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SHARC II Electronics

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ABSTRACT

This document is intended to describe the amplifiers, thermometry, and wiring of SHARC II. It does not include information on the A/D and data acquisition systems and software.

1. Amplifier and Readout Varieties

There are two sets of amplifier electronics. The first uses OP470's in a single ended configuration (one signal per op amp). (ADD FIGURE LATER.) The second uses AD624's in a differential configuration (two signals per in amp). (ADD FIGURE LATER.) The sensible readout possibilities are thus:

1) Single-ended (OP 470)

1A) Secondary chopping at ∼3 Hz with DSP demodulation.

1B) Secondary chopping at ∼3 Hz with hardware demodulation.

1C) Total power readout with ∼30 Hz AC bias and hardware demodulation, with or without slow secondary chopping.

2) Differential (AD 624)

2A) Pixel differencing with ∼3 Hz secondary chopping, DSP demodulation.

2B) Pixel differencing with ∼3 Hz secondary chopping, hardware demodulation.

2C) Pixel differencing with ∼30 Hz AC bias and DSP demodulation, with or without slow secondary chopping.

2D) Pixel differencing with ∼30 Hz AC bias and hardware demodulation, with or without slow secondary chopping.

Selecting between DSP and hardware demodulation is straightforward. The frequency reference to the AD630 demodulators must be changed from square wave to DC, and the DSP must change from demodulation mode to averaging mode. Since it desirable to have low pass filtering before the A/D, we may not use readout mode 2C. It is difficult to preserve the signal content with a 30 Hz fundamental and still filter out frequencies above 1 kHz effectively.

2. Bias Generation

3. Amplifer Thermometry and Control

JFETs must be heated to operating temperature. To minimize digital I/O, use simple switches to activate/deactivate heaters.

4. Dewar Thermometry and Control

5. Amplifier Motherboard Layout

See Figure 1.

6. 78-pin Connector Pinout

See Table 1. The signal and reference numbers in the leftmost columns are labels for the motherboard only and do not necessarily correspond to bolometer numbers.

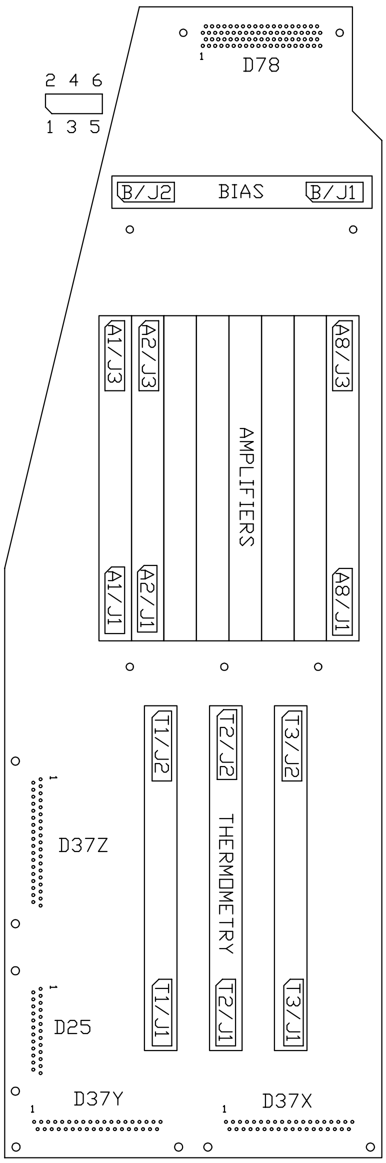

Fig. 1.— Connector locations on SHARC II motherboard. Note labeling convention for 2-row 0.1" connectors.

Table 1. 78-pin Connector Pinout

Signal	D78	Motherboard	D25
Sig,Ref 1 (1_1)	4,24	A1/J3/1,2	
Sig,Ref 2 (1_2)	44,64	A1/J3/3,4	
Sig,Ref 3 (1_3)	43,63	A1/J3/5,6	
Sig,Ref 4 (1_4)	3,23	A1/J3/7,8	
Sig,Ref 5 (2_1)	6,26	A2/J3/1,2	
Sig,Ref 6 (2_2)	46,66	A2/J3/3,4	
Sig,Ref 7 (2_3)	45,65	A2/J3/5,6	
Sig,Ref 8 (2_4)	5,25	A2/J3/7,8	
Sig,Ref 9 (3_1)	8,28	A3/J3/1,2	
Sig,Ref 10 (3_2)	48,68	A3/J3/3,4	
Sig,Ref 11 (3_3)	47,67	A3/J3/5,6	
Sig,Ref 12 (3_4)	7,27	A3/J3/7,8	
Sig,Ref 13 (4_1)	10,30	A4/J3/1,2	
Sig,Ref 14 (4_2)	50,70	A4/J3/3,4	
Sig,Ref 15 (4_3)	49,69	A4/J3/5,6	
Sig,Ref 16 (4_4)	9,29	A4/J3/7,8	
Sig,Ref 17 (5_1)	12,32	A5/J3/1,2	
Sig,Ref 18 (5_2)	52,72	A5/J3/3,4	
Sig,Ref 19 (5_3)	51,71	A5/J3/5,6	
Sig,Ref 20 (5_4)	11,31	A5/J3/7,8	
Sig,Ref 21 (6_1)	14,34	A6/J3/1,2	
Sig,Ref 22 (6_2)	54,74	A6/J3/3,4	
Sig,Ref 23 (6_3)	53,73	A6/J3/5,6	
Sig,Ref 24 (6_4)	13,33	A6/J3/7,8	
Sig,Ref 25 (7_1)	16,36	A7/J3/1,2	
Sig,Ref 26 (7_2)	56,76	A7/J3/3,4	
Sig,Ref 27 (7_3)	55,75	A7/J3/5,6	
Sig,Ref 28 (7_4)	15,35	A7/J3/7,8	
Sig,Ref 29 (8_1)	18,38	A8/J3/1,2	
Sig,Ref 30 (8_2)	58,78	A8/J3/3,4	
Sig,Ref 31 (8_3)	57,77	A8/J3/5,6	
Sig,Ref 32 (8_4)	17,37	A8/J3/7,8	
Therm Gnd	1	T1-3/J2/2	6,18

7. Bias Board Pinout

See Table 2.

8. Thermometry Board Pinout

See Table 3.

9. Amplifier Board Pinout

See Table 4.

10. 25-pin Connector Pinout

See Table 5.

11. 37-pin Connector Pinouts

See Table 6.

Table 1—Continued

Signal	D78	Motherboard	D25
Heater T1	21	T1/J2/4	
Heater T2	2	T2/J2/4	
Heater T3	62	T3/J2/4	
Diode T1 +,–	60,40	T1/J2/3,1	
Diode T2 +,–	41,61	T2/J2/3,1	
Diode T3 +,–	22,42	T3/J2/3,1	
Drain	20	B/J1/2	
Bias +	39	B/J1/4	
Bias –	59	B/J1/6	
No Connect	19		

Table 2. Bias Board Pinout

Signal	Motherboard	D78	D25
Input Gnd	B/J1/1		3,16
Drain	B/J1/2	20	
Input Gnd	B/J1/3		3,16
Bias +	B/J1/4	39	
No Connect	B/J1/5		
Bias –	B/J1/6	59	
Neg Pwr (–12)	B/J2/1		2,15
Bias Sel 2	B/J2/2		19
Digital Bias	B/J2/3		
Pos Pwr (+12)	B/J2/4		1,14
Bias Monitor	B/J2/5		7
Bias Sel 1	B/J2/6		20

Table 3. Thermometry Board Pinout

Signal	Motherboard	D78	D25
Therm Pos Pwr (+12)	T1-3/J1/1		17
Therm Gnd	T1-3/J1/2	1	6,18
Therm Neg Pwr (–12)	T1-3/J1/3		5
Therm Gnd	T1-3/J1/4	1	6,18
Heater Enable	T1,T2,T3/J1/5		9,10,11
Temperature	T1,T2,T3/J1/6		21,22,23
Diode –	T1,T2,T3/J2/1	40,61,42	
Therm Gnd	T1-3/J2/2	1	6,18
Diode +	T1,T2,T3/J2/3	60,41,22	
Heater	T1,T2,T3/J2/4	21,2,62	

Table 4. Amplifier Board Pinout

Signal	Motherboard	D78	D37	D25
Output Gnd	A1-8/J1/1			12,24
Gain Select	A1-8/J1/2			4
Out 1e-8e	A1-8/J1/3		Z 15,13,11, 9, 7, 5, 3, 1	
Ref 1e-8e	A1-8/J1/4		Z 34,32,30,28,26,24,22,20	
Out 1c-8c	A1-8/J1/5		Y 1, 3, 5, 7, 9,11,13,15	
Ref 1c-8c	A1-8/J1/6		Y 20,22,24,26,28,30,32,34	
Out 1f-8f	A1-8/J1/7		Z 16,14,12,10, 8, 6, 4, 2	
Ref 1f-8f	A1-8/J1/8		Z 35,33,31,29,27,25,23,21	
Out 1d-8d	A1-8/J1/9		Y 2, 4, 6, 8,10,12,14,16	
Ref 1d-8d	A1-8/J1/10		Y 21,23,25,27,29,31,33,35	
Out 1b-8b	A1-8/J1/11		X 2, 4, 6, 8,10,12,14,16	
Ref 1b-8b	A1-8/J1/12		X 21,23,25,27,29,31,33,35	
Out 1a-8a	A1-8/J1/13		X 1, 3, 5, 7, 9,11,13,15	
Ref 1a-8a	A1-8/J1/14		X 20,22,24,26,28,30,32,34	
Sig 1_1-8_1	A1-8/J3/1	4, 6, 8,10,12,14,16,18		
Ref 1_1-8_1	A1-8/J3/2	24,26,28,30,32,34,36,38		
Sig 1_2-8_2	A1-8/J3/3	44,46,48,50,52,54,56,58		
Ref 1_2-8_2	A1-8/J3/4	64,66,68,70,72,74,76,78		
Sig 1_3-8_3	A1-8/J3/5	43,45,47,49,51,53,55,57		
Ref 1_3-8_3	A1-8/J3/6	63,65,67,69,71,73,75,77		
Sig 1_4-8_4	A1-8/J3/7	3, 5, 7, 9,11,13,15,17		
Ref 1_4-8_4	A1-8/J3/8	23,25,27,29,31,33,35,37		
Input Gnd	A1-8/J3/9			3,16
Input Gnd	A1-8/J3/10			3,16
Neg Pwr (–12)	A1-8/J3/11			2,15
Pos Pwr (+12)	A1-8/J3/12			1,14

Table 5. 25-pin Connector Pinout

Signal	D25	Motherboard	D78
Pos Pwr (+12)	1	B/J2/4, A1-8/J3/12	
Neg Pwr (–12)	2	B/J2/1, A1-8/J3/11	
Input Gnd	3	B/J1/1, B/J1/3	
		A1-8/J3/9, A1-8/J3/10	
Gain Select	4	A1-8/J1/2	
Therm Neg Pwr (–12)	5	T1-3/J1/3	
Therm Gnd	6	T1-3/J2/2	1
Bias Monitor	7	B/J2/5	
Digital Pwr (+12)	8		
Heater 1 Enable	9	T1/J1/5	
Heater 2 Enable	10	T2/J1/5	
Heater 3 Enable	11	T3/J1/5	
Output Gnd	12	A1-8/J1/1	
Clock In +	13		
Pos Pwr (+12)	14	B/J2/4, A1-8/J3/12	
Neg Pwr (–12)	15	B/J2/1, A1-8/J3/11	
Input Gnd	16	B/J1/1, B/J1/3	
		A1-8/J3/9, A1-8/J3/10	
Therm Pos Pwr (+12)	17	T1-3/J1/1	
Therm Gnd	18	T1-3/J2/2	1
Bias Sel 2	19	B/J2/2	
Bias Sel 1	20	B/J2/2	
Temperature 1	21	T1/J1/6	
Temperature 2	22	T2/J1/6	
Temperature 3	23	T3/J1/6	
Output Gnd	24	A1-8/J1/1	
Clock In –	25		

Table 6. 37-pin Connector Pinouts

Signal	D37X	D37Y	D37Z	Motherboard
Out,Ref 1a	1,20			A1/J1/13,14
Out,Ref 1b	2,21			A1/J1/11,12
Out,Ref 2a	3,22			A2/J1/13,14
Out,Ref 2b	4,23			A2/J1/11,12
Out,Ref 3a	5,24			A3/J1/13,14
Out,Ref 3b	6,25			A3/J1/11,12
Out,Ref 4a	7,26			A4/J1/13,14
Out,Ref 4b	8,27			A4/J1/11,12
Out,Ref 5a	9,28			A5/J1/13,14
Out,Ref 5b	10,29			A5/J1/11,12
Out,Ref 6a	11,30			A6/J1/13,14
Out,Ref 6b	12,31			A6/J1/11,12
Out,Ref 7a	13,32			A7/J1/13,14
Out,Ref 7b	14,33			A7/J1/11,12
Out,Ref 8a	15,34			A8/J1/13,14
Out,Ref 8b	16,35			A8/J1/11,12
Out,Ref 1c		1,20		A1/J1/5,6
Out,Ref 1d		2,21		A1/J1/9,10
Out,Ref 2c		3,22		A2/J1/5,6
Out,Ref 2d		4,23		A2/J1/9,10
Out,Ref 3c		5,24		A3/J1/5,6
Out,Ref 3d		6,25		A3/J1/9,10
Out,Ref 4c		7,26		A4/J1/5,6
Out,Ref 4d		8,27		A4/J1/9,10
Out,Ref 5c		9,28		A5/J1/5,6
Out,Ref 5d		10,29		A5/J1/9,10
Out,Ref 6c		11,30		A6/J1/5,6
Out,Ref 6d		12,31		A6/J1/9,10
Out,Ref 7c		13,32		A7/J1/5,6
Out,Ref 7d		14,33		A7/J1/9,10
Out,Ref 8c		15,34		A8/J1/5,6
Out,Ref 8d		16,35		A8/J1/9,10
Out,Ref 8e			1,20	A8/J1/3,4

12. Detector Cabling

13. Thermometry Cabling

Table 6—Continued

Signal	D37X	D37Y	D37Z	Motherboard
Out,Ref 8f			2,21	A8/J1/7,8
Out,Ref 7e			3,22	A7/J1/3,4
Out,Ref 7f			4,23	A7/J1/7,8
Out,Ref 6e			5,24	A6/J1/3,4
Out,Ref 6f			6,25	A6/J1/7,8
Out,Ref 5e			7,26	A5/J1/3,4
Out,Ref 5f			8,27	A5/J1/7,8
Out,Ref 4e			9,28	A4/J1/3,4
Out,Ref 4f			10,29	A4/J1/7,8
Out,Ref 3e			11,30	A3/J1/3,4
Out,Ref 3f			12,31	A3/J1/7,8
Out,Ref 2e			13,32	A2/J1/3,4
Out,Ref 2f			14,33	A2/J1/7,8
Out,Ref 1e			15,34	A1/J1/3,4
Out,Ref 1f			16,35	A1/J1/7,8