

SPIRE

Subject: BDA Electronic Handling Procedure, SPIRE P/SW-PFM S/N013

Prepared by: Anthony Turner

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Electronic Handling Procedure P/SW-PFM S/N013

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Glossary

1. Introduction:

This document provides the Electronic Handling Procedure for the Proto-Flight Model-Photometer Short Wavelength Bolometer Detector Array serial number 013.

2. Handling:

1. **BDA is Contamination Sensitive:** Handle BDA with Gloves only in a FED-STD-209 Class 10000 clean room (ISO 14644-1 class 7) or better.
2. **BDA is ESD Sensitive:** Electronic parts included in the P/SW-PFM S/N013 science instrument are subject to electro-static discharge failures. Please handle with appropriate ESD hardware handling procedures. Handle with grounding straps, ESD-safe gloves, ESD smocks at an ESD-safer workstation.

3. Signal Requirements:

The interface circuit for the BDA contains a series of resistive networks as depicted in figure 1. Two high resistive load resistors ($\sim 6\text{-}14\text{ M}\Omega$) are coupled to a NTD Ge thermistor (R_{bolo}) through a lithographed metalization circuit and provide the bias circuitry for the device. The maximum DC input voltage for the bias lines $V+$ and $V-$ lines is $\pm 1\text{ V}$, and the maximum AC input voltage is 100mV rms .

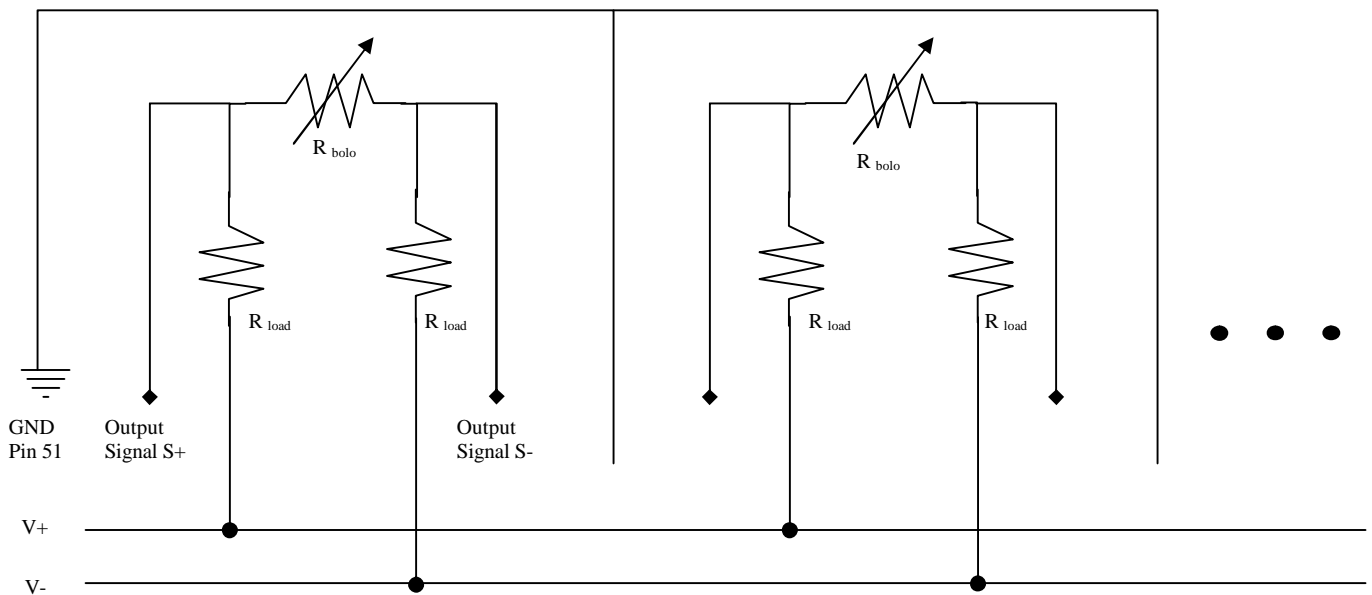


Figure 1: Interface circuit of the Bolometer Detector Array

DC Voltage-Current Limits for Room Temperature Detector Values Check:

Signal	Pin	Nominal Value	Max Value
V+	25	+50mV	+1 V
V-	50	-50mV	-1 V
I+,I-	25,50	10 μ A	25 μ A

DC Voltage-Current Limits for room temperature Load Resistor-Detector Continuity Check:

Signal	Pin	Nominal Value	Max Value
V+	25	+50mV	+1 V
V-	50	-50mV	-1 V
I+, I-	25,50	<0.5 μ A	1 μ A

4. Device Isolation Check:

The 300mK stage Kevlar suspended portion of the detector chassis is grounded directly to the electronic ground on pin 51 of the nanonics 51 pin connectors on each side. A resistance of less than 200 Ω can be checked from the thermal strap of the 300mK stage to electrical ground pin 51. The 2K stage is electrically isolated from the electronic ground via the Kevlar supports. Measuring from pin 51 to any metal section of the 2K stage will yield an open circuit.

5. Room Temperature Detector Values Check

The final measured DC resistance value for each of the bolometer detector at room temperature is shown in tables 1 through 4. The measurements bypass the load resistors in the circuit measuring directly through the output signal pins on the two nanonics 51 pin connectors. All measurements were performed with a Fluke 87 True RMS Multi-meter set in the 4k Ω range. All measurements are in k Ω unless designated otherwise. Channels that are out of range are re-measured using the 40M Ω range to determine their value. The failure mode of any particular channel is also designated in tables 1 through 6. The designation for the failure modes are **open**- Channel open at 300mK, **short**-channel shorted at 300mK, **float**- channel floating at 300mK or **caution**- for cautionary concerning due to detector performance status change during testing at 300mK.

Table 1: P/SW-PFM S/N013 Room Temperature DC Detector Measurements J01 connector

Connector Label	Signal	Nanonics Pin From	Nanonics Pin To	Detector Label	Resistance (kohms)	Failure Mode
J01	1	1	26	D6	2.454	
	2	2	27	B6	2.387	
	3	3	28	C5	2.445	
	4	4	29	A5	2.385	
	5	5	30	E5	2.561	
	6	6	31	B5	2.461	
	7	7	32	D5	2.555	
	8	8	33	C4	2.494	
	9	9	34	A4	2.471	
	10	10	35	D4	2.595	
	11	11	36	B4	2.514	
	12	12	37	C3	2.577	
	13	13	38	B3	2.578	
	14	14	39	A3	2.53	
	15	15	40	A2	2.618	
	16	16	41	D3	2.722	
	17	17	42	C2	2.727	
	18	18	43	B2	2.737	
	19	19	44	D2	2.822	
	20	20	45	A1	2.75	
	21	21	46	C1	2.847	
	22	22	47	B1	2.824	
	23	23	48	DK1	2.793	
	24	24	49	D1	2.926	
	V- to V+	50	25		233.0k	
	V- to gnd	50	51		>30M	
	V+ to gnd	25	51		>30M	
	Chassis to gnd	chassis	51		46.9 ohms	

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Table 2: P/SW-PFM S/N013 Room Temperature DC Detector Measurements J02 connector

Connector Label	Signal	Nanonics Pin From	Nanonics Pin To	Detector Label	Resistance (kohms)	Failure Mode
J02	1	1	26	F12	2.395	
	2	2	27	J11	2.269	
	3	3	28	E12	2.476	
	4	4	29	H12	2.33	
	5	5	30	G12	2.373	
	6	6	31	F13	2.421	
	7	7	32	E13	2.532	
	8	8	33	J12	2.356	
	9	9	34	H13	2.405	
	10	10	35	G13	2.473	
	11	11	36	F14	2.547	
	12	12	37	E14	2.598	
	13	13	38	J13	2.437	
	14	14	39	H14	2.497	
	15	15	40	G14	2.566	
	16	16	41	J14	2.535	
	17	17	42	F15	2.692	
	18	18	43	H15	2.615	
	19	19	44	J15	2.617	
	20	20	45	G15	2.73	
	21	21	46	H16	2.745	
	22	22	47	DK2	2.702	
	23	23	48	F16	2.886	
	24	24	49	E15	2.918	
	V- to V+	50	25		228.0 k	
	V- to gnd	50	51		>30M	
	V+ to gnd	25	51		>30M	
	Chassis to gnd	chassis	51		47.5 ohms	

Table 3: P/SW-PFM S/N013 Room Temperature DC Detector Measurements J03 connector

Connector Label	Signal	Nanonics Pin From	Nanonics Pin To	Detector Label	Resistance (kohms)	Failure Mode
J03	1	1	26	R1	4.00M	
	2	2	27	D16	2.799	
	3	3	28	T1	2.787	
	4	4	29	B16	2.688	
	5	5	30	C15	2.707	
	6	6	31	A15	2.608	
	7	7	32	D15	2.666	
	8	8	33	B15	2.588	
	9	9	34	C14	2.592	
	10	10	35	D14	2.631	
	11	11	36	A14	2.52	
	12	12	37	A13	2.432	
	13	13	38	B14	2.467	
	14	14	39	C13	2.48	
	15	15	40	B13	2.438	
	16	16	41	D13	2.517	
	17	17	42	A12	2.383	
	18	18	43	C12	16.76M	Open
	19	19	44	D12	2.455	
	20	20	45	B12	2.366	
	21	21	46	E11	2.463	
	22	22	47	A11	2.309	
	23	23	48	C11	2.398	
	24	24	49	B11	2.31	
	V- to V+	50	25		233.0k	
	V- to gnd	50	51		>30M	
	V+ to gnd	25	51		>30M	
	Chassis to gnd	chassis	51		49.0 ohms	

Failure mode notes: Channel C12 was non functional at room temperature, 4K and 300mK.

Table 4: P/SW-PFM S/N013 Room Temperature DC Detector Measurements J04 connector

Connector Label	Signal	Nanonics Pin From	Nanonics Pin To	Detector Label	Resistance (kohms)	Failure Mode
J04	1	1	26	E1	2.815	
	2	2	27	F1	2.748	
	3	3	28	T2	2.709	
	4	4	29	H1	2.587	
	5	5	30	G1	2.647	
	6	6	31	J1	2.508	
	7	7	32	H2	2.508	
	8	8	33	F2	2.567	
	9	9	34	J2	2.416	
	10	10	35	G2	2.446	
	11	11	36	H3	2.367	
	12	12	37	J3	2.354	
	13	13	38	E2	2.536	
	14	14	39	F3	2.434	
	15	15	40	G3	2.377	
	16	16	41	H4	2.311	
	17	17	42	J4	2.296	
	18	18	43	E3	2.462	
	19	19	44	F4	2.472	
	20	20	45	G4	2.34	
	21	21	46	H5	2.296	
	22	22	47	E4	2.412	
	23	23	48	J5	2.24	
	24	24	49	F5	2.345	
	V- to V+	50	25		228.0k	
	V- to gnd	50	51		>30M	
	V+ to gnd	25	51		>30M	
	Chassis to gnd	chassis	51		49.0 ohms	

Table 5: P/SW-PFM S/N013 Room Temperature DC Detector Measurements J05 connector

Connector Label	Signal	Nanonics Pin From	Nanonics Pin To	Detector Label	Resistance (kohms)	Failure Mode
J05	1	1	26	D11	2.597	
	2	2	27	A10	2.444	
	3	3	28	E10	2.544	
	4	4	29	C10	2.46	
	5	5	30	B10	2.383	
	6	6	31	D10	2.457	
	7	7	32	A9	2.322	
	8	8	33	E9	2.419	
	9	9	34	C9	2.364	
	10	10	35	B9	2.289	
	11	11	36	D9	2.374	
	12	12	37	A8	2.302	
	13	13	38	C8	2.368	
	14	14	39	E8	2.479	
	15	15	40	D8	2.471	
	16	16	41	B8	2.383	
	17	17	42	C7	2.467	
	18	18	43	E7	2.552	
	19	19	44	A7	2.405	
	20	20	45	D7	2.547	
	21	21	46	B7	2.481	
	22	22	47	C6	2.578	
	23	23	48	E6	2.817	
	24	24	49	A6	2.488	
	V- to V+	50	25		233.0k	
	V- to gnd	50	51		>30M	
	V+ to gnd	25	51		>30M	
	Chassis to gnd	chassis	51		25.6 ohms	

Table 6: P/SW-PFM S/N013 Room Temperature DC Detector Measurements J06 connector

Connector Label	Signal	Nanonics Pin From	Nanonics Pin To	Detector Label	Resistance (kohms)	Failure Mode
J06	1	1	26	G5	2.452	
	2	2	27	H6	2.393	
	3	3	28	J6	2.33	
	4	4	29	F6	2.465	
	5	5	30	G6	2.373	
	6	6	31	H7	2.308	
	7	7	32	F7	2.387	
	8	8	33	J7	5.10K	Open
	9	9	34	G7	2.306	
	10	10	35	H8	2.223	
	11	11	36	F8	2.323	
	12	12	37	G8	2.315	
	13	13	38	J8	2.191	
	14	14	39	F9	2.342	
	15	15	40	H9	2.259	
	16	16	41	G9	2.353	
	17	17	42	J9	2.279	
	18	18	43	F10	2.422	
	19	19	44	H10	2.359	
	20	20	45	G10	2.408	
	21	21	46	F11	2.438	
	22	22	47	J10	2.37	
	23	23	48	H11	2.439	
	24	24	49	G11	2.52	Caution
	V- to V+	50	25		228.0 k	
	V- to gnd	50	51		>30M	
	V+ to gnd	25	51		>30M	
	Chassis to gnd	chassis	51		25.9 ohms	

Failure mode notes: Channel J7 has a problematic In bump bond and has been designated as a non-functioning pixel at 300mK. Channel G11 was functional at 300mK but logged to have an open LR during assembly.

6. Load Resistor-Detector Continuity Check

A DC continuity check of the load resistors in series with the bolometer detectors will complete the electrical checkout at room temperature. The test can be performed with a Fluke 87 True RMS multi-meter set on the $40\text{M}\Omega$ scale. The data set measures from V+ to output signal S+ and V- to output signal S- for each channel. The nominal value read for the live bolometer channels (room temp detector DC resistance $\sim 1.5\text{k}\Omega$) should read approximately $3\text{-}6\text{M}\Omega$. Channels with open bolometer channels will give values $8\text{M}\Omega$ or higher. The Data sets for the P/SW -PFM S/N013 for the final test through the entire circuit are shown in tables 7 through 12.

Table 7: P/SW-PFM S/N013 Load Resistor- Detector DC Continuity Check J01 connector

Connector Label	Signal	Detector Label	Bias V+ (pin 25) To S+ pin	V+ to S+ Resistance (Mohms)	Bias V- (pin 50) To S- pin	V- to S- Resistance (Mohms)
J01	1	D6	1	4.2	26	4.16
	2	B6	2	4.18	27	4.14
	3	C5	3	4.16	28	4.16
	4	A5	4	4.12	29	4.12
	5	E5	5	4.16	30	4.12
	6	B5	6	4.16	31	4.14
	7	D5	7	4.16	32	4.12
	8	C4	8	4.16	33	4.12
	9	A4	9	4.16	34	4.12
	10	D4	10	4.17	35	4.16
	11	B4	11	4.16	36	4.16
	12	C3	12	4.16	37	4.13
	13	B3	13	4.12	38	4.12
	14	A3	14	4.12	39	4.12
	15	A2	15	4.12	40	4.13
	16	D3	16	4.12	41	4.16
	17	C2	17	4.12	42	4.16
	18	B2	18	4.15	43	4.16
	19	D2	19	4.16	44	4.15
	20	A1	20	4.16	45	4.16
	21	C1	21	4.16	46	4.19
	22	B1	22	4.16	47	4.16
	23	DK1	23	4.2	48	4.16
	24	D1	24	4.16	49	4.17

Table 8: P/SW-PFM S/N013 Load Resistor- Detector DC Continuity Check J02 connector

Connector Label	Signal	Detector Label	Bias V+ (pin 25) To S+ pin	V+ to S+ Resistance (Mohms)	Bias V- (pin 50) To S- pin	V- to S- Resistance (Mohms)
J02	1	F12	1	4.08	26	4.08
	2	J11	2	4.08	27	4.08
	3	E12	3	4.08	28	4.08
	4	H12	4	4.08	29	4.08
	5	G12	5	4.08	30	4.08
	6	F13	6	4.08	31	4.08
	7	E13	7	4.08	32	4.07
	8	J12	8	4.08	33	4.09
	9	H13	9	4.08	34	4.08
	10	G13	10	4.09	35	4.08
	11	F14	11	4.08	36	4.08
	12	E14	12	4.08	37	4.08
	13	J13	13	4.11	38	4.12
	14	H14	14	4.09	39	4.09
	15	G14	15	4.12	40	4.12
	16	J14	16	4.12	41	4.12
	17	F15	17	4.12	42	4.1
	18	H15	18	4.12	43	4.12
	19	J15	19	4.12	44	4.11
	20	G15	20	4.12	45	4.08
	21	H16	21	4.12	46	4.09
	22	DK2	22	4.12	47	4.09
	23	F16	23	4.12	48	4.09
	24	E15	24	4.08	49	4.07

Table 9: P/SW-PFM S/N013 Load Resistor- Detector DC Continuity Check J03 connector

Connector Label	Signal	Detector Label	Bias V+ (pin 25) To S+ pin	V+ to S+ Resistance (Mohms)	Bias V- (pin 50) To S- pin	V- to S- Resistance (Mohms)
J03	1	R1	1	5.2	26	5.2
	2	D16	2	4.25	27	4.24
	3	T1	3	4.24	28	4.24
	4	B16	4	4.24	29	4.24
	5	C15	5	4.24	30	4.24
	6	A15	6	4.24	31	4.24
	7	D15	7	4.24	32	4.24
	8	B15	8	4.22	33	4.24
	9	C14	9	4.22	34	4.22
	10	D14	10	4.21	35	4.22
	11	A14	11	4.21	36	4.24
	12	A13	12	4.2	37	4.24
	13	B14	13	4.2	38	4.24
	14	C13	14	4.22	39	4.24
	15	B13	15	4.21	40	4.24
	16	D13	16	4.22	41	4.23
	17	A12	17	4.2	42	4.23
	18	C12	18	8.36	43	8.27
	19	D12	19	4.2	44	4.2
	20	B12	20	4.2	45	4.2
	21	E11	21	4.2	46	4.2
	22	A11	22	4.2	47	4.18
	23	C11	23	4.17	48	4.18
	24	B11	24	4.19	49	4.16

Table 10: P/SW-PFM S/N013 Load Resistor- Detector DC Continuity Check J04 connector

Connector Label	Signal	Detector Label	Bias V+ (pin 25) To S+ pin	V+ to S+ Resistance (Mohms)	Bias V- (pin 50) To S- pin	V- to S- Resistance (Mohms)
J04	1	E1	1	4.19	26	4.19
	2	F1	2	4.19	27	4.18
	3	T2	3	4.16	28	4.19
	4	H1	4	4.16	29	4.16
	5	G1	5	4.16	30	4.16
	6	J1	6	4.18	31	4.16
	7	H2	7	4.19	32	4.18
	8	F2	8	4.17	33	4.16
	9	J2	9	4.16	34	4.16
	10	G2	10	4.16	35	4.15
	11	H3	11	4.16	36	4.16
	12	J3	12	4.16	37	4.12
	13	E2	13	4.16	38	4.12
	14	F3	14	4.12	39	4.12
	15	G3	15	4.12	40	4.12
	16	H4	16	4.12	41	4.12
	17	J4	17	4.12	42	4.12
	18	E3	18	4.11	43	4.12
	19	F4	19	4.12	44	4.11
	20	G4	20	4.1	45	4.09
	21	H5	21	4.12	46	4.11
	22	E4	22	4.11	47	4.12
	23	J5	23	4.11	48	4.11
	24	F5	24	4.04	49	4.03

Table 11: P/SW-PFM S/N013 Load Resistor- Detector DC Continuity Check J05 connector

Connector Label	Signal	Detector Label	Bias V+ (pin 25) To S+ pin	V+ to S+ Resistance (Mohms)	Bias V- (pin 50) To S- pin	V- to S- Resistance (Mohms)
J05	1	D11	1	4.18	26	4.16
	2	A10	2	4.16	27	4.16
	3	E10	3	4.16	28	4.16
	4	C10	4	4.16	29	4.16
	5	B10	5	4.16	30	4.16
	6	D10	6	4.17	31	4.16
	7	A9	7	4.16	32	4.16
	8	E9	8	4.16	33	4.16
	9	C9	9	4.16	34	4.16
	10	B9	10	4.15	35	4.16
	11	D9	11	4.16	36	4.16
	12	A8	12	4.16	37	4.16
	13	C8	13	4.13	38	4.15
	14	E8	14	4.13	39	4.15
	15	D8	15	4.12	40	4.15
	16	B8	16	4.15	41	4.15
	17	C7	17	4.13	42	4.12
	18	E7	18	4.15	43	4.12
	19	A7	19	4.15	44	4.12
	20	D7	20	4.13	45	4.13
	21	B7	21	4.12	46	4.12
	22	C6	22	4.15	47	4.15
	23	E6	23	4.15	48	4.16
	24	A6	24	4.16	49	4.15

Table 12: P/SW-PFM S/N013 Load Resistor- Detector DC Continuity Check J06 connector

Connector Label	Signal	Detector Label	Bias V+ (pin 25) To S+ pin	V+ to S+ Resistance (Mohms)	Bias V- (pin 50) To S- pin	V- to S- Resistance (Mohms)
J06	1	G5	1	4.08	26	4.08
	2	H6	2	4.08	27	4.08
	3	J6	3	4.08	28	4.08
	4	F6	4	4.08	29	4.06
	5	G6	5	4.05	30	4.08
	6	H7	6	4.05	31	4.08
	7	F7	7	4.04	32	4.08
	8	J7	8	4.05	33	4.08
	9	G7	9	4.08	34	4.04
	10	H8	10	4.07	35	4.04
	11	F8	11	4.04	36	4.04
	12	G8	12	4.04	37	4.07
	13	J8	13	4.04	38	4.05
	14	F9	14	4.06	39	4.04
	15	H9	15	4.05	40	4.04
	16	G9	16	4.04	41	4.06
	17	J9	17	4.08	42	4.08
	18	F10	18	4.08	43	4.07
	19	H10	19	4.05	44	4.07
	20	G10	20	4.07	45	4.07
	21	F11	21	4.07	46	4.07
	22	J10	22	4.08	47	4.07
	23	H11	23	4.04	48	4.02
	24	G11	24	8	49	8.28

Failure mode note: Channel G11 was measured as shown to have an open LR during assembly. Re-measurements after performance testing completed on 2/17/2005 revealed the V+ to S+ and V- to S- to now be in the correct range (4.07Mohms and 4.12Mohms respectively). Channel is listed as cautionary due to this change in status.