CTM Splices and Transitions

1 Introduction

1.1 Scope. This specification covers the design, performance and qualification requirements for Raychem CTM cable transition modules for making splices in flat conductor cables or for splicing flat conductor cables to multiple round wires. This specification forms a part of Master Specification C-6100 for the Raychem Integrated Interconnection System (I^2S).

1.1.1 Units. SI units in parentheses are for information only.

1.2 Description. CTMs covered by this specification consist of a heatshrinkable insulating body containing meltable sealing material and pretinned size 26, size 22 or size 16 solder terminals.

1.3 Classification. CTMs covered by this specification are classified as follows:

a. Series
CTM50: Size 26 terminals with 0.05-inch nominal spacing
CTM100: Size 22 terminals with 0.10-inch nominal spacing
CTM200: Size 16 terminals with 0.20-inch nominal spacing

b. Type
Flat-to-Flat: For splicing flat conductor cables
Flat-to-Round: For splicing flat conductor cable to round wires

c. Size
Size 1: 1-inch nominal width
Size 2: 2-inch nominal width

1.4 Temperature Range. CTMs covered by this specification are suitable for use over the temperature range -65° to 125°C. CTMs are rated for 1000 hour service when the operating temperature is the maximum rated temperature. Operating temperature is the maximum temperature reached by any point of the CTM as a result of electrical current flow and ambient temperature.

2. Applicable Documents

2.1 Issues of Documents. The following documents, of the issue in effect on date of order or request for proposal, form a part of this specification to the extent specified herein. However, this specification takes precedence over the referenced documents.

Specifications

Raychem

C-6100	Integrated Interconnection System (I^2S) Component Master Specification

NASA

SP-R-0022A	Vacuum Stability Requirements of Polymeric Material for Spacecraft Applications

U.S. Federal

QQ-S-571	Solder, Tin Alloy: Tin-Lead Alloy; and Lead Alloy

U.S. Military

MIL-H-5606	Hydraulic Fluid, Petroleum Base; Aircraft, Missile and Ordnance
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-L-6082	Lubricating Oil, Aircraft Reciprocating Engine (Piston)
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number 0-148
MIL-H-83282	Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base; Aircraft, NATO Code Number H-537

Standards

U.S. Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-1344	Test Methods for Electrical Connectors
MIL-STD-45662	Calibration Systems Requirements

British Standards Institute

M25	Chemical Preparations for Chemical Closets (Portable Type) for Aircraft
M26	Chemical Preparations for Chemical Closets (Re-Circulation Type) for Aircraft

3 Requirements

3.1 Specification Control Drawings. The requirements for CTMs 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 applicable specification control drawing, the latter shall govern.

3.2 Classification of Requirements. The requirements for the CTMs are classified herein as follows:

Requirement	Paragraph
Qualification	3.3
Materials	3.4
Design and Construction	3.5
Performance	3.6
Identification	3.7
Workmanship	3.8

3.3 Qualification. CTMs furnished under this specification or listed on Qualified Products List C-6116-QPL shall be products which are qualified to this specification in accordance with the requirements of Specification C-6100.

3.4 Materials Requirements. All materials used in the manufacture of these CTMs shall be of the quality and form best suited for the purpose intended. All materials used shall conform to the requirements specified herein.

3.4.1 Fungus Resistance. Finishes and materials shall be fungus inert in accordance with Requirement 4 of MIL-STD-454 and encompassing the fungus species listed in MIL-STD-810, Method 508.

3.4.2 Hydrolytic Stability. All nonmetallic materials shall be selected to meet the hydrolytic reversion resistance requirements specified in Requirement 47 of MIL-STD-454.

3.4.3 Vacuum Stability. CTM assemblies shall meet the vacuum stability requirements of NASA Specification SP-R-0022A.

3.4.4 Component Materials. Materials for specific components of the CTM shall be as follows:

3.4.4.1 Conductor Materials. Copper-based alloy per applicable specification control drawing.

3.4.4.2 Solder. Sn63 per QQ-S-571 and applicable specification control drawing.

3.4.4.3 Insulating Body. Heat-shrinkable, transparent, crosslinked thermoplastic per applicable specification control drawing.

3.4.4.4 Sealing Material. Thermally stabilized thermoplastic per applicable specification control drawing.

3.5 Design and Construction Requirements. CTMs shall consist of a heatshrinkable, crosslinked thermoplastic body containing solder-coated conductor terminals and meltable sealing material.

3.5.1 Types. CTMs shall be as follows: flat-to-flat CTMs for splicing flat conductor cable to flat conductor cable, and flat-to-round CTMs for making a transition between flat conductor cable and round wires. Sizes and terminal arrangements shall be in accordance with the applicable specification control drawings.

3.5.2 Insulating Body. The insulating body shall provide an individual termination cavity for each conductor. It shall be constructed so as to retain the conductor terminals, encapsulate each termination, and provide strain relief for the wires and cables. Insulating bodies shall be available with or without locating ears.

3.5.3 Conductor Terminals. The conductor terminals shall provide termination and electrical continuity for the conductors being spliced. Terminals shall be coated with solder per 3.4.4.2, and round wire terminals shall incorporate a solder preform.

3.5.4 Sealing Material. Sealing material at both ends of the CTM shall seal the conductor termination area. Sealing material shall melt and flow when the CTM is terminated using the tools and procedures specified in the applicable specification control drawing.

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

3.6 Performance Requirements. CTMs shall conform to the requirements specified herein and on the applicable specification control drawing. Unless otherwise specified, room temperature shall be 25 ±5°C.

3.6.1 Insulation Resistance. When CTM assemblies are tested as specified in 4.5.3, the insulation resistance between any pair of conductors and between any conductor and ground shall be 5000 megohms minimum at room temperature and 200 megohms minimum at the maximum rated temperature.

3.6.2 Dielectric Withstanding Voltage. When CTM assemblies are tested as specified in 4.5.4, there shall be no evidence of breakdown or flashover at the test potentials specified in Tables VI and VII. The leakage current shall be 1.0 mA maximum.

3.6.3 Voltage Drop. When CTM assemblies are tested as specified in 4.5.5, the voltage drop of each conductor shall meet the requirements of Table I.

Table I. Voltage Drop Requirements

Conductor Sizes Spliced Together, AWG	Test Current, A	Voltage Drop, max, mV	
		At Room Temperature	At Maximum Rated Temperature
18 to 16	10.0	33	42
18 to 18	10.0	39	49
20 to 20	7.5	45	57
22 to 22	5.0	52	65
24 to 24	3.0	46	58
26 to 26	2.0	54	68
28 to 26	1.5	53	67
28 to 28	1.5	63	79

3.6.4 Termination Tensile Strength.

3.6.4.1 Round Wire Termination Tensile Strength When individual wire terminations are tested at room temperature and at the maximum rated temperature as specified in 4.5.6.1, the tensile load required to separate each wire from its terminal shall be in accordance with Table II.

Table II. Round Wire Termination Tensile Strength

Wire Size AWG	Tensile Load, min			
	At Room Temperature		At Maximum Rated Temperature	
	lbf	(N)	lbf	(N)
16	12.0	(53)	10.0	(44)
18	12.0	(53)	10.0	(44)
20	12.0	(53)	10.0	(44)
22	12.0	(53)	10.0	(44)
24	8.0	(36)	6.0	(24)
26	5.0	(22)	4.0	(18)
28	3.0	(13)	2.0	(9)

3.6.4.2 Flat Conductor Cable Termination Strength. When the terminated CTM is tested at room temperature and at the maximum rated temperature as specified in 4.5.6.2, the assembly shall withstand the axial loads shown in Table III without evidence of mechanical damage to the termination area.

Table III. Flat Conductor Cable Termination Tensile Strength

Conductor Center Spacing (inch)	Axial Load per Unit Cable Width			
	At Room Temperature		At Maximum Rated Temperature	
	lbf/inch	kN/m	lbf/inch	kN/m
0.200	50	(8.8)	20	(3.5)
0.100	50	(8.8)	20	(3.5)
0.050	50	(8.8)	15	(2.6)

3.6.5 Random Vibration. When CTM assemblies are subjected to 41.7 g rms (409 m/s^2 rms) for 8 hours in each major axis as specified in 4.5.7, there shall be no evidence of cracks or breaks. During the test there shall be no electrical discontinuity greater than 50-ns duration.

3.6.6 Mechanical Shock. When CTM assemblies are subjected to eighteen shocks of 300 g (2.943 km/s^2) as specified in 4.5.8, there shall be no evidence of cracks or breaks. During the test there shall be no electrical discontinuity greater than 50-ns duration.

3.6.7 Thermal Shock. When CTM assemblies are conditioned for five thermal shock cycles (to minimum and maximum rated temperatures) as specified in 4.5.9, there shall be no evidence of damage detrimental to performance or handling.

3.6.8 Temperature Life. When CTM assemblies are conditioned for 1000 hours at the maximum rated temperature as specified in 4.5.10, the insulation resistance at the maximum rated temperature shall be 200 megohms minimum.

3.6.9 Humidity. When CTM assemblies are subjected to 240-hour cyclic humidity testing as specified in 4.5.11, the insulation resistance at high humidity shall be 100 megohms minimum, and CTM assemblies shall meet the dielectric withstanding voltage requirements of 3.6.2. After the 24-hour drying period, CTM assemblies shall meet the insulation resistance requirements of 3.6.1 and the dielectric withstanding voltage requirements of 3.6.2.

3.6.10 Altitude Immersion. When CTM assemblies are tested after conditioning at 75,000-foot (22.86-km) altitude equivalent as specified in 4.5.12, the insulation resistance shall be 5000 megohms minimum, and CTM assemblies shall meet the dielectric withstanding voltage requirements of 3.6.2.

3.6.11 Altitude-Low Temperature. When CTM assemblies are tested at 80,000-foot (24.4-km) altitude equivalent as specified in 4.5.13, the CTMs shall withstand the applied potential at low pressure with no evidence of dielectric breakdown. Insulation resistance and dielectric withstanding voltage requirements at ambient conditions shall be as specified in 3.6.1 and 3.6.2.

3.6.12 Salt Spray (Corrosion). When CTM assemblies are subjected to 48 hour salt spray conditioning as specified in 4.5.14, the assemblies shall show no evidence of damage detrimental to performance or handling.

3.6.13 Ozone Exposure. When CTM assemblies are exposed to 100-150 ppm ozone for 2 hours as specified in 4.5.15, the assemblies shall show no evidence of damage detrimental to performance or handling.

3.6.14 Fluid Immersion. When separate CTM assemblies are tested in each of the twenty-two fluids as specified in 4.5.16, the assemblies shall show no evidence of damage detrimental to performance or handling.

3.6.15 Post Test Examination. CTM assemblies shall be inspected as specified in 4.5.17. Any evidence of the effects described in 4.5.17 shall constitute failure.

3.7 Identification. Marking shall be as specified on the applicable specification control drawing, and shall remain legible after completion of all tests specified herein.

3.8 Workmanship. CTMs shall be processed in such a manner as to be uniform in quality; they shall be free from burrs, cracks, voids, chips, blisters, sharp cutting edges, and other defects that would adversely affect life or serviceability.

4. Quality Assurance Provisions.

4.1 Responsibility for Inspection. The supplier is responsible for the performance of all inspection tests specified herein. The supplier may utilize his own or any other suitable testing facility. Inspection records of the tests shall be kept complete and available to the buyer as specified in the contract or order.

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 by the supplier. A calibration system to control the accuracy of the measuring and test equipment shall be maintained in accordance with MIL-STD-45662.

4.2 Classification of Inspections. The examination and testing of CTMs 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 the tests in Table IV. Samples provided under 4.3.1 for test groups 1, 2, 3 and 4 of Table IV shall be subjected to the tests specified for the appropriate group in the sequence indicated.

4.3.1 Test Samples for Qualification Test. Test groups for each part to be qualified shall consist of terminated CTM assemblies. Individual test samples shall be selected in compliance with the qualification requirements of Specification C-6100.

4.3.2 Failures. One or more failures of the tests listed in Table IV shall constitute failure of qualification of the parts under test. The exception to this is visual examination, where occurrence of one major defect or two minor defects shall constitute failure. Major and minor defects shall be as defined in MIL-STD-105.

4.3.3 Qualification Report. Qualification shall be documented in a report which shall be available to the buyer.

Table IV. Qualification Inspection

Test Group 1

Test Sequence	Requirement	Procedure
Visual Examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Thermal Shock	3.6.7	4.5.9
Altitude Immersion	3.6.10	4.5.12
Insulation Resistance Measurement		
Dielectric Withstanding Voltage Test		
Salt Spray (Corrosion)	3.6.12	4.5.14
Voltage Drop	3.6.3	4.5.5
Post Test Examination	3.6.15	4.5.17

Test Group 2

Test Sequence	Requirement	Procedure
Visual Examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Altitude-Low Temperature	3.6.11	4.5.13
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Thermal Shock	3.6.7	4.5.9
Insulation Resistance at Maximum Rated Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Altitude	3.6.2	4.5.4.2
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Random Vibration	3.6.5	4.5.7
Mechanical Shock	3.6.6	4.5.8
Humidity	3.6.9	4.5.11
Insulation Resistance Measurement in High Humidity		
Dielectric Withstanding Voltage Test in High Humidity		
Insulation Resistance Measurement After 24 Hours		
Dielectric Withstanding Voltage Test After 24 Hours		
Voltage Drop	3.6.3	4.5.5
Post Test Examination	3.6.15	4.5.17

Test Group 3

Test Sequence	Requirement	Procedure
Visual Examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Ozone Exposure	3.6.13	4.5.15
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Fluid Immersion	3.6.14	4.5.16
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Voltage Drop	3.6.3	4.5.5
Post Test Examination	3.6.15	4.5.17

Test Group 4

Test Sequence	Requirement	Procedure
Visual Examination	3.1, 3.4, 3.5, 3.7, 3.8	4.5.2
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Temperature Life	3.6.8	4.5.10
Insulation Resistance Measurement at Maximum Rated Temperature		
Insulation Resistance at Room Temperature	3.6.1	4.5.3
Dielectric Withstanding Voltage at Sea Level	3.6.2	4.5.4.1
Humidity	3.6.9	4.5.11
Insulation Resistance Measurement in High Humidity		
Dielectric Withstanding Voltage Test in High Humidity		
Insulation Resistance Measurement After 24 Hours		
Dielectric Withstanding Voltage Test After 24 Hours		
Voltage Drop	3.6.3	4.5.5
Post Test Examination	3.6.15	4.5.17
Tensile Strength	3.6.4	4.5.6

4.4 Acceptance Inspection. Lot acceptance inspection shall consist of the tests listed in Table V. Acceptance inspection shall be performed on every lot of CTMs manufactured under this specification. The sample units shall be tested unterminated and may be shipped against orders. In-process examination may be used for acceptance inspection.

Table V. Acceptance Inspection

Test	Requirement Paragraph	Procedure Paragraph	Inspection Level	AQL
Visual Examination	3.1, 3.4, 3.5, 3.7 and 3.8	4.5.2	I	4.0

*AQL shall apply to individual defects in accordance with MIL-STD-105, Section 4.5.

4.4.1 Sampling for Acceptance Inspection. MIL-STD-105 shall apply for definitions of inspection terms used herein. For purposes of this specification, the following shall apply:

4.4.1.1 Inspection Lot. The inspection lot shall consist of all CTMs of one part number manufactured under essentially the same conditions, and offered for inspection at one time.

4.4.1.2 Inspection Levels and Acceptance Quality Levels (AQL). The inspection levels and acceptable quality levels shall be in accordance with MIL-STD-105 and shall be as specified in Table V.

4.4.2 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.

4.4.3 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 pressure, and relative humidity as specified in the general requirements of MIL-STD-1344 with an ambient temperature of 25 ±5°C. Where conditioning at the maximum rated temperature is specified, the temperature tolerances shall be +0°C and -5°C.

4.5.1.1 Specimen Preparation. When terminated CTMs are specified for testing, CTMs shall be terminated to wire or cable in accordance with the applicable specification control drawing. Wire or cable lengths shall be approximately 3 feet (1 m).

4.5.2 Visual Examination (see 3.1, 3.4, 3.5, 3.7, 3.8). CTMs shall be visually examined at 4X magnification.

4.5.3 Insulation Resistance (see 3.6.1). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 3003. The CTMs shall be immersed in water and the insulation resistance shall be measured between all adjacent conductors and between all conductors and ground. When measurement at the maximum rated temperature is specified, CTMs shall be wrapped with a layer of closely conforming aluminum foil which shall overlap the wire or cable by approximately 0.25 inch (6 mm) and shall be connected to ground. The wrapped CTMs shall be conditioned in an oven at the maximum rated temperature for at least 30 minutes and measurements shall be made while the specimens are at the maximum rated temperature.

4.5.4 Dielectric Withstanding Voltage.

4.5.4.1 Dielectric Withstanding Voltage at Sea Level (see 3.6.2). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 3001. The CTMs shall be immersed in water, and the 60 Hz ac test voltage shall be applied between all adjacent conductors and between all conductors and ground. All conductors not connected to the test voltage shall be grounded. The test voltage shall be as specified in Table VI.

Table VI. Dielectric Withstanding Test Voltage

CTM Series	Test Voltage, V rms
CTM50	750
CTM100	1000
CTM200	1000

4.5.4.2 Dielectric Withstanding Voltage at Altitude (see 3.6.2). Terminated CTMs shall be tested as specified in 4.5.4.1 except that the test voltages and altitude pressure equivalents shall be as specified in Table VII.

Table VII. Test Voltages And Altitudes

Altitude-Pressure Equivalent	Test Voltage, V rms	
	CTM50 Series	CTM100 and CTM200 Series
50,000 ft - 87.5 torr (15.2 km - 11.7 kPa)	700	1000
70,000 ft - 33.5 torr (21.3 km - 4.47 kPa)	500	700
110,000 ft - 5.74 torr (33.5 km - 0.765 kPa	400	400

4.5.5 Voltage Drop (see 3.6.3). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 3004. At least 20% of the conductors in each CTM assembly shall be tested.

4.5.6 Termination Tensile Strength. For flat-to-round CTMs, half of the samples shall be tested per 4.5.6.1 and half per 4.5.6.2. Flat-to-flat CTMs shall be tested per 4.5.6.2.

4.5.6.1 Round Wire Termination Tensile Strength (see 3.6.4.1). Terminated flat-to-round CTMs shall be placed in a tensile testing device and sufficient force applied to individual wires to separate the wires from the terminals or break the wires. The insulating body shall be removed from the terminated flat-to-round CTM and the sealing material cut so as to separate the wire under test from adjacent wires. The flat conductor cable portion of the terminal shall be gripped in one jaw of the tensile testing device. The round wire shall be gripped in the other jaw at a point 2.0 ± 0.5 in. (50 ± 13 mm) from the middle of the terminal. The speed of head travel of the tensile tester shall be 1.0 ± 0.25 inch (25 ± 6 mm) per minute. Conductor breakage outside the soldered-termination shall not constitute failure. At least 20% of the round wire terminations of each CTM shall be tested.

4.5.6.2 Flat Conductor Cable Termination Tensile Strength (see 3.6.4.2). Terminated CTMs shall be placed in a tensile testing device and an axial load as specified in Table III shall be applied for 10 seconds uniformly across the width of the flat conductor cable. Flat conductor cables shall be gripped 2.0 ± 0.5 in. (50 ± 13 mm) from the middle of the CTM. The CTM body of flat to round CTMs shall be gripped in the round wire termination area. The speed of head travel of the tensile tester shall be 1.0 ± 0.25 inch (25 ± 6 mm) per minute.

4.5.7 Random Vibration (see 3.6.5). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 2005, Test Condition VI, Letter J. CTMs shall be mounted by normal means, with at least 8 inches (200 mm) of wire or cable unsupported at both ends of the CTMs. The specimen shall be subjected to the vibration for 8 hours in each major axis, for a total of 24 hours.

4.5.8 Mechanical Shock (see 3.6.6). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 2004, Test Condition D. CTMs shall be mounted by normal means, with at least 8 inches (200 mm) of wire or cable unsupported at both ends of the CTMs.

4.5.9 Thermal Shock (see 3.6.7). Terminated CTMs shall be tested in accordance with MIL-STD-202, Method 107, Test Condition B, except that the high temperature extreme shall be the maximum rated temperature.

4.5.10 Temperature Life (see 3.6.8). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1005 for 1000 hours at the maximum rated temperature, using an air circulating oven. Conductors shall not be wired in series nor connected to an electrical load. Leads shall be brought out through a suitable port so that electrical measurements can be taken. After conditioning 1000 hours and while samples are still at the maximum rated temperature, the insulation resistance shall be measured in accordance with 4.5.3.

4.5.11 Humidity (see 3.6.9). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1002, Type II. The CTMs shall be mounted in a horizontal position within the test chamber, with the wires and cables descending into the CTM with a bend radius of at least 2 inches (50 mm). There shall be no drip loops in the wires or cables, and polarization voltage is not required. Final measurements at high humidity shall be performed by removing the CTMs from the high humidity and immersing them within 10 seconds in water. Insulation resistance and dielectric withstanding voltage shall be tested in accordance with 4.5.3 and 4.5.4.1. The CTM assemblies shall then be removed from the water and allowed to dry for 24 hours at standard ambient conditions. After the 24-hour drying period, insulation resistance and dielectric withstanding voltage shall be tested in accordance with 4.5.3 and 4.5.4.1.

4.5.12 Altitude Immersion (see 3.6.10). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1004.

4.5.13 Altitude-Low-Temperature (see 3.6.11). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1011. The CTMs shall be wrapped with a layer of closely conforming aluminum foil which shall overlap the wire or cable by approximately 0.25 inch (6 mm) and shall be connected to ground. CTM50 specimens shall be tested at 375 V, and CTM100 and CTM200 specimens shall be tested at 625 V. After the specimens have stabilized at ambient conditions, insulation resistance measurement shall be made in accordance with 4.5.3 and the dielectric withstanding voltage test shall be performed in accordance with 4.5.4.1.

4.5.14 Salt Spray (Corrosion) (see 3.6.12). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1001, Test Condition B. Suitable measures shall be taken to preclude migration of condensation along the conductors.

4.5.15 Ozone Exposure (see 3.6.13). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1007.

4.5.16 Fluid Immersion (see 3.6.14). Terminated CTMs shall be tested in accordance with MIL-STD-1344, Method 1016. The following exceptions and additional fluids shall be incorporated into the procedure.

a. One sample shall be tested in hydraulic fluid per MIL-H-83282, using the same procedure as for MIL-H-5606 hydraulic fluid.

b. One sample shall be tested in MIL-T-5624, Grade JP-4, using the same procedure as for MIL-T-5624, Grade JP-5.

c. Conditioning in coolant-dielectric fluid (Coolanol) shall be at the maximum rated temperature,

d. One sample shall be tested in sullage per British Standard M25 and M26, using the same procedure as for MIL-L-7808 lubricating oil, except that the immersion shall be at 23 ± 3°C

e. One sample shall be tested in mineral-based lubricating oil per MIL-L-6082 using the same procedure as for MIL-L-7808 lubricating oil.

f. Samples shall be tested in each of the following fluids, using the same procedure as for MIL-H-5606 hydraulic fluid: Monsanto Skydrol 500B-4, Monsanto Skydrol LD4 and Chevron Hyjet IV.

g. One sample shall be tested in Odex SuperReady, Racasan, Odex Lt water-based with a dilution rate in water of 1.6 g/l, using the same procedure as for MIL-H-5606 hydraulic fluid.

h. One sample shall be tested in Borough Welcome World Health Organization multi-shot insecticide spray, using the same procedure as for MIL-H-5606 hydraulic fluid, except that the fluid exposure (immersion) shall be done at room temperature by spraying from 12 to 18 inch (300 to 450 mm) distance until the CTM is thoroughly wetted.

i. One sample shall be tested in uncracked, unleaded gasoline ("white gas"), using the same procedure as for MIL-G-3056 gasoline.

4.5.17 Post Test Examination (see 3.6.15). The tested CTMs shall be examined for evidence of cracking, loosening of parts, carbon tracking, excess wear, or missing parts.

5. 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. If not otherwise specified in the procurement document, marking shall be in accordance with commercial practice.