SPIRE BDA-JFET Harness Definition

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CHANGE RECORD

ISSUE	DATE	SECTION	CHANGE(S) MADE
Issue 0.1	02/07/02		Comments
Issue 0.2	29/07/02		Added comments from Len Husted and John Delderfield and incorporated more information.
Issue 1.0	17/09/02		Added information discussed during meeting at Tekdata 14/8/02
		§3.5	Updated pin allocation to reflect changes in the JFET ICD
			Removed copies of drawings from Appendices and included them by reference in the list of Reference Documents
		§1	Added note regarding the implementation of the PTC in the STM model of the instrument.
		§8 and §9	Deleted dedicated feedthru for the PTC and incorporated the PTC wiring within the SLW feedthru
		§9	Included pin out information for the PTC. Changed from MDM to Nanonics connector for the PTC
			Included schematic representation of the Signal Reference Connection from the Nanonics backshell to the chassis of the BDA
Issue 1.1	5/3/03		Issued
		Figure 9	Corrected pin number labels as per JPL request
		§9	Corrected MDM-25 pin allocations in the Table.
			Corrected 25-Way Nanonics part number
Issue 1.2	13 May 2003		

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NOMENCLATURE

ADP	Acceptance Data Package
BDA	Bolometer Detector Array
CQM	Cryogenic Qualification Model
FPU	Focal Plane Unit
FS	Flight Spare
JFP	Photometer JFET assembly
JFS	Spectrometer JFET Assembly
MSSL	MullaRD-Space Science Laboratory
PFM	Proto-Flight Model
PLF	Long-Wave Photometer Feedthrough
PLW	Long—wave Photometer
PMF	Medium-Wave Photometer Feedthrough
PMW	Medium-Wave Photometer
PSF	Short-Wave Photometer Feedthrough
PSW	Short-wave Photometer
PTC	Photometer Thermal Control
PTF	Photometer Thermal Control Feedthrough
RAL	RutherfoRD-Appleton Laboratory
SLF	Long-Wave Spectrometer Feedthrough
SLW	Long-Wave Spectrometer
SSF	Short-Wave Spectrometer Feedthrough
SSW	Short-wave Spectrometer
STM	Structural Thermal Model

APPLICABLE DOCUMENTS

AD-1 SPIRE Harness Definition SPIRE-RAL-PRJ-000608, Issue 1.1, 14 February 2003.

REFERENCE DOCUMENTS

RD-1 SPIRE Instrument Block Diagram, Issue 5.2, 14 February 2003
RD-2 ECSS-Q-70-08A, The manual soldering of high-reliability electrical connections, 6 August 1999.
RD-3 BDA Connector Flange (Photometer 4K), MSSL A1 5264 302-23
RD-4 BDA Connector Flange (Spectrometer 4K), MSSL A1 5264 302-22
RD-5 SPIRE BDA-JFET Wiring Concept SPIRE-RAL-NOT-001539
RD-6 Photometer BDA Cable Routes, MSSL A1 5264-306A
RD-7 Spectrometer BDA Cable Routes, MSSL A1 5264-307A

1. SCOPE

This document outlines the specifications for the procurement of the following items for the Herschel/SPIRE instrument.

STM/CQM/FS PSW BDA to JFET Harness Assembly
STM/CQM/FS PMW BDA to JFET Harness Assembly
STM/CQM/FS PLW BDA to JFET Harness Assembly
STM/CQM/FS SSW BDA to JFET Harness Assembly
STM/CQM/FS SLW BDA to JFET Harness Assembly
STM/CQM/FS PTC to JFET Harness Assembly

PFM PSW BDA to JFET Harness Assembly
PFM PMW BDA to JFET Harness Assembly
PFM PLW BDA to JFET Harness Assembly
PFM SSW BDA to JFET Harness Assembly
PFM SLW BDA to JFET Harness Assembly
PFM PTC to JFET Harness Assembly

In the STM/CQM/FS initial procurement of the PTC Harness, the conductors will not be terminated on connectors. The harness will be stowed. After the CQM programme, if the PTC is implemented, then the harness will be reworked and terminated with the appropriate connectors.

2. DESCRIPTION

These harnesses are used to connect the Herschel/SPIRE Photometer BDAs (PSW, PMW and PLW) and Spectrometer BDAs (SSW and SLW) to the JFET units (JFS/JFP). They are used to:
Provide the AC bias current to the arrays, and
Read out each detector element.

The harnesses for each BDA are grouped together and pass through the wall of the FPU using flange mounted RF tight feedthroughs.

3. GENERAL SPECIFICATIONS

3.1 MODELS

There are to be two complete sets of BDA-JFET harnesses procured. The first set will be used during the STM and CQM qualification programmes and which then becomes the flight spare (FS). The second set of harnesses is to be used for the proto-flight model.

3.2 HARNESS ROUTING

The routing of the harness within the FPU is defined in RD-6 and RD-7. A schematic representation of the routing between the FPU Feedthrus and the JFET units is included in RD-5.

A wiring horse representing the detector boxes, the Photometer and Spectrometer Covers and the JFET interfaces is to be used to achieve this.

3.3 CONNECTORS

Wire terminations in all connectors will be made according to RD-2 unless normal good practice for the fabrication of cryogenic harnesses dictates otherwise. Any non-compliance to RD-2 is to be documented in the ADP.

A KIP (Key Inspection Point) occurs after solder termination and prior to connector potting. The inspection is to be conducted by an officer nominated by the RAL PA department.

3.3.1 51-Way MDM Connectors

These connectors mate with the JFET units.
The rear of the connectors are to be potted with Stycast 2850 FT, using Stycast Catalyst 9. The potting is to electrically bond the harness shield to the metal chassis of the connector and provide 360° termination of the shield around the signal conductors.
The dimensions of the potting are to be as indicated in Figure 1.
The Part number for the connectors is: M83513/02-51N

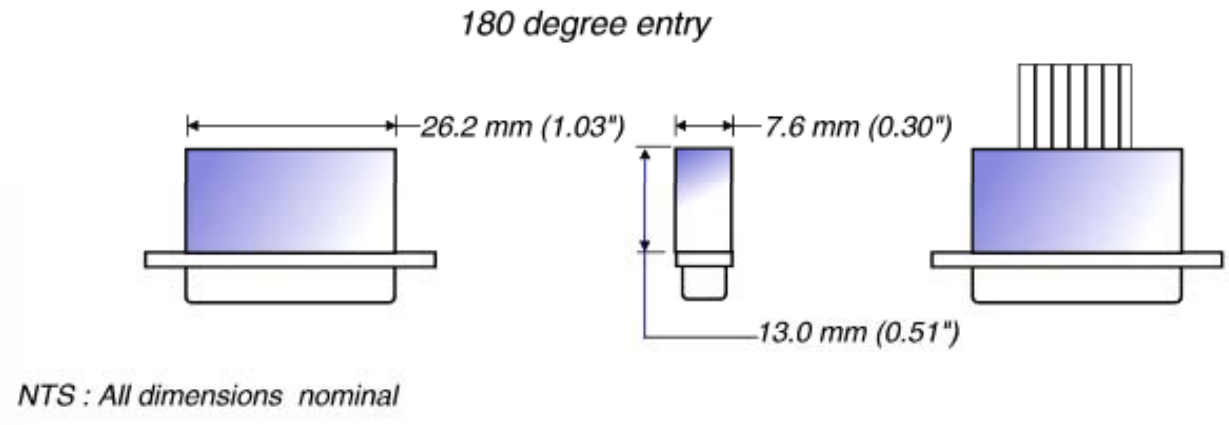

Figure 1 - Nominal dimensions of MDM connectors potted backshells to the SPIRE JFET units.

3.3.2 51-Way Nanonics Connectors

These connectors mate with the SPIRE BDAs.
The rear of the connectors are to be potted with Stycast 2850 FT, using Stycast Catalyst 9.
The dimensions of the potting are to be as indicated in Figure 2.
The Part number for the connectors is: STM05111500PCN

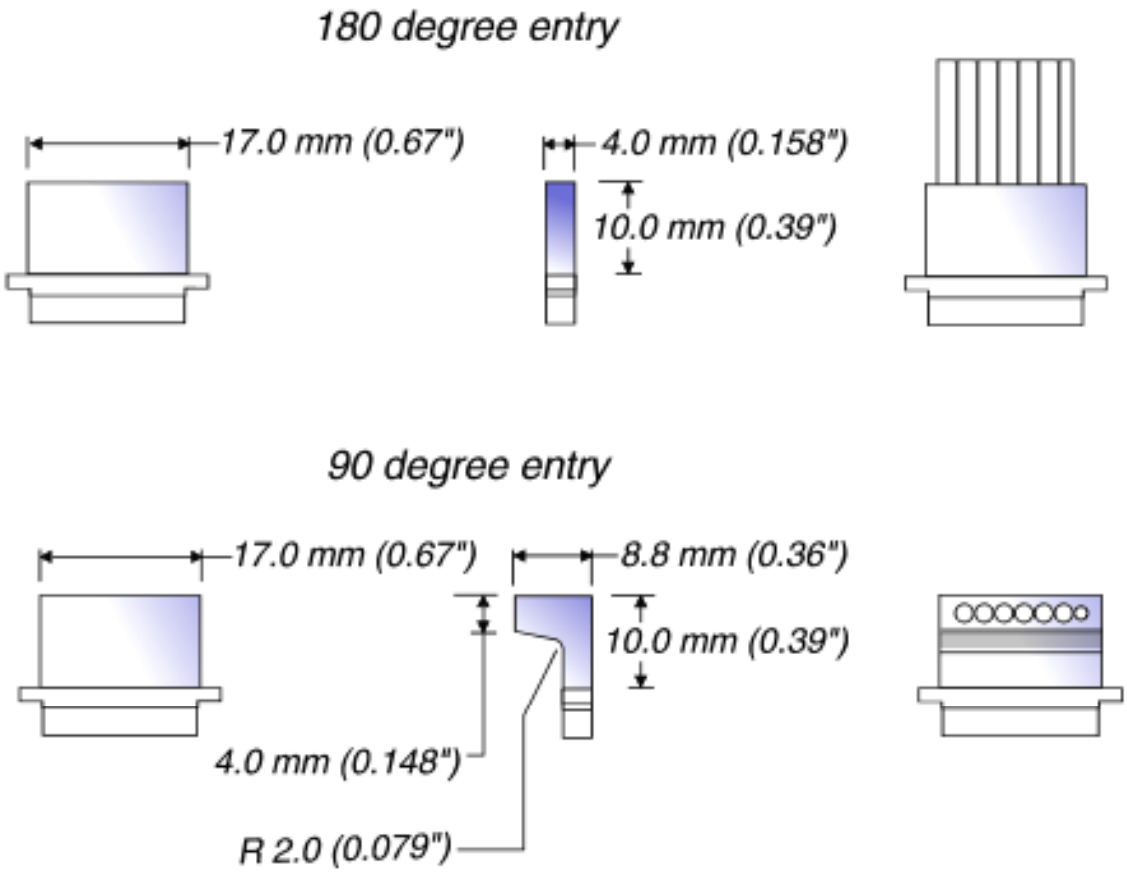

Figure 2 - Nominal dimensions of the Nanonics connector potted backshells to the SPIRE BDAs.

3.3.3 PTC 25 Way Nanonics Connector

This connector mates with a flying lead from the PTC hardware.
The rear of the connectors are to be potted with Stycast 2850 FT, using Stycast Catalyst 9.
The Part number for the connectors is: STM02511500PCN.

3.3.4 Inline connectors

These connectors mate with PTC Heater connectors Harness F20 and F21. For the STM build of the harnesses, no connector will be implemented in this section of the harness. The exact specification of this connector is TBD.

3.4 WIRE SPECIFICATIONS

3.4.1 12-ax

Cooner: P/N CW6515

12 Conductor Cable:
4 twisted triads, each: 3(40 AWG solid soft bare manganin, .003" PFA insulation to 0.009" ± 0.001" o.d. - colour coded as follows: clear, 10 solids, repeat 1 solid)
The four triads cabled to 0.019" ± 0.001" o.d. Cable the 4 twisted triads, 44 AWG type 304 haRD-stainless steel braided shield, to 0.056" ± 0.003" o.d. Add outer PFA jacket to 0.068" ± 0.003" o.d.

3.4.2 Screened Twisted Triple

Three twisted 40 AWG solid soft bare manganin wire. 0.003" PFA insulation to 0.009" ± 0.001". Each conductor uniquely colour coded. Cabled to .019" ± 0.001" o.d.
44 AWG type 304 haRD-stainless steel braided shield with > 80% optical coverage.

3.5 PIN ALLOCATION TABLE

The pin allocation for Harnesses F1-F15 is contained in Table 1. The pin allocation for F28 is to be found in §9 - PTC Readout Harness – F28.

Table 1 - Pin Allocation table. This information is for information only – see The SPIRE Harness Definition SPIRE-RAL-PRJ-000608

Function	**MDM51 contact**	**Cable**	Nanonics contact
Channel A +	35	12-ax (A)	1
Channel A -	18		26
Channel Agnd	To 12-ax shield one end		To 12-ax shield one end
Channel B +	51		2
Channel B -	17		27
Channel Bgnd	To 12-ax shield one end		To 12-ax shield one end
Channel C +	16		3
Channel C -	34		28
Channel Cgnd	To 12-ax shield one end		To 12-ax shield one end
Channel D +	33		4
Channel D -	50		29
Channel Dgnd	To 12-ax shield one end		To 12-ax shield one end
Channel E +	49	12-ax (B)	5
Channel E -	15		30
Channel Egnd	To 12-ax shield one end		To 12-ax shield one end
Channel F +	14		6
Channel F -	32		31
Channel Fgnd	To 12-ax shield one end		To 12-ax shield one end
Channel G +	48		7
Channel G -	31		32

Function	**MDM51 contact**	**Cable**	Nanonics contact
Channel Ggnd	To 12-ax shield one end		To 12-ax shield one end
Channel H +	13		8
Channel H-	47		33
Channel Hgnd	To 12-ax shield one end		To 12-ax shield one end
Channel I +	30	12-ax (C)	9
Channel I-	12		34
Channel Ignd	To 12-ax shield one end		To 12-ax shield one end
Channel J +	46		10
Channel J-	29		35
Channel Jgnd	To 12-ax shield one end		To 12-ax shield one end
Channel K +	11		11
Channel K -	45		36
Channel Kgnd	To 12-ax shield one end		To 12-ax shield one end
Channel L +	28		12
Channel L -	10		37
Channel Lgnd	To 12-ax shield one end		To 12-ax shield one end
Channel M +	27	12-ax (D)	13
Channel M-	44		38
Channel Mgnd	To 12-ax shield one end		To 12-ax shield one end
Channel N +	43		14
Channel N -	9		39
Channel Ngnd	To 12-ax shield one end		To 12-ax shield one end
Channel P +	8		15
Channel P -	26		40
Channel Pgnd	To 12-ax shield one end		To 12-ax shield one end
Channel R +	25		16
Channel R-	42		41
Channel Rgnd	To 12-ax shield one end		To 12-ax shield one end
Channel S+	41	12-ax (E)	17
Channel S -	7		42
Channel Sgnd	To 12-ax shield one end		To 12-ax shield one end
Channel T+	6		18
Channel T -	24		43
Channel Tgnd	To 12-ax shield one end		To 12-ax shield one end
Channel U +	40		19
Channel U -	23		44
Channel Ugnd	To 12-ax shield one end		To 12-ax shield one end
Channel V +	5		20
Channel V-	39		45
Channel Vgnd	To 12-ax shield one end		To 12-ax shield one end
Channel W +	22	12-ax (F)	21
Channel W -	4		46
Channel Wgnd	To 12-ax shield one end		To 12-ax shield one end
Channel X +	38		22
Channel X -	21		47
Channel Xgnd	To 12-ax shield one end		To 12-ax shield one end
Channel Y +	3		23
Channel Y -	37		48
Channel Ygnd	To 12-ax shield one end		To 12-ax shield one end
Channel Z+	20		24
Channel Z -	36		49

Function	**MDM51 contact**	**Cable**	Nanonics contact
Channel Zgnd	To 12-ax shield one end		To 12-ax shield one end
Bias +	1	STT	25
Bias_	2		50
Bias gnd	19+commoned shlds		51+commoned shlds (Note 1)

Note 1: The Bias Ground terminates at the Nanonics connector on Pin 51. A separate insulated copper; multi-strand wire is also connected to Pin 51 and potted into the connector assembly. The length of each of these flying leads is to be greater than 300mm and is to be terminated with a solder lug.

3.6 SHIELDING

A >80% coverage Stainless Steel harness overshield is used between the JFP/JFS and the FPU feedthroughs. This overshield is to be bonded 360° around the signal conductors to both the feedthrough and the MDM connector backshell.

3.7 ACCEPTANCE TESTING

Each harness assembly is to be thermally cycled between room temperature and 77K twice. The hold time at 77K is to be at least 30 minutes. The resistance of each individual signal function is to be measured at 77K and 295K and documented.

3.8 FPU FEEDTHRUS

There are to be six feedthroughs mounted on the wall of the FPU. The Feedthroughs are to mount to the Photometer and Spectrometer FPU Connector Panels.

3.9 LABELLING

Each harness tail is to be clearly marked with Pxx; where “xx” is the two digit numerical identifier of the connector to which the tail connects. The feedthroughs are to be marked with the identifier HSxxx; where xxx identifies the three-letter acronym for the particular feedthrough. The model of the feedthroughs (PFM or QM/FS) is also to be marked.

3.10 BAKE-OUT

The harnesses assemblies are to be baked out prior to delivery at 105°C for 72 hours at less than 10^{-5}torr. The out gassing products between 2-100amu are to be measured and recorded < 10^{-9}torr at 80°C at the end of the bake-out.

3.11 TRANSPORTATION

The harnesses are to be delivered in a sealed dry nitrogen atmosphere. A transportation jig will be used to support the harness and prevent handling damage.

4. PSW BDA ASSEMBLY – F1 TO F6 (FPU FEEDTHRU B3)

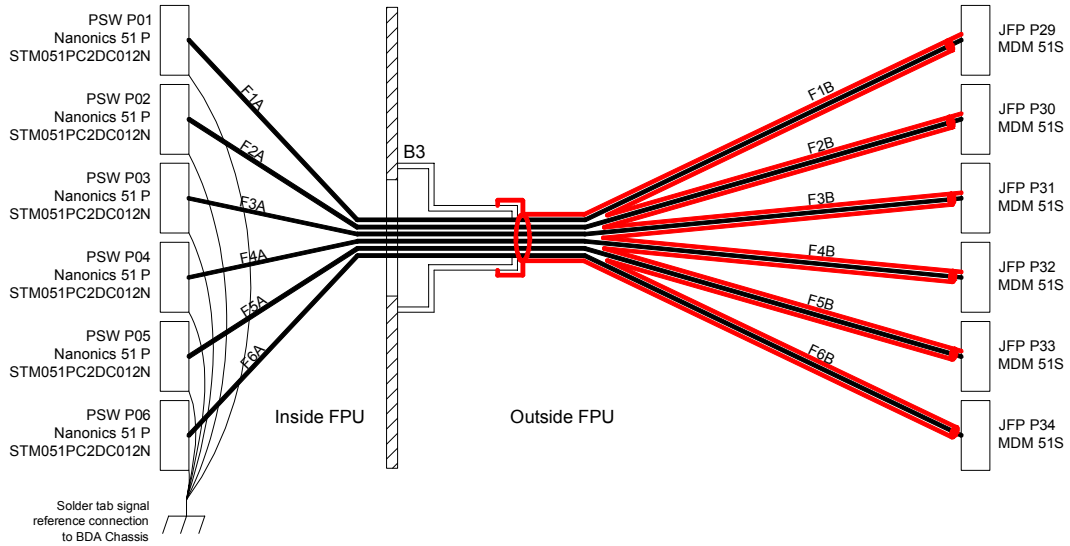

Figure 3 - PSW BDA Assembly – F1 to F6

Harness Element	Length (mm)	Connector entry	Mates with	Harness Composition
F1 A	130	180°	PSW J01	Six 12-Ax, One STT
F1 B	170	180°	JFP J29	
F2 A	130	180°	PSW J02	Six 12-Ax, One STT
F2 B	170	180°	JFP J30	
F3 A	110	180°	PSW J03	Six 12-Ax, One STT
F3 B	170	180°	JFP J31	
F4 A	110	180°	PSW J04	Six 12-Ax, One STT
F4 B	170	180°	JFP J32	
F5 A	96	180°	PSW J05	Six 12-Ax, One STT
F5 B	170	180°	JFP J33	
F6 A	96	180°	PSW J06	Six 12-Ax, One STT
F6 B	170	180°	JFP J34	

5. PLW BDA ASSEMBLY – F7 TO F8 (FPU FEEDTHRU B5)

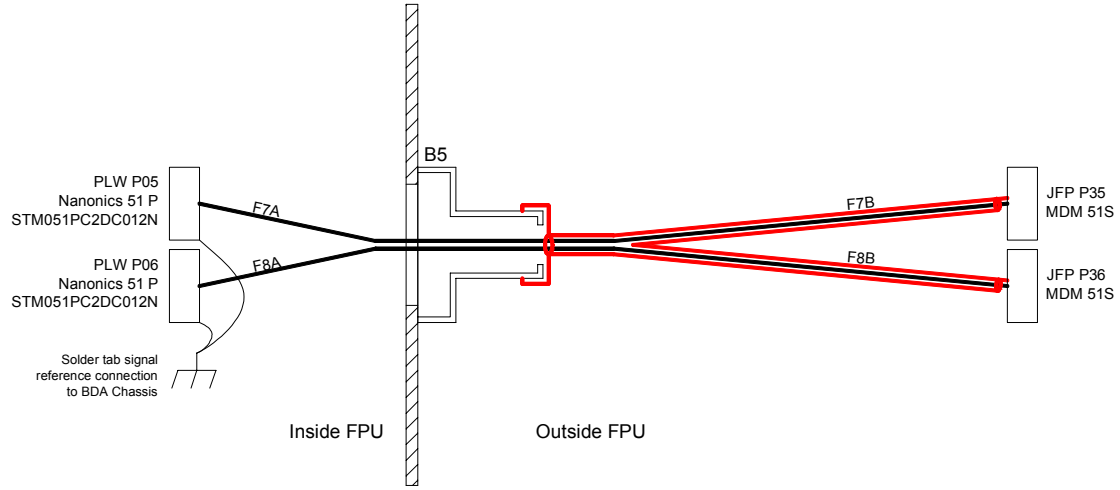

Figure 4 - PLW BDA Assembly – F7 to F8

Harness Element	Length (mm)	Connector entry	Mates with	Harness Composition
F7 A	392	180°	PLW J05	Six 12-Ax, One STT
F7 B	170	180°	JFP J35	
F8 A	491	90°	PLW J06	Six 12-Ax, One STT
F8 B	170	180°	JFP J36	

6. PMW BDA ASSEMBLY – F9 TO F12 (FPU FEEDTHRU B4)

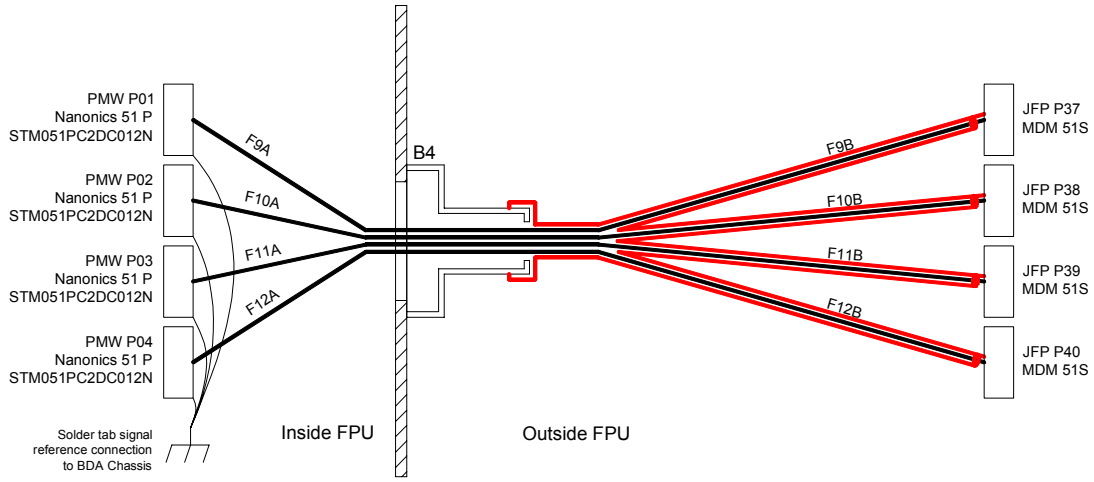

Figure 5 – PMW BDA Assembly – F9 to F12

Harness Element	Length (mm)	Connector entry	Mates with	Harness Composition
F9 A	111	180°	PMW J01	Six 12-Ax, One STT
F9 B	170	180°	JFP J37	
F10 A	111	180°	PMW J02	Six 12-Ax, One STT
F10 B	170	180°	JFP J38	
F11 A	102	180°	PMW J03	Six 12-Ax, One STT
F11 B	170	180°	JFP J39	
F12 A	102	180°	PMW J04	Six 12-Ax, One STT
F12 B	170	180°	JFP J40	

7. SSW BDA ASSEMBLY – F13 TO F14 (FPU FEEDTHRU B1)

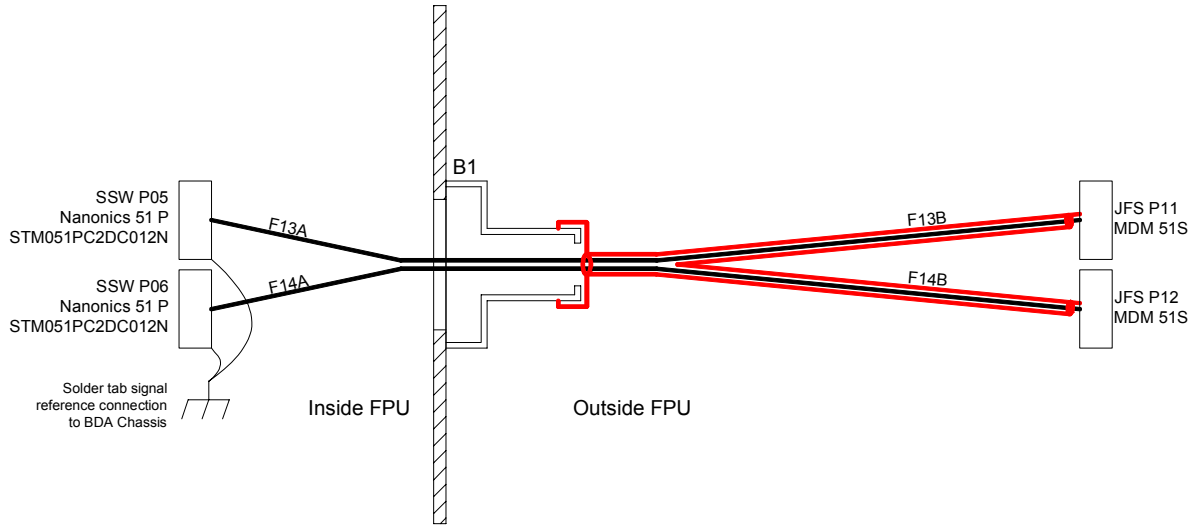

Figure 6 - SSW BDA Assembly – F13 to F14

Harness Element	Length (mm)	Connector entry	Mates with	Harness Composition
F13 A	58	180°	PSW J05	Six 12-Ax, One STT
F13 B	170	180°	JFS J11	
F14 A	167	180°	SSW J06	Six 12-Ax, One STT
F14 B	170	180°	JFS J12	

8. SLW BDA HARNESS ASSEMBLY – F15 (FPU FEEDTHRU B2)

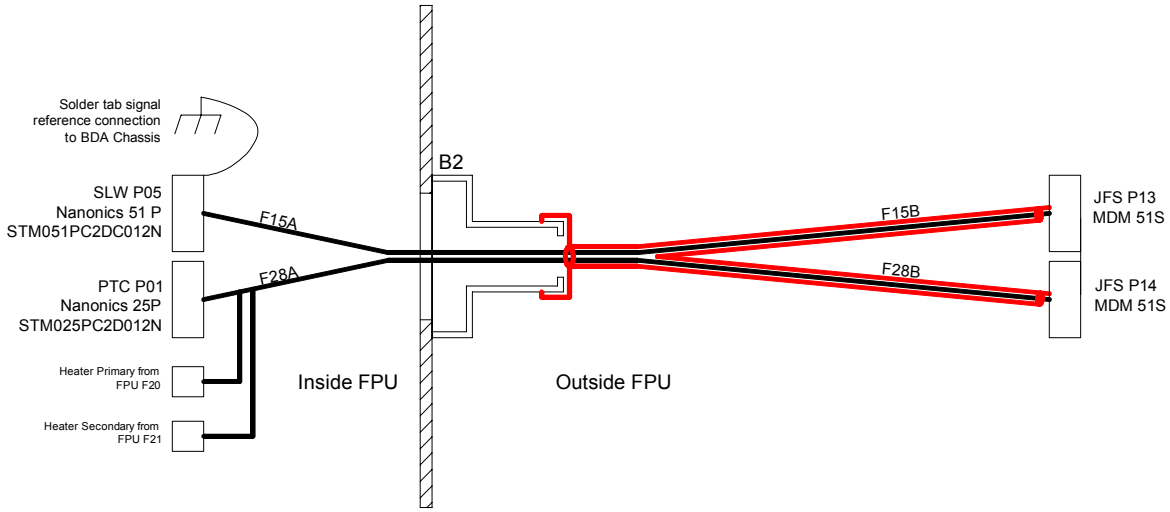

Figure 7 – SLW BDA Harness Assembly – F15 and PTC Harness – F28

Harness Element	Length (mm)	Connector entry	Mates with	Harness Composition
F15 A	67	180°	SLW J01	Six 12-Ax, One STT
F15 B	170	180°	JFS J13	

9. PTC READOUT HARNESS – F28

This harness assembly has been combined into the SLW harness assembly. See §8 for details.

Harness Element	Length (mm)	Connector entry	Mates with	Harness Composition
F28 A	67	180°	PTC Hardware and F20/F21	1 x 12-ax (thermometry signals) to feedthru 1 x STT (NTD biasing) to feedthru 2 x STQ (heaters) 100mm tail length
F28 B	170	180°	JFS J13	1 x 12-ax (thermometry signals) to JFS J14 1 x STT (NTD biasing) to JFS J14

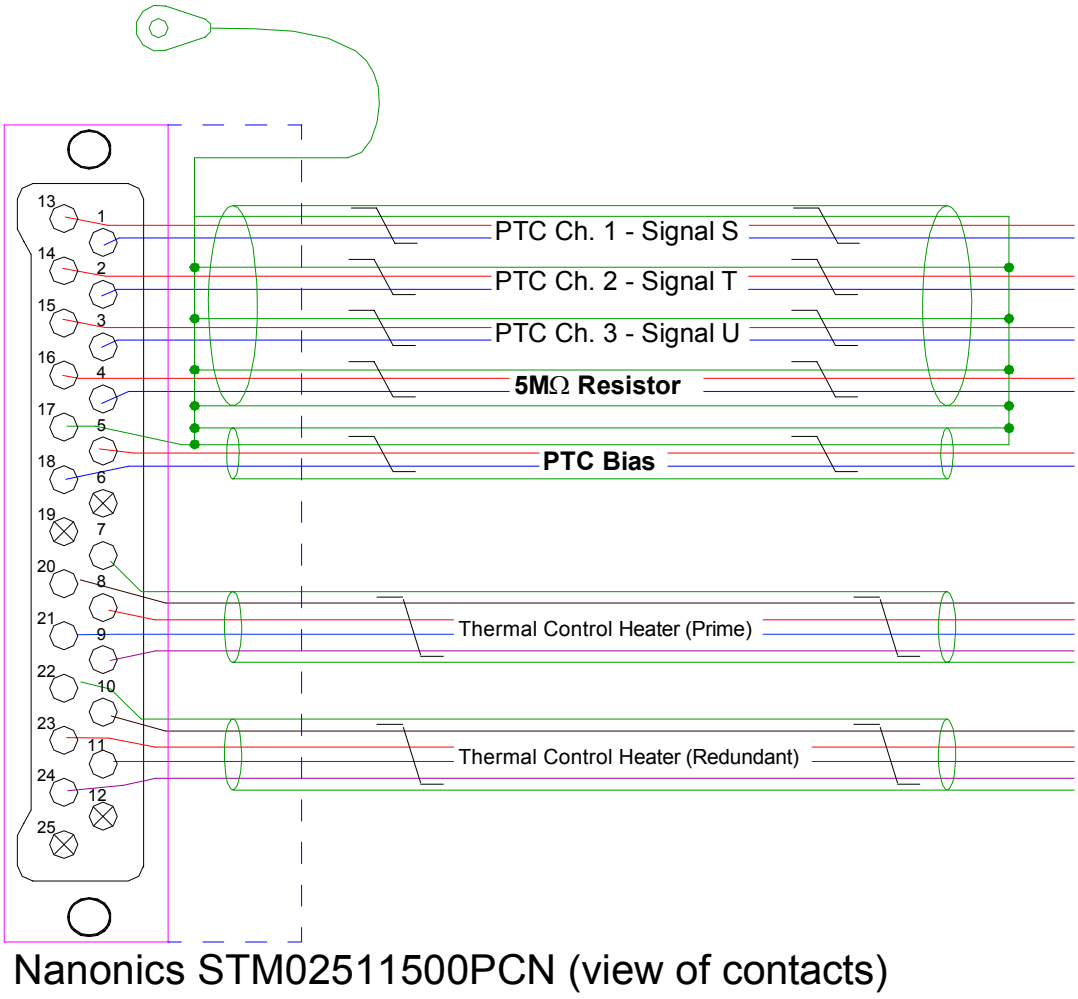

Figure 8 – PTC J01 Pin allocation.

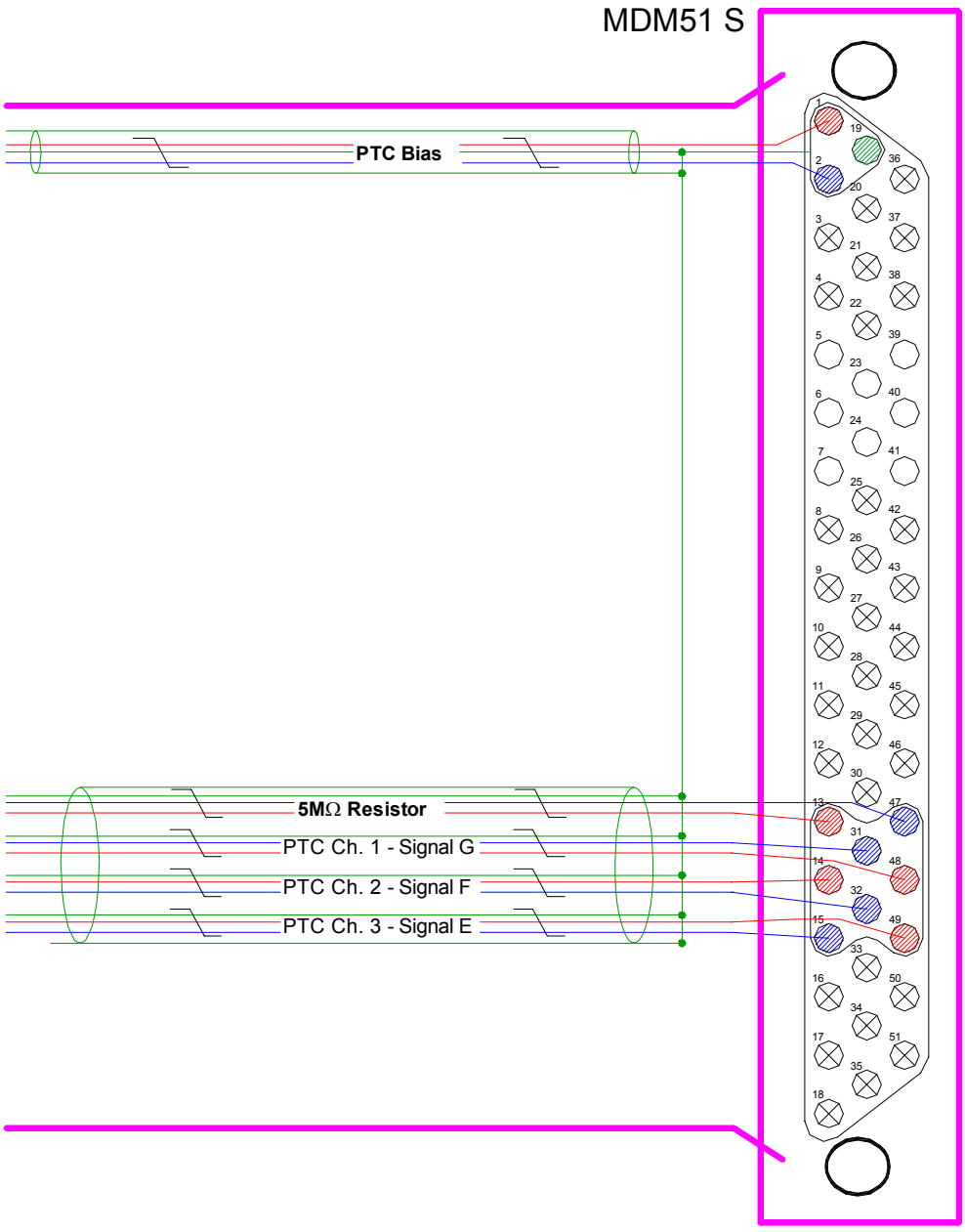

Figure 9 - JFS J14 Pin allocation

Function	MDM51 contact	Cable	Nanonics contact
PTC 1+ (Channel E+)	49	12-ax	13
PTC 1- (Channel E -)	15		1
PTC Ground	To 12-ax shield one end		To 12-ax shield one end
PTC 2+ (Channel F+)	14		14
PTC 2- (Channel F -)	32		2
PTC Ground	To 12-ax shield one end		To 12-ax shield one end
PTC 3+ (Channel G +)	48		15
PTC 3-(Channel G -)	31		3
PTC Ground	To 12-ax shield one end		To 12-ax shield one end
Dummy 5MΩ (Channel H +)	13		16

Function	MDM51 contact	Cable	Nanonics contact
Dummy 5MΩ (Channel H-)	47		4
PTC Ground	To 12-ax shield one end		To 12-ax shield one end
Bias +	1	STT	5
Bias_	2		18
Bias gnd	19+commoned shlds		17+commoned shlds (Note 1)