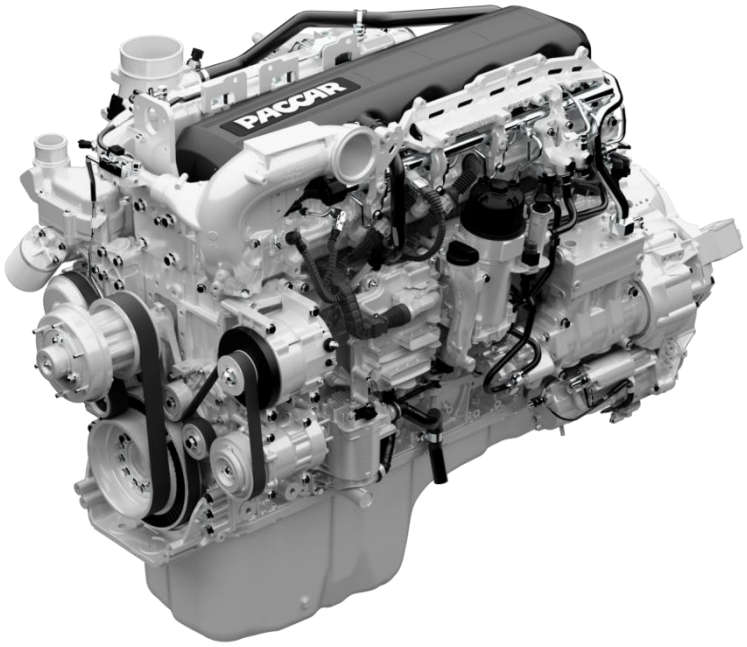
PACCAR MX

Programming Guide

EPA 2017

MX-11



MX-13

PEC017
5/3/2018

Table of Contents

1.0 Introduction

The purpose of this guide is to help dealers assist customers in making informed decisions regarding the programming of their 2017 model year engine.

2.0 References

PACCAR Vehicle Pro (PVP) is a North American software application used for making changes or adjusting engine parameters.

3.0 How to Read This Document

The programming guide is divided into several sections; each section represents a programmable feature offered with the engine. The sections are divided into subsections to organize the details of each feature: Overview, Standard Feature, Feature Options, Orderable Feature & Options, Programmable Parameters, Nonprogrammable Parameters, ON/OFF Requirements, Activate/Deactivate Requirements, and Additional Information.

Overview

The feature is summarized focusing on the customer benefits, options, and functionality.

Standard Feature

This subsection provides details of the stock or standard feature available with the engine.

Feature Options

This subsection provides details of the optional features available with the engine.

Orderable Feature Options & Sales Codes

Features and options that require action during the ordering or the aftermarket parameter setting change processes are detailed in a reference table. The table is divided into three columns: Feature and Peterbilt/Kenworth Sales Codes. The “Feature” column identifies the feature. The “Sales Code” columns provide the division-specific sales code used to identify a feature option during the ordering process.

Feature	KENWORTH®	Peterbilt
Feature Name	**Kenworth Sales Code**	**Peterbilt Sales Code**

Programmable Parameters

Some features have individual parameters that are customizable; the details of these programmable parameters are given in a reference table. The reference table is divided into three columns: “Parameter Name,” “Number,” and “Min/Max/Default/Unit”. The “Number” column references a code number to identify the parameter during the ordering or the aftermarket parameter setting change processes. The “Min/Max/Default/Unit” column defines the minimum and maximum values of the parameter setting. If the parameter is not altered during specification of the vehicle, the default setting is delivered from the factory. The units associated with a parameter are labeled after the value of the parameter.

N-Code	Page Number	Min	Default	Max	Units
Parameter Name		Minimum	Default	Maximum	Units
* Explanatory notes or potential programming conflicts/requirements					

Nonprogrammable Parameters

Unchangeable parameters, also known as nonprogrammable parameters, are used to assist in the explanation of a feature. A reference table is provided which is divided into two columns: “Parameter Name” and “Default/Unit”. The “Parameter Name” column identifies the parameter. The “Default/Unit” column defines the default or standard value and unit associated with it.

Parameter Name	Default/Units
Parameter Name	DEFAULT = Value (Unit)

ON/OFF Requirements

To define when a feature is enabled/ON or disabled/OFF, a reference table is used to detail the required conditions. The table is divided into two columns: ON and OFF. In each column, there is a list of conditions that must be met for the feature to be ON or OFF. In addition, both columns include a stipulation of “All” or “Any” in parentheses. “All” indicates that every condition listed in the column is required to turn the feature ON or OFF. “Any” indicates that only one of the conditions listed in the column is required to turn the feature ON or OFF.

ON (All/Any)	OFF (All/Any)
Setting	Setting

4.0 Engine Ratings

Overview

The engine rating states the peak power and torque of the engine. The engine is available with several power ratings, allowing the engine to provide the correct amount of power to complete the job while limiting the torque within driveline component limitations. Increasing the power rating may put main driveline components at risk for premature wear or damage.

Two MX-13 ratings and one MX-11 rating are available with Multi-Torque; these ratings are identified by the **MT** in the option name. Multi-Torque engine ratings provide an increased maximum torque output in the top two gears of rated transmissions. The increased torque delivery from Multi-Torque is represented in Graph 4.2 and Graph 4.4 as dashed lines.

Two refuse engine configurations are available for the MX-11, which provide specific turbocharger and engine brake control strategies to allow for quieter operation.

MX-13 Standard Feature

Maximum Horsepower	Maximum Torque
405 HP @ 1,600 RPM	1,450 lbf-ft @ 900 RPM

MX-13 Feature Options

Maximum Horsepower	Maximum Torque
405 HP @ 1,600 RPM	1,450 lbf-ft @ 900 RPM
MT 430 HP @ 1,600 RPM	1,450 - 1,650 lbf-ft @ 900 RPM
430 HP @ 1,600 RPM	1,550 lbf-ft @ 900 RPM
MT 455 HP @ 1,600 RPM	1,550 / 1,750 lbf-ft @ 900 RPM
455 HP @ 1,600 RPM	1,650 lbf-ft @ 900 RPM
485 HP @ 1,600 RPM	1,650 lbf-ft @ 1,000 RPM
510 HP @ 1,600 RPM	1,850 lbf-ft @ 1,000 RPM

Note: Due to differences in engine hardware on the MX-13, re-rating engine horsepower cannot be performed between engines with ratings of 455 HP or less and engines of 485 HP or more.

MX-11 Standard Feature

Maximum Horsepower	Maximum Torque
385 HP @ 1600 RPM	1,450 lbf-ft @ 1000 RPM

MX-11 Feature Options

Maximum Horsepower	Maximum Torque
335 HP @ 1,600 RPM	1,150 lbf-ft @ 900 RPM
355 HP @ 1,600 RPM	1,250 lbf-ft @ 900 RPM
REFUSE 355 HP @ 1,600 RPM	1,250 lbf-ft @ 900 RPM
375 HP @ 1,600 RPM	1,350 lbf-ft @ 900 RPM
400 HP @ 1,600 RPM	1,450 lbf-ft @ 900 RPM
REFUSE 400 HP @ 1,600 RPM	1,450 lbf-ft @ 900 RPM
415 HP @ 1,600 RPM	1,550 lbf-ft @ 900 RPM
MT 430 HP @ 1,600 RPM	1,450 - 1,650 lbf-ft @ 900 RPM
430 HP @ 1,600 RPM	1,650 lbf-ft @ 900 RPM

MX-13 Orderable Options & Sales Codes

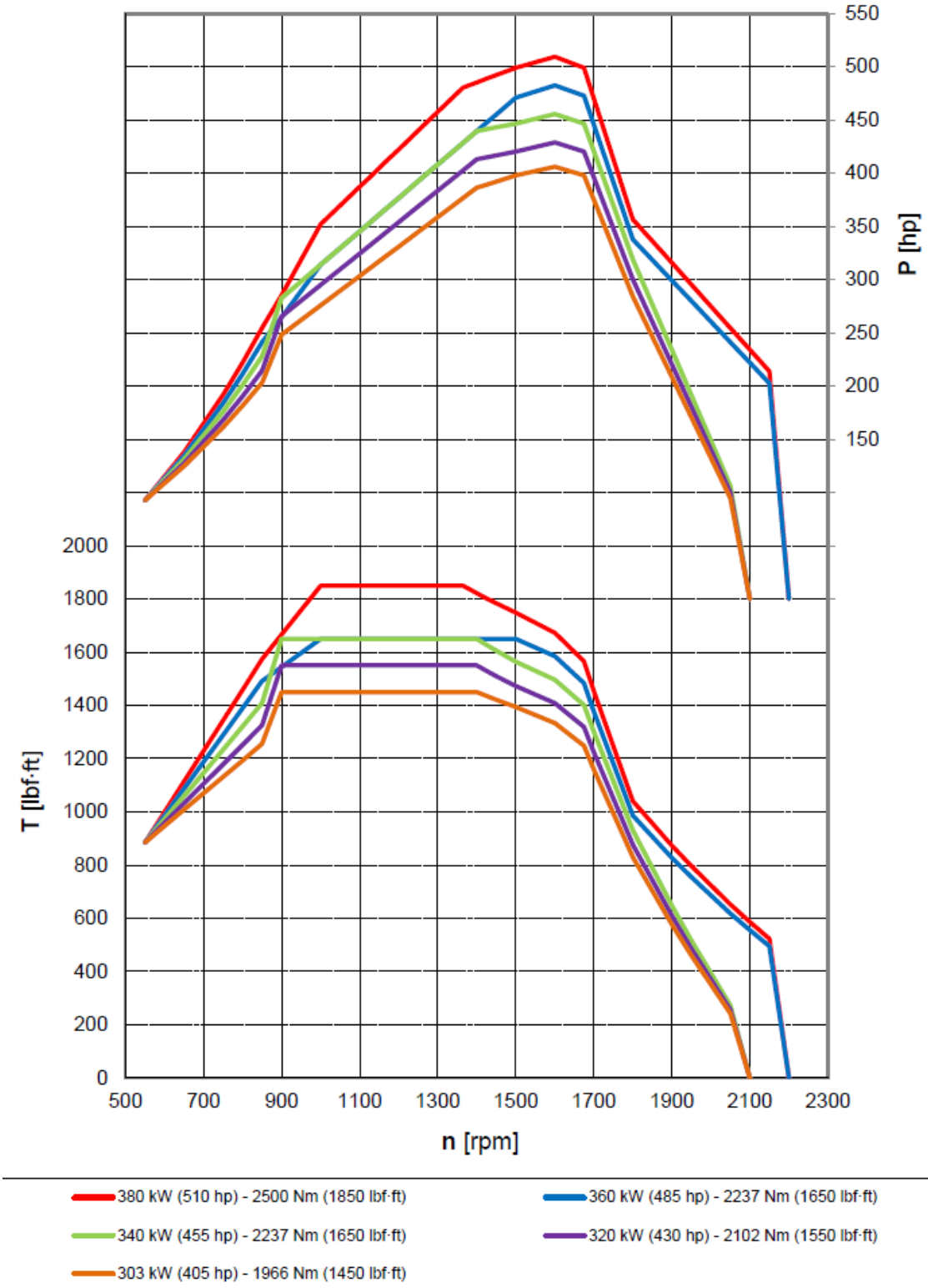
Feature	KENWORTH	Peterbilt
405 HP / 1,450 lbf-ft	**0700607**	**2072717**
MT 430 HP / 1,450-1,650 lbf-ft	**0700633**	**2072718**
430 HP / 1,550 lbf-ft	**0700632**	**2072719**
MT 455 HP / 1,550-1,750 lbf-ft	**0700657**	**2072822**
455 HP / 1,650 lbf-ft	**0700656**	**2072820**
485 HP / 1,650 lbf-ft	**0700686**	**2072823**
510 HP / 1,850 lbf-ft	**0700701**	**2072824**

MX-11 Orderable Options & Sales Codes

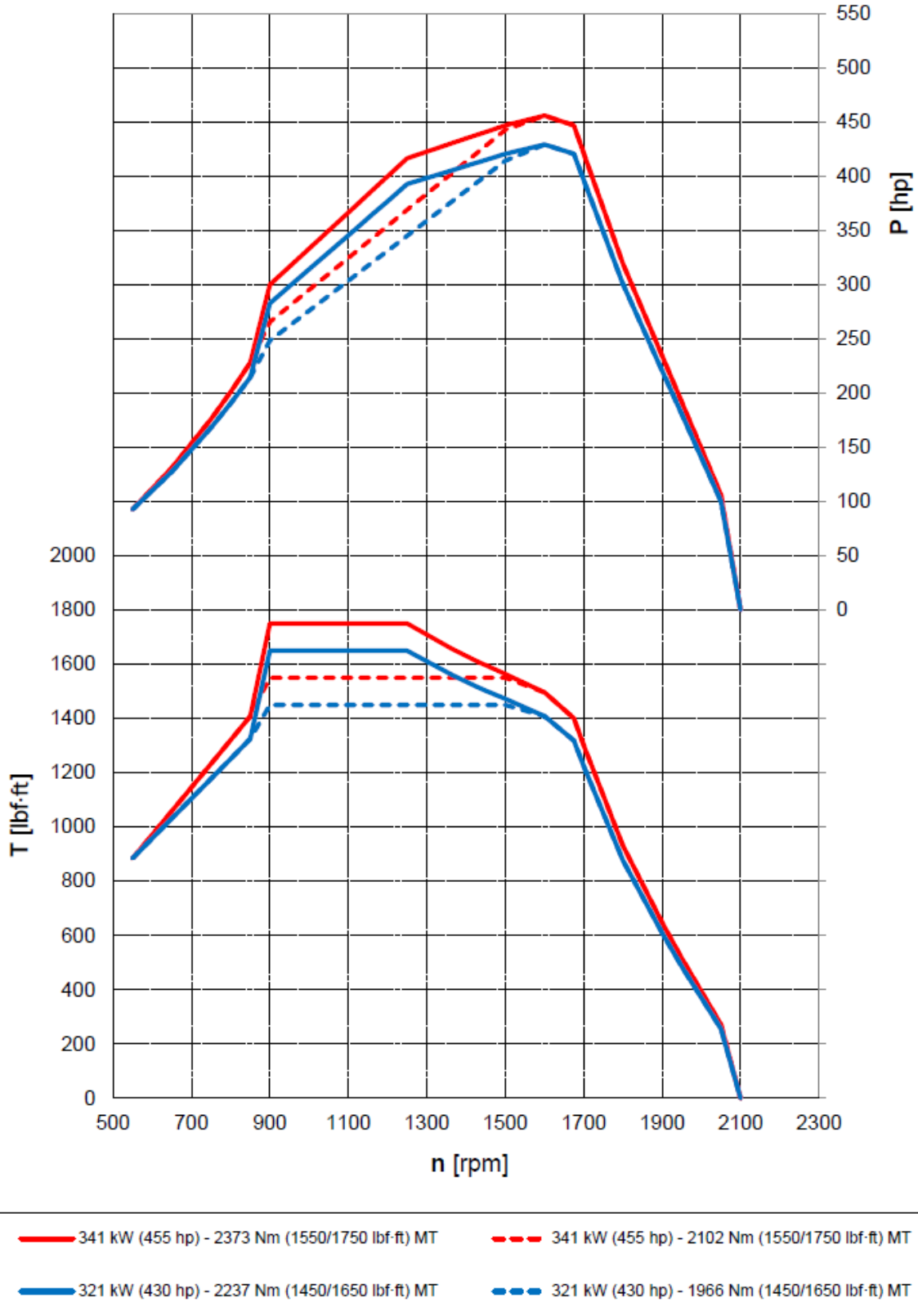
Feature	KENWORTH	Peterbilt
355 HP / 1,150 lbf-ft	**0700191**	**2072404**
355 HP / 1,250 lbf-ft	**0700192**	**2072504**
REFUSE 355 HP / 1,250 lbf-ft	**0700198**	**2072503**
375 HP / 1,350 lbf-ft	**0700193**	**2072607**
400 HP / 1,450 lbf-ft	**0700194**	**2072610**
REFUSE 400 HP / 1,450 lbf-ft	**0700199**	**2072608**
415 HP / 1,550 lbf-ft	**0700195**	**2072720**
MT 430 HP / 1,450 - 1,650 lbf-ft	**0700196**	**2072722**
430 HP / 1,650 lbf-ft	**0700197**	**2072723**

Additional Information

Graph 4.1 and Graph 4.2 show power and torque curves of the MX-13 engine.

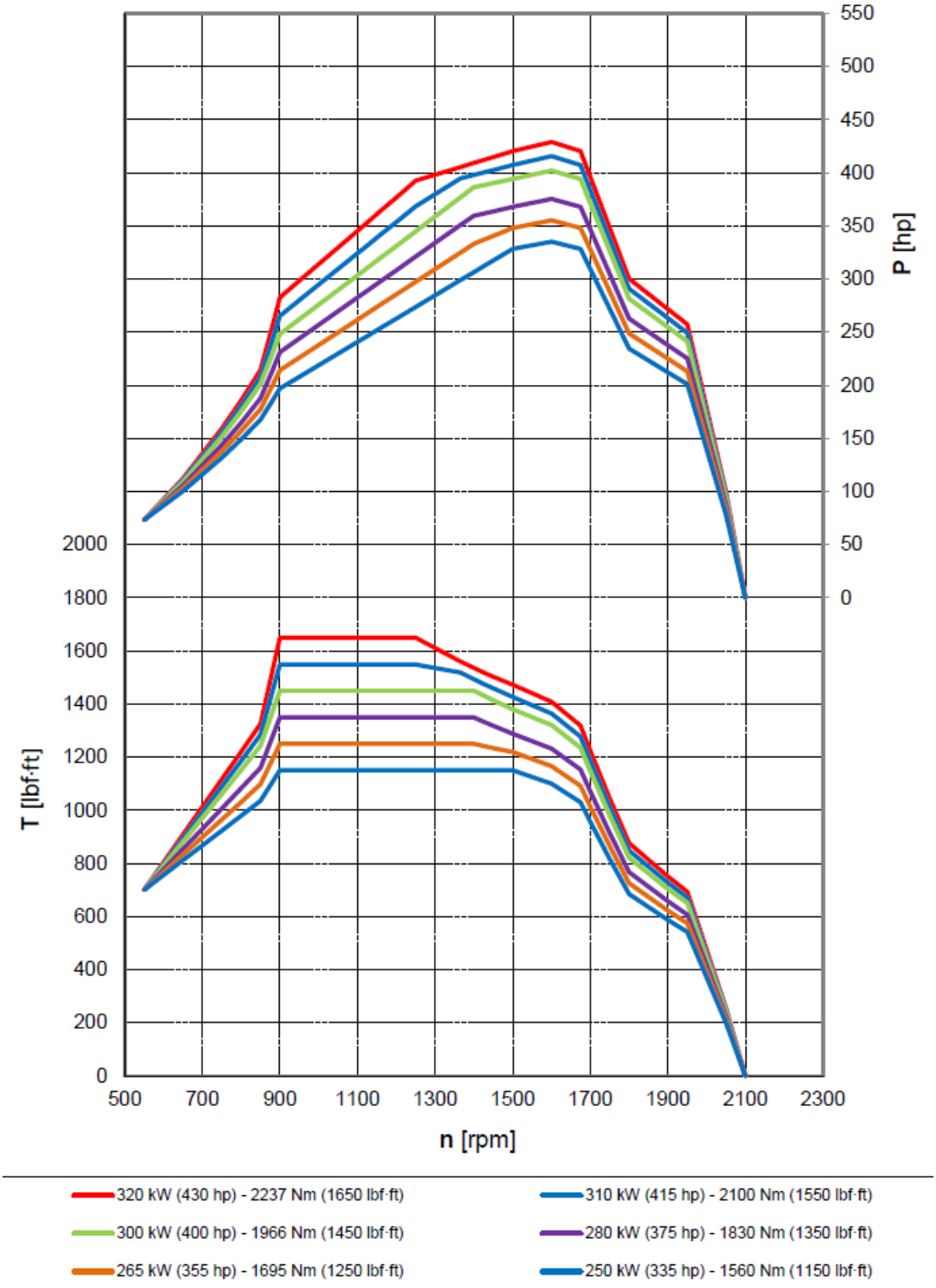


Graph 4.1 – MX-13 Power and Torque Curves for Standard Ratings

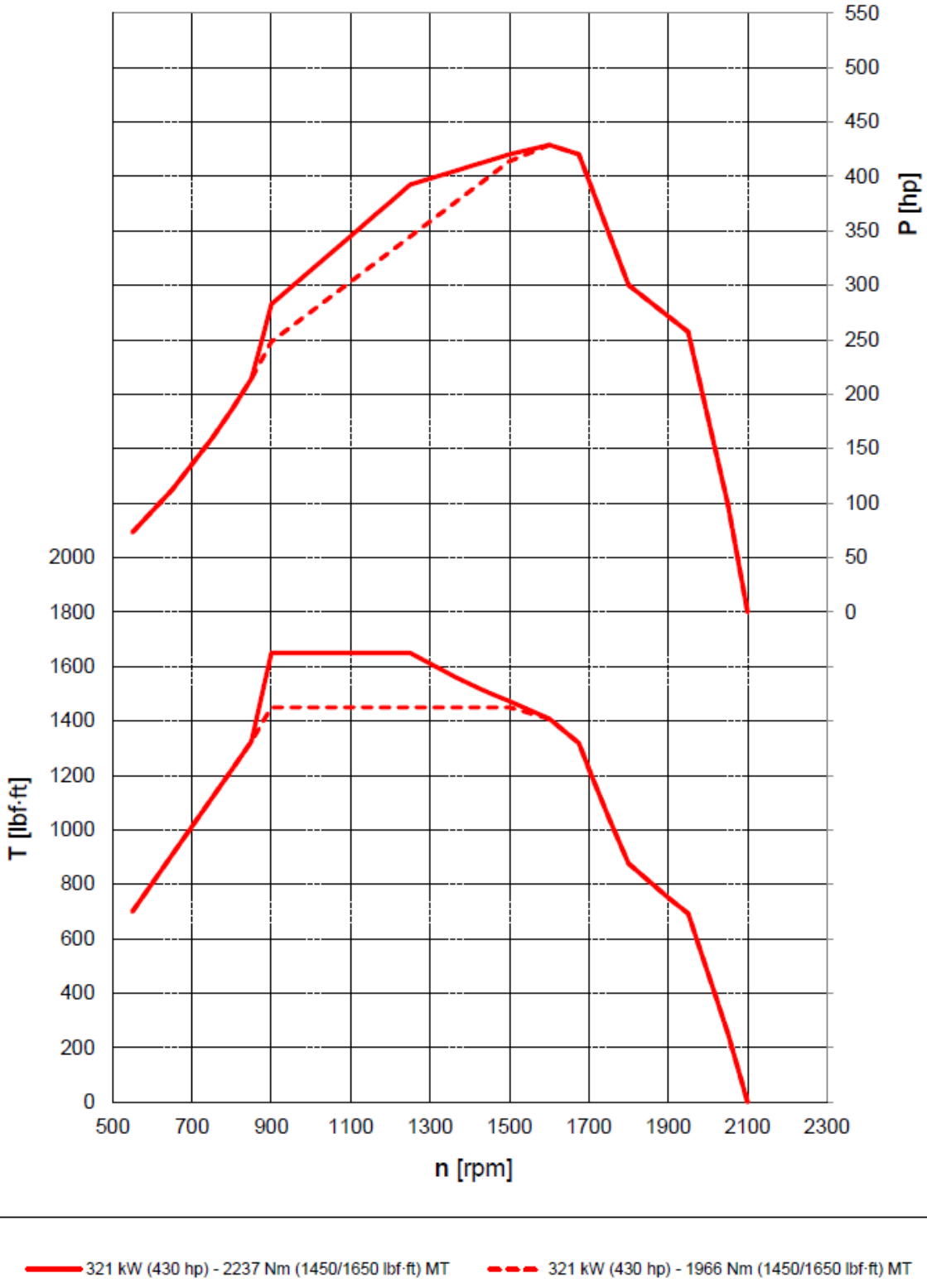


Graph 4.2 - MX-13 Power and Torque Curves for Multi-Torque Ratings

Graph 4.3 and Graph 4.4 show power and torque curves of the MX-11 engine.



Graph 4.3 – MX-11 Power and Torque Curves



Graph 4.4 - MX-11 Power and Torque Curves for Multi-Torque Ratings

5.0 General Settings

Overview

Basic engine parameters

Standard Feature

- High Exhaust System Temperature (HEST) Warning
- Fuel Density

The High Exhaust System Temperature (HEST) warning indicator allows the engine to inform the driver when the exhaust temperature exceeds *HEST Warning Temperature Activation Limit* and the vehicle speed is less than *Minimum Speed for High Exhaust Temp Warning (N065).* The warning indicator will turn off once the exhaust temperature falls below the *HEST Warning Temperature Deactivation Limit.*

Fuel Density (N051) allows the customer to reprogram the engine controller with a fuel density that more precisely represents the local fuel variation used in their vehicles, which will improve the accuracy of the controller's calculated fuel economy.

Programmable Parameters

HEST Warning

N065	Page 12	Min	Default	Max	Units
Minimum Speed for High Exhaust Temp Warning		5	5	50	MPH

Fuel Density

N051	Page 12	Min	Default	Max	Units
Fuel Density		780	855	950	g/L

Nonprogrammable Parameters

HEST Warning

Parameter Name	Default/Units
HEST Warning Temperature Activation Limit	DEFAULT = 842 °(F)
HEST Warning Temperature Deactivation Limit	DEFAULT = 833 °(F)

Activate/Deactivate Requirements

HEST Warning

ON (All)	OFF (Any)
Exhaust Temperature > HEST Warning Temperature Activation Limit	Exhaust Temperature < HEST Warning Temperature Deactivation Limit
Vehicle speed < HEST Warning Minimum Vehicle Speed	Vehicle speed > HEST Warning Maximum Vehicle Speed

Additional information

HEST Warning on the Driver Display

Figure 5.1 shows an example of the indicator on the driver display when the HEST warning is ON.

Figure 5.1 – HEST Warning Light

6.0 Idle Settings

Engine Idle Speed

Overview

Engine Idle Speed (N052) defines the minimum engine operating speed. The engine idle speed is defaulted to 650 RPM from the factory, and is adjustable to a maximum speed of 700 RPM.

Programmable Parameters

N052	Page 14	Min	Default	Max	Units
Engine Idle Speed		650	650	700	RPM

Engine Idle Shutdown Timer (EIST)

Overview

The engine Idle Shutdown Timer (EIST) is a valuable tool fleet owners may use to impose limits on engine idling time to improve overall fuel economy. The EIST has several customizable options to meet the needs of any application. EIST may be overruled by fuel temperature or engine coolant and oil temperature for uninterrupted engine warm-up intervals and allows for separate timer intervals dependent on the engagement of the parking brake. EIST may also be configured with an independent timer or disabled completely while the engine is in Power Take-Off (PTO) mode.

Standard Feature

- EIST
- EIST Low Battery Voltage Overrule

EIST initiates when engine speed is at idle, the vehicle is stationary, and the accelerator pedal is motionless or not depressed. Within the standard feature, there are many programmable parameters:

- Timer Durations and Enablement Conditions
- Coolant, Oil, and Fuel Temperature Overrule
- Programmable resets

Idle Time w/ Parking Brake Set (N187) specifies the timer duration until the engine shuts down while the parking brake is engaged, while *Idle Time w/ Parking Brake Released (N188)* specifies the timer duration until the engine shuts down while the parking brake is disengaged. Once the timer has expired, a warning message in the truck's driver display will indicate that shutdown is imminent. *Idle Timer Shutdown Warning Duration (N194)* determines the duration of the idle shutdown timer warning before the engine is shut down. *Allow Idle Timer Reset During Warning (N178)* specifies if the driver will be able to reset the idle timer by performing one of the programmable reset conditions during the idle shutdown warning period. Otherwise,

the driver may reset the idle timer at any time by performing one of the programmable reset conditions.

Temperature Overrules are available to allow the engine to idle while coolant, oil and fuel temperatures are below calibrated settings.

Programmable Resets are signals from equipment on the vehicle that the driver actuates. The resets can be turned ON or OFF. If the reset is ON when the equipment is actuated, the EIST counter will restart. Programmable resets may only occur once the driver has received notification of an impending shutdown on the driver display. For example, when the EIST is set to 5 minutes with the accelerator pedal reset ON and the vehicle idling for 4 minutes, a message of an impending shutdown will appear on the driver display and an actuation of the accelerator pedal will reset the timer and delay the engine's shutdown for another 5 minutes (total idle time is 9 minutes). The following is a list of programmable reset conditions:

- *Enable Idle Timer Accelerator Pedal Reset (N197)*
- *Enable Idle Timer Service Brake Reset (N198)*
- *Enable Idle Timer Clutch Pedal Reset (N199)*
- *Enable Idle Timer Reset from Park Brake (N179)*
- *Enable Idle Timer Reset from Engine Load (N190)*

Feature Options

- Ambient Air Temperature Override
- Engine Load Override
- Engine Idle Shutdown Timer in PTO Mode

Ambient Air Temperature Override allows the engine to maintain operation without shutdown when the temperature is above *Idle Timer High Ambient Temp Threshold (N184)* or below *Idle Timer Low Ambient Temp Threshold (N185)*. The idle shutdown timer will also be disabled when the coolant temperature is below *Idle Timer Low Coolant Temperature Override Threshold (N182)*.

EIST Engine Load Override allows the engine to maintain operation without shutdown when the engine load is *above Idle Timer Engine Load Threshold (N183)*. *Enable Idle Timer Override from Engine Load (N191)* is only available when *Enable Idle Timer Reset from Engine Load (N190)* is turned OFF. This feature is not available with EIST in PTO Mode.

EIST may be configured to operate while the engine is in PTO Mode, and the timer duration may be set with *Idle Time in PTO Mode (N186)*. The same conditions must be met for the EIST to shutdown the engine.

If preferred EIST settings are selected during the ordering process, the customer will be unable to make changes to EIST timer durations or overrides until the vehicle has exceeded *Idle Timer Expiration Distance (N193)*.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Enable Engine Idle Shutdown Timer	**1000857**	**2091305**
Disable Engine Idle Shutdown Timer	**1000858**	**2091310**
Enable Idle Shutdown Timer in PTO Mode	**1000860**	**2091320**
Enable Idle Timer Ambient Temperature Overrule	**1000859**	**2091315**
Enable Idle Timer Battery Voltage Overrule	**8178354**	**7331000**

Programmable Parameters

EIST

N178	Page 14	Min	Default	Max	Units
Allow Idle Timer Reset During Warning		OFF (0)	ON (1)	ON (1)	ON/OFF
N187	Page 14	Min	Default	Max	Units
Idle Time w/ Parking Brake Set		1	5	1092	MIN
N188	Page 14	Min	Default	Max	Units
Idle Time w/ Parking Brake Released		1	5	1092	MIN
N193	Page 15	Min	Default	Max	Units
Idle Timer Expiration Distance		0	500,000	1,259,000	MILES
N194	Page 14	Min	Default	Max	Units
Idle Timer Shutdown Warning Duration		30	60	255	SEC

EIST Resets and Overrides

N179	Page 16	Min	Default	Max	Units
Enable Idle Timer Reset from Park Brake		OFF (0)	ON (1)	ON (1)	ON/OFF

N182	Page 15	Min	Default	Max	Units
Idle Timer Low Coolant Temperature Override Threshold		2	30	260	°F
N183	Page 15	Min	Default	Max	Units
Idle Timer Engine Load Threshold		0	35	100	%
N184	Page 15	Min	Default	Max	Units
Idle Timer High Ambient Temp Threshold		-40	80	490	°F
N185	Page 15	Min	Default	Max	Units
Idle Timer Low Ambient Temp Threshold		-40	39	490	°F
N190	Page 15	Min	Default	Max	Units
Enable Idle Timer Reset from Engine Load		OFF (0)	ON (1)	ON (1)	ON/OFF
* Requires *Enable Idle Timer Override from Engine Load (N191)* to be disabled					
N191	Page 15	Min	Default	Max	Units
Enable Idle Timer Override from Engine Load		OFF (0)	ON (1)	ON (1)	ON/OFF
* Requires *Enable Idle Timer Reset from Engine Load (N190)* to be disabled * Not Available in PTO Mode					
N197	Page 15	Min	Default	Max	Units
Enable Idle Timer Accelerator Pedal Reset		OFF (0)	ON (1)	ON (1)	ON/OFF
N198	Page 15	Min	Default	Max	Units
Enable Idle Timer Service Brake Reset		OFF (0)	ON (1)	ON (1)	ON/OFF
N199	Page 15	Min	Default	Max	Units
Enable Idle Timer Clutch Pedal Reset		OFF (0)	ON (1)	ON (1)	ON/OFF

EIST with PTO Mode

N186	Page 15	Min	Default	Max	Units
Idle Time in PTO Mode		1	5	1092	MIN

Non-Programmable Parameters

Parameter Name	Number	Min/Max/Default/Units
EIST Low Oil Temperature Overrule Limit	N195	DEFAULT = 30 °(F)
EIST Low Fuel Temperature Overrule Limit	N196	DEFAULT = 23 °(F)

Note Regarding Preferred Settings

If the customer accepts the preferred EIST settings within Prospector, they will be unable to make changes to the following parameters until they exceed the expiration distance specified on the order:

- Timer Setting Non-PTO Mode With Park Brake Set
- Timer Setting PTO Mode w/o Park Brake Set
- Expiration Distance
- Reset EIST Timer Based on Engine Load
- Low Ambient Temperature Overrule
- High Ambient Temperature Overrule
- Overrule EIST Timer Based on Engine Load – No Shutdown

ON/OFF Requirements

EIST

ON	OFF
EIST Enabled	EIST Disabled
Vehicle Speed = 0 MPH	Vehicle Speed > 0 MPH

Outside Ambient Air Temperature Override

ON	OFF
Enable Ambient Overrule Temperature = Yes	Enable Ambient Overrule Temperature = No

EIST with PTO Mode

ON	OFF
Allow EIST Timer Overrules in PTO Mode = Yes	Allow EIST Timer Overrules in PTO Mode = No

Engine Load Override

ON	OFF
Overrule EIST Timer Based on Engine Load – No Shutdown = Yes	Overrule EIST Timer Based on Engine Load – No Shutdown = No

Activate/Deactivate Requirements

EIST

Activate (All)	Deactivate (Any)
EIST Idle Time Limit Elapsed	EIST Idle Time Reset
	EIST Idle Time Overruled

Outside Ambient Air Temperature Override

Activate (Any)	Deactivate (All)
Outside ambient air temperature **<** Low Ambient Air Temperature Overrule	Outside ambient air temperature **>** Low Ambient Air Temperature Overrule
Outside ambient air temperature **>** High Ambient Air Temperature Overrule	Outside ambient air temperature **<** High Ambient Air Temperature Overrule

EIST with PTO Mode

Activate (All)	Deactivate (Any)
All EIST Conditions	All EIST Conditions
Timer Setting When in PTO Elapsed	Timer Setting When in PTO Mode Reset
	Timer Setting When in PTO Mode Overruled

Engine Load Override

Activate	Deactivate
Engine Load **>** Engine Load Threshold	Engine Load **<** Engine Load Threshold

Additional Information

The EIST will be overruled if any of the following conditions are present:

- Coolant temperature is lower than Idle Timer Low Coolant Temperature Override Threshold (N182)
- Oil temperature is lower than *EIST Low Oil Temp Limit*
- Fuel temperature is lower than *EIST Low Fuel Temp Limit*
- Ambient temperature is less than Idle Timer Low Ambient Temp Threshold (N185)
- Ambient temperature is greater than Idle Timer High Ambient Temp Threshold (N184)
- Engine load is greater than Idle Timer Engine Load Threshold (N183), if enabled
- DPF regeneration is in progress
- The engine is in Service Mode

Figure 6.1 shows how the low coolant temperature limit and low and high ambient air temperature limits (if enabled) will affect the EIST.

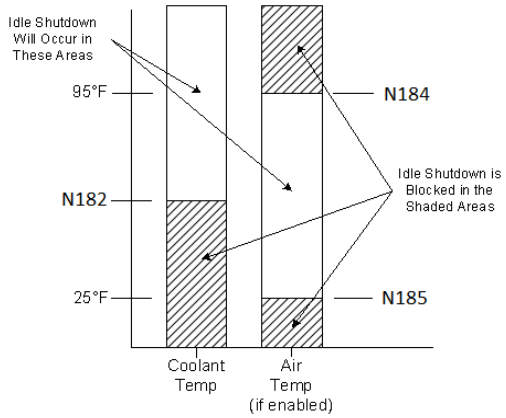


Figure 6.1 – EIST Coolant and Ambient Air Temperature Limits

EIST Shutdown on the Driver Display

Figure 6.2 and Figure 6.3 show examples of indication screens after the engine is about to be shutdown by the EIST.

Figure 6.2 – Small Display: Left:Kenworth, Right: Peterbilt

Figure 6.3 – Large Display: Left:Kenworth, Right: Peterbilt

Figure 6.4 and Figure 6.5 show examples of indication screens when the EIST is overruled.

Figure 6.4 – Small Display: Left:Kenworth, Right: Peterbilt

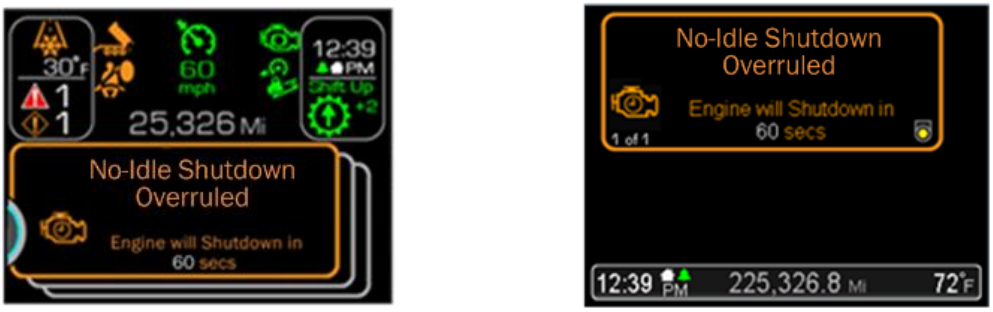


Figure 6.5 – Large Display: Left:Kenworth, Right: Peterbilt

Fast Idle Control (FIC)

Overview

The Fast Idle Control (FIC) functionality allows adjustment of engine idle speed within preprogrammable limits. This allows the driver to adapt to changing engine speed requirements. For example, the driver can raise engine speed for faster engine warm-up on a cold day. Raising the idle can improve HVAC performance in extreme conditions while parked, and may be helpful for other service operations such as charging the batteries or air system. Fleet managers may find that altering some of the FIC settings may yield better fuel economy when the application requires extended idle operations. The FIC module allows a fleet owner to set limits in order to enhance overall operating economy. FIC is a standard feature of the engine, but can be disabled to ensure that engine idle speed cannot be altered.

The default FIC settings are useful for the majority of applications, so modifications of the default settings typically are not necessary. Before changing the default parameters, it is strongly recommended to consult the customer and/or body builder to determine the specific vehicle application.

Standard Feature

- FIC

FIC becomes active and allows the driver to control the engine speed with the Set/Accel and Resume/Decel switches when all of the following conditions are met:

- The Cruise Control switch is in the ON position
- The vehicle is stationary
- The transmission is in neutral
- The parking brake is set

FIC may be enabled or disabled with *Enable Fast Idle Control (N071)* and the maximum FIC engine speed can be limited by *Maximum Engine Speed in Fast Idle Control (N072)*.

FIC will be overruled if the accelerator pedal request exceeds the FIC request, at which point the accelerator pedal will control engine speed. FIC will automatically deactivate if the clutch pedal or the service brake pedal are depressed.

The Set/Accel switch allows the driver to increase the engine speed. When FIC is active and the Set/Accel switch is pressed, the engine speed will increase by *Engine Speed Ramp-Up w/ Set/Accel (N107)*. When FIC is active and the Set/Accel switch is pressed and held, the engine speed will increase at *Engine Speed Increase w/ Set/Accel (N103)*.

The Resume/Decel switch allows the driver to decrease the engine speed. When FIC is active and the Resume/Decel switch is pressed, the engine speed will decrease by *Engine Speed Ramp-down w/ Res/Decel (N105)*. When FIC is active and the Resume/Decel switch is pressed and held, the engine speed will decrease at *Engine Speed Decrease w/ Res/Decel (N104)*.

Programmable Parameters

N071	Page 22	Min	Default	Max	Units
Enable Fast Idle Control		OFF (0)	ON (1)	ON (1)	ON/OFF
N072	Page 22	Min	Default	Max	Units
Maximum Engine Speed in Fast Idle Control		650	1900	1900	RPM
N103	Page 22	Min	Default	Max	Units
Engine Speed Increase w/ Set/Accel		10	250	1000	RPM
N104	Page 22	Min	Default	Max	Units
Engine Speed Decrease w/ Res/Decel		10	250	1000	RPM
N105	Page 22	Min	Default	Max	Units
Engine Speed Ramp-down w/ Res/Decel		10	100	1900	RPM/SEC
N107	Page 22	Min	Default	Max	Units
Engine Speed Ramp-Up w/ Set/Accel		10	100	1900	RPM/SEC

ON/OFF Requirements

ON (All)	OFF (Any)
CC switch is in the ON position	CC switch is in the OFF position
Parking brake is set	Parking brake is not set
Vehicle speed = Stationary	Vehicle speed = Non-Stationary
Transmission is in neutral if equipped	Transmission is not in neutral if equipped
Clutch pedal is NOT depressed if equipped	Clutch pedal is depressed if equipped
Service brake pedal is NOT depressed	Service brake pedal is depressed

7.0 Fan Clutch Control

Overview

The Fan Clutch Control controls the fan clutch based on various engine temperatures.

Standard Feature

- Fan Clutch Control

Fan Clutch Control allows the engine to control the fan clutch based on coolant, charge air cooler, and power steering fluid temperatures. These temperatures are not programmable.

Feature Options

- Minimum Fan Clutch Engagement Time

Minimum Fan Clutch Engagement Time (N057) allows customization of the minimum amount of time the fan clutch is engaged before it can become disengaged.

Programmable Parameters

N057	Page 24	Min	Default	Max	Units
Minimum Fan Clutch Engagement Time		30	30	60	SEC

Additional Information

Fan Clutch Control on the RPM Gauge

Figure 7.1 shows an example of the Fan Indication on the RPM Gauge.

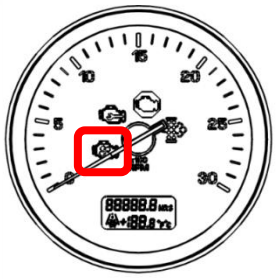


Figure 7.1 – Fan Indication (Kenworth Only)

8.0 Cruise Control (CC)

Overview

The Cruise Control (CC) functionality allows the driver to set a target vehicle speed and then adjust it within programmable limits. This allows the driver to adapt to changing vehicle speed requirements. For example, the driver can increase or decrease speed by briefly pressing or pressing and holding the Cruise Control switches on the dashboard or steering wheel. The vehicle must be within the programmed limits to activate and maintain Cruise Control.

The Cruise Control module allows a fleet owner to set preprogrammed limits in order to enhance overall operating economy. CC is a standard feature of the engine, and the default CC settings are useful for a majority of applications. Before changing the default parameters, it is strongly recommended to consult the customer and/or body builder to review the Cruise Control options.

Standard Feature

- Cruise Control
- Cruise Control ON/OFF switch
- Set/Accel switch
- Resume/Decel switch

CC regulates engine torque to maintain the desired vehicle speed. CC ON/OFF, Set/Accel, and Resume/Decel are in-cab switches that allow the driver to operate CC.

The CC ON/OFF switch allows the driver to control the vehicle speed if the switch is in the ON position. When the switch is in the OFF position, CC is deactivated and the engine will not automatically maintain an driver-desired vehicle speed.

The Set/Accel switch allows the driver to activate CC when the CC is ON, which assigns the current vehicle speed as the Cruise Control target speed. The vehicle speed must be at or above *Minimum Speed to Enable Cruise Control* (N002) to activate cruise control. While CC is active, the driver is free from having to control the vehicle speed using the accelerator pedal. While CC is actively controlling vehicle speed, briefly pressing the Set/Accel switch will cause the vehicle speed to increase by the value of *Vehicle Speed Increase w/Set/Accel (N005)*. While CC is actively controlling vehicle speed, and the Set/Accel switch is pressed and held, the vehicle will accelerate until the switch is released or the *Maximum Cruise Control Target Speed (N006)* is reached.

While Cruise Control is ON, the Resume/Decel switch allows the driver to activate CC and resume maintaining a previously set Cruise Control vehicle speed. The stored target vehicle speed is reset with an ignition key cycle. While CC is actively controlling vehicle speed, briefly pressing the Resume/Decel switch will cause the vehicle speed to decrease by the value of *Vehicle Speed Decrease w/Res/Decel (N004)*. While CC is actively controlling vehicle speed, and the Resume/Decel switch is pressed and held, the vehicle will decelerate until the switch is released or the *Minimum Cruise Control Target Speed (N003)* is reached. If the vehicle speed falls below *Minimum Speed to Disable Cruise Control (N001)*, then CC will become inactive.

Feature Options

- Adaptive Cruise Control (ACC)
- Cruise Control Multi-Torque Mode

Adaptive Cruise Control (ACC) can overrule CC in order to maintain a set following distance to a target vehicle. ACC is not described in this document. Refer to the Original Equipment Manufacturer's (OEM) documentation for a detailed description of ACC functionality.

For engines with a multi-torque engine rating, *Multi-Torque Only when Cruise Active (N039)* is an option that allows the fleet owner to specify when the extra torque available from the multi-torque rating will be available. When this option is enabled, the extra torque will only be available when the Cruise Control is actively controlling vehicle speed. When the Cruise Control Multi-Torque Mode is disabled, the extra torque will be available with or without Cruise Control.

Considerations

Programming for vehicles that are intended for mobile Power Take-Off (PTO) applications:

- N001 must be at least 6 MPH greater than PTO Maximum Vehicle Speed (N080)
- N002 must be at least 3 MPH greater than N001
- N003 must be greater than or equal to N002

Programmable Parameters

N001	Page 25	Min	Default	Max	Units
Minimum Speed to Auto-Deactivate Cruise Control		N080 + 6	16	87	MPH
* Must be at least 6 MPH greater than *PTO Mode Vehicle Speed Limit (N080)*					
N002	Page 25	Min	Default	Max	Units
Minimum Cruise Control Enable Speed		N001 + 3	19	90	MPH
* Must be at least 3 MPH greater than *Minimum Speed to Disable Cruise Control (N001)*					
N003	Page 25	Min	Default	Max	Units
Minimum Cruise Control Target Speed		N002	19	93	MPH
* Must be greater than or equal to *Minimum Speed to Enable Cruise Control (N002)*					

N004	Page 25	Min	Default	Max	Units
Vehicle Speed Decrease from Resume/Decel Switch Press		1	1	6	MPH
N005	Page 25	Min	Default	Max	Units
Vehicle Speed Decrease from Resume/Decel Switch Press		1	1	6	MPH
N006	Page 25	Min	Default	Max	Units
Maximum Cruise Control Target Speed		25	64	100	MPH
N039	Page 26	Min	Default	Max	Units
Multi-Torque Only when Cruise Active		OFF (0)	OFF (0)	ON (1)	ON/OFF

ON/OFF Requirements

ON (All)	OFF (Any)
CC ON/OFF switch is ON	CC ON/OFF switch is OFF
CC initial status test passed	Parking brakes are set

Activate/Deactivate Requirements

Activate (Any)	Deactivate (Any)
CC Set/Accel switch is pressed	Clutch pedal is depressed if equipped
CC Res/Decel switch is pressed	Service brake pedal is depressed
	Trailer hand brake is actuated
	PACCAR Engine Brake manually operated
	Pause switch pressed if equipped
	Deceleration limit is exceeded
	Transmission in neutral if equipped
	Vehicle Stability Control (VSC) is active
	Actual vehicle speed is below minimum vehicle speed limit

Activate (Any)	Deactivate (Any)
	Maximum vehicle speed limit exceeded
	Maximum ASR time limit exceeded

Additional Information

Cruise Control on the Driver Display

Figure 8.1 and Figure 8.2 show examples of screens on the Driver Display when Cruise Control is active.

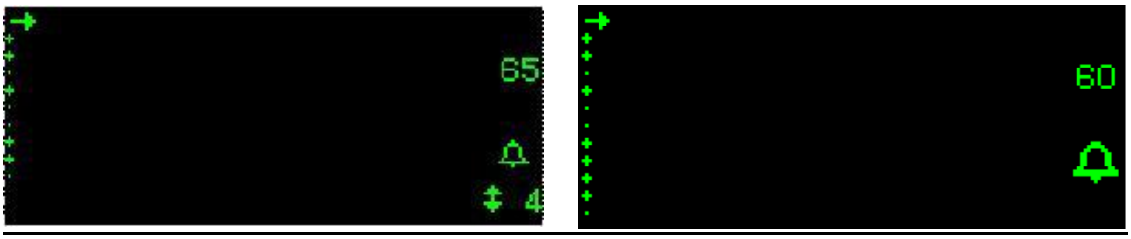


Figure 8.1 –Small Display; Left: Kenworth, Right: Peterbilt

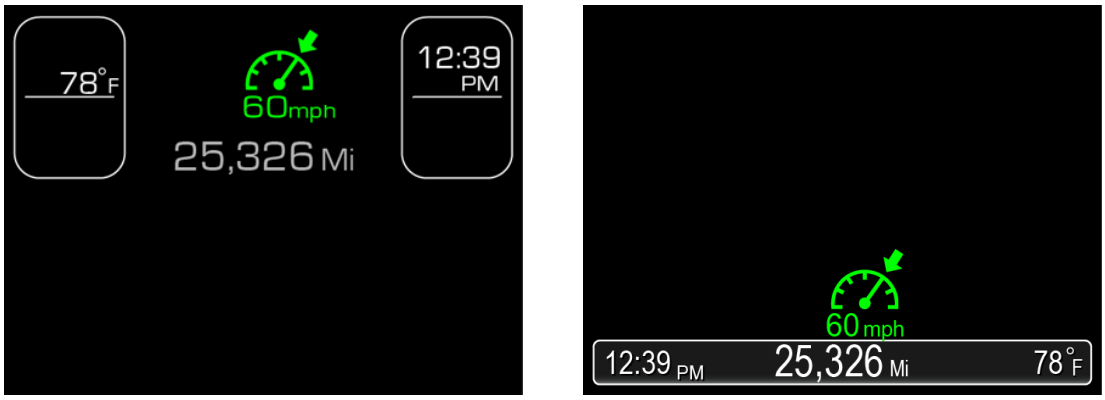


Figure 8.2 – Large Display; Left: Kenworth, Right: Peterbilt

9.0 Vehicle Speed Limiter

Overview

The Vehicle Speed Limiter functionality is designed to improve fuel economy by reducing the maximum vehicle speed and limiting the maximum vehicle acceleration.

Standard Feature

- Without Vehicle Speed Limiter

The speed of the vehicle will be limited to the maximum value of *Maximum Accelerator Pedal Vehicle Speed (N162)* or *Maximum Cruise Control Target Speed (N006)*.

Feature Options

- Vehicle Speed Limiter
- Vehicle Acceleration Limiter

Vehicle Speed Limiter

On Greenhouse Gas (GHG) compliant vehicles, *GHG Maximum Speed Limit (N170)* will limit the overall maximum speed of the vehicle, until the *GHG Expiration Distance (N169)* has been exceeded. The GHG expiration mileage is available in the chassis information within PVP, and may not be changed. For example, if Maximum *Accelerator Pedal Vehicle Speed (N162)* is set to 55 mph, *Maximum Cruise Control Target Speed (N006)* is set to 70 mph, and *Maximum Vehicle Speed Limit (N170)* is set to 64 mph, the vehicle can be driven to a maximum speed of 55 mph with the pedal. If Cruise Control is enabled the vehicle speed may be increased to a maximum of 64 mph, as the vehicle will not exceed the value of *Maximum Vehicle Speed Limit (N170)* when the engine is fueled.

For non-GHG compliant vehicles, or vehicles that have exceeded the GHG expiration mileage, *GHG Maximum Speed Limit (N170)* is ignored, allowing *Maximum Accelerator Pedal Vehicle Speed (N162)* and *Maximum Cruise Control Target Speed (N006)* to determine the overall maximum speed of the vehicle. Table 8.1 illustrates how the overall maximum vehicle speed is determined.

W/ Driver Reward (S218) & W/O GHG Maximum Speed Limit (N170)	
Driver Reward Offset Mode (N219)	Maximum Vehicle Speed Limit
1 (Pedal Control)	Maximum value of: Maximum Cruise Control Target Speed (N006) OR Maximum Accelerator Pedal Vehicle Speed (N162) + Driver Reward Maximum Bonus (N224)
2 (Cruise Control)	Maximum value of: Maximum Cruise Control Target Speed (N006) + Driver Reward Maximum Bonus (N224) OR Maximum Accelerator Pedal Vehicle Speed (N162)

3 (Pedal and Cruise Control)	Maximum value of: Maximum Accelerator Pedal Vehicle Speed (N162) + Driver Reward Maximum Bonus (N224) OR Maximum Cruise Control Target Speed (N006) + Driver Reward Maximum Bonus (N224)
W/ Driver Reward (S218) & W/ GHG Maximum Speed Limit (N170)	
Driver Reward Offset Mode (N219)	Maximum Vehicle Speed Limit
1 (Pedal Control)	GHG Maximum Speed Limit (N170) Requires: Maximum Accelerator Pedal Vehicle Speed (N162) + Driver Reward Maximum Bonus (N224) ≤ GHG Maximum Speed Limit (N170)
2 (Cruise Control)	GHG Maximum Speed Limit (N170) Requires: Maximum Cruise Control Target Speed (N006) + Driver Reward Maximum Bonus (N224) ≤ GHG Maximum Speed Limit (N170)
3 (Pedal and Cruise Control)	GHG Maximum Speed Limit (N170) Requires maximum value of: Maximum Accelerator Pedal Vehicle Speed (N162) + Driver Reward Maximum Bonus (N224) AND Maximum Cruise Control Target Speed (N006) + Driver Reward Maximum Bonus (N224) ≤ GHG Maximum Speed Limit (N170)
W/O Driver Reward (S218) & W/O GHG Maximum Speed Limit (N170)	
Driver Reward Offset Mode (N219)	Maximum Vehicle Speed Limit
0 (No Reward)	Maximum value of: Maximum Cruise Control Target Speed (N006) OR Maximum Accelerator Pedal Vehicle Speed (N162)
W/O Driver Reward (S218) & W/ GHG Maximum Speed Limit (N170)	
Driver Reward Offset Mode (N219)	Maximum Vehicle Speed Limit
0 (No Reward)	GHG Maximum Speed Limit (N170)

Table 8.1 – Determination of Maximum Vehicle Speed Limit

Vehicle Acceleration Limiter

The vehicle acceleration limiter's *Scale Acceleration Target (N296)* parameter may be modified from the NORMAL setting to increase performance or increase fuel economy. Selecting SLOW will decrease the vehicle's acceleration capabilities, while selecting FAST will increase the vehicle's acceleration capabilities over the NORMAL setting.

Programmable Parameters

N162	Page 29	Min	Default	Max	Units
Maximum Accelerator Pedal Vehicle Speed		25	64	155	MPH
N169	Page 29	Min	Default	Max	Units
GHG Expiration Distance		0	0	1,259,000	MILES
* Configurable in Prospector Only					
N170	Page 29	Min	Default	Max	Units
GHG Maximum Speed Limit		0	0	121	MPH
* Configurable in Prospector Only					
N296	Page 30	Min	Default	Max	Units
Scale Acceleration Target		SLOW	NORMAL	FAST	N/A

Note Regarding Preferred Settings

Customers will be unable to make changes to the following parameters until they exceed the expiration distance specified on the order if they accept the preferred VSL settings within Prospector:

- *GHG Maximum Speed Limit (N170)*
- *GHG Expiration Distance (N169)*

10.0 Engine Protection System

Overview

The Engine Protection System monitors the engine systems for conditions that might require the engine to either derate, or in some circumstances shut down. If any of the monitored conditions exceed Engine Protection System thresholds, the functionality will provide a visual warning to the driver. This warning allows the driver to adjust the operation of the vehicle to correct the condition. If the customer has selected either derate or shutdown, and the driver has not succeeded in correcting the condition, a derate or shutdown sequence will be initiated. Derate provides reduced engine performance to correct the engine condition. Shutdown will turn the engine off to prevent imminent failure.

Standard Configuration

- Derate

Derate allows the engine to provide a power reduction or a maximum engine speed limitation. If an engine is equipped with derate, once a visual warning is provided a derate will be implemented in an attempt to correct the condition and mitigate a potential failure. Once a derate request has been triggered, the derate will implement immediately.

Additional Configuration Options

- Warning
- Shutdown

Warning allows the engine to provide a visual indication that the Engine Protection System has detected a condition that could potentially cause an engine failure.

Shutdown allows the Engine Protection System to turn off the engine if the driver does not take action to correct the condition. When a shutdown request is triggered, the engine will shutdown in 60 seconds.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Engine Protection System Derate Only	**1000204**	**2092082**
Engine Protection System Derate with Warning	**1000202**	**2092081**
Engine Protection System Derate with Shutdown	**1000206**	**2092083**

Thresholds and Reactions

Thresholds	Value	"Warning" Reaction	"Derate" Reaction	"Shutdown" Reaction
Coolant Temperature Above	237 ˚F	Stop Engine Light	Stop Engine Light	Vehicle Speed Limit and Engine Shutdown
Coolant Level Below	0%	Stop Engine Light	Stop Engine Light	Vehicle Speed Limit and Engine Shutdown
Oil Pressure Below	9 psi	Stop Engine Light	Stop Engine Light	Vehicle Speed Limit and Engine Shutdown
Oil Temperature Above	266 ˚F	Stop Engine Light	Stop Engine Light	Vehicle Speed Limit and Engine Shutdown
Battery Voltage Below	6 V	Stop Engine Light	Stop Engine Light	Vehicle Speed Limit and Engine Shutdown
Coolant Pump Stall	-	Stop Engine Light	Torque Derate	Torque Derate
Aftertreatment Limp Home	Soot Load >8.2 g/L	Torque Derate	Torque Derate	Torque Derate and Vehicle Speed Limit
	Soot Load >9.2 g/L	Torque Derate	Torque Derate	Torque Derate and Vehicle Speed Limit
	Driving > 5 mph during HC Desorb Request	Torque Derate	Torque Derate	Torque Derate and Vehicle Speed Limit
Aftertreatment Shutdown Request	DOC Outlet > 800˚C **OR** DOC Outlet – DOC Inlet > 500˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown
	DOC Inlet > 687˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown
	DOC Outlet > 650˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown

Thresholds	Value	"Warning" Reaction	"Derate" Reaction	"Shutdown" Reaction
Aftertreatment Shutdown Request	DOC Outlet – DOC Inlet > 365˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown
	DPF Outlet – DOC Outlet > 540˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown
	DOC Outlet > 800˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown
	DPF Outlet > 687˚C **OR** DPF Outlet – DOC Outlet > 300˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown
	SCR Outlet > 650˚C	Torque Derate	Torque Derate	Torque Derate, Vehicle Speed Limit, and Engine Shutdown

Additional Information

Engine Protection System on the Driver Display

Figure 10.1 and Figure 10.2 show examples of Engine Protection System warning screens on the Driver Display.

Figure 10.1 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

Figure 10.2 – Large Display; Left: Kenworth, Right: Peterbilt

Figure 10.3 and Figure 10.4 show examples of Engine Protection System derate screens on the Driver Display.

Figure 10.3 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

Figure 10.4 – Large Display; Left: Kenworth, Right: Peterbilt

Figure 10.5 and Figure 10.6 show examples of Engine Protection System impending shutdown screens on the Driver Display.

Figure 10.5 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

Figure 10.6 – Large Display; Left: Kenworth, Right: Peterbilt

Figure 10.7 and Figure 10.8 show examples of Engine Protection System shutdown screens on the Driver Display.

Figure 10.7 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

Figure 10.8 - Large Display; Left: Kenworth, Right: Peterbilt

11.0 PACCAR Engine Brake

Overview

The PACCAR Engine Brake is a fully integrated engine compression brake that provides braking forces through the driveline. It reduces wear on the service brakes and improves vehicle control in deceleration events when active. The PACCAR Engine Brake operates using standard dash switches, and is customizable to meet the requirements of the driver or fleet.

Standard Feature

- PACCAR Engine Brake ON/OFF Switch
- Retarder Select Switch
- Manual Mode (both with cruise control turned ON and OFF)

The PACCAR Engine Brake ON/OFF switch allows the driver to turn retarder ON and OFF.

The default setting for the PACCAR Engine Brake is Manual Mode. Manual Mode allows the engine to provide braking when the PACCAR Engine Brake switch is in the ON position, the engine is not being fueled, and the cruise control is inactive. The driver may use the Retarder Select Switch to select from three levels of braking power: Low (33%), Medium (66%), and High (100%).

When the PACCAR Engine Brake switch is in the ON position, the driver will be notified by an indicator the driver display. Examples of the notification are provided in the *Additional Information* portion of this section.

Feature Options

- Engine Brake Engagement Delay
- Minimum Vehicle Speed to Enable Engine Brake
- Engine Brake Disable when Out of Gear
- Engine Brake Behavior When Cruise Control is ON:
    - Manual Mode
    - Coast Mode
    - Latch Mode
- Downhill Speed Control (Auto-Retard in Cruise Control)
- Downhill Speed Limiter (DSL)

The customer has the option to select from three operating modes for the PACCAR Engine Brake when the PACCAR Engine Brake ON/OFF switch is ON and cruise control is ON and inactive. The three operating modes are mutually exclusive of one another:

- Manual Mode is the default setting for the PACCAR Engine Brake when the PACCAR Engine Brake ON/OFF switch is ON and cruise control is ON and inactive. It behaves the same way as the Manual Mode described in Standard Features portion of this section.
- Coast Mode allows the engine to provide braking when the PACCAR Engine Brake ON/OFF switch is ON, the Cruise Control is ON and inactive, and the service brake is applied. The PACCAR Engine Brake will de-activate in Coast Mode when the service brake pedal is released or cruise control is activated.
- Latch Mode allows the engine to provide braking when the PACCAR Engine Brake ON/OFF switch is ON, cruise control is ON and inactive, and the service brake pedal is applied. Latch Mode will continue to provide braking after the service brake pedal is released and will de-activate when the accelerator pedal is applied or cruise control is activated.

The engine can be programmed to delay the activation of the engine brake, if needed, using *Time Delay for Retarder Activation (N019)*. For example, the driver may wish to deactivate Cruse Control by quickly pressing the brake pedal without activating the engine brake when using Coast or Latch mode. Specifying a delay would allow this to occur, but still provide engine braking when the driver presses the brake pedal for a prolonged period during a braking event. The engine brake may also be programmed to be disabled when the transmission is out of gear with *Engine Brake Disabled When Out of Gear (N015)* to assist the driver while shifting.

The engine brake will become disabled when the vehicle speed falls below *Minimum Vehicle Speed for Engine Brake Activation (N026).*

Downhill Speed Control allows the engine to provide braking when the PACCAR Engine Brake ON/OFF switch is ON, Cruise Control is active and the vehicle speed exceeds the Cruise Control target speed plus the *Auto-Retarder Vehicle Speed Offset (N014)*. A large offset will reduce engine brake usage, while a lower offset will increase engine brake usage. A lower offset is recommended for vehicles operating in steep terrain. Downhill Speed Control will deactivate when the vehicle speed has been reduced to the Cruise Control target speed or when Cruise Control is deactivated. Downhill Speed Control will function independently of all other PACCAR Engine Brake parameters.

The Downhill Speed Limiter (DSL) allows the engine to provide braking when the PACCAR Engine Brake ON/OFF switch is ON and the vehicle speed exceeds the *Maximum Accelerator Pedal Vehicle Speed (N162)* plus the *Downhill Speed Limiter Vehicle Speed Offset (N013)*, The Downhill Speed Limiter will function independently of all other PACCAR Engine Brake parameters.

In Manual Mode, the Downhill Speed Limiter will activate if the vehicle speed exceeds the *Maximum Accelerator Pedal Vehicle Speed (N162)* plus the *Downhill Speed Limiter Vehicle Speed Offset (N013)*. If the Downhill Speed Limiter is already active, the PACCAR Engine Brake power will be increased, but if the Downhill Speed Limiter is already at maximum capacity, the Downhill Speed Limiter will have no effect on the PACCAR Engine Brake. The Downhill Speed Limiter will automatically deactivate when the vehicle speed has been reduced to the *Maximum Accelerator Pedal Vehicle Speed (N162)*.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Engine Brake Behavior – Manual Mode	**1000282**	**2092027**
Engine Brake Behavior – Coast Mode	**1000283**	**2092028**
Engine Brake Behavior – Latch Mode	**1000284**	**2092029**
Downhill Speed Control – Auto-Retard	**1000285**	**2092075**
Downhill Speed Limiter	**1000287**	**2092077**

Programmable Parameters

Global

N015	Page 38	Min	Default	Max	Units
Engine Brake Disabled When Out of Gear		OFF (0)	ON (1)	ON (1)	ON/OFF
N019	Page 38	Min	Default	Max	Units
Time Delay for Retarder Activation		0.1	0.1	3	SEC
N026	Page 38	Min	Default	Max	Units
Minimum Vehicle Speed for Engine Brake Activation		1	1	30	MPH

Auto-Retard

N014	Page 38	Min	Default	Max	Units
Auto-Retarder Vehicle Speed Offset		2	4	6	MPH

Downhill Speed Limiter

N013	Page 38	Min	Default	Max	Units
Downhill Speed Limiter Vehicle Speed Offset		2	4	6	MPH

Activate/Deactivate Requirements

Global

Activate (All)	Deactivate (Any)
PACCAR Engine Brake ON/OFF switch is ON	ABS system is ON
Transmission (Manual) in gear if equipped	Engine speed is less than 1000 RPM
	PTO switch is in ON position
	Torque converter is not locked (Automatic) transmissions only)
	Accelerator pedal is depressed

Manual Mode (cruise control off)

Activate (All)	Deactivate (Any)
Cruise control OFF	Cruise control ON
Global engagement requirements met	Cruise control is active
	Global disengagement requirements met

Manual Mode (Cruise Control On)

Activate (All)	Deactivate (Any)
Cruise control ON	Cruise control is active
Accelerator pedal deactivated	Accelerator pedal is depressed
Global activation requirements met	Global deactivation requirements met

Coast Mode

Activate (All)	Deactivate (Any)
Cruise control ON	Cruise control OFF
Service brake pedal is depressed	Cruise control active
Global activation requirements met	Service brake pedal is released
	Global deactivation requirements met

Latch Mode

Activate (All)	Deactivate (Any)
Cruise control ON	Cruise control OFF
Service brake pedal is depressed	Cruise control active
Global activation requirements met	Accelerator pedal is depressed
	Global deactivation requirements met

Auto-Retard Mode

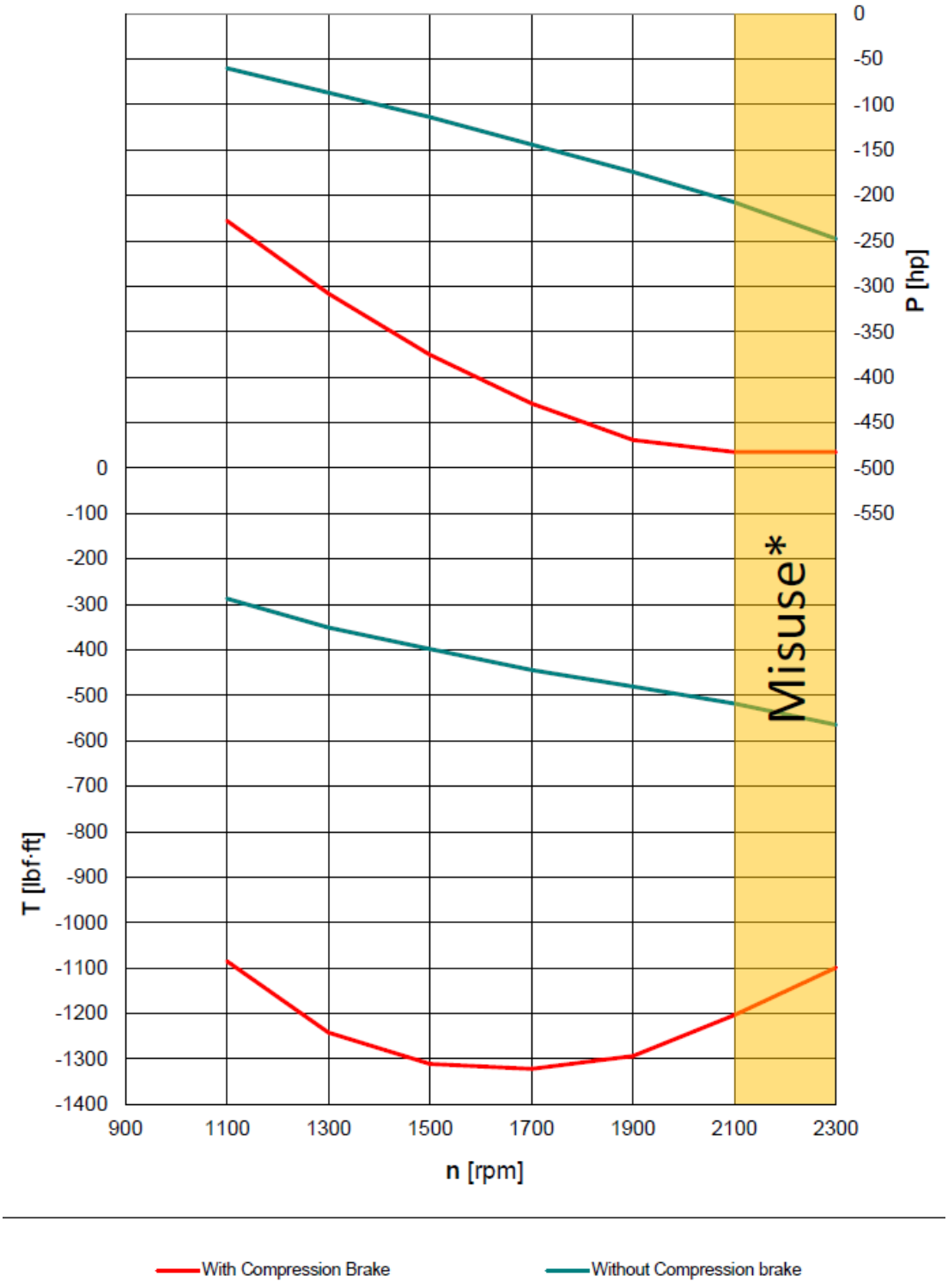
Activate (All)	Deactivate (Any)
Cruise control ON	Cruise control OFF
Cruise control active	Cruise control inactive
Vehicle speed exceeds max vehicle cruise speed + DSC offset	Vehicle speed is equal to or below max vehicle cruise speed
Global activation requirements met	Global deactivation requirements met

Downhill Speed Limiter

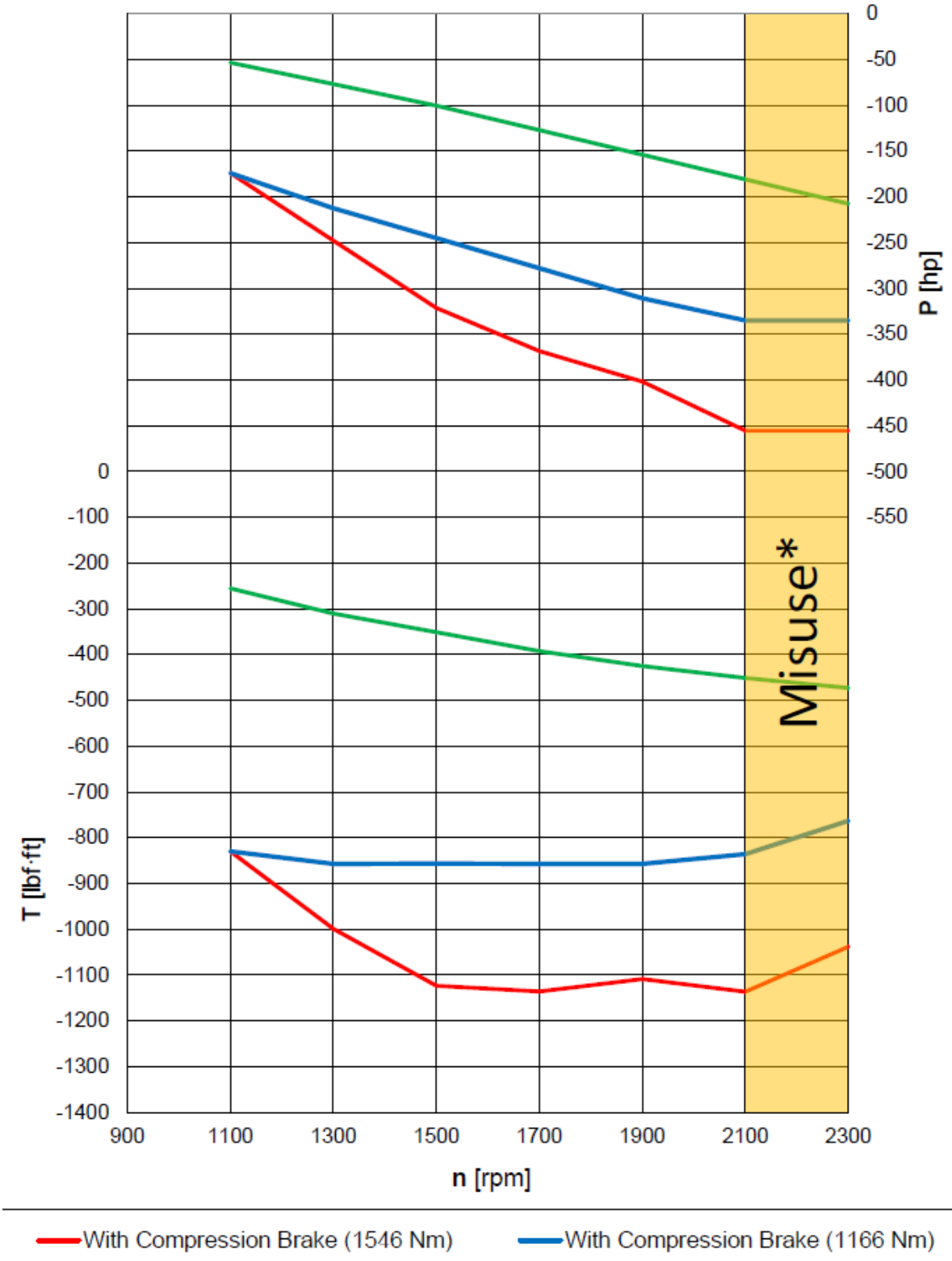
Activate (All)	Deactivate (Any)
Vehicle speed exceeds maximum vehicle speed limit + DSL offset speed	Vehicle speed is equal to or below max vehicle speed + DSL offset speed
Global activation requirements met	Global deactivation requirements met

Additional Information

Graph 11.1 and Graph 11.2 show engine braking performance for the MX engines.



Graph 11.1 – MX-13 Engine Brake Performance Curves



Graph 11.2 – MX-11 Engine Brake Performance Curves

PACCAR Engine Brake on the Driver Display

Figure 11.1 and Figure 11.2 show examples of screens on the driver display when the PACCAR Engine Brake ON/OFF switch is in the ON position.

Figure 11.1 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

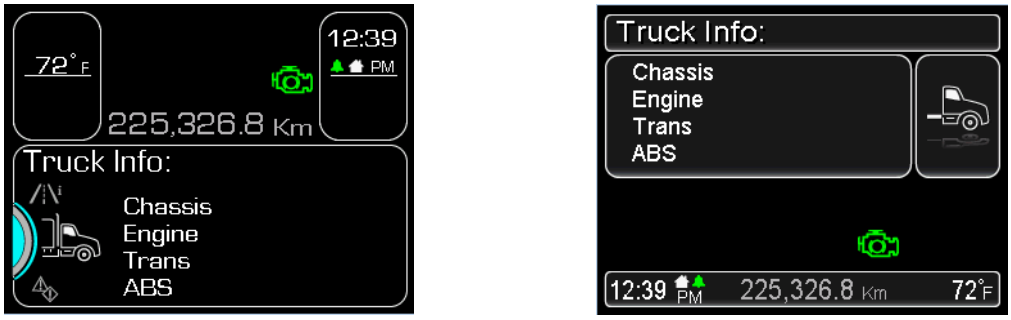


Figure 11.2 – Large Display; Left: Kenworth, Right: Peterbilt

Figure 11.3 and Figure 11.4 show examples of screens on the Driver Display when the PACCAR Engine Brake is activated by Downhill Speed Limiter.

Figure 11.3 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

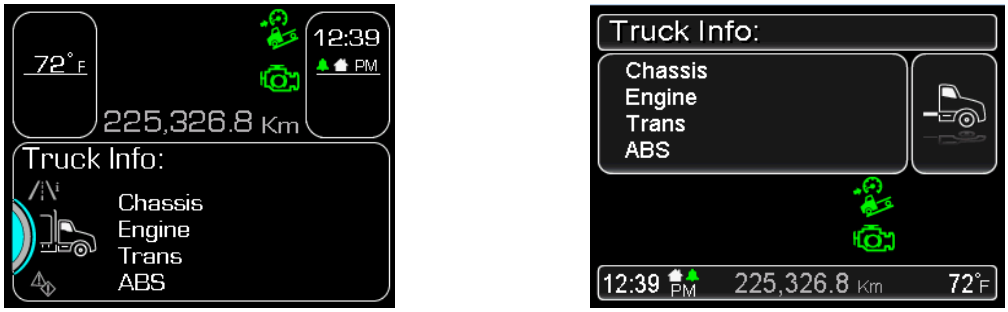


Figure 11.4 – Large Display; Left: Kenworth, Right: Peterbilt

12.0 Power Take-Off (PTO) Mode Engine Speed Control

Overview

Power Take-Off (PTO) Mode provides engine speed controls in addition to configurable interlocks that are available to restrict PTO Mode (if required.) PTO Mode is fully customizable with multiple programmable engine and vehicle speed parameters and safety interlocks.

The MX engines are suitable for use in many applications requiring auxiliary PTO-driven equipment. The engine PTO controls are flexible with many customizable features, which allow for configurations to meet the needs of many different vehicle applications. PTO Mode can make the operation of PTO-driven equipment safer and more convenient for the driver, and can protect both the chassis drivetrain and PTO-driven auxiliary equipment from misuse and potential damage. The Engine Idle Shutdown Timer (EIST) may also be disabled in PTO Mode to allow for extended operations with the engine at idle. The engine is also capable of logging time and fuel consumption in PTO Mode separately from non-PTO operation.

While the engine is in PTO mode, many different limitations can be imposed by software in the engine controller. These limitations may include:

- Engine Speed
- Engine Speed Ramp-Up/Ramp-Down Rates
- Maximum Engine Torque Output
- Vehicle Speed
- Engine Idle Time
- Safety Interlocks

The purpose of this section is to describe the engine PTO Mode programming features and capabilities. The default PTO settings will support many applications. For fine-tuning of the features, it is strongly recommended that the body builder and/or customer be consulted for their specific requirements. If no PTO is anticipated for the vehicle or the PTO operation will not require the engine to go into PTO Mode for specific engine speed controls or safety interlocks, no action is required at order entry. The special features associated with PTO Mode operation may be specified during the vehicle order process, and changes to the factory settings may be made post-delivery via a PRS file from the PACCAR Engine Support Center.

Additional transmission configuration may be necessary depending on the equipped transmission and/or transfer case. PACCAR recommends consulting the transmission manufacturer for information related to specific wiring harnesses and transmission programming requirements for proper PTO functionality. The following references may also assist in properly configuring the transmission for PTO use:

- Allison 5th Generation Controls 1000/2000/3000/4000 Product Families – Controls Installation Manual
- Eaton PTO Information Guide

PTO Control via CAN Communication

PACCAR MX engines support remote PTO Mode controls via the B-CAN network. *Signal Source for Remote Main Switch (N102)* may be configured to allow for PTO

engagement communications between the remote PTO module and the cab electronic control unit (CECU) or via legacy hardwired connection directly from the PTO device to the engine controller. Remote switch and remote throttle signal types must be specified within the drivetrain parameters on the CECU. Additional networking interface parameter changes are required within the CECU depending on the application requirements in order to allow remote PTO control modules to function properly via the B-CAN network. For additional information about the required changes to the CECU parameters, consult the appropriate body builder manual for the vehicle.

PACCAR MX engines allow for remote engine speed control functionality via TSC1 messaging from remote control modules by configuring *Enable Engine Speed Control via TSC1 (N306)*. In addition, a hardwired or CAN PTO engagement feedback signal must be provided to allow the engine to enter PTO mode to enable PTO engine speed control and safety interlocks, and *Signal Source for Remote Main Switch (N102)* must be configured according to the signal source of the PTO mode request. TSC1 messages must be broadcast from source address 36 (0x24) to destination address 0 (0x00). Messages must also specify control purpose P3: PTO Governor to allow the engine controller to respond to TSC1 requests.

The following table describes the J1939 PTO, EEC2 and TSC1 messages supported by the MX engines while programmed with Remote PTO configurations:

PTO (PGN 65264) – PTO On/Off and Engine Speed Controls				
Name	**SPN**	**SB**	**L**	**Description**
Engine PTO Governor Enable Switch	980	40	2	Switch signal which indicates that the PTO governor toggle switch is in the enabled (ON) position 0 = Off 1 = On 2 = Error 3 = Not available
Engine PTO Governor Set Switch	984	48	2	Switch signal of the PTO control activator which indicates that the activator is in the position to "set" the engine PTO governor set speed. 0 = Off 1 = On 2 = Error 3 = Not available
Engine PTO Governor Resume Switch	982	52	2	Switch signal of the PTO control activator which indicates that the activator is in the position to "resume" a previously established PTO governor set speed. 0 = Off 1 = On 2 = Error 3 = Not available

Remote PTO Governor Preprogrammed Speed Control Switch #1	979	42	2	Switch signal which indicates that the remote PTO governor toggle switch #1 is in the enabled (ON) position. If the toggle switch is enabled and other conditions are satisfied then the remote PTO governor feature is activated and the PTO governor will control at the preprogrammed speed #1. 0 = Off 1 = On 2 = Error 3 = Not available
Remote PTO Governor Preprogrammed Speed Control Switch #2	3447	58	2	Switch signal which indicates that the remote PTO governor toggle switch #2 is in the enabled (ON) position. If the toggle switch is enabled and other conditions are satisfied then the remote PTO governor control feature is activated and the PTO governor will control at the preprogrammed speed #2. 0 = Off 1 = On 2 = Error 3 = Not available

EEC2 (PGN 61443) – PTO Mode Remote Throttle

Name	SPN	SB	L	Description
Remote Accelerator Pedal Position	974	24	8	The ratio of actual position of the remote analog engine speed/torque request input device (such as an accelerator pedal or throttle lever) to the maximum position of the input device. (0% to 100%)

TSC1 (PGN 0) – Torque/Speed Control

Name	SPN	SB	L	Description
Engine Override Control Mode	695	0	2	0 = Override disabled - Disable any existing control commanded by the source of this command. Required before stopping transmission of TSC1 message to avoid TSC1 low rate faults. 1 = Speed control - Govern speed to the included “desired speed” value (SPN 898). In this mode, engine speed will be limited to Maximum Engine Speed using Switch Inputs (N086). 2 = Torque control - Control torque to the included “desired torque” value (SPN 518). In this mode, engine speed will be limited to Maximum Engine Speed using Pedal Input (N076). 3 = Speed/torque limit control - Limit speed and/or torque based on the included limit values. In this mode, engine speed will be limited to Maximum Engine Speed using Switch Inputs (N086).

Engine Requested Speed Control Conditions	696	2	2	3 = Stability Optimized for driveline engaged and/or in lockup condition 2 (e.g., PTO driveline)
Override Control Mode Priority	897	4	2	3 = Low Priority (below transmission, ABS, brakes)
Engine Requested Speed/Speed Limit	898	8	16	This is the engine speed which the engine is expected to operate at if the speed control mode is active, or the engine speed which the engine is not expected to exceed if the speed limit mode is active. Applicable when EngOverrideCtrlMode (SPN 695) = 1 or 3
Engine Requested Torque/Torque Limit	518	24	8	Controls or limits the output torque as a percentage of reference engine torque. Applicable when EngOverrideCtrlMode (SPN 695) = 2 or 3
TSC1 Transmission Rate	3349	32	3	7 = Default Rate (10ms)
TSC1 Control Purpose	3350	35	5	2 = P3 (PTO Governor)
Engine Requested Torque - High Resolution	N/A	40	4	High-resolution modifier of torque request. Adds fractional torque request of resolution 0.125% to value of SPN 518
Message Counter	N/A	56	4	The message counter is used to detect situations where the transmitting ECU malfunction repeats the same frame all the time. The receiver of the information may use the counter parameter to detect this situation. The transmitting device will increase the message counter in every cycle. The message counter will count from 0 to 7 and then wrap. The values 0x8 thru 0xE are SAE reserved and should be ignored by the receiver. Value 0xF (all bits set to 1) will indicate that the message counter is not available.
Message Checksum	N/A	60	4	The checksum is used to verify the signal path from the transmitting device to the receiving device. The checksum is the sum of the high nibble and the low nibble of the sum of the identifier, the first 7 data bytes and the message counter. It is calculated as follows: Checksum = (Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7 + message counter & 0x0F + message ID low byte + message ID mid low byte + message ID mid high byte + message ID high byte) Checksum = ((Checksum >> 6) + (Checksum >>3) + Checksum) & 0x07 Value 0xF (all bits set to 1) will indicate that the checksum is not available.

Particular applications will require the use of a split-shaft transfer case to decouple the drive axles and fully divert engine power to auxiliary equipment. The *Split Shaft PTO Installed* parameter must be enabled in the CECU using the Electronic Service Analyst (ESA) tool. Enabling this parameter will allow the transmission to be in gear while the parking brake is engaged without displaying the associated warnings and audible alarms. PACCAR recommends consulting the transmission and/or transfer case manufacturer for details on proper configuration for split-shaft PTO devices.

Note: PTO functionality for remote station controls and hardwired PTO engagement feedback is not currently available for vehicles equipped with Allison and Ultrashift transmissions in applications which require the transmission to be in-gear during PTO operation. Vehicles with these configurations and requirements must rely on in-cab control configurations to allow PTO mode functionality, or provide J1939 PTO message to request the engine to enter PTO mode.

PTO Speed Control Configuration

The standard engine programming is without PTO engine speed controls. Without PTO Mode allows the engine to operate normally without any PTO engine speed controls or restrictions. If the vehicle application will require the engine to go into PTO Mode for specific throttle controls or interlocks, one of the control configurations listed in Figure 12.1 must be selected. The following flow chart may be used to program the required and user configurable parameters to properly configure the vehicle to suit particular applications:

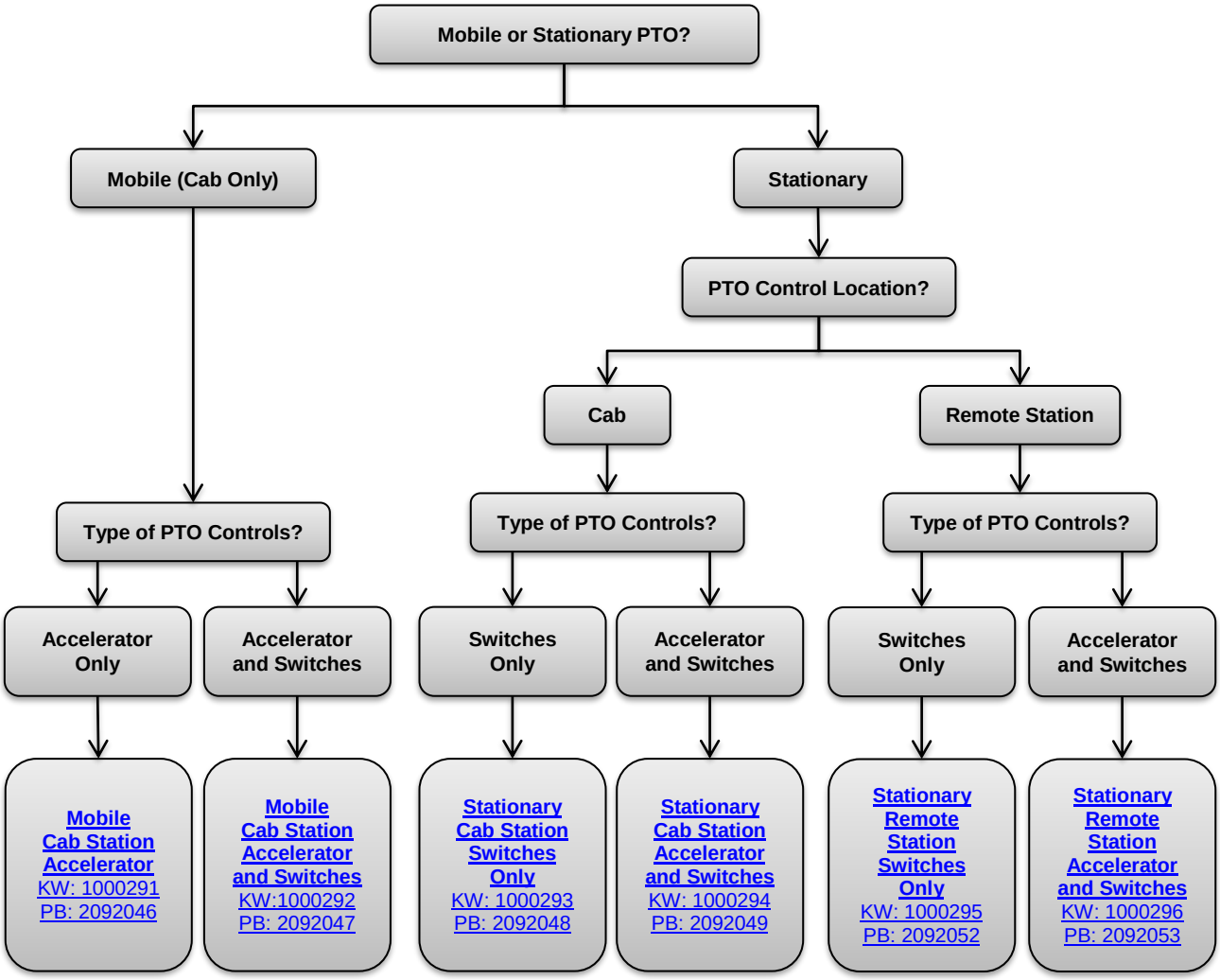


Figure 12.1 – PTO Control Configuration Flow Chart

The following tables provide information relating to each of the six selectable control configurations, including sales codes, required parameter settings, and an indication to which control station inputs are enabled. The listed parameters in each table are automatically selected and/or required by the sales code, and deviating from these required parameter values will likely cause errors when processing changes in PACCAR Vehicle Pro.

PTO Control Configuration	Peterbilt	KENWORTH	In-Cab Throttle Pedal	In-Cab Set & Resume Switches	Remote Throttle Control	Remote Set & Resume Switches
Mobile Cab Station Accelerator Only	**2092046**	**1000291**	Enabled	Disabled	Disabled	Disabled

Parameter Number	Parameter Description	Required Value
N078	Disable PTO Mode w/Clutch Depressed	OFF
N079	Require Parking Brake for PTO Mode	OFF
N086	Maximum Engine Speed using Switch Inputs	IDLE (N052)
N089	Neutral Required for PTO Mode	OFF
N110	Engine Speed Capture or Engine Speed Preset w/ Set Switch	CAPTURE (1)
N102	Signal Source for Remote Main Switch	0
N306	Enable Engine Speed Control via TSC1	OFF
N307	Disable In-Cab Accelerator Pedal in Remote PTO	OFF

Table 12.1 – Mobile Cab Station Accelerator Only Configuration

PTO Control Configuration	Peterbilt	KENWORTH	In-Cab Throttle Pedal	In-Cab Set & Resume Switches	Remote Throttle Control	Remote Set & Resume Switches
Mobile Cab Station Accelerator and Switches	**2092047**	**1000292**	Enabled	Enabled	Disabled	Disabled

Parameter Number	Parameter Description	Required Value
N078	Disable PTO Mode w/Clutch Depressed	OFF
N079	Require Parking Brake for PTO Mode	OFF
N089	Neutral Required for PTO Mode	OFF
N101	Disable PTO Mode w/ Brake Depressed	ON
N102	Signal Source for Remote Main Switch	0
N110	Engine Speed Capture or Engine Speed Preset w/ Set Switch	CAPTURE (1)
N306	Enable Engine Speed Control via TSC1	OFF

Table 12.2 – Mobile Cab Station Accelerator and Switches Configuration

PTO Control Configuration	Peterbilt	KENWORTH	In-Cab Throttle Pedal	In-Cab Set & Resume Switches	Remote Throttle Control	Remote Set & Resume Switches
Stationary Cab Station Switches Only	**2092048**	**1000293**	Disabled	Enabled	Disabled	Disabled

Parameter Number	Parameter Description	Required Value
N079	Require Parking Brake for PTO Mode	ON
N102	Signal Source for Remote Main Switch	0
N306	Enable Engine Speed Control via TSC1	OFF

Table 12.3 – Stationary Cab Station Switches Only Configuration

PTO Control Configuration	Peterbilt	KENWORTH	In-Cab Throttle Pedal	In-Cab Set & Resume Switches	Remote Throttle Control	Remote Set & Resume Switches
Stationary Cab Station Switches and Accelerator	**2092049**	**1000294**	Enabled	Enabled	Disabled	Disabled

Parameter Number	Parameter Description	Required Value
N079	Require Parking Brake for PTO Mode	ON
N102	Signal Source for Remote Main Switch	0
N306	Enable Engine Speed Control via TSC1	OFF

Table 12.4 – Stationary Cab Station Switches and Accelerator Configuration

PTO Control Configuration	Peterbilt	KENWORTH	In-Cab Throttle Pedal	In-Cab Set & Resume Switches	Remote Throttle Control	Remote Set & Resume Switches
Stationary Remote Station Switches Only	**2092052**	**1000295**	Optional (N307)	Disabled	Disabled	Enabled

Parameter Number	Parameter Description	Required Value
N079	Require Parking Brake for PTO Mode	ON

Table 12.5 – Stationary Remote Station Switches Only

PTO Control Configuration	Peterbilt	KENWORTH	In-Cab Throttle Pedal	In-Cab Set & Resume Switches	Remote Throttle Control	Remote Set & Resume Switches
Stationary Remote Station Switches and Accelerator	**2092053**	**1000296**	Optional (N307)	Disabled	Enabled	Enabled

Parameter Number	Parameter Description	Required Value
N079	Require Parking Brake for PTO Mode	ON
N306	Enable Engine Speed Control via TSC1	OFF

Table 12.6 – Stationary Remote Station Switches and Accelerator

Feature Options

- 1 Programmable Preset Engine Speeds in Remote PTO Mode

- 2 Programmable Preset Engine Speeds in Remote PTO Mode
- Enable DPF Regeneration in PTO Mode
- Enable Fan Assist during DPF Regeneration in PTO Mode

PTO Mode Interlocks

PTO interlocks provide an extra level of component protection when operating the engine in PTO Mode. The engine enters PTO Mode when the engine receives a signal via hardwired engagement feedback or a signal from a body controller via BCAN. If an interlock condition exists, the engine will not enter PTO Mode until the interlock condition is eliminated. An existing interlock condition does NOT prevent the PTO from mechanically engaging or cause the PTO device to disengage and will only prevent the engine from entering PTO Mode. When in PTO Mode, if one of the interlock conditions occur, the engine control unit (ECU) reverts back to normal driving mode and all controls, logic, and limits related to PTO Mode will become inactive. This includes limits related to minimum engine speed, maximum engine speed, maximum vehicle speed, and maximum engine torque. Other PTO Mode features, such as disabling the idle shutdown timer and logging PTO Mode hours and fuel usage will also become inactive.

The following list describes the available PTO Mode interlocks and the conditions that will prevent the engine from entering PTO Mode, or cause the engine to exit PTO Mode:

- ***Disable PTO Mode w/Clutch Depressed (N078)*** – When this interlock is enabled, operating the clutch pedal will cause the engine to exit PTO Mode.
    - Disabled for mobile applications
- ***Disable PTO Mode w/ Brake Depressed (N101)*** – When this interlock is enabled, operating the service brake pedal will cause the engine to exit PTO Mode.
    - Required for Mobile Cab Station Accelerator and Switches configuration when *PTO Mode Vehicle Speed Limit (N080)* is greater than 3 MPH
    - May be disabled for Mobile Cab Station Accelerator Only and all Remote station configurations
- ***Require Parking Brake for PTO Mode (N079)*** – When this interlock is enabled, disengaging the parking brake will cause the engine to exit PTO Mode, or prevent the engine from entering PTO Mode.
    - This interlock is automatically configured based on the selected configuration and is **required** for all stationary PTO applications.
- ***Neutral Required for PTO Mode (N089)*** – When this interlock is enabled, the transmission must be in neutral to allow the engine to enter PTO Mode. With this interlock enabled, shifting the transmission out of the neutral position will cause the engine to exit PTO Mode.
    - This interlock is disabled for mobile applications.
- ***PTO Mode Vehicle Speed Limit (N080)*** – While in PTO Mode, the vehicle will not accelerate past the *Maximum Vehicle Speed During PTO Operation*

(N080). If the vehicle exceeds this speed limit by more than 6 MPH, the engine will exit PTO Mode. This may happen in a downhill scenario or when an external force or input (such as an incline or pushing/towing the vehicle) causes the vehicle speed to increase.

- ***PTO Mode Vehicle Speed Limit (N080)*** must be at least 6MPH less than *Minimum Speed to Disable Cruise Control (N001)*. See the section on Cruise Control for more detailed information on avoiding conflicts between PTO Mode and Cruise Control.

NOTE: When an interlock condition occurs, the engine will exit PTO Mode and will disable engine speed controls and protections, but will not cause the PTO device to mechanically disengage from the powertrain. The PTO device will only be mechanically disengaged by toggling the PTO On/Off Switch.

When all interlock conditions are removed, and the engine is receiving a signal that the PTO is mechanically engaged, the engine will return to PTO Mode automatically and the engine speed will return to the *PTO Mode Minimum Engine Speed (N106)*. If the Resume/Decel switch is the first switch pressed after entering PTO mode, the engine speed will increase to the previously stored engine speed prior to exiting PTO Mode. Otherwise, the engine speed can be increased with the Set/Accel switch.

PTO Mode Limits and Set Points

PTO Engine Speed Control has many programmable parameters that may be adjusted to tailor PTO Mode performance to protect specific PTO-driven equipment from damage or misuse.

When PTO switch is in the ON position, if the PTO device is mechanically engaged and the interlock conditions are met, the engine enters PTO Mode automatically and the engine speed will increase to the *PTO Mode Minimum Engine Speed (N106)*.

Maximum Engine Speed using Switch Inputs (N086) may be programmed to prevent the engine from exceeding a specified RPM while using the Set/Accel or Resume/Decel switches to protect speed sensitive PTO-driven equipment from damage due to overspeed while changing the target engine speed. Likewise, *Maximum Engine Speed using Pedal Input (N076)* defines the maximum achievable engine speed while using the accelerator pedal. These parameters can be programmed independently, but *Maximum Engine Speed using Pedal Input (N076)* must be greater than or equal to *PTO Mode Minimum Engine Speed (N106)*. For PTO Mode configured with remote controls, *Maximum Engine Speed using Switch Inputs (N086)* should be programmed as the customer's absolute maximum engine speed.

The engine speed can be controlled by briefly pressing, or pressing and holding the specified switches. With the PTO Mode configured for in-cab controls, these are the cruise control Set/Accel and Resume/Decel switches. In the case of the remote PTO control station mode, these switches are provided by the body builder and are functionally equivalent to the in-cab control switches.

In PTO Mode, a throttle control input is available. When PTO Mode controls are configured in the cab, the accelerator pedal is used for throttle control in PTO Mode. For a remote PTO Mode control station, this would be supplied by the body builder and may be a pedal, hand lever, or similar input device.

When in PTO Mode, pressing the Set/Accel switch momentarily will cause the engine speed to increase by *Engine Speed Increase w/ Set/Accel (In-Cab) (N083)*. For PTO Mode configured with remote controls, *Engine Speed Increase w/Set/Accel (Remote) (N092)* should be programmed instead. Each press of the Set/Accel switch will increase engine speed by this increment, up to the *Maximum Engine Speed using Switch Inputs (N086)*.

When in PTO Mode, pressing the Resume/Decel switch momentarily will cause the engine speed to decrease by *Engine Speed Decrease w/ Res/Decel (In-Cab) (N082)*. For PTO Mode configured with remote controls, *Engine Speed Decrease w/Res/Decel (Remote) (N090)* should be programmed instead. Each press of the Resume/Decel switch will decrease engine speed by this decrement, down to the *PTO Mode Minimum Engine Speed (N106)*.

When in PTO Mode, pressing and holding the Set/Accel switch will cause the engine speed to increase at the rate of *Engine Speed Ramp-Up w/Set/Accel (In-Cab) (N085),* until *Maximum Engine Speed using Switch Inputs (N086)* has been reached. For PTO Mode configured with remote controls, *Maximum Engine Speed using Switch Inputs (N086)* should be programmed as the customer's absolute maximum engine speed. Pressing and holding the Resume/Decel switch will cause the engine speed to decrease at the rate of *Engine Speed Ramp-down w/Res/Decel (In-Cab) (N084),* until the *PTO Mode Minimum Engine Speed (N106)* has been reached. For PTO Mode configured with remote controls, *Engine Speed Ramp-Up w/Set/Accel (Remote) (N093)* and *Engine Speed Ramp-down w/Res/Decel (Remote) (N091)* should be programmed instead.

In the event the engine speed request is canceled either manually or by interlock and the engine returns to PTO mode, the engine can be commanded to return to the previously stored engine speed by pressing the Resume/Decel switch.

Two methods of engine speed control are available when using the Set/Accel switch, and are selected using *Engine Speed Capture or Engine Speed Preset w/ Set Switch (N110)*:

- Programmable Preset Engine Speed
- Capture and Hold Current Engine Speed

When *Engine Speed Capture or Engine Speed Preset w/ Set Switch (N110)* is OFF, pressing the Set/Accel switch immediately after the engine enters PTO Mode will cause the engine speed will increase to *PTO Mode Preset Engine Speed (In-Cab) (N087)*.

When *Engine Speed Capture or Engine Speed Preset w/ Set Switch (N110)* is ON, the programmable preset engine speed functionality is replaced with engine speed capture functionality. In this configuration the Set/Accel switch may be pressed to capture and maintain the current engine speed.

PTO Mode Maximum Engine Speed Rate of Change (N081) limits the maximum rate at which the engine speed increases after a momentary operation of a PTO speed control switch. This is intended to protect equipment that is sensitive to rapid changes in engine speed. To utilize this limiter, *Enable PTO Mode Engine Ramp Rate Limiter (N109)* must be enabled.

Maximum Engine Torque in PTO Mode (N077) may be used to limit the torque produced by the engine while in PTO Mode. The torque value programmed is gross

torque produced; this includes the internal calculated torque from the engine. The torque transmitted to the driveline will be lower than the programmed value.

When Remote PTO Engine Speed Control is configured with one preprogrammed preset speed, pressing Remote Set momentarily after entering PTO mode will cause the engine speed to increase *to Remote PTO Preset Engine Speed 1 (N055)*. This functionality is not time dependent, and may be triggered at any time after entering PTO Mode, provided the Remote Set switch is momentarily pressed before any other input. If Remote Set is pressed a second time, or if any other switch is used first upon entering PTO mode, the engine will revert to normal PTO operation.

When Remote PTO Speed Control is enabled with two preprogrammed preset speeds, momentarily pressing Remote Set will cause the engine speed to increase to *Remote PTO Preset Engine Speed 1 (N055)*. Pressing Remote Set again will cause the engine speed to increase to *Remote PTO Preset Engine Speed 2 (N056)*. Subsequent presses of the Remote Set switch will cause the engine speed to increase beyond the second preset engine speed. Pressing and holding Remote Set will cause the engine speed to steadily increase by the preprogrammed rate. The Remote Resume switch functions normally. If it is desirable for the Remote Set switch to always cause the engine to jump to a single predefined speed, both *Remote PTO Preset Engine Speed 1 (N055)* and *Remote PTO Preset Engine Speed 2 (N056)* may be programmed to the same value.

When programming remote preset engine speeds, ensure that *Remote PTO Preset Engine Speed 1 (N055)* is greater than or equal to *PTO Mode Minimum Engine Speed (N106)*, and *Remote PTO Preset Engine Speed 2 (N056) is greater than or equal to Remote PTO Preset Engine Speed 1 (N055)* and less than or equal to *Maximum Engine Speed using Switch Inputs (N086)*. Figure 12.1 illustrates a general overview of how specific engine speed parameters must be programmed to prevent errors from occurring during the programming process within PACCAR Vehicle Pro. The parameters shown may be programmed to the same value as their neighboring parameters, but if they are programmed as separate values they must not deviate from the displayed order from least to greatest value.

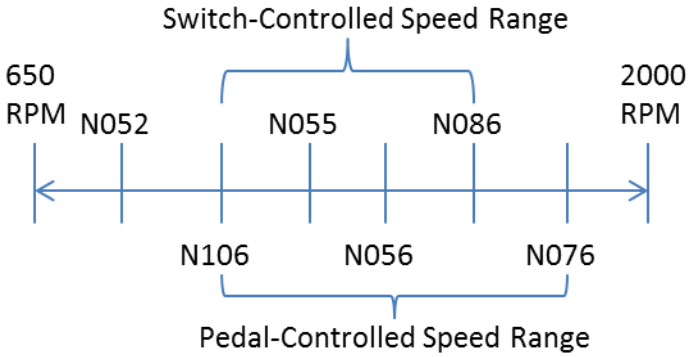


Figure 12.2 – PTO Engine Speed Limits and Set Points for Cab PTO

Note: The Remote PTO Preset Engine Speed feature requires the PTO Preprogrammed Speed Setting functionality to be properly configured as *One Speed* or *Two Speeds* in the CECU software.

Disable In-Cab Accelerator Pedal in Remote PTO (N307) may be enabled to cause the the in-cab accelerator pedal to be disabled when operating the remote station engine speed controls. The accelerator pedal mode can be configured to behave as a linear engine speed pedal or a torque demand pedal using *Accelerator Pedal Type in PTO Mode (N073)*.

Note: When Remote Station controls are selected, enabling the linear engine speed pedal option will cause the in-cab accelerator pedal to be disabled.

Remote PTO in Vehicle Parked State (N088) will specify if the engine, when configured for a Remote PTO configuration, will require the vehicle to be considered parked before the engine will enter PTO mode. This will require the parking brake to be engaged while stationary, and automated manual and automatic transmissions must not be in gear. If this parameter is not enabled, then the engine will require a CAN signal to request PTO mode. This parameter should only be disabled for remote applications configured for TSC1, and the body controller is providing a CAN-based signal for PTO mode request.

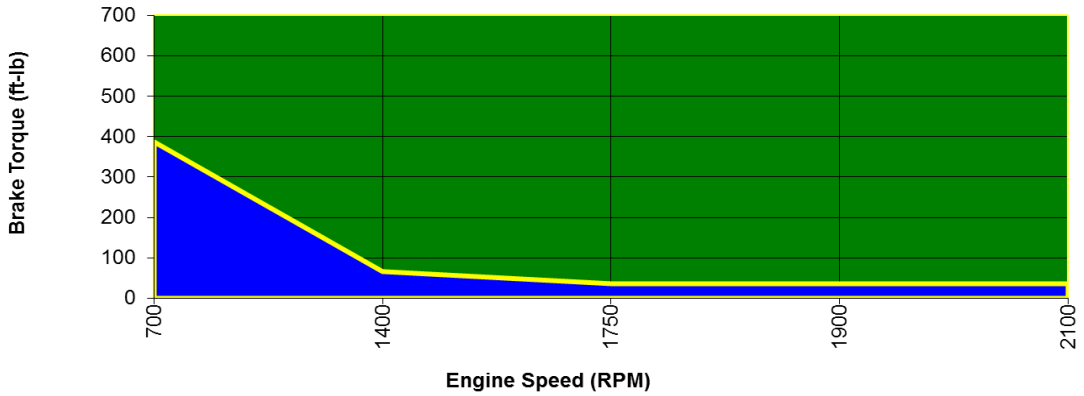
DPF Regeneration in PTO Mode

Regen in PTO Mode allows the engine to perform DPF regenerations while PTO Mode is active or while the vehicle speed is greater than 5 mph, allowing the engine to run continuously without the need to exit PTO Mode to perform a stationary DPF regeneration. This functionality is not California Air Resources Board (CARB) compliant for MX engines manufactured prior to June 2015.

It is important to carefully evaluate the application of the vehicle prior to selecting the Regen in PTO Mode option. There exist certain limitations on when DPF regeneration can occur, and it may be determined that Regen in PTO Mode is not required, or will not be beneficial to the vehicle. Refer to Table 12.7 to determine if the application is suitable for DPF Regeneration in PTO Mode.

1) Will the vehicle be operating in PTO Mode for durations longer than 2 hours?	No	DPF Regeneration in PTO Mode is not recommended
	Yes	Continue to #2
2) Does the application allow the driver to exit PTO Mode on demand?	No	Continue to #3
	Yes	DPF Regeneration in PTO Mode is not recommended
3) Will the customer be operating in the upper (green) region in Graph 12.1?	No	DPF Regeneration in PTO Mode is not recommended
	Yes	DPF Regeneration in PTO Mode is recommended for this application

Table 12.7 – Regen in PTO Mode Application Suitability



Graph 12.1 – Regen in PTO Mode Capability Map (ISO Conditions)

Graph 12.1 indicates when DPF regeneration can occur. If the engine is operated in the green region, a DPF regen will likely be successful and Regen in PTO Mode will be beneficial to the vehicle. If the engine is operated in the blue region, a DPF regen is not likely to be successful and the engine should not be programmed with the Regen in PTO mode option. For additional information or ordering assistance, please contact the Engine Support Center.

The engine may also be configured to engage the engine fan during active DPF regenerations while in PTO mode. Engaging the fan can provide additional engine load and exhaust heat, which may result in more effective DPF regeneration. The engine fan can also provided additional cooling capacity during DPF regenerations.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Mobile Cab Station Accelerator Only	**1000291**	**2092046**
Mobile Cab Station Accelerator + Switches	**1000292**	**2092047**
Stationary Cab Station Switches Only	**1000293**	**2092048**
Stationary Cab Station Switches + Accelerator	**1000294**	**2092049**
Stationary Remote Station Switches + Accelerator	**1000295**	**2092052**
Stationary Remote Station Switches Only	**1000296**	**2092053**
1 Remote PTO Preset Engine Speed	**1000051**	**2140360**
2 Remote PTO Preset Engine Speeds	**1000052**	**2140370**
Enable Regen in PTO Mode	**1000174**	**2092089**
Engine Fan Assist during Active Regen in PTO	**1000176**	**2092091**

Programmable Parameters

Interlocks

N078	Page 54	Min	Default	Max	Units
Disable PTO Mode w/Clutch Depressed		OFF (0)	ON (1)	ON (1)	ON/OFF
N079	Page 54	Min	Default	Max	Units
Require Parking Brake for PTO Mode		OFF (0)	OFF (0)	ON (1)	ON/OFF
N080	Page 54	Min	Default	Max	Units
PTO Mode Vehicle Speed Limit		1	1	N001 - 6	MPH
* Must be at least 6 MPH less than *Minimum Speed to Disable Cruise Control (N001)*					
N089	Page 54	Min	Default	Max	Units
Neutral Required for PTO Mode		OFF (0)	ON (1)	ON (1)	ON/OFF
* With UltraShift transmissions, N089 = 0					
N101	Page 54	Min	Default	Max	Units
Disable PTO Mode w/ Brake Depressed		OFF (0)	ON (1)	ON (1)	ON/OFF
* Required for Mobile Cab Station w/ Accelerator and Switches configurations * Required if *PTO Mode Vehicle Speed Limit (N080)* is greater than 3 MPH					

Global Limits and Set Points

N076	Page 55	Min	Default	Max	Units
Maximum Engine Speed using Pedal Input		N106	2000	2000	RPM
* Must be greater than or equal to *PTO Mode Minimum Engine Speed (N106)*					
N077	Page 56	Min	Default	Max	Units
Maximum Engine Torque in PTO Mode		148	1902	1902	LB-FT

N081	Page 56	Min	Default	Max	Units
PTO Mode Maximum Engine Speed Rate of Change		50	75	200	RPM/SEC
* To Enable, *Enable PTO Mode Engine Ramp Rate Limiter (N109)* must be ON					

N086	Page 56	Min	Default	Max	Units
Maximum Engine Speed using Switch Inputs		N106	2000	2000	RPM
* Must be greater than or equal to *PTO Mode Minimum Engine Speed (N106)* * For Remote applications, should be set to Customer's requested Maximum Engine Speed					

N106	Page 55	Min	Default	Max	Units
PTO Mode Minimum Engine Speed		N052	650	2000	RPM
* Must be greater than or equal to *Engine Idle Speed (N052)* * May not be greater than 800 RPM if *Require Parking Brake for PTO Mode (N079)* and *Neutral Required for PTO Mode (N089)* are disabled * May not be greater than 950 RPM if *Require Parking Brake for PTO Mode (N079)* and *Neutral Required for PTO Mode (N089)* are disabled, and *Disable PTO Mode w/ Brake Depressed(N106)* is enabled.					

N109	Page 56	Min	Default	Max	Units
Enable PTO Mode Engine Ramp Rate Limiter		OFF (0)	OFF (0)	ON (1)	ON/OFF

In-Cab Control Configuration, Limits, and Set Points

N082	Page 56	Min	Default	Max	Units
Engine Speed Decrease w/ Res/Decel (In-Cab)		10	50	1000	RPM

N083	Page 56	Min	Default	Max	Units
Engine Speed Increase w/ Set/Accel (In-Cab)		10	50	1000	RPM

N084	Page 56	Min	Default	Max	Units
Engine Speed Ramp-down w/Res/Decel (In-Cab)		10	250	1000	RPM/SEC

N085	Page 56	Min	Default	Max	Units
Engine Speed Ramp-Up w/Set/Accel (In-Cab)		10	250	1000	RPM/SEC
N087	Page 56	Min	Default	Max	Units
PTO Mode Preset Engine Speed (In-Cab)		0	780	2000	RPM
* To Enable, *Engine Speed Capture or Engine Speed Preset w/ Set Switch (N110)* must be PRESET (0)					
N110	Page 56	Min	Default	Max	Units
Engine Speed Capture or Engine Speed Preset w/ Set Switch		PRESET (0)	CAPTURE (1)	CAPTURE (1)	N/A
* Mobile PTO applications require engine speed capture (1)					

Remote Control Configuration, Limits, and Set Points

N055	Page 57	Min	Default	Max	Units
Remote PTO Preset Engine Speed 1		0	780	2000	RPM
N056	Page 57	Min	Default	Max	Units
Remote PTO Preset Engine Speed 2		0	1030	2000	RPM
* Must be greater than or equal to *Remote PTO Preset Engine Speed 1 (N055)*					
N073	Page 58	Min	Default	Max	Units
Accelerator Pedal Type in PTO Mode		TORQUE (0)	SPEED (1)	SPEED (1)	N/A
N088	Page 58	Min	Default	Max	Units
Remote PTO in Vehicle Parked State		OFF (0)	ON (1)	ON (1)	ON/OFF
N090	Page 56	Min	Default	Max	Units
Engine Speed Decrease w/Res/Decel (Remote)		10	50	1000	RPM

N091	Page 56	Min	Default	Max	Units
Engine Speed Ramp-down w/Res/Decel (Remote)		10	250	1000	RPM/SEC
N092	Page 56	Min	Default	Max	Units
Engine Speed Increase w/Set/Accel (Remote)		10	50	1000	RPM
N093	Page 56	Min	Default	Max	Units
Engine Speed Ramp-Up w/Set/Accel (Remote)		10	250	1000	RPM/SEC
N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
* 0 = Hardwired 12V 1 = CAN Signal					
N306	Page 46	Min	Default	Max	Units
Enable Engine Speed Control via TSC1		OFF (0)	OFF (0)	ON (1)	ON/OFF
N307	Page 58	Min	Default	Max	Units
Disable In-Cab Accelerator Pedal in Remote PTO		OFF (0)	OFF (0)	ON (1)	ON/OFF

ON/OFF Requirements

PTO Mode

ON (Any)	OFF (Any)
PTO ON/OFF switch in the ON position	PTO ON/OFF switch in the OFF position
Clutch pedal NOT depressed (if *PTO Mode Disabled with Clutch Pedal Depressed (N078)* is enabled)	Clutch pedal depressed (if *PTO Mode Disabled with Clutch Pedal Depressed (N078)* is enabled)
Service brake NOT depressed (if *PTO Mode Disabled with Service Brake Depressed (N101)* is enabled)	Service brake depressed (if *PTO Mode Disabled with Service Brake Depressed (N101)* is enabled)
Parking Brake Set (if *PTO Mode Enable Only with Parking Brake Set (N079)* is enabled)	Park Brake NOT Set (if *PTO Mode Enable Only with Parking Brake Set (N079)* is enabled)
Vehicle speed ≤ *Maximum Vehicle Speed During PTO Operation (N080)*	Vehicle speed > *Maximum Vehicle Speed During PTO Operation (N080)* + 6 MPH
Transmission in Neutral (if *PTO Mode Transmission Neutral Position Interlock (N089)* is enabled)	Transmission NOT in Neutral (if *PTO Mode Transmission Neutral Position Interlock (N089)* is enabled)

Additional Information

PTO on the Driver Display

Figure 12.3 shows an example of the indicator on the Driver Display when the PTO is mechanically engaged. This indicator does not necessarily mean the engine is in PTO Mode.

Figure 12.3 – PTO Indication (Kenworth and Peterbilt)

13.0 Application Road Speed Limiter

Overview

The Application Road Speed Limiter feature allows the engine to limit the maximum vehicle speed whenever a customer-specified input is supplied.

Standard Feature

- Without Application Road Speed Limiter

Feature Options

- Application Road Speed Limiter

The Application Road Speed Limiter (ARSL) allows the engine to limit vehicle speed whenever a customer-supplied input is active. This input may be a switch controlled by the operator or another input that is controlled by a function of the body equipment. For example, this may include devices such as a pressure switch being released by an elevated dump bed or activation of beacon/work lights. The ARSL has priority over the PTO Mode Vehicle Speed Limit (*N080*).

Enable Application Road Speed Limiter (N311) enables or disables the ARSL functionality. The desired vehicle speed limit is specified by *Application Road Speed Limiter Vehicle Speed (N313)*. ARSL On/Off with +12V Signal *(N315)* determines if the supplied hardwired 12V input will activate or deactivate the ARSL. The 12V signal should be provided to pin 5 of the J2 (center) connector on the engine controller (PMCI).

Programmable Parameters

Interlocks

N311	Page 65	Min	Default	Max	Units
Enable Application Road Speed Limiter		OFF (0)	OFF (0)	ON (1)	ON/OFF
N313	Page 65	Min	Default	Max	Units
Application Road Speed Limiter Vehicle Speed		0	19	90	MPH
N315	Page 65	Min	Default	Max	Units
ARSL On/Off with +12V Signal		OFF (0)	ON (1)	ON (1)	ON/OFF

Activate/Deactivate Requirements

Activate (Any)	Deactivate (Any)
ARSL Switch Input Active	ARSL Switch Input Not Active

14.0 Driveline Protection

Overview

The Driveline Protection feature allows the engine to reduce the maximum torque output in order to protect driveline components when the drivetrain reduction is calculated to be above a calibrated ratio.

Standard Feature

- Standard

Standard provides normal operation of the advertised torque curve.

Feature Options

- Driveline Protection

Driveline Protection allows the engine to reduce the maximum available torque to 950 lbf-ft when it detects a transmission gear reduction greater than the calibrated value. This functionality provides the rated torque in all conditions, and only reduces torque output if one or both of the following conditions are met:

- The vehicle has an auxiliary transmission with gear ratio greater than 1.0:1
- Vehicle has a transmission in a forward or reverse gear with a gear ratio equal to or greater than 13.0:1

Driveline protection is automatically included within the programming for all multi-torque engine ratings, as it utilizes the same software functions to enable the higher torque values of the multi-torque rating.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Enable Driveline Protection	**1000239**	**2092074**

Activate/Deactivate Requirements

Driveline Protection

Activate (Any)	Deactivate (Any)
Gear ratio > 13.0:1	Gear ratio < 13.0:1
Aux. trans. gear ratio > 1.0:1	Aux. trans. gear ratio < 1.0:1

15.0 Speed Control Management (SCM)

Overview

The Speed Control Management (SCM) feature is intended to help encourage fuel-efficient shifting habits by reducing engine performance or restricting vehicle speed at elevated engine speeds. Speed Control Management consists of two control strategies: Progressive Shift (PGS) and Gear Down Protection (GDP), which may be enabled separately or in combination.

PACCAR offers pre-approved and validated PGS and GDP settings for most manual and automated-manual transmission powertrain configurations. Upon selection of at least one of the SCM features, optimized shift points and the gears in which SCM functionality will be active are identified by PACCAR and programmed into the vehicle. These shift points are based on the customer's powertrain configuration and requested performance optimization goals.

Standard Feature

- Without SCM

Feature Options

- Progressive Shift
- Gear Down Protection
- Progressive Shift and Gear Down Protection

Progressive Shift (PGS)

The Progressive Shift module is typically used to encourage earlier shifts in lower gears to improve fuel economy. By shifting earlier, the engine speed is reduced, improving fuel economy. PGS is a "soft" RPM limit that restricts the rate of engine acceleration when the engine speed is above a predefined engine speed limit. This provides a balance between encouraging a driver to shift at lower engine speeds and the driver's needs to remain in a gear longer to execute a shift under heavy load and/or on a hill. The driver's perception of the restricted engine acceleration gives a clear indication to execute an upshift. Full engine acceleration is restored after the driver executes a shift where the engine speed falls below the customer-defined limit in the next gear. Along with limiting engine acceleration, this function also provides a visual notification to the driver to shift via the driver display.

The Progressive Shift module will provide up to two engine speed limits, allowing customers to use a more aggressive limit in lower gears and a less aggressive limit in higher gears. 10-speed and 13-speed transmissions will receive a two-step engine speed limit, and 18-speed transmissions will receive a single step. The first and last gear in which each progressive shift range is programmed ensuring it is properly configured to the customer's application and for the specified powertrain components.

PGS Speed Step Count (PS25) specifies the number of distinct speed steps desired. *PGS First Limit Gear Min (PS26)* indicates the first gear number in which PGS will become active and *PGS First Limit Gear Max (PS28)* indicates the last gear the the first PGS step will be active. *PGS Second Engine Speed Limit (PS29)* defines the engine speed threshold for the shift advisor. *PGS Highest Gear (PS30)* specifies the

last gear that the second step of PGS will be active. While PGS is active, engine speed will be "soft" limited to *PGS First Engine Speed Limit (PS27)* or *PGS Second Engine Speed Limit (PS29)* depending on the currently selected gear and the defined gear ranges for each step.

Gear Down Protection (GDP)

The Gear Down Protection module encourages the driver to shift into top gear when operating the vehicle at the target operating speed. This is done by restricting the road speed in gears below top gear. When enabled, GDP restricts operation of the vehicle at the target operating speed when not in top gear. This effectively prevents engine operation at excessive RPMs and, as a result, helps to improve fuel economy. GDP is a "hard" limit. The engine RPM, and therefore vehicle speed, will be limited to a specified value in the specified gears. Along with limiting engine RPM and vehicle speed, this function also provides a visual notification to the driver to shift via the driver display.

The gear down protection module offers a single programmable engine speed limit. Selection of the GDP module will automatically set the engine speed limit at one or two gears below top gear depending upon the combination of transmission, rear axle ratio, and equipped tires. Changes to the factory settings can be made post-delivery via a PRS file from the PACCAR Engine Support Center.

GDP First Gear Active (GP11) specifies the first selected gear in which the GDP "hard" engine speed limiter will become active, while GDP Last Gear Active *(GP13)* specifies the last selected gear that the GDP engine speed limiter will remain active. GDP Active Gear Count *(GP14)* is the number of gears that GDP will restrict engine speed to a maximum of GDP Engine Speed *(GP12)*.

Application Guidelines

The SCM features are intended to be used with manual and automated-manual transmissions while operating in manual mode. The SCM feature is not available with 2-speed rear axles, auxiliary transmissions, Allison transmissions, or multi-speed transfer cases. A full list of application guidelines includes:

- Transmissions
  - Available on chassis equipped with Eaton 9, 10, 11, 13, or 18-speed manual transmissions
  - Available on chassis equipped with Eaton Ultrashift automated-manual transmissions (while operating in manual mode)
  - Not available on chassis equipped with Allison transmissions
  - Not available on chassis with auxiliary transmissions
- Rear Axle Ratio
  - Available on chassis with 2.53 to 4.33 rear axle ratios
  - Not available on chassis equipped with multi-speed rear axles

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Progressive Shift (PGS)	**1000276**	**2092084**
Gear Down Protection (GDP)	**1000277**	**2092085**

Programmable Parameters

GP11	Page 68	Min	Default	Max	Units
GDP First Gear Active		*	N/A	GP13	GEAR #
*Never program GDP to be active in 1st gear for 9-12 Speed Transmissions *Never program GDP to be active in first two full gears in 18 speed transmissions (Example: for 18 Speed: Min gear = 5; for 13 Speed: Min gear = 3)					
GP12	Page 68	Min	Default	Max	Units
GDP Engine Speed		1500	1680	1700	RPM
* If enabling GDP in more than one gear for 13 and 18 speed transmissions, maximum GDP Engine Speed is 1600 RPM					
GP13	Page 68	Min	Default	Max	Units
GDP Last Gear Active		GP11	N/A	*	GEAR #
*Never program GDP to be active in top gear					
GP14	Page 68	Min	Default	Max	Units
GDP Active Gear Count		1	1	2	N/A
PS25	Page 67	Min	Default	Max	Units
PGS Speed Step Count		0	0	2	N/A
PS26	Page 67	Min	Default	Max	Units
PGS First Limit Gear Min		*	N/A	<PS28	GEAR #
*Never program PGS to be active in first Gear for 9-13 speed transmissions *Never program PGS to be active in first two split-gears in 18 speed transmissions					

PS27	Page 68	Min	Default	Max	Units
PGS First Engine Speed Limit		1400	N/A	PS29	RPM
*Minimum engine speed limit is 1400 RPM to ensure proper control system stability when PGS is active *Maximum engine speed limit is 1650 RPM to ensure the proper balance between fuel economy shifting and providing power while accelerating					
PS28	Page 67	Min	Default	Max	Units
PGS First Limit Gear Max		>PS26	N/A	<PS30	GEAR #
*Never program PGS to be active in top gear					
PS29	Page 67	Min	Default	Max	Units
PGS Second Engine Speed Limit		PS27	N/A	1800	RPM
*The minimum RPM after a shift in any gear should not fall below 1100 RPM					
PS30	Page 67	Min	Default	Max	Units
PGS Highest Gear		>PS30	N/A	*	GEAR #
*Never program PGS to be active in top gear					

ON/OFF Requirements

Progressive Shift

ON	OFF
ENTER SALES CODE (Progressive Shift ON)	No Sales Code (Progressive Shift OFF)

GDP

ON	OFF
ENTER SALES CODE (Gear Down Protection ON)	No Sales Code (Gear Down Protection OFF)

Activate/Deactivate Requirements

Progressive Shift Activate	Deactivate
Engine speed ≥ Progressive Shift engine speed limit	Engine speed < Progressive Shift engine speed limit

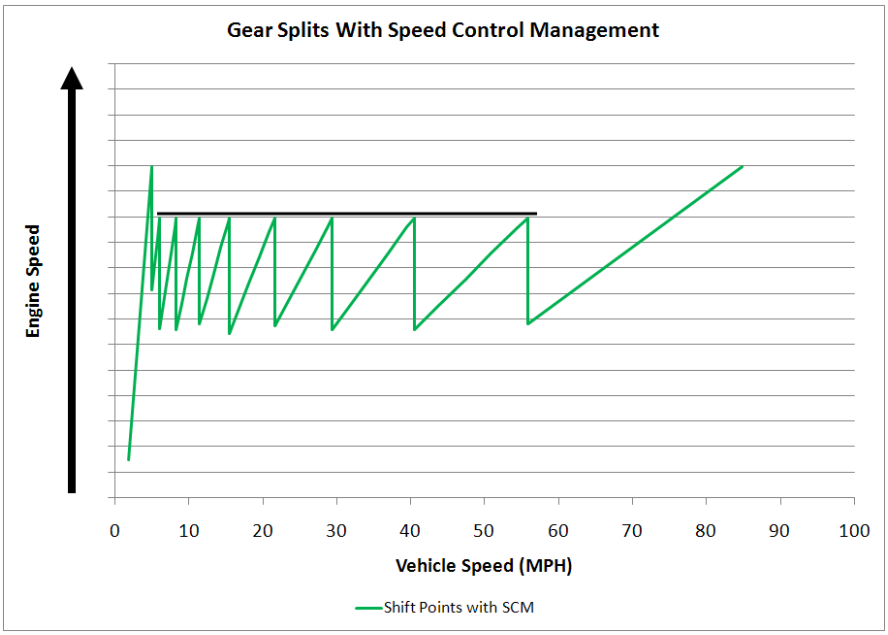
GDP

Activate	Deactivate
Engine speed ≥ GDP engine speed limit	Engine speed < GDP engine speed limit

Additional Information

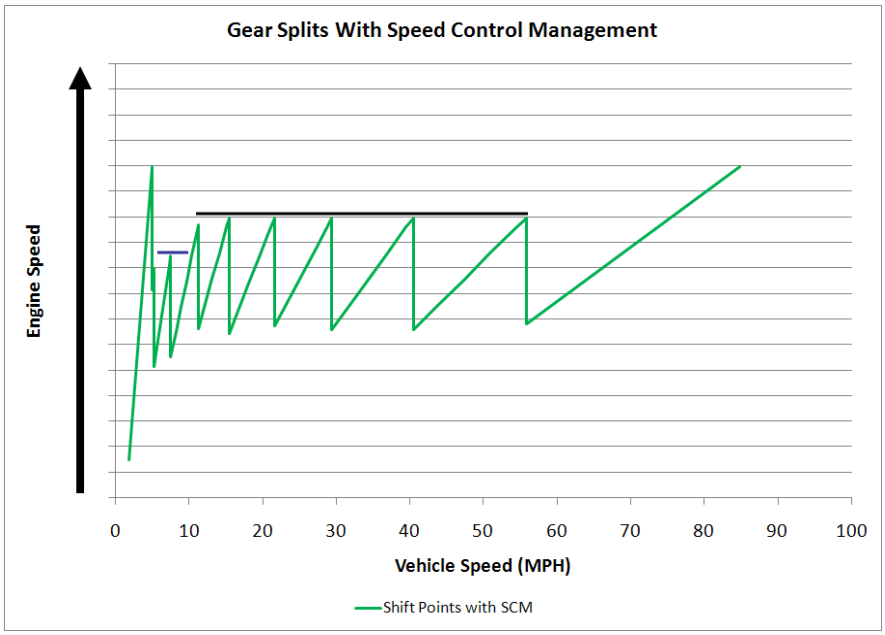
Progressive Shift Threshold Graphs

The black line in Graph 15.1 illustrates the Progressive Shift limit if applicable.



Graph 15.1 - One Engine Speed Control Limit

The blue line in Graph 15.2 illustrates the 1st Progressive Shift limit if applicable. The black line illustrates the 2nd Progressive Shift limit if applicable.



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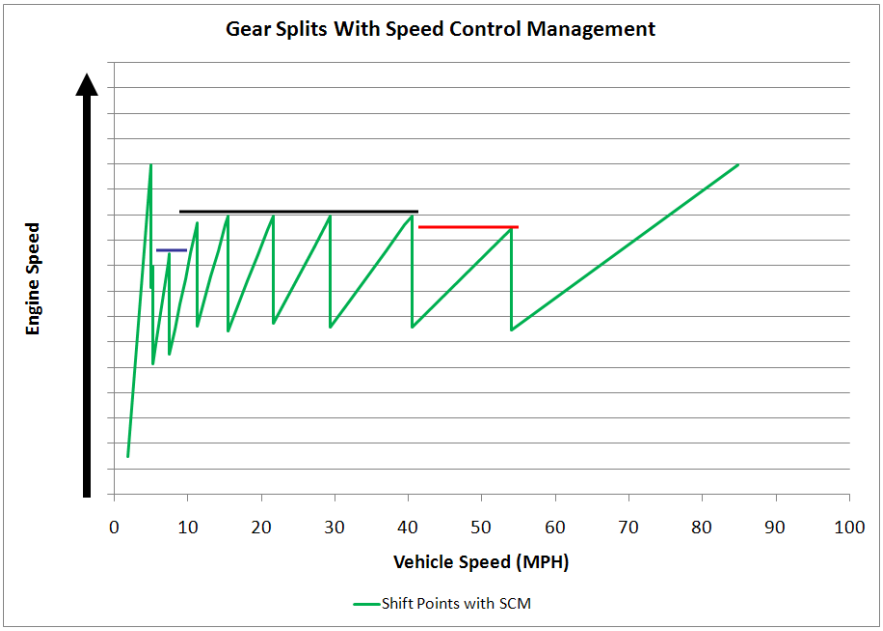
Graph 15.2 – Two Engine Speed Control Limits

Gear Down Protection Threshold Chart

The red line in Graph 15.3 illustrates Gear Down Protection in the gear below top gear.



Graph 15.3 – Gear Down Protection

16.0 Engine Recorder

Overview

The Engine Recorder records three types of engine-sensor and calculated-output data over the life of the vehicle, between reset and defined durations. Each type of data record is stored independently and depending on the type, multiple records might be stored. The records for the three recorders are retrievable with the DAVIE service tool.

Standard Feature

- Combined Trip/Chart Recorder
- Snapshot Recorder
- Faststop Recorder

The Combined Trip/Chart Recorder allows the engine to store data over the life of the vehicle as well as to store data between resets. When the trip reset is triggered, the record is discarded and new data is collected.

The Snapshot Recorder allows the driver to trigger a recording event. Details on triggering the Snapshot Recorder are available in Engine Rapido. The Snapshot Recorder will record data 10 seconds before and 5 seconds after the trigger. Three Snapshot Recorder events will be stored.

Faststop Recorder allows the engine to trigger a recording event when vehicle deceleration is greater than *Faststop Recorder Threshold (N064)*. The Faststop Recorder will record data 5 seconds before and 5 seconds after the trigger. Three Faststop Recorder events will be stored.

Feature Options

- Without Faststop Recorder

The Faststop recorder is enabled by default. Customers may disable the Faststop recorder at the time of production by selecting the appropriate sales code.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
With Faststop Recorder	**1000280**	**2092036**
Without Faststop Recorder	**1000281**	**2092037**

Programmable Parameters

Faststop Recorder

N064	Page 74	Min	Default	Max	Units
Faststop Recorder Threshold		2.24	8.95	15.65	MPH/SEC

ON/OFF Requirements

Faststop Recorder

ON	OFF
Faststop Recorder ON	Faststop Recorder OFF

Activate/Deactivate Requirements

Faststop Recorder

Activate	Deactivate
Vehicle deceleration rate is ≥ Deceleration Rate to Trigger Faststop Recorder	Vehicle deceleration rate is < Deceleration Rate to Trigger Faststop Recorder

17.0 Driver Shift Aid (DSA)

Overview

The Driver Shift Aid feature helps to reduce engine fuel consumption by communicating to the driver the need to upshift in order to reduce engine speed. It is designed to provide visual notifications through the driver display, encouraging the driver to perform an upshift at predefined engine speeds. Driver Shift Aid is compatible with vehicles equipped with manual transmissions or automatic transmissions operating in manual mode.

Note: The Driver Shift Aid feature is only available vehicles equipped with PACCAR MX engines manufactured after June 2015, and is not compatible with vehicles equipped with early model year 2015 or prior engines.

Standard Feature

- Without Driver Shift Aid

Feature Options

- Driver Shift Aid

The Driver Shift Aid provides visual notifications informing the driver that the programmable engine speed limit has been reached and encourages the driver to upshift in order to reduce engine speed and decrease engine fuel consumption. Driver Shift Aid will advise the driver to upshift if a higher gear is available, the engine will not underspeed, and the amount of power or torque available after the upshift is not reduced. Driver Shift Aid is configurable to meet the customer's specific application needs.

Minimum DSA Vehicle Speed (N246) defines the speed at which Driver Shift Aid becomes active. Below this speed, Driver Shift Aid will not display upshift notifications. *Driver Shift Aid Lowest Active Gear (N247)* defines the lowest selected gear that Driver Shift Aid will become active, while *Driver Shift Aid Highest Active Gear (N248)* defines the highest selected gear that Driver Shift Aid functionality will remain active.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Driver Shift Aid	**1903034**	**2092106**

Programmable Parameters

N246	Page 76	Min	Default	Max	Units
Driver Shift Aid Minimum Vehicle Speed		4	4	45	MPH

N247	Page 76	Min	Default	Max	Units
Driver Shift Aid Lowest Active Gear		1	1	4	GEAR #
N248	Page 76	Min	Default	Max	Units
Driver Shift Aid Highest Active Gear		5	TOP GEAR	TOP GEAR	GEAR #

Additional Information

Driver Shift Aid on the Driver Display

Figure 17.1 and Figure 17.2 show examples of the dedicated Driver Shift Aid screens on the driver display, when an upshift is recommended from a known gear.

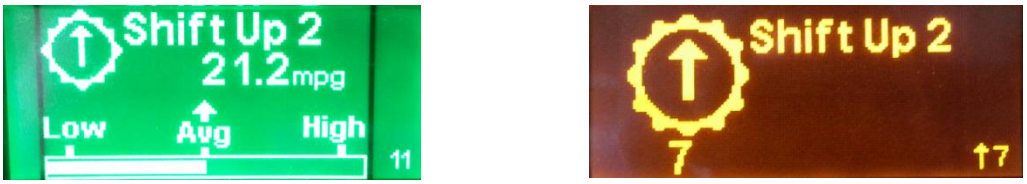


Figure 17.1 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

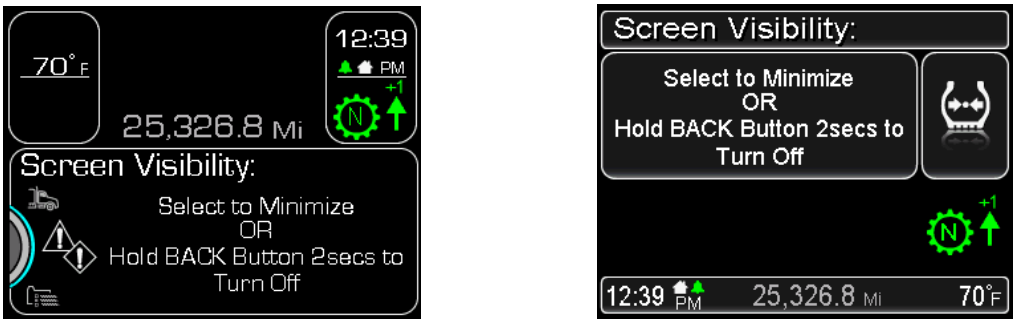


Figure 17.2 – Large Display; Left: Kenworth, Right: Peterbilt

Figure 17.3 and Figure 17.4 show examples of the dedicated Driver Shift Aid screens on the driver display, when an upshift is recommended from an unknown gear.

Figure 17.3 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

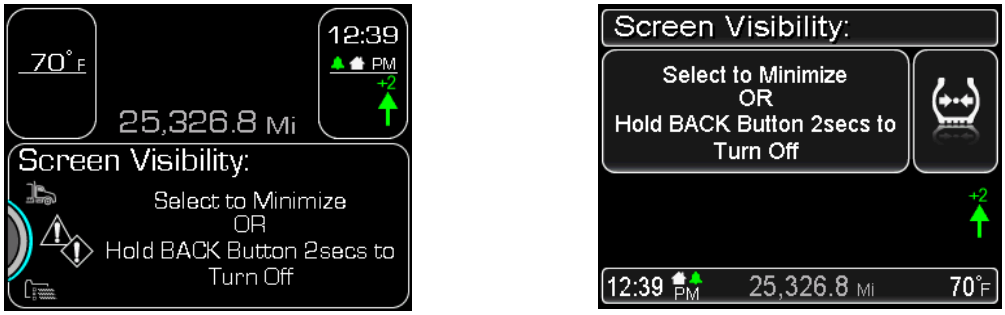


Figure 17.4 – Large Display; Left: Kenworth, Right: Peterbilt

18.0 Driver Reward

Overview

The Driver Reward feature is designed to improve fuel economy by providing incentive for drivers to meet customer-defined goals for fuel economy and idle time. The vehicle speed limit may be lowered when goals are not met, or increased to reward drivers for meeting the goals.

Note: The Driver Reward feature is only available vehicles equipped with PACCAR MX engines manufactured after June 2015, and is not compatible with vehicles equipped with early model year 2015 or prior engines.

Standard Feature

- Without Driver Reward

Feature Options

- Fuel Economy Evaluation
- Idle Time Evaluation

The Driver Reward feature provides the driver with increased vehicle speed for meeting customer-defined fuel consumption and idle time goals. The customer has the option of evaluating driver performance based on Fuel Economy, Idle Time Percentage, or both. *Driver Reward Offset Mode (N219)* may also be configured to apply vehicle speed rewards to the cruise control vehicle speed limit, the accelerator pedal vehicle speed limit, or both.

The Fuel Economy option allows the engine to monitor and compare actual fuel economy to *Fuel Efficiency Expected Threshold (N232)*, which is the threshold at which neither a reward nor penalty will be imposed on the driver. The *Driver Reward Maximum Bonus (N224)* will be applied if the measured fuel economy is greater than or equal to *Fuel Efficiency Bonus Threshold (N231)*. The *Driver Reward Maximum Penalty (N227)* will be applied if the measured fuel economy is less than or equal to *Fuel Efficiency Penalty Threshold (N233)*. As the driver improves the measured fuel economy, the maximum vehicle speed will increase with the driver's performance, until the *Driver Reward Maximum Bonus (N224)* has been reached. As the driver decreases the measured fuel economy, the vehicle speed penalty will gradually increase with the driver's performance, until the *Driver Reward Maximum Penalty (N227)* has been reached.

The Percent Idle Time option allows the engine to monitor the percentage of engine idle time and compare it to *Idle Time Expected Threshold (N236)*, which is the threshold at which neither a reward nor penalty will be imposed on the driver. The *Driver Reward Maximum Bonus (N224)* will be applied if the recorded percentage of idle time is less than or equal to Idle Time Bonus Threshold *(N235)*. The Driver Reward Maximum Penalty *(N227)* will be applied if the recorded percentage of idle time is greater than or equal to *Idle Time Penalty Threshold (N237)*. As the driver decreases the recorded percentage of idle time, the maximum vehicle speed will increase until the *Driver Reward Maximum Bonus (N224)* has been reached. As the driver decreases the recorded percentage of idle time, the vehicle speed penalty will gradually increase until the *Driver Reward Maximum Penalty (N227)* has been reached.

If Fuel Economy and Percent Idle Time are both enabled, the Driver Reward performance criteria are evaluated individually and the overall vehicle speed bonus or penalty will be determined from the lowest individual bonus or penalty.

The following figures may help to illustrate how the Driver Reward feature functions under different configurations and scenarios.

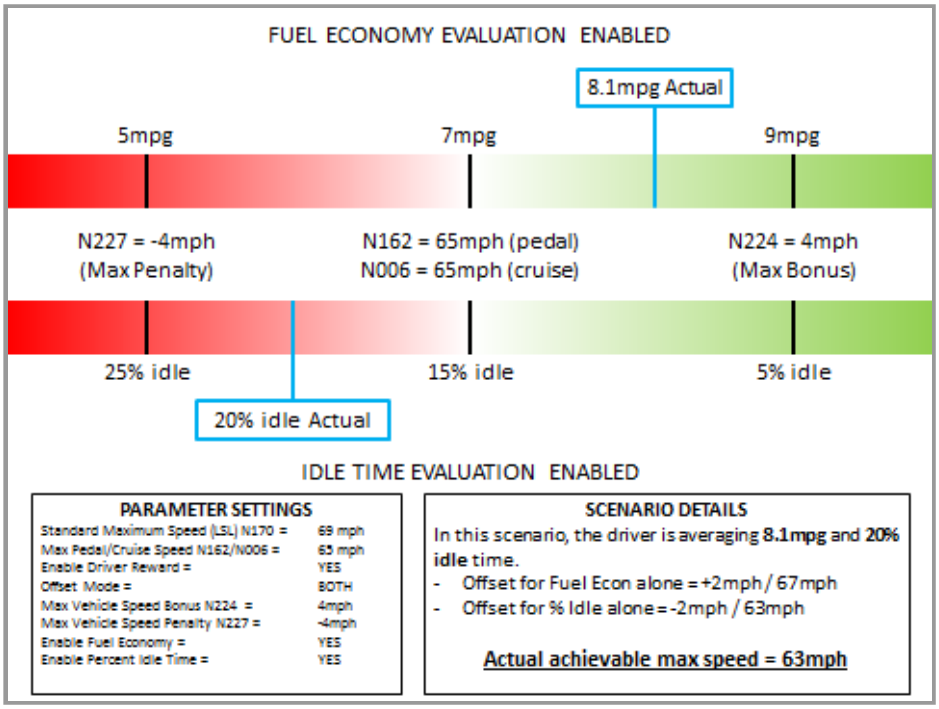


Figure 18.1 – Example Driver Reward Scenario #1

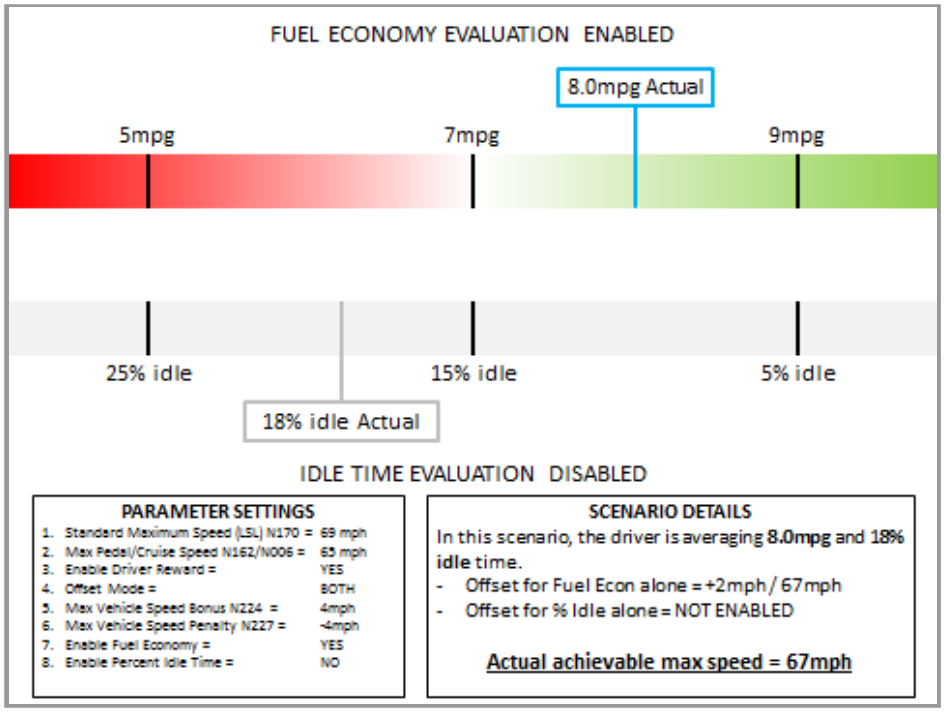


Figure 18.2 - Example Driver Reward Scenario #2

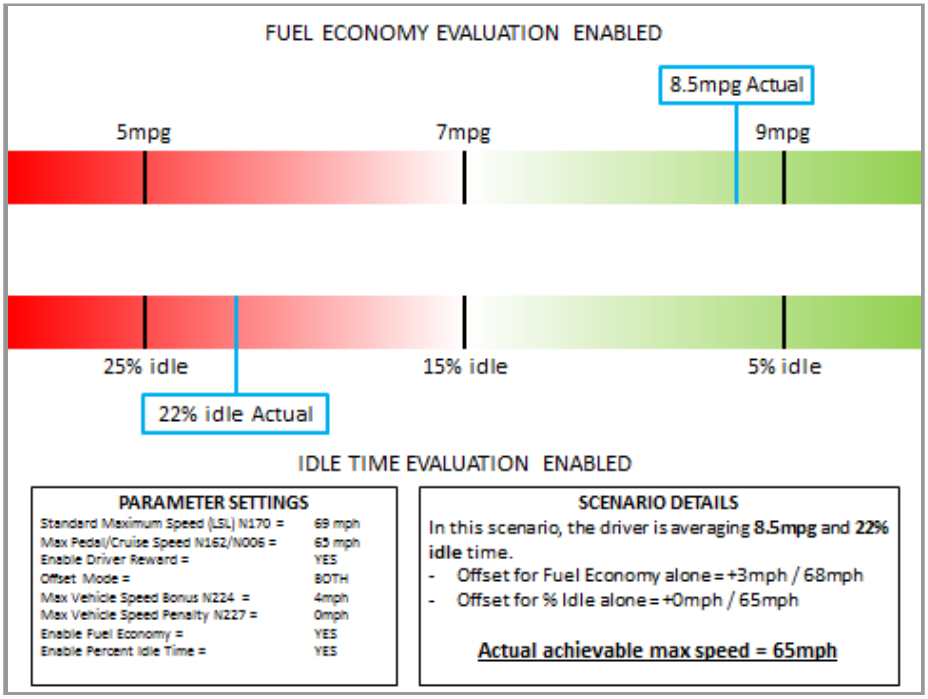


Figure 18.3 - Example Driver Reward Scenario #3

On Greenhouse Gas (GHG) compliant vehicles, *GHG Maximum Speed Limit (N170)* will limit the overall maximum speed of the vehicle, until the GHG expiration mileage has been exceeded. The GHG expiration mileage is available in the chassis information within PVP, and may not be changed. For vehicles which have exceeded the GHG expiration mileage, the *GHG Maximum Speed Limit (N170)* will be ignored. In order to provide a speed bonus on vehicles subject to the *GHG vehicle speed limiter*, the *Maximum Accelerator Pedal Vehicle Speed (N162)* or *Maximum Cruise Control Target Speed (N006)* must be lower than *GHG Maximum Speed Limit (N170)*.

The six parameters which control the bonus, expected, and penalty thresholds of fuel economy and idle time evaluations are configurable using ONLY the PVP interface, and the default values listed in Programmable Parameters will be applied automatically during the ordering process. As the engine progresses in mileage or changes duty-cycles, these parameters may be altered to more appropriately fit the engine's expected behavior.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
Enable Driver Reward	**1903030**	**2092102**
Enable Fuel Economy Evaluation	**1903032**	**2092104**
Enable Idle Time Evaluation	**1903033**	**2092105**

Programmable Parameters

N219	Page 79	Min	Default	Max	Units
Driver Reward Offset Mode		0	3	3	N/A
* 0 = No Driver Rewards 1 = Only During Accelerator Pedal Control 2 = Only While Cruise Control Active 3 = Always On					
N224	Page 79	Min	Default	Max	Units
Maximum Vehicle Speed Bonus		0	2	4	MPH
N227	Page 79	Min	Default	Max	Units
Maximum Vehicle Speed Penalty		0	- 2	- 4	MPH
N231	Page 79	Min	Default	Max	Units
Fuel Economy Threshold for Vehicle Speed Bonus		0	9.0	25.8	MPG
* Programmable only in PACCAR Vehicle Pro					
N232	Page 79	Min	Default	Max	Units
Expected Fuel Economy		0	7.0	21.1	MPG
* Programmable only in PACCAR Vehicle Pro					
N233	Page 79	Min	Default	Max	Units
Fuel Economy Threshold for Vehicle Speed Penalty		0	5.0	16.4	MPG
* Programmable only in PACCAR Vehicle Pro					
N235	Page 79	Min	Default	Max	Units
Idle Time Threshold for Vehicle Speed Bonus		0	5	100	%
* Programmable only in PACCAR Vehicle Pro					

N236	Page 79	Min	Default	Max	Units
Expected Vehicle Idle Time		0	15	100	%
* Programmable only in PACCAR Vehicle Pro					

N237	Page 79	Min	Default	Max	Units
Idle Time Threshold for Vehicle Speed Penalty		0	25	100	%
* Programmable only in PACCAR Vehicle Pro					

Additional Information

Driver Reward on the Driver Display

Figure 18.4 and Figure 18.5 show examples of Driver Reward screens on the driver display, indicating trends contributing to the bonus or penalty.

Figure 18.4 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

Figure 18.5 – Large Display; Left: Kenworth, Right: Peterbilt

Figure 18.6 and Figure 18.7 show examples of Driver Reward screens on the driver display while the vehicle is parked.

Figure 18.6 – NAMUX 2 & 3; Left: Kenworth, Right: Peterbilt

Figure 18.7 – Large Display; Left: Kenworth, Right: Peterbilt

19.0 Ether Starting Aid

Overview

The Ether Starting Aid is a fully integrated system that provides increased starting capabilities for extreme cold weather conditions. This feature is controlled by the engine and will inject ether into the air-intake system when required to start the engine.

Standard Feature

- Without Ether Starting Aid

Without Ether Starting Aid allows the engine to start normally.

Feature Options

- Ether Starting Aid

Ether Starting Aid allows the engine to control when ether will be injected into the intake system to assist in the starting of the engine in extreme cold weather conditions.

Orderable Feature Options & Sales Codes

Feature	KENWORTH	Peterbilt
With Ether Starting Aid	**1502060**	**N/A**

20.0 Manual HC Desorb

Overview

HC Desorb functionality is necessary to protect the aftertreatment from damage after extended idling. Idling a truck results in low exhaust temperatures and low exhaust flows, which promotes unburned hydrocarbons in the exhaust to absorb onto catalysts in the aftertreatment. Extended idling presents a risk for aftertreatment damage because if the aftertreatment catalysts and adsorbed hydrocarbons are brought to high enough temperatures (by driving the truck) after extended idling, there is a risk of uncontrolled temperature increase and thermal damage to the aftertreatment catalysts. After the truck has idled for long enough, there will be enough hydrocarbons accumulated that is not safe to drive the truck and an HC Desorb will be required. HC Desorb functionality protects the aftertreatment using controlled exhaust temperature increase to remove accumulated hydrocarbons in a slow and controlled manner, allowing the truck to be safely driven after completion.

A Manual HC desorb request, along with a “DO NOT DRIVE” notification, will be displayed on the dash after the truck has idled long enough that a dangerous amount of hydrocarbons have accumulated and the truck is NOT safe to drive. At this point, a Manual HC Desorb must be fully completed to safely remove accumulated hydrocarbons before the truck can be driven. Failure to comply will result in a P3880 fault and risk of aftertreatment damage.

Manual HC Desorbs are performed by the driver by pressing the regen switch when the request is displayed on the highline Drivers must complete a Manual HC Desorb before driving the vehicle if requested. As long as there is a “DO NOT DRIVE” notification, do not drive the truck.

All Manual HC Desorb notifications refer to HC Desorb as a “Regeneration” or “Regen”. HC Desorb differs from DPF Regenerations in that there is no additional fuel dosing during an HC Desorb. As a result, tailpipe temperatures will remain below 500 °F (260 °C).

Desorb Notifications on the Driver Display

Figure 20.3 shows an example of the notification displayed when a Manual HC Desorb is required before driving. If this message is displayed on the dash, the driver must complete the Mnaual HC Desorb before driving the truck. This applies to both Peterbilt and Kenworth on non-VECU, NAMUX 2 & 3 trucks.

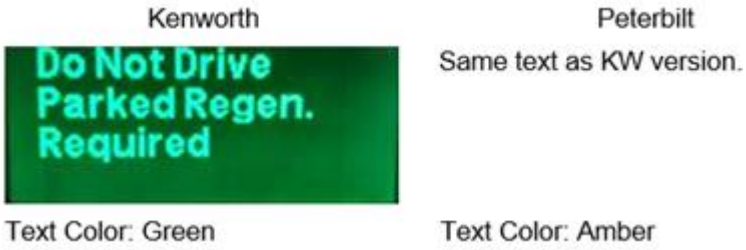


Figure 20.3 – NAMUX 2 & 3 Manual HC Desorb Required Notification; Left: Kenworth, Right: Peterbilt

21.0 Automatic HC Desorb

Overview

Automatic HC Desorb (N318) functionality provides the truck with the ability to perform an HC Desorb (hydrocarbon desorption) automatically during extended idling. This feature is fully integrated into the aftertreatment system and will perform an HC Desorb when the truck is idling, conditions are met, and without any driver inputs, potentially eliminating the need for a Manual HC Desorb.

Prior to Auto HC Desorb functionality, customers had to perform a Manual HC Desorb before driving after idling for an extended amount of time.

Auto HC Desorb functions by periodically increasing engine speed and exhaust temperatures to maintain a low level of HC accumulation in the aftertreatment during extended idle. This operation will maintain a level of accumulated hydrocarbons so that the truck is always safe to be driven and there is minimal risk of aftertreatment damage. Drivers may experience unexpected changes in engine speed when Auto Desorbs occur, sometimes without notification depending on NAMUX version. When the Auto Desorb has completed, engine speed will return to the previous set speed.

Standard Feature

- With Auto HC Desorb

Enabling Auto HC Desorb allows the truck to perform a hydrocarbon desorption automatically during extended idling. This reduces the likelihood of the driver having to perform a Manual HC Desorb after extended idling.

Feature Options

- Without Auto HC Desorb

Disabling Auto HC Desorb may cause the driver to perform a Manual HC Desorb before driving, after idling for an extended period.

Programmable Parameters

N318	Page 87	Min	Default	Max	Units
Enables the Auto HC Desorb functionality		0 (OFF)	0 (OFF)	1 (ON)	ON/OFF

ON/OFF Requirements

ON	OFF
Auto HC Desorb ON	Auto HC Desorb OFF

Activate/Deactivate Requirements

Activate	Deactivate
Accelerator pedal not pressed	Accelerator pedal pressed
Foot brake not pressed	Foot brake pressed
Clutch pedal not pressed if equipped	Clutch pressed if equipped
Vehicle in neutral	Vehicle not in neutral
Parking brake set	Parking brake not set
DPF regen switch is not set to 'inhibit'	DPF regen switch set to 'inhibit'
Vehicle speed = 0	Vehicle speed > 0
No related engine or aftertreatment faults	Related engine or aftertreatment faults, ie: BPV, VGT, aftertreatment overtemps, pre-DOC temp etc.
Coolant at operating temp	Coolant not at operating temp
Engine load less than 600 lb-ft*	Engine load greater than 600 lb-ft*
If PTO active, engine speed greater than 900 RPM**	If PTO active, engine speed less than 900 RPM**
* Engine load threshold varies based on engine speed ** Engine speed threshold varies based on ambient conditions	

Additional Information

Even with Auto HC Desorb enabled, Manual HC Desorb functionality is still available. If Auto HC Desorbs are not successful or are aborted by the user, it is possible that a Manual HC Desorb will be requested on the dash and a driver must complete the Manual HC Desorb before driving. Occurrences of Auto HC Desorb or Manual HC Desorb are normal and do not indicate any issues with the truck.

If an Auto HC Desorb is occurring, the driver is able to cancel the Auto HC Desorb by pressing the brake pedal and drive the truck. As long as there is a "DO NOT DRIVE" notification, do not drive the truck.

If an Auto HC Desorb is aborted by the user (for example, by pressing the service brake), another Auto HC Desorb will restart 10 minutes later if all enable conditions are met again. If Auto HC Desorbs are not desired by the customer, they can be inhibited by using the regen inhibit switch or disabled via PVP. If the regen inhibit switch is used, the driver must remember to un-inhibit the regen switch before starting to drive.

Depending on NAMUX version and software level, some vehicles may display a notification of a pending Auto HC Desorb and during an active Auto HC Desorb. If Auto HC Desorb notifications are available, a 2-minute countdown will be initiated prior to the Auto HC Desorb to alert the driver an Auto HC Desorb is being initiated.

All Manual HC Desorb and Auto HC Desorb notifications refer to HC Desorb as a “Regeneration” or “Regen”.

If PTO is active, Auto HC Desorbs may occur but will not change engine speed. Engine speed needs to be greater than 900 rpm for Auto HC Desorbs to be enabled with PTO active.

HC Desorb differs from DPF Regenerations in that there is no additional fuel dosing during an HC Desorb. As a result, tailpipe temperatures will remain below 500 °F (260 °C).

Desorb Notifications on the Driver Display

Figure 20.1 shows an example of the notification displayed while an Auto HC Desorb is in progress. This applies to both Peterbilt and Kenworth on non-VECU, NAMUX 2 & 3 trucks.

Figure 20.1 – NAMUX 2 & 3 Auto HC Desorb Occuring Notification; Left: Kenworth, Right: Peterbilt

Figure 20.2 shows an example of the countdown timer notification before an Auto HC Desorb is started, counting down from 120 seconds. The Auto Desorb will start when the timer reaches 0 seconds. This applies to both Peterbilt and Kenworth on non-VECU, NAMUX 2 & 3 trucks.

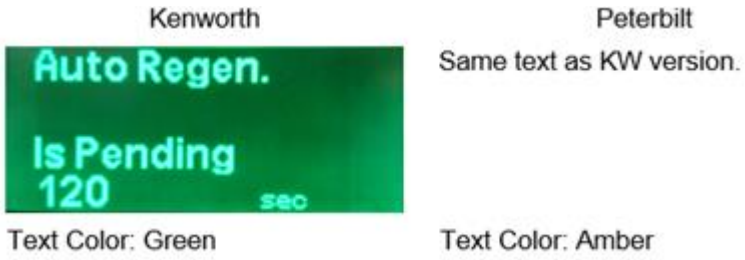


Figure 20.2 – NAMUX 2 & 3 Auto HC Desorb Pending Notification; Left: Kenworth, Right: Peterbilt

22.0 Parameters

The following table of parameters is listed in numeric order.

Comprehensive Parameter List					
N001	Page 25	Min	Default	Max	Units
Minimum Speed to Disable Cruise Control		N080 + 6	16	87	MPH
* Must be at least 6 MPH greater than *PTO Mode Vehicle Speed Limit (N080)*					
N002	Page 25	Min	Default	Max	Units
Minimum Speed to Enable Cruise Control		N001 + 3	19	90	MPH
* Must be at least 3 MPH greater than *Minimum Speed to Disable Cruise Control (N001)*					
N003	Page 25	Min	Default	Max	Units
Minimum Cruise Control Target Speed		N002	19	93	MPH
* Must be greater than or equal to *Minimum Speed to Enable Cruise Control (N002)*					
N004	Page 25	Min	Default	Max	Units
Vehicle Speed Decrease w/Res/Decel		1	1	6	MPH
N005	Page 25	Min	Default	Max	Units
Vehicle Speed Increase w/Set/Accel		1	1	6	MPH
N006	Page 25	Min	Default	Max	Units
Maximum Cruise Control Target Speed		25	64	100	MPH
N013	Page 38	Min	Default	Max	Units
Downhill Speed Limiter Vehicle Speed Offset		2	4	6	MPH
N014	Page 38	Min	Default	Max	Units
Auto-Retarder Vehicle Speed Offset		2	4	6	MPH

Comprehensive Parameter List					
N015	Page 38	Min	Default	Max	Units
Engine Brake Disabled When Out of Gear		OFF (0)	ON (1)	ON (1)	ON/OFF
N019	Page 38	Min	Default	Max	Units
Time Delay for Retarder Activation		0.1	0.1	3	SEC
N026	Page 38	Min	Default	Max	Units
Minimum Vehicle Speed for Engine Brake Activation		1	1	30	MPH
N039	Page 26	Min	Default	Max	Units
Multi-Torque Only when Cruise Active		OFF (0)	OFF (0)	ON (1)	ON/OFF
N051	Page 12	Min	Default	Max	Units
Fuel Density		780	855	950	g/L
N052	Page 14	Min	Default	Max	Units
Engine Idle Speed		650	650	700	RPM
N055	Page 57	Min	Default	Max	Units
Remote PTO Preset Engine Speed 1		0	780	2000	RPM
N056	Page 57	Min	Default	Max	Units
Remote PTO Preset Engine Speed 2		0	1030	2000	RPM
N057	Page 24	Min	Default	Max	Units
Minimum Fan Clutch Engagement Time		30	30	60	SEC
N064	Page 74	Min	Default	Max	Units
Faststop Recorder Threshold		2.24	8.95	15.65	MPH/SEC

Comprehensive Parameter List					
N065	Page 12	Min	Default	Max	Units
Minimum Speed for High Exhaust Temp Warning		5	5	50	MPH
N071	Page 22	Min	Default	Max	Units
Enable Fast Idle Control		OFF (0)	ON (1)	ON (1)	ON/OFF
N072	Page 22	Min	Default	Max	Units
Maximum Engine Speed in Fast Idle Control		650	1900	1900	RPM
N073	Page 58	Min	Default	Max	Units
Accelerator Pedal Type in PTO Mode		TORQUE (0)	SPEED (1)	SPEED (1)	N/A
N076	Page 55	Min	Default	Max	Units
Maximum Engine Speed using Pedal Input		N106	2000	2000	RPM
* Must be greater than or equal to *PTO Mode Minimum Engine Speed (N106)*					
N077	Page 56	Min	Default	Max	Units
Maximum Engine Torque in PTO Mode		148	1902	1902	LB-FT
N078	Page 54	Min	Default	Max	Units
Disable PTO Mode w/Clutch Depressed		OFF (0)	ON (1)	ON (1)	ON/OFF
N079	Page 54	Min	Default	Max	Units
Require Parking Brake for PTO Mode		OFF (0)	OFF (0)	ON (1)	ON/OFF

N080	Page 54	Min	Default	Max	Units
PTO Mode Vehicle Speed Limit		1	1	N001 - 6	MPH
* Must be at least 6 MPH less than *Minimum Speed to Disable Cruise Control (N001)*					
N081	Page 56	Min	Default	Max	Units
PTO Mode Maximum Engine Speed Rate of Change		50	75	200	RPM/SEC
* To Enable, *Enable PTO Mode Engine Ramp Rate Limiter(N109)* must be ON (1)					
N082	Page 56	Min	Default	Max	Units
Engine Speed Decrease w/ Res/Decel (In-Cab)		10	50	1000	RPM
N083	Page 56	Min	Default	Max	Units
Engine Speed Increase w/ Set/Accel (In-Cab)		10	50	1000	RPM
N084	Page 56	Min	Default	Max	Units
Engine Speed Ramp-down w/Res/Decel (In-Cab)		10	250	1000	RPM/SEC
N085	Page 56	Min	Default	Max	Units
Engine Speed Ramp-Up w/Set/Accel (In-Cab)		10	250	1000	RPM/SEC
N086	Page 56	Min	Default	Max	Units
Maximum Engine Speed using Switch Inputs		N106	2000	2000	RPM
* Must be greater than or equal to *PTO Mode Minimum Engine Speed (N106)* * For Remote applications, should be set to Customer's requested Maximum Engine Speed					

N087	Page 56	Min	Default	Max	Units
PTO Mode Preset Engine Speed (In-Cab)		0	780	2000	RPM
* To Enable, *Engine Speed Capture or Engine Speed Preset w/ Set Switch (N110)* must be PRESET (0)					
N088	Page 58	Min	Default	Max	Units
Remote PTO in Vehicle Parked State		OFF (0)	ON (1)	ON (1)	ON/OFF
N089	Page 54	Min	Default	Max	Units
Neutral Required for PTO Mode		OFF (0)	ON (1)	ON (1)	ON/OFF
* Recommended to be disabled with Eaton Ultrashift transmissions					
N090	Page 56	Min	Default	Max	Units
Engine Speed Decrease w/Res/Decel (Remote)		10	50	1000	RPM
N091	Page 56	Min	Default	Max	Units
Engine Speed Ramp-down w/Res/Decel (Remote)		10	250	1000	RPM/SEC
N092	Page 56	Min	Default	Max	Units
Engine Speed Increase w/Set/Accel (Remote)		10	50	1000	RPM
N093	Page 56	Min	Default	Max	Units
Engine Speed Ramp-Up w/Set/Accel (Remote)		10	250	1000	RPM/SEC
N101	Page 54	Min	Default	Max	Units
Disable PTO Mode w/ Brake Depressed		OFF (0)	ON (1)	ON (1)	ON/OFF
* Required for Mobile Cab Station w/ Accelerator and Switches configurations * Required if *PTO Mode Vehicle Speed Limit (N080)* is greater than 3 MPH					

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
* 0 = Hardwired 12V 1 = CAN Signal					
N103	Page 22	Min	Default	Max	Units
Engine Speed Increase w/ Set/Accel		10	250	1000	RPM/SEC
N104	Page 22	Min	Default	Max	Units
Engine Speed Decrease w/ Res/Decel		10	250	1000	RPM/SEC
N105	Page 22	Min	Default	Max	Units
Engine Speed Ramp-down w/ Res/Decel		10	100	1900	RPM
N106	Page 55	Min	Default	Max	Units
PTO Mode Minimum Engine Speed		N052	650	2000	RPM
* Must be greater than or equal to *Engine Idle Speed (N052)* * May not be greater than 800 RPM if *Require Parking Brake for PTO Mode (N079)* and *Neutral Required for PTO Mode (N089)* are disabled * May not be greater than 950 RPM if *Require Parking Brake for PTO Mode (N079)* and *Neutral Required for PTO Mode (N089)* are disabled, and *Disable PTO Mode w/ Brake Depressed(N106)* is enabled.					
N107	Page 22	Min	Default	Max	Units
Engine Speed Ramp-Up w/ Set/Accel		10	100	1900	RPM
N109	Page 56	Min	Default	Max	Units
Enable PTO Mode Engine Ramp Rate Limiter		OFF (0)	OFF (0)	ON (1)	ON/OFF

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
N110	Page 56	Min	Default	Max	Units
Engine Speed Capture or Engine Speed Preset w/ Set Switch		PRESET (0)	CAPTURE (1)	CAPTURE (1)	N/A
* In-Cab use only * Not available with mobile applications					
N162	Page 29	Min	Default	Max	Units
Maximum Accelerator Pedal Vehicle Speed		25	64	155	MPH
N169	Page 29	Min	Default	Max	Units
GHG Expiration Distance		0	0	1,259,000	MILES
* Configurable in Prospector Only					
N170	Page 29	Min	Default	Max	Units
GHG Maximum Speed Limit		0	121	121	MPH
* Configurable in Prospector Only					
N178	Page 14	Min	Default	Max	Units
Allow Idle Timer Reset During Warning		OFF (0)	ON (1)	ON (1)	ON/OFF
N179	Page 15	Min	Default	Max	Units
Enable Idle Timer Reset from Park Brake		OFF (0)	ON (1)	ON (1)	ON/OFF
N182	Page 15	Min	Default	Max	Units
Idle Timer Low Coolant Temperature Override Threshold		2	30	260	°F
N183	Page 15	Min	Default	Max	Units
Idle Timer Engine Load Threshold		0	35	100	%

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
N184	Page 15	Min	Default	Max	Units
Idle Timer High Ambient Temp Threshold		-40	80	490	°F
N185	Page 15	Min	Default	Max	Units
Idle Timer Low Ambient Temp Threshold		-40	39	490	°F
N186	Page 15	Min	Default	Max	Units
Idle Time in PTO Mode		1	5	1092	MIN
N187	Page 14	Min	Default	Max	Units
Idle Time w/ Parking Brake Set		1	5	1092	MIN
N188	Page 14	Min	Default	Max	Units
Idle Time w/ Parking Brake Released		1	5	1092	MIN
N190	Page 15	Min	Default	Max	Units
Enable Idle Timer Reset from Engine Load		OFF (0)	ON (1)	ON (1)	ON/OFF
* Requires *Enable Idle Timer Override from Engine Load (N191)* to be disabled					
N191	Page 15	Min	Default	Max	Units
Enable Idle Timer Override from Engine Load		OFF (0)	ON (1)	ON (1)	ON/OFF
* Requires *Enable Idle Timer Reset from Engine Load (N190)* to be disabled * Not Available in PTO Mode					
N193	Page 15	Min	Default	Max	Units
Idle Timer Expiration Distance		0	500,000	1,259,000	MILES

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
N194	Page 14	Min	Default	Max	Units
Idle Timer Shutdown Warning Duration		30	60	255	SEC
N197	Page 15	Min	Default	Max	Units
Enable Idle Timer Accelerator Pedal Reset		OFF (0)	ON (1)	ON (1)	ON/OFF
N198	Page 15	Min	Default	Max	Units
Enable Idle Timer Service Brake Reset		OFF (0)	ON (1)	ON (1)	ON/OFF
N199	Page 15	Min	Default	Max	Units
Enable Idle Timer Clutch Pedal Reset		OFF (0)	ON (1)	ON (1)	ON/OFF
N219	Page 79	Min	Default	Max	Units
Driver Reward Offset Mode		0	3	3	N/A
* 0 = No Driver Rewards 1 = Only During Accelerator Pedal Control 2 = Only While Cruise Control Active 3 = Always On					
N224	Page 79	Min	Default	Max	Units
Driver Reward Maximum Bonus		0	2	4	MPH
N227	Page 79	Min	Default	Max	Units
Driver Reward Maximum Penalty		0	- 2	- 4	MPH
N231	Page 79	Min	Default	Max	Units
Fuel Efficiency Bonus Threshold		0	9.0	25.8	MPG
* Programmable only in PACCAR Vehicle Pro					

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
N232	Page 79	Min	Default	Max	Units
Fuel Efficiency Expected Threshold		0	7.0	21.1	MPG
* Programmable only in PACCAR Vehicle Pro					
N233	Page 79	Min	Default	Max	Units
Fuel Efficiency Penalty Threshold		0	5.0	16.4	MPG
* Programmable only in PACCAR Vehicle Pro					
N235	Page 79	Min	Default	Max	Units
Idle Time Bonus Threshold		0	5	100	%
* Programmable only in PACCAR Vehicle Pro					
N236	Page 79	Min	Default	Max	Units
Idle Time Expected Threshold		0	15	100	%
* Programmable only in PACCAR Vehicle Pro					
N237	Page 79	Min	Default	Max	Units
Idle Time Penalty Threshold		0	25	100	%
* Programmable only in PACCAR Vehicle Pro					
N246	Page 76	Min	Default	Max	Units
Minimum DSA Vehicle Speed		4	4	45	MPH
N247	Page 76	Min	Default	Max	Units
Driver Shift Aid Lowest Active Gear		1	1	4	GEAR #
N248	Page 76	Min	Default	Max	Units
Driver Shift Aid Highest Active Gear		5	TOP GEAR	TOP GEAR	GEAR #

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
N296	Page 30	Min	Default	Max	Units
Scale Acceleration Target		SLOW	NORMAL	FAST	N/A
N306	Page 46	Min	Default	Max	Units
Enable Engine Speed Control via TSC1		OFF (0)	OFF (0)	ON (1)	ON/OFF
N307	Page 58	Min	Default	Max	Units
Disable In-Cab Accelerator Pedal in Remote PTO		OFF (0)	OFF (0)	ON (1)	ON/OFF
N311	Page 58	Min	Default	Max	Units
Enable Application Road Speed Limiter		OFF (0)	OFF (0)	ON (1)	ON/OFF
N313	Page 58	Min	Default	Max	Units
Application Road Speed Limiter Vehicle Speed		0	19	155	MPH
N315	Page 58	Min	Default	Max	Units
ARSL On/Off with +12V Signal		OFF (0)	ON (1)	ON (1)	ON/OFF
N318	Page 87	Min	Default	Max	Units
Enables the Auto HC-Desorb functionality		OFF (0)	ON (1)	ON (1)	ON/OFF
GP11	Page 68	Min	Default	Max	Units
GDP First Gear Active		1	N/A	GP13	GEAR #
GP12	Page 68	Min	Default	Max	Units
GDP Engine Speed		1500	1680	1700	RPM

N102	Page 45	Min	Default	Max	Units
Signal Source for Remote Main Switch		0	0	1	N/A
GP13	Page 68	Min	Default	Max	Units
GDP Last Gear Active		GP11	N/A	NOT TOP GEAR	GEAR #
GP14	Page 68	Min	Default	Max	Units
GDP Active Gear Count		N/A	N/A	N/A	N/A
PS25	Page 67	Min	Default	Max	Units
PGS Speed Step Count		0	N/A	2	N/A
PS26	Page 67	Min	Default	Max	Units
PGS First Limit Gear Min		1	N/A	<PS28	GEAR #
PS27	Page 68	Min	Default	Max	Units
PGS First Engine Speed Limit		1400	N/A	PS29	RPM
PS28	Page 67	Min	Default	Max	Units
PGS First Limit Gear Max		>PS26	N/A	<PS30	GEAR #
PS29	Page 67	Min	Default	Max	Units
PGS Second Engine Speed Limit		PS27	N/A	1800	RPM
PS30	Page 67	Min	Default	Max	Units
PGS Highest Gear		>PS30	N/A	TOP GEAR	GEAR #

PS29	Page 67	Min	Default	Max	Units
PGS Second Engine Speed Limit		PS27	N/A	1800	RPM
PS30	Page 67	Min	Default	Max	Units
PGS Highest Gear		>PS30	N/A	TOP GEAR	GEAR #

23.0 Troubleshooting Errors in PACCAR Vehicle Pro

When changing parameters in PACCAR Vehicle Pro, errors may occur when paramters are configured outside of their intended ranges or if conflicts exist between paramters. Programming rules are enforced when submitting new software configurations, and error messages may appear. The following table is intended to provide clarification of commonly encountered error messages and requirements to resolve them:

Error Message
N006~MUST~BE~GTE~N003~PLUS~5MPH The Maximum Cruise Control Target Speed (N006) must be at least 5 MPH greater than Minimum Cruise Control Target Speed (N003)
N055~MUST~BE~LESS~THAN~N056 Remote PTO Preset Engine Speed 1 (N055) must be less than Remote PTO Preset Engine Speed 2 (N056)
N055~MUST~BE~WITHIN~N106~AND~N056 Remote PTO Preset Engine Speed 1 (N055) must be greater than or equal to PTO Mode Minimum Engine Speed (N106), and also less than or equal to Remote PTO Preset Engine Speed 2 (N056)
N056~MUST~BE~WITHIN~N055~AND~N086 Remote PTO Preset Engine Speed 2 (N056) must be greather than or equal to Remote PTO Preset Engine Speed 1 (N055), and also less than or equal to Maximum Engine Speed using Switch Inputs (N086)
N076~MUST~BE~GTE~MIN~PTO~ESPD~N106 Maximum Engine Speed using Pedal Input (N076) must be greater than or equal to PTO Mode Minimum Engine Speed (N106)
N078~MUST~BE~DISABLED~IF~N079~~~EQ~~~0 Disable PTO Mode w/Clutch Depressed (N079) must be disabled if Require Parking Brake for PTO Mode (N079) is disabled
N079~MUST~BE~DISABLED~FOR~MOBILE~PTO Require Parking Brake for PTO Mode (N079) must be disabled for Mobile PTO control type selections
N079~MUST~BE~ENABLED~FOR~REMOTE~PTO Require Parking Brake for PTO Mode (N079) must be enabled for Remote PTO control type selections
N079~MUST~BE~ENABLED~FOR~STATIONARY~PTO Require Parking Brake for PTO Mode (N079) must be enabled for Stationary PTO control type selections

N086~MUST~EQUAL~N106~FOR~THIS~CONFIGURATION Maximum Engine Speed using Switch Inputs (N086) must be equal to PTO Mode Minimum Engine Speed (N106) when Mobile Pedal-Only configuration is selected
N086~MUST~BE~GTE~N106 Maximum Engine Speed using Switch Inputs (N086) must be greater than or equal to PTO Mode Minimum Engine Speed (N106)
N101~MUST~BE~ENABLED Disable PTO Mode w/ Brake Depressed (N101) must be enabled if Mobile PTO w/ Pedal and Switch Controls are selected, and PTO Mode Vehicle Speed Limit (N080) is greater than 3 MPH
N102~INVALID~FOR~THIS~CONFIGURATION Signal Source for Remote Main Switch (N102) can only be configured for CAN (1) for Remote PTO control configurations
N106~MUST~BE~LT~800~IF~N079~AND~N089~ARE~DISABLED PTO Mode Minimum Engine Speed (N106) cannot be greater than 800 RPM if Require Parking Brake for PTO Mode (N079) and Neutral Required for PTO Mode (N089) are disabled
N110~MUST~EQ~NONE~(1)~FOR~THIS~CONFIGURATION Engine Speed Capture or Engine Speed Preset w/ Set Switch (N110) must be set to NONE for mobile PTO applications
TSC1~NOT~ALLOWED TSC1 Engine Speed Control is not allowed, unless Remote PTO w/o Throttle Pedal control type is selected

24.0 Document Change Notes

1/11/2018	• Added N296 (Scale Acceleration Target) parameter and description • Updated all references from PACCAR Engine Pro to PACCAR Vehicle Pro • Added table 9.1 to determine overall maximum vehicle speed limit based on vehicle configuration • Added Section 21.0 PVP error troubleshooting guide to address common configuration errors • Section 19.0 re-introduced for Ether Start Aid functionality ○ mistakenly retracted from some previous revisions • Labeled In-Cab Throttle Pedal as optional in Remote PTO configuration tables, as they are configurable in PVP • Added sales codes for “With FastStop Recorder” (default option) in section 16.0 • Increased maximum values for N001, N002, N003 to resolve overlap issues with Maximum PTO Vehicle Speed
4/11/2018	• Section 21.0 introduced for Auto Desorb functionality ○ New functionality introduced • Added N318 (Auto Desorb) parameter and description • Added comments to N086 • Section 20.0 intoduced for Manual Desorb