**FPD LINK**

**Cable & Connector Assembly Design Verification Checklist**

**00.06.** **01.306**

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# Change Control

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Date** | **Author CDSID** | **Changes / Remark** |
| AA | 4/19/2018 | hkadry | Initial Release |
| AB | 3/1/2019 | hkadry | 1. Added checks to determine which protocol is used 2. Added checks for production |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

***Note:***

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# Introduction

## Scope

This document will serve as a design validation document to ensure all cable and connector assemblies requirements are met and implemented with appropriate evidence.

## Reference Documents

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 Specification was written. In the event of a conflict between the requirements of this specification and these documents, the requirements in this document shall have precedence

|  |  |  |  |
| --- | --- | --- | --- |
| **Ref** | Document Number | File Name/Reference | Version |
| **1** | 00.06.01.003 | FPD LINK Cable/Connector Assembly Specification | AB |
| **2** | 00.06.03.002 | Netcom Physical Layer Approved Components List | Latest |
| **3** | - | USCAR 2 Specification | Latest |

Table 1: Reference Documents

## Definitions, Abbreviations and Acronyms

### Abbreviations

|  |  |
| --- | --- |
| FMC | Ford Motor Company |
| JUTP | Jacketed Unshielded Twisted Pair |
| PCB | Printed Circuit Board |
| QTP | Quad Twisted Pair |
| SPP | Shielded Parallel Pair |
| STP | Shielded Twisted Pair |
| TDR | Time Domain Reflectometer |
| UTP | Unshielded Twisted Pair |
| VNA | Vector Network Analyzer |

Table 2: Abbreviations and Acronyms

### Definitions

|  |  |
| --- | --- |
| Assembly | An assembly is cable that terminated with mating connector on both ends. |
| Bus | A bus is a collection of one or more wires connecting two or more nodes. Each electronic device is equipped with a specific, standardized electronic interface in order to guarantee compatibility between exchanged binary items of information |
| Characteristic Impedance | The impedance along a transmission line, as a result of wave voltage to current ratio |
| Differential signalling | This is a method used to transmit data using two complimentary signals. |
| Impedance Discontinuity | The impedance mismatch at a junction in an impedance controlled system |
| Insertion Loss | This defines the amount of signal lost during the journey of a signal from point A to point B. |
| Mode Conversion | This is due to the imbalance in a differential pair (common to differential and vice versa) |
| Return Loss | This defines the amount of signal reflected back to the source after encountering an impedance mismatch in the medium. Return loss can contribute to insertion loss if significant |
| S-Parameters | Scattering Parameters, describe the electrical behaviour of linear electrical networks when stimulated by various electrical signals. Return Loss, Insertion Loss, Mode Conversion, and cross talk represent S-Parameter data. |

Table 3: Definitions

## Overview Checklist

|  |  |  |
| --- | --- | --- |
|  | **Value** | **Comments** |
| **Review Date** |  |  |
| **Supplier** |  |  |
| **Vehicle/Model Year** |  |  |
| **Assembly Length** |  |  |
| **Number of Inlines** |  |  |
| **Number of Segments/Length** |  |  |
| **Assembly Part Number** |  |  |
| **100Base-T1/1000Base-T1** |  |  |
| **Cable Part Number(s)** |  |  |
| **Connector Part Number(s)** |  |  |

Table 4: Overview Data

## Instructions

***Automotive Ethernet cable and connector assembly reviews can be completed by scheduling a 1 hour appointment with:***

*TBD*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Email** | **Telephone** |
| **Supplier Engineer** |  |  |  |
| **FMC D&R Engineer** |  |  |  |

Table 5: Contact Details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Fail** | **Target Resolution Date** | **Pass With Exception** | **Pass** |
| **Overall Status** |  |  |  |  |
| **Comments** |  | | | |

Table 6: Overall Status

# Approved Connector and Cable Combinations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Requirement | Evidence | Pass/Fail | Exception | Comments |
| CCA\_FPDLINK\_02\_001 – Approved List   1. Verify the Ford connector group has approved the connectors. 2. Verify the Ford cable group has approved the cable. |  |  |  |  |
| CCA\_FPDLINK\_02\_002 – Assembly Construction   1. Verify the assembly has been constructed from components on the approved list. |  |  |  |  |

# Cable/Connector Assembly Limit Lines

| Requirement | Evidence | Pass/Fail | Deviation | Comments |
| --- | --- | --- | --- | --- |
| CCA\_FPDLINK\_03\_001 –Return Loss Limit   1. What protocol is used? 2. Verify the assembly meets the return loss budget. 3. Provide measurement report and touch tone file showing evidence of compliance. 4. Verify the simulation incorporated all tolerances (temperature and manufacturing). |  |  |  |  |
| CCA\_FPDLINK\_03\_002 – Insertion Loss Limit   1. What protocol is used? 2. Verify the assembly meets the insertion loss budget. 3. Provide measurement report and touch tone file showing evidence of compliance. 4. Verify the measurement incorporated all tolerances (temperature and manufacturing). |  |  |  |  |

# Cable/Connector Assembly PPAP

| Requirement | Evidence | Pass/Fail | Exception | Comments |
| --- | --- | --- | --- | --- |
| CCA\_FPDLINK\_04\_001 – PPAP   1. Verify the assembly has undergone the PPAP process and is released in the Ford system. 2. Provide evidence-showing compliance. |  |  |  |  |
| CCA\_FPDLINK\_04\_002 – EOL Testing   1. Verify the supplier has a statistical process control method in place to ensure production assemblies meet the differential and single ended impedance requirement of 100Ω±10%. and 50Ω±10% |  |  |  |  |