SAE Aerospace
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Validation Methods for MIL-STD-1760C Aircraft Station Interfaces

FOREWORD

This SAE Aerospace Standard (AS) is a document for validating aircraft station compliance with the interface requirements of MIL-STD-1760C. This document was prepared by the SAE AS-1B, MIL-STD-1760 User Task Group to provide industry guidelines to the U.S. Government's MIL-STD-1760C. This document was prepared to minimize unnecessary or undesirable variations in Aircraft Station Interface validation against MIL-STD-1760C. For validation of aircraft designed to MIL-STD-1760A Notice 2 AS4764 Issued 1995-04 applies. For validation of aircraft designed to MIL-STD-1760B Notice 3 AS47641 Issued 1999-08 applies.

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1. SCOPE:

This document establishes techniques for validating that an Aircraft Station Interface (ASI) complies with the interface requirements delineated in MIL-STD-1760C. For validation of aircraft designed to MIL-STD-1760A Notice 2 AS4764 Issued 1995-04 applies. For validation of aircraft designed to MIL-STD-1760B Notice 3 AS47641 Issued 1999-08 applies.

1.1 Purpose:

The purpose of this document is to provide methods for validating that an aircraft's store electrical interface complies with the aircraft station interface (ASI) requirements of MIL-STD-1760C. This document provides a modular, independent set of methods for each of the requirements in MIL-STD-1760 that applies to aircraft requirements. The methods herein apply to the auxiliary (AUX) interface as well as the primary interface of MIL-STD-1760.

1.2 Application:

The methods herein apply to initial validation of an aircraft design to the requirements of MIL-STD-1760 and are expected to be conducted as part of aircraft design validation (as opposed to qualification test, quality conformance test, flight line test, etc.). The methods contained in this document are sufficient to cover the Class I interface. Aircraft with Class II ASI's will use the appropriate subset of these Class I methods.

1.3 Tailoring:

The methods contained herein are general methods for conducting ASI validation and, as such, do not provide detailed procedures for these methods. It is intended that detailed procedures for validation of a specific ASI will be covered by tailored test plans and procedures prepared specifically for that aircraft. These tailored test procedures would, for example, address those peculiar commands required to step through sufficient operations and states to demonstrate compliance with the particular aircraft/store electrical interconnection system (AEIS) requirement under test.

1.4 Limitations:

The methods contained herein are based on MIL-STD-1760C. In addition, this document addresses testing compliance of an aircraft to MIL-STD-1760 based on the assumption that all tests are conducted at the aircraft's ASI connector and measurements of performance occur only at this ASI.

1.5 Identification System:

The test methods contained in this document are designated by an alphanumeric identification scheme. Each method is identified by a three alphabetical character combination followed by a three-digit number. The meaning of the first three individual letters is:

a. HBW: High Bandwidth Interface

b. MUX: Digital Multiplex Data Interface

c. LBW: Low Bandwidth Interface

d. REL: Release Consent Interface

e. INL: Interlock Interface

f. ADR: Address Interface

g. GND: Structure Ground

h. DCP: 28 V DC Power Interface

i. ACP: 115 V/200 V AC Power Interface

j. HVP: 270 V DC Power Interface

k. FOC: Fiber Optic Interface

l. INT: Initialization

m. CON: ASI Connector

n. UMB: Umbilical Cable

The three numbers following the letter code is a sequentially assigned number such that numbers 101 through 199 are for ASI requirements and 201 through 299 are reserved for mission store interface (MSI) requirements. When applicable, the letter following this three-digit number is the test method revision letter. For example, HBW101 represents the original version of the first test requirement (TR) for the ASI HBW interface while HBW101A represents the first revision of that requirement.

2. REFERENCES:

The following publications form a part of this specification 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 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS4113	Validation Test Plans for the Digital Time Division Commands/Response Multiplex Data Bus Controllers

2.2 U.S. Government Publications:

Available from Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

MIL-C-38999	Connectors Electrical, Circular, Miniature, High Density, Quick Disconnect
MIL-C-45662	Calibration System Requirements
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of MIL-STD-1498
MIL-STD-1553	Digital Time Division Command/Response Multiplex Data Bus
MIL-STD-1560	Insert Arrangements for MIL-C-38999 and MIL-C-27599 Electrical Circular Connectors
MIL-STD-1760C	Aircraft/Store Electrical Interconnection System

2.3 NATO Publications:

Available from Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

STANAG 3350 AVS	Analogue Video Standard for Aircraft Applications

2.4 Abbreviations and Acronyms:

AC	Alternating Current
ACP	Alternating Current Power
ADR	Address
AEIS	Aircraft/Store Electrical Interconnection System
AS	Aerospace Standard
ASD	Avionics Systems Division
ASI	Aircraft Station Interface
AUX	Auxiliary
BC	Bus Controller
COM	Communication
CON	Connector
CSSI	Carriage Store Station Interface
dB	Decibel
dBm	Decibels above 1 mW
DC	Direct Current
DCP	Direct Current Power
DoDISS	Department of Defense Index of Specifications
EIA	Electronic Industries Association
FOC	Fiber Optic Channel
GHz	Gigahertz
GND	Ground
HB	High Bandwidth

2.4 (Continued):

HBW	High Bandwidth
HVP	High Voltage Power
Hz	Hertz
ICD	Interface Control Document
INL	Interlock
INT	Initialization
kHz	Kilohertz
LB	Low Bandwidth
LBW	Low Bandwidth
mA	Milliamp
MHz	Megahertz
MIL	Military
ms	Milliseconds
MSG	Message
MSI	Mission Store Interface
MUX	Multiplex
N/A	Not Applicable
p-p	Peak-to-Peak
REL	Release
RNASP	Routing Network Aircraft System Port
RT	Remote Terminal
RMS	Root Mean Squared

2.4 (Continued):

SAE	Society of Automotive Engineers
STANAG	Standardization Agreement
STD	Standard
TDP	Technical Data Package
TR	Test Requirement
TRMS	True Root Mean Squared
UUT	Unit Under Test
V	Volts
VSWR	Voltage Standing Wave Ratio

3. DEFINITIONS:

3.1 AEIS Terms:

Terminology peculiar to the AEIS is defined in MIL-STD-1760.

3.2 Unit Under Test (UUT):

The UUT is defined as the "production configuration aircraft" undergoing validation tests. The test point for all electrical tests is the ASI.

3.3 Validation:

Validation is defined as the process whereby the final design of an AEIS is evaluated to determine its compliance with the requirements imposed by MIL-STD-1760. This compliance evaluation is accomplished using a combination of techniques including tests, analysis, and inspections. This validation is conducted to determine that the design complies with MIL-STD-1760 under nominal ambient conditions. While this validation may be part of an aircraft's qualification test (if specified in the aircraft's system specification), it is not necessarily intended to be conducted under all aircraft environmental and operational conditions and, as such, does not specifically "qualify" the aircraft to its system specification/interface control document (ICD) requirements.

3.3 (Continued):

The addition of a new column, titled “Shall Statement”, in each of the fourteen (14) Validation Tables, clearly identifies the requirement to be validated. The numbers in the column are directly linked to the corresponding “shall” statement in the order that it appears in the MIL-STD-1760 paragraph. For example, In Table 6 Address Validation Matrix, MIL-STD-1760 paragraph 5.1.6, the first two (2) shall statements, as they appear on 1760, are validated using test method ADR101 while the third (3) shall statement is validated using test method ADR102. In this way, the requirement is easily identified, traceable to MIL-STD-1760 and therefore must be followed or adhered to (tested) to verify overall system compliance to MIL-STD-1760.

4. GENERAL REQUIREMENTS:

4.1 Introduction:

As part of an aircraft’s qualification to its system specification requirements, the AEIS design shall be validated against the requirements of MIL-STD-1760. The specific validation effort for a given ASI will be defined in a test plan prepared for the AEIS. The methods defined in this document provide guidance for the preparation of the test plans by delineating the pertinent requirements in MIL-STD-1760 and validation methodology. For those requirements that can be validated by test or analysis, this document also provides test techniques. Section 5, herein, presents validation details associated with each requirement in MIL-STD-1760.

4.2 Validation Techniques:

Validation of a design to the requirements of MIL-STD-1760 can be accomplished through the use of a number of techniques. A general listing of these techniques includes:

a. Test

b. Analysis

c. Inspection

4.2.1 Test:
Tests are those methodologies that measure characteristics or performance under specified conditions. Tests also include techniques that “demonstrate” operation of circuitry or system performance.

4.2.2 Analysis:
Analyses are those methodologies that verify design compliance with the designated requirements of MIL-STD-1760 without performance of validation test or inspection. These methodologies will primarily be based on technical evaluation of aircraft design documentation such as drawings, parts lists, software listings, etc.

4.2.3 Inspection: Inspections are visual examinations and other nondestructive investigations of hardware and materials to determine compliance with the physical requirements of MIL-STD-1760.

4.3 Tailoring:

The implementation of an AEIS could be unique for each type of aircraft. Therefore, the test techniques presented in this document are written in general terms to avoid addressing aircraft unique operating details that would be required if detailed test techniques were presented. As a result, the procedures for validating an ASI will need to be defined by a custom “Test Plan” tailored specifically for the AEIS. This custom test plan would address specific test setups, test equipment, and those operating procedures required to exercise the ASI under test. These are a set of minimal verification requirements that can be added to but not subtracted from as that would mean that the AEIS may not meet the requirements of the “Standard”.

4.4 Test Conditions:

Except as specified in the detailed AEIS test plan, validation tests are expected to be conducted under the following ambient conditions:

a. Temperature: Room ambient

b. Altitude: Normal ground

c. Vibration: None

d. Humidity: Room ambient up to 90% relative humidity (noncondensing)

e. Power supply: AC: 115 +/- 3.0 V AC RMS, 400 +/- 7 Hz
DC: 27.5 +/- 2.0 V DC

4.5 Measuring Equipment:

This section addresses the test equipment used in the test methods contained in this document.

4.5.1 Equipment Type: The detailed test plan prepared for a specific AEIS will identify the specific equipment (by manufacturer and part number or by characteristics) that is to be used in each of the tests. The following is a list of generic equipment types required for testing an ASI:

a. HBW Interfaces:

(1) Sinusoid Signal Generator capable of 1.3 Vpp at 20 MHz with +/- 2.0 V offset.

(2) Function/Arbitrary Waveform Generator capable of 3.5 Vpp, 20 Hz - 20 MHz with a +/-2.0 V DC offset.

(3) Network Analyzer 20 Hz to 200 MHz both 50 and 75 ohm capability.

(4) Spectrum Analyzer with high persistence display 20 Hz to 200 MHz, 50 ohm & 75 ohm capability.

(5) Oscilloscope with storage facility.

(6) Power Meter capable of measuring -55 dBm.

(7) Adapters Cables, Impedance Matching Attenuators and Test Loads of 50 ohm and 75 ohm.

b. Digital MUX Data Interface:

(1) MIL-STD-1553 data bus tester

(2) Impedance analyzer

(3) Oscilloscope with storage facility.

(4) TRMS differential voltmeter

4.5.1 (Continued):

c. Low Bandwidth Interface:

(1) Audio Spectrum Analyzer covering a frequency range from 150 Hz to 50 kHz with variable voltage output up to 12 V (peak-to-peak) with selectable output and input impedances.

(2) Test loads of 30 ohms, 50 ohms, 60 ohms, 75 ohms and 600 ohms.

(3) Ohmmeter (continuity test).

(4) Digital voltmeters with a signal measurement bandwidth of greater than dc to 10 kHz.

(5) Second order Butterworth low pass filter (12 db/octave roll-off) with a cut-off frequency of 8 kHz.

(6) Oscilloscope with storage facility.

d. Discrete Interfaces (REL Consent, INL, ADR, and Structure GND):

(1) Digital Volt Ammeter

(2) Oscilloscope with storage facility.

(3) DC Power supply

(4) AC Power Supply

(5) Resistor Decade Box

e. 28 V DCP Interface:

(1) Digital Volt-Ammeter

(2) Oscilloscope with storage facility.

(3) DC Power supply

4.5.1 (Continued):

f. 115 V/200 V ACP Interface:

(1) Digital Volt-Ammeter

(2) Oscilloscope with storage facility

(3) ACP (400 Hz) supply

(4) Power factor meter

g. 270 V DCP Interface:

(1) N/A

h. Fiber Optic Interface:

(1) N/A

i. Initialization, Connector Intermateability, Umbilical Cable Interface:

(1) None Required

4.5.2 Equipment Accuracy: The accuracy of instruments and test equipment used to control or monitor the test parameters shall be verified and shall satisfy the requirements of MIL-C-45662 to the satisfaction of the procuring activity. All instruments and test equipment used in conducting the tests specified herein shall:

a. Conform to laboratory standards whose calibration is traceable to the prime standards at the National Bureau of Standards.

b. Have an accuracy of at least ¼ tolerance on the requirement to be measured. For example, if a variable has a tolerance of +/-10%, the test equipment shall have a measurement tolerance of +/-2.5% or better. In the event of conflict between this accuracy and requirement for accuracy in any one of the test methods of this document, the latter should govern.

c. Measurements made to satisfy open-ended maximum or minimum requirements shall be accurate within 5% of the requirements to be satisfied.

4.6 Operation of an ASI Under Test:

The detailed test plan shall include those AEIS peculiar operational requirements necessary to sequence the ASI through the applicable states and modes. These peculiar requirements include such items as: timelines, commands to a store, status and responses from a store, and high and low bandwidth signal sources or loads. Actual or simulated signal inputs (and loads) required to activate, utilize, or operate all AEIS functions may be used during testing.

4.7 Test Data:

Test data shall include complete identification of all test equipment and accessories. The data shall include the actual test setup, test sequence used, and ambient conditions. The test record shall contain a signature and date for certification of the test data by the test engineer.

5. DETAILED REQUIREMENTS:

5.1 Introduction:

Detailed validation methods are given in Appendix A of this document. The paragraphs below present information relative to each of the ASI's.

5.2 High Bandwidth (HBW)

5.2.1 General Requirement: The High Bandwidth (HBW) interfaces of the ASI are to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The HBW validation matrix is presented in Table 1.

TABLE 1 - High Bandwidth Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE1	VALIDATION TECHNIQUE2	VALIDATION TECHNIQUE3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1	-	**X**	-	**HBW101**
		2	X	**X**	X	**HBW107 – HBW121**
		3	X	**X**		**HBW102**
4.3.1	High Bandwidth Interfaces	1	**X**	**X**	-	**HBW101**
		2	**X**	**X**	-	**HBW109, HBW116, HBW117, HBW120**
		3	**-**	**-**	-	**N/A**
		4, 6	**X**	**X**	-	**HBW107 – HBW121**
		5	**-**	**X**	X	**HBW101**
4.3.1.1	Type A Signal Requirements	1, 2	X	-	-	HBW103
4.3.1.1a		1, 2, 3	X	-	-	HBW104
4.3.1.1b		1	X	-	-	HBW105
4.3.1.1c						
4.3.1.2	Type B Signal Requirements	1	-	**-**	**-**	N/A
4.3.1.3	Signal Assignment	1	-	X	-	HBW106
4.3.1.3a		1	-	X	-	HBW106
4.3.1.3b		1	-	X	-	HBW106
4.3.1.3c		1, 2	-	X	-	HBW106
5.1	Aircraft Requirements	1		X		HBW107 – HBW121
5.1.1	Aircraft HB Interfaces	1, 2		X	-	HBW107
		3	X	X	-	HBW109 – HBW114
5.1.1.1	Minimum Transfer Capacity	1	X	X	-	HBW108
5.1.1.2.1	Type A Return Loss	1, 2	X	-	-	HBW109
5.1.1.2.2	Type A Transient Response	1, 2	X	-	-	HBW110
Figure 5b		1 - 6	X	-	-	HBW110
Figure 6b		1 - 5	X	-	-	HBW110
5.1.1.2.3	Type A Insertion Gain	1	X	-	-	HBW111
5.1.1.2.4	Type A Representative Pulse Delay	1, 2, 3	X	X	-	**HBW112**
5.1.1.2.5	Type A Equalization	1, 2, 3	X	-	-	HBW113
5.1.1.2.6	Type A Dynamic Range	1	X	-	-	HBW114
5.1.1.2.7	Type A Signal Path DC Offset	1	X	-	-	HBW115
5.1.1.2.8	Type A Noise Requirements	1	X	-	-	HBW116 – HBW121
5.1.1.2.8.1	Type A Random Noise	1	X	-	-	HBW116
5.1.1.2.8.2	Type A Periodic Noise	1, 2, 3	X	-	-	HBW117
5.1.1.2.8.3	Type A Impulse Noise	1	X	-	-	HBW118
5.1.1.2.8.4	Type A Stimulated Noise	1	X	-	-	HBW119
5.1.1.2.8.5	Type A Common Mode Noise	1	X	-	-	HBW120
5.1.1.4	Ground Reference	1, 2, 3	X			HBW121

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.2.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.2.2.1 Test Techniques: Test of the aircraft's compliance to the HBW interface requirements concerns the effect of the ASI mating connector on the test results. Some of the critical electrical characteristics (such as Return Loss) of the interface can be significantly affected by the ASI connector performance. Likewise, the test results can be significantly affected by calibration methods associated with the test setup. An example case is measuring the Return Loss of the aircraft at the ASI. Typical methods for calibrating a network analyzer create an "opportunity" to cancel the effects of the ASI mating connector on the Return Loss measurement by considering the ASI mating connector as part of the test cable.

MIL-STD-1760 paragraphs 4.3.1 and 4.3.1.2 contain “Shall” statements for the Type B signal. However, there is no applicable test method for this requirement as Type B signals have not yet been adequately defined in the standard.

5.2.2.2 Analysis Techniques: The analysis effort associated with the HB interface is essentially limited to determining compliance by analysis of the aircraft's ICD or system specification, as applicable. In some instances analysis of specific test results is also required.

5.2.2.3 Inspection Techniques: The inspection effort associated with the HB interface is essentially limited to confirming that the aircraft HB interfaces include a signal connection and signal return (shield) connection. This compliance can be determined by analysis of the aircraft's ICD or system specification, as applicable.

5.2.2.4 Revisions and Notices: None.

5.3 Digital Multiplex (MUX) Data

5.3.1 General Requirements: The digital MUX data interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The digital MUX data validation matrix is presented in Table 2.

TABLE 2 - Digital Multiplex Data Validation Test Compliance Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3	X	X	X	MUX101 – MUX119
4.3.2	DIGITAL MULTIPLEX DATA BUS INTERFACE	1,2	-	-	X	MUX101
5.1.2	Aircraft Digital Data Bus Interface	1, 2			X	MUX101
5.1.2.1a 5.1.2.1b 5.1.2.1c 5.1.2.1d 5.1.2.1e	FUNCTIONAL CHARACTERISTICS	1,2 1,2 1 1 1	-	X X X X X	-	MUX102 MUX103 MUX104 MUX102 MUX104, MUX109 – MUX119
B.4.2.2.4	NUCLEAR Weapon Control	1, 2	-	X	-	MUX104
B.4.2.2.5	Nuclear Weapon Monitor	1, 2		X		MUX104
5.1.2.2	Electrical Characteristics	1	X			MUX105 – MUX108
5.1.2.2.1	OUTPUT CHARACTERISTICS	1	X	-	-	MUX105
		3	X			MUX106
5.1.2.2.2	INPUT CHARACTERISTICS	1	X		-	MUX107
5.1.2.2.3	SHIELD GROUNDING	1	X	-	-	MUX108
B.4.1	LOGICAL INTERFACE (COMMUNICATION RULES)	1, 2 ,3	X	X	-	MUX109
B.4.1.1.3.1.5	LOGICAL INTERFACE (TRANSMIT VECTOR WORD)	1, 2,3	-	X	-	MUX11-
B.4.1.1.3.1.6	LOGICAL INTERFACE (SYNCHRONIZE WITH DATA WORD)	1, 2	-	X	-	MUX111
B.4.1.1.3.2	LOGICAL INTERFACE (PROHIBITED MODE COMMANDS)	1, 2	-	X	-	MUX112
B.4.1.2.3	LOGICAL INTERFACE (SUBSYSTEM FLAG BIT)	1, 2, 3	-	X	-	MUX113
B.4.1.5.2 B.4.1.5.2.1	LOGICAL INTERFACE (CHECKSUM REQUIREMENT AND ALGORITHM)	1, 2, 3 1, 2	-	X X	-	MUX114
B.4.1.5.3	LOGICAL INTERFACE (EXECUTION TIME)	1	-	X	-	MUX115
B.4.1.5.5	LOGICAL INTERFACE (REQUEST SERVICING)	1-4	-	X	-	MUX116
B.4.2.1 B.4.2.1.1 B.4.2.1.2	LOGICAL INTERFACE (BASE MESSAGE DATA FORMAT)	1-3 1-2	-	X X X	-	MUX117
B.4.2.2.1	LOGICAL INTERFACE (STORE CONTROL)	1,2,3-4	-	X	-	MUX118
B.4.2.2.2	LOGICAL INTERFACE (STORE MONITOR)	1,2,3-4	-	X	-	MUX119

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.3.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.3.2.1 Test Techniques: Test of the aircraft's compliance to the digital MUX data interface requirements concerns the effect of the mating test cable (between the test equipment and the aircraft) on the test results. Some of the critical electrical characteristic (such as input impedance) measurements can be significantly affected by the test cable characteristics. The test cable should use quality components and be as short in length as practical to minimize test cable effects on the test results.

5.4 Low Bandwidth (LBW)

5.4.1 General Requirement: The low bandwidth (LBW) interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The LBW validation matrix is presented in Table 3.

TABLE 3 - Low Bandwidth Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3	X	X	X	LBW101-LBW111
4.3.3	Low bandwidth interface	1,2,3,4	- - X	X X -	- - -	LBW101 LBW102 LBW104
4.3.3.1	LB signal requirements	1,2,3,4	X X	- -	- -	LBW103 LBW106
4.3.3.2	Signal assignment	1,2	- -	X -	- X	LBW102 LBW112
5.1.3	Aircraft LB interface	1,2	-	X	-	LBW102
5.1.3.1	Minimum transfer capacity	1,2	-	X	-	LBW102
5.1.3.2	Input / output impedance	1,2	X	-	-	LBW104
5.1.3.3	Insertion gain	1	X	-	-	LBW107
5.1.3.4	Equalization requirements	1,2	X	-	-	LBW107
5.1.3.5	Signal path dc offset	1	X	-	-	LBW108
5.1.3.6	Noise	-	N/A	N/A	N/A	-
5.1.3.6.1	Periodic random noise	1,2,3	X	X	-	LBW109
5.1.3.6.2	Impulse noise	1,2	X	X	-	LBW110
5.1.3.6.3	Stimulated noise	1	X	X	-	LBW111
5.1.3.6.4	Common mode noise	1,2	X	-	-	LBW108
5.1.3.7	Ground reference	1,2,3	- X	X -	- -	LBW101 LBW105

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.4.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.4.2.1 Test Techniques: Test of the aircraft's compliance to the LBW interface requirements concerns signal level, impedance, signal quality and frequency range.

5.4.2.2 Analysis Techniques: The analysis effort associated with the LB interface is essentially limited to determining compliance by analysis of the aircraft's ICD or system specification, as applicable. In some instances analysis of specific test results is also required.

5.4.2.3 Inspection Techniques: The inspection effort associated with the LB interface is essentially limited to confirming that if the aircraft uses the interface for only those applications identified in the standard; i.e., tones or voice grade audio. This compliance can be determined by analysis of the aircraft's ICD or system specification, as applicable.

5.5 Release (REL) Consent

5.5.1 General Requirement: The Release Consent (REL) interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The Release Consent validation matrix is presented in Table 4.

TABLE 4 - Release Consent Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1, 2, 3	X	X	X	REL101 – REL107
4.3.4	Release Consent Interface	1, 2	-	X	-	REL101
5.1.4	Aircraft Release Consent	1, 2, 3	-	X	-	REL101
	Interface	4, 5	X	X	-	REL102
5.1.4.1	Voltage Level	1	X	-	-	REL103
5.1.4.a						
5.1.4.b		2	X	-	-	REL103
5.1.4.2	Current Level	1,2	X	-	-	REL103
5.1.4.3	Stabilization Time	1	X	-	-	REL104
5.1.4.4	Enable Lead Time	1	-	X	-	REL105
5.1.4.5	Inhibit Delay	1	-	X	-	REL106
5.1.4.6	Ground Reference	1	-	X	-	REL107

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.5.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.5.2.1 Test Techniques: Test of the aircraft's compliance to the Release Consent interface requirements concerns the electrical isolation to all other ASIs.

5.5.2.2 Analysis Techniques: The analysis effort associated with the Release Consent interface is essentially limited to confirming that the aircraft uses the interface for only those applications identified in the standard. This compliance can be determined by analysis of the aircraft's ICD or system specification, as applicable.

5.5.2.3 Inspection Techniques: The Release Consent interface has no inspection requirements.

5.5.2.4 Revisions and Notices: None.

5.6 Interlock (INL)

5.6.1 General Requirement: The Interlock (INL) interface of the ASI and Auxiliary ASI are to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The INL validation matrix is presented in Table 5.

TABLE 5 - Interlock Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1, 2, 3	X	X		INL101 – INL104
4.3.5	Primary Interlock Interface	1, 3		X		INL101
4.4	Auxiliary Power interface Signal Set	1, 2		X		INL101
4.4.2	Auxiliary Interlock Interface	1, 3		X		INL101
5.1.5	Aircraft Interlock Interface	1		X		INL101
5.1.5a	Open Circuit Voltage	2	X			INL102
5.1.5b	Excitation Current	2	X			INL103
5.1.5c	Impedance Detection Threshold	1, 2	X			INL104

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.6.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.6.2.1 Test Techniques: Test of the aircraft's compliance to the Interlock interface requirements concern measurements required to evaluate impedances at specific voltage, current, and frequency levels.

5.6.2.2 Analysis Techniques: The analysis effort associated with the Interlock interface is essentially limited to confirming that the aircraft uses the interface for the application identified in the standard. This compliance can be determined by analysis of the aircraft's ICD or system specification, as applicable.

5.6.2.3 Inspection Techniques: The Interlock interface has no inspection requirements.

5.6.2.4 Revisions and Notices: MIL-STD-704 contains several revision and notices that may impact the validation criteria.

5.7 Address (ADR)

5.7.1 General Requirements: The address (ADR) interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The ADR validation matrix is presented in Table 6.

TABLE 6 - Address Validation Matrix

MIL-STD-1760 PARAGRAPH		SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1, 2, 3	X	X	-	ADR101 – DR109
4.3.6	Address Interface	1, 2	-	X	-	ADR101
5.1.6	Aircraft Address Interface	1, 2	-	X	-	ADR101
		3	-	X	-	ADR102
5.1.6.1	Address Assignment	2	-	X	-	ADR103
5.1.6.1a		3	-	X	-	ADR104
5.1.6.1b		1, 4	X	-	-	ADR105
5.1.6.2, 5.1.6.2a, 5.1.6.2b	Address Signal	1	X	-	-	ADR106
5.1.6.3, 5.1.6.3a, 5.1.6.3b	Logic Thresholds	1 - 4	X	-	-	ADR107
5.1.6.4	Response Characteristics	1, 2	X	-	-	ADR108
5.1.6.5	Address Isolation	1, 2	X	-	-	ADR109

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.7.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.7.2.1 Test Techniques: Test of the ASI's compliance to the ADR interface requirements concerns the ability to determine if a unique address has been assigned to each ASI and tests for address stability, response times, thresholds, response characteristics and isolation.

5.7.2.2 Analysis Techniques: The analysis effort associated with the ADR interface is essentially limited to confirming that the ASI uses the interface for only those applications identified in the standard. This compliance can be determined by analysis of the aircraft's ICD or system specification, as applicable.

5.7.2.3 Inspection Techniques: The ADR interface has no inspection requirements.

5.7.2.4 Revisions and Notices: None.

5.8 Structure Ground (GND):

5.8.1 General Requirement: The Structure Ground interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The Structure Ground validation matrix is presented in Table 7.

TABLE 7 - Structure Ground Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3	X	X		GND101
4.3.7	Primary Structure Ground	1-3	-	X	-	GND101
4.4.3	Auxiliary Structure Ground	1-3	-	X	-	GND101
5.1.7	Aircraft Structure Ground	1,2	X	X	-	GND101

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.8.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.8.2.1 Test Techniques: The measurements required for the Structure Ground interfaces are current and voltage measurements between the Structure Ground interface contact and the aircraft conductive structure.

5.8.2.2 Analysis Techniques: The analysis aspects of the Structure Ground interface deal with fault analysis. The aircraft design should be evaluated to determine its ability to safely conduct the fault currents that could occur due to internal faults of power sources to vehicle structure. The path resistance shall be low enough that when conducting fault currents, the voltage developed is of safe magnitude. The analysis should confirm, by evaluation of the aircraft's ICD, fabrication drawings and other technical documentation, that the ASI is not relying on the existence of structure ground to complete a ground path for any interface power or signal function.

5.8.2.3 Inspection Techniques: The structure GND interface has no inspection requirements.

5.8.2.4 Revisions and Notices: None.

5.9 28 V DCP

5.9.1 General Requirement: The 28 V DCP interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The 28 V DCP validation matrix is presented in Table 8.

TABLE 8 - 28 V DC Power Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3	X	X		DCP101-DCP109
4.3.8	Primary Power	1	-	X	-	DCP102
		2,4	-	X	-	DCP101 (28V dc only)
		3	N/A	N/A	N/A	-
		5*	N/A	N/A	N/A	-
4.4.1	Auxiliary Power	1	-	X	-	DCP102
		2,4	-	X	-	DCP101 (28V dc only)
		3	N/A	N/A	N/A	-
		5*	N/A	N/A	N/A	-
5.1.8	Aircraft 28 V dc Power Interface	1-3	-	X	-	DCP101
5.1.8.1	Independent Control	1	-	X	-	DCP102
5.1.8.2	Voltage Level	1-4	X	X	-	DCP103
5.1.8.3.1	Current Capacity Primary Signal Set	1,2	X	X	-	DCP104
5.1.8.3.2	Current Capacity Auxiliary Power Signal Set	1	X	X	-	DCP105
5.1.8.3.3	Simultaneous Current	-	N/A	N/A	N/A	-
5.1.8.4	Overcurrent Protection	1	-	X	-	DCP106
5.1.8.5	Off-State Leakage Current	1,2	X	-	-	DCP107
5.1.8.6	Stabilization Time	1	X	-	-	DCP108
5.1.8.7	Ground Reference	1				DCP101
5.1.8.8	Power Application	1,2	-	X	-	DCP109

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

* Shall for 'not to be used for discrete functions' is not considered to be relevant to ASI's.

5.9.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.9.2.1 Test Techniques: Test of the ASI's compliance to the 28 V DCP interface requirements concerns the total 28 V DC continuous current provided simultaneously through both the primary and AUX interfaces at any Class IA or IIA ASI. This current need not exceed 30A.

5.9.2.2 Analysis Techniques: The analysis effort associated with the 28 V DCP interface is essentially limited to confirming that the ASI is "compatible" with MIL-STD-704. This compliance may be determined by analysis of the aircraft's ICD, fabrication drawings and other technical documentation that defines the design.

The abnormal operation voltage limits are to be validated by analysis only due to practical difficulties of arranging for the aircraft to work in an abnormal mode.

The overcurrent and initial surge current requirements are to be validated by analysis only due to possible damage to the ASI occurring if validated by test.

5.9.2.3 Inspection Techniques: The 28 V DCP interface has no inspection requirements.

5.9.2.4 Revisions and Notices: MIL-STD-704 contains several revisions, notices, and amendments that may impact the validation criteria.

NOTE: The requirement in section 4 of MIL-STD-1760 that the power interface is not to be used for discrete functions is considered not relevant to ASI's and is therefore not addressed in this document.

The soft requirement for simultaneous current is validated by the independent control analysis and maximum current capability tests for the Primary and Auxiliary; i.e. combination need not exceed 30 A.

5.10 115 V/200 V ACP

5.10.1 General Requirement: The 115 V/200 V ACP interface of the ASI is to be validated against the requirements of MIL-STD-1760C through a combination of test, analysis, and inspection methods. The 115 V/200 V ACP validation matrix is presented in Table 9.

TABLE 9 - 115 V/200 V AC Power Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3	X	X		ACP101-ACP112
4.3.8	Primary Power	1	-	X	-	ACP102
		2,4	-	X	-	ACP101 (115V ac only)
		3	N/A	N/A	N/A	-
		5*	N/A	N/A	N/A	-
4.4.1	Auxiliary Power	1	-	X	-	ACP102
		2,4	-	X	-	ACP101 (115V ac only)
		3	N/A	N/A	N/A	-
		5*	N/A	N/A	N/A	-
5.1.9	115V/200 V ac power interface	1-3	-	X	-	ACP101
5.1.9.1	Independent control and deadfacing	1-3	-	X	-	ACP102
5.1.9.2	Voltage level	1-3	X	X	-	ACP103
5.1.9.3.1	Current Capacity Primary signal set	1	X	X	-	ACP104
5.1.9.3.2	Current Capacity Auxiliary power signal set	1	X	X	-	ACP105
5.1.9.3.3	Simultaneous current	-	N/A	N/A	N/A	-
5.1.9.4	Overcurrent protection	1	-	X	-	ACP106
5.1.9.5	Off-state leakage current	1,2	X	-	-	ACP107
5.1.9.6	Stabilization time	1	X	-	-	ACP108
5.1.9.7	Phase rotation	1	X	-	-	ACP109
		1	X	-	-	ACP110
5.1.9.8	Load power factor	1	-	X	-	ACP111
5.1.9.9	Phase power unbalance	1	-	X	-	ACP112
5.1.9.10	Ground reference	1	-	X	-	ACP101
5.1.9.11	Power application	-	N/A	N/A	N/A	-

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

* Shall for 'not to be used for discrete functions' is not considered to be relevant to ASI's.

5.10.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.10.2.1 Test Techniques: Test of the ASI's compliance to the 115 V/200 V ACP interface requirements concerns the total 115 V AC continuous current provided simultaneously through both primary and AUX interfaces at any Class IA or IIA ASI. This current need not exceed 30 A per phase.

5.10.2.2 Analysis Techniques: The analysis effort associated with the 115 V/200 V ACP interface is essentially limited to confirming that the ASI is "compatible" with MIL-STD-704. This compliance can be determined by analysis of the aircraft's ICD, fabrication drawings, and other technical documentation that defines the ASI design.

The abnormal operation voltage limits are to be validated by analysis only due to practical difficulties of arranging for the aircraft to work in an abnormal mode.

The overcurrent and initial surge current requirements are to be validated by analysis only due to possible damage to the ASI occurring if validated by test.

5.10.2.3 Inspection Techniques: The 115 V/200 V ACP interface has no inspection requirements.

5.10.2.4 Revisions and Notices: MIL-STD-704 contains several revisions, notices, and amendments that may impact the validation criteria.

NOTE: The requirement in section 4 of MIL-STD-1760 that the power interface is not to be used for discrete functions is considered not relevant to ASI's and is therefore not addressed in this document.

The soft requirement for simultaneous current is validated by the independent control analysis and maximum current capability tests for the Primary and Auxiliary; i.e. combination need not exceed 30 A.

The Power Application requirement is considered to be applicable to stores and not addressed here.

5.11 270 V DCP

5.11.1 General Requirement: The 270 V DC high voltage power (HVP) interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The 270 V DCP validation matrix is presented in Table 10.

TABLE 10 - 270 V DC Power Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1, 2, 3	-	X	-	HVP101
4.3.8	Primary Power Interface	1, 3, 4, 5	-	X	-	HVP101
4.4	Auxiliary Power Interface Signal Set Interface	1, 2	-	X	-	HVP101
4.4.1	Auxiliary Power	1, 3, 4, 5	-	X	-	HVP101
5.1.10	Aircraft 270VDC Power Interface	1, 2	-	X	X	HVP101

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.11.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.11.2.1 Test Techniques: There are no 270 V DC tests required for ASI validation since the 270 V DC interface requirement is limited to reserving cavities in the connectors.

5.11.2.2 Analysis Techniques: The analysis effort associated with the 270 V DCP interface is limited to confirming, by inspection, that the ASI does not use the connector cavities that are reserved for 270 V DCP applications. This compliance can be determined by analysis of the aircraft's ICD, fabrication drawings, and other technical documentation that defines the aircraft design.

5.11.2.3 Inspection Techniques: The inspection requirement associated with the ASI's 270 V DCP interface deals with confirming that the ASI connector contains contacts or plugged contact cavities for the reserved 270 V DCP and power return lines.

5.12 Fiber Optics

5.12.1 General Requirement: The fiber optic (FOC) interface of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The FOC validation matrix is presented in Table 11.

TABLE 11 - Fiber Optic Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1,2,3		X	X	FOC101
4.3.9	Fiber Optics Interfaces	1		X	X	FOC101
5.1.11	FIBER OPTIC INTERFACE	1,2,3	-	X	X	FOC101

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.12.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.12.2.1 Test Techniques: There are no FOC interface tests required for ASI validation since the FOC interface requirement is limited to reserving cavities in the connectors.

5.12.2.2 Analysis Techniques: The analysis effort associated with the FOC interface is limited to confirming, by inspection, that the ASI does not use the connector cavities that are reserved for FOC applications. This compliance can be determined by analysis of the aircraft's ICD, fabrication drawings, and other technical documentation that defines the aircraft design.

5.12.2.3 Inspection Techniques: The inspection requirement associated with the ASI's FOC interface deals with confirming that the ASI connector contains plugged contact cavities for the two reserved FOC channels.

5.13 Initialization Procedures

5.13.1 General Requirement: The power-up initialization performance of the ASI is to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The initialization validation matrix is presented in Table 12.

TABLE 12 - Initialization Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface	1-3	-	X	-	INT101–INT104
5.1.12	Signal Set Initialization	1	-	X	-	INT101
5.1.12.1	Pre-initialization Conditions	1	-	X	-	INT102
5.1.12.1a		1	-	X	-	
5.1.12.1b		1	-	X	-	
5.1.12.1c		1	-	X	-	
5.1.12.2	Power Application	1, 2	-	X	-	INT103
5.1.12.3	First Response	1, 2, 3	-	X	-	INT104

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.13.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.13.2.1 Test Techniques: Test of the ASI's compliance to the power-up initialization process concerns operational limitations that may exist with the aircraft. Conducting these tests will generally require several cycles of power turn-on and turn-off to evaluate the various test cases. The detailed test plan for the specific aircraft ASI under test should identify any power cycling limitations.

5.13.2.2 Analysis Techniques: A number of ASI initialization requirements in MIL-STD-1760 are defined as aspects associated with being compatible with various interface operational conditions. For example, paragraph 5.1.12.1, MIL-STD-1760C, states that Release Consent interface shall be in the inhibit state prior to store power-up. These compatibility requirements shall be validated by analysis.

This validation will be based on evaluation of associated aircraft technical documentation such as ICDs, drawings, software listings, etc.

5.13.2.3 Inspection Techniques: There are no inspection requirements associated with the power-up initialization process validation.

5.14 Connector Intermateability

5.14.1 General Requirement: Connector (CON) intermateability characteristics of the ASI are to be validated against the requirements of MIL-STD-1760 through a combination of test, analysis, and inspection methods. The CON intermateability validation matrix is presented in Table 13.

TABLE 13 - Connector Intermateability Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3		**X**	X	**CON101, CON102**
4.5	Interface connectors	1, 2	**-**	**X**	X	**CON101**
5.6.1a, 5.6.1b, 5.6.1.f, 5.6.1g	Primary interface connectors	1-4,13,14	**-**	**X**	X	**CON101**
5.6.2a, 5.6.2b, 5.6.2c, 5.6.2d	Auxiliary power interface connector	1-4	-	X	X	CON101
5.6.3, 5.6.4	Connector receptacle, Plugged cavities	1	-	X	X	CON101
5.6.6.1a, 5.6.6.1b, 5.6.6.1c, 5.6.6.1d	ASI and CSSI	1	-	-	X	CON102

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.14.2 Special Considerations: The following special considerations apply to the three different validation techniques.

5.14.2.1 Test Techniques: There are no CON intermateability tests required for ASI validation.

5.14.2.2 Analysis Techniques: The analysis effort associated with CON intermateability is limited to confirming that the aircraft uses the correct connector type, insert, and contact assignments. This compliance can be determined by analysis of the aircraft's ICD, fabrication drawings and other technical documentation that defines the ASI design.

5.14.2.3 Inspection Techniques: The inspection requirements associated with the ASI connector characteristics consist of visual verification of connector orientations.

5.14.2.4 Revisions and Notices: MIL-STD-1560, MIL-C-38999, and MIL-C-39029 contain several revisions, notices, and amendments that may impact the validation criteria.

5.15 Umbilical Cables

5.15.1 General Requirement: Umbilical (UMB) characteristics are to be validated against the requirements of MIL-STD-1760 through a combination of analysis, and inspection methods. The UMB cable validation matrix is presented in Table 14.

TABLE 14 - Umbilical Validation Matrix

MIL-STD-1760 PARAGRAPH	TITLE	SHALL STATEMENT	VALIDATION TECHNIQUE 1	VALIDATION TECHNIQUE 2	VALIDATION TECHNIQUE 3	METHOD REFERENCE
4.3	Primary Interface Signal Set	1-3	-	**X**	X	**UMB101-UMB103**
5.4	Umbilical cable requirements	1	**-**	**-**	X	**UMB101**
5.4.1	Primary umbilical HB interfaces	1	**-**	**-**	X	**UMB102**
		2	**-**	**-**	X	**UMB103**
5.4.2	Primary umbilical data bus interface	1	-	-	X	UMB102
		2	-	-	X	UMB103
5.4.3	Primary umbilical LB interface	1	-	**-**	**X**	UMB102
		2	-	**-**	**X**	UMB103
5.4.4	Primary umbilical release consent interface	1	-	-	X	UMB102
5.4.5	Umbilical interlock interface	1	-	-	X	UMB102
5.4.6	Primary umbilical address interface	1	-	-	X	UMB102
5.4.7	Umbilical structure ground	1,2	-	-	X	UMB102
5.4.8	Umbilical 28V dc power interface	1,2	-	-	X	UMB102
5.4.9	Umbilical 115V ac power interface	1,2	-	-	X	UMB102
5.4.10	Umbilical 270V dc power interface	1	-	-	X	**UMB101**
5.4.11	Primary umbilical fiber optic interface	1	-	-	X	UMB101
5.4.12	Umbilical gross shield	1	-	-	X	UMB101
		2	-	-	X	UMB103
5.6.5	Umbilical primary interface connectors	1-4	-	X	X	UMB101
5.6.5	Umbilical auxiliary interface connectors	1-4	-	X	X	UMB101
5.6.6.3	Umbilical cable	1,2	-	-	X	UMB101

NOTE: Validation Techniques:
1. Test
2. Analysis
3. Inspection

5.15.2 Special Considerations: The following special considerations apply to the different validation techniques.

5.15.2.1 Test Techniques: The analysis effort associated with umbilical cables is limited to confirming that the aircraft uses the correct connector type, insert, contact types and cables types that meet the requirements, and that the umbilical production test documentation and reports confirm compliance with the isolation and bonding requirements across the environment the umbilical is expected to operate in. This compliance can be determined by analysis of the aircraft's ICD, fabrication drawings and other technical documentation that defines the Umbilical design.

5.15.2.2 Analysis Techniques: The inspection requirements associated with the umbilical characteristics consist of visual verification of connector orientation, and if desired, identification of contact types.

5.15.2.3 Inspection Techniques: MIL-STD-1560, MIL-C-38999, and MIL-C-39029 contain several revisions, notices, and amendments that may impact the validation criteria.

6. NOTES:

6.1 Guidelines for Validation Plan Development:

6.1.1 Introduction: A custom validation plan should be written specifically for each ASI to be validated. The development of the test plan requires that ASI data items be available. These data items should include, but not be limited to, an aircraft ICD, wiring diagram, system segment specification and data document. With the necessary data items available, a review of the validation methods in Appendix A should be performed to identify the test, analysis, and inspection techniques necessary for validation. Once the required techniques have been identified, a specific validation plan can then be written for each test method.

6.2 Test Sequence:

Careful consideration must be given to the test sequences for each ASI. All operational safety requirements of the aircraft must be identified. Additionally, all operational restrictions of the aircraft must be known. In general, analysis methods will be performed prior to electrical tests on the aircraft. Power limitations of some aircraft may preclude prolonged operation or repetitive cycling of operation power. The initial tests on the ASI should verify the physical interface. All unused pins should be checked, if not plugged, for proper impedance characteristics. The connector should be checked for intermateability, the structure GND interface should be checked, and INL continuity and isolation should be tested. MIL-STD-1553 control signals, such as, the ADR interface, INL, and REL consent tests should be performed. After these tests have been completed, ACP and DCP interfaces should be checked. The final sets of tests should check those portions of the LB and HB interface that have been implemented. Once the required testing has been completed, the aircraft should be returned to a known state and power should be removed.

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COMMITTEE AS-1, AVIONICS/ARMAMENT INTEGRATION

APPENDIX A
VALIDATION METHODS

METHOD: HBW101

PARAMETER: Primary Interfaced Signal Set, High Bandwidth Interfaces

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.1

PURPOSE: This method verifies that the RNASP interfaces meet the minimum requirements for the defined ASI interface class and that each HB interface has a signal connection and a signal return (shield) connection.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the HB signals required by the ASI's interface class are present and supported by the RNASP and that each HB interface has a signal connection and a signal return (shield) connection.

a. The Class I interface consists of HB1, HB2, HB3 and HB4.
b. The Class II interface consists of HB1 and HB3.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to verify the HB interfaces are supported per the required interface class and that each interface contains a signal connection and a signal return.

NOTES: N/A

METHOD: HBW102

PARAMETER: Primary Interface Signal Set

MIL-STD-1760 PARAGRAPH: 4.3

PURPOSE: This method verifies that an RNASP is not damaged by the removal of any termination from any HB interface.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if all HB validation methods are passed after all RNASP inputs and outputs have been exercised with their required signal sets without input or output terminations.

APPARATUS: N/A

VALIDATION METHOD:

To verify by analysis:

Analyze the RNASP TDP for the system to verify that no terminations are required to prevent damage to the input or output.

To verify by test:

Apply the appropriate logic to activate the HB path under test and remove the input and output terminations for the required RNASP path. If this is a bi-directional signal path, switch the direction and repeat the test. Repeat for all required RNASP paths.

Apply the appropriate signal to each required input to the RNASP, apply the appropriate logic to activate the HB path under test and then disconnect the output load from the path being tested. If this is a bi-directional signal path, switch the direction and repeat the test. Repeat for all required RNASP paths.

Apply the appropriate signal to each required input to the RNASP, apply the appropriate logic to activate the HB path under test and then disconnect the input termination from the path being tested. If this is a bi-directional path, switch the direction and repeat the test. Repeat for all required RNASP paths.

Verify the correct operation of each signal path after the completion of the test methods above.

NOTES: N/A

METHOD: HBW103

PARAMETER: Type A Signal Requirements

MIL-STD-1760C Paragraph: 4.3.1.1a

PURPOSE: This method verifies the routing network meets the steady state and transient signal condition requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the routing network can support:

a. A 1.3Vpp signal with a +/-1.55Vdc steady state component.
b. The 1.3Vpp signal returns to within 5% of its steady state limit in less than 250ms when an offset of +/- 2.0 Vdc is applied.

APPARATUS:

a. Function generator capable of producing a 1.3 V peak to peak, 20Hz – 20MHz sine wave and capable of supplying a DC offset of +/- 2.0V.
b. Oscilloscope
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
d. 50 and 75 ohm BNC 'T' with 50 and 75 ohm loads

VALIDATION METHOD:

a. Input a sine wave in the frequency range of 20Hz to 20MHz, 1.3V peak to peak with a +/-1.55VDC component into the signal path input and verify on the oscilloscope, the signal integrity.
b. Input a sine wave in the frequency range of 20Hz to 20MHz, 1.3V peak to peak and record the peak to peak output. Apply a momentary +/-2.0V offset and verify the output recovers to the signals steady state peak to peak limit within 250ms.

NOTES:

1. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
2. HB1 and HB2 are 50 ohm signal paths
3. HB3 and HB4 are 75 ohm signal paths
4. All signal paths must be terminated with their correct characteristic impedance.
5. The +/-1.55VDC component is an offset measured from 0VDC to the mean of the sine wave.

METHOD: HBW104

PARAMETER: Type A Signal Requirements

MIL-STD-1760C Paragraph: 4.3.1.1b

PURPOSE: This method verifies the routing network meets the power spectral component requirement between 20MHz and 200MHz of 14dB/octave.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the output of any signal path is within the power spectral component limit line of 14dB/octave between 20MHz to 200MHz.

APPARATUS:

a. Spectrum Analyzer
b. Signal Generator (20MHz at 1.33V peak to peak)
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.

VALIDATION METHOD:

Connect the signal generator (20MHz at 1.33V peak to peak) to the ASI input connector and the input of the spectrum analyzer to the ASI output. Verify the power spectral component measurement at 20MHz and then scan the spectrum analyzer to 200MHz. Verify that between 20MHz and 200MHz the power spectral component does not exceed 14dB/octave.

NOTES:

1. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
2. HB1 and HB2 are 50 ohm signal paths
3. HB3 and HB4 are 75 ohm signal paths
4. All signal paths must be terminated with their correct characteristic impedance

METHOD: HBW105

PARAMETER: Type A Signal Requirements

MIL-STD-1760C Paragraph: 4.3.1.1c

PURPOSE: This method verifies the routing network meets the slew rate requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the routing network can support a minimum slew rate or 65 volts/microsecond.

EQUIPMENT:

a. Function generator capable of producing a 2V peak to peak, 10MHz squarewave.
b. Oscilloscope
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
d. 50 and 75 ohm BNC ‘T’ with 50 and 75 ohm loads

VALIDATION METHOD:

a. Adjust the function generator output for a 10MHz, 2V peak to peak square wave.
b. View the square wave on the oscilloscope and insure the rise time of the leading or trailing edge is 65Volts/microsecond or greater.
c. Apply the square wave into the signal path input.
d. Connect the oscilloscope to the signal path output.
e. Measure the voltage change versus time of the leading or trailing edge of the output square wave.
f. Calculate the voltage change (slew rate) per microsecond to see if it meets the passing requirement of being equal to or greater than the minimum requirement of 65 volts/ microsecond.

NOTES:

1. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
2. HB1 and HB2 are 50 ohm signal paths
3. HB3 and HB4 are 75 ohm signal paths
4. All signal paths must be terminated with their correct characteristic impedance

METHOD: HBW106

PARAMETER: Signal Requirements

MIL-STD-1760C Paragraph: 4.3.1.3, 4.3.1.3a, 4.3.1.3b, 4.3.1.3c

PURPOSE: This method verifies that the RNASP assigns the allowed signals to the proper HB signal paths.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the:

a. RNASP only transfers signals, which comply with type B signal characteristics on the HB1 interface.
b. RNASP only transfers time correlation (synchronization, clocking and blanking) signals, which comply with type A signal characteristics only on HB1 or HB2 or both.
c. RNASP only transfers monochrome raster composite video that complies with STANAG 3350 on HB3 or HB4 or both.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft HB distribution network only transfers the allowed Type A and B signals on their perspective HB interface.

a. Signals, which comply with type B signal characteristics, shall only be transferred on HB1.
b. Time correlation (synchronization, clocking and blanking) signals, which comply with type A signal characteristics, shall only be transferred on HB1 or HB2 or both.
c. Monochrome raster composite video shall only be transferred on HB3 or HB4 or both. Raster composite video shall comply with STANAG 3350.

NOTES: N/A

METHOD: HBW107

PARAMETER: Aircraft HB Interface

MIL-STD-1760 PARAGRAPH: 5.1.1

PURPOSE: This method verifies that the aircraft provides the HB signal routing network necessary to support bi-directional signal transfer at each ASI for transfer of both type A and type B signals.

PARAMETER TYPE:	( ) ELECTRICAL	( ) PROTOCOL	(X) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the HB distribution network provides the necessary paths to support the transfer of a simplex HB signal between the RNASP and any ASI or between ASI's as applicable. The aircraft shall be capable of assigning, controlling, and routing/re-routing HB signals to their proper destinations.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft HB distribution network provides the necessary paths to support bi-directional signal transfer from RNASP to any ASI and between ASI to applicable.

NOTES: N/A

METHOD: HBW108

PARAMETER: Minimum Transfer Capacity

MIL-STD-1760 PARAGRAPH: 5.1.1.1

PURPOSE: This method verifies that the aircraft provides the minimum simultaneous transfer of HB signals through an ASI.

PARAMETER TYPE:	( ) ELECTRICAL	( ) PROTOCOL	(X) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the HB distribution network provides the necessary capacity to support the transfer of a one type A signal or one type B signal on HB1, simultaneously with the transfer of type A signals on HB2, HB3 and HB4 through an ASI.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft HB distribution network provides the necessary capacity to support the simultaneous signal transfer of one type A signal or one type B signal on HB1 with the transfer of type A on HB2, HB3 and HB4 through an ASI.

NOTES: N/A

METHOD: HBW109

PARAMETER: Type A Return Loss

MIL-STD-1760C Paragraph: 4.3.1, 5.1.1.2.1

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the return loss requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the input and output Return Loss measured is not less than 20 dB from 20 Hz to 20 MHz when properly terminated.

APPARATUS:

a. Network Analyzer (20 Hz to 20 MHz) capable of 50 and 75 ohm measurements
b. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
c. Calibration standards (50 and 75 ohm) including impedance matching attenuator

VALIDATION METHOD:

The input and output return loss of HB1, HB2, HB3 and HB4 shall be measured from 20Hz to 20 MHz.

NOTES:

1. The network analyzer uses type N or SMA connectors that will not mate with the size 12 coaxial contacts used by the MIL-STD-1760 ASI. Therefore an adapter cable will be required to connect the network analyzer cable to the size 12 coaxial contacts. The calibration standards will connect directly to the network analyzer. The adapter cable will not be included in the network analyzer calibration. However, the adapter cable should be normalized with the network analyzer after the analyzer has been calibrated.
2. The open end of the signal path must be terminated with the characteristic impedance during the return loss measurement. HB1 and HB2 must be terminated with 50 ohms and HB3 and HB4 must be terminated with 75 ohm.
3. The test set up is shown in Figure HBW109.
4. If multiple paths through the aircraft routing network are possible, then each path shall be validated.

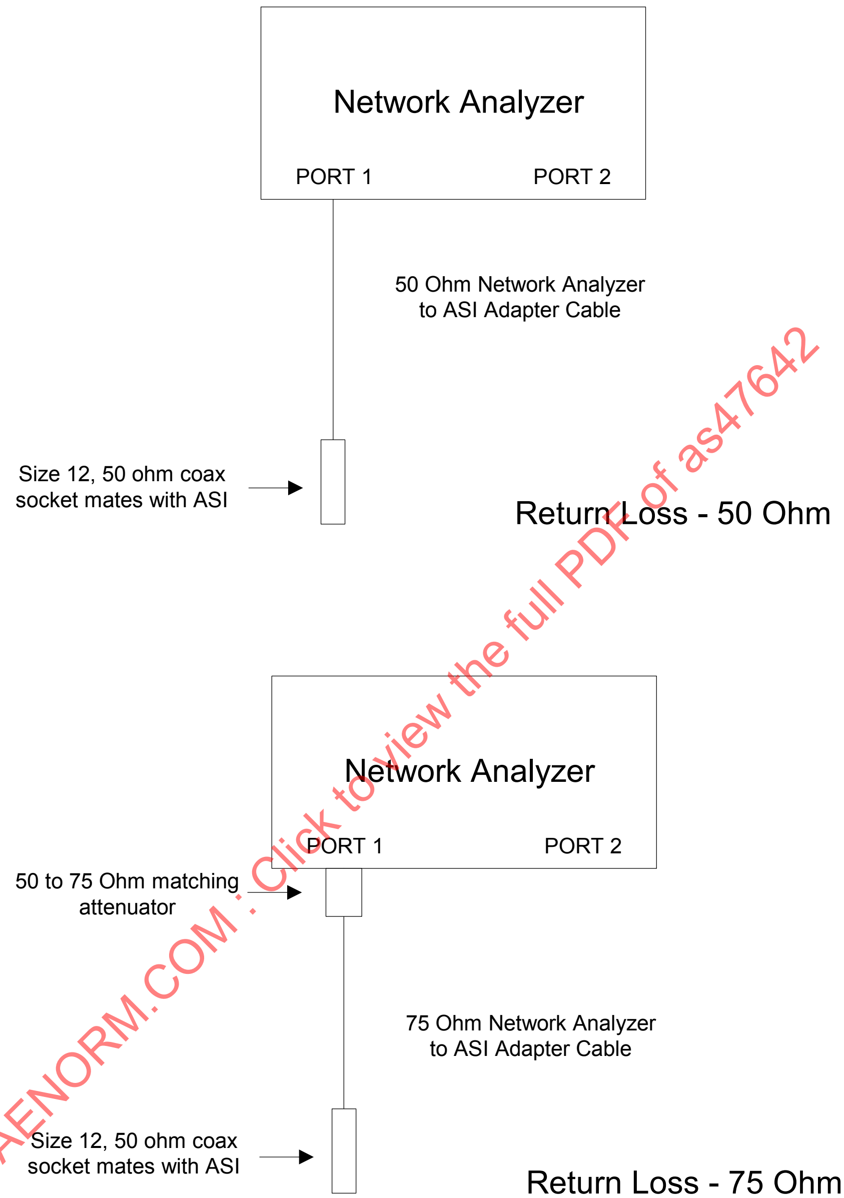


FIGURE HBW109

METHOD: HBW110

PARAMETER: Type A Transient Response

MIL-STD-1760C Paragraph: 5.1.1.2.2, Figure 5b, Figure 6b

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the transient response requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed when the transfer path output signal falls within the allowed response envelope described by figures 5b (Allowed response envelope cosine-squared T), 6b (Allowed response envelope for cosine-squared 2T) and 8b (Allowed response envelope for 2T bar) of MIL-STD-1760. Each figure contains several pass/fail validation test criteria.

APPARATUS:

a. Arbitrary Waveform Generator.
b. Oscilloscope capable of displaying 50 ns rise time pulse.
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
d. 50 and 75 ohm BNC 'T' with 50 and 75 ohm loads
e. Impedance matching attenuator

VALIDATION METHOD:

Connect the output of the waveform generator to the input of the ASI port to be measured. Connect the oscilloscope to the output of the ASI port to be measured. Compare the oscilloscope's output waveform, described in the Validation Criteria, to the input response envelope described in MIL-STD-1760 figure 5a (Cosine-squared T), 6a (Cosine-squared 2T) and 8a (2T Bar).

NOTES:

1. The test set up is shown in Figure HBW110.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. All signal paths must be terminated with their correct characteristic impedance

METHOD: HBW111

PARAMETER: Insertion Gain

MIL-STD-1760C Paragraph: 5.1.1.2.3

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the insertion gain requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the signal insertion gain between the input and output is not more than 0.5 dB and not less than -4.0 dB.

APPARATUS:

a. Arbitrary Waveform Generator.
b. Oscilloscope capable of displaying 50 ns rise time pulse.
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
d. 50 and 75 ohm BNC ‘T’ with 50 and 75 ohm loads
e. Impedance matching attenuator

VALIDATION METHOD:

Configure the waveform generator to produce waveform described by MIL-STD-1760 figure 8a (2T Bar). Connect the output of the waveform generator to the input ASI port to be tested. Connect the oscilloscope to the output ASI port to be measured. Calculate the insertion gain from the output waveform displayed on the oscilloscope using the following formula: Insertion gain = 20 log ($V_{1.3}$/V) where V and $V_{1.3}$ are defined in figures 8a (2T Bar) and 8b (Allowed response for 2T Bar) respectively.

NOTES:

1. The test set up is shown in Figure HBW110.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. All signal paths must be terminated with their correct characteristic impedance

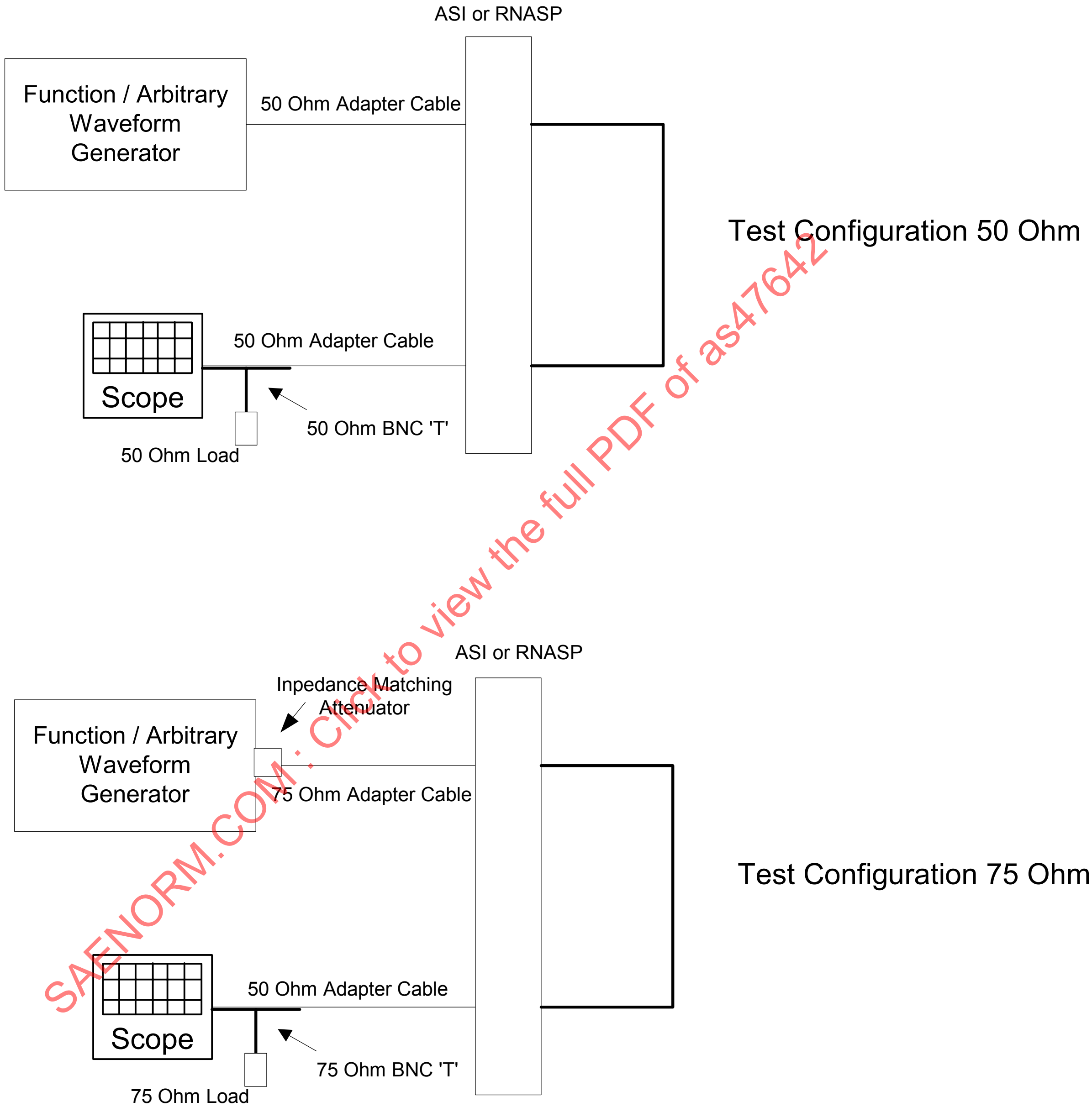


FIGURE HBW110

METHOD: HBW112

PARAMETER: Representative Pulse Delay

MIL-STD-1760C Paragraph: 5.1.1.2.4

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the representative pulse delay requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the pulse delay of any signal path does not exceed 2.0 microseconds and does not vary by more than ± 35 nanoseconds from its nominal value. The nominal value of the signal path representative pulse delay for the current routing path configuration shall be retained and made available for computing signal latency. The pulse delay is measured at the V/2 rising edge.

APPARATUS:

a. Arbitrary Waveform Generator.
b. Oscilloscope capable of displaying 50 ns rise time pulse.
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
d. 50 and 75 ohm BNC ‘T’ with 50 and 75 ohm loads
e. Impedance matching attenuator

VALIDATION METHOD:

Configure the waveform generator to produce waveform described by MIL-STD-1760 figure 8a (2T Bar). Connect the output of the waveform generator to the input ASI port to be tested. Connect the oscilloscope to the output ASI port to be measured. Measure the pulse delay displayed on the oscilloscope. The representative pulse delay is the time difference between the voltage V/2 being measured on the input signal rising edge and the voltage $V_{1.3}/2$ measured on the output signal rising edge. V1.3 is defined in figure 8b (Allowed response envelope for 2T Bar) of MIL-STD-1760. Evaluate the aircraft's TDP to determine if the aircraft HB distribution network retains the Representative Pulse Delay and makes it available for computing signal latency.

NOTES:

1. The test set up is shown in Figure HBW112.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. All signal paths must be terminated with their correct characteristic impedance

METHOD: HBW113

PARAMETER: Equalization

MIL-STD-1760C Paragraph: 5.1.1.2.5

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the gain equalization loss requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the gain of any signal path is within the limits shown in figure 9 (Gain misequalization envelope) of MIL-STD-1760. The zero dB reference gain shall be the gain at 20KHz. The maximum gain between 20 MHz and 200 MHz shall not exceed the envelope limits of 1760 Figure 9 (Gain misequalization envelope).

APPARATUS:

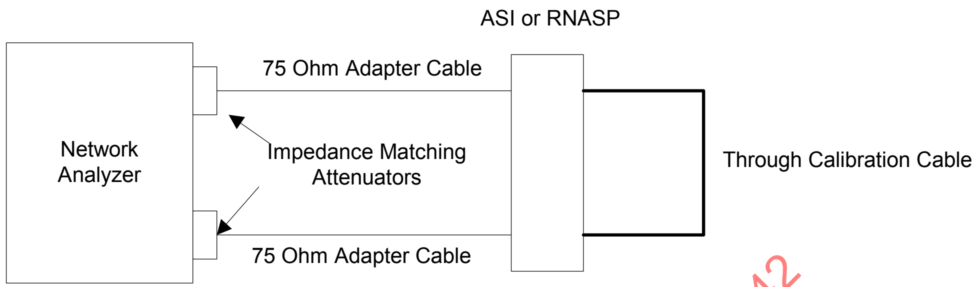
a. Network Analyzer (20 Hz to 200 MHz) capable of 50 and 75 ohm measurements
b. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.

VALIDATION METHOD:

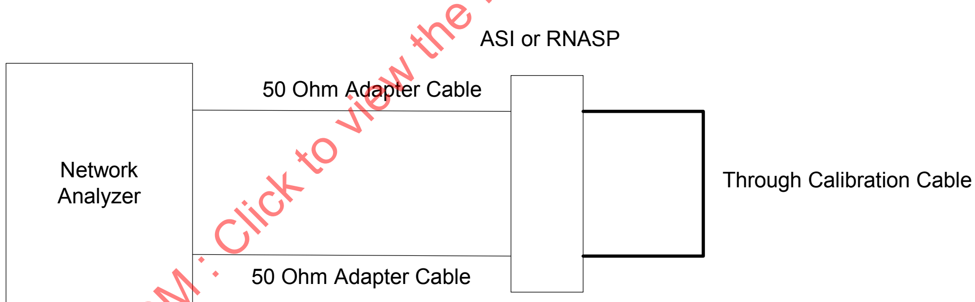
Calibrate the network analyzer for insertion "loss / gain measurements" measurement. Connect the output of the network analyzer to the ASI input connector and the input of the network analyzer to the ASI output. Verify the gain is within the limits of MIL-STD-1760 figure 9 (gain misequalization envelope) and the gain between 20MHz and 200MHz is less than +3dB with respect to the zero 0dB gain reference.

NOTES:

1. The adapter cables that connect the network analyzer to the ASI must be included in the calibration procedure so that they are not part of the measurement.
2. The through calibration cable, used to calibrate the network analyzer for 0 dB attenuation, should be as short as possible to minimize the error introduced in the calibration.
3. The test set up is shown in Figure HBW113.
4. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
5. HB1 and HB2 are 50 ohm signal paths
6. HB3 and HB4 are 75 ohm signal paths
7. All signal paths must be terminated with their correct characteristic impedance



Equalization Loss
Calibration - 75 Ohm



Equalization Loss
Calibration - 50 Ohm

FIGURE HBW113

METHOD: HBW114

PARAMETER: Dynamic Range

MIL-STD-1760C Paragraph: 5.1.1.2.6

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the dynamic range requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the dynamic range of any signal path is not compressed or clipped by more than 6 percent.

APPARATUS:

a. Function generator capable of producing a 3.5 V peak to peak, 1 kHz sine wave and capable of supplying a DC offset.
b. Oscilloscope
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
d. 50 and 75 ohm BNC ‘T’ with 50 and 75 ohm loads

VALIDATION METHOD:

Input a 1kHz sine wave, 3.5V peak to peak with a +/- 0.5VDC component into the signal path input. Verify on the oscilloscope, the signal at the output is not compressed or clipped by more than 6 percent.

NOTES:

1. The test set up is shown in Figure HBW110.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. All signal paths must be terminated with their correct characteristic impedance
6. The +/- .5VDC component is an offset measured from 0VDC to the mean of the sine wave.

METHOD: HBW115

PARAMETER: Signal Path DC Offset

MIL-STD-1760C Paragraph: 5.1.1.2.7

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the DC offset requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the maximum dc voltage at each output of each signal path does not exceed ±250 millivolts with the input terminated in its characteristic impedance.

APPARATUS:

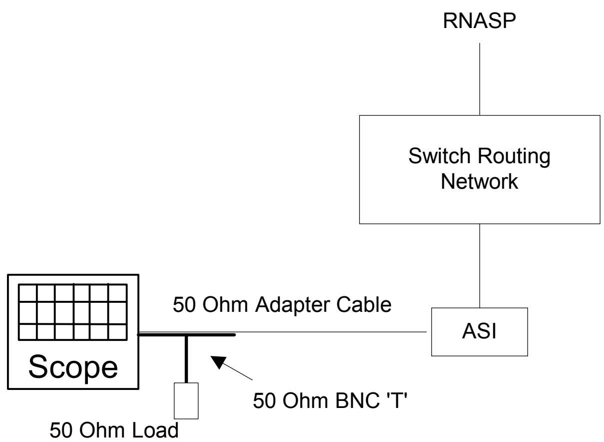
a. Oscilloscope
b. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
c. 50 and 75 ohm BNC ‘T’ with 50 and 75 ohm loads

VALIDATION METHOD:

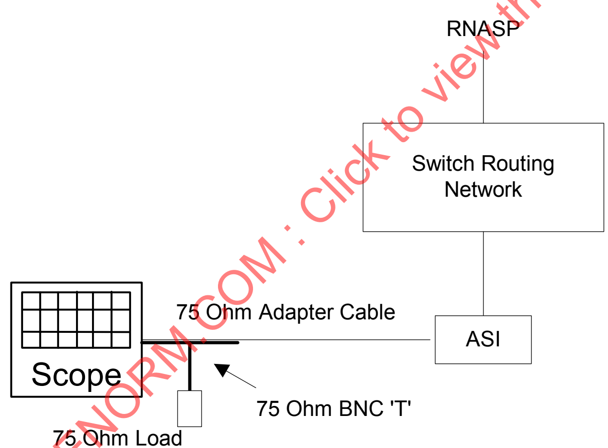
Connect the oscilloscope to the signal path output with proper impedance matching. Apply power to all aircraft systems that connect to the RNASP. With the input properly terminated, verify the signal at the output does not exceed +/- 250mV.

NOTES:

1. The test set up is shown in Figure HBW112.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. All signal paths must be terminated with their correct characteristic impedance



Test Configuration - 50 Ohm



Test Configuration - 75 Ohm

FIGURE HBW112

METHOD: HBW116

PARAMETER: Random Noise

MIL-STD-1760C Paragraph: 5.1.1.2.8, 5.1.1.2.8.1

PURPOSE: This method verifies that all aircraft type A transfer paths meet the random noise requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the random noise power at each signal path output, with the input terminated, does not exceed -45 dBm RMS after the weighting function of MIL-STD-1760 figure 10 (Random noise weighting function) has been applied.

APPARATUS:

a. Power Meter capable of measuring down to at least -55 dBm RMS. Frequency response tailored to take account of the weighting function.
b. Adapters cables (50 and 75 ohm) for connecting the test equipment to the signal path input and output.
c. 50 and 75 ohm loads

VALIDATION METHOD:

Connect the power meter to the output of the signal path with the proper impedance matching components. Replace the signal aircraft source feeding the signal path under test with a load of the proper impedance. Apply power to all aircraft systems that are necessary to support delivery of a weapon. Measure the random noise on the power meter.

NOTES:

1. The test set up is shown in Figure HBW116.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. All signal paths must be terminated with their correct characteristic impedance
6. Random noise is defined as randomly occurring noise, which is distributed over a large bandwidth. Random noise, which is keyed on and off from time to time, is included.

7. The spectral components of random noise are random in phase. Therefore doubling the measurement bandwidth doubles the measured power. For this reason, random noise is usually specified as some noise power per unit bandwidth (dB/Hz). The random noise pass criteria specified by MIL-STD-1760 specified a noise power (-45dBmRMS) without a measurement bandwidth. Therefore a power meter was selected for this test, which measures noise power independent of bandwidth. Some power meters do not allow the frequency response table to be edited. This approach using a power meter is simple providing the weighting function can be implemented.

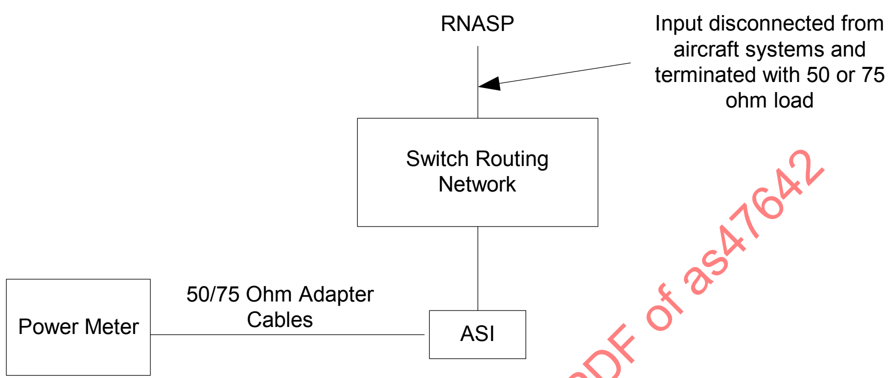


FIGURE HBW116

METHOD: HBW117

PARAMETER: Periodic Noise

MIL-STD-1760C Paragraph: 5.1.1.2.8, 5.1.1.2.8.2

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the periodic noise requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the calculated periodic noise voltage at each signal path output, with the input terminated, does not exceed 0.8 mV RMS for each valid state of the HB routing network, after the weighting function of MIL-STD-1760 figure 11 (Periodic noise weighting function) has been applied. The noise voltage shall be determined by stimulating each HB and LB interface of the AEIS, not associated with the signal path under test, by an in-band maximum amplitude sinusoidal signal which produces the maximum weighted crosstalk voltage at the path output when all HB and LB interfaces are terminated. The calculated periodic noise voltage shall be the root sum of squares of the measured individual crosstalk voltages plus the nonstimulated weighted periodic noise voltage.

APPARATUS:

a. Spectrum Analyzer.
b. Function Generator, 20 Hz to 20 MHz, with sweep capability.
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the signal path input and output.
d. 50 and 75 ohm loads

VALIDATION METHOD:

a. All aircraft systems must be turned off except for those systems necessary for operation of the RNASP.
b. Connect Spectrum Analyzer to the output of the transfer path under test.
c. Replace the signal source feeding the signal path under test with a load of the proper impedance.
d. Apply a 3V peak to peak, 20 Hz to 20 MHz sine wave to each of the type A, HB interfaces not associated with the signal path under test.
e. Apply a 12V peak to peak, 300Hz to 3.4 kHz sine wave to the LB interfaces.
f. Measure the frequency spectrum of the output signal and calculate the maximum weighted crosstalk voltage for each of the stimulated signal paths.
g. Compute the RMS value from all the individual crosstalk voltages.

NOTES:

1. The test set up is shown in Figure HBW117.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. HB1 and HB2 are 50 ohm signal paths
4. HB3 and HB4 are 75 ohm signal paths
5. Low Bandwidth (LB) is 600 ohm signal path
6. All signal paths must be terminated with their correct characteristic impedance
7. Periodic noise includes the effects of cross talk from aircraft and store signal sources.

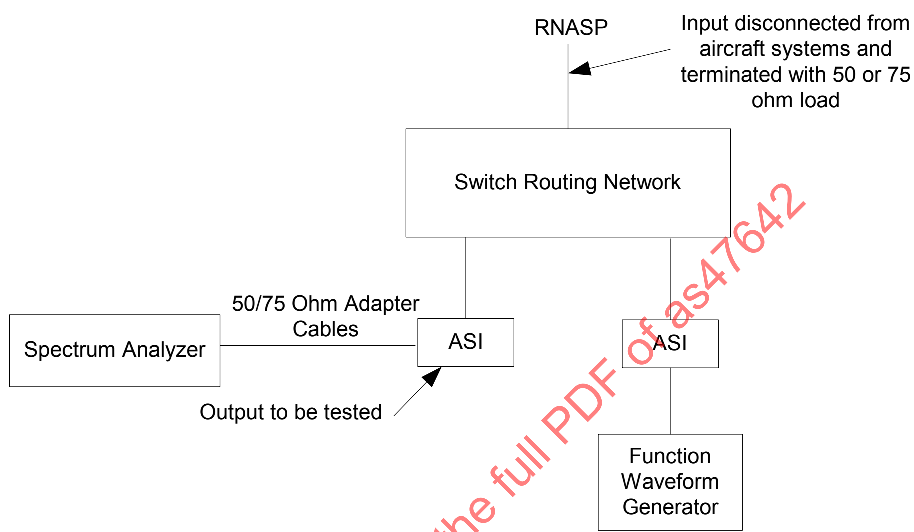


FIGURE HBW117

METHOD: HBW118

PARAMETER: Impulse Noise

MIL-STD-1760C Paragraph: 5.1.1.2.8, 5.3.1.2.8.3

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the impulse noise requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the impulse noise voltage at the signal path output with the input terminated does not exceed 40 mVpp

APPARATUS:

a. Oscilloscope with high persistence display or other features that enable capture and display of fast rise time randomly occurring noise spikes.
b. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
c. 50 and 75 ohm loads

VALIDATION METHOD:

Connect the Oscilloscope to the output of the signal path with the proper impedance matching components. Attach a load of the proper impedance to the input of the signal path under test. Apply power to all aircraft systems that connect to the RNASP. Cycle all switches in the RNASP and others associated with the weapons delivery system. Measure the peak impulse noise on displayed on the Oscilloscope.

NOTES:

1. Impulse noise consists of spikes, which may occur randomly or at fixed intervals.
2. The test set up is shown in Figure HBW118.
3. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
4. HB1 and HB2 are 50 ohm signal paths
5. HB3 and HB4 are 75 ohm signal paths
6. All signal paths must be terminated with their correct characteristic impedance
7. Care must be taken that the oscilloscope is actually measuring while switches are being cycled and not processing between acquisitions or in retrace when an impulse could be missed.

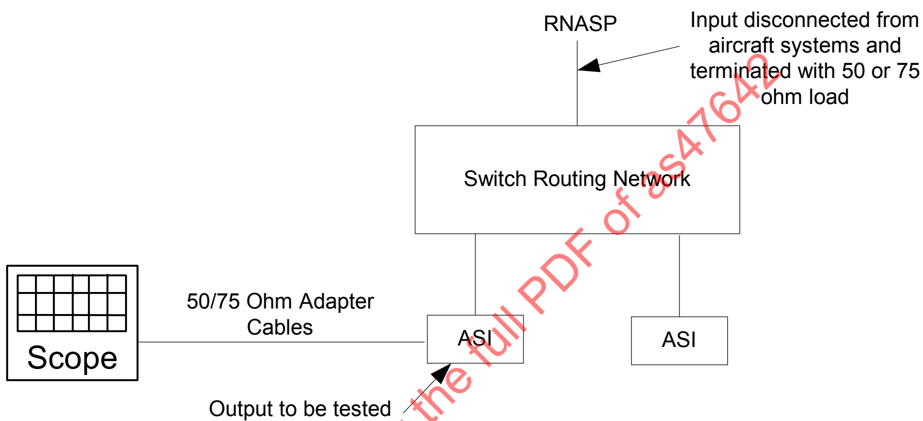


FIGURE HBW118

METHOD: HBW119

PARAMETER: Stimulated Noise

MIL-STD-1760C Paragraph: 5.1.1.2.8, 5.1.1.2.8.4

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the stimulated noise requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if no more than -26 dBm (HB1 and HB2) or -28 dBm (HB3 and HB4) of noise is added to the signal path noise at the output when a 1.3 Vpp sinusoidal excitation signal of any frequency between 1 MHz and 15 MHz is applied to the signal path input.

APPARATUS:

a. Spectrum Analyzer
b. Function Generator, 1 MHz to 15 MHz, with sweep capability.
c. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.

VALIDATION METHOD:

a. All aircraft power will be off except for those systems necessary to support delivery of a weapon.
b. Connect spectrum analyzer to the output of the transfer path under test.
c. Connect the function generator to the input of the transfer path under test.
d. Apply a 1.3V peak to peak, 1MHz to 15 MHz sine wave to the input of the transfer path under test.
e. Record the maximum power added to the signal path due to the excitation signal, excluding the excitation signal.

NOTES:

1. Stimulated noise is additional noise that is induced by the presence of an input signal.
2. The test set up is shown in Figure HBW119.
3. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
4. HB1 and HB2 are 50 ohm signal paths
5. HB3 and HB4 are 75 ohm signal paths
6. All signal paths must be terminated with their correct characteristic impedance
7. 1.3Vpp added to a 50 ohm HB transfer path will add 12.3 dBm at the test frequency. Therefore the spectrum analyzer must have enough attenuation switched in to prevent damage from the 1.3 V input signal.
8. When recording the power added care must be taken to ensure there is not a contribution from the stimulus signal.

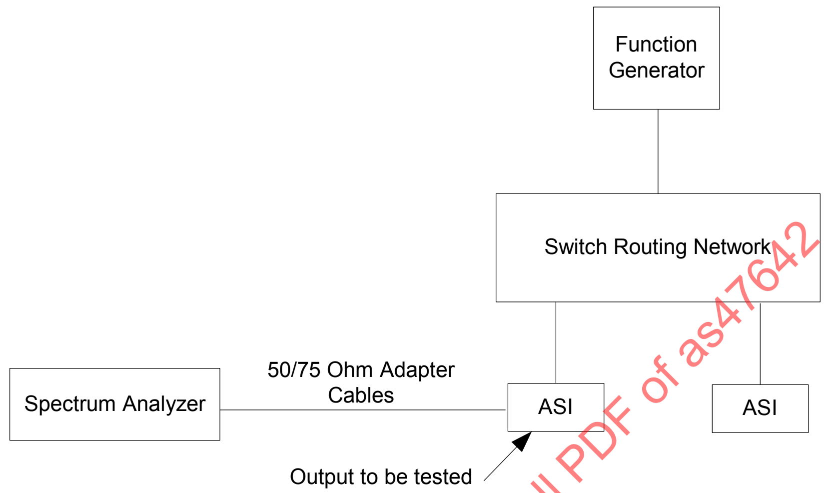


FIGURE HBW119

METHOD: HBW120

PARAMETER: Common Mode Noise

MIL-STD-1760C Paragraph: 5.1.1.2.8, 5.1.1.2.8.5

PURPOSE: This method verifies that all aircraft type A ASI transfer paths meet the common mode noise requirements.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the common mode noise voltage at each signal path output, with respect to output structure ground, does not exceed 200 mV after the weighting function of MIL-STD-1760 figure 12 (Common mode noise weighting function) has been applied. The input is terminated and the input signal return is connected to the input structure ground during this test.

APPARATUS:

a. Spectrum Analyzer
b. Adapters cables (50 and 75 ohm) for connecting the test equipment to the ASI.
c. 50 and 75 ohm loads

VALIDATION METHOD:

Connect the Spectrum Analyzer between the signal return conductor of the output of the transmission path under test and the structure ground. Replace the signal source feeding the signal path under test with a load of the proper impedance connecting the input return conductor to structure ground. Apply power to all aircraft systems that are necessary to support delivery of a weapon. Measure the common mode noise on the spectrum Analyzer and apply the weighting function and calculate the resulting Common Mode Noise voltage over the 20Hz to 20MHz bandwidth.

NOTES:

1. Common mode noise is conducted on the center conductor and outer conductor of the coaxial transmission path in the same direction and returns to the noise source through the structure ground.
2. Stimulated noise is additional noise that is induced by the presence of an input signal.
3. The test set up is shown in Figure HBW120.
4. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
5. HB1 and HB2 are 50 ohm signal paths
6. HB3 and HB4 are 75 ohm signal paths
7. All signal paths must be terminated with their correct characteristic impedance

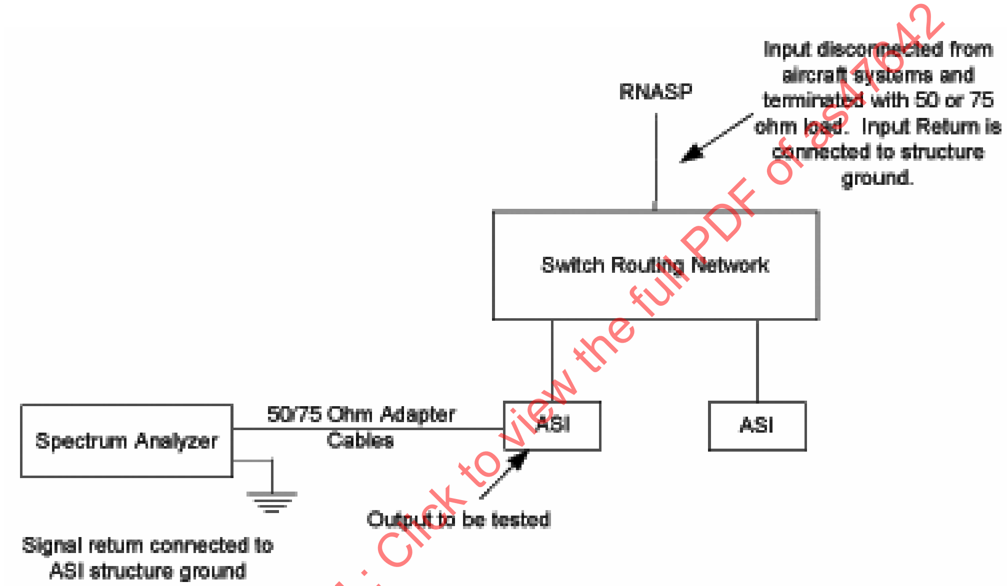


FIGURE HBW120

METHOD: HBW121

PARAMETER: Ground Reference

MIL-STD-1760 PARAGRAPH: 5.1.1.4

PURPOSE: This method verifies that all HB interfaces signal returns, at an ASI, are correctly referenced to ground.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the ASI references the signal return to aircraft structure ground when the ASI is sourcing the signal, when sinking a type A signal the ASI isolates the signal return from aircraft structure ground, and when sinking a type B signal the ASI references the signal return to aircraft structure ground.

APPARATUS: N/A

VALIDATION METHOD: Analysis the aircraft's TDP to verify the ASI references sourced type A and B signal returns to aircraft structure ground, sink type A signals are isolated from aircraft structure ground, and sink Type B signals are referenced to aircraft structure ground.

NOTES: N/A

METHOD: MUX101

PARAMETER: MUX Data Interface

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2

PURPOSE: This method verifies that the connector contacts for MUX A and MUX B is provided at the ASI connector contact h and k

PARAMETER TYPE:	( ) ELECTRICAL	( ) PROTOCOL	(X) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	( ) ANALYSIS	(X) INSPECTION

VALIDATION CRITERIA: Inspect that the MUX A and MUX B contacts are present at the ASI connector with 75 ohms twinaxial style contacts.

APPARATUS: N/A

VALIDATION METHOD: Inspect the ASI connector to verify that the contacts for MUX A and MUX B are provided.

NOTES: N/A

METHOD: MUX102

PARAMETER: MIL-STD-1553 Bus Controller (BC) Compliance (Functional Characteristics)

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.1a

PURPOSE: This method verifies that the aircraft complies with the Bus Controller (BC) requirements of MIL-STD-1553

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS complies with all BC requirements of MIL-STD-1553 (see Notes 1 and 2).

APPARATUS: N/A

VALIDATION METHOD: Check the aircraft's TDP to verify that the aircraft performs its BC functions in compliance with MIL-STD-1553

NOTES:

1. Signal characteristics: MUX A and MUX B interfaces operate in a dual standby redundant mode; store-to-store transfer; and broadcast messages.
2. RT-to-RT transfers and broadcast messages.
3. Reference: AS4113, Test Plan for the Digital Time Division Commands/Response Multiplex Data Bus System Controller.

METHOD: MUX103

PARAMETER: Remote Terminal (RT) Address

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.1b

PURPOSE: This method verifies that the aircraft receives in response to valid commands received from the bus controller directed only to the assigned ASI address on the dual redundant standby interface.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The ASI address is considered to have passed if the tester responds to the assigned command word contains a terminal address which matches the RT address.

APPARATUS:

a. A MIL-STD-1760 test equipment or suitable substitute.
b. Aircraft power sufficient to power the stores management system (SMS).
c. Suitable software in the aircraft's SMS to allow communication to a MIL-STD-1760 test equipment.
d. Test cabling connecting the test equipment to the ASI.

VALIDATION METHOD:

a. Set the address at the ASI remote terminal.
b. Send a message with the correct terminal address. Verify that the RT connected to the ASI under test responds to the message.
c. Repeat for all ASIs.
d. Repeat of MUX A and MUX B

NOTES:

1. Address assigned prior to power being applied to the ASI.

METHOD: MUX104

PARAMETER: Nuclear Subaddress Allocation

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.1c, B.4.2.2.4 and B.4.2.2.5

PURPOSE: This method verifies that the AEIS does not utilize MIL-STD-1553 subaddress 19 and 27 (decimal) for communications to non nuclear subsystems.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if subaddress 19 and 27 (decimal) are not assigned for MIL-STD-1553 subaddress communications except for nuclear stores. Applies only to messages detectable at any ASI.

APPARATUS: N/A

VALIDATION METHOD: Review the AEIS system data specifications.

NOTES: N/A

METHOD: MUX105

PARAMETER: Output Characteristics

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.2.1

PURPOSE: This method verifies the output amplitude of MUX A and MUX B at the ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the MUX A and MUX B signals from the ASI comply with the output characteristics of MIL-STD-1553 transformer coupled stubs. See MIL-STD-1760, Figure 14, ASI Output Waveform Envelope.

APPARATUS

a. Aircraft power sufficient to power the stores management system.
b. A MIL-STD-1760 ASI test set.
c. Voltage measuring/recording instrument such as a storage oscilloscope.
d. Test cabling connecting the test equipment to the ASI.

VALIDATION METHOD: The suggested method is to conduct the test at the ASI MUX A and MUX B (high and low) outputs.

NOTES:

1. Signal characteristics: 1.4V p-p to 14.0V p-p sine wave or square wave. See Figure 14 “ASI Output Waveform Envelope” of Mil-Std-1760.

METHOD: MUX106

PARAMETER: Output Characteristics

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.2.1

PURPOSE: This method verifies the maximum zero cross deviation of MUX A and MUX B at the ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the MUX A and MUX B waveform signals from the ASI has zero crossing deviations which are equal to or less than 90ns from the ideal crossing point, measured with respect to the previous zero crossing.

APPARATUS

a. Aircraft power sufficient to power the stores management system.
b. Time measuring/recording instrument such as a storage oscilloscope.
d. Test cabling connecting the test equipment to the ASI.

VALIDATION METHOD:

Send a valid MIL-STD-1553 message from the aircraft and measure the zero cross deviation for at least 4 waveform pulses (.5 +/-.090us, 1.0 +/-.090us, 1.5 +/-090us and 2.0 +/-090us) Verify compliance on both Mux A and Mux B busses.

NOTES:

METHOD: MUX107

PARAMETER: Input Characteristics

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.2.2

PURPOSE: This method verifies the input signals of MUX A and MUX B at the ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft shall receive, and operate with input signal waveforms is considered to have passed if the MUX A and MUX B signals from the ASI comply with the output characteristics of a MIL-STD-1553 transformer coupled stub terminal.

APPARATUS:N/A

VALIDATION METHOD: The suggested method is to conduct the voltage test at the data bus transformer coupled stub terminal.

NOTES:

1. Signal characteristics: signal p-p amplitude, line-to-line is within the range of 1.4 to 14.0v.

METHOD: MUX108

PARAMETER: Shield Grounding

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.2.2.3

PURPOSE: This method verifies continuity between MUX A and MUX B stub shields and aircraft Structure Ground at the ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The ASI is considered to have passed if the DC resistance between the stub shields and aircraft structure ground is less than 1 ohm (See Note 1).

APPARATUS:

a. A continuity-measuring device such as an ohmmeter.
b. Test cabling connecting the test equipment to the ASI.

VALIDATION METHOD: The suggested method is to measure the resistance between the ASI MUX A shield connection and the aircraft structure ground contact using an ohmmeter. Repeat this test with connections to the ASI MUX B shield connection. Repeat this test for all ASIs.

NOTES:

1. MIL-STD-1760 does not specify a resistance value for "continuity". This validation method suggests using a DC resistance of 1 ohm or less as a definition of "continuity".
2. The aircraft Structure Ground contact is contact "T" in the ASI primary connector.

METHOD: MUX109

PARAMETER: Logical Interface (Communication Rules)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1

PURPOSE: Establish requirement to verify Communication Rules used by the Bus Controller (BC).

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC complies with the Test and Operating Requirements, Data Bus Operation, Characteristics, and Bus Controller requirements of MIL-STD-1553 as modified by MIL-STD-1760.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's AEIS BC system to determine that it complies with the Test and Operating Requirements, Data Bus Operation, Characteristics and Terminal requirements of MIL-STD-1553 as modified by MIL-STD-1760. Verify that the Aircraft act as the BC for the AEIS.

NOTES: N/A

METHOD: MUX110

PARAMETER: Logical Interface (Transmit Vector Word)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.1.3.1.5

PURPOSE: This method verifies the AEIS Bus Controller's (BC's) capability to issue Transfer Vector Word Mode command.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC can functionally issue Transmit Vector Word mode codes command.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the Transmit Vector Word command is properly implemented and the subsequent Vector word can be correctly evaluated for its conformance to Table B-II and B-III.

NOTES: N/A

METHOD: MUX111

PARAMETER: Logical Interface (Synchronize with Data Word)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.1.3.1.6

PURPOSE: This method verifies the AEIS BC's capability to issue Synchronize With Data Word Mode command.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC can functionally respond to valid Synchronize With Data Word Mode command.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the Synchronize With Data Word Mode command is properly implemented and compliant with Table B-IV through Table B-VI.

NOTES: N/A

METHOD: MUX112

PARAMETER: Logical Interface (Prohibited Mode Commands)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.1.3.2

PURPOSE: This method verifies that the AEIS BC does not transmit the Dynamic Bus Control Mode Code, Reserved Mode Codes, or any Mode Code not defined in MIL-STD-1553.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC does not transmit the Dynamic Bus Control Mode Code, Reserved Mode Codes, or any Mode Code not defined in MIL-STD-1553.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the Dynamic Bus Control Mode Code, Reserved Mode Codes, or any Mode Code not defined in MIL-STD-1553 is being used by the AEIS BC.

NOTES: N/A

METHOD: MUX113

PARAMETER: Logical Interface (Subsystem Flag Bit)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.2.3

PURPOSE: This method verifies the AEIS Bus Controller's (BC's) capability to interpret the Subsystem Flag Bit as a total loss of store functionality.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC can functionally interpret the store Subsystem Flag Bit as a total loss of store functionality.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine that the Subsystem Flag Bit is interpreted as a total loss of store functionality.

NOTES: N/A

METHOD: MUX114

PARAMETER: Logical Interface (Checksum Requirement and Algorithm)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.5.2 and B.4.1.5.2.1

PURPOSE: This method verifies the AEIS Bus Controller (BC) uses and properly calculates the Mission Store Control message Checksum.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC issues the Mission Store Control message Checksum.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the Mission Store Control message Checksum algorithm is properly implemented.

NOTES: N/A

METHOD: MUX115

PARAMETER: Logical Interface (Execution Time)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.5.3.

PURPOSE: This method verifies the AEIS Bus Controller (BC) is compatible with the execution time and busy bit application for stores operation as define in paragraph B.4.1.5.3.3.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the AEIS BC is compatible with the execution time and busy bit application for stores operation as defined in paragraph B.4.1.5.3.3.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the BC is compatible with the execution time and busy bit application for stores operation as defined in paragraph B.4.1.5.3.3.

NOTES: N/A

METHOD: MUX116

PARAMETER: Logical Interface (Request Servicing)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.1.5.5

PURPOSE: This method verifies the AEIS Bus Controller (BC) capability to interpret the store Status Word with the Service Request Bit set to Logic 1 as a request for a transmit Vector Word Mode Command.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the AEIS BC generates the Transmit Vector Word mode command to the requesting store.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the BC interprets the store Status Word with the Service Request Bit set to Logic 1 as a request for a transmit Vector Word Mode Command and generates the Transmit Vector Word command to the requesting store.

NOTES: N/A

METHOD: MUX117

PARAMETER: Logical Interface (Base Message Data Format)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.2.1, B.4.2.1.1, and B.4.2.1.2

PURPOSE: This method verifies the AEIS Bus Controller's (BC's) Message Data Format not defined by B.4.2.2 or B.4.2.3 shall conforms to the Base Message format defined in Tables B-VII, B-VIII, and B-IX.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC Base Message Data Format conforms to the format defined in Tables B-VII, B-VIII, and B-IX.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the Base Message Data Format conforms to the format defined by Tables B-VII, B-VIII, and B-IX.

NOTES: N/A

METHOD: MUX118

PARAMETER: Logical Interface (Store Control)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.2.2.1

PURPOSE: This method verifies the AEIS Bus Controller's (BC's) capability to issue the Mission Store Control message and its compliance to Tables B-XI, B-XXXII and B-XXXIII.

PARAMETER TYPE: ( ) ELECTRICAL (X) PROTOCOL ( ) PHYSICAL
VALIDATION TECHNIQUE: ( ) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC can issue the Mission Store Control message and it is compliant in all respects with Tables B-XI, B-XXXII and B-XXXIII..

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the Mission Store Control message is properly implemented and is compliant in all respects with Tables B-XI, B-XXXII and B-XXXIII.

NOTES: N/A

METHOD: MUX119

PARAMETER: Logical Interface (Store Monitor)

MIL-STD-1760 PARAGRAPH: 4.3, B.4.2.2.2

PURPOSE: This method verifies the AEIS Bus Controller's (BC's) capability of responding to a transmit Mission Store Monitor command with the required status and data word.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The platform is considered to have passed if the BC can issue the transmit Mission Store Monitor command and receiving the resulting monitor message response from the store.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the AEIS BC software to determine if the transmit Mission Store Monitor command is implemented and that the AEIS BC software can properly interpret the message. The data words shall comply with table B-XII.

NOTES: N/A

METHOD: LBW101

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.3 and 5.1.3.7

PURPOSE: This method verifies that the aircraft LB interface provides a non-inverting signal connection, inverting signal connection, and a shield connection and complies with the differential signal interface as defined in Figure 16 (Equivalent circuits for LB interfaces) of the standard.

PARAMETER TYPE:	( ) ELECTRICAL	( ) PROTOCOL	(X) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the ASI supplies the required connections and that the signals are referenced to ground as shown in the equivalent circuits of Figure 16 (Equivalent circuits for LB interfaces) of the standard.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft provides the required connections.

NOTES: N/A

METHOD: LBW102

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.3, 4.3.3.2, 5.1.3 and 5.1.3.1

PURPOSE: This method verifies that the aircraft provides the LB distribution network necessary to support bi-directional signal transfer from any ASI to applicable aircraft equipment.

PARAMETER TYPE:	( ) ELECTRICAL	( ) PROTOCOL	(X) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the LB distribution network provides the necessary connectivity to support the transfer of a simplex LB signal between any ASI and applicable aircraft equipment for applications where the signal source is located in either the aircraft or in the connected store. The aircraft shall be capable of assigning, controlling, and routing / re-routing LB signals to their proper destinations.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft LB distribution network provides the necessary connectivity to support bi-directional signal transfer from any ASI to applicable air vehicle equipment.

NOTES: N/A

METHOD: LBW103

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.3.1

PURPOSE: This method verifies that within the transmission passband of 300 Hz to 3.4 kHz, the maximum instantaneous signal voltage (between the non-inverting connection and the inverting connection) shall be ±12V and that the peak to peak signal voltage shall be 12 V maximum.

PARAMETER TYPE: (X) ELECTRICAL( ) PROTOCOL( ) PHYSICAL
VALIDATION TECHNIQUE: (X) TEST (X) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the LB output voltages measured at the RNASP and ASI are within the specified ranges and that aircraft LB sources are specified to comply with the LB signal requirements of the standard.

APPARATUS:

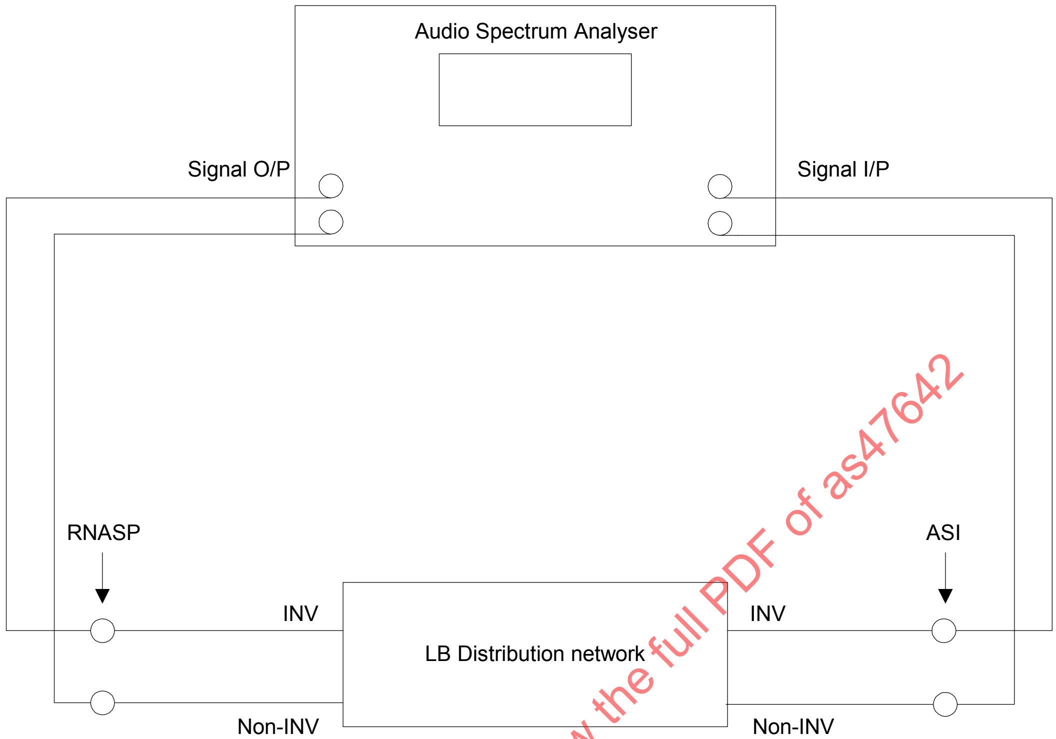
a. Audio Spectrum Analyzer covering frequency range from 300Hz to 3.4kHz with an adjustable output voltage of 0V to 12V (peak-to-peak) and a floating balanced output with zero offset and a 600 ohms input.
b. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD:

a. Set the level of the signal voltage injected into the RNASP at 12V (peak-to-peak). Sweep the audio signal output across a frequency range of greater than 300Hz to 3.4kHz, injected into the LB distribution network and check the Analyzer trace for compliance. Repeat the test when injecting the signal into the ASI and measuring at the RNASP.
b. Evaluate the aircraft's TDP to confirm that the specification of any LB sources or sinks is as defined by the standard.

NOTES:

1. The test set up is shown in figure LBW103.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.
3. The output impedance of the signal generator part of the Audio Spectrum Analyzer shall be less than 60 ohms.



Note: the test must be repeated with the RNASP and ASI is reversed.

FIGURE LBW103

METHOD: LBW104

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.3 and 5.1.3.2

PURPOSE: This method verifies that the input and output impedances of the aircraft routing network when measured at both the RNASP and appropriate ASI, comply with the impedance requirements of the standard.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

a. The input impedance (line-to-line) of each signal path is 600 ohms ±60 ohms, over the frequency band 150 Hz to 8 kHz, when the output is terminated with the nominal sink impedance of 600 ohms.
b. The output impedance (line-to-line) of each signal path is less than 60 ohms, over the frequency band 150 Hz to 8 kHz, when the input is terminated with the nominal source impedance of 0 ohms.

APPARATUS:

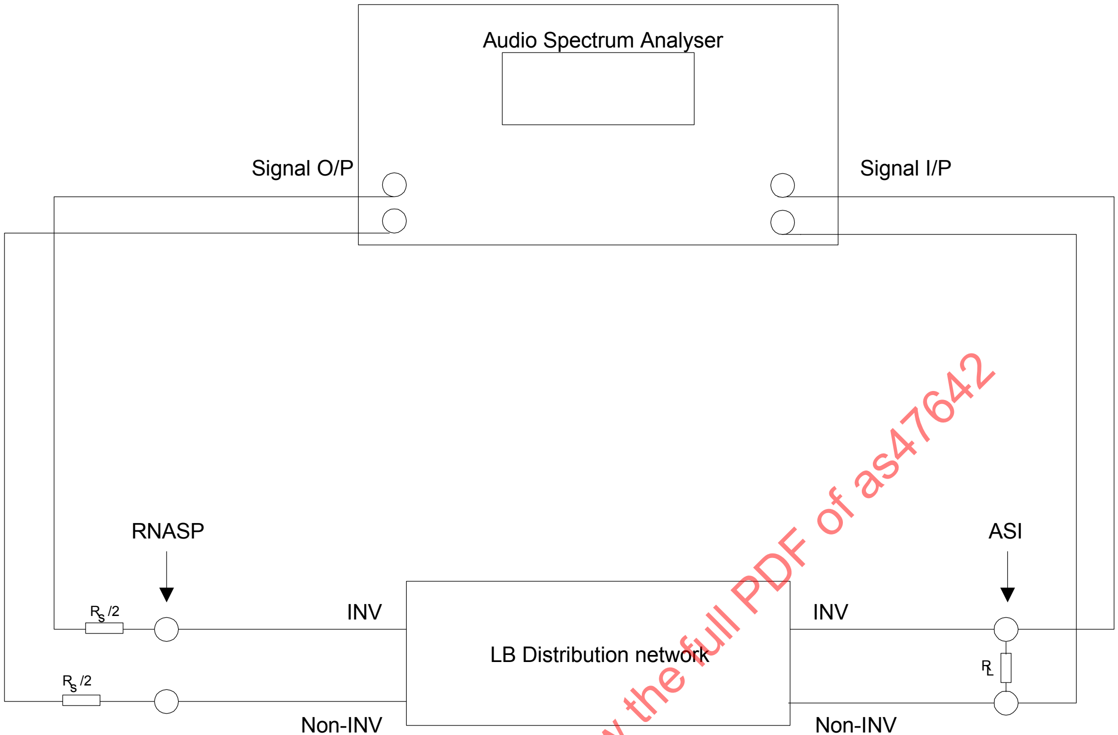
a. Audio Spectrum Analyzer covering frequency range from 150Hz to 8kHz with an adjustable output voltage of 0V to 12V (peak-to-peak) and a floating balanced output with zero offset and a high input impedance.
b. 30ohm, 60 ohm and 600 ohm loads.
c. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD: Set the level of the signal voltage injected into the RNASP at 12V (peak-to-peak). Set the Analyzer to Peak Detect Mode. Sweep the audio signal output across a frequency range of greater than 150Hz to 8kHz, injected into the LB distribution network and check the Analyzer trace for compliance.

a. For the RNASP input impedance (injecting the signal into the RNASP), ensure the Analyzer trace is in the range 5.68V to 6.28V.
b. Repeat step 1 with the alternate values of R_S and R_L to measure the ASI output impedance. Ensure the Analyzer trace is greater than 6V.
c. Repeat steps a) and b) (injecting the signal into the ASI and measuring at the RNASP) in order to measure the ASI input impedance and the RNASP output impedance.
d. Evaluate the aircraft's TDP to confirm that the specification of any LB sources or sinks is as defined by the standard.

NOTES:

1. The test set up is shown in figure LBW104.
2. When measuring the input impedance of the LB distribution network R_S = R_L = 600 ohms.
3. When measuring the output impedance of the LB distribution network R_S is a short circuit and R_L = 60 ohms.
4. If multiple paths through the aircraft routing network are possible, then each path shall be validated.



Note 1: In step e), the RNASP and ASI are reversed.
Note 2: R_S and R_L are set depending on whether input impedance or output impedance is being tested.

FIGURE LBW104

METHOD: LBW105

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.3.7

PURPOSE: This method verifies that the LB signal shield is connected to ground.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The ASI is considered to have passed if the DC resistance between the LB stub shield and the aircraft Structure Ground is less than 1 ohm (see Note 2).

APPARATUS:

a. A continuity-measuring device such as an ohmmeter.
b. Test cabling connecting the test equipment to the ASI.

VALIDATION METHOD: Measure the resistance between the ASI's LB shield connection and Structure Ground using an ohmmeter.

NOTES:

1. The test set up is shown in figure LBW105.
2. MIL-STD-1760 does not specify a resistance value for "continuity". Therefore, use a DC resistance of 1 ohm or less as a definition of "continuity".
3. Structure Ground is contact "T" in the ASI primary connector.

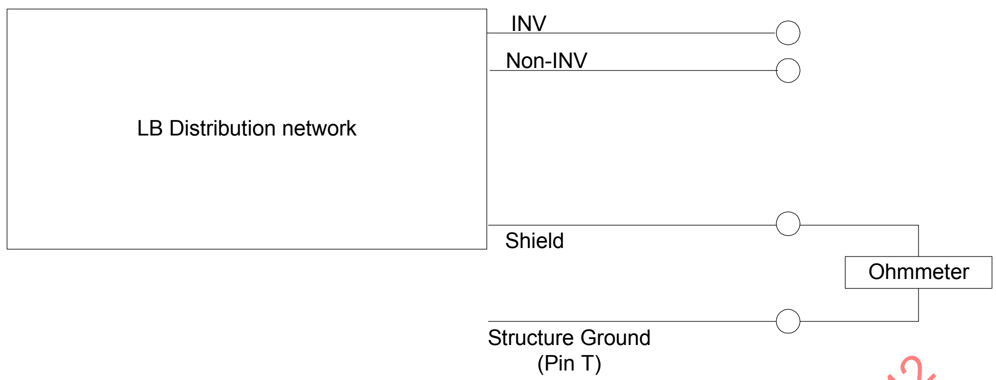


FIGURE LBW105

METHOD: LBW106

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.3.1

PURPOSE: This method verifies that the maximum instantaneous common mode voltage (the voltage between the non-inverting connection and reference ground added to the voltage between the inverting connection and reference ground) is in the range ±1V.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the measured common mode voltage across the frequency band is ±1V.

APPARATUS:

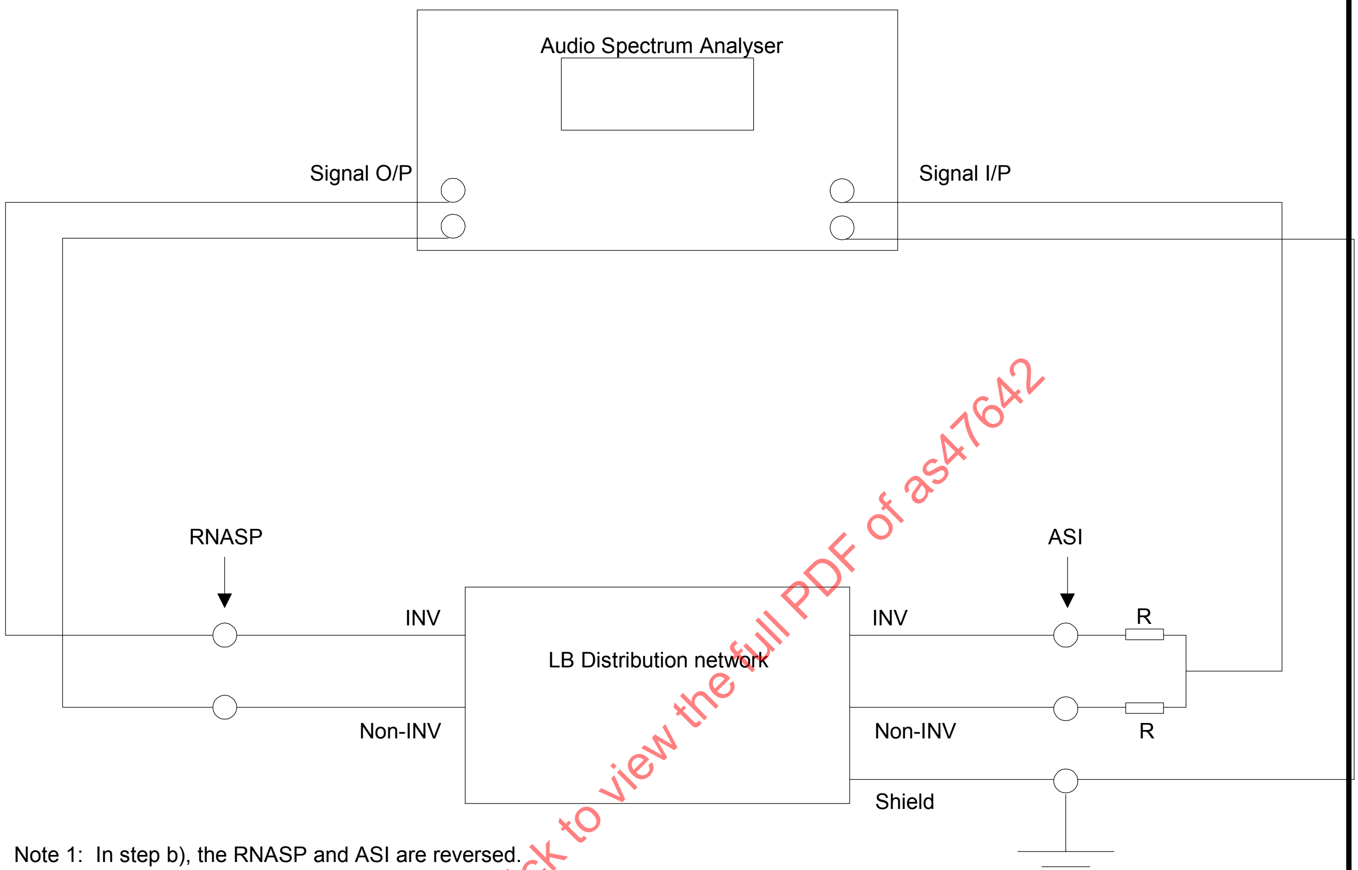
a. Audio Spectrum Analyzer covering frequency range from 300Hz to 3.4kHz with an adjustable output voltage of 0V to 12V (peak-to-peak) and a floating balanced output with zero offset and a high input impedance.
b. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD: Set the level of the signal voltage injected into the RNASP at 12V (peak-to-peak). Set the analyzer to Peak Detect Mode. Sweep the analyzer audio signal output across a frequency range of greater than 300Hz to 3.4kHz, injected into the LB distribution network.

a. Ensure that the peak voltage is always between ±1V.
b. Repeat step 1 when injecting the signal into the ASI and measuring at the RNASP.
c. Evaluate the aircraft's TDP to confirm that the specification of any LB sources is as defined by the standard.

NOTES:

1. The test set up is shown in figure LBW106.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.



Note 1: In step b), the RNASP and ASI are reversed.
Note 2: R = 300ohms.

FIGURE LBW106

METHOD: LBW107

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.3.3 and 5.1.3.4

PURPOSE: This method verifies that:

a. The signal path insertion gain between the input and output shall be 0dB +1dB, -4dB for a 1kHz sine wave input.
b. The gain misequalization of any signal path shall not exceed the limits shown in Figure 15 (Gain misequalization envelope (aircraft, LB)) of the standard.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if both the insertion gain and gain misequalization are within the defined limits.

APPARATUS:

a. Audio Spectrum Analyzer covering frequency range from 150Hz to 8kHz with an adjustable output voltage of 0V to 12V (peak-to-peak) and a floating balanced output with zero offset and a 600 ohms input.
b. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD: Set the level of the signal voltage injected into the RNASP at 12V (peak-to-peak). Sweep the audio signal output across the frequency range 150Hz to 8kHz, injected into the LB distribution network.

a. Check that at a frequency of 1kHz, the Analyzer trace shows the insertion gain to be within the limits defined by the standard.
b. Check that across the frequency band 150Hz to 8kHz that the insertion gain does not vary outside the limits defined in Figure 15 of the standard.
c. Repeat the test when injecting the signal into the ASI and measuring at the RNASP.

NOTES:

1. The test set up is shown in figure LBW107.
2. If multiple paths through the aircraft routing network are possible, then each path shall be validated.

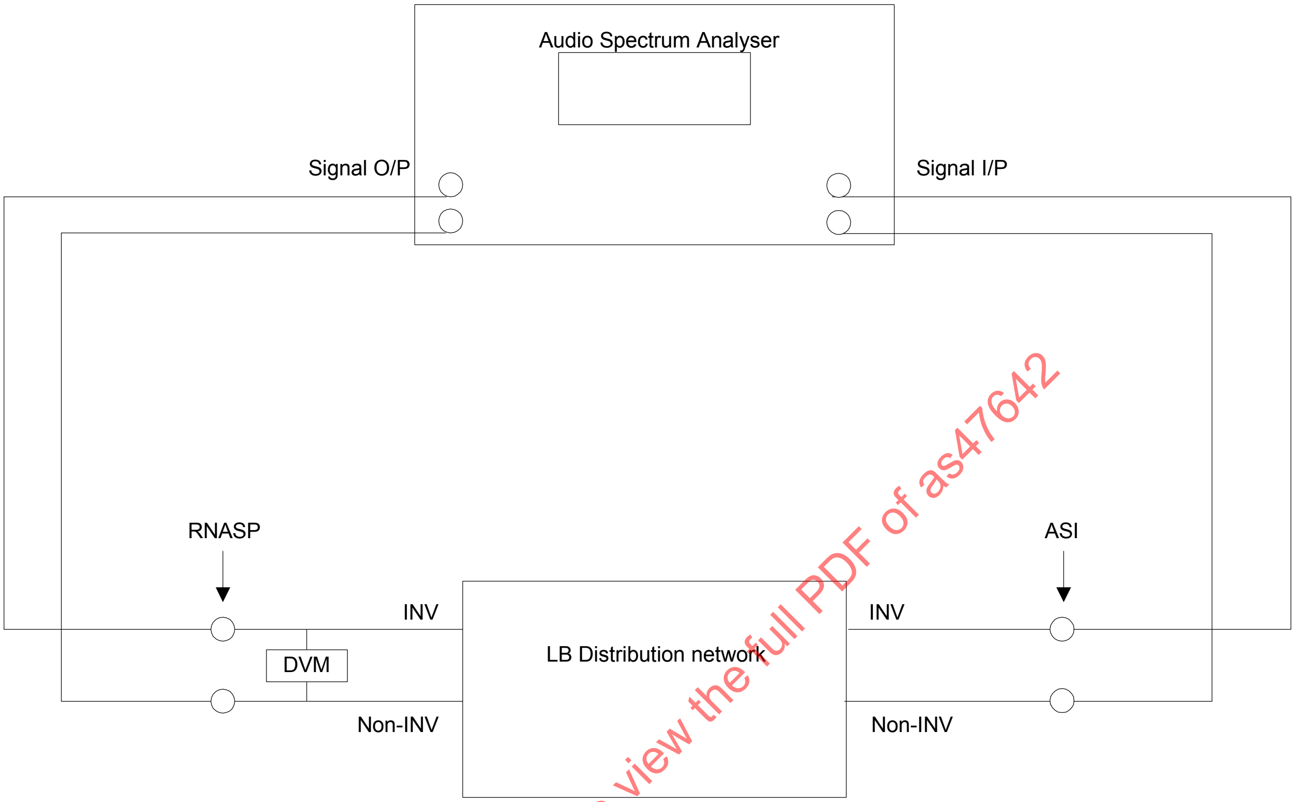


FIGURE LBW107

METHOD: LBW108

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.3.5 and 5.1.3.6.4

PURPOSE: This method verifies that:

a. The maximum dc voltage at the output of each signal path shall not exceed ±1V line-to-line and ±1V line-to-ground with the input terminated.
b. The peak common mode noise voltage at the output of each signal path shall not exceed ±1V when the input is terminated and the input shield is at the same potential as the local structure ground.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the signal path dc offset and the peak common mode noise voltage is within limits.

APPARATUS:

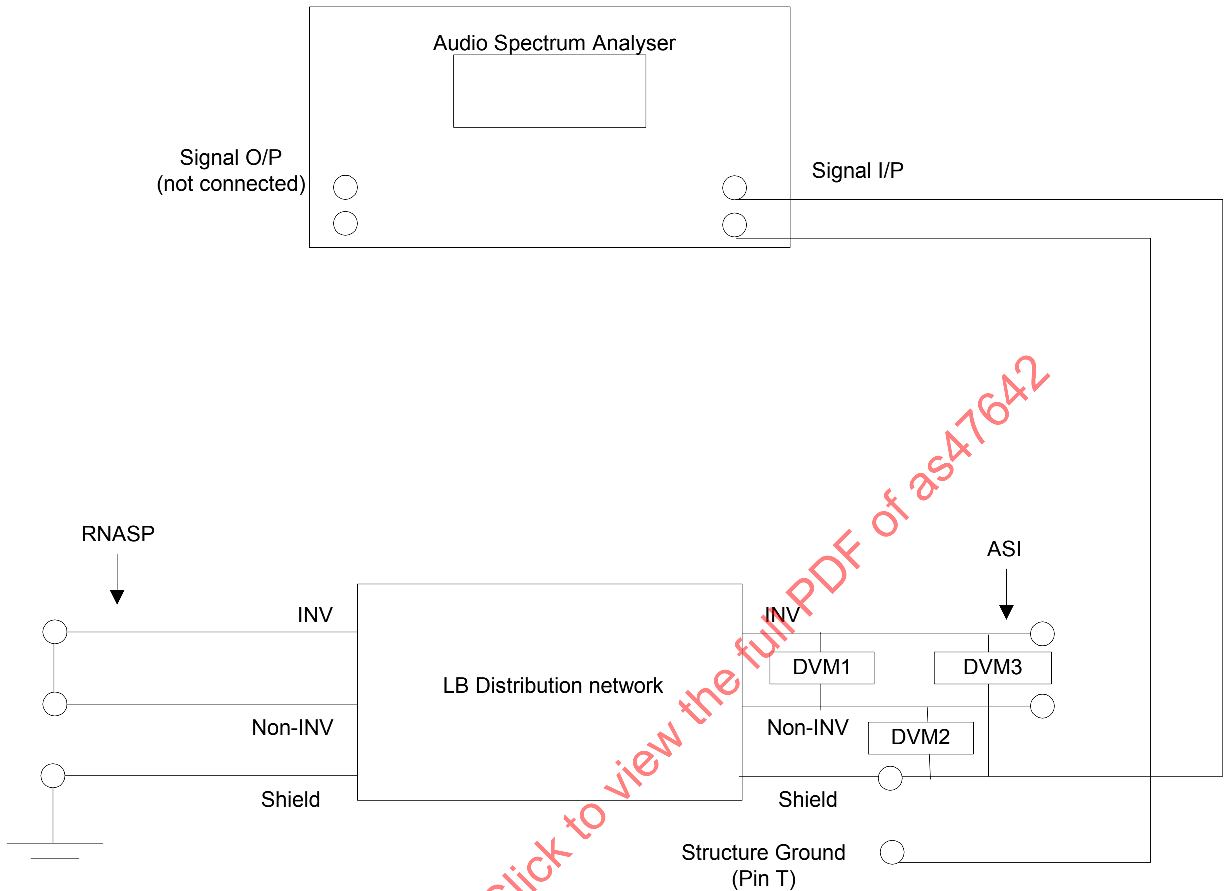
a. Audio Spectrum Analyzer covering frequency range from 150Hz to 50kHz and high input impedance.
b. Digital Voltmeters with a bandwidth of greater than dc to 10kHz.
c. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD:

a. Record the measurements on the DVM's and ensure that the readings are less than ±1V.
b. Sweep the spectrum Analyzer across the frequency range 150Hz to 50kHz. Ensure that any recorded peaks have amplitude of less than 1V.
c. Repeat steps a) and b), measuring at the RNASP with the ASI terminated.

NOTES:

1. The test set up is shown in figure LBW108.
2. The ASI shield must be connected to Structure Ground (pin "T") with a resistance of less than 1 ohm. Similarly, the RNASP shield must be connected to local structure with a resistance of less than 1 ohm.



Note 1: The RNASP shield must be connected to local aircraft structure.
Note 2: In step c), the RNASP and ASI are reversed.
Note 3: The ASI shield must be connected to Structure Ground.

FIGURE LBW108

METHOD: LBW109

PARAMETER: Aircraft LB Interface

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.3.6.1

PURPOSE: This method verifies that the calculated periodic and random noise voltage at each signal path output with the input terminated shall not exceed 12.5mV RMS for each valid state of the LB routing network.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the calculated periodic and random noise voltages are within defined limits.

APPARATUS:

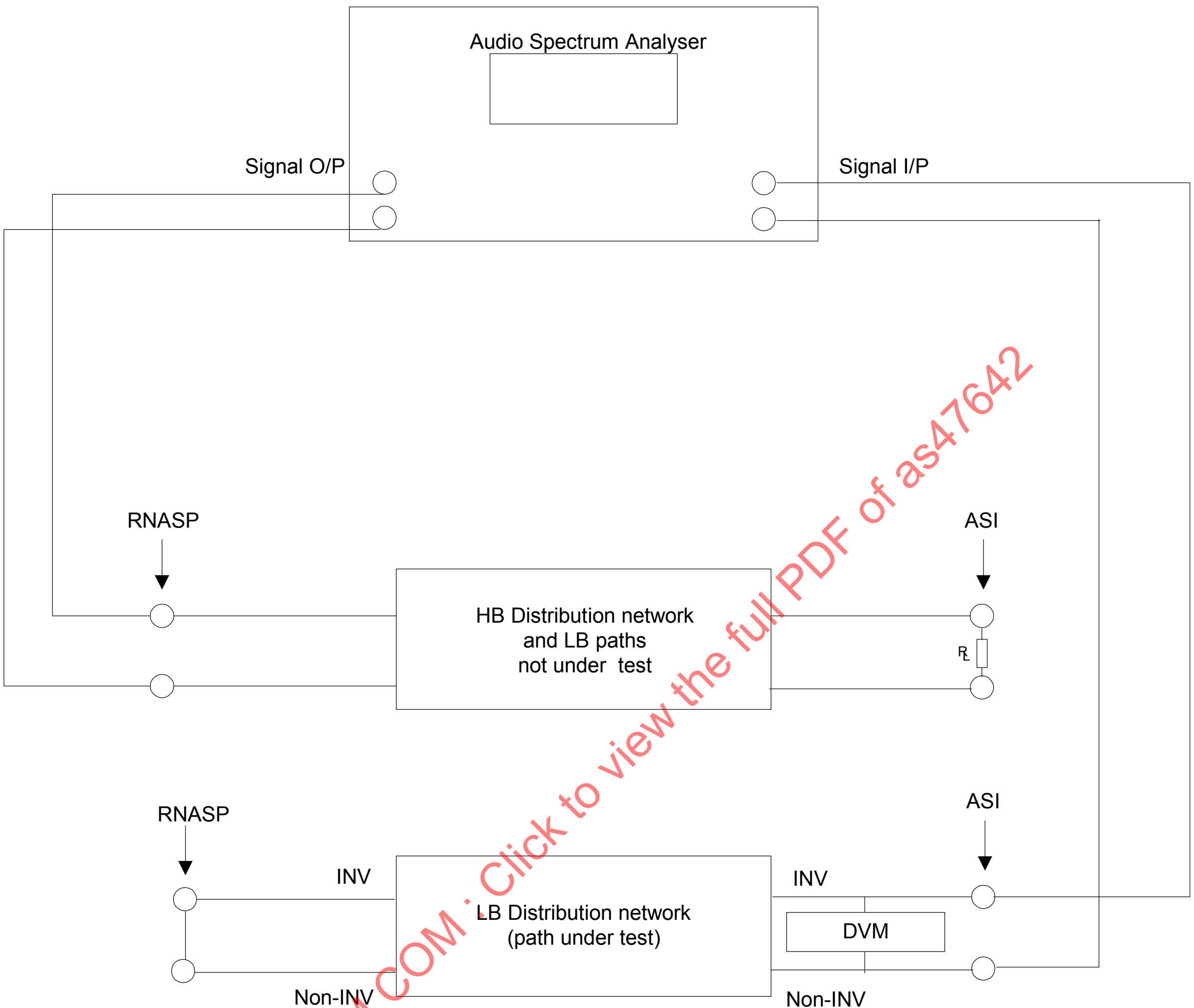
a. Audio Spectrum Analyzer covering frequency range from 150Hz to 8kHz with an adjustable output voltage of 0V to 12V (peak-to-peak) and a floating balanced output with zero offset and a variable (zero, 50 and 75 ohms) output impedance with a 600 ohms input impedance.
b. Digital Voltmeter with a bandwidth of greater than dc to 10kHz.
c. 50ohm, 75ohm and 600ohm loads.
d. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD:

a. Each of the LB and HB interfaces of the AEIS not associated with the signal path under test shall be stimulated in turn, by an in-band (150Hz to 8kHz) maximum amplitude sinusoidal signal by the spectrum Analyzer.
b. The Analyzer trace shall be inspected to determine the maximum cross-talk voltage recorded at the output of the LB path under test.
c. With all of the LB and HB interfaces of the AEIS not associated with the signal path under test terminated by a short circuit, record the un-stimulated noise voltage on the DVM.
d. Calculate the root sum of the squares of the individual worst-case cross-talk voltages from step 2 and the un-stimulated noise voltage from step 3.
e. Steps a) to d) shall be repeated with the ASI as the input and the RNASP as the output.

NOTES:

1. The test set up is shown in figure LBW109.
2. Periodic and random noise is defined in the standard.
3. All LB signal paths through the aircraft routing network shall be tested.
4. When injecting in-band signals into the networks not under test, the maximum signal amplitudes injected shall be 12V (peak-to-peak) for LB and 1.3V (peak-to-peak) for HB. Injection of signals into the HB1B network is not required at this time.



Note 1: R_L is 50Ω for HB1A and HB2, 75Ω for HB3 and HB4 and 600Ω for LB
Note 2: In step e), the RNASP and ASI are reversed.

FIGURE LBW109

METHOD: LBW110

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.3.6.2

PURPOSE: This method verifies that with the input of the signal path terminated, there shall be (to one standard deviation) no more than two occurrences of impulse noise exceeding 20 mV peak over a three minute period.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the requirements for impulse noise are not exceeded.

APPARATUS:

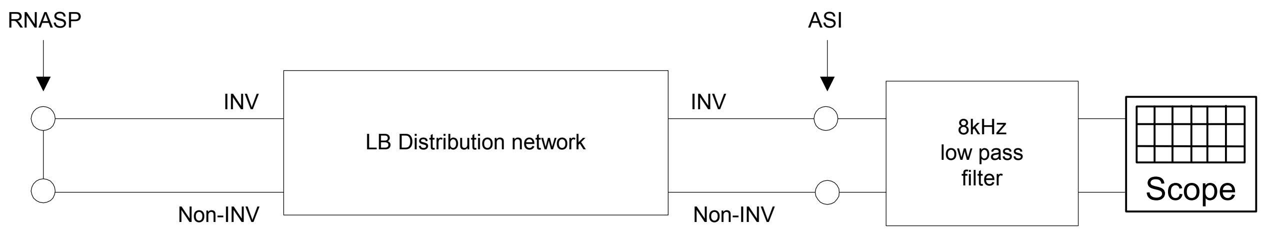
a. Second order Butterworth low pass filter (12db/octave roll-off) with a cut-off frequency of 8kHz.
b. Oscilloscope with storage facility.
c. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD:

a. Set the trigger threshold of the oscilloscope to 20mV.
b. Monitor the scope for triggering and record the number of occurrences when performing a switching routine of aircraft systems (this is dependent on the aircraft under test and will therefore be subject to agreement between the contractor and the contracting authority).
c. Repeat steps a) and b) with the filter and oscilloscope connected to the RNASP and the ASI terminated.

NOTES:

1. The test set up is shown in figure LBW110.
2. The minimum duration of each test will be three minutes. However, this time may be increased in agreement with the contracting authority. As the intention of the switching routine is that the aircraft is placed in a representative state of readiness with regard to other systems, then the time taken to perform these tests will naturally be longer than the three minutes minimum test time.
3. All possible paths through the aircraft routing network shall be tested.



Note: In step d), the RNASP and ASI are reversed

FIGURE LBW110

METHOD: LBW111

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.3.6.3

PURPOSE: This method verifies that for any frequency between 300 Hz and 3.4 kHz, application of a 12 Vpp sinusoidal excitation signal to the signal path input shall not add more than 80 mV RMS of noise to the output over the frequency range 150 Hz to 8 kHz.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if under test, the amount of added noise over the frequency range 150Hz to 8kHz is within limits.

APPARATUS:

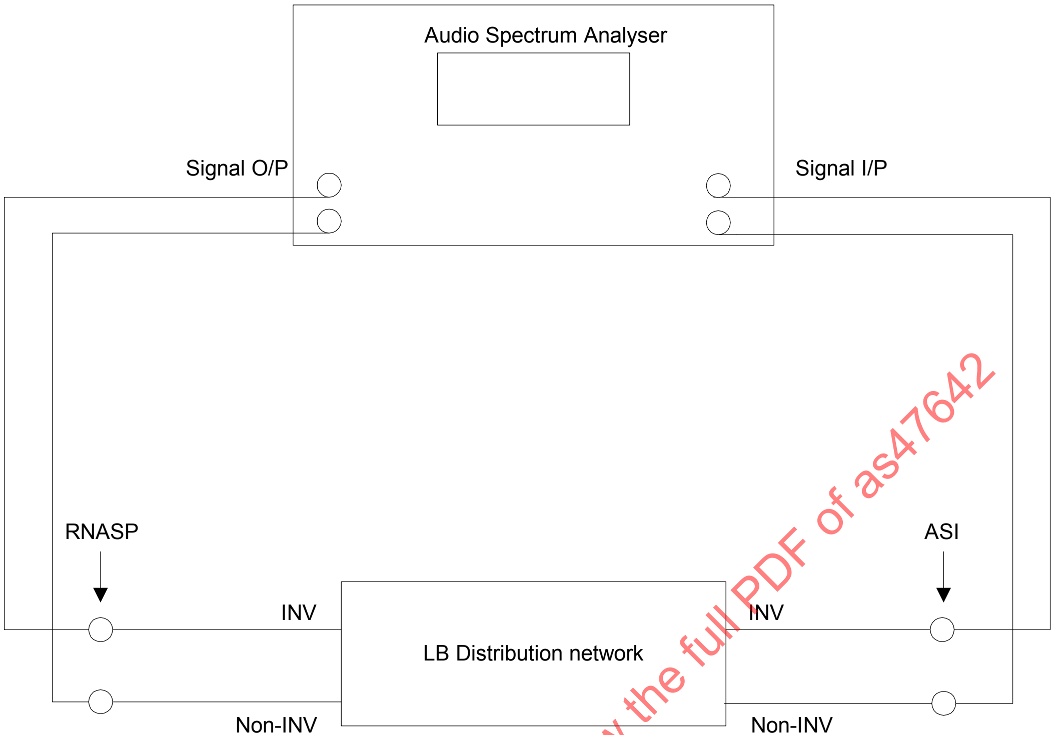
a. Audio Spectrum Analyzer covering frequency range from 150Hz to 8kHz with an adjustable output voltage of 0V to 12V (peak-to-peak) and a floating balanced output with zero offset and a 600 ohms input.
b. Test cabling connecting the test equipment to the ASI / RNASP.

VALIDATION METHOD:

a. Determine the noise floor of the LB network by sweeping with the audio generator output disconnected from the LB network input and replaced by a short circuit between the Inverting and the Non-inverting input.
b. Connect the audio generator output to the RNASP and set the output for a 12V (peak-to-peak) signal and sweep the generator from 300Hz to 3.4kHz.
c. The Analyzer shall be set to record all harmonics in the range 150Hz to 8kHz.
d. Calculate the root sum of squares of the amplitudes of all the harmonics.
e. Repeat steps a) to d) with the audio generator output connected to the ASI and the Analyzer input connected to the RNASP.

NOTES:

1. The test set up is shown in figure LBW111.
2. All possible paths through the aircraft routing network shall be tested.



Note 1: When determining the noise floor of the LB network the input signal must be disconnected and replaced by a short ciruit between the Inverting and Non-inverting terminals.
Note 2: For step e), the RNASP and ASI are reversed.

FIGURE LBW111

METHOD: LBW112

PARAMETER: Aircraft LB Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.3.2

PURPOSE: This method validates that signals on the LB interface are limited to tones and voice grade audio.

PARAMETER TYPE:	( ) ELECTRICAL	( ) PROTOCOL	(X) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if it can be shown that the LB interface is only used for the transmission and receiving of tones and / or voice grade audio.

APPARATUS: N/A

VALIDATION METHOD: A general inspection of the aircraft TDP is sufficient.

NOTES:

1. This is an aircraft implementation and operational use requirement and not a specific ASI or RNASP requirement.

METHOD: REL101

PARAMETER: Provisions and use of the Release Consent Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.4, 5.1.4

PURPOSE: This method verifies that the aircraft's provision and use of the Release Consent interface as a safety critical command.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS:

a. Requires positive crew action to enable the Release Consent signal.
b. Applies the Release Consent signal when in the enable state to each ASI independently.
c. Uses the Release Consent signal only to transfer an enable/inhibit signal for granting consent to the store to act on safety critical commands transmitted over the digital data MUX interface (see Note 1).

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine that the AEIS requires positive crew action to enable Release Consent. Evaluate that when enabled, the Release Consent signal is available to each ASI independently. Evaluate that the AEIS uses the Release Consent signal only as an enable command to the mission store to accept safety critical commands over the data bus. The TDP includes drawings, software listings, technical manuals and ICDs.

NOTES:

1. Examples of improper use of the Release Consent signal include:
   a. Direct firing of electro-explosive devices solely as a result of the activation of Release Consent.
   b. Activation of irreversible functions in the mission store on detection of Release Consent in conjunction with application of a specific power line.
2. Release Consent is a 28 V DC signal provided by the AEIS under hardware/software control. The mechanization of the store determines how this signal is used. The aircraft has no control over a store designer who has connected an EED to Release Consent. No requirement should be placed on the aircraft for improper use of the Release Consent signal relative to the store's intended use of the signal.

METHOD: REL102

PARAMETER: Transfer Requirements

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.4

PURPOSE: This method verifies that the aircraft provides the REL consent interface at each ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if when in the inhibited state, Release Consent at an ASI is electrically isolated from the Release Consent signal at all other ASIs. The required isolation is 100k ohm minimum at DC.

NOTE: The intent of the requirement in MIL-STD-1760 for Release Consent isolation is that a fault in the release consent circuit of one station must not result in the release consent circuit at another station or stations going to the enable state. Since MIL-STD-1760 allows open and grounded circuit implementations of the Release Consent circuit, isolation verification between Release Consent circuits of grounded circuit implementations does not apply. For grounded circuit implementations, use Apparatus #1 and Validation Method #1. For open circuit implementations, use Apparatus #2 and Validation Method #2.

APPARATUS #1 (grounded circuit implementations): N/A

VALIDATION METHOD #1 (grounded circuit implementations): Evaluate the aircraft's TDP to determine if the aircraft Release Consent signal at one ASI connection is grounded to a common ground point with all other Release consent ASI connections.

APPARATUS #2 (open circuit implementations):

a. 100k ohm resistor.
b. DC voltage generator source (1.5V DC).
c. Digital Voltmeter (DVM)
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment as required.

VALIDATION METHOD #2 (open circuit implementations):

a. Connect the DC voltage generator, resistor, and DVM from one aircraft Release Consent ASI connection to all others ASI Release Consent connections as shown in Figure REL 102.
b. Command inhibited Release Consent at all ASIs. Measure voltage between one ASI Release Consent connection and all other ASI Release Consent connections.
c. Repeat until the isolation between all Release Consent combinations of ASIs has been determined.
d. Verify DVM measurement is never less than 0.75 V DC.

NOTES:

1. Tests may need to be run several times to verify all ASI's are properly isolated.

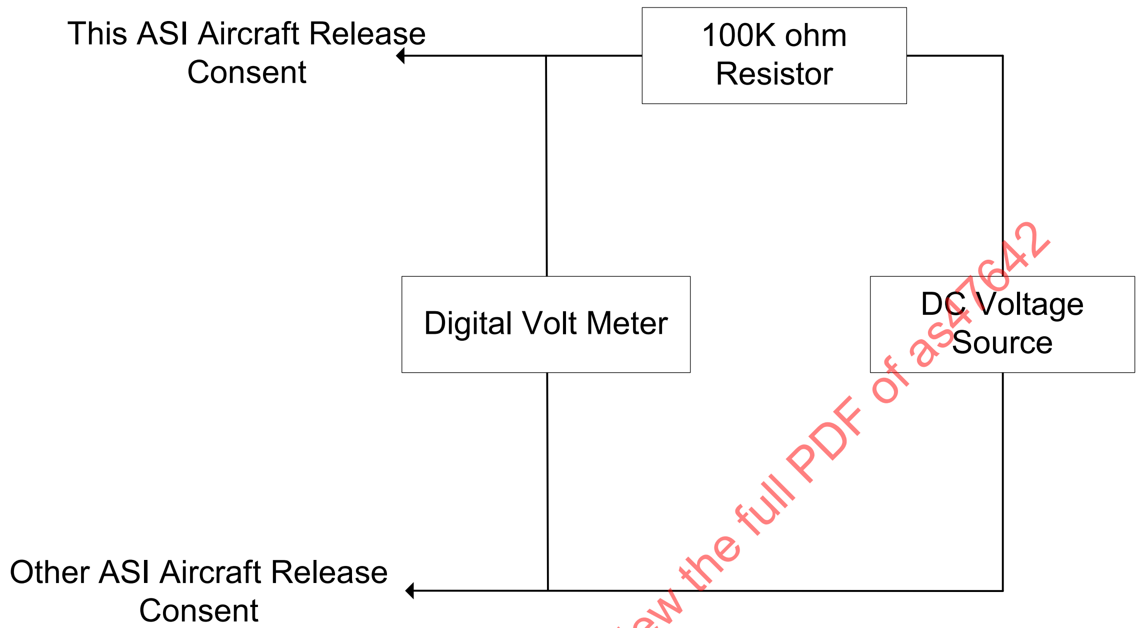


FIGURE REL102

METHOD: REL103

PARAMETER: Output Voltage and current

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.4.1, 5.1.4.1.b.

PURPOSE: This method verifies that the logic levels to the Release Consent interface are within the specified limits of MIL-STD-1760 and the aircraft is capable of sourcing the Release Consent load current.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

a. The enable state voltage is greater than or equal to 19.0 V DC and less than or equal to a maximum for 28 V DC as defined by MIL-STD-704.
b. The inhibit state voltage is less than or equal to 1.5 V DC.
c. The aircraft is capable of providing the required enable voltage levels to store loads ranging between 5 and 100 mA during the Release Consent enable state.

APPARATUS:

a. Aircraft power
b. Resistor decade box variable between 190 ohms and 5.6k ohms.
c. Voltage measuring/recording instrument such as a storage oscilloscope.
d. Test cabling connecting the test equipment to the ASI.
e. Other ASI peculiar test equipment, as required.

VALIDATION METHOD:

a. Connect the resistor decade box (adjusted to 280 ohms) between the Release Consent connection and the 28 V DCP #2 return of an ASI as shown in Figure 103.
b. Connect the DVM and ammeter measuring instruments as shown in Figure REL103.
c. Initiate Release Consent enable to the ASI. Adjust the decade box for the required current levels (5.0 mA and 100 mA); measure and verify that the enable voltage is between 19 and 28V DC.
d. Initiate Release Consent inhibit to the ASI. Measure and verify that the inhibit voltage is less than or equal to 1.5V DC.
e. Repeat for all ASIs.

NOTES:

1. Software may be written for the AEIS to provide a discrete control for the Release Consent interface.

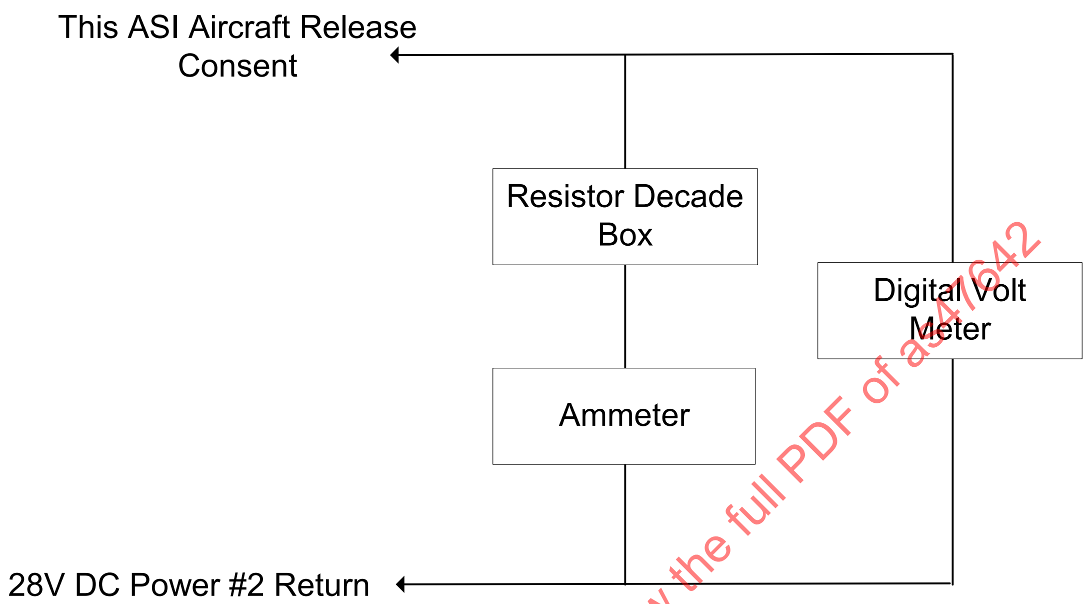


FIGURE REL103

METHOD: REL104

PARAMETER: Stabilization Time

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.4.2

PURPOSE: This method verifies that the aircraft Release Consent stabilization time is within the limits of MIL-STD-1760.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the voltage at the ASI reaches steady state levels within 3 ms during transition between enable and inhibit states.

APPARATUS:

a. Resistor decade box adjustable between 320 ohms and 3.8k ohms.
b. Voltage measuring/recording instrument such as a storage oscilloscope.
c. Test cabling connecting the test equipment to the ASI.
d. Other ASI peculiar test equipment, as required.

VALIDATION METHOD:

a. Connect the resistor decade box, adjusted to 320 ohms, between the Release Consent connection and the 28 V DCP #2 return as shown in Figure REL 104.
b. Connect DVM and oscilloscope as shown in Figure REL104.
c. Initiate Release Consent enable to the ASI. Measure the stabilization time between inhibit and enable.
d. Initiate Release Consent inhibit to the ASI. Measure the stabilization time between enable and inhibit.
e. Repeat steps a through d with a resistor decade box adjusted to 3.8k ohms.
f. Repeat for all ASIs.

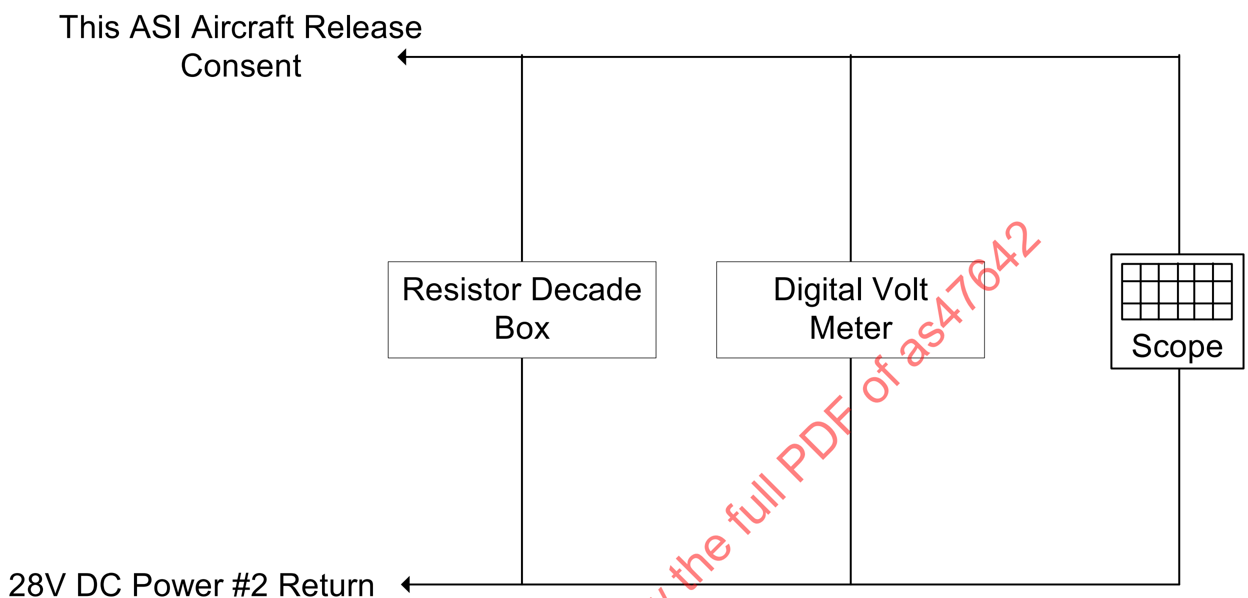


FIGURE REL104

METHOD: REL105

PARAMETER: Enable Lead Time

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.4.3.

PURPOSE: This method verifies that the aircraft enables the Release Consent signal prior to transferring safety critical commands.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the Release Consent signal is enabled 20ms prior to transferring a safety critical command over the digital MUX data interface or prior to transmitting the firing signal to the parent store and release equipment.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft Release Consent signal is enabled at least 20ms prior to transferring a safety critical command over the digital MUX interface or prior to transmitting the firing signal to the parent store and release equipment.

METHOD: REL106

PARAMETER: Inhibit Delay

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.4.4.

PURPOSE: This method verifies that the aircraft expects that a mission store connected to an ASI will remain in an enabled state for up to 20ms after the Release Consent signal has been returned to the inhibit state.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS is programmed to assume that the mission store can take up to 20ms to react to the disabling of the Release Consent interface.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine that the AEIS is programmed such that after it disables the Release Consent interface it waits at least 20ms before assuming that the store has responded by deactivating any associated states.

METHOD: REL107

PARAMETER: Ground Reference

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.4.5.

PURPOSE: This method verifies that the aircraft uses 28 VDCP #2 return as the reference for the Release Consent signal (see Note 1).

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS uses 28V DCP #2 return as the Release Consent signal reference.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine which interface contact is used as the ground return path for the Release Consent circuitry in the AEIS.

NOTES:

1. METHODS REL103, and REL104 use 28 VDCP #2 return as the reference for measurements conducted on the Release Consent interface.

METHOD: INL101

PARAMETER: Provision and use of the Interlock Interface

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.5, 4.4, 4.4.2, 5.1.5

PURPOSE: This method verifies the aircraft's provision and use of the Interlock interface.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the discrete signals Interlock interface and Interlock Return are used to verify electrical mating of associated primary and auxiliary connectors.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP (such as drawings, software listings, technical manuals, and ICDs) to determine that the aircraft provides the interlock interface as part of the ASI and auxiliary ASI (if utilized). Confirm that the aircraft uses the Interlock signals as a means for the aircraft to determine if the store is "electrically" mated to the aircraft. Evaluate the aircraft's TDP (such as drawings, software listings, technical manuals, and ICDs) to confirm that the aircraft does not use the interlock interface as the sole criterion for functions, which could result in an unsafe condition if the interlock signal fails open.
This validation procedure should be utilized to validate both the primary interlock interface and the auxiliary interlock interface (if implemented).

NOTES: N/A

METHOD: INL102

PARAMETER: Open Circuit Output Voltage

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.5.a (Electrical Characteristics)

PURPOSE: This method verifies that the primary and auxiliary ASI complies with the electrical characteristics for the Interlock interface.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

a. The open circuit voltage is greater than or equal to 4.0V DC and less than or equal to a maximum for 28V DC as defined by MIL-STD-704.

APPARATUS:

a. Aircraft power
b. Voltmeter
c. Storage Oscilloscope
d. Test cabling connecting the test equipment to the ASI.
e. Other ASI peculiar test equipment, as required.

VALIDATION METHOD: Apply aircraft power, and use a voltmeter to measure the output voltage at the Interlock connection referenced to its associated interlock return while the interlock signal / interlock return is in an open circuit condition. Confirm that the measured open circuit voltage is equal to or greater than 4.0V DC and less than or equal to the maximum specified voltage for 28V DC in accordance with MIL-STD-704. Repeat for all primary and auxiliary ASIs.

Apply aircraft power, and use an oscilloscope to measure voltage transients and spikes at the interlock connection referenced to its associated interlock return. Repeat for all primary and auxiliary ASIs.

NOTES: N/A

METHOD: INL103

PARAMETER: Excitation Current

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.5.b (Electrical Characteristics)

PURPOSE: This method verifies that the primary and auxiliary ASI complies with the electrical characteristics for the Interlock interface.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the short circuit current does not exceed 100mA and the current through a 2 ohm resistor is not less than 5.0mA.

APPARATUS:

a. Aircraft power
b. 2 ohm resistor
c. Shorting wire with a resistance of less than 500 mohm
d. Current measuring device
e. Test cabling connecting the test equipment to the ASI
f. Other ASI peculiar test equipment, as required

VALIDATION METHOD: Apply aircraft power and connect the 2 ohm resistor between interlock and its associated Interlock Return; measure the current. Confirm that the measured current is greater than 5.0mA.

Connect the shorting wire between Interlock and its associated Interlock Return; measure the current. Confirm that the measured current does not exceed 100mA. Repeat for all primary and auxiliary ASIs.

NOTES: N/A

METHOD: INL104

PARAMETER: Impedance Detection Threshold

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.5.c (Electrical Characteristics)

PURPOSE: This method verifies that the primary and auxiliary ASI complies with the impedance threshold of the Interlock interface.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

a. An Interlock interface connected condition is detected for any impedance between 0 and 2 ohm on the store side of the ASI
b. An Interlock interface disconnected condition is detected for any impedance greater than 100k ohm.

APPARATUS:

a. Aircraft power
b. 100k ohm resistor
c. 2 ohm resistor
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment, as required

VALIDATION METHOD: Apply aircraft power and connect test resistors between Interlock and its associated Interlock Return. Check the stores management system (SMS) readout for appropriate connected or disconnected readings. Use the following procedure:

a. Connect a 2 ohm resistor between Interlock and its associated Interlock Return, check the SMS for an Interlock connected condition.
b. Connect a 100k ohm resistor between Interlock and its associated Interlock Return, check the SMS for an Interlock disconnected condition.
c. Repeat for all primary and auxiliary ASIs.

NOTES: N/A

METHOD: ADR101

PARAMETER: Aircraft Address Interface Connections

MIL-STD-1760 PARAGRAPH: 4.3, 4.3.6, 5.1.6

PURPOSE: This method verifies that the aircraft provides the required Address interface connections at each primary ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS is capable of assigning an address interface, consisting of five address connections, one address parity connection and one common address return connection to each ASI and the aircraft is capable of assigning a unique address to each ASI.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine that the aircraft provides 7 address interface connections at each primary ASI and that each primary ASI has a unique address.

NOTES:

METHOD: ADR102

PARAMETER: Aircraft Address Interface Usage

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6

PURPOSE: This method verifies that the aircraft provides the required Address interface and that the interface is used correctly by the aircraft.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if each ASI has a RT address connection and the aircraft only uses the Address interface to assign an address to the remote terminal associated with the ASI.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the aircraft Address interface is used only to assign an address to the respective ASI.

NOTES: N/A

METHOD: ADR103

PARAMETER: Address Assignment

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.1

PURPOSE: This method verifies that the aircraft uses the proper algorithm to calculate the ASI address assignment.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the AEIS provides a Logic 0 or a Logic 1 state to each of the five address connections and that the following algorithm is used to calculate the logical RT address:

RT address = (A4*16) + (A3*8) + (A2*4) + (A1*2) + (A0*1)

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if the logical address assignment (MIL-STD-1553 command words) corresponds to the physical address assignment given the algorithm.

NOTES:

1. A4 through A0 will be either Logic 0 or 1 depending upon the state of the aircraft's electrical connection at the ASI.
2. The address shall be assigned prior to power being applied to the ASI. The aircraft shall not modify the address assigned to an ASI whenever any power is applied to that ASI.

METHOD: ADR104

PARAMETER: Address Parity

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.1

PURPOSE: This method verifies that the aircraft assigns the proper logic state to the address parity connection.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if an odd number of Logic 1 states exists on the five address bit connections plus the address parity connection.

APPARATUS: N/A

VALIDATION METHOD: Evaluate the aircraft's TDP to determine if odd parity, as required by the above criteria, is implemented at each ASI.

NOTES:

1. This method may be done in conjunction with method ADR103.

METHOD: ADR105

PARAMETER: Address Stability

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.1

PURPOSE: This method verifies that the aircraft will not modify the Address interface connections whenever power is applied to the ASI.

PARAMETER TYPE:	( ) ELECTRICAL	(X) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if each ASI maintains its assigned address connection when any individual primary and/or auxiliary power is applied.

APPARATUS: N/A

VALIDATION METHOD: While monitoring each of the address interface connections, apply each primary, and if applicable each auxiliary power, at the ASI and verify the aircraft address interface does not change states at the respective ASI.

NOTES: N/A

METHOD: ADR106

PARAMETER: Address Electrical Characteristics – Response Times

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.2

PURPOSE: This method verifies the use of excitation voltage and current level response times as sourced by the connected store.

PARAMETER TYPE: (X) ELECTRICAL ( ) PROTOCOL ( ) PHYSICAL
VALIDATION TECHNIQUE: (X) TEST ( ) ANALYSIS ( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the sourced voltage and current (voltage and current versus time) on each of the address lines is within the defined levels in the allocated time.

APPARATUS:

a. Power supply capable of 3.5 VDC and 31.5 VDC at 600 mA
b. 300 ohm, 3 W resistor
c. Voltage measuring/recording instrument such as a storage oscilloscope
d. Current meter capable of measuring a range of 5mA to 600mA dc.
e. Test cabling connecting the test equipment to the ASI

VALIDATION METHOD:

a. Connect the power supply, resistor, and voltage and current measuring instruments as shown in Figure ADR106 (between the address connection and address return).
b. Apply 3.5 VDC at each ASI's logic 1 connection and verify the rise time is less than 10 milliseconds on Scope A.
c. Remove 3.5 VDC at each ASI's logic 1 connection and verify the fall time is less than 10 milliseconds on Scope A.
d. Apply 31.5 VDC at each ASI's logic 1 connection and verify the rise time is less than 10 milliseconds on Scope A.
e. Remove the 31.5VDC at each ASI's logic 1 connection and verify the fall time is less than 10 milliseconds on Scope A.
f. Apply 5mA dc at each ASI's logic 0 connection and verify the rise time is less than 10 milliseconds on Scope B.
g. Remove 5mA dc at each ASI's logic 0 connection and verify the fall time is less than 10 milliseconds on Scope B.
h. Apply 100mA dc at each ASI's logic 0 connection and verify the rise time is less than 10 milliseconds on Scope B.
i. Remove 100mA dc at each ASI's logic 0 connection and verify the fall time is less than 10 milliseconds on Scope B.
j. Verify the total dc current on the address return line is less than 600mA.

NOTES:

1. Tests may have to be run several times to verify all five address connections and one address parity connection.

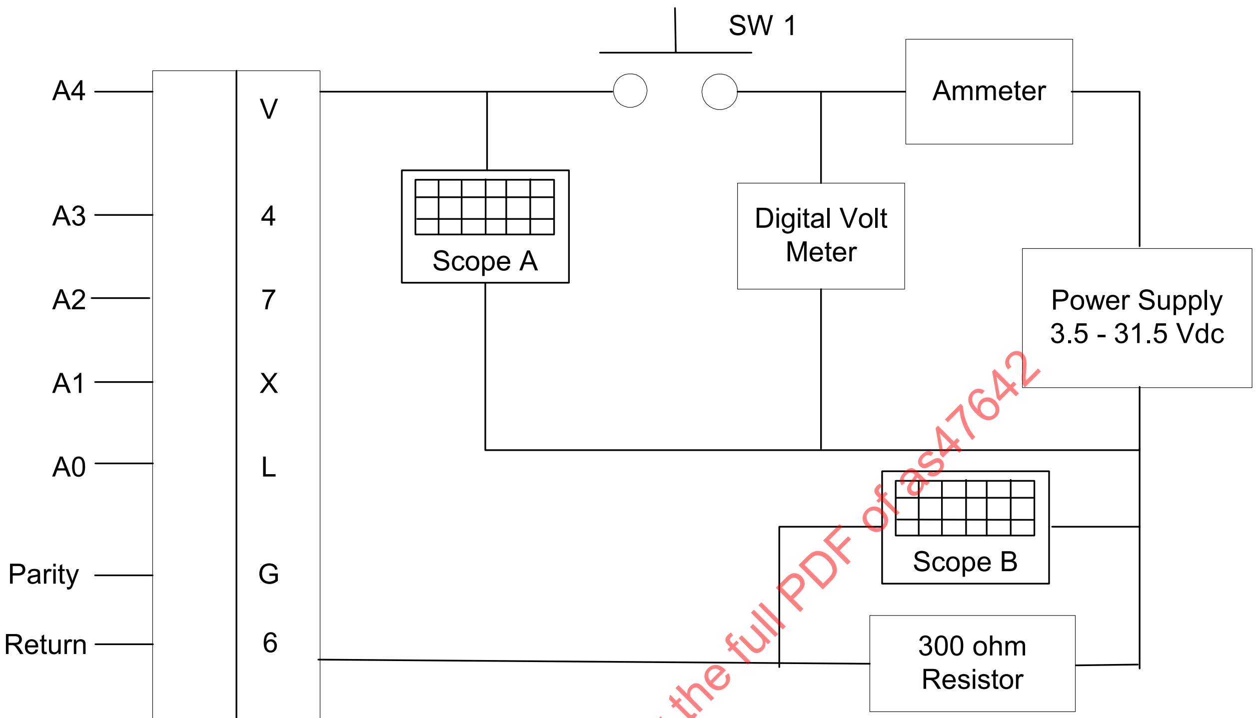


FIGURE ADR106

METHOD: ADR107

PARAMETER: Address Electrical Characteristics – Thresholds

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.3

PURPOSE: This method verifies the use of excitation voltage and current level threshold levels as provided by the aircraft address connections.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the sourced voltage and current (voltage and current versus time) on each of the address lines is within the defined levels for each ASI.

APPARATUS:

a. Power supply capable of 31.5 V DC at 600 mA
b. 300 ohm, 3 W resistor
c. Volt Meter
d. Current meter capable of measuring a range of 0 to 300uA dc.
e. Test cabling connecting the test equipment to the ASI

VALIDATION METHOD:

a. Connect the power supply, resistor, and voltage and current measuring instruments as shown in Figure ADR106 except adjust the power supply to 31.5Vdc and replace the AMP Meter to meet a range of 300 micro amps maximum.
b. Apply 31.5Vdc at each ASI's logic 1 connection and verify the amp meter reads less than 300uamps when SW 1 is depressed.
c. Replace AMP Meter with a one capable of measuring 100mA dc, apply 100mA dc at each ASI's logic 0 connection and verify the volt meter reads less than 1.0 volts dc when SW 1 is depressed.

NOTES:

1. Tests may have to be run several times to verify all five address connections and one address parity connection.

METHOD: ADR108

PARAMETER: Response Characteristics

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.4

PURPOSE: This method verifies the aircraft provides a valid address connection at the ASI within 10 milliseconds of excitation signal sourced by the store.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if a valid address at each of the aircraft address connections is provided within the allocated time.

APPARATUS:

a. Power supply capable of 3.5 V – 31.5 VDC
b. 300ohm, 3 W resistor
c. Voltage measuring/recording instrument such as a storage oscilloscope
d. Current meter capable of measuring a range of 5mA to 600mA dc.
e. Test cabling connecting the test equipment to the ASI

VALIDATION METHOD:

a. Connect the power supply, resistor, and voltage and current measuring instruments as shown in Figure ADR106 (between the address connection and address return).
b. Apply 3.5 VDC at each ASI's logic 1 connection and verify after 10ms, the aircraft address interface is valid on Scope A.
c. Apply 31.5 VDC at each ASI's logic 1 connection and verify after 10ms, the aircraft address interface is valid on Scope A.
d. Remove excitation voltages in b) and c) and verify the aircraft usage of the Address Interface connection does not change.

NOTES:

1. Tests may have to be run several times to verify all five address connections and one address parity connection.

METHOD: ADR109

PARAMETER: Address Isolation

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.6.5

PURPOSE: This method verifies that the aircraft isolates all address connections including the address return from all other ASI's, power returns, and aircraft structure Ground.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the isolation level for all address connections at each ASI, including address return, from address connections at all other ASI's, from power returns and from aircraft structure Ground is 100k ohms minimum for frequencies dc to 4 kHz.

APPARATUS:

a. Storage oscilloscope
b. AC Voltage Generator source of 1Vp-p at (0 to 4 kHz)
c. Test cabling connecting the test equipment to the ASI

VALIDATION METHOD:

a. Connect the AC Generator, resistor, and Scope as shown in Figure ADR109 from each aircraft address connections including address return to all others ASI's:
    1) Address connections
    2) Power returns
    3) Aircraft structure Ground
b. Verify the Scope peak-to-peak measurement is never less than 5Vp-p

NOTES:

1. Tests will have to be run several times to verify all ASI's are properly isolated.

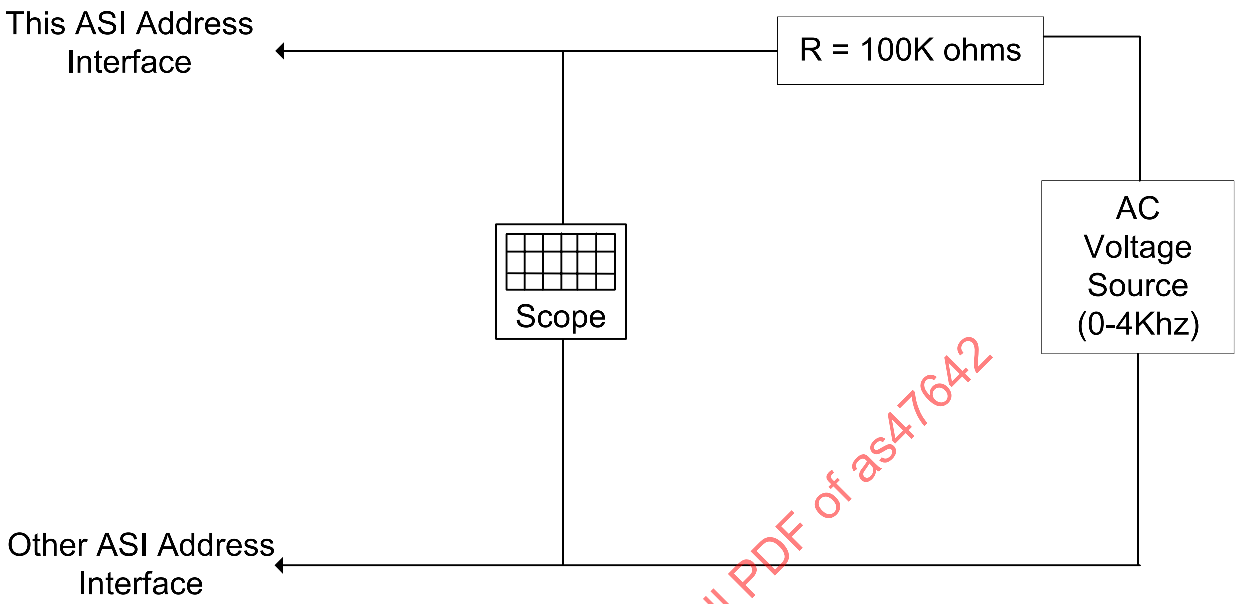


FIGURE ADR109

METHOD: GND101

PARAMETER: Structure Ground Utilization

MIL-STD-1760 PARAGRAPH: 4.3, 5.1.7

PURPOSE: This method verifies that the aircraft complies with the electrical characteristics required for the Structure Ground interface.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if at every store station:

a. Each ASI connector (i.e., primary and auxiliary) contains a Structure Ground interface connection, which is a dedicated electrical circuit between the aircraft and stores used to minimize shock hazards to personnel.
b. Each primary ASI Structure Ground interface connection is capable of conducting the overcurrent levels defined in fig 17 (Primary interface current level) of MIL-STD-1760C.
c. Each auxiliary ASI Structure Ground interface connection is capable of conducting the overcurrent levels defined in fig 18 (Auxiliary interface current level) of MIL-STD-1760C.
d. No Structure Ground interface connection is used as a power or signal return path.

APPARATUS:

a. Variable Power Supply capable of supplying up to 30 amps. (Current limited at 10amps and 30 amps)
b. Ammeter 10-30 amp.
c. Voltmeter 0-1 volt
d. Test cabling connecting the test equipment to the ASI.
e. Other ASI peculiar test equipment, as required.

VALIDATION METHOD:

a. For verification of criteria (b) by test:
   1) Connect the instruments as shown in Figure GND101 to the Primary ASI with the power supply switched off. Ensure the power supply is set to 0v output and limited to 10 amps then switch on. Gradually increase the output voltage until the current measuring device reads 10 amps. Note voltage and determine resistance.
   2) This voltage must be less than 0.2 volts.
   3) Using figure 17 of MIL-STD-1760C, determine if the Structure Ground path can carry the overcurrent levels taking into consideration local heating effects.

b. For verification of criteria (c) by test:
   1) Connect the instruments as shown in Figure GND101 to the Auxiliary ASI with the power supply switched off. Ensure the power supply is set to 0v output and current limited to 30 amps and then switch on. Gradually increase the output voltage until the current measuring device reads 30 amps. Note voltage and determine resistance.
   2) This voltage must be less than 0.2 volts.
   3) Using figure 18 of MIL-STD-1760C, determine if the Structure Ground path can carry the overcurrent levels taking into consideration local heating effects.

c. For verification of all other criteria by analysis:
   Evaluate the aircraft's TDP to determine that the ASI Structure Ground interface complies with the items identified in the validation criteria. This evaluation will consist of a series of analyses using the TDP as analysis input. The TDP includes drawings, technical manuals and ICDs.

NOTES:

1. Ensure that currents in excess of 10 amps for the primary and 30 amps for the auxiliary are not applied.
2. Although not part of MIL-STD-1760 validation, with the evidence obtained above, it shall be determined that the quality of the System Structure Ground path will not have unsafe voltages appearing under fault conditions.

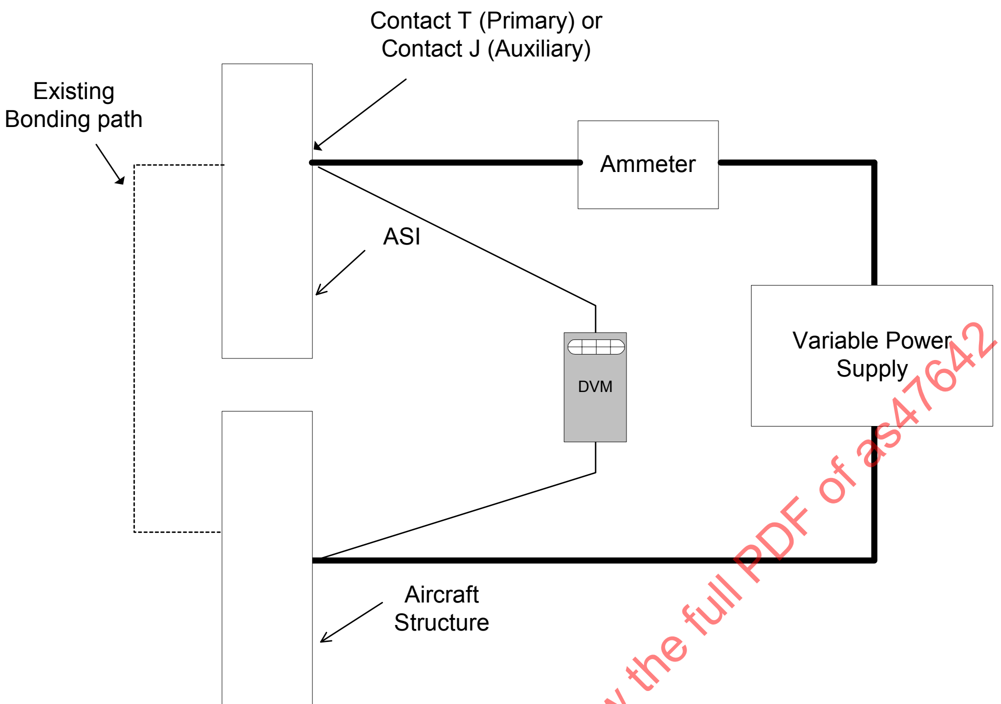


FIGURE GND101

METHOD: DCP101

PARAMETER: Aircraft 28 Volt DC Power Interface

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.8, 5.1.8.7, 4.3.8 and 4.4.1

PURPOSE: This method verifies that all required aircraft 28 V DC interfaces are present at each ASI and have dedicated power returns as a reference.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the following 28 V DCP interfaces are present:

a. At each primary ASI:
   1) 28 V DCP #1
   2) 28 V DCP #1 return as a reference for a (1) above
   3) 28 V DCP #2
   4) 28 V DCP #2 return as a reference for a (3) above (Shared with Release Consent.)

b. At each auxiliary ASI:
   1) 28 V DCP
   2) 28 V DCP dedicated return as a reference for b (1) above

APPARATUS: N/A

VALIDATION METHOD:

a. By analysis of the aircraft's TDP (such as schematics, internal wiring diagrams, and the ICD), verify that the aircraft provides:
   1) 28 V DC #1, 28 V DC #1 dedicated return as a reference, 28 V DC #2, and 28 V DC #2 return as a reference for each primary ASI which is only shared with Release Consent if implemented.
   2) 28 V DC and 28 V DC dedicated return as a reference for each auxiliary ASI

NOTES: N/A

METHOD: DCP102

PARAMETER: Aircraft 28 V DCP Control

MIL-STD-1760C PARAGRAPH: 4.3, 5.1. 8.1

PURPOSE: This method verifies that the aircraft can properly source and independently control all 28 V DCP outputs at each primary and each auxiliary ASI.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if it can independently source and control the:

a. 28 V DC #1 and 28 V DC #2 at each primary ASI.
b. 28 V DC at each auxiliary ASI.

APPARATUS: N/A

VALIDATION METHOD: By analysis of the aircraft's TDP (such as schematics, internal wiring diagrams, and the ICD), verify that the aircraft can independently source and control 28 V DC #1 and 28 V DC #2 at each primary ASI and 28 V DC at each auxiliary ASI.

NOTES: N/A

METHOD: DCP103

PARAMETER: Output Voltage Characteristics

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.8.2

PURPOSE: This method verifies that the aircraft 28 V DC interfaces provide voltage characteristics within the required limits.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if, at each ASI (primary and auxiliary), the voltage characteristics measured between each 28 V DC and 28 V DC return connection complies with:

28 V DC normal and abnormal operation characteristics of MIL-STD-704 except that the normal steady state low voltage shall not be less than the 22.0 V dc at any valid load condition.

(Note: The steady state limits do not include disturbances allowed in MIL-STD-704).

APPARATUS:

a. Storage oscilloscope
b. Variable 10A current sink (2)
c. Variable 30A current sink (1)
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment, as required

VALIDATION METHOD:

Verify by analysis using the aircraft's TDP, that all 28 V DCP connections and associated 28 V DCP return connections at each ASI comply with:

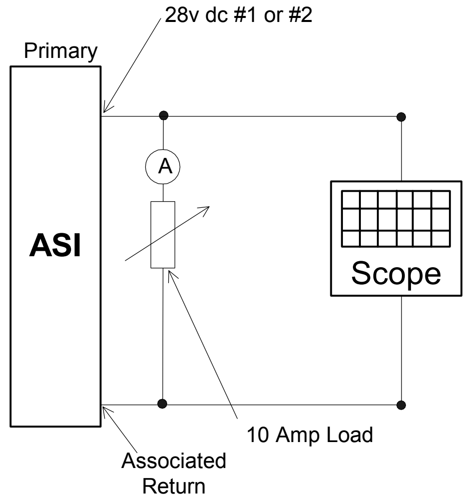
a. MIL-STD-704, normal operation
b. MIL-STD-704, abnormal operation

Verify by test:

1. Energize each 28 V DC interface at the ASI. Measure the voltage, with a storage oscilloscope, between each 28 V DCP and the 28 V DCP return. Verify that this voltage is within the normal operation limits of MIL-STD-704. Repeat for all ASI's.
2. Place the variable 10A current sink in series (set to max resistance) with a 10A ammeter between each primary 28 V DCP and its return (28V DC #1 and 28V DC #2). Energize the 28 V DC interface at the ASI and adjust the current sink until full load current is achieved. Measure the voltage, with a storage oscilloscope, between each 28 V DCP and the 28 V DCP return. Verify that the voltage is within the normal operation limits of MIL-STD-704. Repeat for all Primary ASI's.

3. Place the variable 30A current sink in series (set to max resistance) with a 30A ammeter between the auxiliary 28 V DCP and its return. Energize the 28 V DC interface at the ASI and adjust the current sink until full load current is achieved. Measure the voltage, with a storage oscilloscope, between the 28 V DCP and the 28 V DCP return. Verify that the voltage is within the normal operation limits of MIL-STD-704. Repeat for all auxiliary ASI's.

NOTES: The abnormal operation requirements have been limited to analysis only for both the primary and auxiliary.



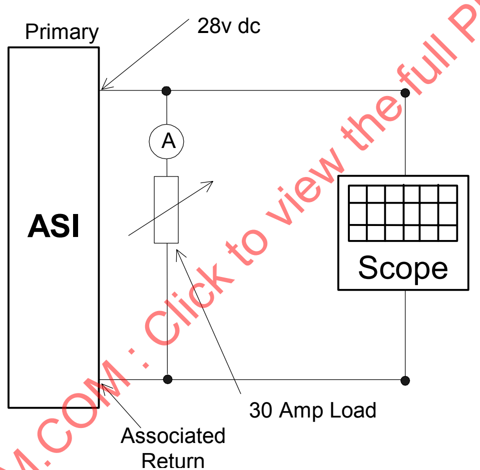


FIGURE DCP103

METHOD: DCP104

PARAMETER: 28 V DC Maximum Load Current (Primary)

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.8.3.1

PURPOSE: This method verifies that the aircraft is capable of sourcing the maximum 28 V DC load current levels required by the standard.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if:

At each primary ASI:

a. The 28 V DC #1 interface is capable of sourcing the maximum load current levels defined by MIL-STD-1760,
Figure 17 (Primary Interface Current Level).
b. The 28 V DC #2 interface is capable of sourcing the maximum load current levels defined by MIL-STD-1760,
Figure 17 (Primary Interface Current Level).
c. The combination of 28 V DC #1 and #2 interfaces can simultaneously source a total of 20 A continuously.

APPARATUS:

a. Voltmeter
b. Variable 10A current sink (2)
c. 10A ammeter (2)
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment, as required

VALIDATION METHOD:

Verification by analysis:

Use the aircraft's TDP to verify that each primary 28 V DCP is capable of sourcing the maximum load current levels defined by MIL-STD-1760, Figure 17 (Primary Interface Current Level).

Verification by test:

a. Place a current sink in series (set to max resistance) with an ammeter between 28 V DC #1 and 28 V DC #1 return and between 28 V DC #2 and 28 V DC #2 return.
b. Energize the primary 28 V DC interface. Adjust the current sinks in order to verify that individual and simultaneous current levels are achieved and the voltages are within the normal operation limits of MIL-STD-704.
c. Repeat 1 and 2 for all other primary ASI interfaces.

NOTES:

1. The initial high currents in excess of 10A shown in Figure 17 (Primary Interface Current Level) of MIL-STD-1760 are to be confirmed by analysis only.

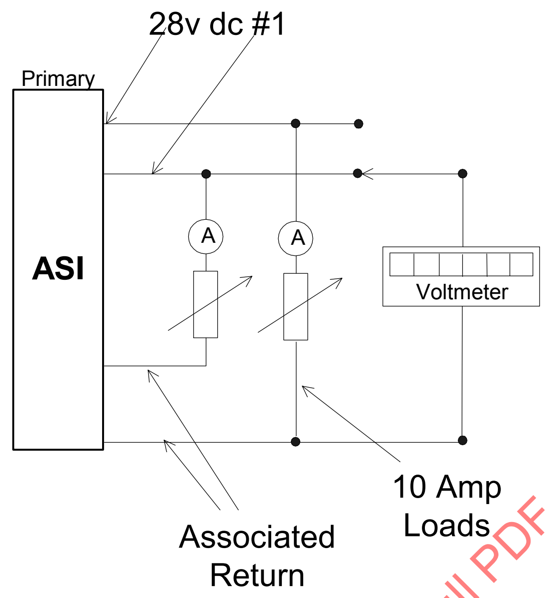


FIGURE DCP104

METHOD: DCP105

PARAMETER: 28 V DC Maximum Load Current (Auxiliary)

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.8.3.2

PURPOSE: This method verifies that the aircraft is capable of sourcing the maximum 28 V DC load current levels required by the standard.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if at each auxiliary ASI:

The 28 V DC interface is capable of sourcing the maximum load current levels defined by MIL-STD-1760, Figure 18 (Auxiliary Interface Current Level).

APPARATUS:

a. Voltmeter
b. 30A current sink
c. 30A ammeter
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment, as required

VALIDATION METHOD:

Verification by Analysis:

Use the aircraft's TDP to verify that each auxiliary 28V DCP is capable of sourcing the maximum load current levels defined by MIL-STD-1760, Figure 18 (Auxiliary Interface Current Level).

Verification by test:

a. Place the current sink in series (set to max resistance) with an ammeter between 28V DC and 28V DC return.
b. Energize the auxiliary 28V DC interface. Adjust the current sink in order to verify that current levels are achieved and the voltage is within the normal operation limits of MIL-STD-704. Repeat steps a) and b) for all other auxiliary ASI interfaces.

NOTES:

1. The initial high currents in excess of 30A shown in Figure 18 (Auxiliary Interface Current Level) of MIL-STD-1760 are to be confirmed by analysis only.

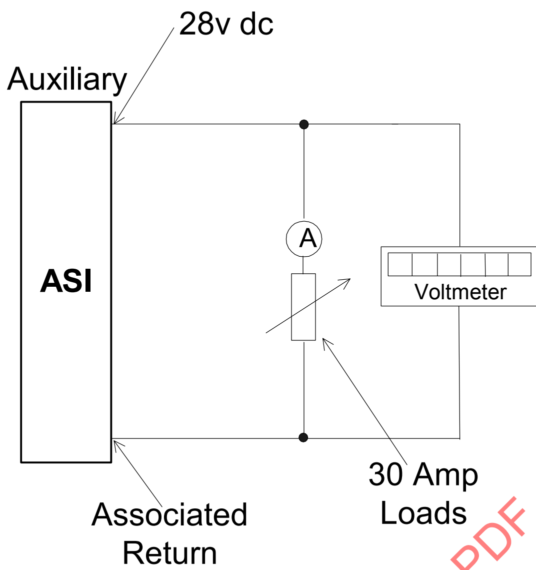


FIGURE DCP105

METHOD: DCP106

PARAMETER: Overcurrent Protection

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.8.4

PURPOSE: This method verifies that the aircraft will not exceed the maximum 28V DC overcurrent limits of the standard.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	( ) TEST	(X) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the current through each 28V DCP connection at each ASI does not exceed:

a. MIL-STD-1760, Figure 17 (Primary Interface Current Level) maximum overcurrent limits at each primary ASI
b. MIL-STD-1760, Figure 18 (Auxiliary Interface Current Level) maximum overcurrent limits at each auxiliary ASI

APPARATUS: N/A

VALIDATION METHOD: Verify, using the aircraft's TDP, that each 28V DC interface at every ASI is controlled by a circuit protection device that will trip before the maximum overcurrent levels of Figure 17 (Primary Interface Current Level) or Figure 18 (Auxiliary Interface Current Level) are reached.

NOTES:

1. Limited to analysis only due to possible damage to ASI's.

METHOD: DCP107

PARAMETER: Off-State Leakage Current

MIL-STD-1760C PARAGRAPH: 4.3, 5.1.8.5

PURPOSE: This method verifies that the aircraft off-state leakage current through each primary or auxiliary 28V DC interface at each ASI does not exceed limits of the standard.

PARAMETER TYPE:	(X) ELECTRICAL	( ) PROTOCOL	( ) PHYSICAL
VALIDATION TECHNIQUE:	(X) TEST	( ) ANALYSIS	( ) INSPECTION

VALIDATION CRITERIA: The aircraft is considered to have passed if the off-state leakage current does not exceed:

a. 1.0 mA through 28V DC #1 or 28 V DC #2 at any primary ASI
b. 2.5 mA through 28V DC at any auxiliary ASI

APPARATUS:

a. DV Multimeter
b. 2.2 ohm valid load resistor
c. 0.7 ohm valid load resistor
d. Test cabling connecting the test equipment to the ASI
e. Other ASI peculiar test equipment, as required

VALIDATION METHOD: With power removed from the ASI, place a 2.2 ohm resistor between 28V DC #1 and 28V DC #1 return, and between 28V DC #2 and 28V DC #2 return. Activate aircraft power (internal or external) but not selecting power to the ASI. Measure the voltage across each resistor and determine the leakage current flowing. Repeat for all primary ASI's. Repeat for all auxiliary ASI with a 0.7 ohm load resistor.

NOTES: N/A