SPIRE

SUBJECT: **SPIRE Warm Electronics Handling and Integration Procedure**

PREPARED BY: **E Sawyer**

DOCUMENT No: **SPIRE-RAL-PRC-002181**

ISSUE: **3** **Date:** **15/4/05**

CHECKED BY: **……** **Date:** **……**

APPROVED BY: **……** **Date:** **……**

Distribution

Change Record

ISSUE	DATE	
1	14/10/04	First issue
2	31/3/05	7.3 Deviations for CQM/EQM only added
3	15/4/05	Section 8 added remote power supply for thermal testing

Table of Contents

References

Applicable Documents

AD1	SPIRE-RAL-PRC-001923	FPU handling and integration procedure.
AD2		
AD3	SAp-SPIRE-CB-0120-03	DCU QM1 and FCU QM1 packaging, unpacking and handling procedure

Reference Documents

1. INTRODUCTION

2. SCOPE

This document describes the procedures to be followed when handing the SPIRE Warm electronics units after delivery to ESA/Alcatel.
It covers the handling and integration procedures to be followed for the following units:

HSDPU Herschel Spire Digital Processor Unit
HSFCU Herschel Spire Focal plane Control Unit
HSDCU Herschel Spire Detector Control Unit

It covers both the CQM and PFM units

3. DELIVERY CONDITION

The SPIRE instrument warm units will be delivered in the following condition:-

The units will be supplied in dedicated, re-useable, containers.

3.1 Shock recorders

Attached to the outside of the transportation containers are shock indicators
Upon inspection, if any of these recorders have triggered the project team at RAL should be informed.

4. TRANSPORT

4.1 In dedicated experiment containers

Protect from rain and moisture.
Transport in closed vehicles only.
Protect from extremes of temperature, -10°C to +50°C, and prevent the formation of dew at any time.

4.2 After integration on the spacecraft (in spacecraft container)

Equivalent to Cleanroom 10,000 conditions for FM
No cleanliness requirements for QM units
No other specific requirement.

5. STORAGE

5.1 In dedicated experiment container

Protect from rain and moisture.
Protect from extremes of temperature, 10°C to +30°C.

5.2 Out of container (in RR100 cleanroom, awaiting integration)

No specific requirement.

6. HANDLING

6.1 General.

The SPIRE warm electronics units are typical of any spacecraft electronics units with only the normal handing requirements.
These units are ESD sensitive.

6.2 ESD protection

All the units are sensitive to ESD.
In particular, the SPIRE DCU contains very sensitive detector electronics that are susceptible to damage by Electro static discharge.
On delivery all connectors will be protected by covers.
When handling, all personnel shall wear anti static protection (wrist straps or other suitable method)

6.3 Unpacking from dedicated experiment container.

Before any entrance in a clean room, the container must be cleaned with isopropyl alcohol.
The containers of the QM units can be opened outside a clean room, in an area whose environment isn't controlled.
Before opening the container, the following checks must be carried:
- Checking of the external condition of the container.
- Checking of the sealed integrity.
- Checking the presence of shock detectors and their states (nominal colour: white).

Remove the seals.
Open the container.
Inspect the condition of the inside of the container.
Remove unit from the container and from the antistatic bag.
Check of the external condition of the units
Close the container and store it in a clean location.
Record the operations in the logbook.

6.4 Preparation for integration.

No specific activities

6.5 Preparation for packing.

No specific activities

6.6 Packing in containers.

Package unit into its antistatic bag. Purge with dry nitrogen and sealed the bag.
- Place unit into the container.
- Put a new dessicator in the container.
- Put a new humidity indicator (nominal colour : blue)
- Close the container.
- Verify the presence of shock detectors outside the container and their states (nominal colour: white). If necessary, replace the shock detectors.
- Install the seals
- Record the operations in the logbook.

7. INTEGRATION

7.1 Required tools/MGSE

SPIRE supplied tools/MGSE:-	Antistatic bag for repacking Desiccators for repacking Humidity indicators Shock detectors
Supplied by spacecraft	Dry nitrogen set up for repacking Isopropyl alcohol Earth conductor bracelets Fixation bolts, Torque wrench to cover 1.5 to 8.25 Nm Allan key, spanners etc DVM for electrical isolation testing

7.2 Mechanical integration to spacecraft.

All the warm electronics units are mounted to the SVM panel with a number of standard fasteners as follows:

UNIT and Model	Fastener size	Qty
DPU QM	M4	6
DCU QM1	M5	6
FCU QM1	M5	4
DPU FM	M4	6
DCU QM2 and FM	M4	12
FCU QM2 and FM	M5	12

The units shall be placed on the panel and attached with the fasteners. Fasteners to be torqued in accordance with Astrium procedures.
No special procedure is foreseen.

7.3 Deviations for CQM/EQM only

7.3.1 External DCU power switch.

The details of this device are explained in SPIRE-RAL-NOT-002383 which is attached as annex B to this document.
The adaptor will be attached to the DCU before delivery to Astrium.
The External DCU switch will need to be attached to the outside of the SVM panel by Astrium.
The harness that normally connects to DCU J29 will connect to the adaptor box.

7.3.2 Mechanism power supply

In order to supply power to the mechanisms in the FPU, during thermal testing, a separated power supply and harness (SPIRE supplied) is required. This is connected to the FCU via connector FCU J20 See section 10

7.4 Electrical integration

Refer to AD1 for electrical integration procedures.

7.5 Removal from spacecraft.

Removal is the reverse of the integration procedure.

8. DEVIATIONS FOR CQM/EQM ONLY

8.1 External DCU power switch.

The details of this device are explained in SPIRE-RAL-NOT-002383 which is attached as annex B to this document.
The adaptor will be attached to the DCU before delivery to Astrium.
The External DCU switch will need to be attached to the outside of the SVM panel by Astrium.
The harness that normally connects to DCU J29 will connect to the adaptor box.

8.2 Mechanism power supply

In order to supply power to the mechanisms in the FPU, during thermal testing, a separated power supply and harness (SPIRE supplied) is required. This is connected to the FCU via connector FCU J20 See section 10

8.2.1 Power Supply

This will be a standard programmable bench power supply.
It will be supplied by SPIRE.
It can be mounted on the floor or a convenient table during EQM testing

8.2.2 Harness

A harness will be supplied that connects the Power supply to the FCU.
The harness is 3m long.

8.2.3 Connection to the FCU

Power will be supplied to the dummy mechanisms via the cryoharness that will connect to FCU J19 as normal. The FCU (CQM) has been configured so that J20 (also marked MCU remote power supply), is connected directly to J20. This enables variable power (via the power supply) to be applied to the dummy mechanisms during the thermal testing with no modification to the cryoharness.

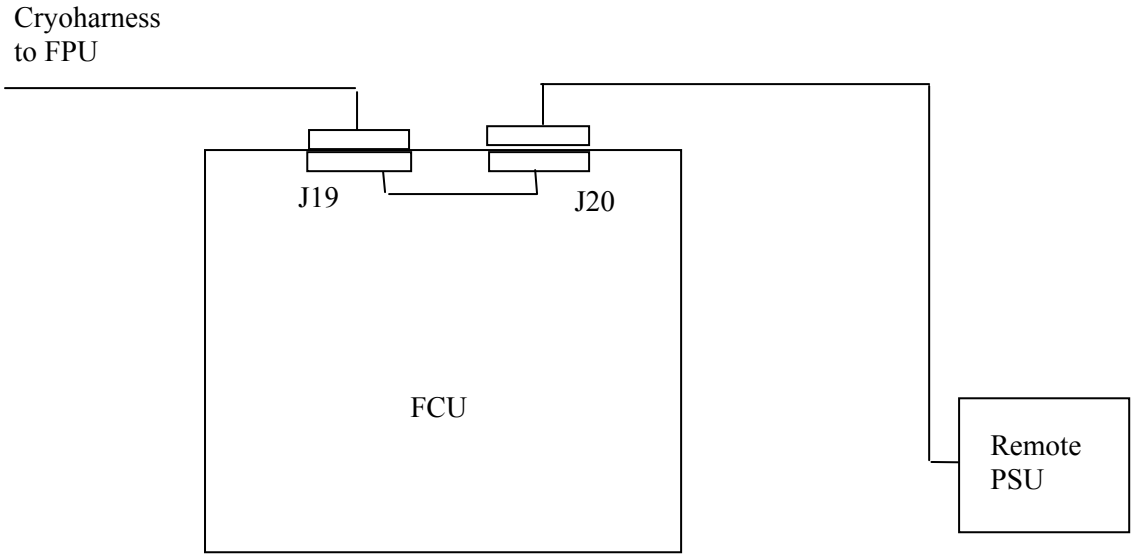


Fig 1 Block diagram of FCU and remote power supply.

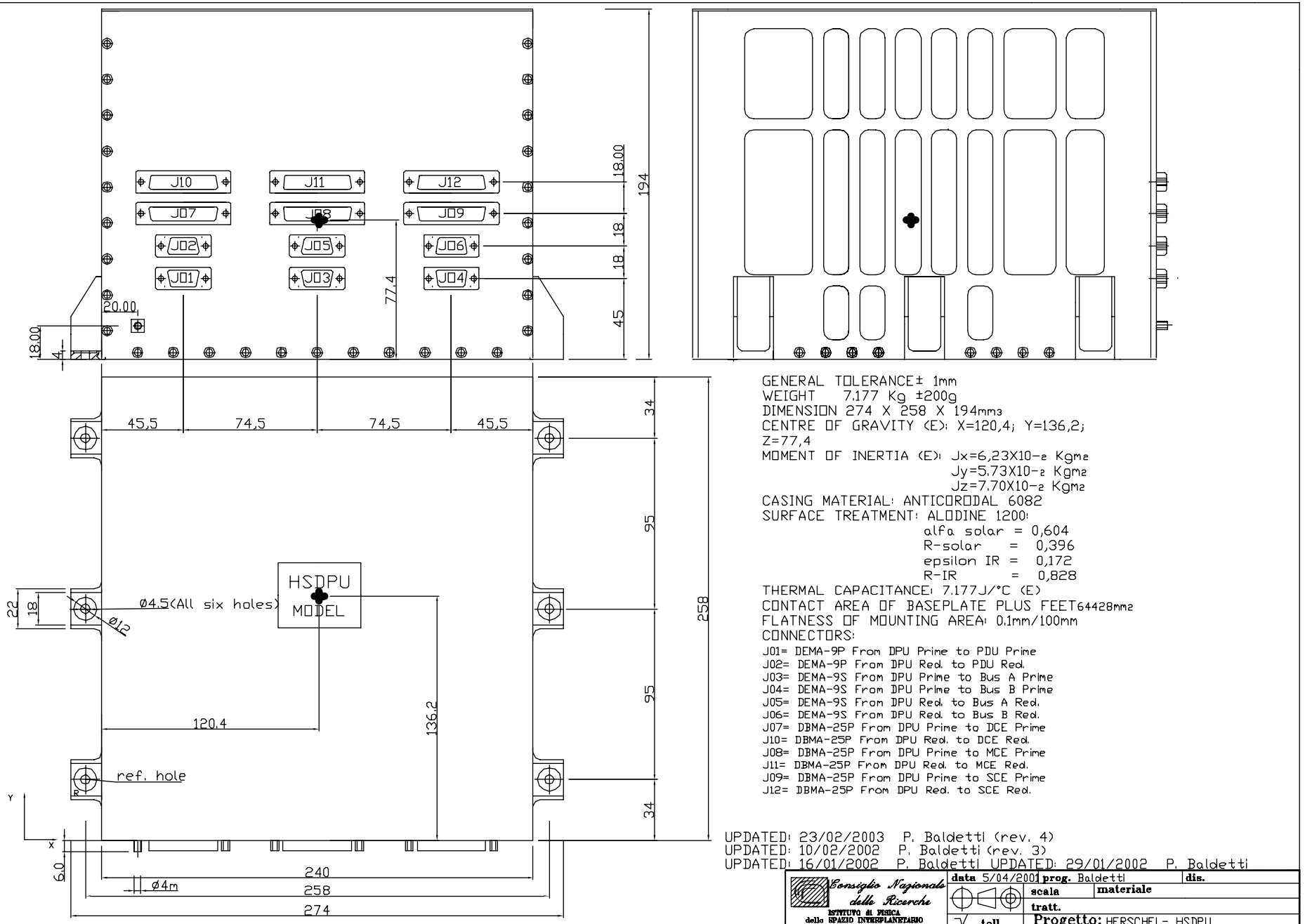
9. RED TAG ITEMS

There are no red tag items

10. GREEN TAG ITEMS

There are no green tag items

11. ANNEX A - INTERFACE DRAWINGS



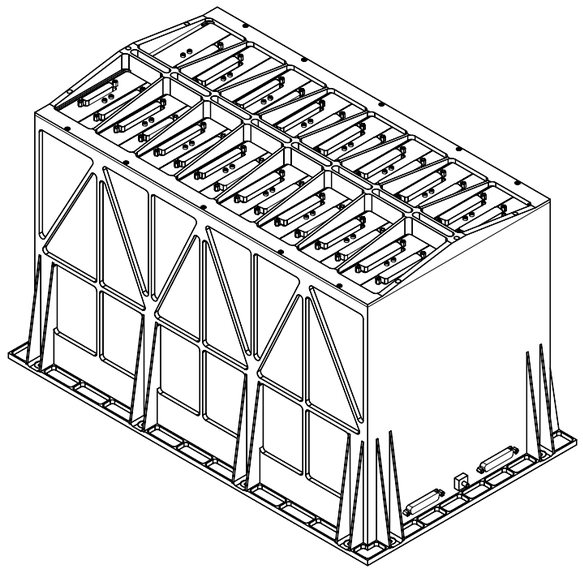
GENERAL TOLERANCE± 1mm
WEIGHT 7.177 Kg ±200g
DIMENSION 274 X 258 X 194mm3
CENTRE OF GRAVITY (E): X=120,4; Y=136,2; Z=77,4
MOMENT OF INERTIA (E): Jx=6,23X10-2 Kgm2
Jy=5.73X10-2 Kgm2
Jz=7.70X10-2 Kgm2
CASING MATERIAL: ANTICORODAL 6082
SURFACE TREATMENT: ALODINE 1200:
alfa solar = 0,604
R-solar = 0,396
epsilon IR = 0,172
R-IR = 0,828
THERMAL CAPACITANCE: 7.177J/°C (E)
CONTACT AREA OF BASEPLATE PLUS FEET64428mm2
FLATNESS OF MOUNTING AREA: 0.1mm/100mm
CONNECTORS:

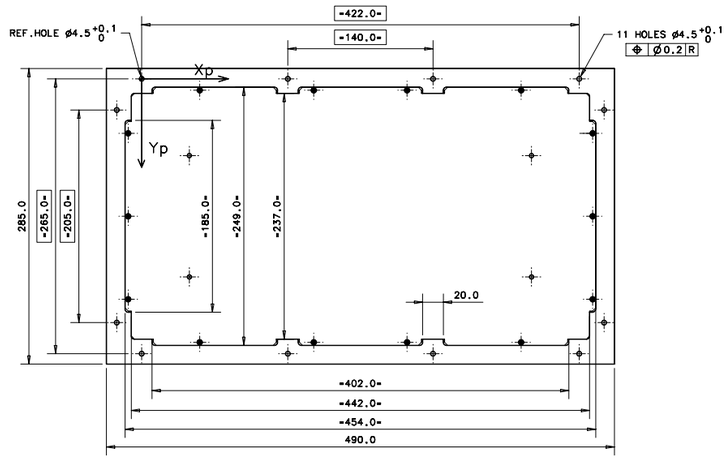
J01= DEMA-9P From DPU Prime to PDU Prime
J02= DEMA-9P From DPU Red. to PDU Red.
J03= DEMA-9S From DPU Prime to Bus A Prime
J04= DEMA-9S From DPU Prime to Bus B Prime
J05= DEMA-9S From DPU Red. to Bus A Red.
J06= DEMA-9S From DPU Red. to Bus B Red.
J07= DBMA-25P From DPU Prime to DCE Prime
J10= DBMA-25P From DPU Red. to DCE Red.
J08= DBMA-25P From DPU Prime to MCE Prime
J11= DBMA-25P From DPU Red. to MCE Red.
J09= DBMA-25P From DPU Prime to SCE Prime
J12= DBMA-25P From DPU Red. to SCE Red.

UPDATED: 23/02/2003 P. Baldetti (rev. 4)
UPDATED: 10/02/2002 P. Baldetti (rev. 3)
UPDATED: 16/01/2002 P. Baldetti UPDATED: 29/01/2002 P. Baldetti

Consiglio Nazionale delle Ricerche
ISTITUTO di FISICA della SPAZIO INTERPLANETARIO
Via del Fosso del Cavaliere n.100
tel. 06/4993 fax 06/49934383

data 5/04/2001	prog. Baldetti	dis.
scala	materiale	
tratt.		
toll.	Progetto: HERSCHEL- HSDPU	
rev. 4	titilo: HSDPU	N.dis HER S005/03
data 23/02/03		

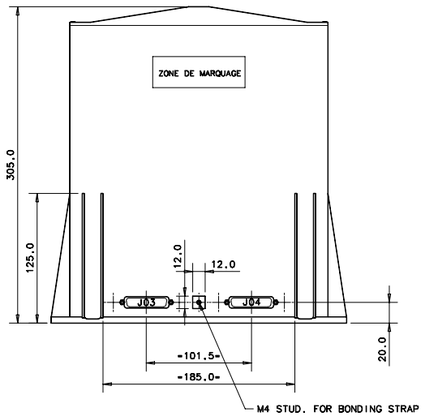


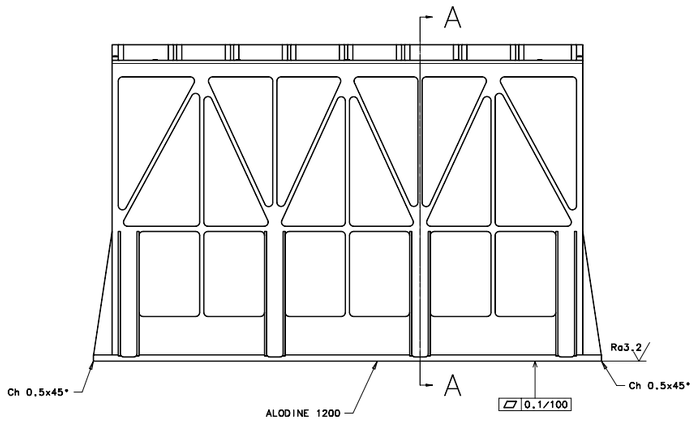


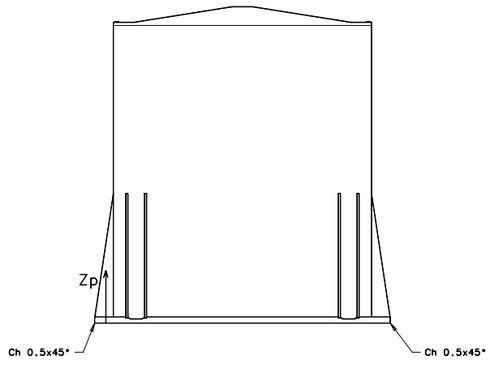
CONNECTORS					
IDENT	TYPE	FUNCTIONS	IDENT	TYPE	FUNCTIONS
J01	DBMA 25S	DAQ_IF_M/DPU_M	J17	DDMA 50P	LIA_P_7/FPU
J02	DBMA 25S	DAQ_IF_R/DPU_R	J18	DDMA 50P	LIA_P_7/FPU
J03	DBMA 25P	DCU/PSU_M	J19	DDMA 50P	LIA_P_8/FPU
J04	DBMA 25P	DCU/PSU_R	J20	DDMA 50P	LIA_P_8/FPU
J05	DDMA 50P	LIA_P_1/FPU	J21	DDMA 50P	LIA_P_9/FPU
J06	DDMA 50P	LIA_P_1/FPU	J22	DDMA 50P	LIA_P_9/FPU
J07	DDMA 50P	LIA_P_2/FPU	J23	DCMA 37P	LIA_S_1/FPU
J08	DDMA 50P	LIA_P_2/FPU	J24	DCMA 37P	LIA_S_1/FPU
J09	DDMA 50P	LIA_P_3/FPU	J25	DCMA 37P	LIA_S_2/FPU
J10	DDMA 50P	LIA_P_3/FPU	J26	DCMA 37P	LIA_S_2/FPU
J11	DDMA 50P	LIA_P_4/FPU	J27	DCMA 37P	LIA_S_3/FPU
J12	DDMA 50P	LIA_P_4/FPU	J28	DCMA 37P	LIA_S_3/FPU
J13	DDMA 50P	LIA_P_5/FPU	J29	DDMA 78S	BIAS_M/FPU
J14	DDMA 50P	LIA_P_5/FPU	J30	DDMA 78S	BIAS_R/FPU
J15	DDMA 50P	LIA_P_6/FPU	J31	DCMA 37S	BIAS_M/FPU
J16	DDMA 50P	LIA_P_6/FPU	J32	DCMA 37S	BIAS_R/FPU

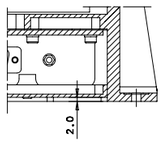
NOTES

MATERIAL AL 6082
CENTRE OF GRAVITY REFERRED TO REFERENCE HOLE
X=213.2mm Y=132.4mm Z=157.9mm
MOMENTS OF INERTIA REFERRED TO CENTRE OF GRAVITY
JXp=0.471 Kg.m2 JYp=0.250 Kg.m2 JZp=0.444 Kg.m2
CONTACT AREA MOUNTING FEET=28180mm2
THERMAL COATING AND BLACK ANODISING ESA.PSS.703
SURFACE EMISSIVITY >0.85
TORQUE VALUE FOR CONNECTOR FIXATION SCREWS=
- MALE=0.3mN
- FEMALE=0.45mN
SPECIFIC HEAT 1170 J/Kg.°K
ESTIMATED MASS=14442g

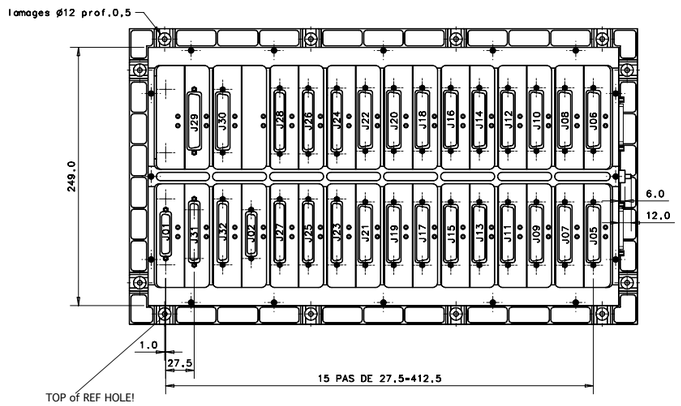








COUPE PARTIELLE A-A
ECHELLE:1/1



CONNECTOR TYPE P

CONNECTOR TYPE S

indice	Modifications	Date	Dessiné par	Vérifié par	Approuvé par
E	Mise à jour	01/04	DHENAIN		
D	Ajout coupe A-A	10/02	DHENAIN		
C	Mise à jour	09/02	DHENAIN		
B	Mise à jour	06/02	DHENAIN		
A	Origine	11/01	DHENAIN	.....	.....

Spécifications particulières

tolérances générales: Indice de rugosité général XXXX — SOUS-TRAITANT
Tol.ang.:±XX°
Casser les angles vifs

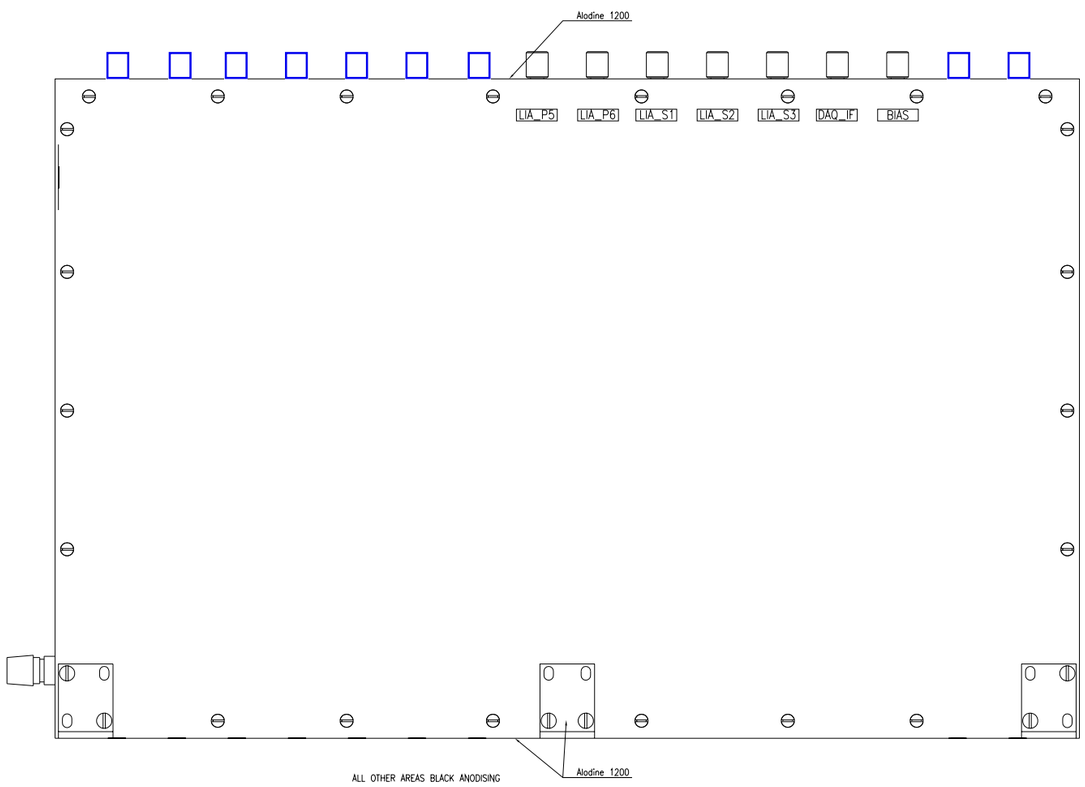
Matière:
Traitement thermique:
First angle Projection
Echelle 1/2 | Poids | Niveau qualité

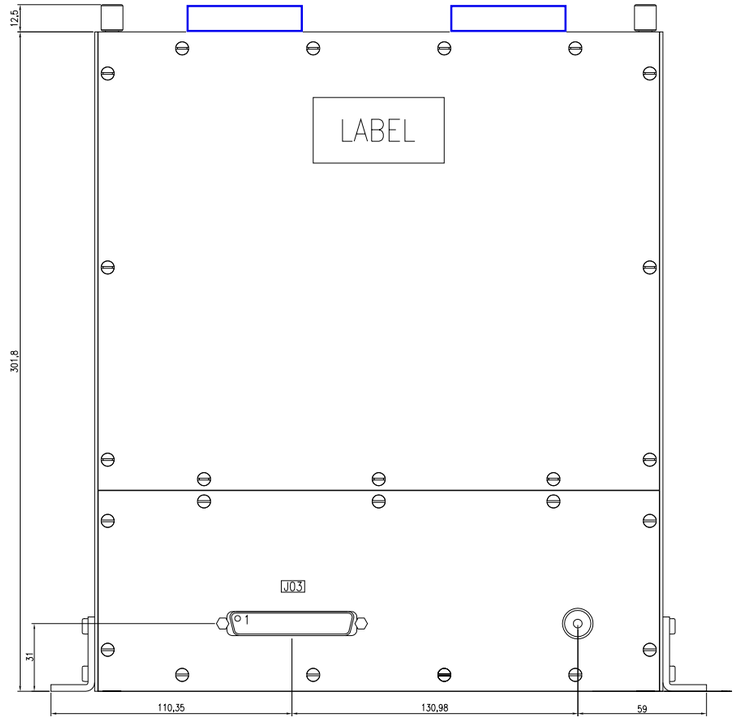
SPIRE
HSDCU ELECTRONIC BOX
MECHANICAL INTERFACE CONTROL DRAWING

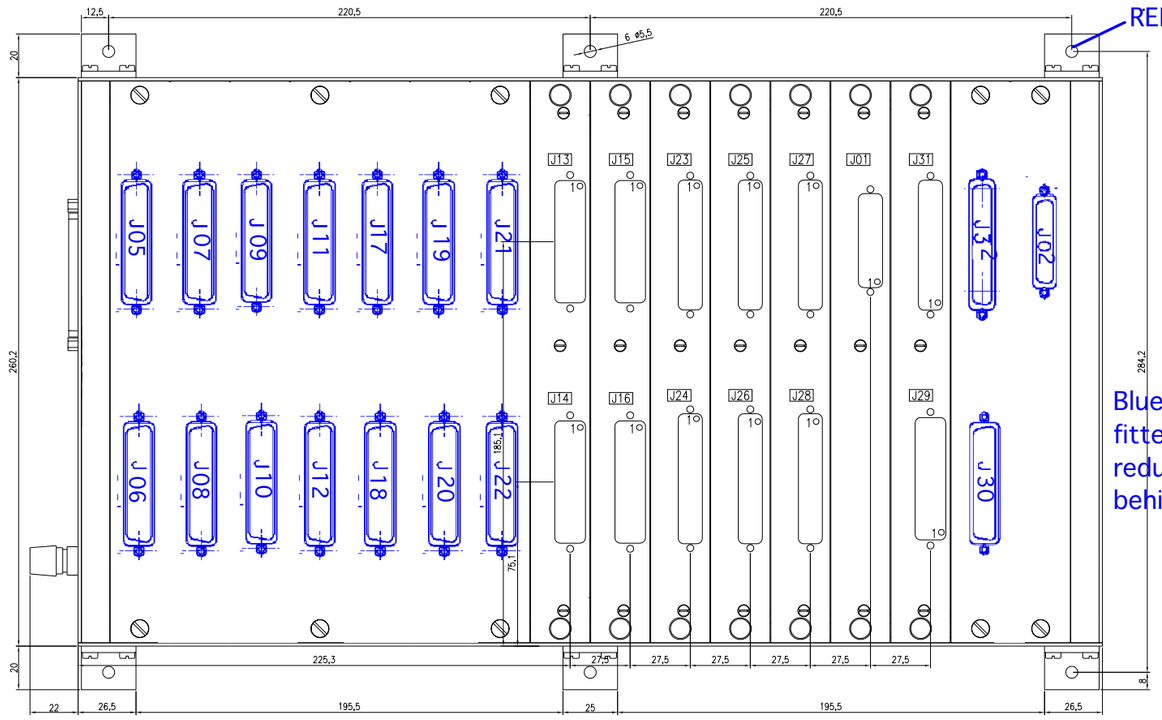
SAP/GERES
Tel:01.69.08.78.25
01.69.08.59.76
Fax:01.69.08.79.96

COMMISSARIAT A L'ENERGIE ATOMIQUE — C.E.N SACLAY

AO | SPIR-MX-5100 000 E

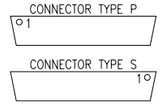






Blue signifies connectors fitted but without redundant side electronics behind them.

CONNECTORS					
IDENT	TYPE	FUNCTION	IDENT	TYPE	FUNCTION
J01	DBMA 25S	DAQ_IF_M/DPU	J24	DCMA 37P	LIA_S_1/FPU
J03	DBMA 25P	DCU/PSU_M	J25	DCMA 37P	LIA_S_2/FPU
J13	DDMA 50P	LIA_P_5/FPU	J26	DCMA 37P	LIA_S_2/FPU
J14	DDMA 50P	LIA_P_5/FPU	J27	DCMA 37P	LIA_S_3/FPU
J15	DDMA 50P	LIA_P_6/FPU	J28	DCMA 37P	LIA_S_3/FPU
J16	DDMA 50P	LIA_P_6/FPU	J29	DDMA 78S	BIAS_M/FPU
J23	DCMA 37P	LIA_S_1/FPU	J31	DCMA 37S	BIAS_M/FPU



ONLY FOR QM1

CEA /SAP 91191 GIF/YVETTE Cedex	MATIERE : Alu 2017A	PROTECTION :	
	TRAITEMENT : Alodine 1200	DESSINE : SREE	
		DATE : 02/12/02	
		VERIFIE :	
		VISA :	

ECHELLE : 3/4	TOLERANCES GENERALES : ±0.2	Ra1.6	
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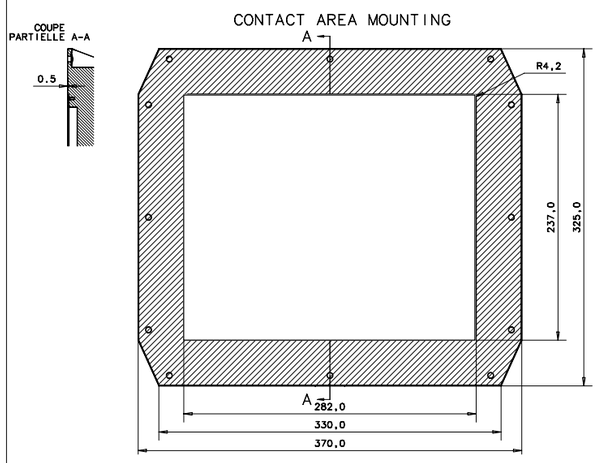
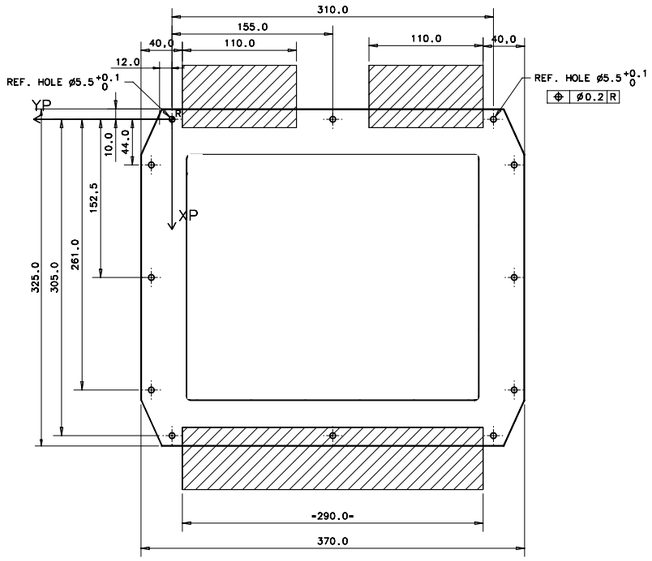
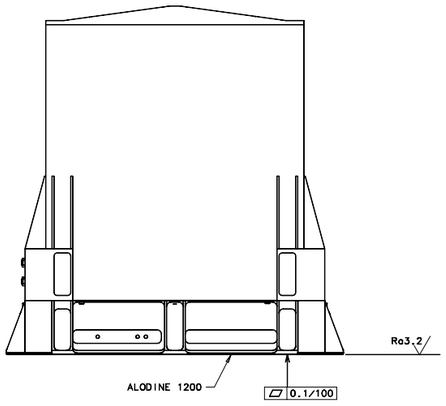


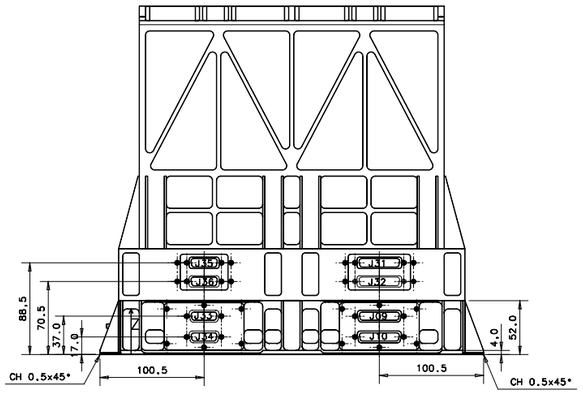


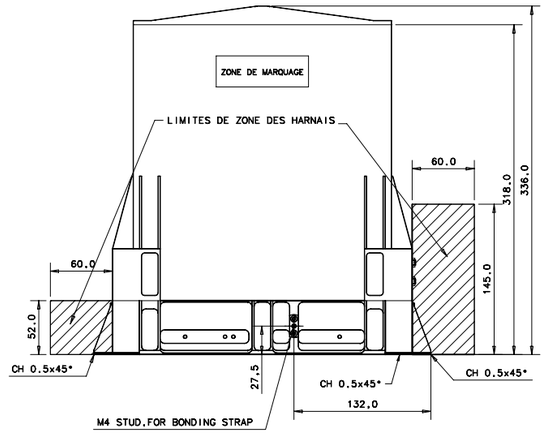
NOTES

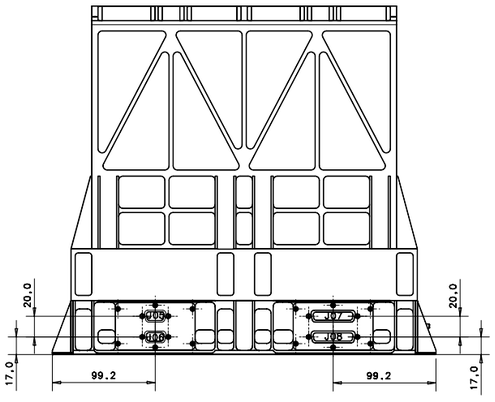
MATERIAL AL 6082
CENTRE OF GRAVITY REFFERED TO REFERENCE HOLE
X=148.8mm Y=-153mm Z=138.5mm
MOMENTS OF INERTIA REFERRED TO CENTRE OF GRAVITY
JX=0.338 Kg.m2 JY=0.318 Kg.m2 JZ=0.282 Kg.m2
CONTACT AREA MOUNTING FEET=51656mm2
THERMAL COATING AND BLACK ANODISING ESA.PSS.703
SURFACE EMISSIVITY >0.85
TORQUE VALUE FOR CONNECTOR FIXATION SCREWS=
-MALE=0.3mN
-FEMALE=0.45mN
ESTIMATED MASS=16254g
CP=1170j/kg.°K

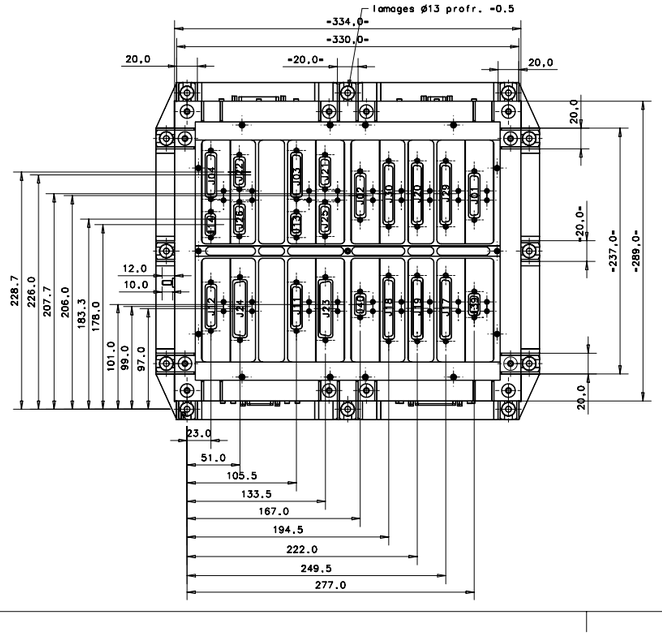
CONNECTORS					
IDENT	TYPE	INTERFACE NAME	IDENT	TYPE	INTERFACE NAME
J01	DBMA 25S	MAC-M/DPU-M	J21	DAMA 15S	TEMP-M/FPU-TS-1-M
J02	DBMA 25S	MAC-R/DPU-R	J22	DAMA 15S	TEMP-R/FPU-TS-1-R
J03	DBMA 25S	CCHK-IF-M/DPU-M	J23	DDMA 50S	TEMP-M/FPU-TS-2-M
J04	DBMA 25S	CCHK-IF-R/DPU-R	J24	DDMA 50S	TEMP-R/FPU-TS-2-R
J05	DEMA 9P	PSU-M/PCDU-M	J25	DAMA 15S	TEMP-M/FPU-MEC-TS-M
J06	DEMA 9P	PSU-R/PCDU-R	J26	DAMA 15S	TEMP-R/FPU-MEC-TS-R
J07	DBMA 25S	PSU-M/DCU	J27	NA	NA
J08	DBMA 25S	PSU-R/DCU	J28	NA	NA
J09	DBMA 25S	PSU-M/MCU-M	J29	DCMA 37P	SMEC-M/FPU-SMECm-2-M
J10	DBMA 25S	PSU-R/MCU-R	J30	DCMA 37P	SMEC-R/FPU-SMECm-2-R
J11	DBMA 25S	CCHK-IF-M/FPU-COOL-CAL-M	J31	DBMA 25P	MCU-M/PSU-M
J12	DBMA 25S	CCHK-IF-R/FPU-COOL-CAL-R	J32	DBMA 25P	MCU-R/PSU-R
J13	DEMA 9S	CCHK-IF-M/FPU-PH-STIM-M	J33	DAMA 15S	PSU-M/SCU-M
J14	DEMA 9S	CCHK-IF-R/FPU-PH-STIM-R	J34	DAMA 15S	PSU-R/SCU-R
J15	NA	NA	J35	DAMA 15P	SCU-M/PSU-M
J16	NA	NA	J36	DAMA 15P	SCU-R/PSU-R
J17	DCMA 37S	SMEC-M/FPU-SMECm-1-M	J37	NA	NA
J18	DCMA 37S	SMEC-R/FPU-SMECm-1-R	J38	NA	NA
J19	DCMA 37S	BSM-M/FPU-BSM-M	J39	DEMA 9S	MAC-H/JTAG
J20	DCMA 37S	BSM-R/FPU-BSM-R	J40	DEMA 9S	MAC-R/JTAG

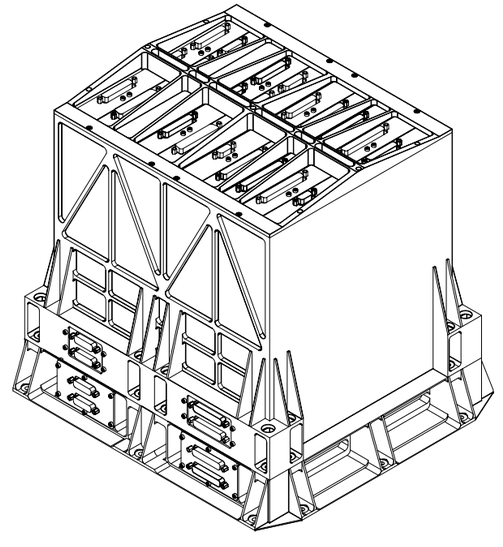












CONNECTOR TYPE P
1°

CONNECTOR TYPE S
1°

Indice	Modifications	Date	Dessiné par	Vérifié par	Approuvé par
J	Mise à jour	01/04	DHENAIN		
I	Modif position CdG	12/03	DHENAIN		
H	Mise a jour	11/03	DHENAIN		
G	Mise a jour	04/03	DHENAIN		
F	Mise à jour	10/02	DHENAIN		
E	Mise à jour connecteurs	09/02	DHENAIN		
D	Mise a jour	07/02	DHENAIN		
C	Mise a jour	06/02	DHENAIN		
B	Mise a jour	05/02	DHENAIN	.....	.....
A	Origine	12/01	DHENAIN	.....	.....

Spécifications particulières

tolérances générales: Indice de rugosité général; Tol.ang.:; Casser les angles vifs — SOUS-TRAITANT

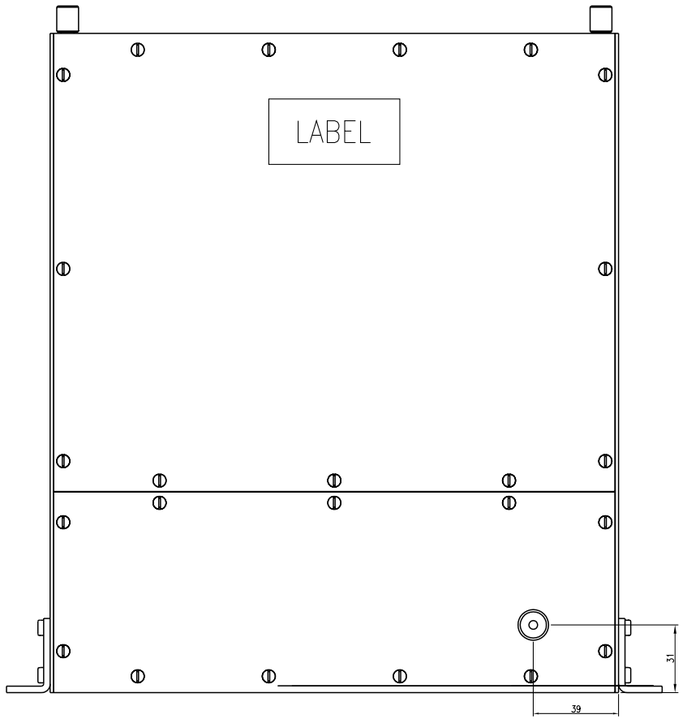
Matière:
Traitement thermique:
Protection
Echelle 1/2 | Poids | Niveau qualité

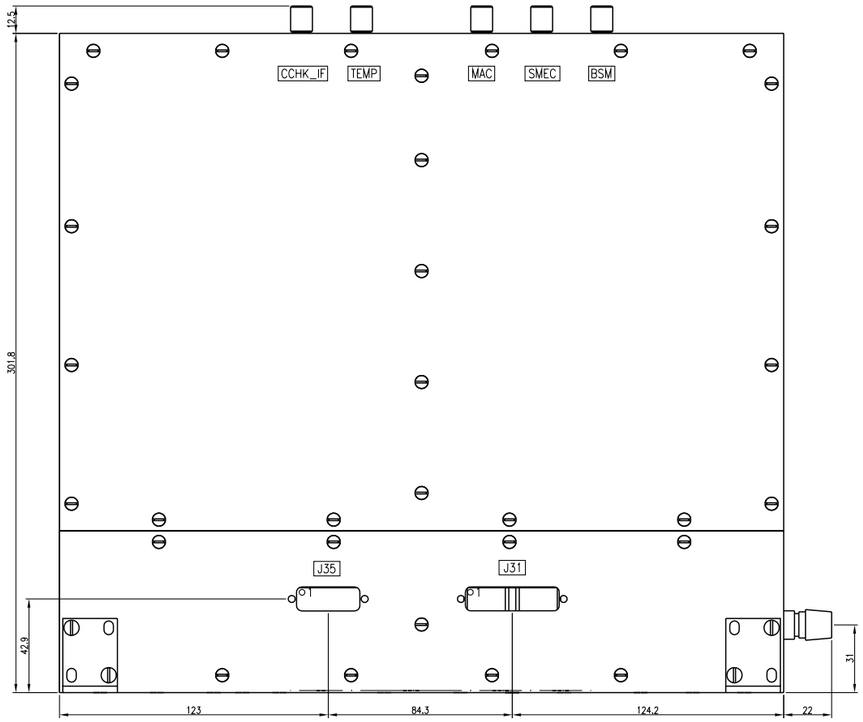
SPIRE
FCU ELECTRONIC BOX
MECHANICHAL INTERFACE CONTROL DRAWING

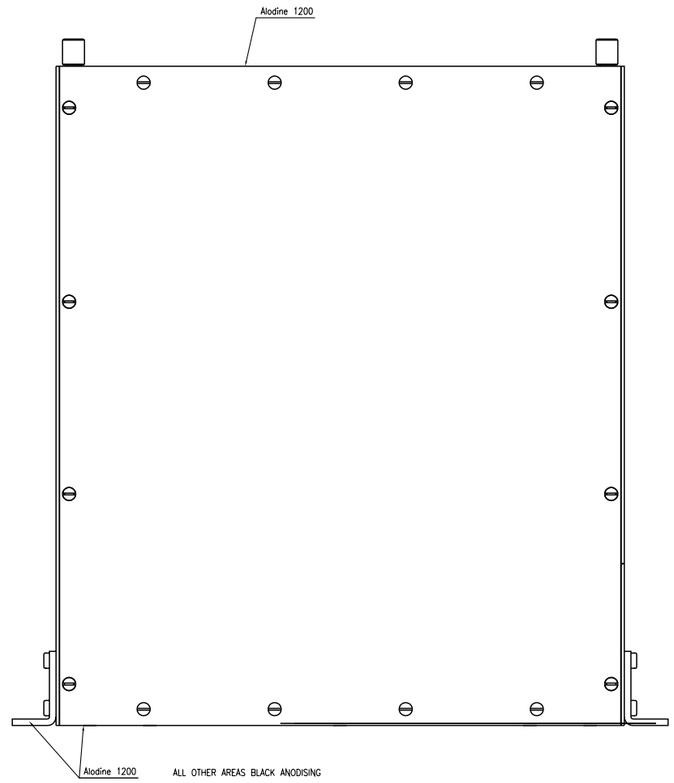
SAP/GERES
Tel:01.69.08.78.25
01.69.08.59.76
Fax:01.69.08.79.96

COMMISSARIAT A L'ENERGIE ATOMIQUE
C.E.N SACLAY

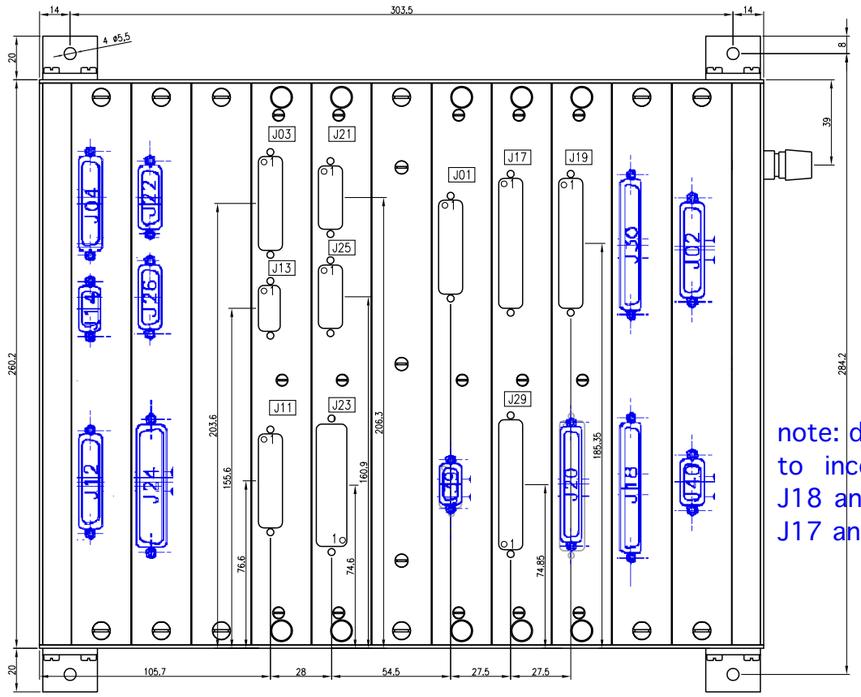
AO SPIR-MX-5200 000 J







ONLY FOR QM1



Blue signifies connectors fitted but without redundant side electronics behind them.

note: do not intend to incorrectly transpose J18 and J30 just because J17 and J39 are swapped!

CONNECTORS					
IDENT	TYPE	FUNCTION	IDENT	TYPE	FUNCTION
J01	DBMA 25S	MAC/DPU	J21	DAMA 15S	TEMP/FPU-TS-1
J03	DBMA 25S	CCHK-IF/DPU	J23	DDMA 50S	TEMP/FPU-TS-2
J11	DBMA 25S	CCHK-IF/FPU-COOL-CAL	J25	DAMA 15S	TEMP/FPU-MEC-TS
J13	DEMA 9S	CCHK-IF/FPU-PH-STIM	J29	DCMA 37P	SMEC/FPU-SMECm-2
J17	DCMA 37S	SMEC/FPU-SMECm-1	J31	DBMA 25P	MCU/PSU
J19	DCMA 37S	BSM/FPU-BSM	J35	DAMA 15P	SCU/PSU

CEA /SAP
91191 GIF/YVETTE Cedex

MATIERE : Alu 2017A
TRAITEMENT : ALODINE 1200
PROTECTION :
DESSINE : SREE
DATE : 08/09/03
VERIFIE :
VISA :

ECHELLE : 3/4
TOLERANCES GENERALES : ±0.2
Ra1.6

DESIGNATION
ICD HS FCU/QM1

SPIR-MX-5201 000 C
0
A1

12. ANNEX B - SPIRE-RAL-NOT-002383

SPIRE external DCU power switch for EQM testing
E Sawyer

Scope
This technical note describes the External DCU Switch Box (EXDSB) required for SPIRE testing on the EQM.

Change notes

1	18 March 2005	first issue
2	15 April 2005	5 switches added

Applicable Documents

Reference Documents

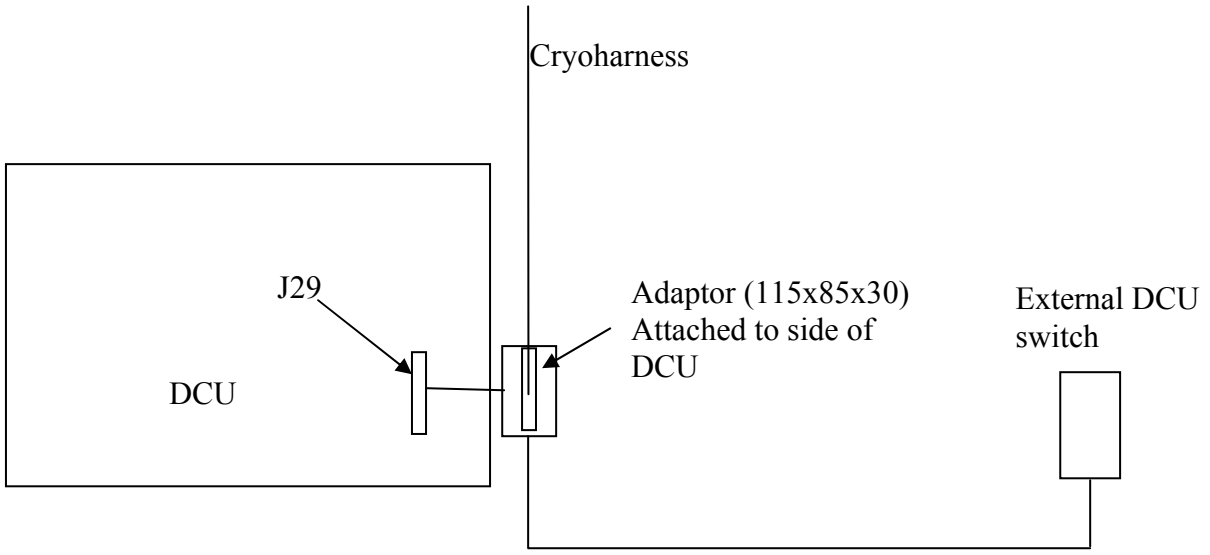
Background
During SPIRE investigations on the JFET failure of December 2004, it was discovered, that transients on the JFET power lines of QM1 DCU may damage the JFET. During PFM1 ILT SPIRE has disconnected the relevant connector on the DCU prior to DCU switch-on, and reconnect it after DCU switch-on.
SPIRE request to maintain a similar switch-on sequence for the EQM test campaign. It is proposed to implement a small adapter (External DCU switch) between the connector of the cryoharness and the DRCU, which contains a TBD long harness with a switch at the other side. The switch side should be accessible from outside the SVM simulator. A special switch-on sequence will need to be followed for EQM test campaign.
This is a feature of the QM1 DRCU, and will not be present on the FM.

Implementation
A small die cast box (115x85x30) will be attached to the side of the DCU as shown in the following diagrams. This box will contain a connector that simulates J29, a short flying lead that plugs into J29 and a second flying lead of length approx 1 metre (TBC by Astrium) which connects to an external switch box. This switch box to be mounted on the opposite face of the SVM panel, in a location to be agreed with Astrium. The switch box will contain 5 switches. A suggested location and dimensions of the box is shown in the following diagrams.
The switch box will be clearly marked ON and OFF.

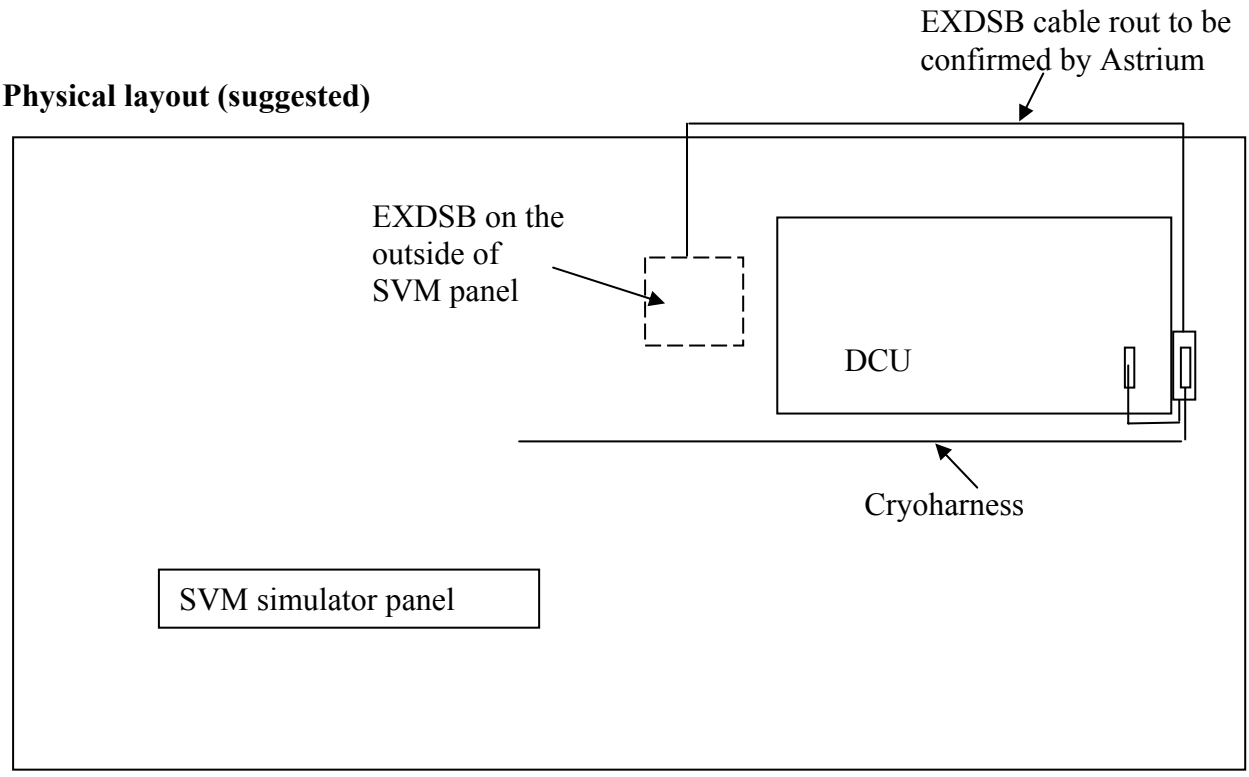
Operation.
Detailed operating procedures will be supplied. In outline the changes to existing procedures will be as follows.

- Before powering the DCU on, check external switches are in the OFF position
- Power up DCU
- Switch external switches to ON

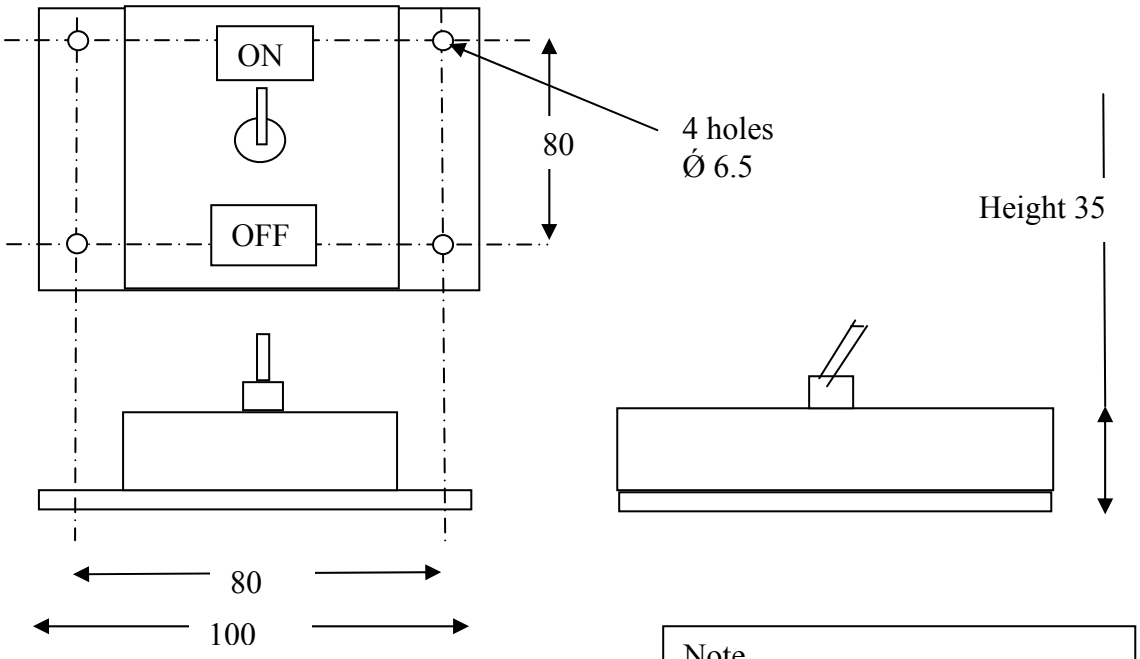
Block diagram



Physical layout (suggested)



External DCU Switch Box (EXDSB) details



Note
One switch shown, 5 switches will be implemented