SAE International™ SURFACE VEHICLE STANDARD

SAE J1811 REAF. NOV2007

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# Power Cable Terminals

*1.* ***Scope***—This SAE Standard is intended for light and heavy-duty on-highway trucks and their trailers; and off-road machinery applications as described in SAE J1116. The terminals described in this document are primarily used to connect batteries, cranking motors, solenoids, magnetic switches, and master disconnect switches and power cable assemblies.

**1.1 Purpose**—This document defines the performance requirements for power cable terminals used in the electrical starting system.

## *2. References*

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

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

SAE J537—Storage Batteries
SAE J1116—Categories of Off-Road Self-Propelled Work Machines
SAE J1127—Battery Cable

## *3. Definitions*

**3.1 Power Cable Assembly**—A power cable assembly consists of a battery cable per SAE J1127 and required terminals. The assembly may also include components such as support clips and additional cable protection. This specification applies to cables, SAE wire size 40 $mm^2$ (1) through 103 $mm^2$ (4/0).

**3.2 Clamp Terminal**—A terminal that connects a power cable to a tapered battery post as defined in SAE J537.

**3.3 Lug Terminal**—A terminal used to connect a power cable to a component with threaded fasteners. Examples of these components are top stud and side post batteries, starter motors, solenoids, magnetic switches, and master disconnect switches.





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***4. General Requirements***—Materials, joint design, and manufacturing processes must provide a solid electromechanical assembly, and must comply with performance requirements in Section 6. Terminals shall be selected to correctly match the cable size and the current carrying requirements of the electrical circuit.

**4.1 Clamp Terminal**—Some typical configurations are shown in Figures 1A through 1D. The dimensions necessary for the terminal to properly mate with the positive and negative tapered posts are shown with the figures as dimension A.

A 5/16-18 or M8 diameter bolt with square anti-turn head and hex head nut shall be provided. Bolt and nut material shall be resistant to corrosion.

**4.2 Lug Terminal**—Three typical insulated lug terminal designs are included and are categorized by function.

4.2.1 Figures 2A, 2B, and 2C lugs mate with a threaded top stud battery as described in SAE J537.

4.2.2 Figure 2D lugs mate with an internal threaded, side terminal battery as described in SAE J537.

4.2.3 Figures 3A and 3B lugs mate with threaded fasteners typically found on heavy-duty batteries, cranking motors, solenoids, magnetic switches, and master disconnect switches.

**4.3 Insulation Requirements**—An insulating cover is recommended for terminals. Terminal insulation shall be color coded to distinguish polarity, red for battery positive and black for battery negative. Terminals per Figures 2A, 2B, 2C, and 2D shall be provided with a molded insulation or equivalent, to provide protection against dust and moisture.

Consideration shall be given to dielectric and temperature characteristics, and flammability and resistance properties of the terminal insulator.

***5. Material Recommendations***

**5.1 Clamp Terminal**—Two common manufacturing methods are recommended:

5.1.1 METHOD 1—A lead alloy terminal shall be cast around the cable conductor. The terminal shall contain an internal steel reinforcement insert. In addition the cable conductor shall be solder dipped prior to die casting the terminal.

5.1.2 METHOD 2—A fabricated terminal, typically of copper alloy, shall be securely attached to the cable.

**5.2 Lug Terminal**—Typically materials are copper or copper alloy and can be forged in assembly with the cable core. Fabricated terminals may also be used and must be securely attached to the cable.

***6. Performance Requirements***

**6.1 Voltage Drop**—The voltage drop of the terminal to cable assembly shall not exceed the voltage drop value in Table 1 at the specified current. Terminal measurements shall be made with a cable assembly prepared as described in Figure 4.

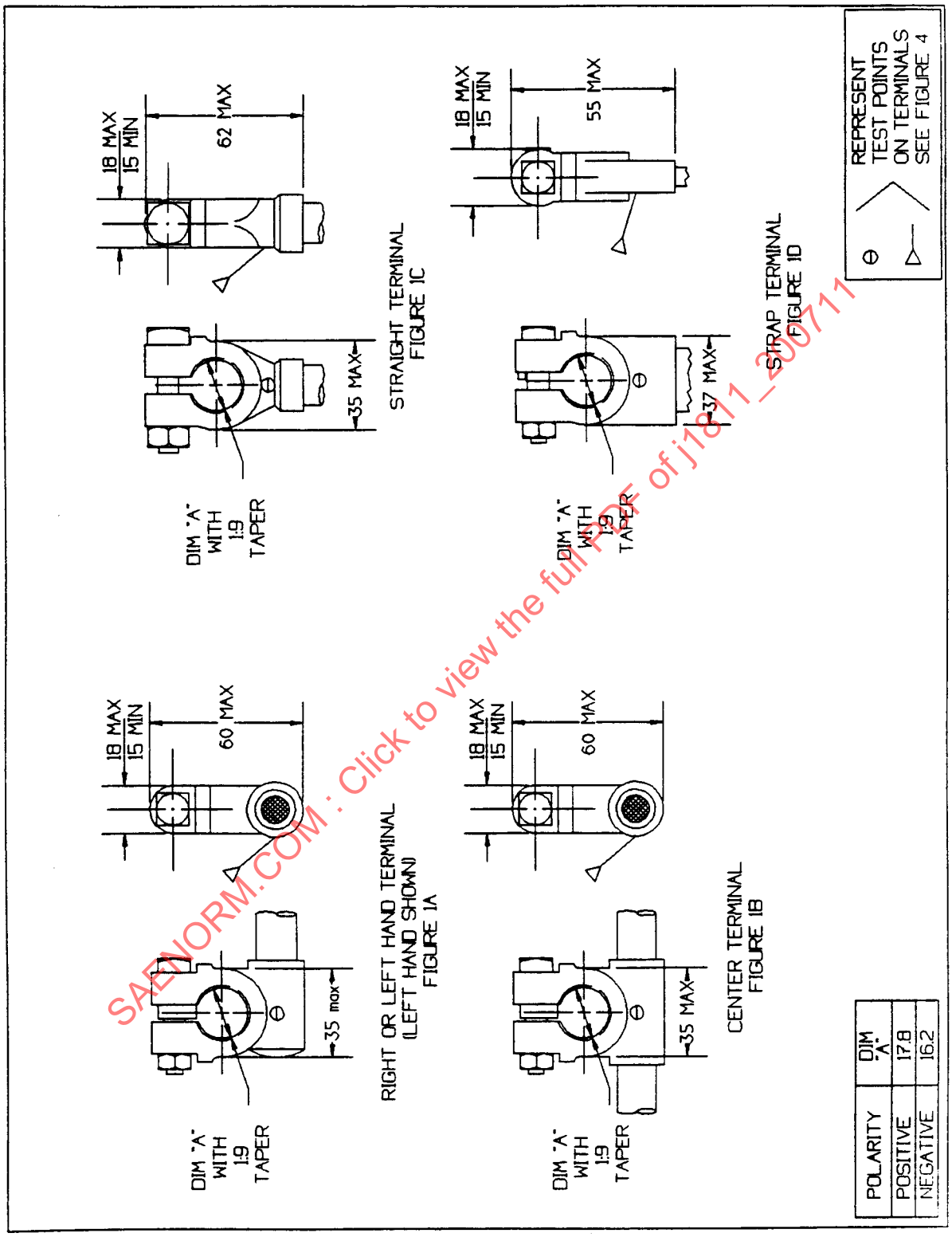


FIGURE 1—TYPICAL CLAMP TERMINAL CONFIGURATIONS

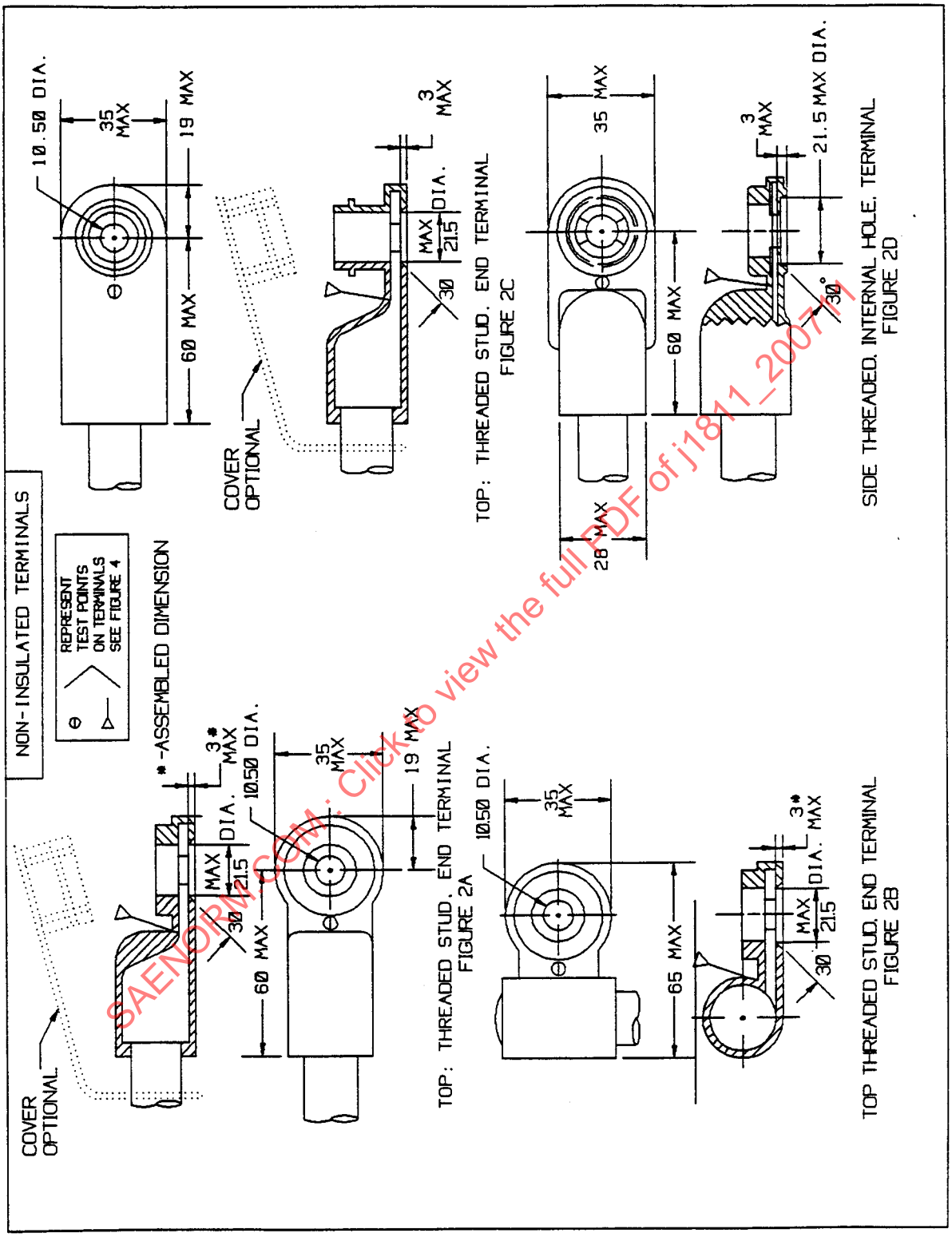




FIGURE 2—INSULATED LUG TERMINALS

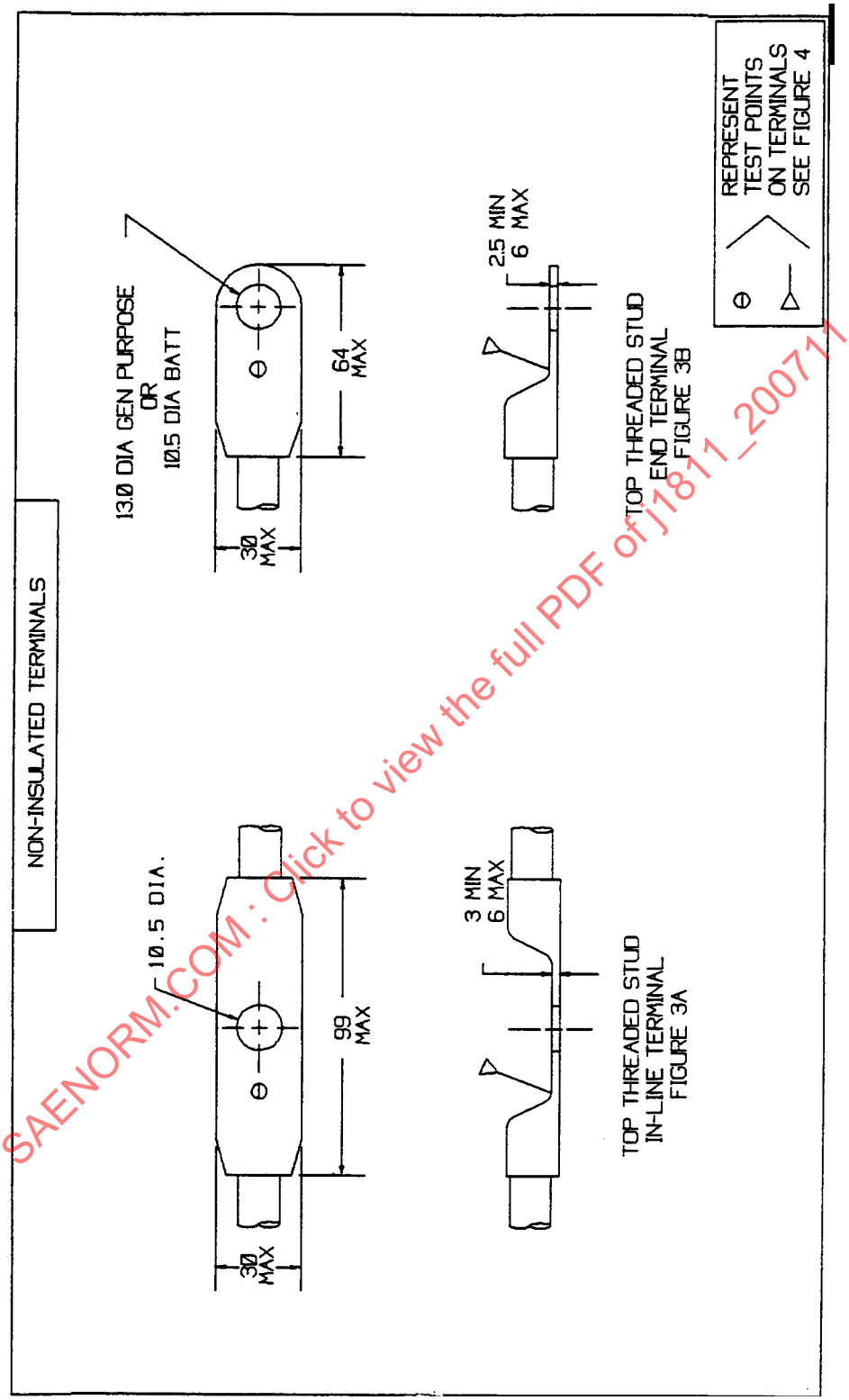




FIGURE 3—NON-INSULATED TERMINALS

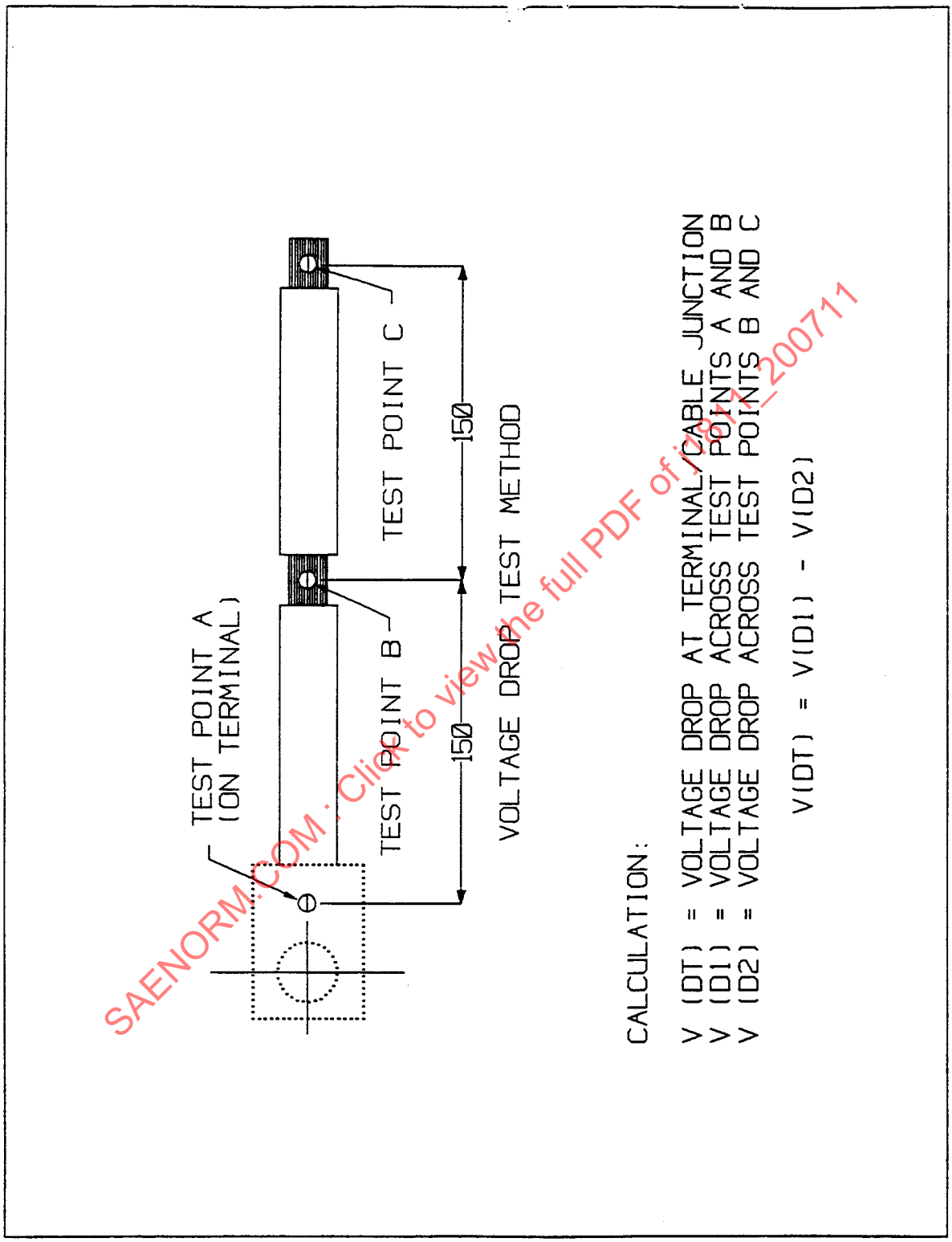




FIGURE 4—TERMINAL AND CABLE