6.1.1. IDLE SHUTDOWN NON-PTO MODE

There are four modes of operation for Idle Shutdown:

- **DISABLED:**
  Idle Shutdown will not occur in this mode.
- **PARK BRAKE:**
  In this mode, Idle Shutdown will be enabled only when the park brake is applied, the accelerator pedal position is at zero and the engine is idling.
- **NO PARK BRAKE:**
  This mode is the same as Park Brake Mode above, except there is no requirement for the park brake to be applied.
- **EDGE-TRIGGERED ACCELERATOR PEDAL:**
  This mode has no requirement on the park brake or on the engine being at idle. The operator may reset the 'Idle Shutdown' procedure by moving the accelerator pedal from below 40% to above 80%.

The idle shutdown period can range from 1 to 5000 seconds (approximately 83 minutes). Certain conditions must be met for the entire time-out period for shutdown to occur. These conditions include:

- Coolant temperature above 50°F (10°C)
- Engine operation at idle
- The parking brake on (optional)
- Ignition ON
- Vehicle Speed less than 3 mph (5 km/h)

Fueling is stopped after the specified idle time; the ignition circuit remains active after the engine shuts down. The AWL will flash 20 seconds before the shutdown occurs. The RSL will flash 10 seconds before shutdown occurs. The AWL will continue flashing until the ignition is turned off to indicate the shutdown. If a shutdown occurs, the ignition switch must be cycled to OFF (wait 10 seconds) and back to ON before the engine will restart.

6.1.2. PTO SHUTDOWN

There are four modes of operation for PTO shutdown:

- **DISABLED:**
  Idle Shutdown will not occur in this mode.
- **PARK BRAKE:**
  In this mode, PTO shutdown will be enabled only when the park brake is applied, the accelerator pedal position is at zero and the actual engine torque is less than 100 Nm ('Max Engine Load PTO Shutdown').
- **NO PARK BARKE:**
  This mode is the same as Park Brake Mode above, except there is no requirement for the park brake to be applied.
- **EDGE-TRIGGERED ACCELERATOR PEDAL:**
  This mode has no requirement on the park brake or the actual torque. The operator may reset the PTO shutdown procedure by moving the accelerator pedal from below 40% to above 80%.

The PTO shutdown period can range from 1 to 5000 seconds (approximately 83 minutes).

6.1.3. IDLE/PTO SHUTDOWN OVERRIDE

This is an optional feature. Idle Shutdown Override allows the operator to temporarily override the Idle Shutdown Timer or the PTO Shutdown Timer. The Idle/PTO Shutdown will be overridden if any of the following conditions occur:

- Accelerator pedal is in limp-home mode
- Operator override is enabled and any of the following operator override conditions are present:
  - → The SEO Override Switch is on
  - → The service brake is applied
  - → The clutch is pressed
- Parked DPF Regen is in progress. After regeneration completes, the override will remain in place for an additional five (5) minutes to allow the particulate filter to cool down after the regeneration cycle has completed.

6.1.4. IDLE SHUTDOWN WITH AMBIENT AIR TEMP

This option allows the override to be disabled based on ambient air temperature. If the upper and lower temperature limits are set and the ambient temperature is within limits, the override will be disabled and the engine will be shutdown after the specified time limit is met. If the ambient air temperature is outside

the specified range, the override would be allowed by increasing the percent throttle to greater than one percent.

For example, if the upper limit is set to 80°F and the lower limit is set to 65°F, the override would be disabled if the ambient air temperature was between 65°F and 80°F (**Figure 5**).

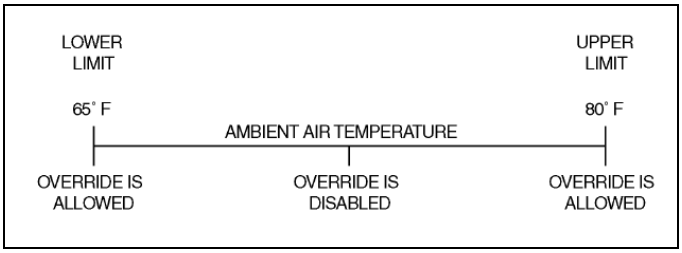


Figure 5: Ambient Air Temperature Graph

6.1.5. IDLE SHUTDOWN WITH AMBIENT AIR TEMP CONTINOUS OVERRIDE

It is possible for Idle Shutdown to be overridden continuously based on ambient air temperature. This allows the engine to continue to run while the temperature is such that power from the engine is required to heat or cool the air to keep the cab temperature comfortable.

Continuous override is only available if an ambient air temperature sensor is configured for use ('Ambient Air Temp Sensor Enable') and overrides are enabled ('Enable Idle PTO Shtdn Override').

There are two modes of operation: Operator Override and Automatic Override. In both cases, the override will only be allowed if the ambient air temperature is reading extreme (outside the limits 'Low Amb Air Override Temp' and 'Hi Amb Air Override Temp').

If automatic override ('Idle Shutdown Auto Override') is enabled, idle shutdown will always be overridden while the ambient air temperature is reading extreme. If automatic override is not enabled and operator override is, the operator may explicitly activate the override by pumping the accelerator pedal while idle shutdown is in progress and the AWL is flashing.

Note that the definition of a pump of the accelerator pedal depends upon the Idle/PTO Shutdown mode:

- **IDLE/PTO SHUTDOWN WITH/WITHOUT PARK BRAKE:**
  In either of these modes, pumping the accelerator pedal – is done simply by pressing the pedal.
- **IDLE/PTO SHUTDOWN WITH EDGE-TRIGGERED ACCEL PEDAL:**
  In this mode, pumping the accelerator pedal is done by moving it from below 40% to above 80%.

The continuous operator override will remain active until the ambient air temperature is no longer extreme, the park brake is not applied, the ignition is turned off, or the operator pumps the pedal again. Pumping the pedal will only cancel the override if it has already been in effect for at least 10 seconds.

6.1.6. VEHICLE POWER SHUTDOWN (OPTIONAL)

Vehicle Power Shutdown is used with Idle Timer Shutdown or Engine Protection Shutdown. After the idle timer times out or engine protection shuts the engine down, the Vehicle Power Shutdown relay shuts down the rest of the electrical power to the vehicle.

6.1.7. MAXIMUM ENGINE LOAD SHUTDOWN

This optional feature, when enabled ('Max Engine Load PTO Shutdown'), allows the setting of a maximum load above which idle shutdown is disabled.

6.2. IDLE/PTO SHUTDOWN PARAMETERS

Enable Idle Shutdown *Enables or disables the Idle Shutdown feature.*	
Options	0 – Disable 1 – Enable with Park Brake 2 – Enable without Park Brake 3 – Enable with Edge-triggered Accel Pedal
Default	0 – Disable
Recommendation	1 – Enable with Park Brake
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	0 – EE1-002 1 – EE1-001

Table 23: Enable Idle Shutdown

Idle Shutdown Time *The amount of engine idle time that is allowed before the Idle Shutdown feature stops fueling the engine.*	
Options	1 – 5000 sec
Default	60 sec
Recommendation	300 sec
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	EE4-99D

Table 24: Idle Shutdown Time

Enable PTO Shutdown *Enables or disables the Idle Timer Shutdown feature when operating on the Power Take-off.*	
Options	0 – Disable 1 – Enable with Park Brake 2 – Enable without Park Brake 3 – Enable with Edge-triggered Accel Pedal
Default	0 – Disable
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	0 – EE2-002 1 – EE2-001

Table 25: Enable PTO Shutdown

PTO Shutdown Time *The amount of engine idle time that is allowed before the Idle Shutdown feature stops fueling the engine.*	
Options	1 – 5000 sec
Default	60 sec
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	EFH-99D

Table 26: PTO Shutdown Time

Min Coolant Temp *Minimum Coolant Temperature before an Idle Shutdown will occur.*		
Options	-40°F to 392°F	-40°C to 200°C
Default	14°F	-10 °C
Access Level		
P-Group (DDDL)	17	
Data Code (SpecPro)	EE5-99D	

Table 27: Min Coolant Temp

Enable Idle PTO Shtdn Override *Enables/disables override of Idle or PTO Shutdown.*	
Options	0 – Disable 1 – Enabled allows SEO/Diagnostic Request Switch to override Engine Idle/PTO Shutdown 2 – Enable without clutch and service brake
Default	1 – Enabled allows SEO/Diagnostic Request Switch to override Engine Idle/PTO Shutdown
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	0 – EE3-002 1 – EE3-001

Table 28: Enable Idle PTO Shutdown Override

Max Engine Load PTO Shutdown *PTO Shutdown disabled for engine loads greater than this value.*	
Options	1 – 5000 Nm
Default	100 Nm
Access Level	
P-Group (DDDL)	17

Table 29: Max Engine Load PTO Shutdown

Ambient Air Temp Sensor Enable *Configures the Ambient Air Temp Sensor.*	
Options	0 – Disabled 1 – Hardwired 2 – Temp from J1939 3 – Temp from J1587
Default	0 – Disabled
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	0 – ESW-998 2 –ESW-006 1 – ESW-005 3 – ESW-007

Table 30: Ambient Air Temp Sensor Enable

Lo Amb Air Override Temp *Extreme Low Ambient Air Temperature to allow override.*		
Options	-40°F– 167°F	-40°C – 75°C
Default	-40°F	-40°C
Access Level		
P-Group (DDDL)	17	
Data Code (SpecPro)	EAU-99D	

Table 31: Low Ambient Air Override Temperature

Hi Amb Air OverrideTemp *Extreme High Ambient Air Temperature to allow override.*		
Options	-40°F– 167°F	-40°C – 75°C
Default	167°F	75°C
Access Level		
P-Group (DDDL)	17	
Data Code (SpecPro)	EAV-99D	

Table 32: High Ambient Air Override Temperature

Idle Shutdown Auto Override *Enables auto override of Idle/PTO Shutdown based on Ambient Air Temperature.*	
Options	0 – No automatic override performed 1 – Automatic override performed
Default	0 – No automatic override performed
Access Level	
P-Group (DDDL)	17
Data Code (SpecPro)	0 – EE8-003 1 – EE8-004

Table 33: Idle Shutdown Auto Override

6.3. IDLE/PTO SHUTDOWN TIMER ADVANTAGES

Idle/PTO Shutdown Timer encourages drivers to minimize idle time during required cool down periods, which are rare in seasonable ambient conditions.

7. ENGINE BRAKE CONTROLS

The Engine Brake option converts a power-producing diesel engine into a power-absorbing air compressor.

SERIES 60:

This is accomplished by opening the cylinder exhaust valves near the top of the normal compression stroke and releasing the compressed cylinder charge to exhaust. The release of the compressed air to atmospheric pressure prevents the return of energy to the engine piston on the expansion stroke, the effect being a net energy loss. Fueling is cut off when this occurs.

MBE 900 AND MBE 4000:

This is accomplished by opening the constant throttle valve over all cylinders near the top of the normal compression stroke and releasing the compressed cylinder charge to exhaust. The release of the compressed air to atmospheric pressure prevents the return of energy to the engine piston on the expansion stroke, the effect being a net energy loss. Fueling is cut off when this occurs. The constant throttle valves are open over all cycles, not just the exhaust cycle.

7.1. ENGINE BRAKE CONTROLS OPERATION

A dash mounted ON/OFF switch enables the Engine Brake option.

The following are features and options for Engine Brake:

- Cruise Control or Road Speed Limit with Engine Brake
- Engine Brake Disable
- Engine Brake Active
- Engine Fan Braking
- Clutch Released Input
- Service Brake Control of Engine Brakes
- Min mph for Engine Brakes

The following conditions must be met for engine brakes to be activated:

- Percent throttle <4%
- Driveline open – engine speed >1100 RPM
- Driveline closed – engine speed >800 RPM
- Road Speed >0 mph (0 km/h) – programmable
- ABS not active

- Clutch pedal released
- Engine not fueling
- Engine not in PTO mode
- Torque converter in lockup (automatic transmission)

If all of these conditions are met, engine brake will be activated when the engine brake switches are on low or medium (for exhaust flap Engine Brake configuration) or on low, medium or high (for turbo Engine Brake configuration). Engine Brakes will be deactivated when at least one of these conditions is no longer met or the engine brake switch is turned back to the OFF position.

7.2. ENGINE BRAKE CONTROLS PARAMETER EXPLANATION

7.2.1. CRUISE CONTROL OR ROAD SPEED LIMIT WITH ENGINE BRAKE

The Engine Brake option can also provide engine brake capability when the vehicle is in Cruise Control or Road Speed Limit. For example, if the vehicle is going downhill in Cruise Control while the engine brake is selected, DDEC VI will control the amount of Engine Brake with respect to the Cruise Control set speed. The level of Engine Brake (low, medium, high) selected with the dash switches will be the maximum amount of engine braking DDEC VI allows. Each engine braking level has a hysteresis for actuating the engine brake or for deactivating the engine brake.

7.2.2. ENGINE FAN BRAKING

The Engine Fan Braking option turns on the cooling fan when the engine brake level is high and DDEC fan control is enabled. This creates about 20 to 40 HP additional engine braking power depending on the size of the cooling fan and engine speed.

7.2.3. SERVICE BRAKE CONTROL OF ENGINE BRAKES

This option allows the engine brake switches to be ON but not engage the engine brakes until the service brake is pressed.

7.2.4. MINIMUM VEHICLE SPEED FOR ENGINE BRAKES

This option will disable the engine brakes until a minimum vehicle speed is reached.

7.3. ENGINE BRAKE CONTROLS PARAMETERS

Cruise Control Enable Eng Brk *Allows the Engine Brake to be used with Cruise Control if the vehicle exceeds the 'Max Cruise Set Speed' or 'Max Road Speed Limit'.*	
Options	0 – Disable 1 – Enable Automatic Engine Brake with Cruise Control
Default	0 – Disable
Access Level	
P-Group (DDDL)	10
Data Code (SpecPro)	0 – EJ1-002 1 – EJ1-001

Table 34: Cruise Control Enable Eng Brake

Hi Eng Brk Max Cruise RSL Spd *Cruise Control/Road Speed Limit vehicle-over-speed for engine brake stage 3 activation.*		
Options	0 – 30 mph	0 – 48 km/h
Default	6 mph	10 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EGU-99D	

Table 35: High Engine Brake Max Cruise RSL Speed

Hi Eng Brk Min Cruise RSL Spd *Cruise Control/Road Speed Limit vehicle-over-speed for engine brake stage 3 deactivation.*		
Options	0 – 30 mph	0 – 48 km/h
Default	4 mph	6 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EGV-99D	

Table 36: High Engine Brake Min Cruise RSL Speed

Low Eng Brk Max Cruise RSL Spd *Cruise Control/Road Speed Limit vehicle-over-speed for engine brake stage 1 activation.*		
Options	0 – 30 mph	0 – 48 km/h
Default	3 mph	5 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EGS-99D	

Table 37: Low Engine Brake Max Cruise RSL Speed

Low Eng Brk Min Cruise RSL Spd *Cruise Control/Road Speed Limit vehicle-over-speed for engine brake stage 1 deactivation.*		
Options	0 – 30 mph	0 – 48 km/h
Default	1 mph	2 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EJ5-99D	

Table 38: Low Engine Brake Min Cruise RSL Speed

Med Eng Brk Max Cruise RSL Spd *Cruise Control/Road Speed Limit vehicle-over-speed for engine brake stage 2 activation.*		
Options	0 – 30 mph	0 – 48 km/h
Default	4 mph	7 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EGT-99D	

Table 39: Medium Engine Brake Max Cruise RSL Speed

Med Eng Brk Min Cruise RSL Spd *'Cruise Control'/'Road Speed Limit' vehicle-over-speed for engine brake stage 2 deactivation.*		
Options	0 – 30 mph	0 – 48 km/h
Default	3 mph	5 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EJ7-99D	

Table 40: Medium Engine Brake Min Cruise RSL Speed

Engine Brake Enable Auto Fan *Provides additional engine braking by activating the DDEC controlled fan whenever the engine brakes are active in high. This function requires both DDEC engine brake controls and DDEC fan controls.*	
Options	0 – Disable 1 – Enable
Default	0 – Disable
Access Level	
P-Group (DDDL)	19
Data Code (SpecPro)	0 – EJ8-007 1 – EJ8-008

Table 41: Engine Brake Enable Auto Fan

Service Brk Enable Eng Brakes *When this function is enabled an input from the service brake is required in order to activate the engine brake.*	
Options	0 – Disable 1 – Enable
Default	0 – Disable
Access Level	
P-Group (DDDL)	10
Data Code (SpecPro)	0 – EJA-002 1 – EJA-001

Table 42: Service Brake Enable Engine Brakes

Min Road Spd Eng Brk Operation *The minimum vehicle speed before engine braking will occur.*		
Options	0 – 124 mph	0 – 200 km/h
Default	0 mph	0 km/h
Access Level		
P-Group (DDDL)	10	
Data Code (SpecPro)	EJ9-99D	

Table 43: Min Road Speed Engine Brake Operation

7.4. ENGINE BRAKE CONTROLS ADVANTAGES

Engine brake controls allow faster downgrade, controlled speeds, increasing productivity, and minimizing service brake intervals. Engine brakes can be programmed in conjunction with Cruise Control to maintain legal cruising speeds in rolling terrain.

7.5. ENGINE BRAKE CONTROLS DISADVANTAGES

Fan Braking for Engine Brake will cause the fan clutch to cycle more frequently. This may cause a need for more frequent fan clutch maintenance.

8. FUEL ECONOMY INCENTIVE

The purpose of Fuel Economy Incentive (FEI) is to allow the fleet manager to set a fuel economy target while providing the driver an incentive to meet the target. On the one hand the driver can drive efficiently with the foot throttle, minimize idle and engine RPM to gain extra speed. On the other hand if the driver abuses the extra speed, the vehicle may only attain the target mpg, whereas the driver could possibly do better than the target mpg.

8.1. FUEL ECONOMY INCENTIVE OPERATION

Using the Fuel Economy Incentive option, a fleet manager can set a target fuel economy for each engine. If this fuel economy is exceeded, the driver will be awarded a slight increase to the 'Vehicle Speed Limit'. In this example the following limits are set as listed in the following table.

Fuel Economy Incentive Limits		
Maximum Road Speed	60 mph	97 km/h
FEI Max Vehicle Speed Reward	5 mph	8 km/h
FEI Conversion Factor	20 mph / mpg	76 km/h / km/l
FEI Minimum Fuel Economy	7 mpg	3 km/l

Table 44: Fuel Economy Incentive Limits

Fuel Economy Incentive Example Calculation
If the driver has an average fuel economy of 7.1 mpg then the new vehicle speed limit is 62 mph.
Vehicle Speed L + (Average FE - FEI Min FE) x FEI Conversion Factor = New Vehicle Speed Limit
Example: 60 mph + (7.1-7.0 mpg) x (20 mph/mpg) = 62 mph
Conclusion: The maximum vehicle speed obtainable regardless of the fuel economy is 65 mph.

Table 45: Fuel Economy Incentive Example Calculation

8.2. FUEL ECONOMY INCENTIVE PARAMETERS

Fuel Economy Incentive Enable *Enables/disables the feature.*	
Options	0 – Disable 1 – Enable
Default	0 – Disable
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	0 – ER6-998 1 – ER6-001

Table 46: Fuel Economy Incentive Enable

FEI Minimum Fuel Economy *Indicates the minimum economy for Fuel Economy Incentive.*		
Options	4 – 20 mpg	2 – 9 km/l
Default	7 mpg	3 km/l
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	ER1-99D	

Table 47: FEI Minimum Fuel Economy

FEI Max Vehicle Speed Reward *Indicates customer set maximum speed increase for vehicle.*		
Options	0 – 12 mph	0 – 20 km/h
Default	0 mph	0 km/h
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	ER2-99D	

Table 48: FEI Max Vehicle Speed Reward

FEI Conversion Factor *The miles per hour allowance for each full mile per gallon above the minimum mpg.*		
Options	0 – 20 mph / mpg	0 – 76 km/h / km/l
Default	2 mph / mpg	7.6 km/h / km/l
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	ER3-99D	

Table 49: FEI Conversion Factor

FEI Use Trip Mileage *Filtered FE bases calculations on the fuel information, by periodic sampling of fuel consumption.* *Trip FE bases the calculation on the trip portion of the fuel usage information.*	
Options	0 – Based on Filtered Fuel Economy **Note:** Filtered fuel economy calculates the fuel economy based on periodic sampling of fuel consumption. It allows rewards over a shorter time period and may be best suited to a slip seat operation. In most instances, an ignition key reset will allow the driver to easily erase historical driving records.
	1 – Based on Trip Fuel Economy **Note:** Trip fuel economy calculates fuel economy over the entire trip (trip defined as DDEC Report Activity period). Rewards may take longer to achieve and is better suited for driver assigned vehicles.
Default	0 – Based on Filtered Fuel Economy
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	ER4-99D

Table 50: FEI Use Trip Mileage

8.3. INTERACTION WITH OTHER FEATURES

Fuel Economy Incentive will increase the Cruise Control and Vehicle Speed Limits. A vehicle can be equipped with both PasSmart and Fuel Economy Incentive, but the extra speed increments provided by the two features do not add together.

For example, if Fuel Economy Incentive is set for 7 mph (11 km/h) of extra speed when the driver hits the maximum fuel economy target and the same vehicle has a 5 mph (8 km/h) PasSmart increase, the resulting speed increase is 7 mph (11 km/h), not 12 mph (19 km/h).

8.4. FUEL ECONOMY INCENTIVE ADVANTAGES

Fuel Economy Incentive rewards the driver for achieving a programmed efficiency plateau. The reward of increased road speed should be used to pass or increase momentum just before the next grade.

9. IDLE ADJUST

This function increases and/or decreases the engine idle speed up to a programmable limit ('Max Adjusted Idle Speed'). Idle Adjust can be used to deter a resonance idle speed that aggravates mirror vibration or similar situations or to increase clutch engagement torque available at zero percent throttle.

9.1. IDLE ADJUST OPERATION

Engine Idle Speed can be varied by the operator using the Cruise Control switches if the following conditions are satisfied:

- Engine is running
- Vehicle speed is less than 6 mph (10 km/h)
- Cruise Control master switch is turned OFF
- PTO is not active and enable switch is OFF
- If an automatic transmission is in use, it is in neutral and no shift is in progress
- Clutch pedal is not pressed
- Throttle inhibit is not active

If any of the above conditions are not satisfied, Idle Adjust is cancelled and the normal idle speed is restored. The current desired speed is increased by 16 RPM ('Single Step Adjusted Idle Speed') when the Resume/Accel switch is toggled. Speed change is active after the switch is released. Holding the Resume/Accel switch for more than one second the current desired speed will be increased by 100 RPM/sec ('Ramp Rate Adjusted Idle Speed') as long as the switch is pressed and the programmed 'Max Adjusted Idle Speed' for idle increment is not exceeded.

Toggling the Set/Coast switch will decrease the current desired idle speed by 16 RPM ('Single Step Adjusted Idle Speed'). Speed change is active after the switch is released. Holding the Set/Coast switch for more than one second will decrease the current desired speed by 100 RPM/sec ('Ramp Rate Adjusted Idle Speed') as long as the switch is pressed and the minimum low idle speed is not yet reached. Once the desired idle speed has increased or decreased again, the new desired idle speed will be stored until the ignition has been switched off.

9.2. IDLE ADJUST PARAMETERS

Max Adjusted Idle Speed *Max Idle Speed that will be allowed by the user.*	
Options	0 – 4000 RPM
Default	850 RPM
Access Level	
P-Group (DDDL)	3
Data Code (SpecPro)	EAG-99D

Table 51: Max Adjusted Idle Speed

Single Step Adjusted Idle Speed *Single step RPM for Adjusted Idle Speed.*	
Options	0 – 100 RPM
Default	16 RPM
Access Level	
P-Group (DDDL)	3

Table 52: Single Step Adjusted Idle Speed

Ramp Rate Adjusted Idle Speed *Ramp rate for the Adjusted Idle Speed.*	
Options	0 – 8191 RPM/sec
Default	100 RPM/sec
Access Level	
P-Group (DDDL)	3

Table 53: Single Step Adjusted Idle Speed

9.3. IDLE ADVANTAGES

Idle Adjust can be utilized to minimize mirror rattle (offset a resonance frequency) or to improve clutch engagement in soft terrain.

9.4. IDLE DISADVANTAGES

Idle Adjust uses the idle shutdown timer. If Idle Shutdown is enabled the engine will also shut down during adjusted idle operation. If elevated engine RPM operation is desired with independent or disabled shutdown use PTO Fast Idle option.

Idle Adjust does not allow a preprogrammed minimum RPM. This feature should not be used with Eaton UltraShift Transmission.

10. LOW GEAR TORQUE REDUCTION

Low Gear Torque Reduction is an optional feature that allows a transmission to be used with engines capable of producing more torque than the transmission's peak torque rating.

10.1. OPERATION

Low Gear Torque Reduction reduces the available torque if the ratio of vehicle speed to engine speed is below a set point. This limits full torque in lower gears and allows a transmission to be used with engines above the transmission's regular torque rating. Two torque limits can be programmed.

10.1.1. ONE TORQUE LIMIT – EXAMPLE 1

The customer wants to hold the torque to 550 ft-lbs (on an engine rated at 860 ft lbs) up to 8th gear. The transmission operates with the ratios listed in the table below:

Gear	Ratio	Low Gear Threshold* CPC – Output/Input Shaft Speed
5	3.57	0.280
6	2.79	0.358
7	2.14	0.467
	Desired Gear Down Protect Ratio	**Gear Down Protect Ratio Parameter**
8	1.65	0.606
9	1.27	0.787
10	1.00	1.0

*The low gear threshold is determined by taking the inverse of the gear ratios and choosing a value in between the gears you want to limit.

Table 54: Transmission Ratios – Example 1

The Torque Factor is determined by dividing the desired torque by the rated torque. The Threshold is determined by taking the inverse of the gear ratios and choosing a value in between the gears you want to limit.

To summarize, the customer wants to limit torque up to the 8th gear to 550 ft-lbs. Estimate the ‘Threshold’ between 7th and 8th (0.5). From 8th gear on up, the full rated torque will be available. Set ‘Gear Ratio Gear Down Protect’ to 0.5 and set the ‘Torque Factor Gear Down Protect’ to 0.64 (550/860).

10.1.2. TWO TORQUE LIMITS – EXAMPLE 2

The customer wants to hold the torque to 450 ft lbs (on an engine rated at 860 ft lbs) up to 6th gear and up to 550 ft lbs up to 8th gear. The transmission operates with the ratios listed in the following table:

Gear	Ratio	Low Gear Threshold* CPC – Output/Input Shaft Speed
5	3.57	0.280
	Desired Gear Down Protect Ratio	**Gear Down Protect Ratio Parameter**
6	2.79	0.358
7	2.14	0.467
	Desired Gear Ratio for High Gear Power	**Gear Ratio for High Gear Power Parameter**
8	1.65	0.606
9	1.27	0.787
10	1.00	1.0

*The low gear threshold is determined by taking the inverse of the gear ratios and choosing a value in between the gears you want to limit.

Table 55: Transmission Ratios – Example 2

The Torque Factor is determined by dividing the desired torque through the rated torque. The Threshold is determined by taking the inverse of the gear ratios and choosing a value in between the gears you want to limit. To summarize, the customer wants to limit torque up to the 6th gear to 450 ft-lb and 550 ft lbs up to 8th gear. Estimate the Threshold between 5th and 6th (0.32) and 7th and 8th (0.5). From 8th gear on up, the full rated torque will be available.

Set ‘Gear Ratio Gear Down Protect’ to 0.32 and set the ‘Torque Factor Gear Dwn Protect’ to 0.52 (450/860). Set ‘Gear Ratio for High Gear Power’ to 0.5 and the ‘Torque Factor High Gear Power’ to 0.64 (550/860).

10.2. LOW GEAR TORQUE REDUCTION PARAMETERS

Torque Factor Gear Dwn Protect *Provides a limit on the available torque if the ratio of vehicle speed to engine speed is below a set point (percent of maximum torque at current engine speed).*	
Options	0.00 – 1.00
Default	1.00
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EEC-99D

Table 56: Torque Factor Gear Down Protection

Gear Ratio Gear Down Protect *The Gear Ratio below which torque is limited (output shaft RPM/input shaft RPM)*	
Options	0.00 – 2.00
Default	0.01
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EED-99D

Table 57: Gear Ratio Gear Down Protection

Torque Factor High Gear Power *Provides a limit on the available Torque if the ratio of vehicle speed to engine speed is below a set point (percent of maximum torque at current engine speed).*	
Options	0.00 – 1.00
Default	1.00
Access Level	
P-Group (DDDL)	23

Table 58: Torque Factor High Gear Power

Gear Ratio for High Gear Power *The Gear Ratio below which torque is limited (output shaft RPM/input shaft RPM)*	
Options	0.00 – 2.00
Default	0.02
Access Level	
P-Group (DDDL)	23

Table 59: Gear Ratio for High Gear Power

10.3. LOW GEAR TORQUE REDUCTION ADVANTAGES

Low Gear Torque reduction takes away rapid “jack rabbit” starts and limits torque to the transmission especially in the high reduction gears that minimize torque spikes delivered to the driveshaft. Over the road 80,000 pound applications in general do not require much more than 1550 lb-ft to accelerate the load at a reasonable rate.

11. OPTIMIZED IDLE

Optimized Idle® with DDEC VI reduces engine idle time by running the engine only when required. Optimized Idle automatically stops and restarts the engine to accomplish the following:

- Keep the engine oil temperature between factory set limits 60 – 104°F (16 – 40°C)
- Keep the battery charged >12.2 V (12 V system)
- Keep the cab/sleeper of an on-highway truck at the desired temperature (using the optional thermostat)

Other benefits include overall reduction in exhaust emissions and noise, and improved starter and engine life (by starting a warm engine and eliminating starting aids). Idle time and fuel savings information can be read with DDDL, ProDriver Reports or DRS. Optimized Idle run times can be accessed with DDEC Reports. The Optimized Idle Active lamp is steadily illuminated when Optimized Idle run times are logged.

11.1. OPTIMIZED IDLE OPERATION

To activate Optimized Idle, the following conditions must be met:

- The Ignition must be ON with the vehicle idling
- Hood and cab closed
- Transmission in neutral
- Park brake set
- Idle shutdown timer must be enabled

Once these conditions are met:

- Turn the Cruise Master Switch to the ON position (if in the ON position, turn to OFF then to ON), the Optimized Idle Active lamp will flash.
- Turn on Thermostat Mode (if equipped and the mode is desired) by turning ON the thermostat, setting the fan controls in the bunk and cab to high, and enabling the vehicle heating and cooling system.

Once these conditions are met, remain idling and the Optimized Idle Active lamp will flash until the Idle Shutdown Timer expires. Optimized Idle allows the operation of all DDEC VI features such as PTO, throttle control, and PTO Cruise, while the active light is flashing. Once Optimized Idle becomes active, the engine will either shutdown if Optimized Idle parameters are satisfied or ramp to 1000 RPM. While the system is active (the active lamp is steadily illuminated), the throttle, PTO, Cruise Switch PTO functions are disabled, and the engine speed is controlled by DDEC VI.

11.1.1. OPTIMIZED IDLE START UP SEQUENCE

The following occurs during any Optimized Idle engine start:

1. Optimized Idle Active lamp is ON. The CPC determines when the engine needs to start to charge the battery, warm the engine, or heat/cool the vehicle interior.
2. The alarm (mounted in the engine compartment) will sound for five (5) seconds.
3. After a short delay, the starter will engage and the engine will start. If the engine speed does not reach a specified RPM within a few seconds, the system will be disarmed for the rest of the ignition cycle. If the engine does not start, 'Optimized Idle' will attempt a second engine start in 45 seconds. The alarm will sound again prior to the second engine start.
4. Once the engine starts, it will ramp up to 1000 RPM (default).
5. Vehicle accessories will be turned on 30 seconds after any thermostat based engine start and will not be turned on for an engine mode start. If the engine is running in engine mode, and the thermostat mode is requested, the vehicle accessories will be turned on 30 seconds after the request.

If two or more conditions exist at the same time, DDEC will satisfy all parameters before shutting down the engine. For example, if the engine started due to battery voltage, the engine will run for a minimum of two hours. If the thermostat becomes unsatisfied and requests the engine to run during this time, DDEC will control the HVAC fans through the Vehicle Power Shutdown relay, turning them on and off as required by the thermostat. At the end of the two hours, if the thermostat is not satisfied, the engine will continue to run.

11.1.2. ENGINE MODE

Engine Mode automatically stops and restarts the engine to maintain oil temperature and battery voltage. The Optimized Idle Active lamp is illuminated whenever Engine Mode is active. Optimized Idle starts and stops the engine to keep the following parameters within limits while in Engine Mode.

11.1.2.1. BATTERY VOLTAGE:

The engine will start when the battery voltage drops below 12.5 Volts for 12 Volt systems. This is the default. If an Ambient Air Temperature Sensor (AAT Sensor) is installed, the customer can select an option to use an AAT Sensor instead of a voltage table to determine the start threshold for the battery. The thresholds are listed below.

Ambient Air Temperature Voltage Threshold	Voltage Threshold
-40°F (-40°C)	12.5V
0°F (-18°C)	12.4V
39°F (4°C)	12.3V
81°F (27°C)	12.2V
120°F (49°C)	12.2V

Table 60: Voltage Threshold Based on Ambient Air Temperature

There are three battery run modes:

- Normal Battery Run Mode
- Alternate Battery Run Mode
- Continuous Battery Run Mode

NORMAL BATTERY RUN MODE:

While in normal battery run mode, all battery voltage Optimized Idle starts are two hours long. This mode is customer selectable by setting the Alternate Time to zero; the default mode is listed in the following table.

Alternate Time	Battery Time	Single Event	1st Consecutive Event	2nd Consecutive Event
0	2 Hours	2 Hours	2 Hours	2 Hours

Table 61: Normal Battery Run Mode

ALTERNATE BATTERY RUN MODE:

This mode is allowed only when the Alternate Time is set to a non-zero value. This parameter is customer selectable. While in Alternate Battery Run Mode, all voltage starts are based on Alternate Time unless a critical battery restart event is detected. A critical battery restart event is detected when the engine starts and runs to recharge the battery for the alternate time and then detects another battery start within one hour after the engine stops. At this point, the run time will change to two hours. The Alternate Battery Run Mode parameters are listed below.

Alternate Time	Battery Time	Single Event	1st Consecutive Event	2nd Consecutive Event
a (customer selectable)	2 Hours	a	2 Hours	2 Hours

Table 62: Alternate Battery Run Mode

CONTINUOUS BATTERY RUN MODE:

In this mode, the engine continues to idle without shutting down when two consecutive critical battery restart events have occurred. This feature is customer selectable. A fault code is logged when this move is initiated.

Alternate Time	Battery Time	Single Event	1st Consecutive Event	2nd Consecutive Event	Further Events
0	2 Hours	a	2 Hours	Continuous	Continuous
a (customer selectable)	2 Hours	a	2 Hours	2 Hours	Continuous

Table 63: Continuous Battery Run Mode

11.1.2.2. OIL TEMPERATURE

The engine will start when the oil temperature drops below 60°F (16°C) and will run until the oil temperature reaches 104°F (40°C).

11.1.2.3. THERMOSTAT MODE

Thermostat Mode automatically stops and restarts the engine to maintain oil temperature, battery voltage and cab temperature. For on-highway applications, Thermostat Mode is used to keep the cab/sleeper (on-highway truck) and passenger area (coach) at the desired temperature and maintain the 'Engine Mode' parameters. The optional thermostat must be turned ON for Thermostat Mode to be active. The Optimized Idle Active lamp is illuminated whenever Thermostat Mode is active.

Engine Mode parameters as well as the interior temperature are monitored in Thermostat Mode. The thermostat informs the CPC when to start/stop the engine to keep the interior warm/cool based on the thermostat setting. Ambient temperature is also monitored to determine if the ambient temperature is extreme enough that the engine should run continuously.

Any accessories (HVAC fans) connected to the Vehicle Power Shutdown relay will turn ON for Thermostat Mode engine starts. The HVAC fans will remain OFF for Engine Mode starts. If Optimized Idle starts the engine for Engine Mode, and Thermostat Mode is then requested, the HVAC fans will turn ON approximately 30 seconds after the Thermostat Mode is requested. Thermostat Mode can be enabled for a maximum amount of time. After which, the engine will ignore any requests from the thermostat. Two automatic conditions which help keep the operator comfortable and reduce engine cycling are Continuous Run Mode and Extended Run Mode.

CONTINUOUS RUN MODE:

This mode allows the engine to run continuously if the outside temperature (determined by the skin temperature sensor or AAT Sensor if installed and configured) falls outside the hot or cold set limits and the thermostat set point can not be met. The default set limits are 25°F (-4°C) for heat mode and 90°F (32°C) for cool mode. When a skin temperature sensor is installed, these values are customer programmable in the thermostat and are password protected. When the thermostat is in the Continuous Run Mode, the thermometer icon will flash along with the heat or cool icon on the thermostat if a skin temperature sensor is installed. If the thermostat set point is satisfied, the engine will shutdown regardless of the outside temperature.

EXTENDED IDLE MODE:

If the Continuous Run Mode is not needed and the thermostat set point is not met within 45 minutes, the engine will shutdown for fifteen minutes and restart and run for fifteen minutes. This 15-minute on and off cycle will continue until the thermostat set point is reached or until the thermostat is turned off. This may be an indication that the heat or cool setting on the thermostat does not match the vehicle heating or cooling system setting. It could also be an indication of low Freon, blockage in the heater system, or system tampering. Extended Idle Mode can be disabled with a customer selectable parameter. After running 45 minutes, the engine will shutdown instead of cycling at 15-minute intervals.

11.2. OPTIMIZED IDLE PARAMETERS

Optimized Idle Enable *Enables Optimized Idle*	
Options	0 – Disable 1 – Enable
Default	0 – Disable
Access Level	
P-Group (DDDL)	12
Data Code (SpecPro)	0 – EL7-998 1 – EL7-003

Table 64: Optimized Idle Enable

11.3. INTERACTION WITH OTHER FEATURES

The Vehicle Power Shutdown feature is used by Optimized Idle to turn off all accessory loads when the engine is shutdown. Optimized Idle will turn these loads on for Thermostat Mode starts. No other DDEC VI features can be used when Optimized Idle is active.

11.4. OPTIMIZED IDLE ADVANTAGES

Optimized Idle helps to minimize idle fuel consumption, by allowing idling only during in-cab temperature swings or to maintain battery voltage and engine block temperature.

12. PASSMART

The PasSmart feature is available on selected on-highway engines equipped with a Vehicle Speed Sensor.

12.1. PASSMART OPERATION

The PasSmart feature allows a fleet manager to enable a second Vehicle Speed Limit (VSL) above the normal VSL to assist while passing other vehicles on the highway. This second VSL is programmed for a limited duration ('PS Pass Speed Duration') during a given time period ('PS Pass Speed Interval'). The passing speed interval starts when the feature is programmed. An interval of 8, 12, or 24 hours will always reset at midnight. The driver activates PasSmart by double-pumping the accelerator pedal. Starting at the full throttle position, the driver releases the throttle completely, returns the throttle to the full throttle position, releases it again and then returns to full throttle. If the driver completes this action within five seconds, PasSmart is activated.

After double-pumping the accelerator pedal, the vehicle is given 20 seconds to accelerate to a speed above the normal VSL. If the vehicle speed does not exceed the normal VSL in 20 seconds, the driver must repeat the double-pump action. Once the normal VSL has been exceeded, a new higher VSL becomes the maximum vehicle speed limit. This limit is the normal VSL plus the PS Pass Speed Increment.

A passing speed duration timer starts when vehicle speed exceeds the normal VSL and continues to count until the vehicle speed drops back below the normal VSL. At the end of the passing event when the vehicle speed drops back below the normal VSL, PasSmart is automatically deactivated and the driver cannot exceed the normal VSL unless the accelerator pedal is double-pumped again.

PasSmart operates only with the foot pedal and not with the Cruise Control switches or hand throttle. However, activating PasSmart does not disturb or deactivate Cruise Control if it is on when the passing event begins. Once the driver has passed the other vehicles and PasSmart has deactivated, Cruise Control automatically takes over. To deactivate Cruise Control during the pass, the driver must turn the Cruise Control switch to off.

When the 'PS Pass Speed Duration' time expires, the AWL will begin to flash one minute prior to ramping down the Vehicle Speed back to the normal VSL. The ramp-down event always takes five (5) seconds regardless of the 'PS Pass Speed Increment' programmed into the controller. The ramp-down alert can be distinguished from an engine fault warning in that the AWL flashes for the PasSmart alert and remains on constantly for an engine fault.

If intervals of 8, 12, or 24 hours are selected, the interval will always reset after the chosen interval and at midnight. This allows fleets to synchronize the reset with driver change periods. All other intervals reset from the time they are selected. For example, if you select 4 hours, then a reset will occur every 4 hours from the time of programming but not necessarily at midnight.

PasSmart still operates when there is an active (non-shutdown) system fault. In this situation the AWL goes from constant illumination to flashing one minute before the VSL ramps down. At the end of the passing event when PasSmart is deactivated, the AWL will return to constant illumination if the fault is still active. If there is an active stop engine fault, the ramp-down/shutdown activity overrides PasSmart. The additional passing speed is not available until the fault is cleared. For example, if the normal fleet speed limit is 65 mph (105 km/h), the fleet manager can increase the Vehicle Speed Limit an additional 10 mph (16 km/h) for a maximum of 30 minutes per reset interval.

An example of these limits is listed in the following table:

Parameter	Setting
PS Pass Speed Duration	30 minutes
PS Pass Speed Interval	8 hours
PS Pass Speed Increment	10 mph (16 km/h)

Table 65: PasSmart Settings

Each time the driver exceeds 65 mph (105 km/h), the 30 minute clock counts down as long as the speed remains above 65 mph (105 km/h). He or she can continue to enter and exit the PasSmart extra speed zone to pass vehicles until the entire 30 minutes of higher VSL is used up. The driver is warned by the AWL one minute before the time expires. The vehicle speed is then limited to 65 mph (105 km/h) until the 8 hour period expires and an additional 30 minutes of passing time is available.

12.2. PASSMART PARAMETERS

PasSmart Enable *Enables/disables PasSmart.*	
Options	0 – Disable 1 – Enable
Default	0 – Disable
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	0 – ER7-998 1 – ER7-001

Table 66: PasSmart Enable

PS Pass Speed Duration *The duration of time per interval that is permitted at the higher speed. A value of zero will disable the feature.*	
Options	0 – 255 minutes
Default	0 minutes
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	EDF-99D

Table 67: PasSmart Pass Speed Duration

PS Pass Speed Interval *The period of time when the CPC resets to begin a new period.*	
Options	1 – 24 hours **Note:** The time within which the road speed limit will return to the programmed road speed limit when the feature is deactivated.
Default	8 hours
Access Level	
P-Group (DDDL)	23
Data Code (SpecPro)	1 hour – EDG-001 2 hours – EDG-002 3 hours – EDG-003 4 hours – EDG-004 6 hours – EDG-006 8 hours – EDG-008 12 hours – EDG-012 24 hours – EDG-024

Table 68: PasSmart Pass Speed Interval

PS Pass Speed Increment *The additional vehicle speed permitted above the programmed vehicle speed limit. A value of zero will disable the feature.*		
Options	0 – 159 mph	0 – 250 km/h
Default	0 mph	0 km/h
Access Level		
P-Group (DDDL)	23	
Data Code (SpecPro)	EDH-99D	

Table 69: PasSmart Pass Speed Increment

12.3. INTERACTION WITH OTHER FEATURES

PasSmart will increase the VSL. A vehicle can be set up with both PasSmart and Fuel Economy Incentive, but the extra speed increments provided by the two features do not add together. For example, if Fuel Economy Incentive is set up to give 7 mph (11 km/h) of extra speed when the driver hits the maximum fuel economy target and the PasSmart increase is 5 mph (8 km/h) the resulting speed increase is 7 mph (11 km/h), not 12 mph (19 km/h).

12.4. PASSMART ADVANTAGES

PasSmart allows some driver discretion with regards to maximum programmed speed in certain situations. When correctly programmed, it only gets the driver out of aggravating situations with respect to other vehicles running in groups.

13. PASSWORDS

DDEC VI is capable of providing password protection for groups of parameters or a fleet password for all parameters.

13.1. PASSWORD OPERATION

A password of “0” is used to deactivate the protection. The lockout passwords may be up to 10 numbers. There are no letters allowed. Each level can have its own unique password. Passwords can be activated with DDDL 7.0, VEPS or DRS. Once activated the parameters may not be changed until the correct password is reentered. The CPC is automatically locked at the next ignition cycle.

13.1.1. BACK DOOR PASSWORD

In cases where the password for a locked module is not available, a separate ‘Back Door Password’ may be obtained from Detroit Diesel Customer Support Center. Detroit Diesel requires the “A” and “B” values read from the locked module with the Service Tool. The new unlock code will be provided by Detroit Diesel Customer Support Center for entry into the Service Tool. When the correct ‘Back Door Password’ is entered, all parameters with write access by the Service tool may be changed.

Level	Parameters Protected
1	Fleet – All Customer Parameters
2	OI, Smart Cruise
3	Export – Road Speed Limiting, VSS Configuration, Antitamper, PasSmart, Fuel Economy Incentive, Fleet Management, Low Gear Torque Limiting and Progressive Shift
4	Limiters
5	PTO, Idle Shutdown
6	I/O Configuration, Engine Protection, Fan Control, Accelerator Pedal, CAN Configuration
7	Not Used

Table 70: Password Protection Levels

13.1.2. CHANGING THE PASSWORD

The password itself may be changed. The CPC is automatically locked at the next ignition cycle. Changing the password to a value of “0” will disable password protection. When the password is changed, the ignition must be off for at least 15 seconds.

13.2. PASSWORD ADVANTAGES

Passwords can be used to lock out unauthorized changes to all parameters, only specific DDEC parameters and/or engine rating changes. Note that the audit trail still records changes to driveline components without crossing over a password.

14. THROTTLE CONTROL/GOVERNORS

There are two types of engine governors that are used with throttle controls. The engine governors are:

1. The Automotive Limiting Speed Governor (ALSG) for torque control; typical governor for on-highway applications
2. The Power Take-off (PTO) for speed control; typical governor for off-highway applications

14.1. AUTOMOTIVE LIMITING SPEED GOVERNOR – ON-HIGHWAY

In on-highway applications and some non-road applications, ALSG is the primary throttle source. The throttle input in an ALSG sets percent load. The amount of fuel input to the engine is determined by the throttle position. As the load on the engine varies the resulting engine speed will vary between idle speed and governed speed.

ALSG ACCELERATOR PEDAL:

The Accelerator Pedal (AP) sends an input signal which the ALSG uses to calculate engine power. This assembly is also referred to as the Accelerator Pedal Sensor (AP Sensor) assembly.

14.2. POWER TAKE-OFF

Power Take-off (PTO) control is available to fuel the engine in order to keep the selected PTO speed regardless of engine torque without driver interaction. The engine torque cannot exceed a programmed limit.

The PTO throttle control options are:

1. Cab PTO – Cruise Switch PTO
2. Remote PTO – preprogrammed set speeds
3. Remote Accelerator Control

14.2.1. CAB PTO – CRUISE SWITCH PTO

The Cruise Control switches are used to activate and control the Cruise Switch PTO (Cab PTO) option.

The recommended maximum fast idle rpm is 900 RPM. There is sufficient speed to maintain chassis heat or cooling and fuel consumption will be lower than at higher speeds. Engine fast idle speeds above 1100 RPM will inhibit function of the idle time offset for the Aftertreatment Device (ATD) and should be avoided. PTO operation with higher load factors do not use the idle time offset and may use higher engine RPM if required.

NOTE: Cab throttle and remote throttle can be overridden with the accelerator pedal unless 'PTO Throttle Override Enable' is disabled.

The Cruise On/Off switch must be turned ON and the park brake must be engaged (if configured). If Cruise Switch PTO is inactive and the Cruise Switch PTO conditions are met, pressing and releasing the Resume/Accel switch will activate Cruise Switch PTO at the resume PTO speed. Pressing and releasing the Set/Coast switch will activate Cruise Switch PTO at the set PTO speed. The Resume PTO Speed and the Set PTO Speed cannot be greater than the Maximum PTO Speed or lower than the Minimum PTO Speed.

Once the PTO set speed is established, the Resume/Accel switch can be used to increment the set speed at a programmable rate up to the Maximum PTO Speed. Releasing the Resume/Accel switch will set the engine speed at the current operating speed. The Set/Coast switch will decrement the set speed at a programmable rate down to the Minimum PTO Speed. Releasing the Set/Coast switch will set the engine speed at the current operating speed.

Cab PTO speed is disabled for any of the following:

- Turning the Cruise master switch off
- Vehicle speed is greater than 'Max Road Speed in PTO Mode' (programmable; default 6 mph (10 km/h))
- Vehicle Speed Sensor fault
- Park Brake or Service Brake is applied ('PTO Dropout Service Brake Park Brake')
- Clutch Pedal is depressed ('PTO Dropout on Clutch Enabled')
- Cruise Control Switch Fault
- Optimized Idle is Active
- Park Brake is off (if configured)

If 'PTO Throttle Override Enable' is enabled, the throttle pedal can override the PTO engine speed up to the maximum engine speed for Throttle Override ('Throttle Override Max Engine Speed'). The previous PTO set speed will become active again, if it is greater than the engine speed equivalent to the throttle pedal percentage.

DDEC will exit the Cab PTO Mode for Automated/Automatic Transmissions if shifting is in progress or the transmission in gear.

14.2.2. REMOTE PTO MODE – PRE-PROGRAMMED SET SPEEDS

The Remote PTO will override the Cab PTO mode when the Remote PTO switch is on. The active throttle will override Remote PTO if 'PTO Throttle Override Enable' is enabled.

Remote PTO speed is disabled for any of the following:

- Turning the Remote PTO switch off for more than two seconds
- Vehicle speed is greater than Max Vehicle Speed in PTO (programmable; default 6 mph (10 km/h))
- Vehicle Speed Sensor fault
- Clutch Released Pedal or Service Brake Pedal are pressed (if configured)
- Park Brake is off (if configured)
- Park Brake or Service Brake is applied ('PTO Dropout Service Brake Park Brake')
- Clutch Pedal is depressed ('PTO Dropout on Clutch Enabled')
- Cruise Control Switch Fault
- Optimized Idle is Active

If 'PTO Throttle Override Enable' is enabled, the throttle pedal can override the PTO engine speed up to the 'Maximum Engine Speed for Throttle Override'. If the throttle pedal or remote throttle engine speed is less than current PTO engine speed, the engine will not respond to throttle requests less than the current PTO engine set speed. The previous PTO set speed will become active again, if it is greater than the engine speed equivalent to the throttle pedal percentage.

NOTE: If remote PTO is active and then disabled due to one or more disabling conditions, PTO mode will automatically reactivate when the disabling condition is removed.

14.2.3. REMOTE ACCELERATOR CONTROL FOR PTO OR ALSG

A Remote Accelerator Pedal can be installed to control either an analog Remote PTO or analog Remote Accelerator Pedal (ALSG). The Remote PTO will start when the Remote PTO switch is switched ON. The Remote PTO logic will override the Cab PTO. The Remote Throttle Select switch input determines the active throttle control. When Remote Throttle Select is ON, the engine will respond to the remote throttle input. When this input is OFF, the engine will respond to the cab throttle pedal.

The PTO Enable input determines if the engine will be in PTO or ALSG mode. If remote PTO is active and then disabled due to one or more disabling conditions, PTO mode will automatically reactivate when the disabling condition is removed.

14.3. THROTTLE CONTROL/GOVERNORS PARAMETERS

Configure PTO Speed Control *Enables/disables the PTO function.*	
Options	0 – Disabled 1 – Enabled 2 – Enabled if neutral 3 – Enabled if neutral & park brake 4 – Enabled if park brake 5 – PTO while driving
Default	0 – Disabled
Recommendation	1 – Enabled
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	0 – EF1-010 1 – EF1-009 2 – EF1-011 3 – EF1-012 4 – EF1-013 5 – EF1-014

Table 71: Configure PTO Speed Control

Maximum PTO Speed Resume Accel Switch *Sets the max PTO speed.*	
Options	500 – 3000 RPM
Default	3000 RPM
Recommendation	900 RPM
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EF6-99D

Table 72: Maximum PTO Speed Resume Accel Switch

Minimum PTO Speed Set Coast Switch *Sets the min PTO speed.*	
Options	500 – 3000 RPM
Default	3000 RPM
Recommendation	900 RPM
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EF4-99D

Table 73: Minimum PTO Speed Resume Accel Switch

PTO Throttle Override Enable *Enables/disables the throttle pedal from overriding PTO mode.*	
Options	0 – Disabled 1 – Enable engine speed in PTO mode to be increased with throttle input
Default	1 – Enable engine speed in PTO mode to be increased with throttle input
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	0 – EFO-003 1 – EFO-004

Table 74: PTO Throttle Override Enable

Throttle Override Max Engine Speed *Sets the max engine speed that the throttle can obtain when in PTO mode.*	
Options	0 – 3000 RPM
Default	3000 RPM
Recommendation	1600 RPM
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EFU-99D

Table 75: Throttle Override Max Engine Speed

PTO Dropout Service Brake Park Brake *Enables/Disables the status of the Service Brake or Park Brake for disabling of PTO.*	
Options	0 – No PTO dropout with Service Brake or Park Brake activation 1 – PTO drops out on Service Brake or Park Brake activation 2 – PTO drops out on Service Brake activation 3 – PTO drops out on Park Brake activation
Default	0 – No PTO dropout with Service Brake or Park Brake activation
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	0 – EFP-004 1 – EFP-003 2 – EFP-005 3 – EFP-006

Table 76: PTO Dropout Service Brake Park Brake

PTO Dropout on Clutch Enabled *Enables/Disables the status of the Clutch switch for disabling PTO.*	
Options	0 – No PTO dropout w/ clutch pedal 1 – Causes PTO to dropout if the clutch is depressed
Default	0 – No PTO dropout w/ clutch pedal
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	0 – EFQ-004 1 – EFQ-003

Table 77: PTO Dropout on Clutch Enabled

Max Road Speed in PTO Mode *Sets the max vehicle speed over which PTO is disabled.*		
Options	0 – 80 mph	0 – 128 km/h
Default	6 mph	10 km/h
Access Level		
P-Group (DDDL)	7	
Data Code (SpecPro)	EEF-99D	

Table 78: Max Road Speed in PTO Mode

Set Coast Switch PTO Set Speed *Sets the initial speed when the Set/Coast switch is used to enable Cab PTO.*	
Options	0 – 3000 RPM
Default	500 RPM
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EF2-99D

Table 79: Set Coast Switch PTO Set Speed

Set Coast Max PTO Torque *Sets the max engine torque that becomes active once the Set/Coast switch is activated.*	
Options	0 – 5000 Nm
Default	5000 Nm
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EJK-99D

Table 80: Set Coast Max PTO Torque

Resume Accel Switch PTO Set Speed *Sets the initial speed when the Resume/Accel switch is used to enable Cab PTO.*	
Options	0 – 3000 RPM
Default	500 RPM
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EJS-99D

Table 81: Resume Accel Switch PTO Set Speed

Resume Accel Max PTO Torque *Sets the max engine torque that becomes active once the Resume/Accel switch is activated.*	
Options	0 – 5000 Nm
Default	5000 Nm
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EJI-99D

Table 82: Resume Accel Max PTO Torque

PTO Ramp Rate *Sets the rate of increase or decrease.*	
Options	25 – 2500 RPM/sec
Default	200 RPM/sec
Access Level	
P-Group (DDDL)	7
Data Code (SpecPro)	EF3-99D

Table 83: PTO Ramp Rate

14.4. THROTTLE CONTROL/GOVERNORS ADVANTAGES

Throttle Control/Governors allow limiting speed foot throttle controls that allow a part throttle application when needed as in slippery conditions and when accelerating. It also allows variable speed governor controls such as in PTO Mode or in Cruise Control governing when a constant engine speed is desired.

Cruise Switch PTO will provide a fast idle feature that is independent of the base idle shutdown timer. A minimum engine speed can be specified for applications such as the Eaton Autoshift transmission where a minimum 900 RPM fast idle is desirable.

15. VEHICLE SPEED SENSOR ANTITAMPERING

Vehicle Speed Sensor (VSS) Antitampering can be used to detect fixed frequency oscillators or devices which track engine RPM and produce fewer pulses per revolution than a VSS wheel. These devices are used to trick the CPC into believing that vehicle speed is low. A VSS fault will be logged if the sensor appears to be working improperly but the vehicle speed is not zero. The engine speed in all gears will be limited for the duration of the ignition cycle to the engine speed at the Vehicle Speed Limit in top gear. This feature should only be enabled on installations with manual transmissions where a Vehicle Speed Sensor is wired directly to the CPC.

15.1. VEHICLE SPEED SENSOR ANTITAMPERING PARAMETERS

Antitamper	
Options	0 – Disable 1 – Enable Antitamper Function via ABS 2 – Enable Antitamper Function via Gear Ratio
Default	0 – Disable
Access Level	
P-Group (DDDL)	8
Data Code (SpecPro)	0 – EMF-004 1 – EMF-003

Table 84: Antitamper

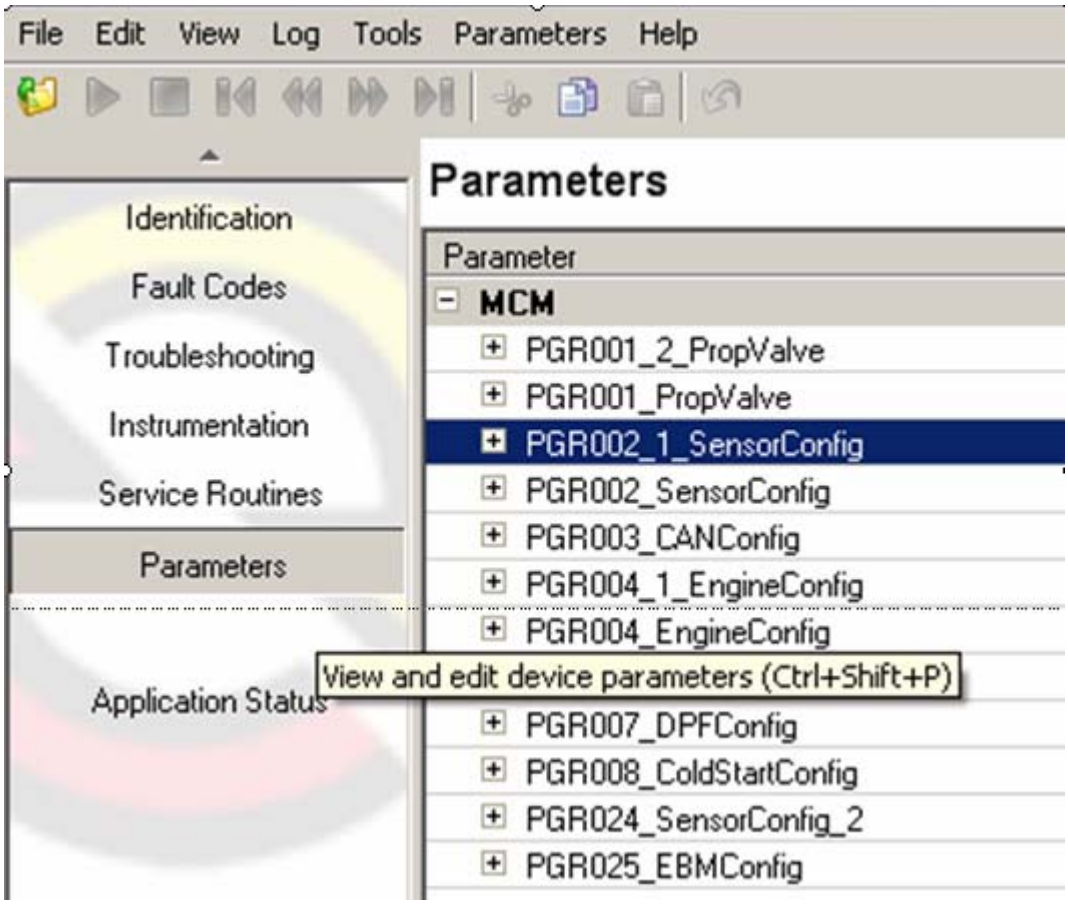
15.2. ADVANTAGES

Vehicle Speed Sensor Antitampering is a concerted effort to watch dog any efforts to trick the speed sensor sending a signal that indicates a slower vehicle speed than actual.

16. DDDL 7.0 – CONFIGURING PARAMETERS FOR 2007 ENGINES

16.1. PARAMETER LAYOUT

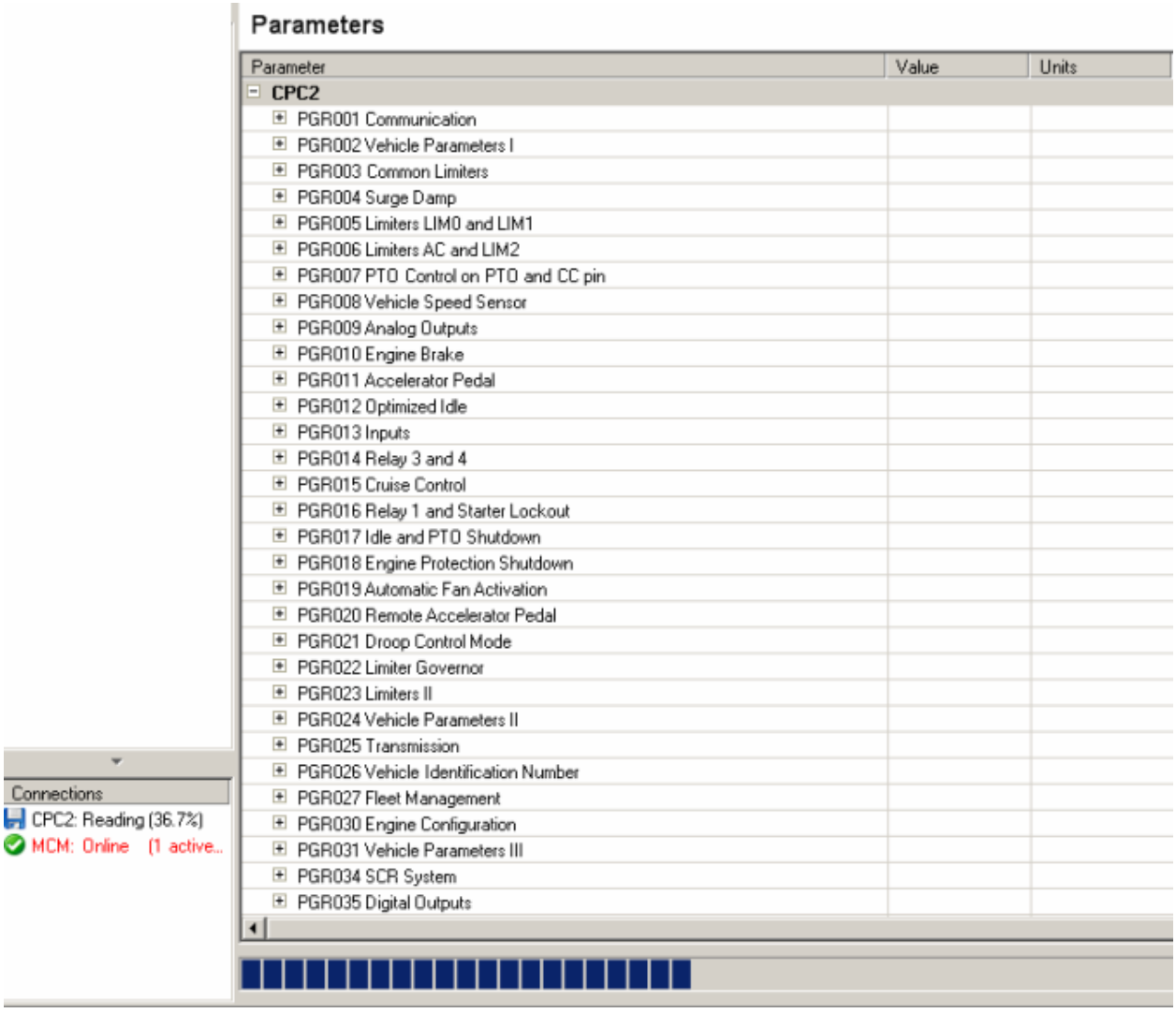
The layout of the parameters is similar to the current MBE system. Values may be displayed in Metric or English units (units of distance, temperature, and volume change; pressure readings remain in bar units). Parameter sets may be stored as files for printing or sending in e-mails using the “Export” function. Immediate recycling of the ignition to save settings should be done to save changes.



DDDL 7.0 MCM Parameter List (Screenshot)

16.2. PROGRESS TRACKING

When entering the ‘Parameters’ section all values of the parameters from all connected modules will be read. Progress will be tracked on screen. Whenever the user retrieves a parameter set from a module (CPC or MCM) the file is automatically stored and encrypted on your hard drive for later use. It may be imported back into a module by using the “History Import” feature.



Parameter Section and Connections Window

16.3. VIEWING INDIVIDUAL VALUES OF PARAMETERS

Parameters are placed in groups. To view the values of individual parameters within the group the user opens and closes the folder by clicking on the '+' or '-' in front of the group name similar to the operation in Windows Explorer.

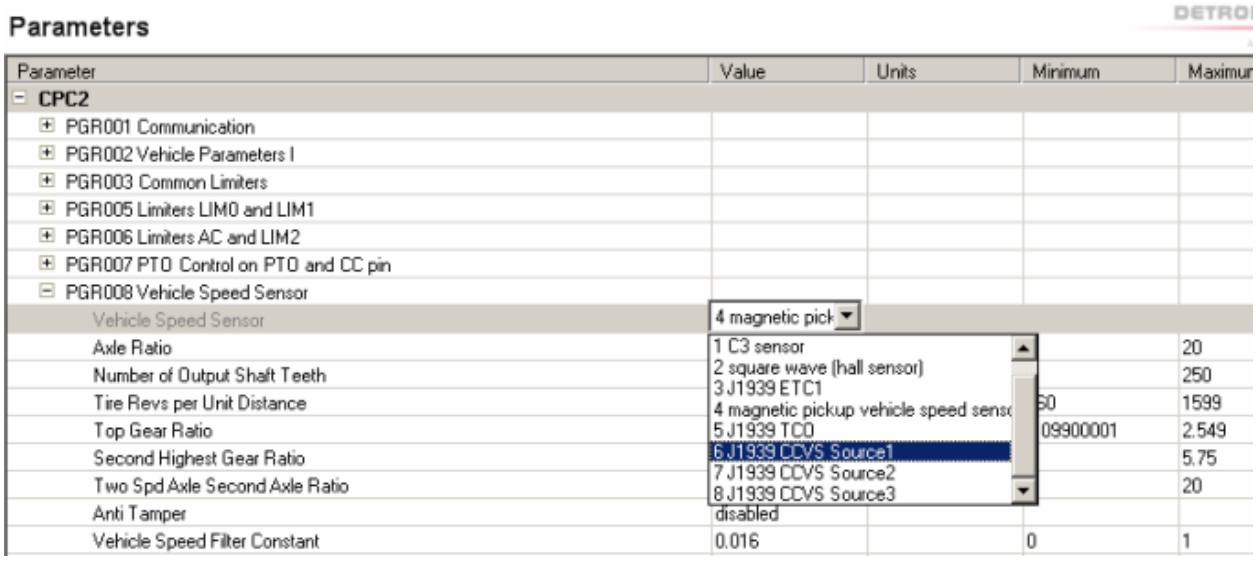
Parameters

Parameter	Value	Units	Minimum	Maximum
⊟ **CPC2**				
⊞ PGR001 Communication				
⊞ PGR002 Vehicle Parameters I				
⊞ PGR003 Common Limiters				
⊞ PGR005 Limiters LIM0 and LIM1				
⊞ PGR006 Limiters AC and LIM2				
⊞ PGR007 PTO Control on PTO and CC pin				
⊟ PGR008 Vehicle Speed Sensor				
Vehicle Speed Sensor	magnetic pickup...			
Axle Ratio	5.29		1	20
Number of Output Shaft Teeth	16		0	250
Tire Revs per Unit Distance	319	1/km	160	1599
Top Gear Ratio	1		0.09900001	2.549
Second Highest Gear Ratio	2.55		0	5.75
Two Spd Axle Second Axle Ratio	5.29		1	20
Anti Tamper	disabled			
Vehicle Speed Filter Constant	0.016		0	1
⊞ PGR010 Engine Brake				
⊞ PGR012 Optimized Idle				
⊞ PGR013 Inputs				
⊞ PGR015 Cruise Control				

Individual Parameter Value View

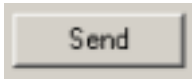
16.4. PARAMETER CHANGES

To change a parameter, simply click into the values column. For numerical values, simply type in the desired value. For CPC parameters with more than one configurable selection (as seen below), a drop-down menu will appear.



Parameter Changes Drop Down Menu

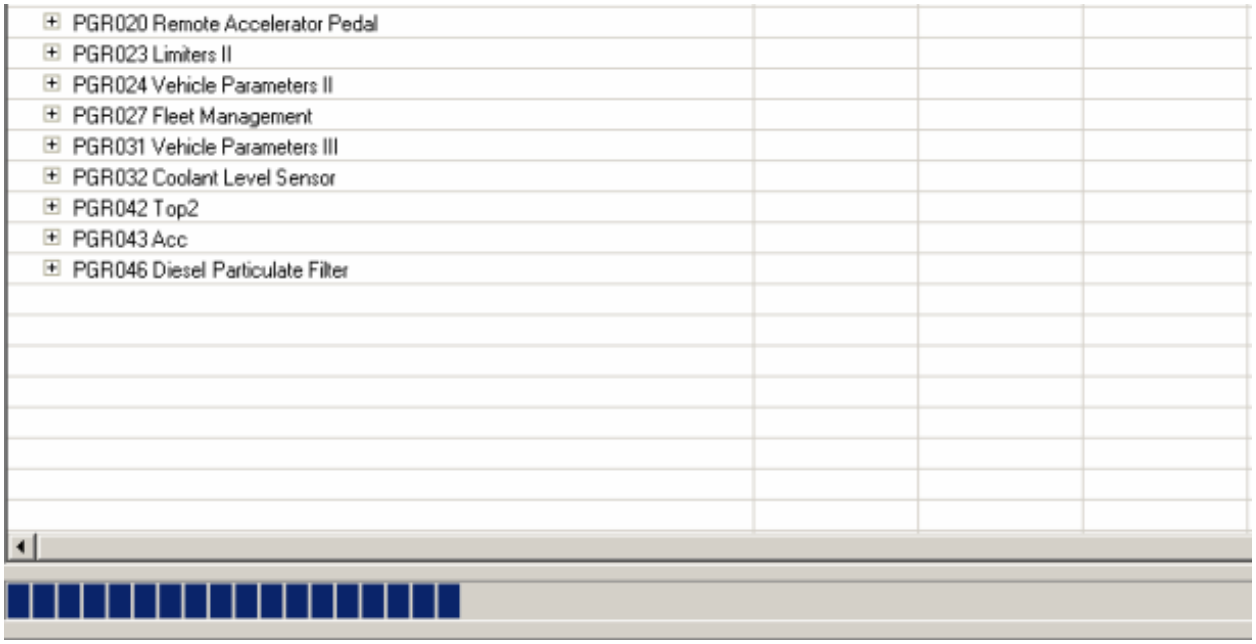
When all changes are made, click on the ‘Send’ box in the lower left of the window.



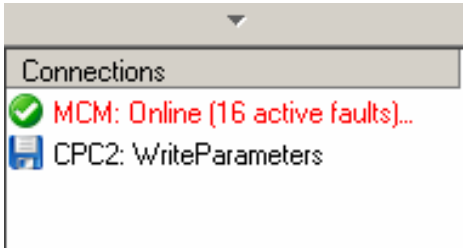
Send Button

16.5. UPLOADING CHANGES

As the parameters are written back to the module a progress bar will appear until the process is complete. At that point you should re-cycle the ignition to store the changes.



Progress Bar on Bottom of Window



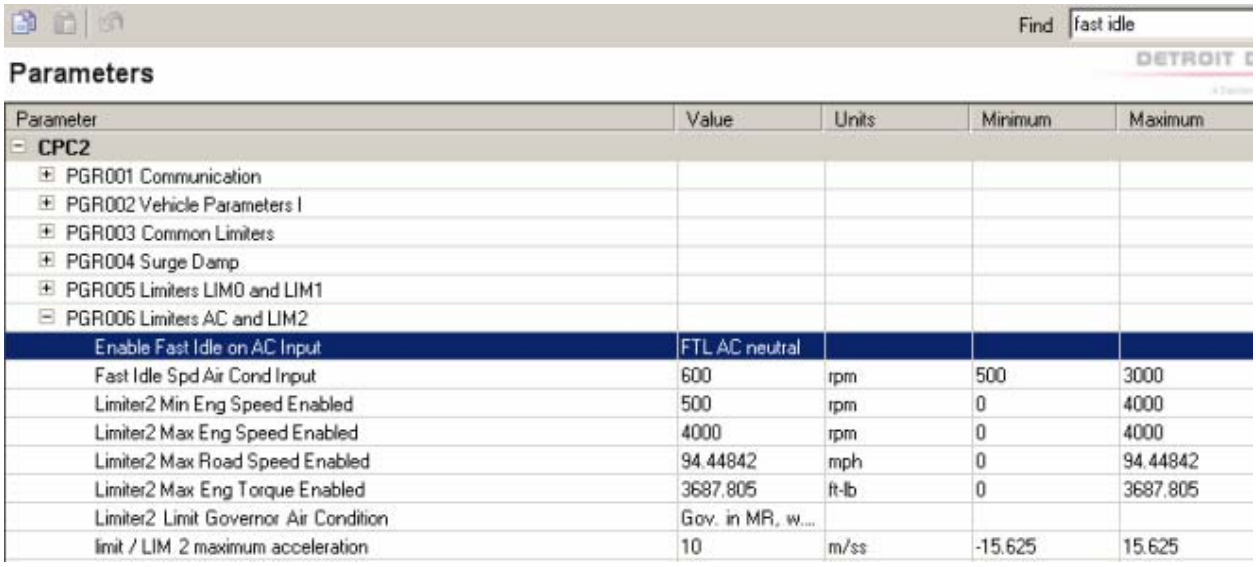
Connections Window

16.6. THE 'FIND' FUNCTION

The "Find" function allows the user to search the entire parameter list for a key word(s). Type in the name of a parameter you wish to locate.

The Find Function

You'll be taken to the first location of that name in the parameter list.



Parameter	Value	Units	Minimum	Maximum
CPC2				
PGR001 Communication				
PGR002 Vehicle Parameters I				
PGR003 Common Limiters				
PGR004 Surge Damp				
PGR005 Limiters LIM0 and LIM1				
PGR006 Limiters AC and LIM2				
Enable Fast Idle on AC Input	FTL AC neutral			
Fast Idle Spd Air Cond Input	600	rpm	500	3000
Limiter2 Min Eng Speed Enabled	500	rpm	0	4000
Limiter2 Max Eng Speed Enabled	4000	rpm	0	4000
Limiter2 Max Road Speed Enabled	94.44842	mph	0	94.44842
Limiter2 Max Eng Torque Enabled	3687.805	ft-lb	0	3687.805
Limiter2 Limit Governor Air Condition	Gov. in MR, w....			
limit / LIM 2 maximum acceleration	10	m/ss	-15.625	15.625

Found Parameter in CPC Folder

SPEC MANAGER – OPTIMIZING & COMPARING ENGINE SPECIFICATIONS

Spec Manager is a powerful software utility for specifying and comparing commercial vehicles and predicting their performance. Creating a new configuration is a simple step-by-step process. When completed, Spec Manager provides advisory notes warning of possible problems and conflicts that might arise from the settings you have chosen. Individual hints are available to help solve specific issues. Once a specification has been produced, a wide range of predicted fuel economy and performance characteristics can be viewed. The program also allows the analysis of the vehicle's performance by route simulation.

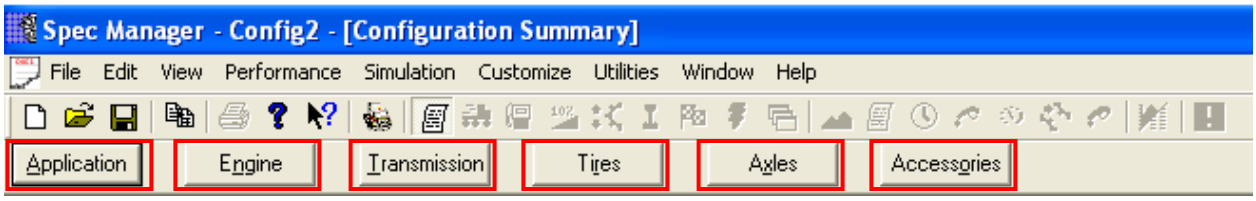
LOGGING IN

1. Enter Name
   This is your login and also the name as it appears on printed reports.
2. Enter Password
   DDC (in small or capital letters)
3. Click Okay
   If your name is not recognized you will be prompted to create a new user account

CREATING A NEW USER ACCOUNT

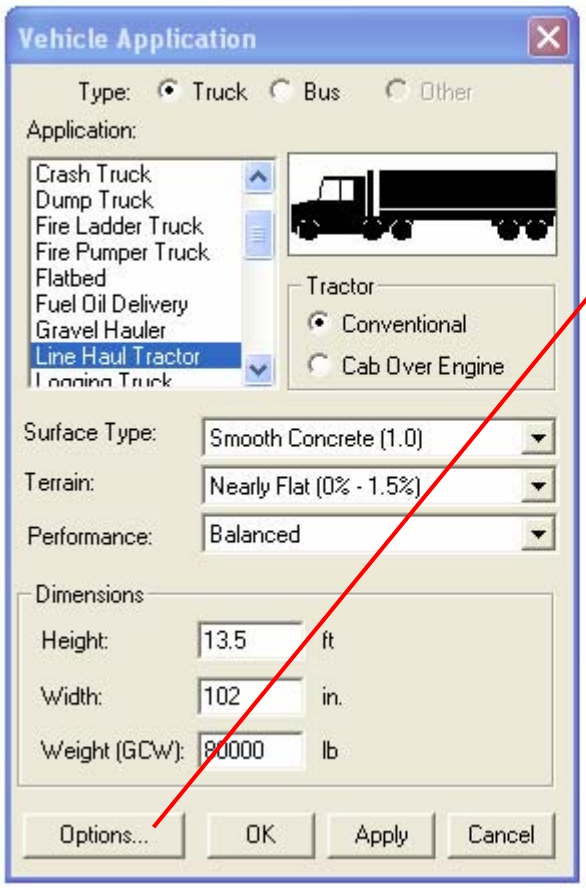
1. Fill in all detail entries. This will be the information that is shown on reports.
2. Click OK.

16.7. CREATING A CONFIGURATION

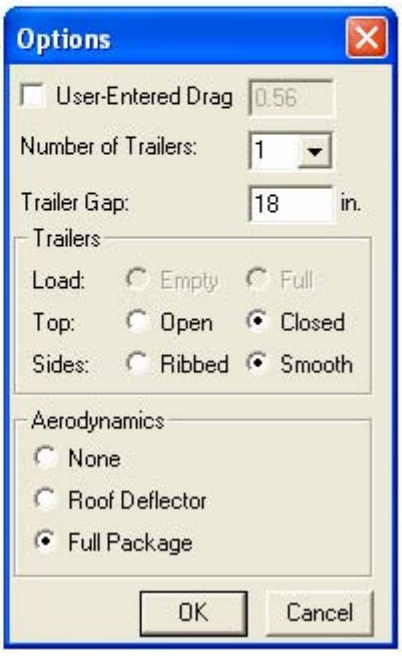


16.7.1. CHOOSE VEHICLE APPLICATION

1. Open 'Application' Window
2. Choose Vehicle Application
3. Choose Surface Type and Terrain
4. Choose Performance Setting
5. Enter Vehicle Dimension
6. Define Aerodynamics and Drag
7. Click OK



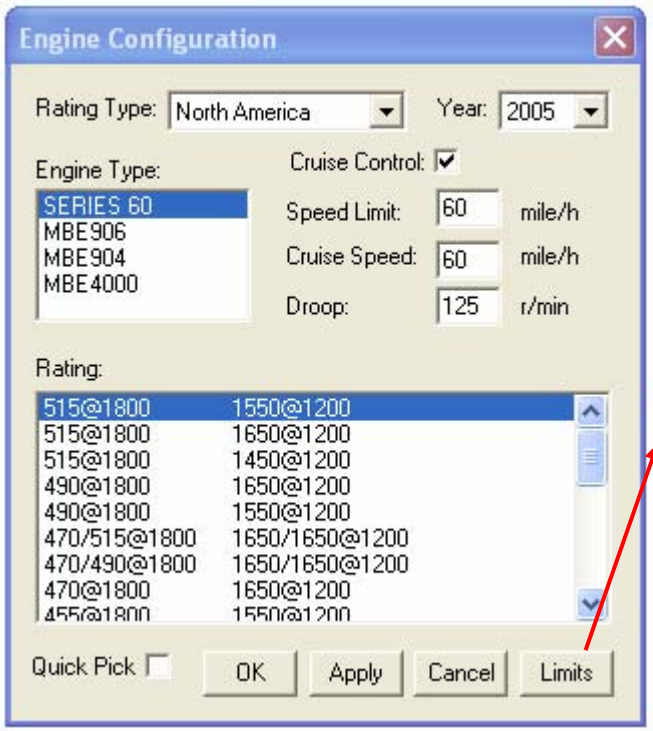
Vehicle Application Window



Options Window

16.7.2. CONFIGURE ENGINE PARAMETERS

1. Open ‘Engine’ Window
2. Choose Engine and Rating
3. Disable/Enable Cruise Control
4. Set Low Gear Torque Limiting Parameters (optional)
5. Click OK



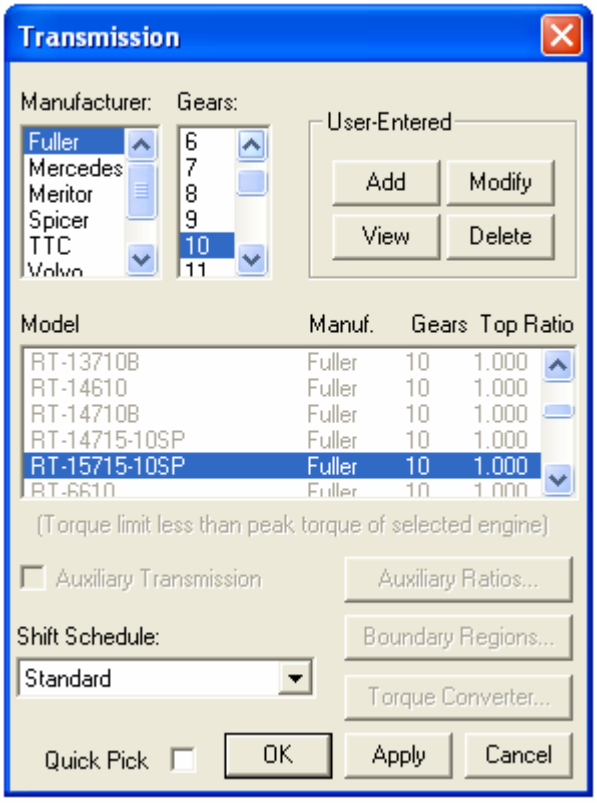
Engine Configuration Window

Low Gear Torque Limit Window

16.7.3. CHOOOSE TRANSMISSION SETTINGS

1. Choose Transmission and Gears

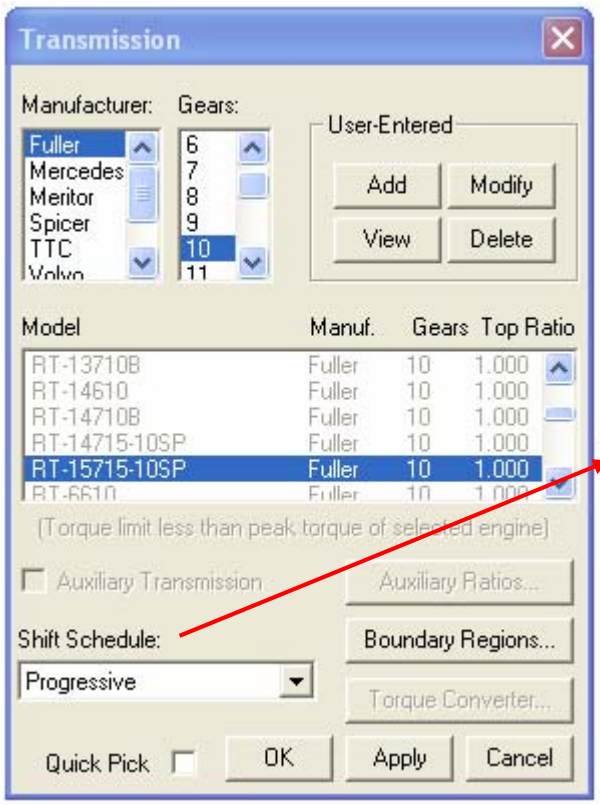
Automatic transmission may or may not appear as a choice based on the selected application and engine rating. Users may select a transmission that does not meet the peak torque or engine rating (this will trigger an advisory note).



Transmission Selection Window

2. Setting Up Progressive Shifting

Progressive Shift electronically limits the maximum RPM of the engine based on vehicle speed. It encourages drivers to stay within specific engine operating ranges in each gear. Progressive Shift also helps improve fuel economy.

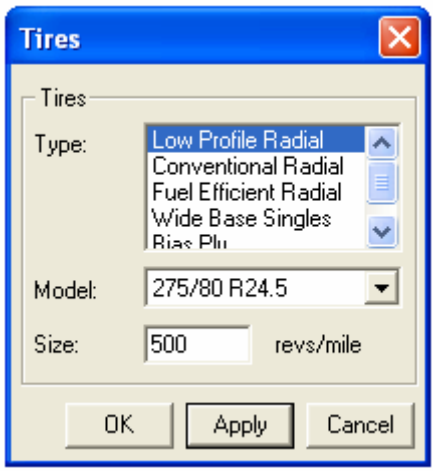


Transmission Selection

Progressive Shift Schedule

16.7.4. CHOOSE TIRES

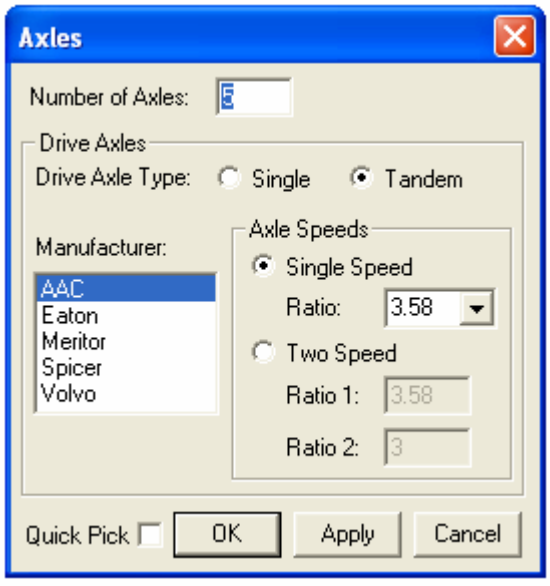
Users may enter any size (rev/mile) for their given tire manufacturer.



Tire Selection

16.7.5. CHOOSE AXLES

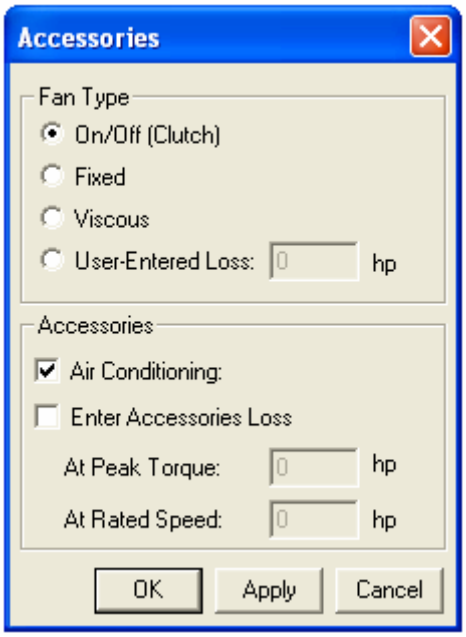
User may pick a ratio from the drop down list or enter one for their particular manufacturer.



Axle Selection

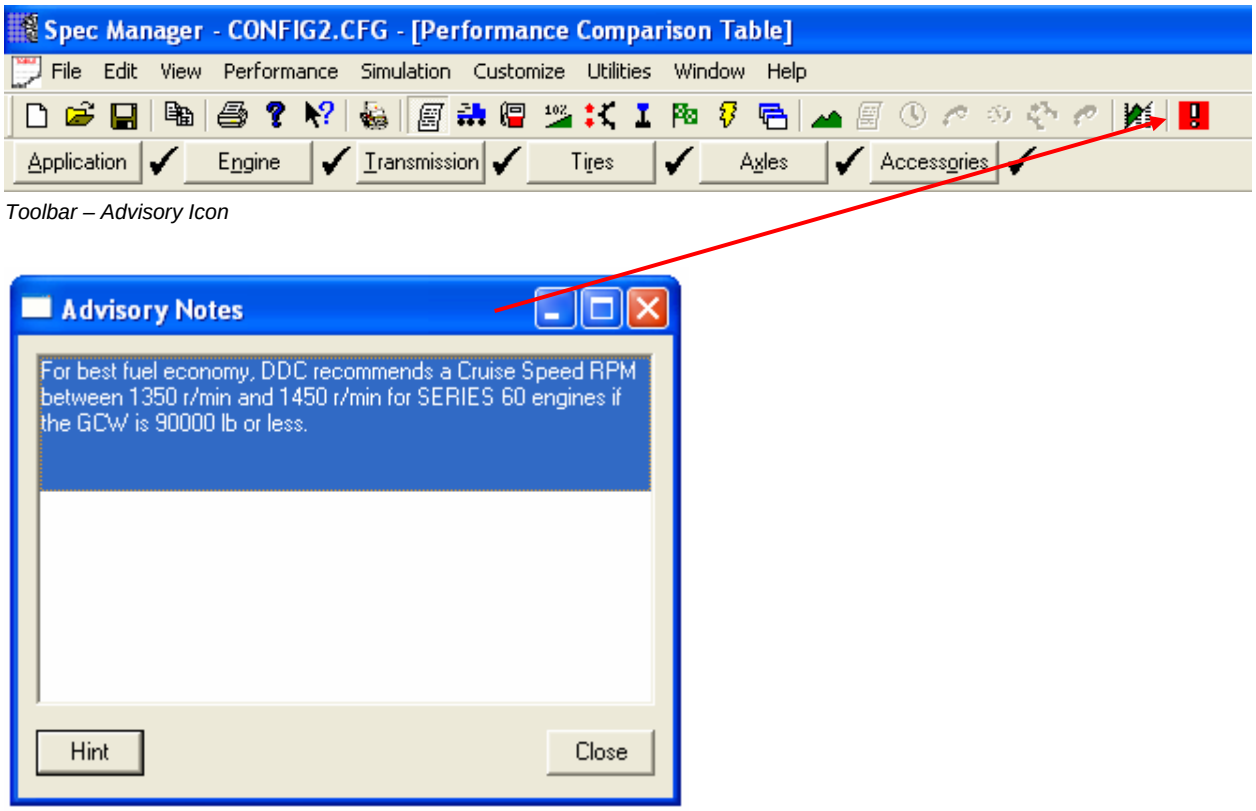
16.7.6. ACCESSORY SELECTION

Users may override the default HP losses associated with each accessory by choosing the ‘User-Entered Loss’ option.



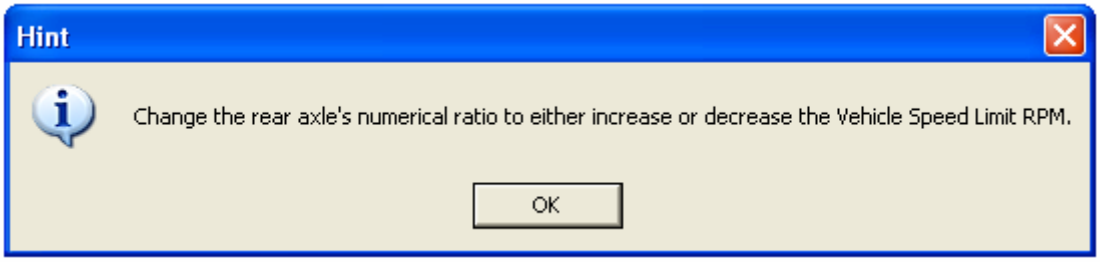
Accessory Selection

16.8. ADVISORY NOTES & HINTS



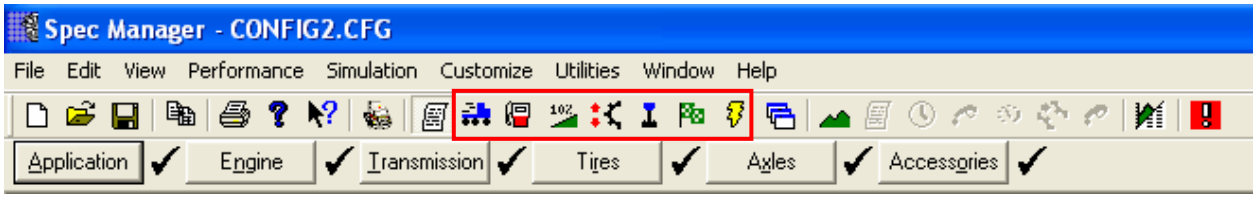
Toolbar – Advisory Icon

Advisory Notes



Hint Window

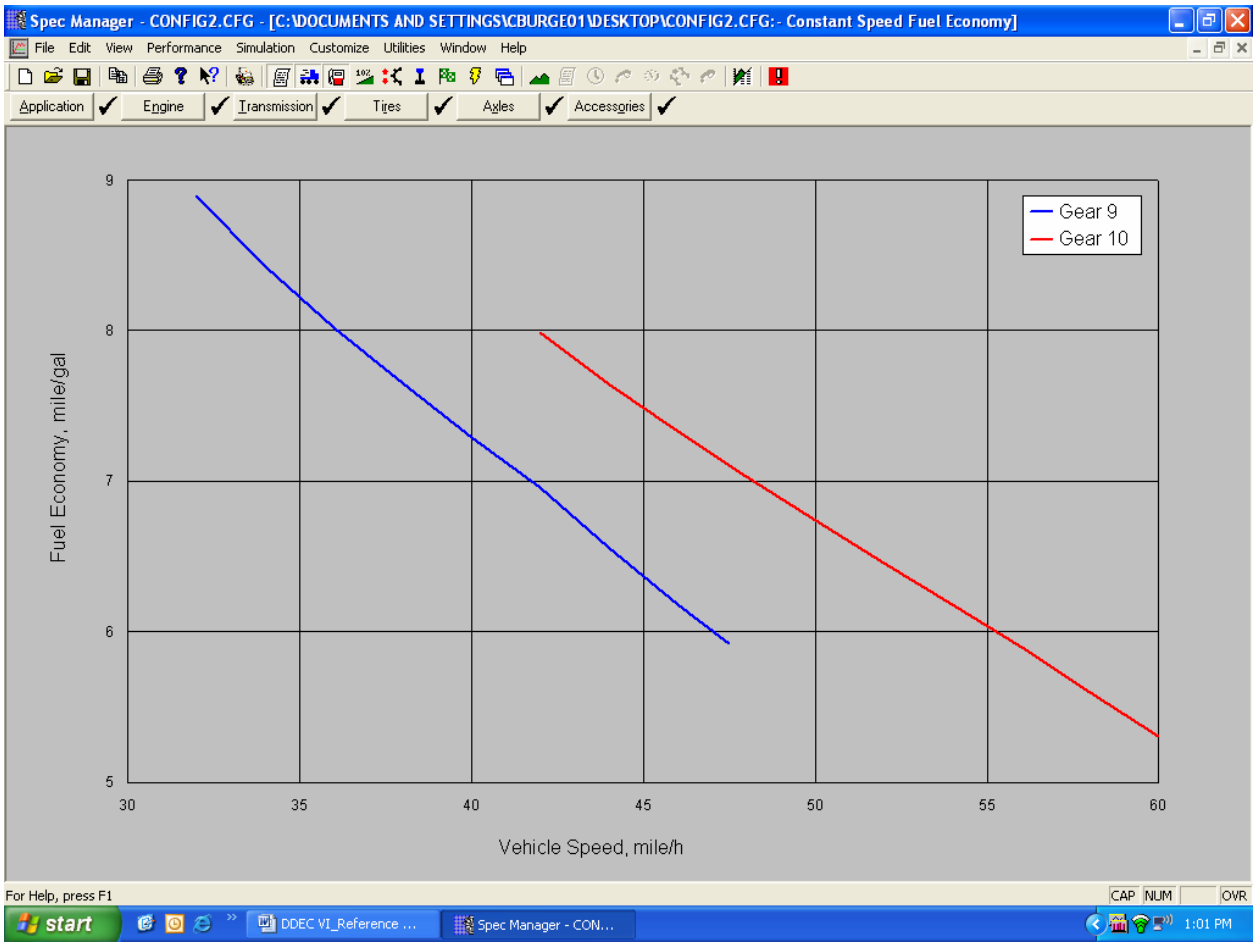
16.9. AVAILABLE PERFORMANCE GRAPHS & TABLES



16.9.1. ACCELERATION

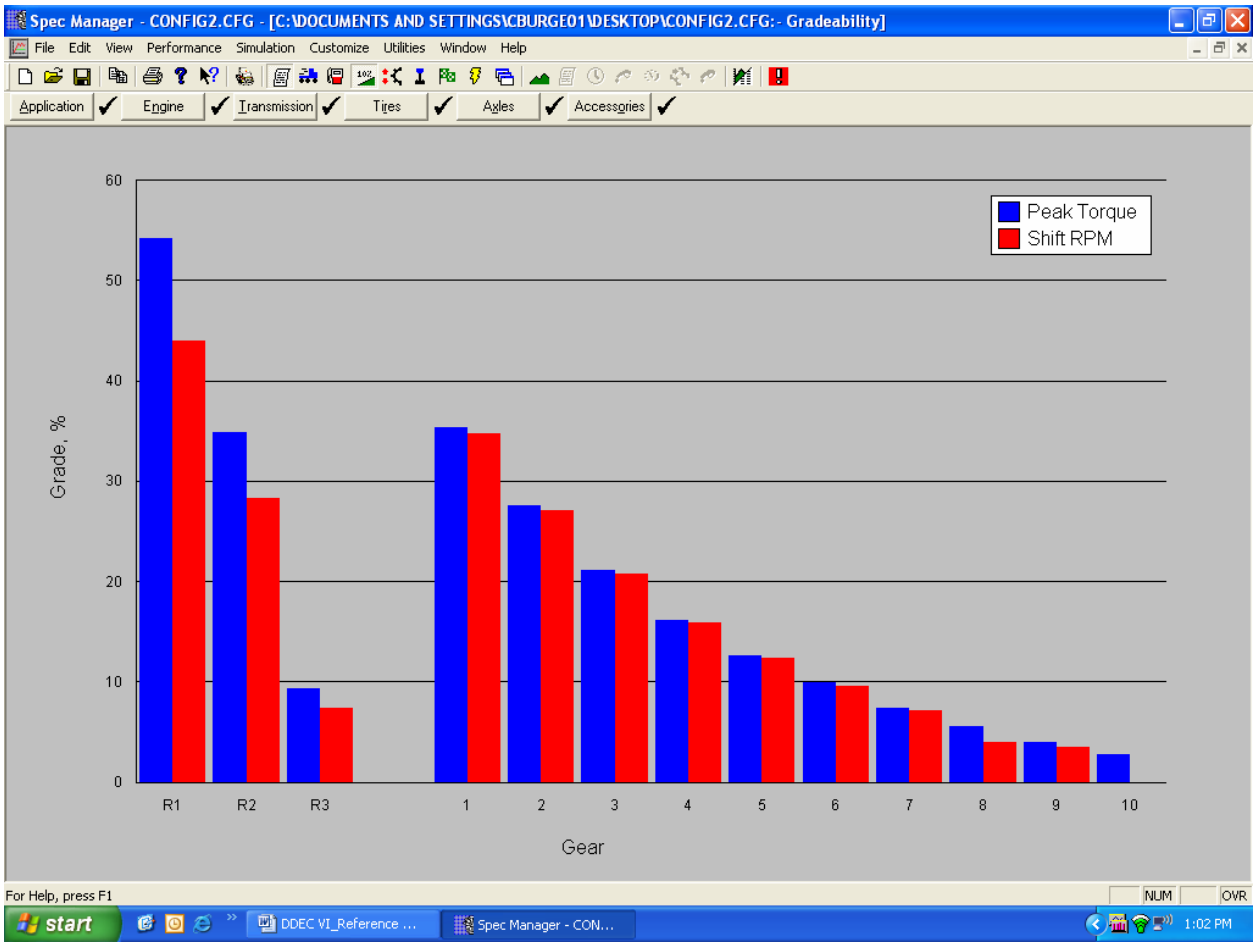
Acceleration Graph

16.9.2. FUEL ECONOMY



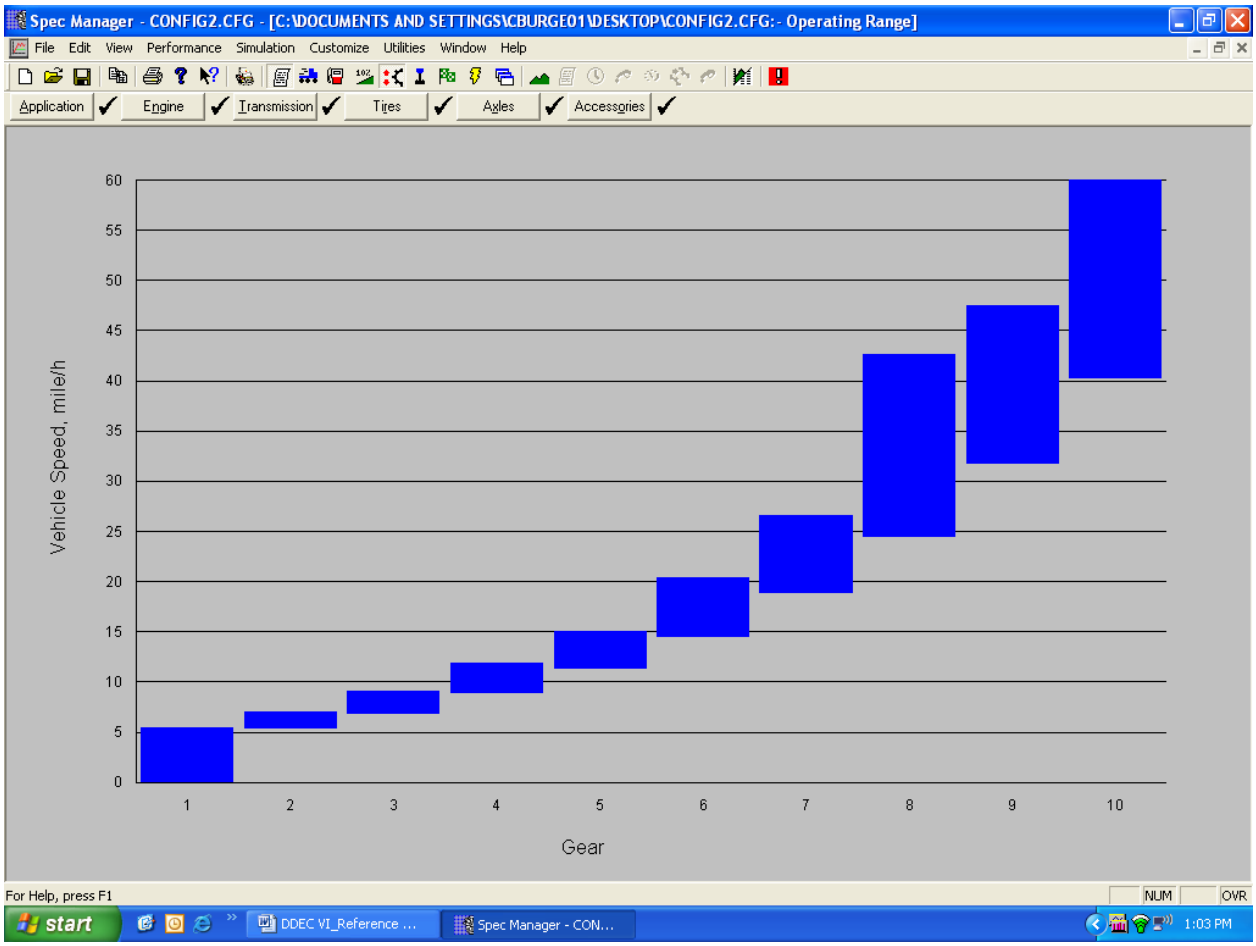
Fuel Economy Graph

16.9.3. GRADEABILITY



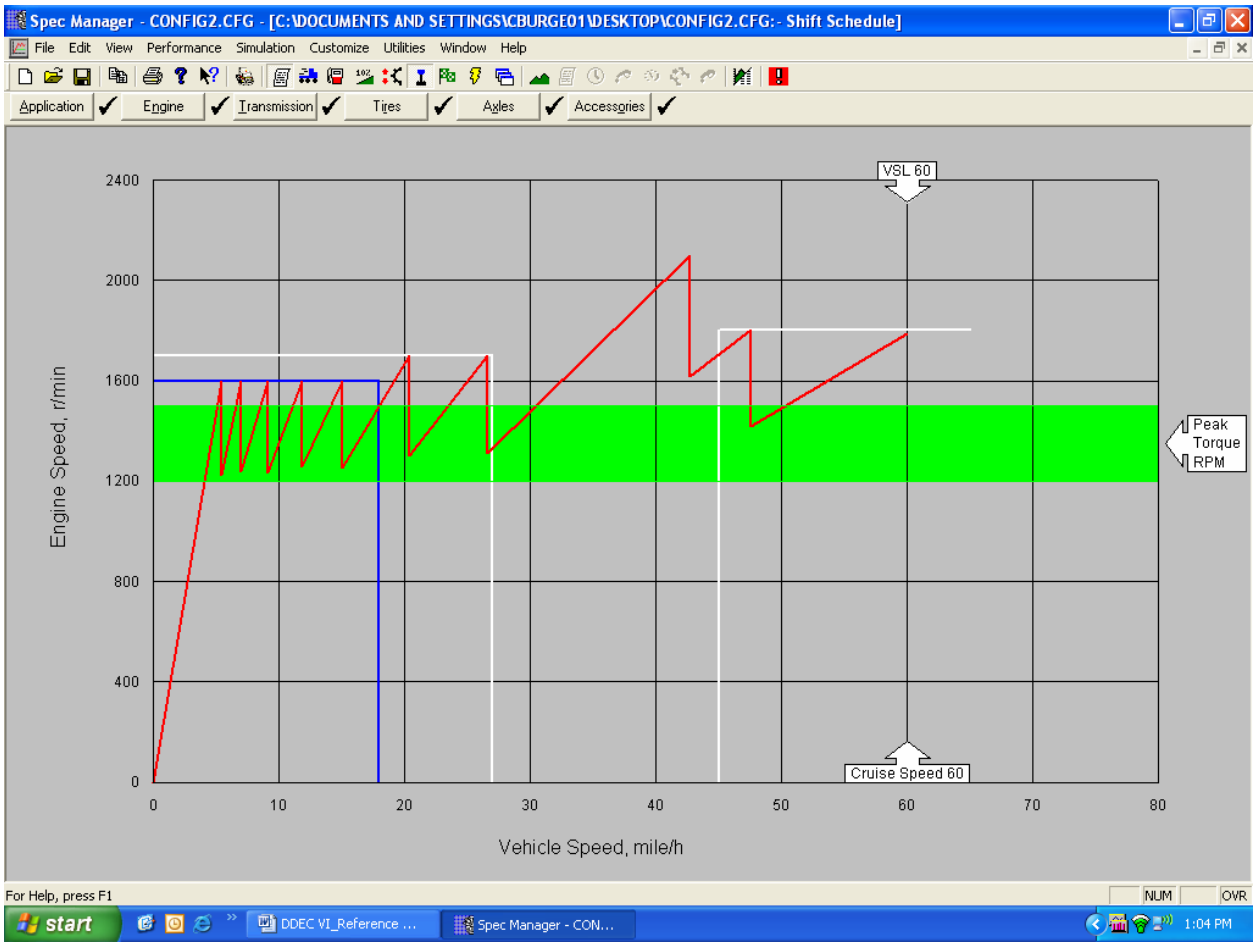
Gradeability Graph

16.9.4. OPERATING RANGE



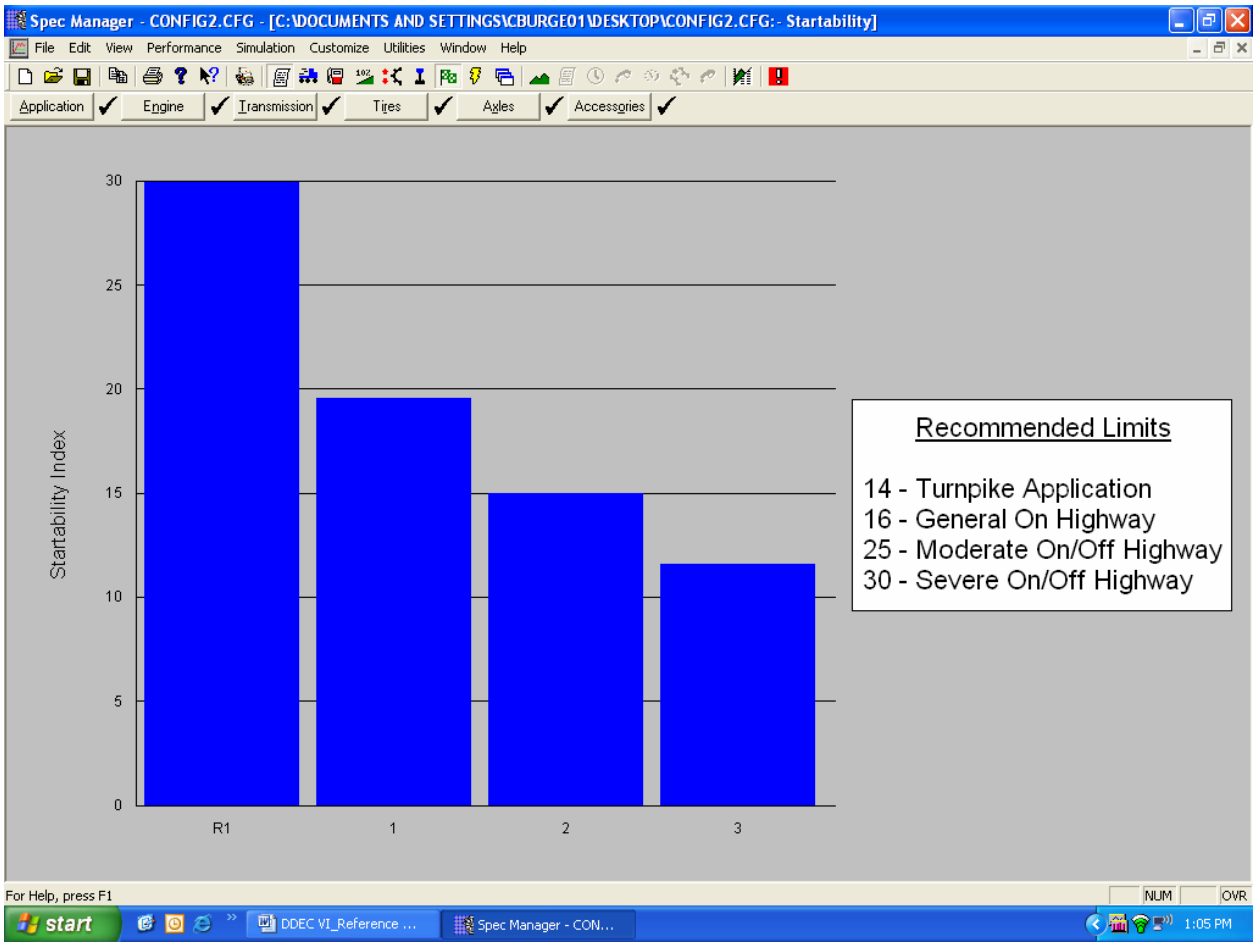
Operating Range Graph

16.9.5. SHIFT SCHEDULE



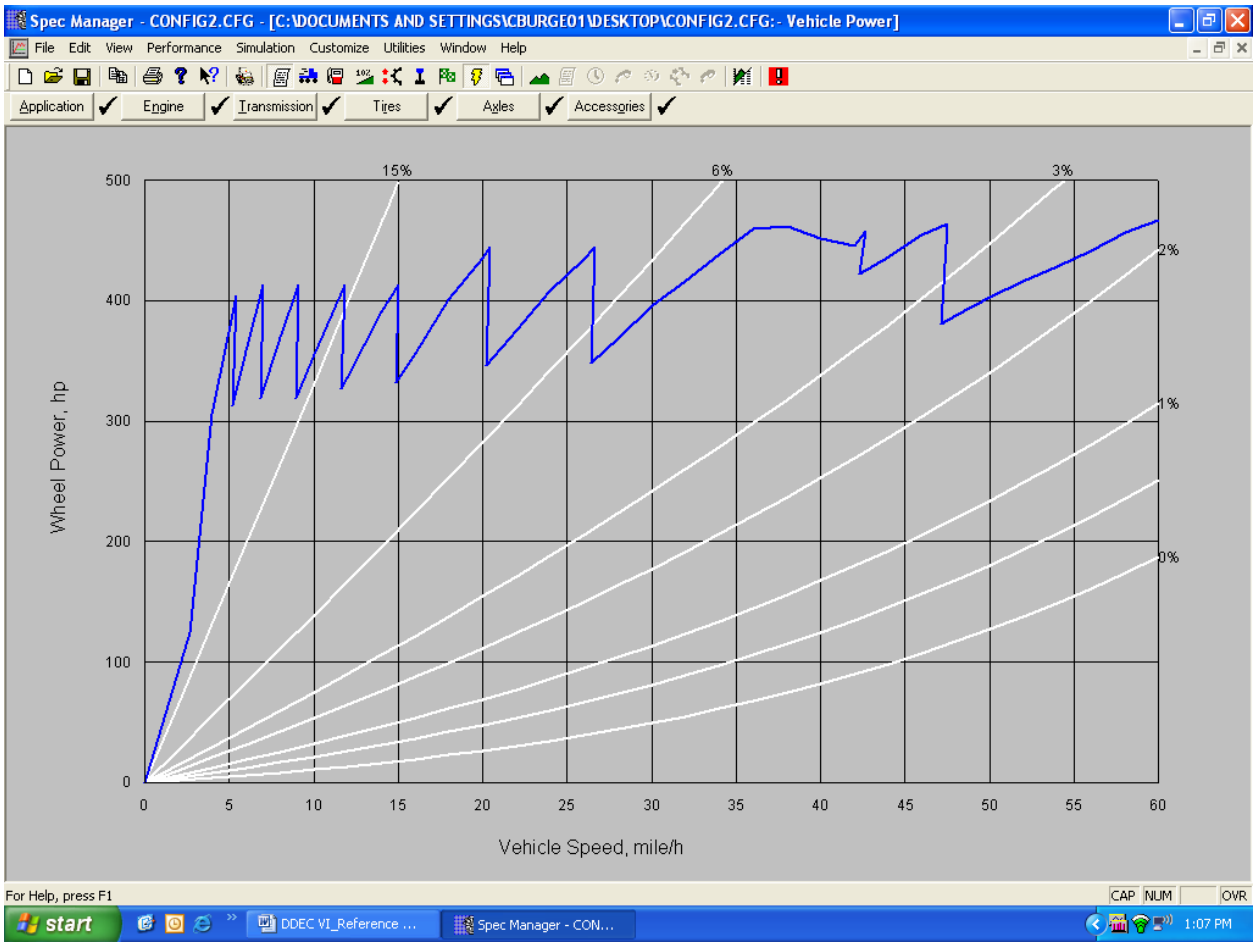
Shift Schedule Graph

16.9.6. STARTABILITY



Startability Graph

16.9.7. VEHICLE POWER CAPABILITIES



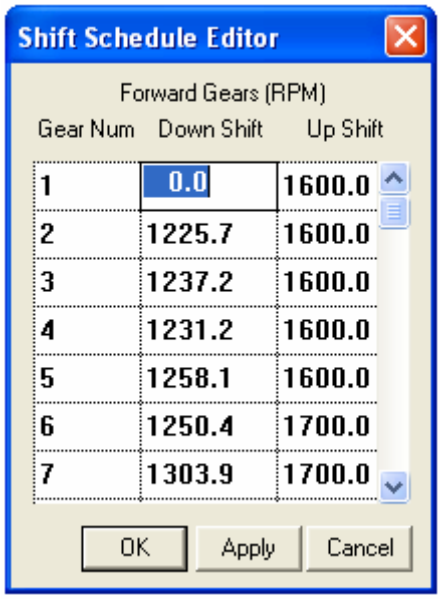
Vehicle Power Graph

16.10. RUNNING VEHICLE ROUTE SIMULATIONS

1. User Entered Shift Scheduled

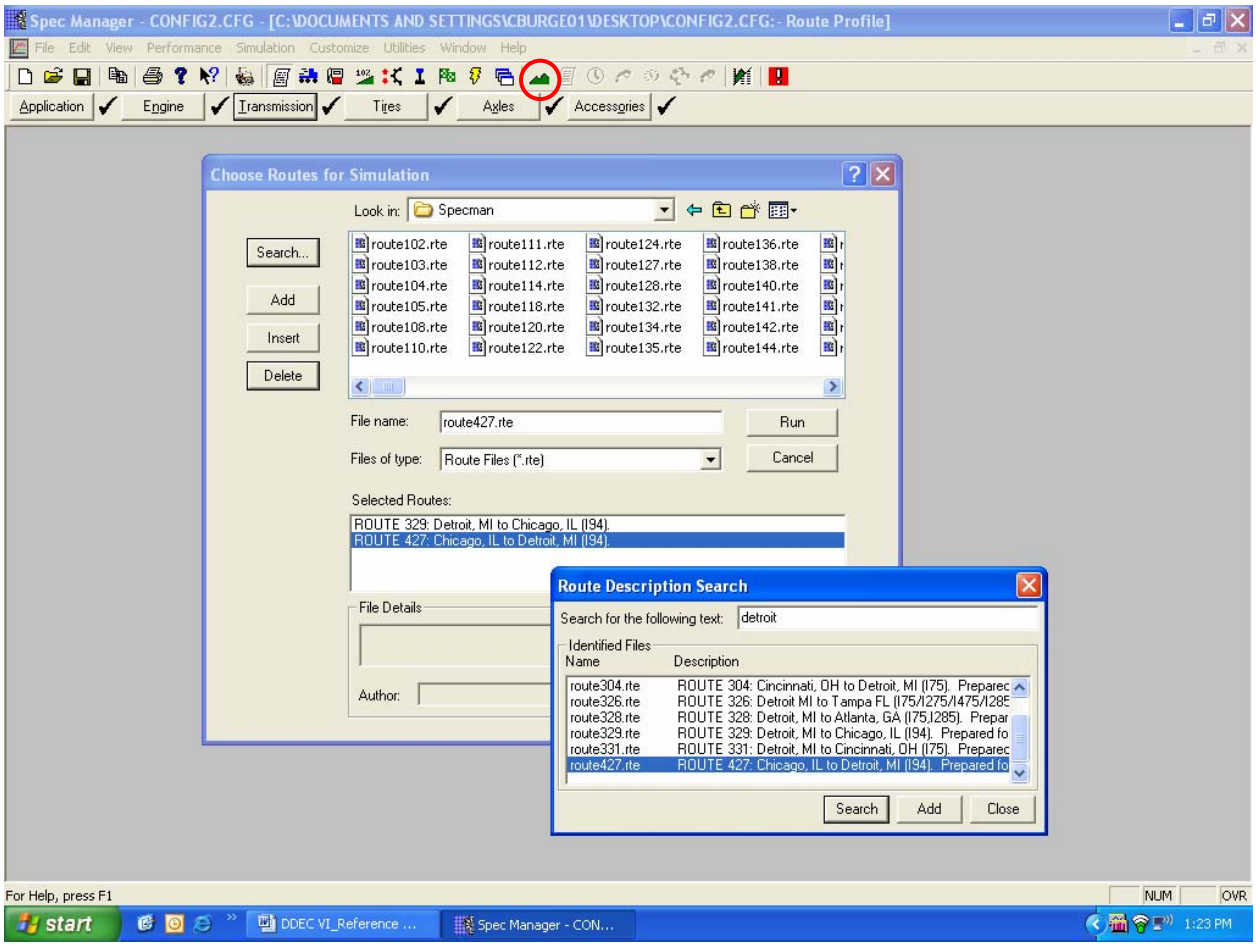
   Users may override the default down shift and up shift speeds for transmission gears.

   [Path: Utilities / User Entered Shift Schedule]



Shift Schedule Editor

2. Click Route Simulation Icon and Select Route [Path: C:\Specman]
    a. Click Search
    b. Type City Name
    c. Click Search
    d. Select Route
    e. Click Add
    f. Click Run



Selecting a Route

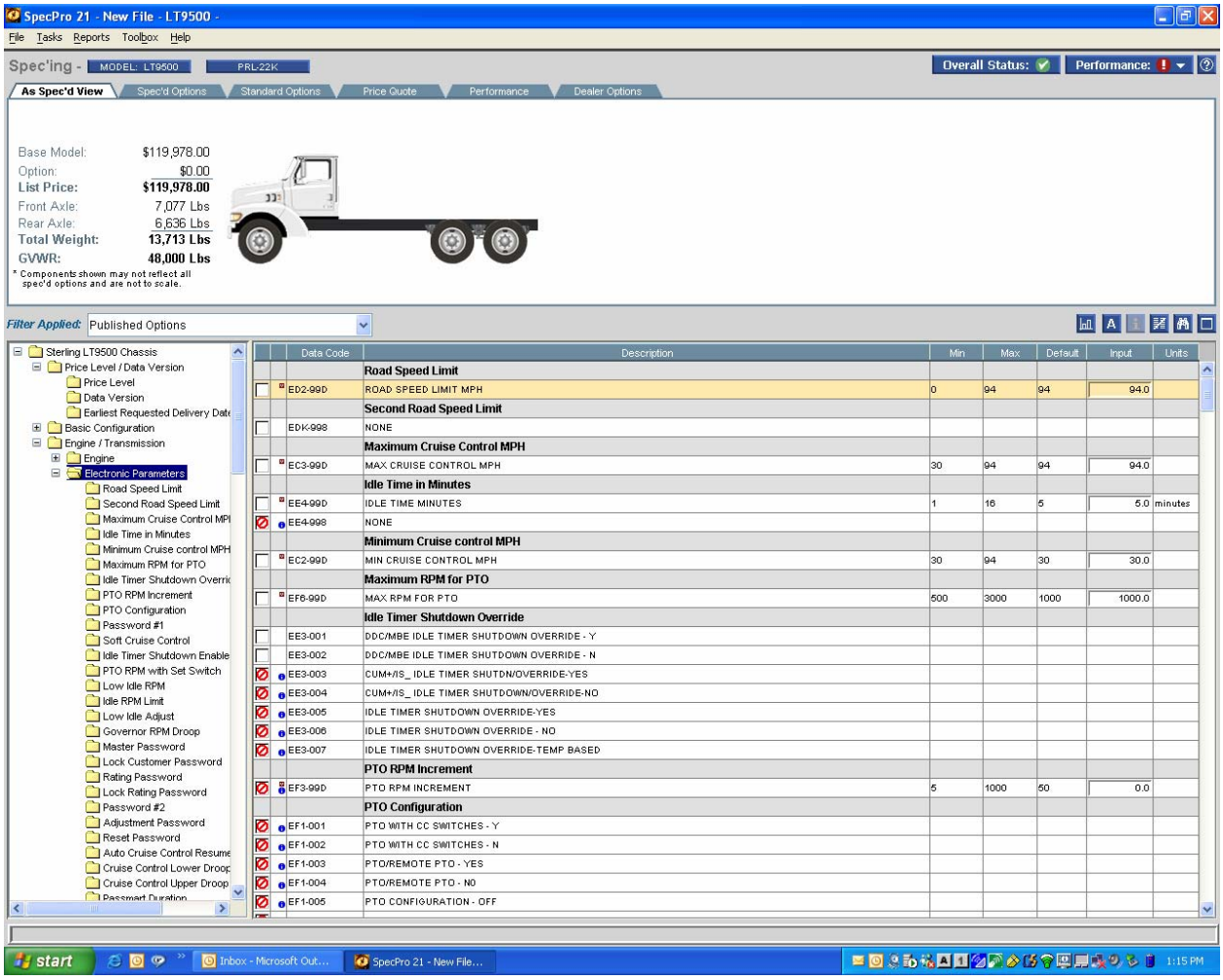
17. SPEC PRO – TIPS AND TRICKS

This section contains of tips and tricks for SpecPro that you might find helpful when ordering your truck.

SpecPro is used by Freightliner, Sterling and Western Star dealers to create specifications for a truck that can be built based on option compatibility. Once a truck is spec'd out, a customer proposal and sales order can be created. Please refer to Detroit Diesel's Spec Manager for detailed engine performance simulations.

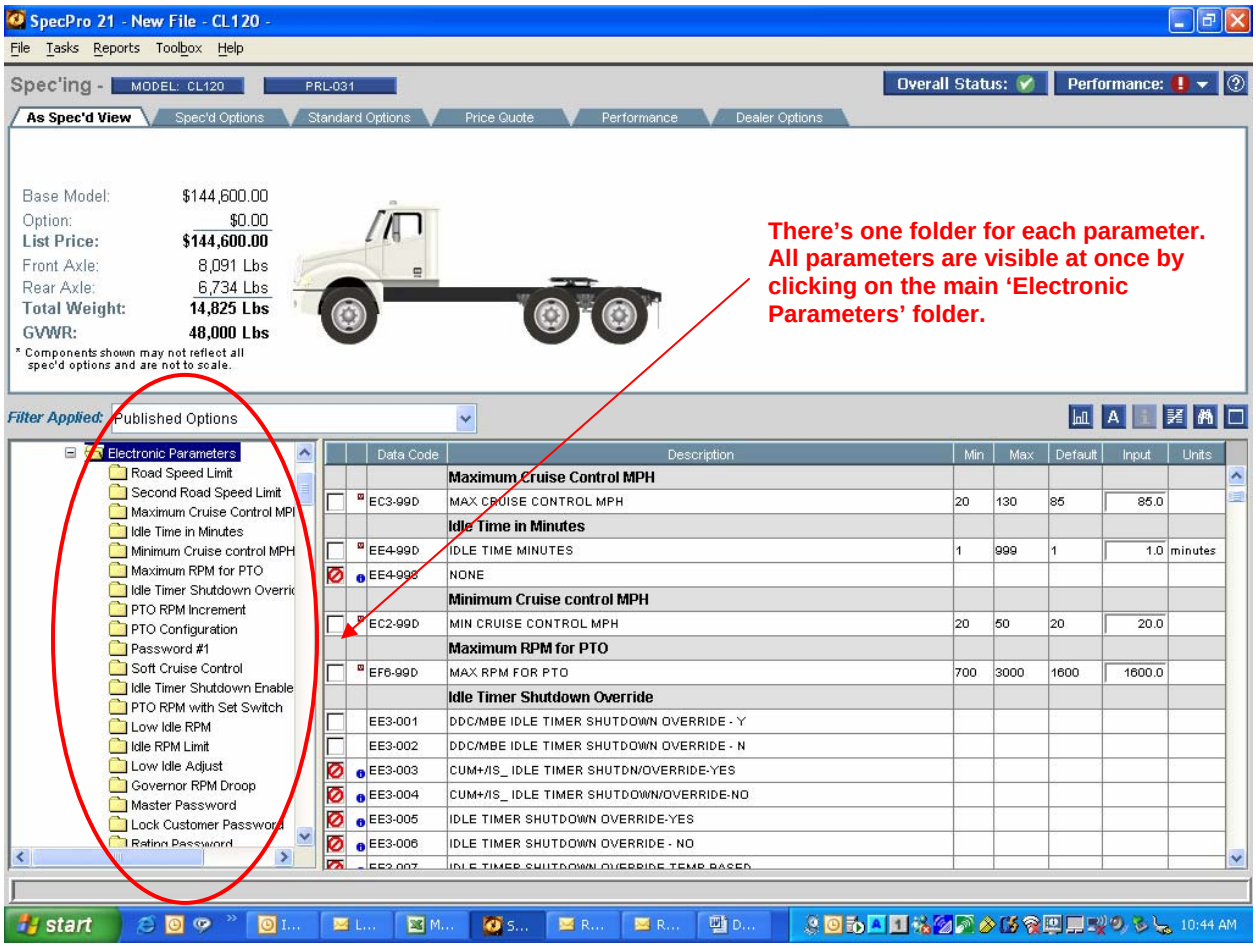
17.1. NAVIGATION

When Spec'ing DDEC, MBE 900 and MBE 4000 engines you need to set the appropriate electronic engine parameters. To do this inside SpecPro, you need to navigate to the 'Electronic Parameters' section of the spec'ing tree under 'Engines'.



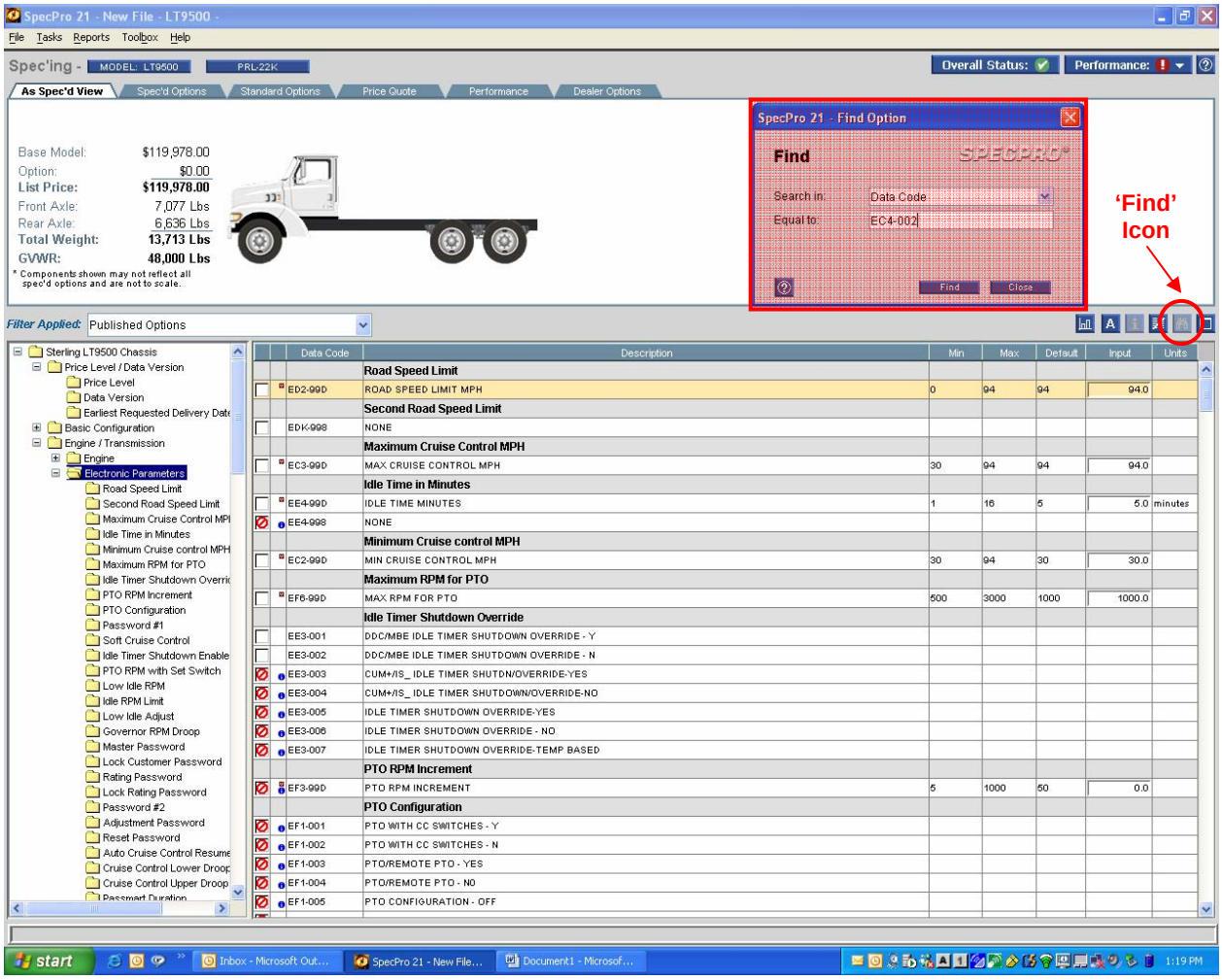
17.2. FOLDER NAVIGATION

Navigation can take place by going through each folder in the spec'ing tree at the left, or a user may decide to see all options on the screen at once and scroll through them. Here is an example of navigating through one folder at a time.



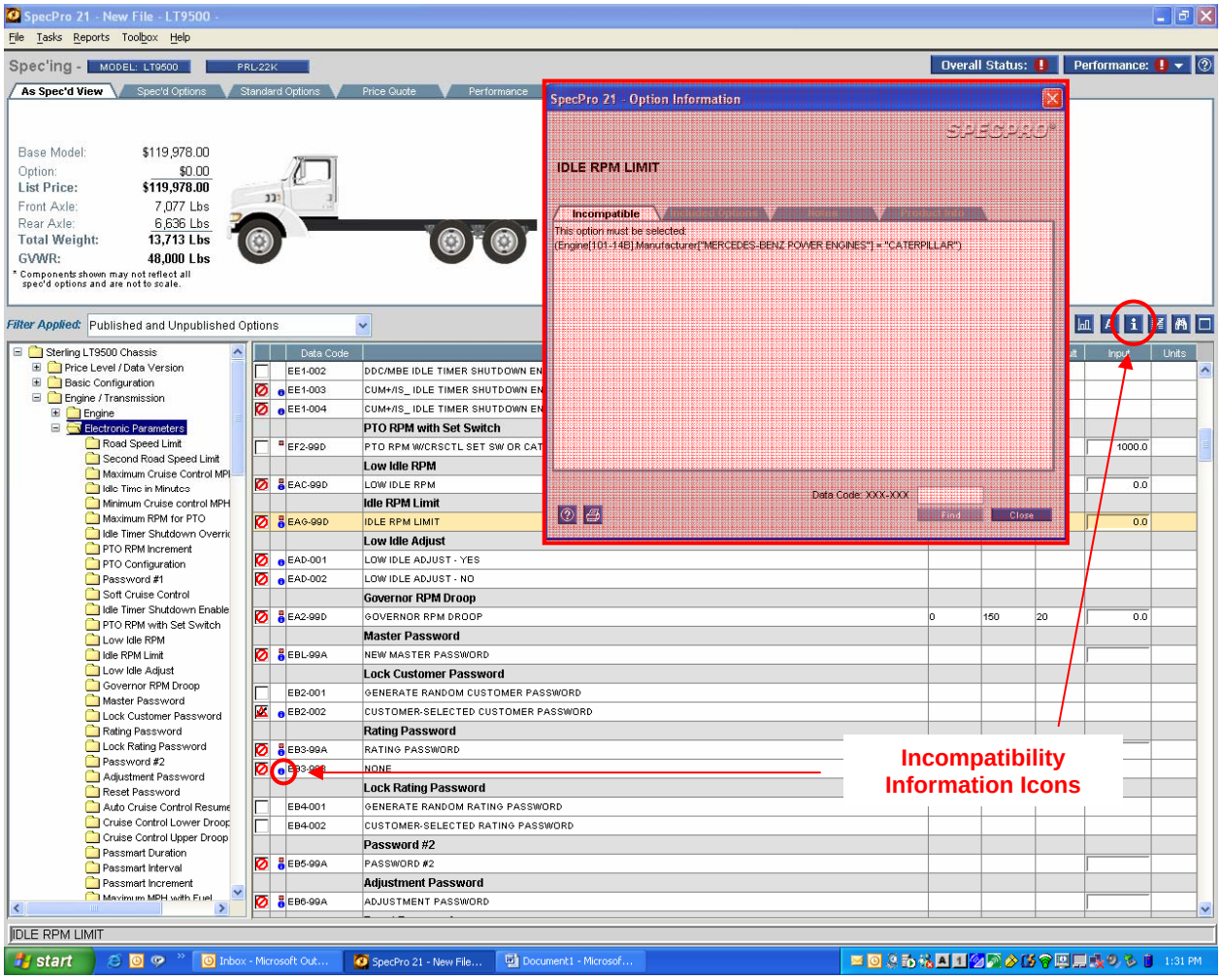
17.3. THE FIND ICON

Another way to find or locate electronic engine parameters is using the find icon inside SpecPro. For instance to find EC4-002, click on the find icon, enter EC4-002 into the 'Equal To' field, and click the Find button.



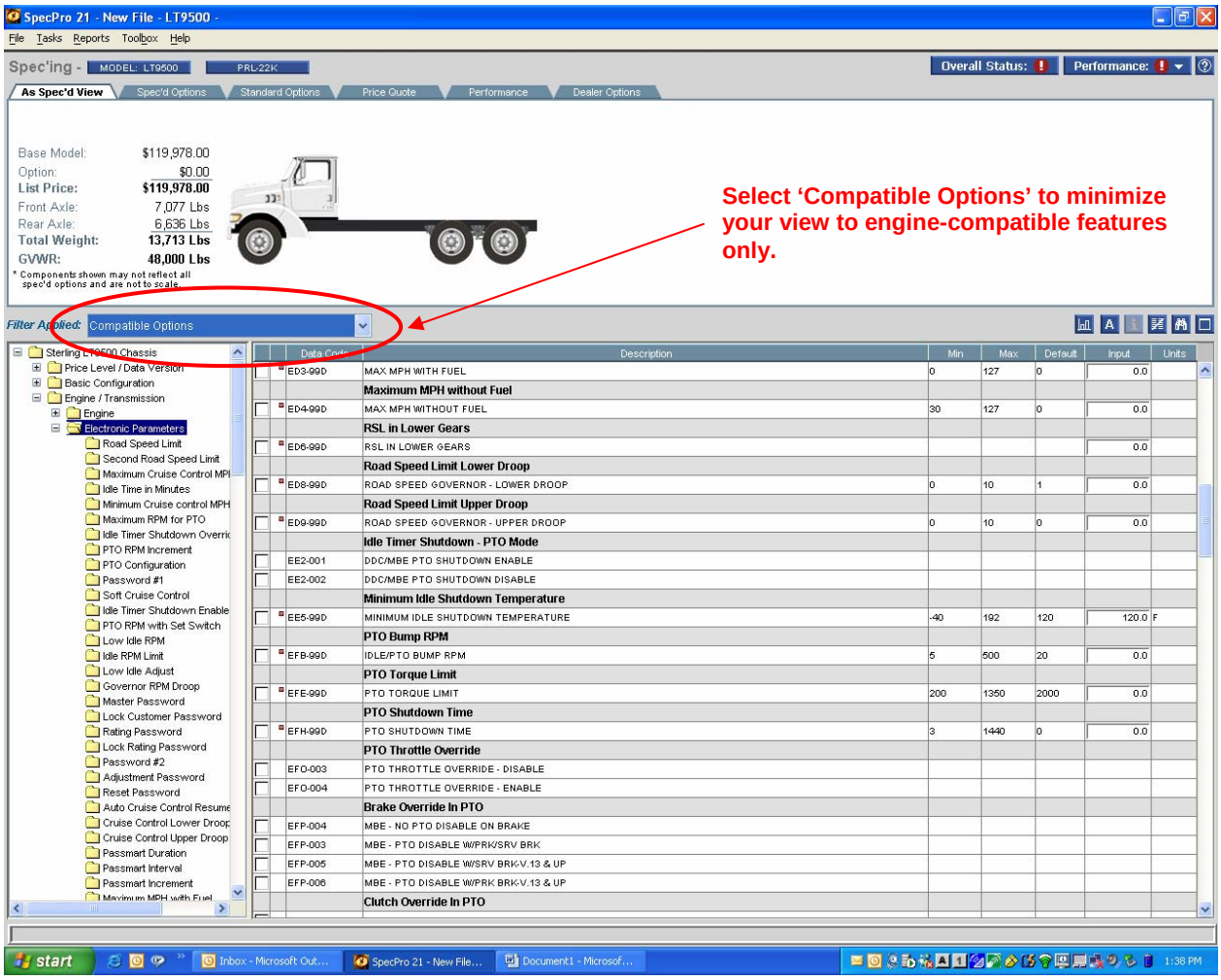
17.4. THE INFORMATION ICON

When the electronic parameter you wish to select is incompatible, you can click on the blue information icon or click on the 'I' for Additional Information to see why a particular option is incompatible.



17.5. COMPATIBLE ELECTRONIC PARAMETERS

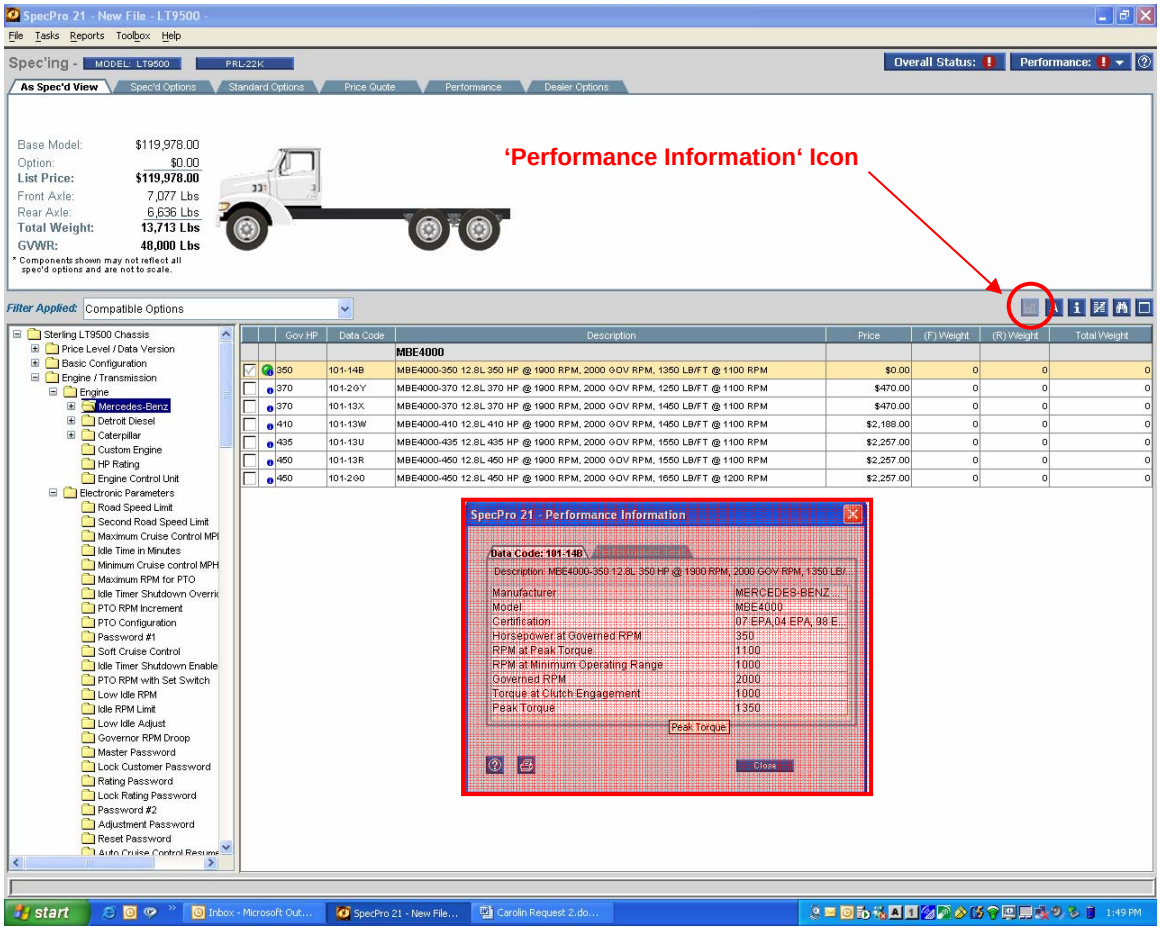
When specifying the parameters for the engine you have selected, you may want to change your filter view to only display compatible electronic parameters for the engine you have selected. To do this, select 'Compatible Options' from the drop down in the Applied Filter section.



Compatible Options View

17.6. PERFORMANCE INFORMATION

Seeing performance information such as HP, Peak Torque, and Governed RPM, is available when selecting an engine and clicking on the 'Performance Information' icon.



Performance Information

III. TABLE OF FIGURES

IV. TABLE OF PARAMETER TABLES