Automotive Wire Harness Cables and Connectors

A brief introduction for non-automotive people

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Rev 1.1
Impressions on a car harness
Impressions on a car harness
Impressions on Car Manufacturing
Impressions on Car Manufacturing

[Image of car manufacturing process with highlighted parts]
Impressions on Car Manufacturing

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Impressions on Car Manufacturing
What are OEMs used to (1)

- Harness is pre-manufactured and tested by TIER1
- Sub-harnesses for pre-assembled modules e.g. dashboard, door, seat, chassis
- Independed (sub-) harness for installation location e.g. engine compartment, passenger compartment (OEM dependend)

OEM dependent:
- Harness layout and segmentation
- Routing strategy of cables / harness
Impressions on Automotive Connectors
Automotive Data Cables and Connector Examples

Non single wire copper cables for special applications:

- Coaxial cables e.g. antenna applications
- Twisted pair cables for data e.g. can, flexray
- Star-Quad cables for some data applications e.g. displays
- Jacketed (or shielded) twisted pair for higher speed (Ethernet)
- Plastic optical fiber (POF) for Infotainment applications (MOST™)
Automotive Connectors – Contact Locking

Primary Locking
Secondary Locking

Secondary Locking (Hinge)
simultaneous for contact and module insert

Primary Locking for Contact
Primary Locking for Module Insert

Primary locking lance

IEEE 802.3 Multi-Gigabit Automotive Optical PHYS (OMEGA) Study Group - teleconference
Automotive Connectors - Housings

Easy assembly process

1. Cutting and stripping of cable jacket and wires
2. Crimping of terminals
3. Insertion of crimped terminals and jacket in lower shell
4. Assembly of upper shell
Automotive Connectors - Modularity

- Fixation element
- Frame
- Position core module
- e.g. 1 pair harness
Automotive Connectors - POF

Laser welding
Inner jacket
Ferrule
Outer jacket

Equipped with dust, plastic (typically orange), fiber-optic lines connected to the radio or amplifier (not necessarily this connector).

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What are OEMs used to (2)

- Cables bundled together in the harness
- Contacts are crimped onto the wire and insulation
- Contacts are assembled into connector housings secured by primary lock
  ➔ For impedance controlled multi-lane and shielded connectors, a core module defining the electrical properties is plugged into a housing instead
- Contacts/core modules are secured with a secondary lock that can only be engaged if the contact/core module is correctly loaded into the housing
- Connector housing provides locking feature and is replaceable if damaged
- Connector housing safeguards contacts from damage due to transport, handling and blind mating attempts
- Audible „click“ when connector is mated and locking is engaged
- Repair kits to mount a connector in the field (garage/repair shop)
  (⇒ to be discussed if repair kits for latest high-speed data connectors are required and feasible)
Thank you