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<p>HERSCHEL - SPIRE</p> <p>MCU Flight model</p> <p>Inter connections list</p>
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Acronyms

AD	Applicable Document
AIV	Acceptance, Integration and Validation
AVM	Avionics Model
BOL	Beginning of Life
BSM	Beam Steering Mirror
CEA	Commissariat à l'Energie Atomique
CQM	Cryogenic Qualification Model
EGSE	Electrical Ground Support Equipment
EOL	End of Life
ESA	European Space Agency
FIRST	Far InfraRed and Submillimetre Telescope
FM	Flight Model
FPU	Focal Plane Unit
FTS	Fourier Transform Spectrometer
FTSE	FTS warm Electronics
FTSP	FTS Preamplifier for the position encoder signals
H/K	HouseKeeping
H/W	Hardware
ICD	Interface Control Document
I/F	Interface
LAM	Laboratoire d'Astrophysique de Marseille
MAC	Multi Axes Controller
MCE	Mechanism Control Electronics
N/A	Not Applicable
RAL	Rutherford Appleton Laboratory
RD	Reference Document
ROE	Royal Observatory of Edinburgh
SAP	Service d'Astrophysique
S/C	Spacecraft
SM	Spare Model
SMEC	Spectrograph MEChanism
S/W	Software
TBC	To Be Confirmed
TBD	To Be Define
TBW	To Be Written
TC	Tele-Command
TM	TeleMetry
WE	Warm Electronics
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1 Scope

The purpose of this document is to specify the interconnections between all parts of the SMEC/BSM control system for the flight model.

2 Documents

2.1 Reference documents

[DR1] Beam steering mirror and electronics electrical interface

Issue 1.6, 26 July 2001, Brian Stobie

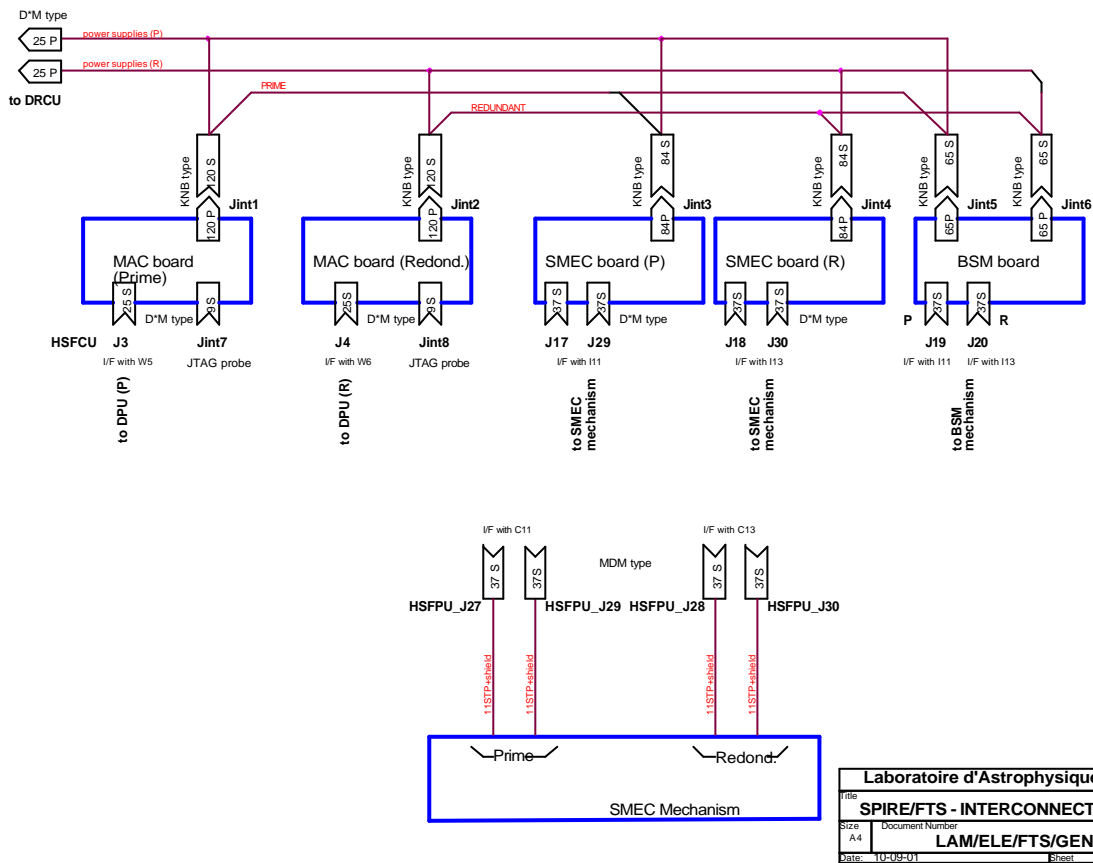
2.2 Applicable documents

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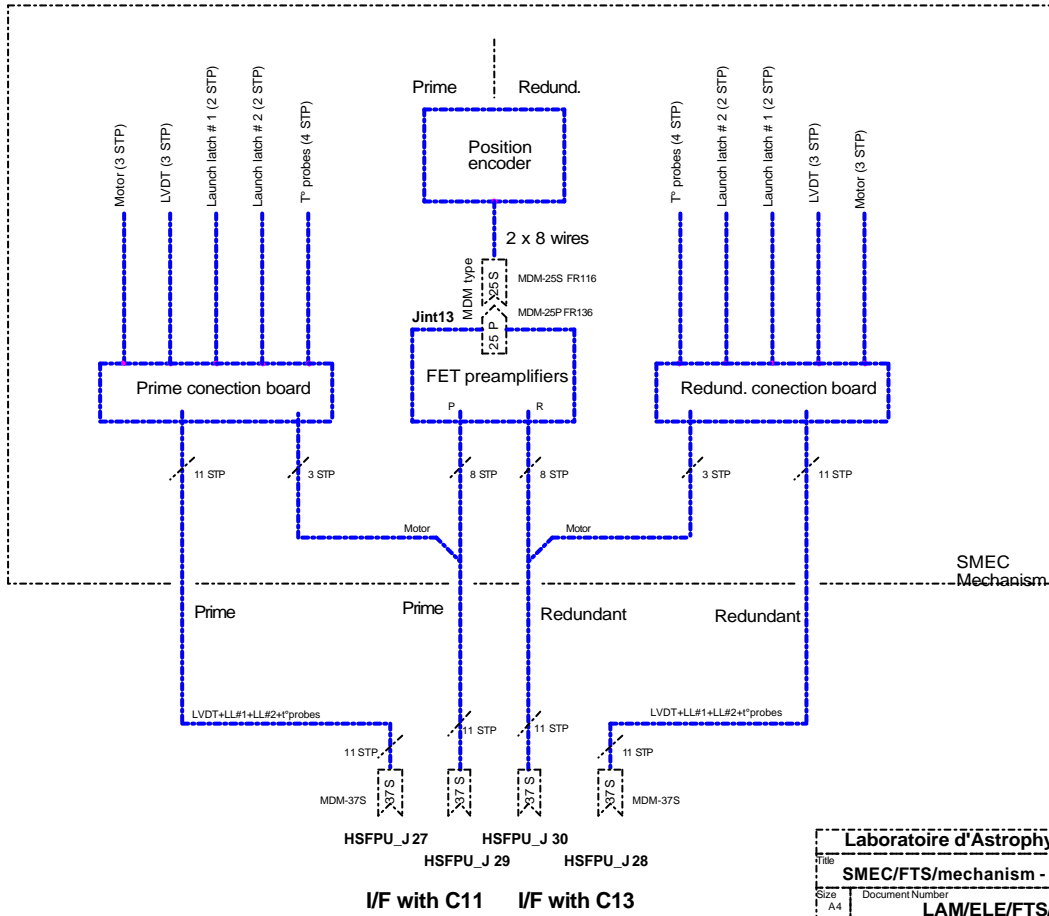
3 Interfaces of the MCU General Definition.

3.1 Interconnections diagram

The interconnection diagram aims to identify the interfaces which are described in this document.



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Laboratoire d'Astrophysique de Marseille			
SMEC/FTS/mechanism - INTERCONNECTIONS			
Size	Document Number	Rev	
A4	LAM/ELE/FTS/GEN/00-12	1.2	
Date: 18-09-2001	Sheet	1	of 1

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3.2 Interconnections layout

The interface matrix aims to identify connector names according to the connection diagram.

Prime/ redund	Macb	Backp.	SMECb	BSMb	Harness	Enc Preamp	SMECm	BSMm	DRCU
MAC Board		Jint1/ Jint2	N/A	N/A	J3 / J4	N/A	N/A	N/A	N/A
Backplane	Jint1/ Jint2		Jint3/ Jint4	Jint5/ Jint6	N/A	N/A	N/A	N/A	JXX/ JYY
SMEC Board	N/A	Jint3/ Jint4		N/A	HSFCU_J 17,J29/J1 8,J30	N/A	N/A	N/A	N/A
BSM Board	N/A	Jint5/ Jint6	N/A		HSFCU_J 19/J20	N/A	N/A	N/A	N/A
Harness	J3 / J4	N/A	HSFCU_J 17,J29/J1 8,J30	HSFCU_J 19/J20		N/A	HSFPU_J 27,J29/J2 8,J30	N/A	N/A
Encoder preampl	N/A	N/A	N/A	N/A	N/A		Jint13	N/A	N/A
SMECm	N/A	N/A	N/A	N/A	HSFPU_J 27,J29/J2 8,J30	Jint13		N/A	N/A
BSMm	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A
DRCU	N/A	JXX/ JYY	N/A	N/A	N/A	N/A	N/A	N/A	

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3.3 List of process signals connected to the MAC Board

The MAC board including the DSP shall have the following interface signals :

3.3.1 DACs analogue outputs (3)

Outp	Name	To board	Use	Remarks
1	VOUT_DAC1	SMEC	FTS mirror actuation	
2	VOUT_DAC2	BSM	chopper actuator	
3	VOUT_DAC3	BSM	jiggle actuator	

3.3.2 Multiplexed analogue inputs (going to ADCs and DSP) (16)

Input	Name	From board	Use	Remarks
1	ANALOG_IN_0	SMEC	position encoder sine	
2	ANALOG_IN_1	SMEC	position encoder 120° sine	
3	ANALOG_IN_2	SMEC	position encoder 240° sine	
4	ANALOG_IN_3	SMEC	LVDT signal (AC)	
5	ANALOG_IN_4	SMEC	LVDT signal A (DC)	
6	ANALOG_IN_5	SMEC	LVDT signal B (DC)	
7	ANALOG_IN_6	SMEC	motor back emf value	
8	ANALOG_IN_7	SMEC	motor current value	
9	ANALOG_IN_8	BSM	chopper position # 1	
10	ANALOG_IN_9	BSM	chopper position # 2	
11	ANALOG_IN_10	BSM	jiggle position # 1	
12	ANALOG_IN_11	BSM	jiggle position # 2	
13	ANALOG_IN_12	BSM	chopper motor back emf	
14	ANALOG_IN_13	BSM	jiggle motor back emf	
15	ANALOG_IN_14	BSM	chopper motor current value	
16	ANALOG_IN_15	BSM	jiggle motor current value	

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3.3.3 Digital inputs (going to DSP) (8)

Input	Name	From board	Use	Remarks
1	DIG_IN_0	SMEC	position encoder A signal	
2	DIG_IN_1	SMEC	position encoder B signal	
3	DIG_IN_2	SMEC	launch latch # 1 status	engaged/ disengaged
4	DIG_IN_3	SMEC	launch latch # 2 status	
5	DIG_IN_4	SMEC	mechanical zero position	
6	DIG_IN_5	BSM	launch latch # 1 status	(ch & jig)
7	DIG_IN_6			
8	DIG_IN_7			

3.3.4 Digital outputs (12)

Input	Name	From board	Use	Remarks
1	DIG_OUT_0	SMEC	launch latch command	
2	DIG_OUT_1	SMEC	launch latch eng/diseng select	
3	DIG_OUT_2	SMEC	LVDT power supply On	
4	DIG_OUT_3	SMEC	position encoder Led power supply bit # 0	also command of preamp power supply
5	DIG_OUT_4	SMEC	position encoder Led power supply bit # 1	also command of preamp power supply
6	DIG_OUT_5	SMEC	position encoder Led power supply bit # 2	also command of preamp power supply
7	DIG_OUT_6	SMEC	launch latch #1/#2 select	
8	DIG_OUT_7	BSM	launch latch command	
9	DIG_OUT_8	BSM	launch latch eng/diseng select	
10	DIG_OUT_9	BSM	chopper position sensor power supply On	
11	DIG_OUT_10	BSM	jiggle position sensor power supply On	
12	DIG_OUT_11			

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4 MAC board interfaces

4.1 MAC board / Backplane interface

4.1.1 MAC prime board / Backplane prime interface

Identification :HSFCU_Jint1, located on the back plane (top)

Type : FRB KNB 120 13 10 111 male

Function : connection to back plane board (prime):

pin 1- 64:analog signals, pin 65–120:digital signals

p = prime

# pin	Name	Signal function	Electrical signal value	Connection to board
1	-13Van (p)		U = -13 V	
3	GND_SIGNAL	analog ground	U = 0 V	
5	+13Van (p)		U = +13 V	
7	GND_SIGNAL	analog ground	U = 0 V	
9	ANALOG_IN_P0 (p)	FTS position encoder sine signal	-10V<U<+10V	SMEC (p)
11	ANALOG_IN_P1 (p)	FTS position encoder 120° sine signal	-10V<U<+10V	SMEC (p)
13	ANALOG_IN_P2 (p)	FTS position encoder 240° sine signal	-10V<U<+10V	SMEC (p)
15				
17	ANALOG_IN_P3 (p)	FTS LVDT A-B signal (AC 1Hz)	-10V<U<+10V	SMEC (p)
19	ANALOG_IN_P4 (p)	FTS LVDT A signal (DC)	-10V<U<+10V	SMEC (p)
21	ANALOG_IN_P5 (p)	FTS LVDT B signal (DC)	-10V<U<+10V	SMEC (p)
23	GND_SIGNAL	analog ground	U = 0 V	
25	ANALOG_IN_P6 (p)	FTS actuator back emf signal	-10V<U<+10V	SMEC (p)
27	ANALOG_IN_P7 (p)	FTS motor current signal	-10V<U<+10V	SMEC (p)
29	GND_SIGNAL	analog ground	U = 0 V	
31	ANALOG_IN_P8 (p)	chopper position sensor # 1 signal	-10V<U<+10V	BSM (p)
33	ANALOG_IN_P9 (p)	chopper position sensor # 2 signal	-10V<U<+10V	BSM (p)
35	ANALOG_IN_P10 (p)	jiggle position sensor # 1 signal	-10V<U<+10V	BSM (p)
37	ANALOG_IN_P11 (p)	jiggle position sensor # 2 signal	-10V<U<+10V	BSM (p)
39				
41	ANALOG_IN_P12 (p)	chopper actuator back emf signal	-10V<U<+10V	BSM (p)
43	ANALOG_IN_P13 (p)	jiggle actuator back emf signal	-10V<U<+10V	BSM (p)
45	ANALOG_IN_P14 (p)	chopper motor current signal	-10V<U<+10V	BSM (p)
47	ANALOG_IN_P15 (p)	jiggle motor current signal	-10V<U<+10V	BSM (p)
49	GND_SIGNAL	analog ground	U = 0 V	
51	VOUT_DAC_P1 (p)	FTS mirror actuator current reference	-10V < U < +10V	SMEC (p)
53	VOUT_DAC_P2 (p)	Chopper actuator current reference	-10V < U < +10V	BSM (p)
55	VOUT_DAC_P3 (p)	Jiggle actuator current reference	-10V < U < +10V	BSM (p)
57	GND_SIGNAL	analog ground	U = 0 V	
59	-13Van (p)		U = -13 V	
61	GND_SIGNAL	analog ground	U = 0 V	
63	+13Van (p)		U = +13 V	

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Jint1 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to board
65	GND	digital ground	U = 0Vdig	
67	VCC (p)	digital power	U = +5V	
69	GND	digital ground	U = 0Vdig	
71	GND	digital ground	U = 0Vdig	
73	DIG_IN_P0 (p)	FTS position encoder A signal	digital, 0v, +5V	SMEC (p)
75	DIG_IN_P1 (p)	FTS position encoder B signal	digital, 0v, +5V	SMEC (p)
77	DIG_IN_P2 (p)	FTS launch latch status # 1	digital, 0v, +5V	SMEC (p)
79	DIG_IN_P3 (p)	FTS launch latch status # 2	digital, 0v, +5V	SMEC (p)
81	DIG_IN_P4 (p)	FTS mechanical zero position	digital, 0v, +5V	SMEC (p)
83	DIG_IN_P5 (p)	BSM launch latch status (ch & jig)	digital, 0v, +5V	BSM (p)
85	DIG_IN_P6 (p)			
87	DIG_IN_P7 (p)			
89	DIG_OUT_P0 (p)	FTS launch latch command	digital, 0v, +5V	SMEC (p)
91	DIG_OUT_P1 (p)	FTS launch latch eng/diseng select	digital, 0v, +5V	SMEC (p)
93	DIG_OUT_P2 (p)	FTS LVDT power supply on	digital, 0v, +5V	SMEC (p)
95	DIG_OUT_P3 (p)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	SMEC (p)
97	DIG_OUT_P4 (p)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	SMEC (p)
99	DIG_OUT_P5 (p)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	SMEC (p)
101	DIG_OUT_P6 (p)	FTS launch latch #1/#2 select	digital, 0v, +5V	SMEC (p)
103	DIG_OUT_P7 (p)	BSM launch latch command	digital, 0v, +5V	BSM (p)
105	DIG_OUT_P8 (p)	BSM launch latch eng/diseng select	digital, 0v, +5V	BSM (p)
107	DIG_OUT_P9 (p)	chopper position sensor power supply on	digital, 0v, +5V	BSM (p)
109	DIG_OUT_P10 (p)	jiggle position sensor power supply on	digital, 0v, +5V	BSM (p)
111	DIG_OUT_P11 (p)			
113	VCC (p)	digital power	U = +5V	
115	GND	digital ground	U = 0Vdig	
117	VCC (p)	digital power	U = +5V	
119	GND	digital ground	U = 0Vdig	

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Jint1 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to board
2	-13Van (p)		U = -13 V	
4	GND_SIGNAL	analog ground	U = 0 V	
6	+13Van (p)		U = +13 V	
8	GND_SIGNAL	analog ground	U = 0 V	
10	ANALOG_IN_N0 (p)	FTS position encoder sine signal	-10V<U<+10V	SMEC (p)
12	ANALOG_IN_N1 (p)	FTS position encoder 120° sine signal	-10V<U<+10V	SMEC (p)
14	ANALOG_IN_N2 (p)	FTS position encoder 240° sine signal	-10V<U<+10V	SMEC (p)
16				
18	ANALOG_IN_N3 (p)	FTS LVDT A-B signal (AC 1Hz)	-10V<U<+10V	SMEC (p)
20	ANALOG_IN_N4 (p)	FTS LVDT A signal (DC)	-10V<U<+10V	SMEC (p)
22	ANALOG_IN_N5 (p)	FTS LVDT B signal (DC)	-10V<U<+10V	SMEC (p)
24	GND_SIGNAL	analog ground	U = 0 V	
26	ANALOG_IN_N6 (p)	FTS actuator back emf signal	-10V<U<+10V	SMEC (p)
28	ANALOG_IN_N7 (p)	FTS motor current signal	-10V<U<+10V	SMEC (p)
30	GND_SIGNAL	analog ground	U = 0 V	
32	ANALOG_IN_N8 (p)	chopper position sensor # 1 signal	-10V<U<+10V	BSM (p)
34	ANALOG_IN_N9 (p)	chopper position sensor # 2 signal	-10V<U<+10V	BSM (p)
36	ANALOG_IN_N10 (p)	jiggle position sensor # 1 signal	-10V<U<+10V	BSM (p)
38	ANALOG_IN_N11 (p)	jiggle position sensor # 2 signal	-10V<U<+10V	BSM (p)
40				
42	ANALOG_IN_N12 (p)	chopper actuator back emf signal	-10V<U<+10V	BSM (p)
44	ANALOG_IN_N13 (p)	jiggle actuator back emf signal	-10V<U<+10V	BSM (p)
46	ANALOG_IN_N14 (p)	chopper motor current signal	-10V<U<+10V	BSM (p)
48	ANALOG_IN_N15 (p)	jiggle motor current signal	-10V<U<+10V	BSM (p)
50	GND_SIGNAL	analog ground	U = 0 V	
52	VOUT_DAC_N1 (p)	FTS mirror actuator current reference	-10V < U < +10V	SMEC (p)
54	VOUT_DAC_N2 (p)	Chopper actuator current reference	-10V < U < +10V	BSM (p)
56	VOUT_DAC_N3 (p)	Jiggle actuator current reference	-10V < U < +10V	BSM (p)
58	GND_SIGNAL	analog ground	U = 0 V	
60	-13Van (p)		U = -13 V	
62	GND_SIGNAL	analog ground	U = 0 V	
64	+13Van (p)		U = +13 V	

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Jint1 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to board
66	GND	digital ground	U = 0Vdig	
68	VCC (p)	digital power	U = +5V	
70	GND	digital ground	U = 0Vdig	
72	GND	digital ground	U = 0Vdig	
74	DIG_IN_N0 (p)	FTS position encoder A signal	digital, 0v, +5V	SMEC (p)
76	DIG_IN_N1 (p)	FTS position encoder B signal	digital, 0v, +5V	SMEC (p)
78	DIG_IN_N2 (p)	FTS launch latch status # 1	digital, 0v, +5V	SMEC (p)
80	DIG_IN_N3 (p)	FTS launch latch status # 2	digital, 0v, +5V	SMEC (p)
82	DIG_IN_N4 (p)	FTS mechanical zero position	digital, 0v, +5V	SMEC (p)
84	DIG_IN_N5 (p)	BSM launch latch status (ch & jig)	digital, 0v, +5V	BSM (p)
86	DIG_IN_N6 (p)			
88	DIG_IN_N7 (p)			
90	DIG_OUT_N0 (p)	FTS launch latch command	digital, 0v, +5V	SMEC (p)
92	DIG_OUT_N1 (p)	FTS launch latch eng/diseng select	digital, 0v, +5V	SMEC (p)
94	DIG_OUT_N2 (p)	FTS LVDT power supply on	digital, 0v, +5V	SMEC (p)
96	DIG_OUT_N3 (p)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	SMEC (p)
98	DIG_OUT_N4 (p)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	SMEC (p)
100	DIG_OUT_N5 (p)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	SMEC (p)
102	DIG_OUT_N6 (p)	FTS launch latch #1/#2 select	digital, 0v, +5V	SMEC (p)
104	DIG_OUT_N7 (p)	BSM launch latch command	digital, 0v, +5V	BSM (p)
106	DIG_OUT_N8 (p)	BSM launch latch eng/diseng select	digital, 0v, +5V	BSM (p)
108	DIG_OUT_N9 (p)	chopper position sensor power supply on	digital, 0v, +5V	BSM (p)
110	DIG_OUT_N10 (p)	jiggle position sensor power supply on	digital, 0v, +5V	BSM (p)
112	DIG_OUT_N11 (p)			
114	VCC (p)	digital power	U = +5V	
116	GND	digital ground	U = 0Vdig	
118	VCC (p)	digital power	U = +5V	
120	GND	digital ground	U = 0Vdig	

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4.1.2 MAC redundant board / Backplane redundant interface

Identification :HSFCU Jint2, located on the back plane (top)

Type : FRB KNB 120 13 10 111 male

Function : connection to back plane board (redundant):

pin 1- 64:analog signals, pin 65–120:digital signals

(r) = redundant

# pin	Name	Signal function	Electrical signal value	Connection to board
1	-13Van (r)		U = -13 V	
3	GND_SIGNAL	analog ground	U = 0 V	
5	+13Van (r)		U = +13 V	
7	GND_SIGNAL	analog ground	U = 0 V	
9	ANALOG_IN_P0 (r)	FTS position encoder sine signal	-10V<U<+10V	SMEC (r)
11	ANALOG_IN_P1 (r)	FTS position encoder 120° sine signal	-10V<U<+10V	SMEC (r)
13	ANALOG_IN_P2 (r)	FTS position encoder 240° sine signal	-10V<U<+10V	SMEC (r)
15				
17	ANALOG_IN_P3 (r)	FTS LVDT A-B signal (AC 1Hz)	-10V<U<+10V	SMEC (r)
19	ANALOG_IN_P4 (r)	FTS LVDT A signal (DC)	-10V<U<+10V	SMEC (r)
21	ANALOG_IN_P5 (r)	FTS LVDT B signal (DC)	-10V<U<+10V	SMEC (r)
23	GND_SIGNAL	analog ground	U = 0 V	
25	ANALOG_IN_P6 (r)	FTS actuator back emf signal	-10V<U<+10V	SMEC (r)
27	ANALOG_IN_P7 (r)	FTS motor current signal	-10V<U<+10V	SMEC (r)
29	GND_SIGNAL	analog ground	U = 0 V	
31	ANALOG_IN_P8 (r)	chopper position sensor # 1 signal	-10V<U<+10V	BSM (r)
33	ANALOG_IN_P9 (r)	chopper position sensor # 2 signal	-10V<U<+10V	BSM (r)
35	ANALOG_IN_P10 (r)	jiggle position sensor # 1 signal	-10V<U<+10V	BSM (r)
37	ANALOG_IN_P11 (r)	jiggle position sensor # 2 signal	-10V<U<+10V	BSM (r)
39				
41	ANALOG_IN_P12 (r)	chopper actuator back emf signal	-10V<U<+10V	BSM (r)
43	ANALOG_IN_P13 (r)	jiggle actuator back emf signal	-10V<U<+10V	BSM (r)
45	ANALOG_IN_P14 (r)	chopper motor current signal	-10V<U<+10V	BSM (r)
47	ANALOG_IN_P15 (r)	jiggle motor current signal	-10V<U<+10V	BSM (r)
49	GND_SIGNAL	analog ground	U = 0 V	
51	VOUT_DAC_P1 (r)	FTS mirror actuator current reference	-10V < U < +10V	SMEC (r)
53	VOUT_DAC_P2 (r)	Chopper actuator current reference	-10V < U < +10V	BSM (r)
55	VOUT_DAC_P3 (r)	Jiggle actuator current reference	-10V < U < +10V	BSM (r)
57	GND_SIGNAL	analog ground	U = 0 V	
59	-13Van (r)		U = -13 V	
61	GND_SIGNAL	analog ground	U = 0 V	
63	+13Van (r)		U = +13 V	

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Jint2 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to board
65	GND	digital ground	U = 0Vdig	
67	VCC (r)	digital power	U = +5V	
69	GND	digital ground	U = 0Vdig	
71	GND	digital ground	U = 0Vdig	
73	DIG_IN_P0 (r)	FTS position encoder A signal	digital, 0v, +5V	SMEC (r)
75	DIG_IN_P1 (r)	FTS position encoder B signal	digital, 0v, +5V	SMEC (r)
77	DIG_IN_P2 (r)	FTS launch latch status # 1	digital, 0v, +5V	SMEC (r)
79	DIG_IN_P3 (r)	FTS launch latch status # 2	digital, 0v, +5V	SMEC (r)
81	DIG_IN_P4 (r)	FTS mechanical zero position	digital, 0v, +5V	SMEC (r)
83	DIG_IN_P5 (r)	BSM launch latch status (ch & jig)	digital, 0v, +5V	BSM (r)
85	DIG_IN_P6 (r)			
87	DIG_IN_P7 (r)			
89	DIG_OUT_P0 (r)	FTS launch latch command	digital, 0v, +5V	SMEC (r)
91	DIG_OUT_P1 (r)	FTS launch latch eng/diseng select	digital, 0v, +5V	SMEC (r)
93	DIG_OUT_P2 (r)	FTS LVDT power supply on	digital, 0v, +5V	SMEC (r)
95	DIG_OUT_P3 (r)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	SMEC (r)
97	DIG_OUT_P4 (r)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	SMEC (r)
99	DIG_OUT_P5 (r)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	SMEC (r)
101	DIG_OUT_P6 (r)	FTS launch latch #1/#2 select	digital, 0v, +5V	SMEC (r)
103	DIG_OUT_P7 (r)	BSM launch latch command	digital, 0v, +5V	BSM (r)
105	DIG_OUT_P8 (r)	BSM launch latch eng/diseng select	digital, 0v, +5V	BSM (r)
107	DIG_OUT_P9 (r)	chopper position sensor power supply on	digital, 0v, +5V	BSM (r)
109	DIG_OUT_P10 (r)	jiggle position sensor power supply on	digital, 0v, +5V	BSM (r)
111	DIG_OUT_P11 (r)			
113	VCC (r)	digital power	U = +5V	
115	GND	digital ground	U = 0Vdig	
117	VCC (r)	digital power	U = +5V	
119	GND	digital ground	U = 0Vdig	

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Jint2 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to board
2	-13Van (r)		U = -13 V	
4	GND_SIGNAL	analog ground	U = 0 V	
6	+13Van (r)		U = +13 V	
8	GND_SIGNAL	analog ground	U = 0 V	
10	ANALOG_IN_N0 (r)	FTS position encoder sine signal	-10V<U<+10V	SMEC (r)
12	ANALOG_IN_N1 (r)	FTS position encoder 120° sine signal	-10V<U<+10V	SMEC (r)
14	ANALOG_IN_N2 (r)	FTS position encoder 240° sine signal	-10V<U<+10V	SMEC (r)
16				
18	ANALOG_IN_N3 (r)	FTS LVDT A-B signal (AC 1Hz)	-10V<U<+10V	SMEC (r)
20	ANALOG_IN_N4 (r)	FTS LVDT A signal (DC)	-10V<U<+10V	SMEC (r)
22	ANALOG_IN_N5 (r)	FTS LVDT B signal (DC)	-10V<U<+10V	SMEC (r)
24	GND_SIGNAL	analog ground	U = 0 V	
26	ANALOG_IN_N6 (r)	FTS actuator back emf signal	-10V<U<+10V	SMEC (r)
28	ANALOG_IN_N7 (r)	FTS motor current signal	-10V<U<+10V	SMEC (r)
30	GND_SIGNAL	analog ground	U = 0 V	
32	ANALOG_IN_N8 (r)	chopper position sensor # 1 signal	-10V<U<+10V	BSM (r)
34	ANALOG_IN_N9 (r)	chopper position sensor # 2 signal	-10V<U<+10V	BSM (r)
36	ANALOG_IN_N10 (r)	jiggle position sensor # 1 signal	-10V<U<+10V	BSM (r)
38	ANALOG_IN_N11 (r)	jiggle position sensor # 2 signal	-10V<U<+10V	BSM (r)
40				
42	ANALOG_IN_N12 (r)	chopper actuator back emf signal	-10V<U<+10V	BSM (r)
44	ANALOG_IN_N13 (r)	jiggle actuator back emf signal	-10V<U<+10V	BSM (r)
46	ANALOG_IN_N14 (r)	chopper motor current signal	-10V<U<+10V	BSM (r)
48	ANALOG_IN_N15 (r)	jiggle motor current signal	-10V<U<+10V	BSM (r)
50	GND_SIGNAL	analog ground	U = 0 V	
52	VOUT_DAC_N1 (r)	FTS mirror actuator current reference	-10V < U < +10V	SMEC (r)
54	VOUT_DAC_N2 (r)	Chopper actuator current reference	-10V < U < +10V	BSM (r)
56	VOUT_DAC_N3 (r)	Jiggle actuator current reference	-10V < U < +10V	BSM (r)
58	GND_SIGNAL	analog ground	U = 0 V	
60	-13Van (r)		U = -13 V	
62	GND_SIGNAL	analog ground	U = 0 V	
64	+13Van (r)		U = +13 V	

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Jint2 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to board
66	GND	digital ground	U = 0Vdig	
68	VCC (r)	digital power	U = +5V	
70	GND	digital ground	U = 0Vdig	
72	GND	digital ground	U = 0Vdig	
74	DIG_IN_N0 (r)	FTS position encoder A signal	digital, 0v, +5V	SMEC (r)
76	DIG_IN_N1 (r)	FTS position encoder B signal	digital, 0v, +5V	SMEC (r)
78	DIG_IN_N2 (r)	FTS launch latch status # 1	digital, 0v, +5V	SMEC (r)
80	DIG_IN_N3 (r)	FTS launch latch status # 2	digital, 0v, +5V	SMEC (r)
82	DIG_IN_N4 (r)	FTS mechanical zero position	digital, 0v, +5V	SMEC (r)
84	DIG_IN_N5 (r)	BSM launch latch status (ch & jig)	digital, 0v, +5V	BSM (r)
86	DIG_IN_N6 (r)			
88	DIG_IN_N7 (r)			
90	DIG_OUT_N0 (r)	FTS launch latch command	digital, 0v, +5V	SMEC (r)
92	DIG_OUT_N1 (r)	FTS launch latch eng/diseng select	digital, 0v, +5V	SMEC (r)
94	DIG_OUT_N2 (r)	FTS LVDT power supply on	digital, 0v, +5V	SMEC (r)
96	DIG_OUT_N3 (r)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	SMEC (r)
98	DIG_OUT_N4 (r)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	SMEC (r)
100	DIG_OUT_N5 (r)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	SMEC (r)
102	DIG_OUT_N6 (r)	FTS launch latch #1/#2 select	digital, 0v, +5V	SMEC (r)
104	DIG_OUT_N7 (r)	BSM launch latch command	digital, 0v, +5V	BSM (r)
106	DIG_OUT_N8 (r)	BSM launch latch eng/diseng select	digital, 0v, +5V	BSM (r)
108	DIG_OUT_N9 (r)	chopper position sensor power supply on	digital, 0v, +5V	BSM (r)
110	DIG_OUT_N10 (r)	jiggle position sensor power supply on	digital, 0v, +5V	BSM (r)
112	DIG_OUT_N11 (r)			
114	VCC (r)	digital power	U = +5V	
116	GND	digital ground	U = 0Vdig	
118	VCC (r)	digital power	U = +5V	
120	GND	digital ground	U = 0Vdig	

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4.2 MAC board / JTAG probe interface connector

4.2.1 MAC board prime / JTAG probe interface

Identification :HSFCU_JINT7, located on the front face of the prime MAC board

Type : Sub D 9 S (DEBMA 9 S NMB FO)

Functions : link with EGSE (not connected in flight)

# pin	Name	Signal function	Electrical signal	Remarks
1	TMS (p)	Test Mode Select	digital	
2	TCK (p)	Test Clock	digital	
3	/TRST (p)	Test Reset	digital	
4	TDI (p)	Test Data Input	digital	
5	TDO (p)	Test Data Output	digital	
6				
7				
8	CLK (p)	DSP Clock	digital	
9	GND	0V digital	V = 0V	

4.2.2 MAC board redundant / JTAG probe interface

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Identification :HSFCU_JINT8, located on the front face of the redundant MAC board

Type : Sub D 9 S (DEBMA 9 S NMB FO)

Functions : link with EGSE (not connected in flight)

# pin	Name	Signal function	Electrical signal	Remarks
1	TMS (r)	Test Mode Select	digital	
2	TCK (r)	Test Clock	digital	
3	/TRST (r)	Test Reset	digital	
4	TDI (r)	Test Data Input	digital	
5	TDO (r)	Test Data Output	digital	
6				
7				
8	CLK (r)	DSP Clock	digital	
9	GND	0V digital	V = 0V	

4.2.3

4.3 MAC board / DPU communication connector

4.3.1 MAC board / DPU communication connector (prime)

Identification :HSFCU_J3, located on the front face of prime MAC board

Type : sub D 25 S (DBMA 25 S NMB FO)

Functions : link with DPU (control / command and telemetry)

Connected to W5 harness

# pin	Name	Signal function	Elec. signal	Remarks
1				
2	CLKS-MCU_P_+	command line clock +	digital	twisted with 15
3	CMD-MCU_P_+	command line +	digital	twisted with 16
4	ACK-MCU_P_+	acknowledge line +	digital	twisted with 17
5	ACK-MCU_P_shd	shield	V = 0V	connected to 0V digital
6				
7				
8	CLKF-MCU_P_+	data line clock +	digital	twisted with 21
9	CLKF-MCU_P_shd	shield	V = 0V	connected to 0V digital
10	DATA-MCU_P_+	data line +	digital	twisted with 22
11	GATE-MCU_P_+	enveloppe line +	digital	twisted with 24
12	GATE-MCU_P_shd	shield	V = 0V	connected to 0V digital

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13				
14	CMD-MCU_P_shd	shield	V = 0V	not connected MAC side
15	CLKS-MCU_P_-	data line clock -	digital	twisted with 2
16	CMD-MCU_P_-	command line -	digital	twisted with 3
17	ACK-MCU_P_-	acknowledge line -	digital	twisted with 4
18				
19				
20				
21	CLKF-MCU_P_-	data line clock -	digital	twisted with 8
22	DATA-MCU_P_-	data line -	digital	twisted with 10
23	DATA-MCU_P_shd	shield	V = 0V	connected to 0V digital
24	GATE-MCU_P_-	Ligne enveloppe -	digital	twisted with 11
25				

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4.3.2 MAC board / DPU communication connector (redundant)

Identification :HSFCU_J4, located on the front face of redundant MAC board

Type : sub D 25 S (DBMA 25 S NMB FO)

Functions : link with DPU (control / command and telemetry)

Connected to W6 harness

# pin	Name	Signal function	Elec. signal	Remarks
1				
2	CLKS-MCU_R_+	command line clock +	digital	twisted with 15
3	CMD-MCU_R_+	command line +	digital	twisted with 16
4	ACK-MCU_R_+	acknowledge line +	digital	twisted with 17
5	ACK-MCU_R_shd	shield	V = 0V	connected to 0V digital
6				
7				
8	CLKF-MCU_R_+	data line clock +	digital	twisted with 21
9	CLKF-MCU_R_shd	shield of data clock	V = 0V	connected to 0V digital
10	DATA-MCU_R_+	data line +	digital	twisted with 22
11	GATE-MCU_R_+	enveloppe line +	digital	twisted with 24
12	GATE-MCU_R_shd	shield	V = 0V	connected to 0V digital
13				
14	CMD-MCU_R_shd	shield	V = 0V	not connected MAC side
15	CLKS-MCU_R_-	data line clock -	digital	twisted with 2
16	CMD-MCU_R_-	command line -	digital	twisted with 3
17	ACK-MCU_R_-	acknowledge line -	digital	twisted with 4
18				
19				
20				
21	CLKF-MCU_R_-	data line clock -	digital	twisted with 8
22	DATA-MCU_R_-	data line -	digital	twisted with 10
23	DATA-MCU_R_shd	shield	V = 0V	connected to 0V digital
24	GATE-MCU_R_-	Ligne enveloppe -	digital	twisted with 11
25				

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5 SMEC board interfaces

5.1 SMEC board / Back plane connectors

5.1.1 SMEC prime board / Back plane prime connector

Identification :HSFCU_Jint3, located on the back plane of the SMEC prime board

Type : FRB KNB 084 13 10 110 for FM male

Function : connection to back plane board (to MAC prime board)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
1	-13V an (p)	analogue power	U = -13V	
3	GND_SIGNAL	analogue ground	U = 0V _{an}	
5	+13V an (p)	analogue power	U = +13V	
7	-15V mot (p)	motor power	U = -15V	
9	0V mot	motor ground	U = 0V _{mot}	
11	+15V mot (p)	motor power	U = +15V	
13	GND_SIGNAL	analogue ground	U = 0V _{an}	
15	S_Current_Ref_P (p)	FTS mirror actuator current reference	-10V< U <+10V	VOOUT_DAC_P1 (p)
17	GND_SIGNAL	analogue ground	U = 0V _{an}	
19	S_Pos_Phot1_P (p)	position encoder sine signal	-10V<U<+10V	ANALOG_IN_P0 (p)
21	S_Pos_Phot2_P (p)	position encoder 120° sine signal	-10V<U<+10V	ANALOG_IN_P1 (p)
23	S_Pos_Phot3_P (p)	position encoder 240° sine signal	-10V<U<+10V	ANALOG_IN_P2 (p)
25	GND_SIGNAL	analogue ground	U = 0V _{an}	
27	S_Pos_Lvdt1_P (p)	LVDT A-B signal (AC 1 Hz)	-10V<U<+10V	ANALOG_IN_P3 (p)
29	S_Pos_Lvdt2_P (p)	LVDT A signal (DC)	-10V<U<+10V	ANALOG_IN_P4 (p)
31	S_Pos_Lvdt3_P (p)	LVDT B signal (DC)	-10V<U<+10V	ANALOG_IN_P5 (p)
33	GND_SIGNAL	analogue ground	U = 0V _{an}	
35	S_Mot_Bemf_P (p)	actuator back emf signal	-10V<U<+10V	ANALOG_IN_P6 (p)
37	S_Mot_Current_P (p)	motor current signal	-10V<U<+10V	ANALOG_IN_P7 (p)
39	GND_SIGNAL	analogue ground	U = 0V _{an}	
41	S_Pos_A_Sig_P (p)	FTS position encoder A signal	digital, 0v, +5V	DIG_IN_P0 (p)
43	S_Pos_B_Sig_P (p)	FTS position encoder B signal	digital, 0v, +5V	DIG_IN_P1 (p)
45	GND_SIGNAL	analogue ground	U = 0V _{an}	
47	S_LL_Status_P (p)	FTS launch latch status # 1	digital, 0v, +5V	DIG_IN_P2 (p)
49	S_LL_Status_P (p)	FTS launch latch status # 2	digital, 0v, +5V	DIG_IN_P3 (p)
51	S_MechZero_Sig_P (p)	FTS mechanical zero position	digital, 0v, +5V	DIG_IN_P4 (p)
53	GND_SIGNAL	analogue ground	U = 0V _{an}	
55	S_LL_Cmd_P (p)	FTS launch latch command	digital, 0v, +5V	DIG_OUT_P0 (p)
57	S_LL_Eng/diseng_P (p)	FTS launch latch eng/diseng select	digital, 0v, +5V	DIG_OUT_P1 (p)
59	S_Lvdt_PwrOn_P (p)	FTS LVDT power supply on	digital, 0v, +5V	DIG_OUT_P2 (p)
61				
63	S_PosEnc_Pwr0_P (p)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	DIG_OUT_P3 (p)
65	S_PosEnc_Pwr1_P (p)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	DIG_OUT_P4 (p)
67	S_PosEnc_Pwr2_P (p)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	DIG_OUT_P5 (p)

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69				
71	S_LL_1/2_select_P (p)	FTS launch latch #1/#2 select	digital, 0v, +5V	DIG_OUT_P6 (p)
73	GND_SIGNAL	analogue ground	U = 0V _{an}	
75	-13V an (p)	analogue power	U = -13V	
77	GND_SIGNAL	analogue ground	U = 0V _{an}	
79	+13V an (p)	analogue power	U = +13V	
81	-15V mot (p)	motor power	U = -15V	
83	+15V mot (p)	motor power	U = +15V	

JINT3 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
2	-13V an (p)	analogue power	U = -13V	
4	GND_SIGNAL	analogue ground	U = 0V _{an}	
6	+13V an (p)	analogue power	U = +13V	
8	-15V mot (p)	motor power	U = -15V	
10	0V mot (p)	motor ground	U = 0V _{mot}	
12	+15V mot (p)	motor power	U = +15V	
14	GND_SIGNAL	analogue ground	U = 0V _{an}	
16	S_Current_Ref_N (p)	FTS mirror actuator current reference	-10V<U<+10V	VOUT_DAC_N1 (p)
18	GND_SIGNAL	analogue ground	U = 0V _{an}	
20	S_Pos_Phot1_N (p)	position encoder sine signal	-10V<U<+10V	ANALOG_IN_N0 (p)
22	S_Pos_Phot2_N (p)	position encoder 120° sine signal	-10V<U<+10V	ANALOG_IN_N1 (p)
24	S_Pos_Phot3_N (p)	position encoder 240° sine signal	-10V<U<+10V	ANALOG_IN_N2 (p)
26	GND_SIGNAL	analogue ground	U = 0V _{an}	
28	S_Pos_Lvdt1_N (p)	LVDT A-B signal (AC 1 Hz)	-10V<U<+10V	ANALOG_IN_N3 (p)
30	S_Pos_Lvdt2_N (p)	LVDT A signal (DC)	-10V<U<+10V	ANALOG_IN_N4 (p)
32	S_Pos_Lvdt3_N (p)	LVDT B signal (DC)	-10V<U<+10V	ANALOG_IN_N5 (p)
34	GND_SIGNAL	analogue ground	U = 0V _{an}	
36	S_Mot_Bemf_N (p)	actuator back emf signal	-10V<U<+10V	ANALOG_IN_N6 (p)
38	S_Mot_Current_N (p)	motor current signal	-10V<U<+10V	ANALOG_IN_N7 (p)
40	GND_SIGNAL	analogue ground	U = 0V _{an}	
42	S_Pos_A_Sig_N (p)	FTS position encoder A signal	digital, 0v, +5V	DIG_IN_N0 (p)
44	S_Pos_B_Sig_N (p)	FTS position encoder B signal	digital, 0v, +5V	DIG_IN_N1 (p)
46	GND_SIGNAL	analogue ground	U = 0V _{an}	
48	S_LL_Status_N (p)	FTS launch latch status # 1	digital, 0v, +5V	DIG_IN_N2 (p)
50	S_LL_Status_N (p)	FTS launch latch status # 2	digital, 0v, +5V	DIG_IN_N3 (p)
52	S_MechZero_Sig_N (p)	FTS mechanical zero position	digital, 0v, +5V	DIG_IN_N4 (p)
54	GND_SIGNAL	analogue ground	U = 0V _{an}	
56	S_LL_Cmd_N (p)	FTS launch latch command	digital, 0v, +5V	DIG_OUT_N0 (p)
58	S_LL_Eng/diseng_N (p)	FTS launch latch eng/diseng select	digital, 0v, +5V	DIG_OUT_N1 (p)
60	S_Lvdt_PwrOn_N (p)	FTS LVDT power supply on	digital, 0v, +5V	DIG_OUT_N2 (p)
62				
64	S_PosEnc_Pwr0_N (p)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	DIG_OUT_N3 (p)
66	S_PosEnc_Pwr1_N (p)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	DIG_OUT_N4 (p)
68	S_PosEnc_Pwr2_N (p)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	DIG_OUT_N5 (p)

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70				
72	S_LL_1/2_select_N (p)	FTS launch latch #1/#2 select	digital, 0v, +5V	DIG_OUT_N6 (p)
74	GND_SIGNAL	analogue ground	U = 0V _{an}	
76	-13V an (p)	analogue power	U = -13V	
78	GND_SIGNAL	analogue ground	U = 0V _{an}	
80	+13V an (p)	analogue power	U = +13V	
82	-15V mot (p)	motor power	U = -15V	
84	+15V mot (p)	motor power	U = +15V	

5.1.2

5.1.3 SMEC redundant board / Back plane redundant connector

Identification :HSFCU_Jint4, located on the back plane of the SMEC redundant board

Type : FRB KNB 084 13 10 110 for FM male

Function : connection to back plane board (to redundant MAC board)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
1	-13V an (r)	analogue power	U = -13V	
3	GND_SIGNAL	analogue ground	U = 0V _{an}	
5	+13V an (r)	analogue power	U = +13V	
7	-15V mot (r)	motor power	U = -15V	
9	0V mot	motor ground	U = 0V _{mot}	
11	+15V mot (r)	motor power	U = +15V	
13	GND_SIGNAL	analogue ground	U = 0V _{an}	
15	S_Current_Ref_P (r)	FTS mirror actuator current reference	-10V<U<+10V	VOUT_DAC_P1 (r)
17	GND_SIGNAL	analogue ground	U = 0V _{an}	
19	S_Pos_Phot1_P (r)	position encoder sine signal	-10V<U<+10V	ANALOG_IN_P0 (r)
21	S_Pos_Phot2_P (r)	position encoder 120° sine signal	-10V<U<+10V	ANALOG_IN_P1 (r)
23	S_Pos_Phot3_P (r)	position encoder 240° sine signal	-10V<U<+10V	ANALOG_IN_P2 (r)
25	GND_SIGNAL	analogue ground	U = 0V _{an}	
27	S_Pos_Lvdt1_P (r)	LVDT A-B signal (AC 1 Hz)	-10V<U<+10V	ANALOG_IN_P3 (r)
29	S_Pos_Lvdt2_P (r)	LVDT A signal (DC)	-10V<U<+10V	ANALOG_IN_P4 (r)
31	S_Pos_Lvdt3_P (r)	LVDT B signal (DC)	-10V<U<+10V	ANALOG_IN_P5 (r)
33	GND_SIGNAL	analogue ground	U = 0V _{an}	
35	S_Mot_Bemf_P (r)	actuator back emf signal	-10V<U<+10V	ANALOG_IN_P6 (r)
37	S_Mot_Current_P (r)	motor current signal	-10V<U<+10V	ANALOG_IN_P7 (r)
39	GND_SIGNAL	analogue ground	U = 0V _{an}	
41	S_Pos_A_Sig_P (r)	FTS position encoder A signal	digital, 0v, +5V	DIG_IN_P0 (r)

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43	S_Pos_B_Sig_P (r)	FTS position encoder B signal	digital, 0v, +5V	DIG_IN_P1 (r)
45	GND_SIGNAL	analogue ground	U = 0Van	
47	S_LL_Status_P (r)	FTS launch latch status # 1	digital, 0v, +5V	DIG_IN_P2 (r)
49	S_LL_Status_P (r)	FTS launch latch status # 2	digital, 0v, +5V	DIG_IN_P3 (r)
51	S_MechZero_Sig_P (r)	FTS mechanical zero position	digital, 0v, +5V	DIG_IN_P4 (r)
53	GND_SIGNAL	analogue ground	U = 0Van	
55	S_LL_Cmd_P (r)	FTS launch latch command	digital, 0v, +5V	DIG_OUT_P0 (r)
57	S_LL_Eng/diseng_P (r)	FTS launch latch eng/diseng select	digital, 0v, +5V	DIG_OUT_P1 (r)
59	S_Lvdt_PwrOn_P (r)	FTS LVDT power supply on	digital, 0v, +5V	DIG_OUT_P2 (r)
61				
63	S_PosEnc_Pwr0_P (r)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	DIG_OUT_P3 (r)
65	S_PosEnc_Pwr1_P (r)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	DIG_OUT_P4 (r)
67	S_PosEnc_Pwr2_P (r)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	DIG_OUT_P5 (r)
69				
71	S_LL_1/2_select_P (r)	FTS launch latch #1/#2 select	digital, 0v, +5V	DIG_OUT_P6 (r)
73	GND_SIGNAL	analogue ground	U = 0Van	
75	-13V an (r)	analogue power	U = -13V	
77	GND_SIGNAL	analogue ground	U = 0Van	
79	+13V an (r)	analogue power	U = +13V	
81	-15V mot (r)	motor power	U = -15V	
83	+15V mot (r)	motor power	U = +15V	

JINT4 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
2	-13V an (r)	analogue power	U = -13V	
4	GND_SIGNAL	analogue ground	U = 0Van	
6	+13V an (r)	analogue power	U = +13V	
8	-15V mot (r)	motor power	U = -15V	
10	0V mot	motor ground	U = 0Vmot	
12	+15V mot (r)	motor power	U = +15V	
14	GND_SIGNAL	analogue ground	U = 0Van	
16	S_Current_Ref_N (r)	FTS mirror actuator current reference	-10V<U<+10V	VOUT_DAC_N1 (r)
18	GND_SIGNAL	analogue ground	U = 0Van	
20	S_Pos_Phot1_N (r)	position encoder sine signal	-10V<U<+10V	ANALOG_IN_N0 (r)
22	S_Pos_Phot2_N (r)	position encoder 120° sine signal	-10V<U<+10V	ANALOG_IN_N1 (r)
24	S_Pos_Phot3_N (r)	position encoder 240° sine signal	-10V<U<+10V	ANALOG_IN_N2 (r)
26	GND_SIGNAL	analogue ground	U = 0Van	
28	S_Pos_Lvdt1_N (r)	LVDT A-B signal (AC 1 Hz)	-10V<U<+10V	ANALOG_IN_N3 (r)
30	S_Pos_Lvdt2_N (r)	LVDT A signal (DC)	-10V<U<+10V	ANALOG_IN_N4 (r)
32	S_Pos_Lvdt3_N (r)	LVDT B signal (DC)	-10V<U<+10V	ANALOG_IN_N5 (r)
34	GND_SIGNAL	analogue ground	U = 0Van	
36	S_Mot_Bemf_N (r)	actuator back emf signal	-10V<U<+10V	ANALOG_IN_N6 (r)
38	S_Mot_Current_N (r)	motor current signal	-10V<U<+10V	ANALOG_IN_N7 (r)
40	GND_SIGNAL	analogue ground	U = 0Van	
42	S_Pos_A_Sig_N (r)	FTS position encoder A signal	digital, 0v, +5V	DIG_IN_N0 (r)

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44	S_Pos_B_Sig_N (r)	FTS position encoder B signal	digital, 0v, +5V	DIG_IN_N1 (r)
46	GND_SIGNAL	analogue ground	U = 0V _{an}	
48	S_LL_Status_N (r)	FTS launch latch status # 1	digital, 0v, +5V	DIG_IN_N2 (r)
50	S_LL_Status_N (r)	FTS launch latch status # 2	digital, 0v, +5V	DIG_IN_N3 (r)
52	S_MechZero_Sig_N (r)	FTS mechanical zero position	digital, 0v, +5V	DIG_IN_N4 (r)
54	GND_SIGNAL	analogue ground	U = 0V _{an}	
56	S_LL_Cmd_N (r)	FTS launch latch command	digital, 0v, +5V	DIG_OUT_N0 (r)
58	S_LL_Eng/diseng_N (r)	FTS launch latch eng/diseng select	digital, 0v, +5V	DIG_OUT_N1 (r)
60	S_Lvdt_PwrOn_N (r)	FTS LVDT power supply on	digital, 0v, +5V	DIG_OUT_N2 (r)
62				
64	S_PosEnc_Pwr0_N (r)	FTS pos. encoder Led power supply bit # 0	digital, 0v, +5V	DIG_OUT_N3 (r)
66	S_PosEnc_Pwr1_N (r)	FTS pos. encoder Led power supply bit # 1	digital, 0v, +5V	DIG_OUT_N4 (r)
68	S_PosEnc_Pwr2_N (r)	FTS pos. encoder Led power supply bit # 2	digital, 0v, +5V	DIG_OUT_N5 (r)
70				
72	S_LL_1/2_select_N (r)	FTS launch latch #1/#2 select	digital, 0v, +5V	DIG_OUT_N6 (r)
74	GND_SIGNAL	analogue ground	U = 0V _{an}	
76	-13V an (r)	analogue power	U = -13V	
78	GND_SIGNAL	analogue ground	U = 0V _{an}	
80	+13V an (r)	analogue power	U = +13V	
82	-15V mot (r)	motor power	U = -15V	
84	+15V mot (r)	motor power	U = +15V	

5.2 SMEC board / SMEC Mechanism harness interfaces

WE side, on the MCU boards :

- prime : 2 x Canon DCMA type, 37 contacts female on board
- redundant : 2 x Canon DCMA type, 37 contacts female on board

5.2.1 SMEC prime board / Mechanism harness connector # 1 (I/F with I11 harness)

Identification :HSFCU_J17, located on the front panel of the SMEC prime board

Type :Sub D 37 S (DCMA 37 S NMB FO)

Functions : motor (3 STP), encoder (8 STP), 11 screens

Connected to I11 harness

37 way FCU_J17	Signal function	Signal name	Max. current	Wire type
1	SMEC drive coil I+	S_Mot_Coil_P	100 mA	Insulated STP
2	SMEC drive coil I-	S_Mot_Coil_N	100 mA	
20	SMEC drive coil shld	S_Mot_Coil_Shd	N/A	
4	SMEC drive coil supply sense	S_Mot_Bemf_P	10 µA	Insulated STP
5	SMEC drive coil return sense	S_Mot_Bemf_N	10 µA	
23	SMEC drive coil supply sense shield	S_Mot_Bemf_Shd	N/A	

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6	NC			
7	SMEC position sensor Led power supply	LEDA	1 mA	Insulated STP
8	SMEC position sensor Led power return	LEDC	1 mA	
26	Shield	LED_Shld	N/A	
10	SMEC position sensor photodiode #1 I+	IPD1A	20 μ A	Insulated STP
11	SMEC position sensor photodiode #1 I-	IPD1C	20 μ A	
29	Shield	IPD1_SHD	N/A	
13	SMEC position sensor photodiode #2 I+	IPD2A	20 μ A	Insulated STP
14	SMEC position sensor photodiode #2 I-	IPD2C	20 μ A	
32	Shield	IPD2_Shld	N/A	
16	SMEC position sensor photodiode #3 I+	IPD3A	20 μ A	Insulated STP
17	SMEC position sensor photodiode #3 I-	IPD3C	20 μ A	
35	Shield	IPD3_Shld	N/A	
21	SMEC drive coil I+ (rob)	S_Mot_Coil_P	100 mA	Insulated STP
22	SMEC drive coil I- (rob)	S_Mot_Coil_N	100 mA	
3	SMEC drive coil shld rob)	S_Mot_Coil_Shld	N/A	
24	NC			
25	NC			
27	SMEC position sensor power supply	-3V	1 mA	Insulated STP
28	SMEC position sensor power return	-3V	1 mA	
9	Shield	POS_POWER_Shld	N/A	
30	SMEC pos. sensor photodiode #1 feedback +	CRPD1A	10 μ A	Insulated STP
31	SMEC pos. sensor photodiode #1 feedback -	CRPD1C	10 μ A	
12	Shield	CRPD1_SHD	N/A	
33	SMEC pos. sensor photodiode #2 feedback +	CRPD2A	10 μ A	Insulated STP
34	SMEC pos. sensor photodiode #2 feedback -	CRPD2C	10 μ A	
15	Shield	CRPD2_Shld	N/A	
36	SMEC pos. sensor photodiode #3 feedback +	CRPD3A	10 μ A	Insulated STP
37	SMEC pos. sensor photodiode #3 feedback -	CRPD3C	10 μ A	
18	Shield	CRPD3_Shld	N/A	

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5.2.2 SMEC prime board / Mechanism harness connector # 2 (I/F with I11 harness)

Identification :HSFCU_J29, located on the front pannel of the SMEC prime board

Type : Sub D 37 S (DCMA 37 S NMB FO)

Functions : launch latch (2 STP), lauch latch status (2 STP), LVDT sensor (3 STP), 7 screens, connected to I11 harness

37 way FCU_J29	Signal function	Signal name	Max. current	Wire type
1	SMEC lauch latch #1 power supply	S_LL#1_Coil_P	400 mA / 50 ms	Insulated STP
2	SMEC lauch latch #1 power return	S_LL#1_Coil_N	400 mA / 50 ms	
20	Shield	S_LL#1_Coil_Shd	N/A	
3	Reserved			
4	Reserved			
5	Reserved			
7	Reserved			
8	Reserved			
9	Reserved			
10	SMEC lauch latch # 2 confirmation + (TBC)	S_LL#2_Stat_P	1 mA	Insulated STP
11	SMEC lauch latch # 2 confirmation - (TBC)	S_LL#2_Stat_N	1 mA	
29	Shield	S_LL#2_Stat_Shd	N/A	
13	SMEC LVDT primary coil power supply (P)	LVDT_PRIM_P	5 mA	Insulated STP
14	SMEC LVDT primary coil power supply (N)	LVDT_PRIM_N	5 mA	
32	Shield	LVDT_PRIM_Shd	N/A	
15	SMEC LVDT secondary coil # 1 signal (P)	LVDT_SECA_P	50 µA	Insulated STP
16	SMEC LVDT secondary coil # 1 signal (N)	LVDT_SECA_N	50 µA	
34	Shield	LVDT_SECA_Shd	N/A	
17	SMEC LVDT secondary coil # 2 signal (P)	LVDT_SECB_P	50 µA	Insulated STP
18	SMEC LVDT secondary coil # 2 signal (N)	LVDT_SECB_N	50 µA	
36	Shield	LVDT_SECB_Shd	N/A	
19				
21	Reserved			
22	Reserved			
23	Reserved			
24	SMEC lauch latch #2 power supply (TBC)	S_LL#2_Coil_P	400 mA / 50 ms	Insulated STP
25	SMEC lauch latch #2 power return (TBC)	S_LL#2_Coil_N	400 mA / 50 ms	
6	Shield	S_LL#2_Coil_Shd	N/A	
26	Reserved			
27	Reserved			
28	Reserved			
30	SMEC lauch latch # 1 confirmation +	S_LL#1_Stat_P	1 mA	Insulated STP
31	SMEC lauch latch # 1 confirmation -	S_LL#1_Stat_N	1 mA	
12	Shield	S_LL#1_Stat_Shd	N/A	
33				
35				
37				

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5.2.3 SMEC redundant board / Mechanism harness connector # 1 (I/F with I13 harness)

Identification :HSFCU_J18, located on the front panel of the SMEC redundant board

Type :Sub D 37 S (DCMA 37 S NMB FO)

Functions : motor (3 STP), encoder (8 STP), 11 screens

Connected to I13 harness

37 way FCU_J18	Signal function	Signal name	Max. current	Wire type
1	SMEC drive coil I+	S_Mot_Coil_P	100 mA	Insulated STP
2	SMEC drive coil I-	S_Mot_Coil_N	100 mA	
20	SMEC drive coil shld	S_Mot_Coil_Shd	N/A	
4	SMEC drive coil supply sense	S_Mot_Bemf_P	10 µA	Insulated STP
5	SMEC drive coil return sense	S_Mot_Bemf_N	10 µA	
23	SMEC drive coil supply sense shield	S_Mot_Bemf_Shd	N/A	
6	NC			
7	SMEC position sensor Led power supply	LEDA	1 mA	Insulated STP
8	SMEC position sensor Led power return	LEDC	1 mA	
26	Shield	LED_Shd	N/A	
10	SMEC position sensor photodiode #1 I+	IPD1A	20 µA	Insulated STP
11	SMEC position sensor photodiode #1 I-	IPD1C	20 µA	
29	Shield	IPD1_SHD	N/A	
13	SMEC position sensor photodiode #2 I+	IPD2A	20 µA	Insulated STP
14	SMEC position sensor photodiode #2 I-	IPD2C	20 µA	
32	Shield	IPD2_Shd	N/A	
16	SMEC position sensor photodiode #3 I+	IPD3A	20 µA	Insulated STP
17	SMEC position sensor photodiode #3 I-	IPD3C	20 µA	
35	Shield	IPD3_Shd	N/A	
21	SMEC drive coil I+ (rob)	S_Mot_Coil_P	100 mA	Insulated STP
22	SMEC drive coil I- (rob)	S_Mot_Coil_N	100 mA	
3	SMEC drive coil shld rob)	S_Mot_Coil_Shd	N/A	
24	NC			
25	NC			
27	SMEC position sensor power supply	-3V	1 mA	Insulated STP
28	SMEC position sensor power return	-3V	1 mA	
9	Shield	POS_POWER_Shd	N/A	
30	SMEC pos. sensor photodiode #1 feedback +	CRPD1A	10 µA	Insulated STP
31	SMEC pos. sensor photodiode #1 feedback -	CRPD1C	10 µA	
12	Shield	CRPD1_SHD	N/A	
33	SMEC pos. sensor photodiode #2 feedback +	CRPD2A	10 µA	Insulated STP
34	SMEC pos. sensor photodiode #2 feedback -	CRPD2C	10 µA	
15	Shield	CRPD2_Shd	N/A	
36	SMEC pos. sensor photodiode #3 feedback +	CRPD3A	10 µA	Insulated STP
37	SMEC pos. sensor photodiode #3 feedback -	CRPD3C	10 µA	
18	Shield	CRPD3_Shd	N/A	

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5.2.4 SMEC redundant board / Mechanism harness connector # 2 (I/F with I13 harness)

Identification :HSFCU_J30, located on the front pannel of the SMEC redundant board

Type : Sub D 37 S (DCMA 37 S NMB FO)

Functions : launch latch (2 STP), lauch latch status (2 STP), LVDT sensor (3 STP), 7 screens, connected to I13 harness

37 way FCU_J30	Signal function	Signal name	Max. current	Wire type
1	SMEC lauch latch #1 power supply	S_LL#1_Coil_P	400 mA / 50 ms	Insulated STP
2	SMEC lauch latch #1 power return	S_LL#1_Coil_N	400 mA / 50 ms	
20	Shield	S_LL#1_Coil_Shd	N/A	
3	Reserved			
4	Reserved			
5	Reserved			
7	Reserved			
8	Reserved			
9	Reserved			
10	SMEC lauch latch # 2 confirmation + (TBC)	S_LL#2_Stat_P	1 mA	Insulated STP
11	SMEC lauch latch # 2 confirmation - (TBC)	S_LL#2_Stat_N	1 mA	
29	Shield	S_LL#2_Stat_Shd	N/A	
13	SMEC LVDT primary coil power supply (P)	LVDT_PRIM_P	5 mA	Insulated STP
14	SMEC LVDT primary coil power supply (N)	LVDT_PRIM_N	5 mA	
32	Shield	LVDT_PRIM_Shd	N/A	
15	SMEC LVDT secondary coil # 1 signal (P)	LVDT_SECA_P	50 µA	Insulated STP
16	SMEC LVDT secondary coil # 1 signal (N)	LVDT_SECA_N	50 µA	
34	Shield	LVDT_SECA_Shd	N/A	
17	SMEC LVDT secondary coil # 2 signal (P)	LVDT_SECB_P	50 µA	Insulated STP
18	SMEC LVDT secondary coil # 2 signal (N)	LVDT_SECB_N	50 µA	
36	Shield	LVDT_SECB_Shd	N/A	
19				
21	Reserved			
22	Reserved			
23	Reserved			
24	SMEC lauch latch #2 power supply (TBC)	S_LL#2_Coil_P	400 mA / 50 ms	Insulated STP
25	SMEC lauch latch #2 power return (TBC)	S_LL#2_Coil_N	400 mA / 50 ms	
6	Shield	S_LL#2_Coil_Shd	N/A	

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26	Reserved			
27	Reserved			
28	Reserved			
30	SMEC lauch latch # 1 confirmation +	S_LL#1_Stat_P	1 mA	Insulated STP
31	SMEC lauch latch # 1 confirmation -	S_LL#1_Stat_N	1 mA	
12	Shield	S_LL#1_Stat_Shd	N/A	
33				
35				
37				

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5.2.5 Requirement for SMEC board / Mechanism harness resistance

Requirements for C11 / C12 and I11 / I12

37 way FCU_J17 FCU_J18	Signal function	Max. ohms	Max. current	Remarks	Wire type
1	SMEC drive coil I+	5	100 mA		Insulated STP
2	SMEC drive coil I-	5	100 mA		
20	SMEC drive coil shld	N/A	N/A		
4	SMEC drive coil supply sense	500	10 µA		Insulated STP
5	SMEC drive coil return sense	500	10 µA		
23	SMEC drive coil supply sense shield	N/A	N/A		
6	NC				
7	SMEC position sensor Led power supply	1000	1 mA		Insulated STP
8	SMEC position sensor Led power return	1000	1 mA		
26	Shield	N/A	N/A		
10	SMEC position sensor photodiode #1 I+	1000	20 µA		Insulated STP
11	SMEC position sensor photodiode #1 I-	1000	20 µA		
29	Shield	N/A	N/A		
13	SMEC position sensor photodiode #2 I+	1000	20 µA		Insulated STP
14	SMEC position sensor photodiode #2 I-	1000	20 µA		
32	Shield	N/A	N/A		
16	SMEC position sensor photodiode #3 I+	1000	20 µA		Insulated STP
17	SMEC position sensor photodiode #3 I-	1000	20 µA		
35	Shield	N/A	N/A		
21	SMEC drive coil I+ (rob)	5	100 mA		Insulated STP
22	SMEC drive coil I- (rob)	5	100 mA		
3	SMEC drive coil shld rob)	N/A	N/A		
24	NC				
25	NC				
27	SMEC position sensor power supply	1000	1 mA		Insulated STP
28	SMEC position sensor power return	1000	1 mA		
9	Shield	N/A	N/A		
30	SMEC pos. sensor photodiode #1 feedback +	1000	10 µA	C=2.2nF max	Insulated STP
31	SMEC pos. sensor photodiode #1 feedback -	1000	10 µA	C=2.2nF max	
12	Shield	N/A	N/A		
33	SMEC pos. sensor photodiode #2 feedback +	1000	10 µA	C=2.2nF max	Insulated STP
34	SMEC pos. sensor photodiode #2 feedback -	1000	10 µA	C=2.2nF max	
15	Shield	N/A	N/A		
36	SMEC pos. sensor photodiode #3 feedback +	1000	10 µA	C=2.2nF max	Insulated STP
37	SMEC pos. sensor photodiode #3 feedback -	1000	10 µA	C=2.2nF max	
18	Shield	N/A	N/A		

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Requirements for C11 / C12 and I11 / I12

37 way FCU_J29 FCU_J30	Signal function	Max. ohms	Max. current	Remarks	Wire type
1	SMEC lauch latch #1 power supply	5	400 mA / 50 ms		Insulated STP
2	SMEC lauch latch #1 power return	5	400 mA / 50 ms		
20	Shield	N/A	N/A		
3	Reserved	N/A	N/A	shield of t° probe on C11/C12	
4	Reserved	1000	1 µA	t° probe on C11/C12	
5	Reserved	1000	1 µA	t° probe on C11/C12	
7	Reserved	1000	1 µA	t° probe on C11/C12	
8	Reserved	1000	1 µA	t° probe on C11/C12	
9	Reserved	N/A	N/A	shield of t° probe on C11/C12	
10	SMEC lauch latch # 2 confirmation + (TBC)	100	1 mA		Insulated STP
11	SMEC lauch latch # 2 confirmation - (TBC)	100	1 mA		
29	Shield	N/A	N/A		
13	SMEC LVDT primary coil power supply (P)	100	5 mA		Insulated STP
14	SMEC LVDT primary coil power supply (N)	100	5 mA		
32	Shield	N/A	N/A		
15	SMEC LVDT secondary coil # 1 signal (P)	100	50 µA	C=2.2nF max.	Insulated STP
16	SMEC LVDT secondary coil # 1 signal (N)	100	50 µA	C=2.2nF max.	
34	Shield	N/A	N/A		
17	SMEC LVDT secondary coil # 2 signal (P)	100	50 µA	C=2.2nF max.	Insulated STP
18	SMEC LVDT secondary coil # 2 signal (N)	100	50 µA	C=2.2nF max.	
36	Shield	N/A	N/A		
19					
21	Reserved	1000	1 µA	t° probe on C11/C12	
22	Reserved	1000	1 µA	t° probe on C11/C12	
23	Reserved	N/A	N/A	shield of t° probe on C11/C12	
24	SMEC lauch latch #2 power supply (TBC)	5	400 mA / 50 ms		Insulated STP
25	SMEC lauch latch #2 power return (TBC)	5	400 mA / 50 ms		
6	Shield	N/A	N/A		
26	Reserved	N/A	N/A	shield of t° probe on C11/C12	
27	Reserved	1000	1 µA	t° probe on C11/C12	
28	Reserved	1000	1 µA	t° probe on C11/C12	
30	SMEC lauch latch # 1 confirmation +	100	1 mA		Insulated STP
31	SMEC lauch latch # 1 confirmation -	100	1 mA		
12	Shield	N/A	N/A		
33					
35					
37					

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6 BSM board interfaces

6.1 BSM board / Backplane connectors

note : prime electronic and redondant electronic are on the same board

6.1.1 BSM board / Backplane prime connector

Identification :HSFCU_Jint5, located on the back plane side (on top)

Type : FRB KNB 065 13 10 110 male

Function : connection to back plane board (to prime MAC board)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
1	-13V an (p)	analogue power	U = -13V	
3	GND_SIGNAL	analogue ground	U = 0Van	
5	+13V an (p)	analogue power	U = +13V	
7	-15V mot (p)	motor power	U = -15V	
9	0V mot	motor ground	U = 0Vmot	
11	+15V mot (p)	motor power	U = +15V	
13	GND_SIGNAL	analogue ground	U = 0Van	
15	Ch_Current_Ref_P (p)	chopper current reference (+)	-10V<U<+10V	VOUT_DAC_P2 (p)
17	Jig_Current_Ref_P (p)	jiggle current reference (+)	-10V<U<+10V	VOUT_DAC_P3 (p)
19	GND_SIGNAL	analogue ground	U = 0Van	
21	Ch_Pos1_P (p)	chopper position sensor # 1 signal (+)	-10V<U<+10V	ANALOG_IN_P8 (p)
23	Ch_Pos2_P (p)	chopper position sensor # 2 signal (+)	-10V< U<+10V	ANALOG_IN_P9 (p)
25	Jig_Pos1_P (p)	jiggle position sensor # 1 signal (+)	-10V<U<+10V	ANALOG_IN_P10 (p)
27	Jig_Pos2_P (p)	jiggle position sensor # 2 signal (+)	-10V<U<+10V	ANALOG_IN_P11 (p)
29	Ch_Mot_Bemf_P (p)	chopper actuator back emf signal (+)	-10V<U<+10V	ANALOG_IN_P12 (p)
31	Jig_Mot_Bemf_P (p)	jiggle actuator back emf signal (+)	-10V<U<+10V	ANALOG_IN_P13 (p)
33	Ch_Mot_Curr_P (p)	chopper motor current signal (+)	-10V<U<+10V	ANALOG_IN_P14 (p)
35	Jig_Mot_Curr_P (p)	jiggle motor current signal (+)	-10V<U<+10V	ANALOG_IN_P15 (p)
37	GND_SIGNAL	analogue ground	U = 0Van	
39	B_LL_Status_P (p)	launch latch status (+)	digital, 0V, 5V	DIG_IN_P5 (p)
41	B_LL_Cmd_P (p)	launch latch command (+)	digital, 0V, 5V	DIG_OUT_P7 (p)
43	B_LL_Eng/diseng_P (p)	launch latch eng/diseng select (+)	digital, 0V, 5V	DIG_OUT_P8 (p)
45	Ch_Pos_Pwr_P (p)	chopper position sensor power supply on	digital, 0V, 5V	DIG_OUT_P9 (p)
47	Jig_Pos_Pwr_P (p)	jiggle position sensor power supply on	digital, 0V, 5V	DIG_OUT_P10 (p)
49				
51				
53	-13V an (p)	analogue power	U = -13V	
55	GND_SIGNAL	analogue ground	U = 0Van	
57	+13V an (p)	analogue power	U = +13V	
59	-15V mot (p)	motor power	U = -15V	
61	0V mot	motor ground	U = 0Vmot	
63	+15V mot (p)	motor power	U = +15V	
65				

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Jint5 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
2	-13V an (p)	analogue power	U = -13V	
4	GND_SIGNAL	analogue ground	U = 0Van	
6	+13V an (p)	analogue power	U = +13V	
8	-15V mot (p)	motor power	U = -15V	
10	0V mot	motor ground	U = 0Vmot	
12	+15V mot (p)	motor power	U = +15V	
14	GND_SIGNAL	analogue ground	U = 0Van	
16	Ch_Current_Ref_N (p)	chopper current reference (-)	-10V<U<+10V	VOUT_DAC_N2 (p)
18	Jig_Current_Ref_N (p)	jiggle current reference (-)	-10V<U<+10V	VOUT_DAC_N3 (p)
20	GND_SIGNAL	analogue ground	U = 0Van	
22	Ch_Pos1_N (p)	chopper position sensor # 1 signal (-)	-10V<U<+10V	ANALOG_IN_N8 (p)
24	Ch_Pos2_N (p)	chopper position sensor # 2 signal (-)	-10V<U<+10V	ANALOG_IN_N9 (p)
26	Jig_Pos1_N (p)	jiggle position sensor # 1 signal (-)	-10V<U<+10V	ANALOG_IN_N10 (p)
28	Jig_Pos2_N (p)	jiggle position sensor # 2 signal (-)	-10V<U<+10V	ANALOG_IN_N11 (p)
30	Ch_Mot_Bemf_N (p)	chopper actuator back emf signal (-)	-10V<U<+10V	ANALOG_IN_N12 (p)
32	Jig_Mot_Bemf_N (p)	jiggle actuator back emf signal (-)	-10V<U<+10V	ANALOG_IN_N13 (p)
34	Ch_Mot_Curr_N (p)	chopper motor current signal (-)	-10V<U<+10V	ANALOG_IN_N14 (p)
36	Jig_Mot_Curr_N (p)	jiggle motor current signal (-)	-10V<U<+10V	ANALOG_IN_N15 (p)
38	GND_SIGNAL	analogue ground	U = 0Van	
40	B_LL_Status_N (p)	launch latch status (-)	digital, 0V, 5V	DIG_IN_N5 (p)
42	B_LL_Cmd_N (p)	launch latch command (-)	digital, 0V, 5V	DIG_OUT_N7 (p)
44	B_LL_Eng/diseng_N (p)	launch latch eng/diseng select (-)	digital, 0V, 5V	DIG_OUT_N8 (p)
46	Ch_Pos_Pwr_N (p)	chopper position sensor power supply on	digital, 0V, 5V	DIG_OUT_N9 (p)
48	Jig_Pos_Pwr_N (p)	jiggle position sensor power supply on	digital, 0V, 5V	DIG_OUT_N10 (p)
50				
52				
54	-13V an (p)	analogue power	U = -13V	
56	GND_SIGNAL	analogue ground	U = 0Van	
58	+13V an (p)	analogue power	U = +13V	
60	-15V mot (p)	motor power	U = -15V	
62	0V mot	motor ground	U = 0Vmot	
64	+15V mot (p)	motor power	U = +15V	

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6.1.2 BSM board / Backplane redundant connector

Identification :HSFCU_Jint6, located on the back plane side (on bottom)

Type : FRB KNB 065 13 10 110 male

Function : connection to back plane board (to redundant MAC board)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
1	-13V an (r)	analogue power	U = -13V	
3	GND_SIGNAL	analogue ground	U = 0Van	
5	+13V an (r)	analogue power	U = +13V	
7	-15V mot (r)	motor power	U = -15V	
9	0V mot	motor ground	U = 0Vmot	
11	+15V mot (r)	motor power	U = +15V	
13	GND_SIGNAL	analogue ground	U = 0Van	
15	Ch_Current_Ref_P (r)	chopper current reference (+)	-10V<U<+10V	VOUT_DAC_P2 (r)
17	Jig_Current_Ref_P (r)	jiggle current reference (+)	-10V<U<+10V	VOUT_DAC_P3 (r)
19	GND_SIGNAL	analogue ground	U = 0Van	
21	Ch_Pos1_P (r)	chopper position sensor # 1 signal (+)	-10V<U<+10V	ANALOG_IN_P8 (r)
23	Ch_Pos2_P (r)	chopper position sensor # 2 signal (+)	-10V<U<+10V	ANALOG_IN_P9 (r)
25	Jig_Pos1_P (r)	jiggle position sensor # 1 signal (+)	-10V<U<+10V	ANALOG_IN_P10 (r)
27	Jig_Pos2_P (r)	jiggle position sensor # 2 signal (+)	-10V<U<+10V	ANALOG_IN_P11 (r)
29	Ch_Mot_Bemf_P (r)	chopper actuator back emf signal (+)	-10V<U<+10V	ANALOG_IN_P12 (r)
31	Jig_Mot_Bemf_P (r)	jiggle actuator back emf signal (+)	-10V<U<+10V	ANALOG_IN_P13 (r)
33	Ch_Mot_Curr_P (r)	chopper motor current signal (+)	-10V<U<+10V	ANALOG_IN_P14 (r)
35	Jig_Mot_Curr_P (r)	jiggle motor current signal (+)	-10V<U<+10V	ANALOG_IN_P15 (r)
37	GND_SIGNAL	analogue ground	U = 0Van	
39	B_LL_Status_P (r)	launch latch status (+)	digital, 0V, 5V	DIG_IN_P5 (r)
41	B_LL_Cmd_P (r)	launch latch command (+)	digital, 0V, 5V	DIG_OUT_P7 (r)
43	B_LL_Eng/diseng_P (r)	launch latch eng/diseng select (+)	digital, 0V, 5V	DIG_OUT_P8 (r)
45	Ch_Pos_Pwr_P (r)	chopper position sensor power supply on	digital, 0V, 5V	DIG_OUT_P9 (r)
47	Jig_Pos_Pwr_P (r)	jiggle position sensor power supply on	digital, 0V, 5V	DIG_OUT_P10 (r)
49				
51				
53	-13V an (r)	analogue power	U = -13V	
55	GND_SIGNAL	analogue ground	U = 0Van	
57	+13V an (r)	analogue power	U = +13V	
59	-15V mot (r)	motor power	U = -15V	
61	0V mot	motor ground	U = 0Vmot	
63	+15V mot (r)	motor power	U = +15V	
65				

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Jint6 (continued)

# pin	Name	Signal function	Electrical signal value	Connection to MAC signal
2	-13V an (r)	analogue power	U = -13V	
4	GND_SIGNAL	analogue ground	U = 0V _{an}	
6	+13V an (r)	analogue power	U = +13V	
8	-15V mot (r)	motor power	U = -15V	
10	0V mot	motor ground	U = 0V _{mot}	
12	+15V mot (r)	motor power	U = +15V	
14	GND_SIGNAL	analogue ground	U = 0V _{an}	
16	Ch_Current_Ref_N (r)	chopper current reference (-)	-10V<U<+10V	VOUT_DAC_N2 (r)
18	Jig_Current_Ref_N (r)	jiggle current reference (-)	-10V<U<+10V	VOUT_DAC_N3 (r)
20	GND_SIGNAL	analogue ground	U = 0V _{an}	
22	Ch_Pos1_N (r)	chopper position sensor # 1 signal (-)	-10V<U<+10V	ANALOG_IN_N8 (r)
24	Ch_Pos2_N (r)	chopper position sensor # 2 signal (-)	-10V<U<+10V	ANALOG_IN_N9 (r)
26	Jig_Pos1_N (r)	jiggle position sensor # 1 signal (-)	-10V<U<+10V	ANALOG_IN_N10 (r)
28	Jig_Pos2_N (r)	jiggle position sensor # 2 signal (-)	-10V<U<+10V	ANALOG_IN_N11 (r)
30	Ch_Mot_Bemf_N (r)	chopper actuator back emf signal (-)	-10V<U<+10V	ANALOG_IN_N12 (r)
32	Jig_Mot_Bemf_N (r)	jiggle actuator back emf signal (-)	-10V<U<+10V	ANALOG_IN_N13 (r)
34	Ch_Mot_Curr_N (r)	chopper motor current signal (-)	-10V<U<+10V	ANALOG_IN_N14 (r)
36	Jig_Mot_Curr_N (r)	jiggle motor current signal (-)	-10V<U<+10V	ANALOG_IN_N15 (r)
38	GND_SIGNAL	analogue ground	U = 0V _{an}	
40	B_LL_Status_N (r)	launch latch status (-)	digital, 0V, 5V	DIG_IN_N5 (r)
42	B_LL_Cmd_N (r)	launch latch command (-)	digital, 0V, 5V	DIG_OUT_N7 (r)
44	B_LL_Eng/diseng_N (r)	launch latch eng/diseng select (-)	digital, 0V, 5V	DIG_OUT_N8 (r)
46	Ch_Pos_Pwr_N (r)	chopper position sensor power supply on (r)	digital, 0V, 5V	DIG_OUT_N9 (r)
48	Jig_Pos_Pwr_N (r)	jiggle position sensor power supply on	digital, 0V, 5V	DIG_OUT_N10 (r)
50				
52				
54	-13V an (r)	analogue power	U = -13V	
56	GND_SIGNAL	analogue ground	U = 0V _{an}	
58	+13V an (r)	analogue power	U = +13V	
60	-15V mot (r)	motor power	U = -15V	
62	0V mot	motor ground	U = 0V _{mot}	
64	+15V mot (r)	motor power	U = +15V	

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6.2 BSM front pannel / BSMm prime connector (I/F with I11 harness)

Identification :HSFCU_J19, located on the front pannel (on top)

Type : Sub D 37 S (DCMA 37 S NMB FO)

Function : link to BSM mechanism (Prime), connected to I11 harness

# pin	Name	Signal function	Electrical signal	Wire type	Remarks
1	Ch_Sens_Sup	Chop sensor supply	I = 1 mA	STP(1,20)	
20	Ch_Sens_Rtn	Chop sensor return	I = 1 mA	STP(1,20)	
22	Ch_Sens_Shd1	Chop sensor supply screen	U = 0 V	screen(1,20) screen(2,3,21) screen(4,23) screen(5,6,24)	commoned on 22
2	Ch_Sens_Sup_Meas	Chop sensor supply sense	U = 0.4 V	STT(2,3,21)	
3	Ch_Sens_Rtn_Meas	Chop sensor return sense	U = 0 V	STT(2,3,21)	
21	Ch_Sens_O/P	Chop sensor o/p	U = 0,4V	STT(2,3,21)	
4	Jig_Sens_Sup	Jiggle sensor supply	I = 1 mA	STP(4,23)	
23	Jig_Sens_Ret	Jiggle sensor return	U = 0 V	STP(4,23)	
5	Jig_Sens_Sup_Meas	Jiggle sensor supply sense	U = 0.4 V	STT(5,6,24)	
6	Jig_Sens_Rtn_Meas	Jiggle sensor return sense	U = 0 V	STT(5,6,24)	
24	Jig_Sens_O/P	Jiggle sensor o/p	U = 0,4V	STT(5,6,24)	
12	B_LL_Sens_Sup	Launch latch sensor	U = 5 V	STP(12,30)	
30	B_LL_Sens_Rtn	Launch latch sensor return	U = 0 V	STP(12,30)	
31	LL_Sens_Shd	Launch latch sensor screen	U = 0 V	screen(12,30)	
13	B_LL_Sup	Launch latch coil supply	I = 400 mA	STP(13,14)	during 50 ms
14	B_LL_Rtn	Launch latch coil return	I = 400 mA	STP(13,14)	during 50 ms
33	LL_Shd	Launch latch coil screen	I = 0 mA	screen(13,14)	TBC (commoned with PCAL shield)
15	Ch_Mot_Sup	Chop motor supply	I = 40 mA	STP(15, 34)	
34	Ch_Mot_Rtn	Chop motor return	I = 40 mA	STP(15,34)	
17	Ch_Mot_Shd	Chop motor screen	U = 0 V	screen(15,34) screen(16, 35)	commoned on 17

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				screen(18,36) screen(19,37)	
16	Ch_Bemf_Meas_P	Chop motor supply sense	U = 15 V	STP(16,35)	
35	Ch_Bemf_Meas_N	Chop motor return sense	U = 0 V	STP(16, 35)	
36	Jig_Mot_Sup	Jiggle motor supply	I = 40 mA	STP(18, 36)	
18	Jig_Mot_Rtn	Jiggle motor return	I = 40 mA	STP(18, 36)	
37	Jig_Bemf_Meas_P	Jiggle motor supply sense	U = 15 V	STP(19, 37)	
19	Jig_Bemf_Meas_N	Jiggle motor return sense	U = 0 V	STP(19,37)	
7		Reserved			
8		Reserved			
9		not connected			
10		Reserved			
11		Reserved			
25		Reserved			
26		Reserved			
27		Reserved			
28		Reserved			
29		Reserved			
32		not connected			

6.3 BSM front pannel / BSMm redundant connector (I/F with I13 harness)

Identification :HSFCU_J20, located on the front pannel (on bottom)

Type : Sub D 37 S (DCMA 37 S NMB FO)

Function : link to BSM mechanism (Redundant), connected to I13 harness

# pin	Name	Signal function	Electrical signal	Wire type	Remarks
1	Ch_Sens_Sup	Chop sensor supply	I = 1 mA	STP(1,20)	
20	Ch_Sens_Rtn	Chop sensor return	I = 1 mA	STP(1,20)	
22	Ch_Sens_Shd1	Chop sensor supply screen	U = 0 V	screen(1,20) screen(2,3,21) screen(4,23) screen(5,6,24)	commoned on 22
2	Ch_Sens_Sup_Meas	Chop sensor supply sense	U = 0.4 V	STT(2,3,21)	
3	Ch_Sens_Rtn_Meas	Chop sensor return sense	U = 0 V	STT(2,3,21)	
21	Ch_Sens_O/P	Chop sensor o/p	U = 0,4V	STT(2,3,21)	
4	Jig_Sens_Sup	Jiggle sensor supply	I = 1 mA	STP(4,23)	
23	Jig_Sens_Ret	Jiggle sensor return	U = 0 V	STP(4,23)	
5	Jig_Sens_Sup_Meas	Jiggle sensor supply sense	U = 0.4 V	STT(5,6,24)	
6	Jig_Sens_Rtn_Meas	Jiggle sensor return sense	U = 0 V	STT(5,6,24)	
24	Jig_Sens_O/P	Jiggle sensor o/p	U = 0,4V	STT(5,6,24)	
12	B_LL_Sens_Sup	Launch latch sensor	U = 5 V	STP(12,30)	
30	B_LL_Sens_Rtn	Launch latch sensor return	U = 0 V	STP(12,30)	
31	LL_Sens_Shd	Launch latch sensor screen	U = 0 V	screen(12,30)	
13	B_LL_Sup	Launch latch coil supply	I = 400 mA	STP(13,14)	during 50 ms

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14	B_LL_Rtn	Launch latch coil return	I = 400 mA	STP(13,14)	during 50 ms
33	LL_Shd	Launch latch coil screen	I = 0 mA	screen(13,14)	TBC (commoned with PCAL shield)
15	Ch_Mot_Sup	Chop motor supply	I = 40 mA	STP(15, 34)	
34	Ch_Mot_Rtn	Chop motor return	I = 40 mA	STP(15,34)	
17	Ch_Mot_Shd	Chop motor screen	U = 0 V	screen(15,34) screen(16, 35) screen(18,36) screen(19,37)	commoned on 17
16	Ch_Bemf_Meas_P	Chop motor supply sense	U = 15 V	STP(16,35)	
35	Ch_Bemf_Meas_N	Chop motor return sense	U = 0 V	STP(16, 35)	
36	Jig_Mot_Sup	Jiggle motor supply	I = 40 mA	STP(18, 36)	
18	Jig_Mot_Rtn	Jiggle motor return	I = 40 mA	STP(18, 36)	
37	Jig_Bemf_Meas_P	Jiggle motor supply sense	U = 15 V	STP(19, 37)	
19	Jig_Bemf_Meas_N	Jiggle motor return sense	U = 0 V	STP(19,37)	
7		Reserved			
8		Reserved			
9		not connected			
10		Reserved			
11		Reserved			
25		Reserved			
26		Reserved			
27		Reserved			
28		Reserved			
29		Reserved			
32		not connected			

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7 MCU BACKPLANE / DRCU POWER SUPPLY INTERFACE

7.1 Requirements for the power supplies

- **Voltage 5.2 V \pm 0.1 V (measured at mean current) : (used for logic)**
 - mean current = 1.7 A
 - max. current = 2.9 A during **TBD** ms
 - min. current = 1.5 A (**TBC**)
 - charge regulation from I_{min} to I_{max} (including primary line voltage range)
 $\Delta V < 100$ mV and transient time < 5 ms
 - ripple voltage in the frequency range of 30 Hz – 20 MHz
 $\Delta V < 50$ mV pk pk, measured at maximum current

- **Voltage +/- 13.5 V \pm 0.2 V (measured at mean current) : (used for analogique)**
 - mean current = 170 mA on +13 V, 150 mA on -13 V
 - max. current = 190 mA on both voltage
 - min. current = 140 mA (**TBC**) on both voltage
 - charge regulation from I_{min} to I_{max} (including primary line voltage range) on one voltage, the other one charged at the mean current
 $\Delta V < 100$ mV and transient time < 5 ms on the first one (I_{min} to I_{max})
 $\Delta V < 10$ mV and transient time < 5 ms on the second one (I_{mean})
 - ripple voltage in the frequency range of 30 Hz – 20 MHz
 $\Delta V < 25$ mV pk pk, measured at maximum current

- **Voltage +/- 15 V \pm 0.2 V (measured at mean current) : (used for motor supply)**
 - mean current = 100 mA on both voltage
 - max. current = 400 mA on both voltage, at the same time during less than 50 ms
 - min. current = 5 mA
 - charge regulation from I_{min} to I_{max} (including primary line voltage range)
 $\Delta V < 800$ mV and transient time < 25 ms
 - ripple voltage in the frequency range of 30 Hz – 20 MHz
 $\Delta V < 250$ mV pk pk, measured at a current of 180 mA on both voltage

N.B. : the voltages are measured at the input connector level.

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7.2 Prime power supply connector

Identification : HSFPU_JXX, located on one cable of MCU

Type : Sub D 25 P (DBMA 25P NMBFO + backshell)

Functions : power supply of logic, analogic, and actuators

Connected to DRCU XX

Pin #	Function	Symbol	Remarks
1	+5 V prime	+5VdigP	
2	+5 V prime	+5VdigP	
3	+5 V prime	+5VdigP	
4			
5	+ 13.5 V prime	+13VanalogP	
6	+ 13.5 V prime	+13VanalogP	
7	- 13.5 V prime	-13VanalogP	
8	- 13.5 V prime	-13VanalogP	
9			
10	+ 15 V prime	+15VmotP	
11	+ 15 V prime	+15VmotP	
12	- 15 V prime	-15VmotP	
13	- 15 V prime	-15VmotP	
14	0 V digital prime	0VdigP	connected to 0VanalogP inside the MAC board
15	0 V digital prime	0VdigP	connected to 0VanalogP inside the MAC board
16	0 V digital prime	0VdigP	connected to 0VanalogP inside the MAC board
17			
18	0 V analog prime	0VanalogP	connected to 0VdigP inside the MAC board
19	0 V analog prime	0VanalogP	connected to 0VdigP inside the MAC board
20	0 V analog prime	0VanalogP	connected to 0VdigP inside the MAC board
21	0 V analog prime	0VanalogP	connected to 0VdigP inside the MAC board
22			
23	0 V motor prime	0VmotP	must be connected to 0VanalogP in the DRCU
24	0 V motor prime	0VmotP	must be connected to 0VanalogP in the DRCU
25	0 V motor prime	0VmotP	must be connected to 0VanalogP in the DRCU

7.3 Redundant power supply connector

Identification : HSFPU_JYY, located on one cable of MCU

Type : Sub D 25 P (DBMA 25P NMBFO + backshell)

Functions : redundant power supply of logic, analogic, and actuators

Connected to DRCU YY

Pinout : same as HSFPU_JXX

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8 SMECm connectors

8.1 Prime connector # 1 (I/F with C11 harness)

Identification :HSFPU_J29, located on the cable of SMECm

Type : MDM 37S

Functions : motor (3 STP), encoder (8 STP), 11 screens

Connected to C11 harness

37 way FPU_J27	Signal function	Signal name	Max. current	Wire type
1	SMEC drive coil I+	S_Mot_Coil_P	100 mA	Insulated STP
2	SMEC drive coil I-	S_Mot_Coil_N	100 mA	
20	SMEC drive coil shld	S_Mot_Coil_Shd	N/A	
4	SMEC drive coil supply sense	S_Mot_Bemf_P	10 µA	Insulated STP
5	SMEC drive coil return sense	S_Mot_Bemf_N	10 µA	
23	SMEC drive coil supply sense shield	S_Mot_Bemf_Shd	N/A	
6	NC			
7	SMEC position sensor Led power supply	LEDA	1 mA	Insulated STP
8	SMEC position sensor Led power return	LEDC	1 mA	
26	Shield	LED_Shd	N/A	
10	SMEC position sensor photodiode #1 I+	IPD1A	20 µA	Insulated STP
11	SMEC position sensor photodiode #1 I-	IPD1C	20 µA	
29	Shield	IPD1_SHD	N/A	
13	SMEC position sensor photodiode #2 I+	IPD2A	20 µA	Insulated STP
14	SMEC position sensor photodiode #2 I-	IPD2C	20 µA	
32	Shield	IPD2_Shd	N/A	
16	SMEC position sensor photodiode #3 I+	IPD3A	20 µA	Insulated STP
17	SMEC position sensor photodiode #3 I-	IPD3C	20 µA	
35	Shield	IPD3_Shd	N/A	
21	SMEC drive coil I+ (rob)	S_Mot_Coil_P	100 mA	Insulated STP
22	SMEC drive coil I- (rob)	S_Mot_Coil_N	100 mA	
3	SMEC drive coil shld rob)	S_Mot_Coil_Shd	N/A	
24	NC			
25	NC			
27	SMEC position sensor power supply	-3V	1 mA	Insulated STP
28	SMEC position sensor power return	-3V	1 mA	
9	Shield	POS_POWER_Shd	N/A	
30	SMEC pos. sensor photodiode #1 feedback +	CRPD1A	10 µA	Insulated STP
31	SMEC pos. sensor photodiode #1 feedback -	CRPD1C	10 µA	
12	Shield	CRPD1_SHD	N/A	
33	SMEC pos. sensor photodiode #2 feedback +	CRPD2A	10 µA	Insulated STP
34	SMEC pos. sensor photodiode #2 feedback -	CRPD2C	10 µA	
15	Shield	CRPD2_Shd	N/A	

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36	SMEC pos. sensor photodiode #3 feedback +	CRPD3A	10 µA	Insulated STP
37	SMEC pos. sensor photodiode #3 feedback -	CRPD3C	10 µA	
18	Shield	CRPD3_Shld	N/A	

8.2 Prime connector # 2 (I/F with C11 harness)

Identification :HSFPU_J27, located on the cable of SMECm

Type : MDM 37S

Functions : LVDT (3 STP), launch latch (4 STP), t° probes (4 STP), 11 screens

Connected to C11 harness

37 way FPU_J27	Signal function	Signal name	Max. current	Wire type
1	SMEC lauch latch #1 power supply	S_LL#1_Coil_P	400 mA / 50 ms	Insulated STP
2	SMEC lauch latch #1 power return	S_LL#1_Coil_N	400 mA / 50 ms	
20	Shield	S_LL#1_Coil_Shld	N/A	
4	SMEC temperature I+		1 µA	Insulated STP
5	SMEC temperature I-		1 µA	
23	Shield		N/A	
7	SMEC/SOB I/F temperature V+		1 µA	Insulated STP
8	SMEC/SOB I/F temperature V-		1 µA	
26	Shield		N/A	
10	SMEC lauch latch # 2 confirmation + (TBC)	S_LL#2_Stat_P	1 mA	Insulated STP
11	SMEC lauch latch # 2 confirmation – (TBC)	S_LL#2_Stat_N	1 mA	
29	Shield	S_LL#2_Stat_Shld	N/A	
13	SMEC LVDT primary coil power supply (P)	LVDT_PRIM_P	5 mA	Insulated STP
14	SMEC LVDT primary coil power supply (N)	LVDT_PRIM_N	5 mA	
32	Shield	LVDT_PRIM_Shld	N/A	
15	SMEC LVDT secondary coil # 1 signal (P)	LVDT_SECA_P	50 µA	Insulated STP
16	SMEC LVDT secondary coil # 1 signal (N)	LVDT_SECA_N	50 µA	
34	Shield	LVDT_SECA_Shld	N/A	
17	SMEC LVDT secondary coil # 2 signal (P)	LVDT_SECB_P	50 µA	Insulated STP
18	SMEC LVDT secondary coil # 2 signal (N)	LVDT_SECB_N	50 µA	
36	Shield	LVDT_SECB_Shld	N/A	
19				
21	SMEC temperature V+		1 µA	Insulated STP
22	SMEC temperature V-		1 µA	
3	Shield		N/A	
24	SMEC lauch latch #2 power supply (TBC)	S_LL#2_Coil_P	400 mA / 50 ms	Insulated STP
25	SMEC lauch latch #2 power return (TBC)	S_LL#2_Coil_N	400 mA / 50 ms	

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6	Shield	S_LL#2_Coil_Shd	N/A	
27	SMEC/SOB I/F temperature I+		1 μ A	Insulated STP
28	SMEC/SOB I/F temperature I-		1 μ A	
9	Shield		N/A	
30	SMEC lauch latch # 1 confirmation +	S_LL#1_Stat_P	1 mA	Insulated STP
31	SMEC lauch latch # 1 confirmation -	S_LL#1_Stat_N	1 mA	
12	Shield	S_LL#1_Stat_Shd	N/A	
33				
35				
37				

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8.3 Redundant connector # 1 (I/F with C13 harness)

Identification :HSFPU_J30, located on the cable of SMECm

Type : MDM 37S

Functions : motor (3 STP), encoder (8 STP), 11 screens

Connected to C13 harness

Same as HSFPU_J29

8.4 Redundant connector # 2 (I/F with C13 harness)

Identification :HSFPU_J28, located on the cable of SMECm

Type : MDM 37S

Functions : LVDT (3 STP), launch latch (4 STP), t° probes (4 STP), 11 screens

Connected to C13 harness

Same as HSFPU_J27

8.5 Incremental encoder /preamp internal interface

Identification :HSFPU_Jint13,

Type :

- MDM 25S FR116, located on the cable of encoder head
- MDM 25P FR136, located on the preamplifier board

Functions : power supply of the encoder head, signals of the encoder

Pin out : TBD