XMM Optical Monitor

MULLARD SPACE SCIENCE LABORATORY
UNIVERSITY COLLEGE LONDON **Author: A P Dibbens**

SPECIFICATION FOR HIGH VOLTAGE CONNECTORS

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CHANGE RECORD

ISSUE	DATE	PAGES CHANGED	COMMENTS
01	18 January 1996	All New	
02	28 June 1996	All	Comments by Reynolds incorporated
03	31 July 1996	1,6	Reference numbers added to table. Par 6.5.1, breakdown voltage changed to >30KVDC

CONTENTS

1. INTRODUCTION

The Blue Module in the XMM Optical Monitor incorporates a high voltage power supply unit(PSU). This PSU provides high voltage power for the image intensifier in the blue detector assembly. The high voltage is channelled from the PSU to the intensifier via high voltage cables and connector assemblies.
These connector assemblies are manufactured by Reynolds Industries Ltd., a company that specialises in the design and manufacture of high voltage electrical connector products.
Other projects into which these connectors have been designed include Solar-A, Solar Maxim Mission, SOHO, Cluster, Peace and the Tethered Space Satellite.
This specification defines the requirements for the connector assemblies for the XMM Optical Monitor.

2. APPLICABLE DOCUMENTS

Mil-M-14	Moulding Compounds, Thermosetting
ASTM-A-582	Free Machining Stainless and Heat Resisting Steel Bar
Mil-C-14550	Copper Plating (Electrodeposited)
Mil-P-5315	Packing, Pre-formed, Hydrocarbon Fuel Resistant
Mil-T-10727	Tin Plating, Electrodeposited or Hot-dipped for Ferrous and Non-ferrous Metals
ASTM-B197	Specification for Copper Beryllium Alloy Wire

3. DESCRIPTION

This specification covers two types of connector assemblies.

3.1 105 Century series

A sub-miniature high voltage connector and cable assembly for use in high voltage applications where dense electronic packaging is required. The single pin variant is specified here. It is rated at 15kVDC.

3.2 600 Series

A sub-miniature high voltage coaxial connector and cable assembly designed to operate at any pressure. Cable assemblies effect an altitude seal through use of internal seals which require no encapsulation. Panel connectors require encapsulation or shrink tubing at the junction of the terminal and the insulator. It is rated at 10kVDC when encapsulated.

4. MATERIALS

4.1 105 Century Series

1. Receptacle.

Body material	Diallylphalate(DAP) per Mil-M-14, type SDG-F, colour black
Interface(threaded coupling)	Stainless steel 303 CRES per ASTM-A-582. Finish - clear passivate per QQ-P-35
Contact	Brass half hard per QQ-B-626, alloy 360. Finish - copper plate Mil-C-1450, class 4, followed by gold plate per Mil-G-45204 type II, grade C, Class 1
Interface seal	Silicone rubber ZZ-R-765, class 4 grade 60-70, colour red
Seal retainer	Kel-F, AMS 3650
O-ring	Nitrile rubber Mil-P-5315 grade 70, colour black

2. Plug

Insulator	DAP per Mil-M-14 type ADG-F, colour black
Insulator sleeve & coupling nut	Stainless steel 303 CRES per ASTM-A-582, condition A. Finish - clear passivate per QQ-P-35 Type II
Retaining spring washer	Beryllium copper per QQ-C-530 1/2 hard. Finish - nickel plate per QQ-N-290 Class 2, followed by dry lubricant per Mil-L-8937
Contact	Body - Beryllium copper, gold plated Clip - beryllium copper, nickel plated Hood - stainless steel, clear passivated
Crimp sleeve	Copper or brass alloy. Finish - tin plated per Mil-T-10727 type I
Heat shrink sleeving	Kynar

3. Cable

See par 5.

4.2 600 Series

1. Receptacle

Insulator	DAP per Mil-M-14, type SDG. Colour green
Body	Stainless steel 303 CRES per ASTM-A-582. Finish - clear passivate per QQ-P-35
Contact	Beryllium copper per QQ-C-530 cond. H. Finish - copper underplate per Mil-C-14550, class 4, followed by gold plate per Mil-G-45204, type II, grade C.
Nut	Brass per QQ-B-626 alloy 360, 1/2 hard. Finish - gold p late per Mil-G-45204, type II, grade C, class 1
Interface seal	Silicone rubber per ZZ-R-765B, grade 60, class 3A colour red. Viton is an optional alternative
Shake-proof washer	Stainless steel

2. Plug

Insulator	DAP per Mil-M-14. type SDG, colour green
Body	Brass 1/2 hard per QQ-B-626 alloy 360. Finish - gold plate per /Mil-G-45204 type I, grade C, class 1.
Coupling nut	Stainless steel 303 CRES per ASTM-A-582. Finish - clear passivate per QQ-P-35
Contact	Beryllium copper, QQ-C-530 condition. H. Finish - copper underplate per Mil-C-14550, class C class 1.
Retaining ring	Beryllium copper, UNS no. C17200 wire, temper TD04 per ASTM-B197
U sleeve	Copper sheet per QQ-C-576. Finish - tin plate per Mil-T-10727 type 1.
O Ring	Silicone rubber per ZZ-R-756, class 3A/3B, grade 70 colour red. Note: seal in Viton may be a possible optional alternative.
Spacer	Teflon
Washer	Stainless steel 301 CRES per QQ-S-766. Finish - clear passivate per QQ-P-35
Heat shrink sleeving	Kynar.

3. Cable

See par 5.

5. HIGH VOLTAGE CABLES

5.1. High Voltage Coaxial Cable .080L, for the 105 Century Series Connectors (P/N 167-9346)

Inner Conductor: 19 strands of silver coated copper wire, nominal diameter per strand .0063 inch. Conductor diameter approximately .0315 inch.
Cable Core: Solid, fluorinated ethylene propylene(Teflon). Diameter .080±.005 inch, spark tested at 10,000 volts AC RMS. Conductor centred within 10% of the dielectric diameter.
Outer Conductor: Single braid, wire no. 36 AWG. Carriers 16. Picks per inch 11. Coverage 93% nominal. Diameter .100±.005 inch.
Jacket: Solid, fluorinated ethylene propylene(Teflon), colour yellow. Minimum wall thickness .009 inch. Diameter .125±.005 inch. Spark tested at 1500 volts AC RMS.
Electrical: Capacitance: 31pF/foot nominal
Attenuation: 10.6dB/100 feet at 400MHz
Impedance: 43±5 ohms
Inductance: .077±.006 nominal μH/foot
Loop Resistance: .019/.022 ohms /foot per 25 foot length(shield coupled to centre conductor)
Test Voltage(max): 45kVDC
Operating Voltage(max): 22kVDC

5.2. High Voltage Coaxial Cable, Type “L”, for the 600 Series Connectors (P/N 167-2896)

Inner Conductor: 19 strands of silver coated copper wire per ASTM B33, nominal diameter per strand .004 inch. Conductor diameter approximately .019 inch.
Cable Core: Solid, fluorinated ethylene propylene(Teflon). Diameter .050±.005 inch, spark tested at 10,000 volts AC RMS. Conductor centred within 10% of the dielectric diameter.
Outer Conductor: Single braid, wire no. 36 AWG, silver coated per ASTM B298. Carriers 16. Picks per inch 16.3±10%. Coverage 93% minimum.
Jacket: Solid, fluorinated ethylene propylene(Teflon), colour white. Minimum wall thickness .009 inch. Diameter .095±.005 inch. Spark tested at 1500 volts AC RMS.
Electrical: Capacitance: 28pF/foot nominal
Attenuation: 25dB/100 feet at 400MHz
Impedance: 46±5 ohms
Inductance: .089±.003 nominal μH/foot
Loop Resistance: .044±.004 ohms /foot per 25 foot length(shield coupled to centre conductor)
Test Voltage(max): 36kVDC
Operating Voltage(max): 18kVDC

6. TESTING

6.1 105 Century Series With Cable Fitted

6.1.1 Pull test connector to cable (where applicable) with a force of 6±1 pounds
6.1.2 Measure the loop resistance (where applicable). The maximum loop resistance shall be determined by the following formula:- 0.0037xL+0.010 ohms, where L=cable length in inches. When measuring loop resistance, move cable from side to side without breaking contact. Any change in resistance (erratic resistance) shall be cause for rejection even if the maximum loop resistance is not exceeded.
6.1.3 High potential test at 21kVDC pin to shell, at a simulated altitude of 130,000 feet, for 60 seconds (mated).
6.1.4 The leakage current shall be less than 1 micro-amp at 10kVDC and ambient temperature and pressure.

6.2 105 Century Series Receptacle

6.2.1 High potential test at 10kVDC for 60 seconds.
6.2.2 The leakage current shall be less than 1 micro-amp at 10kVDC and ambient temperature and pressure

6.3 600 Series With Cable Fitted

6.3.1 Pull test connector to cable (where applicable) with a force of 6±1 pounds
6.3.2 Measure the loop resistance (where applicable). The maximum loop resistance shall be determined by the following formula:- 0.0037xL+0.010 ohms, where L=cable length in inches. When measuring loop resistance, move cable from side to side without breaking contact. Any change in resistance (erratic resistance) shall be cause for rejection even if the maximum loop resistance is not exceeded.
6.3.3 High potential test at 15kVDC pin to shell, at a simulated altitude of 130,000 feet, for 60 seconds (mated).
6.3.4 The leakage current shall be less than 1 micro-amp at 3kVDC and ambient temperature and pressure

6.4 600 Series Receptacle

6.4.1 High potential test at 3kVDC for 60 seconds
6.4.2 The leakage current shall be less than 1 micro-amp at 3kVDC and ambient temperature and pressure

6.5 Test History

6.5.1 Century 105

Breakdown test	>30kVDC, after 3 cycles -54°C to +125°C and tested at -54°C and simulated 70,000ft altitude
Humidity:	Mil-Std-202 method 106 (insulation resistance $\geq 5 \times 10^4$ megohms)
Corrosion:	Mil-Std-202 method 101 condition B
Shock:	Mil-Std-202 method 202 (200G)
Vibration:	Mil-Std-202 method 204 condition B
Durability Cycling:	50 cycles (mating and de-mating)
Thermal shock:	-80°F to +300°F

6.5.2 600 Series

Life test:	3000 hours at 25,000VDC (sea level) 2000 hours at 21,000VDC at 130,000 feet altitude
Humidity:	Mil-Std-202 method 106 (insulation resistance $\geq 5 \times 10^4$ megohms)
Corrosion:	Mil-Std-202 method 101 condition B
Shock:	Mil-Std-202 method 202 (200G)
Vibration:	Mil-Std-202 method 204 condition B
Durability Cycling:	50 cycles (mating and de-mating)
Thermal shock:	-80 °F to +300°F

7. MARKING/PACKING

Each part or package shall be clearly marked with the Reference Number shown in the table below:-

Part Description	MSSL Identifier	Reference Number
105 Century receptacle	r105r	299-0084
105 Century plug + cable assy	r105p	299-0085
600 Series receptacle	r600r	260-0077
600 Series plug + cable + plug assy(1)	r600p1	260-0078
600 Series plug + cable + plug assy(2)	r600p2	260-0079

Components shall be cleaned and individually packed in sealed, robust polythene bags. If it is not possible to identify the part Reference Number through the polythene, then an additional label with this number shall be affixed to the outside of the bag.
N.B. Receptacles will only have the Reference Number marked on the outside of the bags.