

**Research & Vehicle Technology**

**Core Audio Engineering Product Development**

**Infotainment Diagnostics Specification**

**ACM Phoenix Audio Controller**

**Version 8.0.0**

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**FORD CONFIDENTALF**

# FRD-REQ-242657/C-Overall Diagnostics Requirements

## SWR-REQ-242663/A-Overall Diagnostics Requirements

Every Infotainment Module shall comply with all sourced agreements in respect with Netcom Diagnostics Specifications (Netcom specifications override contradicting requirement between the Netcom Specification and this document).

The Diagnostics Part II Specification is maintained by the supplier and shall be submitted to the Ford Infotainment D&R for review to ensure that are requirements are captured as called out in this specification.

## SWR-REQ-242664/B-Diagnostic Reviews

Reviews are held by the Infotainment Diagnostic Engineer or the appropriate Infotainment D&R at the follow timeline to ensure that the specification requirements are captured correctly. These reviews are to be completed and all items closed out before the appropriate milestone date.

1. Initial Supplier Diagnostics Submission (Part II SSDS)– 2 months prior to FDJ
2. Initial Release of Part II - FDJ
3. Completed Part I, Part II and Mux Results – VP
4. Ford Part II Acceptance Test Procedure Completed – VP
5. Completed and Pass Results for Part I, Part 2, Mux and Part 2 Acceptance Test - PEC

A work plan is needed right before the first Diagnostic Review. This document will be discussed during the kickoff meeting.

All deviations to this specification need a signed SVA and a closure date.

All Execution Routines are limited to 20 seconds or less.

All missed dates are to be tracked in Etracker.

# FRD-REQ-242658/A-Common Diagnostic Features

## SWR-REQ-242668/A-Common Diagnostic Features

This section covers all Infotainment Diagnostic Features that are common among all components.

## SWR-REQ-242669/A-Criteria for Setting Continuous DTCs

The following is the criteria that shall be met in order to run the diagnostics routines for Continuous DTC setting in addition to the Netcom requirements:

1. The component must be between 10 volts and 16 volts.
2. The component must be in Run, Accessory, or Delayed Accessory (no logging in Crank or OFF) – Run for ignition switch modules
3. All fault conditions must resume back to normal conditions when fault is removed.
4. The module shall be complete with initialization processes, before continuous monitoring begins.
5. The continuous monitoring of DTCs shall be suspended when performing Diagnostic Routines.
6. The component must be in non-programming modes.
7. All DTCs must be cleared after 80 ignition cycles if fault does not reoccur.
8. Retry strategies must be exhausted before setting DTC.
9. All DTCs need to be stored into permanent memory when triggered.
10. Clearing DTCs shall clear permanent memory when triggered.

## SWR-REQ-242670/B-Criteria for Setting Missing Message DTCs (CGEA 1.3)

The following is the criteria that shall be met in order to set Missing Message DTCs:

1. The component must be between 10 volts and 16 volts.
2. The signal Ignition\_Status must equal RUN (last known)
3. The signal PwPckTq\_D\_Stat must NOT be equal to PwPckStrtInPrgrss\_TqNotAvail (last known)
4. The signal ElPw\_D\_Stat (if supported) must NOT be equal to LV Event in Progress. (last known)
5. The signal Ignition\_Status must not have changed in the last 1000ms.
6. The signal PwPckTq\_D\_Stat must not have changed in the last 1000ms.
7. The signal ElPw\_D\_State (if supported) must not have changed in the last 1000ms.
8. The component must suspend Missing Message Setting Strategy when performing Diagnostic Routines.
9. The component must be in non-programming modes.
10. The status message must be missing for more than five seconds in all of the above states listed above.
11. Timers shall be stored and controlled in the application software.
12. Timers need be continuously reset if they do not match items 1-7 above.
13. Reset time if message is received.

### SWR-REQ-242696/C-Exception for Message

1. The last known ignition message is RUN.
2. The last known ignition is Stable.
3. $3B2 is missing for more than five seconds.
4. If 1-3 are met, then the component shall set the DTC for loss communication with the BCM.

### SWR-REQ-242697/A-Missing, Invalid, or Unknown Messages Failure Modes

1. Failure modes for missing messages, unknown states and invalid messages have the same failure mode as described in the missing/invalid message DTCs.
2. Failure modes will work regardless of DTC setting is enabled.
3. Failure modes will work with these errors as long as CAN is functioning (9 volts and above typically).

## SWR-REQ-242671/B-Criteria for Setting Battery Low and High DTCs

The following is the criteria that shall be met in order to set the Low Voltage DTC.

1. When less than 10 volts +/- 3%, the ECU shall suspend logging DTCs (with exception of Battery Low).
2. When less than 10 volts, for a period greater than 10 seconds, the Battery Low DTC shall set.

The following is the criteria that shall be met in order to set the High Voltage DTC.

1. When above 16 volts +/- 3%, the radio shall suspend logging DTCs (with the exception of Battery High).
2. When above 16 volts +/- 3% for greater than 5.5s, the Battery High DTC shall set.

## SWR-REQ-242672/C-IVS Part Number Scheme

The IVS Base Part Numbers can be pulled from the IVS website. www.ivs.ford.com

The Part Number Hierarchy is as follows:

* Ford Assembly Part Number
  + Core Assembly Part Number (all hardware)
  + Strategy Part Number (main application)
  + Calibration Part Number (calibration files)
  + Secondary Bootloader Part Number
* Configuration (Standalone Calibration) Part Number has no effect on Ford Assembly Part Number.

The ECU requires DIDs for the Delivery Assembly Part Number, Strategy Part Number(s), and Core Assembly Part Number. The Calibration Part Number(s), and Configuration (Standalone Calibration) Part Number(s) may be required by your design.

* Delivery Assembly Part Number (DID F113) – Assembly Part Number stored in non-erasable ROM when part is delivered from supplier. (Required)
* Core Assembly Part Number (DID F111) – Core Assembly Part Number is stored in non-erasable ROM. (Required)
* Strategy Part Number (DID F188) – Application Part Number stored in the strategy file. (Required)
* Calibration Part Number (DID F124) – Calibration Part Number stored in the calibration file. (Depends on if Calibration File is needed)
* Standalone Calibration File (DID F10A) – Configuration Part Number stored in the standalone configuration file. (Depends on if Configuration File is needed)

There is no DID required for Current Assembly Part Number.

## SWR-REQ-242673/B-Security Code for Downloading

All Infotainment Products shall use the following security code for downloading software via CAN:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Security** | **Fixed Bytes from Security Algorithm (SWDL 6)** | | | | | | | | | | | |
| **Level** | **F1** | **F2** | **F3** | **F4** | **F5** | **F6** | **F7** | **F8** | **F9** | **F10** | **F11** | **F12** |
| **01** | 5F | 27 | 8C | 5D | 2F | 73 | A6 | 52 | 50 | 12 | CD | 54 |

Security Level 03 are for Supplier DIDs that are 2E configurable (see note below for PAC):

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Security** | **Fixed Bytes from Security Algorithm (SWDL 6)** | | | | | | | | | | | |
| **Level** | **F1** | **F2** | **F3** | **F4** | **F5** | **F6** | **F7** | **F8** | **F9** | **F10** | **F11** | **F12** |
| **03** | 5F | 1A | 2E | AC | 72 | 66 | 48 | A2 | 93 | 04 | 6F | E7 |

Notes:

PAC – Security Level 03 is required for all 2E, 2F, and several 31 routines.

# FRD-REQ-412635/A-PAC Specific Diagnostics

## SWR-REQ-242674/B-Tx/Rx ID

The Diagnostic CAN Transmit ID is 0x72F for the ACM.

The Diagnostic CAN Receive ID is 0x727 for the ACM.

## SWR-REQ-242675/D-Required Messages

|  |  |  |
| --- | --- | --- |
| **defaultSession (Session 01)** | |  |
| 10 | Diagnostic Session Control | Y |
| 11 | ECUReset | Y |
| 27 | SecurityAccess | N |
| 3E | TesterPresent | Y |
| 85 | ControlDTCSetting | N |
| 22 | ReadDataByIdentifier | Y |
| 23 | ReadMemoryByAddress | N |
| 24 | ReadScalingDataByIdentifier | N |
| 2A | ReadDataByPeriodicIdentifier | N |
| 2C | DynamicallyDefineDataIdentifier | N |
| 2E | WriteDataByIdentifier | N |
| 3D | WriteMemoryByAddress | N |
| 14 | ClearDiagnosticInformation | Y |
| 19 | ReadDTCInformation | Y |
| 2F | InputOutputCtrlByIdentifier | N |
| 31 | RoutineControl | N |
| **ExtendedDiagnosticSession (Session 03)** | |  |
| 10 | Diagnostic Session Control | Y |
| 11 | ECUReset | Y |
| 27 | SecurityAccess | Y |
| 3E | TesterPresent | Y |
| 85 | ControlDTCSetting | Y |
| 22 | ReadDataByIdentifier | Y |
| 23 | ReadMemoryByAddress | N |
| 24 | ReadScalingDataByIdentifier | N |
| 2A | ReadDataByPeriodicIdentifier | N |
| 2C | DynamicallyDefineDataIdentifier | N |
| 2E | WriteDataByIdentifier | Y |
| 3D | WriteMemoryByAddress | N |
| 14 | ClearDiagnosticInformation | Y |
| 19 | ReadDTCInformation | Y |
| 2F | InputOutputCtrlByIdentifier | Y |
| 31 | RoutineControl | Y |
| **ProgrammingSession (Session 02)** | |  |
| 10 | Diagnostic Session Control | Y |
| 11 | ECUReset | Y |
| 27 | SecurityAccess | Y |
| 22 | ReadDataByIdentifier | Y |
| 31 | RoutineControl | Y |
| 34 | RequestDownload | Y |
| 36 | TransferData | Y |
| 37 | RequestTransferExit | Y |
| 3E | TesterPresent | Y |
| **Supplier Session (Session 60)** | |  |
| 10 | Diagnostic Session Control | Y |
| BA | EQ Service | Y |
| 3E | TesterPresent | Y |

## On-Demand Self-Test (0202)

### SWR-REQ-412673/A-On-Demand Self-Test Entry-Exit Criteria

The On-Demand Self Test (0202) shall enter self-test only if all the following criteria are met (if not correct: send conditions not correct message to tester):

* Ignition is in the Run or Accessory State (0x3B2 and 0x167)
* Battery Voltage is Between 10-16 volts
* Normal Diagnostic Session (not programming modes)
* On-Demand Test is requested by tester.

The On-Demand Self Test (0202) shall exit self-test if any one of the following criteria is met:

* Ignition transitions out of Run or Accessory State (0x3B2 and 0x167)
* Battery Voltage Drops below 9 volts or exceeds 16 volts
* A stop routine command is issued.
* Tester does not communicate for more than five (5) seconds.
* Test is complete.

After the test is complete, the radio shall return to previous operating state.

### SWR-REQ-412674/A-PAC On-Demand Self Test DTCs and Criteria

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pin # | I/O | Circuit Description | Tested | DTCs Details | Configuration that applies |
| n/a | n/a | Vehicle Operations Configuration | Y | Verify that ACM has been configured properly. DTC E10000 – for missing initial configuration and E10100 for misconfiguration. | See configuration section |
| n/a | n/a | Flash ROM Checksum | Y | Verify Flash ROM checksum matches stored value. DTC F00041 | N/A |
| n/a | n/a | EEPROM Checksum | Y | Verify non-changing EEPROM Checksum matches stored value. DTC F00041 | N/A |
| n/a | n/a | HD Radio Chip Failure | Y | Verify that HD Chipset is Operating Correctly. DTC F00096 | HD Radio = Available (This is only applicable to ACMs with HD Radio tuners) |
| J1-1 | I | Battery | Y | Checks if battery voltage is below 10 volts for greater than 250ms. DTC F00316. Checks if battery voltage is greater than 16 volts for greater than 5500ms. DTC F00317. | N/A |
| J1-2 | O | RF Speaker (Stream 72) - | Y | Set if Amplifier Chip indicates open (9A0213), short to ground (9A0211), short to battery (9A0212), or shorted across (9A0201). | Speaker2 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-2 | O | RF Speaker (Stream 72)- | Y | Set if Amplifier Chip indicates open (9A0813). | Speaker2 = Tweeter or Speaker and Tweeter or Speaker2 = Two Mains |
| J1-3 | O | RF Speaker (Stream 72)+ | Y | Set if Amplifier Chip indicates open (9A0213), short to ground (9A0211), short to battery (9A0212), or shorted across (9A0201). | Speaker2 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-3 | O | RF Speaker (Stream 72) + | Y | Set if Amplifier Chip indicates open (9A0813). | Speaker2 = Tweeter or Speaker and Tweeter or Speaker2 = Two Mains |
| J1-4 | I/O | Ground | Y | See battery check | N/A |
| J1-5 | O | LR Speaker (Stream 73)- | Y | Set if Amplifier Chip indicates open (9A0413), short to ground (9A0411), short to battery (9A0412), or shorted across (9A0401). | Speaker4 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-5 | O | LR Speaker (Stream 73) - | Y | Set if Amplifier chip indicates open (9A0A13), | Speaker4 = Tweeter or Speaker and Tweeter or Speaker4 = Two Mains |
| J1-6 | O | LR Speaker (Stream 73) + | Y | Set if Amplifier Chip indicates open (9A0413), short to ground (9A0411), short to battery (9A0412), or shorted across (9A0401). | Speaker4 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-6 | O | LR Speaker (Stream 73) + | Y | Set if Amplifier chip indicates open (9A1013), | Speaker4 = Tweeter or Speaker and Tweeter or Speaker4 = Two Mains |
| J1-7 | O | LF Speaker (Stream 74) - | Y | Set if Amplifier Chip indicates open (9A0113), short to ground (9A0111), short to battery (9A0112), or shorted across (9A0101) | Speaker1 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-7 | O | LF Speaker (Stream 74) - | Y | Set if Amplifier Chip indicates open (9A0713). | Speaker1 = Tweeter or Speaker and Tweeter or Speaker1 = Two Mains |
| J1-8 | O | LF Speaker (Stream 74) + | Y | Set if Amplifier Chip indicates open (9A0113), short to ground (9A0111), short to battery (9A0112), or shorted across (9A0101) | Speaker1 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-8 | O | LF Speaker (Stream 74) + | Y | Set if Amplifier Chip indicates open (9A0713). | Speaker1 = Tweeter or Speaker and Tweeter or Speaker1 = Two Mains |
| J1-9 | O | RR Speaker (Stream 75) - | Y | Set if Amplifier Chip indicates open (9A0313), short to ground (9A0311), short to battery (9A0312), or shorted across (9A0301). | Speaker3 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-9 | O | RR Speaker (Stream 75) - | Y | Set if Amplifier Chip indicates open (9A0913). | Speaker3 = Tweeter or Speaker and Tweeter or Speaker3 = Two Mains |
| J1-10 | O | RR Speaker (Stream 75) + | Y | Set if Amplifier Chip indicates open (9A0313), short to ground (9A0311), short to battery (9A0312), or shorted across (9A0301). | Speaker3 = Speaker or Speaker and Tweeter or Two Mains. |
| J1-10 | O | RR Speaker (Stream 75) + | Y | Set if Amplifier Chip indicates open (9A0913). | Speaker3 = Tweeter or Speaker and Tweeter or Speaker3 = Two Mains |
| J1-11 | N/C | No connect | N | N/A | N/A |
| J1-12 | N/C | No connect | N | N/A | N/A |
| J1-13 | O | AVAS Speaker 1 + | Y | Set if Amplifier Chip indicates open (9A0613), short to battery (9A0612), short to ground (9A0611), or shorted together (9A0601). | AVAS Speaker 1 = Enabled |
| J1-14 | O | AVAS Speaker 2 + | Y |  | AVAS Speaker 2 = Enabled |
| J1-15 | O | DRDL RX+ | N | Sync handles test. | N/A |
| J1-16 | O | DRDL TX+ | N | Sync handles test. | N/A |
| J1-17 | N/C | No connect | N | N/A | N/A |
| J1-18 | N/C | No connect | N | N/A | N/A |
| J1-19 | I/O | CAN H | N | On-Demand test will exit if loss communication to tester for greater than 5 seconds. | N/A |
| J1-20 | N/C | No connect | N | N/A | N/A |
| J1-21 | N/C | No connect | N | N/A | N/A |
| J1-22 | N/C | No connect | N | N/A | N/A |
| J1-23 | N/C | No connect | N | N/A | N/A |
| J1-24 | O | AVAS Speaker 1 - | Y | Set if Amplifier Chip indicates open (9A0613), short to battery (9A0612), short to ground (9A0611), or shorted together (9A0601). | AVAS Speaker 1 = Enabled |
| J1-25 | O | AVAS Speaker 2 + | Y |  | AVAS Speaker 2 = Enabled |
| J1-26 | O | DRDL Rx- | N | Sync Handles Test | N/A |
| J1-27 | O | DRDL Tx- | N | Sync Handles Test | N/A |
| J1-28 | N/C | No connect | N | N/A | N/A |
| J1-29 | N/C | No connect | N | N/A | N/A |
| J1-30 | I/O | CAN L | N | On-Demand test will exit if loss communication to tester for greater than 5 seconds. | N/A |
| J1-31 | N/C | No connect | N | N/A | N/A |
| J1-32 | N/C | No connect | N | N/A | N/A |
| J2-1 | N/C | No connect | N | N/A | N/A |
| J2-2 | N/C | No connect | N | N/A | N/A |
| J2-3 | N/C | No connect | N | N/A | N/A |
| J2-4 | N/C | No connect | N | N/A | N/A |
| J2-5 | O | 3rd Row Speaker L (Stream 76) - | Y | Set if Amplifier Chip indicates open (9A1113), short to ground (9A1111), short to battery (9A1112), or shorted across (9A1101). | 3rd Row Left Speakers = Speaker or Speaker and Tweeter. |
| J2-5 | O | 3rd Row Speaker L (Stream 76) - | Y | Set if Amplifier Chip indicates open (928A13). | 3rd Row Left Speakers = Tweeter or Speaker and Tweeter. |
| J2-6 | O | 3rd Row Speaker L( Stream 76) + | Y | Set if Amplifier Chip indicates open (9A1113), short to ground (9A1111), short to battery (9A1112), or shorted across (9A1101). | 3rd Row Left Speakers = Speaker or Speaker and Tweeter. |
| J2-6 | O | 3rd Row Speaker L ( Stream 76) + | Y | Set if Amplifier Chip indicates open (928A13). | 3rd Row Left Speakers = Tweeter or Speaker and Tweeter. |
| J2-7 | N/C | No connect | N | N/A | N/A |
| J2-8 | N/C | No connect | N | N/A | N/A |
| J2-9 | O | 3rd Row Speaker R (Stream 77) - | Y | Set if Amplifier Chip indicates open (9A1213), short to ground (9A1211), short to battery (9A1212), or shorted across (9C1201). | 3rd Row Right Speakers = Speaker or Speaker and Tweeter. |
| J2-9 | O | 3rd Row Speaker R (Stream 77) - | Y | Set if Amplifier Chip indicates open (928B13). | 3rd Row Right Speakers = Tweeter or Speaker and Tweeter. |
| J2-10 | O | 3rd Row Speaker R (Stream 77) + | Y | Set if Amplifier Chip indicates open (9A1213), short to ground (9A1211), short to battery (9A1212), or shorted across (9C1201). | 3rd Row Right Speakers = Speaker or Speaker and Tweeter. |
| J2-10 | O | 3rd Row Speaker R (Stream 77) + | Y | Set if Amplifier Chip indicates open (928B13). | 3rd Row Right Speakers = Tweeter or Speaker and Tweeter. |
| J2-11 | I | Interior Mic 1+ | Y | Microphone is detected if present via hardware. ACM will set if open 916A13, short to ground 916A11, short to battery 916A12 for greater than 1 second, or shorted together 916A01 for greater than 1 second. | Interior Mic1 = Enabled |
| J2-12 | I | Interior Mic 1 Shield | N |  | N/A |
| J2-13 | I | Interior Mic 2+ | Y | Microphone is detected if present via hardware. ACM will set if open 917A13, short to ground 917A11, short to battery 917A12 for greater than one second, or shorted together 916A01 for greater than 1 second. | Interior Mic2 = Enabled |
| J2-14 | I | Interior Mic 3+ | Y | Microphone is detected if present via hardware. ACM will set if open 93F513, short to ground 93F511,short to battery 93F512 for greater than one second, or shorted together 93F501 for greater than 1 second. | Interior Mic3 = Enabled |
| J2-15 | I | Interior Mic 3 Shield | N |  | N/A |
| J2-16 | I | Interior Mic 4+ | Y | Microphone is detected if present via hardware. ACM will set if open 940013, short to ground 940011, short to battery 940012 for greater than one second, or shorted together 940001 for greater than 1 second. | Interior Mic4 = Enabled |
| J2-17 | I | Interior Mic 5+ | Y | Microphone is detected if present via hardware. ACM will set if open 969013, short to ground 969011, short to battery 969012 for greater than one second, or shorted together 96901 for greater than 1 second. | Interior Mic5 = Enabled |
| J2-18 | I | Interior Mic 5 Shield | N |  | N/A |
| J2-19 | I | Interior Mic 6+ | Y | Microphone is detected if present via hardware. ACM will set if open 969613, short to ground 969611, short to battery 969612 for greater than one second, or shorted together 969601 for greater than 1 second. | Interior Mic6 = Enabled |
| J2-20 | N/C | No connect | N | N/A | N/A |
| J2-21 | N/C | No connect | N | N/A | N/A |
| J2-22 | I | Interior Mic 1- | Y | See interior mic 1+ | Interior Mic1 = Enabled |
| J2-23 | I | Interior Mic 2 Shield | N |  | N/A |
| J2-24 | I | Interior Mic 2- | Y | See interior mic 2+ | Interior Mic2 = Enabled |
| J2-25 | I | Interior Mic 3- | Y | See interior mic 3+ | Interior Mic3 = Enabled |
| J2-26 | I | Interior Mic 4 Shield | N |  | N/A |
| J2-27 | I | Interior Mic 4- | Y | See interior mic 4+ | Interior Mic4 = Enabled |
| J2-28 | I | Interior Mic 5- | Y | See interior mic 5+ | Interior Mic5 = Enabled |
| J2-29 | I | Interior Mic 6 Shield | N |  | N/A |
| J2-30 | I | Interior Mic 6- | Y | See interior mic 6+ | Interior Mic6 = Enabled |
| J2-31 | N/C | No connect | N | N/A | N/A |
| J2-32 | N/C | No connect | N | N/A | N/A |
|  | I | SDARS Antenna | Y | Set DTC 9A8913 for Open Circuit greater (>) than 250ms to SDARS Antenna. Set DTC 9A8911 for Short to Ground greater (>) than 250 ms for SDARS Antenna. | Internal SDARS = Available (Note: This is only applicable for ACMs with Integrated SDARS) |
|  | I | Antenna1 | Y | Set DTC 9A5611 when antenna is short to ground (Phantom supply current > 140mA for greater than one second ). Set DTC 9A5615 when antenna is short to battery or open (Phantom supply current < 20ma for greater than one second.) | Antenna Type – 00,10, or 11 (Active Type) |
|  | I | Antenna2 | Y | Set DTC 9D5511 when antenna is short to ground (Phantom supply current > 140ma for greater than one second ). Set DTC 9D5515 when antenna is short to battery or open (Phantom supply current < 20ma for greater than one second.) | Antenna 2 = Enabled |
| J3-1 | O | USB1 Vbus | N |  | N/A |
| J3-2 | I | USB1 D- | Y | USB1 Short to Ground or Overloaded DTC 925211 | USB = Present (Note: This is only applicable for ACMs with USB) |
| J3-3 | I | USB1 D+ | Y | USB1 Short to Ground or Overloaded DTC 925211 | USB = Present  (Note: This is only applicable for ACMs with USB) |
| Shield | I | USB1-Shield | N |  | N/A |
| J3-5 | I | USB1-Ground | N |  | N/A |
| A2B | I/O | A2B | Y | Set for opens, shorts, miswired, and communication failures as described in the continuous DTCs with a one (1) second failure instead of five (5). | A2B = Enabled |

## SWR-REQ-242677/A-Speaker Walkaround

* This test is commanded through the APIM just like as defined in Bezel Diagnostics and ACM does not contain this test number.
* Volume default is determined by DIDs FD03 and FD04, but can be adjusted during the test by the volume button.
* This test will produce tones to the speakers (1kHz, Main Speakers, 5kHz Tweeters, 100Hz Subwoofers)
* The ACM will cycle the speakers for 1.5 seconds each in the following sequence (LF, LF Tweeter (if front tweeters configured), RF, RF Tweeter (if front tweeters configured), RR (if configured for Variable or Power Satellite), RR Tweeter (if rear tweeters configured), LR (if configured for Variable or Power Satellite), LR Tweeter (if rear tweeters configured), Subwoofer(if configured), Center(if configured), 3rd Row Left Speaker (if configured), 3rd Row Left Tweeter (if configured), 3rd Row Right Speaker (if configured), and 3rd Row Right Tweeter (if configured) based on volumes defined in Supplier DIDs FD03 and FD04 [25% +/- 3%, 25% +/- 3% respectively by default].

## SWR-REQ-242679/B-AM/FM Antenna Connection Test

* This test is to measure a configured AM station signal strength and compare it to a configured value to ensure that the AM/FM Antenna is connected.
* This test is intended for **EOL Only (not intended for Service Tools)**
* ACM will switch to AM station configured by EOL(Block DE01).
* When ACM has verified that tuner is at correct station, the ACM will measure the signal strength for 1.5 seconds (averaging the strength). It will also record the average strength in supplier DID FD20.
* The measured strength will be compared to acceptable value configured by EOL (DE02). If strength is lower than Configured Value, then DTC 9A5621 will set.
* The AM/FM Antenna Connection Test will work regardless if AM Tuner is enabled or disabled.

The Antenna Connection Self Test (6006) shall enter self-test only if all the following criteria are met(if not correct: send conditions not correct message to tester):

* Ignition is in the Run or Accessory State (0x3B2 and 0x167)
* Battery Voltage is Between 10-16 volts
* Normal Diagnostic Session (not programming modes)
* Antenna Connection Self Test (6006) is requested by tester.

The Antenna Connection Self Test (6006) shall exit self-test if any one of the following criteria is met:

* Ignition transitions out of Run or Accessory State (0x3B2 and 0x167)
* Battery Voltage Drops below 9 volts or exceeds 16 volts
* A stop routine command is issued.
* Tester does communicate for more than five (5) seconds.
* Test is complete.

## SWR-REQ-242680/A-A2B Configuration Write to Slave Modules Execution Routine (ACM Initiated)

* This execution will write A2B configurations to the peripherals (such as DSP).
* It will use Stream ID configuration in DE00 to write the appropriate data.
* The execution routine identifier is 6037.

The A2B Configuration Write to Slave Modules Execution Routine (6037) shall enter self-test only if all the following criteria are met (if not correct: send conditions not correct message to tester):

* Ignition is in the Run or Accessory State (0x3B2 and 0x167)
* Battery Voltage is Between 10-16 volts
* Normal Diagnostic Session (not programming modes)
* A2B Configuration Write to Slave Modules Execution Routine (6037) is requested by tester.
* Module has been configured (DTC E10000 is not present)
* A2B Clear Error Counters Execution Routine
* This execution will clear A2B Error Counters (DIDs 8055-805A).
* The execution routine identifier is 6038.

The A2B Clear Error Counters Execution Routine (6037) shall enter self-test only if all the following criteria are met (if not correct: send conditions not correct message to tester):

* Ignition is in the Run or Accessory State (0x3B2 and 0x167)
* Battery Voltage is Between 10-16 volts
* Normal Diagnostic Session (not programming modes)
* A2B Clear Error Counters Execution Routine (6037) is requested by tester.

## Offboard Diagnostic Routines (Using DIDs)

### SWR-REQ-242702/A-Speaker Walkaround with Tones

This special routine could be used at a dealer side:

Take control over the radio:

ECU Status (DID 7215)

Active Radio self-created Sine tone:

Speaker Test Tone (DID 8022)

Use Volume Control to set the volume:

Audio Volume Level (DID 833B)

Set Speaker pattern:

Speaker Status (DID 8003)

### SWR-REQ-242703/A-Speaker Walkaround Offboard

This special routine could be used to off-board evaluate the Speaker connection, e.g. eCATS driven Speaker Walk around using FM source.

Take control over the radio:

ECU Status (DID 7215)

Set to Radio and FM Freq corresponding to in-plant FM transmitter:

FM Frequency (DID 61A1)

Use Volume Control to set the volume:

Audio Volume Level (DID 833B)

Set Speaker pattern:

Speaker Status (DID 8003)

Based on external measurement the eCATS will set an off-board DTC or not.

### SWR-REQ-242704/A-Antenna Reception Test (Off-board)

Take control over the radio:

ECU Status (DID 7215)

Set to Radio and FM Freq corresponding to in plant FM transmitter:

FM Frequency (DID 61A1)

Use Volume Control to set the volume, even to “0”.

Audio Volume Level (DID 833B)

Use to readout Signal strength:

Radio Frequency Field Strength - Tuner 1 (dBuV) (DID 8304)

Radio Frequency Field Strength - Tuner 2 (dBuV) [Dual Tuner Radios] (DID 8041)

Based on external measurement the eCATS would set an off-board DTC or not.

## Chimes Diagnostics for PAC

### SWR-REQ-347841/A-Powerup Chimes Test Flowchart



### SWR-REQ-347842/A-Continuous Chimes Test Flowchart



### SWR-REQ-347843/B-Chimes Speaker Check at Startup (Powerup Chimes)

This test ensures the speakers are connected in order to play chimes. Also, this test is used for the ANC/ESE feature to ensure that speakers are connected for these features When HMI Mode is off, then the ACM will check all the speakers. This test is used for only chimes playability and ANC/ESE.

#### SWR-REQ-347844/C-Chime Speaker Check at Startup Flowchart



### SWR-REQ-347845/B-Speaker Shorts Test During Continuous Mode for Chimes

This test is run during the normal HMI Mode is On. It checks to ensure that there are no shorts on any of speakers used for chimes.

#### SWR-REQ-347846/B-Speaker Shorts Test for Chimes Continuous Flowchart



## PAC DIDs

### SWR-REQ-412675/A-GMRDB Supported DIDs

All required DIDs shall be available when battery is connected and ACM is woken up by CAN network.

All required DIDs required by Netcom specifications shall be met.

* D111 Battery Voltage (volts)
* 8304 Radio Frequency Field Strength – Tuner 1 (dBuV)
* 8041 Radio Frequency Field Strength – Tuner 2 (dBuV) [Dual Tuner Radios]
* 1505 Vehicle Speed (kph)
* 411F – Key Status (Ignition)
* F190 – Current VIN (from message 0x40A – All 0s if missing)
* C006 – VIN Missing Counter
* C007 – VIN Invalid Counter
* C008 – VIN History List
* DID 833B – Audio Volume Level (in steps) (2F adjustable)
* DID 8003 – Speaker Status (2F – Temporary Value is required) – ACM will mute/unmute speakers based on DID control.
* DID 7215 – ECU Status (2F – Temporary Value is required) – ACM will turn on to FM1 if commanded on via DID control and set to All Seats Occupancy (if applicable). (will allow speaker walkaround from FCDIM/APIM if requested in this state
* DID 61A1 – FM Frequency (2F – Temporary Value is required) Tuner will change to FM when DID is activated.
* DID 833D Byte 2 Bit1 – Convertible Status
* DID F18C – Serial Number (Format: Serial number + Padded with Nulls)
* DID 8022 – Speaker Test Tone (plays a sine wave through speakers when requested 2F – Temporary Value is required)
* DID 8056 – Node1 Error Counter
* DID 8057 – Node2 Error Counter
* DID 8058 – Node3 Error Counter
* DID 8059 – Node4 Error Counter
* DID 805A – Node5 Error Counter
* DID 8055 – A2B Master Error Counter
* DID 9927 – Internal Ambient Temperature (Main Board)
* 833A –AM Tuner Radio Frequency (2F – Temporary Value is required) Tuner will change to AM when DID is activated.
* F120 – HD/DAB Firmware Software Part Number (Only required for radios equipped with HD or DAB)
* F121 – Dirana 3 (or other DSP) Firmware Part Number (Only required for EU led radios)
* F122 – DAB/TPEG Software Part Number (Only required for TPEG Radios)
* F124 – Digital Media Chimes Calibration Part Number
* DD00 – Global Real Time
* DD01 – Total Distance
* DD09 – Vehicle Speed
* DD0A – Diagnostic Vehicle Mode
* F0E8 – Subwoofer Serial Number (read on every ignition cycle, FFs if part number cannot be read after 1 second) (Serial Number will be padded with 00s after Part Number has been read)
* F129 – Subwoofer Part Number (read on every ignition cycle, FFs if part number cannot be read after 1 second) (Part Number will be padded with 00s after Part Number has been read)

### SWR-REQ-242713/A-RDS Required DIDs

These DIDs are required in all RDS equipped radios.

* 830D – RDS Traffic Program Identification
* 830A – RDS Station Identification Code
* 830B – RDS Station Name
* 8308 – RDS Quality Value
* 800B – FM Text
* 8307 – Adjacent Radio Station Interference Noise
* 8306 – Radio Station Multipath Interference
* 8020 – Traffic Message Channel Information

### SWR-REQ-242714/A-DAB Required DIDs

These DIDs are required in all DAB equipped radios.

* 8054 – Digital Tuner Received Signal Quality
* 802F – Digital Tuner Parameter Status
* 8030 – Digital Tuner Received Signal Quality

### SWR-REQ-412676/A-PAC Supplier DIDs

* FD21 – AM Seek/Stop Sensitivity – (2F – Temporary Value is required – default is 35dBuV )
* Range 0 to 255, Units in dBuV, Size 1 Byte, Resolution 1
* FD22 – FM Seek/Stop Sensitivity – (2F – Temporary Value is required – default is 35dBuV )

– Range 0 to 255, Units in dBuV, Size 1 Byte, Resolution 1

* FD20 – Averaged Signal Strength Measured in AM/FM Antenna Test

– Range 0 to 255, Units dBuV, Size 1 Byte, Resolution 1 – Value is 0dBuV if test has never been ran. Value is stored until battery has been pulled or test overwrites with new value.

* FD03 – Normal Speaker (Includes Satellites and Aux Normal Speakers) Walkaround Volume (2E – Permanent Value is required – default is 25% full volume) – Range 0 to 100.000000065, Units in Percent Volume, Size 1 Byte, Resolution 0.392156863 (This includes Center Image)
* FD04 – Subwoofer Speaker Walkaround Volume (2E – Permanent Value is Required– default is 25% full volume) ) – Range 0 to 100.000000065, Units in Percent Volume, Size 1 Byte, Resolution 0.392156863
* FD08 – Fatal Internal Error States (4 Byte BMP DID)
  + Include the following states:
    - Byte 1 Bit 7 – TPEG Loss Communication Active
    - Byte 1 Bit 6 – TPEG Loss Communication History
    - Byte 1 Bit 5 – HD Radio Loss Communication Active
    - Byte 1 Bit 4 – HD Radio Loss Communication History
    - Byte 1 Bit 3 – Reserved
    - Byte 1 Bit 2 – Reserved
    - Byte 1 Bit 1 – HD Radio Fatal Error Active
    - Byte 1 Bit 0 – HD Radio Fatal Error History
    - Byte 2 Bit 7 – DAB Loss Communication Active
    - Byte 2 Bit 6 – DAB Loss Communication History
    - Byte 2 Bit 5 – ANC Loss Communication Active
    - Byte 2 Bit 4 – ANC Loss Communication History
    - Byte 2 Bit 3 – ANC Fatal Error Active
    - Byte 2 Bit 2 – ANC Fatal Error History
    - Bytes 2 (Bits 1-0) and Bytes 3-4 Reserved for Future Use
* FD0A – Reception Control Parameters – 2E for Permanent Change (1 byte BMP DID)
  + Include the following states:
    - Byte 1 Bit 7 – AM Noise Blanker (0 – enable, 1 – disable)
    - Byte 1 Bits 6-0 – Reserved
* FD0B – HD Data Hysteresis Timer – 2E for Permanent Change (1 byte Unsigned DID) – Range 0 to 255, Units in Seconds, Resolution 1, Default 17 seconds
* FDA2 – Treble Level (in steps) (2F – Temporary Value is required) – Range 0 to 255, Units in Steps, Resolution 1, Default as Defined in SPSS for Treble Level
* FDA3 – Bass Level (in steps) (2F – Temporary Value is required)
* – Range 0 to 255, Units in Steps, Resolution 1, Default as Defined in SPSS for Bass Level
* FD12 – Missing Message (DTC C25300) – 4 Bytes Bitmapped
  + Byte 1 Bit 7 - 0x220 Currently Missing
  + Byte 1 Bit 6 - 0x220 Historical Missing
  + Byte 1 Bit 5 - 0x225 Currently Missing
  + Byte 1 Bit 4 - 0x225 Historical Missing
  + Byte 1 Bit 3- 0x2F4 Currently Missing
  + Byte 1 Bit 2 - 0x2F4 Historical Missing
  + Byte 1 Bit 1 - 0x2E3 Currently Missing
  + Byte 1 Bit 0 - 0x2E3 Historical Missing
  + Byte 2 Bit 7 - 0x229 Currently Missing
  + Byte 2 Bit 6 - 0x229 Historical Missing
  + Byte 2 Bit 5 - 0x222 Currently Missing
  + Byte 2 Bit 4 - 0x222 Historical Missing
  + Byte 2 Bits 3-0 Reserved
  + Bytes 3-4 Reserved
* FD13 – Missing Message (DTC C23800) – 4 Bytes Bitmapped
  + Byte 1 Bit 7 - 0x224 Currently Missing
  + Byte 1 Bit 6 - 0x224 Historical Missing
  + Byte 1 Bits 5-0 Reserved
  + Bytes 2-4 Reserved
  + FD14 – Missing Message (DTC C25600) – 4 Bytes BitmappedByte 1 Bit 7 - 0x2A0 Currently Missing
  + Byte 1 Bit 6 - 0x2A0 Historical Missing
  + Byte 2 Bits 5-0 Reserved
  + Bytes 3-4 Reserved
* FD16 – Missing Message (DTC C10000) – 4 Bytes Bitmapped
  + Byte 1 Bit 7 - 0x167 Currently Missing
  + Byte 1 Bit 6 - 0x167 Historical Missing
  + Byte 1 Bit 5 - 0x202 Currently Missing
  + Byte 1 Bit 4 - 0x202 Historical Missing
  + Byte 2 Bits 3-0 Reserved
  + Bytes 3-4 Reserved
* FD17 – Missing Message (DTC C14000) – 4 Bytes Bitmapped
  + Byte 1 Bit 7 - 0x3B2 Currently Missing
  + Byte 1 Bit 6 - 0x3B2 Historical Missing
  + Byte 2 Bits 5-0 Reserved
  + Bytes 3-4 Reserved
* FD18 – Missing Message (DTC C14200) – 4 Bytes Bitmapped
* Byte 1 Bit 7 - 0x277 Currently Missing
* Byte 1 Bit 6 - 0x277 Historical Missing
  + Byte 2 Bits 5-0 Reserved
  + Bytes 3-4 Reserved
* FD30 - T\_Stage1AccelerationEnter
  + 2E – Permanent Value is Required– (default is 400ms)
  + 1 byte DID, units msec, range 0-1275, resolution 5.0
* FD31 - T\_Stage1AccelerationExit
  + 2E – Permanent Value is Required– (default is 550ms)
  + 1 byte DID, units msec, range 0-1275, resolution 5.0
* FD32 - T\_Stage2AccelerationEnter
  + 2E – Permanent Value is Required– (default is 5ms)
  + 1 byte DID, units msec, range 0-1275, resolution 5.0
* FD33 - T\_Stage2AccelerationExit
  + 2E – Permanent Value is Required– (default is 5ms)
  + 1 byte DID, units msec, range 0-1275, resolution 5.0
* FD34 - S\_Stage1StepSize
  + 2E – Permanent Value is Required– (default is 8)
  + 1 byte DID, units int, range 0-255, resolution 1
* FD35 - S\_Stage2StepSize
  + 2E – Permanent Value is Required– (default is 6)
  + 1 byte DID, units int, range 0-255, resolution 1
* FD36 - N\_Stage1AccelerationEnter
  + FD382E – Permanent Value is Required– (default is 5)
  + 1 byte DID, units int, range 0-255, resolution 1
* FD37 - N\_Stage1AccelerationExit
  + 2E – Permanent Value is Required– (default is 5)
  + 1 byte DID, units int, range 0-255, resolution 1
* FD38 - N\_Stage2AccelerationEnter
  + 2E – Permanent Value is Required– (default is 5)
  + 1 byte DID, units int, range 0-255, resolution 1
* FD39 - N\_Stage2AccelerationExit
  + 2E – Permanent Value is Required– (default is 5)
  + 1 byte DID, units int, range 0-255, resolution 1
* FD41 - FM Seek/Stop Sensitivity Permanent - (2E - Permanent Value is required) - Units in dBuV, Size 1 Byte, Resolution 1)

->refer to HW spec about default value and range.

* FD42 - Low Mode AM Dynamic Search Sensitivity - (2E - Permanent Value is required) - Units in dB, Size 1 Byte, Resolution 1)

->refer to HW spec about default value and range.

* FD43 - High Mode AM Dynamic Search Sensitivity - (2E - Permanent Value is required) - Units in dB, Size 1 Byte, Resolution 1)

->refer to HW spec about default value and range.

## PAC Continuous DTCs

### SWR-REQ-412677/A-PAC Core DTCs

Core Continuous DTCs are set during normal operation mode (Run/ACC/Delayed Accessory.

Continuous DTCs shall be continuously monitored in the ignition state and shall have a fault condition associated with the DTC. Once a fault is logged, it shall log the DTC to permanent memory and state that the fault is active.

Once a fault is removed, the DTC shall update the DTC to aging and age the DTC for 80 ignition cycles.

Below is the table of DTCs and the expectation for setting the DTC:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DTC** | **Condition** | **DTC Trigger** | **Fault Action** | **Configuration Associated** |
| F00041 – Checksums | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | * + Flash ROM checksum failure | * + Radio will cease to function normally | N/A |
| F00041 – Checksums | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | * + EEPROM checksum failure | * + EEPROM portion cannot be used | N/A |
| F00042 – General Memory Fault | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | - EEPROM write failure (after retries have failed) | * + EEPROM portion is flagged for non-use | N/A |
| F00096 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Internal HD Module Failure | * + Loss of HD functionality   + See DID FD08 | HD Radio = Available with Integrated HD Radio Modules |
| F00096 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Internal DAB Module Failure | * + Loss of DAB functionality   + See DID FD08 | DAB Radio = Available with Integrated DAB Radio Modules |
| F00096 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Internal TPEG failure | * + Loss of TPEG functions | TPEG = Enabled |
| F00096 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Internal Bluetooth Failure | * + Loss of Bluetooth Functions | Bluetooth = Enabled |
| 9D5511 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Second antenna short to ground.  Phantom supply current > 140ma for greater than one second. | * + Loss of second tuner functionality.   + Power is turned off to antenna. | Dual Tuner Radios only and Antenna 2 is Enabled |
| 9D5515 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Second antenna short to battery or open.  Phantom supply current < 20ma for greater than one second. | * + Loss of second tuner functionality.   + Power is increased to antenna. | Dual Tuner Radios only and Antenna 2 is enabled |
| 9A5611 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | First antenna short to ground.  Phantom supply current > 140ma for greater than one second. | * + Loss of tuner functionality.   + Power is turned off to antenna. | Antenna Type – 00,10, or 11 (Active Type) |
| 9A5615 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | First antenna short to battery or open.  Phantom supply current < 20ma for greater than one second. | * + Loss of tuner functionality.   + Power is increased to antenna. | Antenna Type – 00,10, or 11 (Active Type) |
| F00317 | Key in Run, ACC, or Delayed Acc. Voltage is above 9 volts. | Set when Battery Voltage is Above (>) 16 volts for greater than 5.5 seconds. | Normal Operating Conditions may begin to shut down. | N/A |
| F00316 | Key in Run, ACC, or Delayed Acc. Voltage is above 9 volts. | Set when Battery Voltage is Below (<) 10 volts for greater than 10 seconds. | Normal Operating Conditions begin to shut down. MS-CAN communication will work until voltage drops below 9 volts. | N/A |
| E10000 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM has not received initial configuration for Blocks DE00-DE03. |  | See configuration section regarding blocks DE00-DE03. |
| E10100 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM is misconfigured – see Configuration section for DTC details |  | See configuration section. |
| 9A0111 – Short to Ground  9A0112 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted Left Front speaker. Chimes will be unavailable in ACM. | Speaker 1 Setting = Enabled (0x000-0x011) |
| 9A0211 – Short to Ground  9A0212 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted Right Front speaker. Chimes will be unavailable in ACM. | Speaker 2 Setting = Enabled (0x000-0x011) |
| 9A0311 – Short to Ground  9A0312 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted Right Rear speaker. Chimes will be unavailable in ACM. | Speaker 3 Setting = Enabled (0x000-0x011) |
| 9A0411 – Short to Ground  9A0412 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted Left Rear speaker. Chimes will be unavailable in ACM. | Speaker 4 Setting = Enabled (0x000-0x011) |
| 9A0511 – Short to Ground  9A0512 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted Center speaker. | Speaker 5 Setting = Enabled (0x000-0x011) |
| 9A0611 – Short to Ground  9A0612 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted Center speaker. | Speaker 6 Setting = Enabled (0x000-0x011) |
| 9A1111 – Short to Ground  9A1112 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted 3rd Row Left speaker. | Speaker 11 Setting = Enabled (0x000-0x011) |
| 9A1211 – Short to Ground  9A1112 – Short to Battery | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM amp chip registers short to ground or short to battery. | ACM may shut down faulted 3rd Row Right speaker. + | Speaker 12 Setting = Enabled (0x000-0x011) |
| 9A01101 – Shorted Together  9A0113 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted Left Front speaker. Chimes will be unavailable in ACM. | Speaker 1 Setting = Enabled (0x000-0x011) |
| 9A02101 – Shorted Together  9A0213 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted Right Front speaker. Chimes will be unavailable in ACM. | Speaker 2 Setting = Enabled (0x000-0x011) |
| 9A01301 – Shorted Together  9A0313 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted Right Rear speaker. Chimes will be unavailable in ACM. | Speaker 3 Setting = Enabled (0x000-0x011) |
| 9A04101 – Shorted Together  9A0413 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted Left Rear speaker. Chimes will be unavailable in ACM. | Speaker 4 Setting = Enabled (0x000-0x011) |
| 9A05101 – Shorted Together  9A0513 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted speaker. | Speaker 5 Setting = Enabled (0x000-0x011) |
| 9A06101 – Shorted Together  9A0613 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted speaker. | Speaker 6 Setting = Enabled (0x000-0x011) |
| 9A11101 – Shorted Together  9A1113 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted 3rd Row Left speaker. | Speaker 11 Setting = Enabled (0x000-0x011) |
| 9A12101 – Shorted Together  9A1213 – Open | On CAN wakeup. Voltage is between 10 and 16 volts. | ACM amp chip registers shorted together or open on wakeup. | ACM may shut down faulted 3rd Row Right speaker. + | Speaker 12 Setting = Enabled (0x000-0x011) |
| 928A13 – open  928A01 – shorted together  928A12 – Short to battery  928A11 – short to ground  928A09 – DC Offset | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM receives error from A2B subwoofer speaker 1 for either open, shorted together, short to battery, short together or DC offset. | Subwoofer Speaker 1 will shut down. | Subwoofer = Enabled |
| 928B13 – open  928B01 – shorted together  928B12 – Short to battery  928B11 – short to ground  928A09 – DC Offset | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM receives error from A2B subwoofer speaker 2 for either open, shorted together, short to battery, short together or DC offset. | Subwoofer Speaker 2 will shut down. | Subwoofer = Enabled |
| 928C13 – open  928C01 – shorted together  928C12 – Short to battery  928C11 – short to ground  928A09 – DC Offset | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM receives error from A2B subwoofer speaker 3 for either open, shorted together, short to battery, short together or DC offset. | Subwoofer Speaker 3 will shut down. | Subwoofer = Enabled |
| 928D13 – open  928D01 – shorted together  928D12 – Short to battery  928D11 – short to ground  928D09 – DC Offset | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM receives error from A2B subwoofer speaker 4 for either open, shorted together, short to battery, short together or DC offset. | Subwoofer Speaker 4 will shut down. | Subwoofer = Enabled |
| 923816 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM receives error from A2B subwoofer of an undervoltage condition. | ACM may shut down Subwoofer. | Subwoofer = Enabled |
| 923817 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM receives error from A2B subwoofer of an over voltage condition. | ACM may shut down Subwoofer. | Subwoofer = Enabled |
| E01A51 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when Calibration (Configuration) file is missing or corrupted | Flat EQ. | DE00 Byte 7 does not equal 00 (Slot 0) |
| 9A8913 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when SRM indicates that Satellite Antenna is Open. | Satellite Radio will not operate properly. | Internal SDARS = Available (Note: this is only for Integrated SDARS and ACM modules) |
| 9A8911 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when SRM indicates that Satellite Antenna is Shorted to Ground. | Satellite Radio will not operate properly. | Internal SDARS = Available (Note: this is only for Integrated SDARS and ACM modules) |
|  |  |  |  |  |
| 916A11 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to ground with Microphone 1. | Loss of microphone 1. | Mic1 = Enabled |
| 916A12 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to battery with Microphone 1. | Loss of microphone 1. | Mic1 = Enabled |
| 916A13 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an open with Microphone 1. | Loss of microphone 1. | Mic1 = Enabled |
| 916A01 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an error of shorted together with Microphone 1. | Loss of microphone 1. | Mic1 = Enabled |
| 917A11 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to ground with Microphone 2. | Loss of microphone 2. | Mic2 = Enabled |
| 917A12 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to battery with Microphone 2. | Loss of microphone 2. | Mic2 = Enabled |
| 917A13 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an open Microphone 2. | Loss of microphone 2. | Mic2 = Enabled |
| 917A01 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | detects an error of shorted together with Microphone 2. | Loss of microphone 2. | Mic2 = Enabled |
| 93F511 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to ground with Microphone 3. | Loss of microphone 3. | Mic3 = Enabled |
| 93F512 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to battery with Microphone 3. | Loss of microphone 3. | Mic3 = Enabled |
| 93F513 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an open with Microphone 3. | Loss of microphone 3. | Mic3 = Enabled |
| 93F501 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an error of shorted together with Microphone 3. | Loss of microphone 3. | Mic3 = Enabled |
| 940011 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to ground with Microphone 4. | Loss of microphone 4. | Mic4 = Enabled |
| 940012 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to battery with Microphone 4. | Loss of microphone 4. | Mic4 = Enabled |
| 940013 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an open with Microphone 4. | Loss of microphone 4. | Mic4 = Enabled |
| 940001 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an error of shorted together with Microphone 4. | Loss of microphone 4. | Mic4 = Enabled |
| 969011 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to ground with Microphone 5. | Loss of microphone 5. | Mic5 = Enabled |
| 969012 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to battery with Microphone 5. | Loss of microphone 5. | Mic5 = Enabled |
| 969013 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an open with Microphone 5. | Loss of microphone 5. | Mic5 = Enabled |
| 969001 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an error of shorted together with Microphone 5. | Loss of microphone 5. | Mic5 = Enabled |
| 969211 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to ground with Microphone 6. | Loss of microphone 6. | Mic6 = Enabled |
| 969212 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects a short to battery with Microphone 6. | Loss of microphone 6. | Mic6 = Enabled |
| 969213 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an open with Microphone 6. | Loss of microphone 6. | Mic6 = Enabled |
| 969201 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | ACM detects an error of shorted together with Microphone 6. | Loss of microphone 6. | Mic6 = Enabled |
| E40092 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | If no Ethernet frames are received for greater than five seconds from Gateway Module then the Link Status register of the PHY is read. If the Link Status indicates the link is down, then set the DTC. | ECG functions may not work. | Ethernet = Enabled |
| E40081 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | If 50% of the MAC frames received during a 5 second period have invalid CRC from the Gateway Module then set the DTC.  (CCPU) | ECG functions may not work. | Ethernet = Enabled |

### SWR-REQ-412678/A-PAC Missing Message DTCs

| **DTC** | **Condition** | **DTC Trigger** | **Fault Action** | **Configuration Associated** |
| --- | --- | --- | --- | --- |
| C10000 | Last known Key in RUN. Voltage is between 10 and 16 volts. Last Known Ignition is Stable. | Set when 0x167 is missing for more than five (5) seconds. | Radio will stop logging DTCs. | N/A |
| C14000 | Last known Key in RUN. Voltage is between 10 and 16 volts. Last Known Ignition is Stable. | Set when 0x3B2 is missing for more than five (5) seconds. | Radio will stop logging DTCs.  Loss of ANC/ESE Functionality. | N/A  S/W ANC = Present or S/W ESE = Enabled |
| C14200 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x277 is missing for more than five (5) seconds when Convertible = Available. | ACM will assume convertible top is in the Not Up state. | Convertible = Available |
| C10000 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x202 is missing for more than five (5) seconds. | Vehicle Speed Compensated Volume will be set to 0 mph conditions (no audio adjustment). | N/A |
| C25300 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x220, 0x225, 0x2F4 is missing for more than five (5) seconds. | Loss of chimes through radio. | N/A |
| C25300 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x2E3 is missing for more than five (5) seconds. | Radio will shut off. | N/A |
| C25300 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x229 is missing for more than five (5) seconds. | Loss of functionality. | N/A |
| C25300 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x222 is missing for more than five (5) seconds. | Loss of Sync Alerts. | N/A |
| C23800 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x224 is missing for more than five (5) seconds. | DSP Alerts are Inactive.  Loss of ANC/ESE Functionality | External DSP = Enabled |
| C25600 | Key in RUN. Voltage is between 10 and 16 volts. Ignition is Stable. | Set when 0x2A0 is missing for more than five (5) seconds. | Loss of button presses from EFP. | EFP = CAN Based |

### SWR-REQ-412679/A-PAC A2B DTCs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DTC** | **Condition** | **DTC Trigger** | **Fault Action** | **Configuration Associated** |
| 951113 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lost communication with ACM for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C13 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lost communication with Slave1 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D13 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lost communication with Slave2 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E13 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lost communication with Slave3 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F13 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lost communication with Slave4 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951013 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lost communication with Slave5 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951111 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B is short to ground with ACM for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C11 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B is short to ground with Slave1 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D11 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to ground with Slave2 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E11 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to ground with Slave3 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F11 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to ground with Slave4 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951011 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to ground with Slave5 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951112 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B is short to battery with ACM for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C12 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B is short to battery with Slave1 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D12 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to ground with Slave2 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E12 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to battery with Slave3 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F12 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to battery with Slave4 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951012 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B short to battery with Slave5 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951101 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B is shorted together with ACM for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C01 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B is shorted together with Slave1 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D01 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B shorted together with Slave2 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E01 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B shorted together with Slave3 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F01 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B shorted together with Slave4 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951001 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B shorted together with Slave5 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951195 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lines are reversed with ACM for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C95 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lines are reversed with Slave1 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D95 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lines are reversed with Slave2 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E95 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lines are reversed with Slave3 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F95 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lines are reversed with Slave4 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951095 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B lines are reversed with Slave5 for greater than five (5) seconds. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C8F | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B has received 5 bit error interrupts within a key cycle from Slave 1. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D8F | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B has received 5 bit error interrupts within a key cycle from Slave 2. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E8F | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B has received 5 bit error interrupts within a key cycle from Slave 3. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F8F | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B has received 5 bit error interrupts within a key cycle from Slave 4. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 95108F | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when A2B has received 5 bit error interrupts a key cycle rom Slave 5. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C87 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot communicate with Slave1 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D87 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot communicate with Slave2 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E87 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot communicate with Slave3 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F87 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot communicate with Slave4 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951087 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot communicate with Slave5 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950C55 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot configure Slave1 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950D55 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot configure Slave2 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950E55 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot configure Slave3 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 950F55 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot configure Slave4 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |
| 951055 | Key in Run, ACC, or Delayed Acc. Voltage is between 10 and 16 volts. | Set when ACM cannot configure Slave5 over A2B. | Loss of audio. Chimes will revert back to backup. | A2B is enabled. |

## PAC Configuration DIDs (DExx)

### SWR-REQ-413532/A-DE00 - Vehicle/PAC Features

Configuration Blocks DE00 - is defined below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Configuration Block** | **Byte** | **Bit(s)** | **Description** | **Default** | **Operation** | **Configuration DTC** |
| DE00 | 1 | 7 | SDARS | 0 | 0 - Integrated SDARS on – This enables the logging of SDARS Antenna DTC.  1 – Integrated SDARS off - This disables the logging of SDARS Antenna DTC. | N/A |
|  |  | 6 | AM Tuner | 0 | 0 – Enabled  1 - Disabled | N/A |
|  |  | 5 | FM Tuner | 0 | 0 – Enabled  1 - Disabled | N/A |
|  |  | 4 | Enhanced Memory | 0 | 0 – Not Present  1 - Present | N/A |
|  |  | 3 | HD Radio | 0 | 0 –HD Radio  1 – No HD Radio |  |
|  |  | 2 | DAB Tuner | 0 | 0 – DAB Tuner Unavailable  1 – DAB Tuner Available | Yes – Not valid (“1”) with Internal SDARS (SDARS has priority) |
|  |  | 1 | Bluetooth | 0 | 0 – Not Present  1 - Present | N/A |
|  |  | 0 | EQ | 0 | 0 – Flat  1 - Downloaded | NA |
| DE00 | 2 | 7-5 | Speaker 1 Setting | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 2 | 4 | External DSP (Missing Message DTC setting) | 0 | 0 – Disabled  1 – Enabled | N/A |
| DE00 | 2 | 3-1 | Speaker 2 Setting | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 2 | 0 | Reserved | 0 | N/A | N/A |
| DE00 | 3 | 7-5 | Speaker 3 Setting | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 3 | 4 | Reserved | 0 | N/A | N/A |
| DE00 | 3 | 3-1 | Speaker 4 Setting | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 3 | 0 | Subwoofer (DTCs for Speaker Faults come over A2B for Subwoofer Amp) | 0 | 0 – Not Available  1 - Available | N/A |
| DE00 | 4 | 7-5 | Speaker 5 Setting | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 4 | 4 | Speaker 5 – AVAS/Interior | 0 | 0 – AVAS  1 – Interior Speaker | N/A |
| DE00 | 4 | 3-1 | Speaker 6 Setting | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 4 | 0 | Speaker 6 – AVAS/Interior | 0 | 0 – AVAS  1 – Interior Speaker | N/A |
| DE00 | 5 | 7-5 | Third Row Speaker Left Output (Speaker 11) | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 5 | 4 | Reserved | 0 | N/A | N/A |
| DE00 | 5 | 3-1 | Third Row Speaker Right Output (Speaker 11) | 000 | 000 – Main Speaker Only  001 – Tweeter Only  010 –Tweeter + Main Speaker  011 – Two Mains  100 –Disabled  101-111 – Reserved | Yes, if equal to 101 and 111. Will function as 000. |
| DE00 | 5 | 0 | Tune Knob Acceleration (Non-NA Tuner) | 0 | 0 – Disabled  1 - Enabled | N/A |
| DE00 | 6 | 7-6 | Speaker 1 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 6 | 5-4 | Speaker 2 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 6 | 3-2 | Speaker 3 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 6 | 1-0 | Speaker 4 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 7 | 7-6 | Speaker 5 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 7 | 5-4 | Speaker 6 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 7 | 3-2 | Speaker 7 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 7 | 1-0 | Speaker 8 Output Chimes | 00 | 00 – Not a Chime Speaker  01 – Main Speaker Chime  10 – Main and Secondary Speaker Chime  11 – Secondary Speaker Chime | N/A |
| DE00 | 8 | 7 | Antenna Type | 00 | 00 – Active Diversity with Phantom FM1  01 – Passive (Antenna 2 Disabled, Phantom Disabled)  10 – Active Non-Diversity (Phantom Enabled, Antenna2 Disabled)  11 – Reserved | Yes, when set o 11. Will act as 00 in this case. |
| DE00 | 8 | 6 | Enable Max Volume Radio Configuration (My Fleet Feature for Police and Taxi) | 0 | 0 – Disable Max Volume Radio Configuration  1 – Enable Max Volume Radio Configuration | N/A |
| DE00 | 8 | 5 | Convertible | 0 | 0 – Non-Convertible  1 – Convertible | N/A |
| DE00 | 8 | 4 | Ethernet (only applies to variants that support Ethernet) | 0 | 0 – Ethernet Enabled  1 – Ethernet Disabled | N/A |
| DE00 | 8 | 3 | Cyclone Chimes | 0 | 0 – Disabled  1 – Enabled | N/A |
| DE00 | 8 | 2 | ANC | 0 | 0 – Disabled  1 – Enabled | N/A |
| DE00 | 8 | 1 | ESE/Propulsion Sound | 0 | 0 – Disabled  1 – Enabled | N/A |
| DE00 | 8 | 0 | My Seat Space (MSS) | 0 | 0 – Disabled  1 - Enabled | N/A |
| DE00 | 9 | 7-0 | A2B Bus Configuration | 0x00 | Enumberated 0-255 | N/A |
| DE00 | 10 | 7 | AVAS | 0 | 0 – Disabled  1 - Enabled | N/A |
| DE00 | 10 | 6 | AVAS System | 0 | 0 – Internal  1 - External | N/A |
| DE00 | 10 | 5-0 | Reserved | 00 0000 | Reserved | N/A |
| DE00 | 11 | 7-0 | Amplifier Selection for A2B | 0x00 | Enumberated 0-255 | N/A |
| DE00 | 12 | 7-0 | Reserved |  |  | N/A |
| DE00 | 13 | 7-0 | Reserved |  |  | N/A |
| DE00 | 14 | 7-6 | Microphone 1 | 00 | 00 – Not Present  01 – Microphone Present (Interior)  10 – Microphone Present (Exterior)  11 – Reserved | Yes, if equal to 11. Function to follow 00 (Not Present) |
|  |  | 5-4 | Microphone 2 | 00 | 00 – Not Present  01 – Microphone Present (Interior)  10 – Microphone Present (Exterior)  11 – Reserved | Yes, if equal to 11. Function to follow 00 (Not Present) |
|  |  | 3-2 | Microphone 3 | 00 | 00 – Not Present  01 – Microphone Present (Interior)  10 – Microphone Present (Exterior)  11 – Reserved | Yes, if equal to 11. Function to follow 00 (Not Present) |
|  |  | 1-0 | Microphone 4 | 00 | 00 – Not Present  01 – Microphone Present (Interior)  10 – Microphone Present (Exterior)  11 – Reserved | Yes, if equal to 11. Function to follow 00 (Not Present) |
| DE00 | 15 | 7-6 | Microphone 5 | 00 | 00 – Not Present  01 – Microphone Present (Interior)  10 – Microphone Present (Exterior)  11 – Reserved | Yes, if equal to 11. Function to follow 00 (Not Present) |
|  |  | 5-4 | Microphone 6 | 00 | 00 – Not Present  01 – Microphone Present (Interior)  10 – Microphone Present (Exterior)  11 – Reserved | Yes, if equal to 11. Function to follow 00 (Not Present) |
|  |  | 3- | Reserved | 0000 | Reserved | N/A |
|  |  |  |  |  |  |  |
| DE00 | 16-20 | 7-0 | Reserved | 0000 0000 | N/A | N/A |

### SWR-REQ-242717/C-Configuration Blocks DE01 and DE02

Blocks DE01 and DE02 follows:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Config Block** | **Size** | **Description** | **Default** | **Res** | **Offset** | **Min** | **Max** | **Units** | **Configuration DTC** |
| DE01 | 8 | AM Station for Antenna Test – NA Tuner | 590 | 10 | 530 | 530 | 3080 | kHz | Set for greater than 1710. |
| DE01 | 8 | AM Station for Antenna Test – GCC Tuner | 585 | 9 | 531 | 531 | 2826 | kHz | Set for greater than 1620. |
| DE01 | 8 | AM Station for Antenna Test – Brazil Tuner | 590 | 10 | 530 | 530 | 3080 | kHz | Set for greater than 1710. |
| DE01 | 8 | AM Station for Antenna Test – Europe Tuner | 576 | 9 | 522 | 522 | 2826 | kHz | Set for greater than 1720. |
| DE01 | 8 | AM Station for Antenna Test –Asia Pacific Tuner | 576 | 9 | 522 | 522 | 2826 | kHz | Set for greater than 1710. |
| DE02 | 8 | AM Signal Strength – Acceptable Value | 35 | 1 | 0 | 0 | 255 | dBuV | N/A |

### SWR-REQ-413533/A-DE03 - Region Configurations

Block DE03 Follows:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Config Block** | | **Description** | | | **State Value** | | **Default** | | **Configuration DTC** | |
| DE03 | | Byte 1 - Tuner Region1 | | | 00 – NA | | 00 | |  | |
|  | |  | | | 01 – GCC | |  | |  | |
|  | |  | | | 02 – Brazil | |  | |  | |
|  | |  | | | 03 - Europe | |  | |  | |
|  | |  | | | 04 – Asia Pacific (APA) | |  | |  | |
|  | |  | | | 05 – South America | |  | |  | |
|  | |  | | | 06-FF - Reserved | |  | | Yes | |
| **Config Block** | **Byte** | | **Size** | **Description** | | **State Value** | | **Default** | | **Configuration DTC** |
| DE03 | 2 | | 8 | First Letter of WERS Destination Code – ASCII | | ASCII Code of the first letter of the WERS Destination Code | | 00 | | Yes – set E10100 if Bytes 1 and 2 don’t equal a valid country code |
| DE03 | 3 | | 8 | Second Letter of WERS Destination Code – ASCII | | ASCII Code of the second letter of the WERS Destination Code | | 00 | | Yes – set E10100 if Bytes 1 and 2 don’t equal a valid country code |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Config Block** | **Byte** | **Size** | **Description** | **Default** | **Offset** | **Resolution** | **Min** | **Max** | **Units** | **Configuration DTC** |
| DE03 | 4 | 8 | Max Radio Volume (only applies if configuration MyFleet is configured as Enabled) | 0xFF (100%) | 0 | 0.392157 | 0 | 100 | Percent | N/A |
| DE03 | 5-10 | 8 | Reserved |  |  |  |  |  |  |  |

## SWR-REQ-242692/A-IVS

The supplier shall meet the latest IVS requirements at time of sourcing.

# FRD-REQ-414491/A-Change Log

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Date of Change** | **Requirements Changed** | **Details** |
| 8.0.0 – DRAFT AA | 04/15/2021 | All | Initial Draft |
| 8.0.0 | 10/7/2021 | SWR-REQ-242675 | Added Y to service 27 for Session 03. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412674 | Added Shorted together DTCs for Interior Mics 1-6. (JIRA AOS-52345) |
| 8.0.0 | 10/7/2021 | SWR-REQ-242679 | Added note that routine 6006 should run regards of AM Tuner Configuration. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-242680 | Correct incorrect execution number in exit conditions. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412675 | Renamed DID descriptions of 8056, 8057, 8058, 8059, and 805A to more reflect current naming standards. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412675 | Added new DIDs F0E8 and F129. (JIRA AOS-52345) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412676 | Removed DID FD10 and updated DIDs FD12, FD3, FD16, FD17 and FD18 based on latest database. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Added subtype 01 and 13 for Speaker DTCs to reflect that these should be set on CAN wakeup. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Added new speaker DTCs 928A, 928B, 928C, and 928D with subtypes 01, 11, 12, 13, and 09 when configured for subwoofer. (JIRA AOS-52345) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Added DTC 923816 and 923817 when subwoofer = enabled. (JIRA AOS-52345) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Removed DTC E02400 as it is no longer needed. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Removed A2B DTCs as they are covered in another section. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Added Shorted together DTCs for Interior Mics 1-6. (JIRA AOS-52345) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Corrected Fault action for Interior Mics 1-6. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Removed DTCs for Mic 7 and Mic 8. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412677 | Added DTC E40092 and E40081 when Ethernet is enabled. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-412678 | Added new DTCs for all known missing message DTCs. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Added new configuration to DE00 Byte 2 Bit 4 External DSP (Missing Message DTC Setting) to enable logging of missing CAN messages from the DSP. |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Correct wrong DExx number from DE04 to DE00 for Speaker 5 Setting and Speaker 5 – AVAS/Interior. (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Added new configuration to DE00 Byte 5 Bit 0 (Tune Knob Acceleration). (JIRA AOS-52344) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Added new configuration to DE00 Byte 8 Bit 0 (My Seat Space). (JIRA AOS-52348) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Renamed DE00 Byte 9 to A2B Bus Configuration to meet new naming conventions. (JIRA AOS-29559) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Added new configuration parameter to DE00 Byte 10 Bit 7 (AVAS). (JIRA AOS-48894) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Added new configuration parameter to DE00 Byte 10 Bit 6 (AVAS System). (JIRA AOS-48893) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Added new configuration parameter to DE00 Byte 11 (Amplifier Selection for A2B). (JIRA AOS-52343) |
| 8.0.0 | 10/7/2021 | SWR-REQ-413532 | Removed Microphone 7 and 8 configurations from DE00. (JIRA AOS-52344) |

# FRD-REQ-242662/A-Appendix A - DTC Failure Sub Type Definitions

## SWR-REQ-242695/A-Appendix A - DTC Failure Sub Type Definitions

Table 1 — DTC Failure Sub Type definition for failure category ‘0’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **General Failure Information** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 00 | 0000 | **no sub type information** |
|  |  | This sub type is used for failures where the base DTC text string provides the complete description of the failure itself (no Category and no Sub Type information used, e.g. emissions-related DTC (012700 hex): P0127 Intake Air Temperature Too High). |
| 01 | 0001 | **General Electrical Failure** |
|  |  | This sub type is used for General Electrical Failures that cannot be assigned to a specific sub type (Category information and no Sub Type information, e.g. DTC (011501): P0115 Engine Coolant Temperature Circuit – General Electrical Failure). |
| 02 | 0010 | **General signal failure** |
|  |  | This sub type is used for General Signal Failures that cannot be assigned to a specific sub type (Category information and no Sub Type information, e.g. DTC (014802): P0148 Fuel Delivery Error – General Signal Failure). |
| 03 | 0011 | **FM (Frequency Modulated) / PWM (Pulse Width Modulated) Failures** |
|  |  | This sub type is used for FM / PWM Failures that cannot be assigned to a specific sub type. |
| 04 | 0100 | **System Internal Failures** |
|  |  | This sub type is used for server Internal Failures that cannot be assigned to a specific sub type. |
| 05 | 101 | **System Programming Failures** |
|  |  | This sub type is used for System Programming Failures that cannot be assigned to a specific sub type. |
| 06 | 0110 | **Algorithm Based Failures** |
|  |  | This sub type is used for Algorithm Based Failures that cannot be assigned to a specific sub type. |
| 07 | 0111 | **Mechanical Failures** |
|  |  | This sub type is used for Mechanical Failures that cannot be assigned to a specific sub type. |
| 08 | 1000 | **Bus Signal / Message Failures** |
|  |  | This sub type is used for Bus Signal / Message Failures that cannot be assigned to a specific sub type. |
| 09 | 1001 | **Component Failures** |
|  |  | This sub type is used for Component Failures that cannot be assigned to a specific sub type. |

Table 2 — DTC Failure Sub Type definition for failure category ‘1’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **General Electrical Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 11 | 0001 | **circuit short to ground** |
|  |  | This sub type is used for failures, where the server measures ground (battery negative) potential for greater than a specified time period or when some other value is expected. |
| 12 | 0010 | **circuit short to battery** |
|  |  | This sub type is used for failures, where the server measures vehicle system (battery positive) potential for greater than a specified time period or when some other value is expected. |
| 13 | 0011 | **circuit open** |
|  |  | This sub type is used for failures, where the server determines an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output, etc. |
| 14 | 0100 | **circuit short to ground or open** |
|  |  | This sub type is used for failures, where the condition detected by the server is the same for either indicated failure mode. |
| 15 | 0101 | **circuit short to battery or open** |
|  |  | This sub type is used for failures, where the condition detected by the server is the same for either indicated failure mode. |
| 16 | 0110 | **circuit voltage below threshold** |
|  |  | This sub type is used for failures, where the server measures a voltage below a specified range but not necessarily a short to ground. |
| 17 | 0111 | **circuit voltage above threshold** |
|  |  | This sub type is used for failures where, the server measures a voltage above a specified range but not necessarily a short to battery. |
| 18 | 1000 | **circuit current below threshold** |
|  |  | This sub type is used for failures, where the server measures current flow below a specified range. |
| 19 | 1001 | **circuit current above threshold** |
|  |  | This sub type is used for failures, where the server measures current flow above a specified range. |
| 1A | 1010 | **circuit resistance below threshold** |
|  |  | This sub type is used for failures, where the server infers a circuit resistance below a specified range. |
| 1B | 1011 | **circuit resistance above threshold** |
|  |  | This sub type is used for failures, where the server infers a circuit resistance above a specified range. |
| 1C | 1100 | **circuit voltage out of range** |
|  |  | This sub type is used for failures, where the server measures a voltage outside the expected range but not identified as too high or too low. |
| 1D | 1101 | **circuit current out of range** |
|  |  | This sub type is used for failures, where the server measures a current outside the expected range but not identified as too high or too low. |
| 1E | 1110 | **circuit resistance out of range** |
|  |  | This sub type is used for failures, where the server measures a resistance outside the expected range but not identified as too high or too low. |
| 1F | 1111 | **circuit intermittent** |
|  |  | This sub type is used for failures, where the server momentarily detects one of the conditions defined above, but not long enough to set a specific sub type. |

Table 3 — DTC Failure Sub Type definition for failure category ‘2’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **General Signal Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 21 | 0001 | **signal amplitude < minimum** |
|  |  | This sub type is used for failures where the server measures a signal voltage below a specified range but not necessarily a short to ground (e.g., low gain). |
| 22 | 0010 | **signal amplitude > maximum** |
|  |  | This sub type is used for failures where the server measures a signal voltage above a specified range but not necessarily a short to battery (e.g., gain too high). |
| 23 | 001 | **signal stuck low** |
|  |  | This sub type is used for failures where the server measures a signal that remains low when transitions are expected. |
| 24 | 0100 | **signal stuck high** |
|  |  | This sub type is used for failures where the server measures a signal that remains high when transitions are expected. |
| 25 | 0101 | **signal shape / waveform failure** |
|  |  | This sub type is used for failures where the shape of the signal (plot of the amplitude with respect to time) is not correct, e.g., improper circuit impedance. |
| 26 | 0110 | **signal rate of change below threshold** |
|  |  | This sub type is used for failures where the signal transitions more slowly than is reasonably allowed. |
| 27 | 0111 | **signal rate of change above threshold** |
|  |  | This sub type is used for failures where the signal transitions more quickly than is reasonably allowed. |
| 28 | 1000 | **signal bias level out of range / zero adjustment failure** |
|  |  | This sub type is used for failures where the server applies a bias voltage to a circuit upon which is superimposed a signal voltage (e.g., Oxygen Sensor circuit.). This sub type is also used for failures where the server applies a zero signal level to a circuit upon which is superimposed a signal voltage (e.g., bias voltage to an Oxygen Sensor circuit, or a filtered digital m/sec2 signal while vehicle stands still for a lateral accelerator sensor module.) |
| 29 | 1010 | **signal signal invalid** |
|  |  | This sub type is used for failures where the value of the signal is not plausible given the operating conditions. |
| 2F | 1111 | **signal erratic** |
|  |  | This sub type is used for failures where the signal is momentarily implausible (not long enough for "signal invalid") or discontinuous. |

Table 4 — DTC Failure Sub Type definition for failure category ‘3’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nible** | **FM (Frequency Modulated) / PWM (Pulse Width Modulated) Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 31 | 0001 | **no signal** |
|  |  | This sub type is used for failures where the server does not detect a signal which ought to be present (e.g., wheel speed signals present for three of the four wheels and brakes not applied.) |
| 32 | 0010 | **signal low time < minimum** |
|  |  | This sub type is used for failures where the server detects the low pulse is too narrow with respect to time. |
| 33 | 0011 | **signal low time > maximum** |
|  |  | This sub type is used for failures where the server detects the low pulse is too wide with respect to time. |
| 34 | 0100 | **signal high time < minimum** |
|  |  | This sub type is used for failures where the server detects the high pulse is too narrow with respect to time. |
| 35 | 0101 | **signal high time > maximum** |
|  |  | This sub type is used for failures where the server detects the high pulse is too wide with respect to time. |
| 36 | 0110 | **signal frequency too low** |
|  |  | This sub type is used for failures where the server detects excessive duration for one cycle of the output across a specified sample size. |
| 37 | 0111 | **signal frequency too high** |
|  |  | This sub type is used for failures where the server detects insufficient duration for one cycle of the output across a specified sample size. |
| 38 | 1000 | **signal frequency incorrect** |
|  |  | This sub type is used for failures where the server measures an incorrect number of cycles in a given time period. |
| 39 | 1001 | **incorrect has too few pulses** |
|  |  | This sub type is used for failures where the server measures too few pulses (e.g., position is calibrated in counts from one extreme to the other). |
| 3A | 1010 | **incorrect has too many pulses** |
|  |  | This sub type is used for failures where the server measures too many pulses (e.g., position is calibrated in counts from one extreme to the other). |

Table 5 — DTC Failure Sub Type definition for failure category ‘4’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **System Internal Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 41 | 0001 | **general checksum failure** |
|  |  | This sub type is used by the server to indicate an incorrect checksum calculation where memory type is not specified. |
| 42 | 0010 | **general memory failure** |
|  |  | This sub type is used by the server to indicate a memory failure where memory type is not specified. |
| 43 | 0011 | **special memory failure** |
|  |  | This sub type is used by the server to indicate a memory failure where the specific memory type is not defined in this category. |
| 44 | 0100 | **data memory failure** |
|  |  | This sub type is used by the server to indicate a data (or working) memory failure for embedded systems using FLASH memory. This is equivalent to RAM in RAM/ROM/EEPROM embedded systems. |
| 45 | 0101 | **program memory failure** |
|  |  | This sub type is used by the server to indicate a progam memory failure for embedded systems using FLASH memory. This is equivalent to ROM in RAM/ROM/EEPROM embedded systems. |
| 46 | 0110 | **calibration / parameter memory failure** |
|  |  | This sub type is used by the server to indicate a calibration / parameter memory failure for embedded systems using FLASH memory. This is equivalent to EEPROM in RAM/ROM/EEPROM embedded systems. |
| 47 | 0111 | **watchdog / safety µC failure** |
|  |  | This sub type is used by the server to indicate a watchdog / safety µC failure. |
| 48 | 1000 | **supervision software failure** |
|  |  | This sub type is used by the server to indicate a supervision software failure. |
| 49 | 1001 | **internal electronic failure** |
|  |  | This sub type is used by the server to indicate the detection of an internal circuit failure. |
| 4A | 1010 | **incorrect component installed** |
|  |  | This sub type is used by the server to indicate a mismatch between the hardware connected to the server and the hardware expected by the server. |
| 4B | 1011 | **over temperature** |
|  |  | This sub type is used by the server to indicate the detection of an internal temperature above the expected range. |

Table 6 — DTC Failure Sub Type definition for failure category ‘5’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **System Programming Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 51 | 00001 | **not programmed** |
|  |  | This sub type is used by the server to indicate that programming is required. |
| 52 | 0010 | **not activated** |
|  |  | This sub type is used by the server to indicate that that some portion of the program has not been enabled. |
| 53 | 0011 | **deactivated** |
|  |  | This sub type is used by the server to indicate that that some portion of the program has been disabled. |
| 54 | 0100 | **missing calibration** |
|  |  | This sub type is used by the server to indicate, that an operational range etc. for a sensor or actuator must be taught to the server, e.g. by programming or learning. |
| 55 | 0101 | **not configured** |
|  |  | This sub type is used by the server to indicate the need to enter (program) the sub system option content or the vehicle option content. |

Table 7 — DTC Failure Sub Type definition for failure category ‘6’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **Algorithm Based Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 61 | 0001 | **signal calculation failure** |
|  |  | This sub type is used for algorithm based calculation failures. |
| 62 | 0010 | **signal compare failure** |
|  |  | This sub type is used for failures where the server compares two or more input parameters for plausibility. |
| 63 | 0011 | **circuit / component protection time-out** |
|  |  | This sub type is used for failures where the server detects a function is active for greater than a specified time period. |
| 64 | 0100 | **signal plausibility failure** |
|  |  | This sub type is used for failures where the server detects plausibility failures. |
| 65 | 0101 | **signal has too few transitions / events** |
|  |  | This sub type is used for failures where the server monitors a parameter over time within specified limits and detects fewer than the expected number of transitions. |
| 66 | 0110 | **signal has too many transitions / events** |
|  |  | This sub type is used for failures where the server monitors a parameter over time within specified limits and detects more than the expected number of transitions. |
| 67 | 0111 | **signal incorrect after event** |
|  |  | This sub type is used for failures where the server does not see the correct change of a parameter or group of parameters in response to a particular event. |
| 68 | 1000 | **event information** |
|  |  | This sub type is used by the server to indicate the detection of a system event that was not caused by the server itself but forces the server to store a DTC (e.g. missing functionality from another system/server). |

Table 8 — DTC Failure Sub Type definition for failure category ‘7’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **Mechanical Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 71 | 0001 | **actuator stuck** |
|  |  | This sub type is used for failures where the server does not detect any motion in response to energizing a motor, solenoid, relay, etc. |
| 72 | 0010 | **actuator stuck open** |
|  |  | This sub type is used for failures where the server does not detect any motion upon commanding the operation of a motor, solenoid, relay, etc., to close some piece of equipment. |
| 73 | 0011 | **actuator stuck closed** |
|  |  | This sub type is used for failures where the server does not detect any motion upon commanding the operation of a motor, solenoid, relay, etc., to open some piece of equipment. |
| 74 | 0100 | **actuator slipping** |
|  |  | This sub type is used for failures where the server detects excessive duration to command a motor, solenoid, relay, etc., to move a piece of equipment to a desired position. |
| 75 | 0101 | **emergency position not reachable** |
|  |  | This sub type is used for failures where the server is unable to command a motor, solenoid, relay, etc., to move a piece of equipment to the emergency position. |
| 76 | 0110 | **wrong mounting position** |
|  |  | This sub type is used for failures where the server detects incorrectly mounted components, e.g., acceleration sensor showing a position error of 90°. |
| 77 | 0111 | **commanded position not reachable** |
|  |  | This sub type is used for failures where the server is unable to command a motor, solenoid, relay, etc., to move a piece of equipment to the commanded position either due to a failure in the actuator or its mechanical environment. |
| 78 | 1000 | **alignment or adjustment incorrect** |
|  |  | This sub type is used for failures where the server detects incorrectly adjusted or aligned components |
| 79 | 1001 | **mechanical linkage failure** |
|  |  | This sub type is used for failures where the server detects that the actuator is operational but the driven device is not operating e.g. drive cable for power sliding door broken |
| 7A | 1010 | **fluid leak or seal failure** |
|  |  | This sub type is used for failures where the server detects that a mechanical component has an unexpected gas or liquid flow in, out or through the component. |
| 7B | 1011 | **low fluid level** |
| This sub type is used for failures where the server detects that a fluid level is too low for proper operation of the system |

Table 9 — DTC Failure Sub Type definition for failure category ‘8’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **Bus Signal / Message Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 81 | 0001 | **invalid serial data received** |
|  |  | This sub type is used by the server to indicate a signal was received with the corresponding validity bit equal to "invalid" or post processing of the signal determines it is invalid. |
| 82 | 0010 | **alive / sequence counter incorrect / not updated** |
|  |  | This sub type is used by the server to indicate, that a signal was received without the corresponding rolling count value being properly updated. |
| 83 | 0011 | **value of signal protection calculation incorrect** |
|  |  | This sub type is used by the server to indicate, that a message was processed with an incorrect protection (checksum) calculation. |
| 84 | 0100 | **signal below allowable range** |
|  |  | This sub type is used for failures where some circuit quantity, reported via serial data, is below a specified range. |
| 85 | 0101 | **signal above allowable range** |
|  |  | This sub type is used for failures where some circuit quantity, reported via serial data, is above a specified range. |
| 86 | 0110 | **signal invalid** |
|  |  | This sub type is used for failures where some circuit quantity, reported via serial data, is not plausible given the operating conditions. |
| 87 | 0111 | **missing message** |
|  |  | This sub type is used for failures where one (or more) expected message(s) is not received, e.g., periodic transmission where the repetition time is too high, or message not received as a result of unforeseen reset events of the concerning component (e.g. engine control unit communicating with ABS). |
| 88 | 1000 | **bus off** |
|  |  | This sub type is used for failures where a data bus is not available. |
| 8F | 1111 | **erratic** |
|  |  | This sub type is used for failures where the signal, reported via serial data, is momentarily implausible or discontinuous. |

Table 10 — DTC Failure Sub Type definition for failure category ‘9’

|  |  |  |
| --- | --- | --- |
| **Failure Type byte** | **Sub Type Nibble** | **Component Failures** |
| **(hex)** | **(binary)** | **Sub Type Description** |
| 91 | 0001 | **parametric** |
|  |  | This sub type is used for failures where the server has detected that a component parameter e.g. capacitance or inductance is outside its expected range. |
| 92 | 0010 | **performance or incorrect operation** |
|  |  | This sub type is used for failures where the server has detected that the component performance is outside its expected range or operating in an incorrect way. |
| 93 | 0011 | **no operation** |
|  |  | This sub type is used for failures where the server has detected that the component is not operating. |
| 94 | 0100 | **unexpected operation** |
|  |  | This sub type is used for failures where the server has detected that the component is operating in a way or at a time that it has not been commanded to operate. |
| 95 | 0101 | **incorrect assembly** |
|  |  | This sub type is used for failures where the server has detected that the component has been incorrectly installed e.g. hydraulic pipes crossed over, circuits cross wired or polarity errors. |
| 96 | 0110 | **component internal failure** |
|  |  | This sub type is used for failures where the server has recived an indication about the component that indicates a failure e.g. an intelligent actuator or sensor is indicating an internal fault. |
| 97 | 0111 | **Component or system operation obstructed or blocked** |
|  |  | This sub type is used for failures where the server has detected that the operation of a component is prevented by an obstruction e.g. advanced cruise system radar beam obstructed. |
| 98 | 1000 | **component or system over temperature** |
|  |  | This sub type is used for failures where the server has detected that the temperature is too high for the correct operation of the component or system. |