X-shooter

Final Design Report

CCD Detector and Acquisition System Design Appendix

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CHANGE RECORD

ISSUE	DATE	SECTION/PAGE AFFECTED	REASON/INITIATION DOCUMENTS/REMARKS
0.1	6.05.05	First Draft	
0.2	19.12.05	APPENDIX F: DRAWINGS	Quality of drawings Figure 19, Figure 20 & Figure 21 improved.
1.1	07.12.06	Section Section Section Figure 13	UVB and VIS PULPOs now supplied by separate connectors on the FIERA power supply. Connector X99 and cable W99 added for this purpose.
3.0	25.05.2009	All	Updated with as-built design

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1 Appendix A: Report on Use of Two Cameras With One FIERA

The following is report provided by Andrea Balestra on operations of two cameras with one FIERA DFE. This is the same report included in PDR document.

In order to safely use two scientific cameras on one electronic some “traffic rules” need to be followed. These rules mainly stem, among others, from the fact that the DMA resource used for the readout process on the SLCU is, due to hardware constraints, unique and computing intensive.

The top requirement on FIERA side in order to have a safe readout is that nothing must happen during the process of reading out one of the two cameras. Thus, provision must be set in FIERA in order to avoid any risk of loosing data. Moreover, measures should be taken also on other packages to enforce this top requirement and to optimize exposure time. The following “safety levels” are required/suggested.

1.1 First Level

DCS (FIERA) code will implement more robust mechanisms in order to avoid any potentially dangerous situation for the scientific data. This will require, mainly, relaxation of timeouts of the commands. Timeouts to be relaxed are both for external commands (e.g. SETUP in the case a SETUP command is issued while a readout is ongoing on the other arm) or internal (e.g. readout: the process polling for the DMA resource to be available).

If a readout request then arrives while readout on the other arm is ongoing, the request will be “queued” until the DMA resource is freed. It should be noted that it is not possible to have another readout request coming in while one is already queued because exposures can only start when the previous one has finished and data are saved to disk. Therefore there will always be at most one readout in the queue. Of course this may make especially the execution of a series of short exposures indeterministic. It should also be noted that coincident readouts are allowed without any restriction. A proper test setup will then be implemented, strengthening the already existing hardware simulation, in order to thoroughly test timing on the system also in absence of the real hardware.

1.2 Second Level

A deterministic behavior can only be enforced by the software sending commands to FIERASW or by still higher level software.

Commands that affect the moment of readout should be handled with care. These are:

- PAUSE
- CONTINUE
- STOP
- Extension of integration time through SETUP keyword

PAUSE/CONTINUE commands should be handled in parallel, i.e. OS will send PAUSE and related CONTINUE commands to both cameras at the same time. This will ensure that readouts will happen with the same relative timing as before the PAUSE command.

A layer of software should be developed in order to take care of checking the safety of a time extension or STOP command. Both commands imply that the readout time is shifted in time for one camera by a fixed amount of time i.e. the “extension time” or “minus remaining time”. This should be accomplished comparing these times with the remaining exposure time of the other camera. If the result clashes with the readout of the other camera, then the user should be warned (command rejected?). The remaining time of an exposure can be determined through the following point in the database (value in seconds):

<alias>:$CCDNAME: exposures: exposure_1.timeRem.

The same layer of software should also take care of defining a safety time zone around the readout phase of each camera where no command for any camera is issued. The starting point (i.e. n seconds before start of readout) of such a time interval should be defined using the value of the remaining time of an exposure. The value of n can be of the order of 1-3 seconds (TBC). The end of the interval corresponds to the setting of the COMPLETED status for that camera in the OLDB.

The total time amounts, therefore, to n + t_{read} where t_{read} is the readout time. During this interval all commands can be delayed by this software. The INTEGRATING status of the other camera will not be affected i.e. it will continue its integration (if active). A readout started by FIERA automatically during this phase (should it unfortunately happen) will be delayed until end of the first readout.

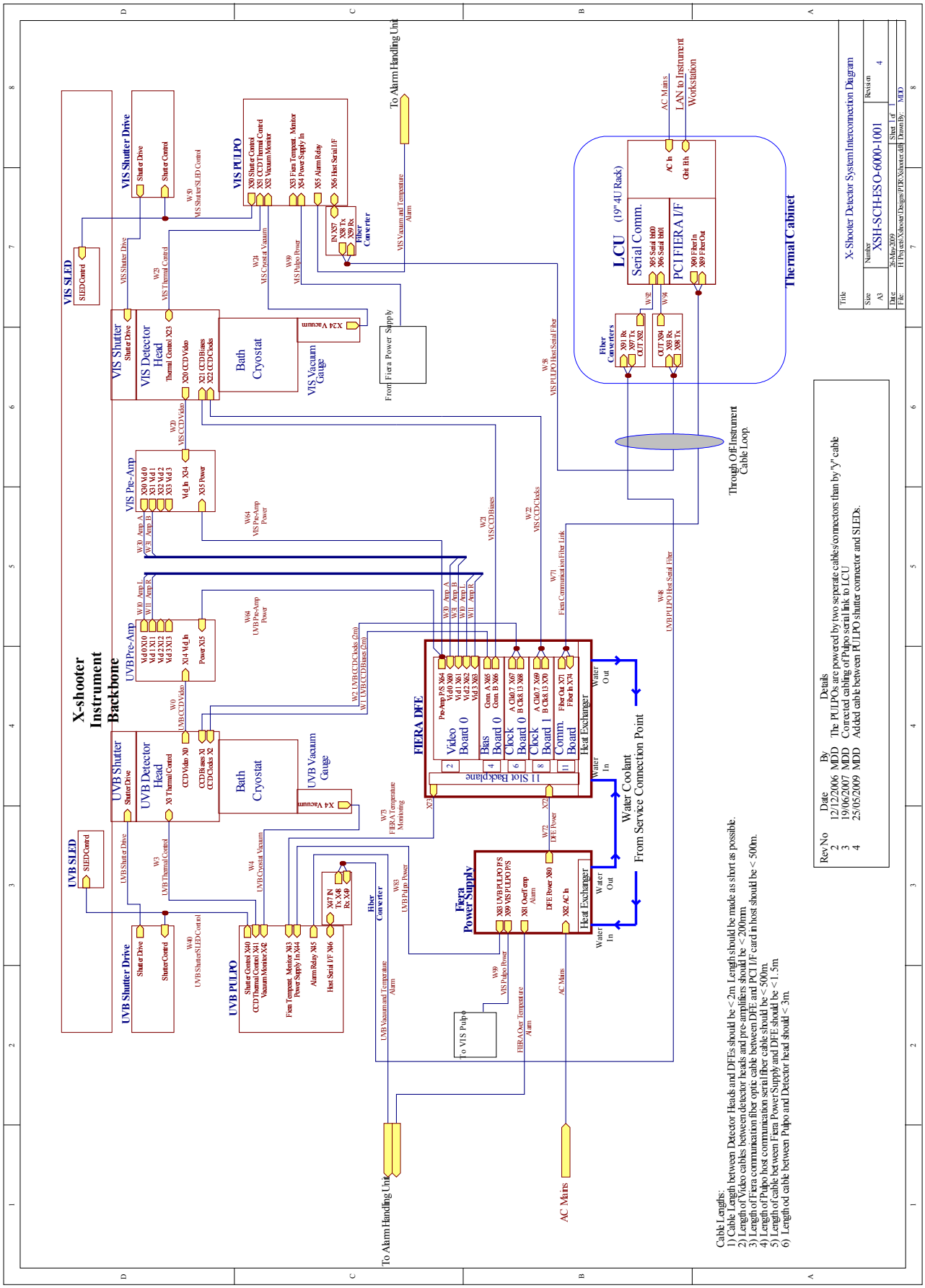
1.3 Third Level

A higher level of safety could then be introduced in the preparation of templates sequencer scripts, where exposures should be scheduled on the two cameras so that readouts and start of exposures do not overlap each other i.e.:

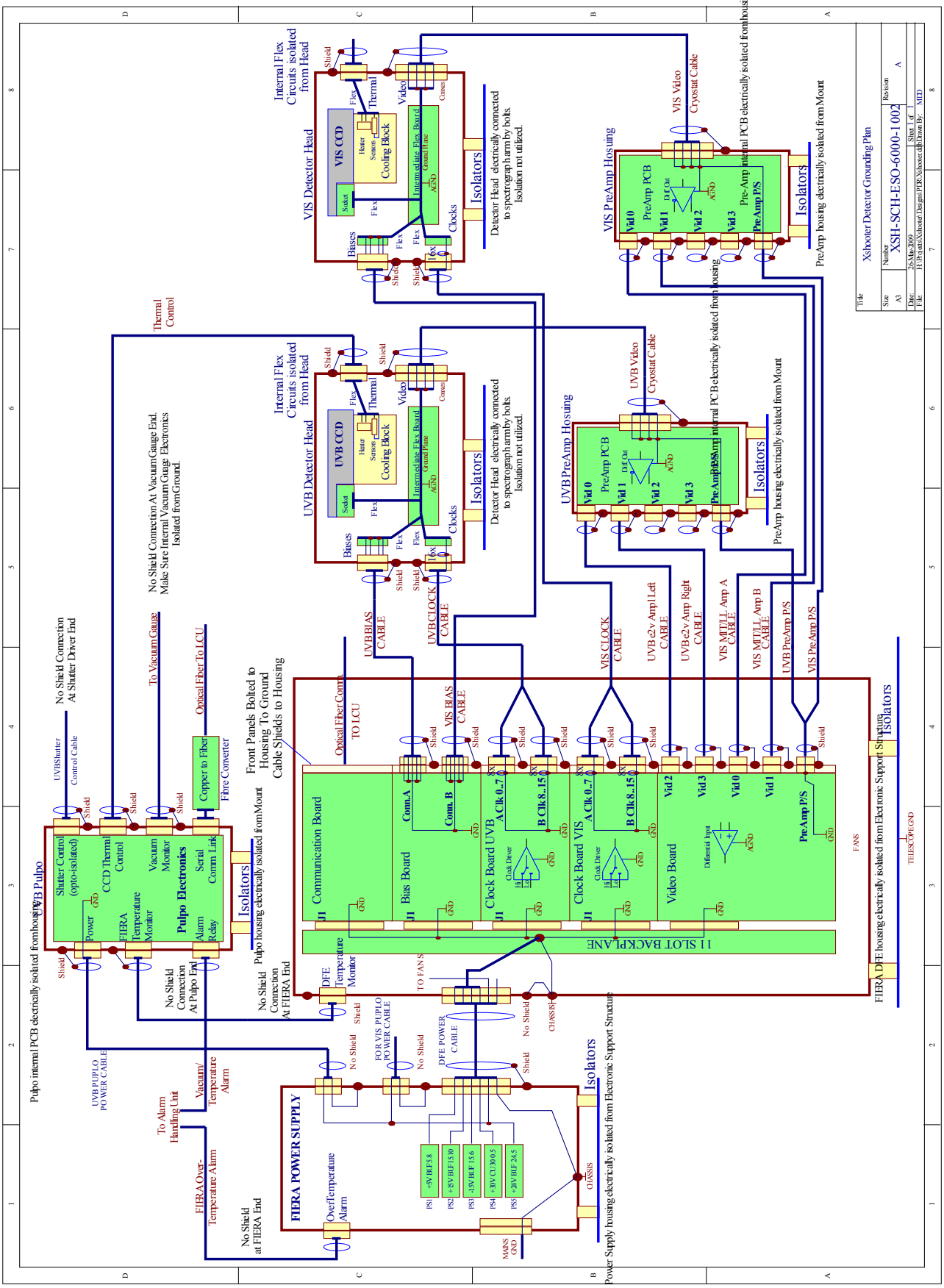
- No SETUP/START in any camera if readout is ongoing on the other one.
- No readouts coinciding unless perfectly simultaneous

In the case of repeated exposures, it is desirable that these are not performed using the normal NREP keyword but should be executed one by one. This will make more straightforward the application of the previous mechanisms.

2 Appendix B: Interconnection Diagram


X-shooter Instrument Backbone
UVB SLED
SLED Control
UVB Shutter Drive
Shutter Drive
Shutter Control
UVB Detector Head
Thermal Control X1
CCD Video X0
CCD Biases X0
CCD Clocks X2
UVB Cryostat
Bath Cryostat
UVB Vacuum Gauge
X34 Vacuum
UVB Pre-Amp
Vd0 X10
Vd1 X11
Vd2 X12
Vd3 X13
Vd_lh X14
Power X15
UVB PULPO
Shutter Control X40
CCD Thermal Control X41
Vacuum Monitor X42
Fiera Temperat. Monitor X43
Power Supply In X44
Alarm Relay X45
Host Serial I/F X46
Fiber Converter
X47 IN
X48 Tx
X49 Rx
W0 UVB CCD Video
W1 UVB CCD Biases (2m)
W2 UVB CCD Clocks (2m)
W3 UVB Thermal Control
W4 UVB Cryostat Vacuum
W40 UVB Shutter/SLED Control
W63 UVB PuLpo Power
W64 UVB Pre-Amp Power
W75 FIERA Temperature Monitoring
W99 VIS Pulpo Power
FIERA DFE
11 Slot Backplane
Pre-Amp PS X64
Vd0 X60
Vd1 X61
Vd2 X62
Vd3 X63
Video Board 0
Bias Board 0
Comm. A X65
Comm. B X66
Clock Board 0
A Clk0.7 X67
B Clk0.13 X68
Clock Board 1
A Clk0.7 X69
B Clk0.13 X70
Comm. Board
Fiber Out X71
Fiber In X74
Heat Exchanger
Water In
Water Out
X72 DFE Power
Fiera Power Supply
X83 UVB PULPO PS
X99 VIS PULPO PS
X81 Overtemp Alarm
X82 AC In
To VIS Pulpo
FIERA Over Temperature Alarm
UVB Vacuum and Temperature Alarm
To Alarm Handling Unit
AC Mains
Water Coolant From Service Connection Point
VIS SLED
SLED Control
VIS Shutter Drive
Shutter Drive
Shutter Control
VIS Shutter
VIS Detector Head
Thermal Control X23
X20 CCD Video
X21 CCD Biases
X22 CCD Clocks
Bath Cryostat
X34 Vacuum
VIS Vacuum Gauge
VIS Pre-Amp
X30 Vd0
X31 Vd1
X32 Vd2
X33 Vd3
Vd_lh X34
X35 Power
VIS PULPO
X50 Shutter Control
X51 CCD Thermal Control
X52 Vacuum Monitor
X53 Fiera Temperat. Monitor
X54 Power Supply In
X55 Alarm Relay
X56 Host Serial I/F
IN X57
X58 Tx
X59 Rx
Fiber Converter
W20 VIS CCD Video
W21 VIS CCD Biases
W22 VIS CCD Clocks
W23 VIS Thermal Control
W24 VIS Cryostat Vacuum
W30 VIS Shutter/SLED Control
W38 VIS PULPO Host Serial Fiber
W39 VIS Pulpo Power
W64 VIS Pre-Amp Power
VIS Vacuum and Temperature Alarm
From Fiera Power Supply
To Alarm Handling Unit
Thermal Cabinet
LCU (19" 4U Rack)
Serial Comm.
X85 Serial 1460
X86 Serial 1460
PCI FIERA I/F
X90 Fiber In
X89 Fiber Out
AC In
Gbit Eth
AC Mains
LAN to Instrument Workstation
Fiber Converters
X91 Rx
X87 Tx
OUT X92
OUT X94
X93 Rx
X88 Tx
W92
W94
W71 Fiera Communication Fiber Link
W48 UVB PULPO Host Serial Fiber
Through Off Instrument Cable Loop.
Rev No Date By Details
2 12/12/2006 MDD The PULPOs are powered by two separate cables/connectors than by 'Y' cable
3 19/06/2007 MDD Corrected cabling of Pulpo serial link to LCU
4 25/05/2009 MDD Added cable between PULPO shutter connector and SLEDs.
Title X-Shooter Detector System Interconnection Diagram
Size A3
Number XSH-SCH-ESO-6000-1001
Revision 4
Drgr 26/May/2009
File H:\Projects\Xshooter\Designs\PDR\Xshooter.ddb
Sheet 1 of 1
DrawnBy MDD
Cable Lengths:
1) Cable Length between Detector Heads and DFEs should be < 2m Length should be made as short as possible.
2) Length of Video cables between detector heads and pre-amplifiers should be < 200mm
3) Length of Fiera communication fiber optic cable between DFE and PCI I/F card in host should be < 500m.
4) Length of Pulpo host communication serial fiber cable should be < 500m.
5) Length of cable between Fiera Power Supply and DFE should be < 1.5m
6) Length od cable between Pulpo and Detector head should < 3m

3 Appendix C: Detector Ground System



4 Appendix D: Connectors

To uniquely identify each connector in the system, each is given a unique number starting with a X. When labeling, prefix "XSH-CCD-" should be added before the "X".

Table 1: List of connectors of Detector System of X-shooter.

Connector Number	Unit	Usage	Connector Type	Comment
X0	UVB Detector Head	UVB CCD Video	Filcon 74000Y-15E-35PA-565	Vacuum circular military connector
X1	UVB Detector Head	UVB CCD Biases	Filcon 74000Y-15E-35PN-565	Vacuum circular military connector
X2	UVB Detector Head	UVB CCD Clocks	Filcon 74000Y-19E-35P-565	Vacuum circular military connector
X3	UVB Detector Head	UVB Detector Head Thermal Control	Filcon 74000Y-15E-35PB-565	Vacuum circular military connector
X4	UVB Cryostat Vacuum Gauge	UVB CCD Cryostat Vacuum Monitoring	HIRSCHMANN GO 6 WF	Commercial unit.
X10	UVB Pre-Amp	UVB CCD Video 0 E2V CCD Left Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X11	UVB Pre-Amp	UVB CCD Video 1 E2V CCD Right Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X12	UVB Pre-Amp	UVB CCD Video 2 Unused	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X13	UVB Pre-Amp	UVB CCD Video 3 Unused	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X14	UVB Pre-Amp	UVB CCD Video In	4xFM8W8S Male RA	4 Coax. Connectors plus housing
X15	UVB Pre-Amp	Power	DB9S	
X20	VIS Detector Head	VIS CCD Video	Filcon 74000Y-15E-35PA-565	Vacuum circular military connector
X21	VIS Detector Head	VIS CCD Biases	Filcon 74000Y-15E-35PN-565	Vacuum circular military connector
X22	VIS Detector Head	VIS CCD Clocks	Filcon 74000Y-19E-35P-565	Vacuum circular military connector
X23	VIS Detector Head	VIS Detector Head Thermal Control	Filcon 74000Y-15E-35PB-565	Vacuum circular military connector
X24	VIS Cryostat Vacuum Gauge	VIS Cryostat Vacuum Monitoring	HIRSCHMANN GO 6 WF	Commercial unit.
X30	VIS Pre-Amp	VIS CCD Video 0 MIT/LL CCD A Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X31	VIS Pre-Amp	VIS CCD Video 1 MIT/LL CCD A Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X32	VIS Pre-Amp	VIS CCD Video 2 Unused	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X33	VIS Pre-Amp	VIS CCD Video 3 Unused	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X34	VIS Pre-Amp	VIS CCD Video In	4xFM8W8S Male RA	4 Coax. Connectors plus housing
X35	VIS Pre-Amp	Power	DB9S	

Connector Number	Unit	Usage	Connector Type	Comment
X40	UVB PULPO	UVB Shutter Control	High Density DB HD15S	
X41	UVB PULPO	UVB Detector Head Thermal Control	DB37S	
X42	UVB PULPO	UVB CCD Cryostat Vacuum Monitoring	DIN 6	
X43	UVB PULPO	FIERA DFE Temperature Monitoring	LEMO 0:4	
X44	UVB PULPO	Power Supply In	LEMO 2:4	
X45	UVB PULPO	UVB Vacuum and Temperature Alarm	LEMO 0:2	
X46	UVB PULPO	LCU Host Serial Communication Interface	DB9P	
X47	UVB PULPO Fiber Converter	LCU Host Serial Communication Interface In	DB9S	
X48	UVB PULPO Fiber Converter	LCU Host Serial Communication Interface Fiber Tx	ST Fiber connector	Tx connects to Rx at LCU.
X49	UVB PULPO Fiber Converter	LCU Host Serial Communication Interface Fiber Rx	ST Fiber connector	Rx connects to Tx at LCU.
X50	VIS PULPO	VIS Shutter Control	High Density DB HD15S	
X51	VIS PULPO	VIS Detector Head Thermal Control	DB37S	
X52	VIS PULPO	VIS CCD Cryostat Vacuum Monitoring	DIN 6	
X53	VIS PULPO	FIERA DFE Temperature Monitoring	LEMO 0:4	
X54	VIS PULPO	Power Supply In	LEMO 2:4	
X55	VIS PULPO	UVB Vacuum and Temperature Alarm	LEMO 0:2	
X56	VIS PULPO	LCU Host Serial Communication Interface	DB9P	
X57	VIS PULPO Fiber Converter	LCU Host Serial Communication Interface In	DB9S	
X58	VIS PULPO Fiber Converter	LCU Host Serial Communication Interface Fiber Tx	Fiber Optic ST connector	Tx connects to Rx at LCU.
X59	VIS PULPO Fiber Converter	LCU Host Serial Communication Interface Fiber Rx	Fiber Optic ST connector	Rx connects to Tx at LCU.
X60	FIERA DFE	Video Board #0 Video 0 VIS MIT/ LL CCD A Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X61	FIERA DFE	Video Board #0 Video 1 VIS MIT/ LL CCD B Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X62	FIERA DFE	Video Board #0 Video 2 UVB E2V CCD Left Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X63	FIERA DFE	Video Board #0 Video 3 UVB E2V CCD Right Amplifier	Huber & Suhner 22 BNO-0-0-2/133	Shielded Twinax
X64	FIERA DFE	Video Board #0 Pre-Amp Power Supply	DB9S	
X65	FIERA DFE	Bias Board #0 Connector A UVB CCD Biases	High Density DB HD44P	
X66	FIERA DFE	Bias Board #0 Connector B VIS CCD Biases	High Density DB HD44S	
X67	FIERA DFE	Clock Board #0 P0-A UVB CCD Clocks 0..7	8xFM8W8S Male RA	8 Coax. Connectors plus housing
X68	FIERA DFE	Clock Board #0 P0-B UVB CCD Clocks 8..13	8xFM8W8S Male RA	8 Coax. Connectors plus housing

Connector Number	Unit	Usage	Connector Type	Comment
X69	FIERA DFE	Clock Board #1 P0-A VIS CCD Clocks 0..7	8xFM8W8S Male RA	8 Coax. Connectors plus housing
X70	FIERA DFE	Clock Board #1 P0-B VIS CCD Clocks 8..13	8xFM8W8S Male RA	8 Coax. Connectors plus housing
X71	FIERA DFE	FIERA Host Communication Fiber Link Out	Fiber Optic ST connector	Out connects to In on PCI Board.
X72	FIERA DFE	Power Supply	Cannon ITT CA02COM-E28-15P	Circular connector
X73	FIERA DFE	FIERA Temperature Monitoring	LEMO 1:4	
X74	FIERA DFE	FIERA Host Communication Fiber Link In	Fiber Optic ST connector	In connects to Out onPCI Board.
X80	FIERA Power Supply	FIERA DFE Power Supply	Cannon ITT CA02COM-E28-15P	Circular connector
X81	FIERA Power Supply	FIERA Over Temperature Alarm	Binder 4 pin socket	
X82	FIERA Power Supply	AC Mains Power In	IEC Appliance Connector	
X83	FIERA Power Supply	UVB PULPO Power Supply	LEMO 2:4	
X89	LCU PCI Board	FIERA Host Communication Fiber Link Out	Fiber Optic ST connector	Out connects to In on Comm. Board.
X90	LCU PCI Board	FIERA Host Communication Fiber Link In	Fiber Optic ST connector	In connects to Out on Comm. Board.
X91	LCU UVB Fiber Converter	UVB PULPO Host Serial Link Interface Fiber Rx	Fiber Optic ST connector	Rx connects to Tx at PULPO.
X92	LCU UVB Fiber Converter	UVB PULPO Host Serial Link Interface Out	DB9P	
X93	LCU VIS Fiber Converter	VIS PULPO Host Serial Link Interface Fiber Rx	Fiber Optic ST connector	Rx connects to Tx at PULPO.
X94	LCU VIS Fiber Converter	VIS PULPO Host Serial Link Interface Out	DB9P	
X95	LCU Serial Communication Board bh00	Serial Link 1 UVB PULPO Host Serial Communication	TBD	Depends on choice of serial interface card in LCU.
X96	LCU Serial Communication Board bh01	Serial Link 2 VIS PULPO Host Serial Communication	TBD	Depends on choice of serial interface card in LCU.
X97	LCU UVB Fiber Converter	UVB PULPO Host Serial Link Interface Fiber Tx	Fiber Optic ST connector	Tx connects to Rx at PULPO.
X98	LCU VIS Fiber Converter	VIS PULPO Host Serial Link Interface Fiber Tx	Fiber Optic ST connector	Tx connects to Rx at PULPO.
X99	FIERA Power Supply	VIS PULPO Power Supply	LEMO 2:4	

5 Appendix E : Cables

To uniquely identify each cable in the system, each is given a unique number starting with a ‘W”. When labeling, prefix “XSH-CCD-“ should be added before the “W”.

Table 2: Details of cable used in Detector System

Cable Number	Cable Name (Purpose)	From Conn. ID/Unit	Intermediate Routing	To Conn. ID/Unit	Max. Length (m)	Test Cable Length (m)	Final Length (m)	Num. [1]of Spare	Manufactures ID or Drawing Reference	Cable Size (Num. x Φ) # Note	Comment
W0	UVB CCD Video	X0 / UVB Detector Head	Short distance, Hang in air	X14 / UVB Pre-Amp Video	< 0.3	0.2	**0.15**	1	Figure 1	6mm	**Right angle** connector at Detector Head
W1	UVB CCD Biases	X1 / UVB Detector Head	Clamped to bottom of UVB Spectr	X65 / FIERA DFE Bias Brd 0 Conn. A	< 2	2	**2.3**	1	Figure 2	10mm	**Right angle** connector at Detector Head
W2	UVB CCD Clocks	X2 /UVB Detector Head	Clamped to bottom of UVB Spectr.	X67 and X68 / FIERA DFE Clock Board 0	< 2	2	**2.3**	1	Figure 4	2x8mm	**Right angle** connector at Detector Head
W3	UVB Detector Head Thermal Control	X3 / UVB Detector Head	Clamped to bottom of UVB Spectr	X41 / UVB PULPO	< 5	3	**2.2**	1	Figure 6	12mm	**Right angle** connector at Detector Head
W4	UVB Cryostat Vacuum Monitoring	X4 / UVB Cryostat Vacuum Gauge	Run along top ring.	X42 / UVB PULPO	< 10	6	**4.0**	1	**Figure 16**	5mm	
W10	UVB E2V CCD Left Amplifier	X10 / UVB Pre-Amp Video 0	Clamped to bottom of UVB Spectr	X62 / FIERA DFE Video Board Video 2	< 2	2	**2.35**	1	**Figure 7 and Figure 8**	6mm	**Straight** connector at Pre-amp. **Right angle** at Video Board
W11	UVB E2V CCD Right Amplifier	X11 / UVB Pre-Amp Video 1	Clamped to bottom of UVB Spectr	X63 / FIERA DFE Video Board Video 3	< 2	2	**2.35**	0	**Figure 7 and Figure 8**	6mm	**Straight** connector at Pre-amp. **Right angle** at Video Board
W20	VIS CCD Video	X20 / VIS Detector Head	Short distance, Hang in air	X34 / VIS Pre-Amp	< 0.2	0.2	**0.2**	1	Figure 1	6mm	**Right angle** connector at Detector Head
W21	VIS CCD Biases	X21/ VIS Detector Head	Cable clamp on lower lip of instrument	X66 / FIERA DFE Bias Brd 0 Conn. B	< 2	2	**2.3**	1	Figure 3	10mm	**Straight** connector at Detector Head

[1] This column indicates the number of cables that will be made and kept as spares.

Cable Number	Cable Name (Purpose)	From Conn. ID/Unit	Intermediate Routing	To Conn. ID/Unit	Max. Length (m)	Test Cable Length (m)	Final Length (m)	Num. of Spare	Manufactures ID or Drawing Reference	Cable Size (Num. x Φ) # Note	Comment
W22	VIS CCD Clocks	X22/ VIS Detector Head	Cable clamp on lower lip of instrument	X69 and X70 / FIERA DFE Clock Board 1	< 2	2	**2.3**	1	Figure 5	2x8mm	**Straight** connector at Detector Head
W23	VIS Detector Head Thermal Control	X23/ VIS Detector Head	Cable clamp on lower lip of instrument	X51 / VIS PULPO	< 5	3	**3.3**	1	Figure 6	12mm	**Straight** connector at Detector Head
W24	VIS Cryostat Vacuum Monitoring	X24/ VIS Cryostat Vacuum Gauge	Run along top ring.	X52 / VIS PULPO	< 10	6	**6.8**	1	**Figure 16**	5mm	Custom Cable
W30	VIS CCD MIT/ LL CCD A Amplifier	X30/ VIS Pre-Amp Video 0	Cable clamp on lower lip of instrument	X60 / FIERA DFE Video Board Video 0	< 2	2	**2.4**	1	**Figure 7 and Figure 8**	6mm	**Straight** connector at Pre-amp. **Right angle** at Video Board
W31	VIS CCD MIT/ LL CCD B Amplifier	X31/ VIS Pre-Amp Video 1	Cable clamp on lower lip of instrument	X61 / FIERA DFE Video Board Video 1	< 2	2	**2.4**	0	**Figure 7 and Figure 8**	6mm	**Straight** connector at Pre-amp. **Right angle** at Video Board
W40	UVB Shutter Control	X40 / UVB PULPO		UVB Shutter/SLED Drive Units	< 10	-	**0.6/5.0**	-	**Figure 17**	2x6mm	Provided by consortium partner.
W48	UVB PULPO Host Serial Link Fiber	X48 & X49 / UVB PULPO Fiber Converter		X93 & X98 / LCU UVB Fiber Converter	< 500	20	**10**	0	Huber & Suhner[2] 50um Fiber cable E-2-50-20/20-4-xx	7mm	xx=length in meter (ST connectors)
W50	VIS Shutter Control	X50 / VIS PULPO		VIS Shutter/SLED Drive Units	< 10	-	**0.6/5.0**	-	**Figure 17**	2x6mm	Provided by consortium partner.
W58	VIS PULPO Host Serial Link Fiber	X58 & X59 / VIS PULPO Fiber Converter		X91 & X97 / LCU VIS Fiber Converter	< 500	20	**10**	0	Huber & Suhner2 50um Fiber cable E-2-50-20/20-4-xx	7mm	xx=length in meter (ST connectors)
W64	Preamplifier Power	X64 / FIERA DFE Video Board 0	Cable clamped same as others	X15 / UVB and X35 / VIS Pre-Amps	< 2	2	**2.4**		Figure 9 and Figure 10	2x6mm	Both cables same length
W71	FIERA Host Comm. Fiber Link	X71 & 74/ FIERA DFE Communicatio		X89 & X90 / LCU PCI Interface Board	< 500	20	**10**	0	Huber & Suhner2 50um Fiber cable E-2-50-20/20-4-xx	7mm	xx=length in meter (ST connectors)

[2] http://www.hubersuhnerinc.com/products/hs-p-fo/hs-p-fo-sys

Cable Number	Cable Name (Purpose)	From Conn. ID/Unit	Intermediate Routing	To Conn. ID/Unit	Max. Length (m)	Test Cable Length (m)	Final Length (m)	Num. of Spare	Manufactures ID or Drawing Reference	Cable Size (Num. x Φ) # Note	Comment
		n Board									
W72	FIERA DFE Power	X72 / FIERA DFE		X80 / FIERA Power Supply	< 1.5	1.5	**0.5**	1	Figure 11	20mm	
W73	FIERA DFE Temperature Monitoring	X73 / FIERA DFE		X43 / UVB PULPO	< 5	-	**0.7**	1	Figure 12	5mm	
W82	FIERA Power Supply AC Mains In	X82 / FIERA Power Supply		AC Mains in thermal cabinet	< 20	3		-	RS 305-9825[3] **Figure 15**	6mm	
W83	PULPO Power Supply	X83 / FIERA Power Supply		X44 / UVB PULPO	< 2	2	**0.9**	1	Figure 13	5mm	Supplies UVB PULPO
W92	UVB PULPO Host Serial Link Copper Cable	X94 / LCU UVB Fiber Converter		X96 / LCU Serial Comm. Board	< 10	2	**1.0**	1	**Figure 14**	5mm	
W94	VIS PULPO Host Serial Link Copper Cable	X92 / LCU VIS Fiber Converter		X95 / LCU Serial Comm. Board	< 10	2	**1.0**	1	**Figure 14**	5mm	
W99	PULPO Power Supply	X99 / FIERA Power Supply		X54 / VIS PULPO	< 2	2	**1.1**	1	Figure 13	5mm	Supplies VIS PULPO

1. Cable sizes are best guess at present. Most cables are custom so diameters can vary slightly.

5.1 Schematics and Assembly

The following section contains schematic, assembly drawings and connection tables of cables custom manufactured by ESO.

Schematic/Assembly/Connection Table	Drawing Number	File Name in Drawing Directory[4]
Figure 1: Schematic and assembly; CCD Video Cable (W0, W20).	XSH-SCH-ESO-6000-2000	XSH-SCH-ESO-6000-2000_vidcab_4lines_upper_w0_w20.pdf
Figure 2: Schematic and assembly; UVB CCD Bias Cable (W1).	XSH-SCH-ESO-6000-2001	XSH-SCH-ESO-6000-2001_UVB_BIAS_CABLE_W1.pdf
Figure 3: Schematic and assembly; VIS CCD Bias Cable (W21).	XSH-SCH-ESO-6000-2002	XSH-SCH-ESO-6000-2002_VIS_BIAS_CABLE_W21.pdf
Figure 4: Schematic and assembly; UVB CCD Clock Cable (W2).	XSH-SCH-ESO-6000-2003	XSH-SCH-ESO-6000-2003_UVB_CLOCK_CABLE_W2.pdf
Figure 5: Schematic and assembly; VIS CCD Clock Cable (W22).	XSH-SCH-ESO-6000-2004	XSH-SCH-ESO-6000-2004_VIS_CLOCK_CABLE_W22.pdf

[3] RS components http://www.rsonline.de/

[4] Design files are accessible on ODT disk in directory SYSTEMS/X-SHOOTER/Cables

Figure 6: Schematic; Detector Head Thermal Control Cable (W3, W23).	XSH-SCH-ESO-6000-2005	XSH-SCH-ESO-6000-2005_Pulpo_Cable_W3_W23.pdf
Figure 7: Schematic; Coax Amplifier Cable (W10, W11, W30, W31).	XSH-SCH-ESO-6000-2006	XSH-SCH-ESO-6000-2006_Std_Video_W10_W11_W30_W31.pdf
Figure 8: Assembly; Coax Amplifier Cable (W10, W11, W30, W31).	XSH-SCH-ESO-6000-2007	XSH-SCH-ESO-6000-2006_Std_Video_W10_W11_W30_W31.pdf
Figure 9: Schematic; Double Preamplifier Power Cable (W64).	XSH-SCH-ESO-6000-2008	XSH-SCH-ESO-6000-2008_PWR_DOUBLE_PREAMP_W64.pdf
Figure 10: Assembly; Double Preamplifier Power Cable (W64).	XSH-SCH-ESO-6000-2009	XSH-SCH-ESO-6000-2008_PWR_DOUBLE_PREAMP_W64.pdf
Figure 11: Connection Table; FIERA DFE Power Cable (W72), XSH-SCH-ESO-6000-2010.	XSH-SCH-ESO-6000-2010	XSH-SCH-ESO-6000-2010_FIERA_DFE_POWER_CABLE_W72.pdf
Figure 12: Connection Table; FIERA DFE Temperature Monitoring (W73).	XSH-SCH-ESO-6000-2011	XSH-SCH-ESO-6000-2011_FIERA_BOX_PT100_W73.pdf
Figure 13: Connection Table; PULPO Power Cable (W83/W99).	XSH-SCH-ESO-6000-2012	XSH-SCH-ESO-6000-2012_Dual_Pulpo_Power_Cable_W83.pdf
Figure 14: PULPO SLCU Serial Interface Adapter cable (W92/W94).	XSH-SCH-ESO-6000-2013	XSH-SCH-ESO-6000-2013_ Pulpo_SLCU_IF_W92_W94.pdf
Figure 15: Photograph of FIERA Power Supply AC Mains In cable, RS 305-9825.		
Figure 16: PULPO to Vacuum Gauge, Edwards WRG-D, cable (W4/W24).	XSH-SCH-ESO-6000-2014	XSH-SCH-ESO-6000-2014_ Vacuum_W4_W24.pdf
Figure 17: UVB and VIS Shutter/SLED Control Cable(W40/W50).	XSH-SCH-ESO-6000-2015	XSH-SCH-ESO-6000-2015_ ShutterControl_W40_W50.pdf

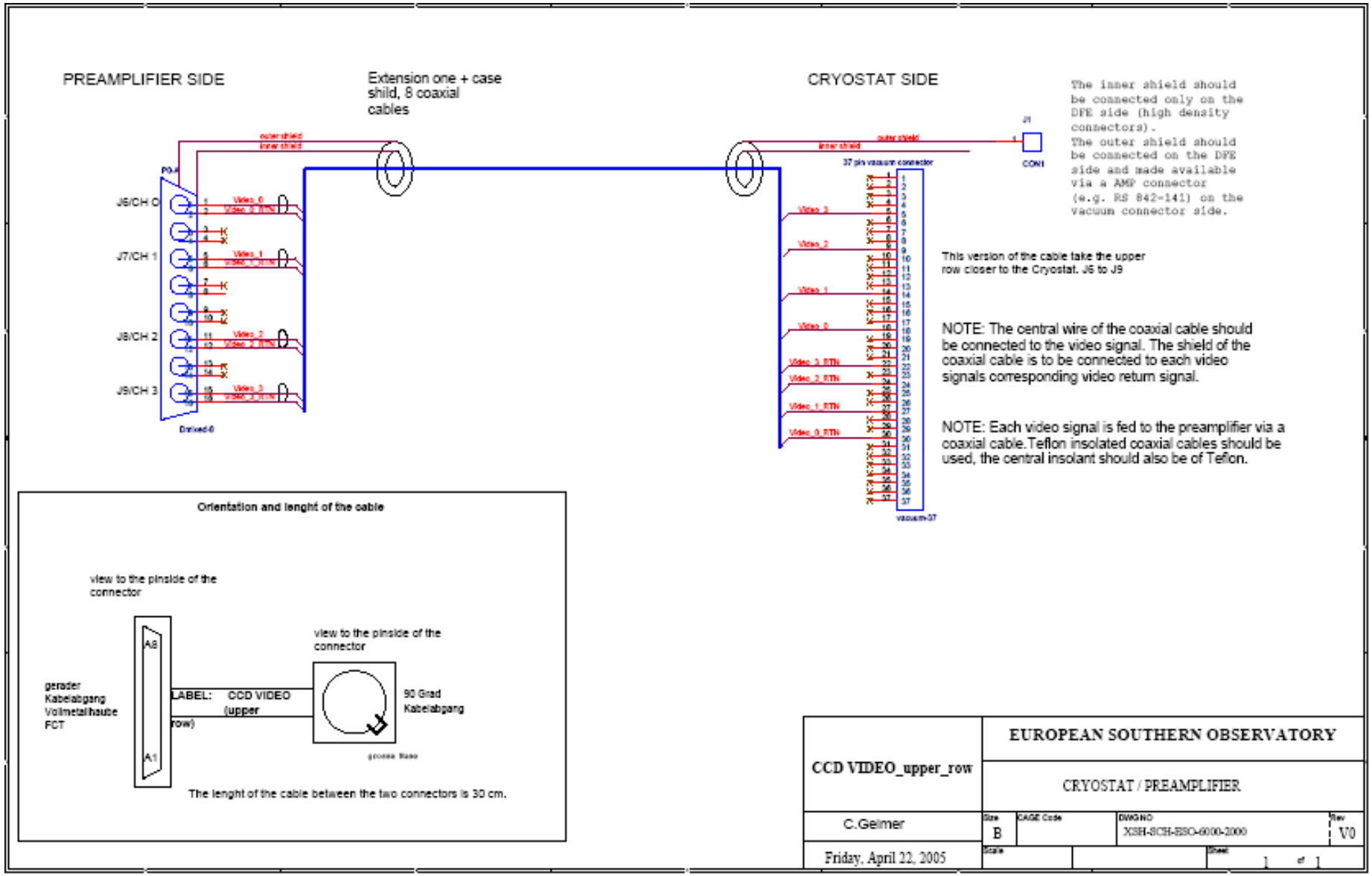


Figure 1: Schematic and assembly; CCD Video Cable (W0, W20).

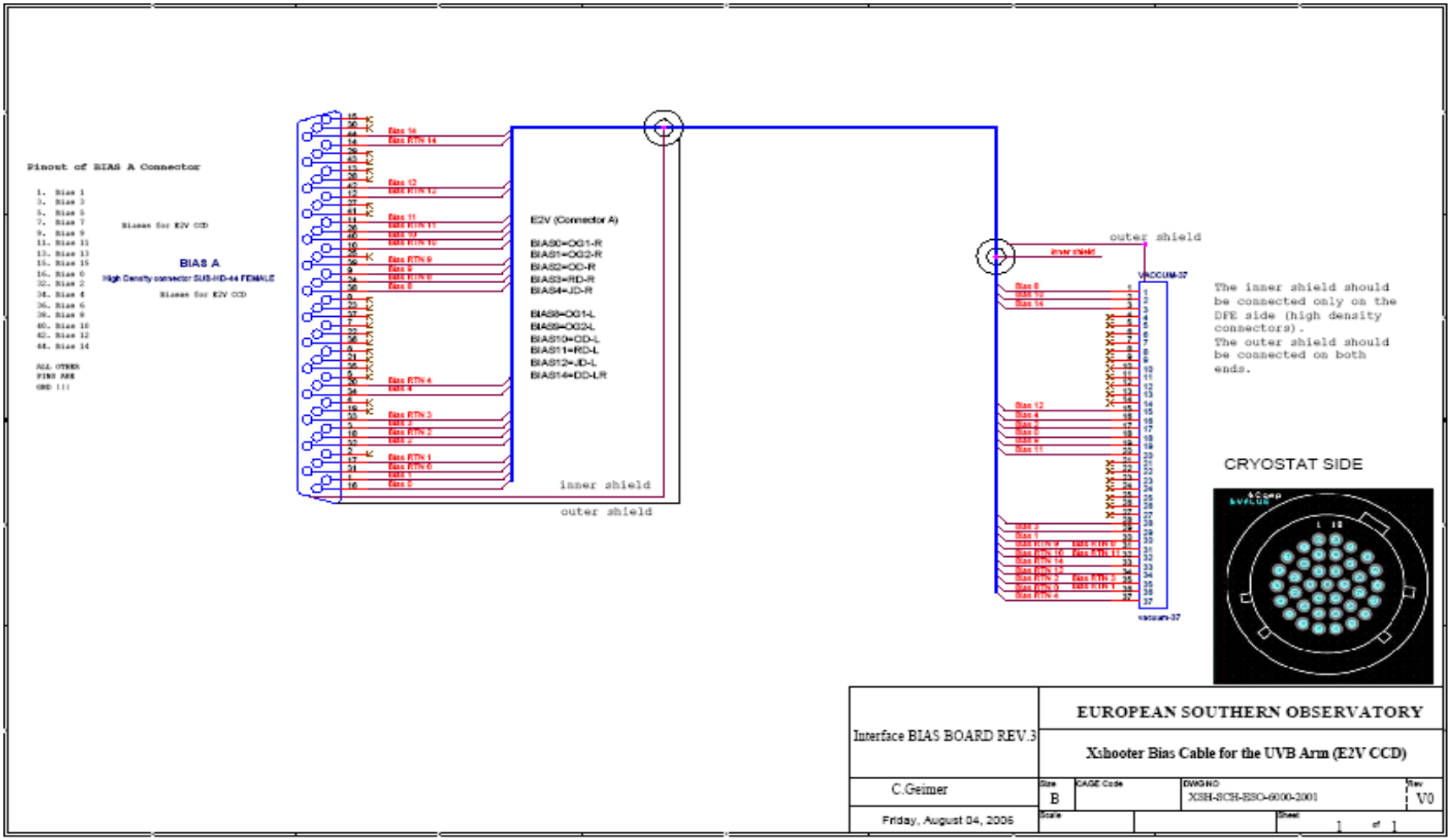


Figure 2: Schematic and assembly; UVB CCD Bias Cable (W1).

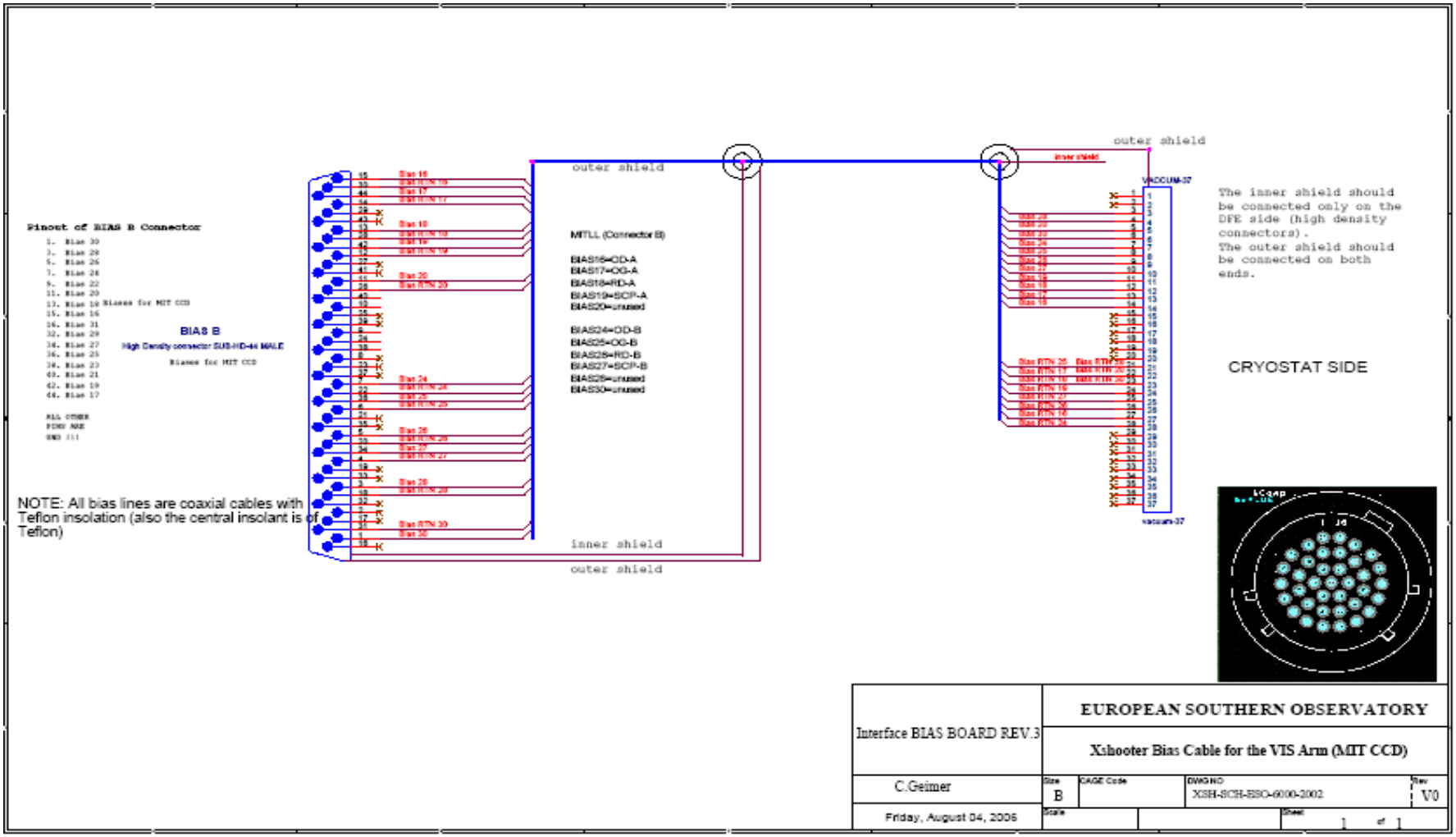


Figure 3: Schematic and assembly; VIS CCD Bias Cable (W21).

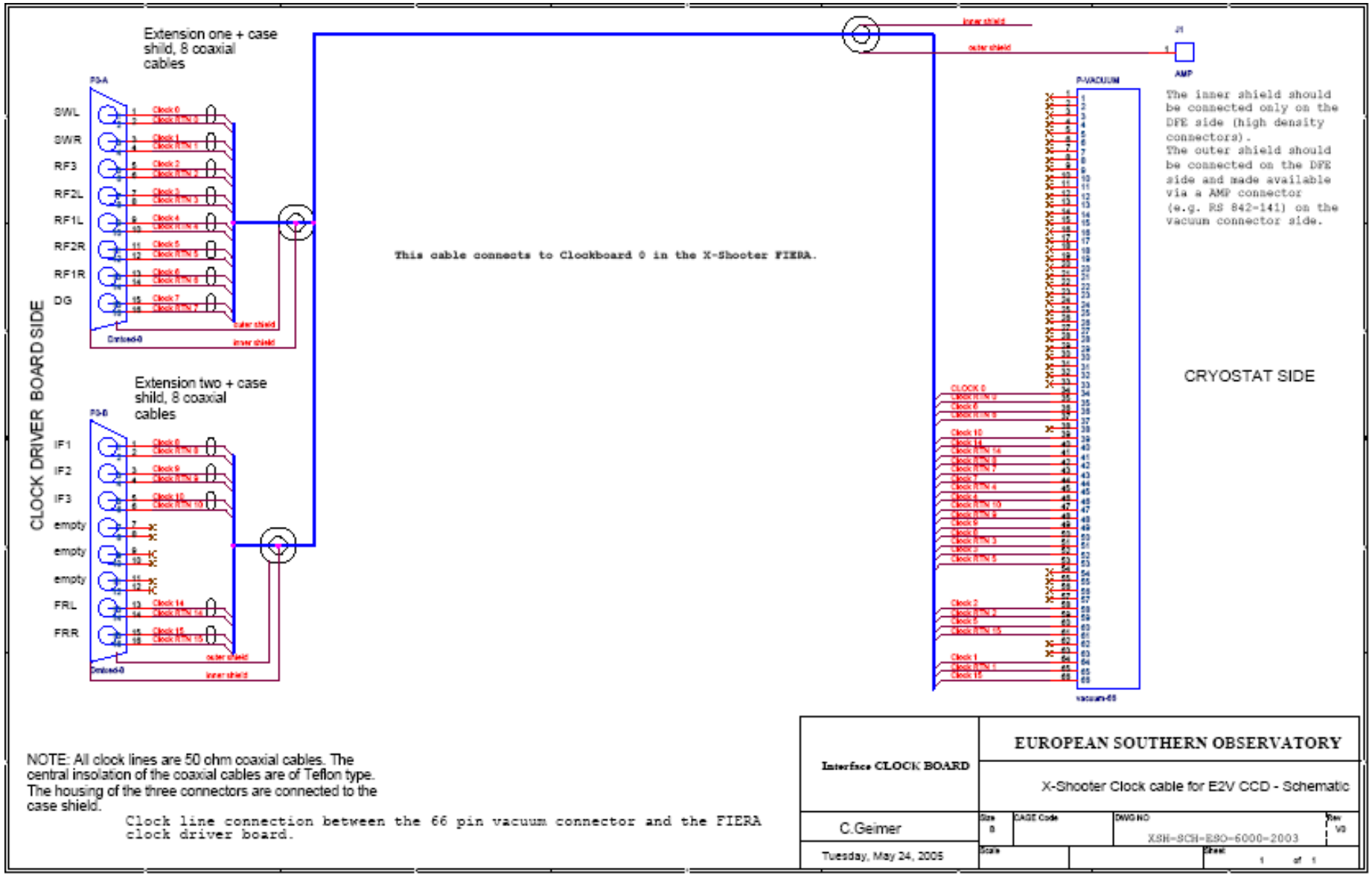


Figure 4: Schematic and assembly; UVB CCD Clock Cable (W2).

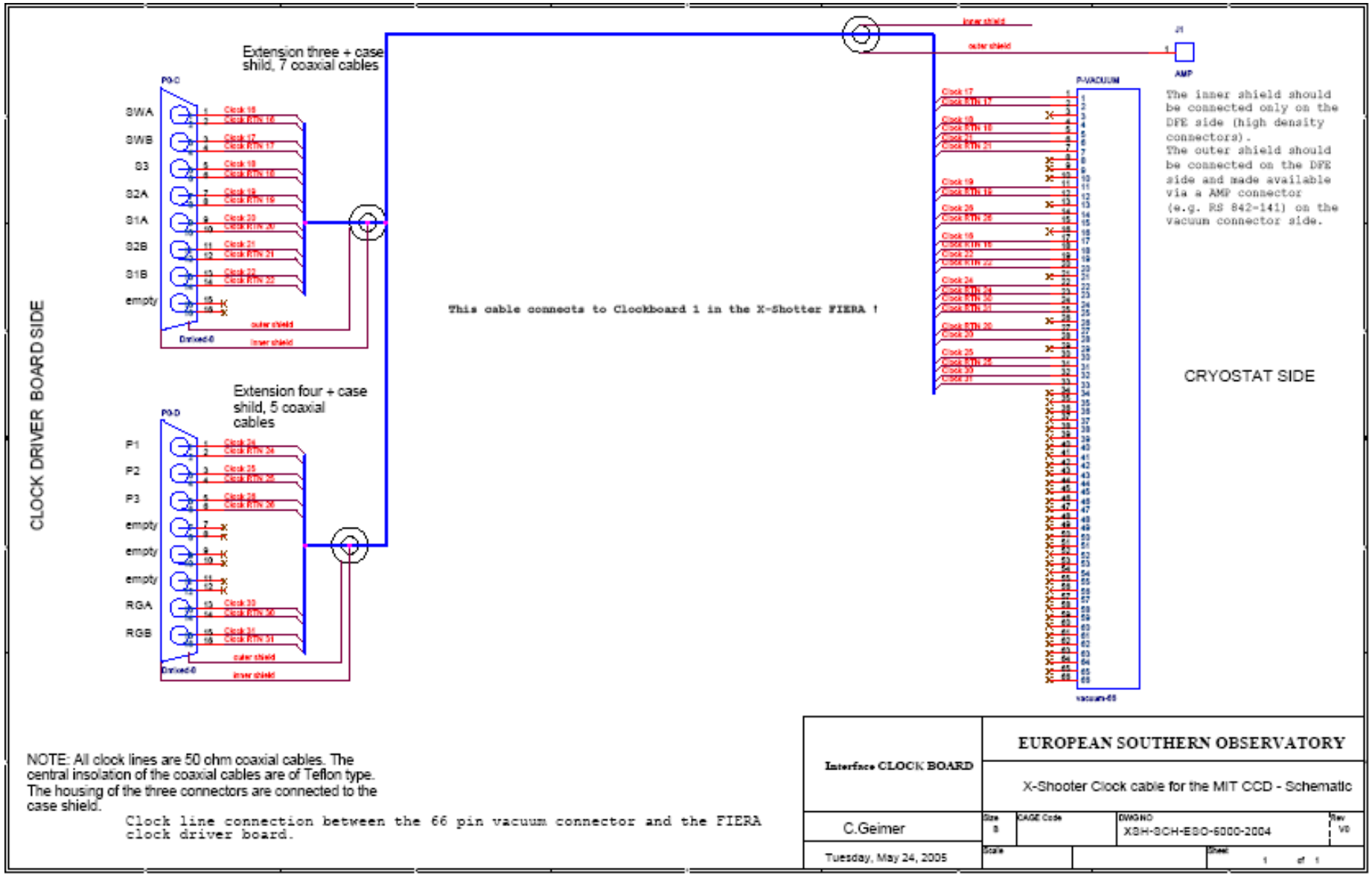


Figure 5: Schematic and assembly; VIS CCD Clock Cable (W22).

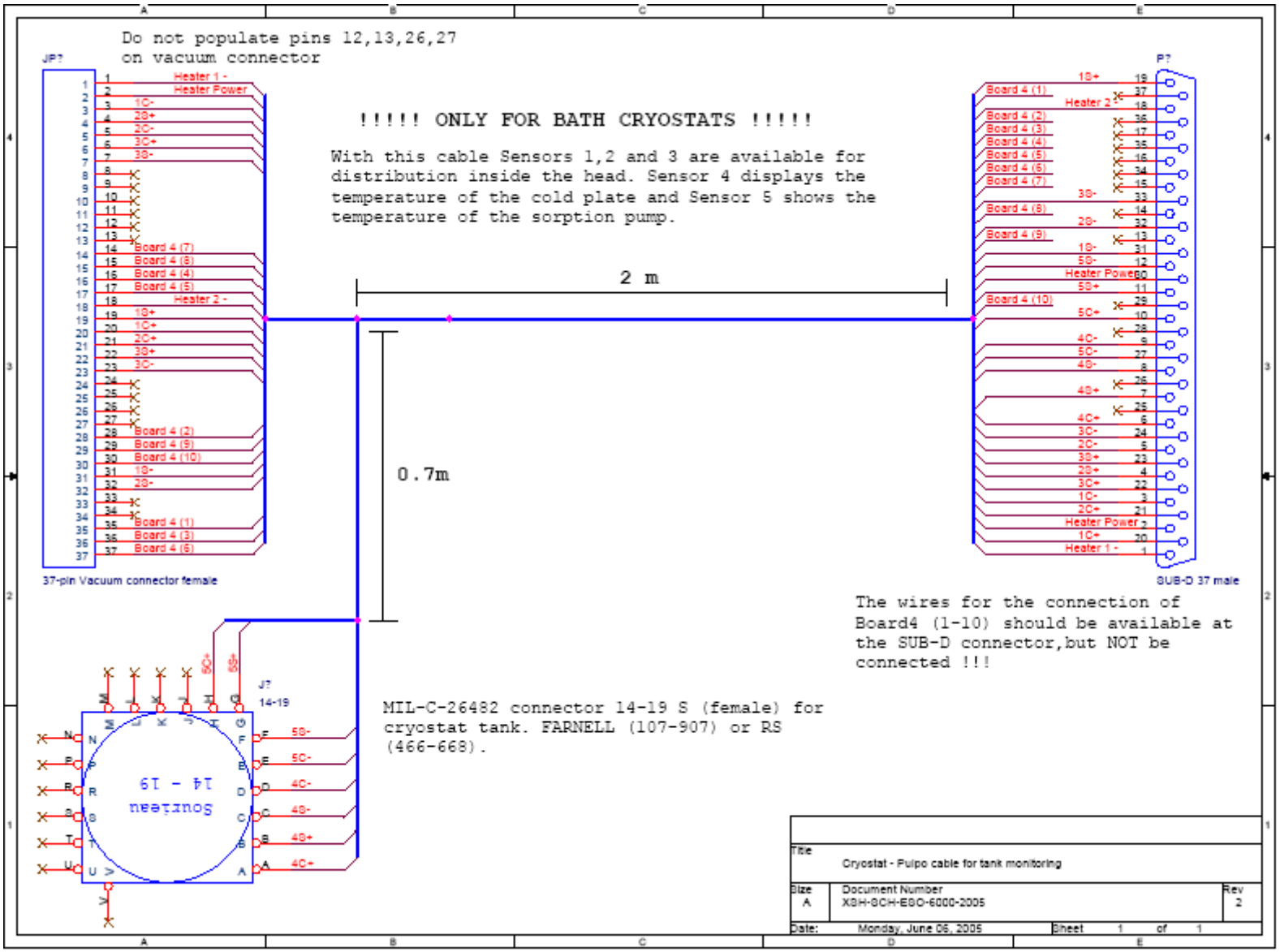


Figure 6: Schematic; Detector Head Thermal Control Cable (W3, W23).

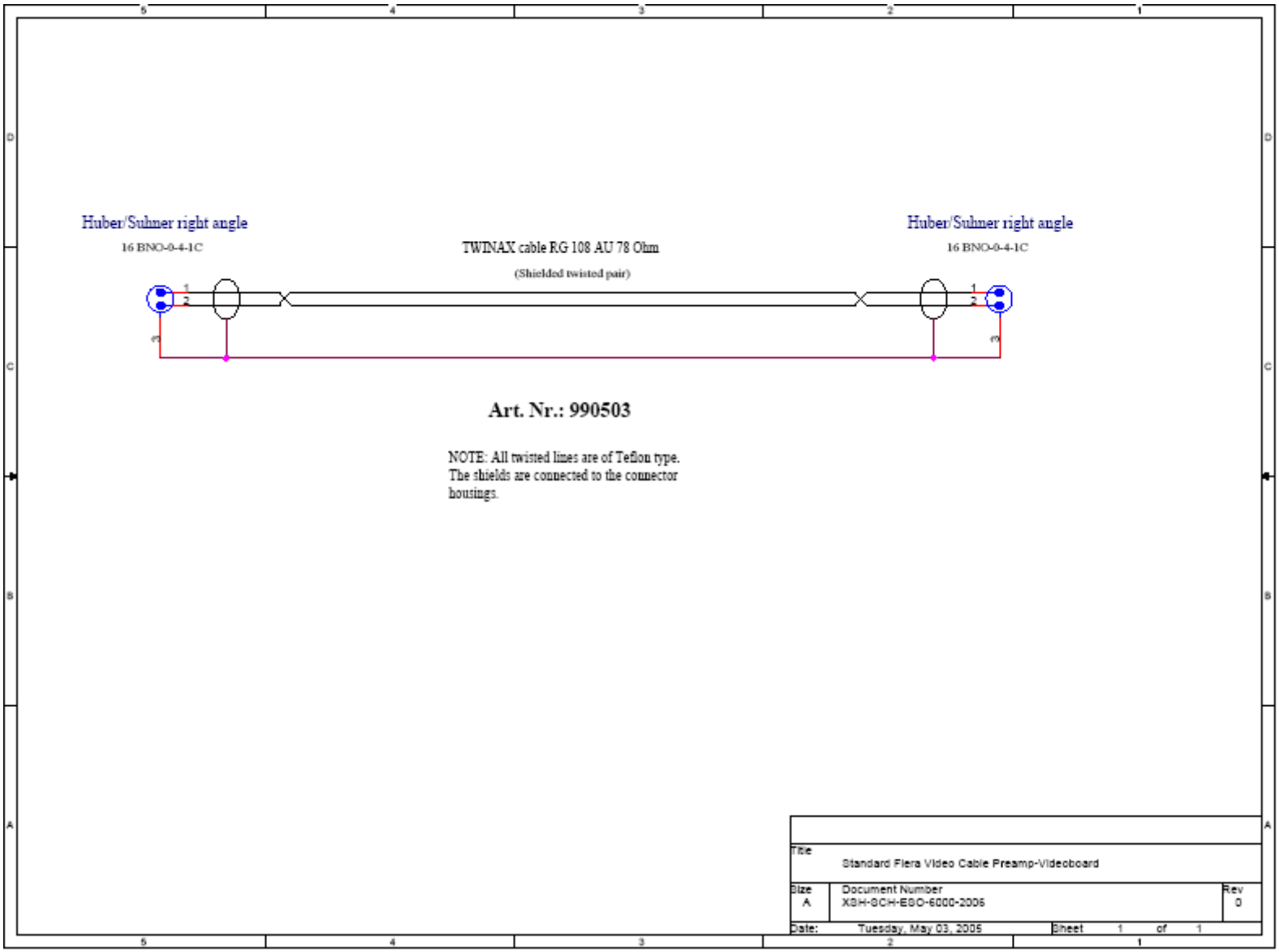


Figure 7: Schematic; Coax Amplifier Cable (W10, W11, W30, W31).

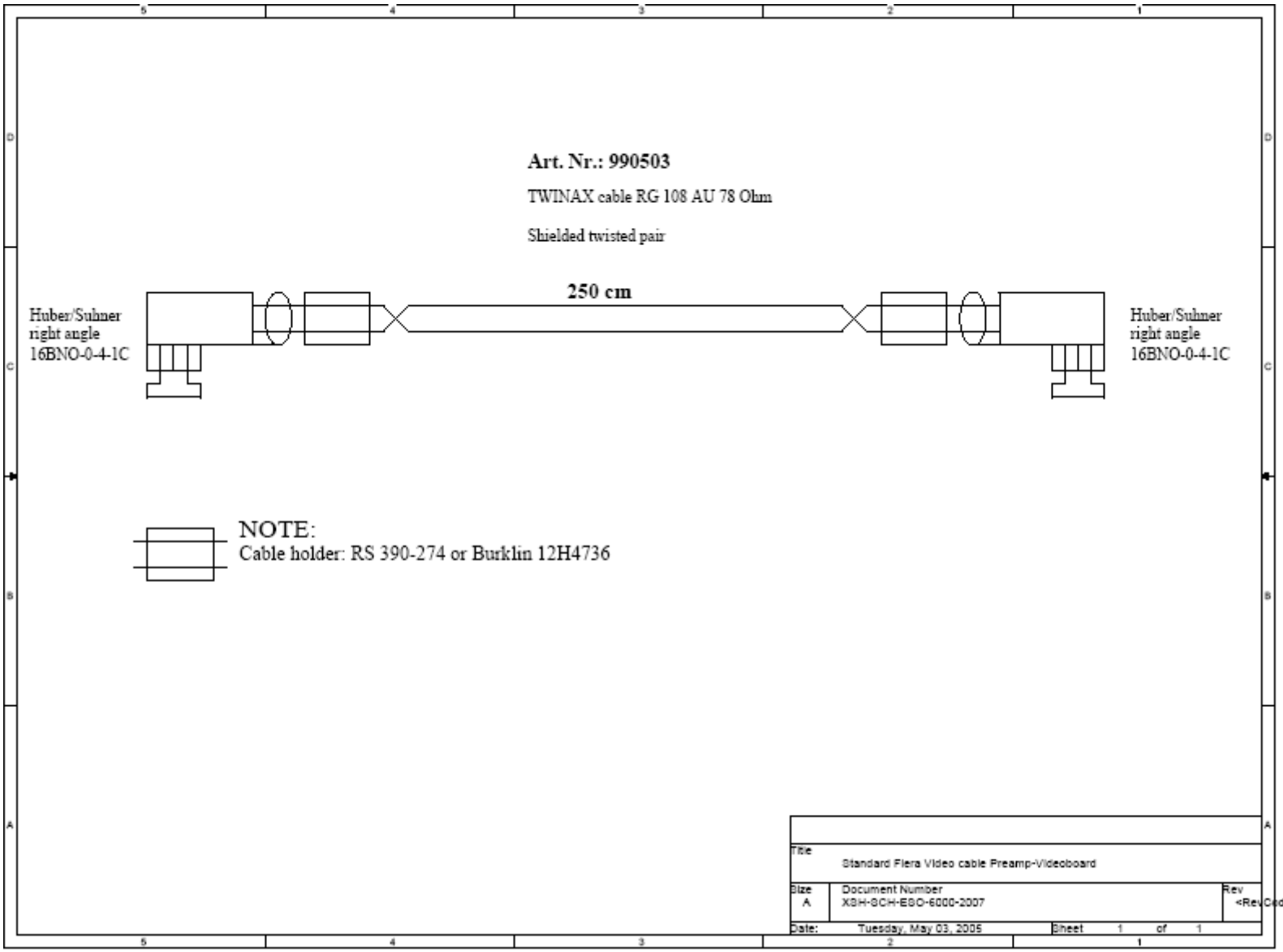


Figure 8: Assembly; Coax Amplifier Cable (W10, W11, W30, W31).

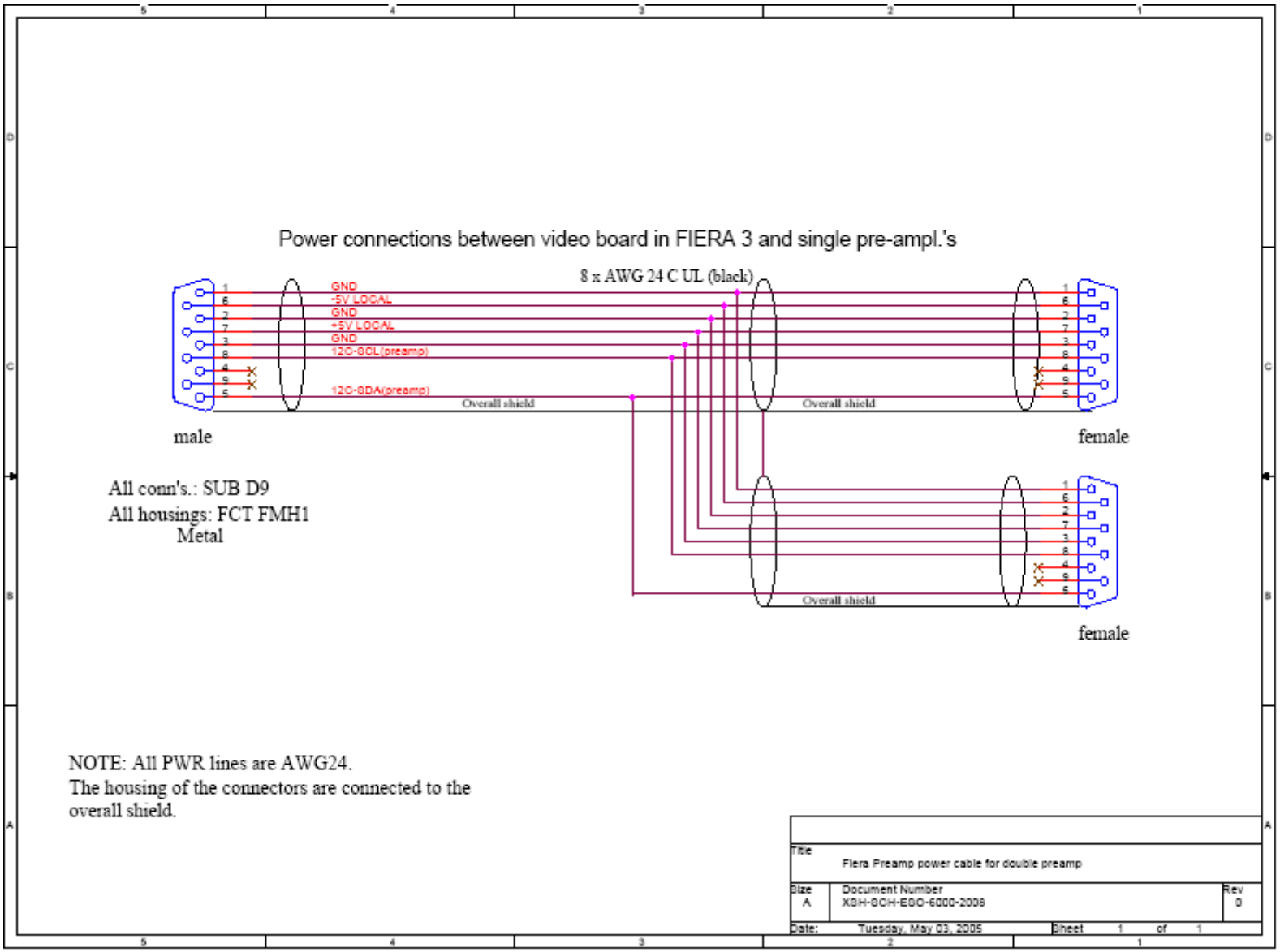


Figure 9: Schematic; Double Preamplifier Power Cable (W64).

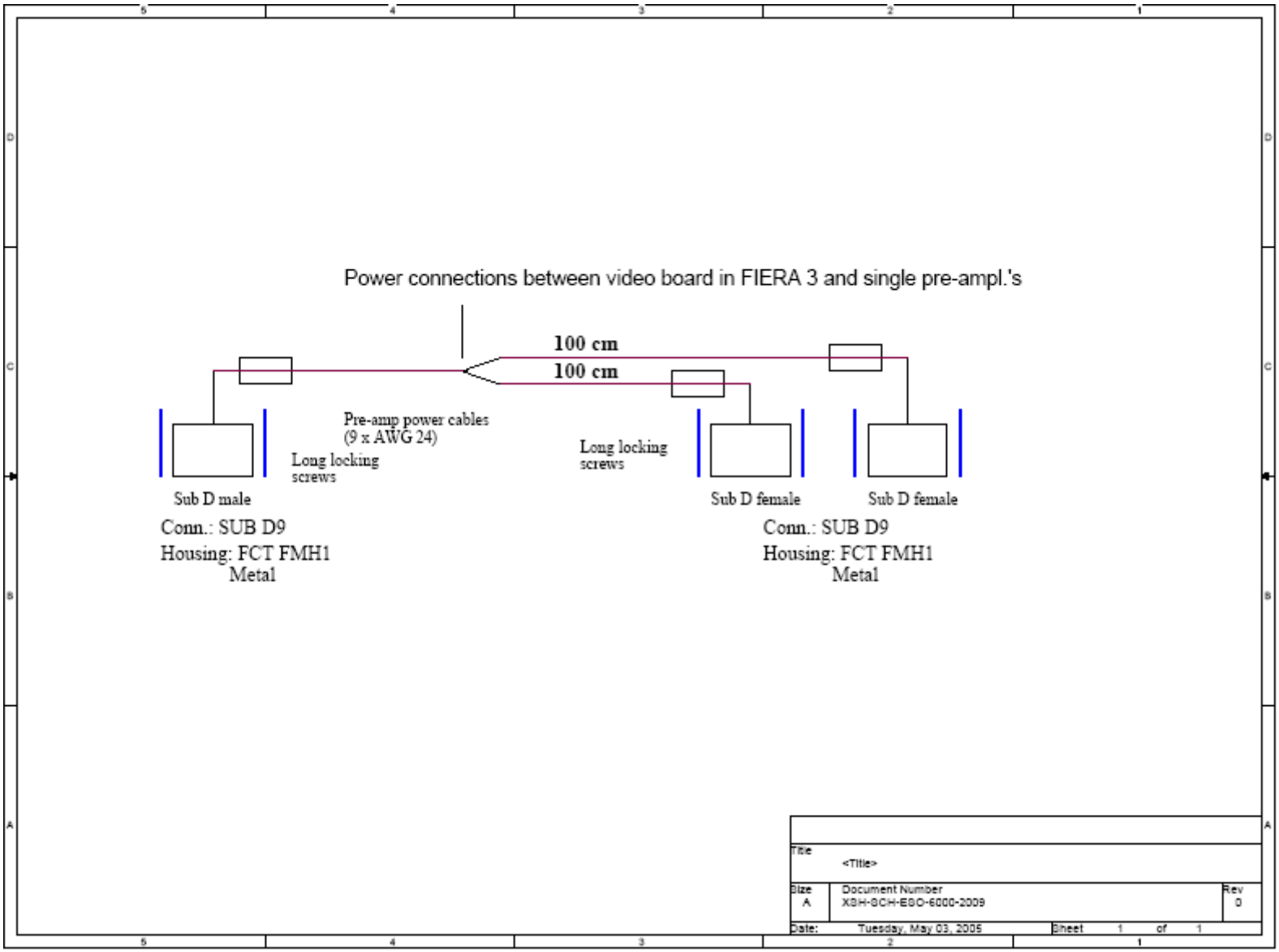


Figure 10: Assembly; Double Preamplifier Power Cable (W64).

Pin Assignment for
FIERA Detector Head /Power Supply
Connector 35pin

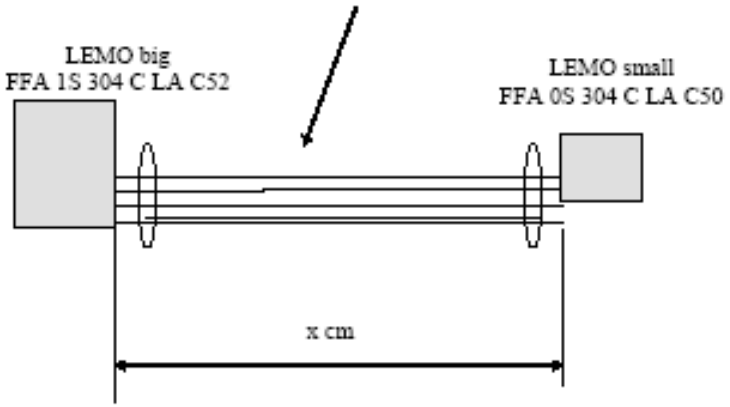
USE	Voltage	cable color	comment	pin on connector
CCD	+5V	rot		P
CCD	+5V	rot		R
CCD	+5V	rot	sense+	S
CCD	5V Gnd	schwarz		U
CCD	5V Gnd	schwarz		V
CCD	5V Gnd	schwarz	sense	W
CCD	+15V	pink		X
CCD	+15V	pink	sense+	Y
CCD	-15V	violett		Z
CCD	-15V	violett	sense-	a
CCD	+30	orange		c
CCD	15V Gnd	schwarz		d
CCD	15V Gnd	schwarz	sense	e
CCD	15V Gnd	schwarz		f
CCD	15V Gnd	schwarz	sense	g
CCD	30V Gnd	schwarz		h
fans +24 V	+24V	weiss		C
bimetal	OHP / pin3	weiss		A
fans 24V GND	24V Gnd	schwarz		B
bimetal	bimetal	schwarz		G
spare	spare	spare		E

Reinhold Dorn, Optical Detector Team, ESO 28.07.98

Notes:
1. Sense lines should be twisted pair and single shielded i.e. -15V, 5V, +15V
2. Cable should have one complete shield around all lines, connected to the housing
3. Pin E should be a spare line 1.5 mm^2
4. normal lines should be 1.5 mm^2
5. sense lines can be form 0.25 to 0.5 mm^2
6. cabling is one to one!
7. Connector is ITT Canon CAO6COM-E28-15S-B

Figure 11: Connection Table; FIERA DFE Power Cable (W72), XSH-SCH-ESO-6000-2010.

FIERA BOX PT100 CABLE DEFINITION
DOC. No.: XSH-SCH-ESO-6000-2011



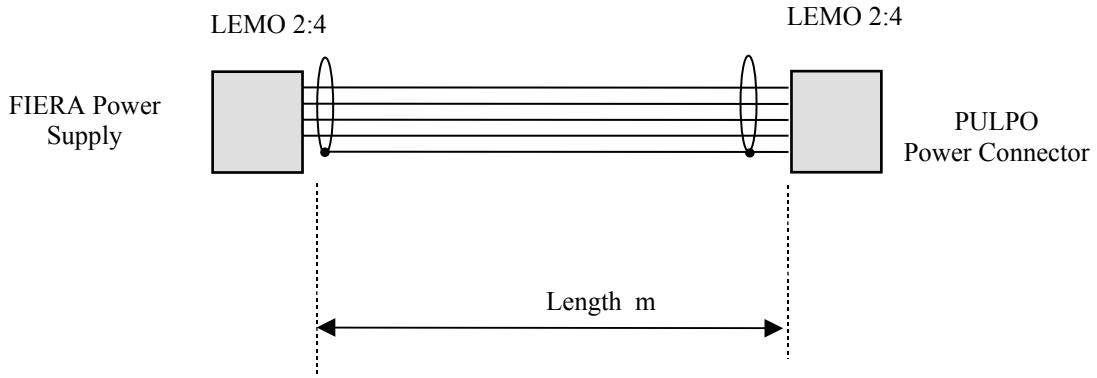
Note: normal cable + shield
Note: LABEL: **FIERA BOX - PT100**

CABLE CONNECTION TABLE:

LEMO CONNECTOR	LEMO CONNECTOR	IGNORE THESE NAMES. FOR REF. ONLY	NOTES IMPORTANT
1	1	sense +	PT100
2	2	sense +	PT100
3	3	sense -	PT100
4	4	sense -	PT100
shield	shield	shield	

Figure 12: Connection Table; FIERA DFE Temperature Monitoring (W73).

PULPO POWER CABLE DEFINITION
DOC No.: XSH-SCH-ESO-6000-2012



CABLE CONNECTION TABLE:

FIERA POWER SUPPLY LEMO CONNECTOR	PULPO LEMO CONNECTOR	Power Module Name	Signal Name
1	**1**	**Vpos**	**24V**
2	**2**	**Vsense +**	**24V**
3	**3**	**Vneg**	**24V Ret**
4	**4**	**Vsense -**	**24V Ret**
shield	**shield**	**shield**	**shield**

Figure 13: Connection Table; PULPO Power Cable (W83/W99).

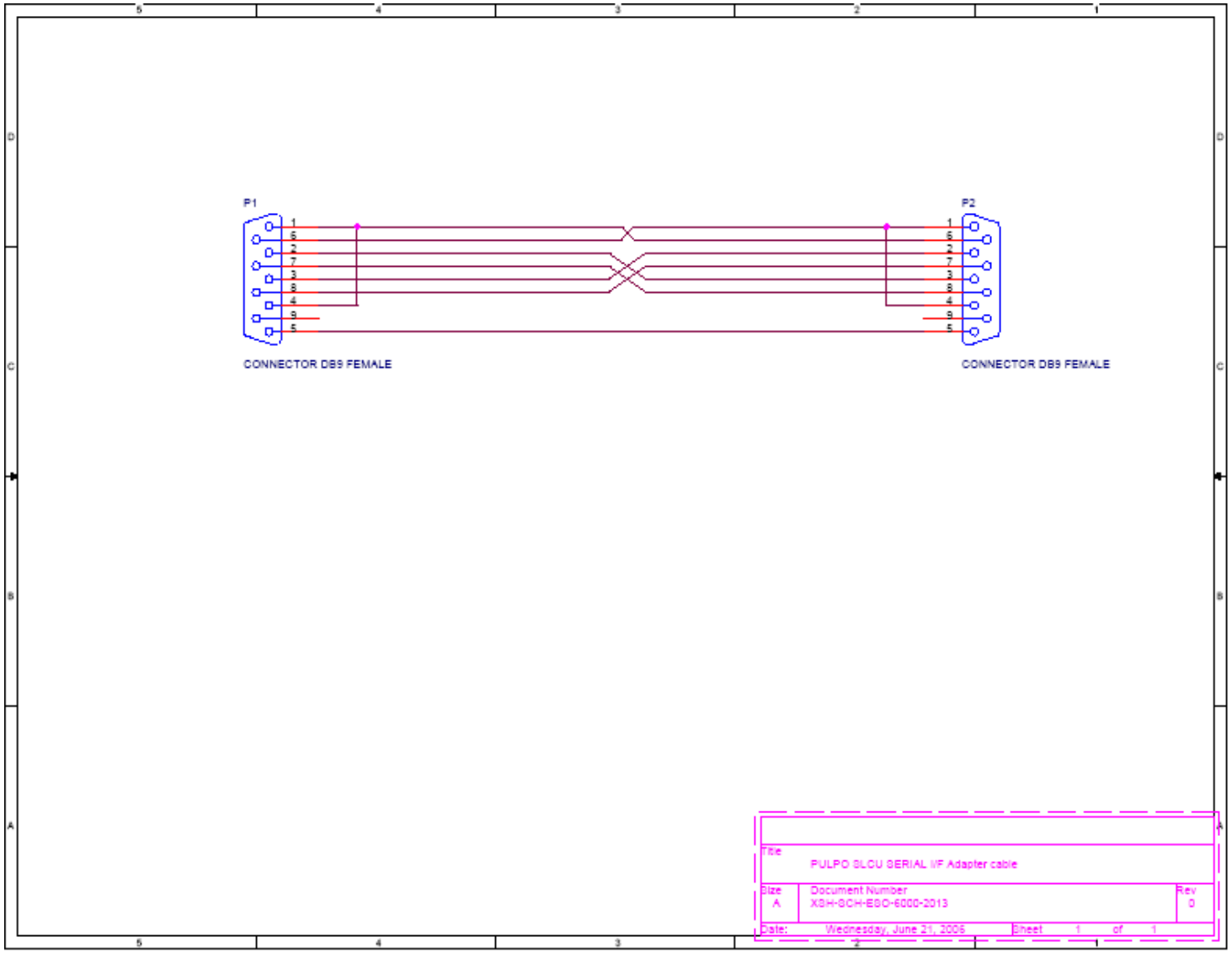


Figure 14: PULPO SLCU Serial Interface Adapter cable (W92/W94).

Figure 15: Photograph of FIERA Power Supply AC Mains In cable, RS 305-9825.

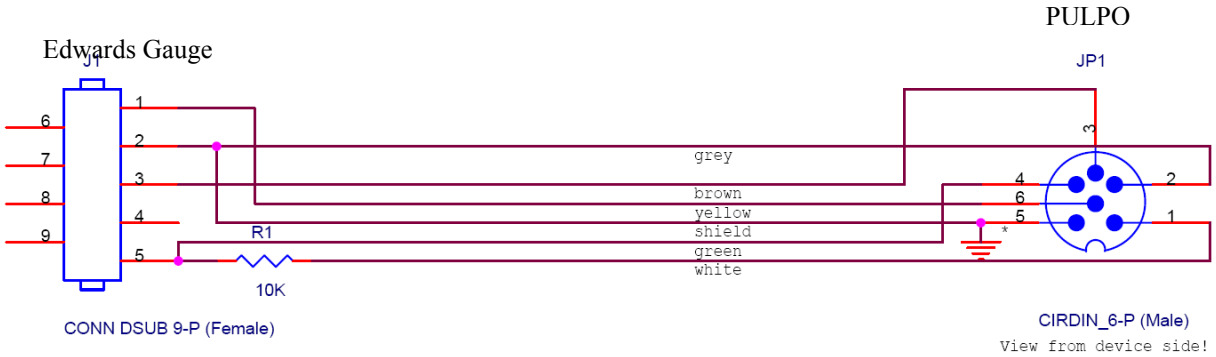


Figure 16: PULPO to Vacuum Gauge, Edwards WRG-D, cable (W4/W24).

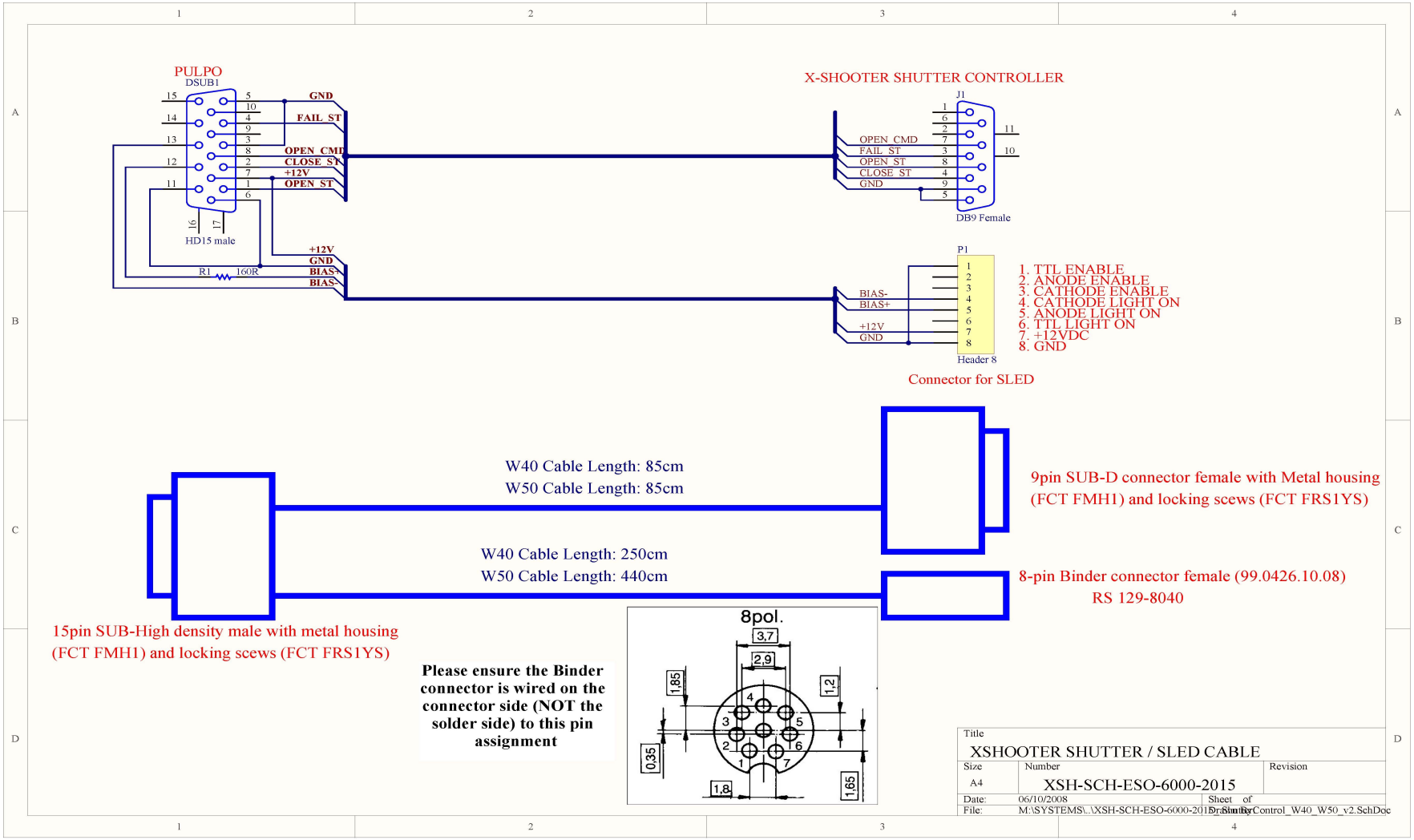


Figure 17: UVB and VIS Shutter/SLED Control Cable(W40/W50).

6 Appendix F: Drawings

The following table provides a list of schematics considered important to X-shooter. More general schematics such as FIERA boards, PULPO, preamplifier can be found on the ODT intranet.

Schematic/ Assembly/ Drawing	Description	Reference	Drawing Number	File Name in Drawing Directory[5]	Comment
System:					
Block Diagram	X-shooter Detector System Block Diagram				
Interconnection Diagram	X-shooter Detector System Interconnection Diagram		XSH-SCH-ESO-6000-1001		
Grounding Scheme	X-shooter Detector System Grounding Scheme		XSH-SCH-ESO-6000-1002		
Detector Head Wiring:					
Detector Head Thermal Control	UVB and VIS Thermal Control	Figure 18	XSH-SCH-ESO-6000-1010	XSH-SCH-ESO-6000-1010_DetHead_Thermal.pdf	
UVB Arm:					
Single E2V Intermediate Flex Schematic	E2V CCD44-82 Intermediate cryogenic board	Figure 19	XSH-SCH-ESO-6000-1011	XSH-SCH-ESO-6000-1011_InterPCB EEV.pdf	
E2V ZIF Socket Flex Schematic	E2V CCD44-82 socket flex board	Figure 20	XSH-SCH-ESO-6000-1012	XSH-SCH-ESO-6000-1012_EEV_ZIFBOARD_PT100.pdf	
VIS Arm:					
Double MIT/LL Intermediate Flex Schematic	MIT/LL CCID-20 Intermediate cryogenic board	Figure 21	XSH-SCH-ESO-6000-1013	XSH-SCH-ESO-6000-1013_interpcb_MIT_MIT.pdf	
Double MIT/LL Flex Circuit Schematic	MIT/LL CCID-20 flex board	Figure 22 and Figure 23		N/A	Manufacturer by Gerry Luppino, Uni of Hawaii/IfA[6]

6.1 Schematics and Assembly Drawings

[5] Design files are accessible on ODT disk in directories under SYSTEMS/X-SHOOTER
[6] http://www.ifa.hawaii.edu/users/ger/default/luppino.html

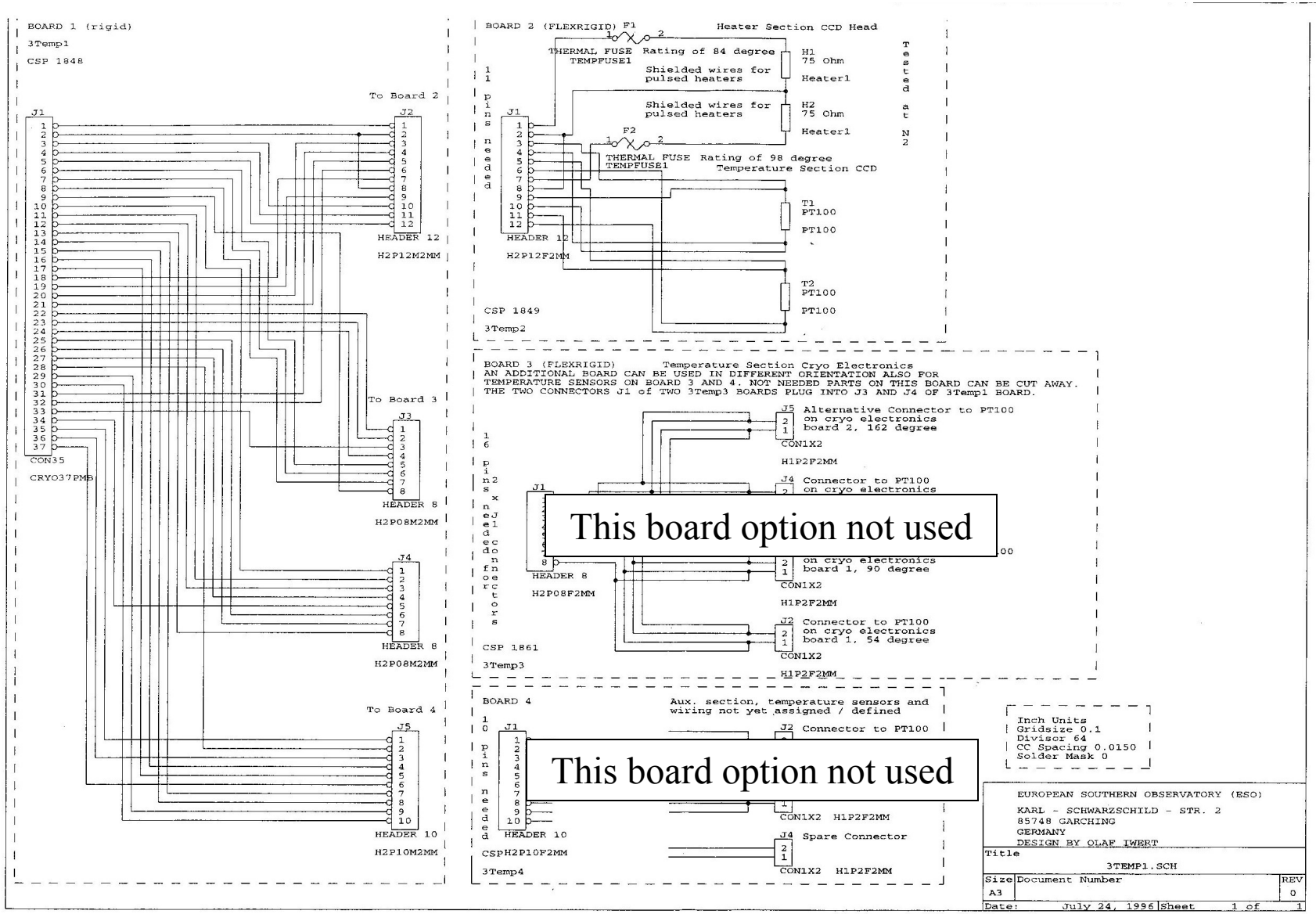


Figure 18: Schematic and assembly; UVB and VIS Detector Head Thermal Control, XSH-SCH-ESO-6000-1010.

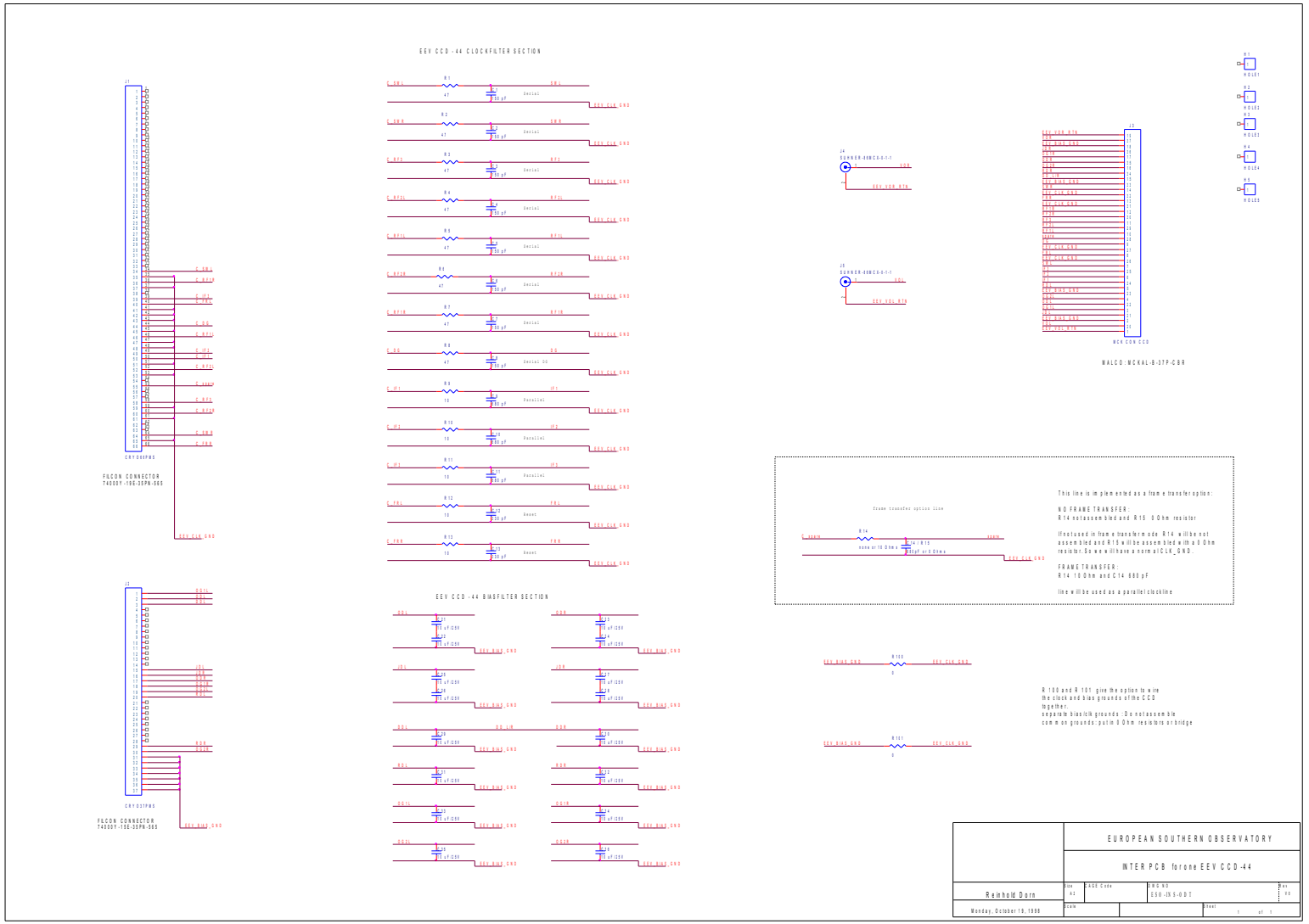


Figure 19: Schematic and assembly; E2V CCD44-82 Intermediate cryogenic board.

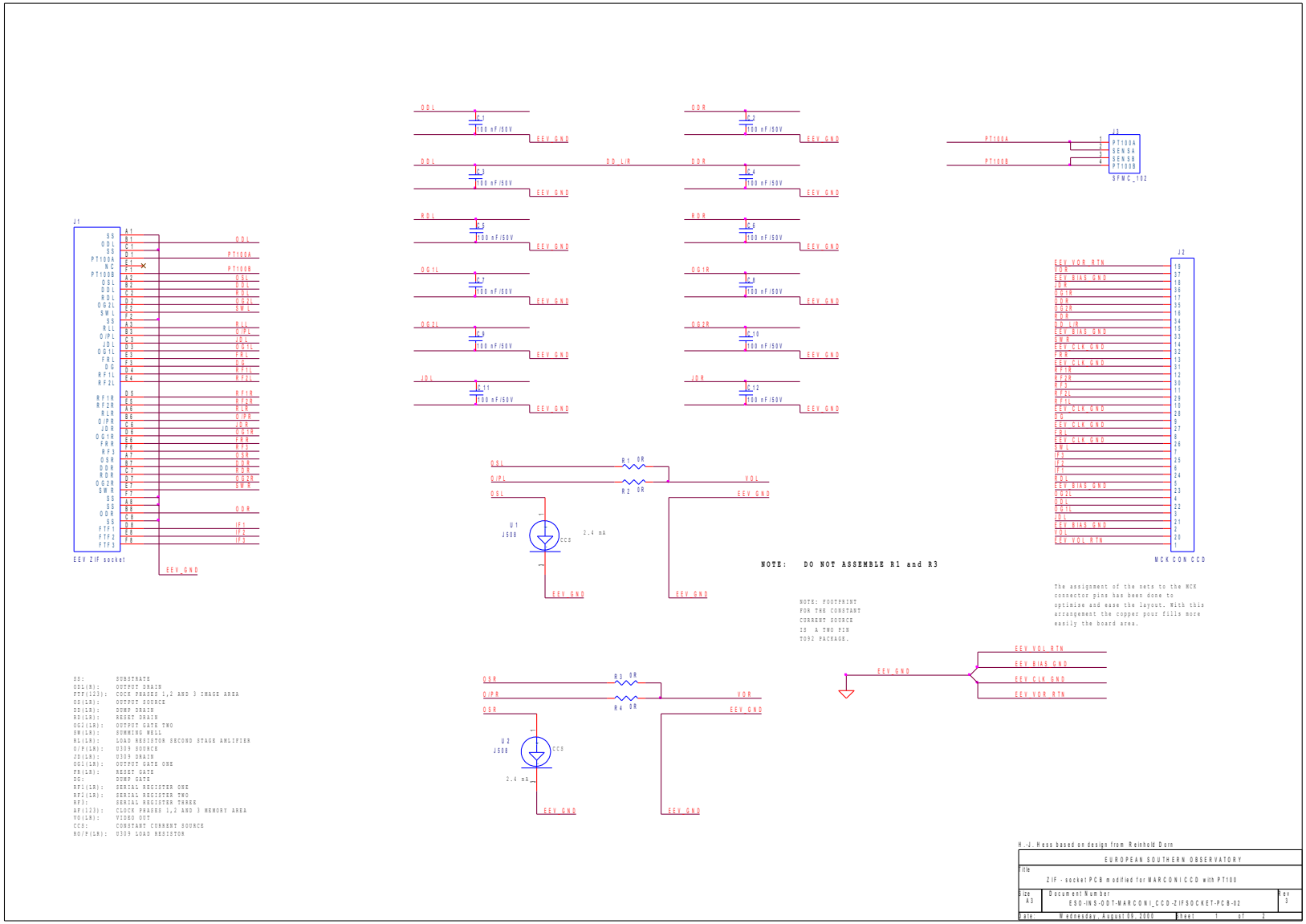


Figure 20: Schematic and assembly; E2V CCD44-82 socket flex board.

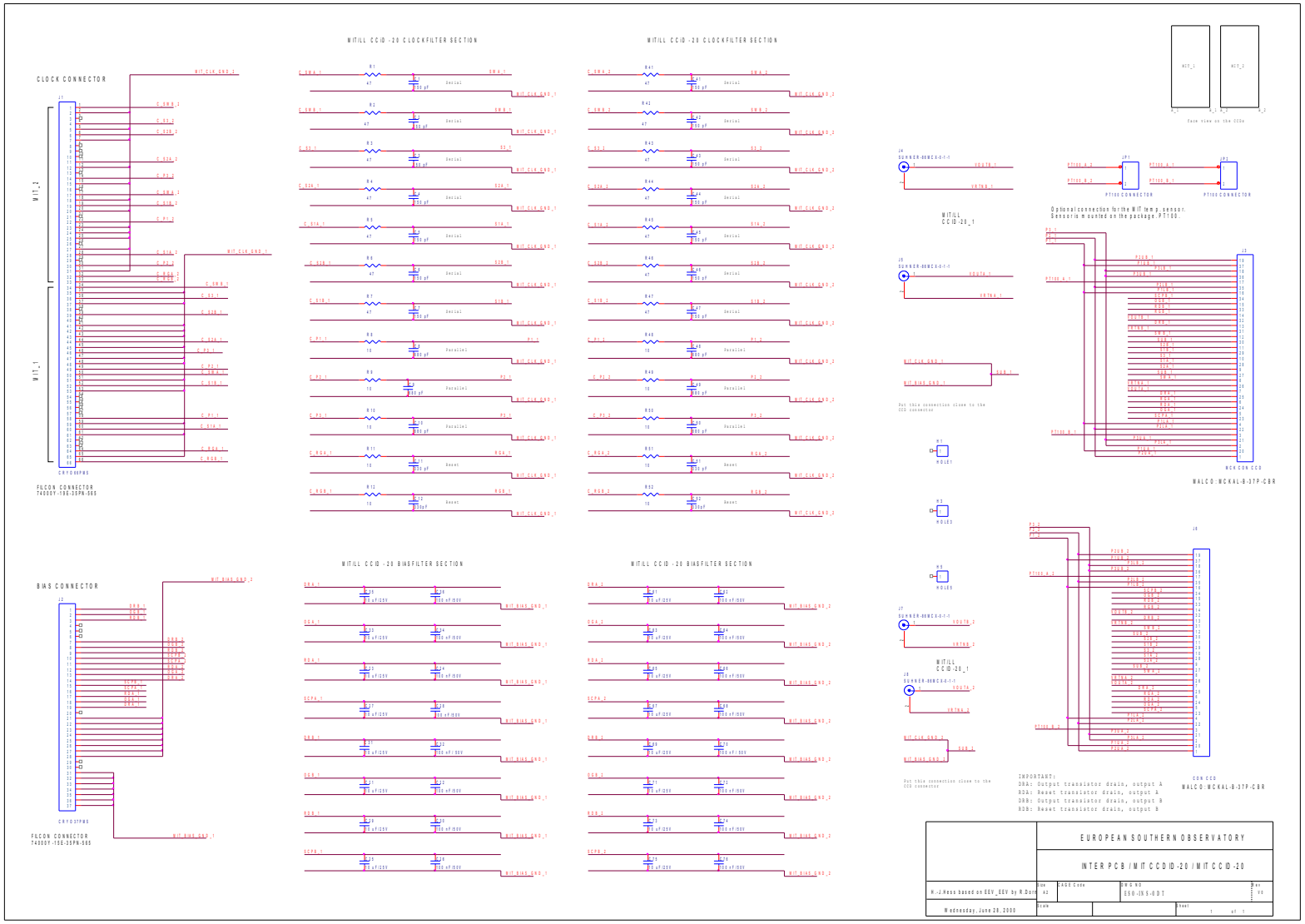


Figure 21: Schematic and assembly; MIT/LL CCID-20 Intermediate cryogenic board.

Nanonics pin no.	Device function	Mnemonic
1	Parallel-2 upper	P2U
2	Parallel-1 upper	P1U
3	Parallel-3 lower	P3L
4	Parallel-3 upper	P3U
5	Temperature sensor	TS
6	Parallel-2 lower	P2L
7	Parallel-1 lower	P1L
8	Scupper	SCP
9	Output gate	OG
10	Reset drain	RD
11	Reset gate	RG
12	Drain	DR
13	Video output	OUT
14	Video return	RET
15	Summing well	SW
16	Substrate	SUB
17	Serial-2, A	S2A
18	Serial-1, A	S1A
19	Serial-3	S3
20	Serial-1, B	S1B
21	Serial-2, B	S2B
22	Substrate	SUB
23	Summing well	SW
24	Video return	RET
25	Drain	DR
26	Video output	OUT
27	Reset gate	RG
28	Reset drain	RD
29	Output gate	OG
30	Scupper	SCP
31	Parallel-1, lower	P1L
32	Parallel-2, lower	P2L
33	Temperature sensor	TS

34	Parallel-3, upper	P3U
35	Parallel-3 lower	P3L
36	Parallel-1, upper	P1U
37	Parallel-2, upper	P2U

Figure 22: Connection Table; MIT/LL CCID-20 flex board.

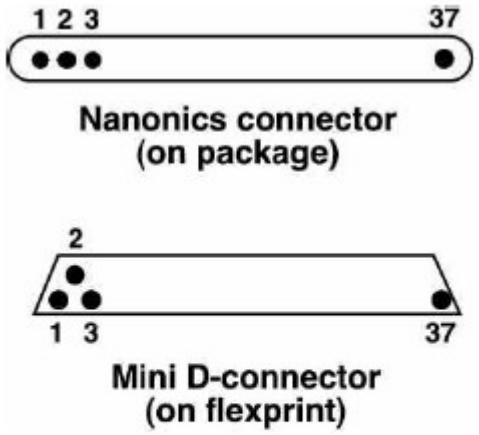


Figure 9. Pin number assignments for the Nanonics connector on the package and the D-connector on the flexprint.

Figure 23: Pin number assignment: MIT/LL CCID-20 flex board.