SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J1962

Issued 1992-06

DIAGNOSTIC CONNECTOR

1. Scope—This SAE Recommended Practice:

a. Defines the functional requirements for a vehicle electrical/electronic diagnostic connector. These functional requirements are separated into two principal areas: connector location/access and connector design.

b. Establishes terminal assignments to conform to either of two categories: Standard or Manufacturer Discretionary. Rationale relative to intent is provided, where applicable, to minimize ambiguity.

1.1 Purpose—The purpose of this document is to define a minimum set of diagnostic connector requirements that will promote the use of a common diagnostic connector throughout the motor vehicle industry.

It is intended that the connector specified herein be used on complex luxury vehicles as well as simple utility vehicles.

This document is under the control and maintenance of the Vehicle E/E Systems Diagnostic Committee. This committee will periodically review and update this document as needs dictate.

2. References

2.1 Applicable Documents—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

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

SAE J1850—Class B Data Communication Network Interface

SAE J1978—OBD II Scan Tool

SAE J2201—Universal Interface for OBD II Scan Tools

2.1.2 ISO PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 8092-1:1989—Road vehicles—Flat, quick-connect terminations—Part 1: Tabs for single pole connections

ISO 8092-2:1988—Road vehicles—Flat, quick-connect terminations—Part 2: Test and performance requirements for single pole connections

ISO 9141—Road vehicles—Diagnostic systems—Requirements for interchange of digital information

3. Connector Location/Access

3.1 Consistency of Location—The connector shall be located in the passenger compartment in the area bounded by the driver's end of the instrument panel to 300 mm beyond the vehicle centerline, attached to the instrument panel, and accessible from the driver's seat. The preferred location is between the steering column and the vehicle centerline. The connector shall be mounted to facilitate mating and unmating.

3.2 Ease of Access—Access to the connector shall not require a tool for the removal of an instrument panel cover, connector cover, or any barriers. The connector should be fastened and located so as to permit a one-handed/blind insertion of the mating diagnostic and/or manufacturing test equipment connector. Refer to Figure 1 for mated connector space requirements.

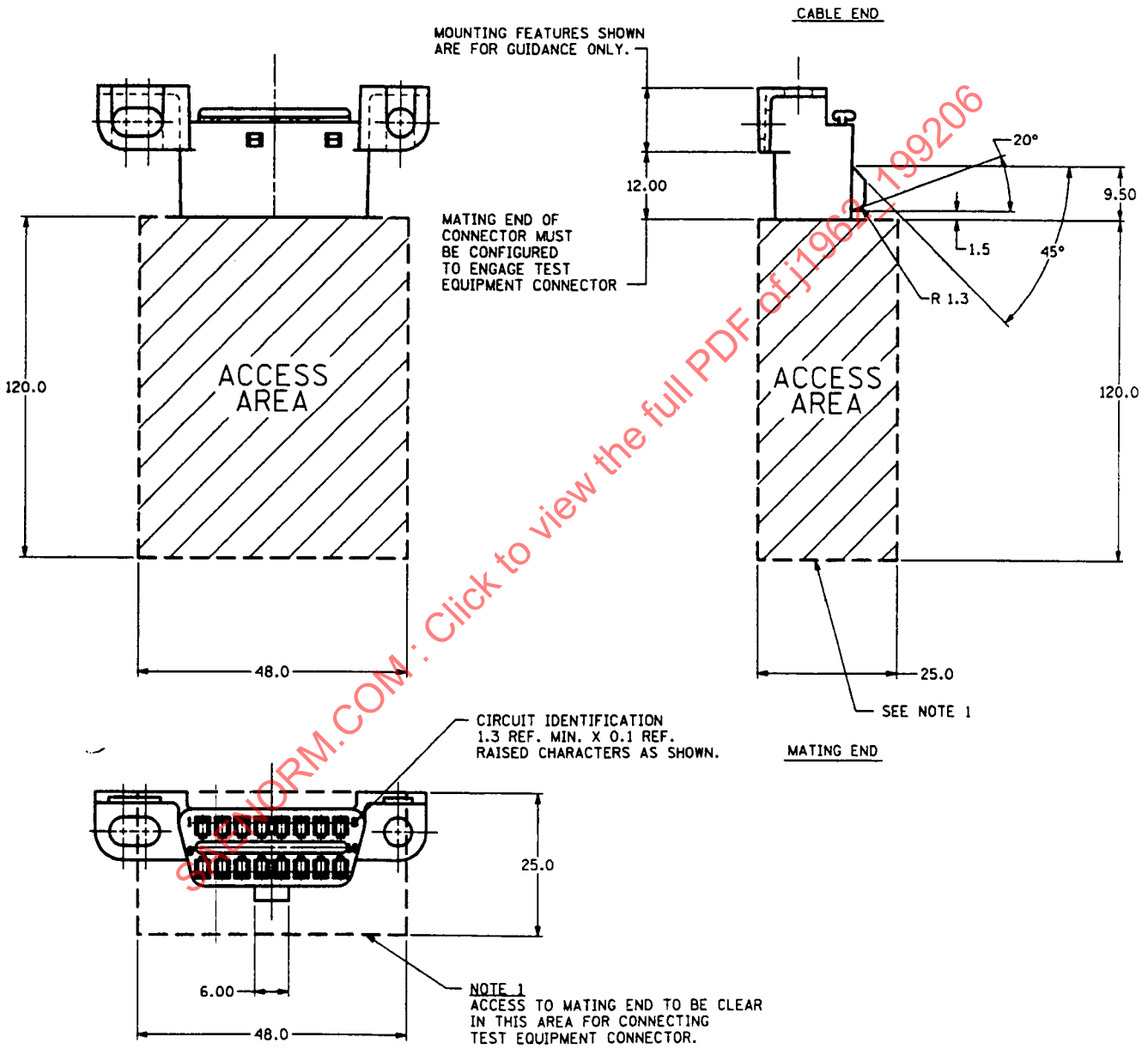


FIGURE 1—VEHICLE CONNECTOR

3.3 Visibility—The connector should be out of the occupant's (front and rear seat) normal line of sight but easily visible to a "crouched" technician.

3.4 Vehicle Operation—Attachment of test equipment to the diagnostic connector (via a simple cable/harness) should not preclude normal physical operation of the vehicle's controls.

4. Connector Design

4.1 Number of Cavities/Terminals—The diagnostic connector shall be capable of accommodating 16 terminals.

4.2 Terminal Requirements—The terminals shall be rated for currents not to exceed 10 A DC continuous.

4.2.1 TERMINAL TYPES—The vehicle half of the connector shall consist of female terminals that will mate with the test equipment connector male blade terminals.

4.2.2 TERMINAL SPACING—All terminals shall be on 4.0 mm centerline spacing.

4.3 Connector Mating—The connector contact mating shall be designed so that the signal ground and the chassis ground will make electrical contact prior to any other terminals making electrical contact. On the disconnect cycle, these same two terminals will not lose electrical contact until all of the other terminals have been disconnected.

4.4 Connector Shape/Features—The connector shall be rectangular. The connector shall have easily discernible keying features to allow for easy connection in a one handed/blind operation.

The vehicle connector and the test equipment connector shall have latching features that assure the test equipment connector will remain mated when properly connected. The latching feature will be designed to provide a positive feel when the connector is fully seated. The latching feature should not require the activation of any levers on either connector to mate or unmate. Pulling on the connector to separate the two mated halves shall not result in any damage to the connector.

The vehicle connector design shall provide features which assure terminal retention; i.e., secondary locks or other terminal position features.

4.5 Material Selection

4.5.1 CONNECTOR MATERIAL—Material selection and specification shall be made by the appropriate vehicle and/or diagnostic equipment manufacturers. However, the recommended temperature range for the selected material is -40 °C to 85 °C.

4.5.2 TERMINAL MATERIAL—Base metal material selection and specification shall be made by the appropriate vehicle and/or diagnostic equipment manufacturers.

4.6 Connector Cycle Life—The test equipment connector should be usable after 25 000 mating cycles and the vehicle connector after 200 mating cycles.

4.7 Strain Relief—The test equipment half of the connector shall have strain relief features for the wires/cable.

4.8 Terminal and Connector Parameters and Performance Requirements

4.8.1 TERMINAL PARAMETERS AND PERFORMANCE REQUIREMENTS—The terminal system must meet the performance standards in (a) through (i) as follows, following each of the environmental exposures listed in 4.8.3. Performance measurements are to be taken at room temperature.

a. Blade Size: 1.5 x 0.82 mm, Refer to 4.9.

b. Maximum Current: 10 A DC continuous

c. Functional Temperature Range: -40 °C to +85 °C

d. Functional Voltage Range: 0.05 VDC to 16 VDC

e. Voltage Drop (Interface): 2 mV/A maximum

f. Recommended Voltage Drop Cable to Cable per Terminal Pair: 10 mV/A maximum.

g. Recommended Low Energy Resistance: 10 mΩ at 100 μA at 20 mV (open circuit voltage) at initial mating

h. Suggested Cable Size: 0.5 mm^2

i. Terminal Engagement Force: 9 N maximum per terminal pair

4.8.2 CONNECTOR PARAMETERS AND PERFORMANCE REQUIREMENTS—The connector system must meet the performance standards outlined in (a) through (g) as follows, following each of the environmental exposures listed in 4.8.3. Performance measurements must be taken at room temperature.

a. Isolation Resistance: Between adjacent terminals must exceed 20 MΩ at 16 VDC

b. Continuity: No intermittencies longer than 1.0 μs; no intermittencies greater than 100 Ω.

c. Retention Force: Terminal to connector retention force to exceed 80 N.

d. Connector Disengagement Force: Not to exceed 88 N.

e. Connector Mating Force with 16 terminals:
(1) Without spring clip 110 N maximum
(2) With spring clip 142 N maximum

f. Indexing Feature: Must prevent mismating of connectors when a force of 200 N is applied.

g. Mounting Feature: The vehicle connector mounting feature shall withstand a 200 N force applied to the connector mating area in the direction of the mating and unmating process.

4.8.3 ACCELERATED ENVIRONMENTAL EXPOSURES—Accelerated environmental testing a and b shall be conducted in the unmated condition.

a. Thermal Cycling: 1000 cycles of 30 min at -40 °C and 30 min at 125 °C.

b. Temperature/Humidity Cycling: 15 cycles of the following:
16 h at 95% RH and 40 °C
2 h at -40 °C
2 h at +85 °C
4 h at room temperature

c. Mechanical Shock: Three shocks of 50 G in each of three mutually perpendicular axes.

d. Vibration: Sinusoidal 1.5 mm ± 0.15 mm amplitude by 15 G for 2 h in each of three mutually perpendicular axes.

4.9 Basic Connector Views

4.9.1 VEHICLE CONNECTOR—See Figure 1.

4.9.2 TEST EQUIPMENT CONNECTOR—See Figure 2.

4.9.3 SPRING CLIP DETAIL—See Figure 3.

4.9.4 BLADE DETAIL—See Figure 4.

5. Terminal Assignments—See Figure 5.

6. Minimum Current Available—In order to ensure that an adequate current is available to operate diagnostic scan tools, the minimum current available shall be no less than 4.0 A at 14.4 VDC.

The Manufacturer shall not be responsible for supplying more than 4.0 A current. Manufacturers of devices that exceed a 4.0 A current may be liable for vehicle damage.

PREPARED BY THE SAE VEHICLE E/E DIAGNOSTIC SYSTEMS STANDARDS COMMITTEE

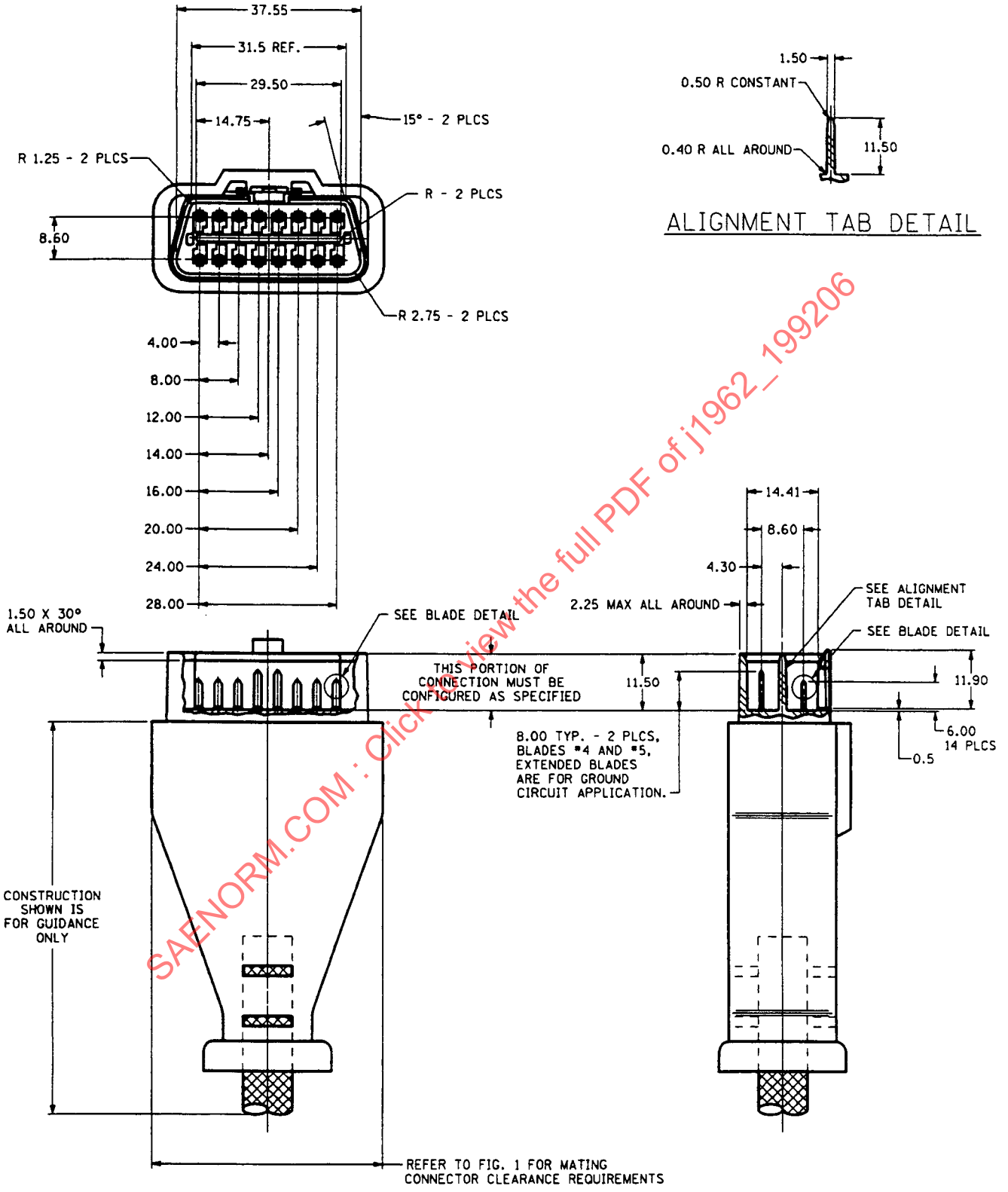
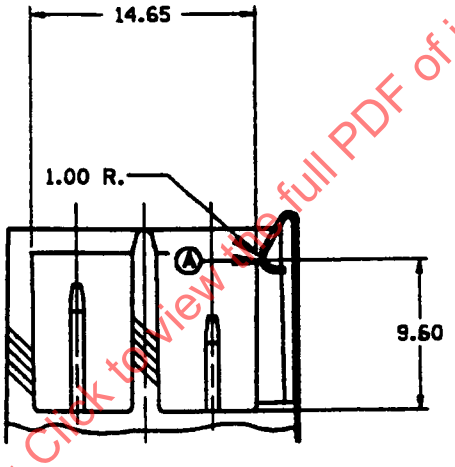
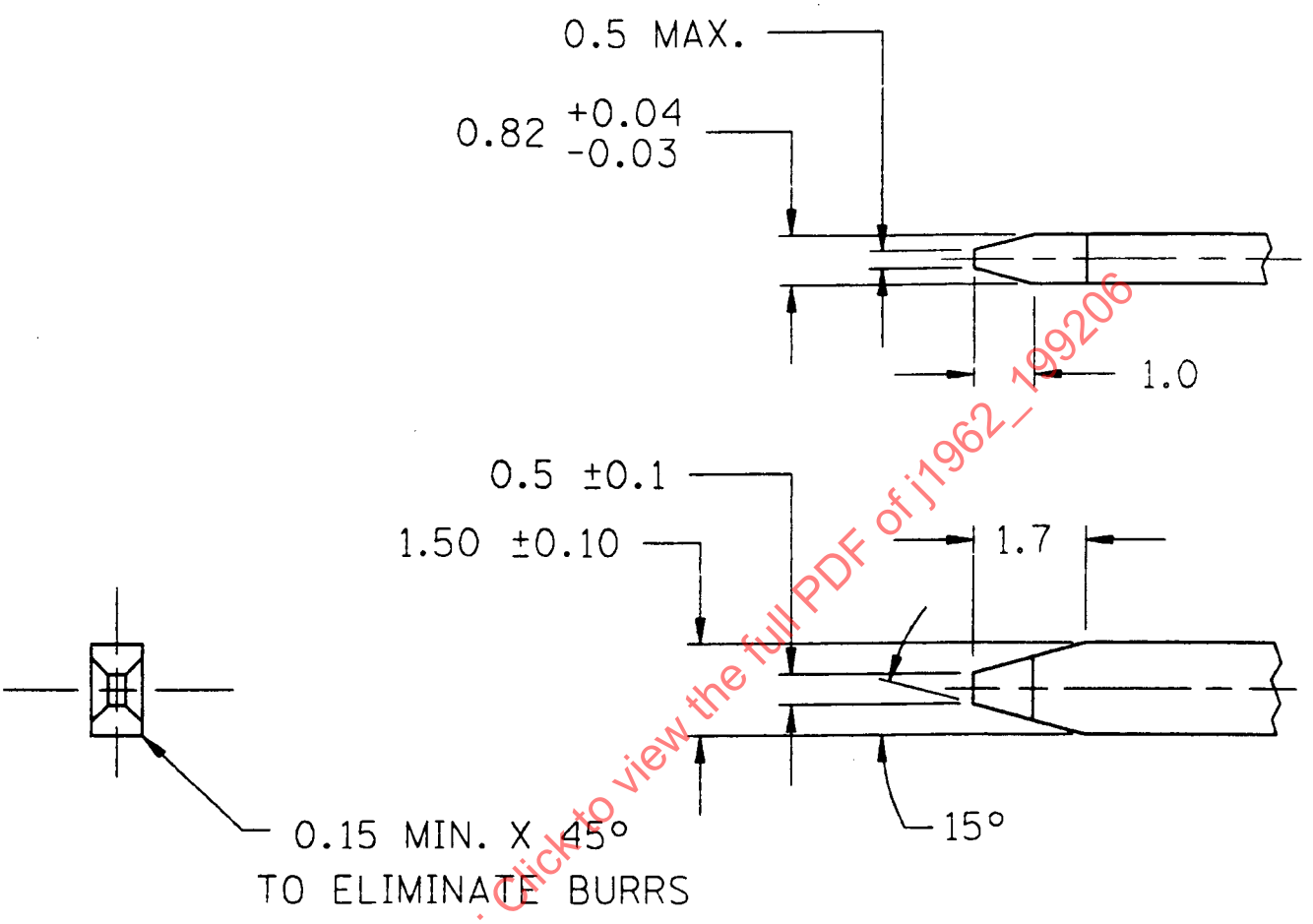


FIGURE 2—TEST EQUIPMENT CONNECTOR



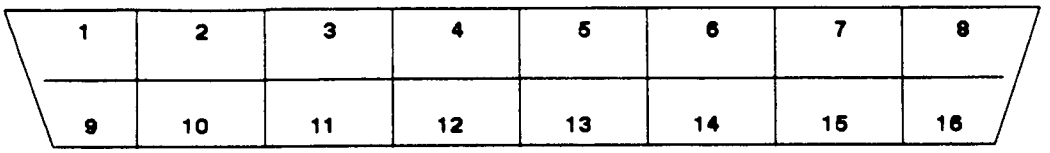
NOTE—A force applied as shown by arrow "A" must deflect clip outward for a distance of 2.50 mm ± 0.15 mm, clip must recover to original position. Connector must meet specification 4.8.2.e.2 with spring clip in place.

FIGURE 3—SPRING CLIP DETAIL



INFORMATION PER ISO 8092. SEE COMPLETE SPEC FOR ADDITIONAL INFORMATION.

FIGURE 4—BLADE DETAIL



Mating End View - Vehicle Connector

Cavity	Definition	Intent
1	Manufacturer Discretionary	
2	Bus + Line of SAE J1850	Shall be used for single wire implementation
3	Manufacturer Discretionary	
4	Chassis Ground	Battery Power Ground, convenient, economical. NOT to be connected to signal ground in external equipment. NOT to be used as reference to signal levels. Shall conform to SAE J2201. MUST be implemented with any use of the J1962 connector.
5	Signal Ground	"Clean" for data signals. Shall conform to J2201.
6	Manufacturer Discretionary	
7	K Line of ISO 9141 CARB	
8	Manufacturer Discretionary	
9	Manufacturer Discretionary	
10	Bus -Line of SAE J1850	
11	Manufacturer Discretionary	
12	Manufacturer Discretionary	
13	Manufacturer Discretionary	
14	Manufacturer Discretionary	
15	L Line of ISO 9141 CARB	
16	Battery Power Positive (Unswitched)	"Clean" and unswitched. Used primarily to provide power to (the) scan tool(s). MUST be implemented with any use of the J1962 connector.

Manufacturer shall be free to use the terminals otherwise reserved for an un-used data port (terminals 2 and 10 for SAE J1850 and/or terminals 7 and 15 for ISO 9141 CARB) provided that the use will not interfere with the operation of, or cause damage to, tools conforming to SAE J1978.

FIGURE 5—TERMINAL ASSIGNMENTS