



AEROSPACE STANDARD

AS5659™

Issued 2012-02
Reaffirmed 2023-11

WDM LAN Standard

RATIONALE

The aerospace industry requires precise standards for avionics system design. This document defines interoperability requirements within and between optical Wavelength Division Multiplexed (WDM) Local Area Networks (LANs) used in military and aerospace applications.

AS5659 has been reaffirmed to comply with the SAE Five-Year Review policy.

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Full document details: SAE AS5659

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Documents

Document Sharing Hub

1. SCOPE

This standard, consisting of five documents, applies to designers, suppliers, and users of optical network services, systems, and components within mobile military and commercial aerospace platforms. The standard applies to any optical network which uses Wavelength Division Multiplexing in any optical media.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and 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.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AS5659/1	Transparent Optical Backbone Specification
AS5659/2	Access and Aggregation Specification
AS5659/3	Network Management and Control Specification
AS5659/4	Physical Layer Specification
AIR6004	Optical Networking Terminology
AIR6005	General Requirements for WDM Backbone Networks
AIR6006	Modeling and Simulation Capabilities for Aerospace WDM LAN Applications
AS5658	Platform / Subsystem Common Interface Control Document Format
AS5603	Digital Fiber Optic Link Loss Budget Methodology for Aerospace Platforms
AIR5667	Fiber Optic Wavelength Division Multiplexed (WDM) Single Mode Interconnect and Component Standards Mapping for Aerospace Platform Applications – Device Level Specification

2.1.2 ITU Publications

Available from the International Telecommunication Union, Place des Nations, 1211 Geneva 20, Switzerland, Telephone: +41-22-730-5111, www.itu.int.

ITU G.694.1	Spectral Grids for WDM Applications- DWDM Frequency Grid
ITU G.694.2	Spectral Grids for WDM Applications- CWDM Wavelength Grid

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Aerospace Standard.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP5061 Guidelines for Testing and Support of Aerospace, Fiber Optic, Inter-Connect Systems

AIR5601 A Guideline for Application of RF Photonics to Aerospace Platforms

2.2.2 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI Z136.1 Safe Use of Lasers

ANSI Z136.2 Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources

ANSI / Telecommunications Industry Association (TIA), ANSI / TIA 440 Fiber Optic Terminology

2.2.3 ARINC Publications

Available from ARINC, 2551 Riva Road, Annapolis, MD, 21401, www.arinc.org. These documents are technically equivalent to documents SAE AS5659 and SAE5659/1 through SAE AS5659/4.

ARINC Specification 859 Part 0 WDM LAN Standard

ARINC Specification 859 Part 1 Transparent Optical Backbone Specification

ARINC Specification 859 Part 2 Access and Aggregation Specification

ARINC Specification 859 Part 3 Network Management and Control Specification

ARINC Specification 859 Part 4 Physical Layer Specification

2.2.4 IEC Publications

Available from International Electrotechnical Commission, 3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland, Tel: +44-22-919-02-11, www.iec.ch.

IEC 60825 Safety of Laser Products

3. OVERVIEW

Earlier mobile platform avionics communications have been handled by multiple interconnects overlaid to satisfy a particular system's connectivity and bandwidth requirements. An interconnect is a fixed wire or fiber connection established a priori. Some of today's avionics systems use bridging to communicate between isolated systems using backbone connections.

An optical network, combined with aggregation and multiplexing, provides a more direct access to the optical backbone. Local interfaces provide access to a shared infrastructure, now made available throughout the platform, to:

- Carry multiple protocols such as Fibre Channel, ARINC-429, MIL-STD-1553, Ethernet, etc.
- Support multiple services such as interactive real time, non-interactive real time, etc.
- Serve multiple client systems.

The network allows easier upgrade through local connections utilizing standard network interfaces which aggregate and multiplex traffic. Ultimately, a transparent Optical Backbone Network (OBN) can support local or remote configuration and monitoring, dynamic rerouting and fault tolerance, as well as potential full "plug and play" capability of a telecommunications network depending on the implementation of network management and control.

This specification provides:

- Definitions, to provide consistent technical communications between users of the WDM LAN standard documents.
- Interface specifications, in order to provide consistent requirements for suppliers of network components to ensure interoperability. Interface specifications, for compatibility to existing and future standards and protocols.
- Functional allocation, to provide consistency of communications between suppliers and users.
- Hierarchical set of requirements for management and control, to provide adequate resources for configuration and health management.

Typical WDM LAN optical networks comply with the general architecture shown in Figure 1, which shows the relationship between network elements and interfaces.

The architecture includes the following entities:

- Client Adaptation Element (CAE).
- Optical Network Element (ONE).
- Optical Fiber Interconnect (OFI).
- Network Management and Control (NM&C).

The architecture includes the following defined interfaces:

- Client Access Interface (CAI).
- Network Access Interface (NAI).
- Backbone Network Interface (BNI).