

INCH-POUND

MIL-PRF-62122E

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SUPERSEDING

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PERFORMANCE SPECIFICATION

CABLE ASSEMBLY, INTER-VEHICLE
POWER: PLUG, RECEPTACLE, AND ADAPTER

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers cable assemblies, plugs, receptacles and adapters used for a temporary connection between electrical systems of two vehicles for the purpose of starting the main engine of a disabled vehicle from an operating vehicle.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

Comments, suggestions, or questions on this document should be addressed to U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-EN/STND/TRANS MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000 or emailed to DAMI_STANDARDIZATION@conus.army.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil .
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DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-PRF-2104 - Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service
- MIL-PRF-46167 - Lubricating Oil, Internal Combustion Engine, Arctic

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines

(Copies of these documents are available from <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

U.S. ARMY TACOM DRAWINGS

- 11674728 - Vehicle Receptacle Assembly Installation Drawing (NATO STANAG 4074) (Interface)
- 11677570 - Adapter, Connector (Interface)
- 11682336 - Cable & Plug Assembly, Inter-vehicle Power (Interface)
- 11682337 - Cable Assembly, Inter-vehicle Power (Interface)
- 11682338 - Connector Plug Assembly, Inter-vehicle Power Cable (Interface)
- 11682345 - Vehicle Receptacle Assembly NATO Inter-vehicle Power (Interface)
- 11682350 - Vehicle Receptacle Assembly NATO Inter-vehicle Power (Interface)
- 7321299 - Receptacle Assembly, Slave (Interface)

(Copies of these documents are available from DAMI_STANDARDIZATION@conus.army.mil or U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-EN/STND/TRANS MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

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AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

- ANSI/ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes
- ANSI/NCSL Z540-1 - General Requirements for Calibration Laboratories and Measuring and Test Equipment

(Copies of these documents are available from www.ansi.org or ANSI Customer Service Department, 25 W. 43rd Street, 4th Floor, New York, NY 10036.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

- ASME Y14.5 - Dimensioning and Tolerancing

(Copies of these documents are available from www.asme.org or the American Society of Mechanical Engineers, 22 law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900.)

ASTM INTERNATIONAL

- ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- ASTM D2240 - Rubber Property – Durometer Hardness

(Copies of these documents are available from www.astm.org or ASTM International, P.O. Box C700, West Conshohocken, PA 19428-2959.)

SAE INTERNATIONAL

- SAE AS478 - Identification Marking Methods

(Copies of these documents are available from www.sae.org or SAE Customer Service, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. Unless otherwise specified (see 6.2), the contractor shall furnish samples of the cable assemblies, plugs, receptacles and adapters which shall be subjected to first article inspection (see 4.3). First article inspection samples, properly marked with identifying information shall be representative of the cable assemblies to be furnished to the Government.

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All subsequent cable assemblies delivered to the Government shall conform to these samples in all of their pertinent physical and performance attributes.

3.2 Materials. Materials shall be as specified herein, and in applicable specifications. Materials not specifically designated shall be suitable for use in the cable assemblies, plugs, receptacles and adapters provided that their use does not cause any change in physical, electrical or dimensional properties that would result in performance of any of these components falling outside of the limits specified herein (see 4.7.1).

3.2.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Design and construction. Cable assemblies, plugs and receptacles shall be designed and constructed in accordance with the manufacturer's standards. Cable assemblies, plugs, receptacles and adapters shall conform to the envelope dimensions and the electrical and mounting interfaces as shown in the following drawings (see 4.7.1 and 4.7.2):

11674728	- Vehicle Receptacle Assembly Installation Drawing (NATO STANAG 4074)
11677570	- Adapter, Connector
11682336	- Cable and Plug Assembly, Inter-vehicle Power
11682337	- Cable Assembly, Inter-vehicle Power
11682338	- Connector Plug Assembly, Inter-vehicle Power Cable
11682345	- Vehicle Receptacle Assembly NATO Inter-vehicle Power
11682350	- Vehicle Receptacle Assembly NATO Inter-vehicle Power
7321299	- Receptacle Assembly, Slave

3.3.1 Voltage. The cable assemblies, plugs and receptacles shall be designed for use in a 24 volt (V) direct current (dc) vehicle electrical system.

3.3.2 Polarity. The cable assemblies, plugs and receptacles shall be designed for use in a negatively grounded vehicle electrical system.

3.4 Performance.

3.4.1 Electrical.

3.4.1.1 Continuity. The conductors shall provide an electrical path between like poles of the plugs, receptacles and adapters (see 4.7.3.1).

3.4.1.2 Current, continuous. When tested (see 4.7.3.2), cable assemblies, plugs and receptacles shall be capable of carrying 500 amperes (A) at 24 Vdc for a period of 15 minutes

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continuous duty. Adapters shall be capable of carrying 300 A for a period of 15 minutes continuous duty. There shall be no shorting or loss of continuity, burning, rupture or other damage to the connectors or cables throughout the test. Smoking shall not be a cause for failures provided performance is not impaired.

3.4.1.3 Current, overload. When tested (see 4.7.3.3), the cable assemblies, plugs and receptacles shall be capable of carrying a current of 1000 A at 24 Vdc for a period of 360 seconds. Adapters shall be capable of carrying a current of 600 A dc for a period of 120 seconds continuous duty. There shall be no shorting or loss of continuity, burning, rupture or other damage to the connectors or cables throughout the test. Smoking shall not be a cause for failures provided performance is not impaired.

3.4.1.4 Dielectric withstanding voltage. When the plugs, receptacles and adapters are tested (see 4.7.3.4), the insulation shall evidence no cracking, charring, burning, smoking, shorting or other damage.

3.4.1.5 Contact resistance. When the plugs and receptacles are tested (see 4.7.3.5) the voltage drop across the contacts of the mated connectors shall be no greater than 250 milli-volts (mV) at 500 A. For adapters the average voltage drop shall not exceed 100 mV at 200 A dc for either the positive or the negative circuits.

3.4.2 Environmental.

3.4.2.1 Waterproofness. When tested (see 4.7.4.1), the plugs shall evidence no leakage or damage which would adversely affect performance. Subsequently, the plugs shall meet the performance requirements of 3.4.1.2, 3.4.1.3, 3.4.1.4 and 3.4.1.5.

3.4.2.2 Corrosion resistance. When tested (see 4.7.4.2), the plugs, receptacles and adapters shall show no evidence of corrosion that would adversely affect performance. Subsequently, the plugs, receptacles and adapters shall meet the requirements of 3.4.1.5.

3.4.2.3 Resistance to petroleum products. When tested (see 4.7.4.3), the cable assemblies, plugs, receptacles and adapters shall show no evidence of damage that would adversely affect performance.

3.4.2.4 Mating. When tested at an ambient temperature of 77 ± 15 degrees Fahrenheit ($^{\circ}\text{F}$) (25 ± 8 degrees Celsius ($^{\circ}\text{C}$)) the forces required to fully engage and disengage the plugs shall be between 20 and 40 pounds (lb.) (9.1 and 18.2 kilograms (kg)). When either the plug or receptacle is at -65°F (-54°C), the force shall be between 20 and 45 lb. (9.1 and 20.4 kg). Maximum 30 degree rotation to facilitate engagement and disengagement is permitted (see 4.7.4.4).

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3.4.2.5 Resistance to low temperature (cold bend). When subjected to the low temperature (cold bend) test, the cable shall show no evidence of cracking, breaking, separation or other damage (see 4.7.4.5).

3.4.2.6 Fungus resistance. After exposure to fungus the cable assemblies, plugs and receptacles shall not exhibit fungus growth that affects performance (see 4.7.4.6).

3.4.2.7 Resistance to ozone exposure. When tested for ozone resistance, the cable shall show no evidence of cracking rupture, or any other deterioration (see 4.7.4.7).

3.4.2.8 Temperature resistance. When tested, plugs and receptacles shall show no evidence of distortion, cracking or shorting (see 4.7.4.8).

3.4.3 Mechanical.

3.4.3.1 Crimp strength. When subjected to the pull test, the crimped terminal attached to the conductor cable shall withstand a pull test of 750 lb. (340.2 kg) (see 4.7.5.1).

3.4.3.2 Clamp strength. When tested (see 4.7.5.2), the cable insulation shall withstand a pull test of 200 lb. (91 kg). The displacement of cable insulation away from the inter-vehicle connector housing shall be not more than 0.063 inch (in.) (1.6 millimeter (mm)).

3.4.3.3 Insert retention. When tested (see 4.7.5.3), the threaded inserts for securing the back plate and the eyelet for the lanyard cord in the plug shall withstand a pull strength of not less than 45 lb. (20.4 kg) without being separated from the main body of the inter-vehicle connector.

3.4.3.4 Body hardness. When tested (see 4.7.5.4), the body of the plug shall have a shore "A" hardness of 80 ± 5 .

3.5 Identification marking. The following information shall be permanently marked or stamped on the plugs and receptacles (see 4.7.2.1):

- a. 24 volt - 500 ampere
- b. US
- c. National stock number
- d. Military part number
- e. Manufacturer's cage code
- f. Manufacturer's part number

3.6 Workmanship. The workmanship shall be of a quality to assure that the cable assemblies, plugs, receptacles and adapters conform to the manufacturer's specifications. The products shall be free of defective connectors, scratches, chips, sharp edges, loose or defective seals, cracked insulation or other defects which affect serviceability or appearance (see 4.7.2).

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4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. First article Test (see 4.3).
- b. Conformance inspection (see 4.4).
 1. Examination (see 4.4.2).
 2. Tests (see 4.4.3).
- c. Control tests (see 4.5).

4.1.1 Inspection equipment. Unless otherwise specified in the contract (see 6.2), the contractor is responsible for the provision and maintenance of all inspection equipment necessary to assure that supplies and services conform to contract requirements. Inspection equipment must be capable of repetitive measurements to an accuracy of 10 percent (%) of the measurement tolerance. Calibration of inspection equipment shall be in accordance with ANSI/NCSL Z540-1. Required measuring instrument tolerances are as listed in table I.

4.1.1.1 Apparatus. In addition to standard measuring equipment (see 4.1.1, table I and applicable test specifications), test apparatus shall include test chambers for conducting low temperature (-65 °F) tests, submersion tank, incubation cabinets (fungus) and ozone chamber.

TABLE I. Measuring instrument tolerance.

Measuring instrument	Accuracy
Voltmeter dc 0-30 V	±0.25% of reading
Ammeter dc 0-2000 A	±0.50% of reading
Millivoltmeter dc 0-500 millivolts	±0.50% of reading

4.2 Inspection conditions. Unless otherwise specified herein, all inspections shall be conducted under the following conditions:

- a. Air temperature: 77±15 °F (25±8 °C).
- b. Barometric pressure: 28.5 (+2, -3) in. [743.9 (+50.8, -76.2) mm] mercury.
- c. Relative humidity: 50±30 percent.
- d. Test specimens shall be thermally stabilized for one hour prior to being subjected to tests.

4.3 First article test. Unless otherwise specified (see 6.2), the Government shall select three cable and plug assemblies produced under the production contract for first article test. When plugs, receptacles, cable assemblies, and adapters are procured separately from cable assemblies, six plugs, six receptacles, three cable assemblies and four adapters shall be submitted for first article test. First article samples (specimens) shall be tested in the order specified in table II (plugs, receptacles and adapters) and table III (cable and plug assemblies). First article

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samples (specimens) shall be representative of the units proposed to be furnished under the contract. First article test shall be conducted under Government surveillance by the contractor, or an authorized testing facility, at a sight approved by the Government. One sample is to be held in reserve (see 3.1). Any changes or deviation of the production units from the first article sample shall be subject to the approval of the contracting officer.

TABLE II a. Order of first article test for plugs.

Title	Requirement	Procedure	Subsequent test	
			Requirement	Procedure
	<u>Specimens 1 through 6</u>			
Materials and construction	3.2 and 3.3	4.7.1	--	--
Defects (see 4.7.2 and table IV)	3.3, 3.5 and 3.6	4.7.2	--	--
Body hardness	3.4.3.4	4.7.5.4	--	--
	<u>Specimens 1 and 2</u>			
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Fungus resistance	3.4.2.6	4.7.4.6	--	--
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4
Clamp strength	3.4.3.2	4.7.5.2	--	--
	<u>Specimens 3 and 4</u>			
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Corrosion resistance	3.4.2.2	4.7.4.2	--	--
Contact resistance	--	--	3.4.1.5	4.7.3.5
Temperature resistance	3.4.2.8	4.7.4.8	--	--
Dielectric withstanding voltage	3.4.1.4	4.7.3.4	--	--
	<u>Specimens 5 and 6</u>			
Mating	3.4.2.4	4.7.4.4	--	--
Continuity	3.4.1.1	4.7.3.1	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Waterproofness	3.4.2.1	4.7.4.1	--	--
Current, continuous	--	--	3.4.1.2	4.7.3.2
Current, overload	--	--	3.4.1.3	4.7.3.3
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4

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TABLE II a. Order of first article test for plugs - Continued.

Title	Requirement	Procedure	Subsequent test	
			Requirement	Procedure
Contact resistance	--	--	3.4.1.5	4.7.3.5
Resistance to petroleum products	3.4.2.3	4.7.4.3	--	--
Current, continuous	--	--	3.4.1.2	4.7.3.2
Current, overload	--	--	3.4.1.3	4.7.3.3
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4
Contact resistance	--	--	3.4.1.5	4.7.3.5
Mating	--	--	3.4.2.4	4.7.4.4
Insert retention	3.4.3.3	4.7.5.3	--	--

TABLE II b. Order of first article test for receptacles.

Title	Requirement	Procedure	Subsequent test	
			Requirement	Procedure
	<u>Specimens 1 and 2</u>			
Materials and construction	3.2 and 3.3	4.7.1	--	--
Defects (see 4.7.2 and table IV)	3.3, 3.5 and 3.6	4.7.2	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Fungus resistance	3.4.2.6	4.7.4.6	--	--
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4
	<u>Specimens 3 and 4</u>			
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Corrosion resistance	3.4.2.2	4.7.4.2	--	--
Contact resistance	--	--	3.4.1.5	4.7.3.5
Temperature resistance	3.4.2.8	4.7.4.8	--	--
Dielectric withstanding voltage	3.4.1.4	4.7.3.4	--	--
	<u>Specimens 5 and 6</u>			
Mating	3.4.2.4	4.7.4.4	--	--
Continuity	3.4.1.1	4.7.3.1	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--

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TABLE II b. Order of first article test for receptacles - Continued.

Title	Requirement	Procedure	Subsequent test	
			Requirement	Procedure
Resistance to petroleum products	3.4.2.3	4.7.4.3	--	--
Current, continuous	--	--	3.4.1.2	4.7.3.2
Current, overload	--	--	3.4.1.3	4.7.3.3
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4
Contact resistance	--	--	3.4.1.5	4.7.3.5
Mating	--	--	3.4.2.4	4.7.4.4

TABLE II c. Order of first article test for adapters.

Title	Requirement	Procedure	Subsequent test	
			Requirement	Procedure
	<u>Specimens 1 and 2</u>			
Materials and construction	3.2 and 3.3	4.7.1	--	--
Defects (see 4.7.2 and table IV)	3.3, 3.5 and 3.6	4.7.2	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Corrosion resistance	3.4.2.2	4.7.4.2	--	--
Contact resistance	--	--	3.4.1.5	4.7.3.5
Dielectric withstanding voltage	3.4.1.4	4.7.3.4	--	--
	<u>Specimens 3 and 4</u>			
Mating	3.4.2.4	4.7.4.4	--	--
Continuity	3.4.1.1	4.7.3.1	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Resistance to petroleum products	3.4.2.3	4.7.4.3	--	--
Current, continuous	--	--	3.4.1.2	4.7.3.2
Current, overload	--	--	3.4.1.3	4.7.3.3
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4
Contact resistance	--	--	3.4.1.5	4.7.3.5
Mating	--	--	3.4.2.4	4.7.4.4

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TABLE III. Order of first article test for cable and plug assembly part number 11682336 1/, 2/.

Title	Requirement	Procedure	Subsequent test	
			Requirement	Procedure
<u>Specimen 1</u>				
Materials and construction	3.2 and 3.3	4.7.1	--	--
Defects (see 4.7.2 and table IV)	3.3, 3.5 and 3.6	4.7.2	--	--
Continuity	3.4.1.1	4.7.3.1	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Resistance to low temperature	3.4.2.5	4.7.4.5	--	--
Resistance to ozone exposure	3.4.2.7	4.7.4.7	--	--
Resistance to petroleum products	3.4.2.3	4.7.4.3	--	--
Current, continuous	--	--	3.4.1.2	4.7.3.2
Current, overload	--	--	3.4.1.3	4.7.3.3
Dielectric withstanding voltage	--	--	3.4.1.4	4.7.3.4
Contact resistance	--	--	3.4.1.5	4.7.3.5
Mating	--	--	3.4.2.4	4.7.4.4
<u>Specimen 2</u>				
Continuity	3.4.1.1	4.7.3.1	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Fungus resistance	3.4.2.6	4.7.4.6	--	--
Dielectric withstanding voltage	3.4.1.4	4.7.3.4	--	--
<u>Specimen 3</u>				
Mating	3.4.2.4	4.7.4.4	--	--
Continuity	3.4.1.1	4.7.3.1	--	--
Current, continuous	3.4.1.2	4.7.3.2	--	--
Current, overload	3.4.1.3	4.7.3.3	--	--
Clamp strength	3.4.3.2	4.7.5.2	--	--
Crimp strength	3.4.3.1	4.7.5.1	--	--

1/ Plugs and receptacles used in testing the cable and plug assemblies shall have passed the tests as specified in table II a and II b.

2/ Cable assemblies part number 11682337 shall be tested as part of cable and plug assembly as specified in table III.

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4.3.1 First article test failure. Deficiencies revealed by first article test shall be cause for rejection of the cable assembly. All prior produced specimens shall be considered similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. The Government shall not accept specimens until all deficiencies are corrected and first article test is completed to the satisfaction of the Government.

4.4 Conformance inspection.4.4.1 Specimen control.

4.4.1.1 Lot formation. Unless otherwise specified (see 6.2), an inspection lot shall consist of all plugs, receptacles, cable assemblies or adapters manufactured during an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.4.1.2 Selection. Specimens selected for conformance testing shall be made in accordance with contractor's Government approved test plan.

4.4.1.2.1 Selection method. Contractor shall use ANSI/ASQC Z1.4 to develop test program to assure quality of the production lot.

4.4.2 Examination.

4.4.2.1 Classification of defects. For examination purposes, defects shall be classified as specified in table IV.

TABLE IV. Classification of defects.

Category	Defect	Method of examination
<u>Major:</u> 101	Dimensions out of tolerance affecting interchangeability (see 3.3).	SIE <u>1/</u>
102	Identification marking - missing or incomplete (see 3.5).	Visual
103	Faulty workmanship affecting performance (see 3.6).	Visual
<u>Minor:</u> 201	Dimensions out of tolerance not affecting interchangeability (see 3.3).	SIE

1/ SIE = Standard Inspection Equipment.

4.4.3 Test. Samples selected in accordance with 4.4.1.2.1 shall be subjected to the order of the test specified in table II or III.

4.5 Control tests.

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4.5.1 Sampling. The contractor shall be responsible for the selection of control test samples. The control test samples shall be identified as to production period, and after having been examined for the defects specified in table IV, they shall then be subjected to the order of the tests listed in table V.

TABLE Va. Order of control test for plugs and receptacles.

Title	Inspection
Dimensions <u>1/</u>	4.7.3.2
Current, overload	4.7.3.3
Contact resistance	4.7.3.5
Clamp strength	4.7.5.2

1/ In accordance with drawings 11682338, 11682345 or 11682350 (see 3.3). For source controlled drawings, dimensions shall be checked in accordance with contractors approved drawings, per ASME Y14.5.

TABLE Vb. Order of control test for adapters.

Title	Inspection
Dimensions <u>1/</u>	4.7.3.2
Current, overload	4.7.3.3
Contact resistance	4.7.3.5

1/ In accordance with Drawing 11677570 (see 3.3).

TABLE Vc. Order of control test for cable and plug assemblies.

Title	Inspection
Dimensions <u>1/</u>	4.7.3.2
Continuity	4.7.3.1
Current, overload	4.7.3.3

1/ In accordance with Drawing 11682336 (see 3.3).

4.6 Failure. Failure of any specimen to pass any of the specified control tests shall be cause for the Government to refuse acceptance of the production quantity represented, until action taken by the contractor to correct defects and prevent recurrence has been approved by the Government.

4.7 Methods of inspection.

4.7.1 Materials and construction. Conformance to 3.2 through 3.3.2, shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

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4.7.2 Defects. Conformance to 3.3, 3.5 and 3.6, shall be determined by examination for the defects listed in table IV. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.7.2.1 Marking. Identification marking shall be inspected to verify conformance to SAE AS478.

4.7.3 Electrical.

4.7.3.1 Continuity. To determine conformance to 3.4.1.1, a visual examination shall be made of the marking for polarity of the plugs and receptacles. Continuity checks shall be performed on cable assemblies, plugs, receptacles and adapters using a digital multimeter, ohmmeter, or other resistance measurement instrument which is capable of detecting open circuits and resistance values of less than 1 ohm. Verify the following:

- a. Plug. Check open circuit:
 1. Between positive and negative terminal.
 2. Between positive terminal and back cover plate.
 3. Between negative terminal and back cover plate.
- b. Receptacle. Check open circuit between positive and negative terminal.
- c. Cable assembly.
 1. Check continuity:
 - (a) Between positive cable terminal on one end of cable and positive cable terminal on the other end of cable.
 - (b) Between negative cable terminal on one end of cable and the negative cable terminal on the other end of cable.
- d. Cable and plug assembly.
 1. Check continuity:
 - (a) Between positive terminal of one plug and positive terminal of the other plug.
 - (b) Between negative terminal of one plug and negative terminal of the other plug.
- e. Adapter.
 1. Check continuity:
 - (a) Between positive terminal of the plug end and positive terminal of the receptacle end.
 - (b) Between negative terminal of the plug end and negative terminal of the receptacle end.
 2. Check open circuit between positive terminal and the negative terminal on each end.

NOTE: "Continuity" shall be less than one (1) ohm. Exact "contract resistance" shall be determined under "continuous current" test conditions.

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4.7.3.2 Current, continuous. To determine conformance to 3.4.1.2, the test item shall be fully engaged to a mating item as follows:

<u>Test item</u>	<u>Mating item</u>
Plug	Receptacle
Cable and plug assembly	Receptacle
Receptacle	Cable and plug assembly
Adapter	Plug and receptacle

A current of 500 A dc shall be passed through the test item, mating items, except adapter and its mating items, for which current shall be 300 A, and associated circuit for a duration of fifteen (15) minutes. The required dc current may be supplied from a current source, or from a voltage controlled dc power source which is capable of producing the required current. Low resistance series load in the test circuit may be inserted to improve the current level control.

4.7.3.3 Current, overload. To determine conformance to 3.4.1.3, the test item shall be fully engaged to a mating item as follows:

<u>Test item</u>	<u>Mating item</u>
Plug	Receptacle
Cables and plug assembly	Receptacle
Receptacle	Cable and plug assembly
Adapter	Plug and receptacle

A current of 1000 A dc shall be passed through the test item, mating items, and associated circuit for a duration of 360 seconds. For adapter, mating items, and associated circuit, current shall be 600 A for a duration of 120 seconds. The dc current may be supplied from a current source, or from a voltage controlled dc power source which is capable of producing the required current. The low resistance series load in the test circuit may be inserted to improve the current level control.

4.7.3.4 Dielectric withstanding voltage. To determine conformance to 3.4.1.4, unmated items shall be subjected to an electrical potential of 500 V ac root mean square (RMS), 60 hertz (Hz), for a period of one minute. The test voltage source shall have a minimum rating of 500 VA. The applied ac potential shall be monitored with a true RMS digital multi-meter (DMM). AC leakage current through the test item shall be monitored continuously with a DMM which has been set to measure milliampere (ma). The voltage shall be applied between following pair of points:

- a. Plug:
 1. Between positive and negative terminal.
 2. Between positive terminal and any other non-metallic portion of the specimen, which includes all the metal inserts in the body.

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3. Between negative terminal and any other non-metallic portion of the specimen, which includes all the metal inserts in the body, ring around the negative terminal is excluded.
- b. Receptacle. Between positive and negative terminal.
- c. Cable and plug assembly. Between positive terminal and negative terminal of each plug.
- d. Adapter. Between positive terminal and negative terminal.

4.7.3.5 Contact resistance. To determine conformance to 3.4.1.5, the test item shall be connected to its mating item as follows:

- a. Plug and receptacle.

<u>Test item</u>	<u>Mating item</u>
Plug	Receptacle <u>1/</u>
Receptacle <u>1/</u>	Cable and plug assembly

1/ Receptacle 11682345 or 11682350

The plugs and receptacles shall be fully engaged to their mating items. A current of 500 A dc shall be passed through the mated items and associated circuit for a duration of five (5) minutes. At the end of the period the voltage drop shall be measured in millivolts (mV) between the following pairs of points:

1. Plug.
 - (a) Between positive terminal of the plug and positive terminal of the receptacle.
 - (b) Between negative terminal of the plug and negative terminal of the receptacle.
2. Receptacle.
 - (a) Between positive terminal of the plug and positive terminal of the receptacle.
 - (b) Between negative terminal of the plug and negative terminal of the receptacle.
- b. Adapter. With a copper bus bar connected across (+) to (-) terminals on plug, the adapter shall be fully engaged with connector 11682338 and receptacle 7321299. A current of 200 A dc shall be passed through the mated items and associated circuit for a duration of five (5) minutes. At the end of the test period the voltage drop shall be measured in millivolts between the following pairs of points:
 - (1) Between positive terminal of the plug and positive terminal of the receptacle.
 - (2) Between negative terminal of the plug and negative terminal of the receptacle.

The contact resistance of the test item shall be the millivolt drop, across each pair of test points.

4.7.4 Environmental.

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4.7.4.1 Waterproofness. To determine conformance to 3.4.2.1, the plugs shall be tested for waterproofness in accordance with method 512 of MIL-STD-810. The following conditions shall apply:

- a. Protective caps shall be installed in place.
- b. Eight (8) in. (203.2 mm) long cables along with terminals (see 11682337) shall be normally attached to the plugs. During the test, free ends of both the cables shall be flexed by not less than 3 in. (76.2 mm) displacement from their straight position and shall be left in that position for 15 minutes before switching to the next 45 ± 5 degree position. Flexing shall be done for each 45 ± 5 degree position, with a total rotation of 360 degrees. Free ends of the cables shall be completely sealed.
- c. Immersion depth shall be 40 in. (101.6 centimeters (cm)) in 5% salt water solution.

4.7.4.2 Corrosion resistance. To determine conformance to 3.4.2.2, the test item, with protective covers removed, shall be subjected to the salt fog test in accordance with MIL-STD-810, method 509, using a 5% (by weight) sodium chloride/water solution. At the conclusion of the 48 hours of exposure to salt fog, the test item shall be inspected for conformance to 3.4.2.2. If the requirements of 3.4.2.2 are met, the test item shall be measured for contact resistance using the test method of 4.7.3.5 and shall meet the requirements of 3.4.1.5.

4.7.4.3 Resistance to petroleum products. To determine conformance to 3.4.2.3, the cable and plug assemblies, plugs, receptacles and adapters shall be tested for resistance to the effect of exposure to petroleum products by submersion in the fluids specified for the indicated time period.

	a. MIL-PRF-46167	Lubricating Oil, Auto	20 hours
	b. MIL-PRF-2104	Grade 15W-40	20 hours

At the conclusion of the submersion period, the cable and plug assemblies, plugs and receptacles and adapters shall be wiped free of the fluids and shall subsequently be tested in accordance with 4.7.3.2, 4.7.3.3, 4.7.3.4, and 4.7.3.5.

4.7.4.4 Mating. To determine conformance to 3.4.2.4, the receptacles shall be rigidly mounted. The central pin of the plug shall be aligned to permit free entry of the pin to the full depth of the socket in the receptacle. A force shall be applied to the plug to affect full engagement with the receptacle. The engaging and disengaging forces required shall be measured in pounds (kilograms). Engagement and disengagement forces for each specimen shall be measured within 5 minutes after temperature conditions have stabilized as indicated below:

- a. Plugs and receptacles conditioned at ambient room temperature of 77 ± 15 °F (25 ± 8 °C) before engagement (1 hour minimum).
- b. Plugs conditioned at -65 °F (-54 °C) for 6 hours in cold chamber, and receptacles conditioned at ambient room temperature of 77 ± 15 °F for 1 hour (minimum) before engagement.

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- c. Receptacles conditioned at -65°F for 6 hours in cold chamber, and plugs conditioned at ambient room temperature of $77\pm 15^{\circ}\text{F}$ for 1 hour (minimum) before engagement.
- d. Adapters and receptacles conditioned at ambient room temperature of $77\pm 15^{\circ}\text{F}$ before engagement (1 hour minimum).
- e. Plugs and adapters conditioned at ambient room temperature of $77\pm 15^{\circ}\text{F}$ before engagement (1 hour minimum).

4.7.4.5 Resistance to low temperature (cold bend). To determine conformance to 3.4.2.5, the test specimen shall be conditioned as specified in 4.7.4.5.1 and tested as specified in 4.7.4.5.2.

4.7.4.5.1 Cooling. The specimen shall be laid out straight in a suitable low temperature chamber and subjected to an ambient temperature of $-65\pm 3^{\circ}\text{F}$ ($-54\pm 2^{\circ}\text{C}$) for 96 hours for first article and control tests and 24 hours for conformance tests.

4.7.4.5.2 Bending. At the conclusion of the refrigeration period and while at $-65\pm 3^{\circ}\text{F}$ ($-54\pm 2^{\circ}\text{C}$), the specimen shall be bent 180° around a mandrel having a diameter of 2.25 in. (57 mm) within 10 seconds after removal from the cold chamber. The specimen shall be observed for the defects specified in 3.4.2.5.

4.7.4.6 Fungus resistance. To determine conformance to 3.4.2.6, the cable assemblies, plugs and receptacles shall be subjected to fungus test as specified in ASTM G21, except that the specimens shall be removed from the incubation chamber only after 90 days of continuous exposure. The following procedure shall be followed:

- a. Plugs. Both specimens shall be tested with cap on. Both specimens shall be tested without the cables.
- b. Receptacles. Both specimens shall be tested without the cables. First specimen shall be tested with cap on. Second specimen shall be tested with cap off.
- c. Cable and plug assemblies. Both specimens shall be tested with cap on.

4.7.4.7 Resistance to ozone exposure. To determine conformance to 3.4.2.7, the test procedure specified in 4.7.4.7.2 shall be followed using the apparatus specified in 4.7.4.7.1.

4.7.4.7.1 Apparatus. The apparatus shall include an exposure chamber containing air mixed with ozone in the proportion of 50 ± 5 parts per 100 million of atmosphere air by volume, and mandrels of the size appropriate for the test specimen as specified below:

<u>Cable outside diameter</u>	<u>Mandrel diameter</u>
Less than 0.5 in. (12.7 mm)	4 x cable OD (outer diameter)
At least 0.5 in. but less than 0.75 in. (19.1 mm)	5 x cable OD
At least 0.75 in. but less than 1.25 in. (31.8 mm)	6 x cable OD
At least 1.25 in. but less than 1.75 in. (44.5 mm)	8 x cable OD
At least 1.75 in. and above	10 x cable OD

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4.7.4.7.2 Procedure. The test specimens shall be wrapped once around the appropriate mandrel and the two ends of the cable shall be bound together with twine or tape at the point where they intersect. After being placed on the mandrel, the specimens shall be conditioned at ambient room temperature for 45 minutes. The specimens shall then be placed in the test exposure chamber for 300 hours for the first article test and for 168 hours for the control test. The tests shall be conducted at a temperature of 100 ± 5 °F (38 ± 3 °C). Immediately after the completion of the test period each sample shall be examined for evidence of cracking, using seven power magnification. The bound and taped portion of the cable and the area adjacent thereto shall not be examined. Immediately after the examination, each sample shall be subjected to the test specified in 4.7.3.4 to determine conformance to 3.4.1.4.

4.7.4.8 Temperature resistance. To determine conformance to 3.4.2.8, plugs and receptacles, with their respective caps, shall be tested in accordance with the following procedure:

- a. Specimens shall be stabilized in a chamber at a temperature of -45 ± 5 °F (-42.8 ± 2.7 °C) for 6 hours.
- b. Immediately after removal from the chamber, specimens shall be dropped on a concrete surface from a height of 36 in. (915 mm). Drops shall be made in four different attitudes within a time period of 5 minutes. Attitudes shall not be less than 90 degrees apart.
- c. Steps a and b shall be repeated at a temperature of 140 ± 5 °F (60 ± 2.7 °C).

4.7.5 Mechanical.

4.7.5.1 Crimp strength (pull test). To determine conformance to 3.4.3.1, specimens shall be tested in accordance with the following procedure:

- a. Connectors from the cable assemblies shall be disconnected.
- b. Conductor cables shall be cut into 12 in. (305 mm) lengths including the terminals to obtain four specimens.
- c. The insulation and sheathing shall be removed from the specimen.
- d. A tensile pull shall be applied between the terminal eye and the bare conductor cable.
- e. Travel of the head applying the load shall be at the rate of 1 in. (25 mm) per minute.
- f. Clamping surfaces may be serrated to provide positive gripping force.
- g. The force shall be sufficient to pull the wire out of the terminal or break the wire or terminal.
- h. Steps c through g shall be repeated for specimens 2, 3 and 4.

4.7.5.2 Clamp strength. To determine conformance to 3.4.3.2, the plug shall be tested in accordance with the following procedure:

- a. Two 12 in. (305 mm) long cables with terminals (see Drawing 11682337) shall be normally attached to each plug.

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- b. A clamp shall be attached to one cable at a distance of 6 in. (152.5 mm) from the point where cable enters the plug, in a manner such that when a pull force is applied, clamp shall not move with respect to the cable insulation.
- c. The plug shall be clamped in a stationary position.
- d. A pull force, away from the plug, of at least 200 lb. (91 kg) shall be applied to two diametrically opposite points on the clamp of the cable.
- e. The displacement of the cable insulation away from the plug housing shall be measured after the pull force, that was applied to the cable, has been released.
- f. Steps a through e shall be repeated for the second cable.

4.7.5.3 Insertion retention. To determine conformance to 3.4.3.3, the inter-vehicle connector 11682338 shall be tested in accordance with the following procedure:

- a. The inter-vehicle connector shall be clamped in a stationary position.
- b. A pull force shall be applied to each threaded insert located in the body of the inter-vehicle connector, until the insert is pulled out of the connector body. The force at that point shall be measured.

4.7.5.4 Body hardness. To determine conformance to 3.4.3.4, the body of the plug shall be tested per ASTM D2240 shore "A" durometer, 15 seconds dwell.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cable assemblies, plugs and receptacles covered in this specification are intended to provide a temporary connection between electrical systems of two vehicles, having the same level voltage power source to permit the use of an operating vehicle as a power source to start the main engine of the second vehicle.

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6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. If required, the specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).
- c. If first article sample is required (see 3.1).
- d. If responsibility for inspection equipment should be other than as specified (see 4.1.1).
- e. If the number of lot samples should be other than as specified (see 4.4.1.1).
- f. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Cable assembly. Cable assembly is defined as the assembly of two cables with terminals attached on both ends.

6.3.2 Cable and plug assembly. Cable and plug assembly is defined as the assembly which comprises of cable assembly with plugs attached to both ends.

6.3.3 Plug. Plug is defined as the part which is assembled to the cable assembly and mates with the receptacle.

6.3.4 Receptacle. Receptacle is the part which is assembled to the cable assembly and mates with the plug.

6.3.5 Adapter. Adapter is defined as the part which mates with two pin receptacle on one end and the plug on the other end.

6.3.6 Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.3.6.1).

6.3.6.1 Solid waste. "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation returns flows or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.). (Source: Federal Acquisition Regulations, section 23.402).

6.4 International standardization agreement. Certain dimensions on plug and receptacle Drawings 11682338, 11682345 and 11682350 are the subject of international standardization agreement, the NATO STANAG 4074. When amendment, revision or cancellation of this

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specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices to change the agreement or make other appropriate accommodations.

6.5 Subject term (key word) listing.

Clamp
Jumper
Mating
Starting

6.6 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodian:
Army - AT

Preparing Activity:
Army - AT

Review Activities:
Army - CR4
DLA - CC

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