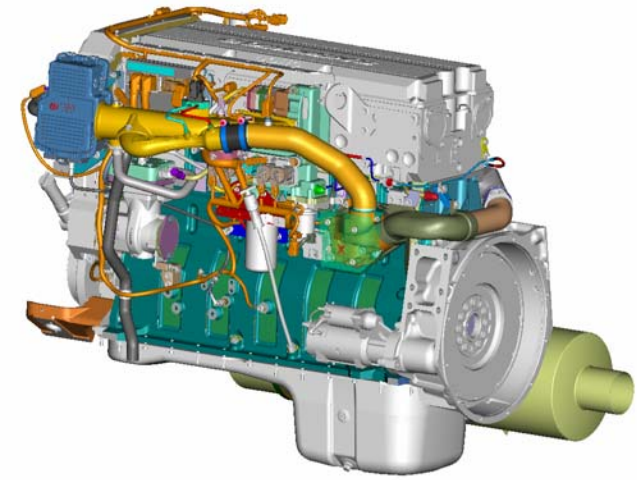
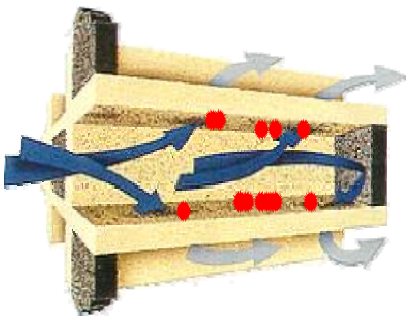
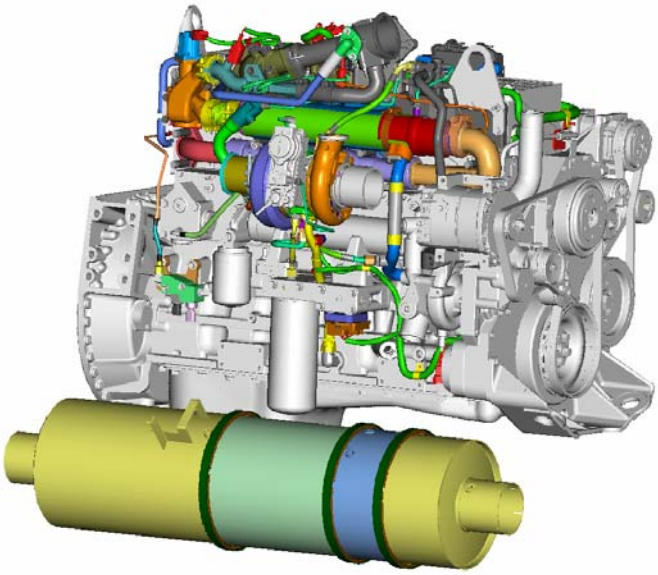
2007 COMMON APPROACH TO CONTROL SYSTEM DIAGNOSTICS

ISX ’07





Soot Filter Cell



ISM ’07

Phase 7.0.0.18 (CM871) and 7.1.0.18 (CM876)
ECM Software

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HD 2007 COMMON APPROACH TO CONTROL SYSTEM DIAGNOSTICS

HD 2007 Common Approach To Control System Diagnostics.doc
FP Version
12/14/2006
Revision Number 00

Please Forward Suggestions For Improvement To:
JEP CPE Team (Russ King)

Where To Find This Document:
CTC LAN: H:\hvyduty\HD_System_Integration\Common Approach To Diagnostics\2007 – CM871 and CM876
Internet: http://www.jep.cummins.com/teams/pde/index_org.html

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 CalTerm III 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. The intent for this document is to provide information and support to those in the field as well as those based in Cummins engineering facilities. This document along with Calterm III 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.

Tools Required: Calterm III Software installation web address → http://etools.ctg.cummins.com/products/caltermiii/

ECFG File Web address of supported ECFG files → http://www.jep.cummins.com/teams/pde/index_org.html

Inline V Web address for ordering the Datalink Adapter, driver download, and driver installation instructions → http://inline.cummins.com/

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I. Data Logging Using Calterm III
II. Critical Parameter Lists
III. Basic Unit Conversions
IV. Control System Overview
V. Common Approach Parameter Lists
VI. Engineering States
VII. Tool Trimmables
VIII. Fault Code List
IX. EPA Certification Information

THIS DOCUMENT SUPPORTS THE FOLLOWING SOFTWARE VERSION:

HD07	**ISX07**	**PHASE 7.0.0.18 SOFTWARE**	**CM871**
HD07	**ISM07**	**PHASE 7.1.0.18 SOFTWARE**	**CM876**

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Datalogging Using Calterm III

Data Logging

The following four methods can be used to collect data using Calterm III:

1. Request/Receive
2. IDL (Internal Data logger)
3. BAM (Broadcast Announce Message)
4. EDM (Engineering Data Monitor)

In this document, only the EDM data logging method will be discussed. EDM data collection mode has sufficient capability to collect data listed in this document. Also, unlike BAM data collection mode, EDM will not stop broadcast on other devices connected to the datalink.

Instructions for using the EDM Data logger

1. Lauch Calterm III
2. The monitor screen should be displayed. If Calterm does not automatically display the Select Module Screen, go to File and select Open Module.
3. On the monitor screen, select Module Type and ECFG file. ECFG files for each software phase can be downloaded at the following link: http://www.jep.cummins.com/teams/pde/index_org.html
4. Click Automatic to connect to the module. Once connected, the default monitor screen will be displayed
5. If unable to connect, go to Tools, select Options and click datalink type - Verify the settings on the Datalink tab are configured to work with an Inline 5 adapter.
6. Once connected, add parameters to the monitor screen or open an existing screen file.
    - To add parameters to the monitor screen, change the data collection mode to EDM. Type the parameter name or use F1 to search for parameters.
    - To open an existing screen file, go to Monitor and select open screen file.
7. Depending on the desired data collection rate, add parameters to achieve a maximum data rate of 20 bits/ms.

-To determine the number of bits for a given parameter, open the ecfg file using word pad. Search for the the parameter name. Under the parameter name, data_length will be listed.
-The majority of parameters are 2 bits. For example, the data length of FSS_Total_Fueling is 2 bits.
-To determine the data rate, add the bits from all parameter on the screen file and divide by the desired data collection rate.
-For example, at a rate of 20 bits/ms, 40 two bit parameters can be collected every 20ms.

8. Change the data collection mode to EDM. Select the desired data monitor rate.
9. If parameter values are not displayed on the screen after switching to EDM mode, you may have too many parameters for the data collection rate. Two options for correcting this are
    a. Decrease number of parameters (Use only recommended parameters from this document).
    b. Decrease the data collection rate

-The data rate of 20 bits/min is only possible under ideal conditions. Increased datalink traffic will decrease the allowable data rate.

10. To start data collection click on start
11. To stop data collection click stop
12. Save datafile to desired location

Critical Parameters List:

1. Mission Data Critical Parameters List

Standard Engine Investigation List:

Engine_Speed	RPM	Vehicle_Speed	km/hr
Accelerator_Pedal_Position	%	Net_Engine_Torque	N_m
FSS_Total_Fueling	MG/STROKE	EGR_Position	%
Combustion_Control_Path_Owner	---	EAC_EGR_Valve_Cmd	%
Final_Timing	deg_BTDC	Compressor_Inlet_Density	kg/m^3
Final_Timing_State	---	CHL_Derate_State	HEX
Boost_Pressure	kPa_G	Filtered_Turbo_Speed	KRPM
Effective_Gear_Ratio	---	PrcntLoadAtCurSpd	%
H_CBR_Alpha	---	TGC_VT_Cmd	%
H_CBR_Chi_Value	---	J39_VGT_Actuator_Position	%
EMM_AECD_State	HEX	Charge_Tmptr	DEG_C
EMM_Protection_State	HEX	Exhaust_Metal_Tmptr	DEG_C
Exhaust_Press	KPA	EGR_Orifice_Tmptr	DEG_C

Standard Aftertreatement Investigation List:

V_ATP_tr_DOC_In	DEG_K	H_HIM_fg_Dosing_Cmd	g/s
V_ATP_tr_DOC_Out	DEG_K	V_OCL_fg_HC_LightOff_Limit	g/s
V_SFL_tr_Regen_Cmd	DEG_K	V_AIM_vr_Engine_Speed	RPM
V_ATP_tr_DPF_Out	DEG_K	V_ATP_fg_Turbo_Out	g/s
V_SFP_mg_Soot_Load_DP	gm	V_SFP_fv_DPF	m^3/s
V_SFP_mg_Soot_Load_Comb	gm	V_SFP_pr_Delta	KPA
V_SFP_fn_Uniform_Dist_Factor	frac	V_SFP_pr_Delta_Low	KPA
V_SFP_fv_DPF	acms	V_SFP_pr_Delta_High	KPA
V_HIM_pr_INJ_Fuel	KPA	H_SFP_DPTrust_Fctr_Adjusted	---
H_HIM_pr_Inj_Fuel_Press_Comp	KPA	V_SFR_Regen_Stage	---
PTM_Final_Oper_Mode	---	V_HIM_bs_Status	HEX
H_ATM_bs_HC_CtrlLimits	HEX	V_ATD_bs_SysPerf_Errs	HEX
		V_ATD_bs_SysIO_Errs	HEX

Basic Unit 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

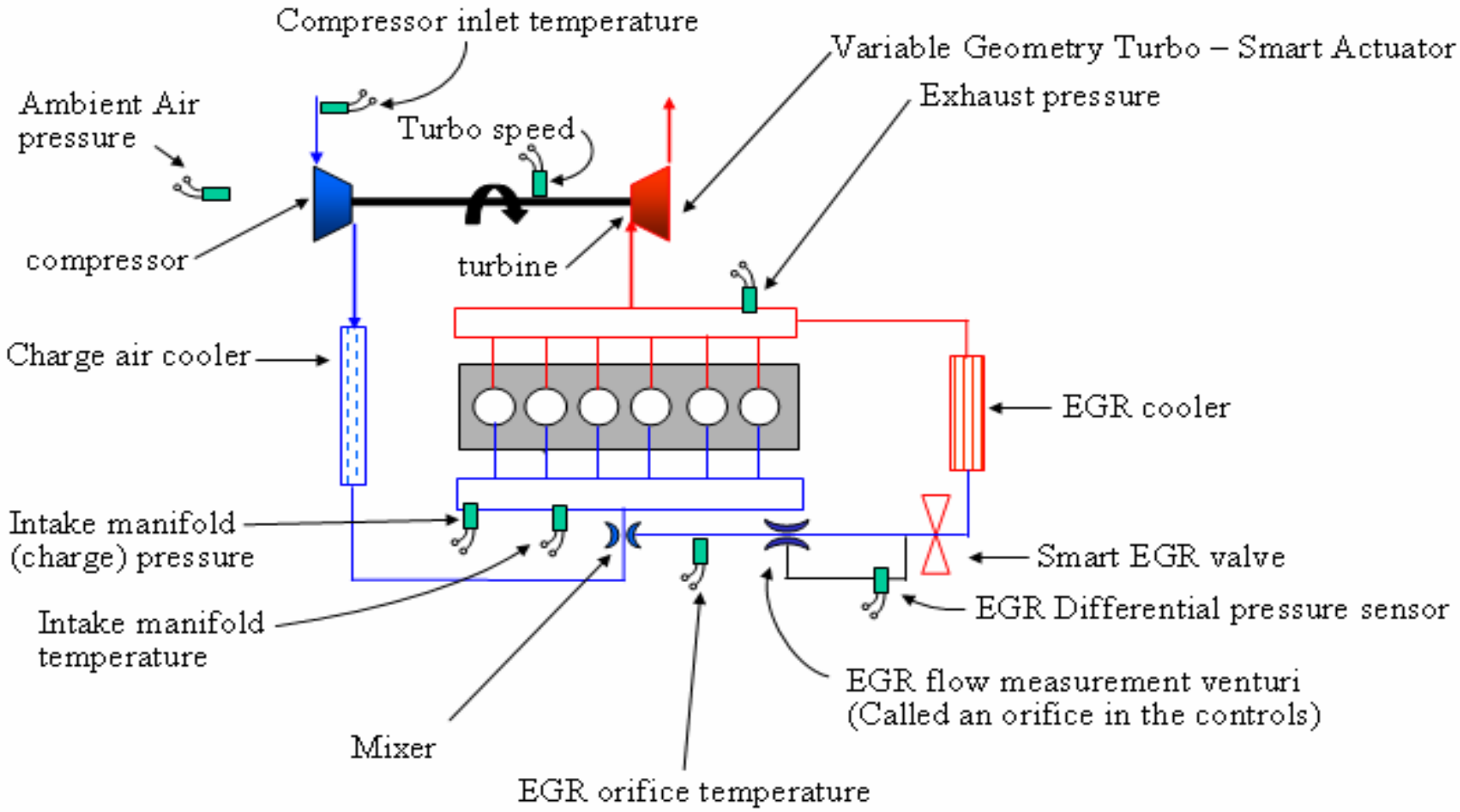
5. Psi to bar
bar = 0.06894757 * Psi

6. Psi to kPa
kPa = 6.8947570 * Psi

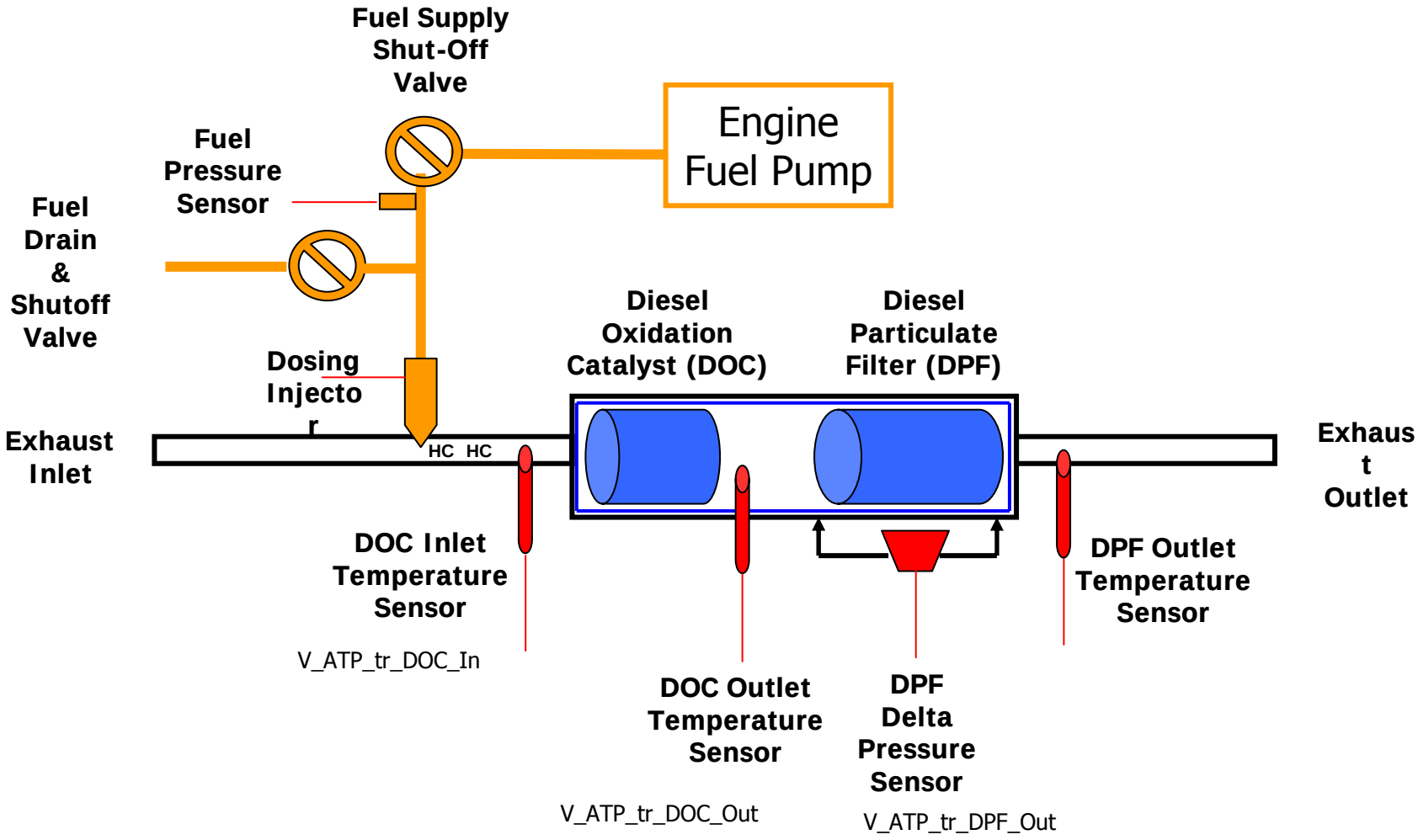
7. Voltage to Raw Counts
Raw Counts = (Sensor Signal Volts) / (5.175) * 1023

Control System Overview

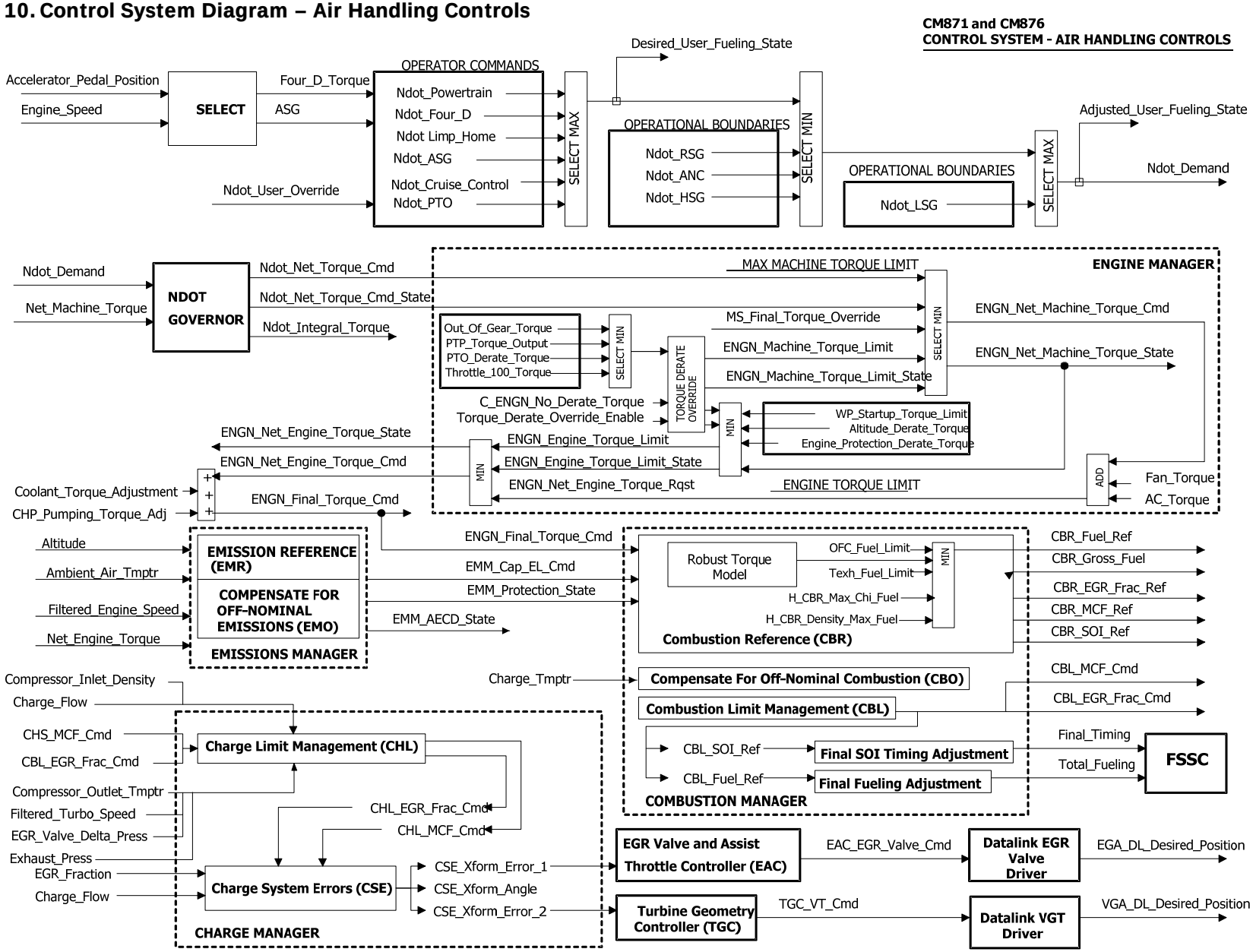
8. Air Handling Sensor Location Schematic



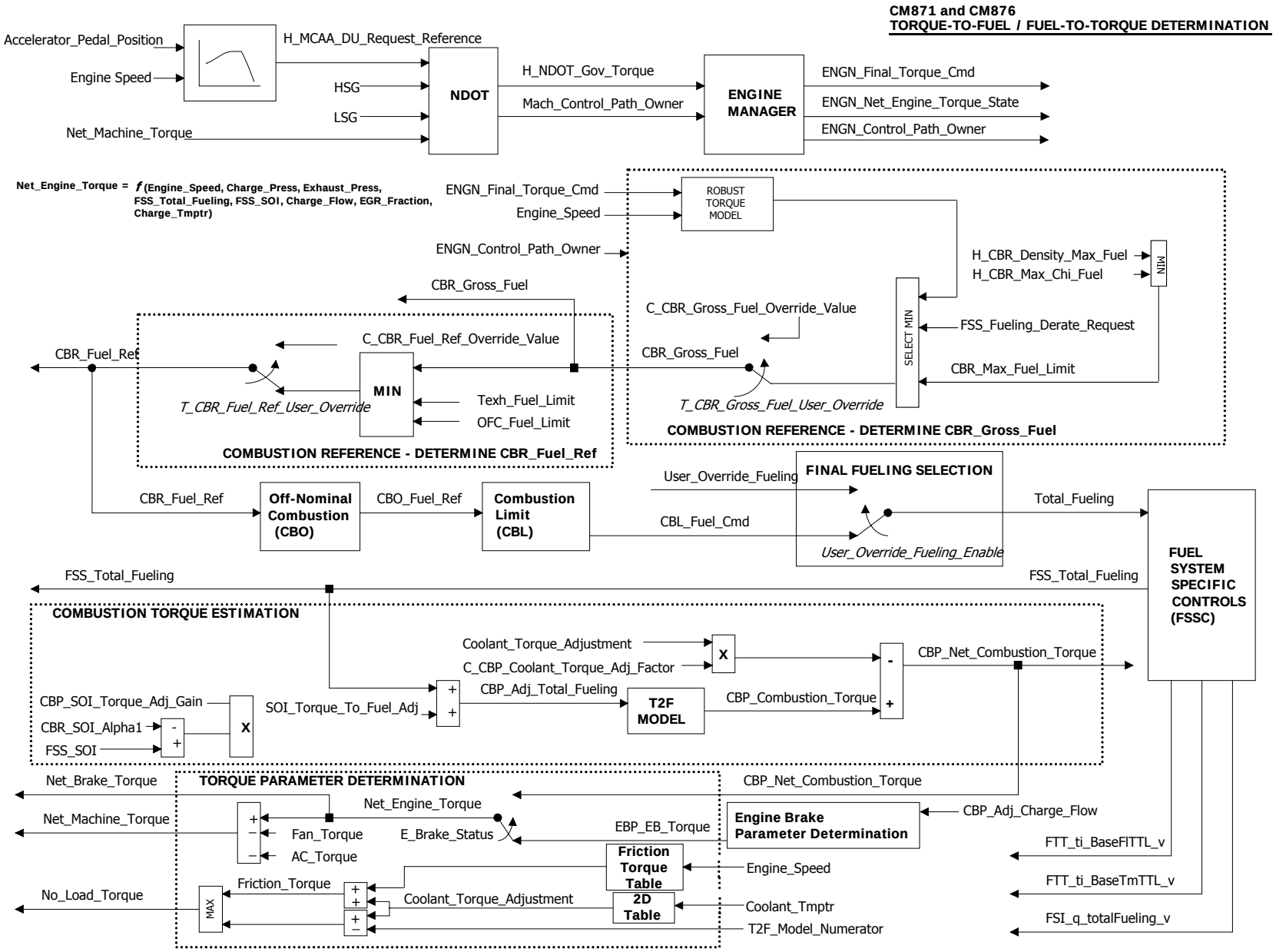
9. Aftertreatment Sensor Location Schematic



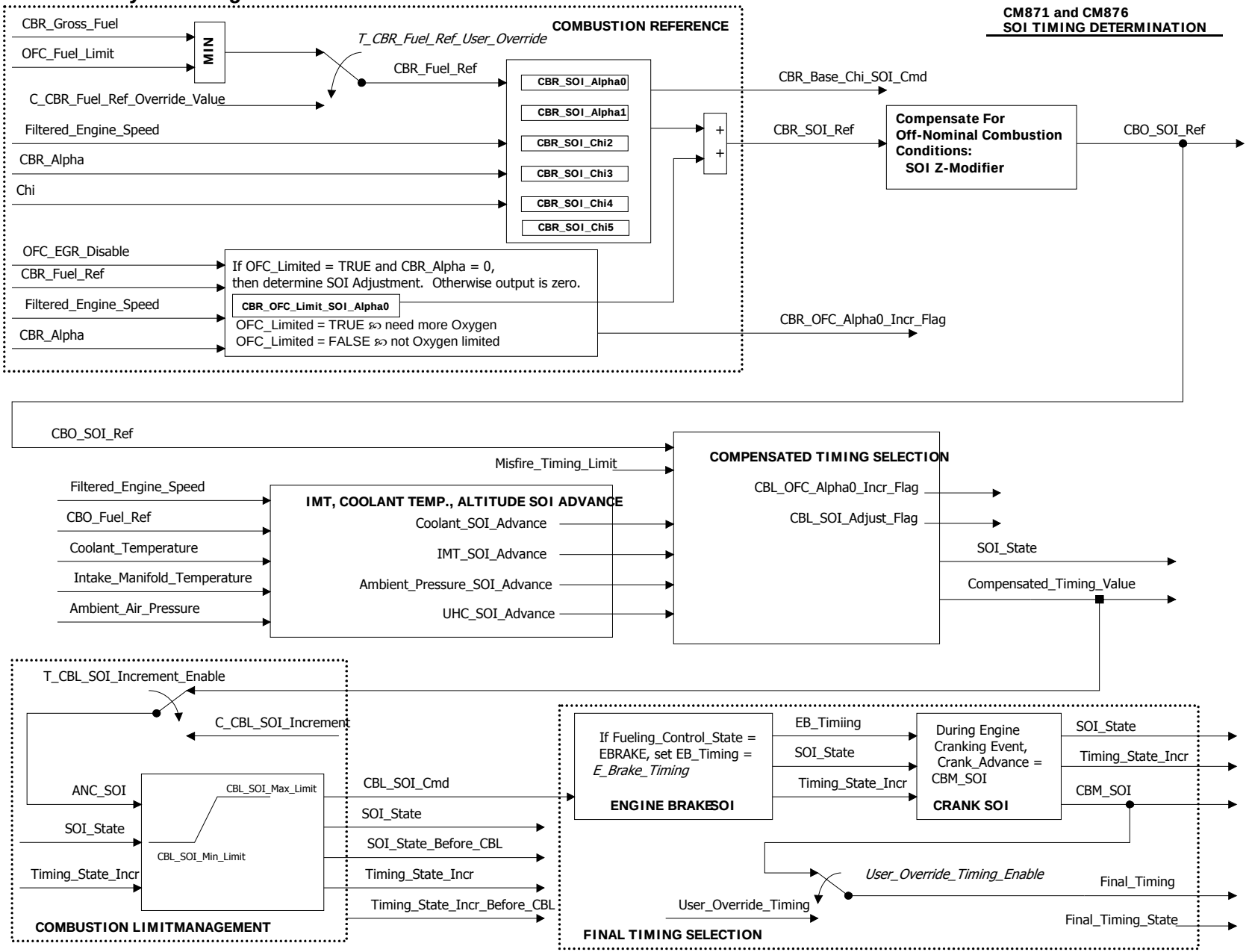
10. Control System Diagram – Air Handling Controls



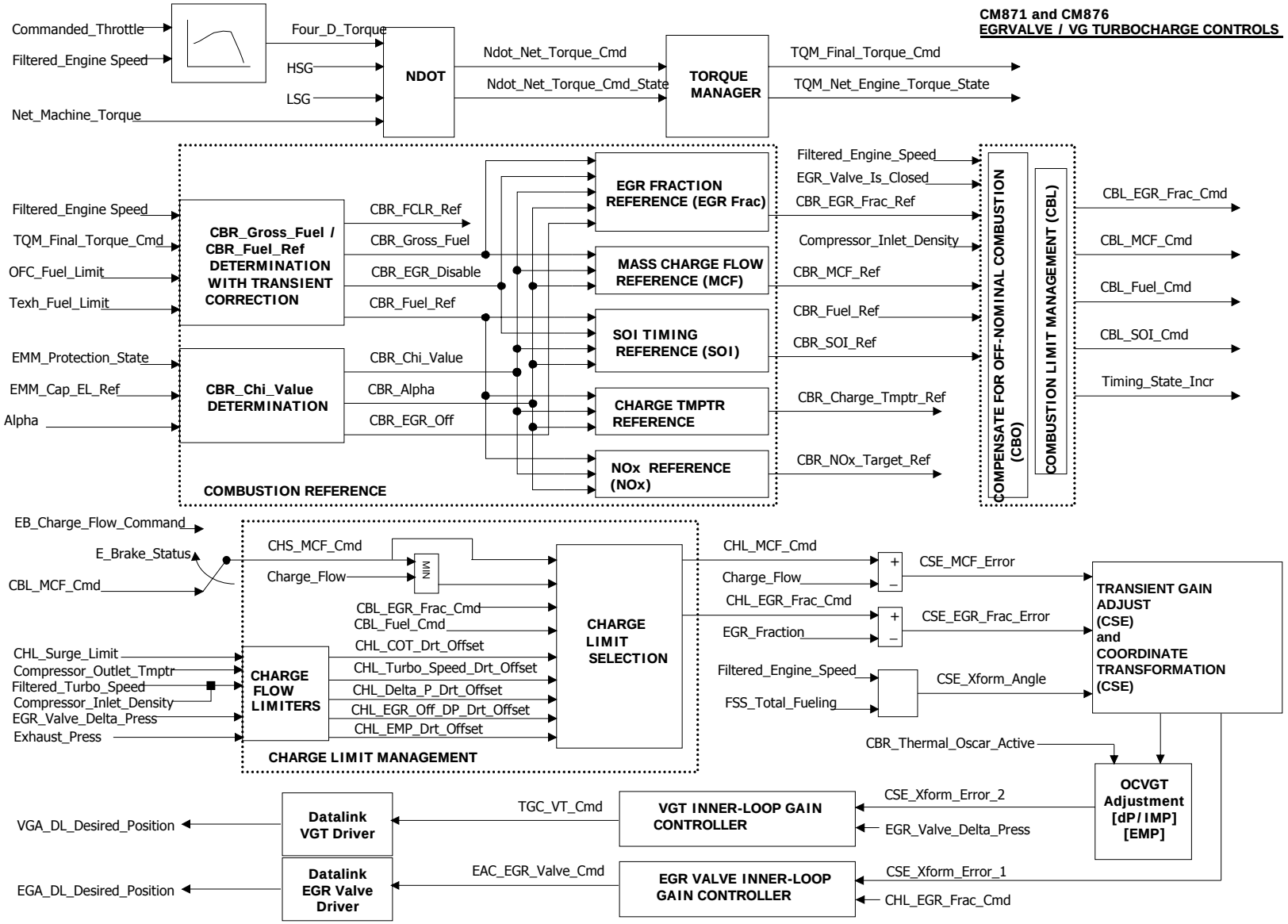
11. Control System Diagram – Torque To Fuel Determination



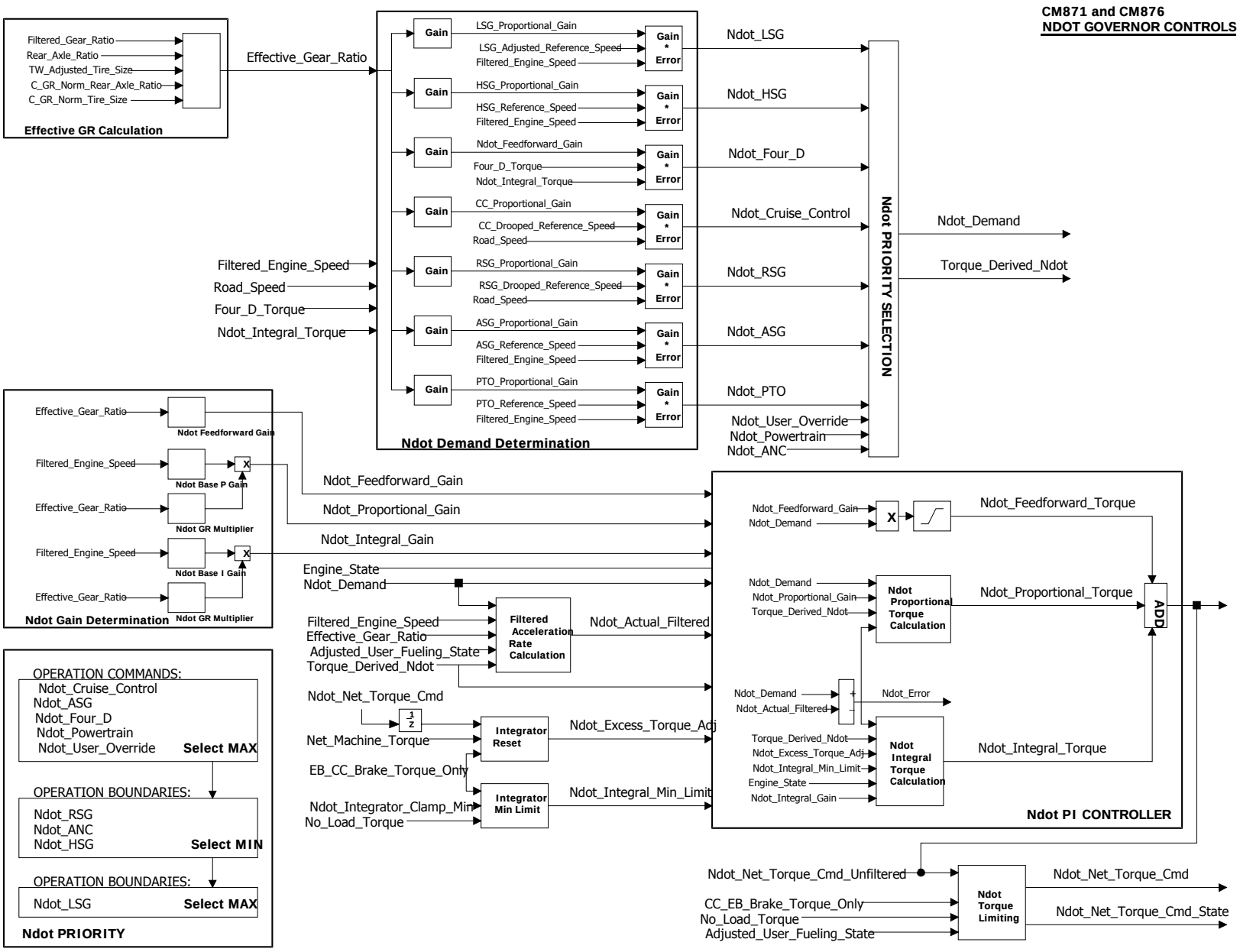
12. Control System Diagram – SOI Determination



13. Control System Diagram – EGR Valve / VG Turbocharger Controls



14. Control System Diagram – Ndot Governor Controls



Common Approach Parameter Lists

Engine Sensors and Actuators

15. Ambient Air Pressure / Compressor Inlet Pressure Sensor

(inm_inp_airp_lib, csdd_emissions_manager)

Air_Press_Sensor	kPa	Air_Press	kPa
Air_Press_Sensor_Volts	V	Air_Press_Source	---
Ambient_Air_Press	kPa	Ambient_Air_Press_Source	---
Ambient_Air_Press_Status	---	T_AMB_AirPressRLOC	---
C_AMB_AirPressSupplyID	---	T_AIP_AMB_User_Override_En	---
AIP_AMB_User_Override_Value	kPa	C_AMB_AirPressGlobalDefault	kPa
Compressor_Inlet_Press	kPa	Compressor_Inlet_Press_Source	---
Compressor_Inlet_Press_Status	---		

16. Charge Pressure Sensor/Boost Pressure Sensor Diagnostics

(inm_inp_icp_lib, csdd_charge_manager)

Charge_Press	kPa	Charge_Press_Sensor	kPa
Charge_Press_Sensor_Volts	V	Charge_Press_Source	---
Charge_Press_State	HEX	Charge_Press_Status	---
C_AIP_ChargePressDefault	kPa	C_AIP_ChargePressSupplyID	---
C_ChargePressEnable	---	H_Charge_Press_Raw	counts
T_AIP_ChargePressRLOC	---	T_AIP_Charge_Press_User_Ovrd_En	---
C_AIP_Charge_Press_Ovrd_Value	kPa	Boost_Pressure	kPa_G
Boost_Pressure_Status	---		

17. Charge Temperature Sensor / Intake Manifold Temperature Diagnostics

(inm_inp_ict _lib, csdd_charge_manager)

Charge_Tmptr	Deg_C	Charge_Tmptr_Sensor	Deg_C
Charge_Tmptr_Sensor_Volts	V	Charge_Tmptr_Source	---
Charge_Tmptr_State	HEX	Charge_Tmptr_Status	---
C_AIP_ChargeTmptrDefault	Deg_C	C_ChargeTmptrEnable	---
H_Charge_Tmptr_Raw	counts	T_AIP_ChargeTmptrRLOC	---
T_AIP_CHT_User_Override_En	---	AIP_Charge_Tmptr_Override_Value	Deg_C
Intake_Manifold_Temperature	Deg_C		

18. Compressor Inlet Temperature / Ambient Air Temperature Sensor Diagnostics

(inm_inp_cit_lib, csdd_charge_manager, inm_amb_lib, csdd_emissions_manager)

Compressor_Inlet_Tmptr	Deg_C	Compressor_Inlet_Tmptr_Sensor	Deg_C
Compressor_Inlet_Tmptr_Raw	counts	Compressor_Inlet_Tmptr_Source	---
Compressor_Inlet_Tmptr_State	HEX	Compressor_Inlet_Tmptr_Status	---
C_AIP_CompInTmptrDefault	Deg_C	C_CompInletTmptrEnable	---
T_AIP_CompInTmptrRLOC	---	Compressor_Inlet_Tmptr_Raw	counts
T_AIP_CompInTmptr_Ovrd_En	---	AIP_CompInTmptr_Override_Value	Deg_C
Ambient_Air_Tmptr	Deg_C	Ambient_Air_Tmptr_Source	---
Ambient_Air_Tmptr_Status	---		

19. Coolant Level Sensor Diagnostics

(csdd_lube_cool)

Coolant_Level	---	Coolant_Level_Sensor_Voltage	V
T_AIP_Cool_Lev_User_Override_En	---	AIP_Cool_Lev_Override_Value	---
C_AIP_Clvl_SensorSupply_ID	---	C_Coolant_Level_Sensor_Type	---
C_Coolant_Level_Type_Select	---	T_AIP_Coolant_Level_RLOC	---
T_CoolantLevelSensorEnable	---		

20. Coolant Temperature Sensor Diagnostics

(csdd_lube_cool)

Coolant_Temperature	Deg_C	Coolant_Tmptr_Sensor_Volts	V
T_AIP_CT_User_Override	---	AIP_Cool_Tmptr_Override_Value	Deg_C
T_AIP_Coolant_Temperature_RLOC	---	T_Coolant_Temperature_Sensor_Enable	---

21. EGR Delta Pressure Sensor Diagnostics

(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		

22. EGR Orifice Temperature Sensor Diagnostics

(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	---

23. EGR Valve Actuator Diagnostics

(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		

24. Exhaust Pressure Sensor Diagnostics

(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

25. Oil Pressure Sensor Diagnostics

(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	---		

26. Oil Temperature Sensor Diagnostics

(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	---

27. Turbocharger Speed Sensor Diagnostics

(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

28. Turbocharger VG Actuator Diagnostics

(csdd_charge_manager)

TGC_VT_Cmd	%	**Diagnostics:**	
J39_VGT_Motor_Effort	None	VGT_Fault_Communication	None
J39_VGT_Actuator_Status	HEX	VGT_Fault_Over_Temperature	None
J39_VGT_Actuator_State	None	VGT_Fault_Actuation	None
C_TGC_ULim	%	VGT_Fault_Driver_Circuit	None
C_TGC_LLim	%	VGT_Fault_Voltage_Low	None
VGA_DL_Mode_Command	HEX	VGT_Fault_Command_Source	None
VGA_DL_Desired_Position	%	VGT_Driver_Failure	None
J39_VGT_Temperature	Deg_C	C_J39_VGT_Status_Timeout	mSec
J39_VGT_Actuator_Position	%		
J39_VGT_Commanded_State	None	**Override:**	
J39_VGT_Position_Requested	%	T_TGC_User_Override	---
VGT_Position_Sensor_Volts	V	C_TGC_Override_Value	%
VGT_Actuator_Position_Commanded	%	T_VGA_DL_Cmd_User_Override	---
VGT_Actuator_Error_Status	None	C_VGA_DL_Cmd_Override_Value	%

29. Open Crankcase Ventilation

Crankcase_Press_Auto_Zero	kPa_G	Net_Engine_Torque	N_m
Crankcase_Press	kPa_G	Engine_Speed	RPM
T_CCP_Zero_Adjustment	kPa_G	OCV_Pressure_Relief_Active	None
H_CCP_Mod_High_Thd	kPa_G	Prev_emx_CCP_Trq_Drt_Idx	None
H_CCP_Sev_High_Thd	kPa_G	Boost_Pressure	kPa_G

HPI-TP Fuel System Sensors:

30. 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	---

31. 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

32. Fuel Temperature Sensor

FSI_t_Fuel_v	Deg_C	**Diagnostis:**	
Fuel_Temperature	Deg_C	C_FSI_ct_FuelTempLLim	Counts
C_FSI_t_FuelTempConstantIRValue	Deg_C	C_FSI_ct_FuelTempULim	Counts

CELECT Fuel System Sensors:

Aftertreatment Sensors:

33. DOC Inlet Thermistor Sensor Diagnostics

V_ATP_tr_DOC_In	DEG_K	T_AIM_tr_DOC_In_RLOC	---
V_AIM_tr_DOC_In	DEG_K	V_AIM_AT1_Source	---
C_AIM_ct_Tmptr_OOR_LLim	---	V_AIM_DOC_In_Tmptr_Status	---
C_AIM_ct_Tmptr_OOR_HLim	---	O_AIM_tr_DOC_In_Enable	---
C_AIM_tr_DOC_In_Default	DEG_K	The default value is also used as the override value	

34. DOC Outlet Thermistor Sensor Diagnostics

V_ATP_tr_DOC_Out	DEG_K	T_AIM_tr_DOC_Out_RLOC	---
V_AIM_tr_DOC_Out	DEG_K	V_AIM_AT2_Source	---
C_AIM_ct_Tmptr_OOR_LLim	---	V_AIM_DOC_Out_Tmptr_Status	---
C_AIM_ct_Tmptr_OOR_HLim	---	O_AIM_tr_DOC_Out_Enable	---
C_AIM_tr_DOC_Out_Default	DEG_K	The default value is also used as the override value	

35. DPF Outlet Thermistor Sensor Diagnostics

V_ATP_tr_DPF_Out	DEG_K	T_AIM_tr_DPF_Out_RLOC	---
V_AIM_tr_DPF_Out	DEG_K	V_AIM_AT3_Source	---
C_AIM_ct_Tmptr_OOR_LLim	---	V_AIM_DPF_Out_Tmptr_Status	---
C_AIM_ct_Tmptr_OOR_HLim	---	O_AIM_tr_DPF_Out_Enable	---
C_AIM_tr_DPF_Out_Default	DEG_K	The default value is also used as the override value	

36. DPF Delta P Sensor Diagnostics

V_ATP_pr_DPF_DeltaP	KPa	T_AIM_pr_DPF_DeltaP_RLOC	---
V_AIM_pr_DPF_DeltaP	KPa	V_AIM_DPF_DeltaP_Source	---
C_AIM_ct_Press_OOR_LLim	---	V_AIM_DPF_DeltaP_Press_Status	---
C_AIM_ct_Press_OOR_HLim	---	O_AIM_pr_DPF_DeltaP_Enable	---
C_AIM_pr_DPF_DeltaP_Default	KPa	The default value is also used as the override value	

37. Doser Fuel Pressure Sensor Diagnostics

V_HIM_pr_Inj_Fuel	KPa	T_HIM_pr_Inj_Fuel_RLOC	---
C_AIM_ct_Press_OOR_LLim	---	V_HIM_Inj_Fuel_Press_Source	---
C_AIM_ct_Press_OOR_HLim	---	O_HIM_pr_Inj_Fuel_Enbl	---
C_HIM_pr_Inj_Fuel_Default	KPa	The default value is also used as the override value	

38. Shut Off Valve Sensor Diagnostics

V_HIM_DFSOV_Cmd	---	O_HIM_DFSOV_Control_Enbl	---
V_HIM_DFSOV2_Cmd	---	O_HIM_DFSOV2_Control_Value	---
		O_HIM_DFSOV_Control_Value	---

39. Doser Actuator Diagnostics

H_HIM_fg_Dosing_Cmd	g/sec	V_HIM_injStatus	---
V_HIM_tm_Inj_On_Time	usec	O_HIM_fg_inj_Cmd_Value	g/sec
V_HIM_fq_inj	Hz	O_HIM_fg_inj_Cmd_Enbl	---

Parameter Estimates and Predictions:

40. 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		

41. Charge Flow Estimate

(inm_chp_chgflw_lib)

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	KG/MIN	Charge_Flow_Source	---

Volumetric Efficiency:

CHP_Veff_Mach	---	Exhaust_Press	kPa
CHP_Veff_Sqrt	---	Charge_Press	kPa
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	kPa	C_CHP_Engine_Displacement	L

42. 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	---		

43. 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	---	H_CBR_Chi_Value	---
TPE_MT_AP	Deg_C		
Intake_Manifold_Temperature	Deg_C		

44. 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	---		

45. Compressor Inlet Pressure Estimate

(inm_amb_lib)

Compressor_Inlet_Press	kPa	Compressor_Inlet_Pressure_Drop	kPa
Air_Press	kPa	Fresh_Air_Flow	Kg/min

46. 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	---		

47. 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	---

48. 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	---		

49. Exhaust Flow Estimation

(inm_chp_airflw_lib)

Exhaust_Flow	kg/min	V_ATP_fg_Turbo_Out	kg/min
Fresh_Air_Flow	kg/min	Fuel_Delivery_Rate_Per_Min	kg/min

50. 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	---		

51. 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	---		

52. 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	---		

53. 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		

54. 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	---

55. NOx Estimation

(inm_cbp_lib)

H_CBR_Nox_Out_Rate_Model	g/hr	EGR_Fraction	----
Intake_Manifold_Temperature	Deg_C	FSS_Total_Fueling	mg/stroke
Final_Timing	Deg	CBM_FdbkTorqueFuel	mg/stroke
Engine_Speed	RPM	CBM_Fuel_Flow	g/hr
Charge_Flow	Kg/min		

56. O2 Estimation

(inm_cbp_lib)

CBM_O2_Out_Frac	----	C_CBM_Gram_Per_MolAir	----
Fresh_Air_Flow	kg/min	C_CBM_Gram_Per_MolFuel	----
Engine_Speed	RPM	C_CBM_MolFuel_Per_MolFuelInj	----
Total_Fueling	mg/stk	C_CBM_MolGen_Per_MolFuel	----
H_CBM_O2_Out_Frac_Status	----	C_CBM_MolO2_Per_MolAir	----
		C_CBM_MolO2_Per_MolFuel	----
		C_CBM_O2_MolFrac_to_MassFrac	----

57. Particulate Matter Estimation

(inm_cbp_lib)

Engine_Speed	RPM	H_PME_FuelDeliveryAftGain	g/hr
FSS_Total_Fueling	mg/stroke	H_PME_SootRateUnclamped	g/hr
Final_Timing	Deg_BTDC	H_PME_Air_FuelRatioAdjusted	----
Fuel_Delivery_Rate_Per_Min	kg/min	H_PME_PM_Factor_Speed	RPM
EGR_Fraction	----	CHL_MCF_Cmd	kg/min
Adjusted_EGR_Fraction	----	Charge_Flow	kg//min
CBP_Air_Fuel_Ratio	----	H_PME_Air_Fuel_Ratio_Ref	----
H_PME_PM_Factor_EGRSOI	----	H_PME_SootRateUnclamped_Ref	g/hr
		PME_M270_SootRate_Ref	g/hr

58. Robust Torque Model / Torque to Fuel

(csdd_combustion_manager => COMB_combustion_control_loop_demands => ACTTOR)

Engine_Speed	RPM	CBP_Comb_Torque_Limit	N_m
CBP_T2F_Engine_Speed_Term	N_m	CBP_Net_Table_Torque	N_m
EGR_Fraction	---	CBP_Charge_Fuel_Ratio	---
CBP_T2F_EGR_Fraction_Term	N_m	CBP_Air_Fuel_Ratio	---
Charge_Flow	kg/min	CBP_Net_Combustion_Torque	N_m
CBP_T2F_Charge_Flow_Term	N_m	CBP_Combustion_Torque	N_m
Charge_Tmptr	Deg_C	H_NDOT_Gov_Torque	N_m
CBP_T2F_Charge_Tmptr_Term	N_m	ENGN_Final_Torque_Cmd	N_m
Charge_Press	kPa	Accelerator_Pedal_Position	%
CBP_T2F_Charge_Press_Term	N_m	CBP_Combustion_Model_Torque	N_m
Exhaust_Press	kPa	CBR_Gross_Model_Fuel	mg/stroke
CBP_T2F_Exhaust_Press_Term	N_m	FSS_Total_Fueling	mg/stroke
FSS_SOI	---	H_NDOT_FF_Torque	N_m
CBP_T2F_SOI_Term	N_m	H_NDOT_INT_Torque	N_m
OFC_Fuel_Limit	mg/stroke	H_NDOT_PP_Torque	N_m
CBP_T2F_Torque_Model_Numerator	N_m	C_CBP_T2F_Constant_Term	N_m

59. Saturation Temperature Estimate

(inm_tpe_sat_lib)

Saturation Temperature 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	---

60. Turbine Out Temperature Estimation

(csdd_charge_manager_lib)

Turbine_Out_Tmptr	Deg C	TPE_Turb_Out_Press	kPa
V_ATP_tr_DOC_In	Deg_K	TPE_Turbine_Pressure_Ratio_Term	%
Exhaust_Metal_Tmptr	Deg C	Turbine_Out_Tmptr_Reg	Deg C
Exhaust_Press	kPa	Turbine_Out_Tmptr_Mod	Deg C
Exhaust_Flow	kg/min	CBR_Thermal_Oscar_Active	----
TPE_Turbiine_Press_Ratio	----	TPE_TOT_EFF	%
Filtered_Turbo_Speed	KRPM		

61. Turbo Speed Estimation

(inm_tpe_tsp_lib)

T_Turbo_Speed_Estimation_Enable	---		

Turbo Speed Estimate

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	---		

62. UHC (Unburned HydroCarbon) Estimation

(inm_cbp_lib)

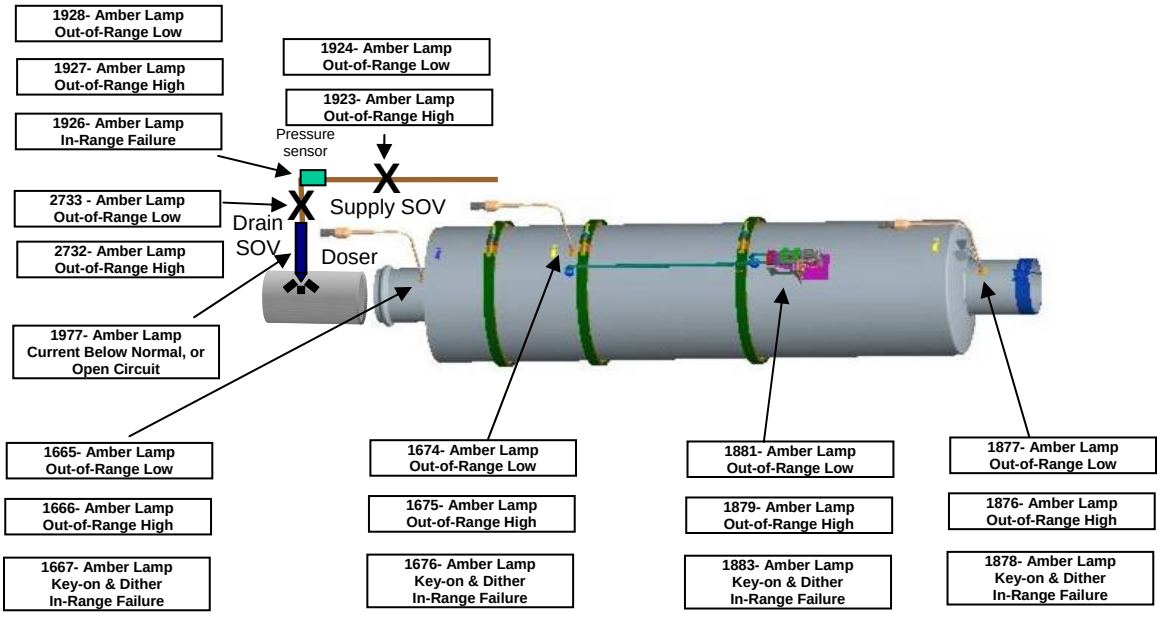
Engine_Speed	RPM	CBP_UHC_BMEP	kPa
FSS_Total_Fueling	mg/stroke	CBP_Tmptr_At_BDC	Deg_K
Final_Timing	Deg_BTDC	CBP_Gamma_Final	----
Charge_Tmptr	Deg_C	CBP_Tmptr_At_Ref_SOI	Deg_K
Coolant_Temperature	Deg_C		
CBP_Net_Combustion_Torque	N_m		

63. Unburned Hydrocarbon Timing Control (UHC IMT/Coolant Advance)

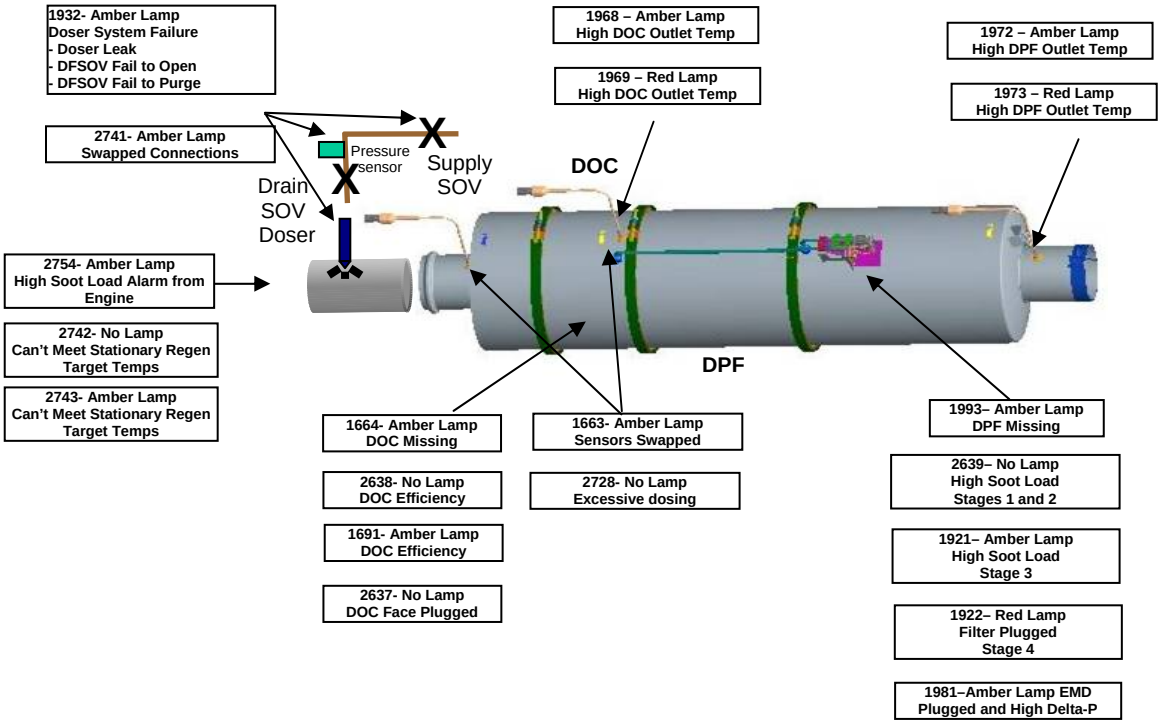
Engine_Speed	RPM	Charge_Flow	kg/min
FSS_Total_Fueling	MG/STROKE	Final_Timing	deg_BTDC
Intake_Manifold_temperature	Deg_C	Charge_Flow	kg/min
Charge_Tmptr	Deg_C	Combustion_Control_Path_Owner	None
Boost_Pressure	kPa_G	Final_Timing_State	None
Ambient_Air_Tmptr	Deg_C	Charge_Tmptr_State	HEX
Charge_Press	kPa	C_CBP_Gamma_Spd_Adj	None
Coolant_Temperature	Deg_C	Charge_Tmptr_Sensor	Deg_C
Charge_Tmptrr_EStat	None	Charge_Tmptr_Source	None
Charge_Press_IR_Fault_Cnt	counts	Charge_Press_Est	kPa
Charge_Press_Status	None	Ambient_Relative_Humidity	None
TPE_IMT_AP	Deg_C	FIW_Lowest_Coolant_Temp	Deg_C
SOI_IMTADV_NTE_Corr	None	SOI_ImtAdvCorr_Selected	None
SOI_AAP_Timing_Advance	deg_BTDC	SOI_Cltmp_Timing_Advance	deg_BTDC
SOI_Timing_Advance	None	C_EPS_ca_MainOffset	deg_BTDC
SOI_State	None	UHC_Advance_Corr	None
C_UHC_SOI_ADV_Enable	None	CBP_Gamma_Final	None
T_EMO_UHC_AECD_Enable	None	CBP_UHC_BMEP	kPa
UHC_Advance	deg_BTDC		

After-Treatment Diagnostics

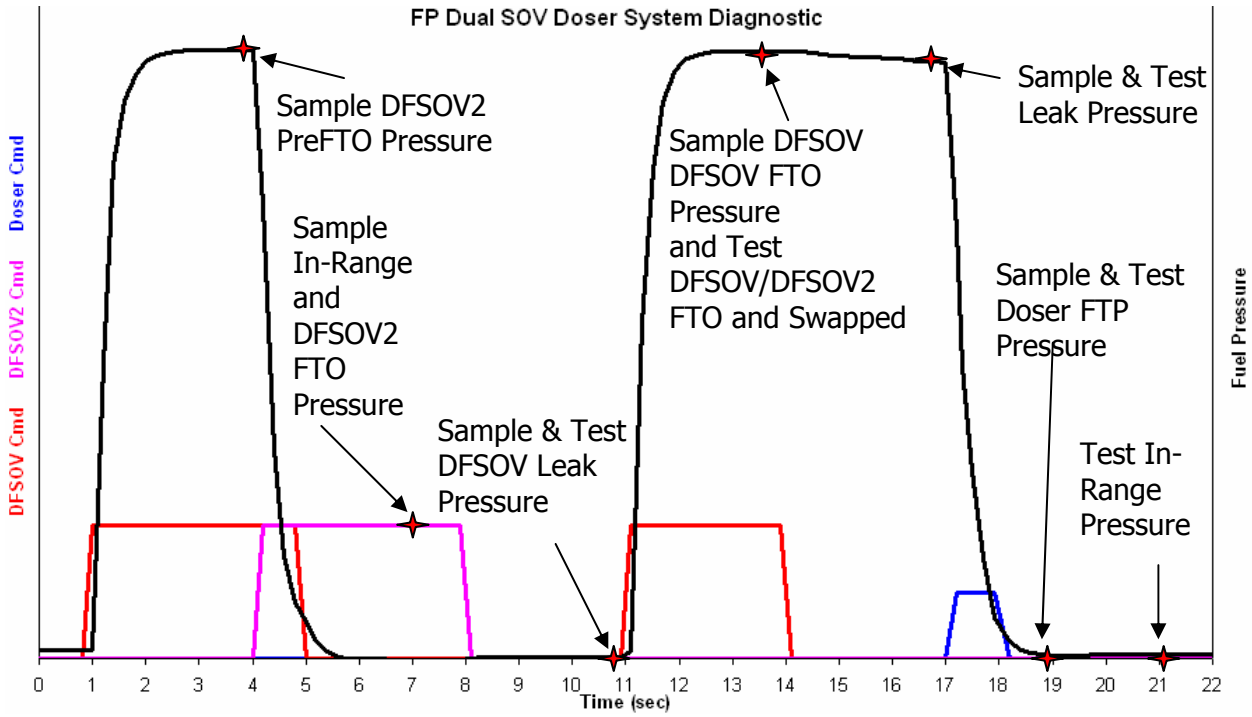
64. Aftertreatment Out-of-Range and In-Range Diagnostics



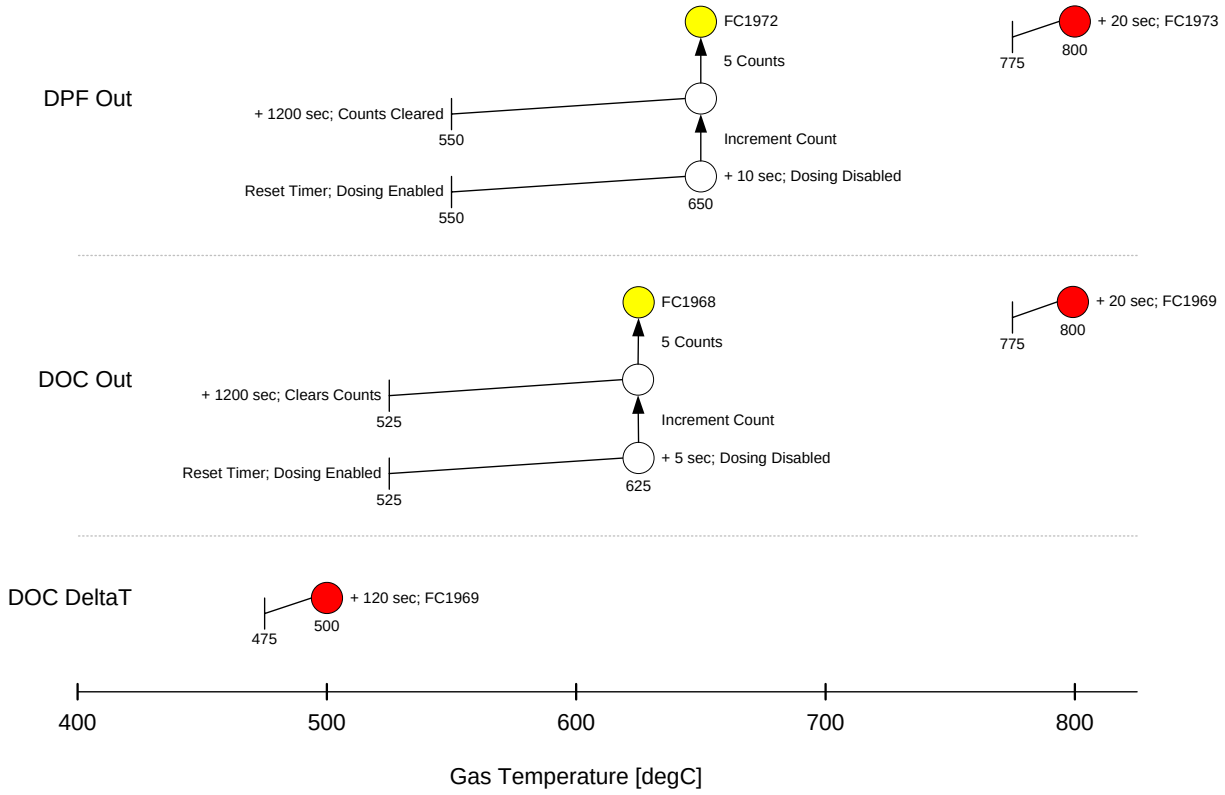
65. After-Treatment System Diagnostics



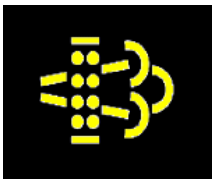
66. Dosing System Diagnostics



67. After-treatment Temperature Diagnostics



68. After-Treatment Lamp User Interface

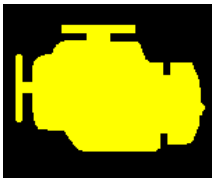


New - DPF Lamp

Indicates Need for Assistance in Achieving Regeneration

New - HEST Lamp (High Exhaust System Temperature)

Indicates An Active Regeneration is Underway



Check Engine Lamp

Indicates Normal Operation No Longer Possible, Service Required

Stop Engine Lamp

Indicates That System Damage Has Occurred or is Imminent, the Engine Should be Stopped as Soon as Practical

69. Dosing System Diagnostics - FC 1926, 1927, 1932, and 2741

(csdd_dsm_him)

V_HIM_DIAG_pr_Ambient	kPa	V_HIM_DIAG_pr_Initial	kPa
V_HIM_DIAG_pr_Sys_Leak	kPa	V_HIM_DIAG_pr_DFSOV2_FTO	kPa
V_HIM_DIAG_pr_Doser_FTP	kPa	H_HIM_fg_Dosing_Cmd	g/sec
V_HIM_DIAG_pr_DFSOV_FTO	kPa	V_HIM_DIAG_Pressure_Test_State	None
V_HIM_DIAG_pr_DFSOV_Leak	kPa	V_HIM_DIAG_Leak_Test_State	None
H_HIM_DIAG_Leak_Test_Failed	None	H_HIM_DIAG_Pressure_Test_Failed	None
V_HIM_DIAG_Leak_Test_Comp	None	V_HIM_DIAG_Pressure_Test_Comp	None
H_HIM_DIAG_Leak_Test_Active	None	H_HIM_DIAG_Pressure_Test_Active	None
V_HIM_DIAG_Amb_Test_Failed	None	V_HIM_DIAG_DFSOV_Swap	None
H_HIM_Dosing_Allowed	None	V_HIM_Engine_Running	None

70. DeltaP Key-On Diagnostic - FC 1883

(csdd_ats_afm)

T_EMD_DPF_dP_Keyon_Enable	--	V_EMD_DPF_dP_Keyon_State	--
V_EMD_PSR_Startup_Complete	None	H_EMD_DPF_dP_Keyon_Enbl_Met	None
V_AIM_pr_DPF_Delta	kPa	C_EMD_pr_DPF_dP_Offset	kPa
V_EMD_DPF_dP_Keyon_Error	None	C_EMD_pr_DPF_dP_Init_Thresh	kPa

71. DeltaP Dither Diagnostic - FC 1883

(csdd_dsm_sfm)

T_EMD_DPF_dP_Dither_Enable	None	V_EMD_DPF_dP_CurrDither_Fail	None
V_EMD_PSR_Startup_Complete	None	H_EMD_DPF_dP_Dither_Enbl_Met	None
V_AIM_pr_DPF_Delta	kPa	H_EMD_DPF_dP_Dither_DistMet	None
V_EMD_pr_DPF_dP_atTestStart	kPa	C_EMD_ds_DPF_dP_Dither_DistLim	km
P_EMD_ds_DPF_dP_AccumDistance	km	V_EMD_PSR_Dither_Dist_DistReached	None
V_EMD_DPF_dP_Dither_Error	None	H_EMD_DPF_dP_Dither_CtExceeded	None
P_EMD_ct_DPF_dP_Dither_Fail	None	C_EMD_ct_PSR_DriveCycle_Limit	None
V_EMD_DPF_dP_Dither_State	None	C_EMD_pr_DPF_dP_Dither_Delta	kPa

72. Reversed Thermistors Diagnostics - FC 1663

(csdd_ats_afm)

T_ATD_RvrsdTherm_Enbl	None	C_ATD_tm_RvrsdTherm_Max	s
V_ATD_RvrsdTherm_Comp	None	H_ATD_tm_RvrsdTherm	s
V_ATD_RvrsdTherm_Quit	None	V_ATD_RvrsdTherm_State	None
O_ATD_RvrsdTherm_Reset	None	P_ATD_ct_RvrsdThermFault	None
V_ATD_RvrsdTherm_Failed	None	H_ATD_RvrsdTherm_IntDer_Passed	None
V_ATP_tr_DOC_In	Deg_K	C_ATD_tr_RvrsdTherm_IntDer_Min	Deg_K
V_ATP_tr_DOC_Out	Deg_K	C_ATD_tr_RvrsdTherm_MinDiff	Deg_K
V_ATP_tr_DPF_Out	Deg_K	C_ATD_ct_MaxRvrsdThermFault	None

73. Thermistors Key-On Diagnostic - FC 1667

(csdd_ats_afm)

T_EMD_AT1_Keyon_Enable	None	V_EMD_AT1_Keyon_Error	None
V_EMD_TSR_Startup_Complete	None	V_EMD_AT1_Keyon_State	None
V_AIM_tr_DOC_in	Deg_K	H_EMD_TSR_Keyon_Enbl_Met	None
V_AIM_tr_Charge_Tmptr	Deg_K	C_EMD_tr_AT1_Coolant_Keyon_Tol	Deg_K
V_AIM_tr_Coolant_Tmptr	Deg_K	C_EMD_tr_AT1_IMT_Keyon_Tol	None
V_AIM_AT1_Source	None		

74. Thermistors Key-On Diagnostic - FC 1676

(csdd_ats_afm)

T_EMD_AT2_Keyon_Enable	None	V_EMD_AT2_Keyon_Error	None
V_EMD_TSR_Startup_Complete	None	V_EMD_AT2_Keyon_State	None
V_AIM_tr_DOC_in	Deg_K	H_EMD_TSR_Keyon_Enbl_Met	None
V_AIM_tr_Charge_Tmptr	Deg_K	C_EMD_tr_AT2_IMT_Keyon_Tol	Deg_K
V_AIM_tr_Coolant_Tmptr	Deg_K	C_EMD_tr_AT2_Coolant_Keyon_Tol	Deg_K
V_AIM_AT2_Source	None		

75. Thermistors Key-On Diagnostic - FC 1878

(csdd_ats_afm)

T_EMD_AT3_Keyon_Enable	None	V_EMD_AT3_Keyon_Error	None
V_EMD_TSR_Startup_Complete	None	V_EMD_AT3_Keyon_State	None
V_AIM_tr_DOC_in	Deg_K	H_EMD_TSR_Keyon_Enbl_Met	None
V_AIM_tr_Charge_Tmptr	Deg_K	C_EMD_tr_AT3_IMT_Keyon_Tol	Deg_K
V_AIM_tr_Coolant_Tmptr	Deg_K	C_EMD_tr_AT3_Coolant_Keyon_Tol	Deg_K
V_AIM_AT3_Source	None		

76. High Temperature Faults - FC 1968

(csdd_ats_afm)

C_APM_tr_DOCOut_HiThd	Deg_K	P_APM_ct_DOCOut_HiTmptr_Persist	None
C_APM_tr_DOCOut_LoThd	Deg_K	V_APM_DOCOut_HiTmptr_Flag	None
C_APM_tr_DOCOut_HiTmptr	Deg_K	V_APM_DOCOut_Persist_Fault	None
C_APM_ct_HiTmptr_Persist_Fault	None	V_ATP_tr_DOC_Out	Deg_K
C_APM_tm_HiTmptr_Persist_Reset	s		

77. High Temperature Faults - FC 1969

(csdd_ats_afm)

C_APM_tr_DOCOut_Severe_HiThd	Deg_K	V_APM_DOCOut_Severe_Fault	None
C_APM_tr_DOCOut_Severe_LoThd	Deg_K	V_ATP_tr_DOC_Out	Deg_K
C_APM_tm_DOC_Severe_Tmptr	s	V_ATP_tr_DOC_In	Deg_K
C_APM_tr_DOC_DeltaT_HiThd	Deg_K	V_APM_DOCDelta_Hi_Condition	None
C_APM_tr_DOC_DeltaT_LoThd	Deg_K	V_APM_DOC_HiDeltaT_Fault	None
C_APM_tm_DOC_HidDeltaT_Fault	s		

78. High Temperature Faults - FC 1972

(csdd_ats_afm)

C_APM_tr_DPFOut_HiThd	Deg_K	P_APM_ct_DPFOut_HiTmptr_Persist	None
C_APM_tr_DPFOut_LoThd	Deg_K	V_APM_DPFOut_HiTmptr_Flag	None
C_APM_tr_DPFOut_HiTmptr	Deg_K	V_APM_DPFOut_Persist_Fault	None
C_APM_ct_HiTmptr_Persist_Fault	None	V_ATP_tr_DOC_Out	Deg_K
C_APM_tm_HiTmptr_Persist_Reset	s		

79. High Temperature Faults - FC 1973

(csdd_ats_afm)

C_APM_tr_DPFOut_Severe_HiThd	Deg_K	V_ATP_tr_DPF_Out	Deg_K
C_APM_tr_DPFOut_Severe_LoThd	Deg_K	V_APM_DPFOut_Severe_Fault	None
C_APM_tm_DPF_Severe_Tmptr	s		

80. Dither Faults - FC 1667

(csdd_ats_afm)

T_EMD_AT1_Dither_Enable	None	V_EMD_AT1_CurrDither_Fail	None
V_EMD_TSR_Startup_Complete	None	H_EMD_TSR_Dither_Enbl_Met	None
V_AIM_tr_DOC_in	Deg_K	P_EMD_ds_AT1_AccumDistance	km
V_EMD_tr_AT1_atTestStart	Deg_K	C_EMD_ds_TSR_Dither_Dist_Limit	km
V_EMD_AT1_Keyon_Error	None	V_EMD_TSR_Dither_DistReached	None
V_EMD_AT1_Keyon_State	None	C_EMD_ct_TSR_DriveCycle_Limit	None
V_AIM_AT1_Source	None	P_EMD_ct_AT1_Dither_Fail	None
V_EMD_AT1_Dither_Error	None	C_EMD_tr_TSR_Dither_Delta	Deg_K
V_EMD_AT1_Dither_State	None		

81. Dither Faults - FC 1676

(csdd_ats_afm)

T_EMD_AT2_Dither_Enable	None	V_EMD_AT2_CurrDither_Fail	
V_EMD_TSR_Startup_Complete	None	H_EMD_TSR_Dither_Enbl_Met	None
V_AIM_tr_DOC_in	Deg_K	P_EMD_ds_AT2_AccumDistance	km
V_EMD_tr_AT2_atTestStart	Deg_K	C_EMD_ds_TSR_Dither_Dist_Limit	km
V_EMD_AT2_Keyon_Error	None	V_EMD_TSR_Dither_DistReached	None
V_EMD_AT2_Keyon_State	None	C_EMD_ct_TSR_DriveCycle_Limit	None
V_AIM_AT2_Source	None	P_EMD_ct_AT2_Dither_Fail	None
V_EMD_AT2_Dither_Error	None	C_EMD_tr_TSR_Dither_Delta	Deg_K
V_EMD_AT2_Dither_State	None		

82. Dither Faults - FC 1878

(csdd_ats_afm)

T_EMD_AT3_Dither_Enable	None	V_EMD_AT3_CurrDither_Fail	None
V_EMD_TSR_Startup_Complete	None	H_EMD_TSR_Dither_Enbl_Met	None
V_AIM_tr_DOC_in	Deg_K	P_EMD_ds_AT3_AccumDistance	km
V_EMD_tr_AT2_atTestStart	Deg_K	C_EMD_ds_TSR_Dither_Dist_Limit	km
V_EMD_AT3_Keyon_Error	None	V_EMD_TSR_Dither_DistReached	None
V_EMD_AT3_Keyon_State	None	C_EMD_ct_TSR_DriveCycle_Limit	None
V_AIM_AT3_Source	None	P_EMD_ct_AT3_Dither_Fail	None
V_EMD_AT3_Dither_Error	None	C_EMD_tr_TSR_Dither_Delta	Deg_K
V_EMD_AT3_Dither_State	None		

83. Ineffective Regenerations - FC 2728

(csdd_dsm_sfm)

C_SFR_ct_Ineff_Regen_Max	None	V_SFR_tr_Regen_Trgt	Deg_K
C_SFR_ct_Ineff_Regen_React	None	V_SFR_Ineff_Regen_React	None
C_SFR_ct_Ineff_Regen_Help	None	V_SFR_Ineff_Regen_Help	None
C_SFR_ct_Ineff_Regen_Error	None	V_SFR_Ineff_Regen_Error	None
C_SFR_tm_Min_Ineff_Dosing	s	P_SFR_tm_Ineff_Dosing	s
C_SFR_tr_Ineff_Close_Thd	Deg_K	H_SFM_tr_Tmptr_In	Deg_K
H_HIM_fg_Dosing_Cmd	g/sec		

84. DOC Presence - FC 1664

(csdd_ats_afm)

T_EMD_DOC_Presence_Enable	None	H_EMD_tm_DOC_dT_Enbl	s
V_ATP_tr_DOC_Out	Deg_K	H_EMD_DOC_Presence_Error	None
V_ATP_tr_DOC_In	Deg_K	C_EMD_tr_DOC_Presence_Delta_Thd	s
V_EMD_DOC_Reverse_Error	None	C_EMD_tm_DOC_Presence_Fail_Thd	s
V_EMD_DOC_Presence_State	None	C_EMD_tm_DOC_Presence_Pass_Thd	s

85. DOC Efficiency - FC 2638

(csdd_ats_afm)

P_OCD_fn_DOC_Eff	None
P_OCD_ct_DOC_Eff_NoLamp	None
C_OCD_ct_LowEff_Thd_NoLamp	None
C_OCD_ct_HiEff_Thd_NoLamp	None

86. DOC Efficiency - FC 1691

(csdd_ats_afm)

P_OCD_fn_DOC_Eff	None
C_OCD_DOC_Eff_LoThd_Lamp	None
C_OCD_ct_LowEff_Thd_Lamp	None
C_OCD_ct_HiEff_Thd_Lamp	None

87. DOC Face Plugged - FC 2637

(csdd_dsm_ocm)

V_OCL_fg_HC_Core_Tmptr_Limit	g/sec	H_OCL_FacePlug_Decr_Delay_Time	s
V_OCM_fg_HC_Fdbk	g/sec	C_OCL_FacePlug_Decr_Delay_Time	s
C_OCL_FacePlug_Decr_Delay_Time	sec	P_OCL_tm_FacePlug_Count	s
C_OCL_tm_FacePlug_Max	sec	C_OCL_tm_FacePlug_Hithd	s
V_ATD_FT_DOC_Reset_Flag	None	C_OCL_tm_FacePlug_LoThd	s
T_OCL_FacePlug_Disable	None	P_OCL_tm_FacePlug_Count	s
P_OCL_DOC_Face_Plug_Active	None	H_OCM_tr_Tmptr_In	Deg_K
H_OCM_fg_MassFlowRate_In	g/sec	H_OCM_mf_PM_Frac_In	Frac
H_OCL_fg_Cont_HC_Rqst	g/sec	V_OCL_fg_Cont_HC_Dosing	g/sec
H_OCL_tm_FacePlug_Cls_Rt	None	H_OCL_tm_FacePlug_Dep_Rt	None

88. DPF Missing - FC 1993

(csdd_dsm_sfm)

T_EMD_DPF_Missing_Enable	None	V_SFP_fv_DPF	ACMS
V_EMD_xx_FlwResist_DPF_Actual	None	V_EMD_DPF_Plugged_Error	None
V_EMD_xx_FlwResist_MissDPF_Lim	None	H_EMD_DPF_Monitor_Inhibit	None
V_EMD_DPF_Missing_Error	None	C_EMD_tm_DPF_Diag_Cycle_Limit	s
V_EMD_DPF_Missing_State	None	C_EMD_fv_DiagTest_Min	ACMS

89. DPF Plugged - FC 1981

(csdd_dsm_sfm)

T_EMD_DPF_Plugged_Enable	None	V_SPF_fv_DPF	ACMS
V_EMD_xx_FlwResist_PlugDPF_Lim	None	V_EMD_DPF_Missing_Error	None
V_EMD_xx_FlwResist_DPF_Actual	None	H_SFD_DeltaP_High_Flag	None
V_EMD_DPF_Plugged_Error	None	H_EMD_DPF_Monitor_Inhibit	None
V_EMD_DPF_Plugged_State	None	C_EMD_fv_DiagTest_Min	ACMS

90. DPF High DeltaP - FC 1981

(csdd_dsm_sfm)

V_SPF_fv_DPF	ACMS	C_SFD_tm_Limit_Persistence	s
V_SFP_pr_Delta_High	kPa	C_SFD_fn_CleanToHi_ClearThd	None
V_SFP_pr_Delta_Clean	kPa	C_SFD_fv_LoThd	ACMS
V_SFP_pr_Delta	kPa	C_SFD_fv_HiThd	ACMS
O_SFD_Limit_Flag_Reset	None		

91. Engine Out Temp (Stationary) - FC 2742 and 2743

(csdd_powertrain_mgr)

PTM_StatDesoot_Ineff_Error	None	H_PTM_IneffDesoot_Count	None
PTM_StatH20_Ineff_Error	None	H_PTM_IneffH20_Count	None
PTM_StatHC_Ineff_Error	None	H_PTM_IneffHC_Count	None
PTM_StatDesoot_Ineffective	None	C_PTM_IneffDesoot_Cnt_Thd	None
PTM_StatH20_Ineffective	None	C_PTM_IneffH20_Cnt_Thd	None
PTM_StatHC_Ineffective	None	C_PTM_IneffHC_Cnt_Thd	None

92. Engine Out PM - FC 2754

(csdd_powertrain_mgr)

PME_M270_SootRate_Ref	g/hr	PTM_EOPM_Rate_Error	None
PME_SootRate	g/hr	C_PTM_EOPM_Rate_Alarm_Enable	None
PTM_EOPM_Accum	g/sec	C_PTM_EOPM_Fault_Cnt_Thd	None
H_PTM_EOPM_Rate_Fault_Cnt	None		

93. Soot Load - FC 2639, 1921, and 1922

V_SFP_mg_Soot_Load_DP	gm	V_SFD_Soot_Load_Medium_Flag	None
V_SFP_mg_Soot_Load_Comb	gm	V_SFD_Soot_Load_High_Flag	None
		V_SFD_Soot_Load_Severe_Flag	None

After-Treatment System Performance

94. Stationary Regeneration and Desorb Enable Conditions

(csdd_powertrain_mgr/PTM_regen_enable_cond)

PTM_StatRegenEnable	None	H_PTM_ServiceBrakeEnCond	None
H_PTM_AcceleratorPedalEnCond	None	H_PTM_OOGearEnCond	None
H_PTM_VehicleSpeedEnCond	None	H_PTM_Ctrl_PTO_EnCond	None
H_PTM_ControlStateEnCond	None	H_TM_EngineWarm_EnCond	None
H_PTM_EPD_EnCond	None	H_PTM_AirHandlingSysEnCond	None
H_PTM_Clutch_EnCond	None		

95. Stationary and Mobile Regeneration

V_ATP_fg_Turbo_Out	g/sec	V_SFL_tr_Regen_Cmd	Deg_K
V_ATP_tr_DOC_In	Deg_K	V_SFP_fn_Uniform_Dist_Factor	None
V_ATP_tr_DOC_Out	Deg_K	V_SFP_fv_DPF	ACMS
V_ATP_tr_DPF_Out	Deg_K	V_SFR_Regen_Stage	None
V_HIM_DFSOV_Cmd	None	V_OCR_fg_HC_Corr	g/sec
V_HIM_DFSOV2_Cmd	None	H_CBR_Alpha	None
V_OCL_fg_HC_LightOff_Limit	g/sec	H_CBR_Chi_Value	None
V_OCL_fg_HC_Slip_Limit	g/sec	H_HIM_pr_Inj_Fuel_Press_Comp	kPa
V_OCR_fg_HC_Cmd	g/sec	V_HIM_pr_Inj_Fuel	kPa
V_OCR_fg_HC_Der_Cntrl	g/sec	J39_VGT_Actuator_Position	%
V_OCR_fg_HC_Int_Cntrl	g/sec	PTM_ApplicationLabel	None
V_OCR_fg_HC_Nominal	g/sec	PTM_DPF_Lamp_State	None
V_OCR_fg_HC_Prp_Cntrl	g/sec	PTM_HET_Lamp_State	None
V_OCR_fg_HC_TransComp	g/sec	V_SFP_pr_Delta	kPa
H_HIM_fg_Dosing_Cmd	g/sec	Vehicle_Speed	km/hr
PTM_Final_Oper_Mode	None	Engine_Speed	RPM
V_ATM_Oper_Mode	None	V_HIM_bs_Status	HEX
V_SFP_mg_Ash_Adj	Gm	V_ATD_bs_SysIO_Errs	HEX
V_ATD_bs_SysPerf_Errs	HEX	H_ATM_bs_HC_CtrlLimits	HEX

96. Stationary and Mobile H_20 Desorption

(ocm_ocl_lib)

H_OCM_fg_MassFlowRate_In	g/sec	C_OCL_fg_Min_Flow	g/sec
C_OCL_tm_H2O_Adsorb_Max	S	C_OCL_H2O_Desorb_Disabled	None
P_OCL_tm_H2O_Desorb_Count	S	H_OCM_tr_Tmptr_In	Deg_K
H_OCM_fg_MassFlowRate_In	g/sec	C_OCL_H2O_Desorb_Rate_Cnsv	None
H_OCL_H2O_Adsorb_Rate	Hz	V_OCL_H2O_Desorb_Request	None
C_OCL_H2O_Desorb_Rate_Norm	None	P_OCL_tm_H2O_Desorb_Count	s
C_OCL_tm_H2O_Desorb_HiThd	S	C_OCL_tm_H2O_Desorb_LoThd	s
H_OCL_H2O_Adsorb_Rate	Hz	Vehicle_Speed	km/hr
V_OCL_H2O_Desorb_Request	None	Engine_Speed	RPM
V_ATP_fg_Turbo_Out	g/sec	V_SFL_tr_Regen_Cmd	Deg_K
V_ATP_tr_DOC_In	Deg_K	V_SFP_fv_DPF	ACMS
V_ATP_tr_DOC_Out	Deg_K	H_CBR_Alpha	None
V_ATP_tr_DPF_Out	Deg_K	H_CBR_Chi_Value	None
PTM_Final_Oper_Mode	None	J39_VGT_Actuator_Position	%
V_ATM_Oper_Mode	None		

97. Stationary and Mobile HC Desorption

(ocm_ocl_lib)

H_OCM_fg_MassFlowRate_In	g/sec	C_OCL_fg_Min_Flow	g/sec
C_OCL_tm_HC_Adsorb_Max	s	C_OCL_HC_Desorb_Disabled	None
P_OCL_tm_HC_Desorb_Count	s	H_OCM_tr_Tmptr_In	Deg_K
H_OCM_fg_MassFlowRate_In	g/sec	C_OCL_HC_Desorb_Rate_Cnsv	None
H_OCL_HC_Adsorb_Rate	Hz	V_OCL_HC_Desorb_Request	None
C_OCL_HC_Desorb_Rate_Norm	None	P_OCL_tm_HC_Desorb_Count	s
C_OCL_tm_HC_Desorb_HiThd	s	C_OCL_tm_HC_Desorb_LoThd	s
H_OCL_HC_Adsorb_Rate	Hz	Vehicle_Speed	km/hr
V_OCL_HC_Desorb_Request	None	Engine_Speed	RPM
V_ATP_fg_Turbo_Out	g/sec	V_SFL_tr_Regen_Cmd	Deg_K
V_ATP_tr_DOC_In	Deg_K	V_SFP_fv_DPF	ACMS
V_ATP_tr_DOC_Out	Deg_K	H_CBR_Alpha	None
V_ATP_tr_DPF_Out	Deg_K	H_CBR_Chi_Value	None
PTM_Final_Oper_Mode	None	J39_VGT_Actuator_Position	%
V_ATM_Oper_Mode	None		

After-Treatment Parameter Estimates

98. Engine Out PM Estimate

(csdd_combustion_manager)

Fuel_Delivery_Rate_Per_Min	kg/min	H_PME_SootRateUnclamped	g/hr
Adjusted_EGR_Fraction	None	H_PME_FuelDeliveryAftGain	g/hr
EGR_Fraction	None	H_PME_Air_FuelRatioAdjusted	None
CBP_Air_Fuel_Ratio	None	H_PME_PM_Factor_Speed	None
Final_Timing	deg_BTDC	H_PME_PM_Factor_EGRSOI	None
Engine_Speed	RPM	H_PME_PM_Factor_PRSPIF	None
PME_SootRate	g/hr		

99. DeltaP Soot Load Estimate

(csdd_dsm_sfm)

C_SFP_pr_DeltaPress_Clean_Tbl	kPa	H_SFP_fv_Unfiltered	ACMS
C_SFP_pr_DeltaPress_Low_Tbl	kPa	V_SFP_mg_Ash_Adj	g
C_SFP_pr_DeltaPress_Mid_Tbl	kPa	V_SFP_fv_DPF	ACMS
C_SFP_pr_DeltaPress_High_Tbl	kPa	V_SFP_pr_Delta	kPa
C_SFP_mg_Soot_Load_Clean	mg	V_SFP_mg_Soot_Load_DP	g
C_SFP_mg_Soot_Load_Lo	mg		
C_SFP_mg_Soot_Load_Mid	mg		
C_SFP_mg_Soot_Load_Hi	mg		
C_SFP_fv_Min_to_Trust_DeltaP	ACMS		

100. Mass Balanced Soot Load Estimate

(csdd_dsm_sfm)

H_SFM_fg_MassFlow_In	g/sec	V_SFP_tr_DPF_Bed	Deg_K
H_SFM_mf_NO2_In	Frac	H_SFP_mg_dt_NO2_Oxid_Rate	g/sec
H_SFM_mf_O2_In	Frac	H_SFP_mg_dt_O2_Oxid_Rate	g/sec
H_SFM_mf_PM_In	Frac	V_SFP_mg_dt_NetSootAccumRate	g/sec

Aftertreatment Overrides

101. User Overrides

Description	Variable	Override Enable	Override Value
DPF Pressure Delta	V_SFP_pr_Delta	O_AIM_pr_DPF_DeltaP_Enable	C_AIM_pr_DPF_DeltaP_Default
DOC In Temperature	V_ATP_tr_DOC_In	O_AIM_tr_DOC_In_Enable	C_AIM_tr_DOC_In_Default
DOC Out Temperature	V_ATP_tr_DOC_Out	O_AIM_tr_DOC_Out_Enable	C_AIM_tr_DOC_Out_Default
DPF Out Temperature	V_ATP_tr_DPF_Out	O_AIM_tr_DPF_Out_Enable	C_AIM_tr_DPF_Out_Default
After-Treatment Operational Mode	V_ATM_Oper_Mode	O_ATR_Oper_Mode_Enbl	O_ATR_Oper_Mode_Value
Turbo Out Temperature	V_ATP_tr_Turbo_Out	O_AIM_tr_TrbnOutOvr_Enbl	O_AIM_tr_TrbnOut
Turbo Out Flow	V_ATP_fg_Turbo_Out	O_AIM_fg_TrbnOutOVr_Enbl	V_AIM_pr_Turbo_Out
Turbo Out Pressure	V_ATP_pr_Turbo_Out	O_AIM_pr_TrbnOut_Enbl	V_AIM_pr_Turbo_Out
NOx Mass Fraction	V_ATP_mf_Turbo_Out_NOx	O_AIM_TrbnOutExhNOxOvr_Enbl	V_AIM_mf_Turbo_Out_NOx
O2 Mass Fraction	V_ATP_mf_Turbo_Out_O2	O_AIM_TrbnOutExhO2_Enbl	V_AIM_mf_Turbo_Out_O2
HC Mass Fraction	V_ATP_mf_Turbo_Out_HC	O_AIM_TrbnOutHCTrgtFdbkOvr_Enbl	V_AIM_mf_TrbnOutHCTrgt_Fdbk
Particulate Matter Mass Fraction	V_ATP_mf_Turbo_Out_PM	O_AIM_TrbnOutExhPMOvr_Enbl	V_AIM_mf_Turbo_Out_PM
Application Label	PTM_ApplicationLabel	C_PTM_Label_Override_Enable	C_PTM_Label_Override_Value
Regeneration Tactic	H_SFR_Regen_Tactic	C_SFR_Regen_Tactic_Ov_Enable	C_SFR_Regen_Tactic_Ov_Value
Regeneration Stage	V_SFR_Regen_Stage	O_SFR_Regen_Stage_Enable	O_SFR_Regen_Stage_Value
Injector Dosing Command	H_HIM_fg_Dosing_Cmd	O_HIM_fg_Inj_Cmd_Enbl	O_HIM_fg_Inj_Cmd_Value
AT Fuel Shut-Off Valve	V_HIM_DFSOV_Cmd	O_HIM_DFSOV_Control_Enbl	O_HIM_DFSOV_Control_Value
AT Drain Shut-Off Valve	V_HIM_DFSOV2_Cmd	O_HIM_DFSOV_Control_Enbl	O_HIM_DFSOV2_Control_Value

102. User Resets

Faulted Parameter	Reset Enable
V_APM_DPFOut_SevereFault	O_APM_DPFOut_SevereFault_Reset
V_APM_DPFOut_PersistsFault	O_APM_DPFOut_PersistsFault_Reset
V_APM_DOCOut_SevereFault	O_APM_DOCOut_SevereFault_Reset
V_APM_DOCOut_PersistsFault	O_APM_DOCOut_PersistsFault_Reset
H_ATD_tm_RvrsdTherm_Fault	O_ATD_RvrsdTherm_Reset
V_OCR_fg_HC_Int_Cntrl	O_OCR_TmptrFdbkInt_Reset

Procedures

103. Soot Load Override

1. Set parameter *C_SFP_Soot_Load_User_Reset_Val* to the desired soot load
2. Set override *C_SFP_Soot_Load_User_Reset_En* to a value *1*
3. Set override *O_SFP_Soot_Load_Reset* to a value *1*
4. Steps 5-6 need completed so that the soot load will decrease per the regeneration (if they are not performed the soot load will not decrement and stay at the value set in step 1)
5. Set override *O_SFP_Soot_Load_Reset* to a value *0*
6. Set override *C_SFP_Soot_Load_User_Reset_En* to a value *0*

104. Trigger Stationary Regeneration without the Stationary Regen Switch

1. Set override *O_SFR_Regen_Trigger_On* to a value of *1*
2. Set override *DIP_SRegen_SW_User_Ovrd_Val* to a value *1*
3. Set override *T_DIP_SRegen_SW_User_Ovrd_En* to a value *1*
4. When testing is complete, switch all three overrides in steps 1-3 to a value of 0

105. Stationary Regeneration Pedal Dance Procedure

Monitor H_PTM_Pedal_Dance_Stage to watch "steps" if having problems getting to activate.

1. Turn keyswitch OFF for 10 seconds
2. Turn keyswitch ON - DO NOT START THE ENGINE
3. Depress throttle pedal to 100% and hold
4. Depress and release service brake pedal 5 times
5. Release the throttle pedal
6. Depress and release service brake pedal 3 times
7. Depress the throttle pedal and hold until Red stop engine light comes on. This will be between 5 and 10 seconds.
8. Release the throttle pedal
9. Start the engine
10. Engine speed will ramp up to the calibrated engine speed for a stationary regeneration if a regeneration is required
    a. Red 1 and 2 = 1100 RPM
    b. Red 3 = 1150 RPM
    c. LE2, LE3, and UBUS = 1400 RPM

106. After-treatment Fuel Shutoff Valve, After-treatment Drain Valve, and Doser Override Procedure

The following procedure allows you to individually override SOV#1, SOV#2, to diagnose after-treatment fuel system issues.

1. Set *C_DDD_s_OverrideEnable* to a value of *1* for doser and SOV override enables
2. Set *H_DDD_s_FSOEnable* to a value of *1* to open the Supply SOV and supply doser with fuel pressure
3. Set *H_DDD_s_FSO2Enable* to a value of *0* to close drain SOV
4. Set *H_DDD_tm_InjOntime* to a value of *10 ms* to turn on the doser

_Aftertreatment_Fuel_Pressure should be reading the same value as *Fuel_Rail_Pressure* with SOV open.

107. After-treatment Fuel Injector (Doser) Bucket Test

This procedure will inject 300ml of fuel in 2.5 minutes. The doser must flow a minimum of 275ml during this test. Note, this procedure must be performed with the doser removed from the engine.

1. Set *C_HIM_FT_DoserTest_Enbl* to a value of *1*
2. Set *V_HIM_FT_Test_Mode* to a value of *1*
3. Set *V_HIM_FT_DoserTest_Start* to a value of *1*
4. Set all three overrides in steps 1-3 to a value of *0* after test is complete

108. Trigger Dosing System Diagnostics

1. Set *O_HIM_DIAG_Pressure_Test_Enbl* to a value of *1*
2. Set *O_HIM_DIAG_Leak_Test_Enbl* to a value of 1
3. Set all three overrides in steps 1-2 to a value of *0* after test is complete

In-Range Fault Codes

109. FC 2359: (EGR_DELTA_P_IR_HIGH_ERROR, EGR_DP_IR_Closed_Error)

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.

Enable conditions for diag. to run	Units			Units
T_EGR_DP_IR_Enable	None	=	TRUE	
EGR_Delta_Press_Status	None	=	DATA_VALID	
EGR_Position_Source	None	=	PRIMARY	
Net_Engine_Torque	N_m	<	C_EGR_DP_IR_Closed_Eng_Trq_Thd	N_m
EGR_Valve_EFA	%	<	C_EGR_DP_IR_Closed_EGR_EFA_Thd	%
Engine_Speed	RPM	<	C_EGR_DP_IR_Closed_Eng_Spd_Thd	RPM
Fault Threshold				
EGR_Delta_Press	kPa	>	C_EGR_DP_IR_Closed_Thd	kPa

110. FC 1899: (EGR_DELTA_P_IR_LOW_ERROR, EGR_DP_IR_Open_Error)

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 or the EGR differential pressure reading is not valid for engine operating conditions.

Enable conditions for diag. to run	Units			Units
T_EGR_DP_IR_Enable	None	=	TRUE	
EGR_Delta_Press_Status	None	=	DATA_VALID	
EGR_Position_Source	None	=	PRIMARY	
Net_Engine_Torque	N_m	>	C_EGR_DP_IR_Open_Eng_Trq_Thd	N_m
EGR_Valve_EFA	%	>	C_EGR_DP_IR_Open_EGR_EFA_Thd	%
Engine_Speed	RPM	>	C_EGR_DP_IR_Open_Eng_Spd_Thd	RPM
Engine_Delta_Press	kPa	<	C_EGR_DP_IR_Open_Eng_DP_Thd	kPa
Fault Threshold				
EGR_Delta_Press	kPa	<	C_EGR_DP_IR_Open_Thd	kPa

111. FC 2774: (EGR_DP_CLOGGED_TUBES_ERROR)

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 or the EGR differential pressure reading is not valid for engine operating conditions.

Enable conditions for diag. to run	Units			Units
C_CHH_EGRTubeClogEnable	None	=	TRUE	
EGR_Delta_Press_Status	None	=	DATA_VALID	
CHH_EGR_DP_Clogged_Tubes_Error	None	=	FALSE	
Fault Threshold				
EGR_Delta_Press_Sensor	kPa	≥	C_CHH_EgrTubeClogThdMaxDP	kPa
		FOR	C_CHH_EgrTubeClogMaxDPTimeThd	Sec (total)
		AND		
EGR_Delta_Press_Sensor	kPa	≤	C_CHH_EgrTubeClogThdMinDP	kPa
		FOR	C_CHH_EgrTubeClogMinDPTimeThd	Sec (total)
		DURING	Any key on drive cycle	

112. FC 1866: (EGR_DP_AUTOZERO_ERROR, EGR_Delta_P_Autozero_Error)

Exhaust Gas Recirculation Valve Delta Pressure - Data Erratic, Intermittent, or Incorrect. An error in the EGR delta pressure signal was detected at initial key-on or the sensor failed the autozero test.

Enable conditions for diag. to run	Units			Units
	None	=	DATA_VALID	None
EGR_Delta_Press_OOR_State	None	=	GOOD	None
EGR_Position_Status	None	=	DATA_VALID	None
EGR_DP_IR_Open_Error	None	=	FALSE	None
EGR_DP_IR_Closed_Error	None	=	FALSE	None
EGR_Driver_Failure	None	=	FALSE	None
Engine_Speed	RPM	=	0	RPM
Key_Switch	None	=	OFF	None
Coolant_Temperature	Deg_C	=	C_EGR_AZ_Coolant_Tmptr_Thd	Deg_C
Charge_Tmptr	Deg_C	>	C_EGR_AZ_IMT_Thd	Deg_C
Charge_Tmptr_Source	None	=	PRIMARY	None
EGR_Valve_Is_Closed	None	=	TRUE	None
All of the above must be true	None	>	C_EGR_Delta_P_AZ_Enable_Time	Sec
InternalTmptr - C_EGR_AZ_ECM_Tmptr_Offset	Deg_C	>	C_EGR_AZ_ECM_Tmptr_Thd	Deg_C
Fault Threshold (EGR_DELTA_PRESS_KEYON_ERROR)				
Abs value (EGR_Delta_Press_Sensor)	kPa	>	EGR_Delta_P_AZ_Tolerance (calculated via a table lookup)	KPa

Note: Once FC 1866 / EGR_DP_AUTOZERO_ERROR goes active, it can only go inactive after the diagnostic has had a chance to run and pass. (The fault is persistent through key cycles.)

113. FC 1943 (CBR_DENSITY_DERATE_ERROR_ID, CBR_Density_Derate_Error)

Ambient Air Density - Data Valid but Below Normal Operational Range - Least Severe Level. Engine torque has been reduced because the vehicle was operating at a high altitude condition.

Enable conditions for diag. to run	Units			Units
CBR_Fuel_Ref_State	None	=	CTRL_AIR_DENSITY_FUEL_LIMIT	None
Fault Threshold				
H_CBR_Density_Max_Fuel / CBR_Gross_Fuel	mg/stroke	<	C_CBR_Derate_Error_Set_Thd	mg/stroke
The above must be true		>	C_CBR_Derate_Fault_Set_Time	Sec

114. FC 2346: (CBR_TFC_DERATE_ERROR_ID, CBR_TFC_Derate_Error)

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.

Enable conditions for diag. to run	Units			Units
CBR_Fuel_Ref_State	None	=	CTRL_TFC_FUEL_LIMIT	None
Fault Threshold				
Texh_Fuel_Limit / CBR_Gross_Fuel	mg/stroke	<	C_CBR_Derate_Error_Set_Thd	mg/stroke
The above must be true		>	C_CBR_Derate_Fault_Set_Time	Sec

115. FC 1942: (BEYOND_THD_AZ_ERROR)

Crankcase Pressure - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the crankcase pressure signal is not changing with engine operating conditions.

Note: There are two separate ways to trigger FC 1942:
1) Key on rationality
2) In-use dither check

Regardless of what triggered it, the fault will remain active until the next key cycle.

Key on rationality

Enable conditions for diag. to run	Units			Units
Runs during every key-on event				
Fault Threshold				
Abs value (Crankcase_Press)	kPa	≥	C_CCP_Rat_Lim	kPa

Note: A FC 1942 that is becomes active by only starting the engine is likely to be a bad sensor.

In-use dither check

Enable conditions for diag. to run				
Engine is operated such that it has cycled a few times between high and low power	None			None
Fault Threshold				
Max observed (Crankcase_Press_Auto_Zero) – Min observed (Crankcase_Press_Auto_Zero)	kPa	<	C_Dither_Pdiff_Thd	kPa

Note: A FC 1942 that occurs only after the truck is driven is due to essentially frozen output of the crankcase pressure sensor. This could be due to a failed sensor … or a sensor that is not being exposed to crankcase pressure variation (e.g. unplugged blow by hose)

116. FC 2973: (CHARGE_PRESS_KEYON_ERROR (key on rationality) or CHARGE_PRESS_IR_ERROR (in-use rationality))

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.

Note: There are two separate ways to trigger FC 2973:
1) Key on rationality: Latches until the next key cycle
2) In-use dither check: Can set and clear during the same drive cycle

Key on rationality

Enable conditions for diag. to run	Units			Units
Runs during every key-on event. Compares Charge_Press to the readings of all other absolute pressure sensors (e.g. Ambient air pressure, Exhaust Pressure, Oil Pressure). Fault is set if Charge_Press is significantly different than the average of the others				

In-use rationality

Enable conditions for diag. to run				
Charge_Press_State	None	=	GOOD	None
Charge_Press_EStat	None	=	GOOD	None
ChargePressFiltConfigError	None	=	GOOD	None
T_Charge_Press_IR_Enable	None	=	TRUE	None
Fault Threshold				
Abs Value (Charge_Press_Est - Charge_Press_Sensor - Charge_Press_Est_Offset)	kPa	>	Charge_Press_Tolerance	kPa

Note: All parameters regarding this fault threshold calculation are dynamically sensed or calculated. In order to understand how the calculated values were generated, it is suggested that you also log the following:

Compressor_Inlet_Press
Engine_Speed
TPE_Corrected_Turbo_Speed
Compressor_Inlet_Press

Engine Protection (EPF)

117. EPF - Line Haul Derate Engine Protection Logic

	Sensor	DerateType (T)orque / (R)PM	Threshold derate begins after X sec	Max derate occurs:	Fault Code
	Coolant Temperature	Tseverity based	> C_EPD_CT_Trq_Drt_Err_Sev for C_EPD_CT_Trq_Err_Dur sec	>= C_EPD_CT_Trq_Drt_Max_Thd	2963 (No Lamp)
		Rtime based	> C_EPD_CT_RPM_Drt_Err_Sev for C_EPD_CT_RPM_Error_Dur sec	>= C_EPD_CT_TB_Time_To_Max_RPM_Drt sec	151 (Red Lamp)
	Coolant Temp (2)	Tseverity based	>C_EPD_CT2_Trq_Drt_Err_Sev for C_EPD_CT2_Trq_ Err_Dur sec	>= C_EPD_CT2_Trq_Drt_Max_Thd	N/A
	Charge Temperature	Tseverity based	> C_EPD_CHT_Trq_Drt_Err_Sev for C_EPD_CHT_Trq_Err_Dur sec	>= C_EPD_CHT_Trq_Drt_Max_Thd	2964 (No Lamp)
		Rtime based	> C_EPD_CHT_RPM_Drt_Err_Sev for C_EPD_CHT_RPM_Error_Dur sec	>=C_EPD_CHT_TB_Time_To_MaxRPMDrt sec	155 (Red Lamp)
	Oil Temperature	Tseverity based	> C_EPD_OT_Trq_Drt_Err_Sev for C_EPD_OT_Trq_Err_Dur sec	>= C_EPD_OT_Trq_Drt_ Max_Thd	214(Red Lamp)
	Oil Pressure	Ttime based	Min Torque Drt Table for C_EPD_OP_Trq_Err_Dur sec	>= C_EPD_OP_TB_Time_To_Max_Trq_Drt sec	143 (YellowLamp)
		Rtime based	Max Torque Drt Table for C_EPD_OP_RPM_Error_Dur sec	>= C_EPD_OP_TB_Time_To_Max_RPM_Drt sec	415 (Red Lamp)
	Exhaust Metal Temp (Virtual)	Tseverity based	> C_EPD_EMT_Trq_Drt_Err_Sev for C_EPD_EMT_Trq_Err_Dur sec	>= C_EPD_EMT_Trq_Drt_Max_Thd	2451 (No Lamp)
	Comp Out Temp (Virtual)	Tseverity based	> C_EPD_COT_Trq_Drt_Err_Sev for C_EPD_COT_Trq_Err_Dur sec	>= C_EPD_COT_Trq_Drt_ Max_Thd	2347 (No Lamp)
	EGR Return Temp	Tseverity based	> C_EPD_EGR_Trq_Drt_Err_Sev for C_EPD_EGR_Trq_Err_Dur sec	>= C_EPD_EGR_Trq_Drt_Max_Thd	2961 (No Lamp)
		Rtime based	> C_EPD_EGR_RPM_Drt_Err_Sev for C_EPD_EGR_RPM_Error_Dur sec	>= C_EPD_EGR_TB_Time_To_MaxRPMDrt	2962(YellowLamp)
	EGR Return Temp (2)	Tseverity based	> C_EPD_EGR2_Trq_Drt_Err_Sev for C_EPD_EGR2_Trq_Err_Dur sec	>= C_EPD_EGR2_Trq_Drt_Max_Thd	N/A
	Crank Case Pressure	N/A	C_EPD_CCP_Tbl1 for C_EPD_CCP_Trq_Err_Dur sec		555 (YellowLamp)
		Ttime based	C_EPD_CCP_Tbl2 for C_EPD_CCP_Trq_Err_Dur sec	>= C_EPD_CCP_TB_TimeToMax_Trq_Drt	556 (Red Lamp)
	Engine Speed	N/A	C_EPD_Overspeed_Limit for C_EPD_Overspeed_Allowed_Time sec	N/A	234 (Red Lamp)
	Soot Load	N/A	>C_SFR_RegenTrgtVec1-8 bit 10 for C_EPD_Soot_RPM_Error_Dur	N/A	2639 (DPF Lamp)
		Rtime based	> C_EPD_Soot_RPM_Drt_Err_Sev for C_EPD_Soot_RPM_Error_Dur	>= C_EPD_Soot_TB_TimeToMaxRPM_Drt	1921 (Yellow and a blink DPF Lamp)
		Rtime based	> C_SFP_mg_Soot_Stage_3_To_4 for C_EPD_Soot_RPM_Error_Dur	>= C_EPD_Soot_TB_TimeToMaxRPM_Drt	1922 (Red Lamp)
	Coolant Level	N/A	= 2 for C_EPD_CL_Trq_Err_Dur sec	N/A	2448*
	Exhaust Pressure	Rtime based	> C_EPD_EP_RPM_Drt_Err_Sev for C_EPD_EP_RPM_Error_Dur sec	>= C_EPD_EP_TB_Time_To_MaxRPMDrt sec	2764(Yellowlamp)

2448 *: Next key on, yellow lamp flash 30 sec

118. EPF - Line Haul Shut Down Engine Protection Logic

	Sensor	Shutdown Type (T)orque / (R)PM	Threshold Shutdown begins after X sec (and lamp begins flashing):	Time before engine shutdown (lamp flashes):	Fault Code
	Coolant Temperature	Tseverity based	> C_EPD_CT_Sev_SD_Thd 0 sec	C_EPD_CT_SD_Warning_Time_Dur sec	2963 (No Lamp)
					151 (Red Lamp)
	Charge Temperature	Tseverity based	> C_EPD_CHT_Sev_SD_Thd for 0 sec	C_EPD_CHT_SD_Warning_Time_Dur sec	2964 (No Lamp)
	Oil Temperature	Tseverity based	> C_EPD_OT_Sev_SD_Thd for 0 sec	C_EPD_OT_SD_Warning_Time_Dur sec	214(Red Lamp)
	Oil Pressure	Ttime based	C_EPD_OP_Min_Trq_Drt_Tbl for C_EPD_OP_Trq_SD_Time_Dur+ C_EPD_OP_SD_Delay_Time sec	C_EPD_OP_SD_Warning_Time_Dur sec	143 (Yellow Lamp)
		Rtime based	C_EPD_OP_Max_Trq_Drt_Tbl for C_EPD_OP_RPM_SD_Time_Dur+ C_EPD_OP_SD_Delay_Time sec	C_EPD_OP_SD_Warning_Time_Dur sec	415 (Red Lamp)
	Aftertreatment Temp	Ttime based	V_ATP_tr_DOC_Out > C_APM_tr_DOCOut_Severe_HiThd for C_APM_tm_DOC_Severe_Tmptr + C_ATM_tm_OT_EPSD_Delay sec	C_ATM_tm_OT_EPSD_Warning Sec	1969(Red lamp)
		Ttime based	V_ATP_tr_DPF_Out> C_APM_tr_DPFOut_Severe_HiThd for C_APM_tm_DPF_Severe_Tmptr + C_ATM_tm_OT_EPSD_Delay sec	C_ATM_tm_OT_EPSD_Warning Sec	1973(Red lamp)

119. EPF - UBus Derate Engine Protection Logic (Only different channel from Line Haul)

	Sensor	Derate Type (T)orque / (R)PM	Threshold derate begins after X sec	Max derate occurs:	Fault Code
	Coolant Level	N/A	= 2 C_EPD_CL_Trq_Err_Dur sec		2448*
		Ttime based	= 0 for C_EPD_CL_Trq_Err_Dur sec	>= C_EPD_CL_TB_Time_To_Max_Trq_Drt	235 (Red Lamp)

2448* :Next key on, yellow lamp flash 30 sec

120. EPF - UBus Shut Down Engine Protection Logic (Only different channel from Line Haul)

	Sensor	Shutdown Type (T)orque / (R)PM	Threshold Shutdown begins after X sec (and lamp begins flashing):	Time before engine shutdown (lamp flashes):	Fault Code
	Coolant Level	Ttime based	= 0 for C_EPD_CL_Trq_SD_Time_Dur + C_EPD_CL_SD_Delay_Time	C_EPD_CL_SD_Warning_Time_Dur Sec	235 (Red Lamp)

121. EPF - FireTruck Derate Engine Protection Logic

	Sensor	Derate Type (T)orque/(R)PM	Threshold Fault Code and Lamps begins after X sec	NO Derate NOShutdown	Fault Code
	Coolant Temperature	Tseverity based	> C_EPD_CT_Trq_Drt_Err_Sev for C_EPD_CT_Trq_Err_Dur sec		2963 (No Lamp) + 146 (Yellow lamp)
		Rtime based	> C_EPD_CT_RPM_Drt_Err_Sev for C_EPD_CT_RPM_Error_Dur sec		151 (Red Lamp) + 146 (Yellow lamp)
	Coolant Temp (2)	Tseverity based	>C_EPD_CT2_Trq_Drt_Err_Sev for C_EPD_CT2_Trq_ Err_Dur sec		N/A
	Charge Temperature	Tseverity based	> C_EPD_CHT_Trq_Drt_Err_Sev for C_EPD_CHT_Trq_Err_Dur sec		2964 (No Lamp)
		Rtime based	> C_EPD_CHT_RPM_Drt_Err_Sev for C_EPD_CHT_RPM_Error_Dur sec		155 (Red Lamp)
	Oil Temperature	Tseverity based	> C_EPD_OT_Trq_Drt_Err_Sev for C_EPD_OT_Trq_Err_Dur sec		214(Red Lamp)
	Oil Pressure	Ttime based	Min Torque Drt Table for C_EPD_OP_Trq_Err_Dur sec		143 (Yellow Lamp)
		Rtime based	Max Torque Drt Table for C_EPD_OP_RPM_Error_Dur sec		415 (Red Lamp)
	Exhaust Metal Temp (Virtual)	Tseverity based	> C_EPD_EMT_Trq_Drt_Err_Sev for C_EPD_EMT_Trq_Err_Dur sec		2451 (No Lamp)
	Comp Out Temp (Virtual)	Tseverity based	> C_EPD_COT_Trq_Drt_Err_Sev for C_EPD_COT_Trq_Err_Dur sec		2347 (No Lamp)
	EGR Return Temp	Tseverity based	> C_EPD_EGR_Trq_Drt_Err_Sev for C_EPD_EGR_Trq_Err_Dur sec		2961 (No Lamp)
		Rtime based	> C_EPD_EGR_RPM_Drt_Err_Sev for C_EPD_EGR_RPM_Error_Dur sec		2962 (Yellow Lamp)
	EGR Return Temp (2)	Tseverity based	> C_EPD_EGR2_Trq_Drt_Err_Sev for C_EPD_EGR2_Trq_Err_Dur sec		N/A
	Crank Case Pressure	N/A	C_EPD_CCP_Tbl1 for C_EPD_CCP_Trq_Err_Dur sec		555 (Yellow Lamp)
		Ttime based	C_EPD_CCP_Tbl2 for C_EPD_CCP_Trq_Err_Dur sec		556 (Red Lamp)
	Engine Speed	N/A	C_EPD_Overspeed_Limit for C_EPD_Overspeed_Allowed_Time sec		234 (Red Lamp)
	Soot Load	N/A	>C_SFR_RegenTrgtVec1-8 bit 10,for C_EPD_Soot_RPM_Error_Dur sec		2639 (DPF Lamp)
		Rtime based	> C_EPD_Soot_RPM_Drt_Err_Sev for C_EPD_Soot_RPM_Error_Dur sec		1921 (Yellow and a blink DPF Lamp)
		Rtime based	> C_SFP_mg_Soot_Stage_3_To_4 for C_EPD_Soot_RPM_Error_Dur sec		1922 (Red Lamp)
	Coolant Level	N/A	= 2 for C_EPD_CL_Trq_Err_Dur sec		2448 *
	Exhaust Pressure	Rtime based	> C_EPD_EP_RPM_Drt_Err_Sev for C_EPD_EP_RPM_Error_Dur sec		2764(Yellow lamp)

2448* :Next key on, yellow lamp flash 30 sec

Engine Performance Diagnostics:

122. Acceleration Noise Control (ANC)

Engine_Speed	RPM	H_ANC_CompensatedEngineSpeed	RPM
Total_Fueling	mg/stroke	H_ANC_Ndot_Demand	RPM/S
Engine_Acceleration	RPM/S	Combustion_Control_Path_Owner	None
Effective_Gear_Ratio	None	Vehicle_Speed	km/h

123. Aftertreatment Doser Diagnostics

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	None
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	gm	V_DSR_pr_Doser_Test_PntC	kPa
V_SFP_Soot_Load_DP	gm	V_DSR_pr_Doser_Test_PntD	kPa

124. Aftertreatment Regeneration / Triggers

V_SFR_Regen_Trigger	None	V_SFR_tr_dt_Warmup_Ramp_Rate	Deg_K/sec
H_SFR_Regen_Tactic	None	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	gm	C_SFR_tm_RegenMaxIneffectivePst	None
H_SFR_Regen_Off_Soot_Load	gm	V_SFR_Regen_Stage	None
H_SFR_tr_Warmup_Trgt	Deg_K	H_SFP_SootConsumeThisRegen	gm
V_SFR_tr_dt_Regen_Ramp_Rate	Deg_K/sec	C_SFR_tm_Regen_Max	None
H_SFR_tm_Warmup_Req	Sec	H_SFR_tm_Regen_Max	sec
V_SFL_tr_Regen_Trgt	Deg_K		

125. Aftertreatment Soot Load

V_SFP_pr_Delta_High	kPa	V_ATP_mf_Turbo_Out_PM	Frac
V_SFP_pr_Delta_Mid	kPa	V_SFP_mg_dt_NetSootAccumRate	gm
V_SFP_pr_Delta_Low	kPa	H_SFP_mg_dt_NO2_Oxid_Rate	gm
V_SFP_pr_Delta_Clean	kPa	H_SFP_mg_dt_O2_Oxid_Rate	none
V_ATP_fg_Turbine_Out	g/s	V_SFP_Ash_Adj	gm
V_ATP_mf_Turbo_Out_O2	Frac	HP_SFP_Ash_Since_Last_Reset	gm
V_ATP_mf_Turbo_Out_Nox	Frac		

126. Altitude Determination

Engine_Speed	RPM	CHL_MCF_Cmd	mg/stroke
Net_Engine_Torque	N_m	Charge_Flow	kg/min
		CBL_EGR_Frac_Cmd	None
Combustion_Control_Path_Owner	None	CHL_EGR_Frac_Cmd	None
Ambient_Air_Press	kPa	EGR_Fraction	None
Ambient_Air_Tmptr	kPa	EGR_Position	%
H_CBR_Compressor_Inlet_Density	kg/m3	VGT_Position	%
Altitude	m	Compressor_Outlet_Tmptr	Deg_C
EGR_Valve_Delta_Press	kPa	Compressor_Inlet_Tmptr	Deg_C
Exhaust_Tmptr	Deg_C	Compressor_Inlet_Press	kPa
Exhaust_Metal_Tmptr	Deg_C	Charge_Press	kPa
H_NDOT_Gov_Torque	N_m	Charge_Tmptr	Deg_C
CBR_Density_Max_Fuel	mg/stroke	Exhaust_Press	kPa
Final_Timing_State	None	Filtered_Turbo_Speed	KRPM
CBR_Max_Fuel_Limit	mg/stroke	EMM_AECD_State	None
CSE_Xform_Error_1	None	EMM_Protection_State	None
CSE_Xform_Error_2	None	ENGN_Final_Torque_Cmd	Nm
Net_Engine_Torque	N_m		

127. Cab Switchable Governor

Engine_Speed	RPM	Engine_No_Load_Torque	None
Total_Fueling	mg/stroke	Accelerator_Pedal_Position	None
Combustion_Control_Path_Owner	None	H_ABS_Ndot_Demand	None
Selected_Governor	None	Ndot_Demand	RPM/S
H_MACH_NetTorqueCmd	None		

128. Charge Flow Derate

Engine_Speed	RPM	Charge_Flow	kg/min
Total_Fueling	mg/stroke	CHL_MCF_Cmd	kg/min
Net_Engine_Torque	Nm	CHL_EGR_Frac_Cmd	None
Combustion_Control_Path_Owner	None	CHL_COT_Drt_Active	None
CHS_MCF_Cmd	kg/min	CHL_Delta_P_Drt_Active	None
CBL_EGR_Frac_Cmd	None	CHL_Turbo_Speed_Drt_Active	None
CHL_Derate_State	None	CHL_EGR_Off_DP_Drt_Active	None
CHL_Surge_Derate_Active	None	CHL_EMP_Drt_Active	None

129. Charge Limit Management (CHL)

(chm_chl_lib)

Engine_Speed	RPM	CHL_Surge_Drt_Active	None
Total_Fueling	mg/stroke	CHS_MCF_Cmd	kg/min
Net_Engine_Torque	Nm	CHL_COT_Drt_Offset	kg/min
Combustion_Control_Path_Owner	None	CHL_COT_Drt_Active	None
CHL_EGR_Frac_Cmd	None	CHL_Turbo_Speed_Drt_Offset	kg/min
EGR_Fraction	None	CHL_Turbo_Speed_Drt_Active	None
CHL_MCF_Cmd	kg/min	CHL_Delta_P_Drt_Offset	kg/min
Charge_Flow	kg/min	CHL_Delta_P_Drt_Active	None
CBL_EGR_Frac_Cmd	None	CHL_EGR_Off_DP_Drt_Offset	kg/min
CHL_Surge_Drt_Offset	None	CHL_EGR_Off_DP_Drt_Active	None
CHL_Derate_State	None	CHL_EMP_Drt_Offset	kg/min
		CHL_EMP_Drt_Active	None

130. CHL – Compressor Outlet Temperature Limit Function

CHL_MCF_Cmd	kg/min	C_CHL_COT_MCF_Cmd_Rate_ULim	kg/min_sec
CHL_Derate_State	None	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	None
CHS_MCF_Cmd	kg/min	C_CHL_COT_Drt_Off_Ratio	None
CHL_COT_Drt_Active	None	C_CHL_COT_Drt_Max	kg/min

131. CHL - Delta-P Derate Function

EGR_Valve_Delta_Press	kPa	C_CHL_Delta_P_Drt_On_Ratio	None
C_CHL_Delta_P_Drt_Limit	kPa	C_CHL_Delta_P_Drt_Off_Ratio	None
Charge_Flow	kg/min	CHL_Delta_P_Drt_Active	None
CHS_MCF_Cmd	kg/min	CHL_Delta_P_Drt_Offset	kg/min
CHL_Derate_State	None	CHL_MCF_Cmd	kg/min

132. CHL - EGR Off Delta-P Derate Function

EGR_Valve_Delta_Press	kPa	C_CHL_EGR_Off_DP_Drt_On_Ratio	None
C_CHL_EGR_Off_DP_Drt_Limit	kPa	C_CHL_EGR_Off_DP_Drt_Off_Ratio	None
Charge_Flow	kg/min	CHL_EGR_Off_DP_Drt_Active	None
CHS_MCF_Cmd	kg/min	CHL_EGR_Off_DP_Drt_Offset	kg/min
CHL_Derate_State	None	CHL_MCF_Cmd	kg/min

133. CHL - Surge Limit Function

Surge_Line_CFP	None	C_CHL_Surge_Drt_On_Ratio	None
Surge_Margin_Source	None	C_CHL_Surge_Drt_Off_Ratio	None
CHL_Surge_Limit	None	CHL_Surge_Drt_Offset	None
TPE_Corrected_Air_Flow	None	CHL_Surge_Drt_Active	None
CHL_Derate_Is_Active	None	C_CHL_Surge_Drt_Limit	%
CHL_MCF_Cmd	kg/min	Charge_Flow	kg/min
CHS_MCF_Cmd	kg/min		

134. CHL - Turbo Speed Limit Function

Compressor_Outlet_Tmptr	Deg_C	C_CHL_COT_Drt_On_Ratio	None
C_CHL_COT_Drt_Limit	Deg_C	C_CHL_COT_Drt_Off_Ratio	None
Charge_Flow	kg/min	CHL_COT_Drt_Active	None
CHS_MCF_Cmd	kg/min	CHL_COT_Drt_Offset	kg/min
CHL_Derate_Status	None	CHL_MCF_Cmd	kg/min
Ambient_Air_Tmptr	Deg_C	Compressor_Inlet_Tmptr	Deg_C
J39_VGT_Actuator_Position	%	Boost_Pressure	kPa_G
Intake_Manifold_Temperature	Deg_C	EGR_Position	%
Compressor_Outlet_Tmptr	Deg_C	C_CHL_COT_Drt_On_Ratio	None

135. Charge System Errors (CSE)

CHL_EGR_Frac_Cmd	None	CBO_Charge_Aggressiveness_Ref	None
EGR_Fraction	None	CSE_Xform_Error_1	None
CHL_MCF_Cmd	kg/min	CSE_Xform_Error_2	None
Charge_Flow	kg/min	CSE_Xform_Angle	Deg

Transient Gain Adjust:

CSE_MCF_Adj_Error	kg/min	CBO_Charge_Aggressiveness_Ref	None
CSE_EGR_Frac_Adj_Error	None	CHL_MCF_Cmd	kg/min
CSE_MCF_Error	kg/min	Charge_Flow	kg/min
CSE_Transient_Gain_Adj	None	EGR_Fraction	None
CSE_Aggressiveness_Gain_Adj	None	CHL_EGR_Frac_Cmd	None
CSE_EGR_Frac_Error	None	CSE_EGR_On_Flag	None
CSE_EGR_Transient_Gain_Adj	None		

OC VGT MCF Error Saturation:

CSE_OCVGT_dP_IMP_Ref_Val	None	PTM_OCVG_Allowed	None
CSE_OCVGT_dP_IMP_Ref	None	Engine_Delta_Press	kPa
CSE_OCVGT_Error	None	Exhaust_Press	kPa
CSE_MCF_Adj_Error	kg/min	Engine_Speed	RPM
Combustion_Control_Path_Owner	None	Total_Fueling	mg/stroke
H_CSE_dP_IMP_Filtered	None	CSE_OCVGT_dP_IMP_Error_Final	None
DPE_Drt_Dp_P_Cmd	kPa	CSE_Xform_Error_2	None

Coordinate Transform Angle Lookup:

CSE_Xform_Angle	None	FSS_Total_Fueling	MG/STROKE
Engine_Speed	RPM		

Coordinate Transformation:

CSE_Xform_Error_1	None	CSE_MCF_Sat_Error	kg/min
CSE_Xform_Error_2	None	CSE_EGR_Frac_Adj_Error	None
CSE_Xform_Angle	None	CSE_MCF_Error	kg/min

EGR Skew:

Engine_Speed	RPM	EGR_Fraction	None
FSS_Total_Fueling	mg/stroke	CHL_EGR_Frac_Cmd	None
		CSE_Skew_Mult	None

136. Chi Determination

Engine_Speed	RPM	H_CBR_Chi_Value	None
Net_Engine_Torque	N_M	H_CBR_Chi_Desired	None
Total_Fueling	mg/stroke	H_CBR_Chi_Source	None
Combustion_Control_Path_Owner	None	CBR_Protection_Chi_Flag	None
H_CBR_Compressor_Inlet_Density	kg/m3	T_CBR_Chi_Selective_Override	None
Coolant_Tmptr	Deg_C	T_CBR_Chi_User_Override	None
CBR_Alpha	None	C_CBR_Chi_Override_Value	None
EMM_Cap_EL_Cmd	None	C_CBR_Chi_Override_EL	g/HP*hr
EMM_Protection_State	None	CBR_EGR_Off	None
Charge_Tmptr	Deg_C		

137. EGR Off Conditions

Engine_Speed	RPM	EGR_Position	% (EFA)
Net_Engine_Torque	N_m	EGA_DL_Mode_Command	None
Total_Fueling	mg/stroke	EGR_Valve_Delta_Press	kPa
Combustion_Control_Path_Owner	None	EGR_Orifice_Delta_Press	kPa
H_CBR_Chi_Value	None	EGR_Valve_Is_Closed	None
H_CBR_Chi_Source	None	CHL_EGR_Frac_Cmd	None
CBR_Alpha	None	EMM_AECD_State	None
CBR_EGR_Off	None	EMM_Protection_State	None
EGR_Orifice_Tmptr	Deg_C	CHH_EGRT_Over_Temperature	None

138. EGR On Conditions

Engine_Speed	RPM	Compressor_Outlet_Tmptr	Deg_C
Net_Engine_Torque	N_m	Filtered_Turbo_Speed	KRPM
Total_Fueling	mg/stroke	EGR_Position	% (EFA)
Combustion_Control_Path_Owner	None	EGA_DL_Mode_Command	None
H_CBR_Chi_Value	None	EGR_Valve_Delta_Press	Kpa
H_CBR_Chi_Source	None	EGR_Orifice_Delta_Press	kPa
CBR_Alpha	None	EGR_Fraction	None
Charge_Press	kPa	CHL_EGR_Frac_Cmd	None
Charge_Tmptr	Deg_C	CHL_MCF_Cmd	None
Coolant_Temperature	Deg_C	Charge_Flow	kg/min
EMM_AECD_State	None	EMM_Protection_State	None
EGR_Orifice_Tmptr	Deg_C		

139. EGR Valve Actuator

EAC_EGR_Valve_Cmd	% (EFA)	**Diagnostics:**	
EGA_DL_Position_Cmd_Final	% (Lift)	C_EGA_DL_Status_Fault_Enable	HEX
EGA_DL_Desired_Position	Counts	J39_EGR_Valve_Status	HEX
J39_EGR_Valve_Position	Counts	EGR_Driver_Failure	None
EGR_Position_Percent	% (Lift)		
EGR_Position	% (EFA)	**Override:**	
EGR_Position_Source	%	T_EGA_DL_Cmd_User_Override	None
C_J1939_BcstEnable_EGRV_CMD	None	C_EGA_DL_Cmd_Override_Value	% (Lift)
EGA_DL_AS_Active	None	T_EAC_User_Override	None
EGA_DL_SC_Active	None	C_EAC_Override_Value	% (EFA)
EGA_DL_Mode_Command	HEX		
J39_EGR_Valve_EDU_Tmptr	Deg_C		
J39_EGR_Valve_Lash	counts		
J39_EGR_Soft_Id	HEX		
C_J39_EGR_Soft_ID_MjRev	HEX		
J39_EGR_Addr_Claim_Count	counts		

140. EGR Valve Controller

Engine_Speed	RPM	CHL_MCF_Cmd	None
Total_Fueling	mg/stroke	Charge_Flow	kg/min
Combustion_Control_Path_Owner	None	CSE_Xform_Error_1	None
EGR_Position	%	CSE_Xform_Angle	Deg
EAC_EGR_Valve_Cmd	None	EGR_Valve_Is_Closed	None
EGA_DL_Mode_Command	None	EGR_Valve_Delta_Press	kPa
CHL_EGR_Frac_Cmd	None	Charge_Temptr	DEG_C
EGR_Fraction	%	T_EGA_Cycle_Counter	counts
EGA_DL_Pos_Cmd_Final	%	CSE_EGR_On_Flag	None
CBL_Fuel_Cmd	mg/stroke	EAC_EGR_Valve_Low	%
CBR_Alpha	None	EAC_EGR_Valve_High	%
Compressor_Inlet_Density	kg/m3		

141. EGR Valve Preferred Valve Position

Engine_Speed	RPM	EAC_Preferred_EFA	%
Total_Fueling	mg/stroke	EAC_Pref_EFA_Error	None
Combustion_Control_Path_Owner	None	EAC_Pref_EFA_Error_Modifier	None
EGR_Position	%	CSE_Xform_Error_1	None
CBL_Fuel_Cmd	mg/stroke	CBR_Alpha	None
Compressor_Inlet_Density	kg/m3	EAC_Modified_Error	None
		EAC_EGR_Valve_Cmd	%

142. Engine Brake Command Level Determination

Engine_Speed	RPM	Clutch_Switch	None
Fueling_MG	mg/stroke	RetarderStatus	None
Combustion_Control_Path_Ower	None	RetarderSwitchTorque	N_m
H_MACH_NetTorqueCmd	N_m	Actual_Gear_Ratio	None
EGR_Position_Source	None	EGR_Valve_Position_Commanded	%
H_ERC_GrossTorqueLmtd	N_m	C_ERC_TransTrqLimGearRatioThd	None

143. Engine Braking Performance

Engine_Speed	RPM	ERC_DriverFractionCmd	None
Fueling_MG	mg/stroke	RetarderStatus	None
Accelerator_Pedal_Position	%	H_ERC_ChargeFlowCmd	kg/min
Vehicle_Speed	km/hr	Charge_Flow	kg/min
RetarderSwitchLevel	%	C_CBL_VGT_Brake_MCF	kg/min
RetarderSwitchTorque	N_m	Boost_Pressure	kPa_G
H_ERC_ActualGrossTrq	None	Compressor_Inlet_Density	kg/m3
EngBrkDriver1	None	EGR_Position	%
EngBrkDriver2	None	VGT_Position	%
EngBrkDriver3	None		

144. Engine Retarder Control

Engine_Speed	RPM	CC_EngageRetarder	None
Fueling_MG	mg/stroke	RetarderSwitchTorque	N_m
Combustion_Control_Path_Owner	None	H_ERC_ChargeFlowCmd	kg/min
H_MACH_NetTorqueCmd	N_m	EngBrkDriver1	None
Charge_Flow	kg/min	EngBrkDriver2	None
CHL_MCF_Cmd	kg/min	EngBrkDriver3	None
Exhaust_Press	kPa	Charge_Press	kPa
CC_BrakingInhibit	None	RetarderStatus	None

145. Engine_Protection EPF

Engine_Speed	RPM	Compressor_Outlet_Temperature	Deg_C
FSS_Total_Fueling	mg/stroke	Coolant_Level	
Combustion_Control_Path_Owner	None	Coolant_Temperature	Deg_C
EPD_TorqueDerateValue	N_m	EGR_Orifice_Tmptr	Deg_C
H_EPD_SpeedDerateValue	RPM	Exhaust_Metal_Tmptr	Deg_C
T_EPD_Engine_Protection_En	None	Charge_Tmptr	Deg_C
T_EPD_Shutdown_En	None	Oil_Pressure	kPa_G
Net_Engine_Torque	N_m	Oil_Temperature	Deg_C
ECM_Run_Time	s	CHL_EGR_Frac_Cmd	None
Charge_Flow	kg/min	EGR_Fraction	None
Accelerator_Pedal_Position	%	EGR_Position	%
EGR_Flow	kg/min	TGC_VT_Cmd	%
H_CBR_Chi_Value	None	J39_VGT_Actuator_Position	%
CHL_MCF_Cmd	kg/min	VGT_Position	%

146. EPF - Aftertreatment High Temp Engine Protection

V_ATP_tr_DOC_Out	Deg_K	V_APM_DPFOut_Severe_Fault	None
V_ATP_tr_DPF_Out	Deg_K	C_ATM_tm_OT_EPSD_Warning	s
T_ATM_OT_Sev_SD_En	None	C_ATM_tm_OT_EPSD_Delay	None
C_APM_tr_DPFOut_Severe_HiThd	Deg_K	V_ATP_tr_DPF_Out	Deg_K
C_APM_tr_DPFOut_Severe_LoThd	Deg_K	V_APM_DOCOut_Severe_Fault	None
C_APM_tm_DPF_Severe_Tmptr	s	V_ATP_tr_DOC_Out	Deg_K
C_APM_tr_DOCOut_Severe_HiThd	Deg_K	V_ATP_tr_DOC_In	Deg_K
C_APM_tr_DOCOut_Severe_LoThd	Deg_K		
C_APM_tm_DOC_Severe_Tmptr	s		

147. EPF - Compressor Outlet Temperature Engine Protection

Compressor_Outlet_Tmptr	Deg_C	C_EPD_COT_Trq_Drt_Fault_Code	None
C_EPD_COT_Trq_Drt_En	None	C_EPD_COT_Trq_Err_Dur	s
C_EPD_COT_Start_Time	s	C_EPD_COT_Trq_Drt_Err_Sev	Deg_C
C_EPD_COT_RPM_Thd	RPM	C_EPD_COT_Trq_Drt_Max_Thd	Deg_C
Prev_COT_Trq_Drt_Idx	None	C_EPD_COT_Sev_SD_En	None
C_EPD_COT_Sev_SD_Thd	Deg_C	C_EPD_COT_SD_Warning_Time_Dur	s
C_EPD_COT_SD_Delay_Time	s	CHRG_CotPrevSevSdReq	

148. EPF - Coolant Level Engine Protection

Coolant_Level	None	C_EPD_CL_Trq_SD_Time_Dur	s
T_AIP_Cool_Lev_User_Override_En	None	C_EPD_CL_RPM_Thd	RPM
AIP_Cool_Lev_Override_Value	None	C_EPD_CL_Trq_Drt_En	None
C_EPD_CL_SD_Delay_Time	s	C_EPD_CL_Trq_Drt_Fault_Code	None
C_EPD_CL_SD_Warning_Time_Dur	s	C_EPD_CL_Trq_Drt_Threshold	None
C_EPD_CL_TB_Time_To_Max_Trq_Drt	s	C_EPD_CL_Trq_Drt_Type	None
C_EPD_CL_Time_Trq_SD_En	None	C_EPD_CL_Trq_Err_Dur	s

149. EPF - Coolant Temperature Engine Protection

Coolant_Temperature	Deg_C	C_EPD_CT_Trq_Drt_En	None
C_EPD_CT_RPM_Drt_En	None	C_EPD_CT_Start_Time	s
C_EPD_CT_RPM_Thd	RPM	Prev_CT_Trq_Drt_Idx	None
Prev_CT_RPM_Drt_Idx	None	C_EPD_CT_Trq_Drt_Fault_Code	None
C_EPD_CT_RPM_Drt_Fault_Code	None	C_EPD_CT_Trq_Err_Dur	s
C_EPD_CT_RPM_Drt_Err_Sev	Deg_C	C_EPD_CT_Trq_Drt_Max_Thd	Deg_C
C_EPD_CT_RPM_Error_Dur	s	C_EPD_CT_RPM_Drt_Err_Sev	Deg_C
C_EPD_CT_Sev_SD_En	None	C_EPD_CT_Time_RPM_SD_En	None
C_EPD_CT_Sev_SD_Thd	Deg_C	C_EPD_CT_RPM_SD_Time_Dur	s
C_EPD_CT_SD_Delay_Time	s	C_EPD_CT_SD_Warning_Time_Dur	s
LUCL_CtPrevSevSdReq	None		

150. EPF - Coolant Temp2 Engine Protection

Coolant_Temperature	Deg_C	C_EPD_CT2_Trq_Drt_En	None
C_EPD_CT2_Start_Time	Sec	C_EPD_CT2_RPM_Thd	RPM
Prev_CT2_Trq_Drt_Idx	None	C_EPD_CT2_Trq_Drt_Fault_Code	None
C_EPD_CT2_Trq_Err_Dur	s	C_EPD_CT2_Trq_Drt_Err_Sev	Deg_C
C_EPD_CT2_Trq_Drt_Max_Thd	Deg_C		

151. EPF - CrankCase Pressure Engine Protection

Crankcase_Press	kPa_G	C_EPD_CCP_Trq_Drt_Fault_Code	None
C_EPD_CCP_Tbl1	Kpa	C_EPD_CCP_Trq_Drt_Ramp_Rate	N_m
C_EPD_CCP_Tbl2	Kpa	C_EPD_CCP_Trq_Drt_Type	None
C_EPD_CCP_TB_TimeToMax_Trq_Drt	s	C_EPD_CCP_Trq_Err_Dur	s
C_EPD_CCP_RPM_Thd	RPM	C_EPD_CCP_yellow_lamp_delay	s

152. EPF - EGR Orifice Temperature Engine Protection

EGR_Orifice_Tmptr	Deg_C	C_EPD_EGR_Trq_Drt_En	None
C_EPD_EGR_RPM_Drt_En	None	C_EPD_EGR_Start_Time	s
C_EPD_EGR_RPM_Thd	RPM	Prev_EGR_Trq_Drt_Idx	None
Prev_EGR_RPM_Drt_Idx	None	C_EPD_EGR_Trq_Drt_Fault_Code	None
C_EPD_EGR_RPM_Drt_Fault_Code	None	C_EPD_EGR_Trq_Err_Dur	s
C_EPD_EGR_Trq_Drt_Err_Sev	Deg_C	C_EPD_EGR_Trq_Drt_Max_Thd	Deg_C
C_EPD_EGR_RPM_Error_Dur	s	C_EPD_EGR_RPM_Drt_Err_Sev	Deg_C
C_EPD_EGR_Sev_SD_En	None	C_EPD_EGR_Sev_SD_Thd	Deg_C
C_EPD_EGR_SD_Delay_Time	s	C_EPD_EGR_SD_Warning_Time_Dur	s
CHRG_EgrPrevSevSdReq	None		

153. EPF - EGR Orifice Temperature 2 Engine Protection

EGR_Orifice_Tmptr	Deg_C	C_EPD_EGR2_Trq_Drt_En	None
C_EPD_EGR2_Start_Time	s	C_EPD_EGR2_RPM_Thd	RPM
Prev_EGR2_Trq_Drt_Idx	None	C_EPD_EGR2_Trq_Err_Dur	s
C_EPD_EGR2_Trq_Drt_Err_Sev	Deg_C	C_EPD_EGR2_Trq_Drt_Max_Thd	Deg_C

154. EPF - Engine Over Speed Protection

Engine_Speed	RPM	C_EPD_Overspeed_Error_Reset	RPM
C_EPD_Overspeed_Allowed_Time	s		
C_EPD_Overspeed_Limit	RPM		

155. EPF - Exhaust Metal Temperature Engine Protection

Exhaust_Metal_Tmptr	Deg_C	C_EPD_EMT_Trq_Err_Dur	s
Charge_Press	Kpa	C_EPD_EMT_SB_Time_To_MaxTrqDrt	s
C_TFC_Fuel_Limit_LLim	mg/stroke	C_EPD_EMT_RPM_Thd	RPM
C_EPD_EMT_Trq_Drt_En	None	C_EPD_EMT_Spd_Derate	RPM
C_EPD_EMT_Trq_Drt_Err_Sev	Deg_C	C_EPD_EMT_Virtual_Sensor_En	None
C_EPD_EMT_Trq_Drt_Fault_Code	None	C_EPD_EMT_Trq_Drt_Type	None
C_EPD_EMT_Trq_Drt_Max_Thd	Deg_C		

156. EPF - Exhaust Pressure Engine Protection

Exhaust_Press	Kpa	C_EPD_EP_RPM_Thd	RPM
C_EPD_EP_RPM_Drt_En	None	C_EPD_EP_Spd_Derate	RPM
C_EPD_EP_RPM_Drt_Err_Sev	Kpa	_EPD_ C EP_Start_Time	s
C_EPD_EP_RPM_Drt_Fault_Code	None	C_EPD_EP_TB_Time_To_MaxRPMDrt	s
C_EPD_EP_RPM_Error_Dur	s		

157. EPF - Intake Manifold Temperature Engine Protection

Exhaust_Metal_Tmptr	Deg_C	C_EPD_EMT_Trq_Drt_En	None
C_EPD_EMT_Start_Time	s	C_EPD_EMT_RPM_Thd	RPM
Prev_EMT_Trq_Drt_Idx	None	C_EPD_EMT_Trq_Drt_Fault_Code	None
C_EPD_EMT_Trq_Err_Dur	s	C_EPD_EMT_Trq_Drt_Err_Sev	Deg_C
C_EPD_EMT_Trq_Drt_Max_Thd	Deg_C	C_EPD_EMT_Sev_SD_En	None
C_EPD_EMT_Sev_SD_Thd	Deg_C	C_EPD_EMT_SD_Delay_Time	s
C_EpD_EMT_SD_Warning_Time_Dur	s	CHRG_EmtPrevSevSdReq	None

158. EPF - Oil Pressure Engine Protection

Oil_Pressure	kPa_G	C_EPD_OP_Trq_Drt_En	None
C_EPD_OP_RPM_Drt_En	None	C_EPD_OP_Start_Time	s
C_EPD_OP_RPM_Thd	RPM	Prev_OP_Trq_Drt_Idx	None
Prev_OP_RPM_Drt_Idx	None	C_EPD_OP_Trq_Drt_Fault_Code	None
C_EPD_OP_RPM_Drt_Fault_Code	None	C_EPD_OP_Trq_Err_Dur	s
C_EPD_OP_RPM_Error_Dur	s	C_EPD_OP_Time_Trq_SD_En	None
C_EPD_OP_Time_RPM_SD_En	None	C_EPD_OP_Trq_SD_Time_Dur	s
C_EPD_OP_RPM_SD_Time_Dur	s	C_EPD_OP_SD_Delay_Time	s
C_EPD_OP_SD_Warning_Time_Dur	s	LUCL_OpPrevTbTrqSdReq	None
LUCL_OpPrevTbSpdSdReq	None		

159. EPF - Oil Temperature Engine Protection

Oil_Temperature	Deg_C	C_EPD_OT_Trq_Drt_En	None
C_EPD_OT_RPM_Drt_En	None	C_EPD_OT_Start_Time	s
C_EPD_OT_RPM_Thd	RPM	Prev_OT_Trq_Drt_Idx	None
Prev_OT_RPM_Drt_Idx	None	C_EPD_OT_Trq_Drt_Fault_Code	None
C_EPD_OT_RPM_Drt_Fault_Code	None	C_EPD_OT_Trq_Err_Dur	s
C_EPD_OT_Trq_Drt_Err_Sev	Deg_C	C_EPD_OT_Trq_Drt_Max_Thd	Deg_C
C_EPD_OT_RPM_Drt_Err_Dur	s	C_EPD_OT_RPM_Drt_Err_Sev	Deg_C
C_EPD_OT_Sev_SD_En	None	C_EPD_OT_Sev_Sd_Thd	Deg_C
C_EPD_OT_SD_Delay_Time	s	C_EPD_OT_SD_Warning_Time_Dur	s
LUCL_OtPrevSdReq	None		

160. EPF - Soot Load Engine Protection

V_SFP_mg_Soot_Load_Comb	gm	C_EPD_Soot_RPM_Drt_En	None
C_SFP_Soot_Load_User_Reset_En	None	C_EPD_Soot_RPM_Drt_Err_Sev	gm
O_SFP_Soot_Load_Reset	None	C_EPD_Soot_RPM_Error_Dur	s
C_SFP_Soot_Load_User_Reset_Val	gm	C_EPD_Soot_TB_TimeToMaxRPM_Drt	s
C_PTM_Label_Override_Enable	None	C_EPD_Soot_Spd_Derate	RPM
PTM_ApplicationLabel	None	C_EPD_Soot_RPM_Thd	RPM
C_PTM_Label_Override_Value	None		

161. Ether Start Injection

Engine_Speed	RPM	EIS_PWM_Duty_Cycle	%
Fueling_MG	mg/stroke	EIS_PWM_Period	mSec
Combustion_Control_Path_Owner	None	C_EIS_CrankTimeDelay	s
Coolant_Temperature	Deg_C	C_EIS_CrankMaxTime	s
EGR_Valve_Is_Closed	None	C_EIS_PreloadMaxTime	s
EIS_Preload_Counter	None	C_EIS_PulseOffTime	mSec
EIS_Active	None	C_EIS_PulseOnTime	mSec
C_EIS_PreloadTmptrThd	Deg_C	C_EIS_CrankTmptrThd	Deg_C
EGR_Position_Source	None	EIS_Ether_Used	s
EIS_Number_Injections	None	C_EIS_System_Select	None
C_EIS_TmptrSel	None	Charge_Tmptr_Source	None
Charge_Tmptr	Deg_C	C_EIS_PreloadMaxCoount	None

162. Exhaust Temperature Fuel Limit

Engine_Speed	RPM	Texh_Fuel_Limit	mg/stroke
Net_Engine_Torque	N_m	Exhaust_Metal_Tmptr	Deg_C
Total_Fueling	mg/stroke	Charge_Flow	kg/min
Combustion_Control_Path_Owner	None	TPE_Energy_Fraction	Deg_C
Charge_Tmptr	Deg_C	TFC_Fuel_Flow_Limit	kg/min

163. Fan Control

Engine_Speed	RPM	FCC_Fan_Torque	N_m
Combustion_Control_Path_Owner	None	FCC_Fan_Clutch_PWM_Duty_Cycle	%
Total_Fueling	mg/stroke	FCC_Fan_Clutch_PWM_Period	mSec
T_FCC_PWM_Inversion	None	Vehicle_Speed	km/hr
Coolant_Temperature	Deg_C	C_FCC_Min_On_Time	s
Charge_Tmptr	Deg_C	T_FCC_AC_Time	s
Air_Conditioner_Pressure_Switch	None	T_FCC_Charge_Tmptr_En	None
Manual_Fan_Input	None	T_FCC_Coolant_Tmptr_En	None
FCC_Fan_Request	%	Fan_Speed	RPM
Fan_Drive_State	None	T_FCC_AC_VS_Interaction_En	None
ERC_DriverFractionCmd	None	T_FCC_RT_En	None
T_FCC_AC_Pressure_En	None	T_FCC_Fan_Type_Selection	None
T_FCC_Fan_Clutch_En	None	T_FCC_SIP_Lock_Fan_Enable	None
T_FCC_Engine_Brake_En	None	T_FCC_Manual_Input_En	None

164. Limp Home Mode

Total_Fueling	mg/stroke	Combustion_Control_Path_Owner	None
Net_Brake_Torque	N_m	Accelerator_Pedal_Position	%
Primary_Accel_Ped_Pos	%	Secondary_Accel_Pedal_Pos	%
Filtered_Raw_Accel_Value	counts	Vehicle_Speed	km/hr
T_LMP_En	None	T_Test_Cell_Throt_En	None
T_Dual_Accelerator_Enable	None	T_RMT_Remote_Accel_Enable	None
Idle_Validation_State	None	H_APP_Before_Auto_Zero	%
Accelerator_Auto_Zero	%	H_MCAA_DU_Request_Reference	N_m

165. NDOT Governor

Engine_Speed	RPM	Accelerator_Pedal_Position	%
H_Ndot_Gov_Torque	N-m	Vehicle_Speed	km/hr
Ndot_PathOwner	None	Inertia_Index	None
H_NDOT_INT_Torque	N-m	Ndot_Demand	RPM/S
H_NDOT_PP_Torque	N-m	Engine_Acceleration	RPM/S
H_NDOT_FF_Torque	N-m	H_NDOT_Filtered_Accel	RPM/s
H_NDOT_Engine_Acceleration	RPM/s	H_NDOT_Actual_Feedback	RPM/s
H_Torque_Derived_Ndot	None	NDOT_Feedforward_Gain	None
H_NDOT_Proportional_Gain	None	H_NDOT_Integral_Gain	None
Engine_No_Load_Torque	N-m	H_MACH_NetTorqueCmd	None
H_NDOT_IntegratorResetAdj	None	ACA_Torque	N-m
Torque_Limit_At_Current_Speed	N-m	H_NDOT_UserDemand	RPM/S
NDOT_UserPathOwner	None	H_NDOT_CONV_SREF	None
LSI_Ndot_Demand	RPM/s	H_HSI_Ndot_Demand	RPM/S
H_ABS_Ndot_Demand	RPM/s	H_ANC_Ndot_Demand	RPM/S
H_RSC_Ndot_Demand	RPM/S	H_CC_Ndot_Demand	RPM/S

166. Oxygen / Fuel Control (OFC) Fuel Limit

Engine_Speed	RPM	CBR_Fuel_Ref	mg/stroke
Net_Engine_Torque	N_m	H_CBR_Compressor_Inlet_Density	kg/m3
Total_Fueling	mg/stroke	OFC_EGR_Disable	None
Combustion_Control_Path_Owner	None	C_CBP_Stoic_OF_Ratio	None
OFC_Fuel_Limit	mg/stroke	Total_O2_In_Cylinder	mg/stroke
CBR_Gross_Fuel	mg/stroke	J39_VGT_Actuator_Position	%
EGR_Position	%	H_OFC_Felix_Gain_Adjust	None
H_OFC_Equiv_Ratio_Limit	None		

167. Powertrain Protection

Engine_Speed	RPM	PTP_Torque_Limit_Switch	None
Total_Fueling	mg/stroke	PTP_Torque_Limit	N_m
Combustion_Control_Path_Owner	None	PrcntLoadAtCurSpd	%
Vehicle_Speed	km/hr	Actual_Gear_Ratio	None
T_TSP_SensorType	None	T_PTP_Enable	None
T_PTP_TrqLimSw_En	None	PTP_Torque_Request	N_m

168. Remote Throttle Control

Accelerator_Pedal_Position	%	Accel_Pedal_Position_ID	None
RMT_Remote_Accel_Valid_Reading	None	T_RMT_Remote_Accelerator_Mode	None
T_RMT_Remote_Accel_Enable	None	RMT_Remote_Accelerator_Switch	None
T_RMT_Accelerator_Mux_Enable	None	RMT_Active_Accel_Indicator	None
RMT_Remote_Accelerator_Posn	%	H_RMT_Accelerator_Priority	None
T_AIP_RMT_Accelerator_Ovrd_En	None	H_AIP_RMT_Accel_User_Ovrd_Val	%

169. Starter Lockout

SLO_Discrete_Output	None	SLO_Relay	None
Engine_Speed	RPM	SLO_Drv_DutyCycle	%
Key_Switch	None	SLO_RelayState	None
T_SLO_Enable	None	Starter_Lockout_Request	None
C_SLO_ExitSpd	RPM	Combustion_Control_Path_Owner	None
Total_Fueling	mg/stroke		

170. Throttle Characteriztion

Combustion_Control_Path_Owner	None	Accelerator_Pedal_Position	%
Primary_Accel_Ped_Pos	%	Secondary_Accel_Pedal_Pos	%
Filtered_Raw_Accel_Value	counts	T_Test_Cell_Throt_En	None
T_Dual_Accelerator_Enable	None	Idle_Validation_State	None
H_APP_Before_Auto_Zero	%	Accelerator_Auto_Zero	%
H_APP2_Before_Auto_Zero	%	Dual_Conformance_Error	None
Accelerator_Position_Error	None	Dual_Conformance_Error	None
Secondary_Accel_Auto_Zero	%	H_Filtered_Raw_Accel2_Value	counts

171. Torque Manager Derates

Engine_Speed	RPM	EPD_No_Derate_Torque	N_m
Net_Engine_Torque	N_m	EEPD_TorqueDerateValue	N_m
Total_Fueling	MG/STROKE	TSD_Active	None
Combustion_Control_Path_Owner	None		
CHH_Charge_Mgr_Derate_Torque	N_m		
EWP_Max_Torque	N_m		
H_NDOT_Gov_Torque	N_m		
ENGN_Final_Torque_Cmd	N_m	Engine_Protection_Derate_Torque	N_m
H_ENGN_Unadj_Torque_Demand	N_m	H_MACH_NetTorqueCmd	N_m
Engn_Control_Path_Owner	None	Mach_EngineStatePathOwner	None

172. Turbocharger VG Actuator

TGC_VT_Cmd	%	**Diagnostics:**	
VGA_DL_Desired_Position	%	J39_VGT_Actuator_Status	None
J39_VGT_Actuator_Position	%	C_VGA_DL_StatusUB_Fault_Enable	None
VGT_Position	%	VGT_Fault_Communication	None
VGT_Position_Source	HEX	VGT_Fault_Over_Temperature	Deg_C
J39_VGT_Motor_Effort	None	VGT_Fault_Actuation	None
VGA_DL_AS_Active	None	VGT_Fault_Driver_Circuit	None
VGA_DL_Mode_Command	None	VGT_Fault_Voltage_Low	None
J39_VGT_Temperature	Deg_C	VGT_Fault_Command_Source	None
J39_VGT_Soft_Id	HEX	VGT_Driver_Failure	None
C_J39_VGT_Soft_ID_MjRev	HEX	C_J39_VGT_Status_Timeout	None
J39_VGT_Motor_Type	None	VGT_Position_At_Shutdown	None
J39_VGT_Customer_ID	None		
VGT_Actuator_Status	None	**Override:**	
J39_VGT_Addr_Claim_Count	counts	T_TGC_User_Override	None
		C_TGC_Override_Value	%
		T_VGA_DL_Cmd_User_Override	None
		C_VGA_DL_Cmd_Override_Value	%

173. UHC Timing Control

Engine Speed	RPM	Charge_Flow	kg/min
Total_Fueling	mg/stroke	Final_Timing	Deg_BTDC
Intake_Manifold_temperature	Deg_C	Charge_Flow	None
Charge_Tmptr	Deg_C	Combustion_Control_Path_Owner	None
Boost_Pressure	kPa_G	Final_Timing_State	None
Ambient_Air_Tmptr	Deg_C	Charge_Tmptr_State	HEX
Charge_Press	kPa	C_CBP_Gamma_Spd_Adj	None
Coolant_Temperature	Deg_C	Charge_Tmptr_Sensor	Deg_C
Charge_Tmptrr_EStat	None	Charge_Tmptr_Source	None
Charge_Press_IR_Fault_Cnt	counts	Charge_Press_Est	kPa
Charge_Press_Status	None	Ambient_Relative_Humidity	None
TPE_IMT_AP	Deg_C	FIW_Lowest_Coolant_Temp	Deg_C
SOI_IMTADV_NTE_Corr	None	SOI_ImtAdvCorr_Selected	None
SOI_AAP_Timing_Advance	deg_BTDC	SOI_Cltmp_Timing_Advance	deg_BTDC
SOI_Timing_Advance	deg_BTDC	SOI_Optimal_Timing_Adv	deg_BTDC
SOI_State	None	C_EPS_Ca_MainOffset	deg_BTDC
C_UHC_SOI_ADV_Enable	None	UHC_Advance_Corr	None
T_emo_uhc_AECD_Enable	None	UHC_SOI_Advance_Corr	None
UHC_Advance	degf_BTDC	CBP_Gamma_Final	None
CBP_UHC_BMEP	Kpa		

174. VGT Controller

Engine_Speed	RPM	TGC_Final_Llim	%
Net_Engine_Torque	N_m	TGC_Final_ULim	%
Total_Fueling	mg/stroke	TGC_Adjusted_I_Gain	None
Combustion_Control_Path_Owner	None	TGC_Adjusted_P_Gain	None
CSE_XForm_Error_2	None	TGC_VT_Cmd	%
EGR_Valve_Delta_Press	kPa	H_TGC_Int_Cnt	%
FSI_s_EBrakeOn	None	H_TGC_PRP_Cnt	%
		H_TGC_FFD_Cnt	%

Vehicle Feature Information

175. Driver Reward

TI_Vehicle_Trip_Avg_Fuel_Eco	km/L	T_CC_MaxRoadSpeed	km/hr
H_DRS_CC_Delta	km/hr	T_RSC_MaxRoadSpeed	km/hr
H_DRS_RSC_Delta	km/hr	Tau_State	None
TI_Base_Trip_Idle_Dst_Tim	km/hr	C_DRS_Reward_Period	s
C_DRS_Distance_Threshold	km	DRS_Reward_State	None
CC_ReferenceSpeed	km/hr	Vehicle_Speed	km/hr
RSC_ReferenceSpeed	km/hr		

NOTE THE FOLLOWING VALUES:

T_DRS_RSG_CC_Reward1	km/hr	T_DRS_RSG_CC_Reward2	km/hr
T_DRS_RSG_CC_Reward3	km/hr	T_DRS_RSG_CC_Reward4	km/hr
T_DRS_FuelEco_Thd1	km/L	T_DRS_IdleTimePct1	%
T_DRS_FuelEco_Thd2	km/L	T_DRS_IdleTimePct2	%
T_DRS_FuelEco_Thd3	km/L	T_DRS_IdleTimePct3	%
T_RSC_Enable	None	T_DRS_Enable	None

176. ECM Trip Information / Fuel Economy Accuracy

For comparison of fill gallons / miles against data-logged ECM data at start and end of trip.
Calculate ECM MPG accuracy based on actual (fill/odom/hubo) versus ECM.
Log data at state line crossings or freeway mile markers for reference to Trip_Distance.
Confidence in results increases with long trips. If possible, trips length to require multiple fuel fills between start and end.

Mmon_Trip_Drive_Distance	km	TI_PTO_Trip_Fuel_Used	L
Trip_CC_Distance	km	TI_Base_Trip_Drive_Fuel_Used	L
TI_Vehicle_Trip_Gear_Down_Dist	km	TI_Base_Engine_Trip_Run_Time	s
TI_Vehcile_Trip_Top_Gear_Dist	km	TI_Base_Trip_Idle_Time	s
TID_Trip_ESP_Distance	km	TI_PTO_Trip_Time	s
Trip_RSG_Distance	km	TI_Vehicle_Total_Engine_Dist	km
TI_Base_Trip_Fuel_Used	L	TI_Base_Total_Fuel_Used	L
TI_Base_Trip_Idle_Fuel_Used	L	TI_Base_Trip_Average_Load	%
TI_Base_Trip_Dosing_Fuel_Used	L	TI_Base_Total_HC_Fuel_Used	L

177. VSS Anti-Tampering

Engine_Speed	RPM	Primary_Accel_Ped_Pos	%
Vehicle_Speed	km/hr	Combustion_Control_Path_Owner	None
Fueling_MG	mg/stroke	T_VSS_Tamper_Sensitivity	None
Actual_Gear_Ratio	None	PrcntLoadAtCurSpd	%

Thermal Management

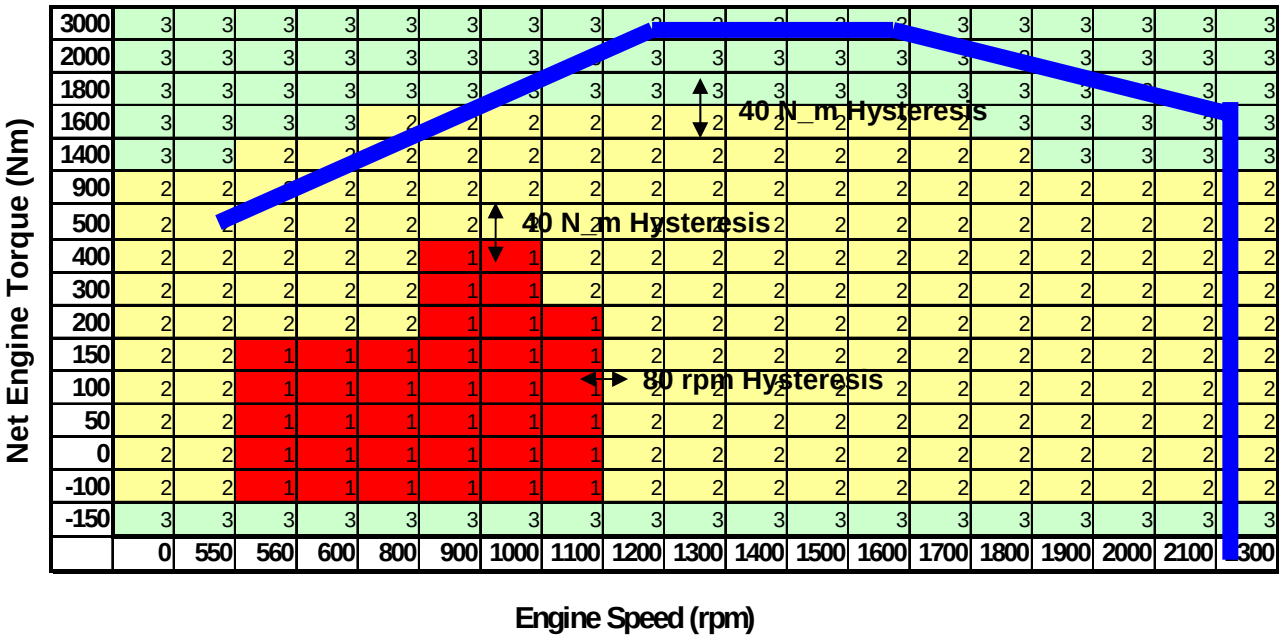
178. Thermal Management Regions

PTM_TMMode =

1 = Region 1 – OSCAR: Chi 5 mode where VGT control is used to achieve an optimum across-engine pressure ratio to generate maximum engine-out temperature. EGR is not used.

2 = Region 2 – FELIX: Chi 5 mode where VGT control is used to achieve lower air flow to generate maximum engine-out temperature, with addition of EGR.

3 = Region 3 – NORMAL: Base Chi mode. Normal engine system operation.



179. Stationary ReGen Engine Thermal Management

Engine_Speed	RPM	V_SFR_Regen_Stage	None
Net_Engine_Torque	N_m	V_SFR_Regen_Trigger	None
Total_Fueling	mg/stroke	V_SFP_RegenDetected	None
Final_Timing	Deg_BTDC	PTM_Stat_Regen_Active	None
TGC_VT_Cmd	%	CSE_OCVGT_dP_IMP_Ref	None
J39_VGT_Actuator_Position	%	H_CSE_dP_IMP_Filtered	None
EGR_Position	%	Turbine_Out_Tmptr	Deg_C
CBR_Alpha	None	V_ATP_fg_Turbo_Out	g/sec
H_CBR_Chi_Value	None	V_ATP_tr_Turbo_Out	Deg_K
H_CBR_Chi_Source	None	V_ATP_tr_DOC_Out	Deg_K
PTM_Final_Oper_Mode	None	V_ATP_tr_DPF_Out	Deg_K
PTM_OCVG_Allowed	None	V_ATP_tr_DOC_In	Deg_K
PTM_UseTM	None	V_ATP_pr_DPF_Delta	kPa
Combustion_Control_Path_Owner	None	V_SFP_mg_Soot_Load_Comb	gm
PTM_TMMode	None	V_SFP_mg_Soot_Load_DP	gm
PTM_StatRegenEnable	None	H_HIM_fg_Dosing_Cmd	g/sec

180. Ineffective Stationary ReGen Engine Thermal Management

Engine_Speed	RPM	CSE_OCVGT_dP_IMP_Ref	None
Net_Engine_Torque	N_m	H_CSE_dP_IMP_Filtered	None
Total_Fueling	mg/stroke	PTM_ATM_TempLow_Rqst	Deg_C
Final_Timing	deg_BTDC	H_PTM_ATM_DocOutTmptr	Deg_C
TGC_VT_Cmd	%	PTM_ATM_FlowLo_Request	g/sec
J39_VGT_Actuator_Position	%	V_ATP_fg_Turbo_Out	g/sec
EGR_Position	%	H_PTM_TmptrBasedTargetSpd	RPM
CBR_Alpha	None	PTM_ATM_TempHi_Rqst	Deg_C
H_CBR_Chi_Value	None	PTM_ATM_TempLow_Rqst	Deg_C
H_CBR_Chi_Source	None	PTM_ATM_FlowHi_Request	g/sec
PTM_Final_Oper_Mode	None	PTM_ATM_FlowLLim_Rqst	g/sec
PTM_OCVG_Allowed	None	PTM_Exhaust_Flow_LLim_Active	None
PTM_UseTM	None	V_ATP_tr_Turbo_Out	Deg_K
Combustion_Control_Path_Owner	None	V_ATP_tr_DOC_Out	Deg_K
PTM_TMMode	None	V_ATP_tr_DPF_Out	Deg_K
PTM_StatRegenEnable	None	V_ATP_tr_DOC_In	Deg_K
PTM_Stat_Regen_Active	None	V_ATP_pr_DPF_Delta	KPA
PTM_Regen_Oper_State	None	V_SFP_mg_Soot_Load_Comb	gm
H_HIM_fg_Dosing_Cmd	g/sec	V_SFP_mg_Soot_Load_DP	gm

181. Stationary ReGen Activation

Engine_Speed	RPM	H_PTM_Operator_Regen_Req	None
Net_Engine_Torque	N_m	H_PTM_StatRegenTrigger	None
Total_Fueling	mg/stroke	H_PTM_RegenTriggerSource	None
Accelerator_Pedal_Position	%	PTM_Stat_Regen_Active	None
Service_Brake_Switch	None	PTM_Final_Oper_Mode	None
H_PTM_Pedal_Dance_Stage	None	PTM_OCVG_Allowed	None
PTM_StatRegenEnable	None	PTM_ATM_OperMode_Rqst	None
		PTM_Regen_Oper_State	None

182. Engine Thermal Management

Engine_Speed	RPM	V_SFR_Regen_Stage	None
Net_Engine_Torque	N_m	V_SFR_Regen_Trigger	None
Total_Fueling	mg/stroke	V_SFP_RegenDetected	None
Final_Timing	deg_BTDC	PTM_OCVG_Allowed	None
Vehicle_Speed	km/hr	PTM_UseTM	None
Accelerator_Pedal_Position	%	PTM_TMMode	None
TGC_VT_Cmd	%	CSE_OCVGT_dP_IMP_Ref	None
J39_VGT_Actuator_Position	%	H_CSE_dP_IMP_Filtered	None
EGR_Position	%	Turbine_Out_Tmptr	Deg_C
EAC_EGR_Valve_Cmd	%	V_ATP_fg_Turbo_Out	g/sec
CBR_Alpha	None	V_ATP_tr_Turbo_Out	Deg_K
H_CBR_Chi_Value	None	V_ATP_tr_DOC_Out	Deg_K
H_CBR_Chi_Source	None	V_ATP_tr_DPF_Out	Deg_K
PTM_Final_Oper_Mode	None	V_ATP_tr_DOC_In	Deg_K
Combustion_Control_Path_Owner	None	V_ATP_pr_DPF_Delta	KPA
Filtered_Turbo_Speed	krpm	V_SFP_mg_Soot_Load_Comb	gm
Altitude	km	V_SFP_mg_Soot_Load_DP	gm
Ambient_Air_Press	kPa	H_HIM_fg_Dosing_Cmd	g/sec
Ambient_Air_Tmptr	Deg_C	Charge_Press	kPa
Charge_Flow	kg/min	Exhaust_Press	kPa
CHL_MCF_Cmd	kg/min	CHL_EGR_Frac_Cmd	None
EGR_Fraction	None		

183. OSCAR – Differential Engine Pressure Control

Engine_Speed	RPM	CBR_Thermal_Oscar_Active	None
Net_Engine_Torque	N_m	TGC_VT_Cmd	%
CBM_Engn_Tmptr_Low	Deg_C	J39_VGT_Actuator_Position	%
CSE_OCVGT_dP_IMP_Ref_Val	None	Turbine_Out_Tmptr	Deg_C
CSE_OCVGT_dP_IMP_Ref	None	V_ATP_fg_Turbo_Out	g/sec
H_CSE_dP_IMP_Filtered	None	V_ATP_tr_Turbo_Out	Deg_K
Exhaust_Press	KPA	V_ATP_tr_DOC_Out	Deg_K
Charge_Press	KPA	V_ATP_tr_DPF_Out	Deg_K
CSE_OCVGT_dP_IMP_Error_Final	None	V_ATP_tr_DOC_In	Deg_K
CSE_Xform_Error_2	None	V_ATP_pr_DPF_Delta	KPA

184. OSCAR – Exhaust Pressure Limiter

Engine_Speed	RPM	DPE_Drt_dP_P_Cmd	kPa
Net_Engine_Torque	N_m	TGC_VT_Cmd	%
Total_Fueling	mg/stroke	J39_VGT_Actuator_Position	%
Exhaust_Press_Filtered	KPA	Turbine_Out_Tmptr	Deg_C
C_DPE_Drt_Limit	KPA	V_ATP_fg_Turbo_Out	g/sec
DPE_Drt_Offset	KPA	V_ATP_tr_Turbo_Out	Deg_K
DPE_Drt_Active	None	V_ATP_tr_DOC_Out	Deg_K
DPE_Drt_Latched	None	V_ATP_tr_DPF_Out	Deg_K
CSE_OCVGT_dP_IMP_Ref	None	V_ATP_tr_DOC_In	Deg_K
H_CSE_dP_IMP_Filtered	None	V_ATP_pr_DPF_Delta	kPa

185. Stationary Regen Enable Conditions

Accelerator_Pedal_Position	%	NDOT_PathOwner	None
H_PTM_AcceleratorPedalEnCond	None	H_PTM_ClutchEnCond	None
Vehicle_Speed	km/hr	H_PTM_ServiceBrakeEnCond	None
H_PTM_VehicleSpeedEnCond	None	H_PTM_CtrlPTO_EnCond	None
H_PTM_EPD_EnCond	None	H_PTM_AirHandlingSysEnCond	None
H_PTM_DLC_Prevent_Regen	None	PTM_Stat_Regen_Active	None
H_PTM_OOGearEnCond	None	H_PTM_EGR_Sys_Failure	None
H_PTM_EngineWarmEnCond	None	H_PTM_VGT_Sys_Failure	None
H_PTM_ControlStateEnCond	None	NDOT_UserPathOwner	None
Combustion_Control_Path_Owner	None		

186. Mobile Regen Enable Conditions

PTM_Mobile_Regen_Active	None	PTM_ATM_OperMode_Rqst	None
PTM_Allow_Regen_State	None	H_PTM_MobileVehicleSpeedEnCond	None
PTM_ATM_OperMode_Rqst	None	PTM_ApplicationLabel	None
H_PTM_AirHandlingSysEnCond	None	H_PTM_ATM_DocOutTmptr	Deg_C
H_PTM_EPD_EnCond	None	H_PTM_DL_ShiftInProgress	None
H_PTM_EngineWarmEnCond	None		
H_PTM_MobilePTO_EnCond	None		
NDOT_PathOwner	None		
Vehicle_Speed	km/hr		

187. "Reverse" AFC / AFC Transient Surge

Engine_Speed	RPM	H_CBR_Max_Chi_Fuel_Low	mg/stroke
Total_Fueling	mg/stroke	H_CBR_Max_Chi_Fuel_High	mg/stroke
Surge_Margin_CFP	kg_sqrt(K)/sec_MPa	H_CBR_Max_Chi_Fuel	mg/stroke
Surge_Margin_Source	None	CBR_Surge_Limit_Fuel	mg/stroke
Surge_Margin	%	CBR_Gross_Fuel	mg/stroke
Surge_Line_CFP	kg_sqrt(K)/sec_MPa	CBR_Gross_Table_Fuel	mg/stroke
CHL_Surge_Limit	None	CBR_Gross_Model_Fuel	mg/stroke
CHL_Surge_Drt_Offset	None	Boost_Pressure	kPa_G
CHL_Surge_Drt_Active	None	H_CBR_Surge_Limit_Inhibit	None
CHL_MCF_Cmd	kg/min	H_CBR_Surge_Limit_Off_Timer	s
CHL_Derate_State	None	H_CBR_Surge_Limit_Max_Timer	s
TPE_Corrected_Turbo_Speed_Est	None	H_CBR_Surge_Limit_Inhibit	None
TPE_Corrected_Turbo_Speed	None	H_CBR_Surge_Limit_Off_Timer	s
TPE_Corrected_Air_Flow	None	H_CBR_Surge_Limit_Max_Timer	s
FSS_Fueling_Derate_Request	mg/stroke	H_CBR_Surge_Limit_Active	None
FSS_Fueling_Derate_Executed	mg/stroke	H_CBR_Surge_Limit_Fuel	mg/stroke
CBR_Max_Fuel_Limit	mg/stroke	H_CBR_Prelim_Fuel_State	None

188. Engine Torque Limits

Engine_Speed	RPM	H_MME_Filtered_Torque	N_m
Net_Engine_Torque	N_m	H_LBSC_Engine_Torque	N_m
Total_Fueling	mg/stroke	ENGN_Final_Torque_Cmd	N_m
Final_Timing	Deg_BTDC	EWP_Max_Torque	N_m
H_MACH_NetTorqueCmd	N_m	Engine_Demand_Torque_from_Ndot	N_m
H_MACH_Neg_Trq_Limit_At_HSI	N_m	Jcomm_Percent_Retarder_Torque	%
H_MACH_Neg_Trq_Limit_At_LSI	N_m	Jcomm_Derate_Torque	%
H_MACH_Neg_Trq_Limit_At_PK_Trq	N_m	H_ERC_GrossTorqueLmtd	N_m
H_MACH_Neg_Trq_Limit_At_PT3	N_m	FCC_Fan_Torque	N_m
H_MACH_Neg_Trq_Limit_At_PT4	N_m	EPD_Torque_Derate_Value_id	None
H_SAT_CurrentTorqueLimit	None	EPD_No_Derate_Torque	N_m
Engine_No_Load_Torque	N_m	EPD_TorqueDerateValue	N_m
PTP_Torque_Limit	N_m	Filte/red_Net_Brake_Torque	N_m
Friction_Torque	N_m	Torque_Limit_At_Current_Speed	N_m
Coolant_Torque_Adjustment	N_m	Torque_Curve_Selection_Switch	None
SOI_Torque_To_Fuel_Adj	mg/stroke	Engine_Torque_Mode	None
ACA_Torque	N_m	H_NDOT_Gov_Torque	N_m

189. Robust Torque Model / Torque to Fuel

Engine_Speed	RPM	CBP_Comb_Torque_Limit	N_m
CBP_T2F_Engine_Speed_Term	N_m	CBP_Net_Table_Torque	N_m
EGR_Fraction	None	CBP_Charge_Fuel_Ratio	None
CBP_T2F_EGR_Fraction_Term	N_m	CBP_Air_Fuel_Ratio	None
Charge_Flow	kg/min	CBP_Net_Combustion_Torque	N_m
CBP_T2F_Charge_Flow_Term	N_m	CBP_Combustion_Torque	N_m
Charge_Tmptr	Deg_C	H_NDOT_Gov_Torque	N_m
CBP_T2F_Charge_Tmptr_Term	N_m	ENGN_Final_Torque_Cmd	N_m
Charge_Press	kPa	Accelerator_Pedal_Position	%
CBP_T2F_Charge_Press_Term	N_m	CBP_Combustion_Model_Torque	N_m
Exhaust_Press	kPa	CBR_Gross_Model_Fuel	mg/stroke
CBP_T2F_Exhaust_Press_Term	N_m	FSS_Total_Fueling	mg/stroke
FSS_SOI	None	H_NDOT_FF_Torque	N_m
CBP_T2F_SOI_Term	N_m	H_NDOT_INT_Torque	N_m
OFC_Fuel_Limit	mg/stroke	H_NDOT_PP_Torque	N_m
CBP_T2F_Torque_Model_Numerator	N_m		

HPI-TP Fuel System:

190. Boost Pressure Compensation (BPC)

Engine_Speed	RPM	BPC_q_FuelComp_v	MG/STROKE
FSI_q_totalFueling_v	MG/STROKE	FTT_q_CompFlCmd_v	MG/STROKE
Net_Engine_Torque	N_M	BPC_lp_BoostErr_v	MBAR
Combustion_Control_Path_Owner	None	BPC_lp_NomBoost_v	MBAR
Charge_Press	kPa	BPC_s_Enable_c	None
FSI_lp_Boost_v	MBAR_A		
FSS_Total_Fueling	MG/STROKE		

191. CBD/EPS Based Unintented Fueling Diagnostic (CUFD)

Engine_Speed	RPM		
FSS_Total_Fueling	MG/STROKE	CUFD_s_AlgorithmEnable_c	None
Combustion_Control_Path_Owner	None	CUFD_s_Enable_v	None
Fuel_Rail_Pressure	BAR	CUFD_s_State_v	None
FSI_q_totalFueling_v	MG/STROKE	CUFD_s_State_v=Normal Sate	
Combustion_Control_Path_Owner	None	CUFD_s_State_v=Diag. State	
H_EPS_s_CamHalfCycle	None	CUFD_s_State_v=Low Power State	
H_EPS_ti_MainPeriod	None	CUFD_s_State_v=Limphome State	
EPS_s_MainSync	None		
H_EPS_ct_MainInterrupt	None	CUFD_s_FSOEnable_v	None
FSI_s_BaseControlState_v	None	CUFD_x_CylinderMask_v	HEX
EPS_s_Status	None	CUFD_x_AugDeltaAccel_v	None
EPS_s_SensorSelect	None	CUFD_x_DeltaAccelThreshold_v	None
		CUFD_x_BankFailed_v	None

192. Cylinder Balancing Diagnostics (CBD)

Engine_Speed	RPM		
FSI_ca_mainSOI_v	Deg_BTDC	C_CBD_s_Compensation	None
FSI_q_totalFueling_v	MG/STROKE	Combustion_Control_Path_Owner	None
H_CBD_ct_LimitsExceeded	CNTS	H_CBD_s_Adjusting	None

CBD Fueling Adjustments

Large Positive Adjustment = Weak Cylinder

Large Negative Adjustment = Strong Cylinder

Cyl 1: FSI_q_cbdTotalAdj_v[0]	MG/STROKE
Cyl 2: FSI_q_cbdTotalAdj_v[1]	MG/STROKE
Cyl 3: FSI_q_cbdTotalAdj_v[2]	MG/STROKE
Cyl 4: FSI_q_cbdTotalAdj_v[3]	MG/STROKE
Cyl 5: FSI_q_cbdTotalAdj_v[4]	MG/STROKE
Cyl 6: FSI_q_cbdTotalAdj_v[5]	MG/STROKE

193. Cylinder Balancing Diagnostics (CBD)

Engine_Speed	RPM	
FSI_q_totalFueling_v	MG/STROKE	
FSI_ca_mainSOI_v	deg_BTDC	
CTS_x_ActiveFlMask_v (indicates active cylinders, 3F = all active)	HEX	This is a lower level cylinder cutout, bypassing the regular tool interface cutout. It is recommended that cylinder cutouts are executed from FSI or the tool interface
CTS_x_UserFlMask_c (003F= All cylinders active)	HEX	
CTS_x_UserFlMask_c=003E	Disables Cyl 1	
CTS_x_UserFlMask_c=003D	Disables Cyl 2	
CTS_x_UserFlMask_c=003B	Disables Cyl 3	
CTS_x_UserFlMask_c=0037	Disables Cyl 4	
CTS_x_UserFlMask_c=002F	Disables Cyl 5	
CTS_x_UserFlMask_c=001F	Disables Cyl 6	
CTS_x_UserFlMask_c=0038	Disables Cyl 1-3	
CTS_x_UserFlMask_c=0007	Disables Cyl 4-6	
CTS_x_UserTmMask_c (003F = All cylinders active)	HEX	Disables timing flow to specific cylinders. If timing flow is disabled, minimize the amount of time the engine is run without timing flow. Running without timing fuel can damage the injectors.
CTS_x_UserTmMask_c=003E	Disables Cyl 1	
CTS_x_UserTmMask_c=003D	Disables Cyl 2	
CTS_x_UserTmMask_c=003B	Disables Cyl 3	
CTS_x_UserTmMask_c=0037	Disables Cyl 4	
CTS_x_UserTmMask_c=002F	Disables Cyl 5	
CTS_x_UserTmMask_c=001F	Disables Cyl 6	
CTS_x_UserTmMask_c=0038	Disables Cyl 1-3	
CTS_x_UserTmMask_c=0007	Disables Cyl 4-6	

Fuel Actuator Addition time on trims		**Timing Actuator Additional time on trims**	
Cyl1: CTS_ti_FlTrim_c[0]	MSEC	Cyl1: CTS_ti_TmTrim_c[0]	MSEC
Cyl2: CTS_ti_FlTrim_c[1]	MSEC	Cyl2: CTS_ti_TmTrim_c[1]	MSEC
Cyl3: CTS_ti_FlTrim_c[2]	MSEC	Cyl3: CTS_ti_TmTrim_c[2]	MSEC
Cyl4: CTS_ti_FlTrim_c[3]	MSEC	Cyl4: CTS_ti_TmTrim_c[3]	MSEC
Cyl5: CTS_ti_FlTrim_c[4]	MSEC	Cyl5: CTS_ti_TmTrim_c[4]	MSEC
Cyl6: CTS_ti_FlTrim_c[5]	MSEC	Cyl6: CTS_ti_TmTrim_c[5]	MSEC

194. (CBD) Engine Speed Procesing (EPS)

Engine_Speed	RPM	C_EPS_s_CrankStartType	None
EPS_s_SensorSelect		H_EPS_s_CamHalfCycle	None
EPS_s_Status	None	P_EPS_ti_BkupGlitch	s
EPS_s_MainSync	None	P_EPS_ti_MainGlitch	s
EPS_s_BkupSync	None	H_EPS_ct_MainInterrupt	counts
H_EPS_n_MainRPM	RPM	H_EPS_ct_BkupInterrupt	counts
H_EPS_n_BkupRPM	RPM	H_EPS_ct_MainAtBkupSync	counts
H_EPS_ct_MainAtBkupTooth	counts		

195. Estimated Valve Delay (EVD)

Engine_Speed	RPM	EVD_ti_EstFlEVD_v	MSEC
FSI_q_totalFueling_v	MG/STROKE	EVD_ti_EstTmEVD_v	MSEC
FSI_v_batt_v	VOLT	EVD_v_FiltBatt_v	VOLT
Battery_Voltage	VOLT	EVD_s_Enable_c	None
FSI_lp_Gallery_v	MBAR	EVD_ti_UserFlEVD_c	MSEC
Fuel_Rail_Pressure	bar_A	EVD_ti_UserTmEVD_c	MSEC

196. Flow-To-Time Conversion (FTT)

Inputs for determining FTT Conversion			
Engine_Speed	RPM		
Fueling parameters		**Timing parameters**	
FSI_q_totalFueling_v	MG/STROKE	SFH_qt_TimingFlow_v	MM3/STROKE
PCC_q_FuelComp_v	MG/STROKE	PCC_qt_TimingComp_v	MM3/STROKE
FTC_q_fuelingComp_v	MG/STROKE	TTC_qt_tFlowComp_v	MM3/STROKE
BPC_q_FuelComp_v	MG/STROKE	FTT_qt_CompTmCmd_v	MM3/STROKE
FTT_q_CompFlCmd_v	MG/STROKE	EVD_ti_EstTmEVD_v	MSEC
EVD_ti_EstFlEVD_v	MSEC		
Outputs from FTT Conversion Algorithm:		**Engineering Addition to Fueling/Timing Pulse Time On**	
FTT_ti_BaseFlTTL_v	MSEC		
FTT_ti_BaseTmTTL_v	MSEC		

197. Fuel Pressure Compensation (PCC)

Engine_Speed	RPM		
FSI_lp_Gallery_v	MBAR	PCC_lp_ModelPressure_v	MBAR
FSI_q_totalFueling_v	MG/STROKE	PCC_lp_PressureError_v	MBAR
SFH_qt_TimingFlow_v	MM3/STROKE	PCC_q_FuelComp_v	MG/STROKE
SFH_ht_FuelColumn_v	MM	PCC_qt_TimingComp_v	MM3/STROKE
SFH_ar_LowerPlunger_c	None		
PCC_s_Enable_c	None		

198. Fuel Pressure Monitor (FPM)

Engine_Speed	RPM		
FSS_Total_Fueling	MG/STROKE	FPM_lp_LowPressureErr_v	MBAR
Combustion_Control_Path_Owner	None	FPM_lp_LowThreshold_v	MBAR
FSI_q_totalFueling_v	MG/STROKE	FPM_ct_LowMBarSec_p	None
FSI_s_BaseControlState_v	None		
FDH_s_GalleryPSensorErr_v	None		
FSO_p_PWMDutyCycle_v	%DC		
FSI_lp_Gallery_v	MBAR	FPM_lp_HighPressureErr_v	MBAR
PCC_lp_PressureError_v	MBAR	FPM_lp_HighThreshold_c	MBAR
FPM_s_Enable_c	None	FPM_ct_HighMBarSec_p	None
PCC_lp_PressureError_v	MBAR		
FPM_ct_FilterMBarSec_p	None		

199. Fuel Shut OFF (FSO) Controls

Engine_Speed	RPM		
FSS_Total_Fueling	MG/STROKE	FSS_FSO_Status	None
Combustion_Control_Path_Owner	None	FSO_p_PWMDutyCycle_v	%
Fuel_Rail_Pressure	bar_A	FSO_s_PWMState_v	None
FSI_v_batt_v	VOLT	FSO_ct_PWMTimer_v	SEC
FSI_s_enableFuel_v	None	CUFD_s_FSOEnable_v	None
FSI_s_receiveStopFuel_v	None		

200. Fuel Shut Off (FSO) Mechanically Stuck Open Diagnostics (FSOD)

Engine_Speed	RPM		
FSS_Total_Fueling	MG/STROKE	FDH_s_GalleryPSensorErr_v	None
Combustion_Control_Path_Owner	None	FDH_s_FSOControlErr_v	None
Fuel_Rail_Pressure	bar_A	FSI_s_BaseControlState_v	None
FSO_s_KeyOffShutdown_v	None	FSI_lp_Gallery_v	MBAR
FSO_ct_Timer_v	SEC	FSO_s_DiagState_v	None
FSO_ct_InternFaultCounter_v	None	FSO_Stuck_Open_Error	None
FSS_Key_Off_Shutdown	None	FSO_s_DiagEnable_c	None

201. Fuel System Fault Derate Handler (FDH)

Engine_Speed	RPM	EPS_s_MainSync	None
FSI_q_totalFueling_v	MG/STROKE	EPS_s_BkupSync	None
FSI_ca_mainSOI_v	Deg_BTDC	EPS_s_Status	None
Combustion_Control_Path_Owner	None	Battery_Voltage	V
Fuel_Rail_Pressure	bar_A	Coolant_Temperature	Deg_c
Fuel_Temperature	Deg_C		

FSSC Fault Derate Handler Parameters:		**Fault Derate Handler Reaction Caltbrations:**	
FDH_x_ActiveReaction_v	HEX	FDH_x_CBDTrimLimReact_c	HEX
FDH_q_mustDerate_v (FSSC active derate)	MG/STROKE	FDH_x_CylCutoutReact_c	HEX
FDH_q_megaDerate_c	MG/STROKE	FDH_x_EPSBackupIntrSyncReact_c	HEX
FDH_q_miniDerate_c	MG/STROKE	FDH_x_EPSBackupReact_c	HEX
FDH_q_normalDerate_c	MG/STROKE	FDH_x_EPSMainIntrSyncReact_c	HEX
FDH_ca_SOIDerate_c	CRANK_DEG_BRDC	FDH_x_EPSMainReact_c	HEX
FDH_n_MinSpeedLimit_c	RPM	FDH_x_EPSPhaseReact_c	HEX
FDH_n_MaxSpeedLimit_c	RPM	FDH_x_FSOHighElectReact_c	HEX
FDH_n_DerateRate_c	RPM	FDH_x_FSOLowElectReact_c	HEX
		FDH_x_FSOMechStuckReact_c	HEX

Derate Reaction	**Bit**
Mini Fueling Derate	0
Normal Fueling Derate	1
Mega Fueling Derate	2
Maximum SOI Advance derate	3
Fueling To Front bank cylinders cut off	4
Fueling To rear cylinders cut off	5
All Fueling Stopped	6
CBD Trims Frozen	7
Speed Derate	8

FDH_x_FrontFlActImpReact_c	HEX
FDH_x_FlPrsSenInRangeReact_c	HEX
FDH_x_FrontFlActSevReact_c	HEX
FDH_x_FrontTmActImpReact_c	HEX
FDH_x_FrontTmActSevReact_c	HEX
FDH_x_RearFlActImpReact_c	HEX
FDH_x_RearFlActSevReact_c	HEX
FDH_x_RearTmActImpReact_c	HEX
FDH_x_RearTmActSevReact_c	HEX
FDH_x_GalleryPOORReact_c	HEX
FDH_x_HiFlSupplyPReact_c	HEX
FDH_x_LowFlSupplyPReact_c	HEX
FDH_x_PrsFlFiltCloggReact_c	HEX
FDH_x_VBattOORReact_c	HEX

202. Fuel Systems Interface (FSI)

Combsution_Control_Path_Owner	None

Fuel System Output Parameters:

Engine_Speed	RPM
FSI_q_totalFueling_v	MG/STROKE
FSI_ca_mainSOI_v	CRANK_DEG
FSI_lp_Gallery_v	MBAR
Fuel_Rail_Pressure	bar_A
FSI_v_batt_v	VOLT
FSI_t_fuel_v	None
Fuel_Temperature	Deg_C
FSI_t_coolant_v	None
FSI_lp_Boost_v	MBAR
FSI_s_stopFuel_c (Overrides FSI_q_totalFueling_c and FSI_ca_mainSoi_v)	1=Override
FSI_s_stopOutputs_c (Suspends calculation of FSSC to Base Control System)	1=Override

Base Control System Parameters:

FSS_Total_Fueling (After Derate)	MG/STROKE
Final_Timing	deg_BTDC
Fuel_Rail_Pressure	bar_A
Battery_Voltage	V
Fuel_Temperature	Deg_C
Coolant_Temperature	Deg_C
Charge_Press	kPa

203. Fuel Temperature Compensation (FTC/TTC)

Outputs From Fuel Temp Comp		**Inputs For Determining Fuel Temp Comp**	
FTC_q_fuelingComp_v	MG/STROKE	Engine_Speed	RPM
TTC_qt_tFlowComp_v	MM3/STROKE	FSI_t_coolant_v	DEGC
		FSI_t_fuel_v	DEGC
Engineering Enable		FSI_q_totalFueling_v	MG/STROKE
		TTC_tc_reset_v	UNITLESS
TTC_s_enable_c (Enables Timing Temp. Comp)	None	TTC_t_ssRefInjInlet_v	UNITLESS
FTC_s_enable_c (Enables Fuelng Temp. Comp)	None	TTC_t_ssInjInlet_v	UNITLESS
TTC_s_useCoolant_c (Removes coolant temp impact from FTC/TTC. Coolant Temp. assumed nominal)	UNITLESS	TTC_t_head_v	UNITLESS
		TTC_t_filtInjInlet_v	UNITLESS
		TTC_qt_unshapedComp_v	UNITLESS
		TTC_qt_filtTFlow_v	UNITLESS
		FTC_t_ssRefInjInlet_v	UNITLESS
		FTC_t_ssInletError_v	UNITLESS
		FTC_t_ssInjInlet_v	UNITLESS
		FTC_t_filtInjInlet_v	UNITLESS
		FTC_q_unshapedComp_v	MG/STROKE
		FTC_q_filtFueling_v	UNITLESS

204. Solid Fuel Height Determination (SFH)

Engine_Speed	RPM	SFH_ca_SOIOffset_c	CRANK_DEG_BTDC
FSI_q_totalFueling_v	MG/STROKE	SFH_ca_MaxSOILimit_c	CRANK_DEG
SFH_ca_TimingCommand_v	CRANK_DEG	SFH_ca_MinSOILimit_c	CRANK_DEG
SFH_ht_FuelColumn_v	MM	SFH_qt_TimingFlow_v	MM3/STROKE
FSI_ca_mainSOI_v	CRANK_DEG	FTT_ti_BaseTmTTL_v	MSEC
FDH_ca_SOIDerate_v	CRANK_DEG	FTT_qt_CompTmCmd_v	MM3/STROKE

205. Solid Fuel Height Determination (SFH)

Engine_Speed	RPM	SFH_ca_SOIOffset_c	CRANK_DEG_BTDC
FSI_q_totalFueling_v	MG/STROKE	SFH_ca_MaxSOILimit_c	CRANK_DEG
SFH_ca_TimingCommand_v	CRANK_DEG	SFH_ca_MinSOILimit_c	CRANK_DEG
SFH_ht_FuelColumn_v	MM	SFH_qt_TimingFlow_v	MM3/STROKE
FSI_ca_mainSOI_v	CRANK_DEG	FTT_ti_BaseTmTTL_v	MSEC
FDH_ca_SOIDerate_v	CRANK_DEG	FTT_qt_CompTmCmd_v	MM3/STROKE

206. Motoring Leakage Algorithm (MOT)

MOT_x_PatternIndex_v	UNITLESS	MOT_s_Flag_v	
MOT_x_CylinderMask_v	HEX	MOT_s_Enable_c	UNITLESS
MOT_ti_FuelTTL_v	MSEC	EVT_ti_FuelOntime_T[0-5]	mSec
MOT_ti_BaseFuelVOT_c	MSEC	EVT_ti_timingOntime_T[0-5]	mSec

User Overrides

207. 2007 ISM and ISX Common User Overrides (Actuators)

Description	Variable	Override Enable	Override Value
Aftertreatment Doser injector	V_HIM_fg_Dosing_Cmd	O_HIM_fg_Inj_Cmd_Enbl	O_HIM_fg_Inj_Cmd_Value
Aftertreatment Doser Pressure SOV	V_HIM_DFSOV_Cmd	O_HIM_DFSOV_Control_Enbl	O_HIM_DFSOV_Control_Value
Aftertreatment Doser Drain SOV	V_HIM_DFSOV2_Cmd	O_HIM_DFSOV_Control_Enbl	O_HIM_DFSOV2_Control_Value
EGR Valve Cmd	EAC_EGR_Valve_Cmd	T_EAC_User_Override	C_EAC_Override_Value
Final Timing	Final_Timing	T_CBL_SOI_User_Override	C_CBL_SOI_Override_Value
SOI Reference	Final_Timing	T_CBL_SOI_Increment_Enable	C_CBL_SOI_Increment
Total Fueling	Total_Fueling	T_CBR_Gross_Fuel_User_Override	C_CBR_Gross_Fuel_Override_Value
VGT Cmd (legacy)	TGC_VT_Cmd	T_TGC_User_Override	C_TGC_Override_Value
VGT Cmd (before sent to actuator)	TGC_VT_Cmd	T_VGA_DL_Cmd_User_Override	C_VGA_DL_Cmd_Override_Value

208. 2007 ISM and ISX Common User Overrides (Commands)

Description	Variable	Override Enable	Override Value
Delta Press Over Charge Pressure	CSE_OCVGT_dP_IMP_Ref	T_CSE_dp_IMP_User_Override	C_CSE_dp_IMP_Override_Value
EGR Fraction Increment	CHL_EGR_Frac_Cmd	T_CBL_EGX_Increment_Enable	C_CBL_EGX_Increment
EGR Fraction Cmd	CHL_EGR_Frac_Cmd	T_CBL_EGR_Frac_User_Override	C_CBL_EGR_Frac_Override_Value
Mass Charge Flow Cmd	CHL_MCF_Cmd	T_CBL_MCF_User_Override	C_CBL_MCF_Override_Value
Mass Charge Flow Cmd Increment	CHL_MCF_Cmd	T_CBL_MCF_Increment_Enable	C_CBL_MCF_Increment
OFC Fuel Limit	OFC_Fuel_Limit	T_OFC_Fuel_Limit_Override_Value	C_OFC_Fuel_Limit_Override_Value
XForm	CSE_Xform_Angle	T_CSE_Xform_User_Override	C_CSE_Xform_Override_Value

209. 2007 ISM and ISX Common User Overrides (Inputs)

Description	Variable	Override Enable	Override Value
Battery Voltage	Battery_Voltage	T_AIP_Battery_Voltage_Ovrd_En	H_AIP_Battery_Voltage_Ovrd_Val

210. 2007 ISX Only Fuel System User Overrides (Sensors)

Description	Variable	Override Enable	Override Value
Fuel Pressure	Fuel_Rail_Pressure	C_FSI_s_FuelRailPresUserOverrideEnable	H_FSI_lp_FuelRailPressOverrideValue
Fuel Temperature	Fuel_Temperature	C_FSI_s_FuelTempUserOverrideEnable	H_FSI_t_FuelTempOverrideValue

211. 2007 ISM and ISX Common User Overrides (Sensors)

Description	Variable	Override Enable	Override Value
Aftertreatment Delta Pressure	V_SFP_pr_Delta	O_AIM_pr_DPF_DeltaP_Enable	C_AIM_pr_DPF_DeltaP_Default
Aftertreatment DOC Inlet Temperature	V_ATP_tr_DOC_In	O_AIM_tr_DOC_In_Enable	C_AIM_tr_DOC_In_Default
Aftertreatment DOC Out Temperature	V_ATP_tr_DOC_Out	O_AIM_tr_DOC_Out_Enable	C_AIM_tr_DOC_Out_Default
Aftertreatment Doser Fuel Pressure	V_HIM_pr_Inj_Fuel	O_HIM_pr_Inj_Fuel_Enbl	C_HIM_pr_Inj_Fuel_Default
Aftertreatment Filter Out Temperature	V_ATP_tr_DPF_Out	O_AIM_tr_DPF_Out_Enable	C_AIM_tr_DPF_Out_Default
Ambient Air Pressure	Ambient_Air_Press	T_AIP_AMB_User_Override_En	AIP_AMB_User_Override_Value
Charge Pressure (Abs)	Charge_Press	T_AIP_Charge_Press_User_Ovrd_En	C_AIP_Charge_Press_Ovrd_Value
CCV Pressure	Crankcase_Press	T_AIP_CrankcasePress_Usr_Ovr_En	C_AIP_CrankcasePress_Ovrd_Value
Comp Inlet Temperature	Compressor_Inlet_Tmptr	T_AIP_CompInTmptr_Ovrd_En	C_AIP_CompInTmptr_Ovrd_Val
Coolant Level	Coolant_Level	T_AIP_Cool_Lev_User_Override_En	AIP_Cool_Lev_Override_Value
Coolant Temperature	Coolant_Temperature	T_AIP_CT_User_Override	AIP_Cool_Tmptr_Override_Value
ECM Internal Temperature	InternalTmptr	T_AIP_InternalTmptr_Ovrd_En	C_AIP_InternalTmptr_Ovrd_Val
EGR Delta Pressure	EGR_Delta_Press	T_AIP_EGRDeltaPress_Ovrd_En	C_AIP_EGRDeltaPress_Ovrd_Val
EGR Return Temperature	EGR_Orifice_Tmptr	T_AIP_EGROrificeTmptr_Ovrd_En	C_AIP_EGROrificeTmptr_Ovrd_Val
Exhaust Pressure	Exhaust_Press	T_AIP_ExhaustPRess_Ovrd_En	C_AIP_ExhaustPress_Ovrd_Val
Charge Temperature	Charge_Tmptr	T_AIP_CHT_User_Override	C_AIP_CHT_Override_Value
OEM Remote Accelerator	RMT_Remote_Accelerator_Posn	T_AIP_RMT_Accelerator_Ovrd_En	H_AIP_RMT_Accel_User_Ovrd_Val
Oil Pressure	Oil_Pressure	T_AIP_OP_User_Override	AIP_Oil_Press_Override_Value
Oil Temperature	Oil_Temperature	T_AIP_OT_User_Override	AIP_Oil_Tmptr_Override_Value
Throttle Position (1)	Accelerator_Pedal_Position	T_AIP_Accelerator_Ovrd_En	AIP_AccPd_User_Ovrd_Val
Throttle Position (2)	Secondary_Accel_Pedal_Pos	T_AIP_APP2_Ovrd_Enable	H_AIP_APP2_User_Ovrd_Val
Water In Fuel	EEM_WIFState	T_AIP_WIF_User_Override_En	H_AIP_WIF_User_Override_Value

212. 2007 ISM and ISX Common User Overrides (States)

Description	Variable	Override Enable	Override Value
Aftertreatment Application Label	PTM_ApplicationLabel	C_PTM_Label_Override_Enable	C_PTM_Label_Override_Value
Aftertreatment Operation Mode	V_ATM_Oper_Mode	O_ATR_Oper_Mode_Enbl	O_ATR_Oper_Mode_Value
Aftertreatment Regen Stage	V_SFR_Regen_Stage	O_SFR_Regen_Stage_Enable	O_SFR_Regen_Stage_Value
Aftertreatment Regen Tactic	H_SFR_Regen_Tactic	C_SFR_Regen_Tactic_Ov_Enable	C_SFR_Regen_Tactic_Ov_Value
Alpha	CBR_Alpha	T_CBR_Alpha_User_Override	C_CBR_Alpha_Override_Value
Chi	H_CBR_Chi_Value	T_CBR_Chi_User_Override	C_CBR_Chi_Override_Value
Emissions Protection State	EMM_Protection_State	T_EMO_State_User_Override	C_EMO_State_Override_Value
Thermal Management	PTM_TMMode PTM_UseTM PTM_OCVG_Allowed	T_PTM_Thermal_Mgt_Ovrd	C_PTM_Thermal_Mgt_Ovrd_Val

213. 2007 ISM and ISX Common User Overrides (Switches)

Description	Variable	Override Enable	Override Value
Clutch Switch	Clutch_Switch	T_DIP_ClutchSwitchOvrdEn	H_DIP_ClutchSwitchOvrdVal

214. 2007 ISM and ISX Common User Overrides (Virtual Sensors)

Description	Variable	Override Enable	Override Value
Aftertreatment Turbo Out Temp	V_ATP_tr_Turbo_Out	O_AIM_tr_TrbnOutOvr_Enbl	O_AIM_tr_TrbnOut
Aftertreatment Nox Estimate	V_ATP_mf_Turbo_Out_Nox	O_AIM_TrbnOutExhNOxOvr_Enbl	O_AIM_ppm_TrbnOutExh_NOx
Aftertreatment O2 Estimate	V_ATP_mf_Turbo_Out_O2	O_AIM_TrbnOutExhO20vr_Enbl	O_AIM_mf_TrbnOutExh_O2
Aftertreatment PM Estimate	V_ATP_mf_Turbo_Out_PM	O_AIM_TrbOutExhPMOrv_Enbl	O_AIM_mf_TrbnOutExh_PM
Aftertreatment HC Estimate	V_ATP_mf_Turbo_Out_HC	O_AIM_TrbOutHCTrgtFdbkOvr_Enbl	O_AIM_mf_TrbnOutHCTrgt_Fdbk
Ambient Temp	Ambient_Air_Tmptr	T_AMB_Amb_Tmptr_User_Override	AMB_Amb_Tmptr_Override_Value
Boost Press (Gage)	Boost_Pressure	T_AIP_Charge_Press_User_Ovrd_En	C_AIP_Charge_Press_Ovrd_Value

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:

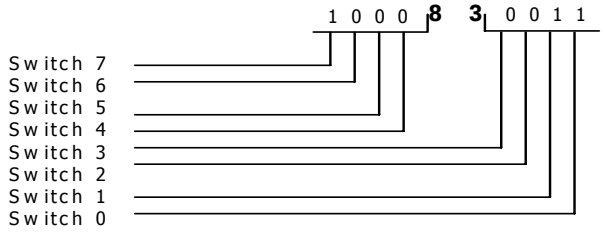
512/2 = 256	remainder	0	BIT 0	87/2 = 43	remainder	1	BIT 0
256/2 = 128	remainder	0	BIT 1	43/2 = 21	remainder	1	BIT 1
128/2 = 64	remainder	0	BIT 2	21/2 = 10	remainder	1	BIT 2
64/2 = 32	remainder	0	BIT 3	10/2 = 5	remainder	0	BIT 3
32/2 = 16	remainder	0	BIT 4	5/2 = 2	remainder	1	BIT 4
16/2 = 8	remainder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

Accelerator_Interlock_State	
State	**Decimal Value**
UNLOCKED	0
LOCKED	1

AFTERTREATMENT:

PTM_StatRegen_Test_Status	
State	**Decimal Value**
INACTIVE	0
ACTIVE	1
TIS_COMPLETED	2
ECM_FAULTS	3
ECM_PROHIBITED	4

H_PTM_Operator_Regen_Req	**H_PTM_ManualTriggerSource**
State	**Decimal Value**
NO_REQUEST	0
AUTOMATIC	1
SERVICE	2
OPERATOR	3
OVERRIDE	4

PTM_Regen_Oper_State	
State	**Decimal Value**
IDLE	0
STANDBY	1
STAT_REGEN	2
REGEN_TIMED_OUT	3
REGEN_COMPLETE	4
REGEN_INEFFECTIVE	5
REGEN_INTERRUPTED	6

C_APM_bs_ProtMode_BySysIO **C_APM_bs_StopDosing_BySysIO**	**C_OCD_bs_Eff_Enable** **V_ATD_bs_SysIO_Errs**
State	**Bit**
V_AIM_AT1_Source (OOR)	0
V_EMD_AT1_Keyon_Error	1
V_EMD_AT1_Dither_Error	2
V_AIM_AT2_Source (OOR)	3
V_EMD_AT2_Keyon_Error	4
V_EMD_AT2_Dither_Error	5
V_AIM_AT3_Source (OOR)	6
V_EMD_AT3_Keyon_Error	7
V_EMD_AT3_Dither_Error	8
V_AIM_DPF_DeltaP_Source (OOR)	9
V_EMD_DPF_dP_Keyon_Error	10
V_EMD_DPF_dP_Dither_Error	11
Ambient Air Pressure (aimAmbAirPr_status)	16
Engine Speed (aimEngineSpeed_status)	17
Turbo Speed (aimTurboSpeed_status)	18
Turbine Out PM (aimExhPM_status)	19
Turbine Out Exhuast Flow (aimExhFlow_status)	20
Turbine Out HC (aimExhHC_status)	21
Turbine Out Nox (aimExhNOx_status)	22
Turbine Out O2 (aimExhO2_status)	23
V_HIM_DIAG_Test_Failed/ V_HIM_ATM_Rqst.ProtMode	24
emd_dp_sensor_supply_fault	25

C_APM_bs_ProtMode_BySysPerf **C_APM_bs_StopDosing_BySysPerf**	**V_ATD_bs_SysPerf_Errs**
State	**Bit**
H_EMD_DOC_Presence_Error	0
V_EMD_DOC_Reverse_Error	1
P_EMD_DOC_Eff_Error_NoLamp	5
P_EMD_DOC_Eff_Error_Lamp	6
P_OCL_DOC_Face_Plug_Active	7
V_EMD_DPF_Missing_Error	8
V_SFD_Soot_Load_Medium_Flag	10
V_SFD_Soot_Load_High_Flag	11
V_SFD_Soot_Load_Severe_Flag	12
H_SFD_DeltaP_High_Flag	14
V_EMD_DPF_Plugged_Error	15
V_APM_DOCOut_HiTmptr_Flag	16
V_APM_DOCOut_Persist_Fault	17
V_APM_DOC_HiDeltaT_Fault	18
V_APM_DOCOut_Severe_Fault	19
V_APM_DPFOut_HiTmptr_Flag	20
V_APM_DPFOut_Persist_Fault	21
V_APM_DPFOut_Severe_Fault	22
V_SFR_Ineff_Dosing_Error	23

V_HIM_DIAG_bs_Status	
State	**Bit**
V_HIM_Engine_Running	0
H_HIM_Dosing_Allowed	1
H_HIM_DIAG_DDC_Rqst	2
H_HIM_DIAG_Leak_Test_Active	3
H_HIM_DIAG_Leak_Test_Failed	4
V_HIM_DIAG_Leak_Test_Comp	5
V_HIM_DIAG_DFSOV_Swap	6
V_HIM_DIAG_Amb_Test_Failed	7
V_HIM_DIAG_DFSOV_FTO	8
V_HIM_DIAG_DFSOV_Leak	9
V_HIM_DIAG_Sys_Leak	10
V_HIM_DIAG_Doser_FTP	11
V_HIM_DIAG_DFSOV2_FTO	12
H_HIM_DIAG_Pressure_Test_Active	13
H_HIM_DIAG_Pressure_Test_Failed	14
V_HIM_DIAG_Pressure_Test_Comp	15

V_HIM_bs_Status	C_HIM_bs_ProtMode_Mask
State	**Bit**
V_HIM_PRR_Active	0
V_HIM_DDC_Rqst	1
V_HIM_DIAG_Amb_Test_Failed	2
H_HIM_DIAG_Leak_Test_Failed	3
H_HIM_DIAG_Pressure_Test_Failed	4
V_HIM_DIAG_Test_Active	5
H_DDD_s_InjOffFault	6
H_DDD_s_InjOnFault	7
H_DDD_s_FSOOffFault	8
H_DDD_s_FSOOnFault	9
H_HIM_ISX_Err	10
H_HIM_Inj_Press_Err	11
H_HIM_Disable_HIM_Err	12
V_HIM_DFSOV_Cmd	13
V_HIM_DFSOV2_Cmd	14
V_HIM_InjStatus	15

H_PTM_ManualTriggerSource	H_PTM_StatRegenTrigger
State	**Decimal Value**
NO_REQUEST	0
SERVICE	2
OPERATOR	3

H_DDD_s_FSO2Enable	H_DDD_s_FSOEnable
State	**Decimal Value**
Closed	0
Open	1

H_DDD_s_InjStatus	
State	**Decimal Value**
Doser Injection Inactive	0
Doser Injection Active	1

PTM_TMMode	
State	**Decimal Value**
OSCAR	1
FELIX	2
NONE	3

PTM_Final_Oper_Mode **V_ATM_Oper_Mode**	
Mode	**Decimal Value**
Normal	1
DeNOx	2
DeSoot	3
DeSOx	4
AT_Protect	5
H_20_Desorb	6
HC_Desorb	7
Forced	8
DeSoot Protection	9

PTM_State_Value	
State	**Decimal Value**
VERIFY_TARGET_TEMPERATURE_REACHED	1
RESET_RPM_TARGET	2
VERFITY_REGEN_COMPLETE	3
EXIT	4

PTM_ApplicationLabel	
Stage	**Decimal Value**
Application Label 1	1
Application Label 2	2
Application Label 3	3

V_SFR_Regen_Stage	
Stage	**Decimal Value**
None	1
Warm to plateau	2
Plateau	3
Warm to regeneration phase	4
Regeneration phase	5
Conditioning phase	6

V_ATD_Rvrsd_State	
Stage	**Decimal Value**
EMD_Idle	0
EMD_Abort	4
EMD_Run	6
EMD_Pause	8

V_EMD_AT1_Dither_State **V_EMD_AT1_Keyon_State** **V_EMD_AT2_Dither_State** **V_EMD_AT2_Keyon_State** **V_EMD_AT3_Dither_State**	**V_EMD_AT3_Keyon_State** **V_EMD_DPF_Missing_State** **V_EMD_DPF_Plugged_State** **V_EMD_DPF_dP_Dither_State** **V_EMD_DPF_dP_Keyon_State**
State	**Enumeration**
NOT RUN	0
PASS	1
FAIL	2
PRELIM_FAIL	3
ABORT	4
SINGLE_PASS	5
RUN	6

V_EMD_DOC_Presence_State	**V_EMD_DOC_Reverse_State**
State	**Enumeration**
NOT RUN	0
PASS	5
RUN	6
FAIL	7
RESET	8

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

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

H_ATM_bs_HC_CtrlLimits	
State	**Decimal Value**
NOT (V_OCL_MassFlow_OK_Flag)	2
P_OCL_DOC_Face_Plug_Active	3
V_OCL_Inlet_Tmptr_Low_Flag	4
V_OCL_Not_Warm_Yet_Flag	5
V_OCL_Bed_Tmptr_Low_Flag	6
V_OCR_HC_Limit_Bypass_Flag	7

V_HIM_FT_DoserTest_Status	
State	**Decimal Value**
_INACTIVE	0
TIS_AFT_DOSING_SYSTEM_TEST	1
TIS_COMPLETE	2
_ECM_FAULTS	3
_ECM_PROHIBITED	4
TIS_DELAY	5
_TIMER_EXPIRED	6
TIS_AFT_INJECTOR_TEST	7
TIS_AFT_SHUTOFF_VALVE_TEST	8

V_HIM_FT_Test_Mode	
State	**Enumeration**
Bucket Test	0
Injector Leak	1
Shutoff Valve Leak	2

PTM_Allow_Regen_State	
State	**Enumeration**
PERMI_ REGEN	1
INHIBIT_REGEN	2
NO_SWITCH_SIGNAL	3

PTM_HET_Lamp_State	
Stage	**Decimal Value**
LAMP_SOLID	1
LAMP_OFF	3

PTM_DPF_Lamp_State	
Stage	**Decimal Value**
LAMP_SOLID	1
LAMP_BLINK	2
LAMP_OFF	3

P_SFR_Regen_Trigger_State	
Mode	**Decimal Value**
Normal Regeneration	1
DeltaP Regeneration	2
Override Regeneration	4
Time Based Regeneration	8
Ineffective Regeneration	16
Forced Regeneration	32
Deep Clean Regeneration	64
Conditioning	128

ANTI-THEFT:

AT_Exit_Mode	
State	**Decimal Value**
Manual (lock upon operator request)	0
Automatic (lock when key off)	1

AUXILLIARY GOVERNOR CONTROL:

T_Aux_Governor_Selector	
State	**Decimal Value**
Speed	0
Pressure	1

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	3

CHARGE FLOW:

CHL_Derate_State		
State	**Text 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
CHL_EMP_Derate_State	EMP_DRT	16

CHP_Veff_Mode	C_CHP_Veff_With_EMP_Active
State	**Decimal Value**
IMP Only	0
EMP/IMP	1

Charge_Flow_Command_State	
State	**Decimal Value**
Normal Operation	0
COT Derate	1
Turbo Speed Derate	2
Delta P Derate	4
Delta P Near EGR Off Limit	8
Density Based MCF Limit	16
CBL MCF Command Override	32
Engine Brake	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

COMBUSTION MANAGER:

H_CBM_O2_Out_Frac_Status H_CBM_PM_Base_Frac_Status	H_CBM_PM_Out_Frac_Status H_CBR_NOx_Out_Frac_Status
State	**Enumeration**
DATA_VALID	0
DATA_ERROR_HIGH_CONFIDENCE	-3

T_CBR_NOx_Est_Select	
State	**Enumeration**
Model	0
Table Look up	1

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
CC_AUTO_RESUME	10

ACC_Mode	
State	**Enumeration**
NO_CRUISE	0
NORMAL_CRUISE	1
HEADWAY_CRUISE	2

CC_Status	
State	**Enumeration**
Inactive	0
Active	1

J39_Adaptive_Cruise_Control_Mode	
State	**Enumeration**
Off	000
Speed Contorl Active	001
Distance Control Active	010
Overtake Mode	011
Hold Mode	100
Finish Mode	101
Disabled	110
Not Valid	111

T_CC_SetAccelSwitchSelect	
State	**Enumeration**
CC_ResumeSwitch	0
CC_SetSwitch	1

CYLINDER PERFORMANCE:

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

CKV_s_CylinderStates_v	
State	**Enumeration**
Pass	0
Fail	1
Unknown	255

DDI_s_CylPerfTestStatus	
State	**Enumeration**
InAct	0
Act	1
Fault	3
Prohibit	4
Init	12
Susp	13

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

FSI_s_CylCutOutToolStatus	
State	**Enumeration**
Inactive	0
Active	1
Prohibit	4

FSI_s_CylindersCutOut	FSI_s_CylindersCutOut_T
State	**Enumeration**
Unused	0
Norm	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:

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

ECM:

Run_Location	
State	**HEX**
Flash	1
RAM	2

Security_Key	
State	**HEX**
SECURE	0000
UNSECURE	00FF

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**	**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
Mtr_Feedback_Error_Detected	10	2357
EGR_Fault_Pos_Sensor	20	2272
EGRV_Stuck_Failure	40	1896
EGR_Fault_Valve_Stuck	80	1896
EGR_Fault_Command_Source	100	1935
EGR_Fault_Communication	2000	1893
EGR_Fault_Software_Release	4000	1895
EGR_Fault_Software_ID_Receive	8000	1893

J39_EGR_Valve_State	
State	**Decimal Value**
Not Used	0
Position Control	1
Motor Init / Autozero	2
Motor Off	3

EGA_DL_Mode_Command	
State	**Hex**
Position Control	0001
Motor Init / Autozero	0002
Engine_Cranking	0020
Nominal Battery Voltage	0040
Actuator Power On	8000

EGR_Valve_Test_Status	
State	
_INACTIVE	0
_ACTIVE	1
_ECM_FAULTS	3
_ECM_PROHIBITED	4

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
General Engine Protection	64	Bit 6
Diagnostic Procedures	128	Bit 7
System Modulation	256	Bit 8
RPF Regeneration Protection	512	Bit 9

EMM_Protection_State **EMO_Condensation_AECD_State** **EMO_Engine_Start_AECD_State** **EMO_Extended_Idle_AECD_State**	**EMM_Gen_Protect_AECD_State** **EMO_Thermal_Mgt_AECD_State** **EMO_White_Smoke_AECD_State**	
State	**Decimal Value**	**Bit Mask**
Normal Operation	0	None
Cranking	1	Bit 0
Oscar Operation	2	Bit 1
Felix Operation	4	Bit 2
Aftertreatment Dosing	8	Bit 3
Engine Component Failure	16	Bit 4
Wet Stack Protection	32	Bit 5
Coolant Advance	64	Bit 6
Misfire Timing	128	Bit 7
OFC Gain Adjustment	256	Bit 8
Ambient Pressure Advance	512	Bit 9
Turbo Surge Protection	1024	Bit 10
UHC Advance	2048	Bit 11
Intake Condensation Protection	4096	Bit 12
BackPressure Protection	8192	Bit 13
Aftertreatment Protection Rqd	16384	Bit 14
Engine Protection Rqd	32768	Bit 15

ENGINE DIAGNOSTICS:

H_EMD_DPF_dP_Dither_SingleState	**H_EMD_TSR_Dither_SingleState**
Text Value	**Enumeration**
NOT_RUN	0
PRELIM_FAIL	3
ABORT	4
SINGLE_PASS	5
RUN	6

ENGINE BRAKE:

DL_RetarderControlMode	
Text Value	**Hex**
Speed Control	0001
Speed Limit Control	0002
Torque Control	0004
Torque Limit Control	0008

RetarderStatus	
Text Value	**Enumeration**
NONE	0
OVERRIDE_ONLY	1
OVERRIDE_AND_NON_OVERRIDE	2

Retarder_Torque_Mode	
Text Value	**Enumeration**
No Request	0000

RetarderCommand	
Text 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	**Text 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
Chi 5: Thermal Management	CHI 5	5

CBR_Chi_Source	
State	**Enumeration**
CCBR_DENSITY_CHI	1
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
CBR_THERMAL_CHI	8
BACKPRESSURE_CHI	10

ENGINE PROTECTION:

CHRG_ChtPrevSevSdReq **CHRG_ChtPrevSpdSdReq** **CHRG_CotPrevSevSdReq** **CHRG_EgrPrevSevSdReq** **CHRG_EgrPrevSpdSdReq** **CHRG_EmtPrevSevSdReq** **CHRG_EmtPrevSpdSdReq**	**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

EPD_Engine_State	
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	16
Previously Shutdown	32

ENGINE SOI TIMING COMMAND:

Final_Timing_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

CBL_SOI_State	
State	**Decimal Value**
IMT	0
MTL	1
AAP	2
CLTMP	3
CBO	4

C_MTL_BoostOrCharge	
State	**Enumeration**
determination based on boost pressure	0
interpolation based on charge flow	1

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

H_SNC_s_HalfCycleState	
State	**HEX**
Not Good	0
Good	1

EPS_s_Status	
State	**Dec**
FAILED	0
DEGRADED	1
HEALTHY	2
EPS_STOP	3
ES_HEALTHY	255

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

Tau_State	
State	**Decimal Value**
NORMAL	0
STEEP_GRADE	1
TAKE_OFF	2

ENGINE TORQUE / FUEL COMMAND:

CBR_Fuel_Ref_State	
State	**Enumeration**
_FUELING_NOT_SET	0
_FUELING_JCOMM_TORQUE_STATE	1
_FUELING_JCOMM_SPEED_STATE	2
_FUELING_PROGRESSIVE_SHIFT_SPEED_STATE	3
_FUELING_PTO_STATE	4
_FUELING_USER_COMMAND_STATE	5
_FUELING_LIMP_HOME_STATE	6
_FUELING_ASG_THROTTLE_STATE	7
_FUELING_FOUR_DIMENSION_STATE	8
_FUELING_CRUISE_CONTROL_STATE	9
_FUELING_RSG_STATE	10
_FUELING_LSG_STATE	11
_FUELING_HSG_STATE	12
_FUELING_TORQUE_DERATE_OVERRIDE_STATE	13
_FUELING_LOW_GEAR_STATE	14
_FUELING_ALTITUDE_DERATE_STATE	15
_FUELING_AFC_DERATE_STATE	16
_FUELING_ANC_DERATE_STATE	17
_FUELING_ENGINE_PROTECT_STATE	18
_FUELING_MAXIMUM_THROTTLE_STATE	19
_FUELING_JCOMM_TORQUE_DERATE_STATE	20
_FUELING_OUT_OF_GEAR_STATE	21
_FUELING_CRANK_STATE	22
_FUELING_OVERRIDE_STATE	23
_FUELING_ENGINE_BRAKE_STATE	24
_FUELING_OVERSPEED_STATE	25
_FUELING_STOP_STATE	26
_FUELING_SHUTDOWN_STATE	27
_FUELING_FSS_DERATE_STATE	28
_FUELING_EPF_DERATE_STATE	29
_FUELING_ASG_APPLICATION_STATE	30
_FUELING_ALTERNATE_TORQUE_STATE	31
_FUELING_MS_OVERRIDE_STATE	32
_FUELING_ENGINE_STARTUP_OIL_LIMIT	33
_FUELING_PTO_DERATE_STATE	34
_FUELING_TORQUE_CONTROL_STATE	35
_FUELING_PTP_DERATE_STATE	36
_FUELING_T2_SPEED_STATE	37
_FUELING_T2_TORQUE_STATE	38
_FUELING_T2_DERATE_STATE	39
_FUELING_NO_DERATE_STATE	40
_FUELING_ANTI_THEFT_DERATE_STATE	41
_FUELING_PARTIAL_THROTTLE_LIMIT_STATE	42
_FUELING_SS_AMBIENT_DERATE_STATE	43
_FUELING_TRANSIENT_COOLANT_DERATE_STATE	44
_FUELING_RMG_STATE	45
_FUELING_AIR_DENSITY_LIMIT_STATE	46
_FUELING_CHI_FUELING_LIMIT_STATE	47
_FUELING_TFC_DERATE_STATE	48
_FUELING_GROSS_OVERRIDE_STATE	49
_FUELING_CHM_DERATE_STATE	50
_FUELING_JCOMM_PTP_DERATE_STATE	51
_FUELING_LIMP_HOME_SPEED	52
_FUELING_TIS_DYNO	53
_FUELING_VSS_DIAGNOSTICS	54

FUELING_ESCC	55
FUELING_WPD	56
FUELING_TSD	57
FUELING_EWP	58
FUELING_JCOMM_SPEED_LIMIT	59
FUELING_AUX_NDOT	60
FUELING_FIW	61
FUELING_FIW_RAMP	62
FUELING_AFW	63
FUELING_REGEN	66
FUELING_RTD	67
FUELING_IRD	68
FUELING_LBSC	69
FUELING_XSC	70
FUELING_XPC	71
FUELING_TORQUE_RATE	73
FUELING_OBD	74
FUELING_JCOMM_MEO	75
FUELING_FUELING_SURGE_LIMIT	76
FUELING_CPL	77
FUELING_FSS_TRQ_DERATE	256
FUELING_EPD_FUEL_TEMP	514

Combustion_Control_Path_Owner H_CBR_Prelim_Fuel_State 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_CC	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_FUEL_OVERRIDE	23
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_ANTI_THEFT	41
CTRL_VAM	45
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_VSS_DIAGNOSTICS	54

CTRL_ESCC	55
CTRL_WPD	56
CTRL_TSD	57
CTRL_EWP	58
CTRL_JCOMM_SPEED_LIMIT	59
CTRL_AUX_NDOT	60
CTRL_FIW	61
CTRL_FIW_RAMP	62
CTRL_AFW	63
CTRL_REGEN	66
CTRL_RTD	67
CTRL_IRD	68
CTRL_LBSC	69
CTRL_XSC	70
CTRL_XPC	71
CTRL_JCOMM_PTP_DERATE	72
CTRL_TORQUE_RATE	73
CTRL_OBD	74
CTRL_JCOMM_MEO	75
CTRL_FUELING_SURGE_LIMIT	76
CTRL_CPL	77
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	28
FUELING_AIR_DENSITY_LIMIT_STATE	46
FUELING_CHI_FUEL_LIMIT_STATE	47
FUELING_TFC_DERATE_STATE	48
FUELING_GROSS_OVERRIDE_STATE	49

ETHER START:

C_EIS_TmptrSel	
State	**Enumeration**
Coolant Temperature	0
Intake Temperature	1

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

H_FCC_Fan_Type_Selection	
State	**Enumeration**
On/Off	0
Variable Speed	1
Three Speed	2

T_FCC_Fan_Type_Selection	
State	**Enumeration**
On/Off	0
Variable Speed	1
Three Speed	2
Elec Viscous No Speed Feedback	3
Elec Variable Speed with Speed Sensor	4
Elec Variable Speed with no Speed Sensor	5

FAST IDLE WARMUP:

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

FIW_Test_Status	
State	**Enumeration**
INACTIVE	0
ACTIVE	1
ECM_FAULTS	3
ECM_PROHIBITED	4
NO_ENGINE_SPEED	7
ENGINE_SPEED_LOW	9
INITIALIZATION_STATE	12

FUEL SYSTEM:

DDI_s_BankTestResults[0] **DDI_s_BankTestResults[1]** **DDI_s_CylTestResults[0]** **DDI_s_CylTestResults[1]** **DDI_s_CylTestResults[2]** **DDI_s_CylTestResults[3]** **DDI_s_CylTestResults[4]** **DDI_s_CylTestResults[5]**	**FSI_s_CylindersCutOut_T[0]** **FSI_s_CylindersCutOut_T[1]** **FSI_s_CylindersCutOut_T[2]** **FSI_s_CylindersCutOut_T[3]** **FSI_s_CylindersCutOut_T[4]** **FSI_s_CylindersCutOut_T[5]**
State	**Decimal**
Unused Cylinder	0
In Use Cylinder	1
Service Tool Cut Out	2
ECM Cut Out	3

FSS_FSO_Status	
State	**Dec**
Off (No Fueling)	0
On (Fueling)	1

FSI_s_BaseControlState_v	
State	**Dec**
Compression Brakes On	1
Engine Stopped	2
Engine Cranking	4
Key On	8

FSO_s_DiagState_v	
State	**Dec**
FSO Run State	1
FSO Delay State	2
FSO Diag State	3
FSO Shutdown State	4

FSO_s_PWMState_v	
State	**Dec**
PWMming State	0
Ninety Seven Percent State	1
Shut Off State	2

FSM_Feedback_Status	
State	**HEX**
FSM Derate Active	0002
FSOV Diag Keep Fueling	0001

P_ADD_x_DfrFault **P_ADD_x_FsrLowerFault** **P_ADD_x_FsrUpperFault**	**P_ADD_x_OffFault** **P_ADD_x_OnFault**
State	**HEX**
FSM Derate Active	0002
FSOV Diag Keep Fueling	0001

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

HIGH SPEED GOVERNOR:

HSI_SwMaxRPM_Selected	
State	**Enumeration**
Speed1	1
Speed2	2

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:

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

POWER TAKE OFF (PTO):

PTO_Status	
State	**Enumeration**
Inactve	0
Active	1

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

REMOTE THROTTLE:

T_RMT_Remote_Accelerator_Mode	
State	**Enumeration**
Remote Accelerator operationwith switch not including transition verification	0
Remote Accelerator operation with switch including transition verification	1

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	**EGR_Orifice_Tmptr_Source**
Ambient_Air_Press_Source	**EGR_Position_Source**
Ambient_Air_Tmptr_Source	**Exhaust_Press_Source**
Charge_Press_Source	**Turbo_Speed_Source**
Charge_Tmptr_Source	**VGT_Position_Source**
Crankcase_Press_Source	**V_AIM_AT1_Source**
Compressor_Inlet_Tmptr_Source	**V_AIM_AT2_Source**
EGR_Delta_Press_Source	**V_AIM_AT3_Source**
EGR_Orifice_Delta_Press_Source	**V_AIM_DPF_DeltaP_Source**
	V_HIM_Inj_Fuel_Press_Source
State	**Decimal Value**
PRIMARY	0 (0)
BACKUP	1 (-2)
DEFAULT	2 (-4)

SENSOR SOURCE INFORMATION (ESTIMATES AND VIRTUAL):

Ambient_Air_Tmptr_Source	**EGR_Flow_Source**
Charge_Flow_Source	**EGR_Valve_Delta_Press_Source**
Charge_Saturation_Tmptr_Source	**Engine_Delta_Press_Source**
Compressor_Inlet_Density_Source	**Exhaust_Saturation_Tmptr_Source**
Compressor_Inlet_Press_Source	**Exhaust_Tmptr_Source**
Compressor_Outlet_Tmptr_Source	**Fresh_Air_Flow_Source**
	Surge_Margin_Source
State	**Decimal Value**
PRIMARY	0
BACKUP	1
DEFAULT	2

SENSOR STATE INFORMATION (A/D SENSORS):

Charge_Press_State	**EGR_Orifice_Tmptr_State**
Charge_Tmptr_State	**Exhaust_Press_State**
Crankcase_Press_State	**Internal_Tmptr_State**
Compressor_Inlet_Tmptr_State	**Turbo_Speed_State**
State	**HEX**
Good	0000
Suspect	0001
Failed	0002

SENSOR STATE INFORMATION (ESTIMATES):

Charge_Press_EStat **Charge_Tmptr_EStat**	**Exhaust_Press_Estat** **Turbo_Speed_EStat**
State	**Decimal Value**
GOOD	0 (0)
EST_SUSPECT	1 (64)
EST_FAILED	2 (128)

SENSOR STATUS INFORMATION (A/D SENSORS)::

Ambient_Air_Press_Status **Ambient_Air_Tmptr_Status** **Boost_Pressure_Status** **Charge_Press_Status** **Charge_Tmptr_Status** **Compressor_Inlet_Tmptr_Status** **Compressor_Inlet_Press_Status** **EGR_Delta_Press_Status** **EGR_Orifice_Tmptr_Status** **EGR_Position_Status** **Exhaust_Press_Gage_Status** **Exhaust_Press_Status**	**Turbo_Speed_Status** **V_AIM_pr_Ambient_Air_Status** **V_AIM_pr_Charge_Press_Status** **V_AIM_tr_Ambient_Air_Status** **V_AIM_tr_Charge_Tmptr_Status** **V_AIM_tr_Coolant_Tmptr_Status** **V_AIM_tr_Oil_Tmptr_Status** **V_AIM_vr_Engine_Speed_StatusV_A** **IM_vr_Turbo_Speed_Status**
State	**Decimal Value**
Data Valid	0
Config Error / Default	-1
Supply Error active / Default	-2
Backup	-3
Default	-5

SENSOR STATUS INFORMATION (Virtual SENSORS):

Exhaust_Flow_Status **V_AIM_fg_Turbo_Out_Status** **V_AIM_mf_Turbo_Out_HC_Status** **V_AIM_mf_Turbo_Out_NO2_Status**	**V_AIM_mf_Turbo_Out_NOx_Status** **V_AIM_mf_Turbo_Out_O2_Status** **V_AIM_mf_Turbo_Out_PM_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

Sensor Type Selection:

C_Coolant_Level_Type_Select	
State	**Decimal Value**
Two-State	0
Three-State	1

SETUP FOR DYNO:

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

SMART ROAD SPEED GOVERNOR:

SRG_State	
State	**Decimal Value**
SRG_CANCEL	0
SRG_SET	1
SRG_KICKDOWN	2
SRG_KICKDOWN_RESUME	3
SRG_BUMP_UP	4
SRG_BUMP_DOWN	5
SRG_ACCEL	6
SRG_DECEL	7
SRG_SET_COAST	8
SRG_SET_ACCEL	9
SRG_OFF	10

STARTER LOCKOUT:

SLO_RelayState	
State	**Decimal Value**
Closed	0
Open	1

THERMAL MANAGEMENT:

C_EMO_CT_TMProtectMask **C_EMO_ECC_TMProtectMask** **C_EMO_EI_TMProtectMask**	**C_EMO_IC_TMProtectMask** **C_EMO_UHC_TMProtectMask** **C_EMO_WS_TMProtectMask**
State	**Decimal Value**
None	0
Oscar	1

TORQUE-TO-FUEL:

T_CBP_T2F_Model_Mode_Selector	
State	**Decimal Value**
Robust Torque Model	0
Table Look Up	1

TRIP INFORMATION:

TIB_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

TI_Vehi_Trip_Data_Fault_Status	**TI_Base_Trip_Data_Fault_Status**
State	**Enumeration**
False	0
True	1

TURBO CONTROL:

T_TGC_Spd_Drt_Mode	
State	**Enumeration**
turbo speed close loop control	0
turbo speed derate method	1

T_TGC_Variable_LLim_Mode	
State	**Enumeration**
C_TGC_LLim	0
Table Based LLim	1

T_TGC_Variable_ULim_Mode	
State	**Enumeration**
C_TGC_ULim	0
Table Based ULim	1

T_CSE_OCVGT_Error_Selector	
State	**Enumeration**
Use EMP for OCVGT Control	0
Use TOT for OCVGT Control	1

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

OOG_ProtectionState	
State	**Enumeration**
Ramping Up	0
Ramping Down	1
Steady State Inactive	2
Steady State Active	3

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

H_TSP_VSSResolutionStatus H_VSP_TghResolutionStatus	
State	**Enumeration**
Low	0
High	1

H_VSP_TghConfigurationStatus	
State	**Enumeration**
Configured	0
Waiting for configuration	1
Unconfigured	2

TSP_VSSConfigurationStatus	
State	**Enumeration**
Configured	0
Unconfigured	1

VGT:

J39_VGT_Actuator_State	J39_VGT_Commanded_State
State	**Enumeration**
Not Used	0
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	J39_VGT_System_Error_Status	
State	**HEX**	**Associated Fault Code**
ACTUATOR_OVER_TEMPERATURE	0001	1962
ACTUATOR_CLOSING_ERROR	0003	2387 / 2634
ACTUATOR_RESPONSE_ERROR	0004	2387 / 2634
ACTUATOR_ELECTRICAL_ERROR	0005	1897
ACTUATOR_VOLTAGE_SUPPLY_ERROR	000F	1938
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
ACTUATOR_LIMITED_EFFORT	0016	2387
ACTUATOR_NO_REF_FOUND	0017	2449
COMM_TIMEOUT_ERROR_BIT	0100	2636
SW_ID_ERROR_BIT	0200	2635
SW_ID_TIMEOUT_ERROR_BIT	0400	2636
CUSTOMER_ID_MISMATCH_ERROR	0800	2635
SYSTEM_VOLT_MISMATCH_ERROR	1000	2635
CONFIG_MESS_TIMEOUT_ERROR	2000	2636

C_VGA_DL_StatusLB_Fault_Enable		
State	**HEX**	**Associated Fault Code**
ACTUATOR_CMD_SOURCE_TIMEOUT	0010	2198
ACTUATOR_NO_CMD_SOURCE	0020	2198
ACTUATOR_VOLTAGE_SUPPLY_ERROR	0040	1938
not used	0080	
ACTUATOR_OVER_TEMPERATURE	0100	1962
ACTUATOR_LIMITED_EFFORT	0200	2387
ACTUATOR_OUT_OF_TOLERANCE	0400	2387
ACTUATOR_CLOSING_ERROR	0800	2387
ACTUATOR_NO_REF_FOUND	1000	2449
ACTUATOR_SPAN_TOO_LARGE	2000	2387
ACTUATOR_RESPONSE_ERROR	4000	2387
ACTUATOR_ELECTRICAL_ERROR	8000	2634

C_VGA_DL_StatusUB_Fault_Enable		
State	**HEX**	**Associated Fault Code**
COMM_TIMEOUT_ERROR	0100	2636
SW_ID_ERROR	0200	2635
SW_ID_TIMEOUT_ERROR	0400	2636
CUSTOMER_ID_MISMATCH_ERROR	0800	2635
SYSTEM_VOLT_MISMATCH_ERROR	1000	2635
CONFIG_MESS_TIMEOUT_ERROR	2000	2636

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
ACTUATOR_MOTOR_OFF_STATE	0008
ACTUATOR_INSTALL_STATE	0016
ACTUATOR_CLEAR_STOPS	0017
ACTUATOR_CLER_CODES	0018

VGT_Actuator_Error_Status	
State	**Enumeration**
DEVICE_OK	0
DEVICE_INOPERABLE	1

VGA_DL_Service_State	
State	**Enumeration**
SERVICE_VGT_NONE	0
SERVICE_VGT_SELF_CAL	2
SERVICE_VGT_LEARN	3
SERVICE_VGT_HYSTERESIS_TEST	4
SERVICE_VGT_STEP_RESP_TEST	5
SERVICE_VGT_OVERRIDE	6
INSTALL	16
CLEAR STOPS	17
CLEAR CODES	18
CALIBRATING	102
OVERRIDE	106
INSTALLING	116
CLEAR STOPS	117

J39_VGT_Actuator_Status		
State	**Enumeration**	**Fault Code**
ACTUATOR_OVER_TEMPERATURE	0100	1962
ACTUATOR_CLOSING_ERROR	0800	2387
ACTUATOR_RESPONSE_ERROR	4000	2387
ACTUATOR_ELECTRICAL_ERROR	8000	2634
ACTUATOR_CMD_SOURCE_TIMEOUT	0010	2198
ACTUATOR_SPAN_TOO_LARGE	2000	2387
ACTUATOR_OUT_OF_TOLERANCE	0400	2387
ACTUATOR_NO_CMD_SOURCE	0020	2198
ACTUATOR_VOLTAGE_SUPPLY_ERROR	0040	1938
ACTUATOR_LIMITED_EFFORT	0200	2387
ACTUATOR_NO_REF_FOUND	1000	2449

WATER-IN-FUEL (WIF):

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

Tool Trimmables – Standard Feature Enables and Settings

Acclerator Interlock	Enable	T_Accelerator_Interlock_Enable
Adaptive Cruise	Enable	T_Adaptive_Cruise_Enable
	Adaptive Cruise Recovery	T_Adaptive_Cruise_Recovery
Adjustable Low Idle Speed	Low Idle Speed	T_LSI_Breakpoint_Speed
	Low Idle Speed Adjustment Switch	T_LSI_Incrt_Decrt_Select_En
Battery Voltage Monitor	Enable	T_AFW_Enable
	Idle Speedup	T_AFW_IdleSpeedup_Enable
Cruise Control	Enable	T_CC_Enable
	Auto-Resume	T_CC_AR_Enable
	Lower Droop	T_CC_BottomDroopWidth
	Max Cruise Control Speed	T_CC_MaxRoadSpeed
	Upper Droop	T_CC_TopDroopWidth
	Save Set Speed	T_CC_SavePoweroffSpeedEnable
Cruise Control Switch Setup	Cruise Switch Setup	T_CC_SetAccelSwitchSelect
Engine Brake Control	Enable	T_ERC_Enable
	Cruise Control Activation	T_CC_EB_Enable
	Engine Brake Delay Time	T_ERC_ServiceBrkDelay
	Engine Brake Minimum Vehicle Speed	T_ERC_MinEngageVehSpd
	Engine Brake Type	T_ERC_Brake_Type
	Service Brake Activation	T_ERC_ServiceBrkActivateEn
	Start Maximum EB in Cruise	T_CC_EB_MaxBrakingSpeedDelta
	Start Minimum EB in Cruise	T_CC_EB_StartBrakingSpeedDelta
Engine Coolant Level Sensor	Enable	T_CoolantLevelSensorEnable
Engine Protection	Engine Protection Limited Restart	T_EPD_Restart_En
	Engine Protection Shutdown	T_EPD_Shutdown_En
	Engine Protection Sutdown Manual Override	T_EPD_Shutdown_Override_En
Fan Control	Enable	T_FCC_Fan_Clutch_En
	Fan Control Logic	
	Fan Control Switch	T_FCC_Manual_Input_En
	Fan on with Engine Braking	T_FCC_Engine_Brake_En
	Vehicle Speed Interaction	T_FCC_AC_VS_Interaction_En
	A/C Pressure Switch Input	T_FCC_AC_Pressure_En
	Minimum Fan On Time for A/C Pressure Switch	T_FCC_AC_Time
	Fan Type	T_FCC_Fan_Type_Selection
Gear-Down Protection	Enable	T_RSC_GD_ProtectionEnable
	GD Max Vehicle Speed (Heavy Load)	T_RSC_HighLoadSpeed
	GD Max Vehicle Speed (Light Load)	T_RSC_LightLoadSpeed
Governor Type	Governor Type	T_ABT_User_Selected_Acctr_Ctrl
	Governor Type Switch	T_SwitchableGovernorEnable
Idle Shutdown	Enable	T_ISD_Enable
	Manual Override	T_ISD_Ovrd_Enable
	Shutdown Accessory Relay	T_ISD_Relay_Enable
	Time Before Shutdown	T_ISD_Period
	Ambient Temperature Override	T_ISD_Tmptr_Enable
	Cold Ambient Air Temperature	T_ISD_MinAmbAir_Tmptr
	Hot Ambient Air Temperature	T_ISD_NoOvrdHigh_Thd
	Intermediate Ambient Air Temperature	T_ISD_NoOvrdLow_Thd
	Shutdown in PTO	T_ISD_ShutdownDuringPTOEn
	Shutdown Percent Engine Load	T_ISD_Loading_Thd

PTO	Max Vehicle Speed in PTO	T_PTO_Max_VS_Thd
	Service Brake Override in PTO	T_PTO_Disable_With_Brake_Switch
	PTO Enable	T_PTOA_En
	Alternate PTO	T_PTO_Alternate_En
	Clutch Override in PTO	T_PTO_Disable_With_Clutch_Switch
	Max Engine Load in PTO	T_PTO_Max_Engine_Load
	Max PTO Speed	T_PTO_Max_Ref_ES
	Min PTO Speed	T_PTO_Min_Ref_ES
	PTO Ramp Rate	T_PTO_Transient_Accel
	PTO Resume Switch Speed	T_PTO_Resume_ES
	PTO Set Switch Speed	T_PTO_Set_ES
	PTO Zero VSS Limit	T_PTO_ZeroVSSLimit_Enable
	Accelerator Override in PTO	T_PTO_Acctr_Override_En
	PTO Accelerator Override Max Engine Speed	T_PTO_Acctr_Override_Max_ES
	Remote PTO Enable	T_PTO_Remote_En
	Number of Remote PTO Set Speeds	T_PTO_Remote_Count_Lim
	Remote Set Speed 1	T_PTO_Remote_ES_1
	Remote Set Speed 2	T_PTO_Remote_ES_2
	Remote Set Speed 3	T_PTO_Remote_ES_3
	Remote Set Speed 4	T_PTO_Remote_ES_4
	Remote Set Speed 5	T_PTO_Remote_ES_5
Remote Accelerator	Enable	T_RMT_Remote_Accel_Enable
	Remote Accelerator Override	T_DIP_RMT_Switch_User_Ovrd_En
Road Speed Governor	Enable	T_RSC_Enable
	Maximum Accelerator Vehicle Speed	T_RSC_MaxRoadSpeed
	Maximum Vehicle Speed	T_RSC_MaxRoadSpeed
	Road Speed Governor Lower Droop	T_RSC_BottomDroopWidth
	Road Speed Governor Upper Droop	T_RSC_TopDroopWidth
	Smart Road Speed Governor	T_SRG_Enable
Starter Lockout	Enable	T_SLO_Enable
	Starter Lockout Relay Type	T_SLO_RelayType
Transmission Setup	Clutch Pedal Position Switch	T_ClutchSwitchEnable
	Gear Down Transmission Ratio	T_RSC_GD_GearRatio
	Top Gear Transmission Ratio	T_RSC_TopGearRatio
	Transmission Type	T_GEAR_VSSTransmission
Vehicle Electrical System Voltage	Vehicle Electrical System Voltage	T_Electrical_System_Voltage
Vehicle Speed Source	Maximum Engine Speed without VSS	T_MaxEngSpd_With_Zero_Vss
	Number of Transmission Tailshaft Gear Teeth	T_TSP_TeethPerRev
	Rear Axle Ratio	T_RAR_RearAxleRatioHigh & T_RAR_RearAxleRatioLow
	Tire Size	T_RAR_TireSize
	Vehicle Speed Sensor Type	T_TSP_SensorType
Water in Fuel Sensor	Enable	T_EEM_WIFEnable

CM871 and CM876 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.	The engine may not start.
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.
124	X	X	Intake Manifold 1 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. Intake manifold pressure has exceeded the maximum limit for the given engine rating.	Engine power derate.
125	X	X	Intake Manifold 1 Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level. Intake manifold pressure is below the minimum operating limit.	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.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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.
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.
146	X	X	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level. Engine coolant temperature is above engine protection warning limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
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.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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.
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	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.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			engine protection critical limit.	
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.
235		bus	Coolant Level - Data Valid but Below Normal Operational Range - Most Severe Level	Engine power derate.
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.
239	X	X	Sensor Supply 3 Circuit - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply number 3 circuit.	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 governor will not work.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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.
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.
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.
257	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.	Possible 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.	Possible 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	At least one multiplexed device will not operate properly.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			of the necessary information.	
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.
293	X	X	Auxiliary Temperature Sensor Input 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the OEM auxiliary temperature circuit.	None on performance.
294	X	X	Auxiliary Temperature Sensor Input 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at OEM auxiliary temperature circuit.	None on performance.
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.
297	X	X	Auxiliary Pressure Sensor Input 2 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the OEM pressure circuit.	None on performance.
298	X	X	Auxiliary Pressure Sensor Input 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage or open circuit detected at the OEM pressure circuit.	None on performance.
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. Engine can possibly misfire or run rough.
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. Engine can possibly misfire or run rough.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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. Engine can possibly misfire or run rough.
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. Engine can possibly misfire or run rough.
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. Engine can possibly misfire or run rough.
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. Engine can possibly misfire or run rough.
322		X	Injector Solenoid Driver Cylinder 1 Circuit - Current Below Normal, or Open Circuit. Current detected at injector Number 1 when the voltage is turned off.	Current to injector is shut off. Engine can possibly misfire or run rough.
323		X	Injector Solenoid Driver Cylinder 5 Circuit - Current Below Normal, or Open Circuit. Current detected at injector Number 5 when the voltage is turned off.	Current to injector is shut off. Engine can possibly misfire or run rough.
324		X	Injector Solenoid Driver Cylinder 3 Circuit - Current Below Normal, or Open Circuit. Current detected at injector Number 3 when the voltage is turned off.	Current to injector is shut off. Engine can possibly misfire or run rough.
325		X	Injector Solenoid Driver Cylinder 6 Circuit - Current Below Normal, or Open Circuit. Current detected at injector Number 6 when the voltage is turned off.	Current to injector is shut off. Engine can possibly misfire or run rough.
331		X	Injector Solenoid Driver Cylinder 2 Circuit - Current Below Normal, or Open Circuit. Current detected at injector Number 2 when the voltage is turned off.	Current to injector is shut off. Engine can possibly misfire or run rough.
332		X	Injector Solenoid Driver Cylinder 4 Circuit - Current Below Normal, or Open Circuit. Current detected at	Current to injector is shut off. Engine can possibly misfire or run rough.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			injector Number 4 when the voltage is turned off.	
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. ECM power supply errors have been detected.	Possible no noticeable performance effects or engine dying or hard starting. Fault information, trip information, and maintenance monitor data can be inaccurate.
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 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.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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.
435	X	X	Engine Oil Rifle Pressure - Data Erratic, Intermittent, or Incorrect. The engine oil pressure sensor is reading an erratic value at initial key-on.	None on performance. No engine protection for oil pressure.
441	X	X	Battery 1 Voltage - Data Valid but Below Normal Operational Range - Moderately Severe Level. ECM supply voltage is below the minimum system voltage level.	Engine may stop running or be difficult to start.
442	X	X	Battery 1 Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level. ECM supply voltage is above the maximum system voltage level.	Possible electrical damage to all electrical components.
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 or open circuit detected at rail fuel pressure circuit.	Engine may **not** start, may have low power, white smoke, or run rough.
555	X	X	Crankcase Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. The crankcase breather filter requires maintenance.	None on performance.
556	X	X	Crankcase Pressure - Data Valid but Above Normal Operational Range - Most Severe Level. The crankcase breather filter requires maintenance.	Engine power derate.
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.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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.
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.	Maintenance reminder only.
686	X	X	Turbocharger 1 Speed - Data Erratic, Intermittent, or Incorrect. An invalid turbo speed signal has been detected by the ECM.	None on performance. The ECM uses an estimated turbocharger speed.
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.
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.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
697	X	X	ECM Internal Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the internal ECM temperature sensor.	None on performance.
698	X	X	ECM Internal Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the internal ECM temperature sensor.	None on performance.
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.	Engine can run rough. Possibly poor starting capability. Engine runs using primary engine position sensor.
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.	Severe derate in power output of the engine. Limp home power only.
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.	Severe derate in power output of the engine. Limp home power only.
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.	The engine will only idle.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1663	X	X	Aftertreatment Exhaust Gas Temperature 1 Swapped - Condition Exists. The aftertreatment diesel oxidation catalyst inlet temperature and aftertreatment diesel particulate filter inlet temperature sensor connectors are reversed.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1664	X	X	Catalyst Missing - Condition Exists. The aftertreatment diesel oxidation catalyst is not present in the exhaust system.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1665	X	X	Aftertreatment Exhaust Gas Temperature 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the catalyst inlet sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1666	X	X	Aftertreatment Exhaust Gas Temperature 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the catalyst inlet sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1667	X	X	Aftertreatment Exhaust Gas Temperature 1 - Data Erratic, Intermittent, or Incorrect. The aftertreatment diesel oxidation catalyst inlet temperature is not changing with engine operating conditions.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1674	X	X	Aftertreatment Exhaust Gas Temperature 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the aftertreatment diesel particulate filter inlet temperature sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1675	X	X	Aftertreatment Exhaust Gas Temperature 2 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the aftertreatment diesel particulate filter inlet temperature sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1676	X	X	Aftertreatment Exhaust Gas Temperature 2 - Data Erratic, Intermittent, or Incorrect. The aftertreatment diesel particulate filter inlet temperature is not changing with engine operating	Active aftertreatment diesel particulate filter regeneration will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			conditions.	
1691	X	X	Catalyst Efficiency - Out of Calibration. The temperature increase across the aftertreatment catalyst is lower than expected.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1695	X	X	Sensor Supply 5 - Voltage Above Normal, or Shorted to High Source. High voltage detected at sensor supply number 5 circuit in the OEM harness,	Severe derate in power output of the engine. Limp home power only.
1696	X	X	Sensor Supply 5 - Voltage Below Normal, or Shorted to Low Source. Low voltage detected at sensor supply number 5 circuit in the OEM harness,	Severe derate in power output of the engine. Limp home power only.
1843	X	X	Crankcase Pressure Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the crankcase 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.
1866	X	X	Exhaust Gas Recirculation Valve Delta Pressure - Data Erratic, Intermittent, or Incorrect. An error in the EGR delta pressure signal was detected at initial key-on or the sensor failed the autozero test.	EGR valve actuation will be disabled.
1876	X	X	Aftertreatment Exhaust Gas Temperature 3 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the aftertreatment diesel particulate filter outlet temperature sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1877	X	X	Aftertreatment Exhaust Gas Temperature 3 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the aftertreatment diesel particulate filter outlet temperature sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1878	X	X	Aftertreatment Exhaust Gas Temperature 3 - Data Erratic, Intermittent, or Incorrect. The aftertreatment diesel particulate filter outlet temperature is not changing with engine operating conditions.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1879	X	X	Aftertreatment Particulate Filter Differential Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the aftertreatment differential pressure sensor circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1881	X	X	Aftertreatment Particulate Filter 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.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1883	X	X	Aftertreatment Particulate Filter Differential Pressure Sensor - Data Erratic, Intermittent, or Incorrect. The aftertreatment diesel particulate filter differential pressure sensor is reading an erratic value at initial key-on or during engine operation.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1893	X	X	EGR Valve Control Circuit - Abnormal Update Rate. No communications on the J1939 datalink between the engine ECM and the smart EGR controller.	EGR valve operation will be disabled.
1895	X	X	EGR Valve Controller - Bad Intelligent Device or Component. A calibration mismatch between EGR valve and the ECM has been detected.	EGR valve operation will be disabled.
1896	X	X	EGR Valve Controller - Out of Calibration. The EGR valve has failed the automatic calibration procedure at initial key-on.	
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 or the EGR differential pressure reading is not valid for engine operating conditions.	EGR valve operation will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1921	X	X	Aftertreatment Particulate Filter Differential Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. The soot load of the aftertreatment diesel particulate filter has exceeded the recommended limits.	The aftertreatment dash lamp will flash. Engine protection derate.
1922	X	X	Aftertreatment Particulate Filter Differential Pressure - Data Valid but Above Normal Operational Range - Most Severe Level. The soot load of the aftertreatment diesel particulate filter has exceeded the recommended limits. Engine protection detrate is enabled.	Severe engine derate.
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.	Active aftertreatment diesel particulate filter 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.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1926	X	X	Aftertreatment Fuel Pressure Sensor - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the aftertreatment fuel pressure signal is not changing with engine operating conditions.	None on performance.
1927	X	X	Aftertreatment Fuel Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the aftertreatment fuel pressure sensor circuit.	None on performance.
1928	X	X	Aftertreatment 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.	None on performance.
1932	X	X	Aftertreatment Fuel Injector 1 - Data Erratic, Intermittent, or Incorrect. An error has been detected in either the aftertreatment fuel injector or the aftertreatment fuel shutoff valve	Active aftertreatment diesel particulate filter regeneration will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			system.	
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 EGR valve.	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 EGR valve.	Low voltage information fault code only.
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.	The EGR valve will hold the position of the last valid J1939 message.
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 VGT actuator.	None on performance.
1942	X	X	Crankcase Pressure - Data Erratic, Intermittent, or Incorrect. The ECM has detected that the crankcase pressure signal is not changing with engine operating conditions.	None on performance.
1943	X	X	Ambient Air Density - Data Valid but Below Normal Operational Range - Least Severe Level. Engine torque has been reduced because the vehicle was operating at a high altitude condition.	Possible engine derate.
1961	X	X	EGR Valve Control Circuit Calculated Over Temperature - Data Valid but Above Normal Operational Range - Least Severe Level. The EGR valve has detected a high temperature condition.	EGR valve operation will be disabled.
1962	X	X	VGT Actuator Driver Over Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level. High internal VGT actuator temperature has been detected.	None on performance.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
1968	X	X	Aftertreatment Exhaust Gas Temperature 2 - Data Valid but Above Normal Operational Range - Moderately Severe Level. The exhaust gas temperature 2 sensor reading has exceeded the maximum temperature limit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1969	X	X	Aftertreatment Exhaust Gas Temperature 2 - Data Valid but Above Normal Operational Range - Most Severe Level. The exhaust gas temperature 2 sensor reading has exceeded the maximum engine protection temperature limit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1972	X	X	Aftertreatment Exhaust Gas Temperature 3 - Data Valid but Above Normal Operational Range - Moderately Severe Level. The exhaust gas temperature 3 sensor reading has exceeded the maximum temperature limit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1973	X	X	Aftertreatment Exhaust Gas Temperature 3 - Data Valid but Above Normal Operational Range - Most Severe Level. The exhaust gas temperature 3 sensor reading has exceeded the maximum engine protection temperature limit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1977	X	X	Aftertreatment Fuel Injector 1 Circuit - Current Below Normal, or Open Circuit. High resistance, short circuit, or open circuit detected on the aftertreatment fuel injector circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled.
1981	X	X	Aftertreatment Particulate Filter Differential Pressure - Data Valid but Above Normal Operational Range - Least Severe Level. The aftertreatment differential pressure has exceeded the maximum operating limits or the diesel particulate filter is plugged.	EGR valve operation will be disabled.
1993	X	X	Aftertreatment Particulate Trap Missing - Condition Exists. The aftertreatment diesel particulate filter in the exhaust system is not present.	Active aftertreatment diesel particulate filter regeneration will be disabled.
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	Engine brake on cylinders 1, 2, and 3 can not be activated.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			1 signal circuit.	
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.
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.
2195	X	X	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions. The emergency door of the vehicle has been detected open.	Engine may shut down.
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.	VGT actuation will be disabled.
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.	The engine may be derated.
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.	EGR valve actuation will be disabled.
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	EGR valve actuation will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			pressure sensor circuit.	
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.
2288	X	X	Turbocharger 1 Speed - Data Valid but Above Normal Operational Range - Least Severe Level. High turbocharger speed has been detected by the ECM.	Engine power derate to lower the turbocharger speed.
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.
2322	X		Engine Camshaft Speed / Position Sensor - Data Erratic, Intermittent, or Incorrect. Camshaft engine speed sensor intermittent synchronization.	None on performance.
2345	X	X	Turbocharger 1 Speed - Abnormal Rate of Change. The turbocharger speed sensor has detected an erroneous speed value.	None on performance. The ECM uses an estimated turbocharger speed.
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.	Fuel is limited in an attempt to decrease the exhaust gas temperature entering the turbocharger.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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 by the smart EGR controller.	EGR valve actuation will be disabled.
2351	X	X	EGR Valve Control Circuit - Voltage Below Normal, or Shorted to Low Source. Motor terminal or motor coil short circuit to ground or power supply has been detected by the smart EGR controller.	EGR valve actuation will be disabled.
2357	X	X	EGR Valve Control Circuit - Mechanical System Not Responding Properly or Out of Adjustment. The EGR motor has exceeded the duty cycle limit indicating a stuck open EGR valve.	EGR valve actuation will be disabled.
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 1, 2, and 3 can not be activated.
2365	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 1, 2, and 3 can not be activated.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
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 circuit.	None on performance.
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.	None on performance.
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.	VGT travel may be limited.
2448	X	X	Coolant Level - Data Valid but Below Normal Operational Range - Least Severe Level. Low engine coolant level detected.	None on performance.
2449	X	X	VGT Actuator Controller - Out of Calibration. The VGT has failed the automatic calibration procedure at initial key-on. VGT will be in the	Low intake manifold pressure.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			open position.	
2451	X	X	Turbocharger Turbine Inlet Temperature (Calculated) - Data Valid but Above Normal Operational Range - Moderately Severe Level. Turbocharger turbine inlet temperature has exceeded the engine protection limit.	Fuel is limited in an attempt to decrease the calculated exhaust gas temperature.
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. 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. The engine can be shutdown using the keyswitch.
2554	X	X	Exhaust Gas Pressure - Data Erratic, Intermittent, or Incorrect. The exhaust gas pressure sensor is reading an erratic value at initial key-on.	The ECM will estimate the exhaust gas pressure.
2557	X	X	Auxiliary PWM Driver 1 Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the analog torque circuit.	Cannot control transmission.
2558	X	X	Auxiliary PWM Driver 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the analog torque circuit.	Cannot control transmission.
2634	X	X	VGT Actuator Controller - Bad Intelligent Device or Component. An internal error has been detected by the smart VGT controller.	VGT actuation will be disabled.
2635	X	X	VGT Actuator Driver Circuit - Condition Exists. A calibration mismatch between VGT actuator and the ECM has been detected.	VGT actuation will be disabled.
2636	X	X	VGT Actuator Driver Circuit - Abnormal Update Rate. No communications on the J1939 datalink between the engine ECM and the smart VGT controller.	VGT actuation will be disabled.
2637	X	X	Catalyst Face Plugged - Root Cause Not Known. The front face of the aftertreatment diesel oxidation catalyst has been detected to be	Active aftertreatment diesel particulate filter regeneration will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			plugged with soot.	
2638	X	X	Catalyst Efficiency - Out of Calibration. The temperature increase across the aftertreatment catalyst is lower than expected.	Active aftertreatment diesel particulate filter regeneration will be disabled
2639	X	X	Aftertreatment Particulate Filter Differential Pressure - Data Valid but Above Normal Operational Range - Least Severe Level. The soot load of the aftertreatment diesel particulate filter has exceeded the recommended limits.	The aftertreatment dash lamp will be illuminated and will begin to flash as the severity of the soot load increases. Possible engine protection derate based on severity.
2646	X	X	Engine Coolant Temperature - Condition Exists. The EGR valve was closed to reduce engine coolant temperatures.	EGR valve actuation will be disabled.
2659	X	X	Engine Coolant Temperature - Condition Exists. The EGR valve was closed to reduce engine coolant temperatures.	EGR valve actuation will be disabled.
2728	X	X	Aftertreatment Fuel Injector 1 - Data Valid but Above Normal Operational Range - Moderately Severe Level. Excessive fuel injection into the aftertreatment system has been detected.	None on performance.
2732	X	X	Aftertreatment Fuel Drain Valve Circuit - Voltage Above Normal, or Shorted to High Source. High signal voltage detected at the aftertreatment fuel drain valve circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled
2733	X	X	Aftertreatment Fuel Drain Valve Circuit - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the aftertreatment fuel drain valve circuit.	Active aftertreatment diesel particulate filter regeneration will be disabled
2738	X	X	Start Enable Device 1 Circuit (Ether Injection) - Voltage Above Normal, or Shorted to High Source. High signal voltage or open circuit detected at the ether start solenoid circuit.	Ether start functionality will be disabled.
2739	X	X	Start Enable Device 1Circuit (Ether Injection) - Voltage Below Normal, or Shorted to Low Source. Low signal voltage detected at the ether start solenoid circuit.	Ether start functionality will be disabled.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
2741	X	X	Aftertreatment Fuel Shutoff Valve 1 Swapped - Condition Exists. Aftertreatment fuel shutoff valve 1 and aftertreatment fuel drain valve wiring harness connections are reversed.	Active aftertreatment diesel particulate filter regeneration will be disabled
2742	X	X	Aftertreatment Exhaust Gas Temperature 2 - Data Valid but Below Normal Operational Range - Least Severe Level. The temperatures in the aftertreatment system cannot reach the required temperatures for stationary regeneration.	None on performance.
2743	X	X	Aftertreatment Exhaust Gas Temperature 2 - Data Valid but Below Normal Operational Range - Moderately Severe Level. The temperatures in the aftertreatment system cannot reach the required temperatures for stationary regeneration.	None on performance.
2754	X	X	Engine Particulate Trap Inlet Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. Excessive black smoke has been detected exiting the engine and entering the aftertreatment diesel particulate filter.	None on performance.
2764	X	X	Exhaust Gas Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level. High exhaust gas pressure has been detected by the exhaust gas pressure sensor.	Fueling derate to bring exhaust gas pressure below the maximum operating limits.
2774	X	X	Engine Exhaust Gas Recirculation (EGR) System - Condition Exists. Plugged EGR differentail pressure sensor tubes have been detected.	EGR valve operation will be disabled.
2777	X	X	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch - Condition Exists. Regeneration of the diesel particulate filter has been prevented due to the inhibit switch being activated.	None on performance.
2789	X	X	Engine Coolant Temperature - Data Valid but Below Normal Operational Range - Moderately Severe Level. Engine coolant temperature is below normal operating	None on performance.

Fault Code	Eagle Red	Eagle Black	Fault Description	Fault Effect
			temperature limits.	
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 is above engine protection warning limit.	Power derate and possible engine shutdown if engine protection shutdown feature is enabled.
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

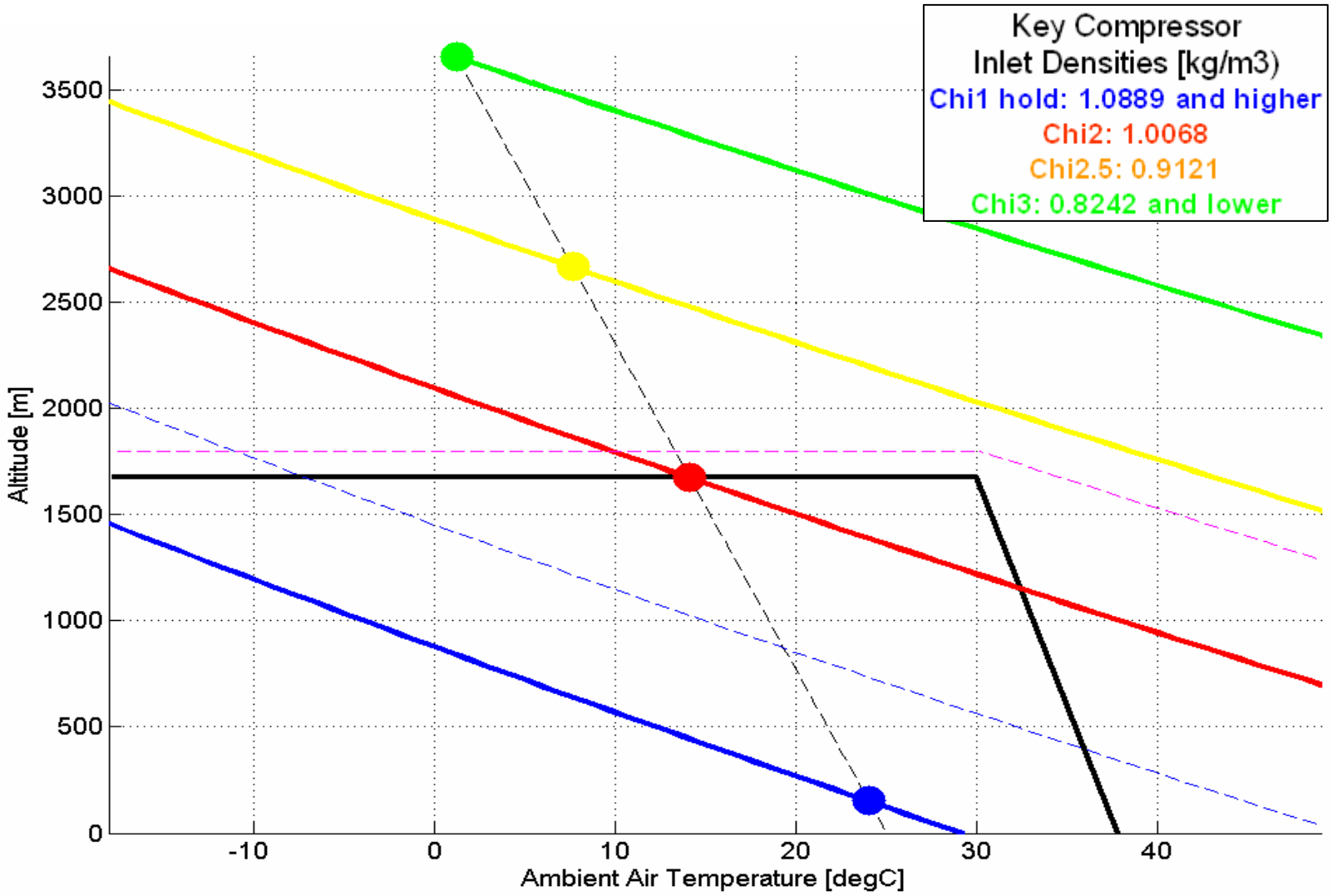
EPA Certification Information

215. AECD List

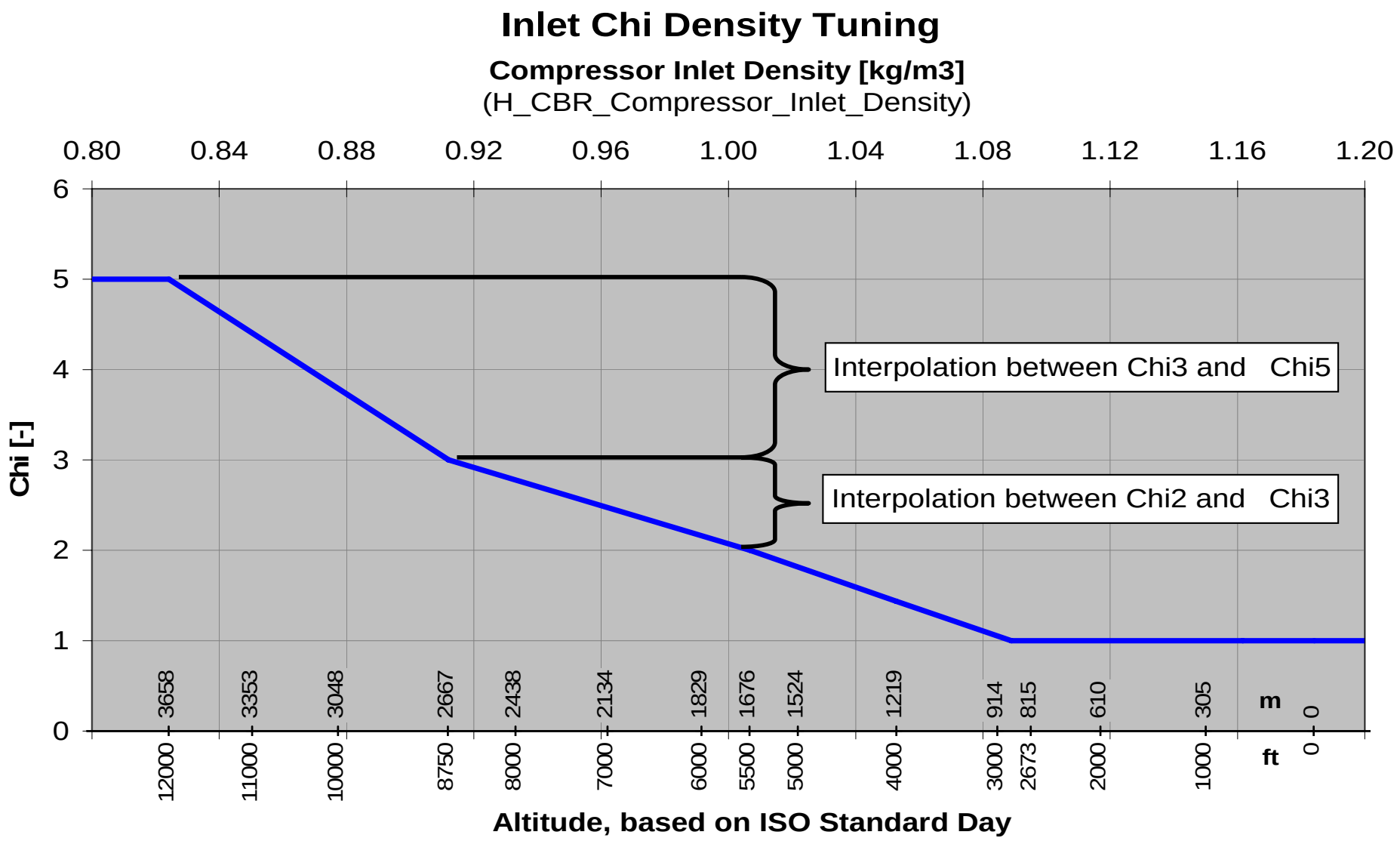
1. Air Handling System
2. Extreme Ambient Overheat
3. Extreme Ambient Conditions
4. Unburned Hydrocarbons / Misfire
5. Extended Idle (Limited Production ISX only, disabled for full production)
6. Engine Starting and Warm-Up
7. Extreme Conditions / Malfunction
    - Part 1 – Electronic Sensor and Actuator Failures
    - Part 2 – Extreme Conditions
    - Part 3 – Cooling System Protection
    - Part 4 - Turbocharger Protection
    - Part 5 - Turbocharger Surge Protection
    - Part 6 – Aftertreatment Protection
8. Diagnostic Procedures (not currently used)
9. Modulation
    - Part 1 – Transient and Steady State Operations
    - Part 2 – Ambient Conditions
    - Part 3 – Transient Acceleration
    - Part 4 – Automated Transmission Shift Modulation
10. Aftertreatment Regeneration
    - Part 1 – Thermal Management
    - Part 2 – Ineffective Dosing
    - Part 3 – High Soot Load Protection
    - Part 4 – DOC Face Plugging Protection
    - Part 5 – Desorption – Hydorcarbon and Water Condensation Protection
    - Part 6 – Manual Requests: Stationary Regeneration and Inhibit Regen
    - Part 7 – Aftertreatment Protection
    - Part 8 – Extreme Ambient Regeneration: Cold Weather or Low Ambient Density

216. AECD Air Handling System

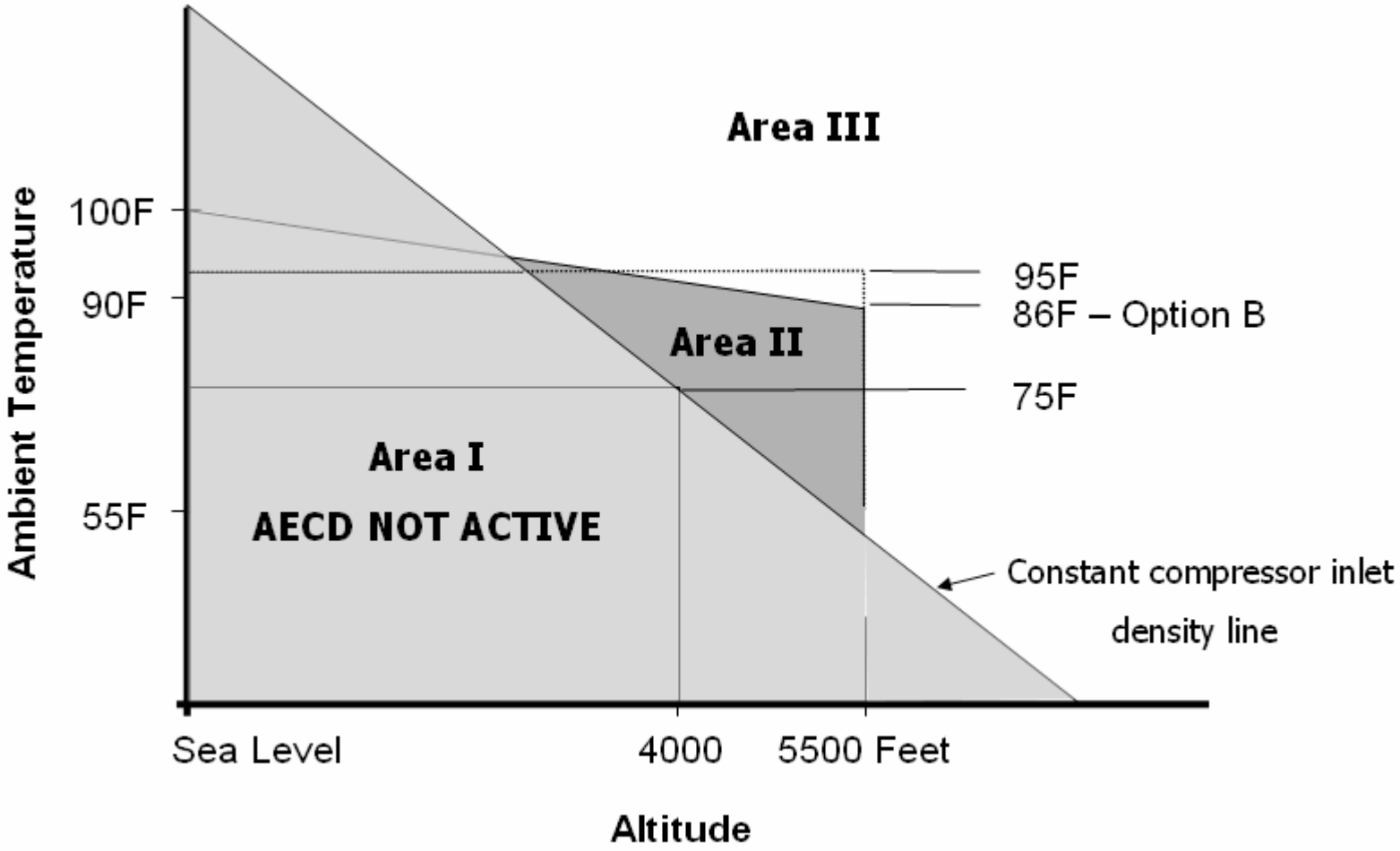
Ambient Operating Conditions Chi Value Determination



Inlet Density Chi Interpolation



Air Handling System Operating Regions



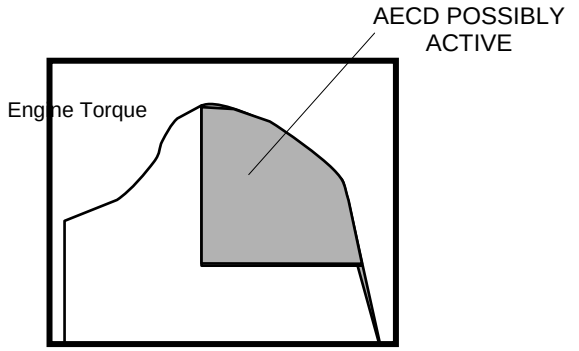
Air Handling System Operating Conditions

Area III Control Strategy

Activation of this AECD requires three conditions to be met simultaneously:

- Engine load within NTE
- Proximity to a critical design limit in the air handling system.
- High altitudes and/or high ambient temperatures

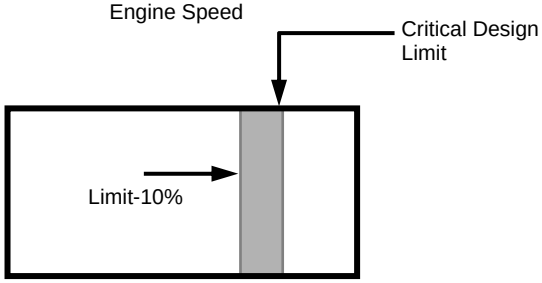
Condition 1 - All Engine Loads within the NTE



- AND -

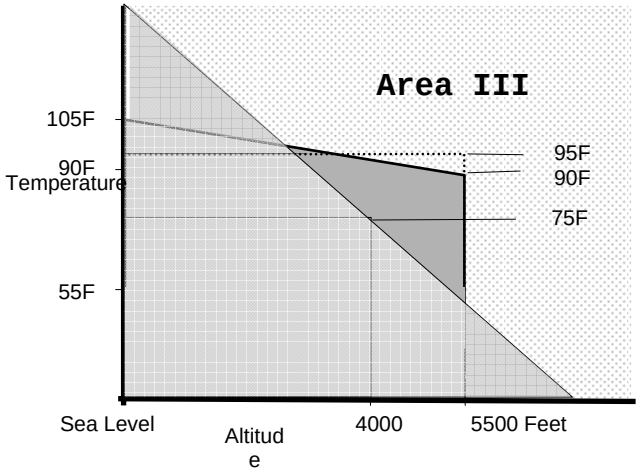
Condition 2 - Near Air Handling System Limit:

- Turbocharger Speed
- Compressor Exit Temperature
- Turbine Inlet Temperature



- AND -

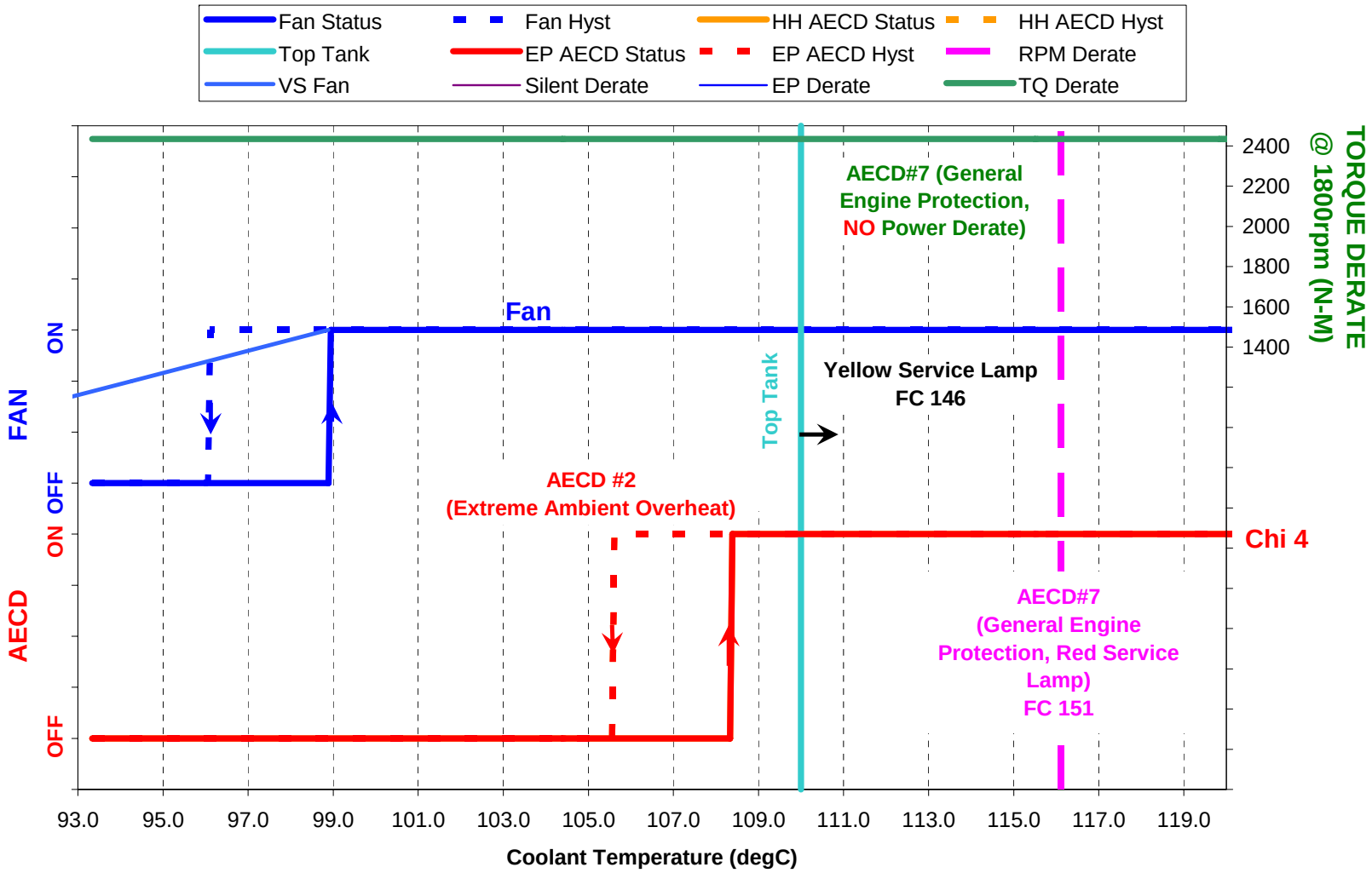
Condition 3 - Operation is in Area III



217. AECD Extreme Ambient Overheat

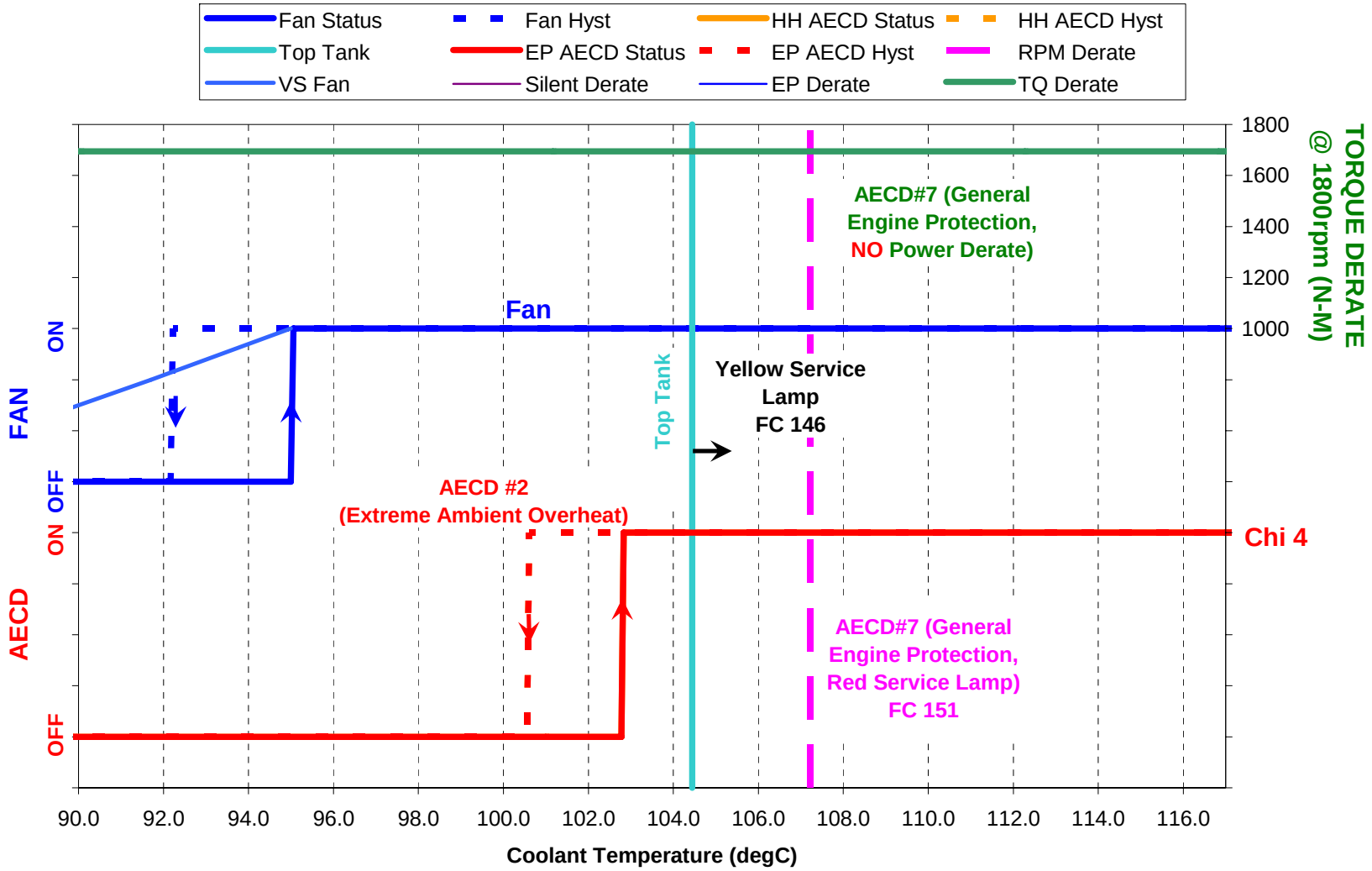
ISX Firetruck

ISX 3 Firetruck Coolant Temperature Based Actions



ISM Firetruck

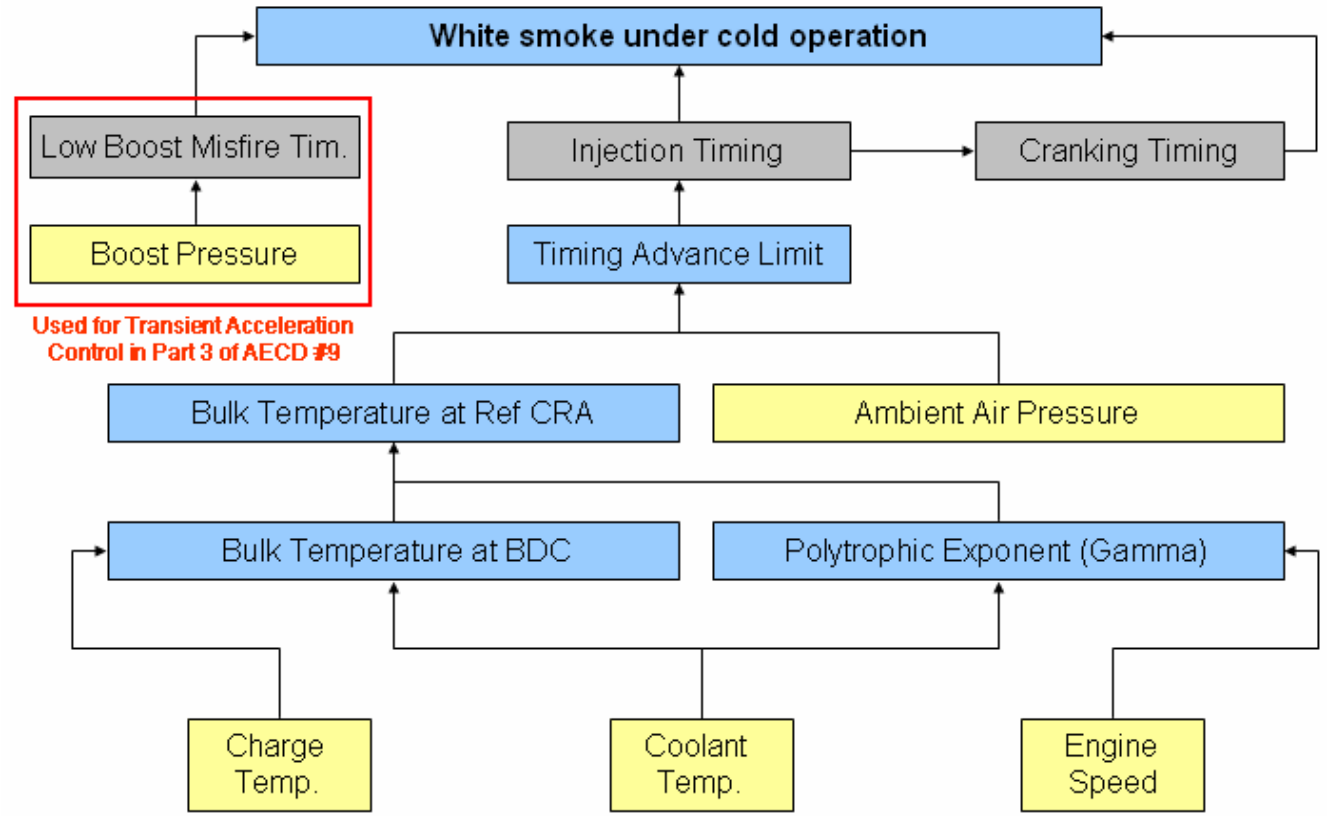
ISM Firetruck Coolant Temperature Based Actions



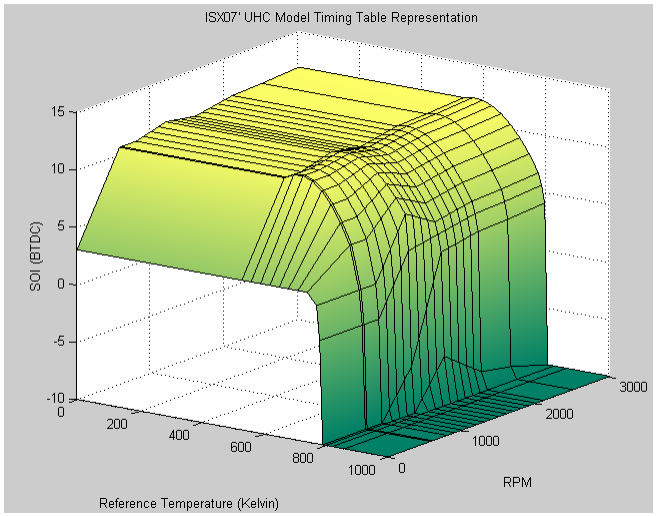
218. AECD Unburned Hydrocarbons / Misfire

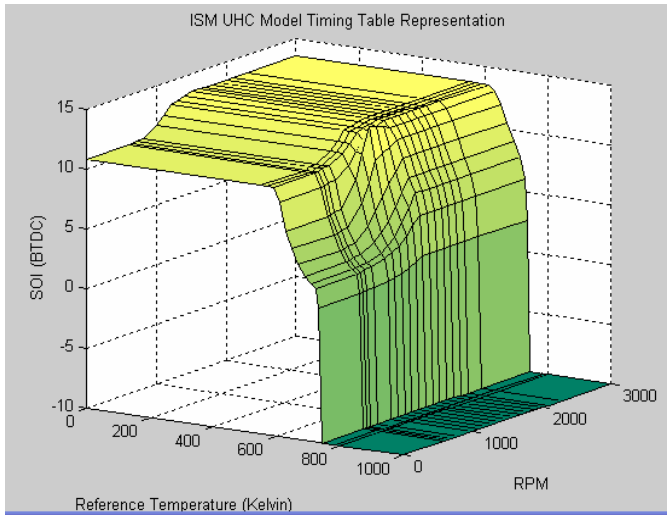
Model-Based Unburned Hydrocarbon (UHC) Protection AECD

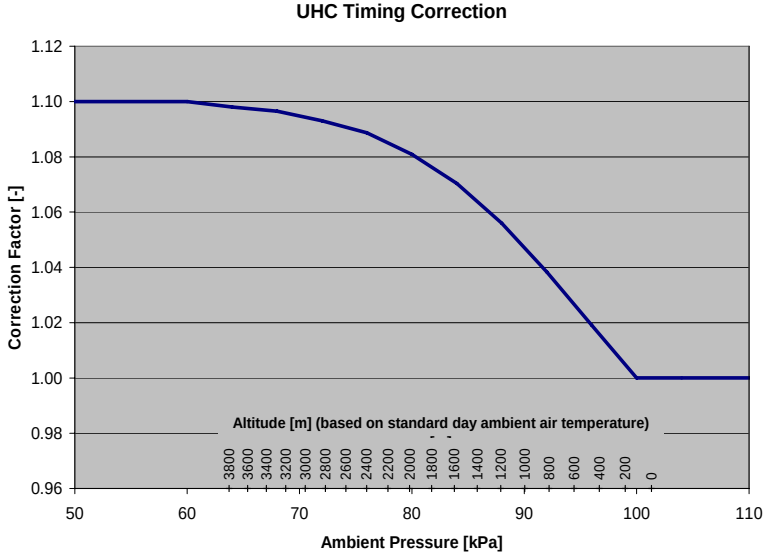
- AECD Logic
- Coolant Temperature : measured, used in conjunction with Charge Temperature to determine cylinder charge temperature at Bottom Dead Center (BDC)
- Charge Temperature : measured, used in conjunction with Coolant Temperature to determine cylinder charge temperature at Bottom Dead Center (BDC)
- Ambient Air Pressure : measured, used to establish injection timing correction based on ambient air pressure (altitude operation)
- Engine Speed : used in calculation of Polytrophic Exponent for temperature calculation of air fuel mixture at 10 deg Before Top Dead Center (BTDC) and establishing target values for injection timing



UHC Model Timing Information ISX and ISM 07'







219. AECD Engine Starting and Warm-up

a. Sensors used to directly measure parameter or operating conditions for which limits may be exceeded
- Engine Speed
- Engine Fueling
- Charge Temperature
- Coolant Temperature

Parameters sensed as surrogates to estimate the parameter for which limits may be exceeded
- EGR_Off Coolant Temperature Threshold

After the engine is started from cold conditions, appropriate action is taken with EGR and Fuel System Parameters to protect the engine - If the IMT or coolant temperature is below a threshold (i.e. -6.67 deg C for IMT and 15.5 deg C for coolant) and the injection timing is advanced due to the Model-Based UHC Protection AECD, the EGR valve is closed to avoid fouling of the intake manifold by unburned fuel in the exhaust which can then be recirculated which results in lacquered intake and egr cooler deposits. (Parameters Controlled: Injection Timing, VGT Actuator Position, EGR Fraction)

220. AECD Extreme Conditions / Malfunction

Part 1 – Electronic Sensor and Actuator Failures

PARAMETER SENSED or ESTIMATED	Type	Threshold	Condition	Action Taken	Fault Code?	Fault Lamp	EGR Off?
EGR Valve Position Sensor	Sensor	OORL, OORH	Failed primary sensor	Log fault code	2272	YELLOW	Yes
		> 2 mm	Failed sensor (excessive autozero)	Log fault code	1896	YELLOW	Yes
EGR Valve Motor	Actuator Hardware	> 95% duty cycle	Over-current for 3 sec	Log fault code	2357	YELLOW	Yes
		< 7 volts	Motor open circuit	Log fault code	2349	YELLOW	Yes
		> 30 Amps	Motor short circuit	Log fault code	2351	YELLOW	Yes
EGR Valve Actuator Temperature	Sensor	> 135 C	Over-temp EGR actuator	Log fault code	1961	YELLOW	Yes
EGR Valve Supply Voltage	Actuator Hardware	> 18 volts for 5 sec	Over voltage	Log fault code	1933	YELLOW	Yes
		< 8 volts for 5 sec	Under voltage	Log fault code	1934	YELLOW	No
	ECM Hardware	> 2.0 v	Over voltage or shorted high	Log fault code	1936	YELLOW	No
		< 0.8 v	Under voltage or shorted low	Log fault code	1937	YELLOW	No
EGR Valve Communication	Datalink	> 50 msec	Receive Communication timeout	Log fault code	1893	YELLOW	Yes
		> 75 mSec	Transmit Communication timeout	Log fault code	1935	YELLOW	No
			Version mismatch	Log fault code	1895	YELLOW	Yes
VGT Actuator Temperature	Sensor	> 125 C	Over-temp VGT actuator	Log fault code	1962	YELLOW	Yes
VGT Actuator Operation	Actuator Hardware		Electrical circuit error	Log fault code	2634	RED	Yes
			Installation failure	Log fault code	2449	RED	Yes
			Mechanism out of tolerance	Log fault code	2387	YELLOW	Yes
VGT Supply Voltage	Actuator Hardware	< 10 volts for 10 sec	Under voltage	Log fault code	1938	YELLOW	No
	ECM Hardware	> 2.0 v	Over voltage or shorted high	Log fault code	1939	YELLOW	No
		< 0.8 v	Under voltage or shorted low	Log fault code	1941	YELLOW	No
VGT Communication	Datalink	> 50 msec	Receive Communication timeout	Log fault code	2636	RED	Yes
		> 75 mSec	Transmit Communication timeout	Log fault code	2198	YELLOW	No
			Version mismatch	Log fault code	2635	RED	Yes

Lamp Colors : RED = Stop YELLOW = Warning

Flashing Lamp = Automatic shutdown within 30 secs (if customer enabled)

OORH = Circuit Out-Of-Range High

OORL = Circuit Out-Of-Range Low

Part 1 – Electronic Sensor and Actuator Failures (continued)

AECD #7: General Engine Protection - Extreme Conditions / Malfunction

Part 3, Electronic Sensor and/or Actuator Failure

PARAMETER SENSED or ESTIMATED	Type	Threshold	Condition	Action Taken	Fault Code?	Fault Lamp	EGR Off?
Coolant Temperature	Sensor	OORH	Failed primary	Log fault code	144	YELLOW	No
		OORL	sensor	Use default sensor value (104.4 C)	145	YELLOW	No
Charge Temperature	Sensor	OORH	Failed primary	Log fault code	153	YELLOW	Yes
		OORL	sensor	Use backup (estimated) sensor value	154	YELLOW	Yes
			Failed primary and backup sensor	Use default sensor value (-1.1 C)	153 or 154	YELLOW	Yes
Charge Pressure	Sensor	OORH	Failed primary	Log fault code	122	YELLOW	No
		OORL	sensor	Use backup (estimated) sensor value	123	YELLOW	No
			Failed primary and backup sensor	Use default sensor value (101.6 kPa)	122 or 123	YELLOW	Yes
EGR Flow Delta Pressure	Sensor	OORH	Failed primary	Log fault code	2273	YELLOW	Yes
		OORL	sensor	Use default sensor value (-6.7 kPa)	2274	YELLOW	Yes
		+/- 1.1 kPa	Failed sensor (excessive autozero)	Log fault code, use default sensor value	1866	YELLOW	Yes
		> 0.64 kPa	High flow detected	Log fault code, use default sensor value	2359	YELLOW	Yes
		< 6.72 kPa	Low flow detected	Log fault code, use default sensor value	1899	YELLOW	Yes
Exhaust Manifold Pressure	Sensor	OORH	Failed primary	Log fault code	2373	YELLOW	No
		OORL	sensor	Use backup (estimated) sensor value	2374	YELLOW	No
			Failed primary and backup sensor	Use default sensor value (169.3 kPa)	2373 or 2374	YELLOW	Yes
EGR Cooler Outlet Temperature (aka EGR Orifice Temperature)	Sensor	OORH	Failed primary	Log fault code	2375	YELLOW	Yes
		OORL	sensor	Use default sensor value (37.8 kPa)	2376	YELLOW	Yes
Turbocharger Speed	Sensor	OORH	Failed primary	Log fault code	686	YELLOW	No
		OORL	sensor	Use backup (estimated) sensor value	687	YELLOW	No
		< -90 krpm/sec > 90 krpm/sec	Failed primary sensor (invalid rate)	Log fault code, use backup sensor value, engine power derate	2345	YELLOW	No
		> 103.5 krpm	Turbo Overspeed	Engine power derate	No	No	No
		> 111 krpm	Turbo Overspeed	Engine power derate	2288	No	No
Compressor Inlet Temperature	Sensor	OORH	Failed primary	Log fault code	691	YELLOW	No
		OORL	sensor	Use default sensor value (15 C)	692	YELLOW	No
Ambient Air Pressure	Sensor	OORH	Failed primary	Log fault code	221	YELLOW	No
		OORL	sensor	Use default sensor value (82.6 kPa)	222	YELLOW	No

Lamp Colors : RED = Stop YELLOW = Warning

Flashing Lamp = Automatic shutdown within 30 secs (if customer enabled)

OORH = Circuit Out-Of-Range High

OORL = Circuit Out-Of-Range Low

Part 1 – Electronic Sensor and Actuator Failures (continued)

AECD #7: Extreme Conditions / Malfunctions

Part 1, Electronic Sensor and/or Actuator Failure For Aftertreatment System

PARAMETER SENSED or ESTIMATED	Type	Threshold	Condition	Action Taken	Fault Code?	Fault Lamp	EGR Off?
DOC Inlet Temperature	Sensor	OORH	Failed Sensor	Log fault code	1666	YELLOW	Yes
		OORL	Failed Sensor	Log fault code	1665	YELLOW	Yes
			Key On / Dither Error	Log fault code	1667	YELLOW	Yes
DOC Outlet Temperature	Sensor	OORH	Failed Sensor	Log fault code	1675	YELLOW	Yes
		OORL	Failed Sensor	Log fault code	1674	YELLOW	Yes
			Key On / Dither Error	Log fault code	1676	YELLOW	Yes
DPF Outlet Temperature	Sensor	OORH	Failed Sensor	Log fault code	1876	YELLOW	Yes
		OORL	Failed Sensor	Log fault code	1877	YELLOW	Yes
			Key On / Dither Error	Log fault code	1878	YELLOW	Yes
DPF Delta Pressure	Sensor	OORH	Failed Sensor	Log fault code	1879	YELLOW	Yes
		OORL	Failed Sensor	Log fault code	1881	YELLOW	Yes
			Key On / Dither Error	Log fault code	1883	YELLOW	Yes
			DPF High dP / Plugged	Log fault code	1981	YELLOW	Yes
Doser System	Actuator		Doser On / Off Fault	Log fault code	1977	YELLOW	Yes
			FSO On Fault	Log fault code	1923	YELLOW	Yes
			FSO Off Fault	Log fault code	1924	YELLOW	Yes
			Leak / Pressure Fault	Log fault code	1932	YELLOW	Yes
DOC System	Perform		DOC Therms Reversed	Log fault code	1663	YELLOW	Yes
			DOC Presense	Log fault code	1664	YELLOW	Yes
			DOC Face Plugged	Log fault code	2637	YELLOW	Yes
			DOC Out Temp High	Log fault code	1968	YELLOW	Yes
			DOC Out Temp Severe	Log fault code	1969	RED	Yes
			DOC Ineffective	Log fault code	2728	YELLOW	Yes
DPF System	Perform		DOC Presense	Log fault code	1993	YELLOW	Yes
			DOC Out Temp High	Log fault code	1972	YELLOW	Yes
			DOC Out Temp Severe	Log fault code	1973	RED	Yes
			DPF Soot Severe	Log fault code	1922	RED	Yes

Lamp Colors : RED = Stop YELLOW = Warning

Flashing Lamp = Automatic shutdown within 30 secs (if customer enabled)

OORH = Circuit Out-Of-Range High

OORL = Circuit Out-Of-Range Low

Part 2 – Extreme Conditions

AECD #7: General Engine Protection - Extreme Conditions / Malfunction

Part 2, EGR System Protection

PARAMETER SENSED or ESTIMATED	Type	Threshold	Condition	Action Taken	Fault Code?	Fault Lamp	EGR Off?
EGR Flow Delta Pressure	Sensor	> 0.64 kPa	High flow detected	Log fault code, use default sensor value	2359	YELLOW	Yes
		< 6.72 kPa	Low flow detected	Log fault code, use default sensor value	1899	YELLOW	Yes
		< -1.92 kPa & > 34.70 kPa	Clogged sensing tube detected	Log fault code, use default sensor value	2774	YELLOW	Yes
EGR Cooler Outlet Temperature (aka EGR Orifice Temperature)	Sensor	> 180 C	Engine Protection	Derate engine power	No	No	No
		> 210 C	Engine Protection	Derate engine power	2961	No	No
		> 250 C	Engine Protection	Limit engine speed	2962	YELLOW	Yes
EGR Valve Actuator Temperature	Sensor	> 135 C	Over-temp EGR actuator	Log fault code	1961	YELLOW	Yes
VGT Actuator Temperature	Sensor	> 125 C	Over-temp VGT actuator	Log fault code	1962	YELLOW	Yes
			Lamp Colors :	RED = Stop	YELLOW = Warning		

AECD #7: General Engine Protection - Extreme Conditions / Malfunction

Part 4 & 5, Turbocharger Protection, Exhaust Over-temperature, and Excessive Backpressure

PARAMETER SENSED or ESTIMATED	Type	Threshold	Condition	Action Taken	Fault Code?	Fault Lamp	EGR Off?
Exhaust Manifold Pressure	Sensor	> 575 kPa	Engine Protection	Log fault code	2764	YELLOW	No
Turbocharger Speed	Sensor	> 121 krpm	Turbo Overspeed	Engine power derate	No	No	No
		> 131 krpm	Turbo Overspeed	Engine power derate	2288	No	No
Compressor Outlet Temperature	Estimate	> 250 C	Engine Protection	Log fault code, engine power derate	2347	No	No
Turbine Inlet Temperature	Estimate	> 760 C	Engine Protection	Log fault code, engine power derate	2346	No	No
			Lamp Colors :	RED = Stop	YELLOW = Warning		

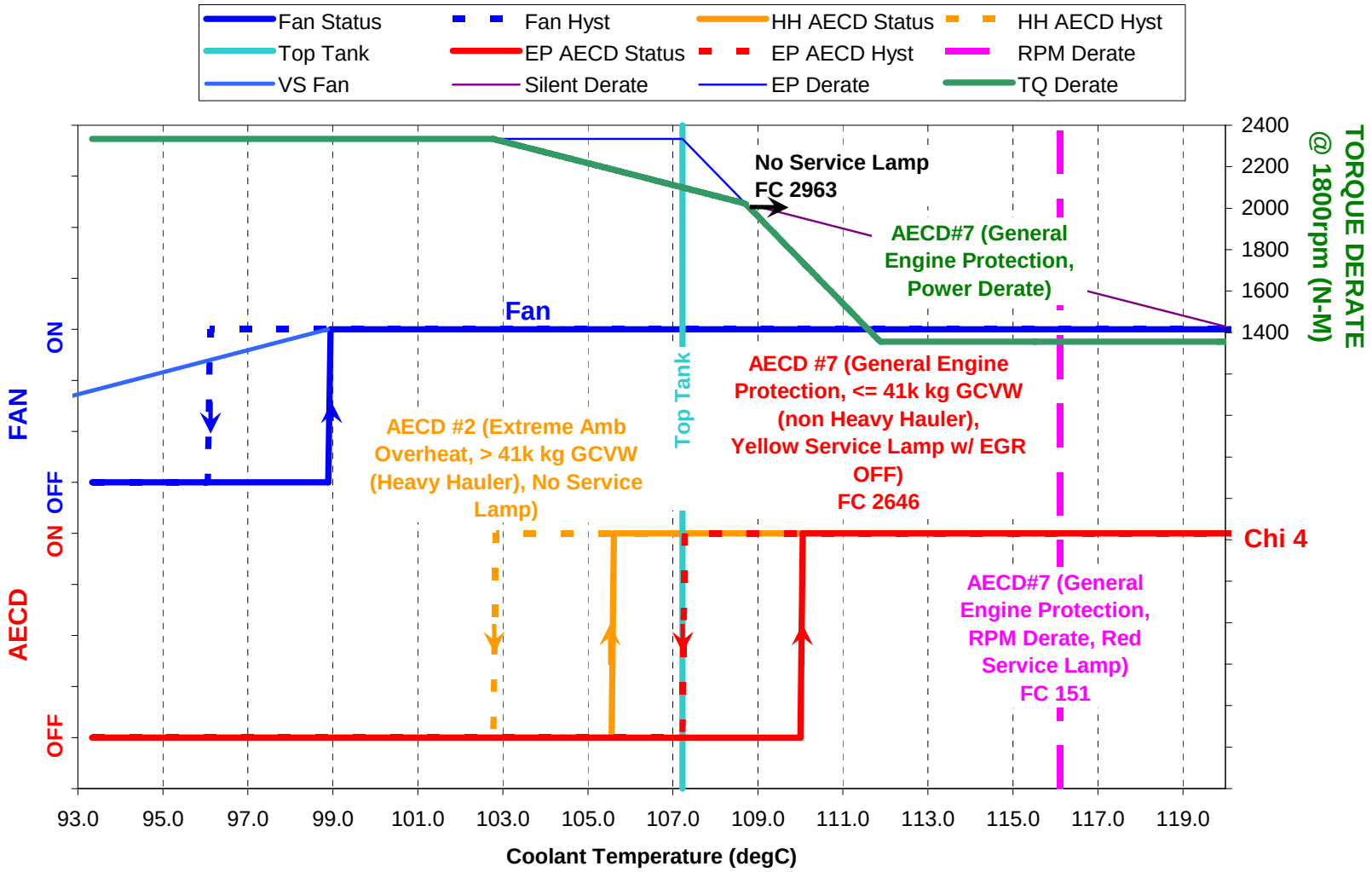
Flashing Lamp = Automatic shutdown within 30 secs (if customer enabled)

OORH = Circuit Out-Of-Range High

OORL = Circuit Out-Of-Range Low

Part 3 – Cooling System Protection

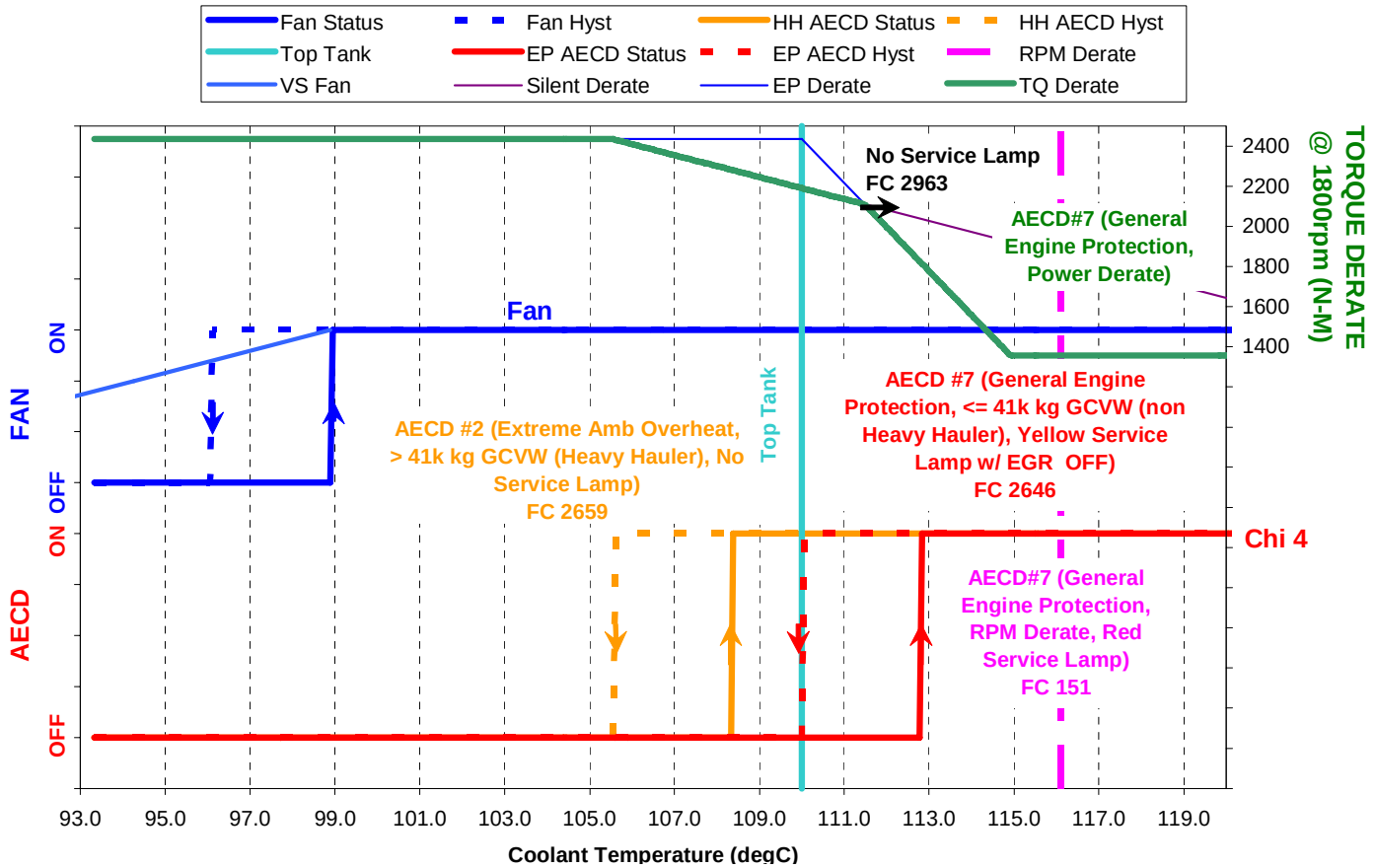
ISX 1&2 Coolant Temperature Based Actions



Part 3 – Cooling System Protection

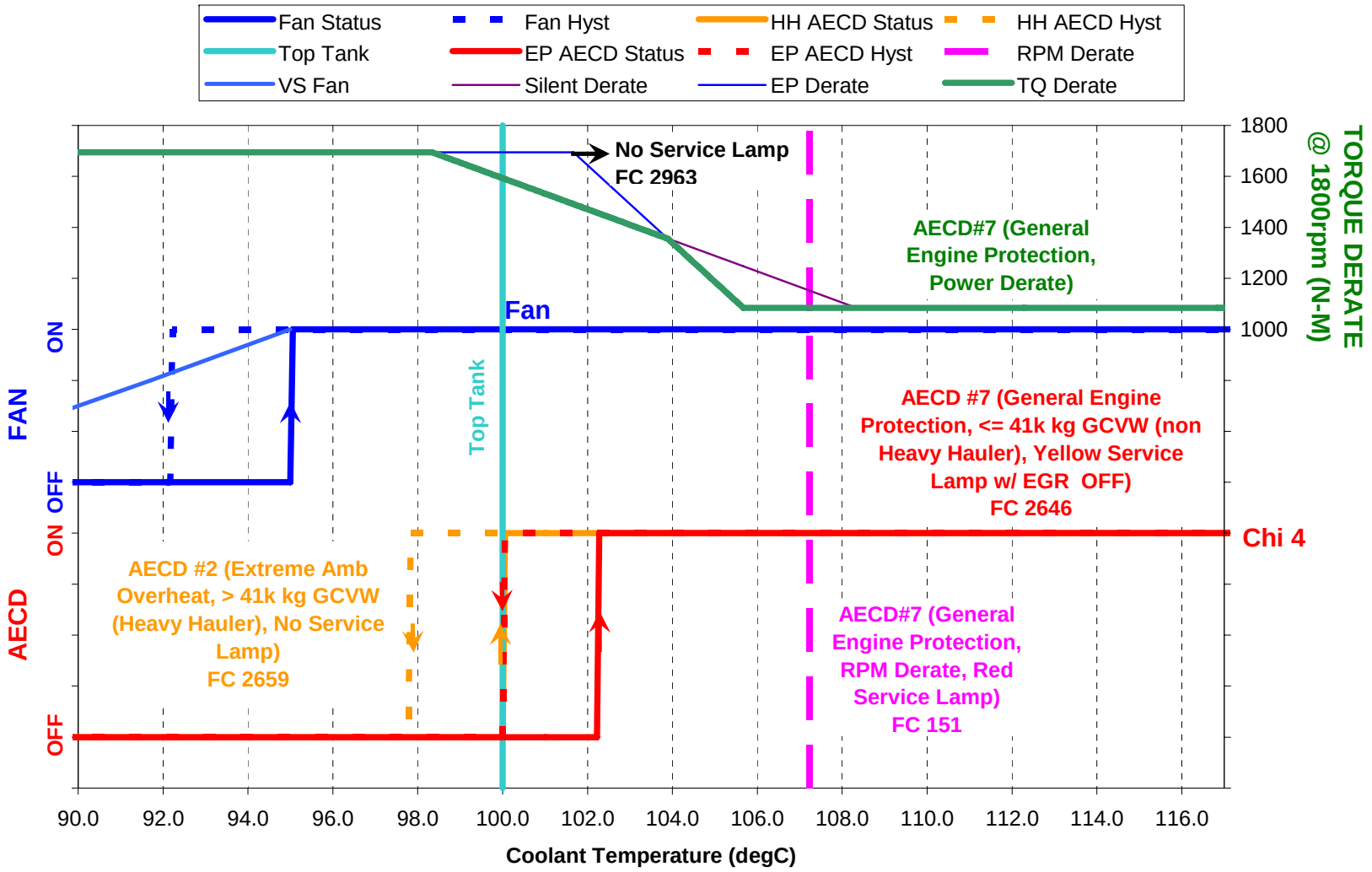
’07 ISX 3

ISX 3 Coolant Temperature Based Actions



Part 3 – Cooling System Protection

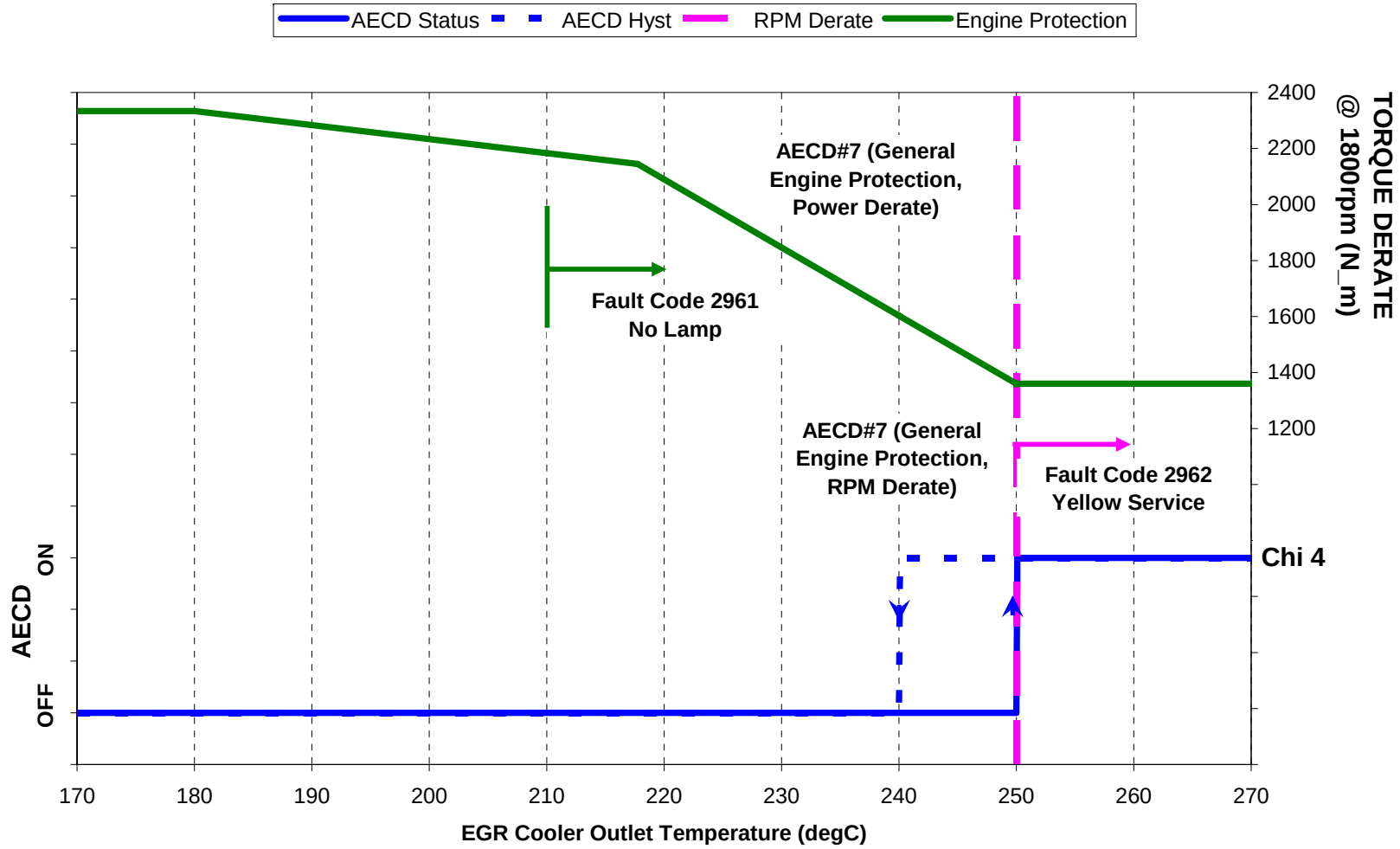
ISM Coolant Temperature Based Actions



Part 3 – Cooling System Protection

EGR Cooler Outlet Temperature Based Actions
ISX Engines

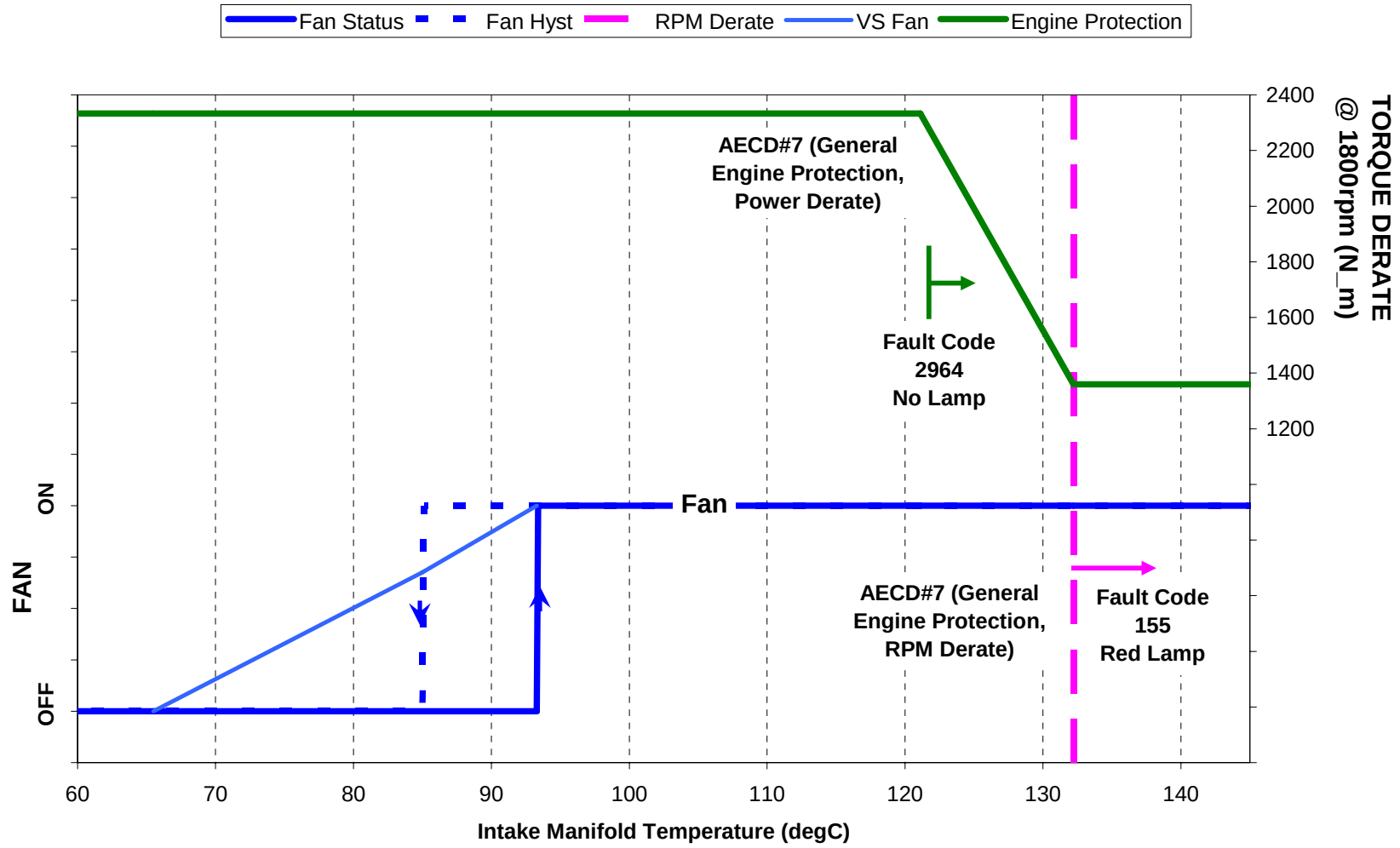
Note: Same Fault Code and derate behavior for ISM



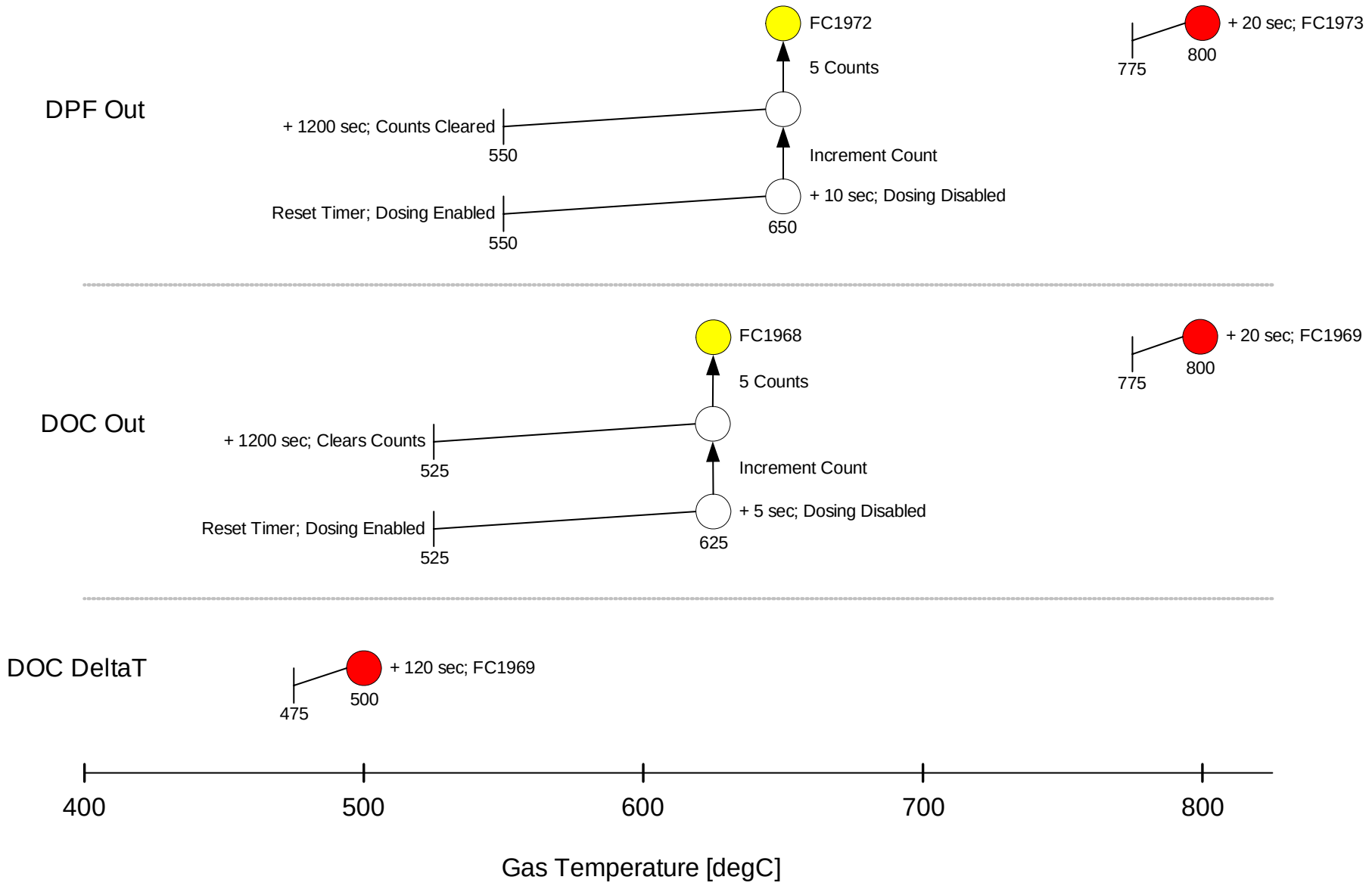
Part 3 – Cooling System Protection

Intake Manifold Temperature Based Actions
ISX Engines

Note: Same Fault Code and derate behavior for ISM



Part 6 – Aftertreatement Protection



221. AECD Aftertreatment Regeneration

Two sets of threshold levels are utilized for the regeneration control, depending on the ECM knowledge of the recent truck operation, monitoring the "Application Label"

Parameters sensed to activate the AECD

- DOC inlet temperature.
- DOC outlet temperature.
- DPF outlet temperature.
- DPF differential pressure.
- Ambient temperature sensor in vehicle air box.
- Ambient pressure sensor in vehicle air box.
- Charge Pressure, Exhaust Pressure, Charge Temperature, Engine Speed

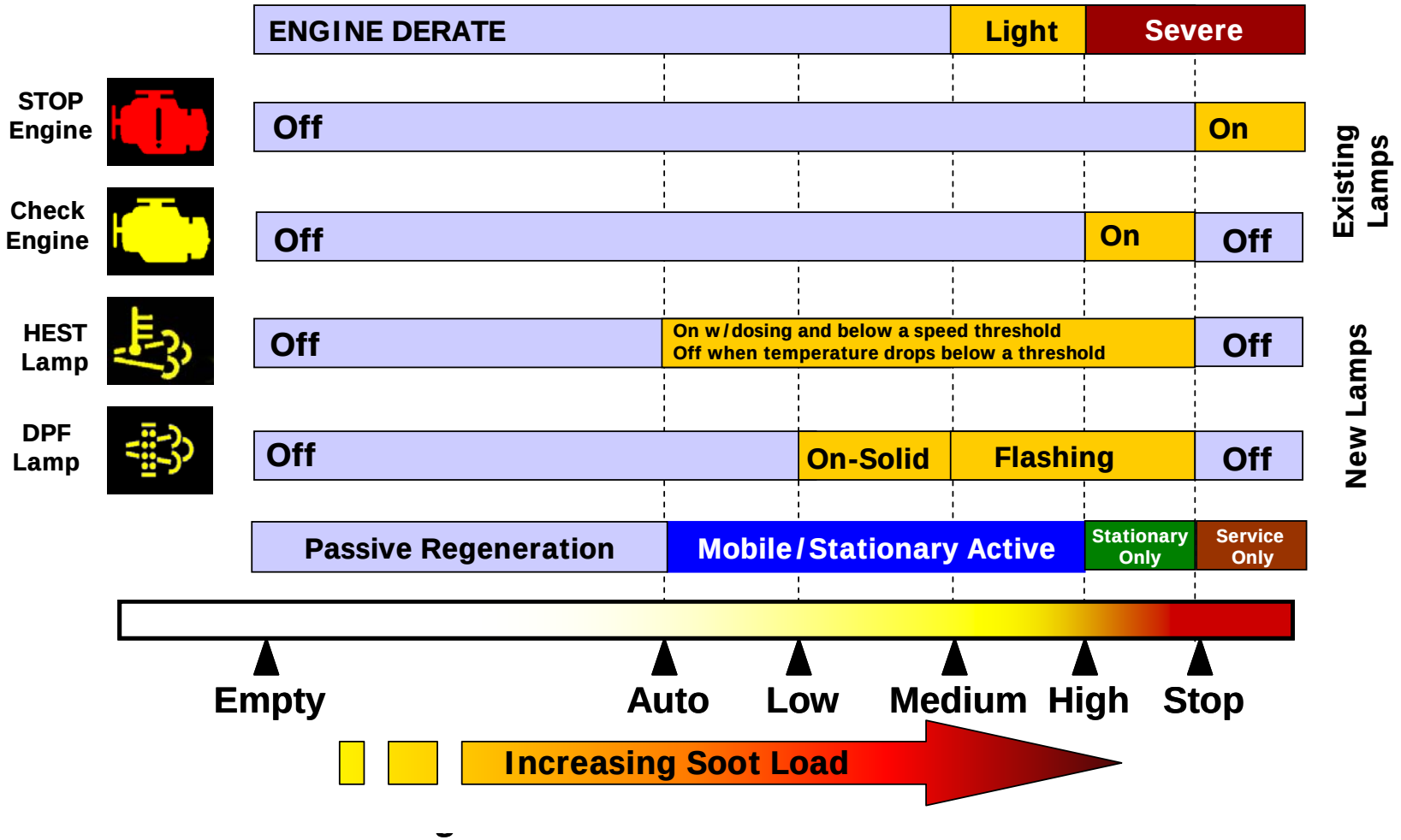
- ApplLabel1: Regenerations are historically carried out with expected conditions
- ApplLabel2: Regenerations are historically difficult to accomplish due to duty cycle limitations (Currently disabled)
- ApplLabel3: Regeneration Inhabit

Exhaust fuel dosing is permitted once satisfactory aftertreatment temperatures have been achieved, requiring the following conditions

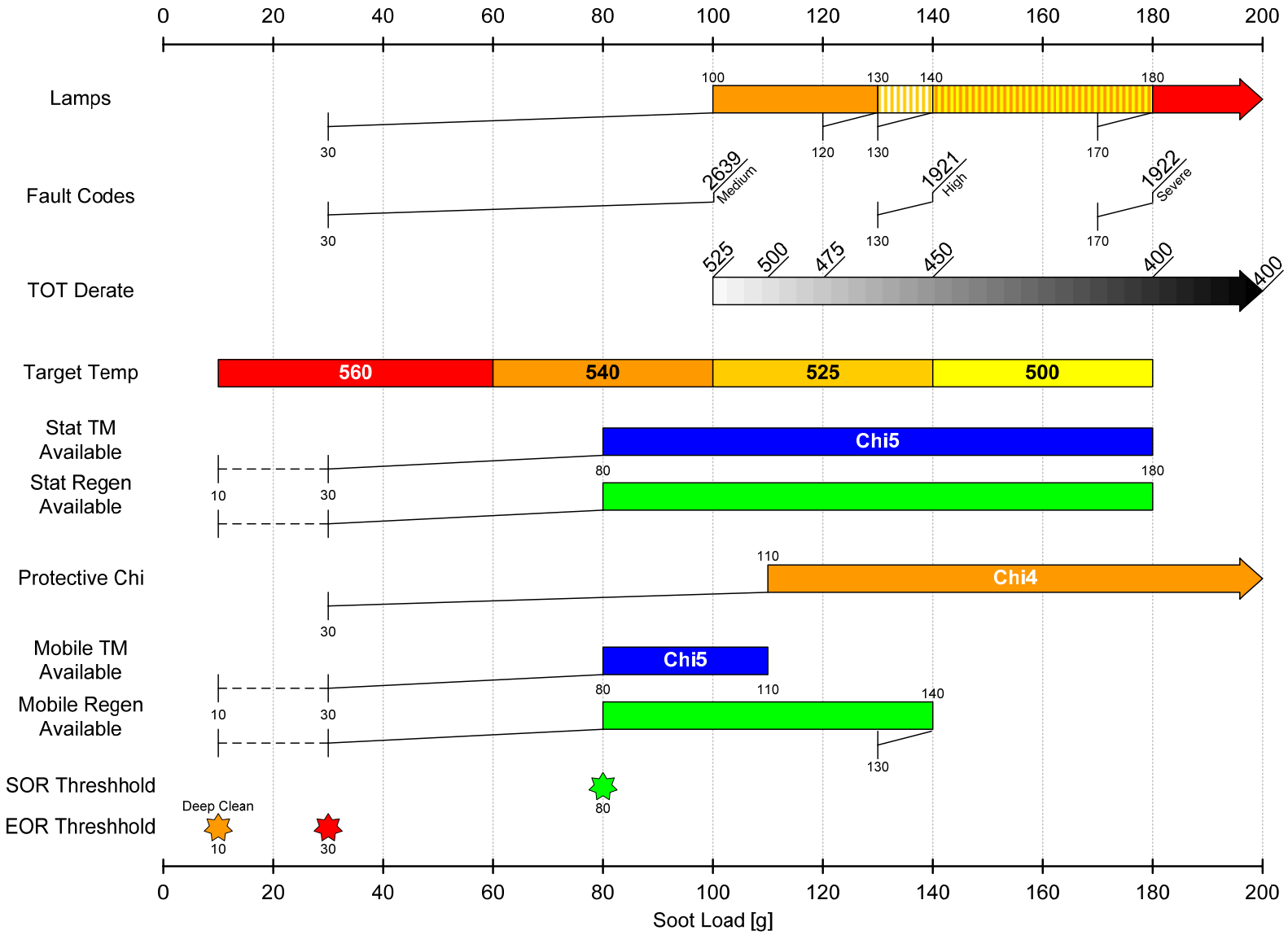
1. DOC inlet temperature > 250 C
2. DOC bed temperature > 250 C
3. DPF bed temperature > 250 C
4. Exhaust mass flow > 90 g/sec
5. Vehicle Speed > threshold (default = 5 MPH, max trim to 25, .62 MPH hysteresis)

Dosing is interrupted during active regeneration when the vehicle speed falls below an OEM trimmable value. This characteristic was requested by our OEM's. The purpose of this interruption is to limit thermal output from the exhaust while operating at low speeds. The OEM's may set any speed in the range of 0-25mph. Cummins has chosen to additionally limit the lower speed to be at least 5mph, resulting in a practical range of 5-25mph. Dosing resumes when the vehicle returns to a speed 2mph than the dosing inhibit setpoint. No other control actions are altered by this change. For example, if thermal management was operating prior to the interruption, it continues to act during the interruption.

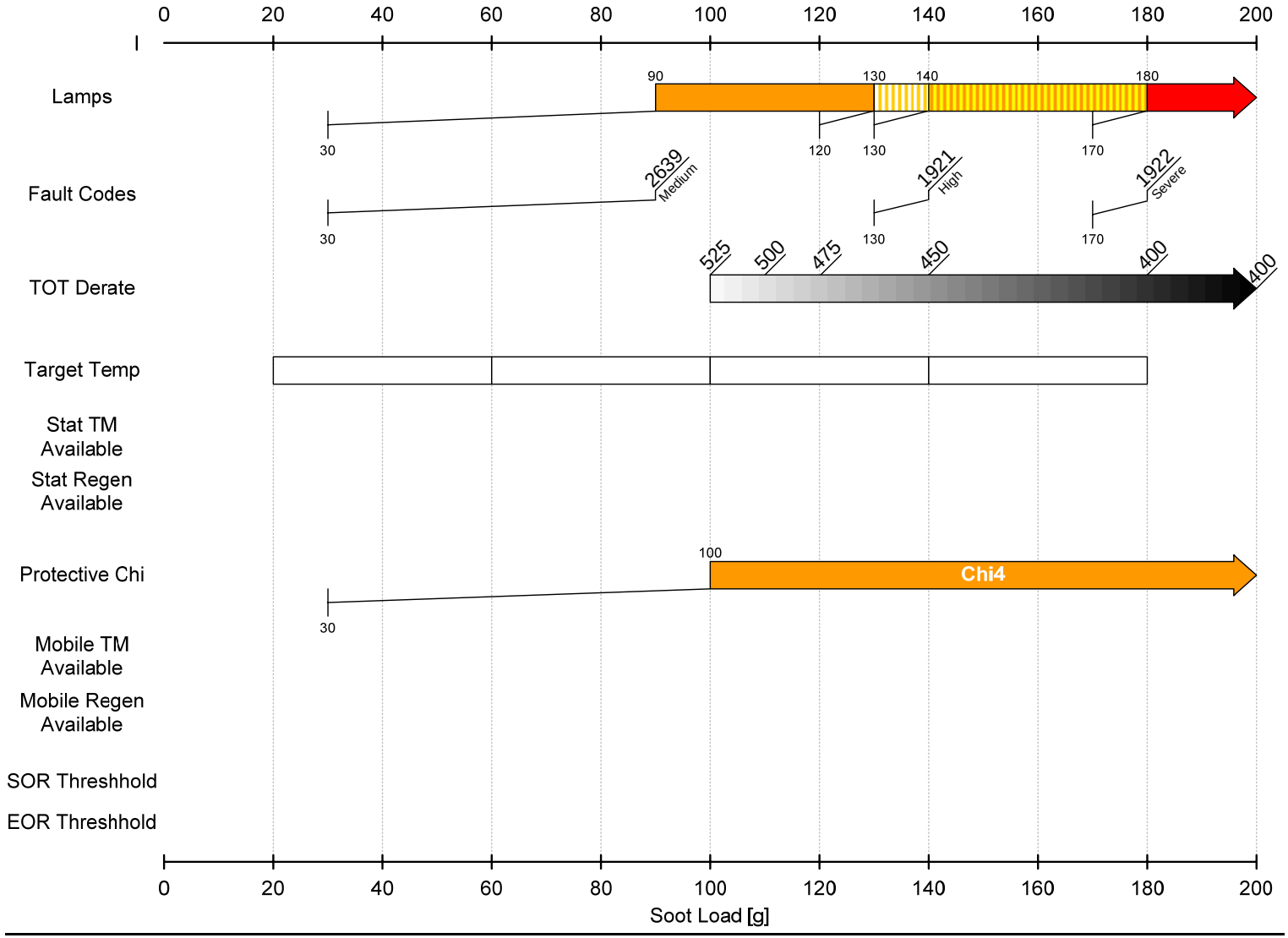
AT Regeneration Lamp Behaviors



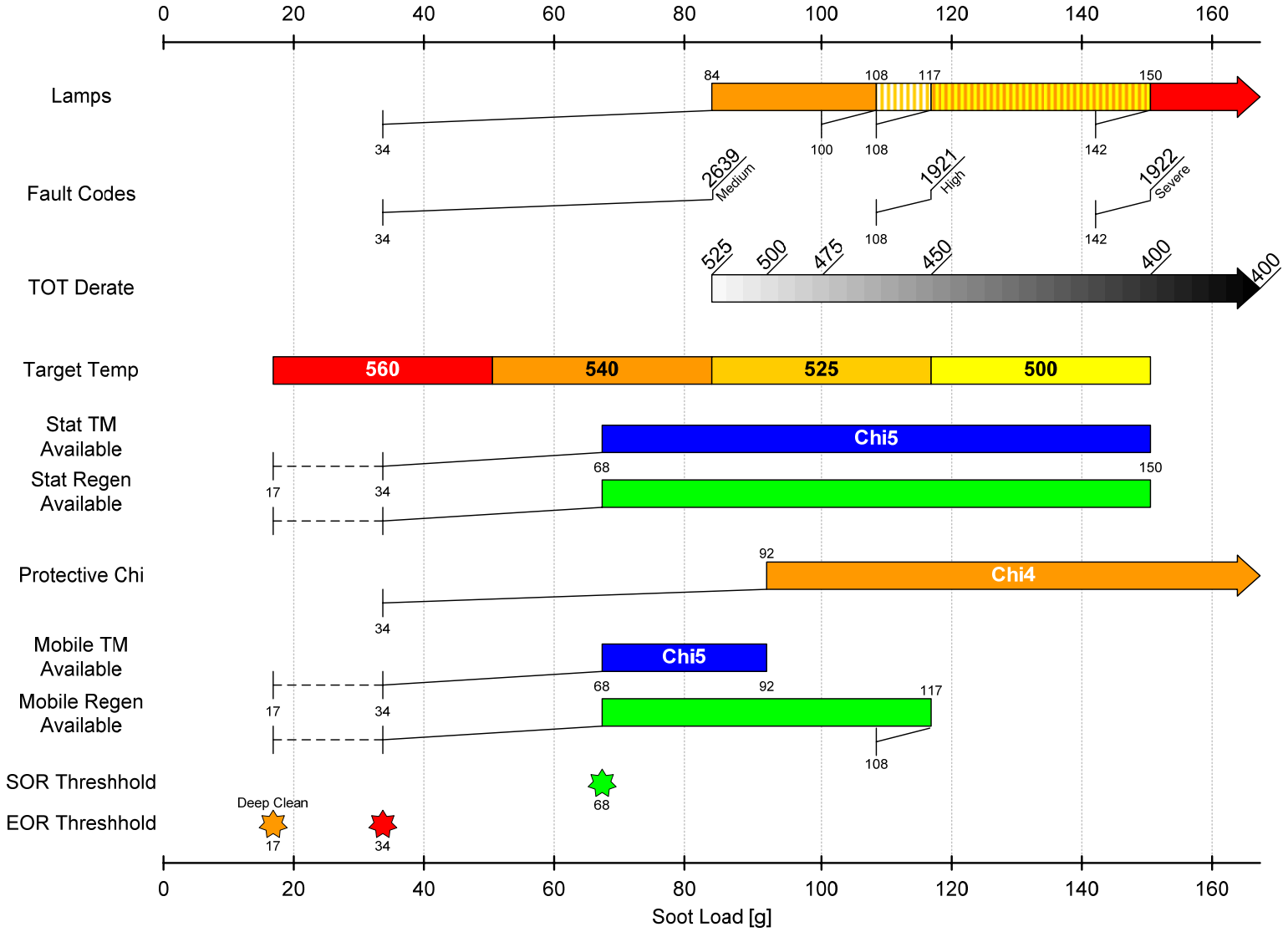
ISX07 "ApplLabel1" Tactic



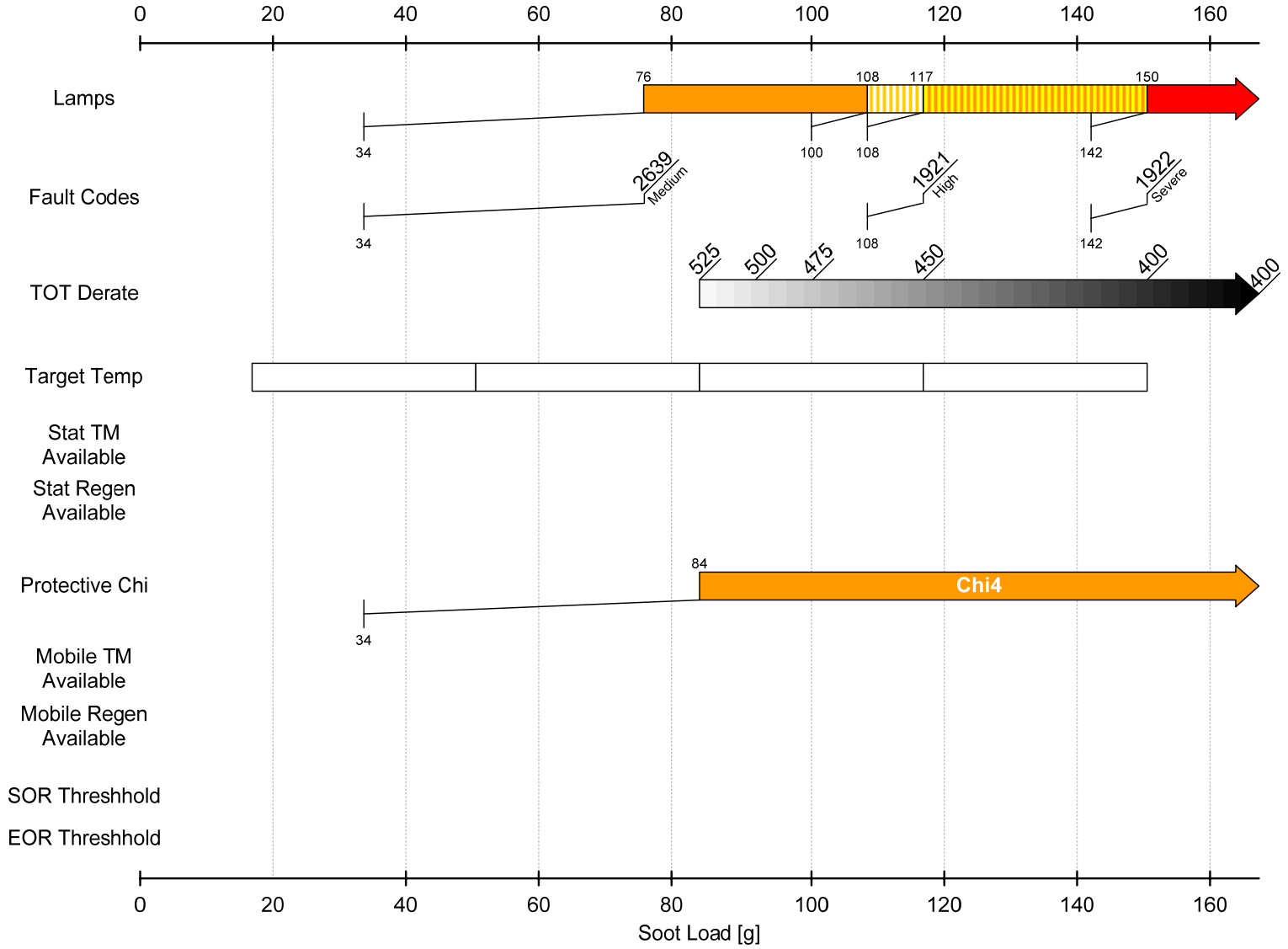
ISX07 ApplLabel 3 Tactic (Inhibit or Cancel)



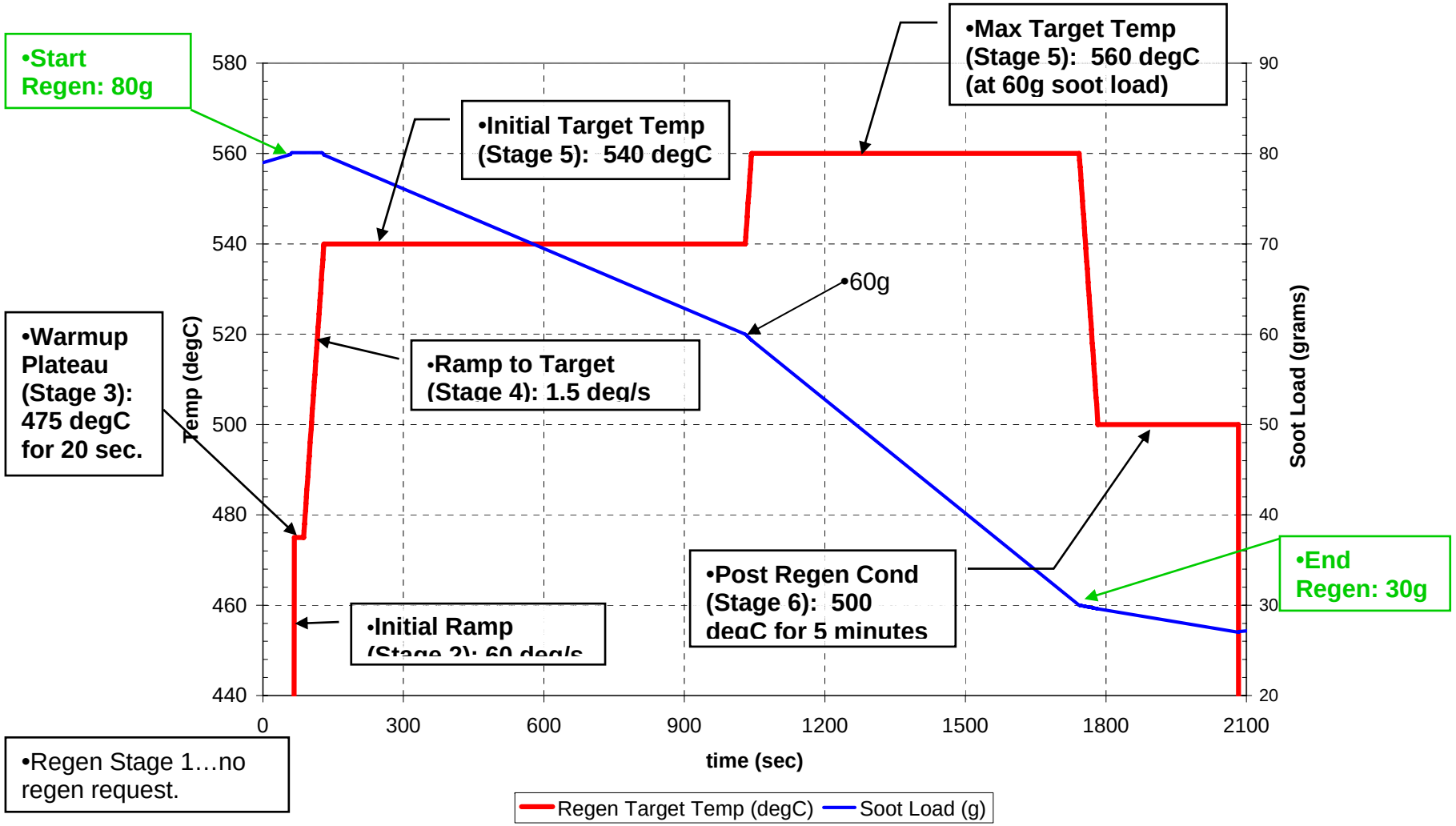
ISM07 "ApplLabel1" Tactic



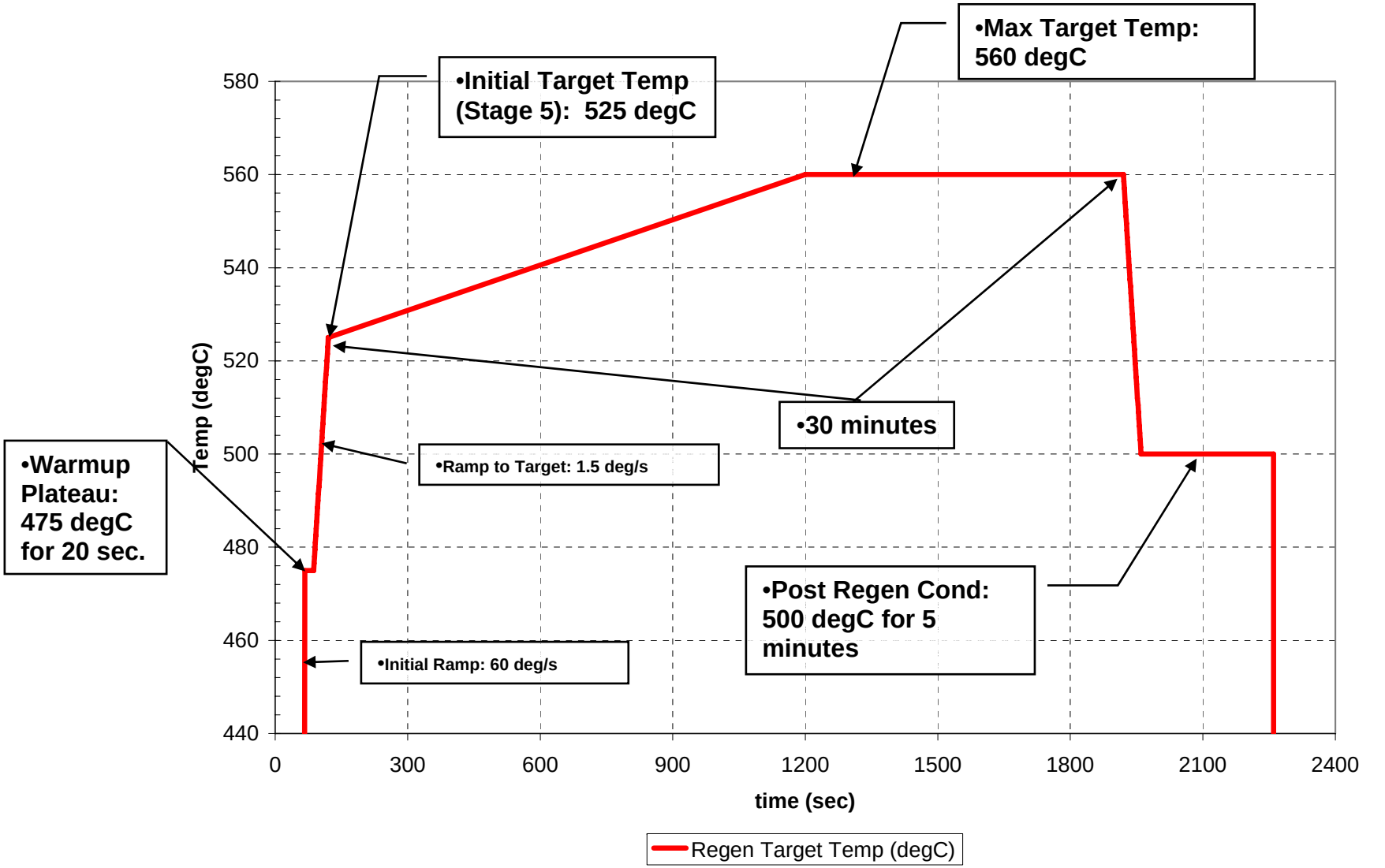
ISM07 "Regen Inhibit" Tactic



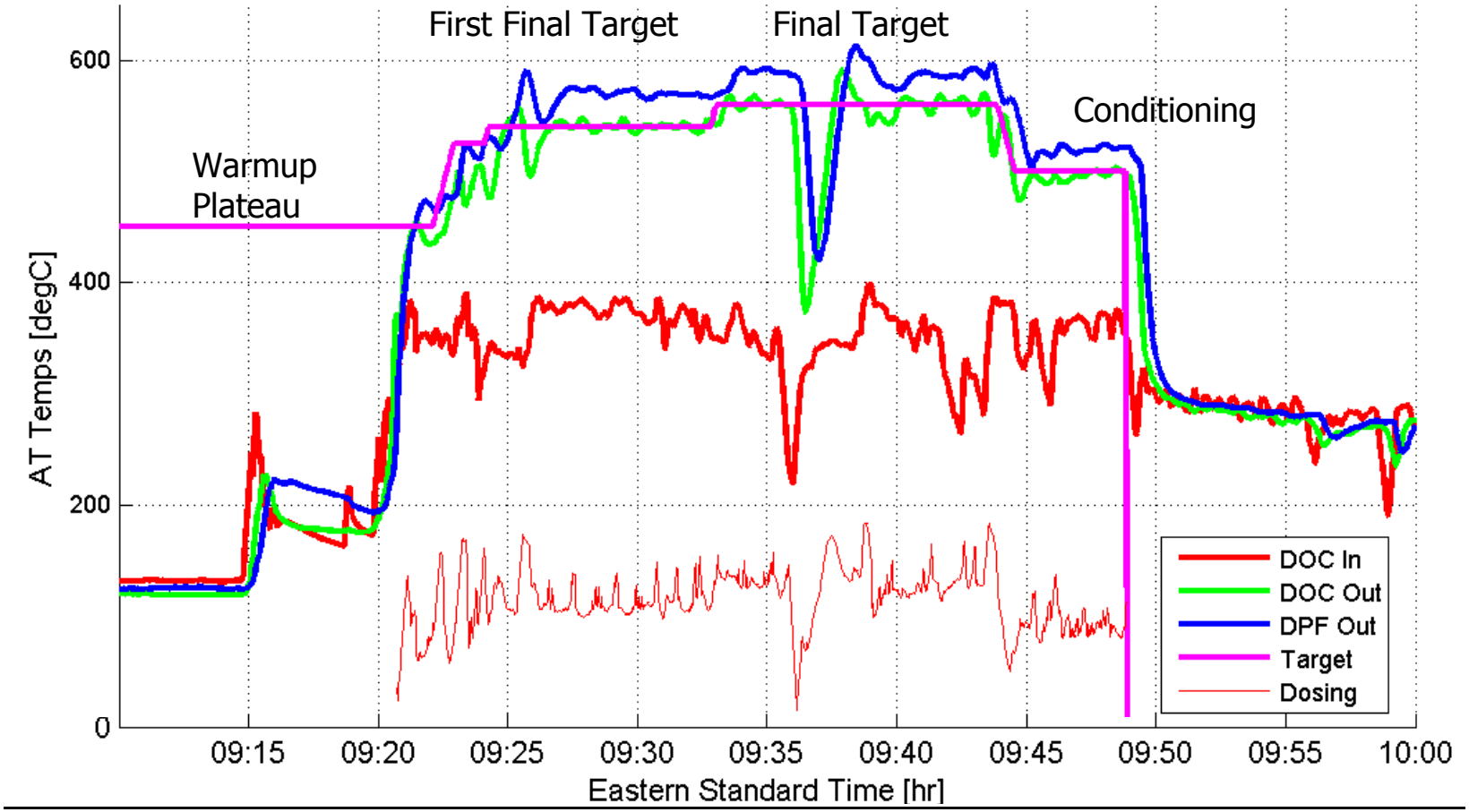
ISX07 Regen Target Temperature Trajectory Example



Time Based Regen Target Temperature Trajectory Example



Regen Stage


First Final Target
Final Target
Conditioning
Warmup
Plateau
600
400
200
0
AT Temps [degC]
09:15
09:20
09:25
09:30
09:35
09:40
09:45
09:50
09:55
10:00
Eastern Standard Time [hr]
DOC In
DOC Out
DPF Out
Target
Dosing

AECD Aftertreatment Regeneration Part 2 - Ineffective Dosing

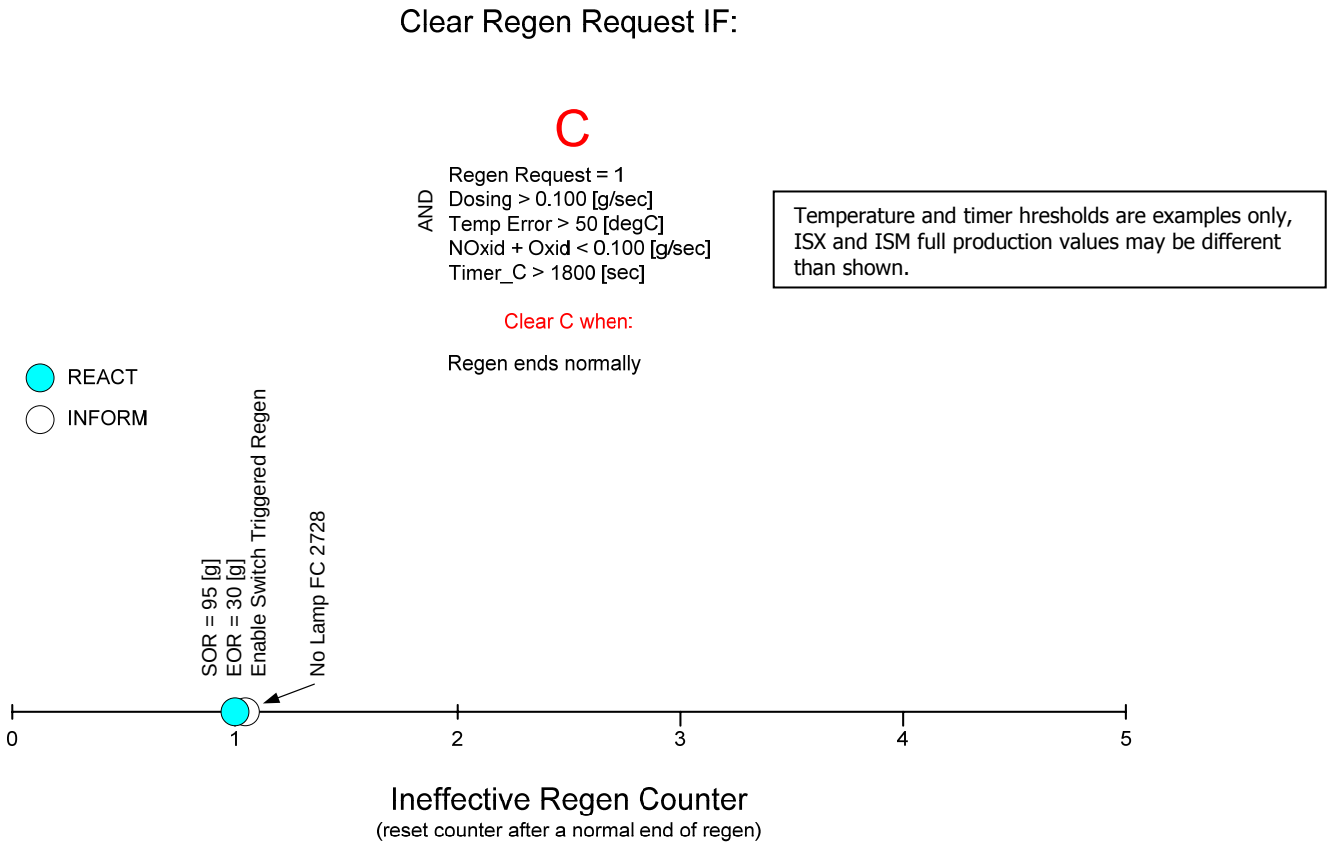
This AECD is designed to protect the aftertreatment should the DOC/doser system fail mechanically or the duty cycle be too transient that fuel is dosed but regen does not occur, thus accumulating hydrocarbons in the DPF.

Parameters sensed to activate AECD

DOC out Temperature located at DOC exit

Surrogate Estimations

Oxidation rate
Noxidation rate



AECD Aftertreatment Regeneration Part 3 -High Aftertreatment Soot Load

The sensed parameter is the Combined Soot Load Estimate (CSLE). This is the estimate in the ECM of the filter soot load. For entry into this condition, the soot load has been climbing well beyond the 80g start of regen (SOR) level and is halfway to the 140g level where mobile regens are disabled in order to protect the filter.

AECD Purpose – Perform an aftertreatment cleaning operation when the following conditions are sensed.

1) Low engine-out soot,
2) Elevated engine-out NO2
3) Regeneration temperatures
4) Elevated Oxygen content and
5) Elevated flow.

AECD Aftertreatment Regeneration Part 4 - DOC Catalyst Face Plugging

The temperature, dosing flow, exhaust flow, PM fraction are fed into a regression equation that estimates how fast the DOC face plugging is occurring and an incremental timer counts up toward its threshold limit. Should the counter reach the limit, dosing is stopped and engine is commanded to run on Chi4 (EGR-off).

Parameters sensed to activate AECD

DOC inlet thermistor: Identifies temperature of the gas stream at the DOC inlet face, risk of coking is linearly increasing with higher temperatures
Dosing flow: Presence of dosing is required to increment the timer, and conversely the timer cannot decrement if dosing is present
Exhaust Flow: Identifies risk associated with low exhaust flow where mass may accumulate on the DOC inlet face
Estimated Engine out PM fraction: High PM amplifies the risk of plugging

If this combination of factors achieves a threshold of the counter indicating severe face plugging, Chi 4 operation is requested.

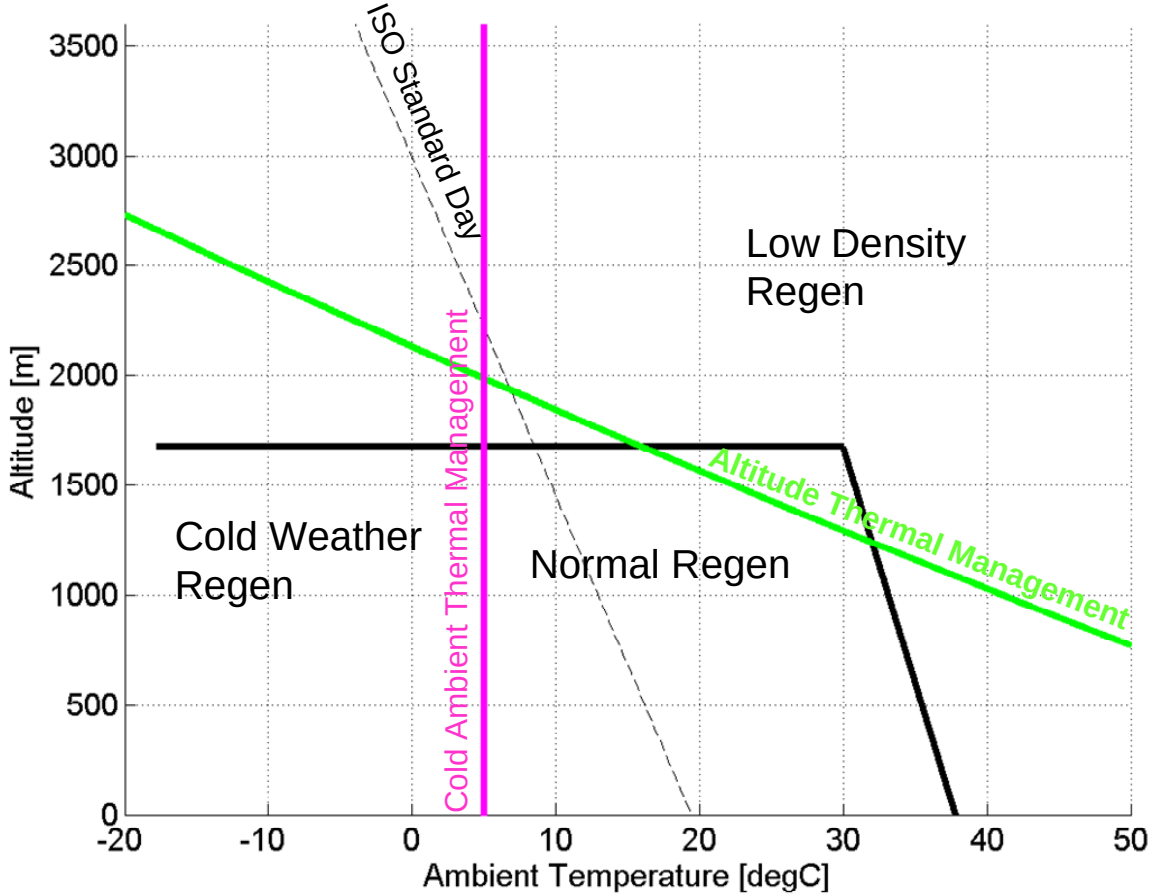
AECD Aftertreatment Regeneration Part 6 - Manual Regeneration Request or Manual Regeneration Inhibit

Manual Regeneration Request:
Certain driving cycles may provide for limited opportunity to accomplish effective regenerations. The electronic control module will alert the operator to the need for regeneration via a dashlamp.When the operator has the opportunity between missions to accomplish a regeneration in a stationary condition, he can initiate an automated regeneration during the out-of-service period. If the regeneration control does not estimate sufficient DPF soot loading and the need to regenerate, the request is ignored.

Manual Regeneration Inhibit:
Vehicle Manufacturers can provide a datalink request to the electronic control module to disable regeneration when in unsafe zones. This request is commanded by the vehicle in response to an operator switch, as required for operation in hazardous areas. Both Manual Regeneration Request and Manual Regeneration Inhibit are available as an option for use by the original equipment manufacturer to accomplish these functions.

AECD Aftertreatment Regeneration Part 8 – Extreme Ambientl Regeneration (Cold Weather or Low Ambient Density)

Robust regeneration of a Diesel Particulate Filter requires certain engine out exhaust conditions. Among those are sufficient temperature, flow and oxygen content. Winter testing has shown that at cooler temperatures, meeting these conditions is difficult, or in some cases impossible. Altitude testing has shown that at low air densities, meeting these conditions is difficult, or in some cases impossible. DOC inlet temperatures above approximately 280 [degC] are required to support dosing while minimizing the risk for DOC face plugging. This limit depends on flow rate and temperature history. Mass flow rates above a minimum threshold are required to support uniform flow distribution. This threshold depends on catalyst diameter and inlet geometry. Sufficient oxygen is required as the goal during a regeneration for an oxidation reaction. Low oxygen concentrations are an indicator that air/fuel ratios are very low, and that soot generation from the engine may be very high. Furthermore, sufficient oxygen must be available for hydrocarbon oxidation across the DOC (the dosing exotherm) and finally soot oxidation in the DPF. Testing has shown that running the engine in an EGR-Off mode is a reliable way to meet temperature, flow rate and oxygen limits.



CM871 and CM876 COMMON APPROACH TO CONTROL SYSTEM DIAGNOSTICS – Regeneration Improvement Software Addendum

Aftertreatment Regeneration Improvement Software – Phase 8.*.0.54 (This functionality applies to ISX1-07 and ISX2-07 Products only)

In Spring of 2009, new software was developed to improve Aftertreatment Regeneration performance. This new software improves the accuracy of the EGR_Flow Virtual Sensor under conditions of 'off-nominal' operation (essentially any time the engine control system is struggling to meet Charge Flow/EGR_Fraction commands, such as: excess exhaust back pressure, high temperature/low CID ambient conditions, charge leaks, etc.). Under these conditions, the current control system (Coupled Controller) is driven towards a solution of Low EGR Lift/Closed VG; at these actuator positions, the EGR_Flow Virtual Sensor tends to significantly under-report actual EGR flow rates. The net result (of the pre-Phase 8.*.0.54 software) can be excess engine-out particulate matter (due to excess EGR flow), ultimately leading to increased DPF loading.

Theory of Operation:

The new software was designed to remove EGR_Valve_Position-dependant bias in the EGR_Flow Virtual Sensor tuning. Trigger logic was developed to detect conditions under which the engine is struggling to meet MCF/EGR_Frac commands. The complete list of Triggers is listed below. When all of the 'Triggers' are satisfied, the new software is used; the new software provides the following additional functionality:

- Secondary 'Piecewise' table [CHP_Downstream_EGR_Flow2]: this table provides the ability to utilize a unique EGR_Flow Virtual Sensor tuning at 'off-nominal' conditions. This functionality is currently not used; therefore, the table is populated with the same values as the Primary 'Piecewise table' (CHP_Downstream_EGR_Flow).
- Secondary 'Untwister' table [C_CHP_EGRF_Adj_Table2]: this table functions in a similar manner as the existing C_CHP_EGRF_Adj_Table table, such that the EGR_Flow value is modified, as a function of EGR_Valve_Position (%EFA). This table is the 'heart' of the new software, in which EGR_Flow bias compensation is provided. Parameter EGR_Fraction_Adjustment2 reflects the output of this table; this parameter represents the magnitude of EGR_Flow (kg/min) that is added to the current EGR_Flow value. Therefore, EGR_Flow is effectively decreased by this same amount. Unique C_CHP_EGRF_Adj_Table2 tables exist in the ISX1-07 and ISX2-7 products.
- Secondary set of command tables: these tables provide the ability to use a separate set of command tables when the new software is activated. Currently, both Alpha1 and Chi2 MCF tables are populated with values common with base Alpha1/Chi2 MCF command tables; therefore, are essentially not used. Both Alpha1 and Chi2 EGR_Frac tables are used, and are populated with values that have been optimized for use with the new software.
    - Alpha1 EGR_Frac: C_CBR_EGRF2_Alpha1_Table
    - Alpha1 MCF: C_CBR_EGRF2_MCF_Alpha1_Table
    - Chi2 EGR_Frac: C_CBR_EGRF2_Chi2_Table
    - Chi2 MCF: C_CBR_EGRF2_MCF_Chi2_Table

Triggers:

The following parameters are used to activate or trigger the new software:

- C_CBR_EGRF2_Frac_Ref — current commanded EGR_Fraction [CBR_EGR_Frac_Ref] must be less than this value to satisfy this trigger
- C_CBR_EGRF2_SFP_pr_Delta — currently not used as a trigger (calibrated such that it is always satisfied)
- C_CSE_EGRF2_XfErr1 — current CSE_Xform_Error1 must be less than this value to satisfy this trigger
- C_CSE_EGRF2_XfErr2 — current CSE_Xform_Error2 must be less than this value to satisfy this trigger
- C_CBR_EGRF2_AFRatio_ULim — current Air Fuel Ratio [H_PME_Air_Fuel_Ratio_Ref] must be below this value to satisfy this trigger
- C_CBR_EGRF2_AFRatio_LLim — current Air Fuel Ratio [H_PME_Air_Fuel_Ratio_Ref] must be above this value to satisfy this trigger
- C_CBR_EGRF2_VGT_Pos — current VGT position must be above this value to satisfy this trigger
- C_CBR_EGRF2_EGR_Pos_Table — current EGR_Valve_Position must be below this table value to satisfy this trigger

All of the above triggers must be satisfied (through use of an AND statement) to increment the counters, which will ultimately activate the new software. Once activated, the new software remains in operation (Latches On) until one of the following conditions is met:

- LSG (CCPO=11)
- PTO (CCPO=4)
- OFC or Alpha0
- Request for Aftertreatment Regeneration

Trigger Counters:

When all Triggers have been satisfied, counters will increment at a rate of 16counts/50msec; 12,800 counts (or 16seconds) is required to activate the new software. Counter decrement time is set to 1count/50msec.

Parameters:

	Parameter Name:	Units:			
	C_CBR_EGRF2_Enable	None			
	C_CBR_EGRF2_Factor_Override	None			
	H_CBR_EGRF2_Active	None			
	H_CBR_EGRF2_Enable	None			
	H_CBR_EGRF2_Trig_Enable	None			
	H_CBR_EGRF2_Nom_Value	Counts			
	EGR_Fraction2	None			
	EGR_Fraction_Adjustment2	None			
	EGR_Fraction_Mixed	None			
	EGR_Flow2	Kg/min			
	EGR_Flow_Mixed	Kg/min			
	CHP_Downstream_Corrected_Flow2	None			
	CHP_Downstream_EGR_Flow2	Kg/min			
	CHP_EGR_Flow_Before_Delay	Kg/min			