



AEROSPACE STANDARD

AS6129™**REV. A**Issued 2012-12
Revised 2019-11

Superseding AS6129

Interface Standard, Airborne EO/IR Systems, Electrical

RATIONALE

If built to original table, errors would occur with communications and timing.

PREFACE

AS6129 is a standard that defines the electrical interface between aircraft (manned and unmanned) and onboard EO/IR systems. Its purpose is to promote platform to sensor system interface standardization by providing substantial, but not 100%, commonality, interoperability, and interchangeability.

This document was prepared by the AS-1C1 Electro-Optic/Infrared Signal Sets Task Group, under the jurisdiction of the AS-1C Subcommittee, Avionic Subsystems, of the SAE AS-1 Committee, Platform Systems and System Integration.

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1. SCOPE

This standard defines a generic set of electrical interfaces between a host aircraft (“platform”) and an electro-optic/infrared (EO/IR) sensor. This includes connectors, cabling, fiber optics, signals, and power.

1.1 Relationship Between Platform/Sensor Interfaces and SAE AS-1C Standards

Figure 1 shows the relationship between the various interfaces and the various SAE standards. AS6129 (electrical) covers connectors, conductors and fiber optics signals, and power, and some aspects of data transport. AS6135 (data) covers data (e.g., imagery, metadata, as well as command, status, and response messages.). AS6135 overlaps AS6129 in the area of protocols for data transport. AS6135 and AS6129 are closely bound together because building a system based on these standards is dependent on the requirements from both standards. Also, requirements put in one standard can impact the options for updating the other standard.

NOTE: Regarding Figure 1, SAE is drafting a standard to cover maintenance and test which, if adopted, will likely overlap both AS6129 and AS6135. SAE is also drafting a standard to cover the mechanical interface which, if adopted, will overlap AS6129 with regard to connectors.

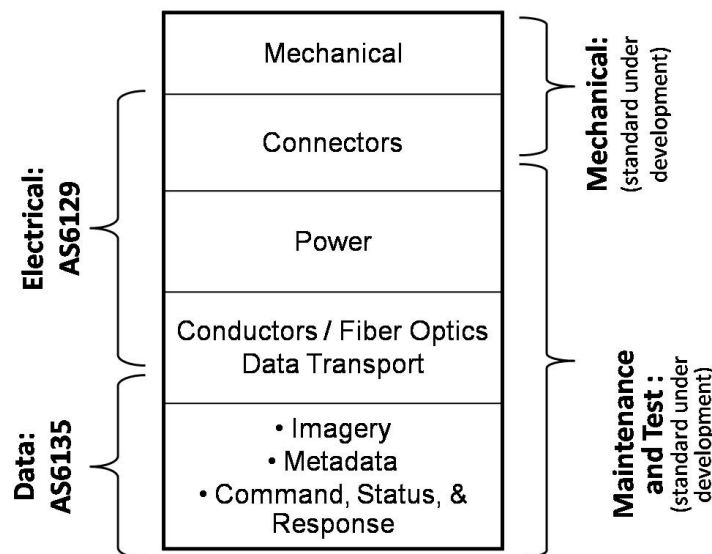


Figure 1 - Related SAE standards

1.2 Purpose

The intent of this standard is to enhance interchangeability and interoperability amongst equipment provided by various EO/IR suppliers and avionic systems. Adoption of this standard will improve procurement flexibility for system integrators and platform providers. Platform providers include fixed wing, rotary wing, UAS (except for micro-UAS), and lighter than air vehicles. The interfaces are designed to facilitate the:

- Operation of EO/IR sensor electrical and mechanical subsystems;
- Interconnection between EO/IR sensor systems and the avionics systems hosted by the platform;
- Exchange of data and metadata between sensor systems and sensor data processing;
- Maintenance of EO/IR systems, allowing for reduction in maintenance equipment in the field and for test.

1.3 Application

This standard applies to all platforms and EO/IR sensors that interface with each other. AS6129 addresses turreted EO/IR sensor systems. Future revisions of AS6129 may address other classes of EO/IR sensor systems, such as non-gimbaled sensors and podded sensors. This standard is intended for application to future sensors and platforms. This includes evolutionary modifications, as well as completely new designs. This standard is intended for use by procuring agencies, and as a general guideline for industry.

2. REFERENCES

2.1 Applicable Documents

The documents listed in this section are cited in Sections 3 and 4 of this standard. This section does not include documents cited in other sections of this standard 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 and 4 of this standard whether or not they are listed here in Section 2.

The following publications form a part of this document to the extent specified herein. When specified herein, the specified revision level of a document shall be used. Otherwise, the latest revision level of the specified document is implied.

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 +1 724-776-4970 (outside USA), www.sae.org.

AS50881	Wiring Aerospace Vehicle
AS39029/28	Contacts, Electrical Connector, Pin, Crimp Removable, Shielded, Size 12 (for MIL-DTL-38999 Series I, II, III and IV Connectors)
AS39029/56	Contacts, Electrical Connector, Socket, Crimp Removable (for MIL-DTL-38999 Series I, III, and IV Connectors)
AS39029/58	Contacts, Electrical Connector, Pin, Crimp Removable (for MIL-DTL-24308, MIL-DTL-38999 Series I, II, III, and IV, and MIL-DTL-55302/69 and MIL-DTL-83733 Connectors)
AS39029/75	Contacts, Electrical Connector, Socket, Crimp Removable, Shielded, Size 12 (for MIL-DTL-38999 Series I, III, and IV Connectors)
AS85049/80	Connector Accessories, Electrical, Dummy Contact, Sizes 16, 12 and 8, Category 7 (For MIL-DTL-38999 Connectors)

2.1.2 Government Documents

Available from <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>.

ICD-GPS-060B	GPS User Equipment (Phase III) Interface Control Document for the Precise Time and Time Interval (PTTI) Interface. 12 February 2002
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Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <https://assist.daps.dla.mil/quicksearch/>.

MIL-DTL-38999/20G	Connectors, Electrical, Circular, Receptacle, Threaded, Wall Mounting Flange, Removable Crimp Contacts, Series III, Metric
MIL-DTL-38999/24J	Connectors, Electrical, Circular, Receptacle, Threaded, Jam-Nut Mounting, Removable Crimp Contacts, Series III, Metric

MIL-PRF-29504/4D	Termini, Fiber Optic, Connector, Removable, Environment Resisting, Pin Terminus, Size 16, Rear Release, MIL-DTL-38999 Series III
MIL-PRF-29504/5D	Termini, Fiber Optic, Connector, Removable, Environment Resisting Socket Terminus, Size 16, Rear Release, MIL-DTL-38999 Series III
MIL-PRF-39012E	Connectors, Coaxial, Radio Frequency, General Specifications for
MIL-STD-464	Electromagnetic Environmental Effects, Requirements for Systems (01 DEC 2010)
MIL-STD-704F	Aircraft Electrical Power Characteristics
MIL-STD-810G	Environmental Engineering Consideration and Laboratory Tests
MIL-STD-1560B	Insert Arrangements for MIL-DTL-38999 Electrical Circular Connectors
MS27488	Plug, End Seal, Electrical Connector

2.1.3 Industry Documents

SMPTE ST 292-1:2011	1.5 Gb/s Signal/Data Serial Interface
SMPTE ST 297:2006	Television-Serial Digital Fiber Transmission System for SMPTE 259, SMPTE 344, SMPTE 292 and SMPTE 424 Signals
SMPTE ST 424:2006	Television-3 Gb/s - Signal/Data Serial Interface
TIA/EIA RS-422	TIA(Telecommunications Industry Association)-422 Electrical Characteristics of Balanced Voltage Differential Interface Circuits
IEEE 802.3-2008	IEEE Standard for Information technology Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
ISO/IEC 11801:2002	International Standard: Information technology - Generic cabling for customer premises
ICD-GPS-060B	GPS User Equipment (Phase III) Interface Control Document for the Precise Time and Time Interval (PTTI) Interface. 12 February 2002

2.2 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.

2.3 Definitions

COMMAND, STATUS, AND RESPONSE INTERFACE: Defines the data elements and message sets passed between the host platform and the sensor used to control the operation of the sensor. The protocol for passing these messages is handled in co-ordination with the groups which specify the messages. The following types of information are passed through the command, status, and response interface:

- a. **COMMANDS:** The set of all digital instructions transmitted to the EO/IR sensor from the controller which directs its operation. These instructions come from an operator, from the platform, or from a pre-programmed set of instructions. These commands instruct the EO/IR sensor where to point, and which features to utilize in gathering images, such as: slew left; turn on stabilization; lock onto a geo-location; change magnification to X; display black as hot versus white hot; turn on image fusion; etc.

- b. **STATUS:** Digital information returned from the EO/IR sensor back to the operator, platform, or recorder which provides feedback of sensor operation and other indications of its condition. Examples of this information include: magnification level, azimuth and elevation, stabilization setting, output scale setting for thermal imaging sensors, heading, etc. Another example is the built-in test information which might occur periodically, in response to a command, or only if a fault or warning is detected. Status information can overlap with metadata.
- c. **RESPONSES:** Digital information returned from the EO/IR sensor back to the operator, platform, in reply or reaction to a command. Responses are a sub-set of status. For example, if the command is to turn on stabilization, the response is "stabilization is on."

ELECTRONIC CONTROL UNIT (ECU): An electronic unit logically between the platform and the sensor, typically inside the platform, which is part of the sensor system.

EO/IR SENSOR: A sensor which generates images based on a specific region of the electromagnetic spectrum: ultraviolet, near-infrared, short-wave infrared, medium-wave infrared and/or long-wave infrared. It can be either the imager itself (e.g., a night vision camera) or a turret (gimbal) or pod which includes the imager.

EO/IR SENSOR POD: An aerodynamically shaped fixed housing containing an EO/IR sensor external to the aircraft body typically mounted on a pylon.

EO/IR SENSOR TURRET: A motorized gimballed mount for one or more EO/IR sensors permitting rotation about one or more axes. This rotation allows the turret to be pointed relatively independent of the platform on which it is mounted.

IMAGE: "An optical counterpart or appearance of an object, as is produced by reflection from a mirror, refraction by a lens, or the passage of luminous rays through a small aperture and their reception on a surface."¹

INTERCHANGEABILITY: A condition which exists when two or more items possess such functional and physical characteristics as to be equivalent in performance and durability, and are capable of being exchanged one for the other without alteration of the items themselves, or of adjoining items, except for adjustment, and without selection for fit and performance.²

INTEROPERABILITY: The ability of two or more systems or components to exchange information and to use the information that has been exchanged.³

COMMONALITY: A shared feature or attribute, or a shared set of features or attributes.⁴

LASER FIRE ANNUNCIATION: A confirmational signal indicating that the laser has fired.

METADATA: Data about data. Imagery Metadata in this standard is the information about image(s). Examples include:

- The time the image was generated;
- The location of and information about the platform (e.g., latitude, longitude, altitude, pitch, roll, and heading of the platform);
- Information about the sensor (e.g., azimuth and elevation of the gimbal, the zoom level);
- Information about the target at the time the image(s) were taken (e.g., latitude and longitude);
- Metadata can be incorporated into the image file and/or be sent in parallel.

¹ <http://dictionary.reference.com/browse/image> visited 4/1/2011.

² Federal Standard 1037C, Telecommunications: Glossary of Telecommunication Terms. <http://www.its.bldrdoc.gov/fs-1037/fs-1037c.htm>. Visited on March 22, 2011.

³ IEEE Glossary.

⁴ Derived from definition in: the American Heritage® Dictionary of the English Language, Fourth Edition, copyright ©2000 by Houghton Mifflin Company. Updated in 2009. Published by Houghton Mifflin Company. All rights reserved.

MOTION IMAGERY: Multiple images of the same location or target taken close enough in time to show movement, typically one frame per second or faster.

TRANSPORT: A mechanism to move, carry, convey, or transfer data and/or electrical/optical signals from one place to another.

TURRET DIAMETER: The diameter of the turreted EO/IR sensor is defined as the best fit circle between the outer edges of the yoke containing the elevation bearings.

VIDEO: A type of motion imagery, typically at 30 frames per second, and typically capable of being displayed on televisions.

2.4 Acronyms

See Table 1 for a list of acronyms and their definitions.

Table 1 - Acronyms

ANSI	American National Standards Institute
ARINC	Aeronautical Radio, Incorporated
AS	Aerospace Standard
ASI	Aircraft Sensor Interface
AWG	American Wire Gauge
ECU	Electronic Control Unit
ECUI	Electronic Control Unit Interface
ECUSI	Electronic Control Unit Sensor Interface
EIA	Electronic Industry Alliance
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EO/IR	Electro Optic/Infrared
GigE	Gigabit Ethernet
GPS	Global Positioning System
HMI	Human Machine Interface
IEEE	Institute of Electrical and Electronics Engineers
INCITS	International Committee for Information Technology Standards
I/O	Input/Output
LRU	Line Replaceable Unit
NFZ	No Fire Zone
PSI	Platform Sensor Interface
PPS	Pulse Per Second
RTN	Return
SDTV	Standard Definition Television
SI	Sensor Interface
SMPTE	Society of Motion Picture and Television Engineers
SSR	Solid State Relay
STP	Shielded Twisted Pair
TBD	To Be Determined/To Be Defined
TIA	Telecommunications Industry Association
TNC	Threaded Neill Concelman
UAS	Unmanned Aircraft Systems
UTP	Unshielded Twisted Pair
VAC	Volts Alternating Current
VDC	Volts Direct Current
WDM	Wavelength Division Multiplexing

3. GENERAL REQUIREMENTS: INTERFACE CONFIGURATIONS

3.1 Platform/Sensor Configurations

AS6129 can support a variety of platforms to sensor interfacing configurations, as depicted in Figures 2a, 2b, 3a, and 3b. Figures 2a and 3a show the case where there is an electronics control unit (ECU), while Figures 2b and 3b show the case where there is no ECU. Figures 2a and 2b show a configuration without an on-board hand-controller, while Figures 3a and 3b show a configuration with an on-board hand-controller. The interface between the host platform processor(s) and the sensor is called the platform sensor interface (PSI). If the sensor has an ECU, then the PSI shall be located at the ECU. If the sensor does not have an ECU, then the PSI shall be located at the sensor. Either way, the PSI has been standardized to be identical. If the sensor has an ECU, then the ECU to sensor interface (ECUSI) shall be considered part of the sensor system; AS6129 is NOT standardizing the ECUSI. AS6129 shall be applied at the PSI. Both the platform and the sensor shall comply with AS6129 at the PSI. Unless otherwise specified, all requirements shall apply to both the platform and the sensor.

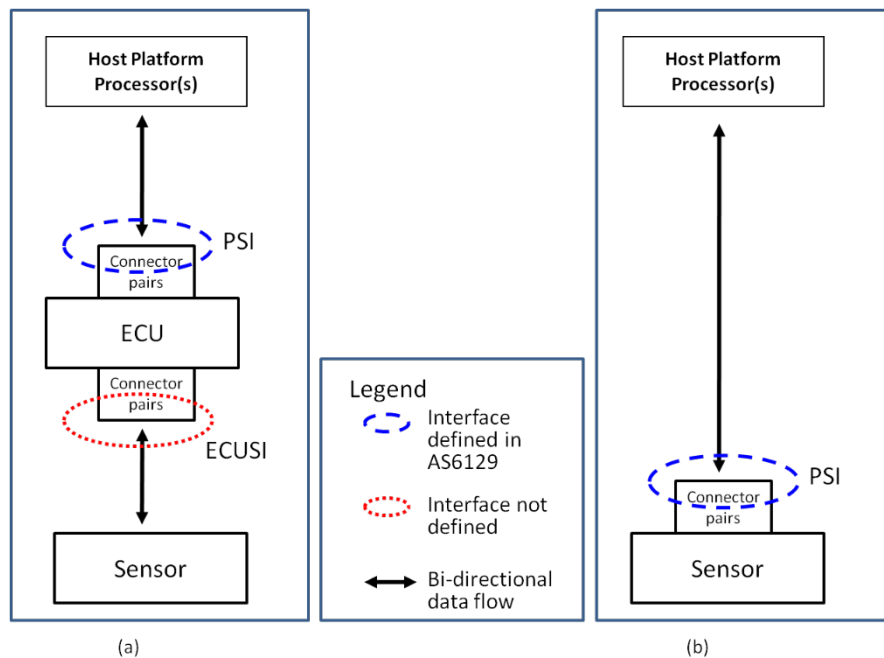


Figure 2 (A and B) - Conceptual platform/sensor interface configurations

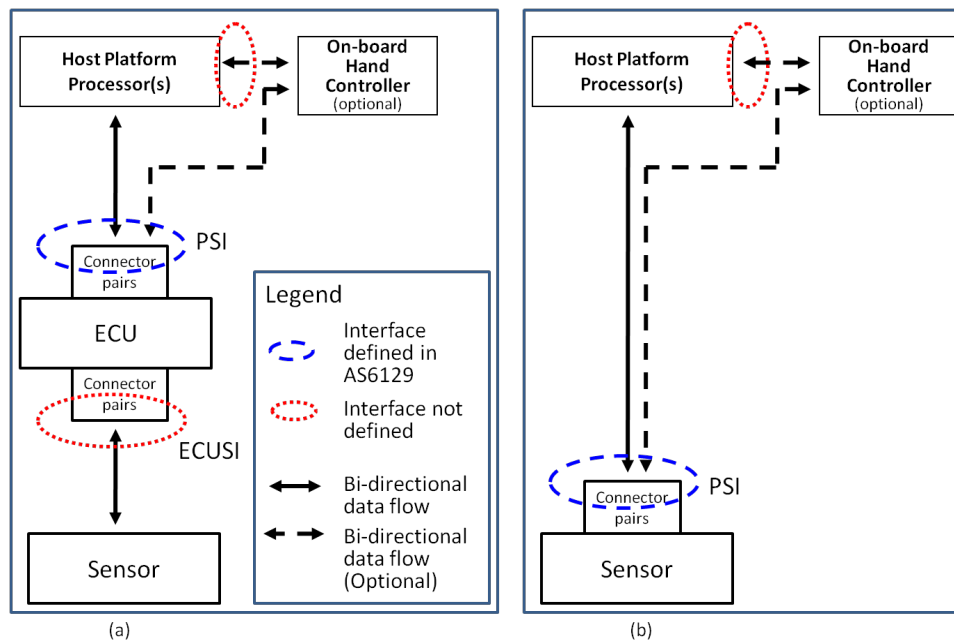


Figure 3 (A and B) - Locations of interfaces assuming a hand-controller

3.2 Classes

Various EO/IR classes are defined in Table 2 based on the diameter of a given sensor package. This standard was developed to address the majority of sensor package sizes available on the market.

Table 2 - Sizes for various classes

Class	Sensor Package Diameter
Class I	>19 inches
Class II	13 to 19 inches
Class III	9 to 13 inches
Class IV	6 to 9 inches

While the classes are designed to address the majority of sensor packages, the defined class structure does not address all applications. Interfaces for a turret shall conform to the appropriate paragraph under 4.1 based on the class of the turret as defined in Table 2.

4. DETAILED REQUIREMENTS

4.1 Connector Characteristics

For Naval Aviation, only connectors which can withstand a minimum of 500 hours salt spray per MIL-STD-1344 Method 1001, Test Method for Electrical Connectors, shall be used.

There are four turret classes. A listing of various connectors for each class including function and sizes are detailed in Table 3.

Table 3 - Connector type and size for various turret classes

	Connector	Type	Shell Size	Keying	Shell Insert
Turret Class I and Turret Class II	J1 - Power	MIL-DTL-38999/ Series III	21	N	21-11
	J2 - Signal	MIL-DTL-38999/ Series III	25	N	25-7
	J3 - Video (Copper)	MIL-DTL-38999/ Series III	17	N	17-8
	J4 - Fiber Optics	MIL-DTL-38999/ Series III	19	N	19-11
	J5 - GPS	MIL-PRF-39012	-		TNC
	J6 - Auxiliary Power	MIL-DTL-38999/ Series III	21	A	21-11
Turret Class III	J1 - Power	MIL-DTL-38999/ Series III	19	N	19-11
	J2 - Signal	MIL-DTL-38999/ Series III	19	A	19-35
	J3 - Video (Copper)	MIL-DTL-38999/ Series III	17	N	17-8
	J4 - Fiber Optic	MIL-DTL-38999/ Series III	13	N	13-4
	J5 - GPS	MIL-PRF-39012	-	-	TNC
Turret Class IV	J1 - Power	MIL-DTL-38999/ Series I	13	N	13-98
	J2 - Signal	MIL-DTL-38999/ Series I	13	N	13-35
	J3 - Video (Copper)	MIL-DTL-38999/ Series I	13	N	13-4
	J4 - Fiber Optic	MIL-DTL-38999/ Series I	13	A	13-4
	J5 - Additional Signals	MIL-DTL-38999/ Series I	11	N	11-35
	J6 - GPS	MIL-PRF-39012	-		TNC

In general, the standard respects the convention that signal sinks are placed on male contacts and sources on female contacts. In the case where sinks and sources are mixed (i.e., J2 - Signal), the EO/IR system is assigned female contacts. The reason is that male contacts are at greater risk of damage, and platform cable connectors often can be repaired in-situ, whereas an EO/IR system cannot.

In general, all connectors are being specified from the same point of view as the connector manufacturers (i.e., looking at the face of the connector). In addition, connectors are specified from the sensor side of all mating pairs.

For the purposes of this standard, photonic (i.e., fiber optic) interfaces are discussed in conjunction with electrical interfaces.

For any pin or contact on a connector which is reserved, unused, or unallocated, the following procedure shall be used:

Spare Contacts

When crimp contact connectors are used, the unused contacts shall be installed in unused cavities. MS27488 or applicable sealing plugs shall be inserted in unused grommet holes of environment resistant connectors. Sealing plugs shall not be installed where they interfere with the free movement of the spring loaded socket termini on connectors containing fiber optic termini. For potted connectors, each spare contact shall have a pigtail attached, consisting of a wire of the largest size that can be accommodated by the contact and extends 5 to 7 inches beyond the potting material. The pigtails shall be identified and dead-ended. In firewall applications, there shall be no spare contacts. All unused contact cavities shall be wired. Stub wires shall be capped with polytetrafluoroethylene insulated dead-end cap. M85049/80-XX Shielded, Coaxial, and Twinax dummy contacts shall be installed in designated unused pin contact cavities in the unpressurized areas (except firewall).

Electrical connectors that contain fiber optic termini shall have empty cavities filled with either spare electrical contacts or dummy termini unless they interfere with the configuration of the mating connector. Connectors with fiber optic pin termini, whose mating connector have the alignment sleeves built-in, must use special contacts with shorter pins to preclude damage to the mating termini.

4.1.1 Turret Class I and II Interface Connectors

The electrical interface for Turret Class I and Turret Class II is partitioned into the following connector types: power (J1), signal (J2), video (copper) (J3), fiber optic (J4), GPS antenna (J5), and auxiliary power (J6). More information about each of these connectors is listed in Table 4.

Table 4 - Turret Class I and Turret Class II connectors

	J1 Power	J6 (Class I Only) Aux Power	J2 Signal	J3 Video (Copper)	J4 Fiber Optic	J5 GPS Antenna
Type	MIL-DTL-38999/ Series III	MIL-DTL-38999/ Series III	MIL-DTL-38999/ Series III	MIL-DTL-38999/ Series III	MIL-DTL-38999/ Series III	MIL-PRF-39012
Shell Size	21	21	25	17	19	TNC
Sensor LRU Gender	Receptacle with pin inserts	Receptacle with pin inserts	Receptacle with socket inserts	Receptacle with socket inserts	Receptacle with socket inserts for fiber optics	Receptacle
Platform Umbilical Gender	Plug with socket inserts	Plug with socket inserts	Plug with pin inserts	Plug with pin inserts	Plug with pin inserts for fiber optics	Plug
Keying	N	A	N	N	N	-
Insert	21-11	21-11	25-7	17-8	19-11	-

Connector specifications shall be as listed in Table 4. The insert descriptors shall be in accordance with MIL-STD-1560B. The connectors used shall be MIL-DTL-38999/series III and gender shall be in accordance with Table 4.

The databus has been assigned to the J2 Signal connector, with an alternate databus connection on the fiber optic (J4) connector. This allows for a great deal of connection flexibility, that is, copper databus with fiber video, or fiber databus and video.

If various connectors are made optional, the possible number of configuration combinations would become unmanageable and would stifle attempts to achieve interoperability. Therefore, for Class I, the platform shall implement, and the sensor shall be compatible with, one of the following configurations in Tables 5 and 6. Examples are shown in Table 7.

Table 5 - Class I configuration control

Connector	Signal Group	Configuration 1	Configuration 2	Configuration 3	Configuration 4
J1	28 VDC Power Channel 1	x	x	x	x
	28 VDC Power Channel 2	x	x	x	x
	28 VDC Laser Power	x	x	x	x
	Safety Ground	x	x	x	x
	Reserved	do not populate			
J2	Power Enable	x	x	x	x
	Ethernet	x	x	x	x
	Serial Comms 1		x	x	x
	Serial Comms 2		x	x	x
	Serial Comms 3				x
	Serial Comms 4				x
	Laser Simple Arming (Pins 2, 95)	x	x	x	x
	Laser Advanced Arming Cluster 1				x
	Laser Advanced Arming Cluster 2				x
	Safety Status 1-3	x	x	x	x
	Enable Gimbal Movement	x	x	x	x
	1 PPS	configured independently (see below)			
	Manufacturer 1-5	Not populated by platform			
	Manufacturer 6-10	Not populated by platform			
J3	Video Ch 1	No J3	x		x

Connector	Signal Group	Configuration 1	Configuration 2	Configuration 3	Configuration 4
	Video Ch 2		x		x
	Video Ch 3		x		x
	Video Ch 4		x		x
	Video Ch 5				x
	Video Ch 6				x
	Video Ch 7				x
	Video Ch 8				x
	J4		Video Ch 1		No J4
Video Ch 2		x	x		
Video Ch 3		x	x		
Video Ch 4		x	x		
Video Ch 5			x		
Video Ch 6			x		
Video Ch 7			x		
Ethernet 1		x	x		
Ethernet 2			x		
J5	GPS Antenna	Configured independently, possibly no J5 (see below)			
J6	Aux Power	Configured independently (see below)			
x = Required. " " (blank) = Do not include.					

For platforms, in addition to the four configurations shown in Table 5, there are some options, such as the type of time synchronization shown in Table 6. Table 6 also shows the naming conventions for these options.

Table 6 - Class I options and their naming conventions

Independently Configured item	Configuration tagA	Configuration tagB	Configuration tagC
IEEE-1588 Synchronization	-IPN		
GPS Antenna	-GPS		
1 PPS Synchronization	-PPS		
Connector Location	-SID	-TOP	-ECU
Auxiliary Power	-AUX		
Naval Applications	-MAR		

Some examples of the use of the naming conventions are shown in Table 7.

Table 7 - Class I configuration naming examples

Configuration Number	1588 Time Sync	GPS Antenna	1 PPS Time Sync	Connector Location	Aux	Name
1	Yes	No	No	Side	No	Class I Configuration-1-IPN-SID
2	Yes	No	Yes	Top	No	Class I Configuration-2-IPN-PPS-TOP
4	No	No	Yes	Side	No	Class I Configuration-4-PPS-SID
4	Yes	Yes	Yes	Side	No	Class I Configuration-4-IPN-GPS-PPS-SID
4	No	Yes	Yes	ECU	Yes	Class I Configuration-4-GPS-PPS-ECU-AUX

As explained for Class I, if various connectors are made optional, the possible number of configuration combinations would become unmanageable and would stifle attempts to achieve interoperability. Therefore, for Class II, the platform shall implement, and the sensor shall be compatible with one of the following configurations in Tables 8, 9, and 6. Examples are shown in Tables 10 and 7.

Table 8 - Class II configuration control

Connector	Signal Group	Configuration			
		1	2	3	4
J1	28 VDC Power Channel 1	x	x	x	x
	28 VDC Power Channel 2	x	x	x	x
	28 VDC Laser Power	x	x	x	x
	Safety Ground	x	x	x	x
	Reserved	Do not populate			
J2	Power Enable	x	x	x	x
	Ethernet	x	x	x	x
	Serial Comms 1		x	x	x
	Serial Comms 2		x	x	x
	Serial Comms 3				x
	Serial Comms 4				x
	Laser Simple Arming (Pins 2, 5)	x	x	x	x
	Laser Advanced Arming Cluster 1				x
	Laser Advanced Arming Cluster 2				x
	Safety Status 1-3	x	x	x	x
	Enable Gimbal Movement	x	x	x	x
	1 PPS	Configured independently (see Table 9)			
	Manufacturer 1-5	Not populated by platform			
Manufacturer 6-10	Not populated by platform				
J3	Video Ch 1	No J3	x	No J3	x
	Video Ch 2		x		x
	Video Ch 3		x		x
	Video Ch 4		x		x
	Video Ch 5				x
	Video Ch 6				x
	Video Ch 7				x
	Video Ch 8				x
J4	Video Ch 1	No J4	No J4	x	x
	Video Ch 2			x	x
	Video Ch 3			x	x
	Video Ch 4			x	x
	Video Ch 5				x
	Video Ch 6				x
	Video Ch 7				x
	Ethernet 1			x	x
J5	Ethernet 2			x	
	GPS Antenna	Configured independently, possibly no J5 (see Table 9)			
x = Required. " " (blank) = do not include.					

For platforms, configurations are identified by number per Table 8, and an indication of the additional options selected, such as type of time synchronization per Table 9. Examples are shown in Table 10.

Table 9 - Class II naming conventions for options

Independently Configured Item	Configuration		
	tagA	tagB	tagC
IEEE-1588 Synchronization	-IPN		
GPS Antenna	-GPS		
1 PPS Synchronization	-PPS		
Connector Location	-SID	-TOP	-ECU
Naval Application	-MAR		

Table 10 - Class II configuration naming examples

Configuration Number	1588 Time Sync	GPS Antenna	1 PPS Time Sync	Connector Location	Aux Power	Naval Application	Name
1	Yes	No	No	Side	Yes	No	Class II Configuration-1-IPN-SID-AUX
2	Yes	No	Yes	Top	No	No	Class II Configuration-2-IPN-PPS-TOP
4	No	No	Yes	Side	No	Yes	Class II Configuration-4-PPS-SID-MAR
4	Yes	Yes	Yes	Side	No	No	Class II Configuration-4-IPN-GPS-PPS-SID
4	No	Yes	Yes	ECU	No	No	Class II Configuration-4-GPS-PPS-ECU

4.1.1.1 Turret Class I and Turret Class II, J1 Power Connector

For Turret Class I and Turret Class II, physical arrangement of pins for the J1 power connector shall have a 21-11 insert pattern which is depicted in Figure 4. Signals for the Turret Class I and Turret Class II, J1 power connector shall be assigned to pins in accordance with Table 11.

NOTE: The contacts for laser power have been specifically placed such that neither pin is adjacent to one with a standing voltage for safety reasons.

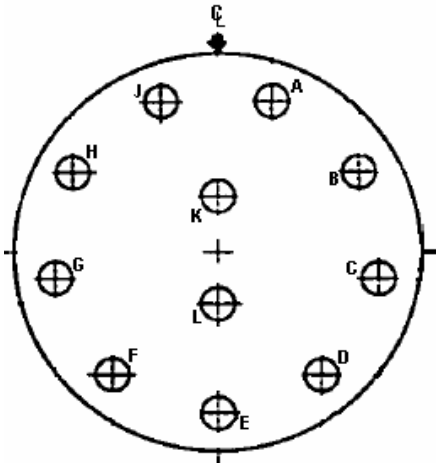


Figure 4 - Turret Class I and Turret Class II, J1 power connector pin arrangement

Table 11 - Turret Class I and Turret Class II, J1 power connector pin allocation

Signal Group	Signal Name	Signal Type	Source	Contact	Wire Type
28 VDC Power Channel 1	DC-1	DC Power	Platform	D	AWG 12 (UTP with E)
	DC-1 RTN	DC Power Return	Platform	E	AWG 12 (UTP with D)
28 VDC Power Channel 2	DC-2	DC Power	Platform	F	AWG 12 (UTP with L)
	DC-2 RTN	DC Power Return	Platform	L	AWG 12 (UTP with F)
28 VDC Power Channel 3	DC-3	DC Power	Platform	C	AWG 12 (UTP with G)
	DC-3 RTN	DC Power Return	Platform	G	AWG 12 (UTP with C)
Safety Ground	Chassis	Ground	Common	K	AWG 12
28 VDC Laser Power	PWRL	DC Power	Platform	A	AWG 12 (UTP with J)
	PWRL_RTN	DC Power Return	Platform	J	AWG 12 (UTP with A)
Unused	-	-	-	B, H	-
Contacts which are reserved, unused, or unallocated shall be populated by a dummy plug.					

Each signal group is described in more detail below.

4.1.1.1.1 Power

The platform shall provide to the sensor system three channels of 28 VDC power sources in accordance with MIL-STD-704F. Each of the three channels of 28 VDC shall be independently controlled.

The platform shall be capable of supplying 15 A steady state per each 28 VDC channel. Inrush current shall be limited to 25 A for 2 seconds with a 25% duty cycle.

The sensor shall isolate power returns or neutral in accordance with MIL-STD-704F from the chassis.

4.1.1.1.2 Safety Ground

This contact shall be used to provide electrical continuity between the sensor system chassis and the host platform in accordance with MIL-STD-464.

4.1.1.1.3 Laser Power

The platform shall provide 28 VDC power for the laser in accordance with MIL-STD-704F. The laser power contacts shall be used to separately power a laser device. This is intended for use with a safety-relevant device, such as a laser designator.

The platform shall be capable of supplying 15 A steady state for laser power. Inrush current shall be limited to 25 A for 2 seconds with a 25% duty cycle.

4.1.1.2 Turret Class I, J6 Auxiliary Power Connector

For Turret Class I, physical arrangement of pins for the J6 auxiliary power connector shall have a 21-11 insert pattern. Signals for the Turret Class I, J6 auxiliary power connector shall be assigned to pins in accordance with Table 12.

This auxiliary connector is used to provide additional power to turrets that require more power.