

**Final Electrical Tests for
MIL-STD-1553B Multiplex DataBus
Couplers, Terminators, and Harnesses**

1. Introduction**1.1 Scope**

This specification provides the final electrical test requirements for couplers, terminators, and harnesses, and harness segments designed to carry MIL-STD-1553B signals.

1.2 Description

These harnesses are described by detailed Specification Control Drawings. They are further defined by Bills of Material. The harnesses are constructed primarily from Raychem components, but they may contain components supplied by other manufacturers.

1.3 Purpose

The purpose of this specification is to define a set of tests that are designed to locate manufacturing defects that occurred during the assembly of the harness. These defects include open circuits, short circuits, phase reversals, and insulation damage. The tests described below also ensure that the couplers or harnesses will carry MIL-STD-1553B signals. These tests will not usually detect components with minor deviations from the MIL-STD-1553B parameters.

2. Safety**2.1 End Product**

Harnesses covered by this specification usually contain lead-based solders. No hazardous products are emitted during conditions of use or reasonable misuse

2.2 Fabrication

Harness fabrication will usually require soldering operations. Provide adequate ventilation and fume extraction.

2.3 Testing

Portions of harness testing involves the application of high voltages to the harnesses. Provide adequate safeguards to ensure operator safety.

3. Requirements

3.1 Detail Drawings

Specification Control Drawings define the requirements for harnesses covered by this specification. Bills of Materials provide a list of components to be used in fabricating the coupler or harness.

3.2 Conflicting Requirements

This specification, detail drawings and referenced documents may contain conflicting requirements. In such cases the order of precedence is:

First	Detail drawings
Second	This specification
Third	Referenced documents

3.3 Qualification

Harnesses furnished under this specification shall be constructed from materials and components that are qualified to the appropriate component specifications. Fabricators of these harnesses must demonstrate the ability to produce harnesses that comply with the environmental performance requirements of Raychem Specifications D-6020, D-6021, and D-6025.

3.4 Materials Requirements

Harnesses must be manufactured using materials and components that meet the requirements of the applicable component drawings and the applicable specifications listed below:

In line-couplers	Raychem Specification D-6020
In-line terminators	Raychem Specification D-6020
Splice kits	Raychem Specification D-6020
Box couplers	Raychem Specification D-6021
Connectors	Raychem Specification D-6025
Contacts	Raychem Specification D-6002
Wire and Cable	Raychem Specification 1200

3.5 Design and Construction Requirements

Construct the harnesses to provide continuous signal paths that maintain the phase of transmitted MIL-STD-1553B signals. Use components and fabrication techniques that provide 360-degree continuous shielding of the signal conductors and other internal components.

3.6 Fabrication and Performance Tests

The following tests must be performed on every harness. Requirements for stub circuits are applicable to every stub circuit in a harness. Signal attenuation and shield resistance will be fully tested by measuring the signal attenuation and shield resistance from one stub to each of the remaining stubs.

3.6.1 Test Equipment

Any suitable equipment can be used for performing the following tests. The equipment may consist of discrete instruments, computer controlled instrumentation, or a fully integrated test station. In all cases the resolution and accuracy of all equipment must be a least one order of magnitude better than the requirement for the parameter being measured.

3.6.2 Coupler and Harness Variations

In general couplers and harnesses will consist of one or more stubs connected to a bus through a transformer and isolation resistors. The ends of the bus conductors may or may not be accessible for test. The following tests indicate when such a harness variation means the test can not be performed.

3.6.3 Terminators

A bus or stub terminator will usually have only one port available. In such cases perform only a terminator resistance test and insulation resistance or dielectric withstanding voltage tests between the conductors and the shield.

3.6.4 Continuity

Confirm circuit continuity by measuring the resistance of the circuits using a volt-ohmmeter or similar instrument with an open circuit voltage of less than 10 volts. Report resistance readings to the nearest 0.1 ohm.

3.6.4.1 Signal Circuit Continuity

3.6.4.1.1 Bus Circuits

Measure the end-to-end resistance of each of the bus conductors. The measured resistance must be less than 10 ohms. (Omit this test if both ends of the bus are not accessible.)

3.6.4.1.2 Stub Circuits

Measure the resistance between the ends of the two stub conductors connected to a data bus coupler. This resistance must be less than 6 ohms.

3.6.4.2 Shield Continuity

Measure shield resistance. The measured shield resistance must be less than 10 ohms between the shields of any two stubs and less than 6 ohm between any stub shield and the bus shield.

3.6.5 Insulation Resistance

Measure insulation resistance of harness segments during fabrication or at the final harness assembly stage. Make sufficient measurements to demonstrate the insulation integrity of every segment of the harness.

3.6.5.1 Bus Circuits to Shield

To measure the insulation resistance between the bus conductors and the shield, connect the two bus conductors together. Connect the shield to the grounded side of the megohmmeter and apply a dc potential of 100 volts between the bus conductors and the shield. The measured resistance must be greater than 1000 megohm. (Omit this test if neither end of the bus conductors is available.)

3.6.5.2 Stub Circuits to Shield

To measure the insulation resistance between the stub conductors and the shield, connect the two conductors together in each stub. Connect the shield to the grounded side of the megohmmeter and apply a dc potential of 100 volts between the conductors and shield of each stub. The measured resistance must be greater than 1000 megohms.

3.6.6 Dielectric Strength

Perform the dielectric strength test on harness segments during fabrication or at the final harness assembly stage. Make sufficient measurements to demonstrate the dielectric integrity of every segment of the harness.

3.6.6.1 Bus Circuits to Shield

To test the dielectric withstanding voltage between the bus conductors and the shield connect the two bus conductors together. Connect the shield to the grounded side of the megohmmeter and apply an ac potential of 500 volts between the bus conductors and the shield. There must be no breakdown of the insulation. (Omit this test if neither end of the bus conductors is available.)

3.6.6.2 Stub Circuits to Shield

To test the dielectric withstanding voltage between the stub conductors and the shield connect the two conductors together in each stub. Connect the shield to the grounded side of the megohmmeter and apply an ac potential of 500 volts between the conductors and shield of each stub. There must be no breakdown of the insulation.

3.6.6.3 Bus-to-Stub Signal Circuits

Apply an ac potential of 100 volts between the bus conductors and the stub conductors. There must be no breakdown of the insulation (Omit this test if neither end of the bus conductors is available.)

3.6.7 Terminator Resistance

Measure the dc resistance of the terminator during harness fabrication or at the finished harness stage. The measured resistance must be within 10% of the specified resistance.

3.6.8 Functional Test

3.6.8.1 Test Equipment

The test equipment consists of a signal generator and a signal detector. The signal generator must be capable of producing a waveform of fundamental frequency between 100 kHz and 1 MHz. The signal detector must be capable of receiving such signals and detecting phase reversals.

3.6.8.2 Test Setup and Procedure

Attach the signal generator to the first stub in the harness or coupler. Connect the signal detector to a different stub. If the harness consists of only a single stub coupler, connect the signal detector to an accessible bus port. Measure the voltage at the signal detector and verify the signal is in phase with the signal generator. Voltage measurements may be recorded as absolute values or as an attenuation of the transmitted value.

4. **Quality Assurance Provisions**

4.1 Responsibility for Inspection

The harness fabricator is responsible for performing all inspection tests and for keeping inspection records complete and available.

4.1.1 Inspection Records

A harness test inspection record shall be generated for each harness tested. This record shall contain the following information, except for items omitted in accordance with section 3.6:

- Customer Harness Description
- Raychem Harness Description
- Lot Number
- Date Tested
- Signal circuit continuity
- Shield continuity
- Insulation Resistance
- Dielectric Withstanding Voltage
- Terminator Resistance
- Functional test voltage or attenuation
- Phase confirmation
- PASS or FAIL conclusion

4.2 Test Equipment and Facilities

Use test and measuring equipment and inspection facilities with sufficient accuracy, quality, and capability to permit performance of all required inspections. Use MIL-STD-45662A or ISO 10012-1 to control calibration of the measuring and test equipment.

4.3 Rejected Harnesses

If a rejected harness is reworked to correct defects, record full details of the defect and the rework procedure. Retest the harness after rework.

6. **References**

6.1 Raychem Documents

6.1.1 Thermofit Division

Obtain copies of Thermofit Division documents from the Quality Assurance group of the Thermofit Division.

Specification D-6002 SolderTacts Military-Grade Electrical Contacts for Solder termination

Specification D-6020 MIL-STD-1553B Multiplex Data Bus Spliced-In Couplers and Terminators

Specification D-6021 MIL-STD 1553B Multiplex Data Bus Box Couplers and Terminators Connectorized with D-6025 Connector Interfaces

Specification D-6025 D-621 Series Connectors for Coaxial, Triaxial and
Twinaxial Cables

6.1.2 Wire and Cable Division

Obtain copies of Wire and Cable Division documents from the Quality Assurance group of the Wire and Cable Division.

Specification 1200 Cable, High Frequency and Controlled Electrical

6.2 Military Documents

Copies of Department of Defense documents may be obtained from the Naval Publications and Forms Center, 5801 Tabor Ave, PA 19120-5099.

MIL-STD-1553B Digital Time Division Command/Response Multiplex Data
Bus

MIL-STD-45662A Calibration System Requirements

7. **Notes**

7.1 Revisions

To revise this document, use Thermofit Division procedures. Forward requests for revision to Interconnect Quality Assurance.

7.2 Owner

The Thermofit Division Document Control holds the master copy of this document. The Interconnect Technical Group will issue revisions to this specification as needed.