



WP5	LPSC	17F
27/09/17		1/21

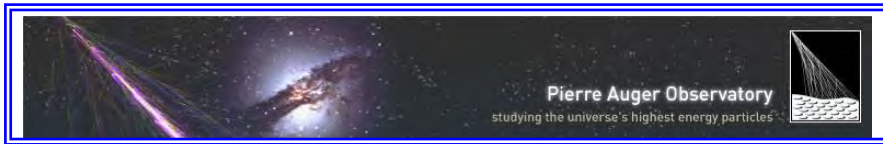
Pierre Auger Observatory

**Surface Detector Electronics Upgrade
Loose Parts Specification**

Abstract: This document is defining and describing the loose parts, which are the parts connected or mounted on the UUB PCB but not soldered.

⚠ WARNING: This document is not validated for production procurement

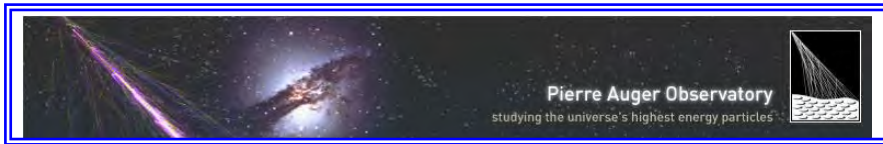
<i>Document written by:</i>	E. Lagorio P. Stassi	<i>Agreed by:</i>	T. Suomijärvi Task leader
<i>Date:</i>	27 September 2017	<i>Date:</i>	27 September 2017
<i>Local Reference:</i>	ATRIUM 9272	<i>Project Reference:</i>	WP5-LPSC-17F
<i>EDMS Reference:</i>	1760299		



WP5	LPSC	17F
27/09/17		2/21

Table of Content

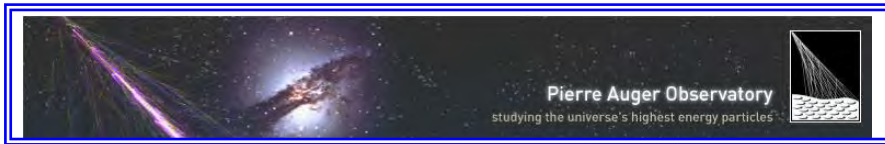
1.	INTRODUCTION	5
1.1.	Reference Documents	5
2.	Definition and description	6
2.1	Definition.....	6
3.	Specifications	7
3.1	#SDEUUB-01-LP-GPS – GPS Receiver.....	7
3.2	#SDEUUB-01-LP-GSC – GPS screw	7
3.3	#SDEUUB-01-LP-GSP – GPS spacer	7
3.4	#SDEUUB-01-LP-FHO – Fuse holder & cable.....	8
3.5	#SDEUUB-01-LP-FUS – Fuse.....	8
3.6	#SDEUUB-02-LP-GCA – GPS cable	9
3.7	#SDEUUB-02-LP-DCA – Digital cable.....	11
3.8	#SDEUUB-02-LP-PCA – PMT cable	14
3.9	#SDEUUB-02-LP-RCA – Radio cable.....	17
3.10	#SDEUUB-01-LP-PWC – Power supply connector.....	17
3.11	#SDEUUB-02-LP-FPA – Front panel	18
3.12	#SDEUUB-01-FP-FPS – Front panel screw.....	19
4	ANNEX.....	20
4.1	SDEUUB-02-LP-DCA – Drawing	20
4.2	SDEUUB-02-LP-PCA – Drawing.....	21



WP5	LPSC	17F
27/09/17	3/21	

ACRONYMS

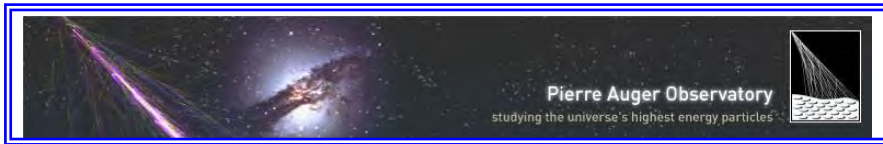
ADC	Analog to Digital Converter
AWG	American Wire gauge
BGA	Ball Grid Array
CR	Configurational Requirement
DC	Direct Current
EICD	Electrical Interface Control Document
ER	Environmental Requirement
FPGA	Full Programmable Gate Array
FR	Functional Requirements
GPS	Global Positioning System
ICD	Interfaces Control Document
IR	Interface Requirements
LP	Loose parts
n/a	non applicable
OR	Operational Requirements
PBS	Product Breakdown Structure
PCB	printed Circuit Board
PMT	Photo Multiplier Tube
PR	Physical Requirements
QR	Quality Requirements
SDE	Surface Detector Electronics
SDEU	Surface Detector Electronics Upgrade
SR	Support Requirements
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
UB	Unified Board
UUB	Upgraded Unified Board
UHE	Ultra High Energy
UHECR	Ultra High Energy Cosmic Ray
VM	Verification Matrix



WP5	LPSC	17F
27/09/17		4/21

DOCUMENT CHANGE RECORD

Issue	Revision	Issue Date	Changes Approved by	Modified Pages Numbers, Change Explanations and Status
17	A	20/05/15	E. Lagorio	DRAFT for approbation
17	B	21/05/15	P. Stassi	Minor corrections
17	C	09/07/15	P. Stassi	Full completion
17	D	17/07/15	P. Stassi	Front panel drawing update
17	E	14/10/16	P. Stassi	Minor corrections and update
17	F	27/09/17	P. Stassi/ E. Lagorio	Adapted to the UUB prototype version 2



WP5	LPSC	17F
27/09/17		5/21

1. INTRODUCTION

This document is defining and describing the loose parts, which are the parts connected or mounted on the UUB PCB but not soldered.

⚠ WARNING: This document is not validated for production procurement

1.1. Reference Documents

- RD1 WP10LPSC03x (EDMS 1760299) - SDEU Specification
- RD2 WP10LPSC05x (EDMS 1760315) - SDEU EICD
- RD3 EDMS 317390 - Conventions for the Pierre Auger Observatory

2. DEFINITION AND DESCRIPTION

2.1 Definition

The loose parts are the parts mounted or connected on UUB PCB of the SDEU, excluding the PCB and the components soldered on it and the enclosure box.

The loose parts are labelled SDEUUB-0a-LP-XXX with a = version number and XXX for the item identification as listed in the table below:

XXX	Name	Version ³	Comments	Qty ⁴
GPS	GPS receiver ¹	01	GPS receiver board I-Lotus M12M timing	1
GSC	GPS screw	01	For GPS receiver board mounting, top and bottom	8
GSP	GPS spacer	01	Nylon spacers for GPS receiver board mounting	4
FHO	Fuse holder & cable	01	Mounted on the front panel	1
FUS	Fuse	01	Placed in the fuse holder, value = 750 mA	1
GCA	GPS cable	02	SMA (front panel) to MMCX antenna coaxial cable	1
DCA	Digital cable	02	DB26HD (front panel) to HE26 (UUB) flat twisted cable	2
PCA	PMT cable	02	DB15HD (front panel) to HE14 (UUB) flat twisted cable	2
RCA	Radio cable	02	DB9 to DB9 molded cable (external)	1
PWC	Power supply connector	01	Binder plug connector (external)	1
FPA	Front panel	02	UUB front panel	1
FPS	Front panel screw ²	01	To fix the front panel on the enclosure	14

1 – GPS receivers are tested and provided through the CWRU Group.

2 – Front panel screws already procured and stored in Malargue

3 – The version number displayed here is valid for the UUB prototype version 2

4 – The quantity needed for one UUB

Table 2a – Loose parts list

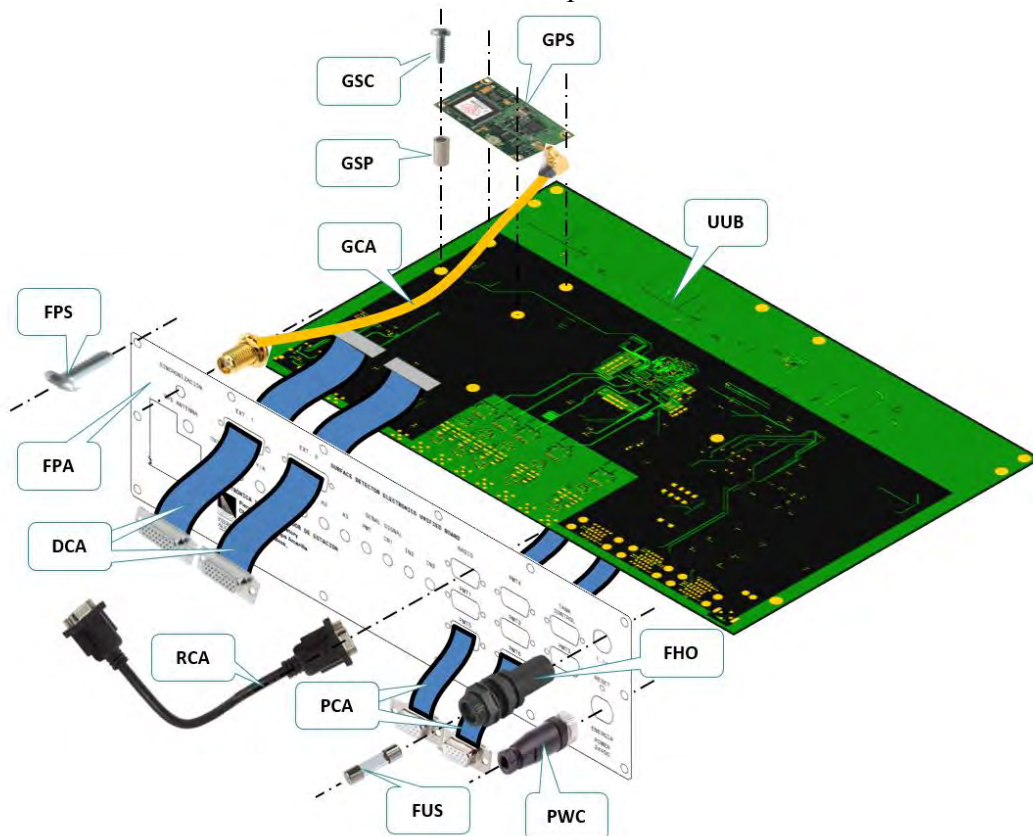
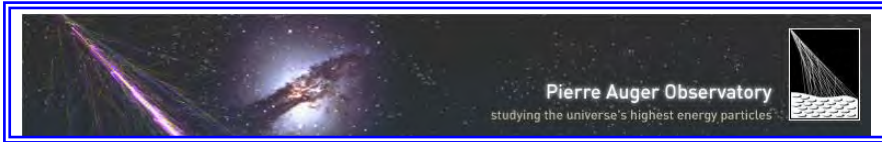


Figure 2a – Loose parts



WP5	LPSC	17F
27/09/17		7/21

3. SPECIFICATIONS

3.1 #SDEUUB-01-LP-GPS – GPS Receiver

OEM Timing GPS

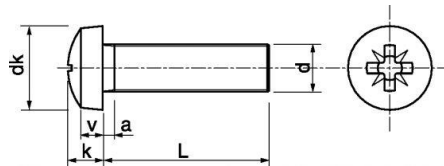
Reference: I-LOTUS M12M timing

The GPS receivers are tested and provided through the CWRU Group

3.2 #SDEUUB-01-LP-GSC – GPS screw

A4 Stainless Steel screws used to fix GPS board to UUB Mother-board.

Dimensions:



d : M3

L: 4 mm

Type: Round-pan head.



POZIDRIV

Or

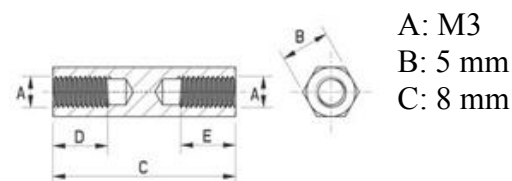


PHILLIPS

3.3 #SDEUUB-01-LP-GSP – GPS spacer

Four A4 Stainless Steel spacers for GPS. Two #LG2 screws for each spacer, one at the GPS side and one at the UUB mother-board (SDE-002-002-IExx) side.

Dimensions:



A: M3

B: 5 mm

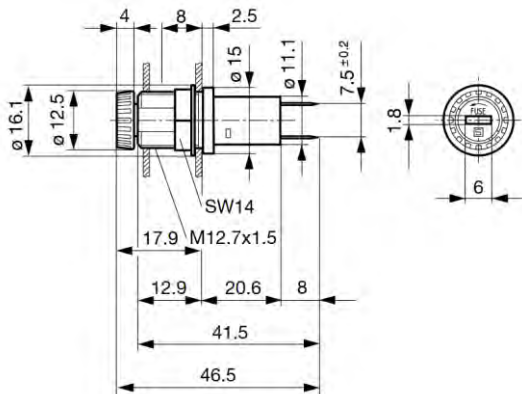
C: 8 mm

3.4 #SDEUUB-01-LP-FHO – Fuse holder & cable

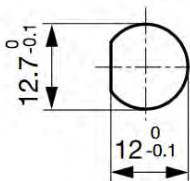
SDEU Current protection fuse holder. Rear side panel mount, with finger-grip, for 5 x 20mm fuses.



Dimensions (mm):



Mounting hole (mm):



Part Reference example:

- SCHURTER 3101.0125

Cable: two multi-wires flexible cables AWG=16, cross section 1.5 mm², PVC insulation, color black. **Length = 4 cm**

Part Reference example:

- Pro-Power PP001188

The cables shall be soldered to the fuse-holder with heat shrink protection and stripped on 5 mm at the end side.

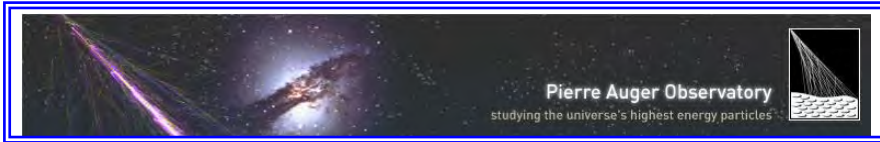
3.5 #SDEUUB-01-LP-FUS – Fuse

5 x 20 mm fuse, glass or ceramic, 750 mA fast acting



Part Reference example:

- BUSSMAN GMA-750-R



WP5	LPSC	17F
27/09/17		9/21


3.6 #SDEUUB-02-LP-GCA – GPS cable

RG316 Coax cable with SMA straight BH jack and MMCX right angle plug. **Length=200mm**



RF Cable
RF316-01BJ1-03RP1-0200

Features				
Cable Type	End 1	End 2	Labels	Length
RG316 coax cable	SMA Straight BH Jack	MMCX R/A Plug	No Label	200 mm

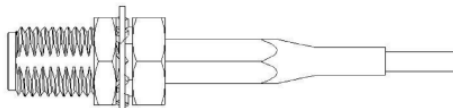


200 mm

Part Reference example:


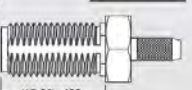
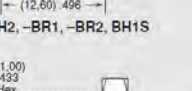
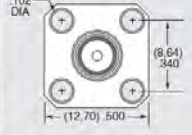

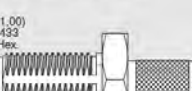

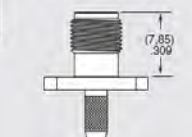
- SAMTEC RF316-01BJ1-03RP1-0200

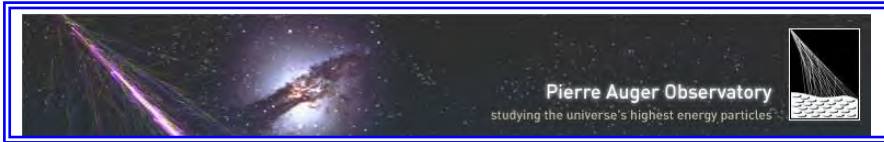
SMA end:



connector Reference example:

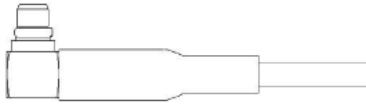
- SAMTEC SMA-J-C-H-ST-BH1

SMA	GENDER	TYPE	PLATING	ORIENTATION	TERMINATION
-J = Jack	-C = Cable	-C4 = Cable 4-Mounting Screws (-PN1 only)	-H = 30µ" (0,76 µm) Gold center contact, 3µ" (0,08 µm) Gold outer contact (N/A with -BH1S)	-ST = Straight	-BH1 = Bulkhead RG 174 / 316 Cable
			-HF = 30µ" (0,76 µm) Gold center contact, 3µ" (0,08 µm) Gold outer contact (-BH1S only)		-BH2 = Bulkhead RG 178 Cable
					-BR1 = Bulkhead RG 174 / 316, Reversed Polarity
-BH1, -BH2, -BR1, -BR2, BH1S		-S10, -B10		-PN1	-BH1S = Bulkhead RG 316 Cable, Double Shield
					-B10 = Bulkhead RG 58 Cable
					-PN1 = 4-Hole Panel Mount RG 174 / 316 Cable
					-S10 = Sealed Bulkhead RG 58 Cable



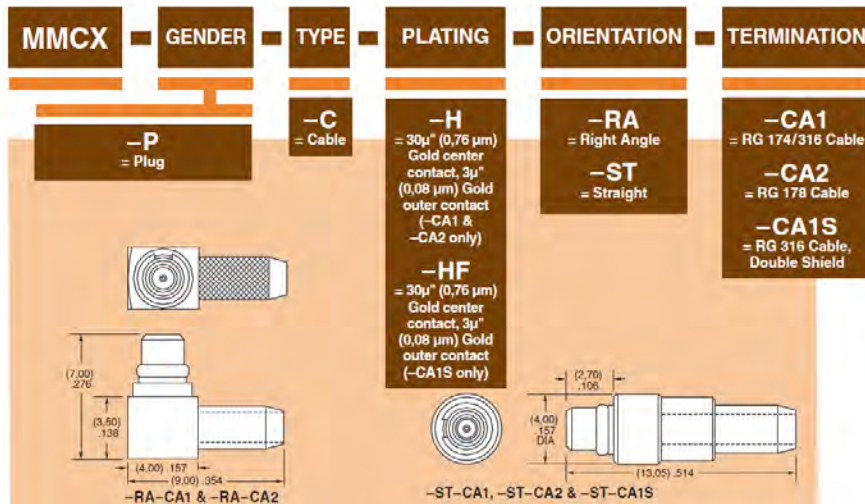
WP5	LPSC	17F
27/09/17		10/21

MMCX end:

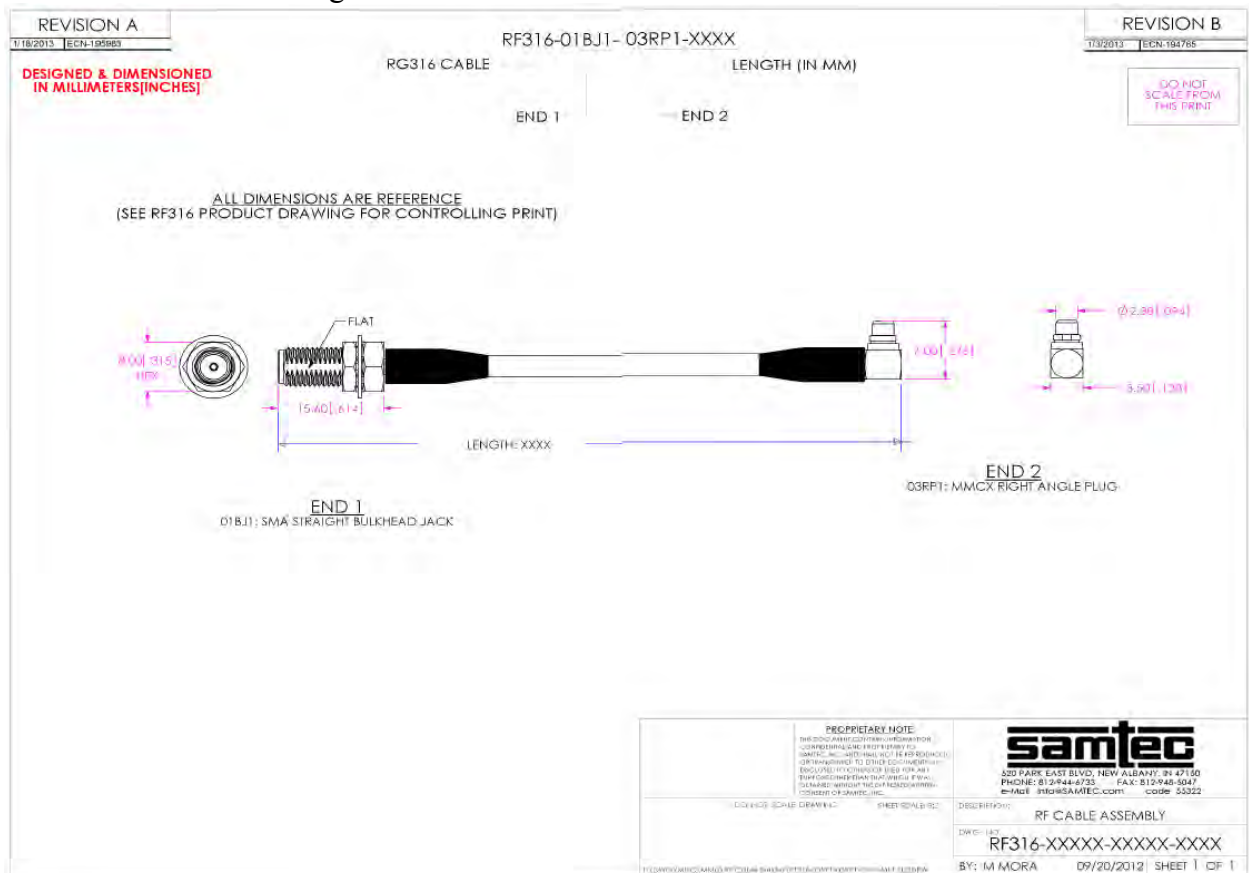


connector Reference example:

- SAMTEC MMCX-P-C-H-RA-CA1



Cable mechanical drawing:



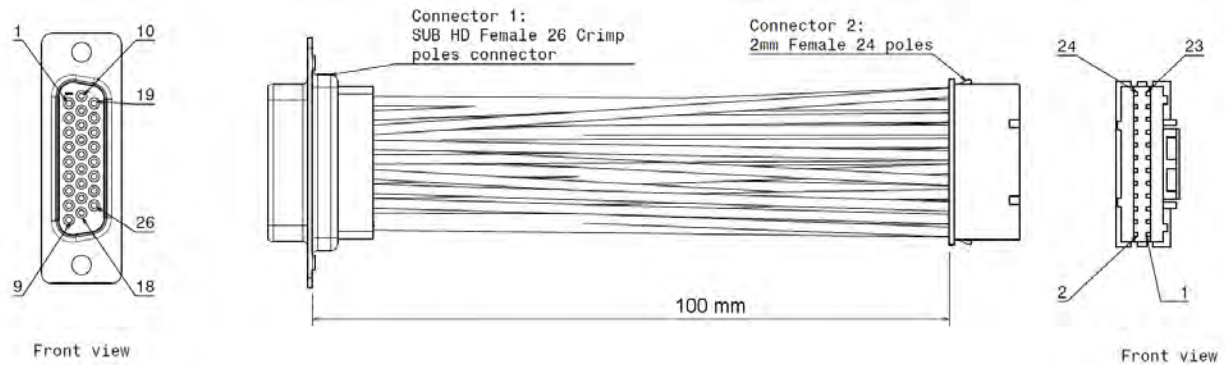
3.7 #SDEUUB-02-LP-DCA – Digital cable

Description (full drawing in annex):

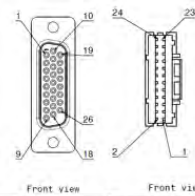
24 contacts multi-wire AWG-24 twisted pair cable (12 individual pairs) with the following connectors:

- At front panel side - SUB-D HD 26 points crimp poles with jack screws
- At PCB side - 2mm, female 24 crimp poles JST ref. PADP-24-1-S

Cable length=100 mm

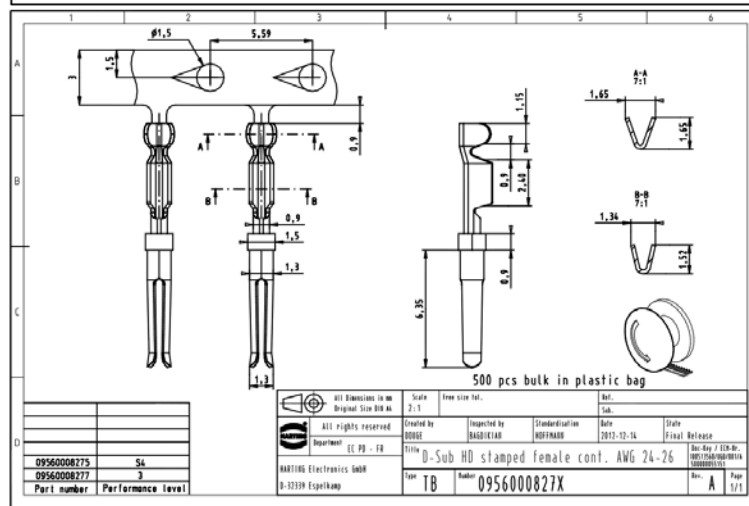
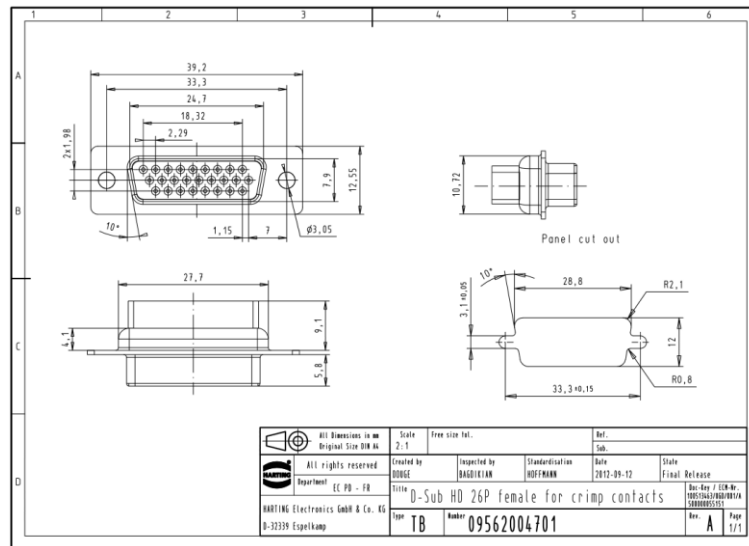


Connectors pin out:



Twin	Signal	Color	Connector 1 pins	Connector 2 pins
D0	D0+	Orange	1	3
	D0-	Grey	2	4
VCC1	VCC	Red	3	6
	GND	Black	4	5
D3	D3+	Orange	5	13
	D3-	Grey	6	14
VCC2	VCC	Red	7	18
	GND	Black	8	17
D7	D7+	Orange	9	21
D1	D1+	Orange	10	1
	D1-	Grey	11	2
-	NC	-	12	-
-	NC	-	13	-
D4	D4+	Orange	14	9
D4	D4-	Grey	15	10
D6	D6+	Orange	16	19
	D6-	Grey	17	20
D7	D7-	Grey	18	22
D2	D2+	Orange	19	7
	D2-	Grey	20	8
VCC3	VCC	Red	21	12
	GND	Black	22	11
D5	D5+	Orange	23	15
	D5-	Grey	24	16
VCC4	VCC	Red	25	24
	GND	Black	26	23

Front panel end:



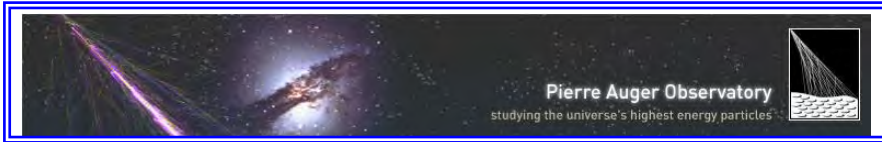
Connector References example:

- HARTING 0956 200 4701 – female crimp contacts: 09560008277
- Crimp tool reference: 09 99 000 0535
- Insertion tool reference: 09 99 000 0513

Jack screws: 2 units, length = 13 mm, thread size – imperial = 4-40, with flat washer, split washer and nut. Reference example:

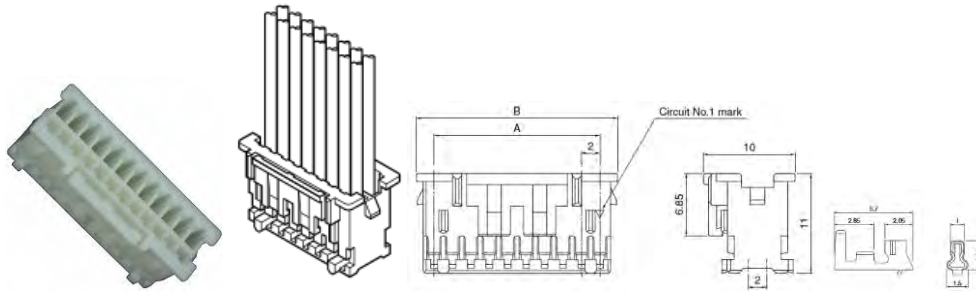
- MULTICOMP SPC15082





WP5	LPSC	17F
27/09/17		13/21

PCB end:

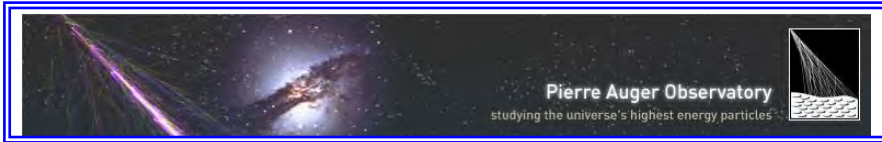


Connector References:

- JST PADP-24V-01-S – crimp contacts: SPH-001T-P0.5L, phosphor-bronze



- Crimp tool reference: YRS-245



WP5	LPSC	17F
27/09/17		14/21

3.8 #SDEUUB-02-LP-PCA – PMT cable

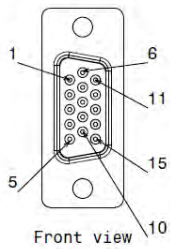
Description (full drawing in annex):

13 contacts multi-wire AWG-24 cable (13 individual wires) with the following connectors:

- At front panel side - SUB-D HD 15 points crimp poles with jack screws
- At PCB side - 2mm, female 14 crimp poles JST ref. PAP-14V-S

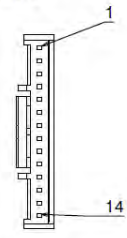
Cable length=70 mm

Connector 1:
D SUB HD Female 15 Crimp poles connector



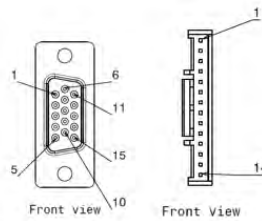
70 mm

Connector 2:
2mm Female 14 poles JST PAP-14V-S

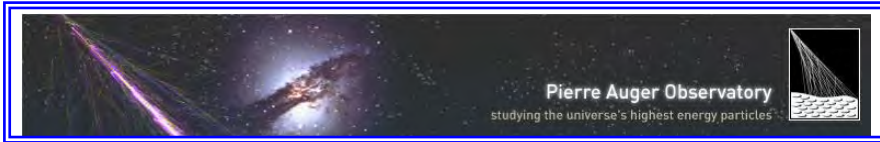


Front view

Connectors pin out:

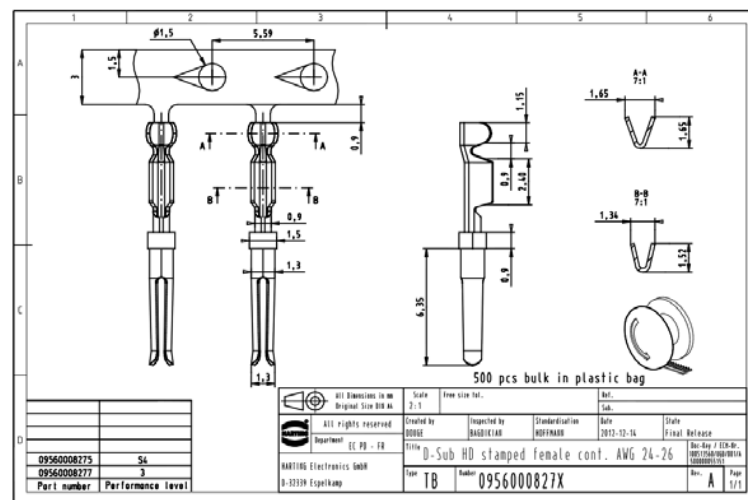
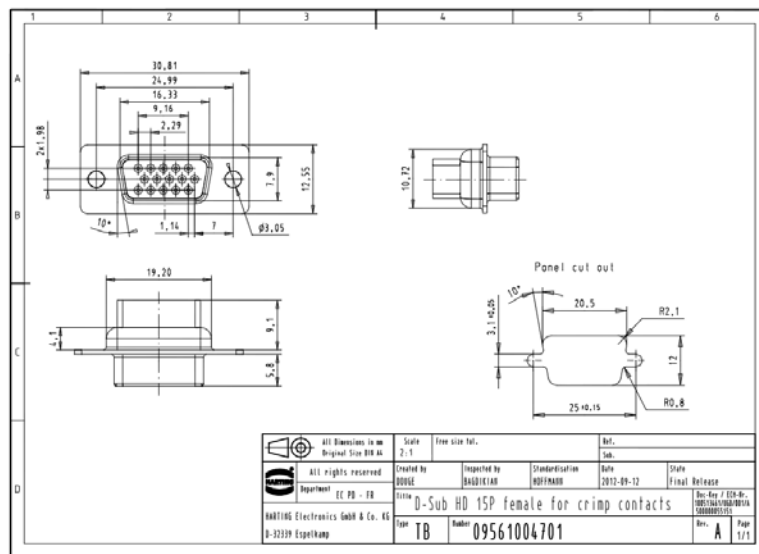


Color	Connector 1 pins	Connector 2 pins
Black	1	2
Black	2	5
Black	3	8
Black	4	11
Black	5	14
Red	6	1
Black	7	3
Black	8	6
Black	9	9
Black	10	12
-	NC	-
Black	12	4
-	NC	NC
Black	14	10
Black	15	13



WP5	LPSC	17F
27/09/17		15/21

Front panel end:



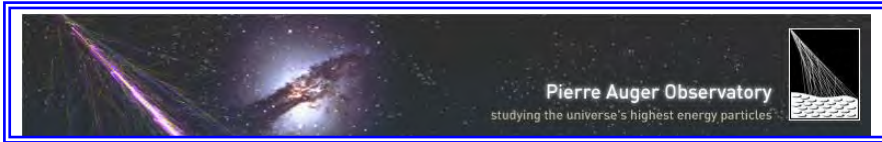
Connector references example:

- HARTING 0956 100 4701 – female crimp contacts: 09560008277
- Crimp tool reference: 09 99 000 0535
- Insertion tool reference: 09 99 000 0513

Jack screws: 2 units, length = 13 mm, thread size – imperial = 4-40, with flat washer, split washer and nut. Reference example:

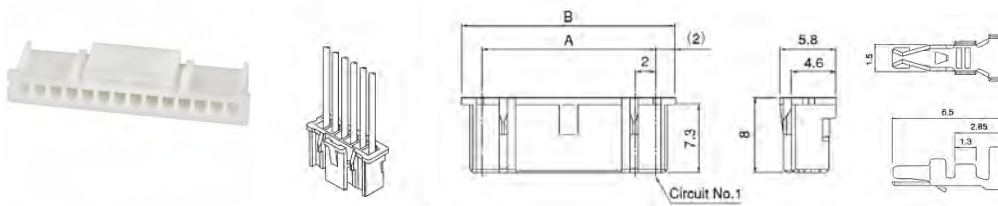
- MULTICOMP SPC15082





WP5	LPSC	17F
27/09/17		16/21

PCB end:



Connector References:

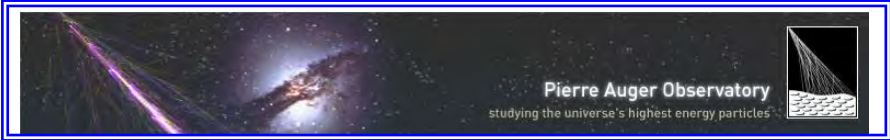
- JST PAP-14V-S – crimp contacts: SPHD-001T-P0.5



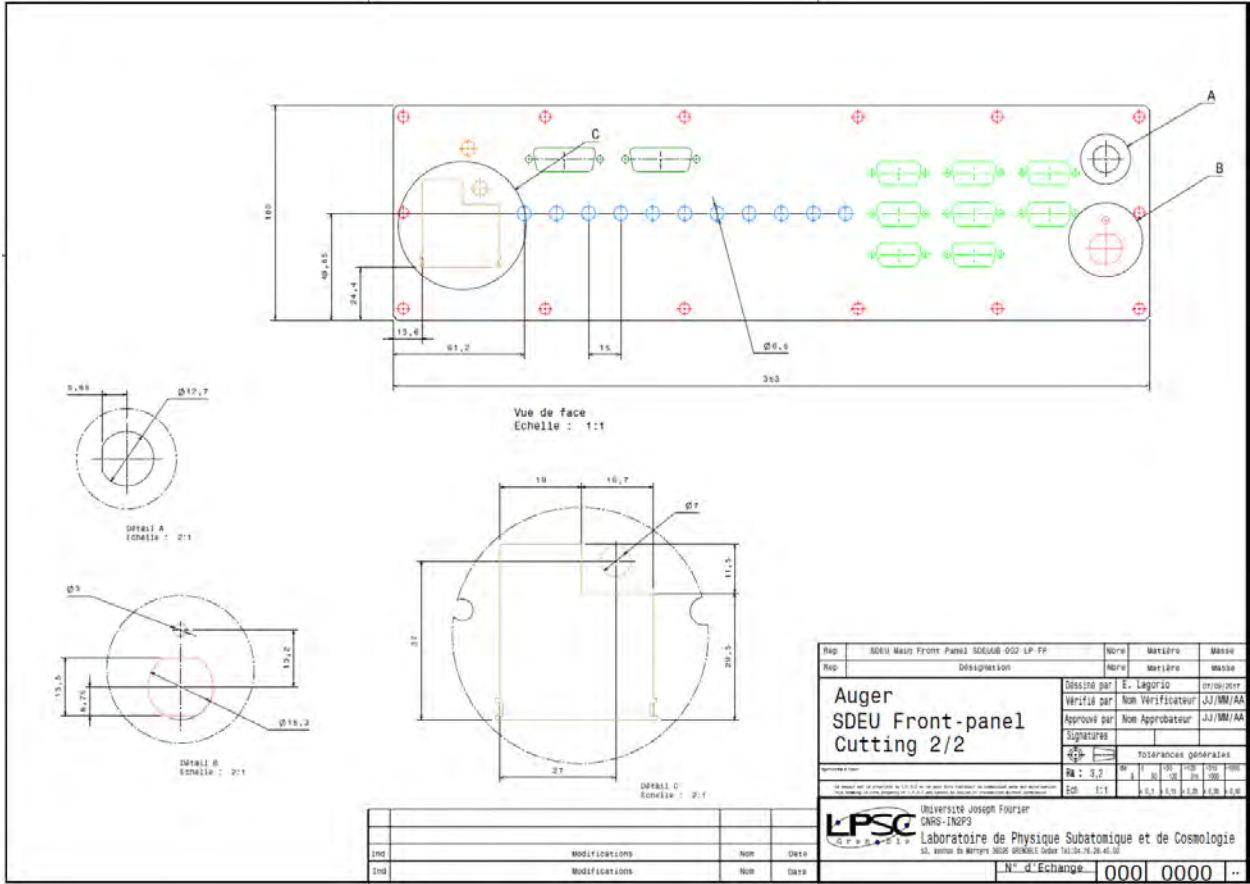
- Crimp tool reference: YC-610R



- Extraction tool reference: EJPHDRB



WP5	LPSC	17F
27/09/17		19/21



3.12 #SDEUUB-01-FP-FPS – Front panel screw

Front panel screws are already procured and stored in PAO at Malargue



WP5	LPSC	17F
27/09/17		20/21

4 ANNEX

4.1 SDEUUB-02-LP-DCA – Drawing

Train	Signal	Color	Connector 1 pins	Connector 2 pins
D0	D0+	Orange	1	3
	D0-	Grey	2	4
VCC1	VCC	Red	3	6
	GND	Black	4	5
D3	D3+	Orange	5	13
	D3-	Grey	6	14
VCC2	VCC	Red	7	18
	GND	Black	8	17
D7	D7+	Orange	9	21
D1	D1+	Orange	10	1
	D1-	Grey	11	2
	NC	-	12	-
	NC	-	13	-
D4	D4+	Orange	14	9

Train	Signal	Color	Connector 1 pins	Connector 2 pins
D4	D4-	Grey	15	10
D6	D6+	Orange	16	19
D7	D7-	Grey	17	20
D2	D2+	Grey	18	22
	D2-	Grey	19	7
VCC3	VCC	Red	20	8
	GND	Black	21	12
D5	D5+	Orange	22	11
	D5-	Grey	23	15
VCC4	VCC	Red	24	16
	GND	Black	25	24
	GND	Black	26	23

Auger ID	Description	Qty	Manufacturer	Manufacturer Ref.	In Charge
	Housing D-SUB HD Female	1	HARTING	D9682004701	WP5
	D-SUB HD Female contacts	24	HARTING	D9680008277	WP5
	D-SUB HD Female Crimp contact AMG 24-28	1	UST	PADP-24V-1-S	WP5
	Housing Female connector, 24 crimp contacts	24	UST	SPH-001T-P0-1L	WP5
	Female Crimp contact, Phosphor-bronze, AMG 26-22	4			WP5
	WIR-004 AMG 24 wire, Red	4			WP5
	WIR-002 AMG 24 wire, Black	4			WP5
	WIR-005 AMG 24 wire, Orange	8			WP5
	WIR-004 AMG 24 wire, Grey	8			WP5

Rep	Description	NB	Material	Mass
	Auger SDEU SDEUUB-02-LP-DCA LVDS extension cable			
	Drawn	E. Lagorio		26/09/2016
	Check	E. Lagorio		26/09/2016
	Approved	E. Lagorio		26/09/2016

Tolerances générales	
Ra : 3,2	de 0 à 300 >120 >315 >1000
Ech : 1:1	± 0,1 ± 0,15 ± 0,20 ± 0,30 ± 0,50

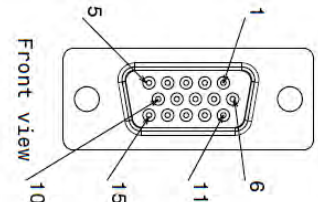
Université Joseph Fourier
 CNRS-IN2P3
 Laboratoire de Physique Subatomique et de Cosmologie
 53, avenue des Martyrs 38026 GRENBLE Cedex 1 tel: 04.76.28.40.00

N° d'Echange	000 0000
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4.2 SDEUUB-02-LP-PCA – Drawing

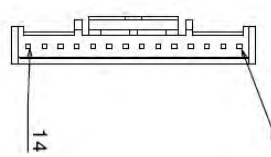
Ind	Version	Modifications	Name	Date
02	version 2 PMT cable			

Connector 1:
D SUB HD Female 15 Crimp poles connector

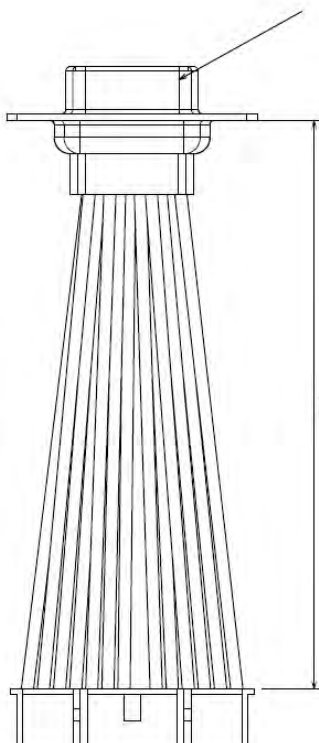


Front view

Connector 2:
2mm Female 14 poles JST PAP-14V-S



Front view



70

PRELIMINARY

Auger ID	Description	Qty	Manufacturer	Manufacturer Ref.	In Charge
	Housing D-SUB HD Female connector, 15 crimp contacts	1	HAARTING	09561004701	WPS
	D-SUB HD Female Crimp contact AWG 24-26 crimp contacts	13	HAARTING	09569008277	WPS
	Female Crimp contact, AWG 26-22	1	JST	PAP-14V-S	WPS
	Female Crimp contact, AWG 26-22	13	JST	SPHD-001T-PQ.5	WPS
	AWG 24 wires, Red	1			WPS
	AWG 24 wires, Black	12			WPS

Rep	Description	Nb	Material	Mass
	Auger SDEU			
	SDEUUB-02-LP-PCA			
	PMT extension cable			
	Drawn	E. Lagorio		25/09/2016
	Check	E. Lagorio		25/09/2016
	Approved	E. Lagorio		25/09/2016

Auger SDEU
SDEUUB-02-LP-PCA
PMT extension cable

LPSC Université Joseph Fourier
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Tolerances générales
Ra : 3,2
Ech : 1:1

0	30	60	120	240	480	960
± 0,1	± 0,15	± 0,20	± 0,30	± 0,50	± 1,00	± 2,00

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