APPENDIX C

ECU Signals for In-Use Vehicle Testing with Production ECU

For purposes of Paragraph 19.b.3 of this Consent Decree only, Defendants shall collect ECU data from testing required pursuant to that Paragraph as outlined in this Appendix. Specifically, for each test required under Paragraph 19.b.3, Defendants shall collect all Priority 1 signals listed below, or their functional equivalents as listed in the AECD for the applicable Emission Modification Category, where a signal is present in the software. Defendants shall also undertake reasonable best efforts to collect the Priority 2 and Priority 3 signals listed below, or their functional equivalents as listed in the AECD for the applicable Emission Modification Category, where such signal is present in the software. In the event that Defendants identify issues during such testing with the collection and/or reliability of the signals due to the data capacity and bus speed limitation of the controller area network, Priority 2 and 3 signals will be removed from the collection list, with Priority 3 signals eliminated first.

Measurement with Production ECU via CAN (recommended) or OBD2 port.

Sample Signal Data Based on EMC 9

Description	Minimum Data Rate	Priority
Priority 1 Signals		
Intake Air Flow (MAF)	10ms	1
Post CAC Pressure	100ms	1
Intake Temperature	100ms	1
Post CAC Temperature	100ms	1
Normalized Intake Temperature	100ms	1
Air Mass Setpoint	10ms	1
Adjustment to EGR by Post CAC temperature in Normal Mode	100ms	1
Adjustment to EGR by CO2 Reduction Strategy	10ms	1
Commanded EGR	10ms	1
EGR Setpoint limitation by Lambda Min / Surge Protection	10ms	1
Surge prevention is active/transient	100ms	1
Estimated Exhaust Mass Flow after turbine	100ms	1
Coolant Temperature	100ms	1

Description	Minimum Data Rate	Priority
Engine Operating States / Mode	100ms	1
DPF pressure difference	10ms	1
Exhaust gas flow volume	100ms	1
SCR Dosing Release Conditions	100ms	1
SCR Dosing State	100ms	1
EGR Cooler Bypass Status	100ms	1
Actuator EGR-Valve	10ms	1
Engine State	10ms	1
Coolant Temperature	100ms	1
Ambient Pressure	100ms	1
Ambient Temperature	100ms	1
Engine Speed	10ms	1
SCR Downstream NOx Sensor Concentration	10ms	1
SCR Upstream NOx Sensor Concentration	10ms	1
DOC inlet temperature	100ms	1
DPF inlet temperature	100ms	1
SCR Temperature average	100ms	1
Main Injection Timing	Segment Synchronous	1
Start of Injection Adjustment by CO2 Reduction Strategy	Segment Synchronous	1
Far Post Injection Proportion	Segment Synchronous	1
Close Post Injection Proportion	Segment Synchronous	1
Diesel Injection Quantity	Segment Synchronous	1
Boost pressure target	10ms	1
DPF Surface Temperature	100ms	1
Conditions for PFlt-Regeneration	100ms	1
DPF Soot Load	100ms	1

Description	Minimum Data Rate	Priority
Rail pressure set point	10ms	1
SCR Adaption factor	100ms	1
Optimal Adaption factor	100ms	1
SCR Adaptation State	10ms	1
Global release mask for Adaption	100ms	1
State of Fast Adaption	100ms	1
Status NOx-Sensor SCR upstream	100ms	1
NOx-Sensor SCR downstream massflow	100ms	1
SCR Upstream Temperature	100ms	1
State reset of optimal Adaption factor	100ms	1
Statemask reset of Fast Adaption	10ms	1
NOEA State	100ms	1
EGR delayed activation in overrun for NOx sensor monitor	100ms	1
NOx-Sensor SCR upstream Concentration for Dosing Control	100ms	1
SCRFFC Dosing Mode Bits	100ms	1
SCRFFC Dosing Mode	100ms	1
SCR total dosing amount request	100ms	1
SCR Target NH3 Fill Level	100ms	1
SCR total dosing amount	100ms	1
SCR Estimated Conversion Efficiency	100ms	1
DOC aging factor for HC oxidation	100ms	1
SCR Estimated NH3 Fill Level	100ms	1
SCR Estimated NO2:NOx Ratio	100ms	1
NOx-Sensor SCR upstream massflow	100ms	1
Normalized ATS Performance	100ms	1
Surge prevention is active/highly transient	100ms	1
Actuator Throttle-Valve	10ms	1
Transmission Gear	100ms	1

Description	Minimum Data Rate	Priority
Actuator Turbocharger LP	10ms	1
Actuator Turbocharger HP	10ms	1
Vehicle Speed	100ms	1
Base Swirl valve set point Normal mode	100ms	1
Priority 2 Signals		
Adjustment to EGR by Cold/Hot Engine Operation normal mode	100ms	2
Fault memory information	100ms	2
Fault memory information	100ms	2
DPF inlet pressure	100ms	2
EGR Cooler bypass reason	100ms	2
Base Start of injection timing Normal mode	Segment Synchronous	2
Base Start of injection timing CldStrt mode	Segment Synchronous	2
Pilot 1 Injection Proportion	Segment Synchronous	2
Pilot 2 Injection Proportion	Segment Synchronous	2
Status flag DPF regeneration	100ms	2
Continuous simulated Soot mass	100ms	2
Distance since last regeneration	100ms	2
Swirl valve position	100ms	2
NOx mass for calculation of optimal Adaption factor	100ms	2
Status NOx-Sensor SCR downstream	100ms	2
Output values Fast Adaption	100ms	2
State Refill signal freeze active	100ms	2
SCR Alternate PreCtl Target Efficiency	100ms	2
SCR catalyst aging factor	100ms	2
DPF condition Value for PM/CO2/NOx Tradeoff Strategy	100ms	2
SCR efficiency measured average OBD in Dosing	100ms	2

Description	Minimum Data Rate	Priority
SCR efficiency threshold OBD in Dosing	100ms	2
Priority 3 Signals		
Air path adaption state Idle	100ms	3
Air path adaption state Load 2	100ms	3
Air path adaption state Load 1	100ms	3
Air Mass Setpoint correction by Post CAC temperature in CldStrt Mode	10ms	3
Air Mass Setpoint correction by coolant temperature in CldStrt Mode	10ms	3
Adjustment to EGR by Post CAC temperature in CldStrt Mode	10ms	3
Base EGR set point CldStrt mode	10ms	3
Base IGR set point normal mode	10ms	3
Final IGR/EGR set point before IGR to EGR calculation and limitation	10ms	3
Adjustment to EGR by Cold Engine Operation CldStrt mode	10ms	3
Fault memory information	100ms	3
Ageing DOC factor	100ms	3
Ageing DPF factor	100ms	3
Expected difference pressure	100ms	3
Vehicle odometer	100ms	3
Start of Injection Adjustment by Engine temperature in CldStrt mode	Segment Synchronous	3
Start of Injection Adjustment by Engine temperature in CldStrt mode	Segment Synchronous	3
Start of Injection Adjustment for stabilization by engine temperature and time after start	Segment Synchronous	3
Base Pilot 1 injection quantity Normal mode	Segment Synchronous	3
Base Pilot 1 injection quantity CldStrt mode	Segment Synchronous	3
Base Pilot 2 injection quantity Normal mode	Segment Synchronous	3
Base Pilot 2 injection quantity CldStrt mode	Segment Synchronous	3
DPF Simulation active	100ms	3

Description	Minimum Data Rate	Priority
Base rail pressure set point Normal mode	10ms	3
Base rail pressure set point CldStrt mode	10ms	3
Rail Pressure	10ms	3
Adaption factor in PreCtl Mode	100ms	3
Release of Adaption	100ms	3
Requestmask of Fast Adaption	100ms	3
Calculated SCR efficiency based on NOx sensors	100ms	3
SCR Feed Forward Dosing Estimate	100ms	3
Stoichiometric Factor NH3 to NOx	100ms	3
SCRFFC Bit 13 Integrator Value	100ms	3
SCRFFC Bit 12 Temperature Thresholds	100ms	3
SCRFFC Bit 12 Temperature Thresholds	100ms	3
SCR Dosing Adjustment Applied by Load Governor	100ms	3
Maximum possible NH3 Dosing amount limited by hydrolysis	100ms	3
DPF aging factor for NO2 generation	100ms	3
Maximum possible NH3 Load	100ms	3
Estimated NOx Downstream Emission	100ms	3
Factor for PM/CO2/NOx Tradeoff Strategy based on DOC inlet Temp and DOC aging	100ms	3
Factor for PM/CO2/NOx Tradeoff Strategy based on SCR Cat Temp and DPF condition value	100ms	3
SCR Fill Level Adjustment (Heat Flux Integrator)	100ms	3
SCR Downstream Temperature	100ms	3
Enhanced DOC temperature	100ms	3
Final corrected Swirl valve set point Normal mode	100ms	3
Final corrected Swirl valve set point CldStrt mode	100ms	3
SCR efficiency measured average OBD in PreCtl	100ms	3
SCR efficiency threshold OBD in PreCtl	100ms	3