

Sprints AUTOSAR Masterclass

Diagnostics Task

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Overview

This report is written as a part of the Sprints AUTOSAR Master Class Program, specifically to complete the Diagnostics Assignment. It is written as per my understanding of the assignment and the requirements. Also, please note that if I state “out of scope”, it does not mean no action will be taken, but rather means that there isn’t enough information to decide about a certain action or a solution. If there are any comments or mistakes, I will be very thankful to send the correct answers and explanations.

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1. Requirements

1. ECU shall record a fault if the voltage level is below a certain threshold as long as the vehicle is powered
2. The voltage level should fail at least 4 times before the fault is recorded
3. Upon time of the fault, the vehicle temperature should be recorded for later checks
4. Voltage Fault Code is 0x777919
5. The Fault shall be possible to check and clear in the Maintenance Centre over CAN

2. Requirement Analysis

1. According to requirement 1, the operation cycle of the test should be when the Vehicle is POWER ON cycle.
2. According to requirement 2, the test should fail at least four successive times (i.e. failed threshold is 4)
3. According to requirement 3, the freeze frame should include the temperature. Since the test is related to the voltage level, it may include the voltage level (optional).
4. Probably, the temperature and voltage level tests and data are included in Application SWC, not a BSW one.
5. According to requirement 4, the Data Trouble Code (DTC) is 0x777919
6. According to requirement 5, such DTC should exist in an extended session that allows reading and clearing of the DTC.
7. According to requirement 5, the protocol ID which is in the session should be a CAN ID.
8. DSD Configurations: The service table should include the following services
 - a. 0x10 Diagnostic Session Control (to switch from Default Session to Extended one)
 - b. 0x11 ECU Reset
 - c. 0x19 Read Fault Info (DTC)
 - d. 0x14 Clear Fault Info (DTC)

3. Assumptions

Most of the Assumptions are in the DEM Event Debouncing

1. Fault Detection Counter (FDC) will increment by 1 step for each fail (i.e. Increment Step = 1)
2. Fault Detection Counter (FDC) will decrease by 1 step for each success (i.e. decrement Step = 1)
3. The Passed Threshold will be equal to the Failed Threshold (i.e. The test should pass at least four successive times)
4. The Confirmed Threshold is 1 Operation Cycle
5. No Warning Indicator
6. Jump Down to Zero
7. Jump Up to Zero

4. DCM Core Configurations

Since the DCM Components is divided into 3 subcomponents; DSL, DSD and DSP, each subcomponent has its configurations. The DSP component will be configured first as other components depend on it.

4.1. DSP Configurations

- 4.1.1. Sessions: At least two sessions must be defined in the scope of requirements; The Default and Extended Sessions. Each session's properties e.g. P2ServerMax and P2StarServerMax must be configured properly according to the required standards (e.g. ISO, OSI,...etc)
- 4.1.2. DIDs: Since there is no mention of data identifiers in the requirements, therefore DIDs are out of scope.
- 4.1.3. Routine: From the initial inferences, there is no need to specify additional custom routines. Consequently, they are out of scope.
- 4.1.4. Other: The DSP module should be configured to perform the configured services in DSD e.g. 0x19 (Read DTC) and 0x21 (Clear DTC).

4.2. DSD Configurations

The DSD module should have at least one service table that has the following services

- 1. 0x10 (Diagnostic Session Control): To switch from the Default state to the Extended State
- 2. 0x11 (ECU reset): This can be used to Request to reset the ECU after repair.
- 3. 0x19 (Read Fault Info (DTC)): This will be used when reading the required fault. This should be configured to be called with the DTC 0x777919.
- 4. 0x14 (Clear Fault Info (DTC)): This will be used when clearing the required fault after repair. This should be configured to be called with the DTC 0x777919.

All the above services in the service table should be configured to be run in the Extended Session. Although the security level is not specified, a proper specification will be a proper security level that allows maintenance centres to connect their client tools.

4.3. DSL Configurations

- 4.3.1. DSL Protocol ID: According to the mentioned services in 1.2. and requirement 5, the protocol ID should refer to a UDS over CAN protocol (since the services 0x10 to 0x3E are UDS services).
- 4.3.2. Protocol Priority: Since the requirements did not mention the priority, it is out of scope.
- 4.3.3. DSD Service Table: The referred service table should have the specifications in 1.2.
- 4.3.4. Connections: The connections should be configured to know the request are coming from external client tool from CAN protocol.

5. DEM Configurations

5.1. Data Elements

- 5.1.1. Data Element 1: Temperature
- 5.1.2. Data Element 2: Fault Detection Counter for Voltage Threshold Test Event
- 5.1.3. Data Element 3: Voltage Level (optional)

5.2. DEM DIDs

- 5.2.1. DEM DID 1: contains data elements 1 and 3

5.3. Freeze Frame Class

- 5.3.1. Freeze Frame Class 1: It should contain DEM DID 0x01
- 5.3.2. Since the requirements did not mention how the requirements should be numbered, they are out of scope.

5.4. Extended Data Class

- 5.4.1. Extended Data Class 1: Should contain Data Element 2

5.5. DTC Event

- 5.5.1. Event Name: Voltage Threshold Test Event
- 5.5.2. Event Kind: Application SWC
- 5.5.3. DTC Reference: 0x777919
- 5.5.4. Operation Cycle Reference: Power On cycle Reference
- 5.5.5. Extended Data Class Reference: Extended Data Class 1 Reference
- 5.5.6. Freeze Frame Class Reference: Freeze Frame Class 1 Reference
- 5.5.7. FF Rec Num Class Reference: Not specified, therefore out of scope
- 5.5.8. Debouncing Algorithm Configurations
 - FDC Increment Step Size: 1 (Assumption 1)
 - FDC Decrement Step Size: 1 (Assumption 2)
 - Failed Threshold: 4.
According to 2.5.8.1. and requirement 1, the Fault Detection Counter will have a failed threshold of 4 (4 successive fails * (1 increment step per fail))
 - Passed Threshold: 4.
According to 2.5.8.2. and assumption 3, the Fault Detection Counter will have a passed threshold of 4 (4 successive passes * (1 increment step per pass))
 - Jump Down with a value of 0 (Assumption 6)
 - Jump Up with a value of 0 (Assumption 7)
 - The Confirmed Threshold is 1 Operation Cycle
 - No Warning Indicator