AECD # ___ of ___

1. Provide the name/title of this AECD.

2. Discuss the purpose of the AECD. Include the physical basis of the problem being solved.

3. Provide the design limits or operating thresholds which trigger the problem. When in the cycle will this be triggered, based on load, speed, throttle opening, temperature limits, etc~~.~~? Indicate whether this AECD will occur during emission testing and/or off-cycle. Include design theory, information from suppliers on hardware limits, component failure experience, etc. For any graphical or numerical data, provide a URL or append it to this form with file name/page #.

4. What is the basis for these design limits? What testing and modeling was done? Explain the limitations of the testing. Be very specific: include test fuel analysis, modeling, and measured parameter comparisons.

5. Indicate the basis for any modeling done to predict engine parameters that necessitate this AECD.

6. Indicate the real world and lab experiences that identified this problem and confirmed that the selected solution was the appropriate one. Include technical citations and data as needed.

7. Explain the possible ways in which the engine, other major component(s), or operation of the engine could be impacted without this AECD. Explain the chain of events and basis, including any metallurgical analysis and data from the component manufacturer. Include your own analysis or other citation. If a part is expected to fail without this AECD, provide the information about how the part is expected to see a failure. Include what parts of the engine are being protected, the specific materials used, why the materials were selected, their chemical makeup, their limitations, and any timing delays built into the model. What will be the effect on emissions and performance if this part fails?

8. Indicate other solutions that were considered and reason(s) why they were not selected. Include but do not limit the discussion to cost, effectiveness, effects on engine control, emissions, level of protection, etc.

9. How is this AECD qualified under the regulations (e.g. engine start-up, engine protection, safety, substantially included in the test procedure)? Describe the systems affected by the AECD (e.g. EGR, SCR)

10. Is this control device expected to activate during normal engine operation? If so, indicate the data you have that demonstrates this, such as actual equipment testing.
Note: "normal operation" consists of all the various speed/loads in which an end-user could operate the product.

Calibration Information

11. Estimate actuation frequency/duration during normal operation of the equipment and anticipated severe conditions.

12. Is there an expected difference in the behavior of this AECD when the engine is on the chassis as opposed to the engine dynamometer?

13. Is the AECD capable of being altered during operation/have any learning modes? If yes, how does it learn and use that information?

14. Is there any data stored in the ECM prior to the setting of the AECD code? How are the AECD codes cleared from the processor? How long are they stored?

Environmental Impact

15. Does the AECD reduce the effectiveness of the emission control system? If not - explain. If so - to what degree?

16. Provide the data/engineering judgment describing the AECD's emissions impact.

17. Describe the emissions rates during AECD activation, as compared to when no AECD is activated.

AECD Calibration Justification

18. Indicate the process used during development to ensure that AECD activation is limited only to conditions in which it is required.

19. Provide the process used to calibrate the strategy to only what is required to protect the engine.

20. Provide the explanation or data showing why lesser frequency would not solve the problem in question.

21. Show your design is necessary to prevent engine damage or accidents. Include the data that guided this decision, such as physical measurements and modeling. If modeled, provide the model and the data validating the model. Be as specific as possible. Also include the effects of any secondary vehicle control/stability devices.

Interaction with Other AECDs (if applicable)

22. Describe how this AECD interacts with other AECDs.

23. Provide a justification for possible redundancies.

24. Indicate when multiple AECDs impact a controlled parameter.

25. If two or more AECDs can be active at once, how are the resultant signals resolved? For example: if two AECDs call for a certain level of enrichment/spark retard, is this additive, weighted, or is one operation point given priority? Be specific for each possible case.

26. Where engine temperature protection is an issue, provide a map of the engine timing and temperature of the part being protected at the range of power modes where this protection is required. Also, provide a map of the air/fuel ratio and temperature of the part being protected at the range of power modes where this protection is required. (Use the box below to indicate the file name/location of the maps.)

Attach Files

Check what files you attached by clicking the paperclip icon on the Navigation Pane on the left.

Provide an index of the files attached. You may either use the box below to list the contents, or upload a document index as a separate attachment and list its file name below.

Calibration Information Tables

27. Entry Conditions

Description of Entry Condition	*Measured Parameter(s)*	*Delays to Entry*	*Basis for Delays*

28. Exit Conditions

Description of Exit Condition	*Measured Parameter(s)*	*Minimum Time in Condition*	*Maximum Time in Condition*	*Minimum Time for Reentry*

How the AECD Works

29. Sensed Parameters

Attach technical drawings/pictures showing sensor locations.

Sensed Parameter	*Sensor Type*	*Location*

30. Controlled Parameters

Controlled Parameter	*Relationship of Sensed/ Controlled Parameters*	*How/Why Modulation is Necessary*