



# 42 V PowerNet Battery Connection System Specification Workgroup

Fourth report  
March 27, 2001

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## History

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- Battery Terminal Workshop
  - Sponsored by Virtual Engineering Initiative (VEI)
  - 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

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### **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



## Timeline

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- Desired 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



## Participants

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- **Battery suppliers**
  - **Bolder Technologies \***
  - **Delphi Automotive Systems \***
  - **East Penn Manufacturing \***
  - **Exide Technologies \***
  - **Johnson Controls \***
  - **Matsushita/Panasonic \***
  - **Douglas Battery**
  - **Hoppecke**

\* participated at least once since October, 2000 Consortium update



## Participants

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- **Connection suppliers**

- **AFL \***
- **Delphi Automotive \***
- **EPC \***
- **FCI \***
- **Hypertronics \***
- **ITT Cannon \***
- **JST \***
- **Konnektech \***
- **Molex/Cardell \***
- **MTA \***
- **Specialty Screw \***
- **Tyco Electronics (AMP) \***
- **Visteon/Sumitomo \***
- **Yazaki \***
- **Amphenol**
- **Anderson Pwr. Prod.**
- **Furukawa Electric**
- **Multi-Contact**
- **Quick Cable Corp**

\* participated at least once since October, 2000 Consortium update



## Participants

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- **Vehicle OEMs**
  - **BMW \***
  - **DaimlerChrysler \***
  - **Ford \***
  - **General Motors \***
  - **Renault \***
  - **PSA**
  - **Toyota**
- **Other**
  - **SAE \***
  - **MIT**

\* participated at least once since October, 2000 Consortium update



## Information

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- Audi
- Honda
- Volvo
- CFEC AUTOSIL
- Grote & Hartmann
- Harting
- iQ Battery
- Kostel
- Leoni
- Littelfuse
- Robert Bosch
- SAFT
- SICAN (SciWorx)
- Siemens Automotive
- UL Inc.
- Varta



## Tasks required

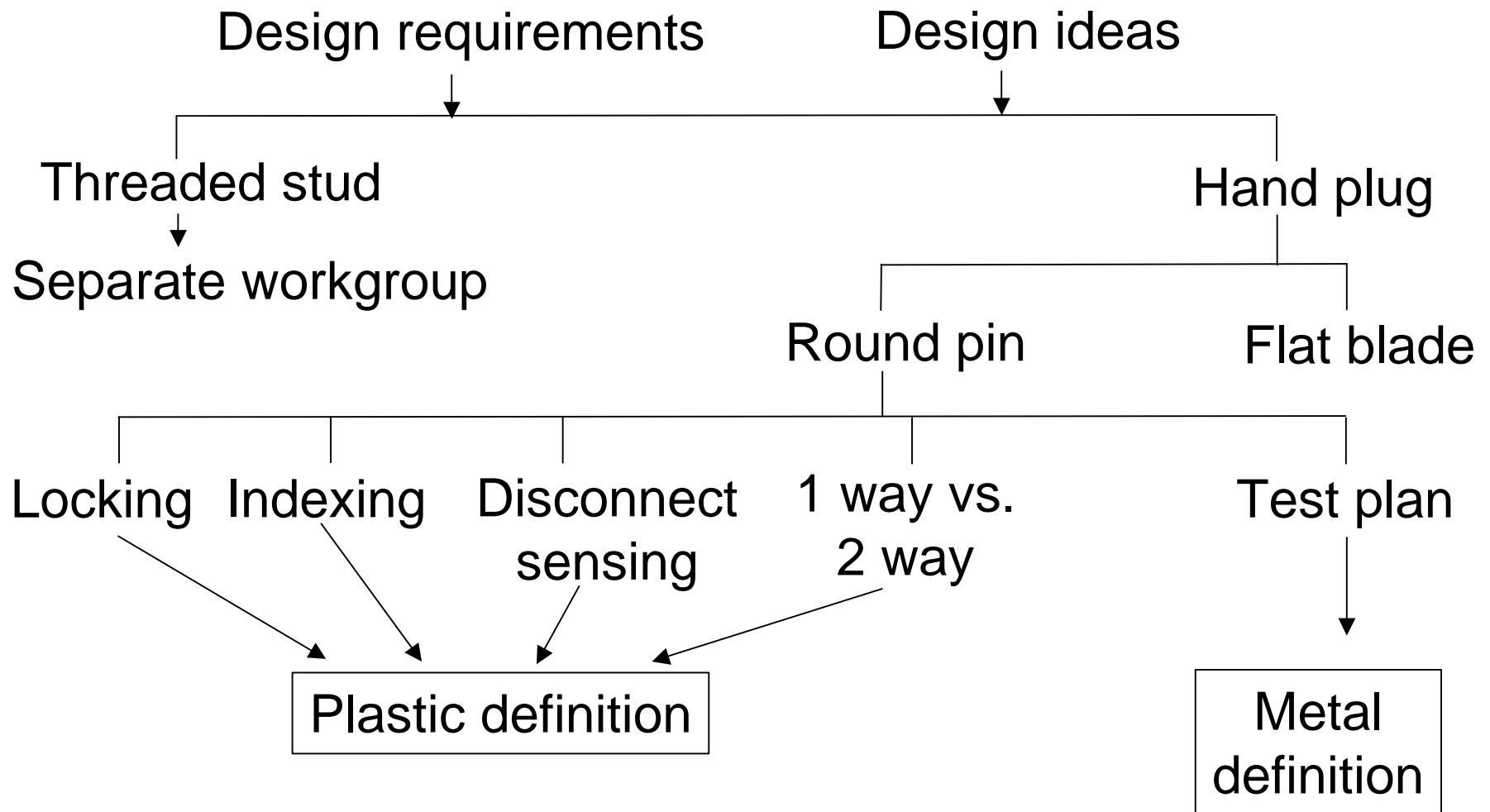
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- Global connection system requirements
- Globally accepted design
- Process to generate a formal international standard



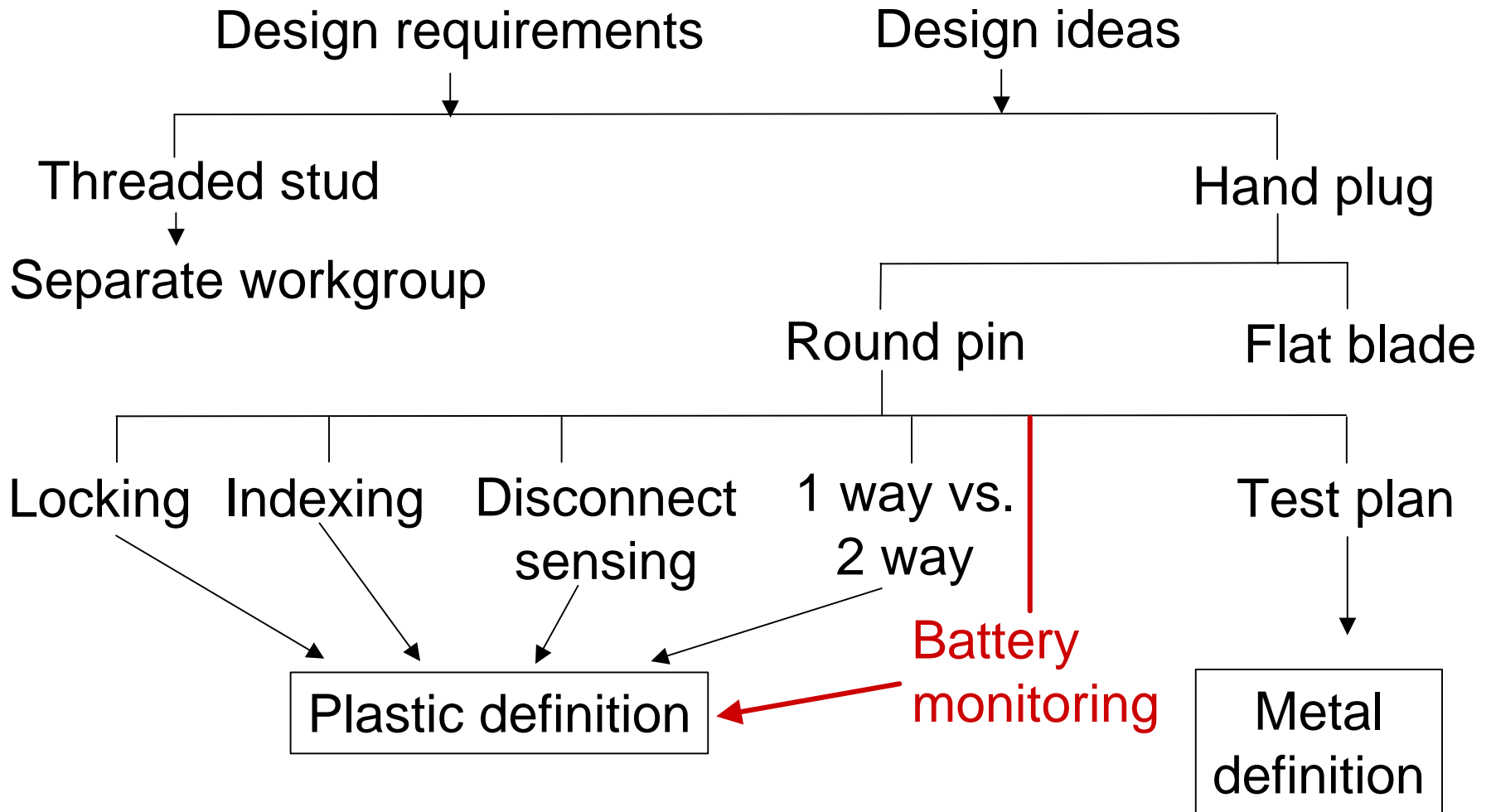
# Flow chart

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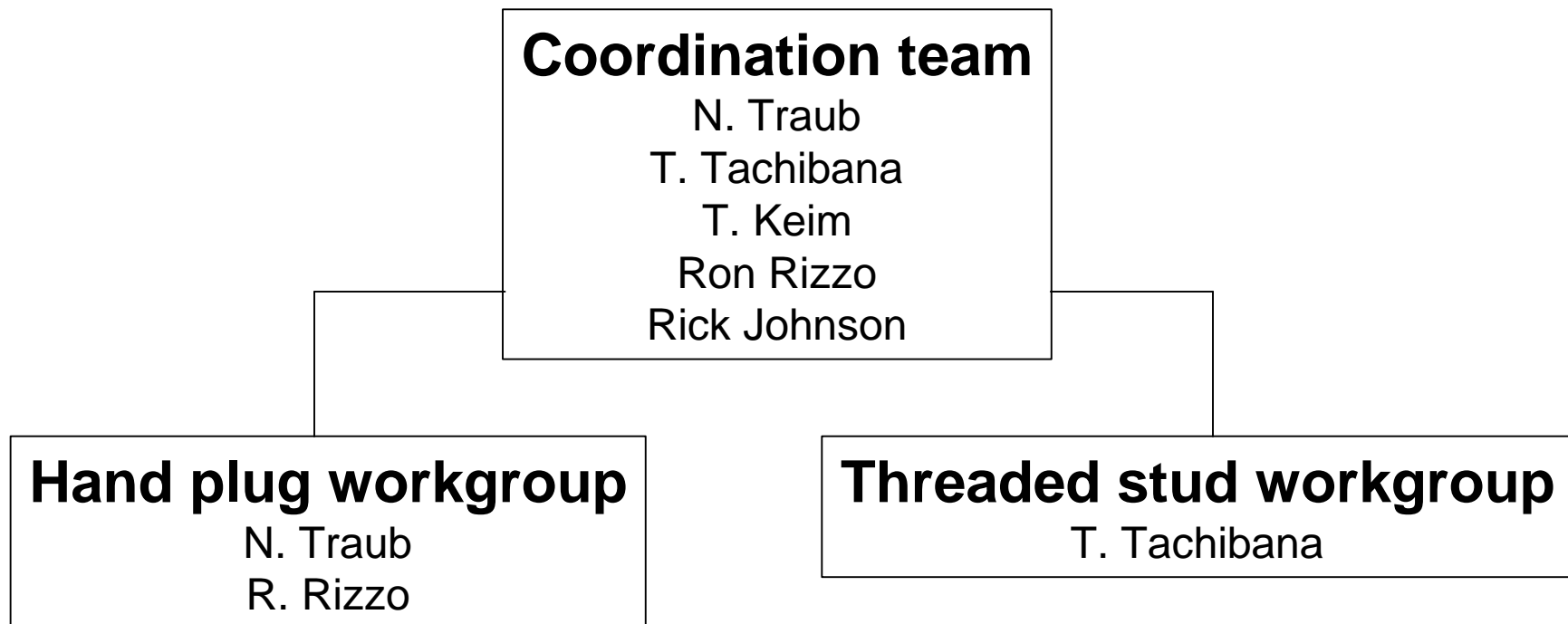
# Flow chart





# Workgroup structure

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## Accomplishments since last update

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- 11 meetings since October, 2000
  - 5 with full workgroup
  - 2 with test plan subgroup
  - 4 with vehicle OEMs



## Accomplishments since last update

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- 11 meetings since October, 2000
- Agreed on global connection requirements
  - Full list will be available on MIT Website
  - Major decisions
    - Only one connection to the battery
    - Disconnection sensing is required
      - Short, signal pin
      - Cam lever lock required
    - Provision for a battery monitoring signal pin



## Specification for 42V Battery Connection

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### Requirement (System)

- Electrical shorts between terminals of different voltage potential and between positive and vehicle ground must be minimized if using simple metal tools for assembly or disconnect

### Solution

- No tools will be needed - connection will be hand pluggable and enclosed in a plastic connector body
- Power circuits (+ & -) will be designed to pass the UL finger-proof test

- Possibility of accidental electrical shorts between the harness positive terminal and vehicle ground must be minimized when disconnected

- Harness positive (+) terminal will be recessed in a plastic connector body



# Specification for 42V Battery Connection

## Requirement (Physical)

- Standardization of design must allow for interchangeability of batteries without a need to change the harness connection

## Solution

- Battery side of connection will be standardized (even if connection is a panel mount on a “battery box” containing other features).
- The male terminal will be on the battery
- One size terminal should cover all current ranges



# Specification for 42V Battery Connection

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## Parameter

## Specification

### Terminal electrical

- Nominal current resistance

- Power pins -  $< 0.5 \text{ m}\Omega$

- Maximum current capability

- Power pins
  - 600 amps for 10 seconds
  - 120 amps for 44 minutes & 50 seconds
  - 0 amps for 15 minutes
- Signal pin (1) - limited by 5K $\Omega$  resistor in series with battery +



## Accomplishments since last update

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- 11 meetings since October, 2000
- Agreed on global connection requirements
- Started a first draft connection design
  - Requested USCAR to coordinate OEM requirements and design feedback
  - Requested EPC to develop a design drawing based on OEM, battery & connection supplier input and feedback



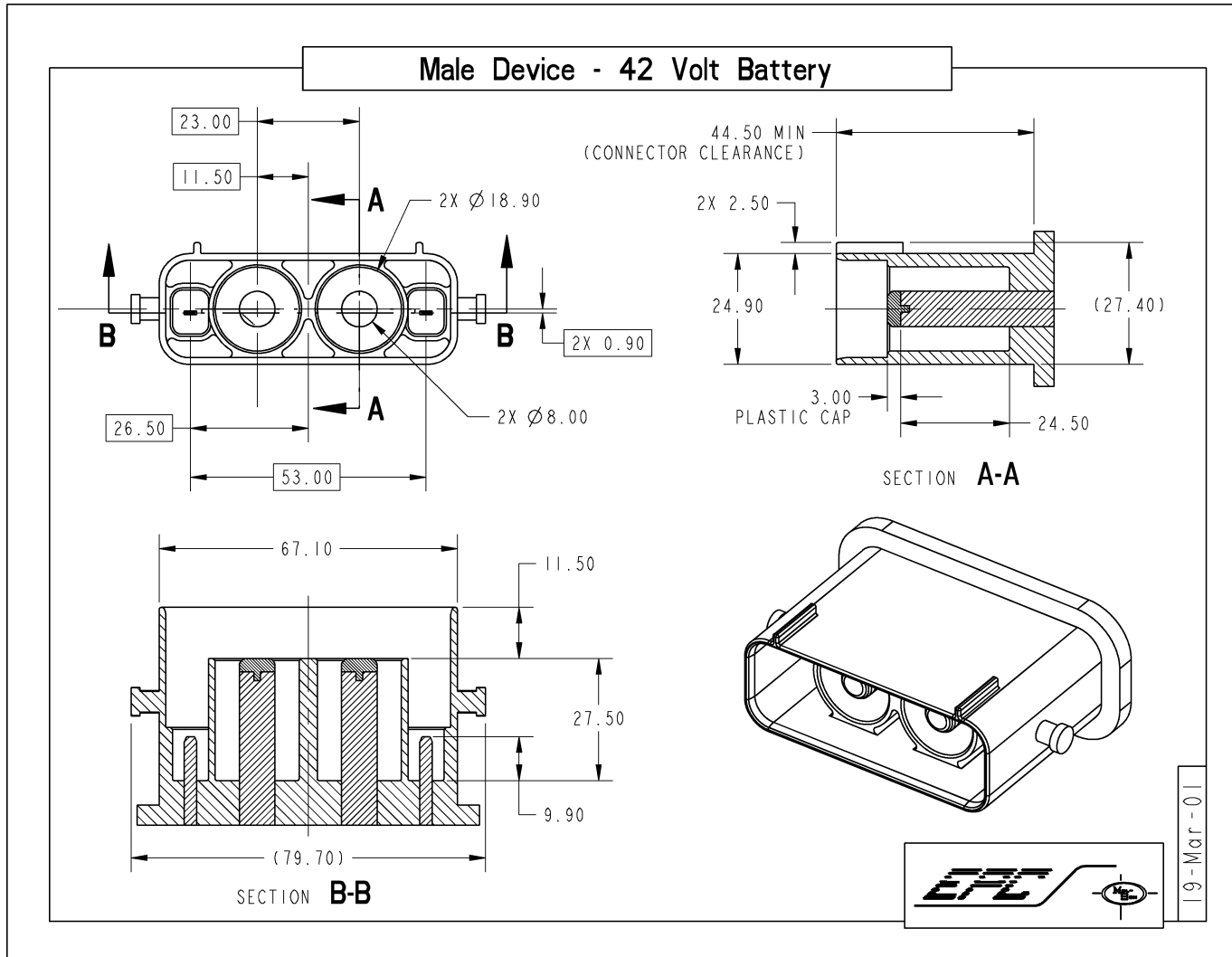
## Global design attributes

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- 8mm dia. power pins (2) 3-22-01 revisit decision?
- 2.8 mm blade signal pins (1-2)
- sealed
- Cam lever locking mechanism



# First draft design





## Accomplishments since last update

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- 11 meetings since October, 2000
- Agreed on global connection requirements
- Started a first draft connection design
  
- Established a process to generate a formal international standard



## Process for international standard

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- SAE will establish a joint work group between the Storage Battery Committee and the Connector Systems Task force to draft a SAE specification
- SAE will communicate/coordinate with other battery standards groups (i.e. CENELAC)
- SAE will present to ISO/IEC for global standardization



## Summary

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- Global connection system requirements have been generated
- A plan to generate a global design is in place
- A process to generate a formal international standard has been proposed



Feedback required

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The 42 V PowerNet Battery Connection System  
Specification Workgroup

asks for your feedback and agreement on the  
proposed process to generate a global  
design and international standard



## Availability of information

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- MIT Website
  - <http://auto.mit.edu/consortium/>
  - **“PUBLIC ACCESS”**
    - **“Battery Termination”**