SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1239

REV. FEB2003

Issued 1978-06
Revised 2003-02

Superseding J1239 OCT1995

Four-, Five-, and Eight-Conductor Electrical Connectors for Automotive Type Trailers

Foreword—This Document has also changed to comply with the new SAE Technical Standards Board format.

TABLE OF CONTENTS

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1. *Scope*—This SAE Recommended Practice covers the wiring and rectangularly shaped connector standards for all types of trailers whose gross weight does not exceed 4540 kg (10 000 lb). These trailers are grouped in SAE J684 with running light circuit loads not to exceed 7.5 A per circuit. This document provides circuits for lighting, electric brakes, trailer battery charging, and an auxiliary circuit color code and protection for the wiring from hazards or short circuits. Color code is compatible with SAE J560 and ISO 1724-1980(E).

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 issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J560—Seven Conductor Electrical Connector for Truck-Trailer Jumper Cable
SAE J684—Trailer Couplings, Hitches and Safety Chains—Automotive Type
SAE J928—Electrical Terminals—Pin and Receptacle Type
SAE J1128—Low-Tension Primary Cable
SAE J2223-1—Connections for On-Board Road Vehicle Electrical Wiring Harnesses—Part 1: Single-Pole Connectors—Flat Blade Terminals—Dimensional Characteristics and Specific Requirements
SAE J2223-2—Connections for On-Board Road Vehicle Electrical Wiring Harnesses—Part 2: Tests and General Performance Requirements
SAE J2223-3—Connections for On-Board Road Vehicle Electrical Wiring Harnesses—Part 3: Multipole Connectors—Flat Blade Terminals—Dimensional Characteristics and Specific Requirements

2.1.2 ASTM PUBLICATION—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM G 90-94—Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

2.1.3 ISO PUBLICATION—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 1724-1980(E)—Road vehicles—Electrical connections between towing vehicles and towed vehicles with 6-or 12-V electrical equipment—Type 12 N (normal)

3. *Receptacles*

3.1 Four-Way Receptacle—The four-way receptacle shall be of the configuration and design dimensions shown in Figure 1.

3.1.1 The four-way receptacle (Figure 1) shall be color coded and attached to the towing vehicle as follows:

a. White—Ground to frame SAE wire size 1 mm^2 (SAE wire size no. 16 gauge) minimum
b. Brown—Spliced to tail and license lamp circuit
c. Yellow—Spliced to left turn and stop circuit
d. Green—Spliced to right turn and stop circuit

3.2 Five-Way Receptacle—The five-way receptacle shall be of the configuration and design dimensions shown in Figure 2.

3.2.1 The five-way receptacle (Figure 2) shall be color-coded and attached to the towing vehicle as follows:

a. White—Ground to frame
b. Brown—Spliced to tail and license light circuit
c. Yellow—Spliced to left turn and stop circuit
d. Green—Spliced to right turn and stop circuit
e. Blue—Auxiliary

3.3 Eight-Way Receptacle—The eight-way receptacle shall be of the configuration and design dimensions shown in Figure 3.

3.3.1 The eight-circuit receptacle (Figure 3) shall be color-coded and attached to the towing vehicle as follows:

3.3.1.1 Left Bank of Receptacles

a. Red—Independent stop
b. Blue—Brake circuit spliced to controller of brake
c. Optional—Auxiliary (See Figure 3, Note 1)
d. Orange—Battery charge circuit-connect to battery positive terminal through separate fuse or circuit breaker

3.3.1.2 Right Bank of Receptacles

a. White—Direct to battery negative SAE wire size 3 mm^2 (SAE wire size no. 12 gauge) minimum
b. Brown—Spliced to tail and license lamp circuit
c. Yellow—Spliced to left turn and stop lamp circuit
d. Green—Spliced to right turn and stop lamp circuit

3.4 The receptacle leads shall be attached to the vehicle wiring harness in a workmanlike manner, mechanically and electrically secure. Further, a well-insulated strain relief shall be provided between the receptacle and the towing vehicle wiring harness connections so that there will be no strain on the vehicle harness in the event of an abnormal pull on the receptacle. The receptacle shall be placed in a location where it will not be exposed to road hazards either when connected or loose. The receptacle leads must be properly routed and protected against damage from cutting and pinching where they leave the vehicle body. Extra insulation should be provided between the strain relief at the trailer hitch and the wiring assembly so that an abnormal pull on the plug will not damage the wiring.

3.5 No receptacle leads designated for lighting shall be smaller than SAE wire size 1 mm^2 (SAE wire size no. 16 gauge) minimum if a single conductor, or smaller than SAE wire size 0.8 mm^2 (SAE wire size no. 18 gauge) if a multiconductor cable.

3.6 No receptacle leads for brake circuits shall be smaller than SAE wire 2 mm^2 (SAE wire size no. 14 gauge) and no circuits shall be smaller than SAE wire 3 mm^2 for (SAE wire size no. 12 gauge) trailer battery charge circuit or battery return circuit.

3.7 The gauge of conductors for the auxiliary circuits shall be sized to provide at least the maximum amperage for the load it will service with a voltage drop not exceeding 3%. The receptacle shall be placed in a location where it will not be exposed to road hazards when disconnected from trailer.

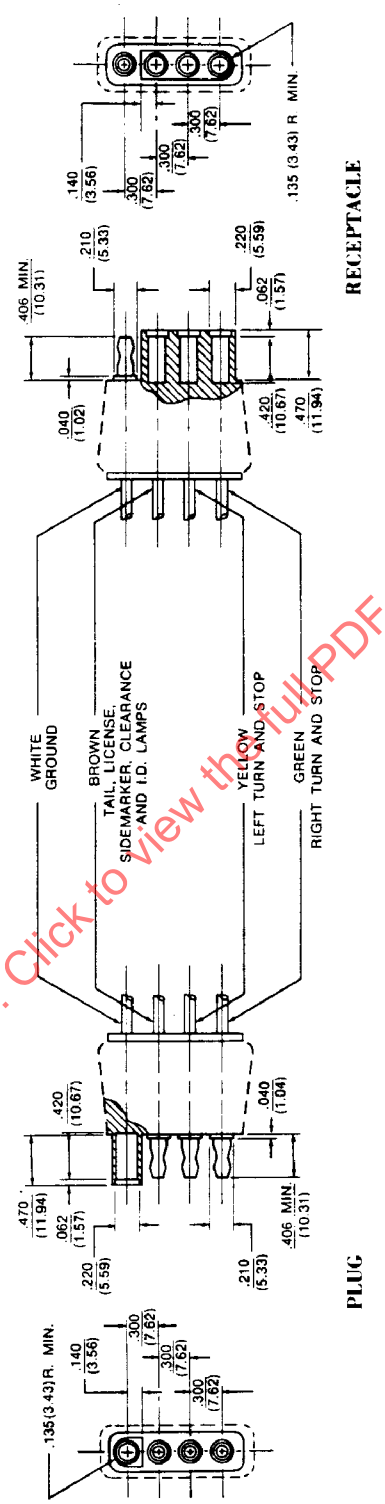

FIGURE 1—FOUR-WAY RECEPTACLE

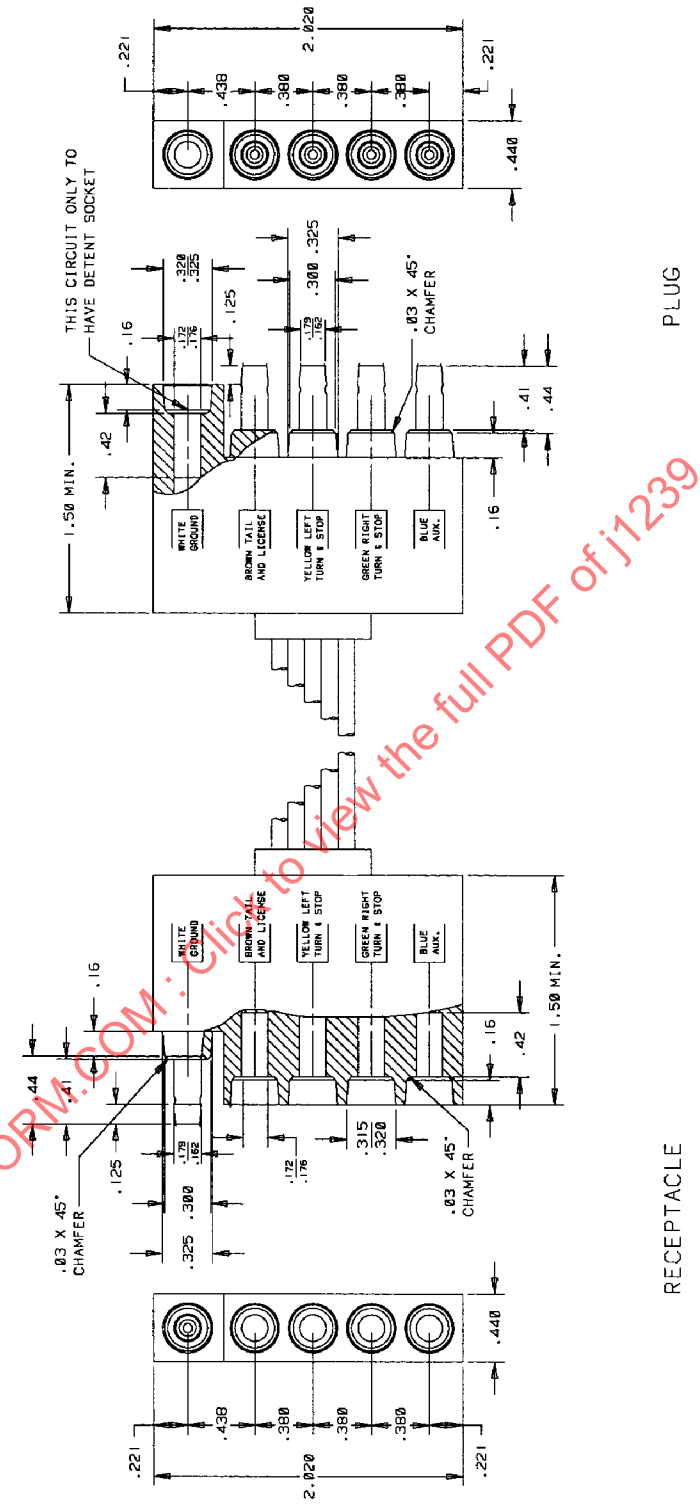

FIGURE 2—FIVE-WAY RECEPTACLE

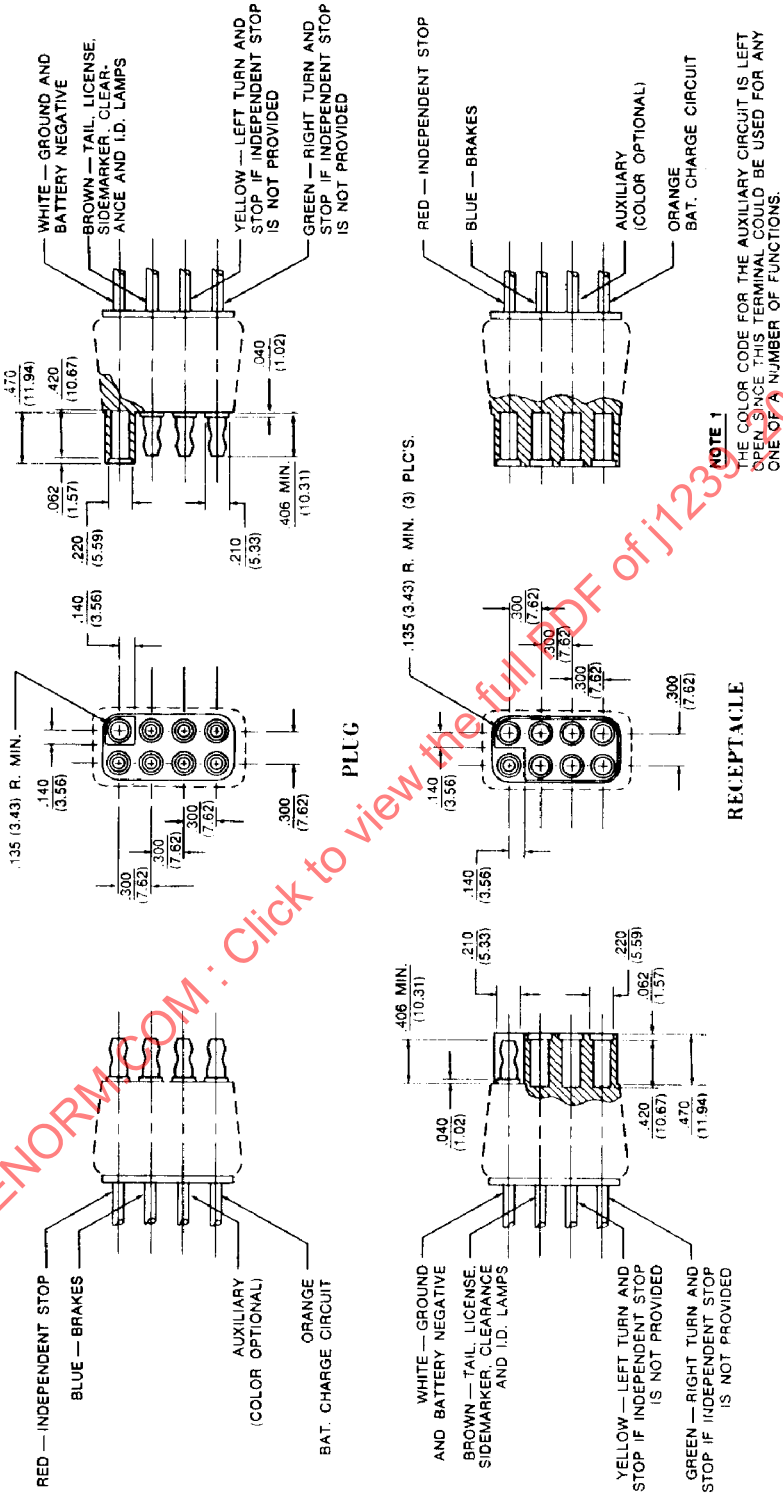

FIGURE 3—EIGHT-WAY RECEPTACLE

4. ***Plug—***The plug shall be of the configuration and design dimensions shown in Figure 1 for four circuits, Figure 2 for five circuits, and Figure 3 for eight circuits.

4.1 **Four-Way Plug—**The four circuit plug (Figure 1) shall be color coded and attached to the trailer harness as follows:

a. White—Ground to frame SAE wire size 1 mm^2 (SAE wire size 16 gauge)
b. Brown—Spliced to tail and license lamp circuit
c. Yellow—Spliced to left turn and stop circuit
d. Green—Spliced to right turn and stop lamp circuit

4.2 **Five-Way Plug—**The five-circuit plug (Figure 2) shall be color-coded and attached to the trailer harness as follows:

a. White—Ground
b. Brown—Tail and license lamp
c. Yellow—Left turn and stop lamp
d. Green—Right turn and stop lamp
e. Blue—Auxiliary

4.3 **Eight-Way Plug—**The eight-circuit plug (Figure 3) shall be color coded and attached to the trailer harness as follows:

4.3.1 RIGHT BANK PLUG

a. Red—Independent stop
b. Blue—Brake circuit spliced to controller of brake circuit
c. Optional—Auxiliary (See Figure 3, Note 1)
d. Orange—Battery Charge Circuit—Connect to trailer battery positive terminal through separate fuse or circuit breaker

4.3.2 LEFT BANK PLUG

a. White—Ground to frame and trailer battery negative terminal
b. Brown—Spliced to tail and license lamp circuit
c. Yellow—Spliced to left turn and stop lamp circuit
d. Green—Spliced to right turn and stop lamp circuit

5. ***Wiring—***All wire and insulation shall conform to the requirements of SAE J1128 Reference Low Tension Primary Cable data on stranded conductors for 12-V circuits with 3% voltage drop. (See Appendix A, Figures A1 and A2.)

5.1 Exposed trailer wiring shall be run in conduits or secured at intervals not greater than 457 mm (18 in) to stop lateral movement and prevent rubbing or chafing.

5.2 So far as practicable, wiring should be located to afford protection from road splash, stones, or abrasion. Wiring exposed to such conditions shall use additional tape, plastic sleeve, nonmetallic conduit, and/or other suitable shielding or covering to further protect the wiring.

6. *Material Requirements*

6.1 The receptacle and plug shall be made of an insulating material such that they can be processed to provide the spacing and splash protection indicated in Figures 1, 2, and 3.

6.2 If the receptacles and plugs are fabricated of either compression molded or extruded plastic, the plastic material shall be stabilized for protection against exposure to ultraviolet light. Reference to ASTM G 90-94 for conducting a general test on plastic material using a radiometer to measure radiant energy incidents upon a unit surface over a unit of time per area and accelerating outdoor exposures with a fresnel reflector concentrator. The practice does not specify materials to be tested. Sample preparation and evaluation of results are covered by existing specifications for specific materials.

6.2.1 The hardness of a molded receptacle or plug shall generally fall within the limits of Shore A 50 as minimum and Shore A 70 as a maximum. Shore A 85 has also been known to perform well if properly reinforced and stabilized.

6.3 The terminal pins and receptacles sockets shown in Figures 1, 2, and 3 shall conform to the size and type shown in SAE J928, TABLE 1—TYPE 1 PIN TERMINALS with a nominal diameter of 4.57 mm (0.180 in). Detailed pin and receptacle dimensions are illustrated in Figures 4 and 5.

6.3.1 The terminal pins and receptacles shall be fabricated from brass or bronze material and suitable coated to protect against corrosion. Finished surfaces of terminal pins and interior walls of terminal receptacles shall be smooth so as not to bind when the parts are engaged.

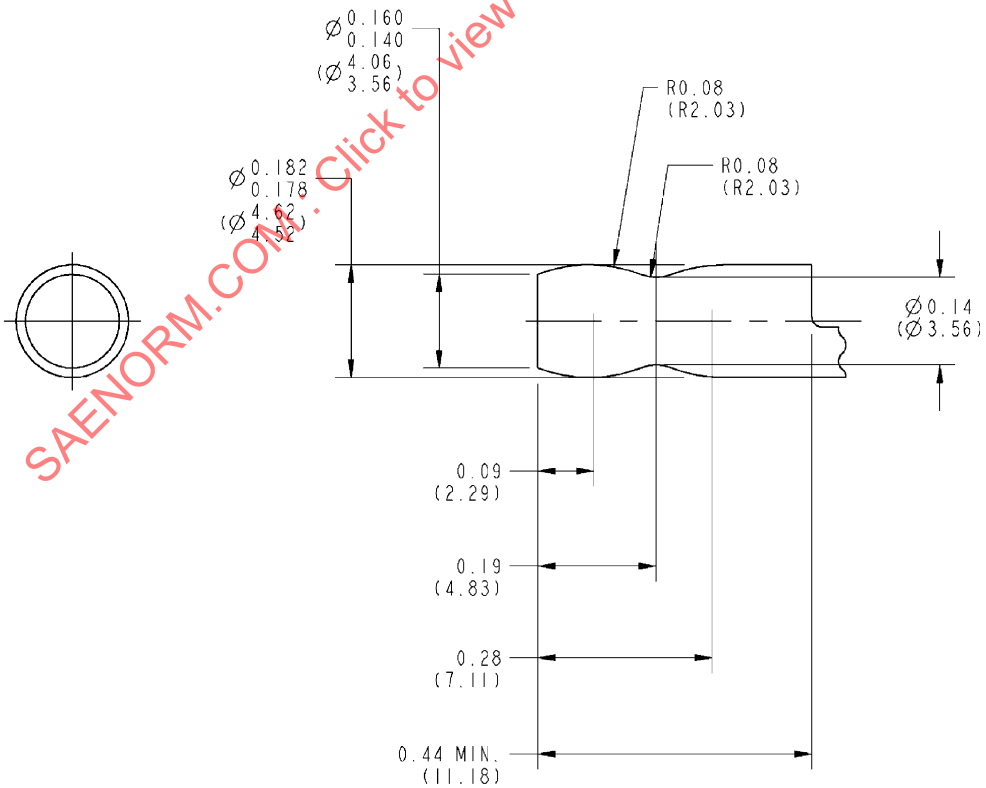

FIGURE 4—PIN

7. *Assembly Requirements*

7.1 The plug and receptacle of a four-way connector assembly shall disengage with a minimum force of 22.24 N (5 lb) per assembly and a maximum force of 88.96 N (20 lb) per assembly.

7.2 The plug and receptacle of a five-way connector assembly shall disengage with a minimum force of 13.34 N (3 lb) per circuit and a maximum of 31.14 N (7 lb) per circuit except the ground circuit, which can be 53.38 N (12 lb) maximum.

7.3 The plug and receptacle of an eight-way connector assembly shall disengage with a minimum of 35.58 N (8 lb) per assembly and a maximum force of 133.44 N (30 lb) per assembly.

7.4 The mechanical force requirements of disengagement do not preclude the requirements for good electrical connections between the male and female connectors of the circuits.

NOTE: THIS SOCKET TO BE USED ONLY ON THE GROUND CIRCUIT OF THE MOLDED PLUG. SOCKETS SIMILAR TO THIS, EXCEPT WITH THE DETENT OMITTED, ARE TO BE USED IN THE MOLDED RECEPTACLE.

METAL STOCK SHOULD BE OF ¾ HARD TEMPER BRASS OR BRONZE MATERIAL.

REFERENCE DIMENSIONS ARE IN MILLIMETERS

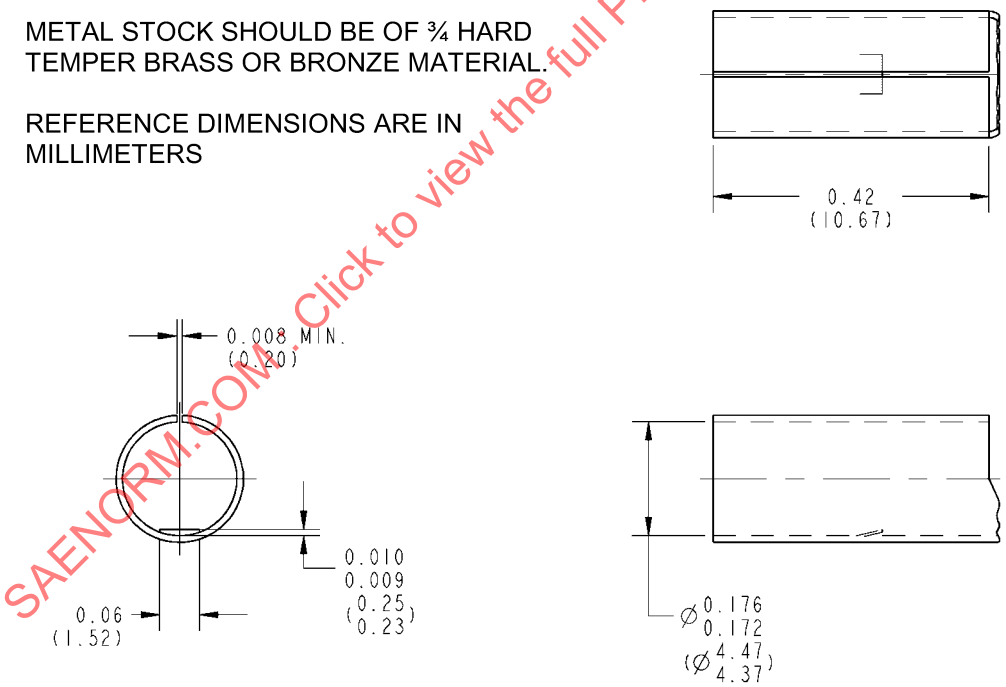

FIGURE 5—SOCKET

8. ***Alternate Connector Selection*—**This specification provides fundamental performance characteristics pertaining to mold-on connectors, which have been established for Class I trailer applications. There is no intention to limit the application to the example four-, five-, and eight-way pin/sleeve connectors, provided that mating pair connectors have equal or superior performance characteristics. Also, additional performance standards for connectors can be referenced in SAE J2223-1, SAE J2223-2, and SAE J2223-3.