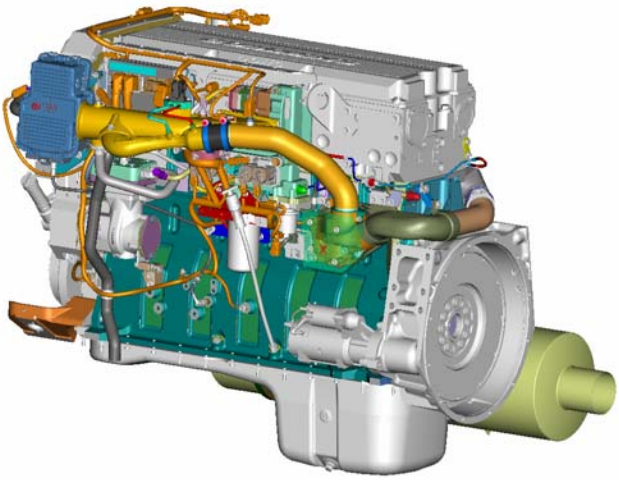
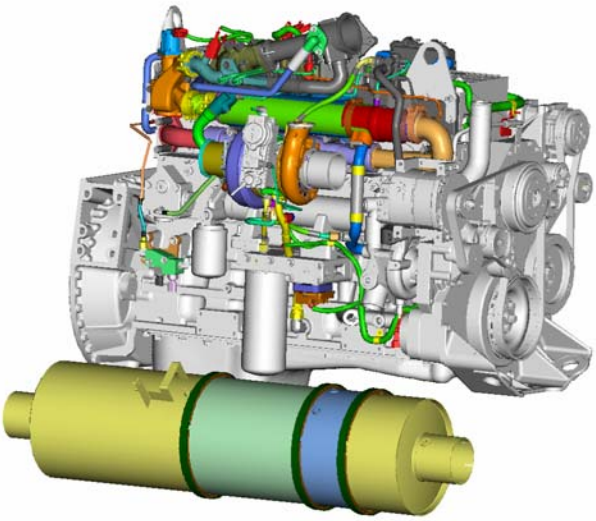
2007 COMMON APPROACH TO CONTROL SYSTEM DIAGNOSTICS

ISX '07





ISM '07

Ryan E. Edgecomb
HD Systems Integration
Phase 1.x.6.07 ECM Software
Phase REHV5120 ERPT Software

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HD 2007 COMMON APPROACH TO CONTROL SYSTEM DIAGNOSTICS

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Please Forward Suggestions For Improvement To:
Ryan E. Edgecomb

Where To Find This Document:
CTC LAN: H:\hvyduty\HD_System_Integration\Common Approach To Diagnostics\2007 - CM870 and CM875
Internet: TBD

Overview: This document is intended to support on-site troubleshooting and diagnostics of customer complaints for **2007 Heavy-Duty engine platforms**. This document can be used along with NGET or Calterm II (ERPT) or CalTerm III (ECM) for investigation, troubleshooting, and diagnosis of engine performance and electronic controls related issues.

Purpose: The information contained in this document is based on information from Simulink Diagrams and Code Files. The 2007 HD control system includes new control strategies for Air Handling and emissions to meet the 2007 requirements. Information on troubleshooting and diagnostics for these systems is included here. My intent for this document is to provide information and support to those in the field as well as those based in Cummins engineering facilities. With tools like NGET and Calterm (II and III), documentation of data within this document will provide more detailed definition of engine conditions associated with specific issues. This information, along with driver comments and concerns, will help in achieving a better responsiveness to customer needs and allow us to develop products which meet or exceed customer expectations.

Credit should be given to Wayne Eberhard, Mark Ulrich, Richard Croft, and Brian Ouellette for their work in creating and maintaining this document in the past.

Ryan E. Edgecomb

Notes and Disclaimers: Calterm II and NGET can only be used to communicate with the ERPT which is GTIS 3.8. Calterm III must be used to communicate with the engine ECM which is GTIS 4.5. Calterm III can communicate with the ERPT, however, it cannot download ERPT calibrations. The tools of choice for the ERPT are NGET and Calterm II. To download a calibration into the ERPT, the user must be on the J2 (OEM) connector J1939 connector. This is the right-most 50-pin connector on the module. When using Calterm III to connect to the engine ECM simultaneously with the aftertreatment ERPT via the OEM supplied 9-pin connector, select Manual and type the source address 00 for the ECM *.ecfg file and source address 01 for the ERPT *.e2m file. This will allow you to efficiently communicate with both modules.

DOCUMENT CONTENTS:

- **Data Logging Using Available Engineering Tools (Calterm (II and III) and NGET)**
- **Troubleshooting And Diagnostics Parameter Guide**
- **Engineering States**
- **Fault Code List**
- **Control System Diagrams**
- **Customer / Driver Survey**

THIS DOCUMENT SUPPORTS THE FOLLOWING SOFTWARE VERSION:

HD07	**ISX07**	**PHASE 1.0.6.12 SOFTWARE**	**CM870**
HD07	**ISM07**	**PHASE 1.1.6.12 SOFTWARE**	**CM875**
HD07	**ISX07**	**PHASE REHV5214 SOFTWARE**	**CM850**
HD07	**ISM07**	**PHASE REHV5213 SOFTWARE**	**CM850**

Ryan E. Edgecomb
HD Systems Integration
(812) 377-3145 / pgr 812-377-8800 x2755
ryan.e.edgecomb @cummins.com

Table of Contents:

DOCUMENT CONTENTS: **2**

Table of Contents: **3**

DATALOGGING USING AVAILABLE ENGINEERING TOOLS (CALTERM III) **7**
- EXTERNAL/MONITOR DATA LOGGING (CALTERM III) 7
- INSTRUCTION FOR USING THE EXTERNAL (MONITOR) DATA LOGGER 7
- INTERNAL DATA LOGGING (CALTERM III) 8
- ECM BUFFER SIZE (Information for IDL only) 8

HD 2007 CONTROL SYSTEM **9**

Critical Parameters List: **9**
1. Mission Data Critical Parameters List 9
   - Standard Service Investigation List: 9
   - Standard ATI Investigation List: 9

Conversions: **10**
2. Deg_F to Deg_C 10
3. InHg to kPa 10
4. MPH to Km/Hr 10
5. Psi to bar 10
6. Psi to kPa 10
7. Voltage to Raw Counts 10

Engine Sensors and Actuators: **11**
8. Ambient Air Pressure / Compressor Inlet Pressure 11
   - Compressor Inlet Pressure: 11
   - Diagnostics: 11
   - Override: 11
9. Charge Pressure / Boost Pressure 11
   - Gage Pressure: 11
   - Estimate: 11
   - Diaganostics: 11
   - Override: 11
10. Charge Temperature / Intake Manifold Temperature 11
    - Diagnostics: 11
    - Estimate: 11
    - Override: 11
11. Compressor Inlet Temperature / Ambient Air Temperature 12
    - Ambient Air Temperature: 12
    - Diagnostics: 12
    - Override: 12
12. Coolant Level 12
    - Diagnostics: 12
    - Override: 12
13. Coolant Temperature 12
    - Override: 12
    - Diagnostics: 12
14. EGR Delta Pressure 12
    - Autozero: 12
    - In-Range: 12
    - Diganostics: 12
    - Override: 12
15. EGR Orifice Temperature 13
    - Override: 13
    - Diagnostics: 13
16. EGR Valve Actuator 13
    - Override: 13
    - Diagnostics: 13
17. Exhaust Pressure 13
    - In-Range: 13
    - Estimate: 13
    - Diagnostics: 13

Override: 13
18. Oil Pressure....13
Override: 13
Diagnostics: 13
19. Oil Temperature 13
Override: 13
Diagnostics: 13
20. Turbocharger Speed 14
Diagnostics: 14
Estimate: 14
Override: 14
21. Turbocharger VG Actuator....14
Diagnostics: 14
Override: 14

HPI-TP Fuel Systems Sensors:....15
22. EPS (Engine Position / Engine Speed) Sensors....15
EPS Main Sensor (Crank): 15
EPS Backup Sensor (Cam): 15
23. Fuel Rail Pressure Sensor....15
Diagnostics: 15
24. Fuel Temperature Sensor....15

Aftertreatment Sensors: 16
25. DOC Inlet Thermistor....16
26. DOC Outlet Thermistor....16
27. RPF Outlet Thermistor....16
28. RPF Delta P Sensor....16
29. Doser Fuel Pressure....16

Parameter Estimates and Predictions: 17
30. Ambient Parameters Estimate....17
Ambient Air Temperature Estimate:....17
Altitude Estimate:....17
Humidity Estimation (engineering use only): 17
31. Charge Flow Estimate 17
Estimate: 17
Volumetric Efficiency: 17
Speed Density Equation:....17
32. Charge Pressure Estimate 18
Estimate With Turbo Speed....18
Estimate Without Turbo Speed....18
Status with Turbo Speed: 18
Status without Turbo Speed:....18
33. Charge Temperature Estimate....18
34. Compressor Inlet Density Estimate 18
Estimate: 18
Source:....18
35. Compressor Inlet Pressure Estimate....18
Compressor Inlet Pressure Estimate: 18
36. Compressor Outlet Temperature Estimate 19
COT Estimate:....19
COT Estimate Source:....19
37. EGR Fraction Estimate....19
EGR Fraction Estimate: 19
Downstream EGR Flow Model: 19
Upstream EGR Flow Model:....19
38. EGR Valve and Engine Delta Pressure Estimates....19
EGR Valve and Engine Delta Pressure Estimate: 19
EGR Valve and Engine Delta Pressure Estimate Source: 19
39. Exhaust Flow Estimation 19
40. Exhaust Pressure Estimate 20
Exhaust Pressure Estimate:....20
Exhaust Pressure Estimate Source:....20
41. Exhaust Temperature Estimate....20
Exhaust Temperature Estimate: 20
42. Fresh Air Flow Estimation....20

43. IMT Prediction 20
44. IMT Lead-Lag Compensation 20
45. Saturation Temperature Estimate 21
Saturation Temperatures Estimate: 21
Charge H2O Mole Fraction: 21
Inlet Mole Fraction of Water: 21
Exhaust H2O Mole Fraction: 21
Saturation Temperature Source 21
46. Turbo Speed Estimation 21
Turbo Speed Estimate Logic: 21
Turbo Speed Estimate Status: 21

Emission Features: 22
47. Charge Limit Management (CHL) 22
[CHL] EGR Fraction Limit Selection: 22
[CHL] Mass Charge Flow Limit Selection: 22
48. Charge System Errors (CSE) 23

Performance Diagnostics: 24
49. Aftertreatment Doser Diagnostics 24
50. Aftertreatment Regeneration / Triggers 24
51. Aftertreatment Soot Load 24
Charge Limit Management (CHL) 25
[CHL] COT Limiter: 25
[CHL] Turbo Speed Limiter: 25
[CHL] EGR Delta Pressure Limiter: 25
[CHL] EGR Off Delta Pressure Limiter: 25
[CHL] Surge Limiter: 26
52. FELIX 26
53. Stationary Regeneration / OSCAR 26
54. User Overrides 27

HPI-TP Fuel System: 29
55. Cylinder Cut-Out Diagnostics (CTS) 29
Fuel Actuator Addition Time-On Trims: 29
Timing Actuator Additional Time-On Trims: 29

CM870 ENGINEERING STATES 30
BINARY DEFINITION: 30
HEXADECIMAL DEFINITION: 30
ACCELERATOR GOVERNOR: 31
ACCELERATOR INTERLOCK: 31
AFTERTREATMENT: 31
CHANGE LOCK: 34
CHARGE FLOW: 34
CRUISE CONTROL: 34
CYLINDER PERFORMANCE: 34
DATALINK: 35
DRIVER REWARD: 35
EGR FRACTION: 35
EGR Valve: 36
EMISSION MANAGER: 36
ENGINE BRAKE: 36
ENGINE OPERATING CONDITION (ALPHA / Chi): 37
ENGINE PROTECTION: 37
ENGINE SOI TIMING COMMAND: 38
ENGINE SPEED PROCESSING (EPS): 38
ENGINE STATES: 38
ENGINE TORQUE / FUEL COMMAND: 40
FAN CONTROL: 42
FAST IDLE WARMUP: 42
GEAR DOWN / OUT OF GEAR PROTECTION: 42
HOT SHUTDOWN: 42
IDLE VALIDATION: 42
POWER TAKE OFF (PTO): 43
SENSOR ERROR INFORMATION (IN-RANGE):: 43
SENSOR SOURCE INFORMATION (A/D SENSORS): 43
SENSOR SOURCE INFORMATION (ESTIMATES AND VIRTUAL): 43

SENSOR STATE INFORMATION (A/D SENSORS): 43
SENSOR STATE INFORMATION (ESTIMATES): 43
SENSOR STATUS INFORMATION (A/D SENSORS):: 44
SENSOR CONFIDENCE INFORMATION (A/D SENSORS):: 44
SETUP FOR DYNO: 44
STATIONARY REGENERATION: 44
TRIP INFORMATION: 45
VEHICLE SPEED SENSOR: 45
VGT: 46
WATER-IN-FUEL (WIF): 47

CM870 and CM875 FAULT CODE LIST 48

Air Handling Control System Overview: 63

AECD and CHI Determination 64
Ambient Operating Conditions – Chi Value Determination – Eagle Red and Black: 64

IMT Based Actions – Eagle Red 65

Coolant Based Actions – Eagle Red 67

Coolant Based Actions – Eagle Black 68

EGR Outlet Temperature Based Actions – Eagle Red 69

EGR Outlet Temperature Based Actions – Eagle Black 70

Stationary Regeneration Procedure 71

CUSTOMER / DRIVER SURVEY 72
Customer Information 72
Typical Driving Techniques 73
Engine Start 73
Engine Idle 74
Engine PTO Operation 74
Clutch Engagement 75
Clutch Engagement (cont.) 76
Cruise Control 77
Driver Input 77
Engine Response 78
Low Speed Maneuvering 78
Engine Brake in Cruise Feature 78
EGR / VGT Control System 79

NOTES 80

DATALOGGING USING AVAILABLE ENGINEERING TOOLS (CALTERM III)

EXTERNAL/MONITOR DATA LOGGING (CALTERM III)

Note: CALTERM II and NGET are only compatible with GTIS 3.8. Therefore, these tools can only be used to communicate with the ERPT module. They cannot be used to communicate with the engine ECM. Calterm II and NGET functionality will not be introduced or discussed here since they are legacy tools.

External (MONITOR) Data Logger Helpful Hints:

When to use:	For data acquisition that does not require high speed collection Collection of Duty Cycle or Vehicle Mission data Macro-view of events or problems Normal event datalogging while monitoring Calterm or NGET monitor screen For capturing Fault Codes as well as data
Advantages of Monitor Data Logger:	Monitor data while logging Time based datalogs beyond a few minutes Able to collect data during extended trips Does not require an unsecured ECM Ability to datalog fault codes
Disadvantages of Monitor Data Logger:	Cannot capture high speed events (requires IDL) Time based data collection only

INSTRUCTION FOR USING THE EXTERNAL (MONITOR) DATA LOGGER

1. Launch Calterm III
2. If Calterm doesn't automatically bring up the Select Module screen, go to File and select Open Module
3. Verify the settings on the Datalink tab are set according to your chosen datalink
4. For one-module engines or if you desire to connect to multiple modules using one ecfg file, select Automatic
5. For multi-module engines, Select Manual and type the ECM Address in the first column followed by the appropriate ECFG or E2M file in the second for each module you will connect to, then click OK
6. Once connected a default Monitor screen will be displayed
7. Either type the parameter names in the monitor screen (use F1 to help search for parameter names) or select a specific screen from the Monitor drop down / Open Screen File.
8. Once the screen is set up appropriately, click on the Start button to begin recording
9. Click on Stop to stop recording and name and save your file

CM870 and CM875 COMMON APPROACH TO CONTROL SYSTEM DIAGNOSTICS

INTERNAL DATA LOGGING (CALTERM III)

Internal Data Logger Helpful Hints:
Note: An Inline IV or greater must be used in conjunction with IDL. Inline II is not sufficient for use with Calterm III and IDL.

When to use IDL:
- For high speed data acquisition or short duration events
- Cranking, stumble, hiccups, idle or PTO quality, transient events
- Snap throttle, quick accel,
- When you need a microscope to view the problem (not a macro-view)
- When you aren't sure when the event will occur (center buffer)
- When you have individual events which allow time to extract the data from ECM

Length of IDL log: Data buffer fills at rate which is function of number of parameters and rate at which data is collected, and also whether the parameter is a byte or a word (2-bytes)

	APPROXIMATE TIME TO FILL BUFFER	
CM875:	2 parameters at 20 msec = 178 secs of data	16 parameters at 20 msec = 30 secs of data
CM870:	2 parameters at 20 msec = 178 secs of data	16 parameters at 20 msec = 30 secs of data

Advantages of IDL :
- Not limited to block transfer capability (sets of 3)
- SPEED!!! 20 msec (CM875/CM870) capability.
- Center buffer or fill buffer or stop buffer modes.
- Calterm is user-friendly, doesn't require knowledge of Calterm scalars.
- Monitor Parameters listed in TROUBLESHOOTING AND DIAGNOSTICS PARAMETER GUIDE section of HD 2007 Common Approach To Diagnostics is equally applicable to IDL as for Calterm external (Monitor) logs.
- Can monitor activities on Monitor screen and activate IDL when necessary
- Can use both Monitor datalogger and IDL simultaneously. You must stop Monitor logger before extracting data from IDL.

Disadvantages of IDL:
- Requires unsecured module: security risks are increased
- Manual processing time is increased for the engineer to extract each set of data
- Requires renaming the file if multiple logs are required
- Larger buffer (CM870) is slower to extract data (approx. 1 minute)
- Very small buffer size limit the practical length of data logs
- Sometimes can lock up during process, may require reboot of Calterm/PC
- Less user-friendly in setup mode than for Calterm monitor

ECM BUFFER SIZE (Information for IDL only)

Buffer size: The internal datalogger buffer is a zone of ECM memory for specific diagnostic needs. The buffer size is different size for each product:

CM870: 32 k bytes
CM875: 32 k bytes
Note: ECM must be unsecured and the tool must have ChangeLock prior to moving to IDL mode

For further help: Calterm III users manual has further information on how to run IDL in addition to other aspects of Calterm III.
The Calterm III manual is online on the Calterm web page at http://etools.ctg.cummins.com/products/caltermiii/7667-UMPM-05-Calterm%20III%20User%20Manual.pdf

HD 2007 CONTROL SYSTEM

Critical Parameters List:

1. Mission Data Critical Parameters List

Standard Service Investigation List:

Engine_Speed	RPM	Vehicle_Speed	km/hr
Accelerator_Pedal_Position	%	Net_Engine_Torque	N_m
FSS_Total_Fueling	MG/STROKE	EGR_Valve_Position	%
Combustion_Control_Path_Owner	---	Alpha	---
Final_Timing	deg_BTDC	TGC_VT_Cmd	%
Final_Timing_State	---	CHL_Derate_Is_Active	---
Boost_Pressure	kPa_G	Filtered_Turbo_Speed	KRPM
Actual_Gear_Ratio	---	PrcntLoadAtCurSpd	%

Standard ATI Investigation List (ERPT):

V_ATP_tr_DOC_In	DEG_K	V_OCL_fg_HC_Cmd	g/s
V_ATP_tr_DOC_Out	DEG_K	V_OCL_fg_HC_LightOff_Limit	g/s
V_SFL_tr_Regen_Trgt	DEG_K	V_AIM_vr_Engine_Speed	RPM
V_ATP_tr_DPF_Out	DEG_K	V_ATP_fg_Turbine_Out	g/s
V_HIM_fl_Inj_Fuel_Actual	CC/MIN	V_SFP_Flow_Rate	ACFM
V_ATP_pr_Inj_Fuel	KPA	V_SFP_pr_Delta	KPA
V_SFP_Soot_Load	g	V_SFP_pr_Delta_Low	KPA
V_SFP_Soot_Load_DP	g	V_SFP_pr_Delta_High	KPA
V_SFP_fv_DPF	acms	H_SFP_DPTrust_Fctr_Adjusted	fn
V_SFP_Unif_Dist_Factor	nu		

Conversions:

2. **Deg_F to Deg_C**
   Deg_C = (Deg_F – 32) * 5/9

3. **InHg to kPa**
   kPa = 3.3863880 * InHg

4. **MPH to Km/Hr**
   Km/Hr = 1.6093440 * MPH

5. **Psi to bar**
   bar = 0.06894757 * Psi

6. **Psi to kPa**
   kPa = 6.8947570 * Psi

7. **Voltage to Raw Counts**
   Raw Counts = (Sensor Signal Volts) / (5.175) * 1023

Engine Sensors and Actuators:

8. Ambient Air Pressure / Compressor Inlet Pressure

(inm_amb_lib, inm_inp_airp_lib)
(inm_inp_airp_lib, csdd_charge_manager, inm_inp_icp_lib, inm_tpe_gage_lib, inm_tpe_imp_lib)

Air_Press	kPa	**Compressor Inlet Pressure:**	
Air_Press_Sensor	kPa	Compressor_Inlet_Press	kPa
Air_Press_Sensor_Volts	V	Compressor_Inlet_Press_Source	---
Air_Press_Source	---	Compressor_Inlet_Press_Status	---
Ambient_Air_Press	kPa	Compressor_Inlet_Pressure_Drop	kPa
Ambient_Air_Press_Source	---		
Ambient_Air_Press_Status	---	**Diagnostics:**	
		C_AMB_AirPressRawLowLimit	---
Override:		C_AMB_AirPressRawHighLimit	---
T_AIP_AMB_User_Override_En	---	Air_Pressure_Keyon_Error	---
AIP_AMB_User_Override_Value	kPa		

9. Charge Pressure / Boost Pressure

(chh_egr_lib, csdd_charge_manager, inm_inp_icp_lib, inm_tpe_imp_lib, inm_tpe_gage_lib)

Charge_Press	kPa	**Gage Pressure:**	
Charge_Press_Sensor_Volts	V	Boost_Pressure	kPa_G
Charge_Press_Source	---	Boost_Pressure_Status	---
Charge_Press_State	HEX	Charge_Press_Gage_Source	---
Charge_Press_Sensor	kPa	Charge_Press_Gage	kPa_G
H_Charge_Press_Raw	Counts		
		Estimate:	
Diaganostics:		Charge_Press_Est_Offset	kPa
C_AIP_ChargePressULim	---	Charge_Press_Est	kPa
C_AIP_ChargePressLLim	---	Charge_Press_EStat	---
Charge_Pressure_Keyon_Error	---	Charge_Press_Est_With_TSS	kPa
		Charge_Press_Est_No_TSS	kPa
Override:			
T_AIP_Charge_Press_User_Ovrd_En	---		
C_AIP_Charge_Press_Ovrd_Value	kPa		

10. Charge Temperature / Intake Manifold Temperature

(csdd_charge_manager, inm_inp_ict_lib, inm_chp_chgflw_lib)

Charge_Tmptr_Sensor_Volts	V	**Diagnostics:**	
TPE_IMT_AP	Deg_C	C_AIP_ChargeTmptrULim	---
Charge_Tmptr_Sensor	Deg_C	C_AIP_ChargeTmptrLLim	---
C_AIP_ChargeTmptrDefault	Deg_C		
Charge_Tmptr_State	HEX	**Estimate:**	
H_Charge_Tmptr_Raw	Counts	Charge_Tmptr_EStat	None
Charge_Tmptr_Source	None	Charge_Tmptr_Est	Deg_C
Charge_Tmptr	Deg_C	T_Charge_Tmptr_Estimate_Enable	None
Intake_Manifold_Temperature	Deg_C		
CHP_Intake_Manifold_Tmptr_K	Deg_K	**Override:**	
		T_AIP_CHT_User_Override_En	---
		C_AIP_CHT_Override_Value	Deg_C

11. Compressor Inlet Temperature / Ambient Air Temperature

(inm_inp_cit_lib, inm_amb_lib)

Compressor_Inlet_Tmptr_Status	---	**Ambient Air Temperature:**	
Compressor_Inlet_Tmptr_Source	---	Ambient_Air_Tmptr_Source	---
Compressor_Inlet_Tmptr_State	HEX	Ambient_Air_Tmptr	Deg_C
Compressor_Inlet_Tmptr_Sensor	Deg_C	C_AMB_Ambient_Air_Tmptr_Default	Deg_C
Compressor_Inlet_Tmptr_Default	Deg_C		
Compressor_Inlet_Tmptr_Raw	Counts	**Diagnostics:**	
Compressor_Inlet_Tmptr	Deg_C	C_AIP_CompInTmptrULim	---
C_AIP_CompInTmptrDefault	Deg_C	C_AIP_CompInTmptrLLim	---
		Override:	
		T_AIP_CompInTmptr_Ovrd_En	---
		C_AIP_CompInTmptr_Ovrd_Val	Deg_C
		T_AMB_Amb_Tmptr_User_Override	---
		AMB_Amb_Tmptr_Override_Value	Deg_C

12. Coolant Level

(csdd_lube_cool)

Coolant_Level_Sensor_Voltage	V	**Diagnostics:**	
C_Coolant_Level_Sensor_Type	---	C_AIP_Clvl_OOR_Lower_Limit	---
Coolant_Level	---	C_AIP_Clvl_OOR_Upper_Limit	---
		Override:	
		T_AIP_Cool_Lev_User_Override_En	---
		AIP_Cool_Lev_Override_Value	---

13. Coolant Temperature

(csdd_lube_coo, csdd_engine_manager)

Coolant_Tmptr_Sensor_Volts	V	**Override:**	
FIW_Lowest_Coolant_Temp	Deg_C	T_AIP_CT_User_Override	---
Coolant_Temperature	Deg_C	AIP_Cool_Tmptr_Override_Value	Deg_C
		Diagnostics:	
		C_AIP_CT_Count_OOR_Low_Limit	---
		C_AIP_CT_Count_OOR_High_Limit	---

14. EGR Delta Pressure

(inm_inp_egrp_lib, csdd_charge_manager)

EGR_Delta_P_Autozero_Offset	kPa	**Autozero:**	
EGR_Delta_Press_Keyon_Error	---	T_EGR_Delta_P_Autozero_Offset	kPa
EGR_DeltaP_Sensor_Volts	V	C_EGR_AZ_Orifice_Tmptr_Thd	Deg_C
EGR_Delta_Press	kPa	C_EGR_AZ_EGR_Flow_Thd	Kg
EGR_Delta_Press_State	HEX	C_EGR_Delta_P_AZ_Tolerance	kPa
H_EGR_Delta_Press_Raw	Counts	C_EGR_AZ_IMT_Thd	Deg_C
EGR_Delta_Press_Sensor	kPa	C_EGR_AZ_Coolant_Tmptr_Thd	Deg_C
EGR_Delta_Press_Default	kPa		
EGR_Delta_Press_AP	kPa	**In-Range:**	
EGR_Delta_Press_Source	---	C_EGR_DP_IR_Open_Eng_Spd_Thd	RPM
EGR_Orifice_Delta_Press	kPa	C_EGR_DP_IR_Closed_Eng_Spd_Thd	RPM
		C_EGR_DP_IR_Open_EGR_Pos_Thd	%
Diganostics:		C_EGR_DP_IR_Open_Eng_Trq_Thd	N_m
C_AIP_EGRDeltaPressULim	Counts	C_EGR_DP_IR_Closed_Eng_Trq_Thd	N_m
C_AIP_EGRDeltaPressLLim	Counts	C_EGR_DP_IR_Open_Thd	kPa
		C_EGR_DP_IR_Open_Eng_DP_Thd	kPa
Override:		C_EGR_DP_IR_Closed_Thd	kPa
T_EGR_Delta_P_AZ_User_Override	---	C_EGR_DP_IR_Closed_EGR_Pos_Thd	%
C_EGR_Delta_P_AZ_Override_Value	kPa		
T_AIP_EGRDeltaPress_Ovrd_En	---		
C_AIP_EGRDeltaPress_Ovrd_Val	kPa		

15. EGR Orifice Temperature

(inm_inp_egrt_lib)

EGR_Orifice_Tmptr_Status	---	**Override:**	
EGR_Orifice_Tmptr	Deg_C	T_AIP_EGROrificeTmptr_Ovrd_En	---
EGR_Orifice_Tmptr_Sensor_Volts	V	C_AIP_EGROrificeTmptr_Ovrd_Val	Deg_C
H_EGR_Orifice_Tmptr_Raw	counts		
C_AIP_EGROrificeTmptrDefault	Deg_C	**Diagnostics:**	
EGR_Orifice_Tmptr_Source	---	C_AIP_EGROrificeTmptrULim	---
EGR_Orifice_Tmptr_State	---	C_AIP_EGROrificeTmptrLLim	---

16. EGR Valve Actuator

(csdd_charge_manager, csdd_dd_egr_dl, inm_egr_mon_lib)

J39_EGR_Valve_Position	Counts	**Override:**	
EGR_Valve_Position_Sensor_Type	---	T_EGA_DL_Cmd_User_Override	---
EGR_Valve_Position_Commanded	%	C_EGA_DL_Cmd_Override_Value	%
C_J1939_BcstEnable_EGRV_CMD	---	T_EAC_User_Override	---
T_EGA_Cycle_Counter	Counts	C_EAC_Override_Value	%
EGA_Position_Cmd_Final	%		
EGA_Position_Cmd	%	**Diagnostics:**	
EGA_DL_Desired_Position	Counts	J39_EGR_Valve_Status	HEX
EGA_DL_Mode_Command	HEX		

17. Exhaust Pressure

(inm_inp_emp_lib, csdd_charge_manager, inm_tpe_exhp_lib,

Exhaust_Press_Sensor_Volts	V	**In-Range:**	
Exhaust_Press	kPa	Exhaust_Press_IR_Low_Enable	---
Exhaust_Press_Sensor	kPa	C_Exhaust_Press_Torque_Thd	N_m
C_AIP_ExhaustPressDefault	kPa	C_Exhaust_Press_Speed_Thd	RPM
H_Exhaust_Press_Raw	Counts	C_Exhaust_Press_IR_Low_Thd	kPa
Exhaust_Press_Source	---	C_Exhaust_Press_Charge_Thd	kPa
C_AIP_ExhaustPressULim	---		
C_AIP_ExhaustPressLLim	---	**Estimate:**	
		T_TPE_Exhaust_Press_Est_Enable	---
Diagnostics:		Exhaust_Press_Est	kPa
C_AIP_ExhaustPressULim	---	Exhaust_Press_EStat	---
C_AIP_ExhaustPressULim	---		
Exhaust_Pressure_Keyon_Error	---	**Override:**	
		T_AIP_ExhaustPress_Ovrd_En	---
		C_AIP_ExhaustPress_Ovrd_Val	kPa

18. Oil Pressure

(csdd_lube_cool)

Oil_Pressure_Absolute	kPa	**Override:**	
Oil_Pressure_Sensor_Volts	V	T_AIP_OP_User_Override	---
Oil_Pressure	kPa_G	AIP_Oil_Press_Override_Value	kPa
Diagnostics:			
C_AIP_OP_Count_OOR_Low_Limit	---		
C_AIP_OP_Count_OOR_High_Limit	---		

19. Oil Temperature

(csdd_lube_cool)

Oil_Tmptr_Sensor_Volts	V	C_AIP_OT_Count_OOR_High_Limit	---
Oil_Temperature	Deg_C	C_AIP_OT_Count_OOR_Low_Limit	---
Override:		**Diagnostics:**	
T_AIP_OT_User_Override	---	C_AIP_OT_Count_OOR_High_Limit	---
AIP_Oil_Tmptr_Override_Value	Deg_C	C_AIP_OT_Count_OOR_Low_Limit	---

20. Turbocharger Speed

(inm_inp_tsp_lib, csdd_charge_manager)

Filtered_Turbo_Speed	KRPM	**Diagnostics:**	
C_Turbo_Speed_Default	KRPM	Turbo_Speed_In_Range_Error	---
Turbo_Speed_Source	---	CHL_Turbo_Speed_Drt_Active	---
Turbo_Speed_State	HEX	CHL_Turbo_Drt_Fuel_Active	---
Turbo_Speed_Status	---	C_TSD_OverSpdThd	KRPM
		Turbo_Speed_High_Error	---
Estimate:		C_Turbo_Speed_Eng_Spd_Thd	RPM
Turbo_Speed_EStat	HEX		
Turbo_Speed_Est	KRPM	**Override:**	
		T_Turbo_Speed_Override_Enable	---
		T_Turbo_Speed_Override	KRPM

21. Turbocharger VG Actuator

(csdd_charge_manager)

TGC_VT_Cmd	**Diagnostics:**	
J39_VGT_Motor_Effort	VGT_Fault_Communication	
J39_VGT_Actuator_Status	VGT_Fault_Over_Temperature	
J39_VGT_Actuator_State	VGT_Fault_Actuation	
C_TGC_ULim	VGT_Fault_Driver_Circuit	
C_TGC_LLim	VGT_Fault_Voltage_Low	
VGA_DL_Mode_Command	VGT_Fault_Command_Source	
VGA_DL_Desired_Position	VGT_Driver_Failure	
J39_VGT_Temperature	C_J39_VGT_Status_Timeout	
J39_VGT_Actuator_Position		
J39_VGT_Commanded_State	**Override:**	
J39_VGT_Position_Requested	T_TGC_User_Override	---
VGT_Position_Sensor_Volts	C_TGC_Override_Value	%
VGT_Actuator_Position_Commanded	T_VGA_DL_Cmd_User_Override	---
VGT_Actuator_Error_Status	C_VGA_DL_Cmd_Override_Value	%

HPI-TP Fuel Systems Sensors:

22. EPS (Engine Position / Engine Speed) Sensors

Engine_Speed	RPM		
EPS_s_Status			
EPS Main Sensor (Crank):		**EPS Backup Sensor (Cam):**	
EPS_ti_MainVSS	uSec	EPS_ti_BkupVSS	uSec
EPS_ct_MainVSS	Counts	EPS_ct_BkupVSS	Counts
EPS_s_MainLevel	---	EPS_s_BkupLevel	---
EPS_s_MainSync		EPS_s_BkupSync	
EPS_s_MainSupplyStatus	---	EPS_s_BkupSupplyStatus	---

23. Fuel Rail Pressure Sensor

FSI_v_FuelRailPrs	V	**Diagnostics:**	
Fuel_Rail_Pressure	bar_A	C_FSI_ct_FuelRailPresULim	counts
C_FSI_lp_FuelRailPresConstantIRValue	bar	C_FSI_ct_FuelRailPresLLim	counts

24. Fuel Temperature Sensor

FSI_t_Fuel	Deg_C	**Diagnostis:**	
FSI_t_fuel_v	DEGC	C_FSI_ct_FuelTempLLim	counts
Fuel_Temperature	Deg_C	C_FSI_ct_FuelTempULim	counts
C_FSI_t_FuelTempConstantIRValue	Deg_C		

Aftertreatment Sensors (ERPT):

25. DOC Inlet Thermistor

To be monitored with REHV5210.e2m through the ERPT

V_ATP_tr_DOC_In	degK	**Override:**	
		O_AIM_tr_DOC_In_Enbl	---
		O_AIM_tr_DOC_In_Value	---

26. DOC Outlet Thermistor

To be monitored with REHV5210.e2m through the ERPT

V_ATP_tr_DOC_Out	degK	**Override:**	
		O_AIM_tr_DOC_Out_Enbl	---
		O_AIM_tr_DOC_Out_Value	---

27. RPF Outlet Thermistor

To be monitored with REHV5210.e2m through the ERPT

V_ATP_tr_DPF_Out	degK	**Override:**	
		O_AIM_tr_DPF_Out_Enbl	---
		O_AIM_tr_DPF_Out_Value	---

28. RPF Delta P Sensor

To be monitored with REHV5210.e2m through the ERPT

V_SFP_pr_DPF_Delta	kPa	V_SFP_pr_Delta_Clean	kPa
		V_SFP_pr_Delta_Low	kPa
Override:		V_SFP_pr_Delta_Mid	kPa
O_AIM_pr_DPFdelta_Enbl	---	V_SFP_pr_Delta_High	kPa
O_AIM_pr_DPFdelta_Value	---		

29. Doser Fuel Pressure

To be monitored with REHV5210.e2m through the ERPT

V_ATP_pr_Inj_Fuel	kPa	**Override:**	
		O_AIM_pr_InjFuel_Enbl	---
		O_AIM_pr_InjFuel_Value	---

Parameter Estimates and Predictions:

30. Ambient Parameters Estimate

(inm_amb_lib)

Ambient Air Temperature Estimate:

Ambient_Air_Tmptr	Deg_C	Vehicle_Speed	Km/hr
Ambient_Air_Tmptr_Source	---	Compressor_Inlet_Tmptr	Deg_C
Fresh_Air_Flow	Kg/min	Compressor_Inlet_Tmptr_Source	---
Fresh_Air_Flow_Source	---	Compressor_Inlet_Tmptr_Rise	Deg_C

Altitude Estimate:

Altitude	m	Ambient_Air_Press_Source	---
Ambient_Air_Press	kPa		

Humidity Estimation (engineering use only):

Ambient_Relative_Humidity	---	CBR_Feul_Ref	Mg/stroke
Engine_Speed	RPM		

31. Charge Flow Estimate

(/vob/base/sys_rqmt/charge_flow_estimate.doc(rev12))

Estimate:

Charge_Tmptr	DEG_F	Charge_Press_Source	---
CHP_Intake_Manifold_Tmptr_R	DEG_R	Charge_Tmptr_Source	---
CHP_Volumetric_Efficiency	---	Exhaust_Press_Source	---
Charge_Flow	LB/MIN	Charge_Flow_Source	---

Volumetric Efficiency:

CHP_Veff_Mach	---	Exhaust_Press	IN_HG
CHP_Veff_Sqrt	---	Charge_Press	IN_HG
CHP_Flow_Area_Constant	---	Exhaust_Press_Disabled	
CHP_Veff_Mode			

Speed Density Equation:

CHP_Volumetric_Efficiency	---	CHP_Intake_Manifold_Tmptr_R	DEG_R
Charge_Press	IN_HG	C_CHP_Engine_Displacement	IN3

32. Charge Pressure Estimate

(inm_tpe_imp_lib)

C_Charge_Press_Estimate_Select
0 = Without Turbo Speed
1 = With Turbo Speed

T_Charge_Press_Estimate_Enable

Estimate With Turbo Speed

Charge_Press_Est_With_TSS	kPa	TPE_Pressure_Ratio_Estimate	---
Compressor_Inlet_Press	kPa	TPE_Pressure_Ratio_Scale	---
Engine_Speed	RPM	Charge_Press_EStat	---
TPE_Corrected_Turbo_Speed	---		

Estimate Without Turbo Speed

Charge_Press_Est_No_TSS	kPa	TPE_Corrected_Fuel_Flow	mg/s_RPS_/_sqrt(K)
Compressor_Inlet_Press	kPa	TPE_EGR_Delta_Boost	kPa
Compressor_Inlet_Density	Kg/m3	EGR_Valve_Is_Closed	---
TPE_Corrected_Engine_Speed	RPM_sqrt(K)_/_K	TPE_EGR_Delta_Boost_Scale	---
Charge_Tmptr	Deg_C	TPE_Non_EGR_Delta_Boost_Scale	---
FSS_Total_Fueling	%FUEL	Charge_Press_EStat	---
Engine_Speed	RPM		

Status with Turbo Speed:

Turbo_Speed_Source	---	Air_Press_Source	---
Filtered_Turbo_Speed	KRPM	EGR_Position_Source	---
Compressor_Inlet_Tmptr_Source	---	EGR_Delta_Press_Source	---
Charge_Tmptr_Source	---	Exhaust_Press_Source	---

Status without Turbo Speed:

Air_Press_Source	---	Compressor_Inlet_Tmptr_Source	---
Charge_Tmptr_Source	---		

33. Charge Temperature Estimate

(inm_inp_ict_lib)

Charge_Tmptr_Est	Deg_C	CBR_Alpha	---
Charge_Tmptr_EStat	---	cbr_chi[2]	
Compressor_Inlet_Tmptr	Deg_C	cbr_chi[3]	
Compressor_Inlet_Tmptr_Source	---	cbr_chi[4]	
T_Charge_Tmptr_Estimate_Enable	---		

34. Compressor Inlet Density Estimate

(inm_tpe_cid_lib)

Estimate:

Compressor_Inlet_Density	kg/m3	Compressor_Inlet_Tmptr	Deg_C
		Compressor_Inlet_Press	kPa

Source:

Compressor_Inlet_Density_Source	---	Compressor_Inlet_Press_Source	---
Compressor_Inlet_Tmptr_Source	---		

35. Compressor Inlet Pressure Estimate

(inm_amb_lib)

Compressor Inlet Pressure Estimate:

Compressor_Inlet_Press	kPa	Compressor_Inlet_Pressure_Drop	kPa
Air_Press	kPa	Fresh_Air_Flow	Kg/min

36. Compressor Outlet Temperature Estimate

(inm_tpe_cot_lib)

COT Estimate:

Compressor_Outlet_Tmptr	Deg_C	TPE_CIT_Sqrt	---
T_TPE_COT_Estimation_Enable	---	Filtered_Turbo_Speed	None
TPE_COT_Est_Enable	---	TPE_Corrected_Air_Flow	---
Compressor_Inlet_Tmptr	Deg_C	TPE_Corrected_Turbo_Speed	---
Fresh_Air_Flow	kg/min	TPE_COT_To_Inlet_Tmptr_Ratio	---
Compressor_Inlet_Press	kPa	C_TPE_COT_Global_Default	Deg_C

COT Estimate Source:

Compressor_Outlet_Tmptr_Source	---	Turbo_Speed_Source	---
Compressor_Inlet_Tmptr_Source	---	Compressor_Inlet_Press_Source	---
Fresh_Air_Flow_Source	---		

37. EGR Fraction Estimate

(inm_chp_egrflw_lib)

C_CHP_Venturi_Vrt_Sensor_Active
- 0 = Downstream
- 1 = Upstream

EGR Fraction Estimate:

EGR_Fraction	---	Engine_Speed	RPM
EGR_Flow	kg/min	CHP_O2_Flow_Delay	s
Charge_Flow	kg/min	CHP_EGR_Flow_Delay	s
CBP_O2_Frac_Residual_Bef_Delay	---	C_CHP_Venturi_Vrt_Sensor_Active	---
CHP_EGR_Flow_Before_Delay	kg/min	EGR_Valve_Is_Closed	---

Downstream EGR Flow Model:

CHP_Downstream_EGR_Flow	kg/min	**Downstream EGR Flow Source:**	
EGR_Position	%	EGR_Position_Source	---
EGR_Orifice_Delta_Press	kPa	EGR_Orifice_Delta_Press_Source	---
Charge_Press	kPa	EGR_Orifice_Tmptr_Source	---
EGR_Orifice_Tmptr	Deg_C	EGR_Flow_Source	---

Upstream EGR Flow Model:

CHP_Upstream_EGR_Flow	kg/min	**Upstream EGR Flow Source:**	
EGR_Position	%	EGR_Position_Source	---
CHP_Pratio	None	Charge_Press_Source	---
Exhaust_Press	kPa	Exhaust_Press_Source	---
Exhaust_Tmptr	Deg_C	Exhaust_Tmptr_Source	---
		EGR_Flow_Source	---

38. EGR Valve and Engine Delta Pressure Estimates

(inm_tpe_dp_lib)

NOTE: Engine_Delta_Press = EGR_Valve_Delta_Press * (-1)

EGR Valve and Engine Delta Pressure Estimate:

EGR_Valve_Delta_Press	kPa	Exhaust_Press	kPa
Engine_Delta_Press	kPa	Charge_Press	kPa
EGR_Orifice_Delta_Press	kPa	EGR_Delta_Press	kPa

EGR Valve and Engine Delta Pressure Estimate Source:

EGR_Valve_Delta_Press_Source	---	Exhaust_Press_Source	---
Engine_Delta_Press_Source	---	Charge_Press_Source	---
EGR_Orifice_Delta_Press_Source	---		

39. Exhaust Flow Estimation

(inm_chp_airflw_lib)

Exhaust_Flow	kg/min	Fuel_Delivery_Rate_Per_Min	---
Fresh_Air_Flow	Fresh_Air_Flow		

40. Exhaust Pressure Estimate

(inm_tpe_exhp_lib)

T_TPE_Exhaust_Press_Est_Enable	---		
Exhaust Pressure Estimate:			
Exhaust_Press_Est	kPa	EGR_Position	%
Engine_Speed	RPM	Charge_Press	kPa
TGC_VT_Cmd	%	Ambient_Air_Press	kPa
Exhaust Pressure Estimate Source:			
Exhaust_Press_EStat	---	Charge_Press_Source	---
EGR_Position_Source	---		

41. Exhaust Temperature Estimate

(inm_tpe_exht_lib)

Exhaust Temperature Estimate:			
Exhaust_Tmptr	Deg_C	Charge_Press	kPa
Exhaust_Metal_Tmptr	Deg_C	Charge_Tmptr	Deg_C
Engine_Speed	RPM	TPE_Invalid_Model	---
CBP_Charge_Fuel_Ratio	---	TPE_Delta_Exhaust_Tmptr	Deg_C
FSS_SOI	CRANK_DEG_BTDC	TPE_Energy_Fraction	Deg_C
Exhaust Temperature Source:			
Exhaust_Tmptr_Source	---	Charge_Tmptr_Source	---
Charge_Flow_Source	---	TPE_Invalid_Model	---
Charge_Press_Source	---		

42. Fresh Air Flow Estimation

(inm_chp_airflw_lib)

Fresh Air Flow Estimate:			
Fresh_Air_Flow	kg/min	Charge_Flow	kg/min
EGR_Flow	kg/min		
Fresh Air Flow Source:			
Fresh_Air_Flow_Source	---	EGR_Flow_Source	---
Charge_Flow_Source	---		

43. IMT Prediction

(inm_chp_law1_lib)

CHP_Predicted_IMT	Deg_C	Coolant_Temperature	Deg_C
Charge_Tmptr	Deg_C	Ambient_Air_Tmptr	Deg_C
CBR_Base_Chi_EGR_Frac_Cmd	---	EGR_Valve_Is_Closed	---
Exhaust_Tmptr	Deg_C		

44. IMT Lead-Lag Compensation

(inm_inp_ict_lib)

TPE_IMT_AP	Deg_C	Charge_Tmptr_State	HEX
TPE_IMT_After_Lead	Deg_C	TPE_IMT_Lead_Term	Deg_C
Charge_Tmptr_Sensor	Deg_C	T_INM_ICT_Lead_Enable	---
TPE_IMT_Lead_Time_Constant	s	T_Bench_Test	---

45. Saturation Temperature Estimate

(inm_tpe_sat_lib)

Saturation Temperatures Estimate:

Charge_Saturation_Tmptr	Deg_C	CBP_Phi	---
Exhaust_Saturation_Tmptr	Deg_C	Ambient_Air_Tmptr	kPa
Exhaust_H2O_PP	kPa	Ambient_Relative_Humidity	---
Charge_H2O_PP	kPa	Ambient_Air_Press	kPa
Charge_Press	kPa	TPE_Charge_H2O_Mole_Fraction	---
EGR_Fraction	---	TPE_Exhaust_H2O_Mole_Fraction	---
CBR_Base_Chi_EGR_Frac_Cmd	---		

Charge H2O Mole Fraction:

TPE_Charge_H2O_Mole_Fraction	---	TPE_Saturation_Vapor_Press	kPa
CBR_Base_Chi_EGR_Frac_Cmd	---	TPE_Vapor_Partial_Press	kPa
EGR_Fraction	---	Ambient_Relative_Humidity	---
CBP_Phi	---	Ambient_Air_Press	kPa
TPE_Inlet_H2O_Mole_Fraction	---	Charge_Saturation_Tmptr	Deg_C
Ambient_Air_Tmptr	Deg_C		

Inlet Mole Fraction of Water:

TPE_Inlet_H2O_Mole_Fraction	---	Ambient_Air_Tmptr	Deg_C
TPE_Vapor_Partial_Press	kPa	Ambient_Relative_Humidity	---
Ambient_Air_Press	kPa	TPE_Saturation_Vapor_Press	kPa

Exhaust H2O Mole_Fraction:

TPE_Exhaust_H2O_Mole_Fraction	---	TPE_Inlet_H20_Mole_Fraction	---
CBR_Base_Chi_EGR_Frac_Cmd	---	Ambient_Air_Press	kPa
EGR_Fraction	---	Ambient_Air_Tmptr	Deg_C
CBP_Phi	---	Ambient_Relative_Humidity	---

Saturation Temperature Source

Charge_Saturation_Tmptr_Source	---	Charge_Press_Source	---
Exhaust_Saturation_Tmptr_Source	---	Ambient_Air_Press_Source	---
		Ambient_Air_Tmptr_Source	---

46. Turbo Speed Estimation

(inm_tpe_tsp_lib)

T_Turbo_Speed_Estimation_Enable	---		

Turbo Speed Estimate Logic:

Turbo_Speed_Est	KRPM	TPE_CIT_Sqrt	---
Engine_Speed	RPM	TPE_Corrected_Turbo_Speed_Est	---
Compressor_Inlet_Press	kPa	TPE_Turbo_Speed_Scale	---
Charge_Press	kPa		

Turbo Speed Estimate Status:

Turbo_Speed_EStat	---	Compressor_Inlet_Tmptr_Source	---
Compressor_Inlet_Press_Source	---	Charge_Press_Source	---
T_Turbo_Speed_Estimation_Enable	---		

Emission Features:

47. Charge Limit Management (CHL)

(chm_chl_lib)

CHL_EGR_Frac_Cmd	---	CHL_COT_Drt_Active	---
CHL_MCF_Cmd	kg/min	CHL_Turbo_Speed_Drt_Offset	kg/min
CBL_EGR_Frac_Cmd	---	CHL_Turbo_Speed_Drt_Active	---
CHL_Surge_Drt_Offset	---	CHL_Delta_P_Drt_Offset	kg/min
CHL_Surge_Drt_Active	---	CHL_Delta_P_Drt_Active	---
CHS_MCF_Cmd	Kg/min	CHL_EGR_Off_DP_Drt_Offset	kg/min
CHL_COT_Drt_Offset	Kg/min	CHL_EGR_Off_DP_Drt_Active	---

(chm_chl_lib)

[CHL] EGR Fraction Limit Selection:

CHL_EGR_Frac_Cmd	---	CHL_EGR_Frac_Cmd_Bef_Rate_Limit	---
CBL_EGR_Frac_Cmd	---	T_CHL_EGR_Frac_Drt_Enable	---
CHL_Surge_Drt_Offset	---	C_CHL_EGR_Frac_Drt_Thd_On	---
CHL_Surge_Drt_Active	---	C_CHL_EGR_Frac_Drt_Thd_Off	---
EGR_Fraction	---	EGR_Valve_Delta_Press	kPa
CHL_EGR_Frac_Cmd_With_Shutoff	---	C_CHL_Max_Opening_Delta_P	kPa
CHL_EGR_Frac_Drt_With_Shutoff	---	EGR_Valve_Is_Closed	---
CHL_EGR_Derate_Conditions	---	CHL_Keep_Valve_Closed	---
CHL_Derate_Is_Active	---	CHL_EGR_Frac_Shutoff	---
CHL_EGR_Frac_Cmd_With_Derate	---		

(chm_chl_lib)

[CHL] Mass Charge Flow Limit Selection:

CHL_MCF_Cmd	kg/min	CHL_Delta_P_Drt_Active	kg/min
CHS_MCF_Cmd	kg/min	CHL_EGR_Off_DP_Drt_Offset	---
CHL_COT_Drt_Offset	kg/min	CHL_EGR_Off_DP_Drt_Active	---
CHL_COT_Drt_Active	---	CHL_Derate_State	---
CHL_Turbo_Speed_Drt_Offset	kg/min	Charge_Flow	kg/min
CHL_Turbo_Speed_Drt_Active	---	T_TGC_Spd_Drt_Mode	---
CHL_Delta_P_Drt_Offset	kg/min	CHL_EGR_Frac_Shutoff	---

48. Charge System Errors (CSE)

(csdd_charge_manager/CHM_ComputeEGRTurbineCommands/err)

CHL_EGR_Frac_Cmd	---	CBO_Charge_Aggressiveness_Ref	---
EGR_Fraction	---	CSE_Xform_Error_1	---
CHL_MCF_Cmd	kg/min	CSE_Xform_Error_2	---
Charge_Flow	kg/min		

Transient Gain Adjust:

CSE_MCF_Adj_Error	kg/min	CBO_Charge_Aggressiveness_Ref	---
CSE_EGR_Frac_Adj_Error	---	CHL_MCF_Cmd	Kg/min
CSE_MCF_Error	Kg/min	Charge_Flow	Kg/min
CSE_Transient_Gain_Adj	---	EGR_Fraction	---
CSE_Aggressiveness_Gain_Adj	---	CHL_EGR_Frac_Cmd	---
CSE_EGR_Frac_Error	---	CSE_EGR_On_Flag	---
CSE_EGR_Transient_Gain_Adj	---		

OC VGT MCF Error Saturation:

CSE_MCF_Sat_Error	kg/min	PTM_OCVG_Allowed	---
CSE_Regen_Error	kPa	Engine_Delta_Press	kPa
CSE_Regen_Ref_Table	kPa	Exhaust_Press	kPa
CSE_MCF_Adj_Error	kg/min	Engine_Speed	RPM
Combustion_Control_Path_Owner	----	Total_Fueling	Mg/stroke

Coordinate Transform Angle Lookup:

CSE_Xform_Angle	---	FSS_Total_Fueling	%FUEL
Engine_Speed	RPM		

Coordinate Transformation:

CSE_Xform_Error_1	---	CSE_MCF_Sat_Error	kg/min
CSE_Xform_Error_2	---	CSE_EGR_Frac_Adj_Error	---
CSE_Xform_Angle	---	CSE_MCF_Error	kg/min

Performance Diagnostics:

49. Aftertreatment Doser Diagnostics (ERPT)

V_ATP_tr_DOC_In	DEG_K	V_OCL_fg_HC_Cmd	g/s
V_ATP_tr_DOC_Out	DEG_K	V_DGM_bs_Doser_Fault_Code	---
V_SFL_tr_Regen_Trgt	DEG_K	V_AIM_vr_Engine_Speed	RPM
V_ATP_tr_DPF_Out	DEG_K	V_ATP_fg_Turbine_Out	g/s
V_HIM_fl_Inj_Fuel_Actual	CC/MIN	V_DSR_pr_Doser_Test_PntA	kPa
V_ATP_pr_Inj_Fuel	kPa	V_DSR_pr_Doser_Test_PntB	kPa
V_SFP_Soot_Load	g	V_DSR_pr_Doser_Test_PntC	kPa
V_SFP_Soot_Load_DP	g	V_DSR_pr_Doser_Test_PntD	kPa

50. Aftertreatment Regeneration / Triggers (ERPT)

V_SFR_Regen_Trigger	None	H_SFR_Regen_Tmptr_Ramp_Rate	K
H_SFR_Regen_Tactic	Nu	V_SFP_pr_Max_at_High_Flow	kPa
H_SFR_ApplType	None	C_SFR_pr_Max_at_High_Load_Thd	None
H_SFR_FilterCondition	None	H_SFR_tm_Ineff_Regen	sec
H_SFR_Regen_On_Soot_Load	g	C_SFR_tm_RegenMaxIneffectivePst	None
H_SFR_Regen_Off_Soot_Load	g	V_SFR_Regen_Stage	Nu
H_SFR_tr_Warmup_Trgt	degK	H_SFP_TimeThisRegen	s
H_SFR_Warmup_Tmptr_Ramp_Rate	degK/sec	H_SFP_SootConsumeThisRegen	g
H_SFR_tm_Warmup_Req	Sec	C_SFR_tm_Regen_Max	None
V_SFL_tr_Regen_Trgt	degK	H_SFR_tm_Regen_Max	sec

51. Aftertreatment Soot Load (ERPT)

V_SFP_pr_Delta_High	kPa	V_ATP_mf_Turbo_Out_DPM	mmf
V_SFP_pr_Delta_Mid	kPa	V_SFP_Net_Soot_Accum_Rate	mg/s
V_SFP_pr_Delta_Low	kPa	H_SFP_NO2_Oxidation_Rate	mg/s
V_SFP_pr_Delta_Clean	kPa	H_SFP_O2_Oxidation_Rate	mg/s
V_ATP_fg_Turbine_Out	g/s	V_SFP_Ash_Adj	g
V_ATP_mf_Turbo_Out_O2	mmf	HP_SFP_Ash_Since_Last_Reset	g
V_ATP_mf_Turbo_Out_NOx	mmf		

Charge Limit Management (CHL)

(chm_chl_lib)

CHL_EGR_Frac_Cmd	---	CHL_COT_Drt_Active	---
CHL_MCF_Cmd	kg/min	CHL_Turbo_Speed_Drt_Offset	kg/min
CBL_EGR_Frac_Cmd	---	CHL_Turbo_Speed_Drt_Active	---
CHL_Surge_Drt_Offset	---	CHL_Delta_P_Drt_Offset	kg/min
CHL_Surge_Drt_Active	---	CHL_Delta_P_Drt_Active	---
CHS_MCF_Cmd	Kg/min	CHL_EGR_Off_DP_Drt_Offset	kg/min
CHL_COT_Drt_Offset	Kg/min	CHL_EGR_Off_DP_Drt_Active	---

(chm_chl_lib)

[CHL] COT Limiter:

CHL_MCF_Cmd	kg/min	C_CHL_COT_MCF_Cmd_Rate_ULim	kg/min_sec
CHL_Derate_State	---	Compressor_Outlet_Tmptr	Deg_C
CHL_COT_Drt_Offset	kg/min	C_CHL_COT_Drt_Limit	Deg_C
Charge_Flow	kg/min	C_CHL_COT_Drt_On_Ratio	---
CHS_MCF_Cmd	kg/min	C_CHL_COT_Drt_Off_Ratio	---
CHL_COT_Drt_Active	---	C_CHL_COT_Drt_Max	kg/min

(chm_chl_lib)

[CHL] Turbo Speed Limiter:

CHL_MCF_Cmd	Kg/min	Turbo_Speed_Source	---
CHL_Derate_State	---	C_CHL_Turbo_Drt_Limit	KRPM
CHL_Turbo_Speed_Drt_Offset	kg/min	CBL_Fuel_Cmd	mg/stroke
AH_Fuel_Derate_Latch	---	Combustion_Control_Path_Owner	---
CHL_Turbo_Speed_Drt_Active	---	CHL_Turbo_Drt_hold_Flag	---
Filtered_Turbo_Speed	KRPM	CHL_Turbo_Drt_Active_Mult	%
CHL_Turbo_Drt_Limit	KRPM	CHL_Turbo_Drt_Multiplier	---
C_CHL_Turbo_Drt_On_Ratio	---	CHL_Delta_Fuel_Rate	Mg/sec
C_CHL_Turbo_Drt_Off_Ratio	---	CHL_Turbo_Drt_Transient	---
C_CHL_Turbo_Drt_Max	kg/min	CHL_Turbo_Drt_Fuel_Active	---
Compressor_Inlet_Density	kg/m3	CHL_Turbo_Drt_Fuel_Timer	S

(chm_chl_lib)

[CHL] EGR Delta Pressure Limiter:

CHL_MCF_Cmd	kg/min	CHL_Delta_Fuel_Rate	mg/sec
CHL_Derate_State	---	CBL_Fuel_Cmd	mg/stroke
C_CHL_Delta_P_MCF_Cmd_Rate_ULim	Kg/min_sec	Combustion_Control_Path_Ownerq	---
EGR_Valve_Delta_Press	kPa	CHL_Delta_P_Drt_Multiplier	---
C_CHL_Delta_P_Drt_Limit	kPa	CHL_Delta_P_Drt_Hold_Flag	---
C_CHL_Delta_P_Drt_On_Ratio	---	CHL_Delta_P_Drt_Active_Mult	%
C_CHL_Delta_P_Drt_Off_Ratio	---	CHL_Delta_P_Drt_Transient	---
CHL_Delta_P_Drt_Offset	kg/min	CHL_EGR_Off_DP_Drt_Fuel_Timer	S
CHL_Delta_P_Drt_Active			

(chm_chl_lib)

[CHL] EGR Off Delta Pressure Limiter:

CHL_MCF_Cmd	kg/min	CHL_Delta_Fuel_Rate	Mg/sec
CHL_Derate_State	---	CBL_Fuel_Cmd	Mg/stroke
C_CHL_EGR_Off_MCF_Cmd_Rate_ULim	kg/min	Combustion_Control_Path_Owner	---
EGR_Valve_Delta_Press	kPa	CHL_EGR_Off_DP_Drt_Hold_Flag	---
C_CHL_EGR_Off_DP_Drt_Limit	KPa	CHL_EGR_Off_DP_Drt_Transient	---
C_CHL_EGR_Off_DP_Drt_On_Ratio	---	CHL_EGR_Off_DP_Drt_Multiplier	---
C_CHL_EGR_Off_DP_Drt_Off_Ratio	---	CHL_EGR_Off_DP_Drt_Active_Mult	%
C_CHL_EGR_Off_DP_Drt_Max	Kg/min	C_CHL_EGR_Off_DP_Drt_Fuel_Max	Mg/stroke
CHL_EGR_Off_DP_Drt_Offset	Kg/min	CHL_EGR_Off_DP_Drt_Fuel_Active	---
CHL_EGR_Off_DP_Drt_Active	---	CHL_EGR_Off_DP_Drt_Fuel_Timer	S

(chm_chl_lib)

[CHL] Surge Limiter:

CHL_MCF_Cmd	kg/min	C_CHL_Surge_Drt_Off_Ratio	---
CHL_Derate_State	---	C_CHL_Surge_Drt_Max	1/%
CHL_Surge_Drt_Offset	---	Surge_Line_CFP	Kg_sqrt(K)/sec_MPa
CHL_Surge_Drt_Active	---	C_CHL_Surge_Drt_Limit	%
CHL_Surge_Limit	---	Surge_Margin_Source	---
TPE_Corrected_Air_Flow	---	T_EMO_Air_Handling_AECD_Enable	---
C_CHL_Surge_Drt_On_Ratio	---		

52. FELIX

CHL_MCF_Cmd	kg/min	H_ENGN_Tmptr_Low	Deg_C
Charge_Flow	kg/min	PTM_Desoot_TLow	Deg_C
EGR_Fraction	None	CSE_Xform_Error_2	None
CHL_EGR_Frac_Cmd	None	CSE_Xform_Error_1	None
Final_Timing	deg_BTDC	CSE_Xform_Angle	None
Total_Fueling	mg/stroke	Exhaust_Press	kPa
H_CBR_Alpha	None	TGC_VT_Cmd	%
H_CBR_Chi_Value	None	J39_VGT_Actuator_Position	%
H_CBR_Chi_Source	None	EGR_Position	%
Engine_Speed	RPM	Combustion_Control_Path_Owner	None
Net_Engine_Torque	N_m	PTM_UseTM	None
Filtered_Turbo_Speed	KRPM	PTM_Stat_Regen_Active	None
Turbine_Out_Tmptr	None	H_PTM_ATM_DocOutTmptr	Deg_C
H_CBM_Turbine_Out_Ulim	Deg_C	PTM_Final_Oper_Mode	None

53. Stationary Regeneration / OSCAR

Final_Timing	deg_BTDC	J39_VGT_Actuator_Position	%
Total_Fueling	mg/stroke	EGR_Position	%
H_CBR_Alpha	None	Combustion_Control_Path_Owner	None
H_CBR_Chi_Value	None	PTM_UseTM	None
H_CBR_Chi_Source	None	H_PTM_StatRegenExitCond	None
Engine_Speed	RPM	H_PTM_StatRegenAllowed	None
Net_Engine_Torque	N_m	H_PTM_StatRegenTrigger	None
Filtered_Turbo_Speed	KRPM	PTM_Stat_Regen_Active	None
Turbine_Out_Tmptr	None	H_PTM_ATM_DocOutTmptr	Deg_C
H_CBM_Turbine_Out_Ulim	Deg_C	PTM_Final_Oper_Mode	None
H_ENGN_Tmptr_Low	Deg_C	H_PTM_TmptrBasedTargetSpd	RPM
PTM_Desoot_TLow	Deg_C	PTM_CurrentDownpipeDeltaT	Deg_C
Exhaust_Press	kPa	H_PTM_Operator_Regen_Req	None
TGC_VT_Cmd	%	H_PTM_RegenTriggerSource	None

54. User Overrides

Parameter Overrides	Oerride Enable	Override Value
Accelerator_Interlock_State	T_DIP_Acc_Interlock_Ovrd_En	DIP_Acc_Interlock_Ovrd_Val
Accelerator_Governor_Switch	T_DIP_Acctr_Gov_Sw_Ovrd_En	DIP_Acctr_Gov_Sw_Ovrd_Val
Accelerator_Pedal_Position	T_AIP_Accelerator_Ovrd_En	AIP_AccPd_User_Ovrd_Val
ATM Requests Disabled	C_PTM_ATM_Input_Override_En	None
Ambient_Air_Tmptr	T_AMB_Amb_Tmptr_User_Override	AMB_Amb_Tmptr_Override_Value
Air_Conditioner_Pressure_Switch	T_DIP_AC_Pressure_User_Ovrd_En	DIP_AC_Pressure_User_Ovrd_Val
Air_Press	T_AIP_AMB_User_Override_En	AIP_AMB_User_Override_Value
Alternate_Idle_Switch	T_DIP_Alternate_Idle_Ovrd_En	DIP_Alternate_Idle_Ovrd_Val
Auto_Idle_Override_Switch	T_DIP_Autoidle_Ovrd_En	DIP_Autoidle_Ovrd_Val
Boost_Power_Request_Switch	T_DIP_Boost_Pow_Req_Ovrd_En	DIP_Boost_Pow_Req_Ovrd_Val
CBR_Alpha	T_CBR_Alpha_User_Override	C_CBR_Alpha_Override_Value
CBR_EGR_Off	T_CBR_EGR_Off_User_Override	C_CBR_EGR_Off_Override_Value
CBR_Fuel_Ref	T_CBR_Fuel_Ref_User_Override	C_CBR_Fuel_Ref_Override_Value
CBL_EGR_Frac_Cmd	T_CBL_EGR_Frac_User_Override	C_CBL_EGR_Frac_Override_Value
CBL_Fuel_Cmd	T_CBL_Fuel_User_Override	C_CBL_Fuel_Override_Value
CBL_MCF_Cmd	T_CBL_MCF_User_Override	C_CBL_MCF_Override_Value
CBL_SOI_Cmd	T_CBL_SOI_User_Override	C_CBL_SOI_Override_Value
CC_OnSwitch	T_DIP_CC_OnUserOvrdEn	DIP_CC_OnUserOvrdVal
CC_ResumeSwitch	T_DIP_CC_ResumeUserOvrdEn	DIP_CC_ResumeUserOvrdVal
CC_SetSwitch	T_DIP_CC_SetUserOvrdEn	DIP_CC_SetUserOvrdVal
Charge_Press	T_AIP_Charge_Press_User_Ovrd_En	C_AIP_Charge_Press_Ovrd_Value
Charge_Tmptr	T_AIP_CHT_User_Override_En	C_AIP_CHT_Override_Value
chi.value	T_CBR_Chi_User_Override	C_CBR_Chi_Override_Value
chi.el	T_CBR_Chi_User_Override	C_CBR_Chi_Override_EL
Clutch_Switch	T_DIP_ClutchSwitchOvrdEn	H_DIP_ClutchSwitchOvrdVal
Clutch_Switch_Raw	T_DIP_ClutchSwRawOvrdEn	H_DIP_ClutchSwRawOvrdVal
Compressor_Inlet_Tmptr	T_AIP_CompInTmptr_Ovrd_En	C_AIP_CompInTmptr_Ovrd_Val
Cool_Detected_Switch	T_DIP_Cl_Det_User_Ovrd_En	DIP_Cl_Det_User_Ovrd_Val
Cool_Not_Detected_Switch	T_DIP_Cl_Not_Det_User_Ovrd_En	DIP_Cl_Not_Det_User_Ovrd_Val
Coolant_Level (for C_Coolant_Level_Sensor_Type = 0)	T_DIP_CL_User_Override	DIP_CL_Override_Value
Coolant_Level (for C_Coolant_Level_Sensor_Type =1)	T_AIP_Cool_Lev_User_Override_En	AIP_Cool_Lev_Override_Value
Coolant_Pressure	T_AIP_CP_User_Override	AIP_Cool_Press_Override_Value
Coolant_Temperature	T_AIP_CT_User_Override	AIP_Cool_Tmptr_Override_Value
Diagnostic_Decrement_Switch	T_DIP_Diag_Decrt_User_Ovrd_En	DIP_Diag_Decrt_Sw_User_Ovrd_Val
Diagnostic_Increment_Switch	T_DIP_Diag_Incrt_User_Ovrd_En	DIP_Diag_Incrt_Sw_User_Ovrd_Val
EAC_EGR_Valve_Cmd	T_EAC_User_Override	C_EAC_Override_Value
EEM_WIFState	T_AIP_WIF_User_Override_En	H_AIP_WIF_User_Override_Value
EGA_Position_Cmd	T_EGA_DL_Cmd_User_Override	C_EGA_DL_Cmd_Override_Value
EGR_Delta_Press	T_AIP_EGRDeltaPress_Ovrd_En	C_AIP_EGRDeltaPress_Ovrd_Val
EGR_Orifice_Tmptr	T_AIP_EGROrificeTmptr_Ovrd_En	C_AIP_EGROrificeTmptr_Ovrd_Val
EMM_Cap_EL_Cmd	T_EMO_Cap_EL_User_Override	C_EMO_Cap_EL_Override_Value
EMM_Protection_State	T_EMO_State_User_Override	C_EMO_State_Override_Value
Engine Brake SW 1	T_DIP_EngBrkSel1SwOvrdEn	H_DIP_EngBrkSel1SwOvrdVal
Engine Brake SW 2	T_DIP_EngBrkSel2SwOvrdEn	H_DIP_EngBrkSel2SwOvrdVal
Engine Brake SW 3	T_DIP_EngBrkSel3SwOvrdEn	H_DIP_EngBrkSel3SwOvrdVal
Engine_Speed	H_EPS_s_UserOverrideSpeedEnable	H_EPS_n_UserOverrideSpeedValue
EPD_Shutdown_Override_Switch	T_DIP_Shutdwn_Ovrd_User_Ovrd_En	DIP_Shutdwn_Ovrd_User_Ovrd_Val
ERC_Drv1_DutyCycle	T_PWM_EngBrkDriver1OvrdEn	H_PWM_EngBrkDrv1_DC_OvrdVal
ERC_Drv2_DutyCycle	T_PWM_EngBrkDriver2OvrdEn	H_PWM_EngBrkDrv2_DC_OvrdVal
ERC_Drv3_DutyCycle	T_PWM_EngBrkDriver3OvrdEn	H_PWM_EngBrkDrv3_DC_OvrdVal
ERC_Drv4_DutyCycle	T_PWM_EngBrkDriver4OvrdEn	H_PWM_EngBrkDrv4_DC_OvrdVal
Exhaust_Press	T_AIP_ExhaustPress_Ovrd_En	C_AIP_ExhaustPress_Ovrd_Val
FCC_Fan_Clutch_PWM_Duty_Cycle	T_PWM_Fan_Clutch_User_Override	H_PWM_Fan_Clutch_Override_Value
H_CBR_Gross_Fuel	T_CBR_Gross_Fuel_User_Override	C_CBR_Gross_Fuel_Override_Value
H_ERC_ChargeFlowCmd	T_ERC_ChgFlwUserOverride	C_ERC_ChgFlwUserValue
H_ERC_DriverFractionCmd	T_ERC_FractionUserOverride	C_ERC_FractionUserValue
Idle_Decrement_Switch	T_DIP_Idle_Decrt_User_Ovrd_En	DIP_Idle_Decrt_User_Ovrd_Val
Idle_Increment_Switch	T_DIP_Idle_Incrt_User_Ovrd_En	DIP_Idle_Incrt_User_Ovrd_Val
InternalTmptr	T_AIP_InternalTmptr_Ovrd_En	C_AIP_InternalTmptr_Ovrd_Val
Key_Switch	T_DIP_Key_Switch_User_Ovrd_En	DIP_Key_Switch_User_Ovrd_Val
Maintenance_Fault_Lamp	T_DOP_FLC_Maint_User_Ovrd_En	DOP_FLC_Maint_User_Ovrd_Val
Manual_Fan_Input	T_DIP_Manual_Fan_User_Ovrd_En	DIP_Manual_Fan_User_Ovrd_Val
OEM_Ambient_Air_Tmptr	T_AIP_OEMAmbAirTmptrOvrdEn	AIP_OEMAirTmptrOverrideVal
OEM_Pressure	T_AIP_OEMPress_Ovrd_En	AIP_OEMPress_Ovrd_Val
OEM_Pressure_2	T_AIP_OEMPress2_Ovrd_En	AIP_OEMPress2_Ovrd_Val

	Parameter Overrides	Oerride Enable	Override Value
	OEM_Temperature	T_AIP_OEMTmptr_Ovrd_En	AIP_OEMTmptr_Ovrd_Val
	OEM_Temperature_2	T_AIP_OEMTmptr2_Ovrd_En	AIP_OEMTmptr2_Ovrd_Val
	Off_Idle_Switch	T_DIP_Off_Idle_User_Ovrd_En	DIP_Off_Idle_User_Ovrd_Val
	Oil_Pressure_Absolute	T_AIP_OP_User_Override	AIP_Oil_Press_Override_Value
	Oil_Temperature	T_AIP_OT_User_Override	AIP_Oil_Tmptr_Override_Value
	On_Idle_Switch	T_DIP_On_Idle_User_Ovrd_En	DIP_On_Idle_User_Ovrd_Val
	Parking_Retarder_Brake_Switch	T_DIP_PRB_Ovrd_En	DIP_PRB_Ovrd_Val
	PTO_Accel_Switch (Mux only)	T_DIP_PTO_Accel_User_Ovrd_En	DIP_PTO_Accel_User_Ovrd_Val
	PTO_Coast_Switch (Mux only)	T_DIP_PTO_Coast_User_Ovrd_En	DIP_PTO_Coast_User_Ovrd_Val
	PTO_Remote_Switch	T_DIP_PTO_Remote_User_Ovrd_En	DIP_PTO_Remote_User_Ovrd_Val
	PTO_Resume_Switch	T_DIP_PTO_Resume_User_Ovrd_En	DIP_PTO_Resume_User_Ovrd_Val
	PTO_Set_Switch	T_DIP_PTO_Set_Sw_User_Ovrd_En	DIP_PTO_Set_Sw_User_Ovrd_Val
	PTO_Switch	T_DIP_PTO_Sw_User_Ovrd_En	DIP_PTO_Sw_User_Ovrd_Val
	Remote_Accelerator_Switch	T_DIP_RMT_Switch_User_Ovrd_En	H_DIP_RMT_Switch_User_Ovrd_Val
	RMT_Remote_Accelerator_Posn	T_AIP_RMT_Accelerator_Ovrd_En	H_AIP_RMT_Accel_User_Ovrd_Val
	Secondary_Accel_Pedal_Pos	T_AIP_APP2_Ovrd_Enable	H_AIP_APP2_User_Ovrd_Val
	Service_Brake_Switch	T_DIP_ServiceBrkSwOvrdEn	H_DIP_ServiceBrkSwOvrdVal
	Stop_Fault_Lamp	T_DOP_FLC_Stop_User_Ovrd_En	DOP_FLC_Stop_User_Ovrd_Val
	Tachometer (no CT III parameter)	TAC_s_TachOverrideEnable	TAC_n_OverrideRPM
	Test_Switch	T_DIP_Test_Switch_User_Ovrd_En	DIP_Test_Switch_User_Ovrd_Val
	TGC_VT_Cmd	T_TGC_User_Override	C_TGC_Override_Value
ERPT	V_ATP_tr_DOC_In	O_AIM_tr_DOC_In_Enbl	O_AIM_tr_DOC_In_Value
ERPT	V_ATP_tr_DOC_Out	O_AIM_tr_DOC_Out_Enbl	O_AIM_tr_DOC_Out_Value
ERPT	V_ATP_tr_DPF_Out	O_AIM_tr_DPF_Out_Enbl	O_AIM_tr_DPF_Out_Value
ERPT	V_SFP_pr_DPF_Delta	O_AIM_pr_DPFdelta_Enbl	O_AIM_pr_DPFdelta_Value
	Warning_Fault_Lamp	T_DOP_FLC_Warning_User_Ovrd_En	DOP_FLC_Warning_User_Ovrd_Val

HPI-TP Fuel System:

55. Cylinder Cut-Out Diagnostics (CTS)

Engine_Speed	RPM	CTS_x_UserTmMask_c		HEX
FSI_q_totalFueling_v	MG/STROKE			
FSI_ca_mainSOI_v	CRANK_DEG	**Fuel Actuator Addition Time-On Trims:**		
Combustion_Control_Path_Owner	---	Cyl #1:	CTS_ti_FlTrim_c[0]	MSEC
		Cyl #2:	CTS_ti_FlTrim_c[1]	MSEC
CTS_x_ActiveFlMask_v	HEX	Cyl #3:	CTS_ti_FlTrim_c[2]	MSEC
FSI_x_ExtCylMask_c	HEX	Cyl #4:	CTS_ti_FlTrim_c[3]	MSEC
C_FSI_x_CylCutOutMask = 00 (all cylinders active)	HEX	Cyl #5:	CTS_ti_FlTrim_c[4]	MSEC
C_FSI_x_CylCutOutMask = 01	Disables Cyl 1	Cyl #6:	CTS_ti_FlTrim_c[5]	MSEC
C_FSI_x_CylCutOutMask = 02	Disables Cyl 2			
C_FSI_x_CylCutOutMask = 04	Disables Cyl 3	**Timing Actuator Additional Time-On Trims:**		
C_FSI_x_CylCutOutMask = 08	Disables Cyl 4	Cyl #1:	CTS_ti_TmTrim_c[0]	MSEC
C_FSI_x_CylCutOutMask = 10	Disables Cyl 5	Cyl #2:	CTS_ti_TmTrim_c[1]	MSEC
C_FSI_x_CylCutOutMask = 20	Disables Cyl 6	Cyl #3:	CTS_ti_TmTrim_c[2]	MSEC
C_FSI_x_CylCutOutMask = 07	Disables Cyl 1-3	Cyl #4:	CTS_ti_TmTrim_c[3]	MSEC
C_FSI_x_CylCutOutMask = 38	Disables Cyl 4-6	Cyl #5:	CTS_ti_TmTrim_c[4]	MSEC
C_FSI_x_CylCutOutMask = 3F	Disables All Cyl	Cyl #6:	CTS_ti_TmTrim_c[5]	MSEC

Note: Cutout values are additive, For Example:

C_FSI_x_CylCutOutMask = 18	Disables Cyl 4 & 5
C_FSI_x_CylCutOutMask = 0C	Disables Cyl 3 & 4

CM870 ENGINEERING STATES

BINARY DEFINITION:

1 = ACTIVE
0 = NOT ACTIVE

0000 = 0	0001 = 1	0010 = 2	0011 = 3	0100 = 4	0101 = 5	0110 = 6	0111 = 7
1000 = 8	1001 = 9	1010 = 10	1011 = 11	1100 = 12	1101 = 13	1110 = 14	1111 = 15

Converting DECIMAL to BINARY:
Divide the DECIMAL value by 2, and keep dividing the remainder by 2 until you reach a value of 1. Integer values are only used, so 1 divided by 2 becomes 0 with a remainder of 1. The combined remainders become the BINARY equivalent. Example:

512/2 = 256	remainder	0	BIT 0	87/2 = 43	remainder	1	BIT 0
256/2 = 128	remainder	0	BIT 1	43/2 = 21	remainder	1	BIT 1
128/2 = 64	remainder	0	BIT 2	21/2 = 10	remainder	1	BIT 2
64/2 = 32	remainder	0	BIT 3	10/2 = 5	remainder	0	BIT 3
32/2 = 16	remainder	0	BIT 4	5/2 = 2	remainder	1	BIT 4
16/2 = 8	remainder	0	BIT 5	2/2 = 1	remainder	0	BIT 5
8/2 = 4	remainder	0	BIT 6	1/2 = 0	remainder	1	BIT 6
4/2 = 2	remainder	0	BIT 7				
2/2 = 1	remainder	0	BIT 8				
1/2 = 0	remainder	1	BIT 9				

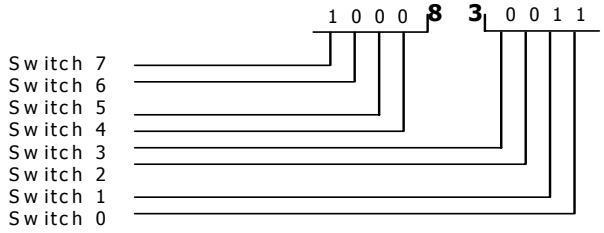
The BINARY equivalent of 512 is 0010 0000 0000

The BINARY equivalent of 87 is 0101 0111

HEXADECIMAL DEFINITION:

1 = ACTIVE
0 = NOT ACTIVE

0000 = 0	0001 = 1	0010 = 2	0011 = 3	0100 = 4	0101 = 5	0110 = 6	0111 = 7
1000 = 8	1001 = 9	1010 = A	1011 = B	1100 = C	1101 = D	1110 = E	1111 = F



ACCELERATOR GOVERNOR:

Selected_Governor	
State	**Decimal Value**
ABT	0
ABS	1

ACCELERATOR INTERLOCK:

(csdd_mca_accel)

Accelerator_Interlock_State	
State	**Decimal Value**
On	0
Off	1

AFTERTREATMENT:

PTM_Regen_Oper_State	
State	**Decimal Value**
NOT_NEEDED	0
IN_PROCESS	1
COMPLETE	2

PTM_Final_Oper_Mode	
State	**Decimal Value**
ATM Request	1
Normal	2
Desoot	3
Default (Non-Operational)	4

H_PTM_Pedal_Dance_Stage	
State	**Decimal Value**
5 Service Brake Activations at 100% Throttle	1
3 Service Brake Activations at 0% Throttle	2
5 Seconds at 100% throttle	3
Done	4

H_PTM_RegenTriggerSource	
State	**Decimal Value**
NO_REQUEST	0
AUTOMATIC	1
SERVICE	2
OPERATOR	3

PTM_Regen_Oper_State	
State	**Decimal Value**
IDLE	0
STAT_REGEN	1
REGEN_TIMED_OUT	2
REGEN_COMPLETE	3
SOOT_LOAD_CHECK	4
OPER_REGEN	5
REGEN_INNEFECTIVE	6
REGEN_INTERRUPTED	7

V_DGM_bs_Sensor_Fault_Code (from ERPT) 1 Flash of red lamp on RPF indicator panel		
State	**Decimal Value**	**Fault**
Engine Speed Timeout	1	9511
Final Fueling Timeaout	2	9511
Fresh Air Flow Rate Timeout	4	9511
Ambient Air Pressure Timeout	8	9511
Boost Pressure Timeout	16	9511
Intake Manifold Temperature Timeout	32	9511
PTM Message Timeout	64	9511
ATM Message Timeout	128	9511

- 1 flash indicates that certain messages are being dropped on the J1939 datalink between the engine ECM and the ERPT module.
- 1 flash can also mean that the ERPT is not communicating with the engine ECM.
- **Check J1939 datalink connections and power/ground/keyswitch to the ERPT module to troubleshoot this fault.**

V_DGM_bs_Sensor_Fault_Code (from ERPT) 2 flashes of red lamp on RPF indicator panel		
State	**Decimal Value**	**Fault**
DOC Inlet Temperature Sensor OOR Flag	1	9511
DOC Outlet Temperature Sensor OOR Flag	2	9511
DPF Outlet Temperature Sensor OOR Flag	4	9511
DPF Delta P Sensor OOR Flag	8	9511
Fuel Pressure Sensor OOR Flag	16	9511

- 2 flashes indicate that a sensor out-of-range fault has occurred. This is either caused buy a failed sensor or a shorted wiring harness.
- Read the J1939_ATM_SysErrStatus parameter to determine which sensor is causing the out-of-range condition.
- **Troubleshoot the out-of-range fault condition.**

V_DGM_bs_Doser_Fault_Code (from ERPT) 5 flashes of red lamp on RPF indicator panel		
State	**Decimal Value**	**Fault**
Fuel Leak Detection	2	9511
FSOV Fail to Open	4	9511
FSOV Fail to Purge	8	9511
Fuel Pressure Sensor IRL/IRH Flag	16	

- 5 flashes indicate that the doser pressure diagnostic has failed. This can be the leak detection, FSOV fail to purge, or the FSOV fail to open diagnostic.
- Make sure you have the latest ERPT cal that was released on 5/19/05
- Check for external fuel leaks around the doser and the fuel pressure/FSOV assembly.
- Check the reading of the doser fuel pressure sensor to make sure it is not failed in range.
- Turn the keyswitch OFF, wait 10 seconds, and turn the keyswitch ON.
- Wait 2 minutes and check for 6 flashes on the ERPT lamp. If 6 falshes, go to 6 flashes troubleshooting
- **Continue driving after performing keyswitch sequence above.**

V_DGM_bs_SF_Fault_Code (from ERPT) 6 flashes of red lamp on RPF indicator panel		
State	**Decimal Value**	**Fault**
Soot Filter Not Present	1	
Soot Filter Leak Detection	2	
Inlet Temperature IRL/IRH	4	
Outlet Temperature IRL/IRH	8	
Delta P Sensor IRL/IRH	16	
Component Degradation => High Soot Load (CSLE) Alarm	32	9613
Out of Limit Operation – High Temperature Flag	64	9511
Component Failure – High dP Flag	128	9511

- 6 flashes indicate that the filter is plugged. Can also indicate high temperature at the outlet of the filter.
- Continue driving under heavy engine loads or perform stationary regen procedure to clean out the filter.
- **Refer to 'Stationary Regen Procedure'**

V_DGM_bs_DOC_Fault_Code (from ERPT) **7 flashes of red lamp on RPF indicator panel**		
State	**Decimal Value**	**Fault**
DOC Not Present	1	
Inlet Temperature IRL/IRH	4	
Outlet Temperature IRL/IRH	8	
Out of Limit Operation – High Temperature Flag	64	9511
Component Failure – DOC Plugged Face	128	

- 7 flashes indicate a high temperature at the DOC outlet.
- Can be caused if a truck comes to a stop when dosing is occurring.
- Turn the keyswitch OFF, wait 10 seconds, and turn the keyswitch ON.
- Wait 30 seconds and see if the 7 flashes clear.
- **Keep driving. If 7 flashes comes back, probably is a control system problem or a stuck open doser.**

V_DGM_bs_ATM_Fault_Code (from ERPT) **8 flashes of red lamp on RPF indicator panel**		
State	**Decimal Value**	**Fault**
System Overtemp Warning	1	9511
System Overtemp Fail, Eng Shutdown Rqst	4	9512

8 flashes indicate high system temperature (over 650C I believe) or greater than 350C temperature rise across the DOC.

- Probably caused by uncontrolled regen.
- Filter has probably cracked.
- Turn the keyswitch OFF, wait 10 seconds, and turn the keyswitch ON.
- Wait 30 seconds and see if the 8 flashes clear.
- **Keep driving and check the filter at next service opportunity. The filter will probably need to be replaced.**

J1939_ATM_SysErrStatus			
State	**Digit (From Left to Right)**	**Bit**	**Decimal**
Boost Pressure Timeout	1	0	1
Intake Manifold Temperature Timeout	1	1	2
PTM Message Timeout	1	2	4
ATM Message Timeout	1	3	8
Engine Speed Timeout	2	0	1
Final Fueling Timeaout	2	1	2
Fresh Air Flow Rate Timeout	2	2	4
Ambient Air Pressure Timeout	2	3	8
Fuel Pressure Sensor OOR Flag	3	0	1
Fuel Leak Detection	3	1	2
FSOV Fail to Open	3	2	4
FSOV Fail to Purge	3	3	8
DOC Inlet Temperature Sensor OOR Flag	4	0	1
DOC Outlet Temperature Sensor OOR Flag	4	1	2
DPF Outlet Temperature Sensor OOR Flag	4	2	4
DPF Delta P Sensor OOR Flag	4	3	8
System Overtem Warning	5	0	1
System Overtemp Fail, Eng Shutdown Rqst	5	1	2
Out of Limit Operation – High Temperature Flag	5	2	4
Component Failure – DOC Plugged Face	5	3	8
DOC Not Present	6	0	1
Fuel Pressure Sensor IRL/IRH Flag	6	1	2
Inlet Temperature IRL/IRH	6	2	4
Outlet Temperature IRL/IRH	6	3	8
Delta P Sensor IRL/IRH	7	0	1
Component Degradation => High Soot Load (CSLE) Alarm	7	1	2
Out of Limit Operation – High Temperature Flag	7	2	4
Component Failure – High dP Flag	7	3	8
Soot Filter Not Present	8	0	1
Soot Filter Leak Detection	8	1	2
Inlet Temperature IRL/IRH	8	2	4
Outlet Temperature IRL/IRH	8	3	8

CHANGE LOCK:

CMGR_ChangeState	
State	**Decimal Value**
CHG_STATE_CHANGES_NOT_OK	0
CHG_STATE_CHANGES_OK	1
CHG_STATE_CANCELING	2
CHG_STATE_SAVING	4

CHARGE FLOW:

CHL_Derate_State		
State	**Alpha Value**	**Decimal Value**
CHL_No_Derate_State	NO_DRT	0
CHL_COT_Derate_State	COT_DRT	1
CHL_Turbo_Speed_Derate_State	TURB_DRT	2
CHL_Delta_P_Derate_State	DLTP_DRT	4
CHL_EGR_Off_DP_Derate_State	DPOFFDRT	8

Charge_Flow_Command_State	
State	**Decimal Value**
Normal Operation	0
COT Derate	1
Turbo Speed Derate	2
Delta P Derate	4
EGR Off Delta P Derate	8
Density Based MCF Limit	16
CBL MCF Command Override	32
Engine Brakes	64
CBL MCF Command Increment	128
Exhaust Temperature Limit	256
Exhaust Flow Low Limit	512
Shift in Progress	1024

Charge_Flow_Derate_Active_State	
State	**Decimal Value**
All Derates Inactive	0
COT Near Limit	1
Turbo Speed Near Limit	2
Delta P Near Limit	4
Delta P Near EGR Off Limit	8

CRUISE CONTROL:

CC_CommandMode	
State	**Enumeration**
CC_OFF	0
CC_SET	1
CC_CANCEL	2
CC_RESUME	3
CC_COAST	4
CC_BDOWN	5
CC_ACCEL	6
CC_BUP	7
CC_HDWAY	8
CC_HOLD	9

CYLINDER PERFORMANCE:

CUFD_s_State_v	
State	**Enumeration**
Normal	0
Diag	1
Lowpower	2
Limphome	3

DDI_s_CylPerfTestStatus	
State	**Enumeration**
InAct	0
Act	1
Fault	2
Prohibit	4
Init	12
Susp	13

FSI_s_CylCutOutBase	**FSI_s_CylCutOutToolStatus**
State	**Enumeration**
Inactive	0
Active	1
Internal Cutout	3
Prohibit	4

FSI_s_CylindersCutOut	**FSI_s_CylindersCutOut_T**
State	**Enumeration**
Unused	0
Normal	1
Tool Cut	2
ECM Cut	3

DATALINK:

DL_EngineControlMode	
State	**Hex**
None	0000
Speed Control	0001
Speed Limit Control	0002
Torque Control	0004
Torque Limit Control	0008

DRIVER REWARD:
(csdd_mcae_auto_rsc & csdd_mcae_auto_rsc.dct)

DRS_Reward_State	
State	**Decimal Value**
NO_REWARD	0
REWARD_LEVEL_1	1
REWARD_LEVEL_2	2
REWARD_LEVEL_3	3
REWARD_LEVEL_4	4

EGR FRACTION:

EGR_Fraction_Command_State	
State	**Decimal Value**
Normal Operation	0
EMM Protection	1
CBR EGR Override	2
OFC EGR Disabled	4
CBL EGR Override	8
Low EGR Command	16
Prevent Opening Against High Delta P	32
CHL Surge Derate	64
CBL EGR Command Increment	128

EGR Valve:

J39_EGR_Valve_Status		
State	**Enumeration**	**Associated Fault Code**
Normal	0	
EGR_Fault_Voltage_High	1	1933
EGR_Fault_Voltage_Low	2	1934
EGR_Fault_Motor_Open	4	2349
EGR_Fault_Motor_Short	8	2351
EGR_Fault_Motor_Lock	10	2357
EGR_Fault_Pos_Sensor	20	2272
EGR_Fault_Valve_Stuck	40	1896
EGR_Fault_Command_Source	80	1935

EMISSION MANAGER:

EMM_AECD_State		
State	**Decimal Value**	**Bit Mask**
Emission Protection	0	None
Air Handling System Protection	1	Bit 0
Extreme Ambient Overheat Protection	2	Bit 1
Condensation Protection	4	Bit 2
White Smoke / Misfire Protection	8	Bit 3
Extended Idle & PTO Protection	16	Bit 4
Engine Starting & Warmup Protection	32	Bit 5
Engine Protection	64	Bit 6
Diagnostic Procedures	128	Bit 7

EMM_Protection_State		
State	**Decimal Value**	**Bit Mask**
Normal Operation	0	None
Cranking	1	Bit 0
Normal Shutdown	2	Bit 1
Minor Engine Protection	4	Bit 2
Major Engine Protection	8	Bit 3
Emergency Shutdown	16	Bit 4
Wet Stack Protection	32	Bit 5
Coolant Advance	64	Bit 6
EGR Off Allowed	128	Bit 7
EGR System Failure	256	Bit 8
Cylinder Pressure Limit	512	Bit 9
Turbo Surge Protection	1024	Bit 10
UHC Advance	2048	Bit 11

(emm_emo_esw_lib & csdd_emissions_manager.dct)

EMO_Engine_Start_AECD_State	
State	**Decimal Value**
EMM_CRANKING	1
EMM_COOLANT_ADVANCE	64
EMM_EGR_OFF_ALLOWED	128

ENGINE BRAKE:

DL_RetarderControlMode	
Alpha Value	**Enumeration**

RetarderStatus	
Alpha Value	**Enumeration**
NONE	0
OVERRIDE	1
OVER_OR_NON_OVERRIDE	2

RetarderCommand	
Alpha Value	**Bit**
Cylinder 1 On	0
Cylinder 2 On	1
Cylinder 3 On	2
Cylinder 4 On	3
Cylinder 5 On	4
Cylinder 6 On	5

ENGINE OPERATING CONDITION (ALPHA / Chi):

Alpha **CBR_Alpha**	**H_CBR_Alpha**
State	**Enumeration**
URBAN	0
OPEN ROAD	1

H_CBR_Chi_Value		
State	**Alpha Value**	**Enumeration**
Chi 1: Steady State	CHI 1	1
Chi 2: AECD Region II	CHI 2	2
Chi 3: AECD Region III	CHI 3	3
Chi 4: EGR Off	CHI 4	4

H_CBR_Chi_Source	
State	**Enumeration**
CCBR_COOLANT_CHI	2
CCBR_EGR_OFF_CHI	3
CBR_FULL_USER_OVERRIDE_CHI	4
CBR_SINGLE_USER_OVERRIDE_CHI	5
CCBR_PROTECTION_CHI	6
CCBR_CORR_AMB_COND_CHI	7
CCBR_DENSITY_CHI	8

ENGINE PROTECTION:

CHRG_ChtPrevSevSdReq **CHRG_CotPrevSevSdReq** **CHRG_EgrPrevSevSdReq** **CHRG_EgrPrevSpdSdReq** **CHRG_EmtPrevSevSdReq** **LUCL_ClPrevTbTrqSdReq**	**LUCL_CpPrevSevSdReq** **LUCL_CtPrevSevSdReq** **LUCL_CtPrevSpdSdReq** **LUCL_OpPrevTbSpdSdReq** **LUCL_OpPrevTbTrqSdReq** **LUCL_OtPrevSdReq**
State	**Enumeration**
Shutdown w/o restart limit	0
Run	1
Shutdown approaching w/o restart limit	2
Shutdown with restart limit	4
Shutdown approaching with restart limit	8
Shutdown timer started (running)	16
Previously shutdown	32

C_EPD_CHT_Trq_Drt_Type **C_EPD_EGR_Trq_Drt_Type**	**C_EPD_EMT_Trq_Drt_Type**
State	**Enumeration**
Time	0
Severity	1

ENGINE SOI TIMING COMMAND:

Final_Timing_State	**CBL_SOI_State** **SOI_State**
State	**Decimal Value**
CRANK	1
ANC_STATE	3
MISFIRE_TIMING_STATE	11
COOLANT_SOI_ADVANCE_STATE	14
IMT_SOI_ADVANCE_STATE	15
AMBIENT_PRESSURE_SOI_STATE	16
CBR_SOI_REF_STATE	17
MAX_TIMING_STATE	19
MIN_TIMING_STATE	20
UHC_TIMING_STATE	21
TEXH_TIMING_STATE	22

ENGINE SPEED PROCESSING (EPS):

EPS_s_MainSync **EPS_s_BkupSync**	**EPS_Main_Sync_State** **EPS_Backup_Sync_State**
State	**Enumeration**
NO_PULSE	0
HAVE_SYNC	1
NO_SYNC	2
START_SYNC	3
SYNC_STATE_UNKNOWN	4
CAM_SYNC_STATE_SIZING	256

EPS_s_BkupLevel	**EPS_s_MainLevel**
State	**Enumeration**
Triggered	0
Low	1
High	2

EPS_s_SensorSelect	
State	**Enumeration**
EPS_MAIN_SPEED_SENSOR	0
EPS_BACKUP_SPEED_SENSOR	1
EPS_EXTERNAL_SPEED_SENSOR	2
EPS_SENSOR_SELECT_SIZING	255

ENGINE STATES:

H_CBD_s_Motoring	
State	**Enumeration**
Motoring	0
Not Motoring	1

H_CBD_s_SteadyState	
State	**Enumeration**
Steady State	0
Transient	1

Engn_Actual_State	
State	**Enumeration**
STOPPED	0
STARTING	1
RUNNING	2
STOPPING	3
BRAKING	4

H_CBM_Engine_Startup_State	
State	**Decimal Value**
ENGINE_STOP_STATE	0
ENGINE_CRANK_STATE	1
ENGINE_RUN_STATE	2
ENGINE_SHUTDOWN_STATE	3
ENGINE_JUMPSTART_STATE	11
ENGINE_CRANK_REENTRY_STATE	12

(csdd_machine_manager & csdd_machine_manager.dct)

ESP_Tau_State	
State	**Decimal Value**
STEEP_GRADE	1
NORMAL	0

ENGINE TORQUE / FUEL COMMAND:

CBR_Fuel_Ref_State		
State	**Alpha Value**	**Enumeration**
NOT_SET	NOT_SET	0
FUELING_JCOMM_TORQUE_STATE	JCOMTORQ	1
FUELING_JCOMM_SPEED_STATE	JCOMSPED	2
FUELING_PROGRESSIVE_SHIFT_SPEED_STATE	PSSPEED	3
FUELING_PTO_STATE	PTO	4
FUELING_USER_COMMAND_STATE	USERCOMD	5
FUELING_LIMP_HOME_STATE	LIMPHOME	6
FUELING_ASG_THROTTLE_STATE	ASGTHROT	7
FUELING_FOUR_DIMENSION_STATE	FOUR_D	8
FUELING_CRUISE_CONTROL_STATE	CRUISE	9
FUELING_RSG_STATE	RSG	10
FUELING_LSG_STATE	LSG	11
FUELING_HSG_STATE	HSG	12
FUELING_TORQUE_DERATE_OVERRIDE_STATE	TRQDROVR	13
FUELING_LOW_GEAR_STATE	LOWGEAR	14
FUELING_ALTITUDE_DERATE_STATE	ALTDERAT	15
FUELING_OFC_DERATE_STATE	OFCDERAT	16
FUELING_ANC_DERATE_STATE	ANCDERAT	17
FUELING_ENGINE_PROTECT_STATE	EPF	18
FUELING_MAXIMUM_THROTTLE_STATE	MAXTHROT	19
FUELING_JCOMM_TORQUE_DERATE_STATE	JCTRQDER	20
FUELING_OUT_OF_GEAR_STATE	OUTOGEAR	21
FUELING_CRANK_STATE	CRANK	22
FUELING_OVERRIDE_STATE	OVERRIDE	23
FUELING_ENGINE_BRAKE_STATE	ENGBRAKE	24
FUELING_OVERSPEED_STATE	OVERSPED	25
FUELING_STOP_STATE	STOP	26
FUELING_SHUTDOWN_STATE	SHUTDOWN	27
FUELING_FSS_DERATE_STATE	FSSDERAT	28
FUELING_EPF_DERATE_STATE	EPFDERAT	29
FUELING_ASG_APPLICATION_STATE	ASG_APPL	30
FUELING_ALTERNATE_TORQUE_STATE	ALT_TORQ	31
FUELING_MS_OVERRIDE_STATE	MSOVRIDE	32
FUELING_ENGINE_STARTUP_OIL_LIMIT	ESUOILLM	33
FUELING_PTO_DERATE_STATE	PTODERAT	34
FUELING_TORQUE_CONTROL_STATE	TORQCTRL	35
FUELING_PTP_DERATE_STATE	PTPDERAT	36
FUELING_T2_SPEED_STATE	T2SPD	37
FUELING_T2_TORQUE_STATE	T2TORQ	38
FUELING_T2_DERATE_STATE	T2DERAT	39
FUELING_NO_DERATE_STATE	NODERAT	40
FUELING_ANTI_THEFT_DERATE_STATE	ATDERAT	41
FUELING_PARTIAL_THROTTLE_LIMIT_STATE	PTTHLM	42
SS_AMBIENT_DERATE_STATE	SSAMBTDR	43
TRANSIENT_COOLANT_DERATE_STATE	TSCOOLDR	44
FUELING_RMG_STATE	RMG	45
FUELING_AIR_DENSITY_LIMIT_STATE	AIRDENLM	46
FUELING_CHI_FUEL_LIMIT_STATE	CHIFULLM	47
FUELING_TFC_DERATE_STATE	TFCDERAT	48
FUELING_CBR_GROSS_FUEL_OVERRIDE_STATE	GROSSOVR	49
FUELING_CHM_DERATE_STATE	CHMDERAT	50
FUELING_JCOMM_PTP_DERATE_STATE	JCPTPDER	51
FUELING_AUX_NDOT_STATE	AUXNDOT	52

Combustion_Control_Path_Owner **Mach_Control_Path_Owner**	**Inc_Dec_Controller** **Engn_Control_Path_Owner**
State	**Enumeration**
CTRL_NONE_SELECTED	0
CTRL_JCOMM_TORQUE	1
CTRL_JCOMM_SPEED	2
CTRL_PTO	4
CTRL_LIMP_HOME_TORQUE	6
CTRL_ABS	7
CTRL_ABT	8
CTRL_C	9
CTRL_RSC	10
CTRL_LSI	11
CTRL_HSI	12
CTRL_TURBO_OVERSPEED	15
CTRL_OFC_FUEL_LIMIT	16
CTRL_TRANSIENT_NOISE	17
CTRL_EPD_SPEED	18
CTRL_TORQUE_CURVE	19
CTRL_JCOMM_TORQUE_DERATE	20
CTRL_OOG_TORQUE_LIMIT	21
CTRL_CRANK	22
CTRL_RETARDER	24
CTRL_ENGINE_OVERSPEED	25
CTRL_STOP	26
CTRL_SHUTDOWN	27
CTRL_FSS_DERATE	28
CTRL_EPD_TORQUE_LIMIT	29
CTRL_ENGINE_START_OIL_LIMIT	33
CTRL_PTO_TORQUE_LIMIT	34
CTRL_POWERTAIN_PROTECTION	36
CTRL_AIR_DENSITY_FUEL_LIMIT	46
CTRL_CHI_FUEL_LIMIT	47
CTRL_TFC_FUEL_LIMIT	48
CTRL_GROSS_FUEL_OVERRIDE	49
CTRL_CHM_TORQUE_LIMIT	50
CTRL_LIMP_HOME_SPEED	52
CTRL_TIS_DYNO	53
CTRL_ESCC	54
CTRL_VSS_DIAGNOSTICS	55
CTRL_WPD	56
CTRL_TSD	57
CTRL_EWP	58
CTRL_JCOMM_SPEED_LIMIT	59
CTRL_ANTI_THEFT	60
CTRL_FIW	61
CTRL_FIW_RAMP	62
CTRL_AFW	63
CTRL_FUEL_OVERRIDE	65
CTRL_REGEN	66
CTRL_RTD	67
CTRL_IRD	68
CTRL_FSS_TRQ_DERATE	256
EPD_FUEL_TEMP	514

CBL_Fuel_State	CBR_Fuel_Ref_State
State	**Decimal Value**
FUELING_OFC_DERATE_STATE	16
FUELING_OVERRIDE_STATE or CTRL_FUEL_OVERRIDE	23
FUELING_FSS_DERATE_STATE	29
FUELING_AIR_DENSITY_LIMIT_STATE	46
FUELING_CHI_FUEL_LIMIT_STATE	47
FUELING_TFC_DERATE_STATE	48
FUELING_GROSS_OVERRIDE_STATE	49

FAN CONTROL:

Fan_Drive_State	
State	**Bit Mask**
Fan is off	0000
Intake air temperature	0010
Engine coolant temperature	0100
manual control or datalink	1001
A/C system	1011
Timer (fan_clutch_tool_request)	1100
Engine Brake	1101
Other (Fuel Temperature, OEMP,OEMT,OEMP2,OEMT2)	1110

FAST IDLE WARMUP:

FIW_State	
State	**Enumeration**
FIW_INACTIVE	0
FIW_DELAY	1
FIW_INITIALIZATION	2
FIW_ACTIVE	3

GEAR DOWN / OUT OF GEAR PROTECTION:

RSC_GD_State	
State	**Enumeration**
INACTIVE	0
ACTIVE_HEAVY_LOAD	1
ACTIVE_LIGHT_LOAD	2

RSC_GearEvaluation	
State	**Enumeration**
LOW_GEAR	1
NEXT_GEAR	2
TOP_GEAR	3

HOT SHUTDOWN:

C_TIB_GHS_EWP_Input_Type Generic_Hot_Shutdown_EWP_Input	
State	**Enumeration**
NONE	0
CT	1
IMT	2
OIL_TEMP	3
OIL_PRES	4

IDLE VALIDATION:

(csdd_mca_accel & csdd_mca_accel.dct)

Idle_Validation_State	
State	**Decimal Value**
NOT_SUPPORTED	2
ERROR	3
NOT_IDLE	0
IDLE	1

POWER TAKE OFF (PTO):

PTO_Status	
State	**Enumeration**
Inactve	0
Active	1

PTO_State	
State	**Enumeration**
Remote	1
Waiting	2
Normal	3

SENSOR ERROR INFORMATION (IN-RANGE)::

H_Charge_Press_IR_Error	
State	**Decimal Value**
GOOD	0
SUSPECT	1
FAILED	2

SENSOR SOURCE INFORMATION (A/D SENSORS):

Air_Press_Source
Ambient_Air_Press_Source
Ambient_Air_Tmptr_Source
Charge_Press_Source
Charge_Press_Gage_Source
Charge_Tmptr_Source
EGR_Orifice_Tmptr_Source
Compressor_Inlet_Tmptr_Source
EGR_Orifice_Delta_Press_Source
EGR_Position_Source
Exhaust_Press_Source
Turbo_Speed_Source
VGT_Position_Source

State	**Decimal Value**
PRIMARY	0
BACKUP	-2
DEFAULT	-4

SENSOR SOURCE INFORMATION (ESTIMATES AND VIRTUAL):

Ambient_Air_Tmptr_Source
Charge_Flow_Source
Charge_Saturation_Tmptr_Source
Compressor_Inlet_Density_Source
Compressor_Inlet_Press_Source
Compressor_Outlet_Tmptr_Source
EGR_Flow_Source
EGR_Valve_Delta_Press_Source
Engine_Delta_Press_Source
Exhaust_Saturation_Tmptr_Source
Exhaust_Tmptr_Source
Fresh_Air_Flow_Source

State	**Decimal Value**
PRIMARY	0
BACKUP	-2
DEFAULT	-4

Surge_Margin_Source	
State	**Decimal Value**
PRIMARY	0
SM_BACKUP	1
SM_DEFAULT	2

SENSOR STATE INFORMATION (A/D SENSORS):

Charge_Press_State
Charge_Tmptr_State
Compressor_Inlet_Tmptr_State
EGR_Orifice_Tmptr_State
Exhaust_Press_State
Internal_Tmptr_State

State	**HEX**
Good	0000
Suspect	0001
Failed	0002

SENSOR STATE INFORMATION (ESTIMATES):

Charge_Press_EStat
Charge_Tmptr_EStat
Exhaust_Press_Estat

State	**Decimal Value**
GOOD	0
EST_SUSPECT	1
EST_FAILED	2

SENSOR STATUS INFORMATION (A/D SENSORS)::

Ambient_Air_Press_Status **EGR_Orifice_Tmptr_Status**
Boost_Pressure_Status **Turbo_Speed_Status**
Compressor_Inlet_Tmptr_Status

State	**Decimal Value**
Data Valid	0
Config Error / Default	-1
Supply Error active / Default	-2
Backup	-3
Default	-5

SENSOR CONFIDENCE INFORMATION (A/D SENSORS)::

FSI_s_FuelTempConfidence	
State	**Decimal Value**
Data Valid	0
Invalid Hardware Resource	-1
Signal OOR, but not timed out – suspect	-2
Signal OOR, timed out	-5

SETUP FOR DYNO:

(csdd_mca_tis & csdd_mca_tis.dct)

Setup_For_Dyno_Test_State	
State	**Decimal Value**
INACTIVE	0
TIMER_EXPIRED	6
ECM_PROHIBITED	4
ACTIVE_WITH_EPD	5
ACTIVE_APP_THROTTLE	3
ACTIVE_TEST_THROTTLE	2

STATIONARY REGENERATION:

(csdd_powertrain_mgr)

PTM_Regen_Oper_State	
State	**Decimal Value**

TRIP INFORMATION:

Trip_Info_State		
State	**Word**	**Bit**
TI_EPF_DERATE	0	0
TI_AIR_COMPRESSOR	0	1
TI_BATTERY_AUTO_START	0	2
TI_BLOCK_AUTO_START	0	3
TI_BUNK_AUTO_START	0	4
TI_ENGINE_ESP	0	5
TI_DRIVER_REWARD_1	0	6
TI_DRIVER_REWARD_2	0	7
TI_DRIVER_REWARD_3	0	8
TI_VEHICLE_ESP	0	9
TI_FAN_DUE_TO_EXT	0	10
TI_FAN_DUE_TO_AC	0	11
TI_FAN_DUE_TO_ENGINE	0	12
TI_FAN_1_WITH_MPH	0	13
TI_FAN_1_WITHOUT_MPH	0	14
TI_VEHICLE_OUT_OF_GEAR	0	15
TI_ENGINE_DRIVE	1	0
TI_ENGINE_IDLE	1	1
TI_FAST_ENGINE_IDLE	1	2
TI_ENGINE_PTO	1	3
TI_HOT_SHUTDOWN	1	4
TI_WARMUP_VIOLATION	1	5
TI_IDLE_SHUTDOWN	1	6
TI_IDLE_SHUTDOWN_OVERRIDE	1	7
TI_ENGINE_REVVING	1	8
TI_ENGINE_OVERREV	1	9
TI_VEHICLE_DRIVE	1	10
TI_VEHICLE_PTO	1	11
TI_CRUISE	1	12
TI_RSG	1	13
TI_VEHICLE_COAST	1	14
TI_VEHICLE_ABOVE_SWEET_SPOT	1	15
TI_VEHICLE_BELOW_SWEET_SPOT	2	0
TI_VEHICLE_BRAKE	2	1
TI_TOP_GEAR	2	2
TI_GEAR_DOWN	2	3
TI_ENGINE_BRAKES	2	4
TI_VEHICLE_OVERSPEED_1	2	5
TI_VEHICLE_OVERSPEED_2	2	6
TI_VEHICLE_DECELERATION	2	7
TI_ECM	2	8
TI_FAN_2_ON	2	9
TI_ENGINE_ON	2	10
TI_VEHICLE_PTO_LOADED_AND_NOT_MOVING	2	11
TI_VEHICLE_PTO_LOADED_AND_MOVING	2	12
TI_AUTO_START	2	13
TI_ENGINE_SLEEP_IDLE	2	14
TI_EPF_TORQUE_DERATE	2	15
TI_EPF_RPM_DERATE	3	0
TI_EPD_SHUTDOWN	3	1
TI_EPD_SHUTDOWN_OVERRIDE	3	2

VEHICLE SPEED SENSOR:

T_TSP_SensorType	
State	**Enumeration**
No Sensor	0
Inductance Vehicle_Speed Sensor	1
Tachograph Sensor	2
Datalink Tailshaft Speed	3
Datalink Road Speed	4

T_GEAR_VSSTransmission	
State	**Enumeration**
Manual	0
Automatic	1
FULL_AMT	2
PART_AMT	3
AUTO_WITHOUT_CLUTCH	4

VGT:

VGT_Service_State	
State	**Enumeration**
None	0
Self Calibration	1
Hysteresis Test	2
Step Response Test	3
Learn	4
Override	6

J39_VGT_Actuator_State	
State	**Enumeration**
Position Control	1
Self Calibration	2
Learn	3
Hysterisis Test	4
Step Response	5
Override	6
Loss of Communication	7
Motor Off Diagnostic	8

J39_VGT_Actuator_Status		
State	**HEX**	**Associated Fault Code**
ACTUATOR_ERROR_BYTE	00FF	
ACTUATOR_OVER_TEMPERATURE	0001	1962
ACTUATOR_CLOSING_ERROR	0003	2387 / 9798
ACTUATOR_RESPONSE_ERROR	0004	2387 / 9798
ACTUATOR_ELECTRICAL_ERROR	0005	1897
ACTUATOR_VOLTAGE_SUPPLY_ERROR	0006	
ACTUATOR_CMD_SOURCE_TIMEOUT	0008	2198
ACTUATOR_SPAN_TOO_LARGE	0009	2387 / 9798
ACTUATOR_OUT_OF_TOLERANCE	000A	2387 / 9798
ACTUATOR_NO_CMD_SOURCE	000B	2198
COMM_TIMEOUT_ERROR_BIT	0100	
SW_ID_ERROR_BIT	0200	
SW_ID_TIMEOUT_ERROR_BIT	0400	

J39_VGT_Command_State	
State	**Enumeration**
None	0
Temperature Fault	1
Temperature Warning	2
Actuation Error	3
No Actuator Response	4
Motor Disabled by Internal Diagnostics	5
Running Internal Test Sequence	7
CAN Command Source Timeout	8
Learned Stop Span too Large	9
100 Stop High / 0 Stop Low	10
No Command Source Present	11
Low Voltage to Actuator	15
Effort Has Been Limited	22
Reference Not Found	23

VGA_DL_Mode_Command	
State	**HEX**
ACTUATOR_POWER_ON	8000
ACTUATOR_POSITION_CONTROL_STATE	0001
ACTUATOR_CALIBRATE_STATE	0002
ACTUATOR_LEARN_STATE	0003
ACTUATOR_HYSTERESIS_TEST_STATE	0004
ACTUATOR_STEP_RESP_TEST_STATE	0005
ACTUATOR_OVERRIDE_STATE	0006

VGT_Actuator_Error_Status	
State	**Enumeration**
DEVICE_OK	0
DEVICE_INOPERABLE	1

VGT_Service_State	
State	**Enumeration**
SERVICE_VGT_NONE	0
SERVICE_VGT_SELF_CAL	1
SERVICE_VGT_HYSTERESIS_TEST	2
SERVICE_VGT_STEP_RESP_TEST	3
SERVICE_VGT_LEARN	4
SERVICE_VGT_OVERRIDE	6

WATER-IN-FUEL (WIF):

(csdd_cagt_eem & csdd_cagt_eem.dct)

EEM_WIFState	
State	**Decimal Value**
NO_WATER_DETECTED	0
WATER_DETECTED	1

CM870 and CM875 FAULT CODE LIST

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
111	X	X	Engine Control Module Critical Internal Failure - Bad Intelligent Device or Component. Error internal to the ECM related to memory hardware failures or internal ECM voltage supply circuits.	Engine may not start.
115	X	X	Engine Magnetic Speed/Position Lost Both of Two Signals - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the primary and backup speed sensor signals are connected backwards.	
122	X	X	Intake Manifold 1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the intake manifold pressure circuit.	Engine power derate.
123	X	X	Intake Manifold 1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the intake manifold pressure circuit.	Engine power derate.
131	X	X	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at accelerator pedal position #1 signal circuit.	Severe derate in power output of the engine. Limp home power only.
132	X	X	Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at accelerator pedal position #1 signal circuit.	Severe derate in power output of the engine. Limp home power only.
133	X	X	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at remote accelerator position signal circuit.	Remote accelerator will not operate. Remote accelerator position will be set to zero percent.
134	X	X	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at remote accelerator position signal circuit.	Remote accelerator will not operate. Remote accelerator position will be set to zero percent.
135	X	X	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the engine oil pressure circuit.	None on performance. No engine protection for oil pressure.
141	X	X	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at engine oil pressure circuit.	None on performance. No engine protection for oil pressure.
143	X	X	Engine Oil Rifle Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. Engine oil pressure signal indicates engine oil pressure is below the engine protection warning limit.	Progressive power derate increasing in severity from time of alert.
144	X	X	Engine Coolant Temperature 1 Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at engine coolant temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for engine coolant temperature.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
145	X	X	Engine Coolant Temperature 1 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine coolant temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for engine coolant temperature.
151	X	X	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Engine coolant temperature signal indicates engine coolant temperature above engine protection critical limit.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after Red Stop Lamp starts flashing.
153	X	X	Intake Manifold 1 Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at intake manifold air temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for intake manifold air temperature.
154	X	X	Intake Manifold 1 Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at intake manifold air temperature circuit.	Possible white smoke. Fan will stay ON if controlled by ECM. No engine protection for intake manifold air temperature.
155	X	X	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Intake manifold air temperature signal indicates intake manifold air temperature above engine protection critical limit.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after Red Stop Lamp starts flashing.
187	X	X	Sensor Supply 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the sensor supply number 2 circuit.	Engine power derate.
195	X	X	Coolant Level Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at engine coolant level circuit.	None on performance.
196	X	X	Coolant Level Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine coolant level circuit.	None on performance.
197	X	X	Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low engine coolant level detected.	None on performance.
212	X	X	Engine Oil Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at engine oil temperature circuit.	No engine protection for engine oil temperature.
213	X	X	Engine Oil Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine oil temperature circuit.	No engine protection for engine oil temperature.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
214	X	X	Engine Oil Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Engine oil temperature signal indicates engine oil temperature above engine protection critical limit.	Progressive speed derate increasing in severity from time of alert. If the Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after red stop lamp starts flashing.
221	X	X	Barometric Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at barometric pressure circuit.	Engine power derate.
222	X	X	Barometric Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at barometric pressure circuit.	Engine power derate.
227	X	X	Sensor Supply 2 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply number 2 circuit.	Engine power derate.
234	X	X	Engine Crankshaft Speed/Position - Data Valid but Above Normal Operational Range - Most Severe Level. Engine speed signal indicates engine speed above engine protection limit.	Fuel injection disabled until engine speed falls below the overspeed limit.
238	X	X	Sensor Supply 3 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected on the +5 volt sensor supply circuit to the engine speed sensor.	Possible hard starting and rough running.
241	X	X	Wheel-Based Vehicle Speed - Data Erratic, Intermittent, or Incorrect. The ECM lost the vehicle speed signal.	Engine speed limited to Maximum Engine Speed without VSS parameter value. Cruise control, gear-down protection, and road speed governor will not work.
242	X	X	Wheel-Based Vehicle Speed Sensor Circuit tampering has been detected - Abnormal Rate of Change. Signal indicates an intermittent connection or VSS tampering.	Engine speed limited to Maximum Engine Speed without VSS parameter value. Cruise control, gear-down protection, and road speed g+H53overnor will not work.
245	X	X	Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the fan control circuit when commanded on.	The fan may stay on continuously or not run at all.
249	X	X	Ambient Air Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at ambient air temperature circuit.	None on performance. The idle shutdown ambient air temperature override feature will use the intake manifold air temperature sensor value to determine idle shutdown and availability of override.
254	X	X	Engine Fuel Shutoff Valve Driver Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at fuel shutoff valve circuit.	Fuel shutoff valve will close. Engine will shutdown.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
255	X	X	Engine Fuel Shutoff Valve Driver Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or short to voltage source detected at fuel shutoff valve circuit.	Fuel shutoff valve may **not** open when keyswitch is in ON position, or may **not** close when keyswitch is OFF position.
256	X	X	Ambient Air Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at ambient air temperature circuit.	None on performance. The idle shutdown ambient air temperature override feature will use the intake manifold air temperature sensor value to determine idle shutdown and availability of override.
257	X	X	Engine Fuel Shutoff Valve Driver - Mechanical System Not Responding Properly or Out of Adjustment. Fuel shutoff valve is stuck open mechanically or leaking.	Engine power derate.
263	X		Engine Fuel Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at engine fuel temperature circuit.	May have white smoke and low power when engine is cold.
265	X		Engine Fuel Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at engine fuel temperature circuit.	May have white smoke and low power when engine is cold.
285	X	X	SAE J1939 Multiplexing PGN Timeout Error - Abnormal Update Rate. The ECM expected information from a multiplexed device but did not receive it soon enough or did not receive it at all.	At least one multiplexed device will not operate properly.
286	X	X	SAE J1939 Multiplexing Configuration Error - Out of Calibration. The ECM expected information from a multiplexed device but only received a portion of the necessary information.	At least one multiplexed device will not operate properly.
287	X	X	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error. The OEM vehicle electronic control unit (VECU) detected a fault with its accelerator pedal.	Engine may only idle or engine will not accelerate to full speed.
288	X	X	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System - Received Network Data In Error. The OEM vehicle electronic control unit (VECU) detected a fault with the remote accelerator.	The engine will not respond to the remote throttle. Engine may only idle. The primary or cab accelerator may be able to be used.
295	X	X	Barometric Pressure - Data Erratic, Intermittent, or Incorrect. An error in the barometric pressure sensor signal was detected by the ECM.	Engine power derate.
311		X	Injector Solenoid Driver Cylinder 1 Circuit - Current Above Normal, or Grounded Circuit. Current detected at injector Number 1 when voltage is turned off.	Current to injector is shut off.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
312		X	Injector Solenoid Driver Cylinder 5 Circuit - Current Above Normal, or Grounded Circuit. Current detected at injector Number 5 when the voltage is turned off.	Current to injector is shut off.
313		X	Injector Solenoid Driver Cylinder 3 Circuit - Current Above Normal, or Grounded Circuit. Current detected at injector Number 3 when the voltage is turned off.	Current to injector is shut off.
314		X	Injector Solenoid Driver Cylinder 6 Circuit - Current Above Normal, or Grounded Circuit. Current detected at injector Number 6 when the voltage is turned off.	Current to injector is shut off.
315		X	Injector Solenoid Driver Cylinder 2 Circuit - Current Above Normal, or Grounded Circuit. Current detected at injector Number 2 when the voltage is turned off.	Current to injector is shut off.
319	X	X	Real Time Clock Power Interrupt - Data Erratic, Intermittent, or Incorrect. Real Time Clock lost power.	None on performance. Data in the ECM will not have accurate time and date information.
321		X	Injector Solenoid Driver Cylinder 4 Circuit - Current Above Normal, or Grounded Circuit. Current detected at injector Number 4 when the voltage is turned off.	Current to injector is shut off.
322		X	Injector Solenoid Driver Cylinder 1 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 1 circuit or no current detected at Number 1 Injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
323		X	Injector Solenoid Driver Cylinder 5 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 5 circuit or no current detected at Number 5 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
324		X	Injector Solenoid Driver Cylinder 3 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 3 circuit or no current detected at Number 3 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
325		X	Injector Solenoid Driver Cylinder 6 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 6 circuit or no current detected at Number 6 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
331		X	Injector Solenoid Driver Cylinder 2 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 2 circuit or no current detected at Number 2 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
332		X	Injector Solenoid Driver Cylinder 4 Circuit - Current Below Normal, or Open Circuit. High resistance detected on injector Number 4 circuit or no current detected at Number 4 injector driver or return pin when the voltage supply at the harness is on.	Engine can possibly misfire or run rough.
338	X	X	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or short to voltage source detected at the idle shutdown vehicle accessory/ignition bus relay circuit.	Vehicle accessories or ignition bus loads controlled by the idle shutdown relay will **not** power up.
339	X	X	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the idle shutdown vehicle accessory or ignition bus relay circuit when commanded on.	Vehicle accessories controlled by the idle shutdown vehicle accessory relay will **not** power down.
343	X	X	Engine Control Module Warning Internal Hardware Failure - Bad Intelligent Device or Component. Internal ECM failure.	No perfomance effects or severe power derate.
351		X	Injector Power Supply - Bad Intelligent Device or Component. The ECM measured injector boost voltage is low.	Possible smoke, low power, engine misfire, and/or engine will not start.
352	X	X	Sensor Supply 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at sensor supply number 1 circuit.	Engine power derate.
386	X	X	Sensor Supply 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply number 1 circuit.	Engine power derate.
415	X	X	Engine Oil Rifle Pressure - Data Valid but Below Normal Operational Range - Most Severe Level. Oil pressure signal indicates oil pressure below the engine protection critical limit.	Progressive power derate increasing in severity from time of alert. If Engine Protection Shutdown feature is enabled, engine will shut down 30 seconds after red stop lamp starts flashing.
418	X	X	Water in Fuel Indicator - Data Valid but Above Normal Operational Range - Least Severe Level. Water has been detected in the fuel filter.	Possible white smoke, loss of power, or hard starting.
427	X	X	SAE J1939 Datalink - Abnormal Update Rate. Communication between the electronic control module (ECM) and another device on the SAE J1939 data link has been lost.	Engine speed will ramp down and remain at idle.
428	X	X	Water in Fuel Indicator Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at the water in fuel circuit.	None on performance. No water in fuel warning available.
429	X	X	Water in Fuel Indicator Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the water in fuel circuit.	None on performance. No water in fuel warning available.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
435	X	X	Engine Oil Rifle Pressure - Data Erratic, Intermittent, or Incorrect. An error in the engine oil pressure switch signal was detected by the ECM.	None on performance. No engine protection for oil pressure.
449	X		Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level. High fuel pressure was detected at the fuel rail.	The engine may produce black smoke and may be derated.
486	X		Injector Metering Rail 2 Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. An unexpectedly low fuel delivery was detected on the rear three cylinders.	Low power or rough idle.
546	X		Fuel Delivery Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the rail fuel pressure circuit.	Engine may crank longer than usual before starting, may have low power, white smoke, or run rough.
547	X		Fuel Delivery Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at rail fuel pressure circuit.	Engine may **not** start, may have low power, white smoke, or run rough.
559	X		Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. The ECM has detected that fuel pressure is lower than commanded pressure.	Possibly hard to start, low power, or engine smoke.
584	X	X	Starter Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at starter lockout circuit.	Either the engine will not start or the engine will not have starter lockout protection.
585	X	X	Starter Relay Driver Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at starter lockout circuit.	The engine will not have starter lockout protection.
595	X	X	Turbocharger 1 Speed - Data Valid but Above Normal Operational Range - Moderately Severe Level. High turbocharger speed has been detected.	Engine power derate. The ECM uses an estimated turbocharger speed.
596	X	X	Electrical Charging System Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level. High battery voltage detected by the battery voltage monitor feature.	Amber lamp will light until high battery voltage condition is corrected.
597	X	X	Electrical Charging System Voltage - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low battery voltage detected by the battery voltage monitor feature.	Amber lamp will light until low battery voltage condition is corrected.
598	X	X	Electrical Charging System Voltage - Data Valid but Below Normal Operational Range - Most Severe Level. Very low battery voltage detected by the battery voltage monitor feature.	Red lamp illuminated until very low battery voltage condition is corrected.
649	X	X	Engine Oil Change Interval - Condition Exists. Change engine oil and filter.	None on performance; maintenance reminder only.
687	X	X	Turbocharger 1 Speed - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low turbocharger speed detected by the ECM.	Engine power derate. The ECM uses an estimated turbocharger speed.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
689	X	X	Engine Crankshaft Speed/Position - Data Erratic, Intermittent, or Incorrect. Loss of signal from crankshaft sensor.	Engine can run rough. Possibly poor starting capability. Engine runs using backup speed sensor. Engine power is reduced.
691	X	X	Turbocharger 1 Compressor Inlet Temperature Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at turbocharger compressor inlet air temperature circuit.	Engine power derate.
692	X	X	Turbocharger 1 Compressor Inlet Temperature Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at turbocharger compressor inlet air temperature circuit.	Engine power derate.
731	X		Engine Speed / Position Camshaft and Crankshaft Misalignment - Mechanical System Not Responding Properly or Out of Adjustment. Engine position signal from the engine speed sensor and camshaft position sensor do not match.	Engine will run derated. Excessive smoke, hard start, and rough idle possible.
778	X	X	Engine Camshaft Speed / Position Sensor - Data Erratic, Intermittent, or Incorrect. The ECM has detected an error in the camshaft position sensor signal.	Possible poor starting. Engine power derate.
784	X	X	Adaptive Cruise Control Mode - Data Erratic, Intermittent, or Incorrect. Loss of communication with adaptive cruise control.	Adaptive cruise control will **not** operate. Standard cruise control may **not** operate.
1117	X	X	Power Supply Lost With Ignition On - Data Erratic, Intermittent, or Incorrect. Supply voltage to the ECM fell below 6.2 volts momentarily, or the ECM was not allowed to power down correctly (retain battery voltage for 30 seconds after key OFF).	Possible no noticeable performance effects or engine dying or hard starting. Fault information, trip information, and maintenance monitor data can be inaccurate.
1239	X	X	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at accelerator pedal position #2 signal circuit.	
1241	X	X	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at accelerator pedal position #2 signal circuit.	
1242	X	X	Accelerator Pedal or Lever Position Sensor 1 and 2 - Data Erratic, Intermittent, or Incorrect. Accelerator position sensors #1 and #2 are reading different values.	
1664	X	X	Catalyst Missing - Condition Exists. The aftertreatment particulate trap in the exhaust system is not present in the aftertreatment system.	The aftertreatment system will be disabled.
1665	X	X	Exhaust Gas Temperature 1 Circuit - Voltage Below Normal, or Shorted to Low Source. High signal voltage detected at the exhaust gas temperature 1 sensor circuit.	

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1666	X	X	Exhaust Gas Temperature 1 Circuit - Voltage Above Normal, or Shorted to High Source. Low signal voltage detected at the exhaust gas temperature 1 sensor circuit.	
1667	X	X	Exhaust Gas Temperature 1 - Data Erratic, Intermittent, or Incorrect. The exhaust gas temperature 1 is not changing with engine operating conditions.	
1674	X	X	Exhaust Gas Temperature 2 Circuit - Voltage Below Normal, or Shorted to Low Source. High signal voltage detected at the exhaust gas temperature 2 sensor circuit.	
1675	X	X	Exhaust Gas Temperature 2 Circuit - Voltage Above Normal, or Shorted to High Source. Low signal voltage detected at the exhaust gas temperature 2 sensor circuit.	
1676	X	X	Exhaust Gas Temperature 2 - Data Erratic, Intermittent, or Incorrect. The exhaust gas temperature 2 is not changing with engine operating conditions.	
1687	X	X	Catalyst Over Temperature - Data Valid but Above Normal Operational Range - Most Severe Level. Very high temperatures have been detected in the aftertreatment system.	
1843	X	X	Crankcase Pressure Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the crankcase pressure pressure circuit.	No engine protection for high crankcase pressure.
1844	X	X	Crankcase Pressure Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the crankcase pressure circuit.	No engine protection for high crankcase pressure.
1876	X	X	Exhaust Gas Temperature 3 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the exhaust gas temperature 3 sensor circuit.	
1877	X	X	Exhaust Gas Temperature 3 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the exhaust gas temperature 3 sensor circuit.	
1878	X	X	Exhaust Gas Temperature 3 - Data Erratic, Intermittent, or Incorrect. The exhaust gas temperature 3 is not changing with engine operating conditions.	
1879	X	X	Aftertreatment Particulate Trap Differential Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the aftertreatment differential pressure sensor circuit.	Aftertreatment regeneration will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1881	X	X	Aftertreatment Particulate Trap Differential Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the aftertreatment differential pressure sensor circuit.	Aftertreatment regeneration will be disabled.
1882	X	X	Aftertreatment Particulate Trap Differential Pressure Sensor Autozero Failure - Condition Exists.	
1883	X	X	Aftertreatment Particulate Trap Differential Pressure Sensor - Data Erratic, Intermittent, or Incorrect.	
1893	X	X	EGR Valve Control Circuit - Abnormal Update Rate. No communications or invalid data transfer rate detected on the J1939 datalink between the ECM and the smart EGR controller.	EGR valve operation will be disabled.
1894	X	X	VGT Actuator Driver Circuit - Abnormal Update Rate. No communications or invalid data transfer rate detected on the J1939 datalink between the ECM and the smart VGT controller.	
1896	X	X	EGR Valve Controller - Out of Calibration. The EGR valve has failed the automatic calibration procedure.	
1897	X	X	VGT Actuator Controller - Bad Intelligent Device or Component. An internal error has been detected by the smart VGT controller.	
1898	X	X	VGT Actuator Controller - Out of Calibration. The VGT has failed the automatic calibration procedure.	
1899	X	X	Exhaust Gas Recirculation Valve Delta Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. The EGR differential pressure sensor has detected low EGR gas flow.	The EGR valve will be closed.
1922	X	X	Aftertreatment Particulate Trap Differential Pressure - Data Valid but Above Normal Operational Range - Most Severe Level.	
1923	X	X	Aftertreatment Fuel Shutoff Valve 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the aftertreatment fuel shutoff valve circuit.	Aftertreatment regeneration will be disabled.
1924	X	X	Aftertreatment Fuel Shutoff Valve 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the aftertreatment fuel shutoff valve circuit.	Aftertreatment regeneration will be disabled.
1925	X	X	Aftertreatment Fuel Shutoff Valve 1 - Data Erratic, Intermittent, or Incorrect.	
1926	X	X	Aftertreatment 1 Fuel Pressure Sensor - Data Erratic, Intermittent, or Incorrect.	
1927	X	X	Aftertreatment 1 Fuel Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the aftertreatment fuel pressure sensor circuit.	Aftertreatment regeneration will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1928	X	X	Aftertreatment 1 Fuel Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the aftertreatment fuel pressure sensor circuit.	Aftertreatment regeneration will be disabled.
1932	X	X	Aftertreatment Fuel Injector 1 - Data Erratic, Intermittent, or Incorrect. An error has been detected in doser	Flanagan is writing
1933	X	X	ECU Power Output Supply Voltage 2 - Data Valid but Above Normal Operational Range - Moderately Severe Level. High battery voltage detected by the smart EGR controller.	EGR valve actuation will be disabled.
1934	X	X	ECU Power Output Supply Voltage 2 - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low battery voltage detected by the smart EGR controller.	EGR valve actuation will be disabled.
1935	X	X	EGR Actuator Driver Circuit - Root Cause Not Known. Intermittent communication between the smart EGR valve controller and the ECM and been detected.	EGR valve actuation will be disabled.
1936	X	X	ECU Power Output Supply Voltage 2 - Voltage Above Normal, or Shorted to High Source.	
1937	X	X	ECU Power Output Supply Voltage 2 - Voltage Below Normal, or Shorted to Low Source.	
1938	X	X	ECU Power Output Supply Voltage 1 - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low battery voltage detected by the smart VGT controller.	
1939	X	X	ECU Power Output Supply Voltage 1 - Voltage Above Normal, or Shorted to High Source.	
1941	X	X	ECU Power Output Supply Voltage 1 - Voltage Below Normal, or Shorted to Low Source.	
1943	X	X	Ambient Air Density - Data Valid but Below Normal Operational Range - Least Severe Level. The engine has been derateed for a high altitude condition.	Possible engine derate.
1962	X	X	VGT Actuator Driver Over Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level. High internal temperature has been detected by the smart VGT controller.	
1977	X	X	#N/A	
2182		X	Engine Brake Actuator Driver 1 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage or open circuit detected at the engine brake solenoid number 1 signal circuit.	Engine brake on cylinders 1, 2, and 3 can not be activated or exhaust brake will not operate.
2183		X	Engine Brake Actuator Driver 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the engine brake solenoid number 1 signal circuit.	Engine brake on cylinders 1, 2, and 3 can not be activated or exhaust brake will not operate.

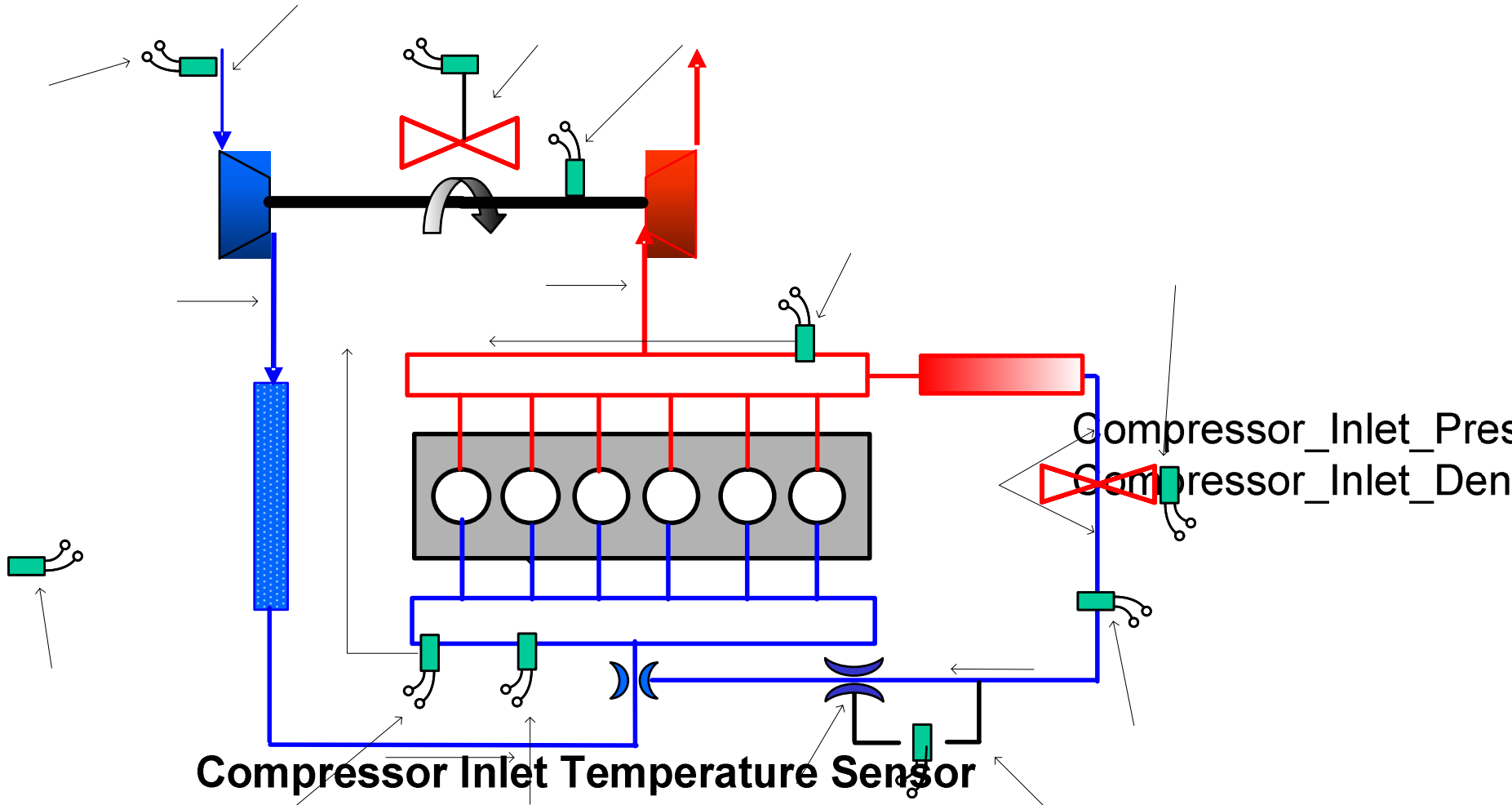
Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
2185	X	X	Sensor Supply 4 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at +5 volt sensor supply circuit to the accelerator pedal position sensor.	Engine will only idle.
2186	X	X	Sensor Supply 4 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at +5 volt sensor supply circuit to the accelerator pedal position sensor.	Engine will only idle.
2198	X	X	VGT Actuator Driver Circuit - Root Cause Not Known. Intermittent communication between the smart VGT controller and the ECM and been detected. The VGT controller is not interpreting the J1939 message from the ECM correctly.	
2215	X		Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. Low fuel pressure has been detected by the ECM.	Engine may **not** start, white smoke, run rough, or lose power.
2216	X		Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. High fuel pressure was detected at the fuel rail in the IFSM.	
2272	X	X	EGR Valve Position Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage has been detected at the EGR position sensor circuit.	
2273	X	X	Exhaust Gas Recirculation Valve Delta Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at EGR differential pressure sensor circuit.	EGR valve actuation will be disabled.
2274	X	X	Exhaust Gas Recirculation Valve Delta Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at EGR differential pressure sensor circuit.	EGR valve actuation will be disabled.
2311	X		Electronic Fuel Injection Control Valve Circuit - Condition Exists. Error detected on the front fueling actuator circuit.	Cylinders in front bank will **not** receive fuel. Engine will run rough with low power.
2312	X		Timing Actuator Driver Circuit - Condition Exists. Timing Actuator Number 1 Circuit Error. Error detected on the front timing actuator circuit.	Cylinders in front bank will **not** receive fuel. Engine will run rough with low power.
2313	X		Fuel Control Valve Solenoid Driver 2 Circuit - Condition Exists. Error detected on the rear fueling actuator circuit.	Cylinders in rear bank will **not** receive fuel. Engine will run rough with low power.
2314	X		Engine Timing Actuator Driver 2 Circuit Error - Condition Exists. Error detected on the rear timing actuator circuit.	Cylinders in rear bank will **not** receive fuel. Engine will run rough with low power.
2321	X		Engine Crankshaft Speed/Position - Data Erratic, Intermittent, or Incorrect. Crankshaft engine speed sensor intermittent synchronization.	Engine may exhibit misfire as control switches from the primary to the backup speed sensor. Engine power is reduced while the engine operates on the backup speed sensor.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
2346	X	X	Turbocharger Turbine Inlet Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level. Turbocharger turbine inlet temperature has exceeded the engine protection limit.	Engine power derate.
2347	X	X	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level. High turbocharger compressor outlet air temperature has been calculated by the electronic control module (ECM).	Fuel is limited in an attempt to decrease the calculated turbocharger compressor outlet air temperature.
2349	X	X	EGR Valve Control Circuit - Current Below Normal, or Open Circuit. Motor terminal or motor coil open circuit has been detected be the smart EGR controller.	
2351	X	X	EGR Valve Control Circuit - Voltage Below Normal, or Shorted to Low Source. Motor terminal short to ground or motor coil short has been detected by the smart EGR controller.	
2357	X	X	EGR Valve Control Circuit - Mechanical System Not Responding Properly or Out of Adjustment. EGR valve is not responding to commands from the ECM.	
2359	X	X	Exhaust Gas Recirculation Valve Delta Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. The EGR differential pressure sensor has detected high EGR gas flow or the EGR differential pressure reading is not valid for engine operating conditions.	EGR valve actuation will be disabled.
2363	X	X	Engine Brake Actuator Driver Output 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the engine brake solenoid number 2 signal circuit.	Engine brake on cylinders 4, 5, and 6 can not be activated.
2365	X	X	Engine Brake Actuator Driver Output 3 Circuit - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at the engine brake solenoid Number 3 signal circuit.	Engine brake on cylinders Number 4, 5, and 6 can **not** be activated.
2367	X	X	Engine Brake Actuator Driver Output 2 Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at the engine brake solenoid number 2 signal circuit.	Engine brake on cylinders 4, 5, and 6 can not be activated.
2368	X		Engine Brake Actuator Driver 3 Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at the engine brake solenoid Number 3 signal circuit.	Engine brake on cylinders Number 4, 5, and 6 may be on all the time, or can **not** be activated.
2372	X		Fuel Filter Differential Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. Fuel filter is plugged or fuel inlet restriction is high.	The engine can respond poorly after motoring and/or the engine can have low power at high engine speeds.
2373	X	X	Exhaust Gas Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at exhaust gas pressure	Engine power derate.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			circuit.	
2374	X	X	Exhaust Gas Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at exhaust gas pressure circuit.	Engine power derate.
2375	X	X	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at EGR temperature circuit.	EGR valve actuation will be disabled.
2376	X	X	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at EGR temperature circuit.	EGR valve actuation will be disabled.
2377	X	X	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source. Open circuit or high voltage detected at the fan control circuit.	The fan may stay on continuously or not run at all.
2387	X	X	VGT Actuator Driver Circuit (Motor) - Mechanical System Not Responding Properly or Out of Adjustment. The smart VGT controller has detected incorrect stop limits or the VGT is unable to move to the closed position.	
2551	X		Injector Metering Rail 2 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. Unexpected high fueling detected on the rear bank.	Engine will return to idle speed and possibly surge. The engine can be shutdown using the keyswitch.
2552	X		Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. Unexpected high fueling detected on the front bank.	Engine will return to idle speed and possibly surge. The engine can be shutdown using the keyswitch.
2554	X	X	Exhaust Gas Pressure - Data Erratic, Intermittent, or Incorrect. An error in the exhaust gas pressure sensor signal was detected by the ECM.	Engine power derate. The ECM will estimate the exhaust gas pressure.
2961	X	X	Exhaust Gas Recirculation Temperature - Data Valid but Above Normal Operational Range - Least Severe Level. EGR temperature has exceeded the engine protection limit.	Slight fueling derate to bring EGR temperature under the maximum limit.
2962	X	X	Exhaust Gas Recirculation Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level. EGR temperature has exceeded the engine protection limit.	Severe fueling derate to bring EGR temperature under the maximum limit.
2963	X	X	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Least Severe Level. Engine coolant temperature signal indicates engine coolant temperature is above engine protection warning limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.

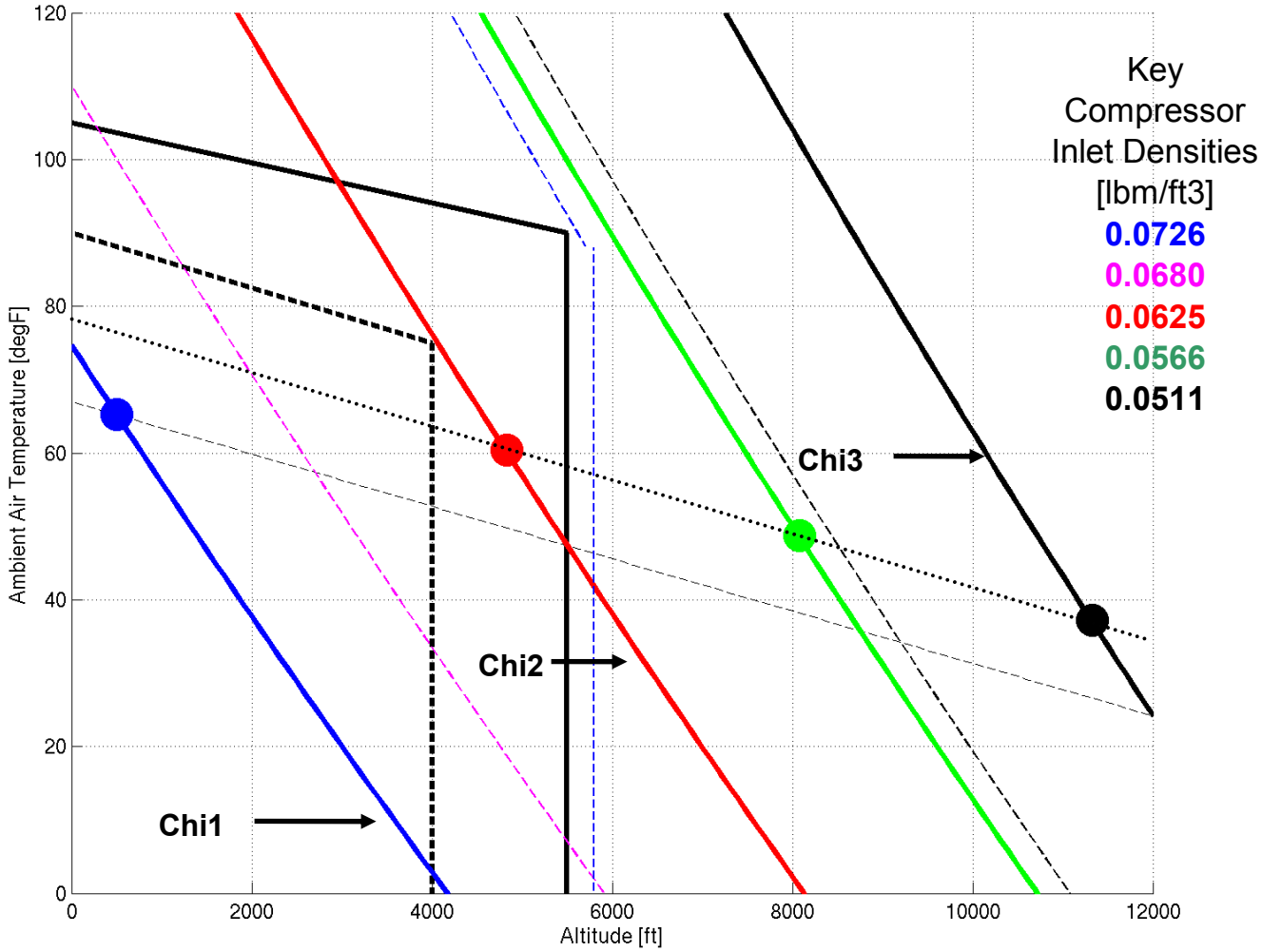
Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
2964	X	X	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Least Severe Level. Intake manifold air temperature signal indicates intake manifold air temperature is above the engine protection warning limit.	Progressive power derate increasing in severity from time of alert.
2973	X	X	Intake Manifold 1 Pressure - Data Erratic, Intermittent, or Incorrect. The ECM has detected an intake manifold pressure signal that is too high or low for current engine operating conditions.	Engine power derate
9511	X	X	The ERPT has detected a fault code.. Temporary fault code for ERPT.	
9513	X	X	The ERPT has detected a fault code.. Temporary fault code for ERPT.	
9613	X	X	REGEN required - Maintenance lamp. Perform stationary regen	
9798	X	X	VGT Actuator Driver Circuit (Motor) - Mechanical System Not Responding Properly or Out of Adjustment. Temporary fault code for 2387. Refer to 2387 troubleshooting.	
9814	X	X	Temporary fault code for 111. Amber lamp	
9815	X	X	Temporary fault code for 111. Amber lamp	
9816	X	X	Temporary fault code for 111. Amber lamp	

Air Handling Control System Overview:



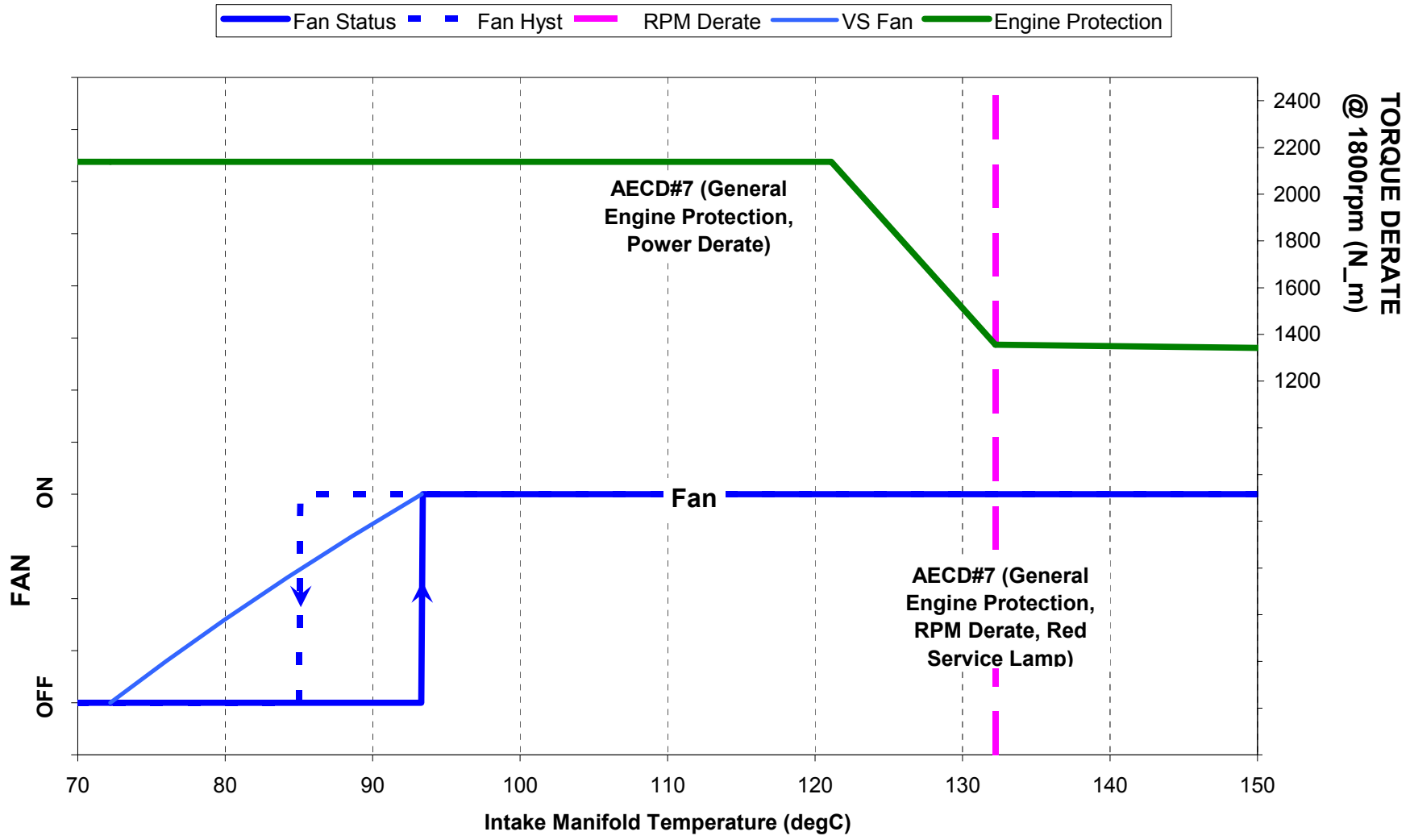
AECD and CHI Determination

Ambient Operating Conditions – Chi Value Determination – Eagle Red and Black:



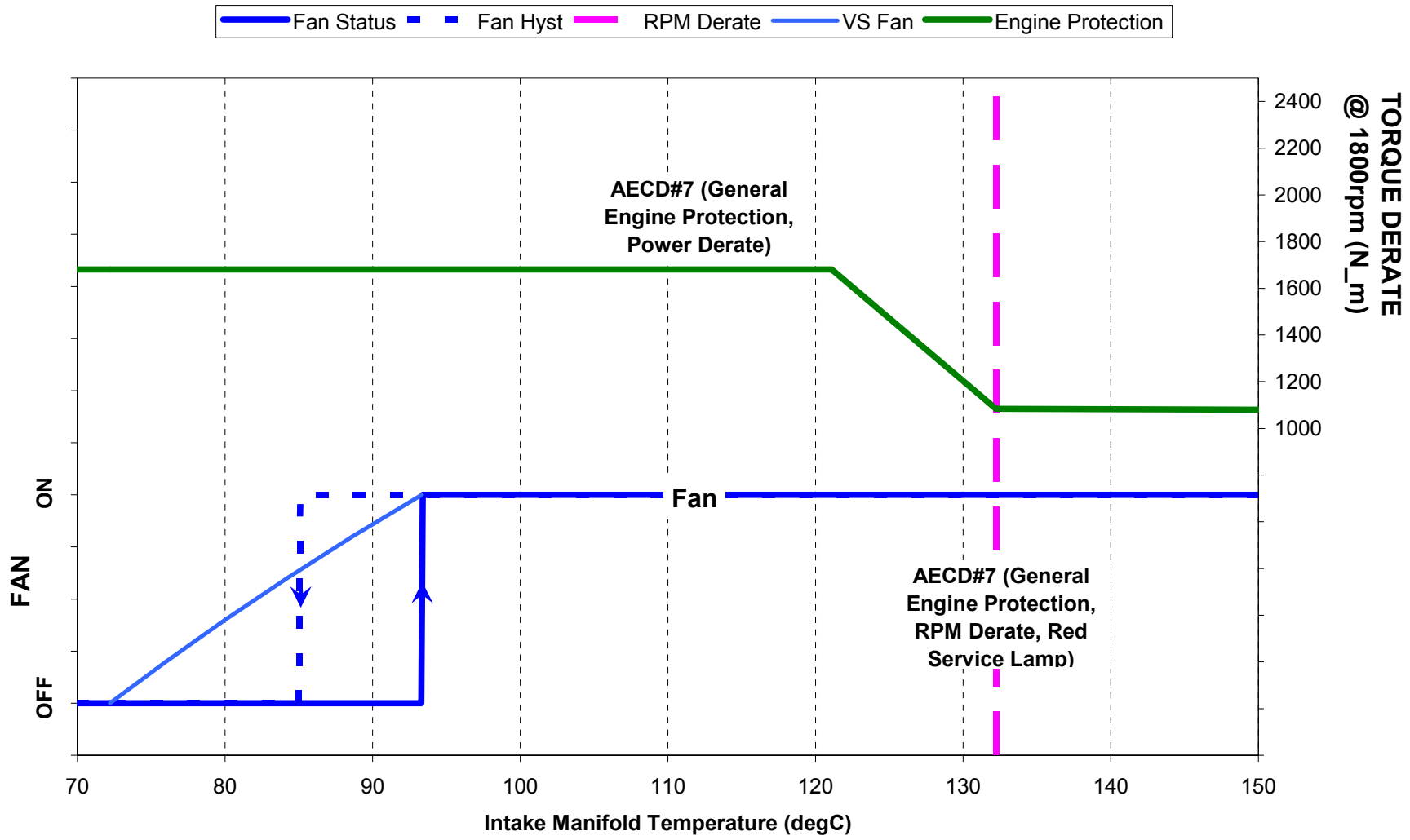
IMT Based Actions – Eagle Red

Intake Manifold Temperature Based Actions
Eagle Red Engines



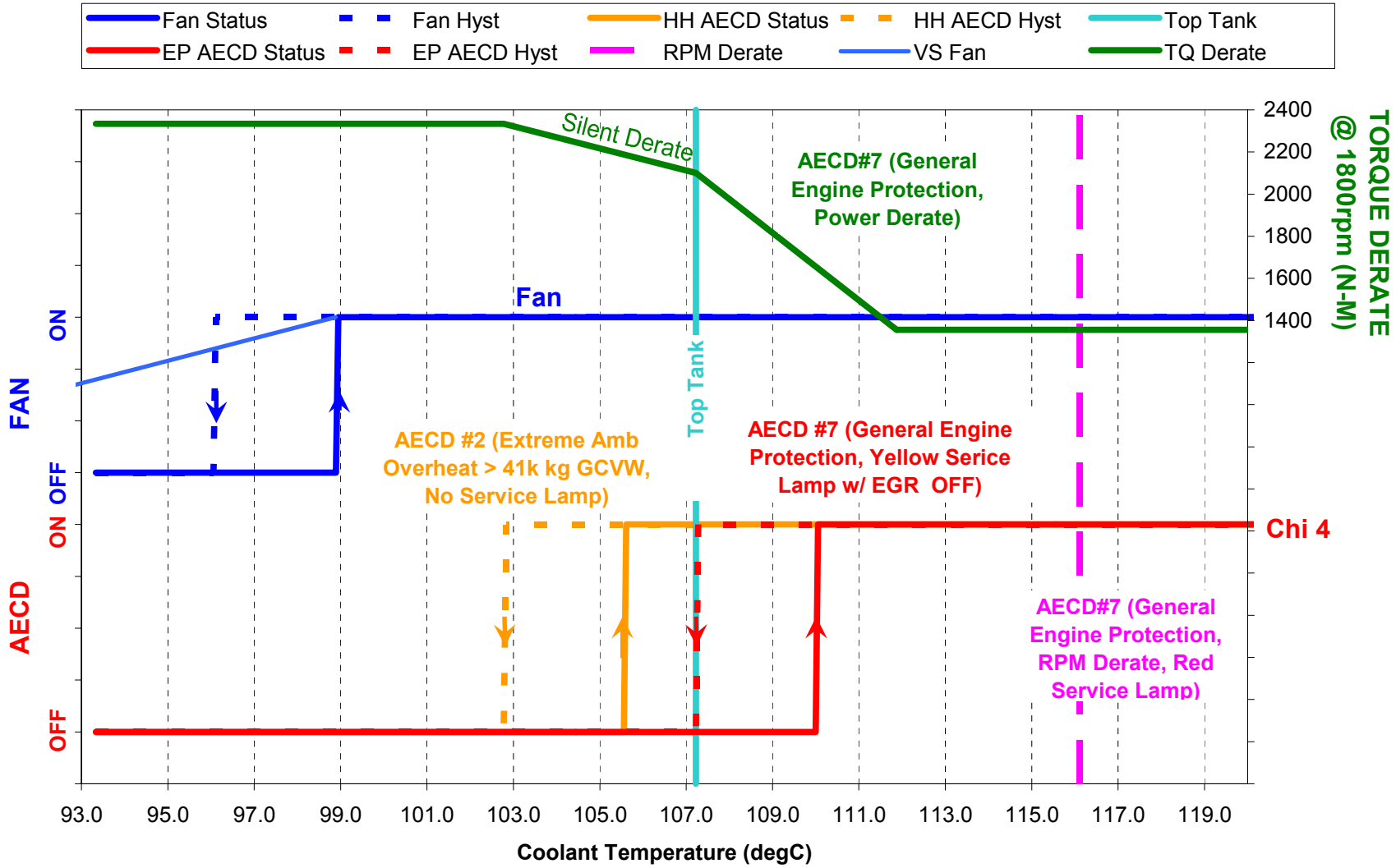
IMT Based Actions – Eagle Black

Intake Manifold Temperature Based Actions
Eagle Black Engines



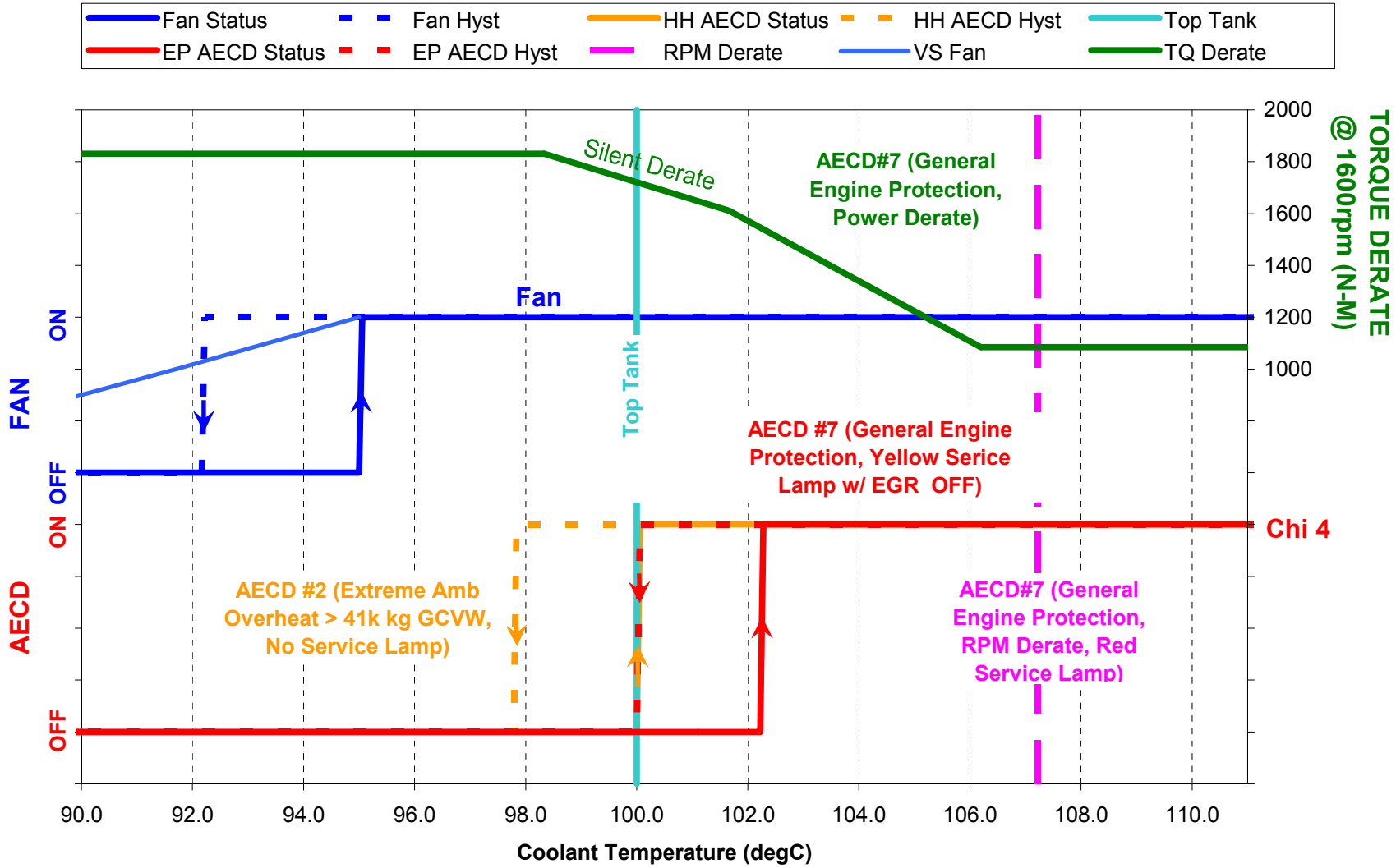
Coolant Based Actions – Eagle Red

Red Alpha Coolant Temperature Based Actions

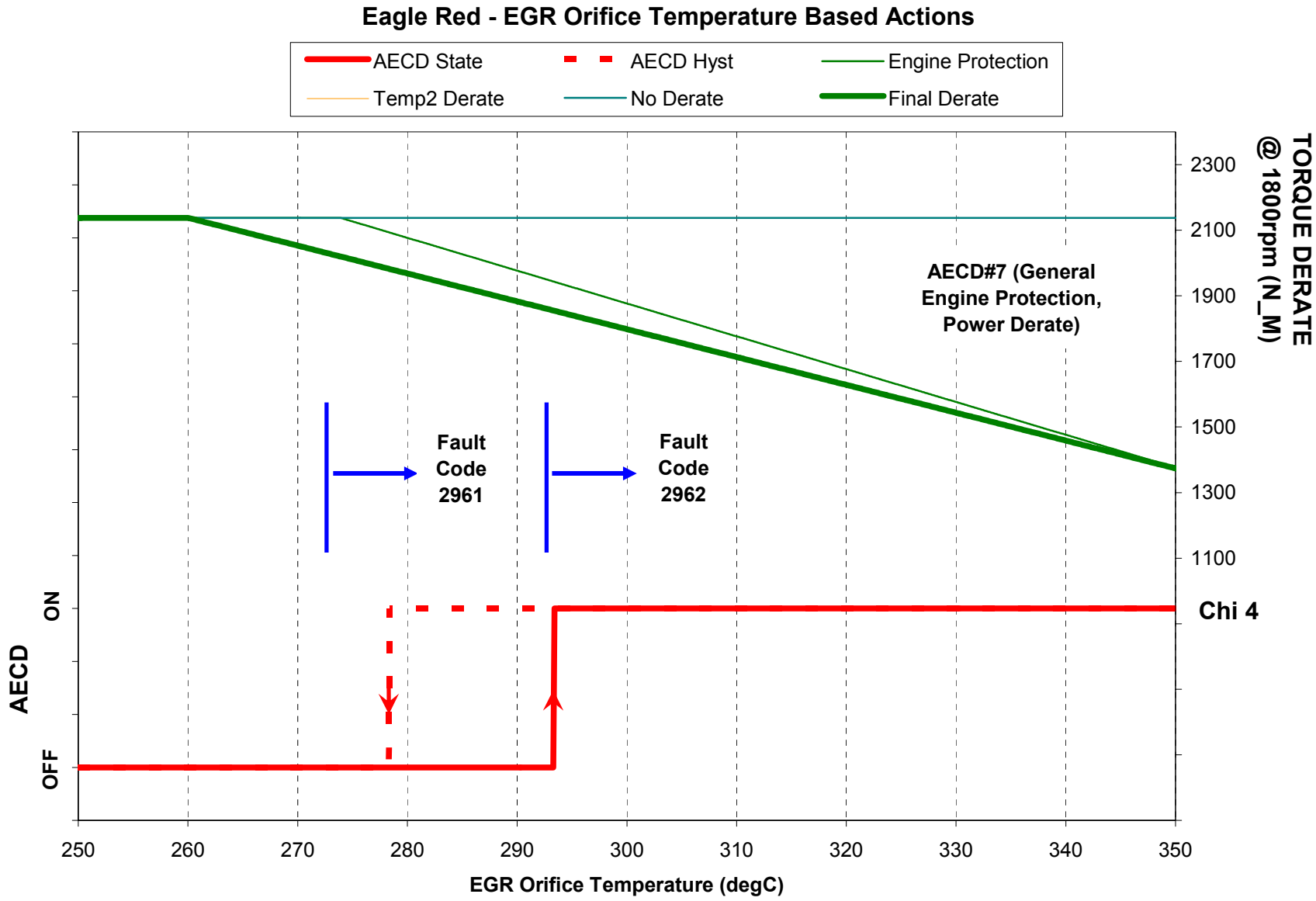


Coolant Based Actions – Eagle Black

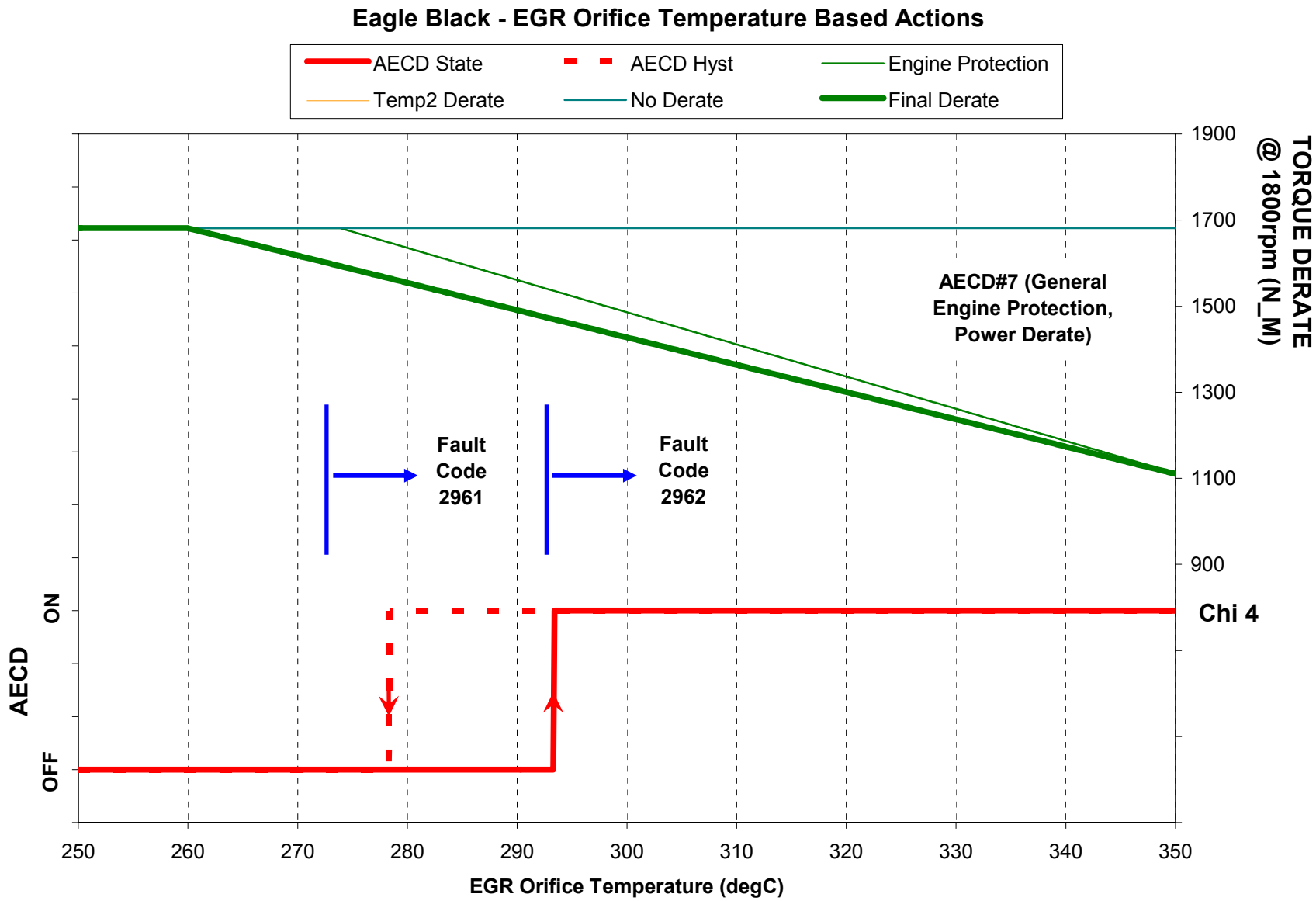
Eagle Black Coolant Temperature Based Actions



EGR Outlet Temperature Based Actions – Eagle Red



EGR Outlet Temperature Based Actions – Eagle Black



Stationary Regeneration Procedure

1. Turn keyswitch ON - ENGINE NOT RUNNING
2. Depress throttle pedal to 100% and hold
3. Depress and release service brake pedal 5 times
4. Release the throttle pedal
5. Depress and release service brake pedal 3 times
6. Depress the throttle pedal and hold for 5 seconds
7. Release the throttle pedal
8. The red stop engine lamp will illuminate on the dash
9. Start the engine
10. Engine speed will ramp and stationary regen will be performed

CUSTOMER / DRIVER SURVEY

Questions intended to encourage feedback on engine performance. Make record of vehicle configuration, engine model rating, transmission, axle, etc. Where possible use open ended questions to solicit driver feedback.

Customer Information

Driver Name: _____

Owner / Operator ☐ YES ☐ NO Unit #: _____

Fleet Driver ☐ YES ☐ NO Fleet Name: _____

Years of Driving Experience: _____

Other Engine(s) Driven or Familiar With: _____

Engine Model / Rating / ECM Calibration (if known): _____

How Long Have You Driven With This Engine? _____

Base Location: _____

Typical Route: (Check all that apply)

☐ Local Delivery ☐ Mountainous

☐ Interstate ☐ Hilly Terrain

☐ City ☐ Flat Terrain

☐ Rural ☐ Dirt / Gravel Roads

☐ Off-Road ☐ Snow / Ice Covered Roads

Approx. Gross Vehicle Weight: _____

Truck Model / Year: _____

Transmission Make and Model: _____

Number of Gears: _____ Automatic / Automated Transmission? _____

Power Train Data: Rear Axle Ratio: _____

Tire Size: _____

Clutch Make / Model: _____

Auxiliary Devices: _____
(Ex. Anti-Lock Brakes, Anti-Slip, PTO, Turbo-Conveyor, etc.)

Typical Driving Techniques

Do you normally use the clutch when shifting? _____

What engine speed do you normally use to upshift? _____

What engine speed do you normally use to downshift? _____

Do you maintain Top Gear? Gear-Down? _____

What type of throttle control do you prefer to use? ☐ Automotive (Min/Max) Governor ☐ All-Speed Governor (CAT Throttle)

When do you use Cruise Control? _____

If not, do you run on the road speed governor? _____

Do you use the Smart Road Speed Governor Feature? _____

When climbing a grade do you:
Resume Cruise Control after a downshift? _____

Keep your foot on the throttle? _____

With Engine Brakes, what engine speed do you typically maintain on steep grades:
☐ 1600 – 1700 RPM ☐ 1700 – 1800 RPM ☐ 1800 – 1900 RPM
☐ 1900 – 2000 RPM ☐ 2000 – 2100 RPM ☐ Other (Specify) _____ RPM

Engine Start

Is engine cranking time acceptable? Cold Start ☐ YES ☐ NO Crank Secs _____
Hot Start ☐ YES ☐ NO Crank Secs _____

Does engine start acceptably? ☐ YES ☐ NO

Comments? _____

How long does the engine crank before it fires? _____

Does engine speed overshoot at startup? ☐ YES ☐ NO

Comments? _____

How soon does engine speed settle after the engine starts? _____

Does the engine smoke at startup? ☐ YES ☐ NO

If yes, is smoke: ☐ BLUE ☐ WHITE

Ambient Temp _____ deg Fahrenheit

How does the engine exhaust appear? _____

Is throttle response noticed after startup? Cold Start? ☐ YES ☐ NO
Hot Start? ☐ YES ☐ NO

How well does the engine respond to throttle motion after startup? _____

Comments? _____

Engine Idle

Idle speed setting used _____ RPM Idle Time (Driver Estimate) _____ % ECM Idle Time _____ %

Does the engine idle smoothly? ☐ YES ☐ NO

Does the engine surge at idle? ☐ YES ☐ NO

Does the idle increment/decrement switch operate acceptably? ☐ YES ☐ NO

Does the engine idle at desired speed? ☐ YES ☐ NO

How would you describe the engine at idle speed in terms of:

Sound? _____

Vibration? _____

When do you use the Idle Increment / Decrement (Idle Adjust) Feature? _____

What idle speed do you prefer? RPM

Does idle undershoot when coming off higher RPM engine operation? ☐ YES ☐ NO

Comments? _____

Is there any smoke during idle? ☐ YES ☐ NO

If yes, is smoke: ☐ BLUE ☐ BLACK ☐ WHITE

Ambient Temperature: _____ deg Fahrenheit

Comments? _____

Engine PTO Operation

PTO set speed used _____ RPM PTO Time (Driver Estimate) _____ % ECM PTO Time _____ %

When do you use PTO? _____

What PTO set speeds do you prefer? _____

Does the PTO operate smoothly? ☐ YES ☐ NO

Does the engine surge on PTO? ☐ YES ☐ NO

Does the PTO speed adjustment switch operate acceptably? ☐ YES ☐ NO

Does the PTO operate at desired speed? ☐ YES ☐ NO

Does PTO overshoot or undershoot when engaging PTO or changing RPM? ☐ YES ☐ NO

Comments? _____

Is there any smoke during PTO? ☐ YES ☐ NO

If yes, is smoke: ☐ BLUE ☐ BLACK ☐ WHITE

Ambient Temperature: _____ Deg Fahrenheit

Comments? _____

Clutch Engagement

In what gear do you normally launch the vehicle?

Gear:	1L	1	1H	2L	2	2H	3L	3	3H	4L	4	4H
Loaded:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Unloaded:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bobtail:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Do you use the throttle while releasing the clutch to launch the vehicle? ☐ YES ☐ NO

Do you let the clutch completely out before applying throttle? ☐ YES ☐ NO

Has the engine ever stalled during vehicle launch? ☐ YES ☐ NO

If YES, how often? _____

If YES, what were the conditions when this occurred?

- On-hill Launch? ☐
- Loading Dock? ☐
- Unfamiliar with Truck / Engine? ☐
- Mud / Snow / Ice? ☐
- Released Clutch Too Fast? ☐
- Foot Slipped Off Clutch? ☐
- Chose Wrong Gear? ☐
- Other: _____ ☐

If YES, what adjustments have you made to prevent stall?

- Use Lower Gear? ☐
- Slip / Feather Clutch? ☐
- Use Throttle? ☐
- Raise Idle Speed? ☐
- Nothing? ☐
- Other: _____ ☐

Do you watch your tachometer when launching the vehicle? ☐ YES ☐ NO

If YES: Is engine speed drop excessive? ☐ YES ☐ NO Approx. RPM Drop: _____ RPM

If YES: Is engine speed overshoot excessive? ☐ YES ☐ NO Approx. RPM Overshoot: _____ RPM

Does engine speed decelerate too fast, too slow, or just right on clutch engagement? ☐ Too Fast ☐ Too Slow ☐ Just Right

Explain why: _____

Does engine speed recover (accelerate) too fast, too slow, or just right on clutch engagement? ☐ Too Fast ☐ Too Slow ☐ Just Right

Explain why: _____

Clutch Engagement (cont.)

How would you rate the overall vehicle launch performance (clutch engagement)?

- ☐ Excellent
- ☐ Good
- ☐ Acceptable
- ☐ Poor

Explain why: _____

How would you rate the engine torque (power) during vehicle launch (clutch engagement)?

- ☐ Excellent
- ☐ Good
- ☐ Acceptable
- ☐ Poor

Explain why: _____

How would you rate the engine accepting load during vehicle launch (clutch engagement) on level ground? (Check all that apply)

- ☐ Smooth
- ☐ Jerky
- ☐ Must "feather" clutch
- ☐ Engine accepts load easily
- ☐ Engine struggles to accept load
- ☐ Engine feels like it wants to stall

Comments: _____

How would you rate the engine accepting load during vehicle launch (clutch engagement) on uphill grade? (Check all that apply)

- ☐ Smooth
- ☐ Jerky
- ☐ Must "feather" clutch
- ☐ Engine accepts load easily
- ☐ Engine struggles to accept load
- ☐ Engine feels like it wants to stall
- ☐ Other _____

Comments: _____

How does this engine compare to the last engine you drove in terms of clutch engagement performance?

- ☐ Much Better
- ☐ Better
- ☐ Same
- ☐ Worse
- ☐ Much worse

Comments: _____

Overall vehicle launch (clutch engagement) comments? _____

Cruise Control

Fill in customer trim information to detail how engine is trimmed:

Road Speed Governor Upper Droop _____ MPH

Road Speed Governor Lower Droop _____ MPH

Cruise Control Upper Droop _____ MPH

Cruise Control Lower Droop _____ MPH

When do you use Cruise Control? _____

Driver Input

Can the driver easily set the desired cruise speed? ☐ YES ☐ NO

Comments? _____

Does the cruise control maintain desired set speed? ☐ YES ☐ NO

Comments? _____

When Setting ☐ YES ☐ NO Road Speed Gain MPH _____ Road Speed Loss MPH _____

On Hills ☐ YES ☐ NO Road Speed Gain MPH _____ Road Speed Loss MPH _____

Level Ground ☐ YES ☐ NO Road Speed Gain MPH _____ Road Speed Loss MPH _____

How does the engine feel and sound when:

Cresting a hill? _____

Rolling out at the bottom of a hill? _____

Does the cruise control cause the engine to surge? ☐ YES ☐ NO

At the bottom of hills? ☐ YES ☐ NO

When starting up a hill? ☐ YES ☐ NO

Does the engine respond when over-riding the cruise control with the throttle? ☐ YES ☐ NO

Does the cruise control Auto-Resume perform acceptably? (IF TRIMMED) ☐ YES ☐ NO
(Is there a noticeably time delay before resume occurs?)

Does the cruise control Auto-Resume overshoot/undershoot after clutch event? ☐ YES ☐ NO

On Hills ☐ YES ☐ NO Road Speed Gain MPH _____ Road Speed Loss MPH _____

Level Ground ☐ YES ☐ NO Road Speed Gain MPH _____ Road Speed Loss MPH _____

Engine Response

How well does the engine respond to throttle movements when:
Moving? _____

In-gear? _____

Stationary, at idle? _____

Is there noticeably delay from the time the throttle is depressed until the engine RPM or torque picks up? ☐ YES ☐ NO

Does it occur at all engine speeds or in one range of engine speed? ☐ YES ☐ NO

Range _____ RPM

Is the response predictable when the throttle pedal is depressed? ☐ YES ☐ NO
(Is it more sensitive in lower speed ranges, etc?)

Is it easy to synchronize speed during gear shifts? ☐ YES ☐ NO

Upshifts? ☐ YES ☐ NO Downshifts? ☐ YES ☐ NO

Low Speed Maneuvering

What is idle speed setting when performing parking lot maneuvers? _____ RPM

Is throttle control acceptable for low speed maneuvers (parking lots, delivery terminals, etc)

Loaded ☐ YES ☐ NO Bobtail ☐ YES ☐ NO

Is throttle control in reverse gear acceptable?

Loaded ☐ YES ☐ NO Bobtail ☐ YES ☐ NO

Is there any surge when maneuvering at low speeds? ☐ YES ☐ NO What gear? _____

How well does the engine respond during:

Low speed maneuvers? _____

Parking? _____

Braking? _____

Engine Brake in Cruise Feature

Is the delay time from the expected brake actuation until the brakes actuate acceptable? ☐ YES ☐ NO

Do the correct number of brakes actuate at the desired speed increment above cruise speed? ☐ YES ☐ NO

Does the cruise control resume correctly after the brakes have deactivated? ☐ YES ☐ NO

Does the cruise control surge when resuming? ☐ YES ☐ NO

Does the cruise control overshoot? ☐ YES ☐ NO

Does the cruise control undershoot? ☐ YES ☐ NO

Does the auto cruise braking feature cause a surge when engaging in cruise? ☐ YES ☐ NO

Does the engine brake manual shut off switch work correctly? ☐ YES ☐ NO

Does the manual brake selector switch work correctly? ☐ YES ☐ NO

EGR / VGT Control System

How does the performance of this engine compare to a previous Cummins engine you may have operated?

☐ BETTER ☐ WORSE ☐ NO CHANGE

Comments? _____

Please describe what you experience while operating/driving during:

Rapid Accels _____

Rapid Decels _____

Uphill Climb _____

Downhill Grades _____

In-City Driving _____

Highway Driving _____

Engine Idle _____

Truck Yard Maneuvers _____

During Cruise Control Events _____

During Engine Brake Events _____

Cold Engine Start _____

Approximate outside temperature _____ deg Fahrenheit

Hot Engine Starts _____

Approximate outside temperature _____ deg Fahrenheit

At Altitude _____

Approximate altitude for engine operation _____ feet

NOTES