

MIL-STD-681D
NOTICE 1
19 June 2000

DEPARTMENT OF DEFENSE
STANDARD PRACTICE

IDENTIFICATION CODING AND APPLICATION
OF HOOKUP AND LEAD WIRE

TO ALL HOLDERS OF MIL-STD-681D:

1. THE FOLLOWING PAGES OF MIL-STD-681D HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
2	19 June 2000	2	13 August 1990
3	19 June 2000	3	Reprinted without change
4	19 June 2000	4	13 August 1990
5	19 June 2000	5	Reprinted without change
10	19 June 2000	10	Reprinted without change
11	19 June 2000	11	13 August 1990

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-681D will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the standard is completely revised or canceled.

CONCLUDING MATERIAL

Custodians:
ARMY - CR
NAVY - EC
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

(Project 6145-2237)

Review activities:
Army - AR, AT, AV, CR4, MI
Navy - AS, MC, OS, SH
Air Force - 19

International Interest:
(See section 6)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-104 - Limits for Electrical Insulation Color.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME-Y14.38 - Abbreviations and Acronyms

(Applications for copies should be addressed to the American Society of Mechanical Engineers, (ASME), 22 Law Drive, P O box 2900, Fairfield, NJ 07007-2900.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC.

SAE-AS50881- Wiring, Aerospace Vehicle

(Applications for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.3 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. DEFINITIONS

3.1 Definitions. For the purpose of this standard, the following definitions apply:

3.1.1 Hookup wire. Hookup wire refers to an insulated conductor free at both ends and used for chassis wiring and interconnecting wiring.

3.1.2 Lead wire. Lead wire refers to an insulated conductor forming an integral part of components such as motors, transformers, Hall generators, etc., and used for chassis wiring.

3.1.3 Chassis wiring. Chassis wiring may consist of hookup wire, lead wire, shielded cable, jacketed multiconductor cable, coaxial, or twisted multiconductor groups of wires or cables, or wires and cables, used to connect electrical or electronic elements within the same equipment.

3.1.4 Interconnecting wiring. Interconnecting wiring consists of wires cables, groups or harnesses used to connect complete units of electrical or electronic systems.

3.1.5 Harness. An assembly of wires or cables, or wires and cables arranged so it may be installed or removed as a unit in the same electronic or electrical equipment.

3.1.6 Homogenous cable. Cable composed of identical insulated conductors.

3.1.7 Jacketed cable. A jacketed cable is a bundle of insulated wires encased in a common sheath.

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4. GENERAL REQUIREMENTS

- 4.1 Coding of hookup wire. All hookup wire shall be coded by one or more of the systems listed in 1.2.
- 4.2 Coding of interconnecting wiring. Coding of interconnecting wiring (systems IV) need not apply to jacketed cables.
- 4.3 Abbreviations. Abbreviations shall be in accordance with ASME-Y14.38.
- 4.4 Shielded and unshielded wires. All requirements for all systems shall apply to both shielded and unshielded wires.
- 4.5 Color limits. Unless otherwise specified, all colors on the finished wire shall conform to class 1 colors of MIL-STD-104.
- 4.5.1 White, clear and neutral insulations. The term "white" shall apply only to colors meeting the requirements of "white" in MIL-STD-104. Clear or translucent uncolored (unpigmented) insulation shall be designated "clear". Natural or neutral colored insulations shall be designated "neutral" (see 4.6).
- 4.6 Clear and neutral colored insulations. Clear and neutral colored insulations shall be used on wires in lieu of white insulation only when specified by the applicable wire specification.
- 4.7 Lead wires. Lead wires used for motor leads, transformer leads, and similar applications shall be color coded in accordance with table I, where no conflict would be created with another component color-code standard.
- 4.8 Hall generator leads. Hall generator lead wires shall be color coded in accordance with table II.
- 4.9 DC power wiring for chassis and interconnecting systems. DC power wiring for chassis and interconnecting wiring shall be color coded in accordance with table II or table III.
- 4.10 AC power wiring in assembled units. AC power wiring in assembled units shall be color coded in accordance with table IV.

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TABLE I. Preferred color sequence for single wires. 1/ 2/

Base color	First stripe or band	Second stripe or band	Third stripe or band	Identification number
Black				0
Brown				1
Red				2
Orange				3
Yellow				4
Green				5
Blue				6
Violet				7
Gray				8
White				9
White	Black			90
White	Brown			91
White	Red			92
White	Orange			93
White	Yellow			94
White	Green			95
White	Blue			96
White	Violet			97
White	Gray			98
White	Black	Brown		901
White	Black	Red		902
White	Black	Orange		903
White	Black	Yellow		904
White	Black	Green		905
White	Black	Blue		906
White	Black	Violet		907
White	Black	Gray		908
White	Brown	Red		912
White	Brown	Orange		913
White	Brown	Yellow		914
White	Brown	Green		915
White	Brown	Blue		916
White	Brown	Violet		917
White	Brown	Gray		918
White	Red	Orange		923
White	Red	Yellow		924
White	Red	Green		925
White	Red	Blue		926
White	Red	Violet		927
White	Red	Gray		928
White	Orange	Yellow		934
White	Orange	Green		935
White	Orange	Blue		936

See footnotes at end of table.

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5. DETAIL REQUIREMENTS

5.1 System I – Differentiation color coding for chassis wiring (see 1.2).

5.1.1 Standard color code for single wires. Single conductor chassis wires to be coded for differentiation only shall be identified by colors in accordance with table I, preferably in the order given. All combinations listed in table I are made up of the first 10 colors.

5.1.1.1 Method of color coding. Color coding shall be accomplished by use of solid colored insulations, and by helical striping or circumferential banding on all-white insulation, in accordance with 5.7 except that system VI shall be used for circumferential banding (see 5.6). Longitudinal (nonhelical) color striping may be used if colored insulation material is used for striping. Materials or paints used for helical striping or circumferential banding shall not be electrically conductive.

5.1.1.2 Identification numbers. Identification numbers appearing in table I are a ready reference to color combinations. The first digit indicates the background color (color of insulation or braid), and the succeeding digit or bands. Therefore, the second and third digit indicates the color of the first and second stripe or band, respectively.

5.1.1.3 Color sequence of helical stripes or circumferential bands. Where stripes or bands are used, the first stripe or band shall be of the color with the lowest identification number, the second with the next higher number, and the third with the highest number.

5.1.2 Harness wiring. Unless the wiring is routed to the same terminal, two or more wires shall not be identically color coded if they break out of a harness and are routed to terminations in close proximity where they could be misconnected.

5.1.3 Grouping of wires. Where it is not practical to use wires each of which is differently color coded, the wires may be divided into groups. (Typical instances are where many wires enter a connector, or connect to grouped terminal blocks, or multiple terminations in close proximity.) Within each group, each wire shall be differently color coded, and the groups shall be distinguished by colored metal bands, pressure-sensitive tapes, or other approved devices that hold each group of wires together. The wire color coding sequence may be repeated in different groups. This method shall be used only where a large number of wires is involved.

5.1.4 Termination points. Wires terminating where it would be difficult to distinguish one wire from another shall not be identically color coded unless the wiring is routed to the same termination point. For example, if three wires from one harness, three wires from another harness, and two point-to-point wires are all connected to a tube socket, different color coding shall be used on each wire to eliminate confusion.

5.2 Systems II – Functional color coding of chassis wiring. Simple electronic connections where it is advantageous to identify circuit function (see 1.2).

5.2.1 Standard colors. Colors used to identify chassis wires by function shall be as specified in table II and 5.2.2 unless otherwise specified by the contracting activity. Color identification shall be accomplished by use of solid color insulation, or as an alternate method, by use of a single colored helical stripe or circumferential band over white insulation. For example, a white insulated wire having a blue helical stripe or a blue circumferential band would be considered an alternate equivalent to a solid blue wire. When more than one value of the same function must be identified, the alternative method may use a second stripe or band over white insulation as shown in table I.

5.2.2 Miscellaneous circuits. White insulation shall be used for all circuits not designated in tables II, III, and IV or 5.2.3.

5.2.3 Direct-coupled circuits. In direct-coupled circuits, connecting wires shall be white with appropriately colored helical stripes or circumferential bands at the ends of the insulated wire to identify the elements to differentiate from the method of marking described in 5.2.2. For example, if a plate is connected directly to a control grid, the wire shall be white with helical green and blue stripes, or have green and blue circumferential bands at both ends of the wire (green designates grid, and blue, the plate). This is in contrast to the coding of wires connecting plate and grid through a coupling capacitor; in such case the wire from the plate to the capacitor would be solid blue, or have a blue stripe or band on a white wire (for the plate), and the wire from the other end of the capacitor to the grid would be black, or have a black stripe or band on a white wire (for the grid). This method of identification will normally be applied by the equipment fabricator to white insulated wire, when required.

5.3 System III – Differentiation or functional coding of chassis wiring by printed markings. Chassis wiring shall be identified by printed characters (see table V) over white insulation-braid. The printed characters shall represent differentiation or functional code marking (see 1.2).

5.3.1 Differentiation marking. Wires shall be differentiated by printing the name(s), abbreviation(s) in accordance with ASME-Y14.38, or identification number(s) of the colors and combinations listed in table I. Random printed numbers for alpha numerical characters designating specific coded information may be used provided this specific coding is not intermixed with stripe or band identification. The marking shall appear either along the entire length of the wire at 2-inch intervals, at each end of the wire (for wire harness only), on sleeves, or in the manner prescribed in applicable specifications.

5.3.2 Functional markings. Functional information shall be as specified in table II or in the applicable equipment specification. Such information shall be printed either at the ends of the wire, on the sleeve, or in some other manner as prescribed in the applicable equipment specification.

5.4 System IV – Coding of interconnecting wiring.

5.4.1 Wire insulation color. Wire insulation shall be used for all interconnecting wires unless a particular color is prescribed in the equipment or system specification to identify a definite arrangement of elements, a specific function, or a hazardous condition.

5.4.2 Differentiation markings. Circuit identification, if required, shall be printed in black on the wire insulation, on the white sleeve, or on some other type of marker. Printed markings shall be legible and applied so that the wire type is readily identified.

5.4.3 Interconnecting wiring on aircraft and guided missiles. The coding of interconnecting wiring on aircraft shall and on guided missiles shall be in accordance with SAE-AS50881. In the event of conflict between the requirements of this standard and those of the referenced specifications, the requirements of the referenced specifications shall govern.

5.4.4 Flat, multiconductor, homogenous cable. When color coding is required, the base colors of table I shall be used, and shall be repeated in sequence for the required number of conductors by using solid colored insulation or striping on all-white insulation.