

**Research & Vehicle Technology**

**Automotive Audio Bus A2B**

**Data Link Implementation Specification 00.06.03.501**

Version 2.1

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**Table of Contents**

[1 FRD-REQ-393043/A-Scope 5](#_Toc70517068)

[1.1 NFN-REQ-393049/A-Scope 5](#_Toc70517069)

[1.2 NFN-REQ-393050/A-Not in Scope 5](#_Toc70517070)

[1.3 NFN-REQ-393054/B-Product Overview 5](#_Toc70517071)

[1.4 NFN-REQ-393051/B-Definitions 5](#_Toc70517072)

[1.5 NFN-REQ-393052/A-Abbreviations 6](#_Toc70517073)

[2 FRD-REQ-393045/A-Implementation Requirements 7](#_Toc70517074)

[2.1 SWR-REQ-393143/B-Implementation Requirements 7](#_Toc70517075)

[2.2 SWR-REQ-393144/B-Type of Network (Automotive Audio Bus) 7](#_Toc70517076)

[2.2.1 SWR-REQ-393153/B-Sampling Rate 7](#_Toc70517077)

[2.2.2 SWR-REQ-393154/B-Audio Streams and Mapping to A2B slots 7](#_Toc70517078)

[2.2.3 SWR-REQ-393155/B-Channel Size 7](#_Toc70517079)

[2.3 SWR-REQ-393145/B-Network Bandwidth Allocation 8](#_Toc70517080)

[2.4 SWR-REQ-393146/A-System Level 8](#_Toc70517081)

[2.4.1 SWR-REQ-393156/B-Audio Bus/Network Topology 8](#_Toc70517082)

[2.4.2 SWR-REQ-393157/B-Number of Nodes and Links 8](#_Toc70517083)

[2.4.3 SWR-REQ-393158/B-Allowed Devices 8](#_Toc70517084)

[2.4.4 SWR-REQ-393159/B-Common A2B Network Wakeup Source 8](#_Toc70517085)

[2.5 SWR-REQ-393147/A-Host ECU Level Requirements 9](#_Toc70517086)

[2.5.1 SWR-REQ-393168/B-Host to A2B Main Node Network Interface 9](#_Toc70517087)

[2.5.2 SWR-REQ-393169/B-Host to A2B Main Node Software 9](#_Toc70517088)

[2.5.3 SWR-REQ-393170/B-Host A2B Network Startup/Shutdown Time 9](#_Toc70517089)

[2.5.4 SWR-REQ-393171/B-A2B Main/Sub/Peripheral Network Configuration Information 9](#_Toc70517090)

[2.5.5 SWR-REQ-393172/B-Host A2B Network Configuration 10](#_Toc70517091)

[2.5.6 SWR-REQ-393173/B-Host A2B Network Error DTC support 10](#_Toc70517092)

[2.5.7 SWR-REQ-393174/B-Host A2B Network Error Detection and Reporting 10](#_Toc70517093)

[2.5.8 SWR-REQ-393175/B-Host A2B Network Error Handling 10](#_Toc70517094)

[2.5.9 SWR-REQ-393176/B-Audio Main Node Clock 11](#_Toc70517095)

[2.5.10 SWR-REQ-393177/B-Loss of Audio Main Node Clock Error Detection on Main and Sub Hosts 11](#_Toc70517096)

[2.6 SWR-REQ-393148/A-Specific Diagnostic Support via CAN 12](#_Toc70517097)

[2.6.1 SWR-REQ-393178/B-A2B Network Discovery at EOL/Service Bay 12](#_Toc70517098)

[2.6.2 SWR-REQ-393179/B-A2B Network Errors 12](#_Toc70517099)

[2.6.3 SWR-REQ-393180/B-A2B Error Counters 12](#_Toc70517100)

[2.7 SWR-REQ-393149/B-Main Node Requirements 12](#_Toc70517101)

[2.7.1 SWR-REQ-393181/B-Maximum Phantom Power Allocation 12](#_Toc70517102)

[2.8 SWR-REQ-393150/B-Sub Node Requirements 12](#_Toc70517103)

[2.8.1 SWR-REQ-393182/B-Sub Node Communication 13](#_Toc70517104)

[2.8.2 SWR-REQ-393183/B-Last Sub Node 13](#_Toc70517105)

[2.8.3 SWR-REQ-393184/B-Sub Node Network Error Detection & Reporting 13](#_Toc70517106)

[2.8.4 SWR-REQ-393185/B-Sub Node Peripheral Error Detection & Reporting 13](#_Toc70517107)

[2.8.5 SWR-REQ-393186/B-Sub Node's Main Node Clock Error Detection and Reporting 13](#_Toc70517108)

[2.9 SWR-REQ-393151/B-Peripheral Requirements 13](#_Toc70517109)

[2.9.1 SWR-REQ-393187/A-Types of Peripherals 13](#_Toc70517110)

[2.10 SWR-REQ-393152/B-A2B Software Development Tools, Software Stack and Process 14](#_Toc70517111)

[2.10.1 SWR-REQ-393203/B-Sigma Studio Software 14](#_Toc70517112)

[2.10.2 SWR-REQ-393204/B-A2B Software Stack 14](#_Toc70517113)

[2.10.3 SWR-REQ-393205/B-Sigma Studio Development Process 14](#_Toc70517114)

[2.10.4 SWR-REQ-393206/B-A2B Software Capabilities 14](#_Toc70517115)

[3 FRD-REQ-393046/A-Verification Methods 15](#_Toc70517116)

[3.1 SWR-REQ-393207/A-Node conformance tests 15](#_Toc70517117)

[3.2 SWR-REQ-393208/B-Verification traceability 15](#_Toc70517118)

[4 FRD-REQ-393047/A-Appendices 17](#_Toc70517119)

[4.1 HR-REQ-393053/A-References 17](#_Toc70517120)

[4.2 SWR-REQ-393209/A-Appendix.1 Approved A2B Host Processors 17](#_Toc70517121)

[4.3 SWR-REQ-393210/B-Appendix.2 Approved A2B Main Nodes/Sub Nodes 17](#_Toc70517122)

[4.4 SWR-REQ-393211/A-Appendix.3 Approved A2B Peripherals 17](#_Toc70517123)

[4.5 SWR-REQ-393212/B-Appendix.4 Current Questions/Answers 17](#_Toc70517124)

[5 FRD-REQ-393048/B-Revision History 19](#_Toc70517125)

[5.1 SWR-REQ-393213/B-Revision History 19](#_Toc70517126)

# FRD-REQ-393043/A-Scope

## NFN-REQ-393049/A-Scope

This document is a technical specification for a multiplexed A2B network between automotive audio ECU’s, an inter-systems network. In combination with a protocol standard for multiplex it is a full specification regarding communication, all requirements in the Technical Regulation for the specific ECU also have to be fulfilled.

This document shall be used to define and develop all production intent ECU’s using the Analog Devices A2B Automotive Audio Bus for the Ford Enterprise.

Attention: Failure to comply with these requirements of this specification by any production intent ECU may result in an inability to communicate on the vehicle network for which the ECU was intended.

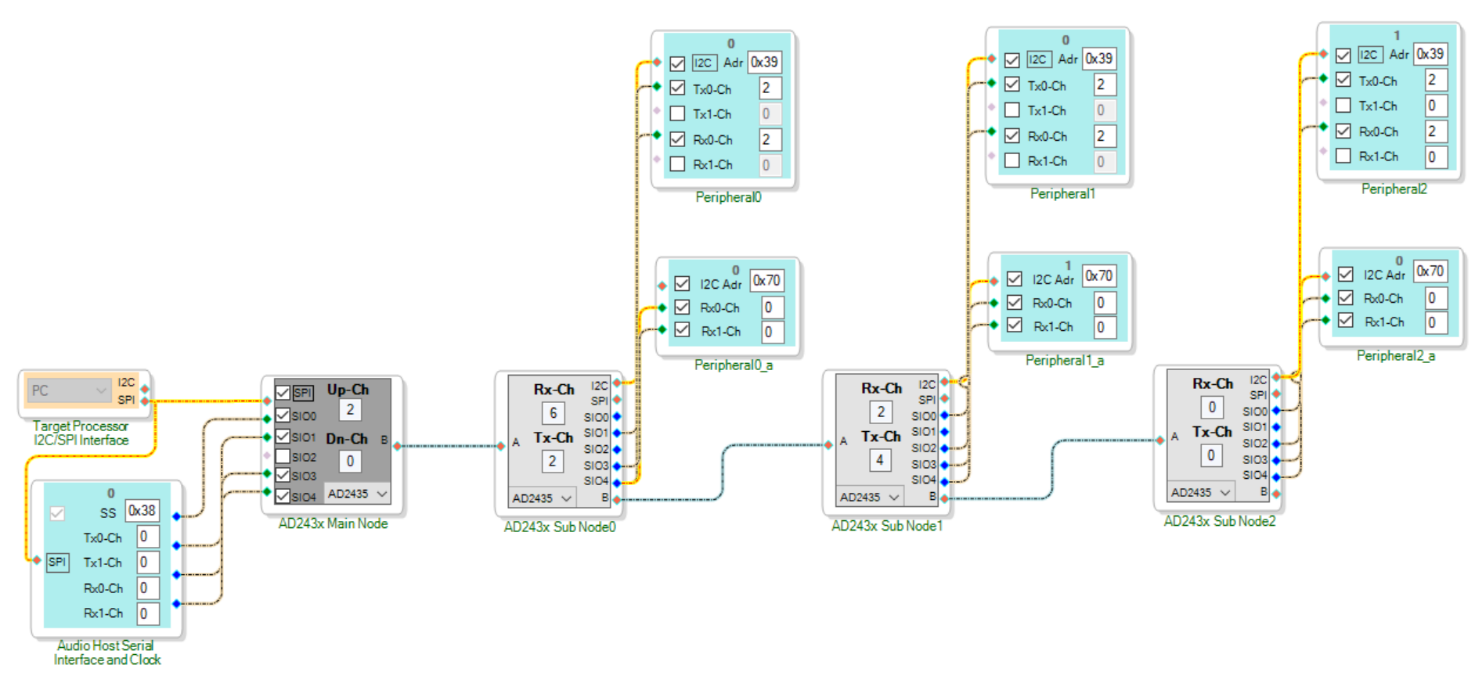
## NFN-REQ-393050/A-Not in Scope

Requirements specifically related to the physical implementation of the A2B network (e.g. Connectors, Wires, Physical Layer and other specifically related components) are not within the scope of this specification. Please see III. References

## NFN-REQ-393054/B-Product Overview

The specification addresses the implementation of the ANALOG DEVICES Automotive Audio network.

Automotive Audio Network Example



Host Module /

Main Node

Sub Node

Sub Node

Sub Node

I2S/TDM/SPI/I2C 

A2B Bus 

## NFN-REQ-393051/B-Definitions

|  |  |
| --- | --- |
| A2B Pin – BP | One of the two pins connecting a network node with ANALOG DEVICES A2B interface towards the last Sub. |
| A2B Pin – BN | One of the two pins connecting a network node with ANALOG DEVICES A2B interface towards the last Sub. |
| A2B Pin – AP | One of the two pins connecting a network node with ANALOG DEVICES A2B interface towards the Main. |
| A2B Pin – AN | One of the two pins connecting a network node with ANALOG DEVICES A2B interface towards the Main. |
| Bus | A bus is a collection of one or more wires connecting two or more nodes. Each electronic device (in this case: Host ECU, Main Node or Sub Node) is equipped with a specific, standardised electronic interface in order to guarantee compatibility between exchanged binary items of information |
| Host/ECU | An electronic control unit connected to a Main A2B node via I2S or I2C. A host can also be connected to one or more A2B nodes or peripherals. The Host controller provides Sync clock and control data to the Main node. |
| Main node | An A2B Node that is connected to a Host/ECU and is the ‘Main’ of one or more A2B Sub nodes in an Automotive Audio network. |
| Multiplex | To interleave or simultaneously transmit two or more messages/signals or sets of data on a single channel. |
| Network | A set of electronic and cabling devices facilitating the multidirectional exchange of information between two or more nodes on one or more busses. |
| Sub node | An A2B node that is connected to an A2B Main node directly or to another Sub node that is connected to the Main node. A Sub node can be connected to one or more A2B peripheral units (e.g. EEPROM, Microphone(s), Codec/DSP) |

## NFN-REQ-393052/A-Abbreviations

|  |  |
| --- | --- |
| A2B | **A**utomotive **A**udio **B**us (Analog Devices Trademark) |
| DPR | Design Prerequisites |
| ECU | Electronic Control Unit |
| EMC | Electromagnetic Compatibility |
| ESR | Equivalent Series Resistance |
| FMC | Ford Motor Company |
| ISO | International Standards Organisation |
| OSI | Open Systems Interconnect |
| PCB | Printed Circuit Board |
| PLL | Phase Locked Loop |
| SAE | Society of Automotive Engineers |

# FRD-REQ-393045/A-Implementation Requirements

## SWR-REQ-393143/B-Implementation Requirements

This document specifies the High Level Hardware and Software Link (HLSL) requirements related to the implementation of an Analog Devices Automotive Audio (A2B) bus network.

The A2B network consists of a host microprocessor connected to a Main node A2B chip, which is then connected to one or more A2B sub nodes for the purpose of sending and receiving multiple synchronous digitally encoded analog streams.

## SWR-REQ-393144/B-Type of Network (Automotive Audio Bus)

### SWR-REQ-393153/B-Sampling Rate

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.1)*

The network sampling rate shall be set to 48kHz, support for 96kHz and 192Khz will be supported by using multiple A2B slots.

Rationale: The default sample rate of 48kHz, usage of 44.1kHz will necessitate of upsampling to 48Khz.

### SWR-REQ-393154/B-Audio Streams and Mapping to A2B slots

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.2)*

The A2B network will support a limited number of slots depending on the channel (audio stream) size and the sampling rate. Each pre-defined audio stream which shall be selected from DABUS-SR-REQ-086676/F-A2B Audio Stream ID assignments found in Ref [11] Audio Stream ID assignments will be mapped to one or more A2B slots. All audio streams shall be documented and approved by the in-Vehicle Infotainment & Connectivity team before usage.

Rationale: The number of slots an audio stream occupies, and the slot location is dependent on the specific configuration the sub nodes receiving/sending those streams in the A2B network, however the audio stream (e.g. CHIME) should always have a specific sample rate (e.g. 48 kHz) and Channel Size (e.g. 24 bits).

Rationale: At the sample rate of 48 kHz and 24 bits/sample the A2B network will support a total of 32 combined slots.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Audio Channel Identifier** | **Audio Stream Name** | **Sample Rate** | **Data Size** | **Slots Used** |
| Channel ID 1 | Stereo Right Audio | 48 KHz | 24 bit | 1 |
| Channel ID 2 | Stereo Left Audio | 48 KHz | 24 bit | 1 |
| Channel ID 3 | Mixable Prompts | 48 KHz | 24 bit | 1 |

Table 3.1.2: EXAMPLE Audio Stream Definitions/Channel Mapping.

Main node is defined in Ref [11] DSP AMP Infotainment Subsystem Part Specific Specification (SPSS)

### SWR-REQ-393155/B-Channel Size

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.3)*

Each audio stream shall be encoded in single channel size which shall be set at 24 bits for all channels.

Rationale: The A2B system supports different upstream and downstream channel sizes, but Ford will be utilizing 24 bits for both.

## SWR-REQ-393145/B-Network Bandwidth Allocation

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.4)*

The total maximum A2B bus bandwidth (either at the node level or at the network level) shall not exceed 100% of the total available bandwidth as calculated by latest A2B bus calculation spreadsheet for a specified bus topology.

Rationale: Total bandwidth allocation that can be supported by the A2B network is a function the number of Audio Streams, channel size, the number of Nodes, and the total network length. The total bandwidth allocation shall be determined within the Analog Devices SigmaStudioTM or latest Analog Devices A2BBandwidth Calculation Spreadsheet.

## SWR-REQ-393146/A-System Level

### SWR-REQ-393156/B-Audio Bus/Network Topology

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.5)*

The Automotive Audio bus link consists of one twisted pair wire cable (bus) running from one Main node ECU to one Sub Node or from one Sub Node to the next Sub Node. The entire network will consist of one or more bus links. See *NFN-REQ-393054-Product Overview*.

### SWR-REQ-393157/B-Number of Nodes and Links

An ANALOG DEVICES A2B bus utilizes point to point bus links which are daisy chained to form a network. The maximum number of ECU's on each link that forms an A2B bus is 2 (one Main Node to one Sub Node, or one Sub Node to one Sub Node.)

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.6)*

The maximum number of Main and Sub Nodes for the entire network shall be:

* For AD241x devices, 7 (1 Main, and a maximum of 6 Sub Nodes).
* For AD242x devices, 11 (1 Main, and a maximum of 10 Sub Nodes).
* For AD243x devices, 17 (1 Main, and a maximum of 16 Sub Nodes).

Rationale: The maximum number of nodes will be related to the Total bandwidth allocation that can be supported by the A2B network, the number of Nodes, and the total network length.

### SWR-REQ-393158/B-Allowed Devices

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.7)*

An A2B network shall be constructed from the one or more of the following approved devices.

1. Host Processor/ECU. See Appendix.1 Approved A2B Host Processors
2. Main Node A2B Transceiver(s). See Appendix.2 Approved A2B Main/Sub Nodes
3. Sub Node A2B Transceiver(s) See Appendix.2 Approved A2B Main/Sub Nodes
4. Audio Peripheral Devices. See Appendix.3 Approved A2B Peripherals
5. Non-Audio Peripheral Devices See Appendix.3 Approved A2B Peripherals

*Rationale: Devices must be pre-approved by the appropriate* ***in-Vehicle Infotainment & Connectivity team before*** *usage.*

### SWR-REQ-393159/B-Common A2B Network Wakeup Source

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.8)*

All A2B hosts, main and sub nodes shall be connected to a single common wakeup source. This may be a dedicated hardware wakeup source, or a single CAN Network wakeup source.

Rationale: All devices must use a single wakeup source to make sure that all A2B nodes will startup and shutdown in the same time periods. The main node waking up via the CAN Network and the sub nodes waking up via the A2B Bus bias going high is an example of an acceptable network configuration.

## SWR-REQ-393147/A-Host ECU Level Requirements

An A2B network will consist of a single host connected to one Master A2B device, which is then connected to a slave device via an A2B link. The slave may be connected to additional downstream slave units.

### SWR-REQ-393168/B-Host to A2B Main Node Network Interface

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.9)*

The host interface to the main node A2B device interface shall be specified according to ANALOG DEVICES A2B standard, ref [1], [7]. Currently it can be an I2C, I2S, and/or SPI connection.

### SWR-REQ-393169/B-Host to A2B Main Node Software

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.10)*

The Host ECU shall utilize an approved A2B Software driver to communicate to/from the A2B main node.

This software shall be derived from the Analog Devices Recommended A2B Stack User Guide Ref [10] and shall be reviewed/approved by the **in-Vehicle Infotainment & Connectivity team**.

### SWR-REQ-393170/B-Host A2B Network Startup/Shutdown Time

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.11)*

The host shall be capable of completing initialization of the A2B network (node count per SWR-REQ-393157 – Number of Nodes and Links) within (50 ms times the number of nodes) of a wakeup event.

The A2B system may be configured at vehicle runtime IF it can be completed within the above time, otherwise the A2B system shall be configured at EOL/Service Bay and stored in non-volatile memory.

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.12)*

The host shall be capable of shutting down the A2B network within 250 ms of the wakeup source going away.

Rationale: Sleep may come from dedicated input pins or an attached CAN network.

### SWR-REQ-393171/B-A2B Main/Sub/Peripheral Network Configuration Information

The A2B network consists of one main node, one or more sub node, and one or more peripheral devices attached to a sub node. Each device requires specific initialization information which is performed by the main node reading and writing specific “registers”. The Host or the Main node shall contain this information.

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.13)*

Each Main, Sub or Peripheral device shall identify its specific needs for “register initialization” in the form of one or more specifically defined .XML files or Bus Configuration File created in Sigma Studio. This information shall be passed from the Host to the Main node, then from the Main node to one or more Sub nodes at startup/EOL.

The following information will be required from both the Main and the Sub nodes:

1. Transmit Channels defined in order (dependent on the TDM interfaces used)
2. Receive Channels defined in order (dependent on the TDM interfaces used)
3. Any specific ‘register’ addresses and values

### SWR-REQ-393172/B-Host A2B Network Configuration

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.14)*

The A2B network Main and Sub modules need to be initialized with specific information to set the Sample Rate, Number of Slots, Channel size and other A2B information. This activity may be performed in one of the following ways. The Multimedia Core Engineer shall define the method to be implemented.

1. Main node, Sub nodes, and peripherals will pre-configured with all information with no Host interaction needed this could be done by storing configuration in local memory and sending it on power up (A2B chipsets cannot store configuration)
2. Host will configure Main node, Sub nodes, and peripherals from a Diagnostic EOL Command which will select a single specific configuration from a pre-defined configuration table at end of line. This table may encode main node, sub node, and peripheral configuration information.
3. Host will perform network “discovery” using the ‘Super BCF’ file to discover the main node and any attached sub nodes and peripherals, and properly configure them. Due to the additional workload discovery may not support the 200 ms network startup time. The configuration information for ‘discovery’ will also be larger than pre-configuration, or ‘table’ configuration.

### SWR-REQ-393173/B-Host A2B Network Error DTC support

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.15)*

The A2B network host shall be capable of determining A2B network errors on the main node, or any of its sub nodes or peripherals. The Host shall set an A2B Network Specific Diagnostic DTC per the Infotainment Diagnostics Spec, and an additional code identifying the specific node and/or type of error.

### SWR-REQ-393174/B-Host A2B Network Error Detection and Reporting

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.16)*

The A2B network host shall support detection and reporting of the following A2B network errors:

1. Errors during Host A2B Network Configuration (w/ Diagnostic Command Response Code) [A2BCONFIG\_ERROR]
2. Count of Hard Network Errors during operation of the A2B network (w/ Non-volatile DID support) [A2BHARD\_NETWORK\_ERROR\_CTR]
3. Count of Transient Errors during operation of the A2B network (w/ Non-volatile DID support) [A2BTRANSIENT\_NETWORK\_ERROR\_CTR]

Rationale: See [6] AD Technical Requirements Manual for flowcharts and additional A2B register information.

A2B\_INTSRC Sub Node # that generated the interrupt

A2B\_INTTYPE Specific Error enumerated by value

A2B\_SWCTL Switch Control Register

### SWR-REQ-393175/B-Host A2B Network Error Handling

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.17)*

The A2B network host shall support the following error handling procedures:

1. For errors which occur during the Host A2B Network configuration, the host shall try the configuration multiple times per Infotainment Diagnostics Spec, and then report the success or failure of that configuration via the Diagnostic Command Response code.
2. For hard network errors (errors which require one or more Main or Sub nodes to be re-initialized) which occur at a normal A2B wakeup event and require re-initialization of the A2B network, the host shall increment a nonvolatile A2B\_HARD\_ERROR\_COUNTER, and allow up to 800 ms [CAL\_MAX\_STARTMS] for startup and initialization (@50 ms per node[CAL\_NODE\_STARTMS]), and will perform constant retries until the A2B network starts, or the wakeup source is turned off. For A2B bus shorts, the Main node shall not attempt rediscovery until after the short is removed. The host shall identify the specific hard error via a Diagnostic DTC and related DID.
3. For transient errors (detected by the main node, or detected by the sub nodes) which occur after a successful key on or other startup event, the host shall count the number of transient errors per second. If more than 50 [CAL\_MAX\_ERRORCNT] errors occur within a 5 second interval [CAL\_MAX\_ERRORSEC], the Host shall increment an non-volatile A2B\_TRANSIENT\_ERROR\_COUNTER (perform automatic retries every until the A2B network re-starts, or the wakeup source is turned off. The host shall identify the specific error via a Diagnostic DTC.

A2B Error Handling Table

**INTTYPE**

**Register**

**Value Description Error Type R Handling**

0x00 Header Count Error Transient Error Increment Soft Error Counter

(HDCNTERR)

0x01 Data Decode Error (DDERR) Transient Error Increment Soft Error Counter

0x02 (CRCERR) Transient Error Increment Soft Error Counter

0x03 Parity Errors (DPERR) Transient Error Increment Soft Error Counter

0x04 Bit Errors (BECOVF) Transient Error Increment Soft Error Counter

0x05 (SRFERR) Transient Error Increment Soft Error Counter

0x06 SRFCRCERR (sub node only) Transient Error Increment Soft Error Counter

0x09 Pos Short to Ground Hard Error Identify Error at location, Retry after correction

0x0A Neg Short to VBat Hard Error Identify Error at location, Retry after correction

0x0B Wires Shorted Together Hard Error Identify Error at location, Retry after correction

0x0C Wires Disconnected Hard Error Identify Error at location, Retry after correction

0x0D Wires Reversed Hard Error Identify Error at location, Retry after correction

0x0F Indeterminate Fault Hard Error Identify Error at location, Retry after correction

0x29 Neg Short to Ground Hard Error Non Localized Error, Retry after correction

0x2A Pos Short to VBat Hard Error Non Localized Error, Retry after correction

0xFC Startup error Hard Error Return part to factory

0x18 Discovery Done No Error Init Next Sub Node, or Discovery Finished

0xFF Main node Running No Error

### SWR-REQ-393176/B-Audio Main Node Clock

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.18)*

The network host shall support supplying the Audio Main Node Clock to the Main Node A2B chip within 50 ms [CAL\_MAX\_CLOCKMS] of power up (see 3.4.3 Host A2B Network Startup/Shutdown Time). This clock stream is required even if the Audio system is not on or functional.

### SWR-REQ-393177/B-Loss of Audio Main Node Clock Error Detection on Main and Sub Hosts

(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.19)

Loss of Main Node Clock (from the Host to the Main node, Main to Sub node, or Sub to Sub node), will result in the A2B transceiver going into RESET within 100us to 600us. This will result in the following actions:

1. Sub Node A2B transceivers will detect the loss of clock from the Main node or another Sub node, and any GPIO’s used will tri-state (in our proposed configuration the GPIO outputs e.g. GPIO2 would indicate Clock not Available). Hosts attached to A2B Sub nodes shall use this as an indication that Digital Audio will not restart until the Host has re-initialized the Sub nodes(s), and utilize a timer or counter to determine effect on the local audio (e.g. May want to mute or redirect the audio after a specified period of time, or number of errors). The Host response will be to detect the loss of the Sub node (due to loss of Sub node response in the Main node), Increment a Diagnostic DID Counter, and will re-initialize the Sub node(s). The Host may want to mute or redirect audio after a specified period of time, or number of errors).
2. Main node A2B transceivers will detect the loss of clock from the host, and will also reset. The Host response shall be to increment the A2B\_HARD\_ERROR\_COUNTER, and re-initialize the Main node and ALL of the Sub nodes (Note: Sub nodes will also enter RESET, due to loss of the Main node clock from the Main node or upstream Sub nodes). The Host may want to mute or redirect audio after a specified period of time, or number of errors).
3. If GPIO’s are used, then it is the host responsibility to reset the I/O’s (the sub nodes will already have set them to a Tri-State condition).

## SWR-REQ-393148/A-Specific Diagnostic Support via CAN

### SWR-REQ-393178/B-A2B Network Discovery at EOL/Service Bay

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.20)*

The A2B Host processor shall support a Diagnostic Routine that supports A2B network initialization and sub node discovery, and writing the correct configuration information to the main node and sub nodes. The routine shall support a command to set the correct configuration, and shall return an appropriate success/failure code.

### SWR-REQ-393179/B-A2B Network Errors

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_\_3.2.21)*

If the A2B network fails to initialize after a wakeup event, the Host ECU shall support one or more Diagnostic Trouble Codes, and two DID counters indicating the number of specific errors via the CAN network.

### SWR-REQ-393180/B-A2B Error Counters

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.22)*

The host shall support the following non-volatile diagnostic counters:

1. A2B\_HARD\_ERROR\_COUNTER (16 bits, will not wrap if it hits 0xFFFF)
2. A2B\_TRANSIENT\_ERROR\_COUNTER (16 bits, will not wrap if it hits 0xFFFF)

## SWR-REQ-393149/B-Main Node Requirements

An A2B main node communicates to the Host module and one or more downstream sub nodes. The main node initiates all communication to/from the sub devices.

### SWR-REQ-393181/B-Maximum Phantom Power Allocation

The Main Node can supply power to one or more sub node units

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.23)*

The maximum amount of constant current a Main Node can supply is **300** mA.

Rationale: Power consumption can be controlled by using Power down Mode, Standby Mode or Control Mode within the Main Node. Analog Devices recommends a 500 mA regulator to account for inrush current.

## SWR-REQ-393150/B-Sub Node Requirements

An A2B Sub node communicates to a Main node, and optionally one or more Sub nodes. After initial configuration by Master node, a Sub node can optionally send/receive audio data to/from another Sub node directly without requiring the data to be routed by Main node.

A Sub node cannot independently send audio data to other Sub nodes in AD241x. A Sub node can independently send audio data to/from other Sub nodes in AD242x/AD243x.

### SWR-REQ-393182/B-Sub Node Communication

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.24)*

An A2B sub node communicates in one of four configurations:

1. To a main node on the upstream side and nothing on the downstream side.
2. To a main node on the upstream side and a sub node on the downstream side.
3. To a sub node on the upstream side and a sub node on the downstream side.
4. To a sub node on the upstream side and nothing on the downstream side.

### SWR-REQ-393183/B-Last Sub Node

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.25)*

The last sub node in an A2B network needs to be properly terminated only on the upstream channel (differently than a Main node or a sub node which communicates to one or more downstream sub node).

Rationale: The last node in an A2B network will not need the downstream network physical layer. If a node has the downstream physical layer populated, it can still be used in an end node configuration.

### SWR-REQ-393184/B-Sub Node Network Error Detection & Reporting

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.26)*

All sub nodes shall detect A2B Bit/Data errors from the A2B network. If the sub node detects 128 bit errors (CAL\_SLAVE\_BITTHRESHOLD\_ERRORS=128) in a 5 second period (CAL\_SLAVE\_BITTHRESHOLD\_PERIOD=5000ms), the sub node shall indicate this to the main node by generating a sub node interrupt with the appropriate error type.

A sub node shall also report bit error count overflow (BECOVF) to master.

Rationale: The host is the only A2B node that can initialize and detect ALL A2B errors (Bit/Data Errors, Network Shorts, Opens, Intermittent, Missing or out of order slaves, etc.) and report these on the CAN network via a Diagnostic Trouble code, with the specific error and associated counters).

### SWR-REQ-393185/B-Sub Node Peripheral Error Detection & Reporting

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.27)*

Sub node may detect errors related to the peripherals attached to it, and may report this information via A2B (via the sub node interrupt), and/or using CAN. Sub nodes shall **NOT REPORT** peripheral errors using the **A2B** Network Error DTC (sub nodes should use an Audio System specific DTC).

### SWR-REQ-393186/B-Sub Node's Main Node Clock Error Detection and Reporting

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.28)*

Loss of Main Node Audio Clock (from the Host to the Main node, Main to Sub node, or Sub to Sub node) will result in the A2B transceiver going into RESET within 100us to 600us. If this condition occurs, the Main Node shall set a DET for *Main Node Audio Clock Error Detection*.

## SWR-REQ-393151/B-Peripheral Requirements

The Host, Main Nodes and Sub nodes are capable of communication to/from A2B peripherals. The Host communicates to the main node, and the main node can communicate to its peripherals, or its downstream sub nodes.

### SWR-REQ-393187/A-Types of Peripherals

The Ford’s In-Vehicle Infotainment & Connectivity team shall maintain a list of approved peripheral devices.

## SWR-REQ-393152/B-A2B Software Development Tools, Software Stack and Process

All modules using the A2B system must follow a specified software design process. In general, the modules shall utilize the Analog Devices SigmaStudio design software to configure all main node and sub node device registers. This will allow the SigmaStudio software to generate a compatible configuration file for A2B software stack for all design.

### SWR-REQ-393203/B-Sigma Studio Software

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.29)*

All modules shall use the most current version of the Analog Devices SigmaStudio software. Available from *www.analog.com/SigmaStudio*

### SWR-REQ-393204/B-A2B Software Stack

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.30)*

The Host/Main node module shall use the most current version of the A2B Software Stack. Available from:

* https://www.analog.com/SRF
* <https://www.analog.com/en/gated/a2b/a2b-technology.html>

Please contact your ADI representative for assistance.

### SWR-REQ-393205/B-Sigma Studio Development Process

(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.31)

All modules shall use the identified Sigma Studio process to design sub node and host configurations:

1. The Host/Main node and Sub nodes shall use the Sigma Studio tool to select and configure all A2B node properties that define that module’s A2B IC interface.
2. The Host/Main node and Sub nodes shall use the Sigma Studio tool to generate and export module specific node configuration files and provide the export files to Core Multimedia engineering.
3. Core Multimedia engineering shall utilize the Sigma Studio tool to import all the provided Host/Main node and Sub node configuration files in order to produce a full system A2B schematic including all of the necessary A2B devices (Super Bus Configuration File).
4. Core Multimedia engineering shall then generate and export the Super Bus Configuration File for use in the Host/Main node A2B Software Stack.
5. The Host/Main node will then use the Sigma Studio’s export file to perform configuration during the A2B self-discovery process.

### SWR-REQ-393206/B-A2B Software Capabilities

*(Verification Test: HLSL\_A2B\_LINK\_REQ\_3.2.32)*

The A2B Software shall be used to support the following specific capabilities:

1. Bit Error Rate Testing
2. Bandwidth Estimation (SigmaStudio and A2B Calculation Spreadsheet)
3. Power Estimation (SigmaStudio and A2B Calibration Spreadsheet)
4. Line Fault Diagnostics including Bus loss detection
5. Interrupt handling support
6. A2B Software Stack Debug Tracing

# FRD-REQ-393046/A-Verification Methods

## SWR-REQ-393207/A-Node conformance tests

All A2B network nodes must demonstrate conformance to the applicable tests defined in the conformance tests in table below.

|  |  |
| --- | --- |
| **Protocol** | **Conformance test** |
| Ford Component DV | Ref [3] |
| Ford Hardware Review DV | Ref [5] |

## SWR-REQ-393208/B-Verification traceability

The following matrix itemizes all requirements specified herein and cross-references them to one of several means for verification. Due the criticality of a requirement there may be more than one procedure identified for verification. Below is a brief description of each of the verification methods:

ECU Level Test Plans Design Verification test where requirements are verified on a specific ECU.

Vehicle Level Test Plans Design Verification test where requirements are verified at a Vehicle Level.

Hardware Review Inspection Inspection where requirements are verified during a Hardware Review. Reference [3], [4].

Application Testing Testing performed on the application software, by (sub) system engineering group that verifies the requirement.







Table : Traceability Matrix

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Requirement | Host Software Review | Review Wiring Harness | Main Node Functionality | Main Node Hardware Review | Sub Node Functionality | Sub Node Hardware Review |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.1 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.2 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.3 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.4 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.5 |  | X |  | X |  | X |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.6 |  | X |  | X |  | X |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.7 |  | X |  | X |  | X |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.8 |  |  |  | X |  | X |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.9 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.10 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.11 (Hardware timing from “wakeup’ to ‘discovery complete’ via ‘analysis tool’) | X |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.12 (Hardware timing from “sleep’ to ‘main node clock’ off’ via ‘analysis tool’) | X |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.13 |  |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.14 (Specific set of test vectors, short, open and CAN DTC’s and DID’s) |  |  | X |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.15 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.16 (Specific set of test vectors, short, open and CAN DTC’s and DID’s) | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.17 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.18 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.19 | X |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.20 | X |  | X |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.21 | X |  | X |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.22 | X |  | X |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.23 |  |  | X |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.24 | X |  |  |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.25 |  |  |  |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.26 | X |  |  |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.27 | X |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.28 | X |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.29 | X |  |  |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.30 | X |  | X |  |  |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.31 | X |  | X |  | X |  |
| HLSL\_A2B\_LINK\_REQ\_\_3.2.32 | X |  | X |  | X |  |

# FRD-REQ-393047/A-Appendices

## HR-REQ-393053/A-References

The requirements of the documents listed in the following table, form a part of this specification. The revision levels shown in the table were the latest at the time this Functional Specification was written. In the event of a conflict between the requirements of this specification and these documents, the requirements of the documents in the table shall have precedence.

| Rev Level | | Requirement Document Name (i.e., SDS/ARL requirements, Deviations, Engineering Specifications) |
| --- | --- | --- |
|  | [1] - Analog Devices Data Sheet1 |
|  | [2] - Electromagnetic Compatibility Specification - [FMC1278](http://www.fordemc.com/docs/requirements.htm) |
|  | [3]- Analog Devices A2B Link Implementation Specification |
|  | [4] - Analog Devices A2B link Data Link and Physical Layer Specification |
|  | [5] - Analog Devices A2B Hardware Review |
|  | [6] - Analog Devices Technical Requirements Manual1 |
|  | [7] - Analog Devices A2B System Specification1 |
|  | [8] - Netcom Physical Layer Approved Components |
|  | [10] - Analog Devices A2B Porting Guide1 (A2B Stack user guide) |
|  | [11] – DSP AMP Infotainment Subsystem Part Specific Specification (SPSS) |
|  |  |
|  |  |

1 Contact Analog Devices for the latest Data sheets, Manuals and guides specific to the chipsets under consideration.

## SWR-REQ-393209/A-Appendix.1 Approved A2B Host Processors

Approval of A2B Host Processors will be addressed by in-Ford’s Vehicle Infotainment & Connectivity teams.

## SWR-REQ-393210/B-Appendix.2 Approved A2B Main Nodes/Sub Nodes

Approval of A2B Main Nodes/Sub Nodes will be addressed by Ford’s Advanced Netcom or In-Vehicle Infotainment & Connectivity team. The current approved list of chipsets are specified in [8].

## SWR-REQ-393211/A-Appendix.3 Approved A2B Peripherals

Approval of A2B Peripherals will be addressed by Ford’s In-Vehicle Infotainment & Connectivity team.

## SWR-REQ-393212/B-Appendix.4 Current Questions/Answers

QUESTION:

Can a single audio channel be routed to multiple downstream sub nodes?

Answer:

Yes, for AD241x, broadcast is available, but it must be encoded in the first slots. For AD242x and AD243x, streams can be sent to multiple nodes without broadcasting.  
*(found in requirement* 8

QUESTION:

How do we indicate to sub nodes the stream to frame/slot mapping?

Answer:

Sub nodes and Main nodes will indicate stream inputs and outputs in order within the ‘Architecture Tool’.  
*(found in requirement* 8

QUESTION:

What API support is needed for determining network errors. (Net Up, Down, Transients, Sub node Errors)?

Answer:

Device Driver will support error detection (Shorts, Opens, Sub node sequencing errors, etc…).  
*(found in requirement* 12

QUESTION:

How many ‘errors’ until we re-initialize the network or take it down until next key cycle? Put another way, how many frames/superframes can be lost until the user will notice an audio issue?

Answer:

32 cosecutive errors will cause a bus drop.  
*(found in requirement* 12

QUESTION:

How do sub nodes indicate an error (interrupt), and indicate specific type of error (register number, list of values)?

Answer:

Sub nodes generates interrupt, Host/Main Node reads registers.  
*(found in requirement* 13

QUESTION:

How long before losing the A2B link is considered to be ‘failed’?

Answer:

Proposed 5 seconds.  
*(found in requirement* 14

QUESTION:

How shall the module handle intermittent A2B bus failures?

Answer:

Attempt to reconnect the A2B bus every 300ms for an infinite number of times.  
*(found in requirement* 14

# FRD-REQ-393048/B-Revision History

## SWR-REQ-393213/B-Revision History

| **Date** | **Version** | **Notes** | |
| --- | --- | --- | --- |
| June 22, 2020 | 2.0 | Initial Specification Release | |
| April 28, 2021 | 2.1 | ECU-775564/A-A2B Data Link Implementation Specification | 2020-06-17 DWALUS: Transferred content from "Analog Devices A2B Data Link Implementation Specification, 000603.501.AA', dated 2019-02-15 |
|  |  | FRD-REQ-393043/A-Scope | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | NFN-REQ-393049/A-Scope | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | NFN-REQ-393050/A-Not in Scope | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | NFN-REQ-393054/A-Product Overview+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | NFN-REQ-393054/B-Product Overview | 2021-04-19 DWALUS: Updated to reflect using SPI as well. Changed to Main/Sub node names. |
|  |  | NFN-REQ-393051/A-Definitions+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | NFN-REQ-393051/B-Definitions | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | NFN-REQ-393052/A-Abbreviations | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | FRD-REQ-393045/A-Implementation Requirements | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393143/A-Implementation Requirements+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393143/B-Implementation Requirements | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | SWR-REQ-393144/A-Type of Network (Automotive Audio Bus) | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393144/B-Type of Network (Automotive Audio Bus) | 2021-04-26 DWALUS: Content deleted. |
|  |  | SWR-REQ-393153/A-Sampling Rate+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393153/B-Sampling Rate | 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393154/A-Audio Streams and Mapping to A2B slots+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393154/B-Audio Streams and Mapping to A2B slots | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393155/A-Channel Size+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393155/B-Channel Size | 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393145/A-Network Bandwidth Allocation+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393145/B-Network Bandwidth Allocation | 2021-04-19 DWALUS: Revised to 100% bandwidth and point to the Analog Devices A2B bandwidth calculation spreadsheet. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393146/A-System Level | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393156/A-Audio Bus/Network Topology+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393156/B-Audio Bus/Network Topology | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393157/A-Number of Nodes and Links+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393157/B-Number of Nodes and Links | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. Also added node count for each generation of IC. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393158/A-Allowed Devices+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393158/B-Allowed Devices | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393159/A-Common A2B Network Wakeup Source+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393159/B-Common A2B Network Wakeup Source | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. Also provided an example of the current A2B bus wakeup process. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393147/A-Host ECU Level Requirements | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393168/A-Host to A2B Master Network Interface+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393168/B-Host to A2B Main Node Network Interface | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. Added SPI. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393169/A-Host to A2B Master Software+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393169/B-Host to A2B Main Node Software | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393170/A-Host A2B Network Startup/Shutdown Time+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393170/B-Host A2B Network Startup/Shutdown Time | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393171/A-A2B Master/Slave/Peripheral Network Configuration Information+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393171/B-A2B Main/Sub/Peripheral Network Configuration Information | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393172/A-Host A2B Network Configuration+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393172/B-Host A2B Network Configuration | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393173/A-Host A2B Network Error DTC support+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393173/B-Host A2B Network Error DTC support | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393174/A-Host A2B Network Error Detection and Reporting+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393174/B-Host A2B Network Error Detection and Reporting | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-23 DWALUS: Reworded "count" to make it easier to understand. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393175/A-Host A2B Network Error Handling+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393175/B-Host A2B Network Error Handling | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. Allowed multiple retrys per IDS spec. 2021-04-23 DWALUS: Removed several retry requirements. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393176/A-Audio Master Clock+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393176/B-Audio Main Node Clock | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393177/A-Loss of Audio Master Clock Error Detection on Master and Slave Hosts+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393177/B-Loss of Audio Main Node Clock Error Detection on Main and Sub Hosts | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393148/A-Specific Diagnostic Support via CAN | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393178/A-A2B Network Discovery at EOL/Service Bay+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393178/B-A2B Network Discovery at EOL/Service Bay | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393179/A-A2B Network Errors+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393179/B-A2B Network Errors | 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393180/A-A2B Error Counters+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393180/B-A2B Error Counters | 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393149/A-Master Node Requirements+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393149/B-Main Node Requirements | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | SWR-REQ-393181/A-Maximum Phantom Power Allocation+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393181/B-Maximum Phantom Power Allocation | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393150/A-Slave Node Requirements+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393150/B-Sub Node Requirements | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | SWR-REQ-393182/A-Slave Node Communication+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393182/B-Sub Node Communication | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393183/A-Last Slave Node+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393183/B-Last Sub Node | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393184/A-Slave Network Error Detection & Reporting+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393184/B-Sub Node Network Error Detection & Reporting | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393185/A-Slave Peripheral Error Detection & Reporting+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393185/B-Sub Node Peripheral Error Detection & Reporting | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393186/A-Slave Master Clock Error Detection and Reporting+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393186/B-Sub Node's Main Node Clock Error Detection and Reporting | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-23 DWALUS: Reworded requirement to make sense. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393151/A-Peripheral Requirements+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393151/B-Peripheral Requirements | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | SWR-REQ-393187/A-Types of Peripherals | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393152/A-A2B Software Development Tools, Software Stack and Process+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393152/B-A2B Software Development Tools, Software Stack and Process | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-23 DWALUS: Removed reference to A2B module. |
|  |  | SWR-REQ-393203/A-Sigma Studio Software+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393203/B-Sigma Studio Software | 2021-04-23 DWALUS: Removed reference to A2B module. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393204/A-A2B Software Stack+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393204/B-A2B Software Stack | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-23 DWALUS: Corrected web links. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393205/A-Sigma Studio Development Process+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393205/B-Sigma Studio Development Process | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-23 DWALUS: Reworded the process flow to reflect current system build process. 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | SWR-REQ-393206/A-A2B Software Capabilities+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393206/B-A2B Software Capabilities | 2021-04-28 DWALUS: Updated HLSL\_A2B\_LINK\_REQ reference number. |
|  |  | FRD-REQ-393046/A-Verification Methods | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393207/A-Node conformance tests | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393208/A-Verification traceability+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393208/B-Verification traceability | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. 2021-04-23 DWALUS: Changed numbering and various requirement callouts. |
|  |  | FRD-REQ-393047/A-Appendices | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | HR-REQ-393053/A-References | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393209/A-Appendix.1 Approved A2B Host Processors | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393210/A-Appendix.2 Approved A2B Masters/Slaves+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393210/B-Appendix.2 Approved A2B Main Nodes/Sub Nodes | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | SWR-REQ-393211/A-Appendix.3 Approved A2B Peripherals | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393212/A-Appendix.4 Current Questions/Answers+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393212/B-Appendix.4 Current Questions/Answers | 2021-04-12 DWALUS: Changed Master to Main and Slave to Sub. |
|  |  | FRD-REQ-393048/A-Revision Histroy+ | 2020-06-17 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | FRD-REQ-393048/B-Revision History | 2021-04-12 DWALUS: Corrected spelling error. |
|  |  | SWR-REQ-393213/A-Revision History+ | 2020-06-18 DWALUS: Transferred from Analog Devices A2B Data Link Implementation Specification 00.06.03.501, 2019-02-15 |
|  |  | SWR-REQ-393213/B-Revision History | 2021-04-28 DWALUS: Updated Revision list. |
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