

PMODE for In-Vehicle Networks

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- 1. Scope**—This SAE Recommended Practice describes the power mode requirements for in-vehicle networks that conform to the Automotive Multimedia Interface Collaboration (AMI-C) specifications. These networks include, but are not limited to, the IDB-C (SAE J2366), IDB-1394, and MOST.

This version of the document covers primarily IDB-C and may be revised when the PMODE requirements for the other networks are more fully developed by AMI-C.

2. References

- 2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

- 2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, or <http://www.sae.org>.

SAE J1113-11—Immunity to Conducted Transients on Power Leads
 SAE J2366-1—ITS Data Bus—Physical Layer
 SAE J2366-2—ITS Data Bus—Link Layer

- 2.1.2 AMI-C DOCUMENTS—Available from the AMI-C web site: <http://www.ami-c.org>

AMI-C Spec 3001—Vehicle Interface Specification – Release 1
 AMI-C Spec 3003—OEM to IDB-C Gateway
 AMI-C Spec 3004—1394 to IDB-C Gateway
 AMI-C Spec 3005—MOST to IDB-C Gateway

- 2.1.3 ISO DOCUMENTS—Available from the ISO or ANSI

ISO/CD-16750-2—Road vehicles—Environmental conditions and testing for electrical and electronic equipment—Part 2: Electrical loads

- 2.2 Related Publications**—These documents further contribute to the understanding of the context of this standard.

- 2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, or <http://www.sae.org>.

SAE J2355—ITS Data Bus – Architecture Reference Model Information Report
 SAE J2366-4—ITS Data Bus—Thin Transport Layer
 SAE J2366-7—ITS Data Bus—Application Message Layer
 SAE J2366-7X—ITS Data Bus—Message Sets for Device Classes
 SAE J2366-7LX—ITS Data Bus—IDB Lexicon

2.2.2 AMI-C PUBLICATIONS—Available from the AMI-C web site: <http://www.ami-c.org>

AMI-C Spec 1001—Release 1 Architecture
 AMI-C Spec 1002—Functional Requirements
 AMI-C Spec 3002—Common Message Set
 AMI-C Spec 1004—AMI-C Release 1 Message-Level Security
 AMI-C Ref Doc 1003—AMI-C Use Cases

3. Definitions

- 3.1 AMI**—Automotive Multimedia Interface – the general term used to identify all interfaces defined by AMI-C.
- 3.2 AMI-C**—Automotive Multimedia Interface Collaboration – a non-profit corporation established by automotive manufacturers to adopt or develop standards for multimedia interfaces to vehicles.
- 3.3 AMI Connector**—The connector to which an AMI-C compliant OEM or embedded (permanently installed) component is connected.
- 3.4 Consumer Convenience Port**—The connector through which portable or other ad-hoc components are connected to the network.
- 3.5 HMI**—Human Machine Interface – used to define any user / driver interface mechanism.
- 3.6 IEEE**—Institute of Electrical and Electronic Engineers
- 3.7 MOST**—Media Oriented System Transport – optical fiber-based multimedia and control networking technology.
- 3.8 OEM**—Original Equipment Manufacturer – in this document the term OEM is used to describe a vehicle manufacturer.
- 3.9 PMODE**—The Power Mode signal – the subject of this document.
- 3.10 Selective Wake-up**—A process by which only certain components on the network are activated when the Power state is OFF.
- 3.11 Timing Parameters**
- 3.11.1 T_{off_min} – PMODE ON-TO-OFF DELAY TIMER—The time that starts with the detection of a condition that warrants signaling of the Power OFF state and the actual transition of the PMODE signal to OFF. $T_{off_min} = 500$ ms.
- 3.11.2 T_{on_min} – PMODE OFF-TO-ON DELAY TIMER—The time that starts with the detection of a condition that warrants signaling of the Power ON state and the actual transition of the PMODE signal to ON. $T_{on_min} = 1000$ ms.
- 3.11.3 T_{node_off} – NODE TURN OFF TIMER—The maximum time that a component is allowed to continue to be ACTIVE after PMODE changes from ON to OFF. $T_{node_off} = 60$ S.
- 3.11.4 T_{sel_wakeup} – NETWORK SELECTIVE WAKE-UP PULSE—The time period for which a component asserts the PMODE signal (from the OFF state to the ON state and back to the OFF state) to request a Selective Wake-up. $T_{sel_wakeup} = 250$ -500 ms.
- 3.12 VBatt**—Unconditioned vehicle battery voltage. $VBatt_Max$ = maximum value of $VBatt = 16$ V DC

3.13 Vehicle Services Interface—The component on the network that is responsible for the primary control of the PMODE signal.

3.14 Vehicle Services Interface Connector—The connector provided by the vehicle manufacturer through which the network is supplied with power and negative ground circuits.

4. Power Management

4.1 Vehicle Power Characteristics—The following typical values are provided for clarification only. For specific values, refer to ISO/CD 16750-2.

- It is expected that AMI-C compliant components will operate using a standard 12 V automotive power supply. This document does not cover any future 42 V requirements or specifications.
- Typical system voltage range during normal operation and engine running above idle speeds is 11.5 to 16 V.
- Typical voltage range during engine cranking (starter engaged) is 5 to 9 V. The lowest voltage occurs during low temperature extreme or during low battery state-of-charge.
- Transient voltage peaks during alternator load dump can be between +80 to 200 V.
- Transient voltage peaks during load switching from -100 to -300 V.
- Typical voltage during battery jump-start ranges between 12 and 24 V.
- Typical voltage during reverse battery connector (service error) ranges between -8 to -12 V, but could be greater. Actual negative voltage will depend on several factors, including the ability of the battery to accept charge. A dead battery could allow system voltage to be greater than -12 V.

Figure 1 shows the previous in graphical form.

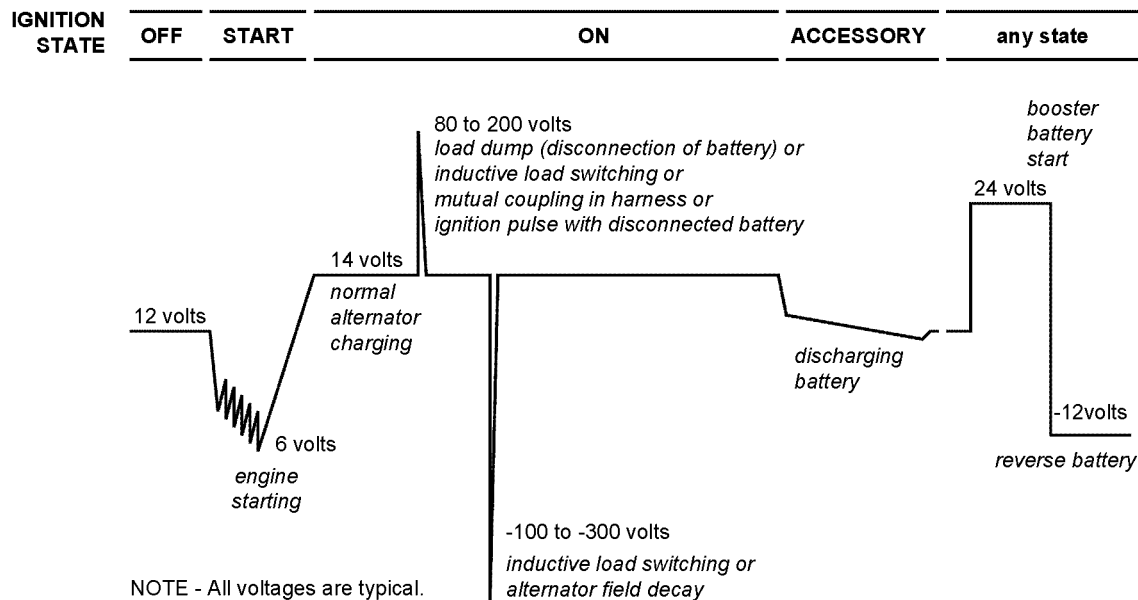


FIGURE 1—TYPICAL AUTOMOTIVE POWER CHARACTERISTICS

4.2 Power and Ground Requirements—This section describes and specifies several aspects of the automotive power supply system to achieve interchangeability among the wide variety of electrical and electronic components required to operate in the AMI-C compliant system. This section covers power and ground circuits and circuit voltage offsets.

NOTE— Self-powered components (e.g., internal battery-driven) that are not connected to the vehicle's electrical subsystem or to the AMI Interface Connector Power and Ground pins may be used.

4.2.1 INTERFACE COMPONENT—An AMI-C compliant vehicle is only required to have one component – the AMI-C Vehicle Services Interface. It is assumed that this component will provide the required power for the components connected to the network. The Vehicle Services Interface shall be capable of sourcing at least 10.5 V DC at 5 A to the network.

4.2.2 POWER PIN—An AMI-C compliant component can draw limited power from the power pin of its AMI Connector.

- A component shall be capable of operating with a VBatt of 8-16 V DC (see ISO 16750 for further details).
- The maximum internal current draw from the power pin of any connector comprising the AMI Connector set is limited to 0.5 A for each component. Current requirements of a component that exceed this maximum amount must be provided through a separate connector and separately fused circuit.
- Systems with a total current requirement of more than the 5.0 A current draw on an AMI Connector require a break in the series circuit and a second power source inserting an additional 5.0 A supply (see Figure 2). This provides an extension of the daisy-chained power circuit to an additional 10 components.

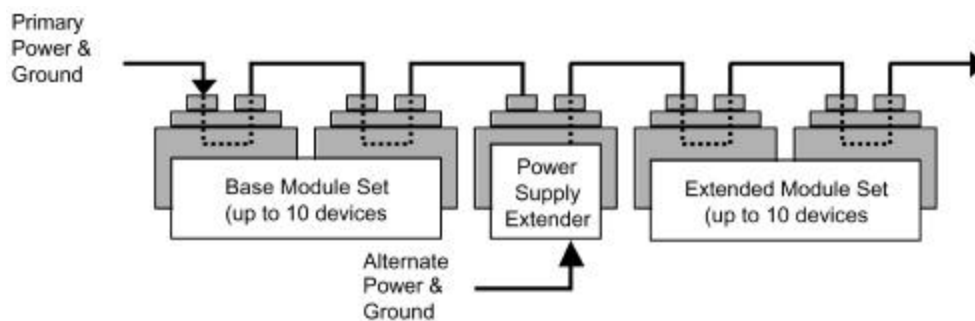


FIGURE 2—EXTENDED POWER SUPPLY

4.2.3 GROUND CIRCUIT—The Ground circuit of the AMI Interface Connector set sinks current from the components back to negative ground. The maximum current returned to negative ground via each AMI Connector shall be 0.5 A.

Electrical grounding of components shall preclude ground loops and high current flow from affecting normal system operation.

Components having secondary connectors providing power to them must use isolated negative ground return lines for those circuits back to a single common point in the vehicle. This secondary negative ground return must also be isolated within the component from the Vehicle Services Interface ground.