Component Information 4000 Models

2004 Body Builder Data

ECM2 Electronic Engine Control Features and Programmable Parameters For International Diamond Logic II Controlled Engines Only



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<u>Component Information:</u> ECM2 Engine Control System

FOREWORD—Body Builder Data Book

The CT-471 — Body Builder Data is a set of booklets. The complete set includes:

- General Information Body Builder Data booklet for information about the International Truck product line
- *Model Series* Body Builder Data booklets that contain information related to the features and specifications for each of their respective models
- *Component* Body Builder Data booklets containing information for components that have common application in more than one truck series

This manual is part of the Component booklets and shall describe the engine speed control features for operating auxiliary equipment as applied to the new ECM2 engine control system.

TECH CENTRAL HELP LINE

International provides a telephone service that answers technical questions about vehicle maintenance and repair. The telephone number for Customers and Equipment Manufacturers (Body Builders) is:

1-800-448-7825

The Tech Central staff will be pleased to assist you with your questions about the installation and use of the engine speed controls reviewed here. Contact Tech Central with your programming problems that cannot be resolved locally.

PUBLICATION PURPOSE

The purpose of this document is to provide background and examples to properly install and operate auxiliary equipment that is connected to an International engine with the new ECM2 engine control system.

International Truck & Engine Corporation (International) provides flexibility for its customers by providing a truck chassis that can be assembled for a multitude of applications (ie. refuse packer, crane, wrecker, etc...). Typically, International does not provide the final assembly for a particular application, so the truck chassis is sent to a body builder for completion. The body builder must understand how to interface and operate the International engine with any auxiliary equipment.

This document is not intended as a cookbook. The circuitry described in this manual should be used as a guide. You must adapt the principals illustrated and develop designs that suit your durability, installation, and parts availability needs. This manual shows individual examples of engine speed control interfaces. These individual examples can be combined to form multi-function applications. For example, the same vehicle can use multiple engine speed control features such as the Remote Throttle feature to provide the power needed to operate a crane, while using Preset Engine Speed Control to operate an air compressor.

The content of this document is two-fold:

ECM2 Engine Speed Control features:

This document provides the information needed to integrate the ECM2 International electronic engine with auxiliary equipment such as air compressors, hydraulic pumps, generators and other equipment powered by the electronic engine.

ECM2 Programmable Parameters:

This information supports the process used by International Engine customers to specify values to be programmed for both factory programmable parameters and field programmable parameters. The programmable parameters are described in detail under each feature.

Contents – In this Body Builder Book, International Truck and Engine Corporation provides information about its different products to assist those who wish to modify these products for individual applications. International does not recommend or approve any firm nor make any judgments on the quality of the work performed by a particular firm. Individuals who use the services of a body builder must satisfy themselves as to the quality of the work.

The party installing a body, equipment, a fifth wheel, etc., to complete the vehicle for delivery and make it road-ready is responsible to see that the completed vehicle meets all applicable safety standards.

Specifications, descriptions and illustrative material in this literature are as accurate as known at time of publication, but are subject to change without notice. Illustrations are not always to scale and may include optional equipment and accessories but may not include all standard equipment.

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DISCLAIMER

- **NOTE:** International does not take any responsibility for customer or body builder wiring. After-market installed wiring for engine speed control must comply with the following guidelines:
 - 1. Sealed switches and connectors must be used for switches and connections that are exposed to the weather or to salt spray emanating from the vehicle's tires.
 - 2. Route and clip wiring to minimize chaffing and exposure to weather. Use conduit, loom, and/or tape to achieve this.
 - 3. Fuse all power leads as close to the power source as possible. Remember fuses protect the wiring size fuses accordingly.
 - 4. All ground connections that will be made to the frame or body must be connected to clean bare metal. Remove all dirt, paint, grease and rust that would insulate the terminal from ground. After connecting the ground, seal the connection with a good quality grease or surface sealant to protect the connection from corrosion.
 - 5. Spliced wires should be twisted together and soldered. Use a heat shrink tube with a meltable inner wall to seal the connection. Do not expose splices to the weather.

CAUTION – To avoid damage to vehicle electronic components, disconnect both the positive (+) and the negative (–) battery cables prior to electric welding. Attach the welder's ground cable as close as possible to the joint being welded. If it is necessary to weld close to an electronic component, it is recommended that the electronic component be temporarily removed.

Warning: To avoid sudden, unexpected vehicle movement and possible personal injury:

- Always fully set the parking brake. Do not use the gearshift lever instead of the parking brake.
- Turn off the engine when you leave the vehicle. Never leave the vehicle unattended with the engine running.

What International is doing for you

International provides a variety of engine speed control features to operate auxiliary equipment. Auxiliary equipment is typically powered by a Power Take Off (PTO) which is interfaced either to the vehicle transmission or tail shaft. PTO features are provided to permit precise management and control of auxiliary equipment.

This document provides information needed to integrate International ECM2 electronically controlled engines with auxiliary equipment such as air compressors, hydraulic pumps, generators, and the equipment they power. The features for engine speed control offer:

- More flexible installation locations control stations can be installed anywhere you can run wires or where a Remote
 Engine Speed Controller can be mounted. In fact, by using a RESCM the wire lengths can be shortened considerably.
 Instead of running wires the length of the truck to the engine controller, the wires and switches can be wired to a
 RESCM which can be located within close proximity of the engine speed control station (currently mounted on the
 back of the battery box or under the cab, depending on the configuration). Engine speed control can be initiated from
 outside or inside the vehicle's cab.
- 2. Capability to use either discrete hardwires to the engine controller or to the multiplexed Remote Engine Speed Controller (RESCM).
- 3. Precise engine speed governing the electronic engines will maintain engine speed within ~50 RPM (2 percent) of the set point. Accurate engine speed control should provide predictable flow and pressure from hydraulic pumps.
- 4. Two built-in engine speed selections (besides idle) for operating auxiliary equipment. Variable speed selections are also available through a remote throttle potentiometer or through switches to increase or decrease engine speed.
- 5. Control stations can be disabled by integrating equipment interlocks into them.
- 6. Diagnostics and programming are accomplished using either a PC-based software package or an electronic service tool.
- 7. Increases in engine speed are ramped, instead of accelerating the engine at full fuel levels. The slower load transfer rates can increase the equipment life of some mechanical systems.
- 8. Soft features—Feature selection and operating set points and limits can be changed to adapt the chassis to the new equipment.
- 9. A Password protects the configuration and speed settings from tampering.
- 10. Reduced assembly, maintenance, and repair costs over comparable mechanical control systems.

Hardware and software aspects of each engine speed control feature are discussed in this document. All options for features can be programmed at the factory. Features can be changed in the field after the vehicle has been manufactured using a pc-type computer or an electronic service tool. Section 2 reviews both the monitoring feature and programming capability using the pc-based Master Diagnostic Software (MDS) and the handheld Electronic Service Tool (EST). Emphasis will be placed on the MDS in this manual since at this time it is more commonly used in industry for field diagnostics and programming than the EST.

1 International Truck Electrical System Overview

International Truck has two electrical configurations for its trucks depending on the truck model:

The older system uses extensive direct wiring to the engine for its needed inputs and some outputs. It still requires data output via J1587 for gauge data (clusters, drivers displays, etc.) and J1939 data transfer for powertrain control such as transmission shift assist, ABS retarder override, ATC throttle derate, etc. if the suppliers choose to offer these features.

The *Next Generation Vehicle (NGV)* electrical system significantly reduces the direct wiring to the powertrain components. This system uses an Electrical System Controller (ESC) which can be considered a vehicle control module. All of the in-cab switches which were formerly direct wired to the powertrain modules are now connected to this ESC which then communicates the values to the other devices via J1939. The trucks implementing this system also use a J1939 driven cluster and still, in general, maintain the same powertrain interfacing (Engine-Transmission-ABS) as in previous vehicles. Even with this increased J1939 usage, the standard J1587 communications are still available for uses such as diagnostics as the supplier chooses.

1.1 ECM2 Engine Control System

The ECM2 is one of two electronic controllers on the International VT365 and I313 engine. The Engine Control Module (ECM2) and Injector Drive Module (IDM2) are mounted directly on the engine. These two controllers work in conjunction to allow the engine to run and operate. The ECM2 is considered the computer brain for the engine, while the IDM2 acts as a computer brain for the fuel injection. The ECM2 also interfaces with other vehicle features such as communicating with the Cruise Control switches, PTO switches, and Accelerator Pedal to name a few.

The ECM2 engine control system has been specifically designed to work with the new multiplex system, using the J1939 datalink to communicate with the ESC. As a result, some of the hardwired switches from the days of old have been removed from the engine controller and have been replaced by a multiplexed switch that has its information sent to the engine controller over the J1939 datalink. A few examples of switches that are now multiplexed are: Cruise Control and PTO switches, Brake Pedal switch, and Clutch Pedal switch to name a few.

1.2 Remote Engine Speed Controller

As stated earlier and different from past International vehicles, NGV Electrical System uses multiplexed wiring technologies for interfacing major functional areas of the vehicle. The NGV Electrical System includes the Remote Engine Speed Control Module (RESCM) to provide a means to control engine speed from a remote location on the vehicle. The RESCM is responsible for interfacing control signals to the operator and communicates signal status over J1939 datalink. Furthermore, the system relies on software algorithms to accomplish logic functions instead of implementing similar features using complex wire harness designs with relays and switches. A natural benefit of this system is increased diagnostic capability in terms of on-line, off-line, and off-board testing as well as simplifying the harness design. In layperson's terms, the new electrical system uses switches that communicate digital messages over a two-wire datalink, rather than having to hardwire a large bundle of wires that would often extend from one end of the truck to the other. Also, the RESCM is able to accomplish all of the functionality that the old hardwire method was able to achieve.

1.3 Body Builder Wiring

When control over engine speed is required from outside the vehicle cab, remote mounted switches [either hardwired (12VYC) or multiplexed using the RESCM (12VXY)] must be used. Even though the NGV electrical system tends not to use discrete hardwires, International has decided to retain certain body builder inputs as hardwired to the engine controller. Depending upon the function desired, it may be more cost effective to continue with the old method of hardwiring certain inputs.

When code 12VYC is ordered, the hardwired inputs and body builder wiring are still made available. However, there is a limited set of functions available when using the hardwire method. Not all of the engine controller inputs were able to be saved with the new ECM2 engine controller. See **Table 1.1**. The hardwired version does not include such features as Remote Throttle or Transfer Case/Split Shaft. If those functions are desired, the Remote Engine Speed Control Module (RESCM) must be ordered.

Again, body builder wiring connections are provided only when code 12VYC is specified. The controller module and the wiring connections for body builder use are generally located underneath the hood of the truck. **Figure 1.1** shows a picture of a truck cab with the hood raised to reveal the engine. The location of the controller module and wire connections for a typical VT365 V8 engine is circled in the figure. A more detailed view of the enclosed area is depicted in **Figure 1.2**. It is highly recommended by International that a male/female connector pair be used to interface with the body builder wires. Recommended connectors can be found in Appendix D2 and D3. Hardwire connections should be avoided if possible in order to make electrical diagnostics and servicing convenient. Electrical wires spliced to these connections should be twisted

together and then soldered. A heat shrink tube should be used to seal the connections and the splices should not be exposed to the weather. Each wire connection has a circuit number printed on the insulation. **Table 1.1** summarizes the circuit numbers and functions available with the hardwired version, 12VYC. In addition, the table includes information on wire gauge sizes and colors.



Figure 1.1 Engine Control Module and Wire Connection Location

Table 1.1 Functions available with 12VYC, hardwired body builder wiring

Circuit #	ECM Pin Designation and Name	Function	Wire Gauge / Color					
K97CB	X3-19 RPRE	Preset PTO Enable	18 / Violet					
K97CC	X3-20 RVAR	Variable PTO Enable	18 / Violet					
K46B	X3-21 SCS	Set PTO Speed	18 / Gray					
K46A	X3-14 RAS	Resume PTO Speed	18 / Gray					
K47B	X3-17 VSSCALA	Speedometer	18 / Gray					
K97AR	X3-11 TACA	Tachometer	18 / Violet					
K97DF**	12V 1 Amp Source	Voltage PTO	18 / Violet					
	Wiring provided with Code 12VVC							

Wiring provided with Code 12VYC

NOTE: For protection purposes, each wire is capped with a piece of heat shrink tube.

** 1 Amp maximum current draw.



Figure 1.2 Closer View of Location for Body Builder Connections

It is highly recommended by International that a male/female connector pair be used to interface with these wires. Recommended connectors can be found in Appendix D2 and D3. Hardwire connections should be avoided if possible in order to make electrical diagnostics and servicing convenient.

The other option is to order a RESCM by using code 12VXY. See **Figure 1.3**, **Figure 1.4**, and **Figure 1.5**. The RESCM uses the J1939 datalink to transmit (multiplex) the messages to the engine controller that were previously hardwired with past-generation International trucks. The operation of the engine control features behaves exactly the same whether the body builder switches are hardwired or multiplexed. Plus, added functionality (ie. Remote Throttle and Transfer Case/Split Shaft) is available with the RESCM. Because there are no longer hardwired inputs to the engine controller for the two above mentioned features, the RESCM (12VXY) must be ordered if such functions are desired. If 12VXY is ordered, the RESCM is mounted with the J1939 datalink, power and ground wires already connected (connectors J1 and J2). Body Builder applications are installed into the J3 connector.





Figure 1.4 RESCM- J1939, Power, & Ground Connectors



Figure 1.5 RESCM- Body Builder (Applications) Connector



2 Master Diagnostics Software and Feature Programming

After engine assembly, changes can be made using the Master Diagnostics Software (MDS) package or the Electronic Service Tool (EST). The scope of the changes that may be needed is discussed in this section. International primarily uses the Master Diagnostic Software package for engine control diagnostics and programming. The MDS permits monitoring of engine speed control functions during engine operation. This tool also permits modification of engine speed control parameters via reprogramming. The specific functions for monitoring and programming are discussed in this section. In order to use the software package, a pc-type computer must be interfaced to the controller through the PC's communications port using an adapter harness. Appendix A shows the required part numbers to connect the computer. The software package can be installed on a computer by following the instructions on the installation disk.

In addition to the MDS, International also uses the MPSI Pro-Link 9000 EST for engine control diagnostics and programming. The tool contains a micro-processor, keypad, and screen with removable application cartridges. A preliminary description of important EST features related to engine speed control is also included in this section. The service tool and cartridges can be purchased through International part dealers. Appendix A shows the service part numbers for the MPSI Pro-link 9000 and International Electronic Engine Cartridge. However, this scan tool is no longer in wide use and will only be briefly mentioned in this section.

2.1 Monitoring Engine Speed Control Parameters with Master Diagnostics Software

MDS can be used to monitor engine speed control parameters during equipment operation. **Table 2.1** shows the data display items for engine speed control features that are displayed by the diagnostic software. Beside each item is a short explanation of the data displayed. Switch states and accelerator pedal values contained in **Table 2.1** are shown while the engine is not running and the ignition key is on. This Key On/Engine Off functionality permits a particular installation to be verified prior to actual use. Active values for PTO related parameters appear only when PTO MODE is set to REMOTE, IN-CAB or IN-CAB+REMOTE. Remote throttle indications appear only when REMOTE-PEDAL is set to ON. Similar data display names are used by the EST. The next section discusses programming for each engine speed control feature.

MDS Tool and MPSI EST	Value	Display Item Contents
Display Item		
Accel Pedal	0.00%	Displays the Throttle Percent of the Remote Throttle (if
		enabled) or the Driver's Foot Pedal depending upon which is
		greater.
Engine Speed	0.00 RPM	Displays Engine Speed in revolutions per minute.
PTO On/Off *	Off	Displays the status of the in-cab ON / OFF switch.
PTO Set Switch	Off	Displays the status of the SET switch.
PTO Coast Switch	Off	Displays the status of the SET switch (Hold SET for COAST).
PTO Resume Switch	Off	Displays the status of the RESUME switch.
PTO Accel Switch	Off	Displays the status of the RESUME switch (Hold the
		RESUME switch for the ACCEL function).
PTO Brake Switch	Off	Displays the status of the service brake switch.
PTO Clutch Switch	On	Displays the status of the clutch or neutral position switch.
PTO Ctrl Mode	Inactive	Displays ACTIVE when engine speed control is active.
PTO Set RPM	700.00	Displays desired engine speed in RPM when speed control is
	RPM	active.
Rem VAR PTO	Off	Displays ON when Remote Variable PTO Switch is enabled.
Rem Preset PTO	Off	Displays ON when Remote Preset Switch is enabled.
Remote Throttle	N/A	Displays ON when the remote throttle is enabled to control
		desired engine speed. Remote Throttle displays FAIL when
		the remote throttle is faulted.
Split Shaft	N/A	Displays driveline status (neutral or split shaft)

Table 2.1 Diagnostic Tool Display Items for Monitoring Speed Control Features

*This display item name is only valid for MDS. The corresponding parameter name for the EST is "PTO Speed".

2.2 Programming Engine Speed Control Parameters with Master Diagnostics Software What Can You Change with Master Diagnostics?

All parameters for PTO Engine Speed Control features can be programmed at the factory. Parameters can be re-programmed in the field after the vehicle has been manufactured. A service tool is used to modify the factory settings for engine speed control features. Re-programming permits customization of feature operation to exactly match the auxiliary equipment being operated; it also permits changing from one feature to another. **Table 2.2** shows which parameters are used for each engine speed control feature. Each of the parameters can be accessed and reprogrammed with the Master Diagnostics Software tool. Parameter settings can be reviewed and changed by selecting the appropriate engine speed control parameters within the VEHICLE PROGRAMMING menu.

When a feature is added or modified, all parameters should be checked to ensure that the equipment will operate as intended. Particular attention should be given to parameters that have a "Yes" in the column for the feature in **Table 2.2**. A more comprehensive discussion of all parameters is provided in Section 3. In this manual, the MDS parameter name will be used in situations where two different names describe the same parameter.

Additional references for feature programming can be found in Appendix B of this manual. Appendix E contains a flow chart for the service tool that shows a complete list of menus and features. For further assistance, contact your International dealer or call Tech Central at 1-800-448-7825 for help with field re-programming.

MDS Service Tool Parameter Name	Preset Engine Speed Control	Variable Engine Speed Control	Remote Throttle Pedal	Remote Engine Speed Control	Mobile Engine Speed Control	Split Shaft
PTO: Power Take Off Mode	Yes	Yes	Yes	Yes	Yes	Yes
PTO: In-Cab Mode	Yes	Yes	No	No 1	Yes	Yes
PTO: In-Cab Control	Yes 2	Yes 2	No 1	No 1	Yes 2	Yes
PTO: Remote Pedal	No 2	No 2	Yes	Yes	No 2	Yes
PTO: Preset RPM 1 (Set)	Yes	No	No	No 1	No	No
PTO: Preset RPM 2 (Resume)	Yes	No	No	No 1	No	No
PTO: Max RPM	Yes	Yes	Yes	Yes	Yes	Yes
PTO: RPM Ramp Rate	Yes	Yes	No	Yes	Yes	Yes
PTO: Max Vehicle Speed	No	No	No	No	Yes	No
EPG: Driveline Mode	No	No	No	No	Yes	Yes

NOTE:

Program as required for use with the Preset or the Variable Engine Speed Control features when they are used in combination with the Remote throttle.

² Program as required for use with the Remote Throttle when the Remote Throttle is used in combination with the Preset or the Variable Engine Speed Control features.

3 Engine Speed Control for Power Take Off (PTO) Applications

There are 3 different engine speed control features available for vehicle vocations:

- Preset Engine Speed Control
- Variable Engine Speed Control
- Mobile Variable Engine Speed Control

The first two features require a non-moving (stationary) vehicle for operation. The "Preset" feature always controls engine speed to a previously programmed value, while the "Variable" feature permits a desired engine speed to be selected via the incab or remote mounted switches. The "Mobile Variable" feature is the same as the "Variable" feature, with the exception that the vehicle can be moving or stationary during PTO operation.

Table 3.1 lists the programmable parameters that apply to these three PTO Engine Speed Control features. For each programmable parameter, this table shows the minimum and maximum permissible values that can be programmed, engineering units, and the resolution (increment) applicable for a particular parameter.

Detailed descriptions are provided for each of the programmable parameters in the Programmable Parameters, Section **Error! Reference source not found.**

Master Diagnostic Tool Variable Name	Units	Lower Limit	Upper Limit	Increment
PTO: Power Take Off Mode	N/A	0	3	1
PTO: In-Cab Mode	N/A	0	3	1
PTO: In-Cab Control	N/A	0	1	1
PTO: Remote Pedal	N/A	0	1	1
PTO: Preset RPM 1 (Set)	RPM	LOW IDLE	GOVERNED SPEED	1
PTO: Preset RPM 2 (Resume)	RPM	LOW IDLE	GOVERNED SPEED	1
PTO: Max RPM	RPM	LOW IDLE	GOVERNED SPEED	1
PTO: RPM Ramp Rate	RPM/SEC	1	1500	1
PTO: Max VS	MPH	2	20	1

Table 3.1 Programmable Parameter Attributes for PTO Engine Speed Control

3.1 Preset Engine Speed Control

This feature provides two pre-determined engine speed settings (besides idle) for equipment operation. Preset Engine Speed Control satisfies the majority of the intended engine speed control applications. Use Preset Engine Speed Control when a constant engine speed is required to operate equipment. Either the in-cab engine speed controls or remotely mounted control stations may be used.

Typical operation of this system requires the operator to perform the following steps:

- 1) Activate the system.
- Select one of the desired engine speeds using the SET/COAST or RESUME/ACCEL switch. The SET/COAST switch requests one preset speed setting; while the RESUME/ACCEL switch requests the other preset speed. Once one of these switches has been pressed, engine speed will begin ramping to the pre-programmed engine speed set-point.

The desired engine speed set-point can be field-programmed to any speed between low idle and governed engine speed. Preset Engine Speed Control operates only while the vehicle is stationary. Manipulation of cab located sensor inputs (ie. Neutral safety, Service Brake, or Clutch Pedal) will cause the engine speed control to disengage.

Preset Engine Speed Control can be combined with a Remote Throttle. If the engine RPM has reached the desired preset engine speed and a remote throttle input is present, the engine will respond to the greatest demand. In other words if the remote throttle is pressed so that the demanded engine speed is greater than the preset engine speed, the engine will ramp up to the greater of the two. Once the remote throttle pedal is released, the engine speed will ramp back down to the preset engine speed.

Table 3.2 summarizes the operation of Preset Engine Speed Control. The columns are labeled with the switch inputs. The first row discusses what happens when the switch contacts are momentarily closed. The second row discusses the effect of held switches (continuous contact) or multiple use of the same switch.

Table 3.2 Preset Engine Speed Control Switch Us	Table 3.2	Preset	Engine	Speed	Control	Switch	Use
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	ON	OFF	SET/COAST	RESUME/ACCEL	BRAKE	CLUTCH
Single Press (Momentary Contact)	Enables engine speed control	Disables engine speed control	Sets the desired engine speed to the "Set" Switch RPM	Sets the desired engine speed to the "Resume" Switch RPM	Deactivates engine speed control and establishes a standby state. Engine speed returns to low idle rpm.	Deactivates engine speed control and establishes a standby state. Engine speed returns to low idle rpm.
Held Switch (Continuous Contact)	Enables engine speed control	Disables engine speed control	Same 1	Same 1	The change In brake status establishes the standby state.	The change in driveline status establishes the standby state.

NOTE: 1 The held switch acts like the switch is being "hit" multiple times.

3.1.1 In-Cab Operation of Preset Engine Speed Control

When control of engine speed is not needed outside the vehicle's cab, the in-cab switches can be used to activate engine speed control and select the desired engine speed.

Press the CRUISE "ON" Switch to enable engine speed control. Note: This switch is located on the steering wheel. See Figure 3.1 NOTE: There is no indication to the user that the Cruise On switch has been depressed. Next, select the desired engine speed using either the SET/COAST or the RESUME/ACCEL switch. The engine speed acceleration will be limited according to the value programmed for the parameter *PTO RPM Ramp Rate*. This acceleration limit should be programmed as required to minimize stress on auxiliary equipment drive links.



Figure 3.1 (STANDARD) In-Cab Switches located on the steering wheel

Engine speed will be reduced to idle by any of the following actions:

- CRUISE "OFF" switch is pressed
- Brake pedal is pressed
- Clutch pedal is pressed
- Automatic transmission is shifted out of neutral (NOT RECOMMENDED)

Note that these actions are always applicable for in-cab PTO Operation, regardless of the value programmed for the parameter "PTO IN-CAB CONTROL". Only when engine speed is controlled by remote input signals and the cab interface is disabled will the engine speed be unaffected by the above actions.

WARNING!

SHIFT OF AUTOMATIC TRANSMISSION FROM NEUTRAL TO FORWARD OR REVERSE GEAR WHILE OPERATING ANY PTO MODE IS NOT RECOMMENDED; VEHICLE MAY LURCH FORWARD WHEN TRANSMISSION IS PLACED IN GEAR DUE TO INCREASED POWER OUTPUT OF THE ENGINE WHICH IS OPERATING AT THE ELEVATED ENGINE SPEED.

Warning--To avoid sudden, unexpected vehicle movement and possible personal injury:

- Always fully set the parking brake when using the Preset PTO Engine Speed Control Feature.
- Do not abort the Preset Engine Speed Control Feature by shifting an automatic transmission from neutral gear into a forward or reverse gear.
- Turn off the engine when you leave the vehicle. Never leave the vehicle unattended with the engine running.

3.1.2 In-Cab Switch Configuration for Preset Engine Speed Control

The right-hand portion of **Figure 3.2** and **Figure 3.3** illustrates the circuitry provided by International for in-cab operation of Preset Engine Speed Control. Though the ECM2 pins and RESCM are shown in Figure 3.2 and 3.3, in-cab PTO operation does not require any additional wiring to these modules, nor any other module. The circuitry provided by International must not be tampered with.

If Preset PTO Engine Speed Control is already active and a different switch is pressed, engine speed will change from the original speed commanded by the ECM to the new speed corresponding to the latest switch that was pressed by the operator.

12V Ignition * K97DF 18VT 12volt 1 Amp Source (Voltage PTO) **Circuit Number** ECM2 Pin Designation & Function Gauge & Color Cruise Contro **ECM2 Engine Controller** Switches on * K97CB 18VT Steering Whee * Optional hard-wired Pin X3-19 RPRE (Preset PTO Enable) circuits present only * K97CC 18VT with code 12VYC Pin X3-20 RVAR (Variable PTO Enable) Cruise Control Cruise Control **Resume/Accel** On R/A On/Off * K46B 18GY and Pin X3-21 SCS (Set PTO Speed) Switch Off S/C Set/Coast Switch * K46A 18GY Pin X3-14 RAS (Resume PTO Speed) * K47B 18GY J1939 Pin X3-17 VSSCALA (Speedometer) VT = Violet Public GY = Grey Datalink ESC * K97AR 18VT Pin X3-11 TACA (Tachometer) Vehicle Controller **Body / Equipment International Supplied Manufacturer Supplied**

Figure 3.2 In-Cab Switch Layout for Engine Control with hardwired body builder wiring present

Figure 3.3 In-Cab Switch Layout for Engine Control with a Remote Engine Speed Controller present



3.1.3 Remote Operation of Preset Engine Speed Control

When control over engine speed is required from <u>outside</u> the vehicle cab, remote mounted switches [either hardwired (code 12VYC) or multiplexed using the RESCM (code 12VXY)] must be used to turn on PTO engine speed control and select the desired engine speed. **Figure 3.4** and **Figure 3.5** illustrate how remotely located switches must be interfaced to the ECM to accomplish Preset PTO Engine Speed Control. **Figure 3.4** details the hardwired body builder circuitry—12VYC, while **Figure 3.5** shows the circuitry need for the multiplexing RESCM—12VXY. The hardwired version does not include such features as Remote Throttle or Transfer Case/Split Shaft. If those features are desired, the Remote Engine Speed Control Module (RESCM) must be ordered. The RESCM uses the J1939 datalink to transmit (multiplex) the messages to the engine controller that were previously hardwired with past-generation International trucks. Switch functionality remains the same as described for the in-cab located switches (see **Table 3.2**)

A REMOTE PRESET PTO ON/OFF switch (RPRE) is required to remotely turn on the Preset Engine Speed Control. The desired engine speed is then selected using a remotely located SET/COAST or RESUME/ACCEL switch. Once a desired engine speed has been selected using one of these switches, engine speed will begin to increase. This rate of increase will be limited according to the value programmed in the parameter **PTO RPM Ramp Rate**. This acceleration limit should be programmed as required to minimize stress on auxiliary equipment power drive links.

WARNING!

Be aware that the Remote Set Switch and Remote Resume Switch are connected in parallel (logic "OR-ed") with the cabmounted SET/COAST and RESUME/ACCEL switches respectively. This means that once preset PTO Engine Speed Control has been placed in "standby" on-mode (by pressing either the In-Cab located CRUISE ON switch, or the remotely located REMOTE PRESET PTO ON switch), the desired engine speed can be modified both from within the cab or from the remote located PTO Engine Speed Control switches. This is ALWAYS TRUE, even when the PTO MODE parameter is programmed for REMOTE OPERATION ONLY.

A remote throttle can also be used to increase the engine's speed while operating in Preset PTO Engine Speed Control. See Section 5 of this manual for information on remote throttle interfaces.



Figure 3.4 Remote Installation for Preset Engine Control using hardwired body builder wiring

Figure 3.5 Remote Installation for Preset Engine Control using the Remote Engine Speed Controller



3.2 Variable Engine Speed Control

Variable engine speed control permits a desired engine speed to be achieved between low idle and rated engine speed even without use of the accelerator pedal or Remote Throttle. The switches that must be used to achieve this functionality are ON, OFF, SET/COAST, and RESUME/ACCEL. These switches can be remote and/or cab mounted. If only temporary increases in engine speed are needed, consider using Preset Engine Speed Control in combination with the Remote Throttle. **Table 3.3** summarizes the operation of Variable Engine Speed Control. Columns are labeled according to the switch being used. The first row presents the control system's response when the toggle switch position is changed by the operator. The second row documents the control system's response when the switch contacts are momentarily closed. The third row discusses the effect of maintaining a switch in the closed (pressed) condition; this row also discusses multiple applications of the same switch.

	ON	OFF	SET/ COAST	RESUME/ ACCEL	BRAKE	CLUTCH
On/Off switch (Toggle Switch)	Turns engine speed control ON (remote)	Turns engine speed control OFF (remote)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Single Press (Momentary Contact)	Turns engine speed control ON (in-cab only)	Turns engine speed control OFF (in-cab only)	Latch the current engine speed as the desired engine speed, if enabled. Decrease engine speed by 25 RPM, if active.	Resume speed control function at the last desired engine speed, if in standby state. Increase engine speed by 25 RPM, if active.	Deactivate vehicle speed control and maintain standby state. (Pedal use returns the engine to the low idle	Deactivate vehicle speed control and maintain standby state. (Pedal use returns the engine to the low idle
Held Switch (Continuous Contact)	Not Applicable	Not Applicable	Decrease engine speed if engine speed control is active 2	Increase engine speed if engine speed control is active 2	Any change in brake status establishes a standby state.1	Any change in driveline status establishes a standby state.1

Table 3.3	Variable Engi	ne Speed Contro	ol Switch	Interpretations
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NOTE:

Engine speed control stops only when there is a transition from one pedal state (pedal pressed or pedal released) to the other.
 The held switch acts like the switch is being "hit" multiple times, until the switch is released. When the RESUME switch is held closed, the engine speed will be commanded to accelerate. When held, the standby state will be momentarily recognized , then engine speed will continue to accelerate.

3.2.1 In-Cab Operation of Variable Engine Speed Control

In-cab located switches can be used to turn on engine speed control and select the desired engine speed. Press the CRUISE "ON" Switch to enable engine speed control. This switch is located on the steering wheel. NOTE: There is no indication to the user that the Cruise On switch has been depressed. Next, set the engine speed using the SET/COAST switch. Then, if needed, press RESUME/ACCEL or SET/COAST to increase or decrease the engine speed until the desired engine speed is achieved.

The accelerator pedal can be used, as well, to increase or decrease engine speed as desired; the desired engine speed will be maintained by the engine controller once a momentary press of the SET/COAST switch occurs. Once an initial engine operating speed is selected, a momentary press of the RESUME/ACCEL and/or SET/COAST switches will cause engine speed to increase or decrease by a small amount. This incremental amount can be used to fine tune the engine speed selected. Should speed control be interrupted (ie. by the brake or the clutch switch), the RESUME/ACCEL switch can be pressed to return to the last engine speed set point. The engine's acceleration rate will be limited according to the value programmed for the parameter *PTO RPM Ramp Rate*. This acceleration rate should be programmed as required to minimize stress on auxiliary equipment power drive links. Anytime Variable Engine Speed Control is active, the engine will maintain the selected speed until one of the following events occur:

- CRUISE "OFF" switch is pressed
- Brake pedal is pressed
- Clutch pedal is pressed
- Automatic transmission is shifted out of neutral (NOT RECOMMENDED)

Note that these actions are always applicable for in-cab PTO Operation, regardless of the value programmed for the parameter "PTO IN-CAB CONTROL". Only when engine speed is controlled by remote input signals and the cab interface is disabled will the engine speed be unaffected by the above actions.

WARNING!

SHIFT OF AUTOMATIC TRANSMISSION FROM NEUTRAL TO FORWARD OR REVERSE GEAR WHILE OPERATING ANY PTO MODE IS NOT RECOMMENDED; VEHICLE MAY LURCH FORWARD WHEN TRANSMISSION IS PLACED IN GEAR DUE TO INCREASED POWER OUTPUT OF THE ENGINE WHICH IS OPERATING AT THE ELEVATED ENGINE SPEED.

Warning--To avoid sudden, unexpected vehicle movement and possible personal injury:

- Always fully set the parking brake. Do not use the gearshift lever instead of the parking brake.
- Turn off the engine when you leave the vehicle. Never leave the vehicle unattended with the engine running.

3.2.2 In-Cab Switch Configuration for Operation of Variable Engine Speed Control

Once again, the right-hand portion of **Figure 3.2** and **Figure 3.3** illustrates the circuitry provided by International for in-cab operation of Variable Engine Speed Control. This circuitry is provided by International and must not be tampered with.

3.2.3 Remote Operation of Variable Engine Speed Control

When control over engine speed is required from outside the vehicle cab, remote mounted switches must be used to turn on PTO engine speed control and select the desired engine speed. **Figure 3.6** and **Figure 3.7** illustrate how remotely located switches must be interfaced to the ECM to accomplish Variable Engine Speed Control. Switch functionality remains the same as described for the in-cab located switches (see **Table 3.3**)

A REMOTE VARIABLE PTO ON/OFF switch (RVAR) is required to turn on the Variable Engine Speed Control. The desired engine speed is then selected using a remotely located SET/COAST or RESUME/ACCEL switch, just as previously described for in-cab operation of Variable Engine Speed Control.

The Remote Throttle (see Section 5)can be used, as well, to increase or decrease engine speed as desired; the desired engine speed will be maintained by the engine controller once a momentary press of the SET/COAST switch occurs. Once an initial engine operating speed is selected, a momentary press of the RESUME/ACCEL and/or SET/COAST switches will cause engine speed to increase or decrease by a small amount. This incremental amount can be used to fine tune the engine speed selected. Should speed control be interrupted (ie. by the brake or the clutch switch), the RESUME/ACCEL switch can be pressed to return to the last engine speed set point. The engine's acceleration rate will be limited according to the value programmed for the parameter *PTO RPM Ramp Rate*. This acceleration rate should be programmed as required to minimize stress on auxiliary equipment power drive links. Anytime Variable Engine Speed Control is active, the engine will maintain the selected speed until one of the following events occur:

- CRUISE "OFF" switch is pressed
- Brake pedal is pressed
- Clutch pedal is pressed
- Automatic transmission is shifted out of neutral (NOT RECOMMENDED)

WARNING!

Be aware that the Remote Set Switch and Remote Resume Switch are connected in parallel (logic "OR-ed") with the cabmounted SET/COAST and RESUME/ACCEL switches respectively. This means that once preset Variable PTO Engine Speed Control has been placed in "standby" on-mode (by pressing either the In-Cab located CRUISE ON switch, or the remotely located REMOTE VARIABLE PTO ON switch), the desired engine speed can be modified both from within the cab or from the remote located PTO Engine Speed Control switches. This is ALWAYS TRUE, even when the PTO MODE parameter is programmed for REMOTE OPERATION ONLY.





Figure 3.7 Variable Engine Speed Control Schematic using Remote Engine Speed Controller



3.3 Engine Speed Control for Mobile Applications

This section discusses the Variable Mobile Engine Speed Control. Mobile Variable Engine Speed Control functions like cruise control, except that the engine speed (instead of the vehicle speed) is being controlled. Mobile control can be performed only below a programmed maximum vehicle speed. The default vehicle speed limit is 20 MPH.

Functionality for mobile control is identical to the functionality described previously for Variable PTO Engine Speed Control, with the exception that the vehicle is no longer required to be stationary; vehicle movement is permitted up to a maximum threshold, specified by the programmable parameter **PTO Max Veh Speed**.

When the specified vehicle speed limit is exceeded, Variable Engine Speed Control will be placed in the "standby" mode of operation and engine speed will return to idle. Pressing the RESUME/ACCEL switch after the vehicle speed has slowed to a value less than the programmed maximum speed limit will reestablish engine speed control at the previously selected engine speed. Changes in the status of the brake and clutch switches will also return the engine to its idle speed.

Switch functionality remains the same as described for the Variable Stationary Engine Speed Control switches (see Table 3.3).

Press the CRUISE ON switch to turn on Engine Speed Control. Press the SET/COAST switch to select an engine speed. Then press RESUME/ACCEL or SET/COAST until the desired engine speed is achieved. Momentary presses of the RESUME/ACCEL and SET/COAST switches will cause the engine speed to increase or decrease by a small amount. This incremental amount can be used to fine tune the engine speed selected. Should speed control be interrupted by the brake or the clutch switches, press the RESUME/ACCEL switch to return to the last engine speed set point. The engine's acceleration will be limited to the *PTO RPM Ramp Rate*. The acceleration limit can be set to reduce the stress on the auxiliary equipment power couplings.

4 Transfer Case / Split Shaft Operation

This section describes the Transfer Case/Split Shaft feature and its applications. This feature is used in conjunction with Engine Speed Control and is targeted for applications that use a transfer case or auxiliary driveshaft. The auxiliary drive unit is often connected to a pump that performs vacuum functions. (ie. sewage removal truck). **Figure 4.1** illustrates the wiring required for a typical Split Shaft application.

4.1 Transfer Case Switch Operation

The Transfer Case Status Switch must be in the proper state indicating that it is "OK" to operate. The Transfer Case Status Switch input is provided as a safety interlock feature and must be wired as shown in **Figure 4.1**. The purpose of the transfer case input is to inhibit the system from entering Engine Speed Control mode if the transfer case is operating in driveline mode versus split shaft mode. The Transfer Case Status Switch must be wired such that when the transfer case is in Split Shaft mode, pin J3-23 of the RESCM sees 12 volts.

4.2 EPG Driveline Mode

This parameter indicates how the driveline disengagement signal should be interpreted by the ECM and is programmable by International Truck and Engine Corporation only.

0: NEUTRAL OPERATION, driveline must be disengaged at all times for operation of the split shaft feature.

1: SPLIT SHAFT, a transition in driveline status will cause the split shaft feature to be deactivated.

4.3 Wheel Based Vehicle Speed

If the system is configured to function in Split Shaft mode (*EPG Driveline Mode* parameter equals SPLIT SHAFT), then the engine ECM must receive Wheel Based Vehicle Speed from a Brake System Electronic Control Unit (ECU). This message (PGN 65265, bytes 2 & 3) must be broadcast by the Brake System over the public J1939 data link. At this time, only one Brake System supports this message, the Bendix EC–30. The availability of this parameter for the EC–30 system is currently a programmable feature. This programmable feature must be enabled for the EPG system to function. If the engine ECM does not receive this message, it will not allow the system to enter into Engine Speed Control. If the Brake System ECU broadcasts the Wheel Based Vehicle Speed parameter as being 0 mph, then it will allow the system to function. This is a safety interlock feature to ensure that the vehicle is not moving while the system is functioning in Split Shaft mode.

Figure 4.1 Split Shaft Engine Speed Control



5 Remote Throttle Control

The Remote Throttle Control functions like an additional accelerator pedal or hand throttle. Remote throttles provide equipment operators with direct control over engine speed from a location outside of the vehicle cab. By using a potentiometer, a remote throttle is useful when an infinitely variable range of engine speeds is desired to operate equipment. Remote throttles can be used to provide temporary increases in engine speed when Preset or Variable Engine Speed control is in use.

The hand and/or foot actuated potentiometer can be located in one or more locations on the vehicle (see **Figure 5.2**). Increasing or decreasing the voltage from the potentiometer will result in a corresponding increase or decrease in engine speed (similar to stepping on or releasing the accelerator foot pedal in the vehicle cab).

NOTE: To be noticed by the engine control system, the engine speed requested by the Remote Throttle must exceed the engine speed requested by the cab accelerator pedal and other engine speed control requests. Reason: The highest engine speed requested becomes the engine speed commanded to the engine.

Use of either the Remote Preset PTO Switch or Remote Variable PTO Switch is required to activate or deactivate the Remote Throttle, and the engine control system must be programmed to accept the Remote Throttle input. Use spring-loaded designs for throttle devices so that the engine returns to idle when the throttle is released. **Note**: The only way the Remote Throttle control system can be disabled is to turn it off with the switch previously used to turn in on.

The programmable parameter **PTO REMOTE PEDAL** must be programmed to "1" to enable operation of the remote throttle input. Also, the maximum engine speed permitted when operating with the Remote Throttle will be limited to the value programmed for **PTO MAX RPM**. Refer to the descriptions of all the PTO related programmable parameters in Section **Error! Reference source not found.** for more information about these parameters.

Figure 5.2 shows the circuits needed to operate the Remote Throttle feature. The remote potentiometer circuits are interfaced to the RESCM. The RESCM communicates the status of these circuits via J1939 to the engine control system via the ESC. The same potentiometer that is used for the cab's accelerator pedal can be used for this remote potentiometer. Terminals A, B, and C are cavities in the 6-way Packard mating connector to the accelerator pedal sensor. Do not cross the wires to terminals A, B and C. Cross-wiring terminals B and C will provide a high voltage level on the APS signal at the sensor's mechanical idle position. The remote throttle input must be turned on and off by an enable switch. Enabling either the Remote Preset PTO Switch or the Remote Variable PTO Switch will turn the Remote Throttle input on. Theses two switches must not be enabled at the same time—it's one or the other. Opening the switch circuit disables the Remote Throttle input.

The Master Diagnostics tool can be used for troubleshooting and verifying the Remote Throttle installation. The *PTO Remote Pedal* parameter must indicate ON and either the Rem Var PTO Switch or the Rem Preset PTO Switch must indicate ON. When these conditions are met, the Accel Pedal parameter will display the percent throttle commanded to the ECM. If the Remote Throttle parameter indicates FAIL, a fault exists in the circuits or in the potentiometer itself.

Display of the parameter Accel Pedal should be used to set mechanical stops for custom throttle designs. Mechanical stops must be used with potentiometer-based throttle control systems to prevent the supply of inadequate or excess voltage to the engine controller. The ECM detects under- and over-voltage conditions for Remote Throttle; occurrence of one of these conditions will result in activation of a fault code.

The 12 volt supply from pin J3-10 of the RESCM is strictly for remote engine speed control use. It should not be used as a power feed for other systems.

Figure 5.1 Switch Requirements



TOGGLE OR LATCHED SWITCH (USED FOR SYSTEM ACTIVATION OR INTERLOCKS)

POTENTIOMETER OR RHEOSTAT (USED FOR REMOTE PEDAL INPUTS)

Figure 5.2 Remote Throttle Interface Example



NOTE: Close the circuit from J3-10 to either circuit J3-18 or circuit J3-19 to enable the remote potentiometer. When either of these circuits are closed, the engine speed requested by the remote potentiometer is demanded as long as the Remote Throttle percentage is greater than any other engine speed control requests. Cavities A, B, and C of the remote potentiometer designate pins for the International accelerator pedal sensor using the 6-pin Metri-Pack connector. Again, the speed demanded by the Remote Throttle must exceed the current operating speed of the engine. Open the circuit (J3-18 or J3-19 depending upon which one was turned on) to stop the demand. To resume the demanded speed, close the circuit again. The Remote Throttle may need to be adjusted to attain the same engine speed. Equipment interlocks may be placed in series with the toggle switch to open the supply circuit from J3-10.

5.1 Accelerator Pedal Sensor Notes and Diagnostics

Appendix D lists part numbers for floor-mounted and suspended accelerator pedals and the accelerator pedal sensor kits. These parts include a jumper harness for the sensor with a Packard Weather-pack connector. The typical wire colors for the jumper harness are shown in **Table 5.1**. The Weather-pack connector can be cut off and the circuits spliced according to their identifying colors.

APS Cavity	Α	В	С	D	Ε	F
Signal	Sensor	Sensor	Sensor Supply	Normally Closed	Normally Open	Idle Validation Switch
	Output	Ground	(5 v dc)	Idle validation	Idle validation	Common
Color	Black	White	Red	Green	Blue	Orange

Table 5.1 Accelerator Pedal Sensor Wire Colors and Signals

The RESCM remote throttle input is preloaded with a resistor fixed in connector J3, pins 17 and 14. This resistor fixes the input at 0%. If using a remote throttle pedal of any kind, remove this resistor when installing the remote throttle connections. If not installing a remote throttle, leave this resistor in place.

Do not remove the jumper in J3 pins 1-2, if it is installed.

The accelerator pedal sensor includes an idle validation switch [IVS]. The N.C. contacts are connected to the common terminal when the sensor is at the idle position. The N.O. contacts are connected to the common terminal when the sensor is in the off-idle position. Due to the thick film construction of the sensor, the IVS switch has a contact resistance of ~80 Ohms. Do not use this switch in series with the sensor circuits.

The remote throttle potentiometer is protected through circuit diagnostics. Faults are detected when the potentiometer is open or short circuited. These faults recover when the fault condition is corrected. **Table 5.2** summarizes typical voltage levels for throttle operation and diagnostics. The voltage levels are designed to be compatible with a total resistance of 2.5K Ohms. As the voltage detected increases, the engine speed demanded by the remote pedal input increases. Diagnostic ranges are provided at the top and bottom of the potentiometer voltage. The voltage shown in **Table 5.2** is between RESCM pin J3-17 and J3-14.

Voltage (Volts)	Result
0 - 0.15	Out of range low or open, Fault Code 213
0.15 - 0.90	0%, Low Idle Speed demanded
0.90 - 3.50	0 – 100%, Normal Operating Range
3.50 - 4.55	100%, PTO Max RPM demanded
4.55 - and above	Out of range high, Fault Code 214

Table 5.2 Remote Accelerator Pedal Sensor Voltage Levels

New designs incorporating the accelerator pedal sensor must include their own return springs to ensure that the sensor returns to the idle position when the control is released. The sensor's internal stops must not be used to limit the travel of its drive mechanism. To make sure the sensor always returns to the idle position, pre-load the internal return spring by 15.2 degrees. Another reason to pre-load the return spring in this manner is that the voltage output from the sensor will fall into the out of range low diagnostic region if the sensor is not pre-loaded by 15.2 degrees of travel. Sensors that are disconnected from the drive mechanism will generate a diagnostic code. The maximum range of travel applied to the accelerator pedal must be limited to a maximum of 52.3 degrees beyond 15.2 degree pre-load for the idle position. For additional information see SAE recommended practice "J1843, Accelerator Pedal Position Sensor for use with Electronic Controls in Medium- and Heavy-Duty Vehicle Applications".

Hand Operated Throttle Control Kit

See Appendix D for a hand operated throttle parts list.

6 Remote Engine Stop and Start

This section describes the circuit modifications necessary to stop and start the engine from a remote location. Modifications that implement remote start must also implement remote stop. When remote stop is implemented, all ignition sources to the engine control system must be interrupted.

International does not suggest adding a remote start on vehicles with manual transmissions. The following modifications are suggestions only and do not take into account any interlocking that might be needed to maintain safe vehicle operation. It is our belief that safe modifications to start/stop circuitry will vary with truck application and should be the responsibility of the party making the modification.

The circuit modifications to implement remotely controlled engine stops and starts are shown in Figure 6.1 and Figure 6.2.



Figure 6.1 Circuit Diagram for Remote Engine Stop

Figure 6.2 Circuit Diagram for Remote Engine Start



7 Body Builder Connections and Circuit Protection

This section discusses general information related to the installation of new circuits to a chassis. Available options for power connections and recommendations for the installation of new power circuits are reviewed. Wire, fuse and circuit breaker sizing for circuit protection are displayed, along with unique ECM circuits that must never see 12 volts with the key switch in the OFF or Accessory positions.

7.1 Body Builder Connections

An option for connecting to the vehicle lighting system is available from the factory. The feature code for this option is 08HAB. The table below gives the circuit information available for this feature. For wiring schematic and connector & terminal part numbers, see circuit diagram book.

Connection	Cavity	Circuit	Description	Fuse (amps)	Available Current at Connector (amps)	Sharing (Truck Lamp fed from same fuse)
	А	N68BB	Tail Lamp	20	20	None
	В	N56BB	Left Rear Turn Lamp / Stop	10	8	Truck Left Rear Turn Lamp
4450 0	С	N57BB	Right Rear Turn Lamp / Stop	10	8	Truck Right Rear Turn Lamp
4450 &	D	N58BB	Marker Lamp	20	20	None
9900	Е	N71BB	Back up Lamp	10	6	Truck Back up Lamps
	F	N12BB	Accessory Feed	20	20	None
	G	N11–GBB	Ground (12 ga)			None
4460 &	А	N56BA	Left Front Turn Lamp	10	8	Truck Left Front Turn Lamp
9910	В	N57BA	Right Front Turn Lamp	10	8	Truck Right Front Turn Lamp

Table 7.1 Body Builder Connections

Note: Any unused circuit cavities must be plugged with sealing plugs provided with chassis harness.

Connectors 9900 and 9910 have their mating connectors attached filled with cavity plugs. To use connectors, remove cavity plugs and use the following:

Table 7.2 Connectors 9900 & 9910

Terminals	Wire Gauge
2033912C1	12, 14
2033911C1	16, 18, 20
Cavity Seals	Wire Gauge
0589390C1	12
0589391C1	14
1652325C1	16, 18, 20
Mating Conne	ector Part Nos.
9900 Connector	2039312C91
9900 Lock	2039342C1
9910 Connector	1671611C1
9910 Lock	1671608C1



7.2 Circuit Protection

All new circuits that are added to the chassis after its assembly must be protected by fuses or circuit breakers. The fuse or circuit breaker should be located as close as possible to the connection point into the chassis wiring. The size of the protection device is determined by the size of the wire used for the circuit. Common wire gauges and device sizes are shown below:

Wire Gauge	Protective Device Size	Maximum Current (Amps)
18 Ga	10 AMP Fuse/Circuit Breaker	8A
16 Ga	10\5 AMP Fuse/Circuit Breaker	12A
14 Ga	20 AMP Fuse/Circuit Breaker	16A
12 Ga	25 AMP Fuse/Circuit Breaker	20A
10 Ga	30 AMP Fuse/Circuit Breaker	24A
8 Ga	12 Gauge Fusible Link	80A
6 Ga	10 Gauge Fusible Link	108A
4 Ga	2-12 Gauge Fusible Link	160A

Table 7.3	Wire Gauges	and Circuit	Protection	Devices
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CAUTION — Wire gauge is designed to match fuse / circuit breaker rating. Do not increase the size of a circuit breaker or fuse. To do so could cause wiring to overheat and burn.

International part numbers for narrow-blade circuit breakers according to type and size are shown below. Type III circuit breakers can only be reset manually. Type I circuit breakers continuously try to reset when tripped. Use Type I circuit breakers only where required by the function performed by the circuit to be protected. In general, Type III circuit breakers should be adequate for most needs.

SIZE	CIRCUIT BREAKER TYPE	PART NUMBER	COLOR	
2000, 4000, & 8000 MODELS	5			
7.5 A	Type III – Manual Reset	3536177C1	Brown	
10 A	Type III – Manual Reset	3536178C1	Red	
15 A	Type III – Manual Reset	3536179C1	Blue	
20 A	Type III – Manual Reset	3536180C1	Yellow	
25 A	Type III – Manual Reset	3536181C1	White	
30 A	Type III – Manual Reset	3536182C1	Green	
1000, 3000, 5000 & 9000 CONVENTIONAL MODELS				
10 A	Type I – Continuous Reset	2007463C1	Black	
20 A	Type I – Continuous Reset	2007465C1	Black	
10 A	Type III – Manual Reset	2011944C1	Red	
20 A	Type III – Manual Reset	2011946C1	Yellow	
25 A	Type III – Manual Reset	2011947C1	White	
30 A	Type III – Manual Reset	2011948C1	Green	

Table 7.4 Circuit Breaker Part Numbers

Circuit breakers and fuses can be installed in the chassis wiring using the following in-line connectors:

1676841C91 - Inline socket & cable for circuit breaker/fuse (20 A Maximum)

1682115C91 - Inline socket & cable for circuit breaker/fuse (30 A Maximum).

7.3 Back Feeds

The circuits that are connected to the following Engine Control Module pins must always be connected to switched ignition power. Connecting any one of these circuits to battery power can cause the ECM to remain powered when the ignition switch is turned off. This can produce excess battery current causing the batteries to be discharged overnight.

Remote PTO (Pre-Set) Bap Sensor Output Engine Coolant Temperature Idle Validation Switch Drive Disengage Signal Remote PTO (Variable) Engine Oil Temperature Warn Engine Lamp Coolant Level Sensor Injection Pressure Regulator Ambient Temperature Sensor MAP Sensor Output Glow Plug Controller

7.4 Welding

Whenever welding is done on any part of the vehicle, the batteries should be disconnected – both power and ground including the electronic power feeds. The electronic components may easily be damaged from the high voltage used and R.F. energy present in the arc.

CAUTION – To avoid damage to vehicle electronic components, disconnect both the positive (+) and the negative (–) battery cables prior to electric welding. Attach the welder's ground cable as close as possible to the joint being welded. If it is necessary to weld close to an electronic component, it is recommended that the electronic component be temporarily removed.

General Information 8

This section reviews information of general interest about the circuits provided with the chassis. Installation of a Master Disconnect switch and two-way radios are reviewed. Access points for the Speedometer and Tachometer Signals and the ATA Data Link (SAE RP J1708/J1587) are reviewed along with other general information.

8.1 **Remote PTO Engine Speed Control Circuits**

Do not use the electrical wires provided for Remote Engine Speed Control connections to power other electrical chassis components. The activation switches (ie. Set/Coast, Resume/Accel) should be momentary with Normally Open contacts. The +12 Volt connection should be used only to power these switches to allow them to activate Remote Engine Speed Control.

8.2 **High Voltages In Harnesses**

WARNING!

Do not probe the harnesses between the engine electronics and the engine. The injector solenoids have a higher electrical potential.

8.3 **Master Disconnect Switch**

Specify sales order code 08WCS or 08WAD for a factory installed Master Disconnect Switch. The disconnect switch cannot be put into the battery ground cable as was previously done. The electronic modules will provide a ground path around the Master Disconnect switch if this method is employed. The engine modules must always be connected to the batteries, even when the Master Disconnect switch is opened. On each vehicle, separate power and ground circuits are provided to the engine electronics.

To install a Master Disconnect Switch, break into the positive battery cable going from the batteries to the cranking motor and insert the disconnect switch into that circuit, as shown in Figure 8.1. Insure that adequate insulation is used between the positive battery cable, the switch mounting, and the surrounding area. Place boots or covers over the disconnect switch studs to protect the batteries and cables from accidental shorting. Do not disturb the direct connections from the battery to the engine electronics.



Figure 8.1 Master Disconnect Switch Insertion Point

8.4 **Two-Way Radio Installation**

A qualified technician should do all two-way radio installations. The power connections for any radio installation should always go to the vehicle's batteries with proper circuit protection installed closest to the batteries. A filter may have to be added to the radio power feed. Wire routing should always be routed away from all vehicle harnesses to prevent pickup from the vehicle electrical system into the radio and/or from the radio system into the vehicle electrical system. Evaluation of the antenna location should be assessed before permanent mounting is made to assure minimum interference to the radio reception and vehicle electrical system.

8.5 ATA Data Link Connections

The engine control system provides a data link compatible with the specifications in TMC RP 1202. These requirements are the same as those given by SAE recommended practices J1708 and J1587. Temporary connections can be made using the 9-way Deutsch diagnostic connector located in the cab by the driver's kick panel. Do not make permanent connections to the ATA data link without a full understanding of load requirements and data protocol required for the device being attached. See Appendix C for more information on the data provided by the engine on the data link.

Figure 8.2 ATA Data Link Connections

COMBINATION CONNECTOR 9 - Way Deutch



HD10-9-1939-P

A = GND B = BAT (+) C = J1939 CAN (H) D = J1939 CAN (L) E = CAN (SHLD) F = J1708 / ATA (+) C = J1708 (ATA (-)) C = J1708 (ATA	
E = CAN (SHLD) F = J1708 / ATA (+)	
G = J1708 / ATA (-) H = Not Used J = Not Used	

8.6 Clutch Switch and Neutral Position Switch Connections

The clutch and neutral position switches are part of the engine control system circuits. These circuits should never be disturbed. If there is a need for either one of these functions, then contact International Tech Central for guidance.

8.7 Speedometer and Tachometer Outputs

Interfaces conforming to TMC RP 123 are provided for speedometer and tachometer signals. Speedometer output is calibrated to 30,000 pulses per mile. Tachometer output is 12 pulses per engine revolution. Access to these signals is provided by the electrical wire connections located at the bulkhead. The speedometer and tachometer output signals are provided by circuits K47B and K97AR respectively. These signals are also provided on the RESCM, pins J3-12 and J3-13 respectively.

The sink and source currents for the available interfaces are shown below. Both interfaces source 5 milliamps and sink 5 milliamps. These interfaces are noted in the table below. The signal waveform provided is a square wave with a 50% duty cycle. See TMC RP 123 for more information about the signal waveform.

Table 8.1 Signal Interface Parameters

Parameter	Potential	Parameter	Current
Vo low	0 to 0.5 Volts	Isink (Vo low) ¹	50 microamps
Vo high	4 V to Vbattery	Isource (Vo high)	5 milliamps

1 Designates enhanced interfaces that sink 5 milliamps of current instead of 50 microamps.

DIAMOND LOGIC[™] CONTROL SYSTEMS PROGRAMMABLE PARAMETERS

Section 9 — Programmable Parameters

Section A – Parameter Tables

Two tables are provided in this section. Information presented in these tables is summarized as follows:

Table A.1 — Parameter Attributes Table

Provides information about parameter type (read only, write only, or read/write), minimum and maximum permissible values, and engineering units.

Table A.2 — Parameter Cross Reference

Provides a cross reference of different parameter names that actually refer to the same parameter.

Component	CT-471 October, 2002	Component

Table A.1 — Parameter Attributes

Table A.1 — Parameter Attributes Table. Information generated directly from the International® EERS System (International EMR Report, Location Melrose Park, Rules Effective August, 1997)

Supplier Name	EERS Parameter Name	Туре 1	Units	Lower Limit	Upper Limit	Increment
69001	ENG-OILP-SIG-ENAB	F , B	N/A	0	1	1
70001	RETARDER – SERVICE BRAKE INTERFACE	F , B	N/A	0	3	1
71001	GLOW-PLUG	F	N/A	0	1	1
72001	EXHAUST-BACKPRESS	F , B	N/A	0	1	1
73001	ENG-CRANK-INHIBIT	F , B	N/A	0	1	1
73011	ENG-CRK-INHIB-TIME	F , B	SEC	1	5	1
74001	IDLE SHUTDOWN MODE	F	N/A	0	2	1
74011	IDLE-SHTDWN-TIME	F , B	MINUTES	2	120	1
74021	IST-MAX-AIT	F , B	С	-40	150	.25
74031	IST-MIN-AIT	F , B	С	-40	150	.25
75001	PTO-CONTROL (ON/OFF)	F , B	N/A	0	3	1
75011	MAX ROAD SPEED FOR MOBILE CONTROL	F , B	MPH	3	20	1
75021	INCAB-PTO-MODE	F , B	N/A	0	3	1
75031	DISABLE CAB INTERFACE FOR PTO	F , B	N/A	0	1	1
75041	REMOTE THROTTLE FOR PTO CONTROL	F , B	N/A	0	1	1
75051	SET ENGINE SPEED (SPEED 1)	F , B	RPM	LIDLE	GOVERNED SPEED	1
75061	RESUME ENGINE SPEED (SPEED 2)	F , B	RPM	LIDLE	GOVERNED SPEED	1
75071	ENGINE RESPONSE RATE FOR PTO	F , B	RPM/SEC	1	1500	1
75081	MAX PTO ENGINE SPEED	F , B	RPM	LIDLE	GOVERNED SPEED	1
76001	CRUISE-CONTROL	F , B	N/A	0	1	1
76011	CRUISE-MIN-ENG-SPD	F	RPM	1200	1400	1
76021	CRUISE-RAMP-RATE	F	MPH/SEC	0.5	15.9375	1
76031	MIN CRUISE CONTROL SPEED	F , B	MPH	20	99	1
76041	MAXIMUM CRUISE CONTROL SPEED	F , B	MPH	MIN-CRUS-CNTRL- SPD	MAX-VEHICLE-SPEED	1

NOTE: 1 W:EST Write Only Parameter

B: EST Customer Programmable Parameter (Both EST Read and EST Write Parameter)

F: Factory Programmable Parameters (non-EST programmable).

Information shown in **BOLD** indicates modification from the EERS database.

Component
Supplier Name	EERS Parameter Name	Туре 🔟	Units	Lower Limit	Upper Limit	Increment
77001	ENG-PROT-MODE	F , B	N/A	0	3	1
77011	ECT-WARNING	F	С	90	125.5	.5
77021	ECT-CRITICAL	F	С	90	125.5	.5
77031	PROT-ENG-SPD1	F	RPM			1
77041	PROT-ENG-SPD2	F	RPM			1
77051	PROT-ENG-SPD3	F	RPM			1
77061	OIL-PRES-WARN-SPD1	F	PSI			1
77071	OIL-PRES-WARN-SPD2	F	PSI			1
77081	OIL-PRES-WARN-SPD3	F	PSI			1
77091	OIL-PRES-CRIT-SPD1	F	PSI			1
77101	OIL-PRES-CRIT-SPD2	F	PSI			1
77111	OIL-PRES-CRIT-SPD3	F	PSI			1
78001	OVER TEMPERATURE PROTECTION	F	N/A	0	1	1
78011	CTC-INITIAL	F	С	90	127.5	.5
78021	CTC-TRANSITION	F	С	90	127.5	.5
78031	CTC-TAIL-FACTOR	F	%/C	0.5	15.9375	.0625
79001	VEH-ROAD-SPD-GOV	F , B	N/A	0	1	1
79011	MAX-ENGINE SPEED (NO VSSN)	F , B	N/A	1400	ENG-HI-IDLE-SPEED	1
79021	VEHICLE SPEED LIMIT	F , B	MPH	10	CAL-GEARED-SPD-NGD	1
80001	TWO-SPEED-AXLE	F , B	N/A	0	1	1
80011	TIRE-REVS-PER-MILE	F , B	REVS	350	800	1
80021	REAR-AXLE-RATIO-HI	F , B	N/A	2	14.530	.001
80031	REAR-AXLE-RATIO-LO	F , B	N/A	2	14.530	.001
80041	TRANS-LO-NUM-RATIO	F , B	N/A	0.6	5.0	.001
80051	VEH-SPEED-CAL-HIGH	F , B	PPM	18017	157157	1
80061	VEH-SPEED-CAL-LOW	F , B	PPM	18017	157157	1
80071	TAIL-SHAFT-TEETH	F , B	N/A	11	60	1
81001	TORQUE-TAILORING	F	N/A	0	1	1
81011	TT-LOW-NVS-RATIO	F	RPM/MPH	0	255	1
81021	TT-HI-NVS-RATIO	F	RPM/MPH	0	255	1

DIAMOND LOGIC II CONTROLLER ENGINE CON-

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 NOTE: I
 W:EST Write Only Parameter

 B: EST Customer Programmable Parameter (Both EST Read and EST Write Parameter)

 F: Factory Programmable Parameters (non-EST programmable).

 Information shown in **BOLD** indicates modification from the EERS database.

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Supplier Name	EERS Parameter Name	Туре 🔟	Units	Lower Limit	Upper Limit	Increment
82001	TRANSMISSION-TYPE	F	N/A	0	4	1
82011	ENG-FAM-RATING-CD	F	N/A	0000	FFFF	1
82021	ENG-LOW-IDLE-SPEED	F	RPM	600	875	1
82031	ENG-HI-IDLE-SPEED	F	RPM	Accept Val		1
82041	ENG-RATED-SPEED	F	RPM	1600	2800	1
82051	ENG-RATED-HP	F	BHP	135	350	1
83001	TOTAL-FUEL	F	GALLONS	0	536,870,911.875	.125
83011	ENGINE-HOURS	F	HOURS	0	214,748,364.75	.1
83021	TOTAL-MILES	F	MILES	0	429,496,729.5	.1
84001	EL-OVERSPEED-1	F	HOURS		214,748,364.75	.05
84011	EL-OVERSPEED-2	F	HOURS		214,748,364.75	.05
84021	EL-LOWOILPRS-1	F	HOURS		214,748,364.75	.05
84031	EL-LOWOILPRS-2	F	HOURS		214,748,364.75	.05
84041	EL-OVERHEAT-1	F	HOURS		214,748,364.75	.05
84051	EL-OVERHEAT-2	F	HOURS		214,748,364.75	.05
84061	EL-LOWCOOL-1	F	HOURS		214,748,364.75	.05
84071	EL-LOWCOOL-2	F	HOURS		214,748,364.75	.05
84081	EL-OVERSPEED-MI1	F	MILES		429,496,729.5	.1
84091	EL-OVERSPEED-MI2	F	MILES		429,496,729.5	.1
84101	EL-LOWOILP-MI1	F	MILES		429,496,729.5	.1
84113	EL-LOWOILP-MI2	F	MILES		429,496,729.5	.1
84121	EL-OVERHEAT-MI1	F	MILES		429,496,729.5	.1
84131	EL-OVERHEAT-MI2	F	MILES		429,496,729.5	.1
84141	EL-LOWCOOL-MI1	F	MILES		429,496,729.5	.1
84151	EL-LOWCOOL-MI2	F	MILES		429,496,729.5	.1
85001	VEHICLE-IDENT	F	N/A			1
87002	CUSTOMER PASSWORD	W	N/A	Accept Val		1
88001	ENG-SERIAL-NO	F	N/A			1
NOTE: 11	W:EST Write Only Parameter					

DIAMOND LOGIC II CONTROLLER ENGINE CON-TROL

B: EST Customer Programmable Parameter (Both EST Read and EST Write Parameter) F: Factory Programmable Parameters (non-EST programmable). Information shown in **BOLD** indicates modification from the EERS database.

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Supplier Name	EERS Parameter Name	Туре	Units	Lower Limit	Upper Limit	Increment
89001	VEH-SPD-SIG-MODE	F	N/A	0	2	1
90001	COOL-FAN-ENABLE	F	N/A	0	1	1
90011	AC-DEMAND-ENABLE	F	N/A	0	1	1
90021	COOL-FAN-ON-TEMP	F , B	С	0	125	.25
90031	COOL-FAN-OFF-TEMP	F , B	С	0	125	.25
91001	RAD-SHUT-ENABLE	F	N/A			1
91011	SHUTTER-OPEN-ECT	F	С	-40	150	.25
91021	SHUTTER-CLOSE-ECT	F	С	-40	150	.25
92001	CONDUCT-CLNT-SNSR	F , B	N/A	0	1	1
93001	HYD-PRESS-GOV-ENAB	F , B	N/A	0	1	1
93011	EPG-DRIVELINE STATUS	F , B	N/A	0	1	1
93021	EPG-MODE-IND-ENABLE	F , B	N/A	0	1	1
93031	EPG-RAMP-RATE	F , B	RPM/SEC	0	1024	.0625
93041	EPG-INTG-GAIN-OFST	F , B	RPM/PSI	-4	3.96875	.03125
93051	EPG-PROP-GAIN-OFST	F , B	RPM/PSI	-16	15.875	.125
94001	COLD-AMB-PROT-MODE	F	N/A	0	1	1
95001	SERVICE-INT-ENABLE	F , B	N/A	0	1	1
95011	SI-FUEL-INTERVAL	F , B	GALLONS	0	65535	1
95021	SI-HOUR-INTERVAL	F , B	HOURS	0	2000	.5
95031	SI-DIST-INTERVAL	F , B	MILES	0	65535	1
95041	SI-FUEL-START	F	GALLONS	0	536,870,911.875	.125
95051	SI-HOUR-START	F	HOURS	0	214,748,364.75	.05
96061	SI-DISTANCE-START	F	MILES	0	429,496,729.5	.1
95071	SI-SRV-SOON-PCT	F	N/A	5	100	1
95081	SI-LAMP-CONT-ON	F , B	N/A	0	1	1
96091	SI-LAMP-ACT-TIME	F , B	SECONDS	0	1275	5
96101	SI-RESET-REQST	F , B	N/A	0	1	1

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 NOTE: I
 W:EST Write Only Parameter

 B: EST Customer Programmable Parameter (Both EST Read and EST Write Parameter)

 F: Factory Programmable Parameters (non-EST programmable).

 Information shown in **BOLD** indicates modification from the EERS database.

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Component

able A.2	— Parameter Cross Reference Table. Informat (International [®] EMR Report, Location Melros	ion generated directly from Internationa e Park, Rules Effective August, 1997)	al® EERS System
Supplier Name	Parameter Name	Sales Description	Service Description
69001	ENG-OILP-SIG-ENAB	OIL PRESS SIG ENABLE	ENG-OILP-SIG-ENAB
70001	RETARDER – SERVICE BRAKE INTERFACE	RETARDER MODE	VEHICLE-RETARDER
71001	GLOW-PLUG	GLOW PLUG ENABLE	GLOW-PLUG
72001	EXHAUST-BACKPRESS	EXHAUST BACKPRESS	EXHAUST-BACKPRESS
73001 73011	ENG-CRANK-INHIBIT ENG-CRK-INHIB-TIME	CRANK INHIBIT MODE CRNK INH RUN MODE TM	ENG-CRANK-INHIBIT ENG-CRK-INHIB-TIME
74001 74011	IDLE SHUTDOWN MODE IDLE–SHTDWN–TIME	IDLE SHUTDN TMR MODE IDLE SHUTDOWN TIME	ENG-SHUTDOWN-CNTRL IDLE SD TIME
74021 74031	IST–MAX–AIT IST–MIN–AIT	IST MAX INTAKE TEMP IST MIN INTAKE TEMP	IST MAX AIT IST MAX AIT
75001	PTO-CONTROL (ON/OFF)	PTO MODE	PTO-CONTROL
75011	MAX ROAD SPEED FOR MOBILE CONTROL	PTO MAX ROAD SPEED	MAX-RD-SPD-IN-PTO
75021	INCAB-PTO-MODE	PTO INCAB MODE	INCAB-PTO-MODE
75031		PTO OPER. DISABLE	DISABLE-PIO-CAB-IF
75051			
75061	BESUME ENGINE SPEED (SPEED 1)	PTO PRESET SPEED 2	PTO-CNTRL-BES-BPM
75071	ENGINE RESPONSE BATE FOR PTO	PTO SPEED BAMP BATE	PTO-BPM-BAMP-BATE
75081	MAX PTO ENGINE SPEED	PTO MAX ENG SPEED	MAX-PTO-SPEED
76001	CRUISE-CONTROL	CRUISE CONTROL	CRUISE-CONTROL
76011	CRUISE-MIN-ENG-SPD	CRUISE MIN RPM	CRUISE-MIN-ENG-SPD
76021	CRUISE-RAMP-RATE	CRUSE RAMP RATE	CRUISE-RAMP-RATE
76031	MIN CRUISE CONTROL SPEED	CRUISE CTL MIN SPEED	MIN-CRUS-CNTRL-SPD
76041	MAXIMUM CRUISE CONTROL SPEED	CRUISE CTL MAX SPEED	MAX-CRUS-CNTRL-SPD

upplier ame	Parameter Name	Sales Description	Service Description
77001	ENG-PROT-MODE	WARN MODE	ENG-PROT-MODE
77011	ECT-WARNING	COOLANT WARNING TEMP	ECT-WARNING
77021	ECT-CRITICAL	COOLANT SHUTDOWN TMP	ECT-CRITICAL
77031	PROT-ENG-SPD1	OIL WARNING RPM 1	PROT-ENG-SPD1
77041	PROT-ENG-SPD2	OIL WARNING RPM 2	PROT-ENG-SPD2
77051	PROT-ENG-SPD3	OIL WARNING RPM 3	PROT-ENG-SPD3
77061	OIL-PRES-WARN-SPD1	OIL PRESS WARNING 1	OIL-PRES-WARN-PSI1
77071	OIL-PRES-WARN-SPD2	OIL PRESS WARNING 2	OIL-PRES-WARN-PSI2
77081	OIL-PRES-WARN-SPD3	OIL PRESS WARNING 3	OIL-PRES-WARN-PSI3
77091	OIL-PRES-CRIT-SPD1	OIL PRESS SHUTDOWN 1	OIL-PRES-CRIT-PSI1
77101	OIL-PRES-CRIT-SPD2	OIL PRESS SHUTDOWN 2	OIL-PRES-CRIT-PSI2
77111	OIL-PRES-CRIT-SPD3	OIL PRESS SHUTDOWN 3	OIL-PRES-CRIT-PSI3
78001	OVER TEMPERATURE PROTECTION	CTC MODE	COOLANT-TEMP-COMP
78011	CTC-INITIAL	CTC INIT TEMP	CTC-INITIAL
78021	CTC-TRANSITION	CTC TRANSITION TEMP	CTC-TRANSITION
78031	CTC-TAIL-FACTOR	CTC TAILORING FACTOR	CTC-TAIL-FACTOR
79001	VEH-ROAD-SPD-GOV	SPEED LIMITING	VEH-ROAD-SPD-GOV
79011	MAX. ENGINE SPEED (NO VSSN)	MAX ENG RPM W/O VSS	MAX-ENGSPD-NO-VSSN
79021	VEHICLE SPEED LIMIT	MAX VEHICLE SPEED	MAX-VEHICLE-SPEED
80001	TWO-SPEED-AXLE	TWO SPEED AXLE ENBLE	TWO-SPEED-AXLE
80011	TIRE-REVS-PER-MILE	TIRE REVOLUTIONS	TIRE-REVS-PER-MILE
80021	REAR-AXLE-RATIO-HI	REAR AXLE RATIO 1	REAR-AXLE-RATIO-H
80031	REAR-AXLE-RATIO-LO	REAR AXLE RATIO 2	REAR-AXLE-RATIO-LO
80041	TRANS-LO-NUM-RATIO	TRANS TOP GEAR RATIO	TRANS-LO-NUM-RATIO
80051	VEH-SPEED-CAL-HIGH	HI AXLE RATIO PULSES	VEH-SPEED-CAL-HIGH
80061	VEH-SPEED-CAL-LOW	LO AXLE RATIO PULSES	VEH-SPEED-CAL-LOW
80071	TAIL-SHAFT-TEETH	TAILSHAFT GEAR TEETH	TAIL-SHAFT-TEETH
81001	TORQUE-TAILORING	TORQUE LVL TAILORING	TORQUE-TAILORING
81011	TT-LOW-NVS-RATIO	N/VS LOWER GEAR PT	TT-LOW-NVS-RATIO
81021	TT-HI-NVS-RATIO	N/VS UPPER GEAR PT	TT-HI-NVS-RATIO

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Supplier Name	Parameter Name	Sales Description	Service Description
82001	TRANSMISSION-TYPE	TRANSMISSION TYPE	TRANSMISSION-TYPE
82011	ENG-FAM-RATING-CD	ENG RATING CODE	ENG-FAM-RATING-CD
82021	ENG-LOW-IDLE-SPEED	MIN ENGINE IDLE	ENG-LOW-IDLE-SPEED
82031	ENG-HI-IDLE-SPEED	MAX ENGINE IDLE	ENG-HI-IDLE-SPEED
82041	ENG-GOVERNED-SPEED	RATED ENGINE SPEED	ENG-GOVERNED-SPEED
82041	ENG-RATED-SPEED	RATED ENGINE SPEED	ENG-RATED-SPEED
82051	ENG-RATED-HP	RATED ENGINE POWER	ENG-RATED-HP
82061		ENG FAMILY EXT	ENG-FAM-EXT
83001	TOTAL-FUEL	TOTAL FUEL USED	TOTAL-FUEL
83011	ENGINE-HOURS	ENGINE RUN HOURS	TOTAL-ENG-HOURS
83021	TOTAL-MILES	TOTAL DISTANCE	TOTAL-MILES
84001	EL-OVERSPEED-1	ENGINE SPEED FAULT 1	EL-OVERSPEED-HRS-1
84011	EL-OVERSPEED-2	ENGINE SPEED FAULT 2	EL-OVERSPEED-HRS-2
84021	EL-LOWOILPRS-1	OIL PRESSURE FAULT 1	EL-LOWOILP-HRS-1
84031	EL-LOWOILPRS-2	OIL PRESSURE FAULT 2	EL-LOWOILP-HRS-2
84041	EL-OVERHEAT-1	COOLANT TEMP FAULT 1	EL-OVERHEAT-HRS-1
84051	EL-OVERHEAT-2	COOLANT TEMP FAULT 2	EL-OVERHEAT-HRS-2
84061	EL-LOWCOOL-1	COOLANT LEVEL FAULT1	EL-LOWCOOL-HRS-1
84071	EL-LOWCOOL-2	COOLANT LEVEL FAULT2	EL-LOWCOOL-HRS-2
84081	EL-OVERSPEED-MI1	ENGINE SPEED FAULT1	EL-OVERSPEED-MLS-1
84091	EL-OVERSPEED-MI2	ENGINE SPEED FAULT 2	EL-OVERSPEED-MLS-2
84101	EL-LOWOILP-MI1	OIL PRESSURE FAULT 1	EL-LOWOILP-MLS-1
84113	EL-LOWOILP-MI2	OIL PRESSURE FAULT 2	EL-LOWOILP-MLS-2
84121	EL-OVERHEAT-MI1	COOLANT TEMP FAULT 1	EL-OVERHEAT-MLS-1
84131	EL-OVERHEAT-MI2	COOLANT TEMP FAULT 2	EL-OVERHEAT-MLS-2
84141	EL-LOWCOOL-MI1	COOLANT LEVEL FAULT1	EL-LOWCOOL-MLS-1
84151	EL-LOWCOOL-MI2	COOLANT LEVEL FAULT2	EL-LOWCOOL-MLS-2
85001	VEHICLE-IDENT	VIN	VEHICLE-IDENT
86001	TOTAL-TATTLETALES	TOTAL TATTLE TALES	TOTAL-TATTLETALES
87002	CUSTOMER PASSWORD	CUSTOMER PASSWORD	PASSWORD-1
88001	ENG-SERIAL-NO	ENGINE SERIAL #	ENG-SERIAL-NO

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Supplier Name	Parameter Name	Sales Description	Service Description	
89001	VEH-SPD-SIG-MODE	VEH SPEED SIGNAL	VEH-SPD-SIG-MODE	
90001	COOL-FAN-ENABLE	FAN CONTROL MODE	FAN-CONTROL-MODE	
90011	AC-DEMAND-ENABLE	AC DEMAND INPUT	AC-DEMAND-INPUT	
90021	COOL-FAN-ON-TEMP	FAN ON TEMP	FAN-CNTRL-ON-TEMP	
90031	COOL-FAN-OFF-TEMP	FAN OFF TEMP	FAN-CNTRL-OFF-TEMP	
91001	RAD-SHUT-ENABLE	SHUTTER CONTROL	SHUTTER-CNTRL-ENAB	-
91011	SHUTTER-OPEN-ECT	SHUTTER OPEN COOLANT TEMP	SHUTT OPEN ECT	Ч
91021	SHUTTER-CLOSE-ECT	SHUTTER CLOSE COOLANT TEMP	SHUTT CLOSE ECT	õ
92001	CONDUCT-CLNT-SNSR	COOLANT TANK	COOLNT-TANK-SELECT	GR,
93001	HYD-PRESS-GOV-ENAB	EPG ENABLE	HYD-PRESS-GOV-ENAB	AN
93011	EPG-DRVLINE-STATUS	EPG DRVLINE STATUS	EPG-DRVLINE-STATUS	Z
93021	EPG-MODE-IND-ENABL	EPG MODE INDICATOR	EPG-MODE-IND-ENABL	⋗
93031	EPG-RAMP-RATE	EPG RAMP RATE	EPG-RAMP-RATE	Ξ
93041	EPG-INTG-GAIN-OFST	INT GAIN OFFSET	EPG-INTG-GAIN-OFST	5
93051	EPG-PROP-GAIN-OFST	EPG PROP GAIN OFFSET	EPG-PROP-GAIN-OFST	ש
94001	COLD-AMB-PROT-MODE	COLD AMBIENT PROT MODE	CAP MODE	AR
95001	SERVICE-INT-ENABLE	SERVICE INTERVAL ENABLE	SRVC INT ENAB	Ā
95011	SI-FUEL-INTERVAL	SERV INT FUEL INTERVAL	SI FUEL INT	Ē
95021	SI-HOUR-INTERVAL	SERV INT HOUR INTERVAL	SI HOUR INT	ᅼ
95031	SI-DIST-INTERVAL	SERV INT DISTANCE INTERVAL	SI DISTANCE INT	Щ
95041	SI-FUEL-START	SERV INT FULE START	SI FULE START	ິທ
95051	SI-HOUR-START	SERV INT HOUR START	SI HOUR START	
95061	SI-DISTANCE-START	SERV INT DISTANCE START	SI DISTANCE START	
95071	SI-SRV-SOON-PCT	SERV INT SERV SOON PCT	SI SRV SOON PCT	
95081	SI-LAMP-CONT-ON	SERV INT LAMP CONT ON	SI LMP CONT ON	
95091	SI-LAMP-ACT-TIME	SERV INT LAMP ACTIVE TIME	SI LMP ACTV TIME	
95101	SI-RESET-REQST	SERV INT RESET REQUEST	SI RESET REQUEST	

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Section B – Parameter Table Descriptions

Programmable parameters are grouped according to control system feature. Features are listed in alphabetical order. An index is also provided for help in locating parameters.

Since interactions exist between certain control system features, text is provided at the end of each section to clarify what parameters not belonging to the given feature must be considered when programming parameters belonging to the given feature. Refer to the text in each section preceded by the heading: "Other parameters which must be considered when programming this feature:"

FEATURE NAME: ACCUMULATORS

TOTAL-FUEL (gallons)

Records total fuel usage since installation of this ECM.

ENGINE-HOURS (hours)

Records total engine on time since installation of this ECM. "On" time is defined as any time the engine is running.

TOTAL-MILES (miles)

Records total distance traveled since installation of this ECM.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: COLD AMBIENT PROTECTION

COLD AMBIENT PROTECT ENABLE

Enable/Disable of Cold Ambient Protection Feature

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled and may be activated by the ECM when activation criteria are met.

Cold ambient protection permits the engine to idle at an elevated RPM when certain operating temperature conditions are met. For more information, refer to International[®] publications listed in the reference section of this document.

Other parameters which must be considered when programming this feature:

IDLE SHUTDOWN MODE (Idle Shutdown Control Feature): If this parameter is programmed to enable the IST feature, CAP CANNOT be enabled. This is because the functionality of these two features conflicts.

PTO-CONTROL ON/OFF (Power Take Off Control Feature): CAP is disabled anytime PTO Control is operating in "Active" mode.

ENG-PROT-MODE (Engine Warning and Protection Control Feature): Disables CAP when coolant level is detected to be low.

TRANS_MODE (Transmission Type Feature): If this parameter is programmed to indicate a manual or Allison WT transmission, then the maximum engine speed achievable by CAP is limited to CAP_N_NLMX (parameter not yet available in International[®] EERS database). If TRANS_MODE is programmed to indicate an Allison AT/MT transmission, the maximum engine speed achievable by the CAP feature is limited by the engine control software to a non-programmable parameter value.

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FEATURE NAME: COOLANT TANK SELECTION

CONDUCT-CLNT-SNSR

Specifies type of coolant tank and/or coolant level sensor installed on truck.

- 0: Normally open coolant level sensor switch installed (plastic tank)
- 1: Conductive coolant level probe installed (metal tank)

Other parameters which must be considered when programming this feature: None

FEATURE NAME: COOLANT TEMPERATURE COMPENSATION

OVER TEMPERATURE PROTECTION

Enable/Disable Coolant Temperature Compensation feature.

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled and may become active for certain engine operating conditions.

IMPORTANT: Vehicles using PTO speed control for emergency vehicle applications may need to disable the Coolant Temperature Compensation feature in order to comply with NFPA 1901.

The event logging feature will log occurrence of an engine shutdown event according to engine hours and odometer reading.

CTC-INITIAL (degrees centigrade)

Specifies initial coolant temperature threshold for activation of the Coolant Temperature Compensation feature.

The Coolant Temperature Compensation feature will begin reduction of torque output from the engine for coolant temperatures greater than the threshold specified by this parameter.

CTC-TRANSITION (degrees centigrade)

Temperature threshold where no additional engine torque reduction is requested by Coolant Temperature Compensation for coolant temperature greater than the value programmed into this parameter.

CTC-TAIL-FACTOR (%torque reduction per degree centigrade temperature rise)

Rate used for reducing engine torque.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: CRUISE CONTROL

CRUISE-CONTROL

Enable/Disable Cruise Control Feature

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled and may be turned on and activated by the operator.

IMPORTANT: If Cruise control is disabled, do not program any additional cruise control parameters. Instead, go to the PTO Control section.

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CRUISE-MIN-ENG-SPD (mph)

Cruise Control Low RPM Limit

Minimum engine speed permitted for activation of cruise control.

CRUISE-RAMP-RATE (mph/second)

Cruise Control Vehicle Speed Ramp Rate

Maximum rate of vehicle acceleration permitted when the Accel button is pressed.

MIN CRUISE CONTROL SPEED (mph)

Cruise Control Low Vehicle Speed Limit

Minimum vehicle speed permitted for cruise control engagement (cruise control "active").

MAXIMUM CRUISE CONTROL SPEED (mph)

Cruise Control Maximum Vehicle Speed Limit

Maximum vehicle speed permitted for cruise control engagement and operation (cruise control "active").

If cruise control is disabled, do not enter a value for this parameter. Leave the parameter value blank.

This parameter should not be programmed with a value that exceeds the maximum road speed limit.

Other parameters which must be considered when programming this feature:

1) **RETARDER-SERVICE BRAKE INTERFACE** (Vehicle Retarder Feature): For this parameter programmed to a non-zero value, VRE will be enabled when the brake pedal is depressed and Cruise Control is in a "standby" or "active" mode of operation.

2) PTO-CONTROL ON/OFF (Power Take Off Control): The PTO Control and Cruise Control features operate in a mutually exclusive manner if they are both programmed to be enabled. Cruise Control will function at vehicle speeds greater than 35 mph; PTO control will function at speeds less than 20 mph when PTO-CONTROL is set to 3 (MOBILE-VARIABLE); otherwise, PTO Control will operate only when the vehicle is not moving.

3) VEH-ROAD-SPD-GOV (Road Speed Limiting)

VEHICLE SPEED LIMIT (Road Speed Limiting): In order to encourage use of cruise control for best fuel economy, the MAXIMUM CRUISE CONTROL SPEED should not be programmed to be less than the value programmed for the VEHICLE SPEED LIMIT in the Road Speed Limiting feature.

FEATURE NAME: CUSTOMER PASSWORD

CUSTOMER PASSWORD

Specifies alphanumeric characters that become the customer password for the engine in this vehicle; 4 characters minimum, 8 characters maximum.

Other parameters which must be considered when programming this feature:

None

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FEATURE NAME: ENGINE CRANK INHIBIT

ENG-CRANK-INHIBIT

Enable/disable of the Engine Crank Inhibit feature.

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled. The operator is prevented from starting the engine while the driveline is engaged or the engine is running by disabling the starter control circuitry.

IMPORTANT: In order to comply with Federal Motor Vehicle Safety Standards, vehicles with an automatic transmission must have the engine starter wired in series with the vehicle neutral switch, or this feature must be enabled.

ENG-CRK-INHIB-TIME (seconds)

Engine Crank Inhibit Run Mode Time

Time duration after engine starts before operator is inhibited from engaging the starter motor.

Other parameters which must be considered when programming this feature:

TRANS_MODE (Transmission Type Feature): If this parameter indicates presence of an automatic transmission, (TRANS_MODE = 2 or 4), the Engine Crank Inhibit feature is enabled regardless of the actual status of ENG-CRANK-INHIBIT.

FEATURE NAME: ENGINE FAN CONTROL

COOL-FAN ENABLE

Enable/Disable different features of the Engine Fan Control

- 0: DISABLE, feature is turned off at all times.
- 1: FOR COOLING ONLY, fan activation is performed for engine cooling and air conditioner performance requirements only.
- 2: FOR COOLING AND VEHICLE RETARDER: fan activation is performed based on engine cooling and air conditioner requirements, as well as for use as a vehicle retarding device.

AC-DEMAND-ENABLE

Indicates to ECM that an air conditioner pressure demand switch should be used to engage the engine cooling fan.

- 0: DISABLE, air conditioner demand switch is not available
- 1: ENABLE, air conditioner demand switch is available to the ECM.

COOL-FAN-ON-TEMP (degrees centigrade)

Specifies coolant temperature threshold for fan control operation. Engine fan will be turned on by ECM when coolant temperature is above this threshold.

COOL-FAN-OFF-TEMP (degrees centigrade)

Specifies coolant temperature threshold for fan control operation. Engine fan will be turned off by ECM when coolant temperature is below this threshold.

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Other parameters which must be considered when programming this feature:

RETARDER-SERVICE-BRAKE-INTERFACE (Vehicle Retarder Feature): The Vehicle Retarder Feature should be enabled via this parameter if COOL-FAN ENABLE is programmed to a "2".

RAD-SHUT-ENABLE (Radiator Shutter Control): This parameter indicates to the ECM that the position of the radiator shutter is controlled by the ECM. This parameter must be properly programmed to ensure that the radiator shutters are opened when required to achieve engine cooling by the Engine Cooling Fan feature.

FEATURE NAME: ENGINE SERIAL NUMBER

ENG-SERIAL-NO

Engine Serial Number

Specifies the 17 alphanumeric characters that make up the engine serial number for the engine in this vehicle.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: EVENT LOGGING

EL-OVERSPEED-1 (hours)

Log of engine hour meter for either the last occurrence of an engine overspeed event, or the next to last occurrence of an engine overspeed event.

EL-OVERSPEED-2 (hours)

Log of engine hour meter for either the last occurrence of an engine overspeed event, or the next to last occurrence of an engine overspeed event.

EL-LOWOILP-1 (hours)

Log of engine hour meter for either the last occurrence of low oil pressure detected, or the next to last occurrence of low oil pressure detected.

EL-LOWOILP-2 (hours)

Log of engine hour meter for either the last occurrence of low oil pressure detected, or the next to last occurrence of low oil pressure detected.

EL-OVERHEAT-1 (hours)

Log of engine hour meter for either the last occurrence of engine overheat condition detected, or the next to last occurrence of engine overheat condition detected.

EL-OVERHEAT-2 (hours)

Log of engine hour meter for either the last occurrence of engine overheat condition detected, or the next to last occurrence of engine overheat condition detected.

EL-LOWCOOL-1 (hours)

Log of engine hour meter for either the last occurrence of low coolant level detected, or the next to last occurrence of low coolant level detected.

EL-LOWCOOL-2 (hours)

Log of engine hour meter for either the last occurrence of low coolant level detected, or the next to last occurrence of low coolant level detected.

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EL-OVERSPEED-MI-1 (miles)

Log of vehicle odometer reading for either the last occurrence of an engine overspeed event, or the next to last occurrence of an engine overspeed event.

EL-OVERSPEED-MI-2 (miles)

Log of vehicle odometer reading for either the last occurrence of an engine overspeed event, or the next to last occurrence of an engine overspeed event.

EL-LOWOILP-MI-1 (miles)

Log of vehicle odometer value for either the last occurrence of low oil pressure condition detected, or the next to last occurrence of low coolant level detected.

EL-LOWOILP-MI-2 (miles)

Log of vehicle odometer value for either the last occurrence of low oil pressure condition detected, or the next to last occurrence of low coolant level detected.

EL-OVERHEAT-MI-1 (miles)

Log of vehicle odometer value for either the last occurrence of engine overheat condition detected, or the next to last occurrence of engine overheat condition detected.

EL-OVERHEAT-MI-2 (miles)

Log of vehicle odometer value for either the last occurrence of engine overheat condition detected, or the next to last occurrence of engine overheat condition detected.

EL-LOWCOOL-MI-1 (miles)

Log of vehicle odometer value for either the last occurrence of low coolant level detected, or the next to last occurrence of low coolant level detected.

EL-LOWCOOL-MI-2 (miles)

Log of vehicle odometer value for either the last occurrence of low coolant level detected, or the next to last occurrence of low coolant level detected.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: EXHAUST BACKPRESSURE

EXHAUST BACKPRESS

Specifies enable/disable of the exhaust back pressure feature which is only available for the International[®] T444E V-8 Engine. This feature is not an option for International I-6 engines.

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled for use on this vehicle. Exhaust back pressure control will be activated any time the ECM determines that the feature is required for engine warm up.

Other parameters which must be considered when programming this feature:

None

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FEATURE NAME: GLOW PLUG ENABLE

GLOW-PLUG

Specifies enable/disable of the glow plug feature for the International® I-6 engine.

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled for use on this vehicle. Glow plugs will be activated any time the ECM determines that glow plugs are required for engine start and warm up.

This feature is standard on the T444E V-8 engine and cannot be disabled.

Other parameters which must be considered when programming this feature: None

FEATURE NAME: ELECTRONIC PRESSURE GOVERNOR

HYD-PRESS-GOV-ENAB

Enable/Disable electronic pressure governor feature.

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled and may be turned on and activated by the operator.

EPG-DRVLINE-STATUS

Electronic Pressure Governor DDS

Specifies how the driveline disengaged signal should be processed by the ECM for use by Electronic Pressure Governor feature.

- 0: NEUTRAL OPERATION, driveline must be disengaged at all times for operation of the electronic pressure governor.
- 1: SPLIT SHAFT, driveline must be engaged at all times for operation of the electronic pressure governor..

EPG-MODE-IND-ENABL

EPG Mode Indicator

Specifies if Indicator lamp for electronic pressure governor is available.

- 0: DISABLE, indicator is not available.
- 1: ENABLE, indicator is available.

EPG-RAMP-RATE (psi/sec)

Rate of desired pressure increase for the Electronic Pressure Governor feature when the Resume/Accel button is maintained in a depressed position.

EPG-INTG-GAIN-OFST (rpm/psi/EPG software execution period)

Integral gain offset for Electronic Pressure Governor

EPG-PROP-GAIN-OFST (rpm/psi)

Proportional gain adjustment for Electronic Pressure Governor

Other parameters which must be considered when programming this feature:

1) PTO-CONTROL ON/OFF (Power Take Off Control): This parameter must be programmed to "tbd" before the Electronic Pressure Governor feature can be activated.

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FEATURE NAME: IDLE SHUTDOWN TIMER

IDLE-SHUTDOWN-MODE

Specifies configuration of the IDLE SHUTDOWN TIMER feature.

- 0: DISABLE, feature is turned off at all times.
- 1: IDLE SHUTDOWN PTO OPTION, shutdown the engine after a programmed period of time when PTO Speed Control is NOT active, engine speed is at low-idle, and there is no detectable load on the engine.
- 2: IDLE SHUTDOWN NO LOAD, shutdown the engine after a programmed period of time when no detectable load is placed on the engine. Shutdown criteria are based completely on engine load. Shutdown will occur independent of PTO Speed Control status or engine speed magnitude.
- 3: IDLE SHUTDOWN TAMPER PROOF, operation is same as option 2 except IST will continue to function normally when an APS signal fault or a brake signal fault is detected. In addition, a rationality check is performed on the APS signal to ensure tampering has not been performed.

IST-MAIN-AIT (degrees centigrade)

Specifies maximum ambient air temperature threshold for operation of the Idle Shutdown feature. Engine Idle shutdown feature must be enabled by programming IDLE-SHUTDOWN-MODE to 1, 2, or 3.

If ambient air is above the threshold specified by this parameter, the idle shutdown feature is disabled to permit prolonged use of air conditioning.

IST-MIN-AIT (degrees centigrade)

Specifies minimum ambient air temperature threshold for operation of the Idle Shutdown feature. Engine Idle shutdown feature must be enabled by programming IDLE-SHUTDOWN-MODE to 1, 2, or 3.

If ambient air is below the threshold specified by this parameter, the idle shutdown feature is disabled to permit prolonged use of the cab heater/defroster, and to permit operation of the COLD AMBIENT PROTECTION feature.

IDLE SHUTDOWN TIME (minutes)

Specifies minimum idle duration time before a shutdown can be commanded by the ECM.

Other parameters which must be considered when programming this feature:

1) COLD AMBIENT PROTECT ENABLE (Cold Ambient Protection Feature): If CAP is enabled (via programming of COLD AMBIENT PROTECT ENABLE to "1", the IST feature must NOT be enabled. This is because the functionality of CAP and IST are in conflict. If IST is enabled, the CAP feature will be overridden and will not function at any time.

2) PTO-CONTROL ON/OFF (Power Take Off Control): IST will be disabled when PTO Control is operating in "Active" mode for IDLE-SHUTDOWN-MODE programmed to "1".

3) REMOTE THROTTLE FOR PTO CONTROL (Power Take Off Control): For this parameter programmed to a "1" and PTO control actively operating in remote mode, IST will be disabled regardless of the value programmed for IDLE-SHUTDOWN-MODE

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FEATURE NAME: OIL PRESSURE SIGNAL ENABLE

ENG-OILP-SIG-ENAB

Specifies if engine oil pressure sensor is available for processing by the ECM.

- 0: DISABLE, sensor is not available.
- 1: ENABLE, sensor is available.

If enabled, the ECM will process the signal and broadcast engine oil pressure information over the ATA data link.

This feature must be enabled for operation of Oil Pressure Warning and Protection.

Other parameters which must be considered when programming this feature:

1) ENG-PROT-MODE (Engine Warning and Protection Feature): If this parameter is programmed to 2, 3, or 4, ENG-OILP-SIG-ENAB must be programmed to 1.

FEATURE NAME: POWER TAKE OFF CONTROL

PTO-CONTROL (ON/OFF)

Enable/Disable several different options for PTO Speed Control

- 0: DISABLE, feature is turned off at all times
- 1: REMOTE OPERATION ONLY, feature is operated only with remote located PTO ON/OFF switches.
- 2: IN-CAB OPERATION ONLY, feature is operated only with in-cab located PTO speed control switches
- 3: REMOTE AND IN-CAB OPERATION, feature can be operated with either the remote located or the in-cab located PTO ON/OFF switches. In cases where both switches are used simultaneously, commands given to the ECM from the remote switches will take precedence over commands given to the ECM from the in-cab located PTO switches.

MAX ROAD SPEED FOR MOBILE CONTROL (mph)

Limit maximum vehicle speed when operating in Mobile Engine Speed Control.

Enabled only when the parameter INCAB-PTO-MODE is set to MOBILE VARIABLE.

INCAB-PTO-MODE

Specifies how in-cab located Cruise Control switches are interpreted by the PTO Speed Control for in-cab operation of PTO Speed Control.

- 0: DISABLED, in-cab located Cruise Control switches are not used by the PTO Speed Control feature.
- 1: STATIONARY PRESET, in-cab located Cruise Control switches are used by the PTO Speed Control feature for PRESET PTO Control operation when the vehicle is stationary.
- 2: STATIONARY VARIABLE, in-cab located Cruise Control switches are used by the PTO Speed Control for VARIABLE PTO Control operation whenever the vehicle is stationary. VARIABLE operation means the in-cab located cruise control switches can be used only when PTO Speed control is active to modify the desired engine speed maintained by the ECM.
- 3: MOBILE VARIABLE, in-cab located Cruise Control switches are used by the PTO Speed Control for VARIABLE PTO Control operation when the vehicle is either stationary of moving forward at a speed less than MAX-ROAD-SPEED-FOR-MOBILE-CONTROL.

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DISABLE CAB INTERFACE FOR PTO

Disable use of in-cab located control system interfaces when PTO Speed is controlled by remote input signals.

In-cab interfaces include the accelerator pedal, driveline engagement signal, brake pedal, and cruise control switches.

- 0: ENABLE, use information from all in-cab located operator interfaces
- 1: DISABLE, Ignore all information from in-cab located operator interfaces.

NOTE: This parameter should only be set to "1" when in-cab located operator interfaces (accelerator, brake, clutch, and cruise switches) must be ignored during operation of stationary remote PTO speed control.

REMOTE THROTTLE FOR PTO CONTROL

Enable/disable use of remote throttle for PTO Speed control

- 0: DISABLE, do not use remote throttle.
- 1: ENABLE, use remote throttle

SET ENGINE SPEED (SPEED1) (rpm)

Engine speed maintained by PTO Speed Control feature when operator depresses the SET/COAST button.

Applicable only for PTO_MODE programmed to STATIONARY PRESET mode of operation.

RESUME ENGINE SPEED (SPEED2) (rpm)

Engine speed maintained by PTO Speed Control feature when operator depresses the Resume/Accel button.

Applicable only for PTO_MODE programmed for STATIONARY PRESET mode of operation.

ENGINE RESPONSE RATE FOR PTO (rpm)

Rate engine speed is increased when operator continuously depresses and holds the Resume/Accel button.

MAX PTO ENGINE SPEED (rpm)

Maximum engine speed permitted for PTO speed control.

Limits engine speed during variable speed control use and during operation with remote throttle pedal.

Other parameters which must be considered when programming this feature:

1) COLD AMBIENT PROTECT ENABL (Cold Ambient Protection): CAP is disabled anytime PTO Control is operating in "Active" mode.

2) CRUISE-CONTROL (Cruise Control Feature): The PTO Control and Cruise Control features operate in a mutually exclusive manner if they are both programmed to be enabled. Cruise Control will function at vehicle speeds greater than 35 mph; PTO control will function at speeds less than 20 mph when PTO-CONTROL is set to 3 (MOBILE-VARIABLE); otherwise, PTO Control will operate only when the vehicle is not moving.

3) RETARDER-SERVICE BRAKE INTERFACE (Vehicle Retarder Feature): For this parameter programmed to a non-zero value, VRE will be enabled when the brake pedal is depressed and PTO Control is in "standby" or "active" modes of operation.

4) HYD-PRESS-GOV-ENAB (Electronic Pressure Governor Feature): PTO-CONTROL must be programmed to "tbd" before the EPG feature can be activated.

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FEATURE NAME: RADIATOR SHUTTER CONTROL

RAD-SHUT-ENABLE

Enable/Disable of Radiator Shutter Control Feature

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is enabled, position of radiator shutter is controlled by the ECM.

SHUTTER-OPEN-ECT (degrees centigrade)

Specifies coolant temperature threshold for shutter control operation. Radiator shutters will be opened by the ECM when coolant temperature is above this value.

SHUTTER-CLOSE-ECT (degrees centigrade)

Specifies coolant temperature threshold for shutter control operation. Radiator shutters will be closed by the ECM when coolant temperature is below this value.

Other parameters which must be considered when programming this feature: AC-DEMAND-ENABLE (Engine Fan Control Feature) COOL-FAN-ON-TEMP (Engine Fan Control Feature) COOL-FAN-OFF-TEMP (Engine Fan Control Feature)

To maximize fuel economy, the above parameters should be programmed to ensure that the engine fan is normally not operating when the radiator shutters are closed (except when the fan is being used as a vehicle retarding device).

FEATURE NAME: ROAD SPEED LIMITING

VEH-ROAD-SPD-GOV

Enable/Disable for Road Speed Limiting Feature

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is turned on and active at all times.

MAX-ENGINE SPEED (NO VSSN) (rpm)

Engine speed will be limited to this value when a vehicle speed sensor fault is present and the Road Speed Limiting feature is enabled.

VEHICLE SPEED LIMIT (mph)

Maximum vehicle speed is limited to this value when VEH-ROAD-SPD-GOV is "1" (Road Speed Limiting is enabled).

Other parameters which must be considered when programming this feature:

1) MAXIMUM CRUISE CONTROL SPEED (Cruise Control): In order to encourage use of cruise control for best fuel economy, the MAXIMUM CRUISE CONTROL SPEED should not be programmed to be less than the value programmed for VEHICLE SPEED LIMIT in the Road Speed Limiting feature.

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FEATURE NAME: SERVICE INTERVAL

SERVICE-INT-ENABLE

Enable/disable operation of SERVICE INTERVAL feature.

- 0: DISABLE, feature is turned off at all times.
- 1: ENABLE, feature is turned on, ECM monitors accumulation of specified parameter(s) (distance in miles, operating time in hours, and/or fuel used in gallons), and activates a CHANGE OIL LAMP when the specified interval(s) is reached.

SI-FUEL-INTERVAL (gallons)

Fuel used interval at which the ECM will activate the CHANGE OIL LAMP. Setting SI-FUEL-INTERVAL = 0 will disable the FUEL INTERVAL portion of the feature.

SI-HOUR-INTERVAL (hours)

Engine operating hours interval at which the ECM will activate the CHANGE OIL LAMP. Setting SI-HOUR-INTERVAL = 0 will disable the HOUR INTERVAL portion of the feature.

SI-DIST-INTERVAL (miles)

Vehicle miles interval at which the ECM will activate the CHANGE OIL LAMP. Setting SI-DIST-INTERVAL = 0 will disable the DISTANCE INTERVAL portion of the feature.

SI-FUEL-START (gallons)

Accumulated total engine fuel (obtained from ECM ACCUMULATORS) used to reset SERVICE INTERVAL feature. This value is used by the ECM to calculate interval status by comparison with current accumulator value.

SI-HOUR-START (hours)

Accumulated total engine hours (obtained from ECM ACCUMULATORS) used to reset SERVICE INTERVAL feature. This value is used by the ECM to calculate interval status by comparison with current accumulator value.

SI-DIST-START (miles)

Accumulated total vehicle miles (obtained from ECM ACCUMULATORS) used to reset SERVICE INTERVAL feature. This value is used by the ECM to calculate interval status by comparison with current accumulator value.

SI-SRV-SOON-PCT

Percent of specified interval(s) (distance in miles, operating time in hours, and/or fuel used in gallons), at which ECM will activate the CHANGE OIL LAMP. CHANGE OIL LAMP will operate in a flashing mode until 100% of the specified interval(s) is reached.

SI-LAMP-CONT-ON

Enable/disable CHANGE OIL LAMP continuous mode of operation.

- 0: DISABLES continuous OIL CHANGE LAMP operation. Duration of CHANGE OIL LAMP operation will be controlled by SI-LAMP-ACT-TIME parameter when specified interval is reached.
- 1: ENABLES continuous CHANGE OIL LAMP operation. CHANGE OIL LAMP will operate continuously when specified interval is reached.

SI-LAMP-ACT-TIME (seconds)

Duration of CHANGE OIL LAMP operation. ECM will activate CHANGE OIL LAMP for this period of time when a specified interval is reached, the SI-LAMP-CONT-ON parameter is disabled (=0), and a key-off/ key-on cycle is performed.

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SI-RESET-REQST

Performs a SERVICE INTERVAL feature reset.

- 0: DISABLE, No reset is performed.
- 1: ENABLE, SERVICE INTERVAL feature is reset. Upon a key-off/ key-on, SI-FUEL-START, SI-HOUR-START and SI-DISTANCE-START parameters are updated with current ECM ACCUMULATOR values to begin a new SERVICE INTERVAL feature cycle, and SI-RESET-REQST parameter is automatically reset to 0.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: TORQUE LEVEL TAILORING

TORQUE-TAILORING

Enable/disable different options for Torque Level Tailoring

- 0: DISABLE, feature is turned off at all times.
- 1: TRANSMISSION GEAR SELECT, torque curve selection is based on the engine and vehicle operating conditions only.
- 2: TORQUE CURVE SWITCH SELECT, torque curve selection is based on a dedicated operator selection switch.

TT-LOW-NVS-RATIO

The tailored torque curve will be used by the ECM for N/VS ratios (ratio of engine speed to vehicle speed) larger than the value programmed for this parameter.

For N/VS ratios less than this value but greater than TT-HI-NVS-RATIO the ECM will interpolate between the tailored torque curve and the regular torque curve, based on the actual value of the N/VS ratio.

TT-HI-NVS-RATIO

The regular torque curve will be used by the ECM for N/VS ratios (ratio of engine speed to vehicle speed) less than the value programmed for this parameter.

For N/VS ratios greater than this value but less than TT-LOW-NVS-RATIO, the ECM will interpolate between the tailored torque curve and the regular torque curve, based on the actual value of the N/VS ratio.

Other parameters which must be considered when programming this feature:

TWO-SPEED-AXLE (Two Speed Axle Feature) TIRE-REVS-PER-MILE (Two Speed Axle Feature) REAR-AXLE-RATIO-HI (Two Speed Axle Feature) REAR-AXLE-RATIO-LO (Two Speed Axle Feature) TRANS-LO-NUM-RATIO (Two Speed Axle Feature) VEH-SPEED-CAL-HIGH (Two Speed Axle Feature) VEH-SPEED-CAL-LOW (Two Speed Axle Feature) TAIL-SHAFT-TEETH (Two Speed Axle Feature)

For TORQUE TAILORING = 1, all the above parameters in the Two Speed Axle feature must be programmed correctly in order to calculate N/VS ratio properly. N/VS ratio is used to select or interpolate between the standard and tailored torque curves for TORQUE TAILORING = 1.

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FEATURE NAME: TRANSMISSION TYPE

TRANSMISSION-TYPE

Type of transmission installed on vehicle. The value programmed into this parameter will determine the type of governing used by the ECM for controlling engine speed. Options for this parameter are as follows:

- 0: MANUAL TRANS BROAD REGULATION; a manual transmission is installed, broad (10 to 20%) engine speed regulation will be provided by the ECM governor.
- 1: MANUAL TRANS CLOSE REGULATION, a manual transmission is installed, close (2 to 5%) engine speed regulation will be provided by the ECM governor.
- 2: ALLISON AT/MT, Allison automatic transmission is installed, broad (10 to 20%) engine speed regulation will be provided by the ECM governor.
- 3: NO TRANS, No transmission is specified. Diagnostics for the vehicle speed sensor will be disabled, broad (10 to 20%) engine speed regulation will be provided by the ECM governor.
- 4: ALLISON MD, Allison MD World Transmission is installed.

IMPORTANT: In order to comply with selected Federal Motor Vehicle Safety Standards, vehicles with an automatic transmission may be required to have the engine starter wired in series with the vehicle neutral switch, or the **Engine Crank Inhibit** feature must be enabled.

ENG-FAM-RATING-CD

Specifies engine family for the engine installed in this vehicle.

ENG-LOW-IDLE-SPEED (rpm)

Low idle engine operating speed used when engine is warm.

ENG-HI-IDLE-SPEED (rpm)

Specifies high idle engine operating speed to be used at all times.

ENG-RATED-SPEED (rpm)

Specifies rated engine operating speed.

ENG-RATED-HP (horsepower)

Specifies rated horsepower.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: TWO-SPEED AXLE

TWO-SPEED-AXLE

Specifies presence or absence of two speed axle on this vehicle.

If a two speed axle is installed and this parameter is set to a "1" (enabled), the ECM will process the two speed axle signal as part of the Vehicle Speed calculation.

TIRE-REVS-PER-MILE (rotations per mile)

Specifies tire rotations per mile of distance traveled.

Component CT-47	1 October, 2002	Component

REAR-AXLE-RATIO-HI

Specifies rear axle gear ratio for two powertrain operating conditions:

- 1. two speed axle operating in "high" range
- 2. two speed axle not present

REAR-AXLE-RATIO-LO

Specifies rear axle gear ratio for low range operation of the two speed axle.

TRANS-LO-NUM-RATIO

Specifies top gear ratio (lowest numerical gear ratio) for transmission.

VEH-SPEED-CAL-HIGH (pulses per mile)

Specifies relationship between pulses counted by ECM for each mile of distance traveled for two powertrain operating conditions:

- 1. two speed axle operating in "high" range
- 2. two speed axle not present

VEH-SPEED-CAL-LOW (pulses per mile)

Specifies relationship between pulses counted by ECM for each mile of distance traveled when two speed axle is operating in "low" range.

TAIL-SHAFT-TEETH

Specifies total number of transmission tailshaft gear teeth, used for calculation of vehicle speed.

Other parameters which must be considered when programming this feature: TORQUE-TAILORING (Torque Level Tailoring) TT-LOW-NVS-RATIO (Torque Level Tailoring)

TT-HI-NVS-RATIO (Torque Level Tailoring)

Correct functionality of the Torque Level Tailoring feature (for TORQUE TAILORING programmed to "1") requires that all parameters in the Two-Speed Axle feature be programmed correctly.

FEATURE NAME: VEHICLE IDENTIFICATION NUMBER

VEHICLE-IDENT

Specifies the 17 Alphanumeric Characters that make up the vehicle identification number for this vehicle.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: VEHICLE RETARDER MODE

RETARDER-SERVICE BRAKE INTERFACE

Specifies desired mode of operation for the vehicle retarder as follows:

- 0: DISABLE, feature is disabled at all times.
- 1: LATCH, feature is enabled for the following conditions:

Component

Component

When cruise control or PTO speed control is in any non-zero mode of operation (standby or active), the vehicle retarder will become active when the brake pedal is depressed. This active condition is latched by the ECM. The vehicle retarder will remain in this active latched condition until the accelerator pedal is depressed or until low idle engine speed is achieved.

• 2: COAST, feature is enabled for the following conditions:

When cruise control or PTO speed control is in any non-zero mode of operation (standby or active), the vehicle retarder will be active anytime the brake pedal is depressed. The vehicle retarder will be inactive anytime the brake pedal is released.

 3: TRANSMISSION/DRIVELINE, should be selected whenever a transmission or driveline mounted retarder will be used. The transmission/driveline mounted retarder will be enabled whenever engine speed exceeds a value specified by the engine controller calibration. Otherwise, conditions are the same as for the Latched mode described previously (RETARDER-SERVICE-BRAKE-INTERFACE = 1).

The vehicle retarder will be enabled during an engine overspeed condition for any of the above non-zero Vehicle Retarder operating modes.

Other parameters which must be considered when programming this feature: None

FEATURE NAME: VEHICLE SPEED SIGNAL

VEH-SPD-SIG-MODE

Specifies how vehicle speed information will be provided to the ECM. Parameter should always be a zero.

- 0: VEHICLE SPEED SENSOR, Vehicle speed sensor is available.
- 1: J1587, future feature usage
- 2: J1939, future feature usage

Other parameters which must be considered when programming this feature:

All parameters in Cruise, PTO, Road Speed Limiting, and Two-Speed axle features require proper indication of vehicle speed; therefore, the proper programming of the VEH-SPD-SIG-MODE parameter is required to achieve proper functionality of these features.

Component	CT-471 October, 2002	Component

FEATURE NAME: WARN MODE

ENG-PROT-MODE

Enable/Disable several different options for the Engine Warning and Protection System

- 0: STANDARD WARNING (RPM, ECT), Detection of engine over speed and engine overheat are provided as the default operating mode. No engine shut down is available. The Oil and Water Lamp (OWL) is illuminated (either flashing or constant) and a fault code is activated.
- 1: 3-WAY WARNING (RPM, ECT, EOP, ECL), Engine over speed, engine overheat, engine pressure low, and loss of engine coolant are provided as the engine warning operating mode. No engine shut down is available. OWL is illuminated (either flashing or constant) and a fault code is activated.
- 2: 3-WAY PROTECTION (RPM, ECT, EOP, ECL), Engine over speed, engine overheat, engine pressure low, and loss of engine coolant are provided as the engine warning operating mode. Engine shut down is available if the critical condition is detected. Critical engine conditions include overheat, low oil pressure, and low coolant level. OWL is illuminated (either flashing or constant) and a fault code is activated.
- 3: 2-WAY WARNING (RPM, ECT, EOP), Engine over speed, engine overheat, and engine pressure low are provided as the engine warning operating mode. No engine shut down is available. OWL is illuminated (either flashing or constant) and fault codes are activated as required.

ECT-WARNING (degrees centigrade)

Specifies temperature threshold where the OIL/WATER lamp and the warning buzzer should be turned on due to an engine overheat condition.

ECT-CRITICAL (degrees centigrade)

Specifies temperature threshold where an engine shut down should be commanded due to an engine overheat condition.

The Engine Warning and Protection System feature must be enabled.

PROT-ENG-SPD1 (rpm)

Specifies RPM breakpoint where OIL-PRES-CRIT-SPD1 will be used by the ECM as the oil pressure threshold for detecting low oil pressure.

PROT-ENG-SPD2 (rpm)

Specifies RPM breakpoint where OIL-PRES-CRIT-SPD2 will be used by the ECM as the oil pressure threshold for detecting low oil pressure.

PROT-ENG-SPD3 (rpm)

Specifies RPM breakpoint where OIL-PRES-CRIT-SPD3 will be used by the ECM as the oil pressure threshold for detecting low oil pressure.

OIL-PRES-WARN-SPD1 (psig)

The OIL/WATER lamp and the warning buzzer are turned on for engine oil pressure less than this threshold and engine speed greater than PROT-ENG-SPD1.

The event logging feature will log occurrence of this event according to engine hours and odometer reading.

OIL-PRES-WARN-SPD2 (psig)

The OIL/WATER lamp and the warning buzzer are turned on for engine oil pressure less than this threshold and engine speed greater than PROT-ENG-SPD1 and less than PROT-ENG-SPD2.

The event logging feature will log occurrence of this event according to engine hours and odometer reading.

Component	CT-471	October, 2002	Component
•		,	•

OIL-PRES-WARN-SPD3 (psig)

The OIL/WATER lamp and the warning buzzer are turned on for engine oil pressure less than this threshold and engine speed greater than PROT-ENG-SPD2 and less than PROT-ENG-SPD3.

OIL-PRES-CRIT-SPD1 (psig)

Specifies when engine shut down will be commanded due to engine oil pressure less than this threshold and engine speed greater than PROT-ENG-SPD1. The event logging feature will log occurrence of this event according to engine hours and odometer reading.

OIL-PRES-CRIT-SPD2 (psig)

Specifies when an engine shut down will be commanded due to engine oil pressure less than this threshold and engine speed greater than PROT-ENG-SPD1 and less than PROT-ENG-SPD2. The event logging feature will log occurrence of this event according to engine hours and odometer reading.

OIL-PRES-CRIT-SPD3 (psig)

Specifies when an engine shut down will be commanded due to engine oil pressure less than this threshold and engine speed greater than PROT-ENG-SPD2 and less than PROT-ENG-SPD3. The event logging feature will log occurrence of this event according to engine hours and odometer reading.

The event logging feature will log occurrence of this event according to engine hours and odometer reading.

Other parameters which must be considered when programming this feature:

ENG-OILP-SIG-ENAB (Oil Pressure Signal Enable): This parameter must equal "1" for correct operation of Engine Oil Pressure Warning and Protection.

Component CT-471 October, 2002 Componen			
	Component	CT-471 October, 2002	Component

Section C – International® Proprietary Parameters

The following pages include proprietary parameter tables.

Table C.1 — International[®] Proprietary Parameter Attributes

Table C.1 — International Proprietary Parameter Attributes Table. Information generated directly from EERS Rele (International EMR Report, Location Melrose Park, Rules Effective August, 1997)					ERS Release
Supplier Name	EERS Sales Description	Туре 1	Units	Lower Limit	Upper Limit
42000	READ-ECM-FAULTS	R	N/A		
43002	CLEAR-ECM-FAULTS	W	N/A		
44000	ECM-SELF-TEST	R	N/A		
66010	SERIAL-NO-CEC	R	N/A		
68000	LAST-SERVICE-TOOL1	R	N/A		
68010	LAST-SERVICE-TOOL2	R	N/A		

NOTE:

1 R: EST Read Only Parameter W:EST Write Only Parameter

Component	CT-471	October, 2002	Component

Table C.2 — Proprietary Parameter Cross Reference

Table C.2 — Proprietary Parameter Cross Reference Table. Information generated directly from International® EERS S (International EMR Report, Location Melrose Park, Rules Effective August, 1997)

			1
Supplier Name	Parameter Name	Sales Description	Service Des
			CAL-TRANS
0			CAL-MAX-0
0			CAL-CRUS-
0			CAL-MAX-F
0			CAL-CRUS-
0			CAL-MAX-F
1			CAL–SPEED
42000	READ-ECM-FAULTS		READ-ECM
43002	CLEAR-ECM-FAULTS		CLEAR-ECM
44000	ECM-SELF-TEST		ECM-SELF-
45000			CAL-GEARI
66010	SERIAL-NO-CEC	ECM SERIAL NUMBER	MOD-SERIA
68000	LAST-SERVICE-TOOL1	LAST SERVICE TOOL 1	LAST-SERV
68010	LAST-SERVICE-TOOL2	LAST SERVICE TOOL 2	LAST-SERV
68023	LAST-TOOL-CALIB	LAST CALIB TOOL	LAST-TOOL
68033	LAST-TOOL-CAL-DATE	LAST CALIB DATE	LAST-TOOL
68043	LAST-TOOL-STRATEGY	LAST STRATEGY TOOL	LAST-TOOL
68053	LAST-TOOL-STR-DATE	LAST STRATEGY DATE	LAST-TOOL

Component

DIAMOND LOGIC[™] CONTROLLER ENGINE CONTROL PROGRAMMABLE PARAMETERS

FEATURE NAME: CLEAR-ECM-FAULTS

CLEAR-ECM-FAULTS

Command ECM to clear fault codes.

Other parameters which must be considered when programming this feature: None

FEATURE NAME: ECM-SELF-TEST

ECM-SELF-TEST Command ECM to perform diagnostic self-test.

Other parameters which must be considered when programming this feature: None

FEATURE NAME: ECM COMPATIBILITY DATA

PP LIST LEVEL

Indicates what powertrain control features are configured for this vehicle.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: ECM MANUFACTURING DATA

MANUFACTURING DATE

Specifies manufacturing date of this ECM.

The year, month, day, and hour of manufacture is displayed. Each of the separate fields uses two numbers. For example, the display "97013018" means this ECM was manufactured on January 30, 1997 at 6 PM.

SERIAL-NO-CEC

ECM serial number.

H/W VERSION

ECM Hardware level.

S/W STRATEGY VERSION

Level of software functionality programmed into this ECM.

S/W CALIBRATION VERSION

Calibration level programmed into this ECM.

In general, calibration refers to the set of parameters used by the control system that are not programmable by the customer or by the factory (i.e. control system gains, out-of-range thresholds, ramp rates, etc.).

Other parameters which must be considered when programming this feature:

None

Component	OT 474	Santambar 2000	Component
Component	01-471	September, 2000	component

DIAMOND LOGIC[™] CONTROLLER ENGINE CONTROL PROGRAMMABLE PARAMETERS

FEATURE NAME: PROGRAMMING TRACE

LAST-SERVICE-TOOL1

Logs identification of last service tool used to modify a programmable parameter.

LAST-SERVICE-TOOL2

Logs most recent date when a customer service tool was used to modify a programmable parameter.

LAST-TOOL-CALIB

Identifies identification of programming tool last used to modify engine calibration data. Also indicates locations of calibration parameters modified by the service tool.

LAST-TOOL-CAL-DATE

Date when factory programming tool last downloaded calibration data.

LAST-TOOL-STRATEGY

Identifies factory programming tool last used to modify the engine control software. Also indicates memory locations modified in the control system software.

LAST-TOOL-STR-DATE

Logs most recent date when a programming tool downloaded control system software to the ECM.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: READ-ECM-FAULTS

READ-ECM-FAULTS

Query ECM memory for fault codes.

Other parameters which must be considered when programming this feature:

None

FEATURE NAME: SOFTWARE PARAMETER AUDITS

PP LIST CHECKSUM

Used by ECM to validate integrity of values programmed into memory by factory and/or customer.

S/W CALIBRATION CHECKSUM

Used by ECM to validate integrity of calibration data programmed into memory.

S/W STRATEGY CHECKSUM

Used by ECM to validate integrity of software instructions programmed into memory.

Other parameters which must be considered when programming this feature:

None

Component	CT-471	September, 2000	Component

DIAMOND LOGIC[™] CONTROLLER ENGINE CONTROL PROGRAMMABLE PARAMETERS

NOTES:

Component	CT-471	September, 2000	Component

APPENDICES

APPENDIX A — DIAGNOSTIC SERVICE TOOLS

Diagnostic service tools are available from your International[®] Dealer. The following kits apply the most to electrical diagnosis and engine control system feature programming

ZTSE4357	Fluke 88 Digital Volt-Ohm Meter
ZTSE4445	ECM Breakout Box – with Diamond Logic [™] Control System
ZTSE4582	96 Pin Breakout Box – with Diamond Logic [™] II Control System
ZTSE4463–A	Master Diagnostic [™] Software
ZTSE4463–4	Master Diagnostics [™] MD32 (Fleet)
ZTSE4632	EZ–Tech [™] IC3 COM Interface
ZTSE4357	Fluke 88 Multimeter
ZTSE4505A	Breakout Harness Kit
ZTSE4435A	Terminal Test Kit
ZTSE4282	Crimping Tool Set
ZTSE4403	Terminal Release Tool Kit
ZTSE4443	Terminal Extraction Kit
ZTSE4496	Terminal Repair Kit

The Master Diagnostic[™] Software is the primary International EZ TECH[™] service tool.

Component	CT-471 October, 2002	Component

APPENDIX B — REFERENCES AND SERVICE PUBLICATIONS

Publications for diagnosing and repairing International[®] Electronic Engines are available to assist diagnosis and repair of the engine control system electronics. The circuit diagram books can be valuable aids in diagnosing and repairing electrical and electronic problems. The electrical trouble shooting guides discuss terminal crimping, connector repair and the tools required to perform repairs.

	E	INGINE AND VEHICLE DIAGNOSTICS		
CTS-5000	International® Service Information Systems, CTS-5000 Service Manual (Compact Disc)			
CTS-5276	Engine Servic	e Tips , 1/13/97		
		PROGRAMMABLE PARAMETERS		
CGE-524	Diamond Logi	c™ Programmable Parameters Manual		
	CURRE	ENT PRODUCTION ENGINE PUBLICATIONS		
International® DT	466E and 530E	Engines		
EGES 175–1	DT 466E and I	NTERNATIONAL® 530E Engine Diagnostics Manual		
	EGED 180-2	Mechanical Diagnostics Form		
	EGED 180–5	Electronic Control System Diagnostics Form		
EGES 210	DT 466E and I	NTERNATIONAL® 530E Diesel Engine Service Manual		
1171734R6	DT 466E Engiı	ne Operation and Maintenance Manual		
1171735R5	INTERNATION	AL® 530E Engine Operation and Maintenance Manual		
1171764R2	The INTERNA Maintenance I	TIONAL® 530E GREEN TECHNOLOGY™ Engine Operation and Manual		
International® DT 466, DT 530 and HT 530				
EGES 215	DT 466 and D	「530 Engine Diagnostics Manual for NGV Trucks		
	EGED 220	DT 466 and DT 530 Mechanical Diagnostics Form		
	EGED 230	DT 466 and DT 530 Electronic Control System Diagnostics Form		
EGES 210	DT 466E and I	NTERNATIONAL® 530E Diesel Engine Service Manual		
EGES 230	DT 466 AND D	T 530 AND HT 530 530E Diesel Engine Service Manual Supplement		
1171753R3	DT 466 Engine	e Operation and Maintenance Manual		
1171755R3	DT 530 and H	۲ 530 Engine Operation and Maintenance Manual		
International® VT	365			
EGES 240	VT 365 Engine	e Diagnostics Manual		
	EGED 245	VT 365 Hard and No Start Diagnostic Form		
	EGED 250	VT 365 Performance Diagnostic Form		
	EGED 255	VT 365 Electronic Control System Diagnostics Form		
EGES 235	VT 365 Diesel	Engine Service Manual		
1171765R2	VT 365 Engine	e Operation and Maintenance Manual		

Component

CURRENT PRODUCTION ENGINE PUBLICATIONS (Continued)

International® T 444E EGES 190 T 444E Diesel Engine/Vehicle Diagnostic Manual EGED 195 T 444E Hard Start/No Start and Performance Engine Diagnostics Form EGED 200 T 444E Electronic Control System Diagnostic Form EGES 120–1 T 444E Diesel Engine Service Manual EGES 120 T 444E Diesel Engine Service Manual 1171737R6 T 444E Engine Operation and Maintenance Manual

Component	CT-471 October, 2002	Component

APPENDIX C — ATA DATA LINK SUPPORT

The parameters transmitted by the system over the ATA data link are reviewed below in Appendix C1. The parameters are defined by SAE recommended practice J1587. For information regarding MIDs, PIDs and their content please refer to Appendix C2, SAE recommended practice J1587.

Parameter Name (Units)	PID	Frequency (Hz)	Data Length (bytes)	Notes 1
Retarder Inhibit Status	62	1.0	1	10
Torque Limiting Factor (%)	68	1.0	1	1
Two-Speed Axle Switch Status	69	1.0	1	
Idle Shutdown Timer Status	71	1.0	1	16
Auxiliary Water Pump Pressure (psi)	73	1.0	1	18
Maximum Road Speed Limit (mph)	74	on request	1	3,11
Road Speed Limit Status	83	1.0	1	11
Road Speed (mph)	84	10.0	1	5
Cruise Control Status	85	5.0	1	12
Cruise Control Set Speed (mph)	86	0.1	1	12
Cruise Control High Set Limit (mph)	87	on request	1	3,12
Cruise Control Low Set Limit (mph)	88	on request	1	3,12
Power Take off Status	89	1.0	1	8
Percent Accelerator Pedal Position (%)	91	10.0	1	5
Percent Engine Load (%)	92	10.0	1	
Engine Oil Pressure (psig)	100	1.0	1	5,9
Boost Pressure (psig)	102	1.0	1	5
Barometric Pressure (psia)	108	1.0	1	5
Engine Coolant Temperature (°F)	110	1.0	1	5
Engine Coolant Level (%)	111	0.1	1	1,9
Engine Retarder Status	121	5.0	1	10
Engine Crank Inhibit Torque Curve Selection Switch Status Engine Fan Control Status Radiator Shutter Enable Status Air Conditioning Demand Status [Auxiliary Input and Output Status #2]	154	1.0	2	1,17
Remote PTO Interface Status Electronic Pressure Governor Status Electronic Pressure Governor Mode Indicator [Auxiliary Input and Output Status #1]	155	1.0	2	1,14
Injection Control Pressure (Mpa) [Lubrication Rail Pressure]	164	1.0	2	5
Rated Horsepower (HP) [Rated Engine Power]	166	on request/ on change	2	3,7
Battery Voltage (Volts) [Battery Potential Voltage]	168	1.0	2	5
Ambient Air Temperature (°F)	171	0.1	2	5
Engine Oil Temperature (°F)	175	1.0	2	5
Fuel Rate (gal/sec)	183	5.0	2	

APPENDIX C1 — EECM TRANSMITTED ATA PARAMETERS – V7.0

Component

CT-471 October, 2002

Component

Parameter Name (Units)	PID	Frequency (Hz)	Data Length (bytes)	Notes 1
Power Take off Set Speed (rpm)	187	0.1	2	4,14,15
Idle Engine Speed (rpm)	188	on request/0.1	2	1,3,6
Rated Engine Speed (rpm)	189	on request	2	3,7
Engine Speed (rpm)	190	10.0	2	
Transmission Output Shaft Speed (rpm)	191	10.0	2	5
Transmitter System Diagnostic Code Table	194	on request/1.0	variable	2
Diagnostic Data/Count Clear Response	196	on request	variable	2
Vehicle Identification Number	237	on request	17	
Change Reference Number	240	on request	9	1
Component Identification	243	on request	17	1
Total Miles (miles)	245	0.1	4	
Total Engine Hours (hours)	247	on request	4	
Total Fuel Used (gal)	250	on request	4	

1 NOTES:

- 1. SAE J1587 RP definition is amended as described in Appendix A of IF36 Interface Requirements Specification
- 2. The details of diagnostic messages and responses are discussed in section 3.3.1.2 ATA Diagnostic Data of the IF36 Interface Requirements Specification
- 3. Value may vary from the value programmed as a result of some error conditions. The value will always reflect the operating parameters of the EECM
- 4. Values will reflect the engine speed commanded for PTO use by the Preset or Variable SCCS inputs
- 5. Not broadcast when signal fault is detected
- 6. Broadcast at 0.1 Hz rate until Idle Engine Speed stabilizes at **N_LIDLE[PP]**
- 7. Broadcast immediately following a EECM power-up sequence and then broadcast as changes occur
- 8. Only broadcast when the DDS signal is enabled
- 9. Only broadcast when Engine Warning/Protection System is enabled
- 10. Only broadcast when Vehicle Retarder is enabled
- 11. Only broadcast when Road Speed Limiting is enabled
- 12. Only broadcast when Cruise Control is enabled
- 13. Only broadcast when Exhaust Back Pressure Control is enabled
- 14. Only broadcast when remote PTO or Electronic Pressure Governor is enabled
- 15. Only broadcast when in-cab PTO is enabled
- 16. Only broadcast when Idle Shutdown Timer is enabled
- 17. Only broadcast when Engine Fan Control, Radiator Shutter Enable, Service Interval Lamp, or TCSS is enabled
- 18. Only broadcast when Electronic Pressure Governor is enabled
- [] Indicates J1587 description

Component	CT-471 October,	2002	Component

APPENDIX C2 — AMENDMENTS TO SAE J1587 RP DEFINITIONS

PID 111, Engine Coolant Level:

A constant value of **100 percent** shall be transmitted as long as the sensor determines that there is engine coolant. When the sensor determines that there is no engine coolant (or insufficient coolant level), then the value provided in PID 111 shall be **0 percent**.

PID 62, Retarder Inhibit Status:

62 a; where a = Retarder Inhibit Status Parameter Data Length: 1 Character Data Type: Binary Bit-Mapped Resolution: Binary Maximum Range: 0 to 255 Transmission Update Period: On Request Message Priority: 8 Bit 8–5: Reserved – all bits set to 1 Bit 4–3: Engine Brake System Signal #2 Status Bit 2–1: Engine Brake System Signal #1 Status

PID 154, Auxiliary Input/Output Status (Remote Interface):

154 a b

а

b

- Auxiliary Input #5 through #8 Status
- Bits 1–2, (Aux. Input #5) Reserved both bits set to 1
- Bits 3-4, (Aux. Input #6) Reserved both bits set to 1
- Bits 5–6, (Aux. Input #7) ATA_ACD_STS (Air Conditioning Demand Status)
- Bits 7–8, (Aux. Input #8) ATA_TCSS_STS (Torque Curve Selection Switch)
- Auxiliary Output #5 through #8 Status

Bits 1–2, (Aux. Output #5) ATA ECI STS (Engine Crank Inhibit)

Bits 3–4, (Aux. Output #6) Reserved – both bits set to 1

Bits 5–6, (Aux. Output #7) ATA_RSE_STS (Radiator Shutter Enable Status)

Bits 7–8, (Aux. Output #8) ATA_EFC_STS (Engine Fan Control Status)

Each bit field will be coded as follows; 00 = off, 01 = on, 10 = faulted, 11 = not available

Priority 3 shall be used to transmit this PID in lieu of the standard transmission priority specified in SAE J1587 RP.

PID 155, Auxiliary Input/Output Status (Remote Interface):

155 a b

а	 Auxiliary Input #1 through #4 Status
	Bits 1–2, (Aux. Input #1) PTOR_PRE Status (Remote Preset Requested)
	Bits 3–4, (Aux. Input #2) PTOR_VAR Status, (Remote Variable Requested)
	Bits 5–6, (Aux. Input #3) RPS_Status, (Remote APS Active or Inactive)
	Bits 7–8, (Aux. Input #4) HPE Status, (Electronic Pressure Governor Enable)
b	 Auxiliary Output #1 through #4 Status
	Bits 1–2, (Aux. Output #1) HMI Status, (Electronic Pressure Governor Mode Indicator)
	Bits 3–4, (Aux. Output #2) Reserved – both bits set to 1
	Bits 5–6, (Aux. Output #3) Reserved – both bits set to 1
	Bits 7–8, (Aux. Output #4) Reserved – both bits set to 1
Ead	ch bit field will be coded as follows; 00 = off, 01 = on, 10 = faulted, 11 = not available
Prie	ority 3 shall be used to transmit this PID in lieu of the standard transmission priority specified in SAE

J1587 RP.

Component

PID 188, Idle Engine Speed:

The Idle Engine Speed is a dynamic quantity as the engine warms up. Thus to reflect the idle speed the Engine seeks to maintain, PID 188 will be transmitted to reflect the changes. The transmission frequency shall not exceed **0.1 Hz**. When the normal idle speed has been reached, this value will be transmitted via PID 188 once to reflect the normal idle speed. Thereafter, the value for PID 188 may be obtained only upon request. The data format for PID 188 shall be as described in SAE J1587 RP.

PID 240, Change Reference Number:

The data content of the change reference number parameter below identifies the hardware and software present for MRD Next Generation Electronics components. The number of data bytes field content reflects this change. The following defines the format of PID 240 to be transmitted by International[®]:

240 n aaaaaaaa b

240	=	Change Reference Number PID
n	=	9: number of data bytes in message.
aaaaaaaa	=	EECM Software Strategy Version number. Display as alphanumeric, such as:
		EC0B6001.
b	=	EECM Software Calibration Version number. Display as 001 through 255 .

b = EECM Software Calibration Version number. Display as **001** through **255**. Priority 3 shall be used to transmit this PID in lieu of the standard transmission priority specified in SAE

J1587 RP. All EECM software contains a unique 16–bit checksum of ROM contents (Program Software and Data).

PID 243, Component Identification Parameter:

243 n 128 ccccc * ddddddddd

243	=	Component Identification PID
n	=	number of data bytes in message
128	=	the MID of the EECM
ccccc	=	073 078 084 032 032: "INT" The ATA/VRMS notation for the International® brand of
		engines and vehicles from International [®] .
*	=	042: "*" field delimiter
dddddddd	=	engine model ASCII characters. Up to 10 characters with the last character "*".
		example: 084 045 052 052 052 069 042 042 042 042 = "T-444E****"

Component	CT-471	October, 2002	Component
		00 7	

APPENDIX C3 — EECM TRANSMITTED ATA FAULT CODE LIST – V7.0

PID	SID	FMI	CODE	Description
168	0	3	112	Electrical System Voltage B+ Out of Range HIGH
168	0	4	113	Electrical System Voltage B+ Out of Range LOW
110	0	4	114	Engine Coolant Temperature Signal Out of Range LOW
110	0	3	115	Engine Coolant Temperature Signal Out of Range HIGH
102	0	3	121	Intake Manifold Abs. Press. Signal Out of Range HIGH
102	0	4	122	Intake Manifold Abs. Press. Signal Out of Range LOW
102	0	2	123	Intake Manifold Abs. Press. Inrange Fault
164	0	4	124	Injection Control Press. Signal Out of Range LOW
164	0	3	125	Injection Control Press. Signal Out of Range HIGH
91	0	4	131	Accelerator Position Signal Out of Range LOW
91	0	3	132	Accelerator Position Signal Out of Range HIGH
91	0	2	133	Accelerator Position Signal Inrange Fault *M*
91	0	7	134	Accelerator Position and Idle Validation Disagree
0	230	11	135	Idle Validation Switch Circuit Fault
84	0	4	141	Vehicle Speed Signal Out of Range LOW
84	0	3	142	Vehicle Speed Signal Out of Range HIGH
0	21	2	143	Wrong Number of CAMP Signal Transitions per Cam Rev
0	21	8	144	CAMP Signal Noise Detected
0	21	12	145	CAMP Signal Inactive While ICP has Increased
108	0	3	151	Barometric Press. Signal Out of Range HIGH
108	0	4	152	Barometric Press. Signal Out of Range LOW
171	0	4	154	Air Inlet Temperature Signal Out of Range LOW
171	0	3	155	Air Inlet Temperature Signal Out of Range HIGH
100	0	4	211	Engine Oil Press. Signal Out of Range LOW
100	0	3	212	Engine Oil Press. Signal Out of Range HIGH
0	29	4	213	Remote Throttle Signal Out of Range LOW
0	29	3	214	Remote Throttle Signal Out of Range HIGH
84	0	8	215	Vehicle Speed Signal Freq. Out of Range HIGH
73	0	4	216	Aux. Water Pump Press. Signal Out of Range LOW
0	244	2	221	Cruise–PTO Control Switch Circuit Fault
0	247	2	222	Brake Switch Circuit Fault
111	0	2	236	ECL Circuit Out of Working Range Fault
0	254	2	224	Flash Memory Fault
100	0	0	225	Engine Oil Press. Above Spec With Engine Off
73	0	3	226	Aux. Water Pump Press. Signal Out of Range HIGH
0	250	2	231	ATA Data Link Communication Error
0	42	11	241	Injection Cntrl. Press. Regulator OCC Self Test Failed
0	37	11	243	Main Power Relay (MPR) OCC Self Test Failed
0	248	11	244	Engine to Trans. Data Line OCC Self Test Failed
0	35	11	245	Exhaust Press. Regulator OCC Self Test Failed

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PID	SID	FMI	CODE	Description
0	56	11	246	Engine Fan Control OCC Self Test Failed
0	38	11	251	Glow Plug Cntrl. OCC Self Test Failed
0	36	11	252	Glow Plug Lamp OCC Self Test Failed
0	55	11	256	Radiator Shutter Enable OCC Self Test Failed
0	238	11	263	Oil/Water Lamp OCC Self Test Failed
62	0	11	265	Vehicle Retarder Enable OCC Self Test Failed
0	239	11	266	Warn Engine Lamp OCC Self Test Failed
175	0	4	311	Engine Oil Temperature Signal Out of Range LOW
175	0	3	312	Engine Oil Temperature Signal Out of Range HIGH
100	0	1	313	Engine Oil Pressure Below Warning Level
100	0	7	314	Engine Oil Pressure Below Critical Level
190	0	0	315	Engine Speed Above Warning Level
110	0	0	321	Engine Coolant Temperature Above Warning Level
110	0	7	322	Engine Coolant Temperature Above Critical Level
111	0	1	323	Engine Coolant Level Below Warning/Critical Level
71	0	14	324	Idle Shutdown Timer engine shutdown
110	0	14	325	Power Reduced Matched to Cooling SYS Performance *M*
164	0	0	331	Injection Cntrl. Press. Above System Working Range
164	0	13	332	Injection Control Press. Above Spec with Engine Off
164	0	10	333	Injection Control Press. Above/Below Desired Level
164	0	7	334	Injection Control Press. Poor Performance *M*
164	0	1	335	Injection Control Press. Unable to Build Press At Engine Crank
73	0	10	336	Aux. Water Pump Press. Above/Below Desired Level
0	34	4	341	Exhaust Back Pressure Signal Out of Range LOW
0	34	3	342	Exhaust Back Pressure Signal Out of Range HIGH
0	34	0	343	Excessive Exhaust Back Pressure
0	34	13	344	Exhaust Back Press. Above Spec. with Engine Off
0	34	7	351	Exhaust Back Press. Below Expected Level at High Eng. Speeds
0	34	10	352	Exhaust Back Press. Above/Below Desired Level
0	1	5	421	Cyl 1: Low Side to High Side OPEN
0	2	5	422	Cyl 2: Low Side to High Side OPEN
0	3	5	423	Cyl 3: Low Side to High Side OPEN
0	4	5	424	Cyl 4: Low Side to High Side OPEN
0	5	5	425	Cyl 5: Low Side to High Side OPEN
0	6	5	426	Cyl 6: Low Side to High Side OPEN
0	7	5	427	Cyl 7: Low Side to High Side OPEN
0	8	5	428	Cyl 8: Low Side to High Side OPEN
0	1	4	431	Cyl 1: Low Side SHORTED to High Side
0	2	4	432	Cyl 2: Low Side SHORTED to High Side
0	3	4	433	Cyl 3: Low Side SHORTED to High Side
0	4	4	434	Cyl 4: Low Side SHORTED to High Side
0	5	4	435	Cyl 5: Low Side SHORTED to High Side

Component

PID	SID	FMI	CODE	Description
0	6	4	436	Cyl 6: Low Side SHORTED to High Side
0	7	4	437	Cyl 7: Low Side SHORTED to High Side
0	8	4	438	Cyl 8: Low Side SHORTED to High Side
0	1	6	451	Cyl 1: High Side SHORTED to Ground or B+
0	2	6	452	Cyl 2: High Side SHORTED to Ground or B+
0	3	6	453	Cyl 3: High Side SHORTED to Ground or B+
0	4	6	454	Cyl 4: High Side SHORTED to Ground or B+
0	5	6	455	Cyl 5: High Side SHORTED to Ground or B+
0	6	6	456	Cyl 6: High Side SHORTED to Ground or B+
0	7	6	457	Cyl 7: High Side SHORTED to Ground or B+
0	8	6	458	Cyl 8: High Side SHORTED to Ground or B+
0	1	7	461	Cyl 1: Cylinder Contribution Test Failed
0	2	7	462	Cyl 2: Cylinder Contribution Test Failed
0	3	7	463	Cyl 3: Cylinder Contribution Test Failed
0	4	7	464	Cyl 4: Cylinder Contribution Test Failed
0	5	7	465	Cyl 5: Cylinder Contribution Test Failed
0	6	7	466	Cyl 6: Cylinder Contribution Test Failed
0	7	7	467	Cyl 7: Cylinder Contribution Test Failed
0	8	7	468	Cyl 8: Cylinder Contribution Test Failed
0	151	5	513	Low Side to Bank 1 OPEN
0	152	5	514	Low Side to Bank 2 OPEN
0	151	6	515	Bank 1 Low Side SHORTED to Ground or B+
0	152	6	521	Bank 2 Low Side SHORTED to Ground or B+
0	254	6	525	Injector Driver Circuit Fault *M*
0	21	7	612	Incorrect EECM Installed for CAMP (Timing) Wheel *M*
0	252	13	614	EFRC/EECM Configuration Mismatch
0	253	1	621	Manufacturing Defaults were Selected
0	253	0	622	Field Defaults were Selected
0	253	13	623	Invalid Engine Family Rating Code
0	240	14	624	Field Defaults Active
0	254	8	626	Unexpected Reset Fault *M*
0	240	2	631	Read Only Memory Fault
0	254	12	632	RAM/CPU Self Test Fault
0	240	13	655	Programmable Parameter List Level Incompatible
0	240	11	661	RAM Programmable Parameter List Corrupt
0	253	14	664	Calibration Level Incompatible
0	252	14	665	Programmable Parameter Memory Content Corrupt

APPENDIX D — ENGINE SPEED CONTROL PARTS

APPENDIX D1 — ENGINE SPEED CONTROL RELATED KITS AND PARTS

Appendix D1 provides part information that is useful for building remote engine speed control applications. The following kits and individual parts are available from International[®] and its dealers. Consult Parts Information Letter 94-08-04 or your International parts catalog for more information.

Part Number	Description
2016250C91	Floor-mounted Accelerator Pedal assembly with integrated pedal sensor and jumper harness.
2016247C92	Suspended accelerator pedal assembly with integrated pedal sensor. Does not include jumper harness.
1698044C1	Jumper harness for the integrated pedal sensor.
1695251C91	Integrated Pedal Sensor with sensor jumper harness. Requires user-supplied method for mechanical actuation of the sensor with a spring return.
2037274C1	Sealed Toggle Switch (for ON / OFF switch)
2037275C1	Sealed Momentary Switch (for SET / RESUME) switch
879630R1	Terminals for switch connections — Packard 56 series (quantity 8)
2644005R1	Heat shrink tubing 9 mm ID by 25 mm long (quantity 8)
2037311C1	Hand-operated Speed Control
587570C91	3-way connector body for Hand-operated Speed Control
587577C1	Terminals for 3-way connector body
1652325C1	Terminal seals for 3-way connector body

Integrated Pedal Sensors provided by 2016250C91, 2016247C92 and 1696727C91 can be used to build remote engine speed controls. Any engine speed from low idle to a programmed maximum engine speed can be selected with such controls. The accelerator pedals provide for foot-operated engine speed controls. Controls incorporating the integrated sensor 1696727C91 can be designed. Such controls must provide mechanical actuation for the remote pedal sensor. Refer to Section 4 for more information on the application of integrated pedal sensors for engine speed control. 1698044C1 provides an interface harness for suspended accelerator pedals (part number 2016247C92). The floor-mounted accelerator pedal and Integrated Pedal Sensor kit include this harness.

2016250C91	Floor-mounted Accelerator Pedal assembly with integrated pedal sensor and jumper harness.
2016247C92	Suspended accelerator pedal assembly with integrated pedal sensor.
1695251C91	Integrated Pedal Sensor with sensor jumper harness. The sensor requires a user-supplied method for mechanical actuation with a spring return.
1698044C1	Jumper harness for the integrated pedal sensor.

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Pedal Sensor Jumper Harness Mating Connector and Terminals

One end of the jumper harness 1698044C1 plugs directly into the integrated pedal sensor. The mating connector and terminals for the other end are shown below.

587574C91	Jumper harness mating connector with seal and integral lock (6-way Packard Weather Pack)
587575C1	Push–Pull terminals for mating connector
589391C1	Wire seals — crimp to wire insulation.

Integrated Pedal Sensor Mating Connector and Terminals

The mating connector and terminals for the integrated pedal sensor is shown below. The connector seals and terminals work best with 16 or 18 gauge (AWG) terminals using GXL insulation. This connector is provided on the jumper harness, 1698044C1.

1687790C1	Integrated pedal sensor mating connector with seals (6-way Packard Metri-Pack).

1673745C1 Pull to seat terminals for mating connector.

Engine Speed Control Switches provided in the Cab

2004675C1	Cab ON/OFF switch with a THROTTLE legend.
2004674C1	Cab ON/OFF switch with a CRUISE/THROTTLE legend
2004676C1	Cab SET/COAST and RESUME/ACCEL switch for both engine speed control and cruise control applications

In addition to the ON/OFF and SET/RESUME switches, a clutch switch must be installed for a manual transmission and the brake switches must be connected to the brake switch relay. The clutch switch part number is 1622366C91. Use part number 2012557C1 for the brake switch relay. Refer to the electrical circuit diagrams for circuit information.

1622366C91 Cab clutch switch for vehicles equipped with manual transmissions

2012557C1 Cab brake switch relay for electronic engines with cruise or engine speed controls and International[®] electronic engines.

Terminal Crimp and Connector Repair Tools

Terminals must receive adequate crimps onto the wire to make good electrical contact and prevent wire from wire pulling out. Connectors and terminals require crimping tools to attach terminals and removal tools to remove the terminal from the connector cavity. Common crimp and terminal removal tools are shown below for the connectors discussed in this document.

ZTSE4180	Automatic Wire Strippers for 8 to 22 AWG wires
ZTSE4176	Crimp tool for Packard Weather Pack contacts and seals. Crimps the wire/cavity seal and the core at the same time.
ZTSE4181	Packard terminal crimp tool for 10 to 18 gauge wire. Crimps core wing and insulation wings separately.
ZTSE4175	Terminal removal tool for Packard Weather Pack connectors
ZTSE4283	Terminal removal tool for Packard Metri-Pack connectors

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APPENDIX D2 — DEUTSCH DT SERIES CONNECTORS AND TERMINALS

# of Cavities	Туре	International [®] No.	Deutsch No.	Color
2	Male	1684261C1	D-DT06-25	Black
	Body Lock	1684263C1	D-WS2	
6	Male	2005240C1	D-DT06-6S	Grey
	Body Lock	2005242C1	D-W6S	
12	Male	1689500C1	D-DT06-12SB	Black
	Body Lock	1661376C1	D-W12S	

Female Terminals				
Wire Size International No. Packard No.				
16, 18	1680205C1	D-1062-16-0122		

# of Cavities	Туре	International No.	Deutsch No.	Color
2	Female	1684260C1	D-DT04-2P	Black
	Body Lock	1684262C1	D-WP2	
6	Female	2005241C1	D-DT04-6P	Grey
	Body Lock	2005243C1	D-W6P	
12	Female	1689499C1	D-DT04-12PB	Black
	Body Lock	1689501C1	D-W12P	

Male Terminals				
Wire Size International No. Packard No.				
16, 18	1680206C1	D-1060-16-0122		

Cable Seals				
Wire Size International No. Packard No.				
16, 18	0453133C1	D-114017		

APPENDIX D3 — METRI-PAK (PACKARD) 280 SERIES CONNECTORS AND TERMINALS

# of Cavities	Туре	International [®] No.	Deutsch No.	Color
1	Male	1664531C1	12065172	Black
	Body Lock	1675053C1	12065249	
2	Male	1671610C1	15300027	Black
	Body Lock	1671608C1	15300014	
5	Male	1661375C2	12084891	Black
	Body Lock	1661376C1	15300017	

Female Terminals				
Wire Size International No. Packard No.				
16, 18	2033819C1	12077411		

# of Cavities	Туре	International No.	Deutsch No.	Color
1	Female	1669834C1	12065171	Black
	Body Lock	1675053C1	12065249	
2	Female	1671611C1	15300002	Black
	Body Lock	1671608C1	15300014	
5	Female	1677851C1	12085036	Black
	Body Lock	1677914C1	12084673	

Male Terminals				
Wire Size International No. Packard No.				
16, 18, 20	2033911C1	12048159		

Cable Seals					
Wire Size International Packard No. Color No.					
14P, 16X	0589391C1	12010293	Grey		
16P, 18P, 20	1652325C1	12015323	Lt. Green		

Co	Connector Plugs (for Empty Cavities)				
Wire Size	International [®] No.	Packard No.	Color		
All	0587579C1	12010300	Green		

Nomenclature for wire size:

P = GXL X = SXL

Component

APPENDIX F – PARAMETER FORM

PARAMETERS	NIER	NATIO	NAL ELEÇTRÜNIÇ	ENGIN
PARAMETER	UNITS	DEFAUL	T RANGE	VALUE
INTERNATIONAL ELECTRONIC ENGI	VE PARA	AMETERS		
Place the customer's selections in the right-most column. Default values will sufornatically be used for black items. Model standards pegas and engine sales codes describe the included features. [This form is S pages long.]				
YOUR PASSWORD for field programm	ning cha	nnes		
protects selected values from unauthorized changes		ngeo		
CUSTOMER PASSWORD	N/A	0000		
Numeric passwords are suggested. Passwords must at least 4 characters long up to 8 characters may be provided. A password should be provided if luture changes to the parameter values might be desired. If no password is provided, the default value will permit anyone to change persmeter values with the service tool after vehicle manufacture. CAUTION - Do not lose or longet YOUR password.	4 be 1			
ROAD SPEED GOVERNOR SETTING Governors are provided by codos 12UGM or 12VW	4.			
VEHICLE SPEED LIMIT timits vehicle speed attained using engine powor. The default velue is 55 MPH for bus models (with code 12VWH) and 62 for all other models.	MPH	62	30 - GEARED SPEED	
CRUISE CONTROL PARAMETERS Cruise Control Is provided with code 12VVN.				
MIN ORUISE CONTROL SPEED Cruise Control works only above this vehicle speed.	MPH	95	30 - 100	
MAX CRUISE CONTROL SPEED Cruise Control works only below this vehicle speed.	мрн	62	MIN CRUISE CONTROL SPEED - VEHICLE SPEED LIMIT	
ENGINE - VEHICLE RETARDER				
use with engine or transmission-mounted retardors,				
RETARDER - SERVICE BRAKE INTERFACE Select 2 aro (Off) when no reterder will be used, Select 3 (TRANDRV) whenever a transmission or driveline-mounted retarder will be used. When cruise control is on, the retarder is turned off until the service brakes are pressed. Select 1 (LATCHED) for the retarder to stay on when the service brake is released. Select 2 (COAST) to burn the retarder off when the brake is released. (See the engineering notes for more information.)	N/A	0 - OPF	0 - OFF 1 - LATCHED 2 - COAST 3 - TRAN/DRV	
To ensure proper programming of your customer's en Parameters Form with your truck order. Careful parameters a vehicle that meets and fulfills your customer will result in 'Default Value' programming which may your customor's vohicte locally. Chassis specific info obtained automatically from the truck order. A printor	rgine, pleas neter select 's expectati not be idea nmation, sur ut of all prog	e review, con lice, based or lons. Falluro l for your unk cb as transmi grammable pa	opiote, and submit this Customer S 1 your unique vehicle drivetrath con 10 submit the Customer Specified F aue specification and may require n selor ratios, rear the size, and roar anameters will be included in every f	pecified nponents will apargya.mming axio ratio, an vohicio.

Component

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ARAMETERS	INTERNATIONAL	ELECTRONIC ENGI
ENGIN	IEERING NOTES AND COMM	ENTS
SET ENGINE SPEED (speed 2)		
SET Engine Speed defines the desired an use this feature. Preset engine speed contri	gine speed for Preset Engine Speed Cont of nurst be ordered using code 12VVS.	rol, when the 'SET' switch is pressed. T
DISABLE CAB INTERFACE FOR	3 PTO	
Disable Cab Interface specifies whether the stationary PTO operations. (See code 12V) to avoid uninternional disturbances of engin Interface should not be set to 1, when code	e in-Cab socielerator pedia, brake padal, s VW, Provision for Remote PTO.) When se le speed control from personnel entering o 12VVU, Mobile PTO Control Is ordered fo	and clutch pedal shall be ignored during at to 1, Disable Cab Interface can be us or exiting the cab, Note: Disable Cab or the vehicle.
REMOTE THROTTLE FOR PTO	CONTROL	
Romote Throttle for PTO Control determine performance. Romote Pedal for PTO Com ordered for the vehicle. The actual remote	es whether a remote throttle pedal (potem rol may be set to 1, only if code 12VVW P controls are not included in code 12VVW.	tiometer) may be used to cantrol engine TO Control, Remote (Provision far.) is
ENGINE RESPONSE RATE FOR	1 PTO	
Engine Response Rate controls the engine speed command input such as the 'RESUM speed control. This value may be set to be Control for may be ordered using codes 12 ordered using code 12VVW.	a acceleration rate when an Increase In an AE' function of variable engine speed cont at suit the equipment being operated by t VVS, 12VVT, 12VVU or 12UGM. Access	ngine speed is demanded by an oxyloo rol or the 'SET' switch of preset engine he Power Take Off unit. Engine Speed to remote control features may be
MAX ROAD SPEED FOR MOBIL	E CONTROL	
Mobile Engine Speed Control only operate reduced to limit the use of mobile angles and only when code 12/V/U. Mobile Engine Sp	is below Maximum Road Spood for Mobile beed control to slower vehicle speeds. Ma and Control is ordered for the vehicle.	e Control. The default value may be aximum Road Speed in PTO is effective
only millioned is a do, moste crigina opi	een Computs Gloered for Ing Advicio.	
To ensure proper programming of your cust Parameters Form with your truck order. Car ensure a vehicle that meets and futilits your will result in "Default Value" programming w your customer's vehicle locally. Chessis ap obtained automatically from the truck order.	lorner's engine, please roview, complete, a reful parameter selection, based on your un customer's expectations. Failure to subm rhich may not be ideal for your unique spe sectile information, such as transmission ra excite information, such as transmission ra	and submit this Customer Specified intere vehicle drivetrain components with nit the Customer Specified Parameter P collection and may require reprogrammi atios, rear the size, and rear axis ratio, a ars will be included in every vehicle.

Component

PARAMETERS	INTER	NATIONA	L ELECTRONIC	C ENGIN
PARAMETER	UNITS	DEFAULT	RANGE	VALU
ENGINE SPEED CONTROL for PTO-0, ENGINE SPEED CONTROL Parameters need to be only when codes 12UGN, 12VVS, 12VVT, 12VVU o 12VVW are ordered.	perated E o providod or	Equipment		
MAX PTO ENGINE SPEED Finits engine speed during variable speed control use. Variable engine speed control may be ordered using codes 12VVT, 12VVU, 12VVW, or 12UGN. T engine speed demanded by the remote throttle ped is also limited by Max Engine Speed. The default value is Governed [Engine] Speed.	RPM 5 hə al	··· CALC ···	LOW IDLE • GOVERNED SPEED	
RESUME ENGINE SPEED (speed 1) Is the desired engine speed when the 'RESUME' switch is pressed to begin Preset Speed Control. Preset Control may be ordered using code 12VVS.	8PM	1200	Low Idle - Governed Speed	
SET ENGINE SPEED (speed 2) Is the desired engine speed when the 'SET switch Is precised to begin preset engine speed control. Preset control may be ordered using code 12VVS.	8PM	1000	LOW IDLE - GOVERNED SPEED	
DISABLE CAB INTERFACE FOR PTO Set to 1 only when the in-cab controls for the accelerator, brake and clutch padals must be ignored during use of remote engine speed controls See code 12VVW for use of remote engine speed controls. Set to 0 (the default) when code 12VVU (Mobile PTO) is ordered.	N/A	0 · NO	0 - NO 1 - YES	
REMOTE THROTTLE FOR PTO CONTROL specifies whether a remote throttle pedal (or potentiometer) will be used to control engine performance. Set to 1 only if code 12VVW is ordered.	N/A	0·1/0	0 • NO 1 • YES	
ENGINE RESPONSE RATE FOR PTO controls angine acceleration whon angine speed control demands an increase in engine speed.	APM/SEC	250	1 • 1500	
MAX ROAD SPEED FOR MOBILE CONTROL limits the use of Mobile Engine Speed Control to vehicle speeds below the value selected. The limit is effective only when code 12VVU is ordered to select engine speed control for a moving vehicle.	мрн	20	2 • 20	
To ensure proper programming of your customor's o Parameters Form with your truck order. Careful para ensure a vehicle that moots and fulfals your customa will result in "Default Value" programming which ma your customer's vehicle locally. Chassis specific ind chicked and entertainly the test of soft	prograo, pleas amotor solect or's expectal y not be idea ermetion, suc	o review, completi ion, based on you ons. Failure to su i tor your unique a ch as transmission	e, and submit this Customer r unique vehicle drivetrain c bmit the Customer Specifier pecification and may require ratios, rear the sizo, and re	: Specified oniponents wi d Parameter F e reprogrammi ear axio ratio, a

Component

	INITED		ELECTRON	
AHAME1EKS			ELECTRON	
PARAMETER	UNITS	DEFAULT	RANGE	VALU
IDLE SHUTDOWN and SERVICE INTE Engine operation and maintenance can be enhance by using the Idle Shutdown can save fuel costs incurrod from excessive operation of the engine at Idle speed. Service faterval indicates when engine oil changes are due. Ptease refer to the Engineering Notes and Comments section for a full description of these features and Engine Fan Control for On/Off style fan drives.	FRVAL 9d			
IDLE SHUTDOWN MODE Vehicles using engine speed control to operate equipment should select only values 0 or 1. Modes 2 and 3 can stop the engine during use of a speed control feature (12UGN, 12VVS, 12VVT 12VVU). Select 0 to comply with NFPA 1901.	N/A	0 · OFF	0 · OFF 1 · PTO_RUNS 2 · STOP_PTO 3 · TAMPRPRF	
SERVICE INTERVAL indicates the expiration of the recommended oil	WA	0 - OFF	0 - OFF	
l6 – 12,000 miles, 450 hours, or 1500 U.S. ga	llons		1.04	

Component

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	Onyrotatie;	ikame
PARAMETERS	INTERNATIONAL	LELECTRONIC ENGIN
ENGIN	EERING NOTES AND COMM	IENTS
IDLE SHUTDOWN MODE		
Idle Shutdown limits operation of the engin alarm will sound for 30 seconds before the operation, EXCEPT when Engine Speed C limit idle operation oven whon Engine Spee Ignore Accolorator Pedat or Brake Switch c	e at tow icts speeds to 5 minutes. The 6 engine shutdown. Select 0 to turn tole 5 ordrol foaturos aro in uso (facluding 120 to Control foaturos aro in uso (12VVS, 1) ircuit faults in addition to Engine Speed 4	DIL/WATER lamp will Rash, and an audibl Shutdown OFF. Select 1 to limit engine id GM, Electronic Hand Throttle). Select 2 to 2VVT, 12VVW and 12UGM). Select 3 to Control leatures.
The '5 minute' time period can be changed mininum time limit for kile Shutdown is 5 n weather conditions, tdle Shutdown is cîsab Fahrenheit. These temperatures can be ad	d with the service tool. This value is prot nimites. To allow continuous use of the v led for temperatures below 60 degrees (tjusted using the service tool.	ected with the customer password. The shicle's climate control system in extreme 16 C) or above 110 degrees (44 C)
The '5 minute' time period is reset when the equipped with Cruise Control (12VVN) or a or the clutch pedal. Cruise control is recom	e engine is accelerated above the idle s ny Engine Speed Control teature may ra mended to provide the brake switch rese	paed using the accelerator pedal. Vehicle set file timer by depressing the brake peo it featuro.
tdie shutdown will net occur; 1) when a ror engine temperature is cold (polow approxin provont the engine shutdowe. Engines the	note angine speed control festure is in u nately 140 degrees), or 3) when the vahi t de not shutdown should be checked for	se, (mode 1 only) 2) when the internal cle is moving. Sensor fault conditions can r faults.
When mode 2 or mode 3 is solucted, the o engine. Engines that are operating under h down the angine, oven if engine speed con will prevent idle shutdown from occuring. N 1901.	ngino's operating conditions are assess ligh load factors will not be shutdown. C, irol is operating. When mode 1 is select laviatar recommends that mode 0 be sele	ed to dotormine whother to sawl down the AUTION - Mode 2 and mode 3 will shut od, any active engine speed control featur acted to insure compliance with NFPA
Note: Cold Ambient Protection is defeated described below.	by Idle Shutdown. When mode 0 is sale	cted, Cold Ambient Protection operates a
COLD AMBIENT PROTECTION	1	
Balow freezing temperatures, Cold Amble degrees F (65 deg. C) for 486E and 530E t the engine. The idle speed is slowly ramp been Idling for S minutes. Many of several is depressed, b) the dutch pedal is depres selector, e) the PTO ON switch is pressed, information.	ent Protection (CAP) seeks to maintain e angines or above 156 degrees for T4446 ad up until the desired angine coolant iar actions will return the engine speed to its sed, c) the accelerator is degressed, d) r or t) a sensor or brake switch fault is de	ngine coolant temporature above 149 i engines by advancing the idle speed of nperature is reached, after the engine has a normal low idle value: a) the brake pedal everse or drive is setected with the shift tected. See TSI-96-12-30 for more
SERVICE INTERVAL		
The service interval reminder turns on the upon key on, after any one of the intervals values. Once turned on, the the Change C does not affect the operation of the engine	yellow Change Oll Lamp, provided in the for millos, engine hours, or gallons of fue XI tamp will flash for 30 seconds and turn	e instrument cluster. The lamp is lumed of I used exceeds a set of predetermined a itself off. Expiration of the service interva
The service interval factory settings are hours or 1000 U.S. gallons of fuel. The with the customer password. The service	e: I6: 12,000 miles, 450 hours, or 1500 factory settings can be changed using ce interval can be reset with the servic) gallons of fuel; V-8: 10,000 miles, 350 g the service tool. They are protected ce tool. It can also be reset manually,
using the engine diagnostics switch. ENGINE FAN CONTROL		
Electronic fan control is provided automat temperatures are matched to the engine's it is needed. The engine ECM also sense with air conditioning.	ticelly with advertised On/Off style fan dr coolant pump thermostet opening tempe s air conditioning demand to twrn the eng	ives. The fan tum on and tum off instrie to ensure the fan is used only when ine fan an vehicles thet are also equipped
To ensure proper programming of your cus	lomer's engine, please review, complete	, and submit this Customer Specified
Parameters Form with your truck order. Can ensure a vehicle that meets and tolfits your will result in "Detault Value" programming w your customer's vehicle locally. Chassis sp obtained automatically from the truck order.	retul parameter selection, based on your costomer's expectations. Facure to sub which may not be ideal for your unique sp pocific information, such as transmission . A printout of all programmable parame	unique Vehice drivetrain components will wit the Customer Specified Parameter Fo lecification and may require reprogrammin ratios, rear the size, and rear axte ratio, a tors will be included in every vehicle.
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USTOMER SPECIFIED		
AHAMEIEHS		
E	ENGINEERING NOTES AND COMME	NTS
CUSTOMER PASSWORD		
The Customer Password protects t changes to the factory provided set change the Customer password or ONLY when NO changes to ANY p	the parameter settings from unauthorized changes. tilngs are desired. The Electronic Service Tool for h the value of any other parameters secured by the C larameter values are desired after vehicle manufact	A password should be provided when stemational engines may be used to sustomer Password. Order code 12VV ure.
VEHICLE SPEED LIMIT		
Vehicle Speed Limit is the maximu must be less then the gear bound a Engines have a standard governor changed by providing a vasue for Ve	am road speed that the vehicle will be allowed to atta speed of the vehicle. Effective July 19, 1994, bus m (code 12VWH) that provides a 55 MPH default setti efficie Speed Limit.	ain under engine power. The limit velue odele with Electronic International ing. The default governor limit can be
MIN CRUISE CONTROL S	PEED	
Cruise control will not operate at vi control use to higher vehicle speed	whicle speeds less than Min Cruise Control Speed. Is, Order code 12VVN to get Cruise Control on your	Increase the default value to limit cruis vehicle.
MAX CRUISE CONTROL S	SPEED	
Cruise control will not operate whe increased to use cruise control at h	an the vehicle speed is greater than Max Cruise Cor righer vehicle speeds. The value selected must be l	ntrol Speed. The default value may be less then Vehicle Speed Limit.
RETARDER - SERVICE BI	RAKE INTERFACE	
Aotardor - Service Brake Interface non-zero value when a retarder (su selected for an engine-mounted ret	e selects how the engine should control the retarder uch as an engine exhaust brake) is to be installed or tarder TRAN/DRV should be selected for a driveli	during service brake use. Choose a n the vohicle. Latohod or Ceast must b no or transmission-mounted rotardor.
When cruise control switch is in the engine. When the cruise control su	e off position, the retarder will be enabled wheneve witch has been turned on, the following selections w	r there is no fuel demanded of the III govern the use of the retarder:
1 (LATCHED): When the service b released until either the clutch or a	trakes are applied, the reterder is enabled and ram: coelerator padala are depressed. (The resume swite	ains enabled after the service brakes ar ch may also be pressed.)
2 (COAST): The retarder is enable retarder is enable	ad only while the service brakes are depressed. Wh	en the service brakes are released the
3 (TRAWORV): This mode should well operate as described for the lat	l be selected when a driveline or transmission moun Iched mode,	ntéd retardér is to be uséd. This módé
A dash-mounted switch is provider	d to onable and disable the retarder. It also can be	used to turn the retardor off.
Engino-mounted retarders will also turned off to avoid engine damage TRAM/DRV mode is selected, this	o be enabled whenever engine speed exceeds high before the origine speed operating limit for retardin restriction is ignored.	Idia. Engine-mounted rotardors will be g devices is exceeded. When the
MAX PTO ENGINE SPEEL	0	
Maximum Engine Speed limits en Variable Engine Speed control are variable engine speed control.	gine speed only during the use of Engine Speed Co I limited by Maximum Engine Speed, Codes 12VVT,	ntrol. Both the ramote throttle and 12VVU, 12VVW, and 12UGN include
RESUME ENGINE SPEED	(speed 1)	
Resume Engine Speed is the desi To use this feature, Preset ongine	ired engine speed for Preset Engine Speed Control speed control nust be ordered using code 12VVS.	, when the 'RESUME' switch is pressed
To ensure proper programming of y Parameters Form with your truck or ensure a vahicle that meets and full will result in "Default Value" program your customar's vehicle locally. Ch obtained automatically form the local	rous customer's engine, please review, complete, au rder. Careful parameter selection, based on your un fills your customer's expectations. Failure to submit numing which may not be ideal for your unique spec lassis specific information, such as transmission reti service - à printer of all concernments concernio	nd submit this Customer Specified ique vehicle drivetrain components will the Customor Spodiled Parameter So illoation and may require reprogrammir ics, rear the size, and rear axie ratio, a will be inducted to every vehicle.
DEM Advers		Di Aco Destal M-

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CT-471 October, 2002

NOTES: