PHOENIX
LOGISTICS
INC.

Data Bus Box Couplers
Requirements Document

DC-1002-A

Revision B

2507 W. Geneva Dr.
Tempe, Arizona 85282
Phone [602] 231-8616
FAX [602] 273-9135
www.phxlogistics.com

TABLE OF CONTENTS

1. Introduction

1.1. Scope. The scope of this document is to describe the design, performance and qualification test requirements of Phoenix Logistics, Inc. manufactured data bus box couplers with threaded and bayonet connectors utilized for connection into the data bus system, as equivalent to Raychem D-500-0255 series.

1.2. Description. Box couplers covered in this document are EMI-shielded, non-repairable assemblies, which are installed into a data bus system between the Bus and Stub cables. These couplers are designed to meet or exceed MIL-STD-1553B box couplers referenced in US Air Force Drawing 8340707. The box couplers are not environment resistant.

1.3. Connector mating accommodation. Box couplers specified in this document utilize the following connectors:

1.3.1. Threaded connectors, jack, pin or socket; reference Phoenix Logistics part numbers DB-0412-X (X= P (pin) or S (socket)), which mates with DB-0411-X.

1.3.2. Bayonet connectors, jack, pin or socket; reference Phoenix Logistics part numbers DB-0434-X (X= P (pin) or S (socket)) Interface A, which mates with DB-0433-X

DB-0436-X (X= P (pin) or S (socket)) Interface A, which mates with DB-0435-X

DB-0438-X (X= P (pin) or S (socket)) Interface C, which mates with DB-0437-X

DB-0440-X (X= P (pin) or S (socket)) Interface D, which mates with DB-0439-X

NOTE: See individual Box Coupler Data Sheet for connector contact configuration.

1.3.3. Capabilities exist to incorporate customer defined connectors into a customer or program specific box coupler design.

1.4. Classification.

1.4.1. Box couplers, Threaded coupling

1.4.2. Box couplers, Bayonet coupling

1.5. Material and Finishes.

1.5.1. Transformer: MIL-PRF-21038 and MIL-STD-1553B

1.5.2. Isolation Resistors: MIL-PRF-39007/9, 56.60 – 58.90 ohms, 1 Watt minimum, non inductive, or equivalent

1.5.3. Coupler Housing: Aluminum Alloy 6061-T651per MIL-DTL-32262; enamel painted per TT-E-527, gray per Fed-STD-595 #36321 over tin plating per ASTM B545 (mounting surface is not painted), or cold rolled steel per ASTM A1008; tin plating per ASTM B545.

1.5.4. Connectors: Per Phoenix Logistics, Inc. specification DB-1001-A

1.6. Temperature Range. Box Couplers covered in this specification are suitable for use over the temperature range -55° to +150° C. Operating temperature is the maximum temperature reached at any point as a result of electrical current and ambient temperature.

FIGURE 1

BOX COUPLER PART NUMBERING SYSTEM

DC - 0255 - 5 X X - X

Bus Bayonet Connector Arrangement
-1 Face
-2 Side

Note: Threaded is always -1

BUS Bayonet Connector Keying - OR - BUS Threaded Connector Arrangement

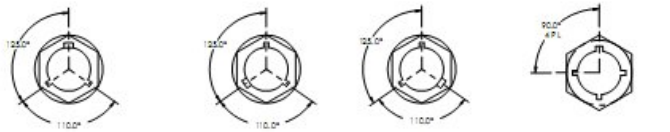
Keying	Connector Style
3 = "A"	Bayonet
5 = "B"	Bayonet
7 = "C"	Bayonet

Arrangement	Connector Style
1 = Face	Threaded
2 = Side	Threaded

STUB Connector Keying is always "D"

1-Face

2-Side



3=A RED 5=B WHITE 7=C GREEN 4=D N/A

JACK

Pin Contact
(PLI P/N: DB-0126)

Socket Contact
(PLI P/N: DB-0127)

See individual Data Sheet for Contact configurations.

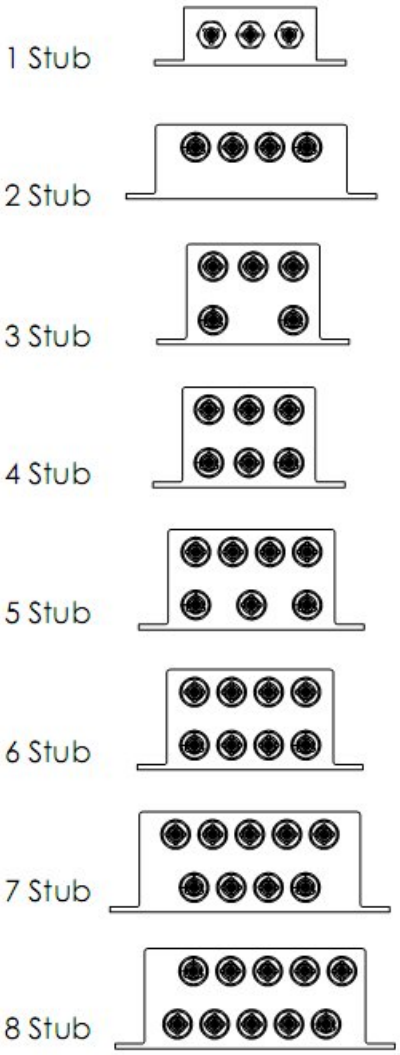
Number of Stubs
2 = 2 Stub
3 = 3 Stub
4 = 4 Stub
5 = 5 Stub
6 = 6 Stub
7 = 7 Stub
8 = 8 Stub

NOTE: Capabilities exist to incorporate customer defined connectors into a customer or program specific box coupler design.

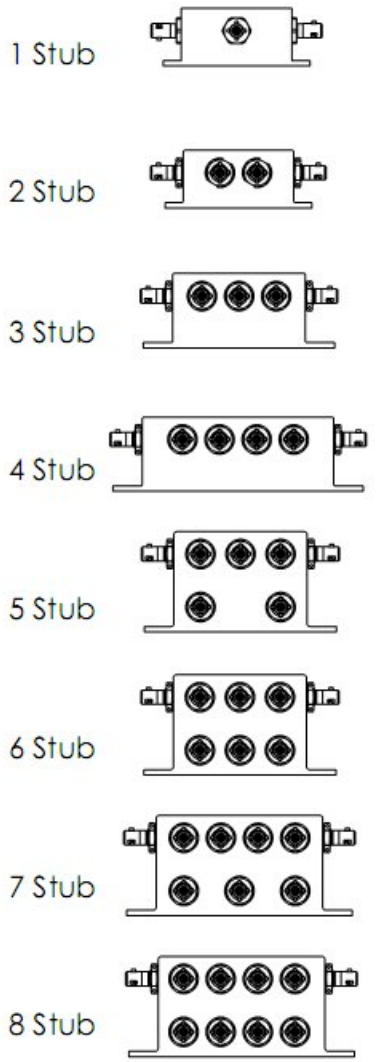
DB-Box Coupler

FIGURE 2

FACE BUS ARRANGEMENT CONFIGURATIONS



SIDE BUS ARRANGEMENT CONFIGURATIONS



2 Standards and Specifications

2.1 Order of Precedence. This document forms part of a specification to the extent specified herein. In the event that the requirements stated in this document conflict with the applicable drawing, the drawing shall take precedence. If this document and the referenced specifications or standards listed herein conflict, this document shall take precedence.

J-STD-004	Soldering Fluxes
J-STD-006	Electronic Grade Solder Alloys and Fluxed or Non-Fluxed Solid Solders
MIIL-DTL-32262	Armor Plate, Aluminum Alloy, Unweldable Applique 6061
ASTM A1008	Steel, Sheet, Cold Rolled
SAE-AMS-C-26074	Coatings, Electroless Nickel
ASTM B545	Coatings, Electrodeposited Tin
TT-E-527	Coatings, enamel, alkyd, lusterless, low VOC content
FED-STD-595C	Colors Used in Government Procurement
MIL-STD-1553B	Aircraft Internal Time Division Command/ Response Multiplex Data Bus
SAE AS 15531	Digital Time Division Command/ Response Multiplex Data Bus
USAF 8340707	MIL-STD-1553 Data Bus System Components
MIL-PRF-21038	Transformer, Pulse, Low Power
MIL-PRF-39007	Resistors, Fixed, Wire-Wound
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
ISO10012-1	Calibration System Requirements
ANSI/ASQ Z1.4	Sampling Procedure
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-HDBK-454	General Guidelines for Electronic Equipment

3 Requirements

3.1 Material Requirements. All materials used in the manufacture of box couplers shall be of quality and form best suited for the intended purpose.

3.1.1 Dissimilar Materials shall be in accordance with Guideline 16 of MIL-HDBK-454.

3.1.2 Materials and finishes for specific components of the couplers and terminators shall be as defined herein.

3.2 Design and Construction Requirements. Box couplers shall be designed to be non-repairable components, connectorized for inclusion into data bus harnesses. They shall consist of encapsulated transformers and resistors within an EMI shielded housing.

3.2.1 Weight, configuration, and dimensions. These attributes shall be as shown in the applicable box coupler specification drawing.

3.2.2 Interchangeability. All assemblies having the same part number shall be completely interchangeable with each other for both installation and performance.

3.3 Product Identification. Box couplers shall be labeled on an external surface with manufacturer name, part number, cage code, and serial number and/or date code. All marking shall be in accordance with MIL-STD-130 and shall remain legible after completion of all testing specified herein.

3.4 Workmanship. Box couplers shall be processed to be uniform in quality and shall be free from defects that would adversely affect life or performance.

3.5 Performance Requirements. Box coupler assemblies shall conform to the requirements specified herein and the applicable box coupler specification drawing. Room temperature shall be 25 ± 5 ˚C unless otherwise specified.

ELECTRICAL TESTS; INTERNAL COMPONENTS

3.5.1 Transformer Turns Ratio. When tested as specified in 4.7.2 the turns ratio of the transformer shall meet the requirements of MIL-STD-1553B, paragraph 4.5.1.5.1.1.

3.5.2 Transformer Input Impedance. When tested as specified in 4.7.3 the input impedance of the transformer shall meet the requirements of MIL-STD-1553B, paragraph 4.5.1.5.1.1.1

3.5.3 Transformer Waveform Integrity. When tested as specified in 4.7.4 the waveform integrity of the transformer shall meet the requirements of MIL-STD-1553B, paragraph 4.5.1.5.1.1.2.

3.5.4 Transformer Common Mode Rejection. When tested as specified in 4.7.5 the common mode rejection of the transformer shall meet the requirements of MIL-STD-1553B, paragraph 4.5.1.5.1.1.3.

ELECTRICAL TESTS; COUPLER

3.5.5 Electrical Performance Test. When tested as specified in 4.7.6 there shall be no detected errors. This test may be used instead of discontinuity monitoring during environmental testing.

3.5.6 Dielectric Withstanding Voltage. When tested as specified in 4.7.7 there shall be no arcing or breakdown between each contact and the connector body or between Bus and Stub center and outer contacts.

3.5.7 Insulation Resistance. When tested as specified in 4.7.8 the insulation resistance between each contact and the connector body shall be 1000 M Ohms minimum.

3.5.8 Surface Transfer Impedance. When tested as specified in 4.7.9 the surface transfer impedance shall be equal to or less than 14 milliohms per meter over the frequency range of 1 MHz – 30 MHz.

3.5.9 Stub Min/Max Voltage. When tested as specified in 4.7.10 the voltage on the coupler Stub shall be 1.0 -14.0 V p-p.

ENVIRONMENTAL TESTS: Box coupler test specimens shall be interconnected with cable into data bus networks in order that correct function of the components can be verified during environmental exposure. Mating connectors shall be torqued to the specified value and of the same environmental resistance and finish as those of the box coupler connectors. Following each environmental test box coupler test specimens shall be visually examined without magnification for any evidence of damage that could impair proper functioning.

3.5.10 Thermal Shock (-65 ˚C to +150 ˚C). When tested as specified in 4.7.11 there shall be no evidence of functional damage. There shall be no discontinuities during the test and test specimen shall pass electrical performance test requirements at both high and low temperatures.

3.5.11 Temperature Altitude. When tested as specified in 4.7.12 there shall be no discontinuities during the test, and there shall be no evidence of functional damage.

3.5.12 Sinusoidal Vibration (0.06-in double amplitude). When tested as specified in section 4.7.13 there shall be no electrical discontinuities greater than 1 microsecond during the test and no visual evidence of functional damage.

3.5.13 Random Vibration (34g rms). When tested as specified in section 4.7.14 there shall be no electrical discontinuities greater than 1 microsecond during the test and no visual evidence of functional damage.

3.5.14 Mechanical Shock (100g, 11 msec). When tested as specified in section 4.7.15 there shall be no electrical discontinuities greater than 1 microsecond during the test and no visual evidence of functional damage.

4 Quality Assurance

4.1 Responsibility. Phoenix Logistics, Inc. shall be ultimately responsible for performance of all inspection requirements as specified herein. Inspection records shall be kept complete and available to the buyer as specified in the contract or order.

4.1.1 A contracted testing facility may be utilized for any or all qualification test requirements stated in this document as specified in the contract or purchase order to the contracted testing facility. The contracted testing facility may use its own or any other suitable testing facilities. Test records shall be kept complete and available to Phoenix Logistics, Inc. as specified in the contract or order.

4.2 Calibration. A calibration system in accordance with ISO 10012-1shall be utilized on all test and measurement equipment to control the accuracy of the tests performed.

4.3 Material Inspection. Unless otherwise specified, Phoenix Logistics, Inc. will maintain materials inspection and control, consisting of certification that the materials used are in accordance with the applicable engineering control drawing, prior to the assembly of the box couplers.

4.4 Acceptance Inspection. Shall be performed as indicated in Table 1 on every lot manufactured. In-process inspection may be used to fulfill acceptance inspections.

4.4.1 Acceptance Inspection shall be performed using sampling inspection per ANSI/ASQ Z1.4 as indicated in Table 1.

4.4.1.1 Rejected lots may be reworked or replaced and be resubmitted. Resubmitted lots shall be inspected using tightened inspection. Resubmitted lots shall include records of details of the rejection and action taken.

4.4.1.2 Inspection data shall be kept on record and be available for customers.

Table 1: Acceptance Inspections

Inspection / Test	Requirement Paragraph	Method Paragraph	Inspection Level *	AQL *
Material Requirements	3.1	4.7.1	II	1.0
Design & Construction	3.2	4.7.1	II	1.0
Product Identification	3.3	4.7.1	II	1.0
Workmanship	3.4	4.7.1	II	1.0
Electrical Performance Test	3.5.5	4.7.6	100%	100%
Dielectric Withstanding Voltage	3.5.6	4.7.7	100%	100%
Insulation Resistance	3.5.7	4.7.8	100%	100%
Stub Min/Max Voltage	3.5.9	4.7.10	100%	100%

*Per ANSI/ASQC Z1.4

4.5 Qualification Inspection. Items furnished under this specification shall be products that are qualified to this specification by testing, by engineering analysis, by similarity to already qualified product, or by a combination of these methods.

4.5.1 Testing shall be performed as defined in Table 2, in the order shown. To determine order – go to the Test Specimen Group columns first, and then perform each test for that Test Specimen Group in the order of the numbers listed.

4.5.2 Qualification Test Specimens. Sufficient test specimens shall be selected to enable performance of all qualification tests listed. They shall be representative of product produced under normal production processes and equipment.

4.6 Qualification Test Report (QTR). Qualification testing is documented in Qualification Test Report D15246, and is available upon request.

Table 2: Qualification Inspection; List and Performance Sequence

Requirement Paragraph	Procedure Paragraph	Examination or Test	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
			Specimens Tested & Sequence					
3.1	4.7.1	Material Requirements	1		N/A	N/A	N/A	N/A
3.2	4.7.1	Design & Construction	2	1				
3.3	4.7.1	Product Identification	3	2				
3.4	4.7.1	Workmanship	4	3				
3.5.1	4.7.2	Transformer Turns Ratio	5					
3.5.2	4.7.3	Transformer Input Impedance	6					
3.5.3	4.7.4	Transformer Waveform Integrity	7					
3.5.4	4.7.5	Transformer Common Mode Rejection	8					
3.5.5	4.7.6	Electrical Performance Test	9	4				
3.5.6	4.7.7	Dielectric Withstanding Voltage	10	5				
3.5.7	4.7.8	Insulation Resistance	11	6				
3.5.8	4.7.9	Surface Transfer Impedance	12					
3.5.9	4.7.10	Stub Min/Max Voltage	13					
3.5.10	4.7.11	Thermal Shock	14					
3.5.11	4.7.12	Temperature Altitude		7				
3.5.12	4.7.13	Sinusoidal Vibration	15					
3.5.13	4.7.14	Random Vibration	16					
3.5.14	4.7.15	Mechanical Shock (Specified Pulse)	17					

4.7 METHODS OF INSPECTION

4.7.1 Material, Design & Construction, Product ID & Workmanship (3.1 - 3.4). Box couplers shall be examined to verify that the material, design & construction, product ID, and workmanship are in accordance with the requirements specified herein and the applicable engineering control drawings.

4.7.2 Transformer Turns Ratio (3.5.1). Testing shall be performed in accordance with MIL-PRF-21038. Transformer turns ratio shall be 1:1.41 ± 3% and the polarity of the transformer. During testing the output shall be between 0.6880 and 0.7300, with 0.7090 being nominal and the output voltage shall have the same instantaneous polarity as the input voltage, be in phase.

4.7.3 Transformer Input Impedance (3.5.2). Testing shall be performed in accordance with MIL-PRF-21038. Transformer input impedance shall be greater than 3000 Ohms.

4.7.4 Transformer Waveform Integrity (3.5.3). Testing shall be performed in accordance with MIL-PRF-21038. Transformer output waveform integrity shall be verified and shall include waveform droop, overshoot, and ringing. Droop shall be 20% max and Overshoot/Ringing shall be less than +/-1.0 V.

4.7.5 Transformer Common Mode Rejection (3.5.4). Testing shall be performed in accordance with MIL-PRF-21038. Transformer common mode rejection ratio shall be greater than 45 dB at 1 MHz

4.7.6 Electrical Performance (3.5.5). Testing shall be performed utilizing a network tester that includes normal transmission testing using simulated 1553 data bus signals, testing for phase throughout the network, measuring insertion loss, testing for continuity on Bus and Stubs, and detecting shorts between conductors, conductors and shields, or bus terminating resistors.

4.7.7 Dielectric Withstanding Voltage (3.5.6). Testing shall be performed in accordance with MIL-STD-202, Method 301. Apply 500 VAC between each contact and outer body for one minute. Apply 100 VAC between bus and stub center and outer contacts for one minute.

4.7.8 Insulation Resistance (3.5.7). Testing shall be performed in accordance with MIL-STD-202, Method 302, Condition B. Measure resistance between each contact and outer body and between Bus and Stub center and outer contacts.

4.7.9 Surface Transfer Impedance (3.5.8). Testing shall be performed in accordance with SAE AS85485. Assemble a box coupler test specimen measuring four feet overall (including box coupler and attached cables), with the coupler approximately centered. Prepare ends of the attached cables as detailed in SAE-AS85485, paragraph 4.7.24.2.

4.7.10 Stub Min/Max Voltage (3.5.9). A 77 Ω terminator shall be mated to one of the bus connectors. Minimum and maximum voltage signals shall be applied to one of the stub connectors. Voltage shall be measured at the opposite bus connector across a 77 Ω resistor.

4.7.10.1 Minimum Voltage: Apply an 18 V p-p at 250 kHz signal, measure the bus output voltage. Adjust waveform to 1MHz and repeat the measurement.

4.7.10.2 Maximum Voltage: Apply a 27 V p-p at 250 kHz signal, measure the bus output voltage. Adjust waveform to 1MHz and repeat the measurement.

4.7.11 Thermal Shock (3.5.10). Testing shall be performed in accordance with MIL-STD-202, Method 107, Condition F. During testing the specimen shall be monitored for discontinuities greater than 1 microsecond and shall have electrical performance testing at both high and low temperatures.

4.7.12 Temperature Altitude (3.5.11). Box couplers shall be exposed to the conditions detailed in Table 3.

Table 3: Temperature Altitude Conditions

Step	Temp (˚C)	Altitude (ft)	Duration (hrs)
1	-65	Site	2.0
2	-54	Site	*
3	-54	70,000	*
4	-10	Site	*
5	95	Site	16.0
6	71	Site	4.0
7	95	Site	0.5
8	36	50,000	4.0
9	60	50,000	0.5
10	10	70	4.0
11	35	70	0.5

* Duration sufficient to allow temperature stabilization.

4.7.13 Sinusoidal Vibration (3.5.12). Testing shall be performed in accordance with MIL-STD-202, Method 201, except that the frequency limits shall be 5 and 50 Hz. During testing the specimen shall be monitored for discontinuities greater than 1 microsecond.

4.7.14 Random Vibration (3.5.13). Testing shall be performed in accordance with MIL-STD-202, Method 214, Test Condition II, Test Letter H, for 8 hours in each of the three perpendicular axes. During testing the specimen shall be monitored for discontinuities greater than 1 microsecond.

4.7.15 Mechanical Shock (Specified Pulse) (3.5.14). Testing shall be performed in accordance with MIL-STD-202, Method 213, Condition C. During testing the specimen shall be monitored for discontinuities greater than 1 microsecond.