



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 1 of 13
--	----------------	--

**MIL-STD-1553B Multiplex Data Bus Spliced-In Couplers and Terminators**

**1.0 Introduction**

**1.1 Scope**

This specification covers Tyco Electronics MIL-STD-1553B multiplex data bus spliced-in couplers and terminators with shielded twisted pair, data bus cables.

**1.2 Description**

Items covered by this specification are EMI-shielded, environmentally-sealed, non-repairable assemblies, which are installed as integral parts of a data bus harness.

**1.3 Classification**

These items are classified as follows:

- Couplers, including types with integral terminators
- Terminators

**1.4 Intended use**

Data bus couplers covered by this specification provide fault isolation by transformer coupling with isolation resistors between data bus cables and stub cables connected to remote terminals. Data bus terminators covered by this specification provide matched impedance termination at each end of a data bus cable. These products may be used in applications where the maximum hot spot temperature while operating does not exceed the rated operating temperature of the coupler or terminator.

**1.5 US Air Force Drawings**

These couplers and terminators are designed to meet or exceed the requirements for MIL-STD-1553B couplers and terminators referenced in US Air Force Drawing 8340707.

**1.6 European Specifications**

Some couplers covered by this specification are designed to comply with the requirements of EN 3567.



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 2 of 13
--	----------------	--

**2.0 Applicable Documents**

**2.1 Issues of Documents**

The following documents form a part of this specification to the extent specified herein. This specification takes precedence over the referenced documents.

**2.2 Referenced Documents**

**2.2.1 Military Specifications**

- MIL-H-5606 Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance
- MIL-DTL-5624 Turbine Fuel, Aviation, Grades JP-4, JP-5 and JP-5/JP-8 ST
- MIL-PRF-7808 Lubricating Oil: Aircraft Turbine Engine, Synthetic Base, NATO Code Number 0-148
- MIL-C-85485 Cable, Electric, Filter Line, Radio Frequency Absorptive

**2.2.2 Military Standards**

- MIL-STD-129 Marking for Shipment and Storage
- MIL-STD-202 Test Methods for Electronic and Electrical Component Parts
- MIL-HDBK-454 Standard General Guidelines for Electronic Equipment
- MIL-STD-810 Test Methods and Engineering Guidelines
- MIL-STD-1344 Test Methods for Electrical Connectors
- MIL-STD-1553 Aircraft Internal Time Division Command/Response Multiplex Data Bus

**2.2.3 US Air Force Drawings**

- 8340707 MIL-STD-1553B Data Bus System Components

**2.2.4 American Society for Testing and Materials (ASTM) Documents**

- D-1655 Aviation Turbine Fuels (Type Jet A-1)

**2.2.5 American National Standards Institute**

- ANSI/ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

**2.2.6 AECMA Documents**

- EN 3567 Aerospace series Couplers for use in multiplex data bus systems in accordance with STANAG 3838

**2.2.7 ISO Documents**

- ISO 10012-1 Quality Assurance Requirements for Measuring Equipment, Part 1.

**2.2.8 Tyco / Electronics (Raychem Wire & Harnessing) Specifications**

- D-6029 Final Electrical Tests for MIL-STD-1553B Multiplex Data Bus Couplers, Terminators, and Harnesses



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 3 of 13
--	----------------	--

**3.0 Requirements**

**3.1 Specification Control Drawings**

The requirements for individual items under this specification shall be as specified herein and in the applicable specification control drawing. In the event of conflict between the requirements of this specification and those of the specification control drawing, the latter shall govern.

**3.2 Classification of Requirements**

The requirements for these products are classified herein as follows:

<b>Requirement</b>	<b>Paragraph</b>
Qualification	3.3
Materials	3.4
Design and Construction	3.5
Performance	3.6
Product Identification	3.7
Workmanship	3.8

**3.3 Qualification**

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

**3.4 Materials Requirements**

All materials used in the manufacture of these products shall be of the quality and form best suited for the purpose intended.

**3.4.1 Dissimilar Metals**

When dissimilar metals are used in intimate contact with each other, protection against electrolytic corrosion shall be provided as specified in MIL-HDBK-454, Guideline 16.

**3.4.2 Fungus Resistance**

Finishes and materials shall be fungus-inert in accordance with MIL-HDBK-454, Guideline 4 (Fungus growth rating of 0 or 1), and encompassing the fungus species listed in MIL-STD-810, Method 508.



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 4 of 13
--	----------------	--

**3.4.3 Component Materials**

Materials for specific components of these items shall be as shown in the applicable specification control drawings.

**3.5 Design and Construction Requirements**

Couplers and terminators are designed and constructed to withstand handling during installation and maintenance. They shall consist of electrical components, within an EMI-shielded housing, environmentally-sealed or with an environmentally sealed cover, and attached data bus cables.

**3.5.1 Weight, Configuration and Dimensions**

Weight, configuration, and dimensions of couplers and terminators shall be as shown in the applicable specification control drawings.

**3.5.2 Interchangeability**

All items having the same part number shall be completely interchangeable with each other in regard to installation and performance.

**3.6 Performance Requirements**

Couplers and terminators shall conform to the requirements specified herein and in the applicable specification control drawing. Unless otherwise specified, room temperature shall be 25±5°C. The nominal characteristic impedance of the databus cable is 77-Ohm.

**3.6.1 Electrical Tests**

**3.6.1.1 Internal Components**

When tested in accordance with 4.5.3.1 components used in the construction of DataBus couplers and terminators shall meet the following requirements as specified by MIL-STD-1553:

Transformers:	Turns Ratio Input Impedance Waveform Integrity Common Mode Rejection
Isolation Resistors:	Resistance
Termination Resistors:	Resistance



*Electronics*

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 5 of 13
--	----------------	--

**3.6.1.2 Finished Couplers and Terminators**

When tested in accordance with 4.5.3.2 finished couplers and terminators shall meet the requirements of Specification D-6029.

**3.6.1.3 Functional Test**

Functional testing shall consist of transmitting MIL-STD-1553B words between one stub and another of a single coupler or a group of couplers in accordance with 4.5.3.3. No detected errors shall be allowed. This functional test may be used instead of discontinuity monitoring during environmental testing.

**3.6.1.4 Voltage Withstand**

**3.6.1.4.1 Signal Circuits to Shield**

When specimens are tested as specified in 4.5.3.4.1, there shall be no arcing or breakdown between each conductor and shield of attached cables or between bus and stub signal conductors.

**3.6.1.4.2 Shield to Water Bath**

When specimens are tested as specified in 4.5.3.4.2, there shall be no arcing or breakdown between the cable shield and the water bath in which the specimen is immersed. This test is not applicable to couplers with a mounting eyelet that is electrically connected to the EMI case.

**3.6.1.5 Insulation Resistance**

**3.6.1.5.1 Signal Circuits to Shield**

When specimens are tested as specified in 4.5.3.5.1, the insulation resistance between each conductor and shield of attached cables shall be 100 megohms minimum.

**3.6.1.5.2 Shield to Water Bath**

When specimens are tested as specified in 4.5.3.5.2, the insulation resistance between the cable shield and the water bath in which the specimen is immersed shall be 1000 megohms minimum. This test is not applicable to couplers with a mounting eyelet that is electrically connected to the EMI case.



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 6 of 13
--	----------------	--

**3.6.1.6 EMI Shielding Effectiveness (Surface Transfer Impedance)**

When specimens are tested as specified in 4.5.3.6, the surface transfer impedance shall not exceed the limits shown in Table 1.

**Table 1: Surface Transfer Impedance**

Attached Cable Shield Style	USAF Drawing 8340707 Class	Maximum Zt @ 1 MHz (milliohms / meter)
Single Braid	A or B	Not required
Optimized Single Braid	C	50
Optimized Double Braid	D	10
EMP Hardened	E	1.0

**3.6.2 Environmental Tests**

Couplers and terminators shall be able to meet the functional test requirements of 3.6.1.3 and the voltage withstand requirements of 3.6.1.4 after any of the environmental tests referenced below.

**3.6.2.1 Thermal Cycling (-65°C to max rated temperature)**

When specimens are tested as specified in 4.5.4.1, there shall be no visual evidence of functional damage. Specimens shall exhibit no discontinuities during the test and shall pass the functional test requirement of 3.6.1.3 at both high and low temperatures.

**3.6.2.2 Altitude Immersion (75,000 ft)**

When specimens are tested as specified in 4.5.4.2, there shall be no visual evidence of functional damage, and specimens shall meet the insulation resistance requirements of 3.6.1.5 following the altitude immersion conditioning.

**3.6.2.3 Moisture Resistance (10 day cyclic humidity)**

When specimens are tested as specified in 4.5.4.3, there shall be no visual evidence of functional damage, and specimens shall meet the insulation resistance requirements of 3.6.1.5 following the moisture conditioning.

**3.6.2.4 Salt Spray (1000 hrs)**

When specimens are tested as specified in 4.5.4.4, there shall be no visual evidence of functional damage.



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 7 of 13
--	----------------	--

**3.6.2.5 Sinusoidal Vibration (0.06-in double amplitude)**

When specimens are tested as specified in 4.5.4.5, there shall be no visual evidence of functional damage and no electrical discontinuities greater than 1 microsecond during the vibration conditioning.

**3.6.2.6 Random Vibration (34g rms)**

When specimens are tested as specified in 4.5.4.6, there shall be no visual evidence of functional damage and no electrical discontinuities greater than 1 microsecond during the vibration conditioning.

**3.6.2.7 Mechanical Shock (100g, 6 msec)**

When specimens are tested as specified in 4.5.4.7, there shall be no visual evidence of functional damage and no electrical discontinuities greater than 1 microsecond during the shock test.

**3.6.2.8 Fluids Resistance (39°C and 135°C)**

When specimens are tested as specified in 4.5.4.8, there shall be no visual evidence of functional damage.

**3.6.3 Post Test Examination**

When specimens are visually examined as specified in 4.5.5 after the performance of any of the Environmental Tests of 3.6.2, any evidence of damage that could impair proper functioning shall constitute failure.

**3.7 Product Identification**

Couplers and terminators shall be labeled on an external surface with the appropriate part number, lot number or serial number, and the brand name or manufacturers name. All marking shall remain legible after completion of the tests specified herein. Couplers that are subsequently fabricated into harnesses are not required to be individually marked.

**3.8 Workmanship**

Couplers and terminators shall be processed in such a manner as to be consistent in quality; they shall be free from defects that would adversely affect life or performance.

**4.0 Quality Assurance Provisions**

**4.1 Responsibility for Inspection**

Tyco Electronics is responsible for the performance of all inspection tests specified herein. Tyco Electronics may utilize its own or any other suitable testing facility. Inspection records of the tests shall be kept complete and available.



**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: <b>C</b> Date: <b>October 19, 2001</b> Page: <b>8 of 13</b>
--	----------------	---

**4.1.1 Test Equipment and Inspection Facilities**

Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained. A calibration system to control the accuracy of the measuring and test equipment shall be maintained in accordance with ISO 10012-1.

**4.2 Classification of Inspections**

The examination and testing of items covered by this specification shall be classified as follows:

- a. Qualification inspection (See paragraph 4.3).
- b. Acceptance inspection (See paragraph 4.4).

**4.3 Qualification Inspection**

Qualification inspection shall consist of all of the tests in Table II. Environmental tests may be performed on individual couplers or a part of a test sequence.

**Table II. Qualification Inspection**

Test Sequence	Requirement Paragraph	Procedure Paragraph
<b>Examinations</b>		
Specification Control Drawings	3.1	4.5.2
Material	3.4	4.5.2
Design & Construction	3.5	4.5.2
Post Test Examination	3.6.3	4.5.5
Product Identification	3.7	4.5.2, 4.5.5
Workmanship	3.8	4.5.2
<b>Electrical Tests</b>		
Internal Components	3.6.1.1	4.5.3.1
Finished Couplers and Terminators	3.6.1.2	4.5.3.2
Functional Tests	3.6.1.3	4.5.3.3
Insulation Resistance	3.6.1.4	4.5.3.4
Dielectric Strength	3.6.1.5	4.5.3.5
EMI Shielding Effectiveness	3.6.1.6	4.5.3.6
<b>Environmental Tests</b>		
Temperature Shock	3.6.2.1	4.5.4.1
Altitude Immersion	3.6.2.2	4.5.4.2
Humidity	3.6.2.3	4.5.4.3
Salt Spray	3.6.2.4	4.5.4.4
Sinusoidal Vibration	3.6.2.5	4.5.4.5
Random Vibration	3.6.2.6	4.5.4.6
Mechanical Shock	3.6.2.7	4.5.4.7
Fluid Resistance	3.6.2.8	4.5.4.8

**4.3.1 Qualification Test Samples**

Sufficient samples shall be selected to enable the performance of all qualification tests.





**Electronics**

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 9 of 13
--	----------------	--

**4.3.2 Qualification Test Report**

The qualification test report shall provide evidence that the products meet all applicable specification requirements and shall be available to purchasers of couplers or terminators.

**4.4 Acceptance Inspection**

Acceptance inspection shall consist of the tests listed in Table III. Acceptance inspection shall be performed on every lot of items manufactured under this specification. In-process inspection may be conducted in fulfillment of acceptance inspection where appropriate.

**Table III. Acceptance Inspection**

<b>Test</b>	<b>Requirement Paragraph</b>	<b>Procedure Paragraph</b>	<b>Inspection Level*</b>	<b>AQL *</b>
Visual examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2	II	1%
Finished Couplers & Terminators	3.6.1.2	4.5.3.2	100%	-

\*Inspection Level and AQL per ANSI/ASQC Z1.4

**4.4.1 Rejected Lots**

If an inspection lot is rejected, the lot shall be replaced, or the defective units shall be reworked to correct the defect or screened out. If the lot is reworked or the defective units are screened out, the lot shall be resubmitted for inspection. Resubmitted lots shall be inspected using tightened inspection in accordance with MIL-STD-105. Before resubmitting, full particulars concerning the rejection and the action taken to correct the defect shall be recorded.

**4.4.2 Examination of Preparation for Delivery**

Preparation for delivery of material ready for shipment shall be examined to determine compliance with the requirements of Section 5.

**4.5 Test Procedures**

**4.5.1 Test Conditions**

Unless otherwise specified, all tests shall be performed at ambient temperature, pressure, and relative humidity as specified in the general requirements of MIL-STD-810.

**4.5.1.1 Water Solution**

Whenever immersion in a water solution is specified, the solution shall contain sufficient sodium chloride to make the solution conductive, unless otherwise specified in the test procedure.



*Electronics*

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 10 of 13
--	----------------	---

**4.5.2 Visual Examination**

Samples shall be visually examined to ensure conformance with 3.1, 3.4, and 3.5, 3.7 and 3.8 of this specification.

**4.5.3 Electrical Tests**

**4.5.3.1 Internal Components (see 3.6.1.1)**

Internal component measurements shall be made in accordance with MIL-STD-1553B and Specification D-6029.

**4.5.3.2 Finished Couplers and Terminators (see 3.6.1.2)**

Finished component measurements shall be made in accordance with Specification D-6029.

**4.5.3.3 Functional Test (see 3.6.1.3)**

This equipment for this test shall consist of a device capable of transmitting valid MIL-STD-1553B words and a device for receiving MIL-STD 1553B words. The receiving device shall be capable of detecting that each word has a valid sync field, that all bits are a valid Manchester II Code; and that word parity is odd. The number of good words received and the number of words containing errors received shall be recorded on counters. For this test bus lines shall be terminated with standard termination resistances.

**4.5.3.4 Voltage Withstand**

**4.5.3.4.1 Signal Circuits to Shield (see 3.6.1.4.1)**

Test the specimens in accordance with MIL-STD-202, Method 301. Apply a test voltage of 500 V ac for one minute between each conductor and the shield of attached cables. Apply a test voltage of 100 V ac for 1 minute between bus and stub conductors of attached cables.

**4.5.3.4.2 Shield to Water Bath (see 3.6.1.4.2)**

Immerse the specimen in a water bath such that 6-inch at the end of each cable is above the water. Test the specimens in accordance with MIL-STD-202, Method 301. Apply a test voltage of 500 V ac for one minute between each the water bath and the shield of attached cables.



*Electronics*

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 11 of 13
--	----------------	---

4.5.3.5 **Insulation Resistance**

4.5.3.5.1 **Signal Circuits to Shield (see 3.6.1.5.1)**

Test the specimens in accordance with MIL-STD-202, Method 302. Use Test Condition B (500 Volts DC). Measure insulation resistance between the bus and stub conductors and the shield of attached cables.

4.5.3.5.2 **Shield to Water Bath (see 3.6.1.5.2)**

Immerse the specimen in a water bath such that 6-inch at the end of each cable is above the water. Test the specimens in accordance with MIL-STD-202, Method 302. Use Test Condition B (500 Volts DC). Measure insulation resistance between the cable shield and the water bath in which the specimen is immersed.

4.5.3.6 **EMI Shielding Effectiveness {Surface Transfer Impedance} (see 3.6.1.6)**

Test the specimens in accordance with MIL-C-85485. The test specimen shall consist of a cable assembly with a modified coupler installed near the center. The modified coupler shall be prepared by cutting off the stub cable near the coupler and enclosing the cut end by the shield.

4.5.4 **Environmental Tests**

4.5.4.1 **Thermal Cycling (see 3.6.2.1)**

Test the specimens in accordance with MIL-STD-202, Method 107, Test Condition B or F, according to the maximum rated temperature of the part. During the test the specimen shall be monitored for discontinuities in excess of 1 microsecond. Couplers shall be functionally tested at high and low temperatures.

4.5.4.2 **Altitude Immersion (see 3.6.2.2)**

Test the specimens in accordance with MIL-STD-1344, Method 1004. Test connectors and at least 6-inch of attached cable shall be kept out of the water bath.

4.5.4.3 **Moisture Resistance (see 3.6.2.3)**

Test the specimens in accordance with MIL-STD-202, Method 106, omitting Step 7b and Paragraph 3.6.

4.5.4.4 **Salt Spray (see 3.6.2.4)**

Test the specimens in accordance with MIL-STD-202, Method 101. The exposure time shall be 1000 hrs.

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 12 of 13
--	----------------	---

4.5.4.5 **Sinusoidal Vibration (see 3.6.2.5)**

Test the specimens in accordance with MIL-STD-202, Method 201, using the frequency range of 5 to 50 Hertz. During the test the specimen shall be monitored for discontinuities in excess of 1 microsecond.

4.5.4.6 **Random Vibration (see 3.6.2.6)**

Test the specimens in accordance with MIL-STD-202, Method 214, Test Condition II, Test Letter H, for 8 hours in each of three mutually perpendicular directions. During the test the specimen shall be monitored for discontinuities in excess of 1 microsecond.

4.5.4.7 **Mechanical Shock (see 3.6.2.7)**

Test the specimens in accordance with MIL-STD-202, Method 213, Test Condition C. During the test the specimen shall be monitored for discontinuities in excess of 1 microsecond.

4.5.4.8 **Fluid Resistance (see 3.6.2.8)**

The specimens shall be conditioned for 30 minutes in an oven at the temperature specified. And then immersed in fluid for 5 minutes at room temperature. After immersion the specimen shall be drained for 1 hour at room temperature. This shall comprise 1 cycle. Each specimen shall be subjected to 3 cycles.

**Table IV. Fluids Resistance Test**

<b>Test Fluid</b>	<b>Conditioning Temperature</b>
Coolanol 25 *coolant	+135°C
JP-8 jet fuel (MIL-DTL-5624)	+39°C
JP-5 jet fuel (MIL-DTL-5624)	+39°C
JET-A1 fuel	+39°C
MIL-H-5606 hydraulic fluid	+135°C
MIL-PRF-7808 lubricating oil	+135°C

\*Synthetic Silicate Ester Base Dielectric Fluid



*Electronics*

Tyco Electronics Corporation 300 Constitutional Drive Menlo Park, CA 94025 USA DCR# T-30160	<b>Raychem</b>	No: <b>D-6020</b> Rev: C Date: October 19, 2001 Page: 13 of 13
--	----------------	---

4.5.5 **Post Test Examination (see 3.6.3)**

Visually examine the specimens at 3X magnification for any evidence of damage that could impair proper functioning.

**5.0 Preparation For Delivery**

5.1 **Packaging and Packing**

If not otherwise specified in the procurement document, packaging and packing shall be in accordance with commercial practice.

5.2 **Marking**

Unless otherwise specified, packages shall be marked in accordance with MIL-STD-129.