



42 V Powernet Battery Connection System Specification Workgroup

Interim report
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History

- Consortium Steering Committee discussion
 - Battery manufacturers were starting to prototype 36 V batteries with different connection systems
 - Having a common, global connection system for 36 V batteries would be a valuable task to undertake early in the development stage



History

- Battery Terminal Workshop
 - Stuttgart, Germany - September 22, 1999
 - Presentations made on possible connection systems for 36 V batteries
 - Realization that we could not choose a preferred connection without establishing performance specifications
 - Commissioned a workgroup co-chaired by Delphi Automotive Systems and Johnson Controls, Inc.



Goal/Scope

Goal

- **To propose a universal 42-volt PowerNet battery connection system specification that will allow for all manufacturers to build 42-volt batteries that can be electrically interchangeable in any application specifying that design**

Scope

- 1) **All 42-volt PowerNet vehicle battery applications where the currents expected from the battery are at least 50 amperes (initially pertaining to passenger vehicles and light trucks)**
- 2) **The specification should be accepted worldwide**



Membership

- AMP
- Bolder Technologies
- DaimlerChrysler
- Delphi Automotive
- Ford
- Johnson Controls
- Matsushita/Panasonic
- MIT
- Visteon
- Yazaki



Timeline

- Desire to produce results within one year
- Realization that adopting an official global standard would take many years
- Established a plan to make an engineering recommendation to this Consortium by fall of 2000.
- Parallel activities to establish a standard (SAE, ISO, etc.) would be initiated



Accomplishments to date

- October & November 1999 meetings were organizational
 - Established a list of issues needing resolution
- December 9, 1999 - Vehicle OEM responses
- January 6, 2000 - Battery supplier responses
- January 19, 2000 - Connection supplier responses



Future plans

- March, 2000
 - Connection system preliminary design specification
- April, 2000
 - Review potential connection proposals (paper design)
- September, 2000
 - Review prototype designs & test data
- October, 2000
 - Choose a preferred design concept
- Initiate the process of drafting a specification



Issues list

- System issues
- Terminal mechanical
- Terminal electrical
- Connection system mechanical
- Connection system electrical
- Connection system environmental



Vehicle OEM responses

- Sent out questionnaire to all vehicle OEMs that are members of the MIT/Industry Consortium (10)
- Received responses from:
 - Audi
 - DaimlerChrysler - Europe
 - DaimlerChrysler - NA
 - Ford
 - PSA
 - Renault



Vehicle OEM responses

Vehicle OEM response to questions

	OEM #1	OEM #2	OEM #3	OEM #4	OEM #5	OEM #6
# of cycles?	25-35		20-50	20-50	10-20	100 50
maximum current?	800-1000A 10-20 sec	500 A - 10 sec. 2000A - 1 sec	600A - 5 sec 320A - 5 sec	125A - 30 sec 300A - 30 sec @ -20°F	100A - 15 sec	170A - 30 sec
voltage drop?	0.5V @Imax 0.5 mohm	0.1 - 0.2 V @ 500A 0.2 -0.4 mohm	0.5 mohm	0.2 0.5 mohm	<1 V 10 mohm	100 mv 150 mv after 500 cycles 0.6 mohm
ambient temperature?	-40°C, 60°C	-40°C, 130°C	-35°C, 60°C +80°C - 3 hrs	-40°C, 100°C	-50°C, 100°C	-40°C, 75°C
prevent electrical access to terminals?	no alligator yes	no alligator ok to have access	yes	yes	yes	yes
mate/unmate without tools?	desirable		desirable	don't care	no	yes
accommodate electronic module?	desirable		desirable	don't care	no	yes
index for battery technology?	yes	yes - tech	yes - tech	yes	yes	yes



Battery supplier responses

- Sent out questionnaire to battery manufacturers (8)
- Received group response from:
 - Delphi Automotive
 - Douglas Battery
 - East Penn Manufacturing
 - Exide
 - GNB Technology
 - Johnson Controls
 - Matsushita/Panasonic



Battery responses

- 16 questions asked
(sample responses)
- “Should battery terminals be male or female?”
 - Male - however, the flex member should be on the harness side
- Maximum current capability including time functionality?
 - Nominal set by the OEM application
 - Short circuit capability being defined by battery manufacturers



Connection supplier responses

- Sent out questionnaire to connection manufacturers (21)
- Received group response from:
 - AFL
 - AMP
 - Anderson Power Products
 - Delphi Automotive Systems
 - EPC
 - FCI
 - ITT Cannon
 - JST Corp.
 - Konnekttech
 - Molex/Cardell
 - MULTI-Contact USA
 - Yazaki



Connection supplier responses

(sample responses)

- 50 mate/unmate cycles is ok
- Need better definition of some requirements
 - continuous, cyclical, short circuit currents
 - standards to measure voltage drop
- Initial proposals will not be limited to tool-less connections
- Maximum force to make connection is 75 N



Issues list

- Issues closed by consensus of the workgroup
 - Electrical shorts between poles (+ & -) must not be possible using simple metal tools
 - Battery connections must be designed to prevent the connection of “alligator” type jumper cables
 - Battery connections must be designed to prevent connection to the wrong voltage bus
 - Battery connections must be designed to prevent reverse polarity



Issues list - continued

- Centerline distance between positive and negative battery connections will not be specified by this workgroup
- Location of connections (top, side, etc.) will not be specified by this workgroup
- Separate connections will be specified for positive and negative terminals
- Connector indexing must be specified to differentiate between battery technologies



Availability of information

- MIT Website
 - <http://auto.mit.edu/consortium/>
 - **“PUBLIC ACCESS”**
 - **“Battery Termination”**
 - Goal/Scope
 - Connection Glossary
 - Meeting Schedule
 - Closed issues (decisions)



Connection System Workshop

- January 27, 2000
 - Greenville - Spartanburg Airport Marriott
 - Salon ABCD
 - 8:30 am
- Interested companies can request to be on the e-mail list for minutes of meetings