



Technical Note

The Channel Number Mapping Calibration Product

Ref: SPIRE-RAL-NOT-003224

Issue: 1.0

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SPIRE Channel Number Mapping Calibration Product

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1.1 Reference Documents

<i>Calibration Products for SPIRE Data Processing</i>	SPIRE-RAL-DOC-002261
<i>SPIRE Pixel Map Spreadsheet</i> , Issue 1.21	SPIRE-RAL-NOT-001541
<i>SPIRE Pixel Map Spreadsheet Description</i> , Issue 1.0	SPIRE-RAL-NOT-001540
<i>Housekeeping Conversion Tables Description Document</i>	SPIRE-RAL-DOC-003113
<i>SPIRE Instrument User Manual</i> , Issue 1.0	SPIRE-RAL-PRJ-002395
<i>SPIRE DRCU/DPU ICD</i> , Issue 1.3	SPIRE-SAP-PRJ-001364
<i>SPIRE DCU Design Document</i> , Issue 1.0	SPIRE-SAP-PRJ-001243
<i>SPIRE PFM AS BUILT STATUS (ABCIDL)</i> , Issue 2.2	SPIRE-RAL-DOC-002840

1.2 Introduction

This technical note describes the origin of the data used to fill the Channel Number Mapping calibration product. This product gives the mapping between channel numbers and channel names, both in full array mode and also in individual array modes. It also gives the JFET output connector number and LIA board for each channel and a series of columns that can be used to distinguish between detectors viewing the sky, resistors, thermistors, dark detectors, non-connected channels and PTC channels.

The format of the product is described in the document, *Calibration Products for SPIRE Data Processing*. The entries should not change after launch.

1.3 The ASCII Parameter Tables

The information on mapping between channel numbers and names is held in a series of ASCII tables that are included in the build. This information is accessed with the `Bolometer` and `BolArray` classes in the HCSS. These are the same tables that are used for the display in QLA. There is one table for each array. These tables are described in the *Housekeeping Conversion Tables Description Document*.

Table Name
SPIRE_PLW_Pixel_Mapping.txt
SPIRE_PMW_Pixel_Mapping.txt
SPIRE_PSW_Pixel_Mapping.txt
SPIRE_PTC_Pixel_Mapping.txt
SPIRE_SLW_Pixel_Mapping.txt
SPIRE_SSW_Pixel_Mapping.txt

Each file contains the following information:

- Bolometer name (e.g. "A1")
- Array position (the channel number if only this array is read out)
- Full Array position (the full channel number)
- Coalign Flag
- Coaligned detectors on the other arrays of the sub-instrument
- JFET group
- LIA board

The information used to fill these columns is derived from the *Pixel Map Spreadsheet*. The following table shows the correspondence between the columns used in the ASCII file, the column name in the Channel Number Mapping product, and the column in the *Pixel Map Spreadsheet* (note that `jfetMembrane` is an additional column in the calibration product that is not in the ascii table).



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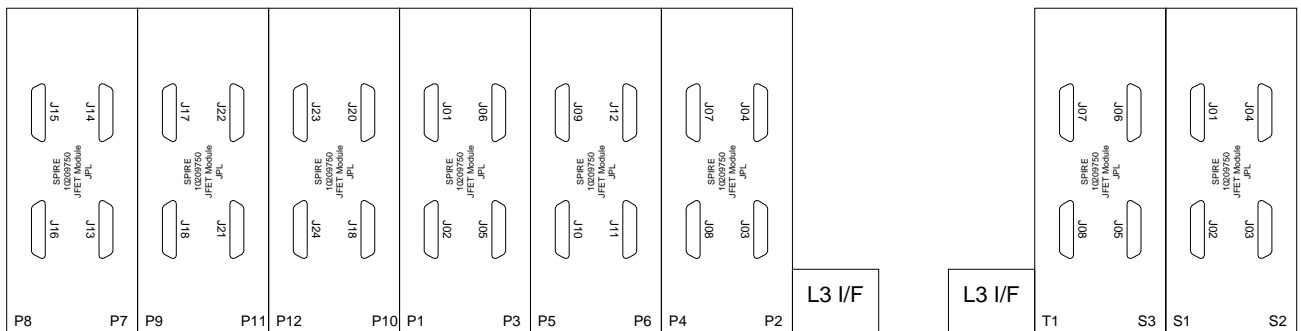
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Column Name in ASCII File	Column Name in Channel Number Mapping Product	Column Name in Pixel Map Spreadsheet	Worksheet Columns				
			PSW	PMW & PTC	PLW	SSW	SLW
Bolometer name	names		B	A	A	A	A
Array position	indivChannel	<i>Out of FPGA T1</i>	AW	AX	AW	AS	AS
Full Array position	fullChannel	<i>Out of FPGA T2</i>	AX	AY	AX	AT	AT
Coalign Flag	isAligned						
Coaligned detectors							
JFET group	jfetConnector	<i>Output Conn.</i>	Y	Y	Y	V	V
	jfetMembrane	<i>JFET Module S/N & JFET Board S/N</i>	V & W	V & W	V & W	S & T	S & T
LIA board	liaBoard	<i>DCU LIA</i>	AN	AO	AN	AK	AK

The JFET connector and LIA board numbers should be set to (although the numbers are written as an integer in the calibration product rather than a string):

Array	JFET conn.	LIA
PSW:	"J01" to "J12"	"P1" to "P5"
PMW:	"J17" to "J24"	"P7" to "P9"
PLW:	"J13" to "J16"	"P5" to "P6"
PTC:	"J07"	"P9"
SSW:	"J01" to "J04"	"S1" to "S2"
SLW:	"J05" to "J06"	"S3"

The following figure shows the physical location of the JFET connectors and boards – the table below gives the serial numbers for the board above it in the diagram. The serial number information is derived from the *Pixel Map Spreadsheet*, which reports the values as given in the *SPIRE PFM AS BUILT STATUS (ABCIDL)*. The module and board serial numbers are written into the calibration product as a string (for example for PLW as "17-41" and "17-43").



BDA	PLW	PLW	PMW	PMW	PMW	PMW	PSW	PSW	PSW	PSW	PSW	PSW
Module S/N	S/N 017		S/N 015		S/N 012		S/N 019		S/N 016		S/N 020	
Connector pair	JAA/JBB	JAA'/JBB'	JAA/JBB	JAA'/JBB'	JAA/JBB	JAA'/JBB'	JAA/JBB	JAA'/JBB'	JAA/JBB	JAA'/JBB'	JAA/JBB	JAA'/JBB'
Board S/N	S/N 041	S/N 043	S/N 035	S/N 034	S/N 023	S/N 022	S/N 042	S/N 044	S/N 040	S/N 045	S/N 051	S/N 050
Noise nV/rtHz	7.47	7.56	7.24	7.32	7.41	8.28	6.64	6.85	7.21	7.63	8.08	6.70
Power mW	3.99	3.77	4.42	4.72	4.41	4.57	4.22	4.43	3.80	3.53	4.50	4.46
Low power yield	21	21	11	9	7	14	18	18	23	24	20	24

BDA	PTC	SLW	SSW	SSW
Module S/N	S/N 014		S/N 024	
Connector pair	JAA/JBB	JAA'/JBB'	JAA/JBB	JAA'/JBB'
Board S/N	S/N 037	S/N 036	S/N 059	S/N 060
Noise nV/rtHz	9.45	9.2	6.55	6.43
Power mW	5.14	4.01	4.84	4.66
Low power yield	18	22	14	10



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The coaligned flag and coaligned detectors were determined from the *SPIRE Instrument User Manual*.

This information is filled into the Channel Number Mapping Product using the *Bolometer* and *BolArray* classes in HCSS.

1.4 Additional Information in the Channel Number Mapping Product

The following additional columns are provided in the Channel Number Mapping Product:

Name	Description	Criterion used to fill
isConnected	This is true for all useful channels. It is false for the 6 channels in SSW packets which are not connected to anything	False for channels named <i>N#</i>
isBolometer	True for all Bolometer channels - ie. both for detectors that see the sky and also for dark detectors.	True for channels named <i>A#</i> to <i>J#</i>
isThermistor	True for the two thermistor channels on each array	True for channels named <i>T#</i>
isResistor	True for the resistor channel on each array	True for channels named <i>R#</i>
isDark	True for the two dark bolometers on each array	True for channels named <i>DP#</i>
isPtc	True for the three channels used for photometer thermal control	True for channels named <i>P#</i>

In addition, the identifier of the ADC processing each channel is provided. This information is used in the "Check ADC flags and truncation" module to know which channels are affected by ADC latch-up occurrences. The ADC channel is given by the formula:

$$\begin{aligned} \text{ADC channel} &= (\text{full channel number} - 1)/48 && \text{for the photometer} \\ \text{ADC channel} &= (\text{full channel number} - 1)/12 && \text{for the spectrometer} \end{aligned}$$

The relation between ADC channel number and detector channel number comes from *SPIRE DRCU/DPU ICD* (Issue 1.3, page 100), note that the second table is correct for the photometer but wrong for the spectrometer, and the *SPIRE DCU Design Document* (Issue 1.0, pages 25 to 30).