



Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N. Y. 10001

AEROSPACE INFORMATION REPORT

AIR 1273

Issued August 1972
Revised

IDENTIFICATION AND CODING OF FLUID AND ELECTRICAL PIPING SYSTEM FUNCTIONS

1. PURPOSE

This Aerospace Information Report is intended for use by those involved in the design of aircraft, missile, or space systems, and support equipment to establish a positive identification of the functions and, if applicable, the hazards and direction of flow of pipe, hose, tube, or electrical conduit lines.

2. DEFINITION

As referred to herein, lines include any pipe, hose, tube, or duct used to convey liquids or gases. It also includes any conduit used to contain electrical wires or cables. Accessories such as pipe covering are considered as parts of the line.

3. GENERAL

Properly and judiciously applied, line identification can promote safety, expedite training, lessen error in operation, and facilitate servicing. Location, temperature and environmental conditions dictate the proper identification media, if any, that can be applied. However, care must be used to prevent the selection of an identification method that will contribute to an unsafe condition. Use of tapes, tags, or bands in engine compartments or other critical system areas where they may cause trouble, should they become detached, should be avoided.

Certain features of line identification have been subject to International Agreements. In addition, the references at the end of this AIR should be consulted for information on specific applications and limitations of requirements herein specified.

4. DESIGNATION OF FUNCTION

As applicable, the following functions of a line may be identified:

- (a) Contained medium (e.g. Oil, Fuel, Propellant, Electric, etc.)
- (b) Direction of Flow
- (c) Instrument Line
- (d) Hazard
- (e) Pressure
- (f) Fire Control

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- (g) Temperature (e.g. Cold Lines, flowing medium is below 0°C (32°F) and Hot Lines, surface temperature ranges above 74°C (165°F))
- (h) Electrical characteristics (e.g. Voltage, Polarity, Frequency, etc.)
- (i) Supplementary Information (e.g. Drain, Nozzle Open, Flap Up, etc.)

5. IDENTIFICATION MEDIA

- (a) Tapes (Ref. MIL-T-9906) of nonmetallic material which completely encircle the line may be used subject to limitations of temperature, environment, or location in the system. These tapes should incorporate colors, symbols and lettering.
- (b) Bands (Ref. NAS1411) which are metallic and include a tangslot or other bandlock may be used in environments where the nonmetallic tapes are not suitable. A small spot weld may be applied to the folded back tang for additional security. Bands (Ref. MS3368) which are of plastic, adjustable, and self-clinching are often used on cables or wiring harnesses for the dual purpose of identification and bundling.
- (c) Tags generally have usage dependent upon type and method of application. The conventional metallic or nonmetallic plate is affixed to the line by means of wire or string as a temporary method. This method of application should not be used except for temporary information and should be removed immediately after permanent identification has been applied or the part is installed. Preferably, these tags should be limited to items prior to final system installation. Another use of tag is what would be commonly considered a clamp. A clamp such as MS21919 (with the cushion removed in some cases) may have all function marking applied to it.
- (d) Words and symbols permanently marked directly on the line. This is only practical on metal tubes or conduit and care must be taken to assure that the marking is visible in the assembled position. A suitable method of application should be specified and utilized (See AS478). The method of marking will generally be the same as that for part number identification, in any case a non-harmful method must be specified.
- (e) Colors and symbols using suitable paints, dyes, color anodize, etc. which have no harmful effect upon the lines may be used. This type of identification is suitable in such places as engine compartments or other critical system areas where tapes, tags, or bands may have a deleterious effect (e.g. being drawn into engine intake). Disconnects for engine build-ups (EBU's) which, when required, may be marked with a solid band of international orange paint conforming to TT-P-59. This method is also commonly used for large diameter lines where environmental conditions will permit. Hue, value, and chroma should be in accordance with FED-STD-595. Color bands, combinations of color stripes and symbols (usually applied with stencils) have been standardized in MIL-STD-1247 which also gives environmental limitations.
- (f) Continuous marking (paint, dye or ink) by the use of wire marking machines may be used for electrical wires or small tubing. Flexible tubing with molded-in color may have a significant identification conveyed by the particular colors.

6. REFERENCES

The following references contain information on specific applications, requirements, and limitations and should be consulted as applicable.

Military and Federal Standards are obtainable from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, ATTN: NPFC105, Philadelphia, Pennsylvania 19120.

AFRPL documents are obtainable from the Air Force Rocket Propulsion Laboratory, Edwards, California 93523.

International Standardization Organization Documents (ISO) are obtainable from the American National Standards Institute, Inc., 1430 Broadway, New York, N. Y. 10018

ASCC Air Standards are obtainable from the Naval Air Systems Command, Code AIR 52021, Washington, D. C. 20360 or the Aeronautical Systems Division, 4950/TZSS, Wright-Patterson AFB, Ohio 45433.

NAS standards are obtainable from National Standards Association, Inc., 1321 Fourteenth Street, N.W., Washington, D. C. 20005.

Aerospace Standards (AS) are obtainable from the Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, N. Y. 10001.

MIL-STD-161	"Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels"
MIL-STD-454	"Standard General Requirements for Electronic Equipment"
MIL-STD-1247	"Markings, Functions, and Hazard Designations of Hose, Pipe, and Tube Lines for Aircraft, Missile, and Space Systems"
MIL-STD-1472	"Human Engineering Design Criteria for Military Systems, Equipment and Facilities"
MIL-T-9906	"Tape - Aircraft Tubing Identification Marker"
MIL-P-15024	"Plates, Tags, and Bands for Identification of Equipment"
FED-STD-595	"Color"
TT-P-59	"Paint, Ready Mixed, International Orange"
MS 3368	"Strap, Tiedown, Identification, Adjustable, Self-Clinching, Plastic"
MS 14100	"Tape Identification, Coaxial Cable Transmission Line Assembly"
MS 16837	"Tape, Aircraft Tubing Identification Marker"
MS 33739	"Aircraft Marking, Servicing and Precautioning"