KONGSBERG

Project.: Sentinel DFEP
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DFEP User Manual and Operations Procedures

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1/4	14 October	All	Major rewrite to align with GUI online help CDR-RID-114 / ED-22 (JIRA-Id-DFEP-373)

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Acronyms

8PSK	8 Phase Shift Keying)
AGC	Automatic Gain Control
AOS	Acquisition of Signal
AOS	Advanced Orbiting Systems
BER	Bit Error Rate
BERT	Bit Error Rate Tester
BPSK	Binary Phase Shift Keying
CCSDS	Consultative Committee for Space Data Systems
DDS	Direct Digital Synthesizer
DVB-S	Digital Video Broadcast – Satellite
ECL	Emitter Coupled Logic
FEP	Front End Processing
FIFO	First In First Out
FTP	File Transfer Protocol
GMSK	Gaussian Minimum Shift Keying
GS	Ground Segment
GUI	Graphical User Interface
HK	House Keeping
HRD	High Rate Demodulator
HRDFEP	High Rate Demodulator and Front End Processor
HRFEP	High Rate Front End Processor
HRPT	High Rate Picture Transmission
HRR	High Rate Recorder
HRTG	High Rate Test Generator
I/O	Input/Output
I/Q	In-phase/Quadrature-phase
IP	Internet Protocol
ISP	Instrument Source Packet
KSPT	Kongsberg Spacetec as
LO	Local Oscillator
LOS	Loss of Signal
M&C	Monitor and Control
MEOS	Multimission Earth Observation System
MNRT	Meta Near Real-Time
NRT	Near Real-Time
OQPSK	Offset Quadrature Phase-Shift Keying
PT	Packet Telemetry
QA	Quality Assurance
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
R-S	Reed Solomon

RT	Real Time
SCS	Station Control System
SMA	SubMiniature version A
SNR	Signal-to-Noise Ratio
TBC	To Be Confirmed
TBD	To Be Defined
TCP	Transmission Control Protocol
TF	Transfer Frame
TG	Test Generator
TLE	Two-Line Elements
TM	Telemetry
UQPSK	Unbalanced Quadrature Phase-Shift Keying
VCDU	Virtual Channel Data Unit
XBDC	X-Band Down Converter
XML	Extensible Markup Language

Table of Contents

1 Introduction

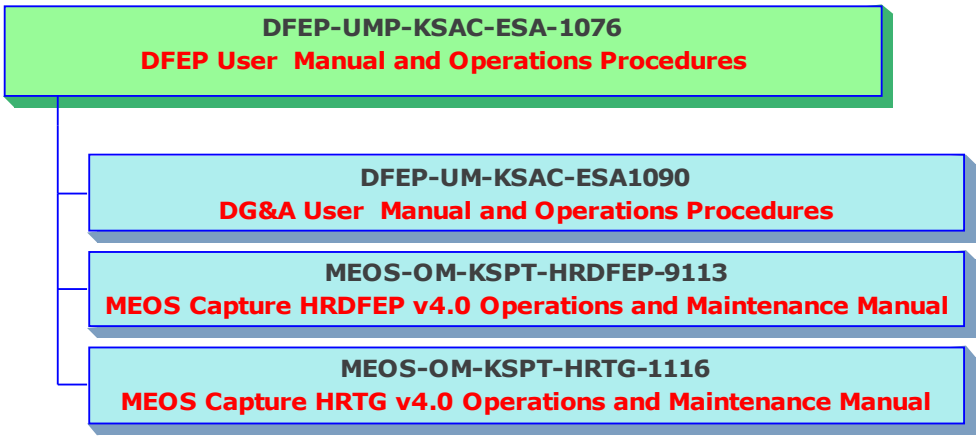
1.1 Purpose

This manual contains the information necessary to configure, operate and maintain the Sentinel DFEP system. More information regarding status, configuration and software interfaces of the Sentinel DFEP can be found in documents [R-4] and [R-5].

The Sentinel DFEP architecture is based on COTS products that all of them have separate User Manual and Operations Procedures documents. The COTS components composing the Sentinel DFEP are:

- MEOS Control
- MEOS Capture HRDFEP
- MEOS Capture HRTG
- Data Gate and Archive

Therefore the SDFEP User Manual is composed of a set of documents depicted below. This document, the DFEP User Manual and Operations Procedures, which is the overall SDFEP User Manual, is based on the MEOS Control Manual. Supplementary documents are the DG&A User Manual, MEOS Capture HRDFEP User Manual and the MEOS Capture HRTG User Manual.



1.2 Intended Audience

The intended audience is the personnel at the Agency involved in Sentinel DFEP development and Sentinel 1, 2 and 3 ground segment contractors.

1.3 Definitions and Abbreviations

1.3.1 Definitions

This document uses the terms:

- The Agency to indicate the European Space Agency (ESA)
- The Consortium to indicate the Kongsberg Spacetec/ACS consortium

1.3.2 Abbreviations

A list of acronyms and abbreviations can be found in [R-6].

2 Documents

2.1 Applicable Documents

A-1	DFEP-STD-KSAC-ESA-10521	DFEP - System Technical Description and Budget Issue/Rev.: 1/3

2.2 Reference Documents

R-1	MEOS-OM-KSPT-HRDFEP-9113	MEOS Capture HRDFEP v4.0 – Operations and Maintenance Manual Issue/Revision: 1/0.
R-2	MEOS-OM-KSPT-HRTG-1116	MEOS Capture HRTG v4.0 – Operations and Maintenance Manual Issue/Revision: 1/0.
R-3	DFEP-UM-KSAC-ESA-1090	DG&A – User Manual and Operations Procedures Issue/Revision: 1/2.
R-4	DFEP-ICD-KSAC-ESA-1066	DFEP <-> PDGS Interface Control Document for Sentinel 1, 2, 3, Issue/Revision: 1/3.
R-5	DFEP-ICD-KSAC-ESA-1074	Internal ICD, Issue/Revision: 1/1.
R-6	DFEP-AA-KSAC-ESA-10536	Acronyms and Abbreviations, Sentinel 1, 2, 3 DFEP Issue/Revision: 1/2.

3 System Overview

This section provides the overall presentation of the Sentinel DFEP.

Figure 1 shows the DFEP component architecture, along with the main data and control flows. Note that for both the MEOS Capture HRDFEP and MEOS Capture HRTG the second channel is shown as shadows.

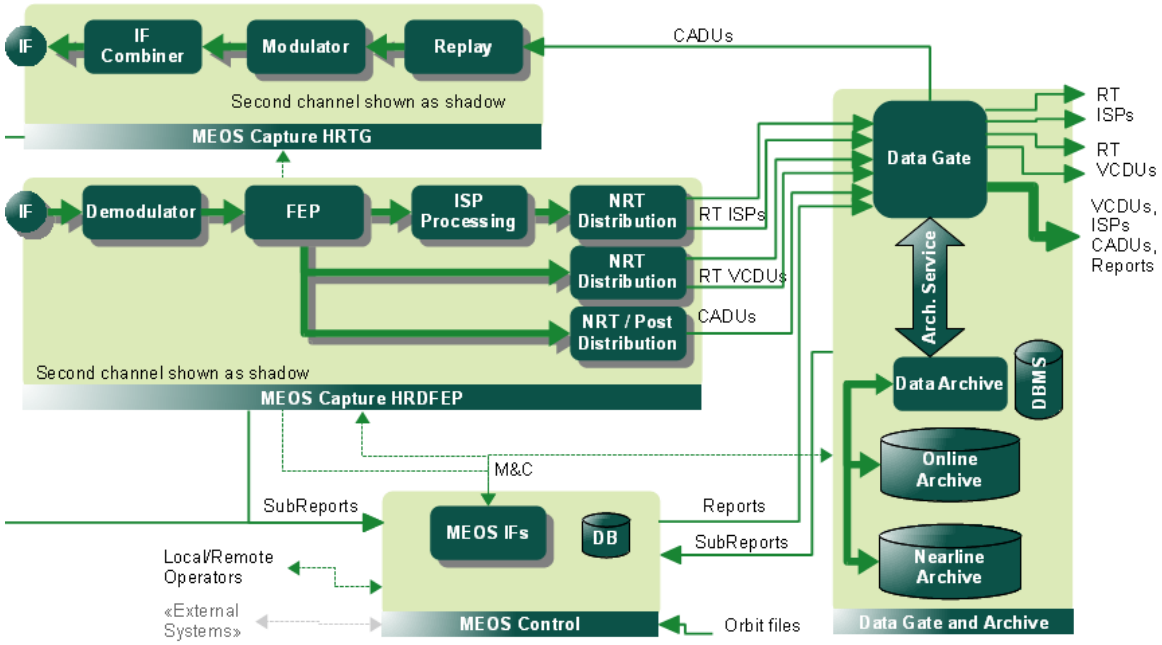


Figure 1. DFEP Component Architecture

3.1 Component Description

Referring to figure 1, the following components are present in the DFEP:

- MEOS Capture HRDFEP
  - Demodulator (two instances, one for each channel), providing IF signal acquisition, demodulation and decoding
  - FEP (two instances, one for each channel), providing acquisition of demodulated streams, frame synchronization, de-randomization, decoding, packet error control, VCDU reconstruction and annotation.
  - ISP Processing (two instances, one for each channel), providing source packet reconstruction and annotation
  - NRT Distribution: 4 RT instances – ISP and VCDU (CADU)

- Post-pass Distribution: CADUs
- Generation of sub-reports, including the activities performed by this component. These sub-reports will be sent to MEOS Control of overall activity consolidation.
- Local archives, that can be configured to store data between each processing step (CADU, VCDU, ISP), in addition to generated sub-reports.
- Contingency management: providing replay of data from HRTG including initial transmission of data from HRDFEP and final transfer of data to DG&A

- Data Gate and Archive
  - Data Gate Processor function for:
    - Real-time ingestion from HRDFEP
    - Processing of VCDU and ISP streams for VCDU and ISP splitting and cutting
    - Real-time distribution to external clients of ISP and VCDU streams
    - Generation of sub-reports, including the activities performed by this component. These sub-reports will be sent to MEOS Control of overall activity consolidation.
  - Data Manager function:
    - On-line storage
    - Near-line storage (tape backups)
    - On-demand post-pass distribution to external/internal clients (including MEOS Capture HRTG)
- MEOS Capture HRTG
  - IF Combiner, combining the output from the two modulators
  - Modulator (two instances, one for each channel), providing modulation and noise and Doppler generation.
  - Replay (two instances, one for each channel), providing data replay and testing
  - Generation of sub-reports, including the activities performed by this component. These sub-reports will be sent to MEOS Control of overall activity consolidation.
  - Local archive to hold test data, either real or synthetic, which may be retrieved from the Data Gate and Archive. It also holds generated sub-reports.
- MEOS Control
  - Provides seamless integration of MEOS Capture HRDFEP, MEOS Capture HRTG and Data Gate and Archive into one system from a monitoring and control perspective.
  - Reception of status and events (warning, error, alarms) generated on the connected systems, available in real-time:
    - in the HMI,
    - via the external interface,
    - and storing in local database for post-pass report generation and to enable historic viewing capabilities).
  - Reception of sub-reports, and consolidating these into overall activity reports, sent to the Data Gate & Archive for archiving and user distribution.
  - Forwarding commands (received from the HMI, the external interface, or as part of an overall schedule) to the appropriate connected system, at the correct time.

4 Systems Installation

4.1 DFEP Installation

4.1.1 Component List

This section describes the components included in the DFEP shipment.

- 1 Rack Mount Display
  - HP TFT7600 G2 KVM Console Rack-mount Keyboard & Monitor
- 1 Server Console Switch
  - HP Server Console 0x2x8 Port Analogue Switch
- 1 MEOS Capture HRDFEP
  - HP Proliant DL 370 Server
- 1 MEOS Capture HRTG
  - HP Proliant DL 370 Server
- 1 MEOS Control
  - HP Proliant DL 320 Server
- 1 Data Gate and Archive
  - HP Proliant DL 370 Server
  - D2700 Disk Enclosure
  - HP Storageworks MSL 2026 Tape Library
- 1 Switch
  - HP Procurve E2910-24G
- Cables
  - Power Cables
  - Network Cables for 1GbE network
  - Network Direct Attached Cables for 10GbE network
  - IF Cables
- Rack
  - HP 10642 G2 42U
- 1 Remote PC with monitor
  - HP Compaq 8100 Elite CMT PC
  - HP ZR24w 24-inch S-IPS LCD Monitor

The PC and monitor will be delivered to support the remote monitor and control operation.

4.1.2 Rack Layout and Cabling

This section describes the rack layout and cabling between the DFEP components.

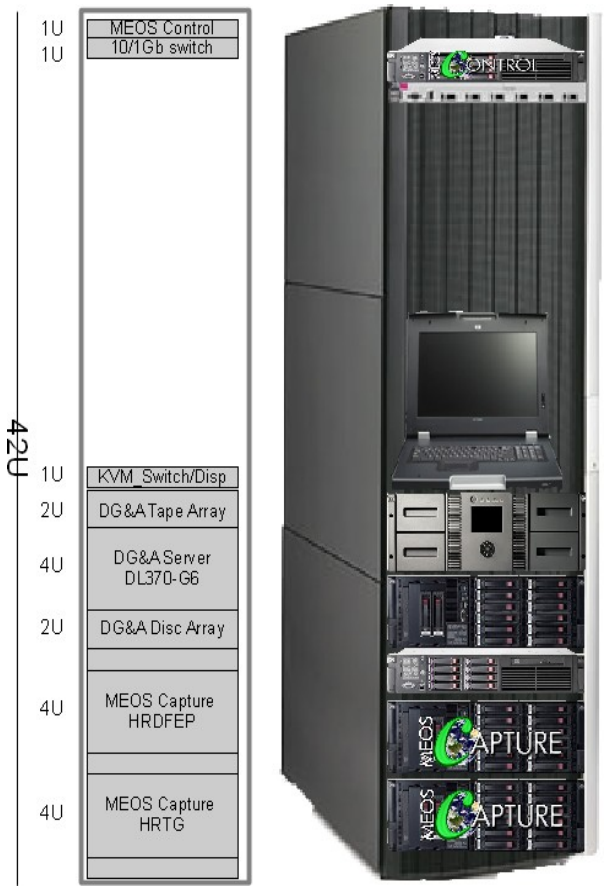


Figure 2: DFEP Rack Layout

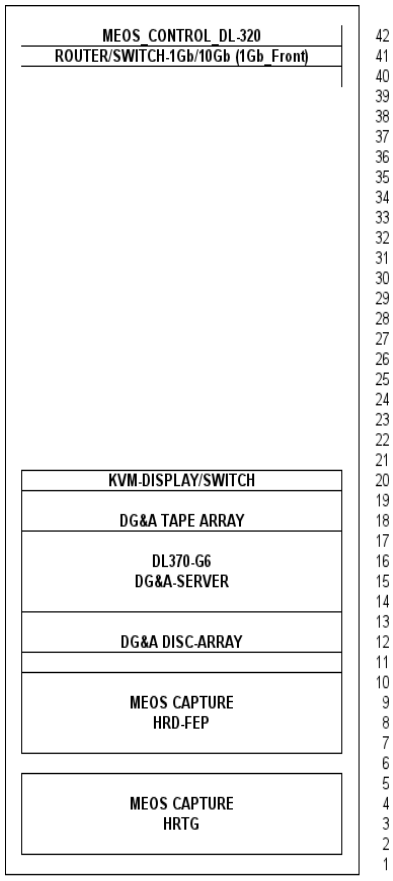


Figure 3: DFEP rack distribution

From the top to the bottom the rack includes the following components:

- The DFEP Switch (1U)
- The MEOS Control Computer (1U)
- The Rack Mount Display (1U) with integrated keyboard and mouse
- MEOS Capture HRDFEP Computer (4U)
- MEOS Capture HRTG Computer (4U)
- Data Gate & Archive Computer (4U)
- Data Gate& Archive Storage Cabinet (2U)

- Data Gate& Archive Tape Library (2U)

At the back of the rack:

- The Server Console switch - to be mounted close to the position of the Rack Mount Display.
- Two power distribution units – to be mounted at the back of the rack to provide power outlets to all the rack mounted equipment.

Figure 4: Server Console Switch/Display

The different items will be delivered as individual boxes including the equipment power cables and rack mounting kit. Figure 5 shows a cabling overview of the DFEP rack. All Servers/switches/KVM-eqipment are CE certified from the vendor, Hewlett-Packard (HP).

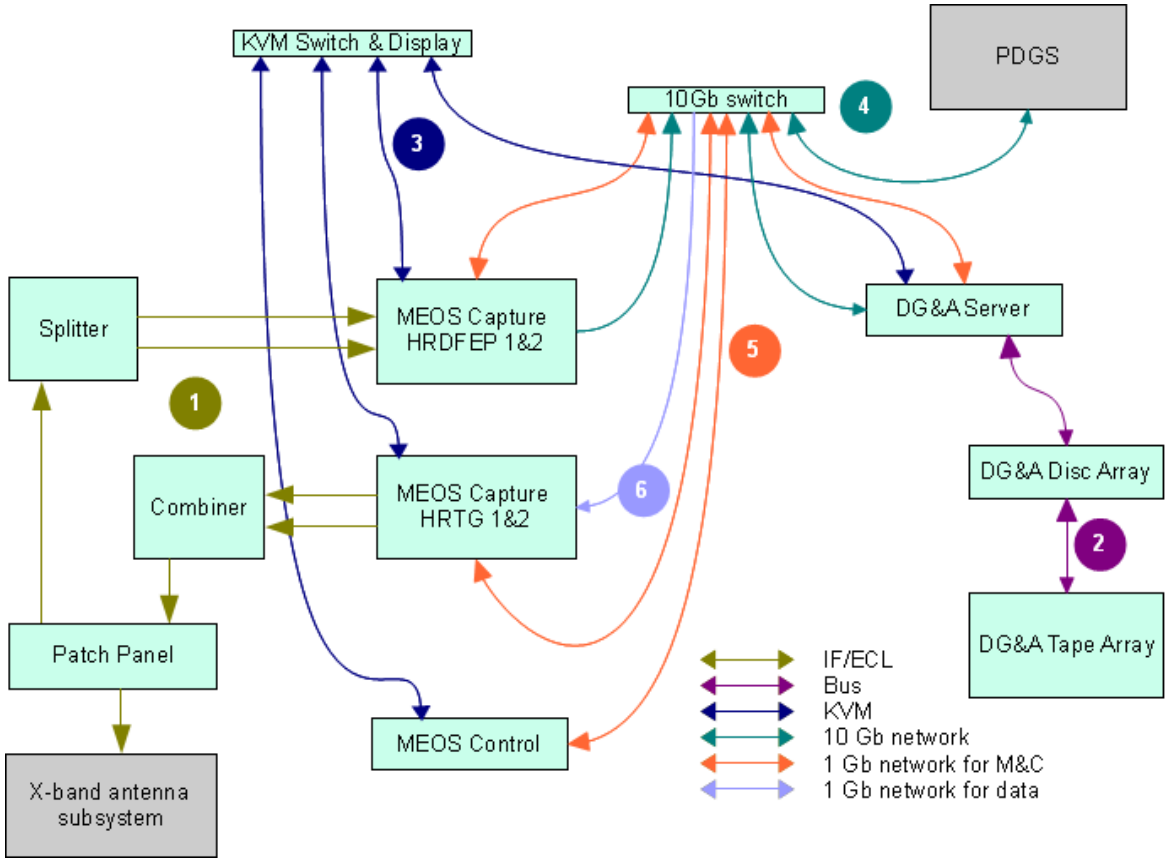
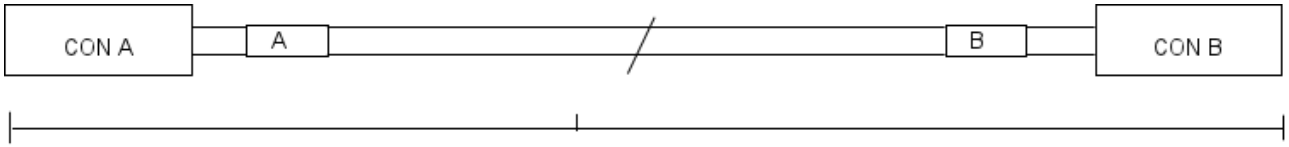


Figure 5: Cabling overview of the DFEP Rack



The table below shows the DFEP cable list containing the wire number, signal name, connector type,cable type, cable length and cable marking.

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
WT-0001	PATCH PANEL IF3	IF SPLITTER S-INPUT	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	PATCH PAN IF3 In	IF_SPL S-INPUT
WT-0002	IF SPLITTER OUTPUT_1	MEOS-Capture HRDFEP HRD_CH_1 IN1	SMA	SMA	HUBER-SUHNER S04262	3.0 m	IF_SPL OUTPUT_1	DEMOD_CH1 IN_1
WT-0003	IF SPLITTER OUTPUT_2	MEOS-Capture HRDFEP HRD_CH_2 IN1	SMA	SMA	HUBER-SUHNER S04262	3.0 m	IF_SPL OUTPUT_2	DEMOD_CH2 IN_1
WT-0004	IF COMBINER Output-S	PATCH PANEL IF3_Output	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	IF_COMB Output_S	PATCH_PAN IF_3 Out
WT-0005	MEOS-Capture HRTG	IF COMB1 # IF1_Out	SMA	SMA	HUBER-SUHNER	3.0 m	MODULATOR_1	IF_Co1#IF1_out

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
	MOD-1/IF_Output	Input-1 # P_P-IF1			S04262		IF_Output	In_1 # P-P_IF1
WT-0006	MEOS-Capture HRTG MOD-2/IF_Output	IF COMB2 # IF2_Out Input-2 # P_P-IF2	SMA	SMA	HUBER-SUHNER S04262	3.0 m	MODULATOR_2 IF_Output	IF_Co2#IF2_out In_2 # P-P_IF2
WT-0007	PATCH PANEL IF1 INPUT	MEOS Capture HRDFEP HRD_CH_1 IN2	SMA	SMA	HUBER-SUHNER S04262	3.0 m	PATCH PAN IF1 In	DEMOD_CH1 IN_2
WT-0008	PATCH PANEL IF2 INPUT	MEOS Capture HRDFEP HRD_CH_2 IN2	SMA	SMA	HUBER-SUHNER S04262	3.0 m	PATCH PAN IF2 In	DEMOD_CH2 IN_2
WT-0009	DG&A-SERVER DL-370-G6 SAS_OUT	DG&A DISC ARRAY SAS_IN	SAS	SAS	HP_Part 407339-B21	2.0 m	DG&A-SERVER SAS-PORT_1	DG&A DISC ARRAY SAS-PORT_1
WT-0010	DG&A-SERVER DL-370-G6 SAS_OUT	DG&A TAPE ARRAY SAS_IN	SAS	SASx4	Amphenol PN:445892-001 Rev. A0A	2.0 m	DG&A-SERVER SAS-PORT_2	DG&A TAPE ARRAY SAS-PORT_1

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
WT-0011	KVM-SWITCH/DISPLAY INPUT_1	MEOS-Control DL320 KVM_ADAPTER	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_1	MEOS_CTRL_DL320 KVM_ADAPTER
WT-0012	KVM-SWITCH/DISPLAY INPUT_2	MEOS-Capture HRDFEP KVM_ADAPTER	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_2	HRDFEP KVM_ADAPTER
WT-0013	KVM-SWITCH/DISPLAY INPUT_3	MEOS-Capture HRTG KVM_ADAPTER	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_3	HRTG KVM_ADAPTER
WT-0014	KVM-SWITCH/DISPLAY INPUT_4	DG&A SERVER DL-370-G6 KVM_ADAPTER	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_4	DG&A_SERVER KVM_ADAPTER

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
WT-0015	SWITCH/ROUTER 10Gb/1Gb	MEOS-Capture HRDFEP 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	3.0 m	SWITCH 1Gb_PORT2	HRDFEP 1Gb_PORT1
WT-0016	SWITCH/ROUTER 10Gb/1Gb	MEOS-Capture HRDFEP 10Gbit (Rear)	Fibre Connector	Fibre Connector	HP ProCurve 10GbE SFP	3.0 m	SWITCH 10Gb_PORT1	HRDFEP 10Gb_PORT1
WT-0017	SWITCH/ROUTER 10Gb/1Gb	MEOS-Capture HRTG (M&C) 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	3.0 m	SWITCH 1Gb_PORT4	HRTG 1Gb_PORT1
WT-0018	SWITCH/ROUTER 10Gb/1Gb	MEOS-Capture HRTG (DATA) 1Gbit	RJ45	RJ45	PATCH CABLE	3.0 m	SWITCH 1Gb_PORT6	HRTG 1Gb_PORT2
WT-0019	SWITCH/ROUTER	MEOS-Control	RJ45	RJ45	PATCH CABLE	3.0 m	SWITCH	MEOS_CTRL

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
	10Gb/1Gb	DL-320 1Gbit					1Gb_PORT8	1Gb_PORT1
WT-0020	SWITCH/ROUTER 10Gb/1Gb	ARCHIVE-SERVER DL-370-G6 1Gbit	RJ45	RJ45	PATCH CABLE	3.0 m	SWITCH 1Gb_PORT10	DG&A_SERV 1Gb_PORT1
WT-0021	SWITCH/ROUTER 10Gb/1Gb	ARCHIVE-SERVER DL-370-G6 10Gbit (Rear)	Fibre Connector	Fibre Connector	HP ProCurve 10GbE SFP	3.0 m	SWITCH 10Gb_PORT2	DG&A_SERV 10Gb_PORT1
WT-0022	SWITCH/ROUTER 10Gb/1Gb	DG&A TAPE ARRAY 1Gbit	RJ45	RJ45	PATCH CABLE	3.0 m	SWITCH 1Gb_PORT12	DG&A TAPE ARRAY 1Gb_PORT1
WT-0023	MEOS-Capture HRTG Power_1	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	HRTG Power_1	POWER_RAIL

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
WT-0024	MEOS-Capture HRTG Power_2	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	HRTG Power_2	POWER_RAIL
WT-0025	MEOS-Capture HRDFEP Power_1	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	HRDFEP Power_1	POWER_RAIL
WT-0026	MEOS-Capture HRDFEP Power_2	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	HRDFEP Power_2	POWER_RAIL
WT-0027	DG&A DISC ARRAY Power_1	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	DISC_ARRAY Power_1	POWER_RAIL
WT-0028	DG&A DISC ARRAY Power_2	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	DISC_ARRAY Power_2	POWER_RAIL
WT-0029	DG&A SERVER DL370G6 Power_1	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	DG&A_SERVER Power_1	POWER_RAIL

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
WT-0030	DG&A SERVER DL370G6 Power_2	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	DG&A_SERVER Power_2	POWER_RAIL
WT-0031	DG&A_TAPE ARRAY Power	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	TAPE_ARRAY Power	POWER_RAIL
WT-0032	KVM SWITCH Power	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	KVM_SW Poer	POWER_RAIL
WT-0033	ROUTER/SWITCH 1Gb/10Gb	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	SWITCH POWER	POWER_RAIL
WT-0034	MEOS-Control DL-320 Power_1	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	MEOS_CTRL POWER_1	POWER_RAIL
WT-0035	MEOS-Control DL-320 Power_2	POWER RAIL	IEC-320	POWER	H05W-F	2.0 m	MEOS_CTRL POWER_2	POWER_RAIL

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
WT-0036	HRTG OUTPUT1 C1P	HRTG MODULATOR1 C_P	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT 1 C1P	HRTG_MOD1 C_P
WT-0037	HRTG OUTPUT1 C1N	HRTG MODULATOR1 C_N	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT 1 C1N	HRTG_MOD1 C_N
WT-0038	HRTG OUTPUT1 D1P	HRTG MODULATOR1 D_P	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT 1 D1P	HRTG_MOD1 D_P
WT-0039	HRTG OUTPUT1 D1N	HRTG MODULATOR1 D_N	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT 1 D1N	HRTG_MOD1 D_N
WT-0040	HRTG OUTPUT2 C1P	HRTG MODULATOR2 C_P	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT 2 C1P	HRTG_MOD2 C_P
WT-0041	HRTG OUTPUT2 C1N	HRTG MODULATOR2 C_N	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT 2 C1N	HRTG_MOD2 C_N
WT-0042	HRTG OUTPUT2	HRTG MODULATOR2	SMA	SMA	HUBER-SUHNER	0.18 m	HRTG_OUT 2	HRTG_MOD2

Cable no.	Signal name		Connector type		Cable type	Length	Cable marking	
	From (A)	To (B)	A	B		[meter]	A	B
	D1P	D_P			RG317D		D1P	D_P
WT-0043	HRTG OUTPUT2	HRTG MODULATOR2	SMA	SMA	HUBER-SUHNER	0.18 m	HRTG_OUT 2	HRTG_MOD2
	D1N	D_N			RG317D		D1N	D_N

4.2 Compact DFEP (CDFEP) Installation

4.2.1 Component List

This section describes the components included in the Compact DFEP shipment.

- 1 Rack Mount Display
  - HP TFT7600 G2 KVM Console Rack-mount Keyboard & Monitor
- 1 Server Console Switch
  - HP Server Console 0x2x8 Port Analog Switch
- 1 MEOS Capture HRDFEP
  - HP Proliant DL 370 Server
- 1 MEOS Capture HRTG
  - HP Proliant DL 370 Server
- 1 MEOS Control
  - HP Proliant DL 320 Server
- 1 Switch
  - HP Procurve 1810G-24
- Cables
  - Power Cables
  - Network Cables for 1GbE network
  - IF Cables
- 1 Remote PC with monitor
  - |HP Compaq 8100 Elite CMT PC
  - HP ZR24w 24-inch S-IPS LCD Monitor

4.2.2 Rack Layout and Cabling

This section describes the rack layout and cabling between the Compact DFEP components.

From the top to the bottom the rack includes the following components:

- The MEOS Control Computer (1U)
- The DFEP Switch (1U)
- The Rack Mount Display (1U) with integrated keyboard and mouse
- MEOS Capture HRDFEP Computer (4U)
- MEOS Capture HRTG Computer (4U)

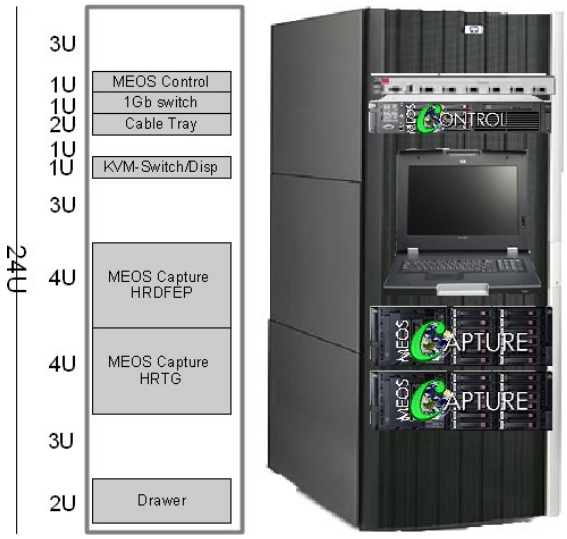


Figure 6: CompactDFEP Rack Layout

At the back of the rack:

- The Server Console switch - to be mounted close to the position of the Rack Mount Display.
- Three power distribution units – to be mounted at the back of the rack to provide power outlets to all the rack mounted equipment.

Figure 7: Server Console Switch/Display

The different items will be delivered as individual boxes including the equipment power cables and rack mounting kit. Figure 7 shows a cabling overview of the Compact DFEP rack. All Servers/switches/KVM-eqipment are CE certified from the vendor, Hewlett-Packard (HP).

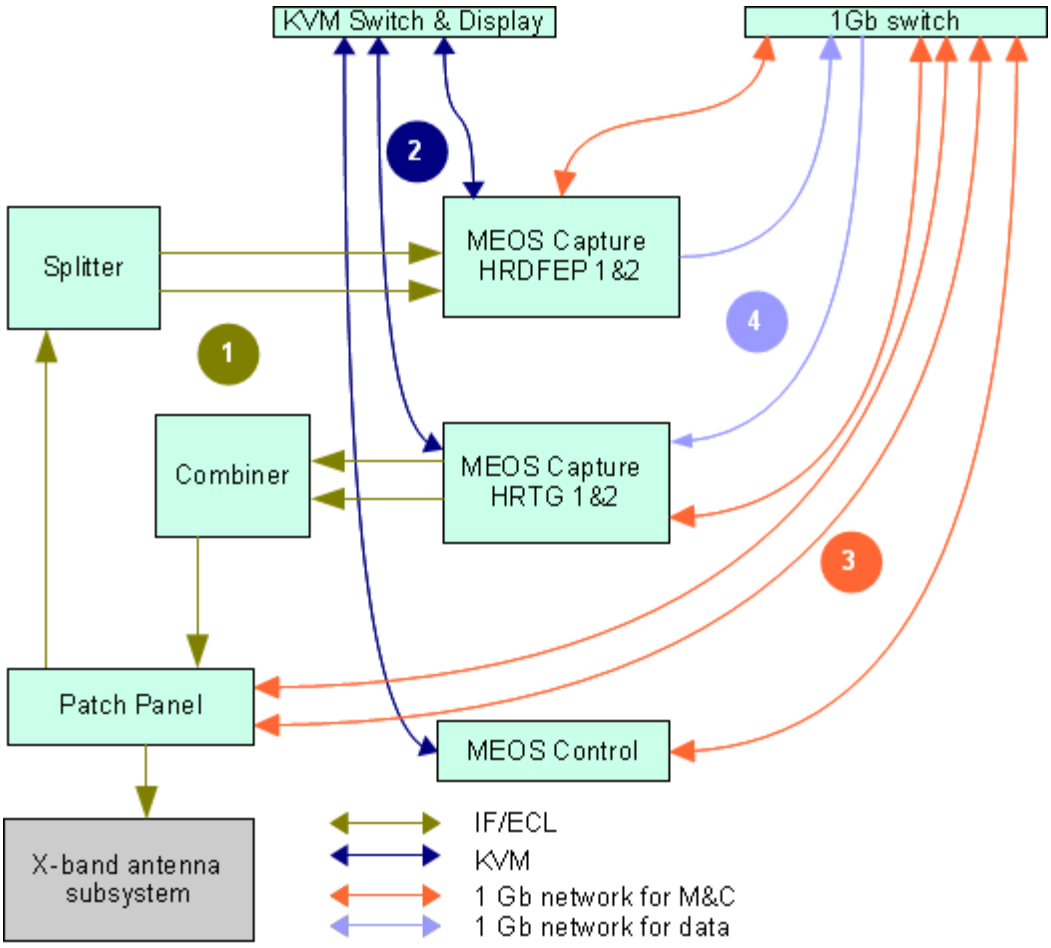
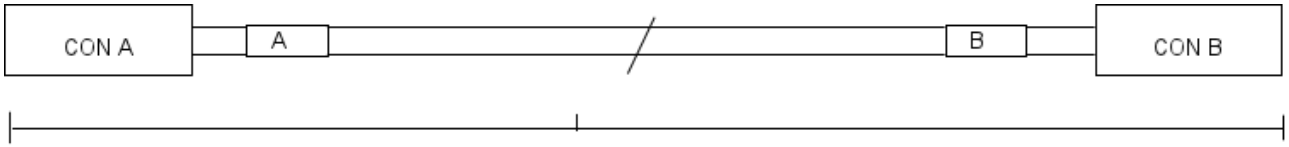


Figure 8: Shows the Compact DFEP Cabling Overview.

The table below shows the Compact DFEP cable list containing the wire number, signal name, connector type,cable type, cable length and cable marking.



Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
WT-0001	PATCH PANEL IF3	IF SPLITTER S-INPUT	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	PATCH PAN IF3 In	IF_SPL S-INPUT
WT-0002	IF SPLITTER OUTPUT_1	MEOS-Capture HRDFEP HRD_CH_1 IN1	SMA	SMA	HUBER-SUHNER S04262	3.0 m	IF_SPL OUTPUT_1	DEMOD_CH1 IN_1
WT-0003	IF SPLITTER OUTPUT_2	MEOS-Capture HRDFEP HRD_CH_2 IN1	SMA	SMA	HUBER-SUHNER S04262	3.0 m	IF_SPL OUTPUT_2	DEMOD_CH2 IN_1
WT-0004	IF COMBINER Output-S	PATCH PANEL IF3_Output	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	IF_COMB Output_S	PATCH_PAN IF_3 Out
WT-0005	MEOS-Capture HRTG MOD-1/IF_Output	IF COMB1 # IF1_Out Input-1 # P_P-IF1	SMA	SMA	HUBER-SUHNER S04262	3.0 m	MODULATOR_1 IF_Output	IF_Co1#IF1_out In_1 # P-P_IF1

Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
WT-0006	MEOS-Capture HRTG MOD-2/IF_Output	IF COMB2 # IF2_Out Input-2 # P_P-IF2	SMA	SMA	HUBER-SUHNER S04262	3.0 m	MODULATOR_2 IF_Output	IF_Co2#IF2_out In_2 # P-P_IF2
WT-0010	KVM-SWITCH/DISP INPUT_1	MEOS-Control DL-320	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_1	MEOS_CTRL_DL320 KVM_ADAPTER
WT-0011	KVM-SWITCH/DISP INPUT_2	MEOS-Capture HRDFEP	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_2	HRDFEP_KVM KVM_ADAPTER
WT-0012	KVM-SWITCH/DISP INPUT_3	MEOS-Capture HRTG	RJ45	RJ45	PATCH CABLE UTP Cat. 5E Green 2m	2.0 m	KVM_SW INPUT_3	HRTG_KVM KVM_ADAPTER
WT-0013	SWITCH/ROUTER 1Gbit	MEOS-Capture HRDFEP (DATA)	RJ45	RJ45	PATCH CABLE UTP Cat. 6	3.0 m	SWITCH 1Gb_PORT2	HRDFEP 1Gb_PORT1

Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
	PORT_2	1Gbit			Grey			
WT-0014	SWITCH/ROUTER 1Gbit	MEOS-Capture HRDFEP (M&C) 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	3.0 m	SWITCH 1Gb_PORT3	HRDFEP 1Gb_PORT2
WT-0015	SWITCH/ROUTER 1Gbit	MEOS-Capture HRTG (DATA) 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	3.0 m	SWITCH 1Gb_PORT4	HRTG 1Gb_PORT1
WT-0016	SWITCH/ROUTER 1Gbit	MEOS-Capture HRTG (M&C) 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	3.0 m	SWITCH 1Gb_PORT6	HRTG 1Gb_PORT2
WT-0017	SWITCH/ROUTER 1Git	MEOS-Control DL-320 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	2.0 m	SWITCH 1Gb_PORT8	MEOS_CTRL 1Gb_PORT1
WT-0018	SWITCH/ROUTER 1Gbit_PORT1	PATCH PANEL EXT1 1Gbit	RJ45	RJ45	PATCH CABLE UTP Cat. 6 Grey	2.0 m	SWITCH 1Gb_PORT1	PATCH_PANEL EXT1
WT-0019	SWITCH/ROUTER 1Git_PORT13	PATCH PANEL EXT2	RJ45	RJ45	PATCH CABLE UTP Cat. 6	2.0 m	SWITCH 1Gb_PORT13	MEOS_CTRL 1Gb_PORT1

Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
		1Gbit			Grey			
WT-0020	MEOS-Control DL-320 Power_1	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	MEOS_CTRL POWER_1	POWER_RAIL
WT-0021	MEOS-Control DL-320 Power_2	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	MEOS_CTRL POWER_2	POWER_RAIL
WT-0022	MEOS-Capture HRDFEP Power_1	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	HRDFEP_PWR _1	POWER_RAIL
WT-0023	MEOS-Capture HRDFEP Power_2	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	HRDFEP_PWR _2	POWER_RAIL
WT-0024	MEOS-Capture HRTG Power_1	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	HRTG_PWR_1	POWER_RAIL

Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
WT-0025	MEOS-Capture HRTG Power_2	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	HRTG_PWR_2	POWER_RAIL
WT-0026	ROUTER/SWITCH Power	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	SWITCH POWER	POWER_RAIL
WT-0027	KVM SWITCH Power	POWER RAIL	C13	POWER +GND	H05W-F	2.0 m	KVM_SW POWER	POWER_RAIL
WT-0028	HRTG OUTPUT1 C1P	HRTG MODULATOR1 C_P	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT1 C1P	HRTG_MOD1 C_P
WT-0029	HRTG OUTPUT1 C1N	HRTG MODULATOR1 C_N	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT1 C1N	HRTG_MOD1 C_N
WT-0030	HRTG OUTPUT1	HRTG MODULATOR1	SMA	SMA	HUBER-SUHNER	0.18 m	HRTG_OUT1	HRTG_MOD1

Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
	D1P	D_P			RG317D		D1P	D_P
WT-0031	HRTG OUTPUT1 D1N	HRTG MODULATOR1 D_N	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT1 D1N	HRTG_MOD1 D_N
WT-0032	HRTG OUTPUT2 C1P	HRTG MODULATOR2 C_P	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT2 C1P	HRTG_MOD2 C_P
WT-0033	HRTG OUTPUT2 C1N	HRTG MODULATOR2 C_N	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT2 C1N	HRTG_MOD2 C_N
WT-0034	HRTG OUTPUT2 D1P	HRTG MODULATOR2 D_P	SMA	SMA	HUBER-SUHNER RG317D	0.18 m	HRTG_OUT2 D1P	HRTG_MOD2 D_P
WT-0035	HRTG OUTPUT2	HRTG	SMA	SMA	HUBER-	0.18 m	HRTG_OUT2	HRTG_MOD2

Cable no.	Signal name		Connector type		Cable type	Length [meter]	Cable marking	
	From (A)	To (B)	A	B			A	B
	D1N	MODULATOR2 D_N			SUHNER RG317D		D1N	D_N

5 Getting Started

Log on the system using the following user and password:

User: *dfep*

Password: *1meospasswd*

5.1 Starting from Local Installation

The local installation of the MEOS Control is a desktop icon representing the application. Click or double click the application icon on the desktop to start the system. When the application starts you will see a login screen.

Starting from local installation is only possible if the system is equipped with display, mouse and keyboard. If this is not the case, please proceed to the following section.

5.2 Starting from a Web Browser

Start your web browser. The browser must be Java Web Start enabled. For details, visit

http://www.oracle.com/technetwork/java/javase/javawebstart/index.html.

Then point your browser to the home page of the MEOS Control host computer (e.g. http://HOST, where HOST is the name of the MEOS Control host).

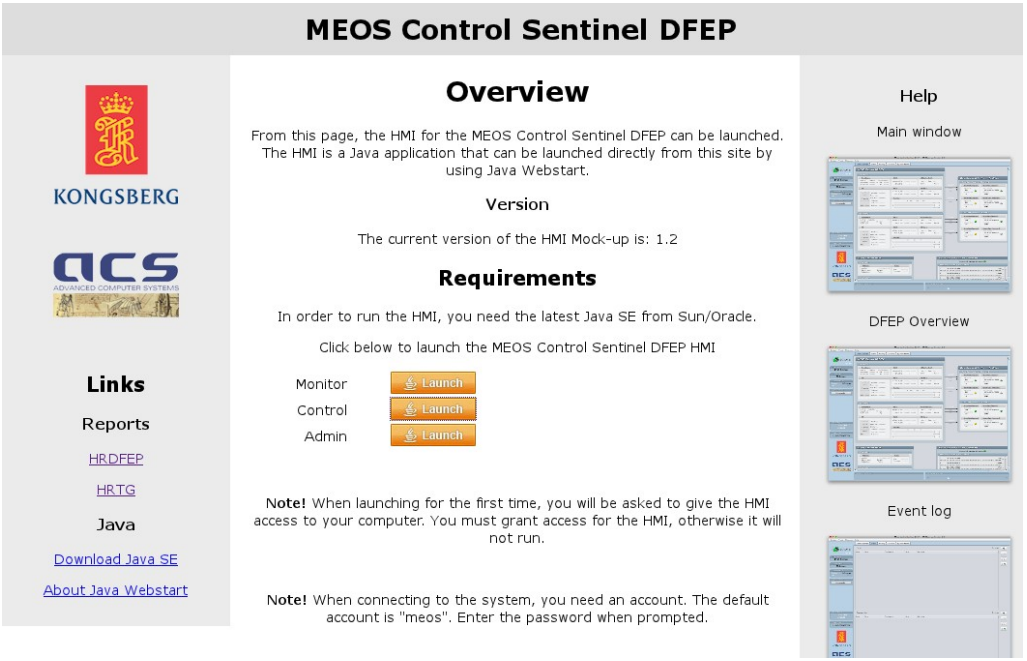


Figure 9: The WEB start page

When the page has been loaded (see figure 9), follow the directions described on the page.

Three GUI choices are provided:

- Monitor – start GUI in monitoring only mode
- Control – start GUI in controlling mode
- Admin – start administration GUI

Click the appropriate link. Doing so will cause the necessary application software to be downloaded to your computer. When the download is complete, the application will start up.

Java Web Start maintains a cache of downloaded applications and only downloads updates, if available. This means that the application will be downloaded only when necessary every time you click the link.

When the application starts you will see a login screen.

Figure 10: The login window

Dependent of the GUI chosen, the following username / password combinations are default:

- Monitor
  - monitor / akkar
- Control
  - control / akkar

- Admin
  - admin / akkar

See section 9.4 for how to change these.

If the GUI is used for the first time, or if Cancel is clicked in figure 10, the Connection Center will appear (see figure 11).

The Connection Center is used to manage connections to different systems. To connect to a pre-defined session (system), select the system in the Sessions list and click «Ok» button.

To delete existing sessions, select the system in the Sessions list and click the «minus» button.

To use a session as default, select the system in the Sessions list and click the «Set as default» button.

To add a new session, click the «+» button, and fill in correct values in the Setup part.

To edit an existing session, select the system in the Sessions list and fill in correct values in the Setup part.

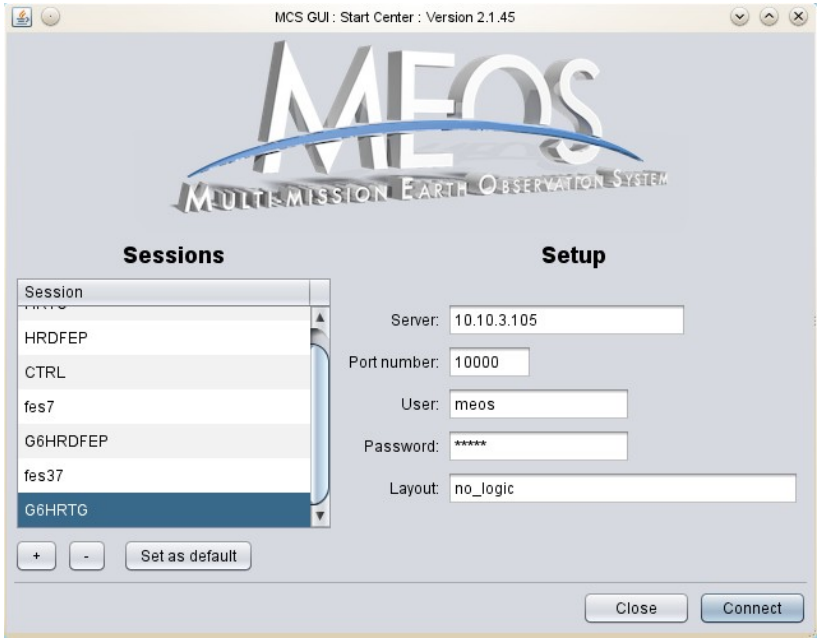


Figure 11: The Connection Center

After entering the correct password, the GUI will start to load (see figure 12).

Figure 12: Progress window

Once the loading process has completed, the corresponding DFEP GUI will appear.

5.3 Starting DFEP components

All DFEP components are configured to start automatically when powered up.

The DFEP components have separate graphical user interfaces, supporting additional functionality and monitoring capabilities.

More information on the individual components can be found:

- MEOS Capture HRDFEP
  - Refer to MEOS Capture HRDFEP Operational and Maintenance Manual [R-1] for details
- MEOS Capture HRTG
  - Refer to MEOS Capture HRTG Operations and Maintenance manual [R-2] for details.

- Data Gate and Archive
  - Refer to Data Gate and Archive User Manual [R-3] for details.

6 MEOS Control Graphical User Interface

All sub-systems constituting the Sentinel DFEP provide their own HMI's documented in separate volumes (ref. section 2). MEOS Control provides a common DFEP GUI for operators, both locally and remotely (see figure 13). Accessing the GUI requires authentication, which is used to control the access level (monitor, command, system, etc.).

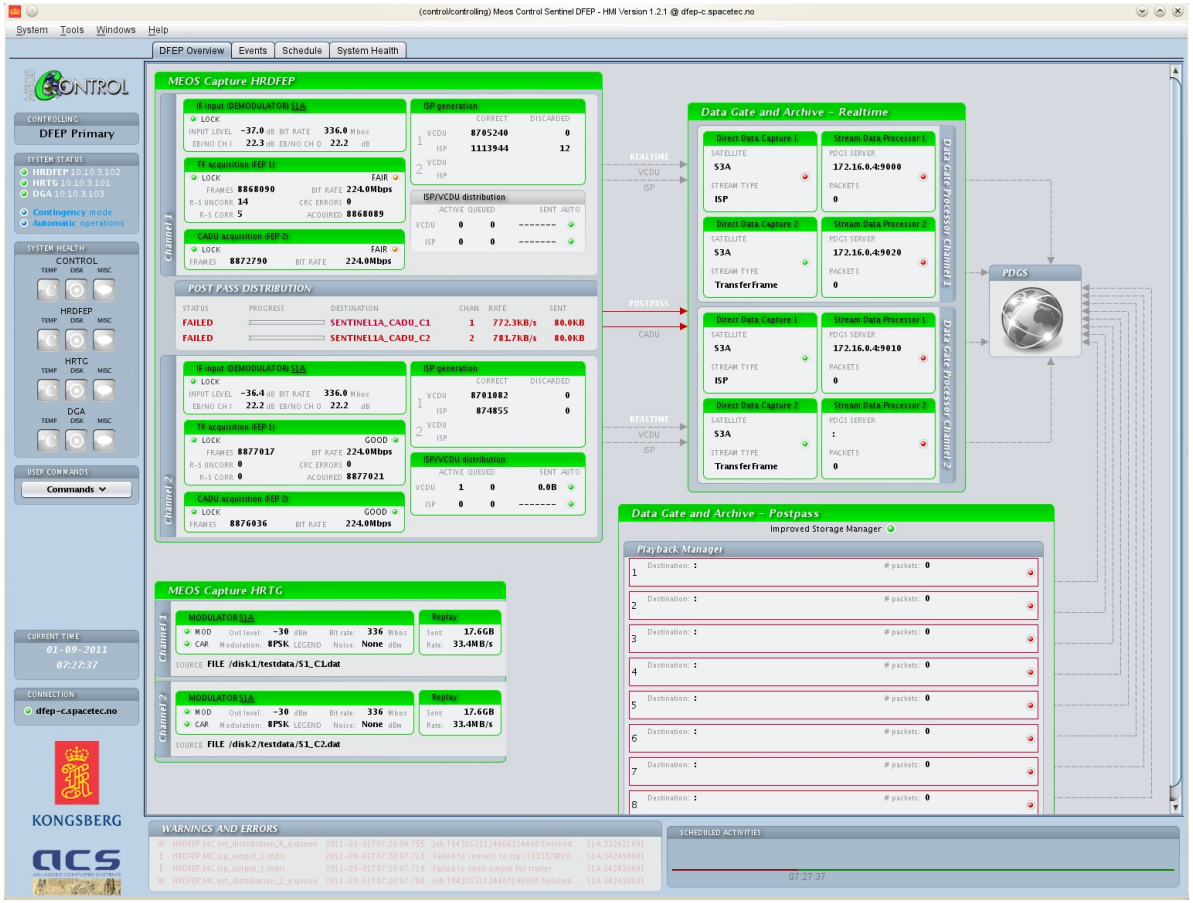


Figure 13: DFEP GUI

This top level HMI will provide an overview of the complete DFEP, while still enabling the operators to go into details for each of the connected components.

The main purpose of the MEOS Control GUI is to provide operators with a central view for monitoring ongoing activities in the system, and the GUI is divided in two main parts:

- A fixed part (see section 6.1), consisting of the Sidebar, Warnings and Errors, and Scheduled activities. These parts will always be visible.
- A Tab part. The contents of this part will change, dependent of the selected tab. The following tabs are present:
  - DFEP Overview (see section 6.2)
  - Events:
    System events are shown in this view (see section 6.3).
  - Schedule:
    This view shows planned activities for the station. Here you can see which activities are scheduled and what tasks are involved for each activity (see section 6.4).
  - System health (see section 6.5).

The HMI has the functionality to launch supplied manuals in PDF viewer, using the viewers search functionality.

6.1 Fixed Part

6.1.1 Menu Bar

The menu bar includes menus accessible independent of the actual GUI tab selected by the operator.

Note that available choices will be dependent of the GUI started; Monitor or Control. If Monitor is started, some selections will not be present.

6.1.1.1 System Menu

The System Menu gives access to system level operations as Reconnect and Quitting the MEOS Control DFEP GUI.

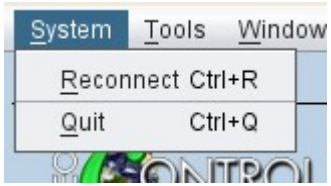


Figure 14: The System Menu commands

- *Reconnect button:* Use this button to re-establish the connection between the MEOS Control Server and the GUI
- *Quit*: Use this button to quit the HMI. This will NOT affect the MEOS Control system itself.

6.1.1.2 Tools Menu

The Tools Menu gives direct access to tools for screen-shots, plots and logs operations.

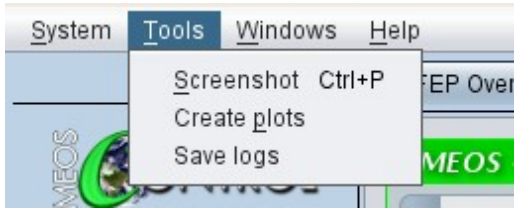


Figure 15: The Tools Menu commands

- *Screenshot:* Clicking this button will open a print dialogue box, and can be used to print a screenshot of the HMI
- *Create plots*: By clicking this button, both single and multi parameter plots can be created (see section 6.1.1.2.1)

- *Save logs*: Click this button to save systems logs to a specific location (see figure 16).

Figure 16: The Save Logs box

6.1.1.2.1 Creating plots

When creating plots, a number of steps are required:

1. Select a new plot, or making a plot from preset (see figure 17). Click Next when done.
2. Select the source; live or from the database (see figure 18). If live is selected, data will be plotted as new values for selected parameters are generated by the system. If database is selected, the plot will be generated based on stored data for a given satellite and orbit. Click Next when done, or Back to change earlier selection.
3. Select the type of plot to be generated (see figure 19). Available choices will be dependent of selected source. Click Next when done, or Back to change earlier selection.
4. Select the variables to be plotted (see figure 20). Browse through all available variables, and select candidate ones by clicking on the right-arrow button (top between the two fields). Selected parameters will show up in the right-most field.
   To remove a selected parameter, highlight it in the right-most field and click on the left-button (second from top between the two fields).
   Several parameters can be selected to be plotted together.
   Click Finish when done, Back to change earlier selection, or Cancel to cancel the plot generation.
5. When satisfied with the selection, click the Finish button, and the generated plot will appear (see figure 21)

Figure 17: Creating new plots

Figure 18: Selecting source

Figure 19: Selecting plot type

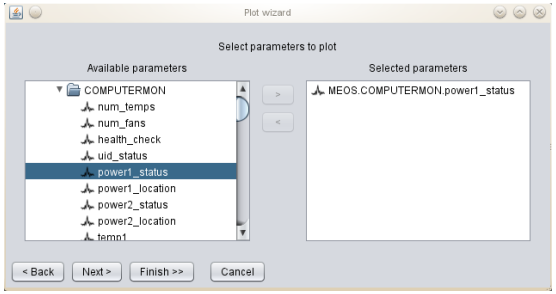


Figure 20: Selecting variables

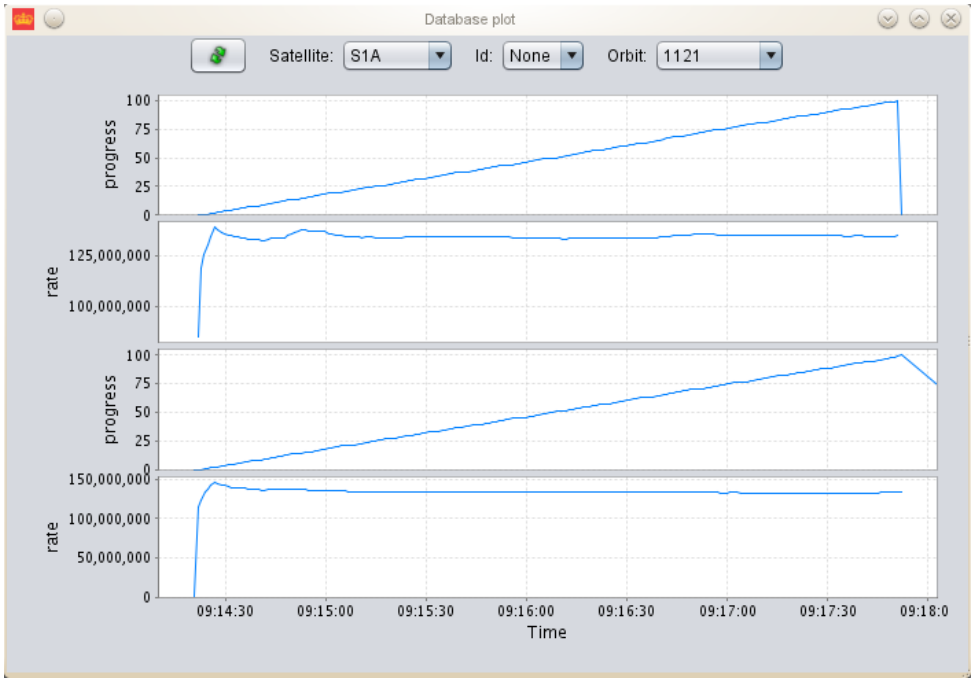


Figure 21: Final plot example

The window in figure 21 will be slightly different dependent of the source selection. If live is chosen, the plot will appear at once, and graphs will be updated as selected data arrives. If database is chosen, satellite and orbit must be selected from the top of the window.

6.1.1.3 Windows Menu

The Windows menu gives access to information and HMI's for all connected systems (MEOS Capture HRDFEP, MEOS Capture HRTG, DG&A) and MEOS Control itself (see figure 22)

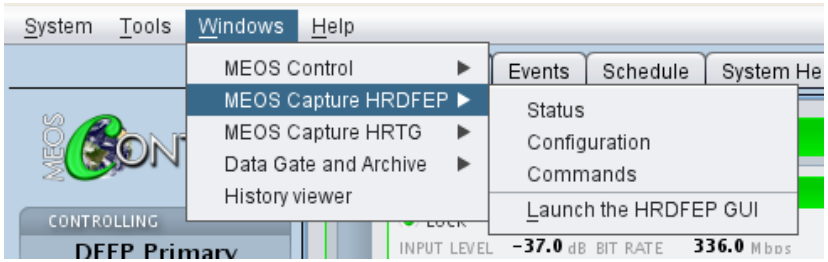


Figure 22: The Windows Menu commands

The following commands are present:

- MEOS Control
  - Status
    This selection will bring up a window where all status parameters can be viewed (see figure 25)
  - Configuration
    This selection will bring up a window where all configuration settings can be viewed (see figure 23)
  - Commands
    This selected will bring up a window with all available commands, per function (see figure 15). Dependent of the selected command, additional parameters may be required (see figure 14)
- MEOS Capture HRDFEP
  - Status, Configuration and Commands; as for MEOS Control

- Launch the HRDFEP GUI
  This selection will launch the MEOS Capture HRDFEP GUI as a separate window
- MEOS Capture HRTG
  - Status, Configuration and Commands; as for MEOS Control
  - Launch the HRTG GUI
    This selection will launch the MEOS Capture HRTG GUI as a separate window
- Data Gate & Archive
  - Status, Configuration and Commands; as for MEOS Control
  - Launch the Data Gate& Archive GUI
    This selection will launch the Data Gate & Archive GUI in a browser
- History viewer

Selecting this will launch the History viewer in a separate window. See section 6.6 for more information.

6.1.1.4 Help Menu

The Help Menu gives access to the online help and access to “information” about the MEOS Control application.

Figure 23: The Help Menu commands

The following commands are present:

- Online help

Will provide online documentation in a browser

- About

Will bring up a new window with version information.

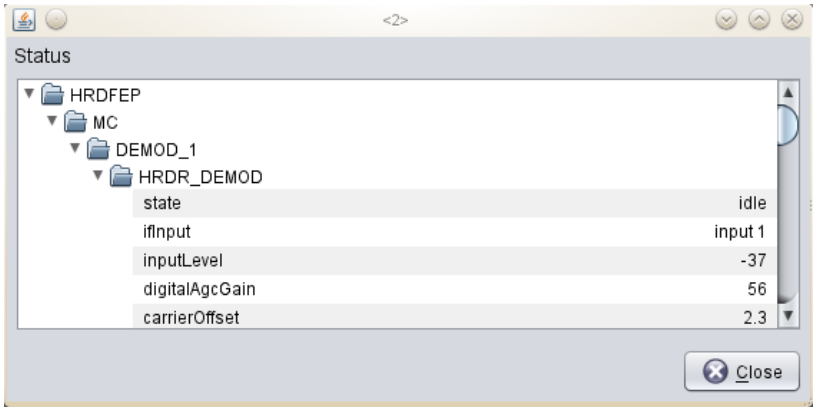


Figure 24: Example of status window

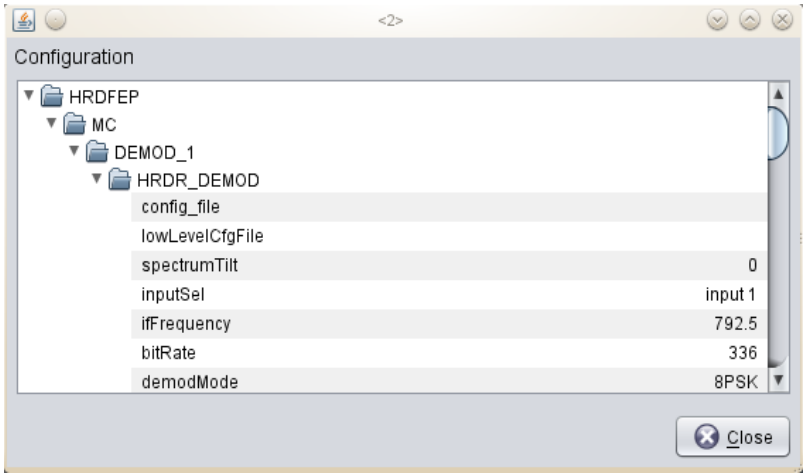


Figure 25: Example of configuration window

Figure 26: Example of command information window

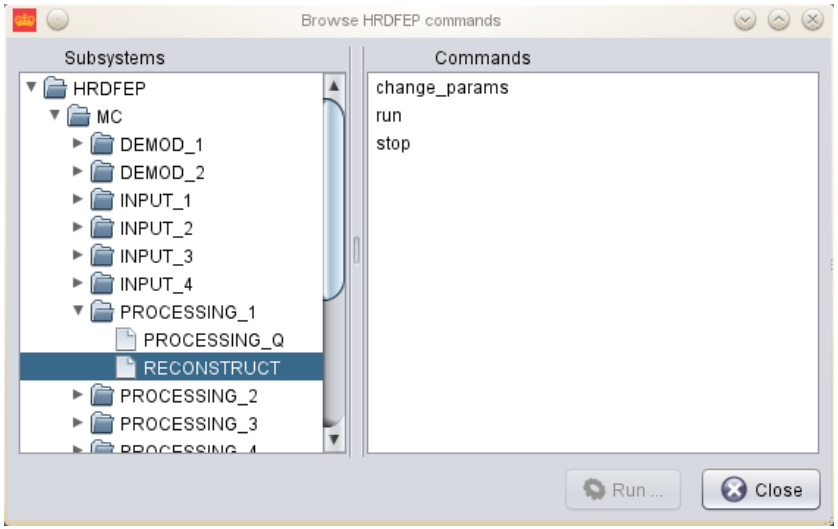


Figure 27: Example of commands window

6.1.2 Side Bar

The sidebar is always present in the GUI, regardless of the selected views- Figure 28 shows the status and functions in the sidebar.

Figure 28: Sidebar

Controlling

Indicates the MEOS Control Instance (DFEP Primary, DFEP Secondary or DFEP Backup).

System Status

Indicates which of the controlled systems is running (green) or has stopped (black). The name of the server is shown after the colored system status.

This part also shows the operational and schedule mode of the DFEP:

- Operational mode
  - Nominal mode in white color, green LED
  - Contingency mode in blue color, blue LED
  - Inconsistent mode in red color, red LED. Used if the system is not able to detect the operational mode.
- Schedule mode
  - Scheduled operations in white color, green LED
  - Automatic (data driven) operations in blue color, blue LED

System Health

Indicates to the operator if anything needs attention on the controlled systems. The icons and labels show various system status from the connected systems. If warnings are detected, the corresponding LED will blink yellow, and red if errors are detected. The cause of the alarm can be found by holding the mouse-pointer over the LED in question (see figure 29).

The following categories are monitored:

- TEMP

If temperatures within the systems exceeds normal limits. For MEOS Capture systems, card temperatures are also monitored.

- DISK

User Commands

The Commands Button gives the operator the choice of entering predefined DFEP commands (see figure 30).

Current Time

Indicates the system date and time (UTC).

Connection

The LED is green when there is activity on the connection to the DFEP Control Server.

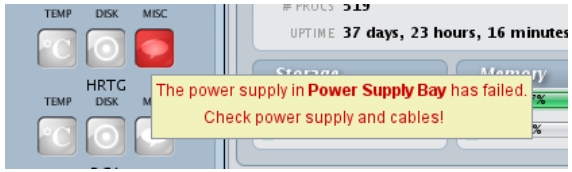


Figure 29: Alarm cause popup

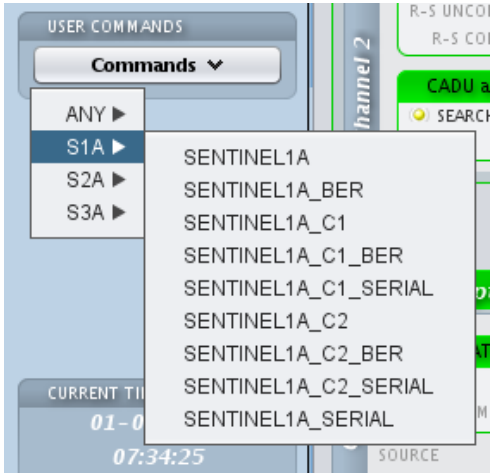


Figure 30: Predefined commands

6.1.3 Warnings and Errors

This field is used to display system level warnings or errors (see figure 31). Old messages disappear upwards and fade out as new messages are displayed.

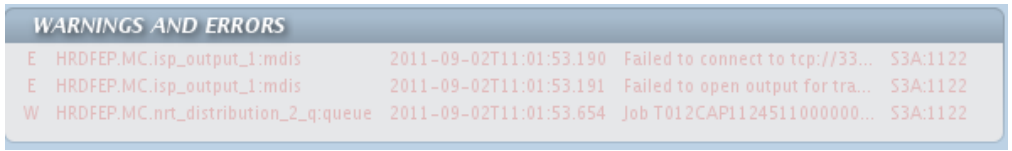


Figure 31: Warnings and Errors

The same events will also be present in the overall Events view (see section 6.3).

6.1.4 Scheduled Activities

Activities are scheduled in order to set up the system for reception and distribution of data, and can be viewed by switching to the *Schedule* view (see section 6.4).

A time-line in the main window shows the activities relative to the current time, called a *scheduled activities* display (see figure 32). The time-line is relative to the fields width, where appr 25% is used for passed activities (red line) and 75% is used for future activities (green line). By holding the mouse-pointer over a pass, additional information is shown (see figure 33).

The following symbols are used:

Active pass.
An active pass will have green color, showing the satellite and orbit

Future pass
A future pass will have gray color, showing the satellite and orbit

Passed pass
A passed pass will have gray color, showing the satellite and orbit. In addition, a symbol will show the status of the pass (see below)

Failed or aborted pass

Waiting pass

Running pass

Successful pass

The length of the pass "block" on the time-line indicates the relative length of the pass.

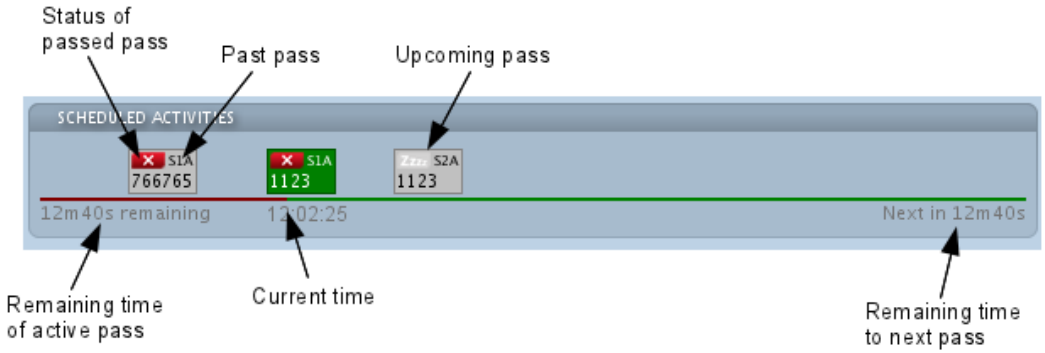


Figure 32: Scheduled activities

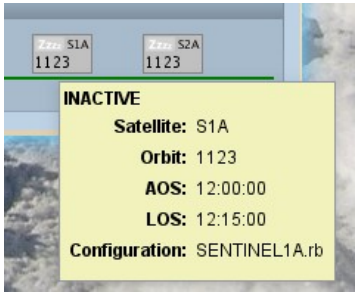


Figure 33: Additional pass information

6.2 Overview Tab

The main purpose of this tab is to display key parameters and show their values in ways that are easy for the operators to interpret. This view is typically used during activities to show how the different components are operating.

The Overview Tab is shown in figure 34.

Figure 34: The Overview Tab

The Overview Tab shows a high-level representation of all connected systems:

- MEOS Capture HRDFEP – upper left part
- MEOS Capture HRTG – lower left part
- DG&A Real-time – upper right part
- DG&A Post Pass – lower right part

All these parts are described in the following sections.

In addition, the lines between the different parts illustrate data flows, direction indicated by an arrow:

- White legend – type of dataflow
- Gray legend – contents of dataflow
- Gray dotted line – defined, but inactive data flow
- Green solid line – active data flow

- Red solid line – indicating error related to the data flow

6.2.1 MEOS Capture HRDFEP View

Figure 35 shows the MEOS Capture HRDFEP as presented in the Overview tab.

Figure 35: The MEOS Capture HRDFEP view

The outer frame will green if the MEOS Capture HRDFEP is running, and red otherwise.

The HRDFEP is a two channel system, consisting of two individual processing channels (each shown in figure 36) and a post-pass distribution part.

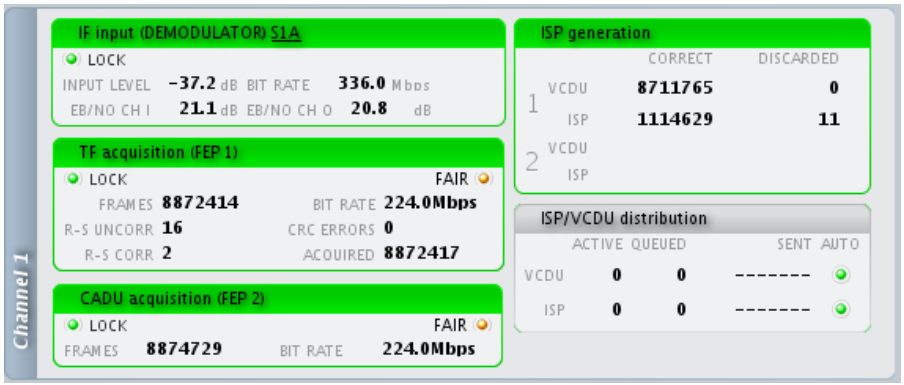


Figure 36: One channel

6.2.1.1 Processing channel

Each channel is composed of 5 different functional blocks (see figure 36):

- IF Input (Demodulator)
  - Frame:
    - Gray: Inactive
    - Green: Running
    - Red: If not running in automatic (data-driven) schedule mode
    - When running, both satellite and orbit will be shown
  - Lock LED:

- Gray: Inactive
- Yellow: Search
- Green: Lock

- Input level: The monitored input level
  - Bit rate: Indicates the output bit rate
  - Eb/N0 Ch1/Ch2: Indicates (for each channel) how much energy there is in the signal (per bit) in relation to the noise (per Hz). Eb/No should be over 10dB to have good frame synchronizer lock. An Eb/No at 10.6 dB equals a BER at 10^{-6} for an uncoded signal.

- TF acquisition (FEP 1)
  - Frame:
    - Gray: Inactive
    - Green: Running
    - Red: If not running in automatic (data-driven) schedule mode
    - When running, both satellite and orbit will be shown
  - Lock LED:
    - Gray: Inactive
    - Yellow: Search
    - Green: Lock
  - Good/Fair/Poor LED:
    Back to search events average over last 6 seconds
    - Green: Good – 0 events
    - Yellow: Fair – 1-9 events
    - Red: Poor - > 9 events
  - Frames: Number of frames output from frame synchronization
  - Bit rate: The current bit rate

- R-S uncorr: Number of uncorrectable frames
- R-S corr: Number of corrected frames
- CRC errs: Number of CRC errors detected
- Acquired: Number of frames output from R-S function

- CADU acquisition (FEP 2)
  - Frame:
    - Gray: Inactive
    - Green: Running
    - Red: If not running in automatic (data-driven) schedule mode
    - When running, both satellite and orbit will be shown
  - Lock LED:
    - Gray: Inactive
    - Yellow: Search
    - Green: Lock
  - Good/Fair/Poor LED: Back to search events average over last 6 seconds
    - Green: Good – 0 events
    - Yellow: Fair – 1-9 events
    - Red: Poor - > 9 events
  - Frames: Number of frames output from frame synchronization
  - Bit rate: The current bit rate
- ISP generation
  - Frame:
    - Gray: Inactive

- Green: Running
- VCDU | ISP/Correct: Number of correct VCDUs | ISPs
- VCDU | ISP/Discarded: Number of discarded VCDUs | ISPs

- ISP/VCDU distribution
  - Frame:
    - Gray: Inactive
    - Green: Running
  - VCDU | ISP:
    - Active: Number of active distributions
    - Queued: Number of queued distributions
    - Sent: Amount of data sent
    - Auto: Green if in automatic mode, gray otherwise
      - In automatic mode, data is transmitted in the order of appearance.
      - In manual mode, data is queue and paused, and manual changes to queue ordering etc. can be made. To restart the transmission of queued data, go back to Automatic mode.

For more details, please refer to the MEOS Capture HRDFEP Operations and Maintenance manual [4].

6.2.1.2 Post-pass distribution

Post-pass distribution supports two simultaneous file transfers, and the corresponding block is shown in figure 37.

Figure 37: The Post-pass distribution block, one active and one failed

There is one line for each ongoing distribution, with the following information shown:

- Status: Status of ongoing or previous distribution
  - Working: Distribution is ongoing
  - Complete: Distribution is complete. After a successful distribution, all information will be «grayed out» 5 seconds after completion (see figure 38)
  - Failed: Distribution has failed, inspect event log for more information. After a failed distribution, all fields will be red, and the status will remain until next distribution.
- Progress: Indicates the progress, in percent, of the ongoing distribution
- Destination: The configured destination
- Chan: The channel associated with the distributed data
- Rate: The distribution rate
- Sent: The amount of data sent

Figure 38: The Postpass distribution block, one completed

For more details, please refer to the MEOS Capture HRDFEP Operations and Maintenance manual [R-1].

6.2.2 MEOS Capture HRTG View

Figure 39 shows the MEOS Capture HRTG as presented in the Overview tab.

Figure 39: The MEOS Capture HRDFEP view

The outer frame will green if the MEOS Capture HRTG is running, and gray otherwise.

The HRTG is a two channel system, consisting of two individual processing channels (each shown in figure 40) and a post-pass distribution part.

Figure 40: One channel

6.2.2.1 Processing channel

Each channel is composed of 2 different functional blocks (see figure 40):

- Modulator
  - Frame:
    - Gray: Inactive
    - Green: Running
    - When running, both satellite and orbit will be shown
  - Mod LED:
    - Gray: Modulation is off
    - Green: Modulation is on
  - Car LED:
    - Gray: Carrier is off
    - Green: Carrier is on
  - Output level: The output level
  - Bit rate: Specifies the bitrate of the modulated signal
  - Modulation: Specifies the modulation type used. BPSK, CBPSK, QPSK, OQPSK, UQPSK, 8PSK and 16QAM
  - Noise: Noise level set
- Replay
  - Frame:
    - Gray: Inactive
    - Green: Running
  - Sent: The amount of data sent
  - Rate: The output rate

For more details, please refer to the MEOS Capture HRTG Operations and Maintenance manual [R-2].

6.2.3 Data Gate and Archive Realtime View

Figure 41 shows the Data Gate and Archive (DG&A) Realtime block as presented in the Overview tab.

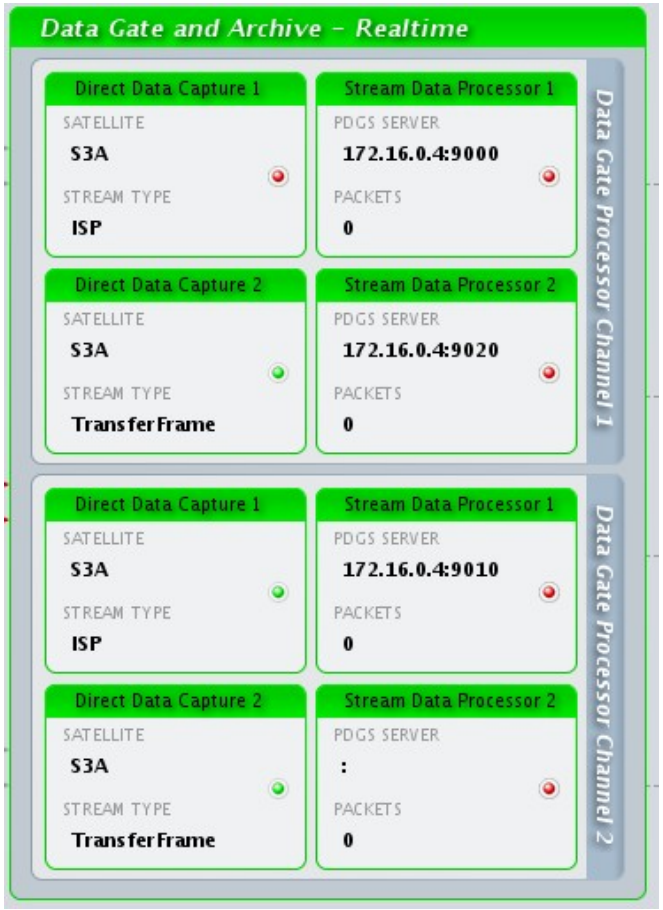


Figure 41: The DG&A Realtime block

The outer frame will green if the DG&A is running, and red otherwise.

The DG&A supports handling of two channels, each channel consisting of two input parts, Direct Data Capture (DDC), and two output parts, Stream Data Processor (SDP). The two parts handles Transfer Frames and ISPs individually.

Each channel block is shown in figure 42.

Figure 42: One channel

The following information is available per channel:

- Direct Data Capture 1/2
  - Frame:
    - Green: Running
    - Red: Inactive
    - Satellite: The satellite identification for the data being received

- Stream type: Type of data being received; ISP or TransferFrame
- LED:
  - Black (off): Stopped
  - Yellow: Listening for incoming connections
  - Green: Receiving data
  - Red: Error condition, see EventLog for more information

- Stream Data Processor 1/2
  - Frame:
    - Gray: Inactive
    - Green: Running
  - PDGS server: The IP address:port of the PDGS server receiving the data
  - Packets: The number of packets sent on this connection
  - LED:
    - Black (off): Inactive
    - Green: Distributing data
    - Red: Error condition, see EventLog for more information

6.2.4 Data Gate and Archive Postpass View

Figure 43 shows the Data Gate and Archive (DG&A) Postpass block as presented in the Overview tab.

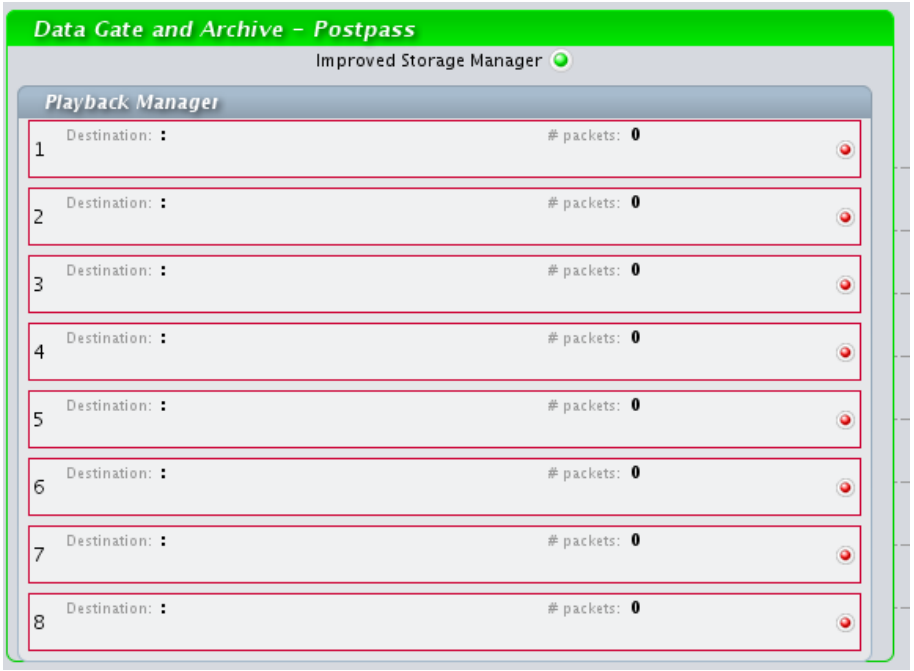


Figure 43: The DG&A Postpass block

The outer frame will green if the DG&A is running, and gray otherwise.

The DG&A Postpass function supports up to 8 simultaneous distributions, each represented with one entry in the overall block (see figure 44).

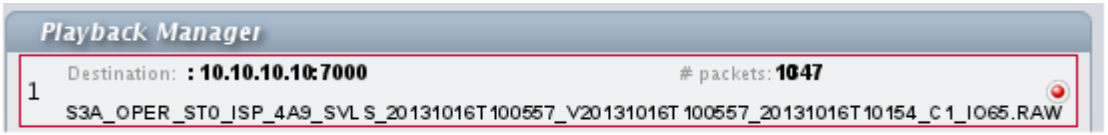


Figure 44: One channel

The following information is available:

- Frame:
  - Gray: Inactive
  - Green: Running
  - Red: Error condition, see EventLog for more information.
- Destination: The IP address:port of the server receivingthe data
- # packets: The number of packets sent on this connection
- Filename: The name of the file being sent
- LED:
  - Black (off): Inactive
  - Green: Distributing data
  - Red: Error condition, see EventLog for more information

6.3 Events tab

Events generated by the control system are reported to the operator and shown in the Event view. To show the event view, click on the “Events” tab in the main GUI. The event view is shown in figure 48.

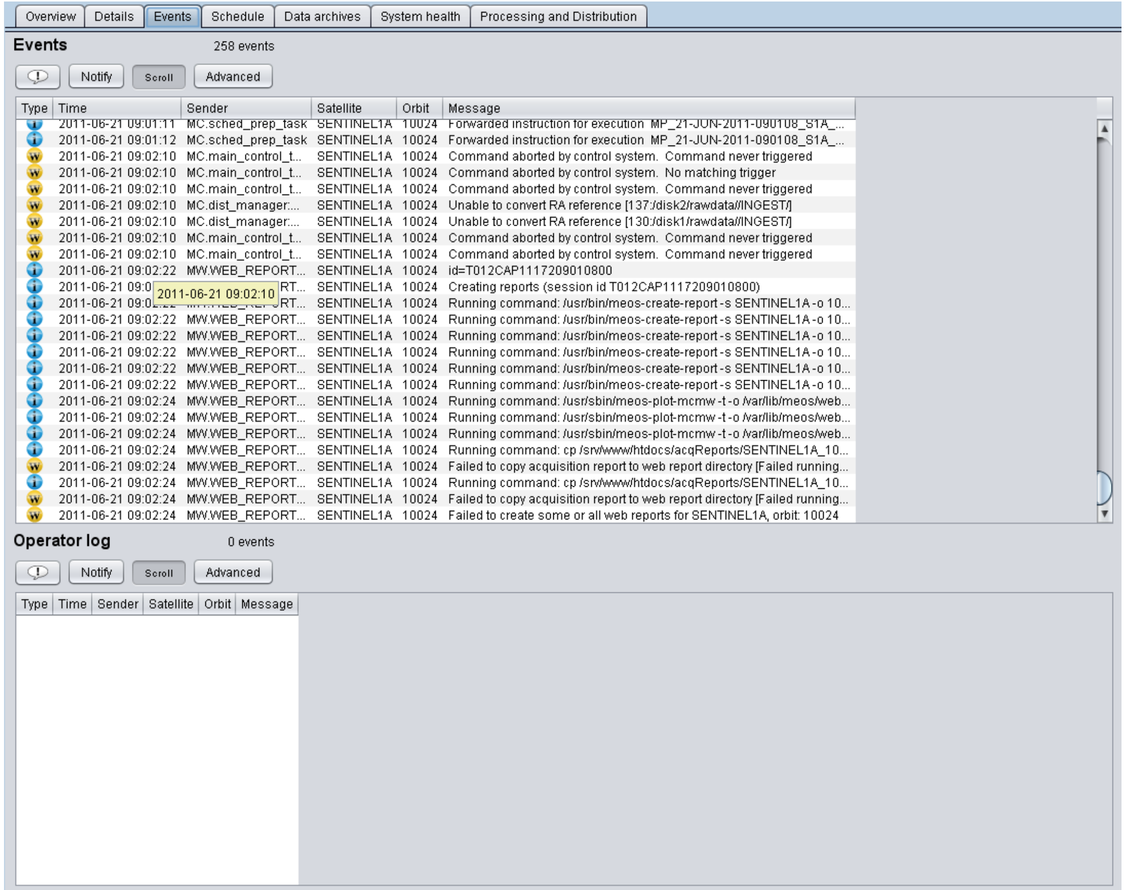


Figure 45: Events tab

The alarm view displays messages from the underlying systems. The messages are divided into four categories:

Type	Icon	Description
Information		Informational message
Warning		Warning, non critical message. Operator intervention may be necessary
Error		A critical error. Operator investigation required, actions may be necessary
Feedback		Informational message resulting from a specific command initiated by the operator

The default is to view realtime alarms since the GUI was started and onwards. Optionally, alarms for the last hour or the last day can be shown. This will also show realtime alarms, but as soon as they are older than one hour or one day, respectively, they are popped off the alarm list.

Historical alarms can also be viewed. By specifying two dates and times, the database is queried and the alarms between the specified times are shown.

Note

There is a configurable limit of the number of messages to show in an alarm list. The default is 10000.

It is possible to search among the displayed alarms. Filtering out alarm messages can also be done on the server side.

Below is an overview of the alarm panes.

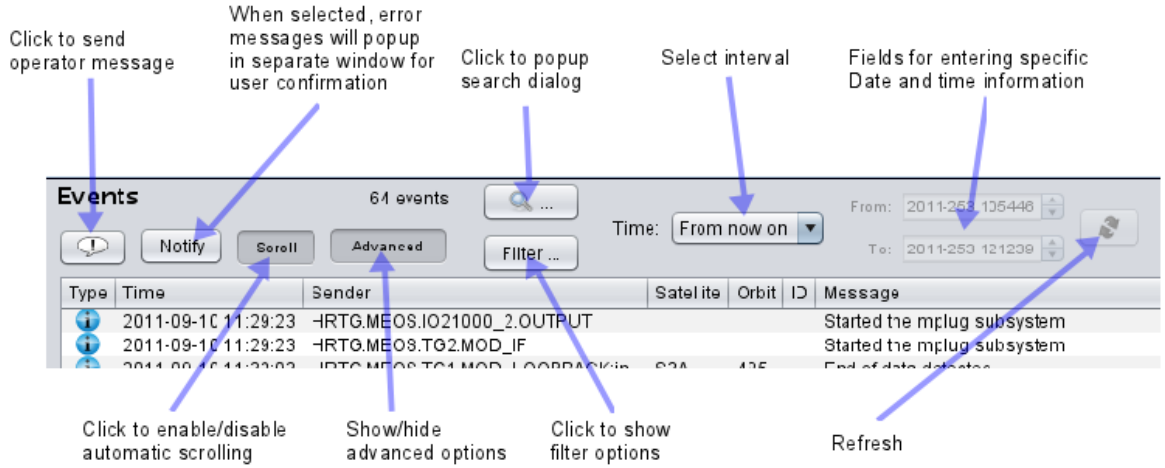


Figure 46: Event options

If the message is very long, there might not be room enough to show the complete message text in the table. To display the complete message, hover the mouse over the message in question. This will pop up a multiline tooltip window showing the complete message. The tooltip will stay up for 30 seconds.

6.3.1 Copying cell values

It is possible to copy cell values from the table to the clipboard. To do so, click the right mouse button on the row where the cell is located. A popup menu is displayed, showing the contents of each cell of the row. Browse the menu and select the cell value of choice by clicking either the left or right mouse button. The selected cell value will now be available in the clipboard, and subsequently pasted in other programs.

6.3.2 Error alarms

By default, error alarms are shown in a separate window in addition to the normal alarm list. In order to get rid of this window, the alarms must be acknowledged by the user.

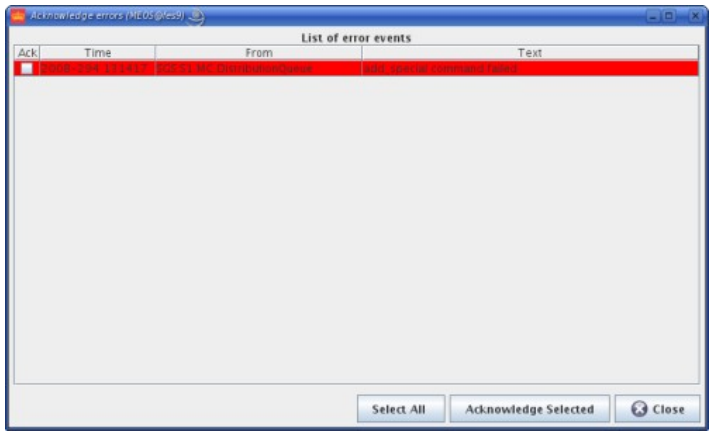


Figure 47: Error alarms are popped up in a separate window

6.3.3 Selecting events by timestamp

All events are timestamped, and there are four different ways to select events based on time. These are as follows:

- *From now on:* This mode will show all events at the time that the GUI was first started and continuously from then on. Selecting this mode again, will clear the event list and start over from that point in time. This is the default mode and is selected automatically at startup.
- *Last hour:* Selecting this mode will always show events from the last hour. This means that when an event is older than one hour, it will be removed from the list.

- *Last day:* This works in the same way as Last hour, except that it keeps events from the last 24 hours.
- *Other*: This mode allows you to specify the From time and To time and query the database for events between these timestamps. In this mode, new events will not be shown when they arrive. Only the events that was in the database at the time of query will be shown in this mode, even if the To time is set to the future. To receive new events as they arrive, use any of the other modes. This mode is mainly used for examining events that occurred outside the range of the other modes. When using this mode, enter the timestamps in the text boxes, and click the Update button. This will send a request to the database, and the result will be shown in the event list. Although there is no limit on the range of time you can enter in the text boxes, be aware that the number of events for a week or month can be substantial, and that it will take some time to retrieve the events from the database.

6.3.4 Searching for alarms

To search for a specific event, click on the search button. The search dialog window is shown below.

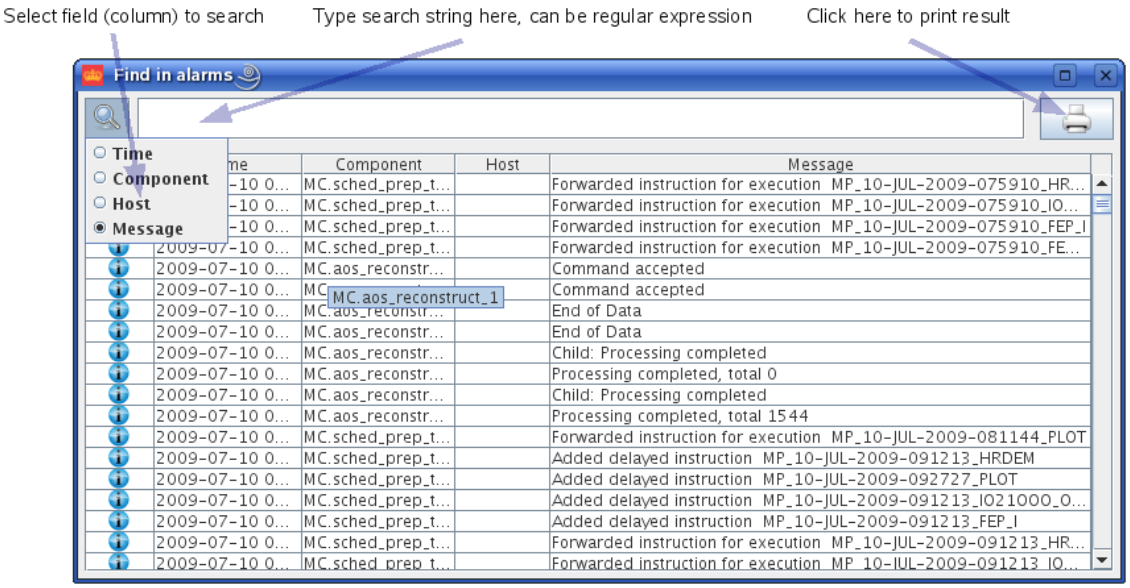


Figure 48: Searching for alarms

The searching takes place only among alarms already received. No queries are executed. In case of one of the realtime alarm modes being selected, new alarms matching the search criteria will be added.

6.3.5 Alarms filtering

Alarms can be hidden by creating an alarm filter. Each filter is stored in the database and is shared between users and profiles. The selected and available filters are displayed by selecting the filter button, as shown here:

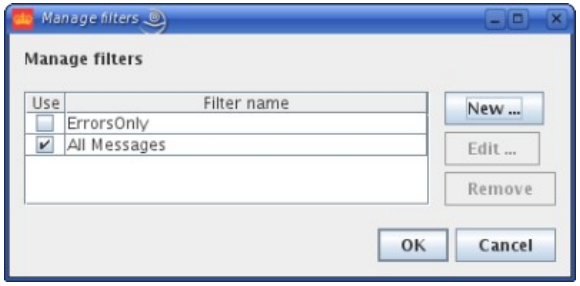


Figure 49: Displaying alarm filters

To activate a filter click the check box in the Use column. The filters themselves are shared between profiles, but activating or deactivating an event filter only affects the current profile. Which filter is active will be stored in the current profile and restored the next time you start the system. To edit a filter, highlight it and click the Edit button. To create a new filter, click the New ... button. If you add or edit a filter a new dialog window will pop up, letting you change the properties of the filter. The event filter dialog window is shown below:

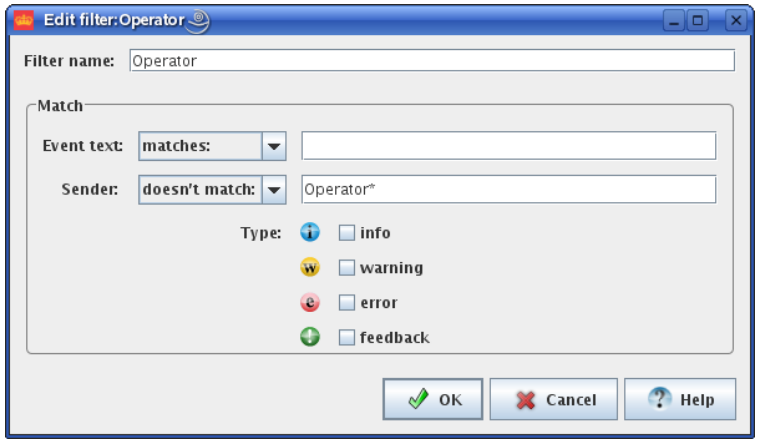


Figure 50: Creating a new filter that hides all informational alarms

If you create a new filter, you must first give it a name. Enter a suitable name in the Filter name field Enter a pattern to match the event text in Event text field. From the drop down menus you can select either matches or doesn't match. This means the pattern you enter must either match text, or must not match the text. The pattern can be a regular expression. The Event text field can be left blank, if you do not want to match against the event text part of the event. To match against the sender of the event, enter a pattern in the Sender field.

Here are some examples:

Pattern	Description
Event text matches: [Ll]icense	This filter will hide all events containing the words License and license from the list
Event text doesn't match: [Ll]icense	This filter will show only events containing the words License and license
Sender matches: gsc_interface_task	This filter will hide all events originating from the gsc_interface_task
Sender does not match: gsc_interface_task	This filter will hide all events not coming from the gsc_interface_task

Events can also be filtered on the different event types. The available types are:

- info
- warning
- error
- feedback

Check the appropriate box to hide events of the given type.

All filter options can be combined to create very specific rules. To create a filter that hides all information events, leave the Event text and Sender fields blank, and just check the info box.

Filters can be deleted, but it will not be removed physically from the database until all users currently logged in to the same profile are logged out. Changing a filter's name creates a new filter.

6.4 Schedule tab

Activities are scheduled instructions that set up the system for reception and distribution of data. The activities can be viewed by switching to the schedule view.

The Scheduled view (see figure 51) contains several parts:

- Left part
  - A table of all scheduled activities. The table is sorted on AOS time and satellite. To highlight an activity, click on its line. To expand the contents of the activity, click on the icon next to the name of the activity.
- Right part

- Shows activity details.

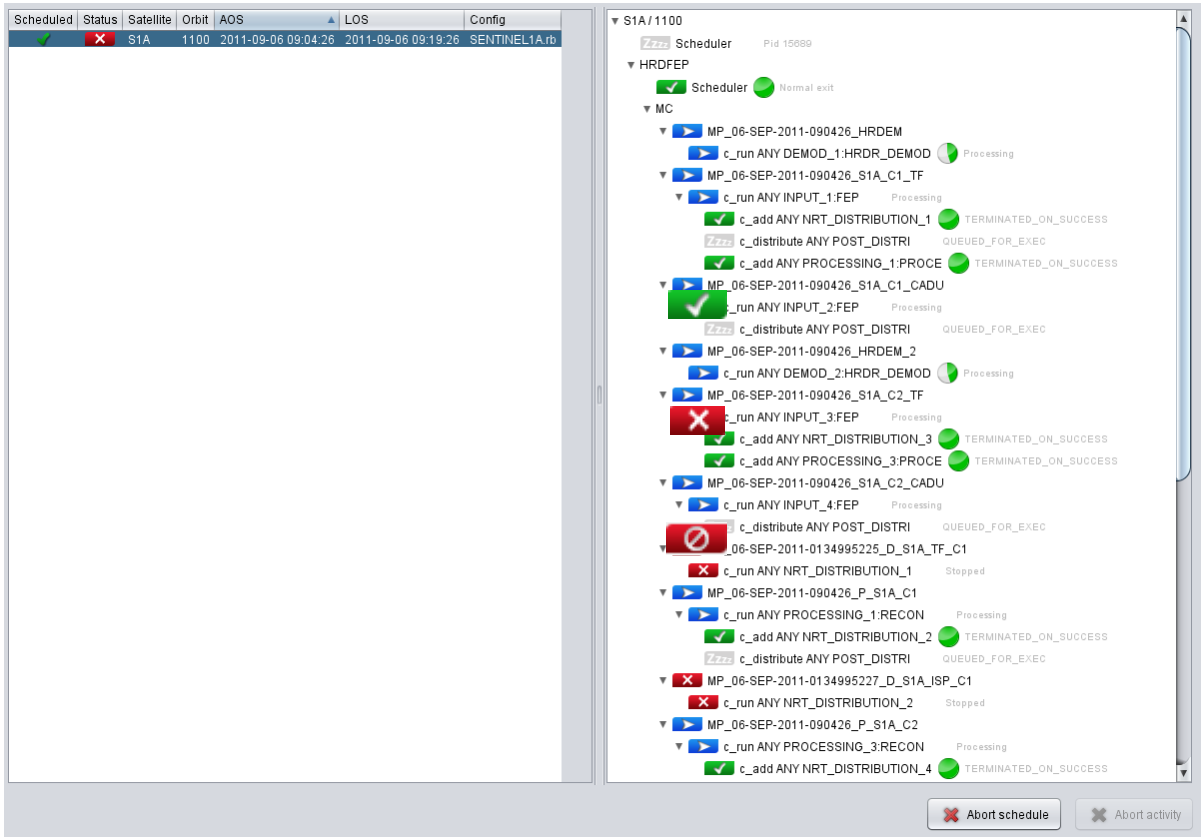


Figure 51: The Schedule tab

6.4.1 Left part

This part shows all scheduled activities, one activity per line.

6.4.2 Right part

The right part shows additional information of activities that are part of a selected pass, as show in figure 51. Activities are layed out in a tree manner, where branches can be collapsed and expanded by clicking on the down and right arrows.

The following table explains the icons and text used.

Icon	Extra icon	Text	Description
		QUEUED_FOR_EXEC	The activity is queued for execution, based on status from other activites
		Processing	The activity is running. The additional icon is used to indicate progress, if provided by the function itself. If no progress is provided, the icon will not be present.
		TERMINATED_ON_SUCCESS	The activity has terminated succesfully
		Stopped	The activity has terminated with error. Inspect Events for details.
			The activity has been aborted.

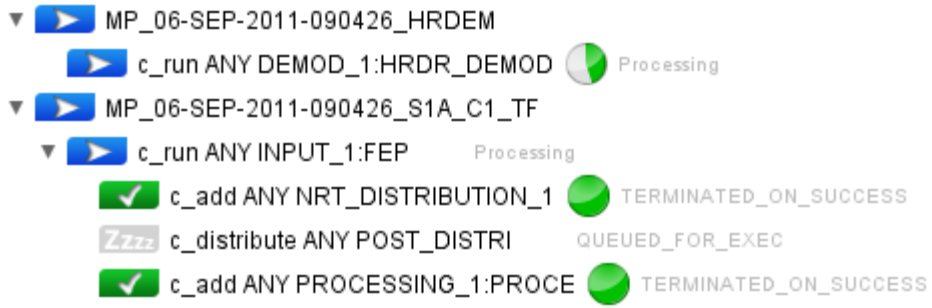


Figure 52: Part of right side view

Figure 52 shows an example of right part view, and shows two activities:

- The first one, `MP_XXXX_HRDEM`, includes one sub-activity:
  - `c_run ANY DEMOD_1:HRDR_DEMOD`, which is currently running

  This activity startes the demodulator, `DEMOD_1:HRDR_DEMOD`
- The second one, `MP_XXXX_S1A_C1_TF`, including the following sub activities:
  - `c_run ANY INPUT_1:FEP`, which is running
    - `c_add ANY NRT_DISTRIBUTION_1`, which terminated on success
    - `c_distribute ANY POST_DISTRI`, which is waiting for the mother (`c_run ANY INPUT_1:FEP`) to terminate
    - `c_add ANY PROCESSING_1:PROCE`, which terminated on success

  This activity starts input of TranferFrames for S1A channel1, in addition to adding TransferFrame processing (`c_add ANY PROCESSING_1:PROCE`) and distribution (`c_add ANY NRT_DISTRIBUTION_1`)

6.4.3 Canceling an activity

To cancel an activity, instruction or command, click on its name in the left side part. The button marked “Abort” below the activities table will be enabled if the current selection can be canceled. Click the “Abort” button to cancel the selected item. If the entire activity was canceled, it will be removed from the list, otherwise the “Status” column will show a «aborted» icon at the canceled item. For details about the result of canceling an activity, look in the event log.

6.5 System Health Tab

The System Health Tab provides status on the MEOS Control and the connected systems (MEOS Capture HRDFEP, MEOS Capture HRTG and DG&A), see figure 53.

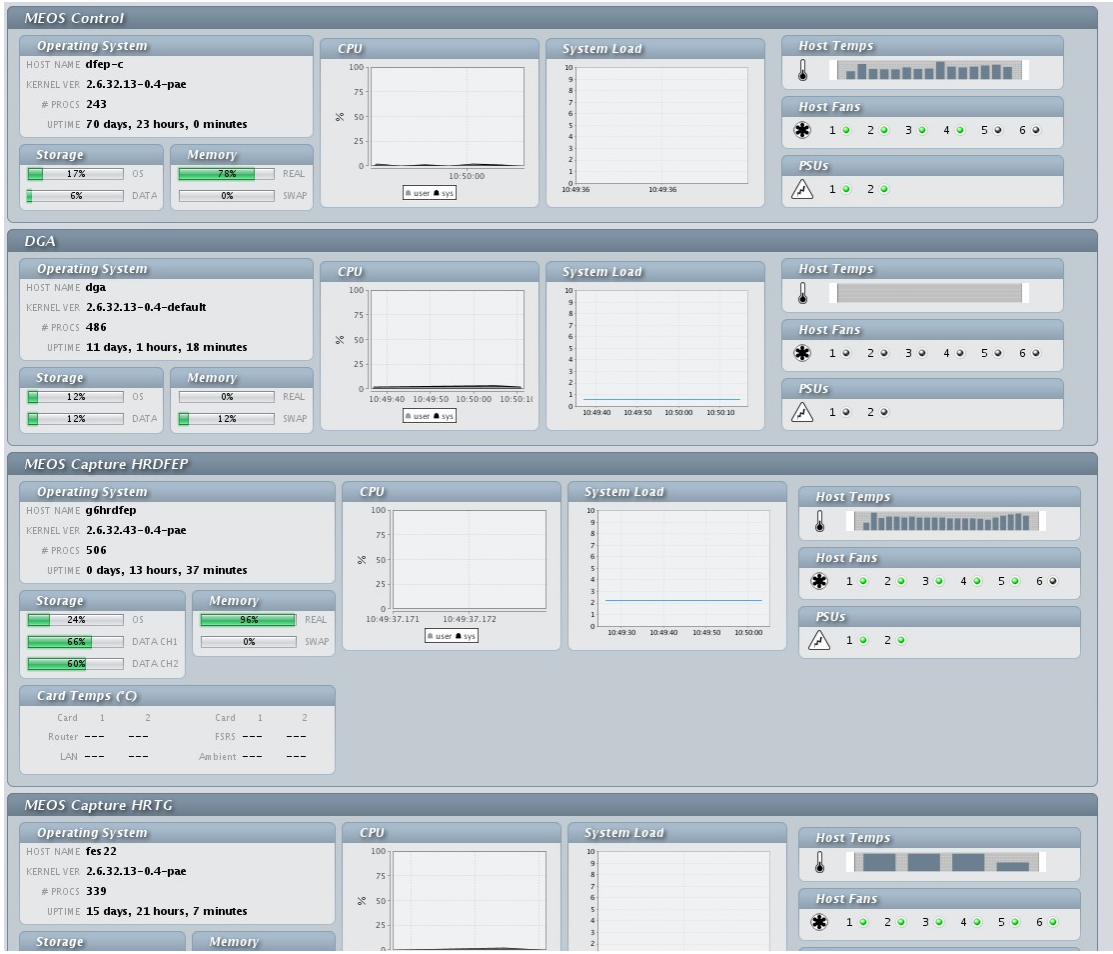


Figure 53: System Health Tab

The System health Tab provides information on important parameters regarding system operation. Critical parameters are also linked to the System Health part of the left sidebar, i.e. overall status is always available independent of the selected view.

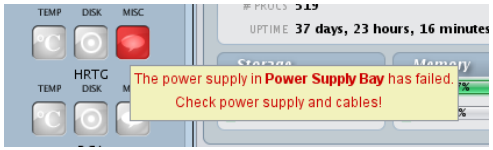


Figure 54: PSU error in sidebar

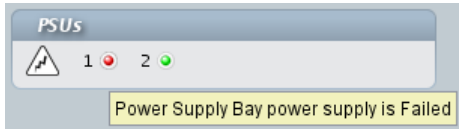


Figure 55: PSU error in System Health Tab

Figure 54 and 55 illustrates how a PSU (Power Supply Unit) failure is indicated in both the sidebar and in the System Health overview.

The System Health Tab has one overall block per system, as shown in figure 56 (MEOS Capture HRTG).

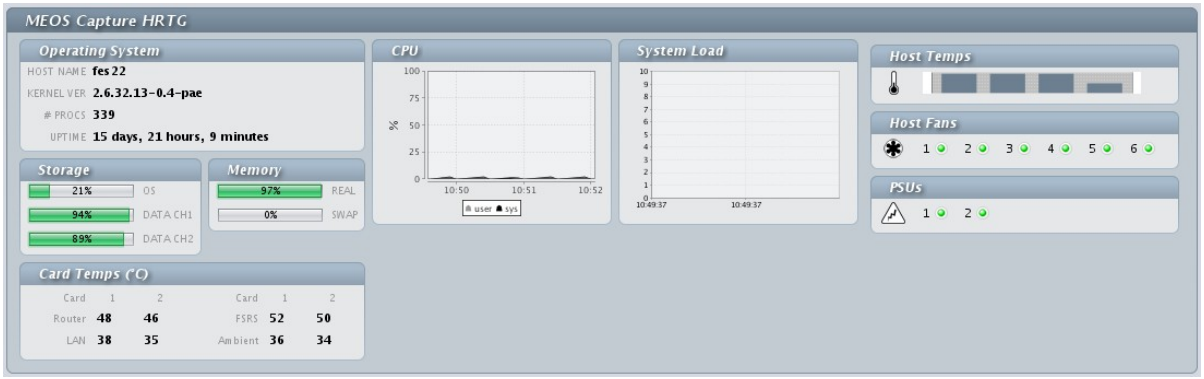


Figure 56: Example of system view

The following categories are monitored:

- Operating System
- Storage
- Memory
- CPU usage (user and sys)
- System Load over the last 15 minutes
- Host temperatures
- Host fans
- Host PSUs
- IO card temperatures (only for MEOS Capture systems)

These categories are detailed in the following sections.

6.5.1 Operating System

The Operating System block is shown in figure 57, and shows operating system related information.

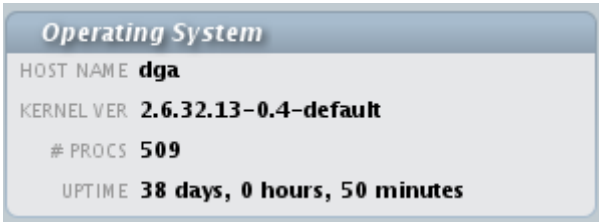


Figure 57: The Operating System block

The following information is presented:

- Host name: A nickname given to the host computer. Used to identify this specific host computer.
- Kernel ver.: Version of the system kernel
- # procs: The number of active processes in the system
- Uptime: The time elapsed since the system was last (re)started.

6.5.2 Memory

The Memory block bars indicate how much of the available memory is allocated by the system, and is shown in figure 58.

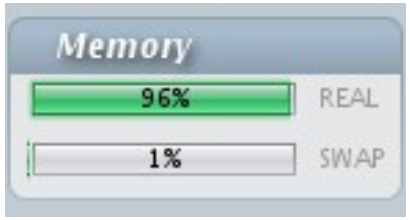


Figure 58: The Memory block

The following information is presented:

- Real: Percentage of allocated RAM.
- Swap: Percentage of allocated disk swap memory.

6.5.3 Storage

The Storage block bars indicate how much of the disk space reserved for the various parts is being used, and is shown in figure 59.

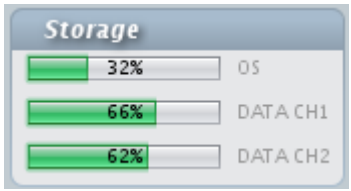


Figure 59: The Storage block

The following information is presented:

- OS: The disk space used by the operating system
- Data Ch1: The disk space used by channel 1
- Date Ch2: The disk space used by channel 2

6.5.4 System Load

The system load graph displays the average load on the kernel the last 15 minutes. This number is the same one gets by running the command:

```
>uptime
```

The load average is calculated as the exponentially damped/weighted average of the load number, where the load number is the number of processes currently running on CPU. If the number is > 1.0 the CPU is overloaded. For a multiprocessor system, the load number should be divided by the number of CPUs.

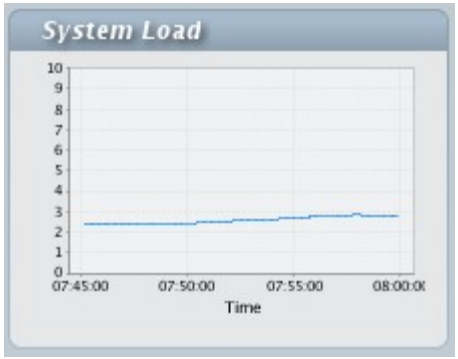


Figure 60: The System Load block

6.5.5 CPU

This block shows the CPU usage (sys and user) for the last 15 minutes, and is shown in figure

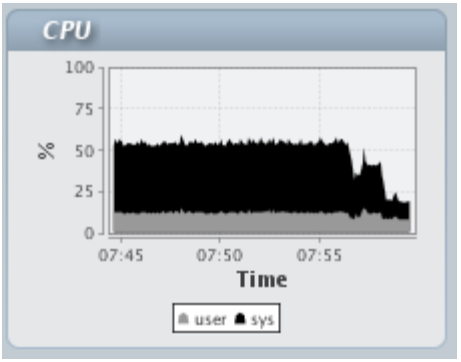


Figure 61: The CPU block

6.5.6 Computer information

Computer information is composed of thee blocks; Host Temps, Host Fans and PSUs, and shown in figure

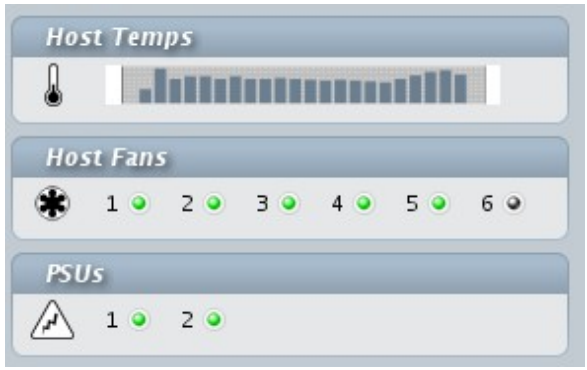


Figure 62: The Computer Information block

For all blocks, a LED is used to indicate the current status:

- Green: Ok
- Yellow: Warning condition
- Red: Error condition

More information on a particular point can be obtained by placing the mouse-pointer over the LED in question, as shown in figure 63.

Warning and errors will also be flagged in the System Health part of the sidebar.

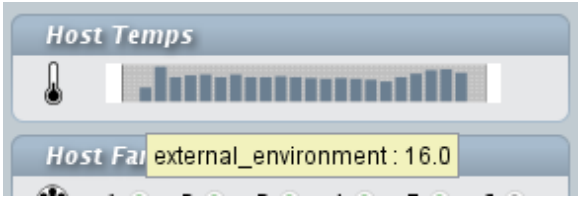


Figure 63: Popup information

6.5.6.1 Host Temps

The Host Temps block (as shown in figur 63) shows the temperatures in different zones within the particular systems host computer. Zone information is available by holding the mouse-pointer of the bar in question.

6.5.6.2 Host Fans

The Host Fans block (as shown in figure 62) shows the status of the different fans within the particular systems host computer. Fan information is available by holding the mouse-pointer of the LED in question.

6.5.6.3 Host PSUs

The PSUs block (as shown in figure 62) shows the status of the power supply units installed in the particular systems host computer.

6.5.7 Cards Temp

The MEOS Capture systems have IO cards installed, and this block shows the temperatures on these cards (see figure 64)

Figure 64: The Card Temps block

The temperatures are measured in four different zones; Router, LAN, FSRS and Ambient. For each card/zone, the corresponding temperature is shown using color codes. The following color codes are used:

- Black: Within normal range
- Orange: Reached warning level
- Red: Reached error level

Warning and errors will also be flagged in the System Health part of the sidebar.

6.6 History viewer

The system generates both quality and quantitative status, and this information can be viewed after a pass using the History viewer. The History viewer is started from the main menu:

View->History

The History viewer is shown in figure 65.

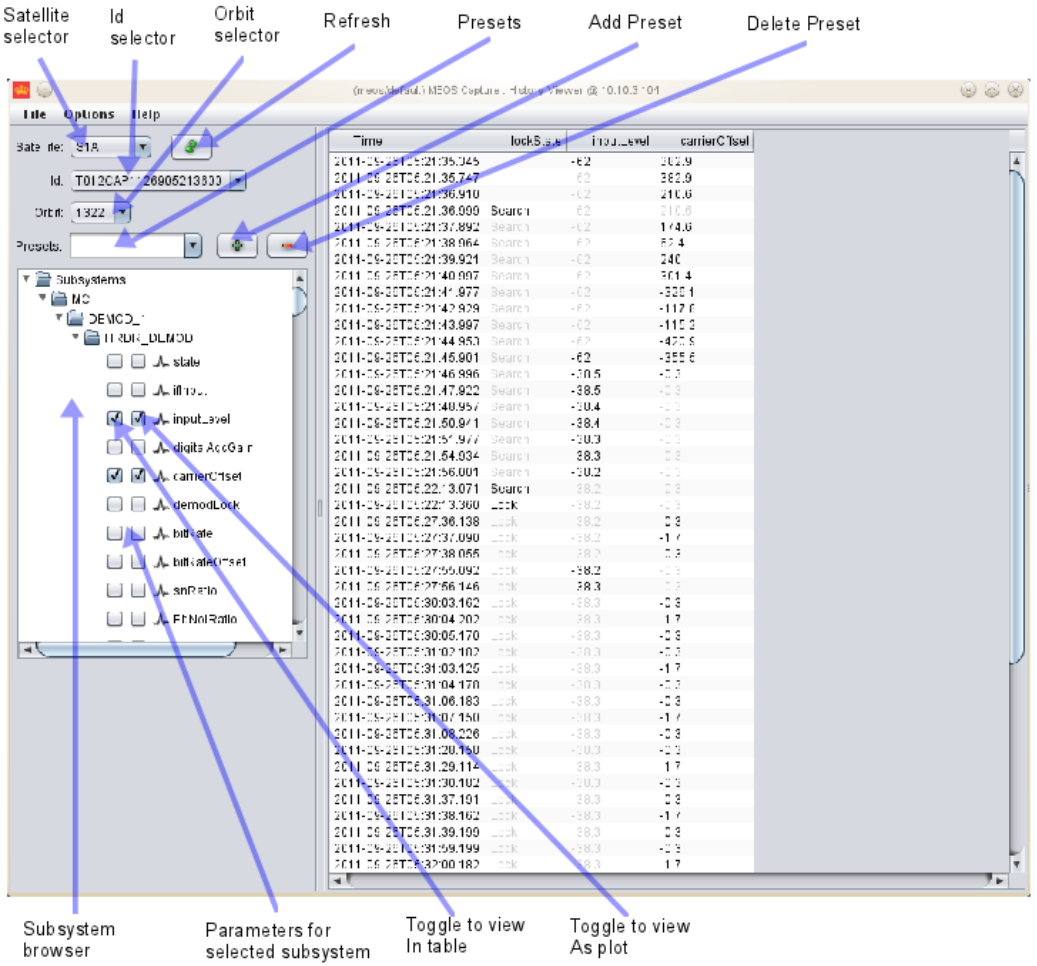


Figure 65: History viewer

6.6.1 Viewing parameters

In order to view stored parameters:

- Select the satellite in question, using the “Satellite selector”
- Select the orbit in question, using the “Orbit selector”
- Select the Id, using the “Id selector”
- Expand subsystems holding the parameters of interest in the “Subsystem browser”
- For all parameters, toggle the left box to view values in the right-most table. Toggled parameters will show up, one column each.
- To view parameters as graphs (see figure 66), toggle the right box.

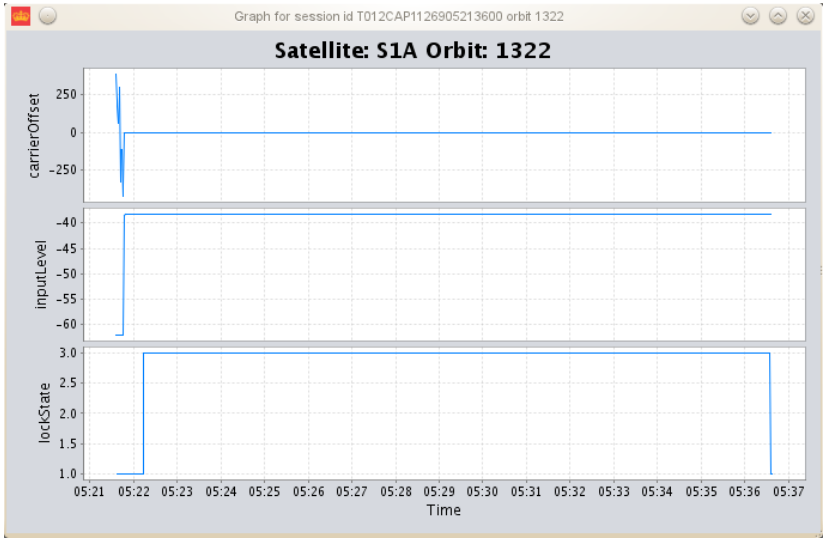


Figure 66: Graph window

6.6.2 Setting presets

Current views can be stored as “presets”:

- Select the parameters to be viewed, as described in section 6.6.1.
- Enter the name of the new preset in the “Presets” box
- Click on the “Add Preset” button. The preset is now stored for future use.

6.6.3 Retention time

Normally, historic data will be available one month on the MEOS Capture HRDFEP and HRTG systems, dependent on use pattern.

The MEOS Control has a larger database, targeted to store historic data for 3 months (which includes historic status from MEOS Capture HRDFEP and MEOS Capture HRTG.)

Please note that this database is not meant as long-term storage, i.e. if you want to keep some status forever, the data must be exported.

7 MEOS Control Administration GUI

Administration of the DFEP has been separated from the operational GUI due to different access rights. See section 5 for how to start this GUI.

The administration GUI is shown in figure 67.

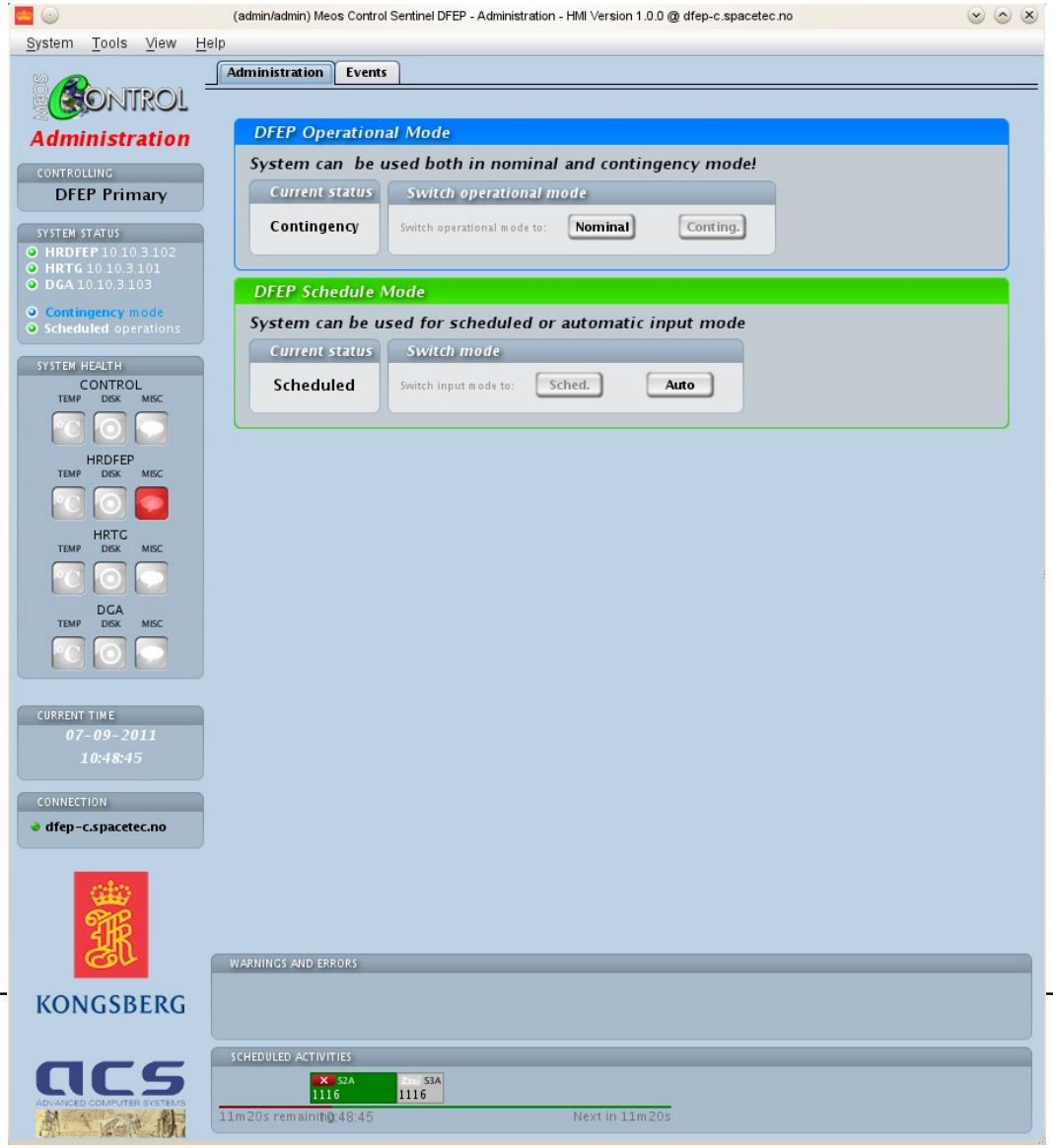


Figure 67: DFEP Administration GUI

The administration GUI has the same side panel and Events tab as the operational GUI. It also includes the Warnings and Errors and Scheduled Activities views, but layed out differently. More details on these parts can be found in section 6.

7.1 The Administration Tab

The Administration Tab contains two parts, DFEP Operational Mode and Schedule Mode settings. These are explained in the following sections.

7.1.1 Changing operational mode

The DFEP supports two operational modes:

- Nominal

In this mode, data will be distributed through the DG&A to the final destination, e.g. PDGS.
Switching to nominal mode implies that the underlying MEOS Capture HRDFEP configuration will be changed, reflecting the DG&A as distribution destination.

- Contingency

In this mode, the DG&A will not be present, meaning that real-time distribution of Transfer Frames and ISPs will be distributed elsewhere, e.g. directly to the PDGS.
Switching to contingency mode implies that the underlying MEOS Capture HRDFEP configuration will be changed, reflecting an alternative distribution destination.

For more information on these modes, please consult the System Technical Description and Budget [A-1].

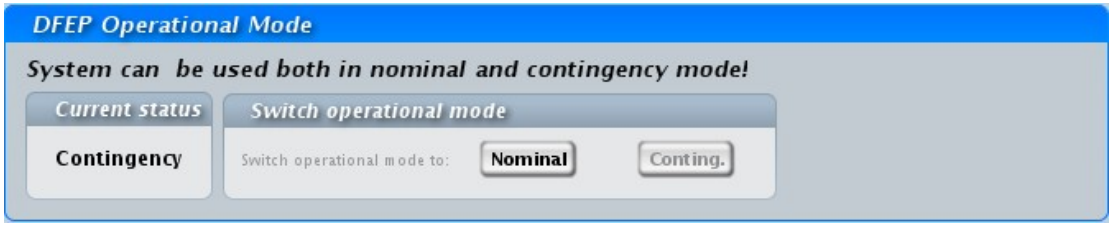


Figure 68: Operational mode part

Figure 68 shows the Operational Mode part:

- Frame:
  - Green: Nominal mode
  - Blue: Contingency mode
  - Red: Inconsistent mode. Refer to section Error: Reference source not found.
- Current status: Shows the current status (nominal, contingency, inconsistent)
- Switch operational mode:
  - Nominal button: Available when in Contingency mode. Click to switch to nominal mode. Must be confirmed.
  - Conting. Button: Available when in Nominal mode. Click to switch to contingency mode. Must be confirmed.
  - The selected mode will also be visible in the side bar.

7.1.2 Changing scheduling mode

The DFEP supports two scheduling modes:

- Scheduled

In this mode, the DFEP will operate based on schedule fixed received

- Automatic

In this mode, the DFEP will listen for data and, based on the data received, invoke the appropriate processing steps

For more information on these modes, please consult the System Technical Description and Budget [A-1].

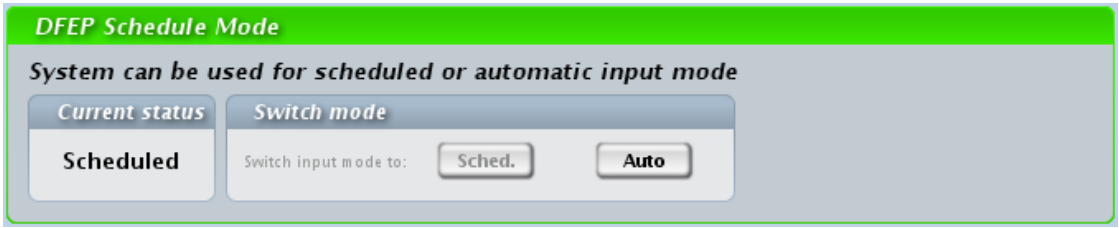


Figure 69: Scheduling mode part

Figure 69 shows the Schedule Mode part:

- Frame:
  - Green: Schedule mode
  - Blue: Automatic mode
  - Current status: Shows the current status (Scheduled, Automatic)
- Switch mode:
  - Sched button: Available when in Automatic mode. Click to switch to Scheduled mode. Must be confirmed.
  - Auto Button: Available when in Scheduled mode. Click to switch to Automatic mode. Must be confirmed.
  - The selected mode will also be visible in the side bar.
  - When set to automatic mode, both demodulators and FEPs will be active for both channels.

8 Configuration Editor “mxmled”

The configuration editor *mxmled* is used for editing xml-formatted configuration files. To start *mxmled*, enter mxmled or mxmled <xmlfile> at the prompt and hit ↵.

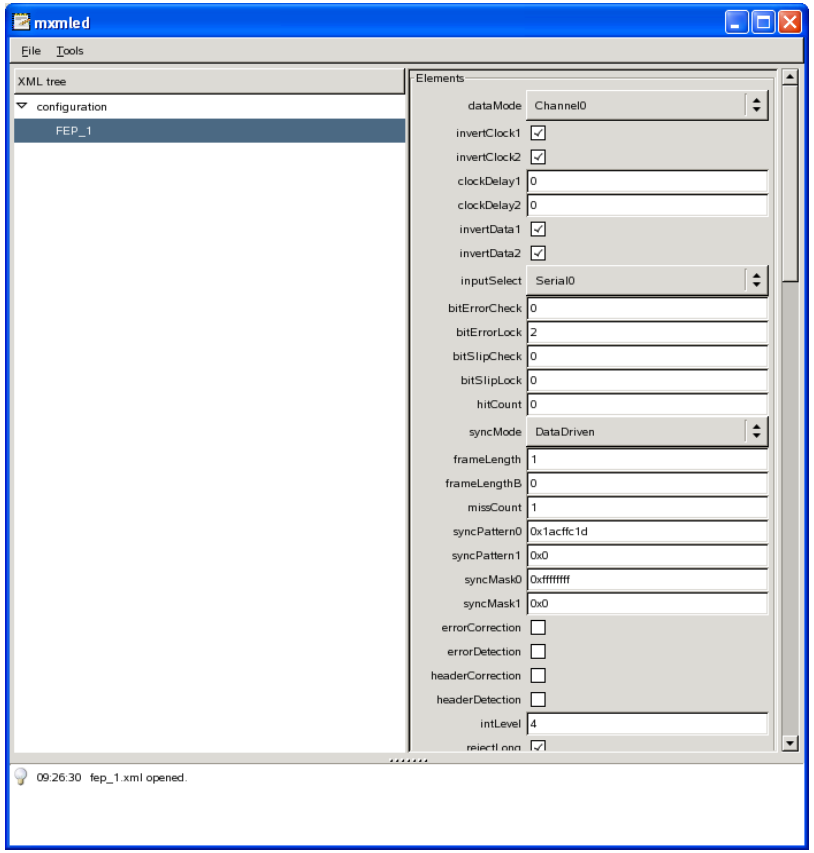


Figure 70: Configuration Editor mxmled

The syntax is:

Usage mxmled [OPTION]... [xml-file]

- n <name> Attribute to show in tree nodes, default is “name”
- N Do not show name attribute in tree
- s <dir> Directory where to look for schema files

Figure 70 shows a typical view after starting mxmled with a filename parameter, and selecting the configuration.

8.1 Menu Options

File->Open: Opens an existing configuration file.

File->Save: Save the configuration file.

File->Save As: Saves the configuration file with a new name.

File->Quit: Close the current configuration.

Tools->Diff...: Select another file to perform a diff between the current configuration file and another configuration file.

8.2 Editing Configuration Files

The configuration parameters are edited on the right hand side of the panel. If no parameters are listed it is either because no file has been loaded or the sub-system has not been selected by clicking on a configuration element in the *XML tree* on the left hand side of the window.

The parameters are displayed either as a text string (integer values), a check-box (boolean values) or a spin-box (strings/enumerated types).

A help text is displayed by holding the cursor over the parameter value.

See [R-5] for a full listing of the parameters and their meaning.

NOTE

It is a good idea to take a backup of the configuration file before editing it. Use the Tools->Diff… option to verify the changes made to the configuration file.

9 Configuring the system

9.1 Configuring Host Information

The MEOS Control system is delivered with a pre-configured hostname and IP-address. To change this, the following steps must be followed (as System Administrator ("*root*" user)):

- Use the *yast* (or *yast2*) configuration tool to change hostname and IP-address.
- Edit the */etc/meos/mc-middleware.xml* file using a text editor (e.g. *vi*)
  - Replace HOST with the correct hostname in the following line:
    <logo url="http://HOST/mControl/images/Ny_MEOS_Control_300_90.png"/>
- Edit the *.jnlp* files under */src/www/htdocs/jws* using a text editor (e.g. *vi*)
  - Replace HOST with the correct hostname in the following lines
    codebase="http://HOST/jws/"
    <property name="java.util.logging.config.file" value="http://HOST/jws/logging.properties"/>
- If needed, set the correct timeserver using the *yast* (or *yast2*) configuration tool.

9.2 Configuring operational mode

These sections describe the operations needed in the case of a failure within the DG&A subsystem or failure in components on the "path" between the HRDFEP and the DG&A.

Generally the above nominal operations will be available except the operations on the Data Gate and Archive.

9.2.1 Configuring for contingency operations

An administrative user may issue a command to set the HRDFEP system into contingency mode, to configure the system to forward directly the data to the PDGS. The implication of this command is that the distribution setup file for the HRDFEP system is changed.

See section 7.1.1 for how to do this.

9.2.2 Configuring for nominal operations

See section 7.1.1 for how to do this.

9.3 Configuring scheduling mode

The DFEP system can be operated both in scheduling and automatic mode, and this section describes how to switch between the modes.

9.3.1 Configuring for scheduling mode

An administrative user may issue a command to set the system in scheduling mode, where all activities are based on in-coming schedules.

See section 7.1.2 for how to do this.

9.3.2 Configuring for automatic mode

An administrative user may issue a command to set the system in automatic mode, where all activities are based on in-coming data from the satellites.

See section 7.1.2 for how to do this.

9.4 User management

9.4.1 Starting mcmw-usermng

To start *mcmw-usermng*, simply enter mcmw-usermng at the promp and hit ↵.

```
mcontrol@HOST:~> mcmw-usermng
```

This should present you with the window shown below.

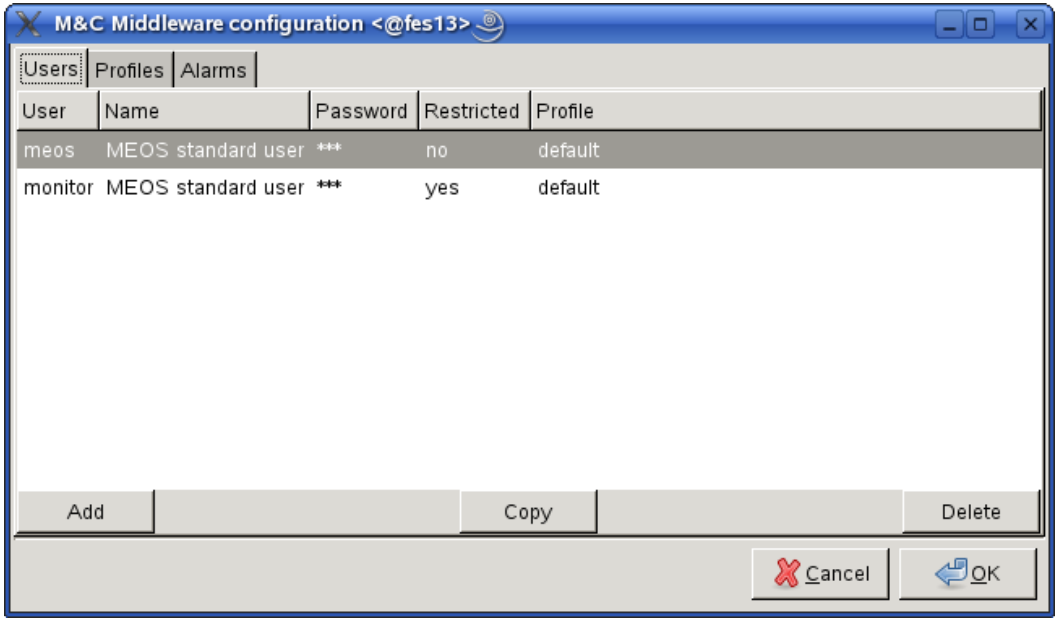


Figure 71: The mcmw-usermng Program

9.4.2 Creating Profiles

A profile is defined by a name and an URL that points to a top level GUI specification file. Layouts can be used to create GUI's for specific purposes. For example, the local operator will typically have a GUI with all features, but a remote operator may only be offered a subset of the available features. You can also have different profiles for different roles.

To create a profile you must at least have one layout file. The system is delivered with a collection of layout files that are referenced by one top level layout file called default.xml and it resides on the host computer. The default profile uses this file as its layout.

To edit profiles, click the “Profiles” tab to switch to the profile editor. The figure below has a screenshot of the profile editor.

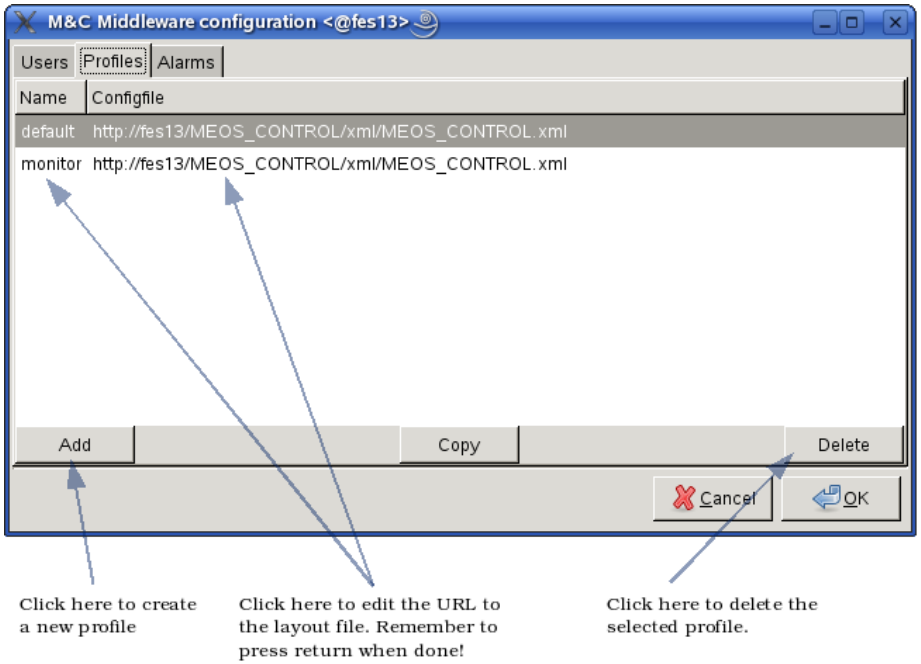


Figure 72: The Profile

Note that a profile cannot be deleted as long as one of the users has it as his default profile. Also note that you cannot change the name of the profile once it has been created. If you need to change the name, you must first delete the profile and create it again with the new name.

9.4.3 Creating Users

To create user accounts, click on the *"Users"* tab in *mcmw-usermng*. This will switch to the user editor. A user account has the following fields:

- user name
- full name
- password
- email address
- restricted
- default profile

Only the user name and password are used when logging on to the system. The default profile is automatically highlighted when you log on. The restricted field means that the user not will be allowed to issue direct commands.

The user editor is shown in figure below.

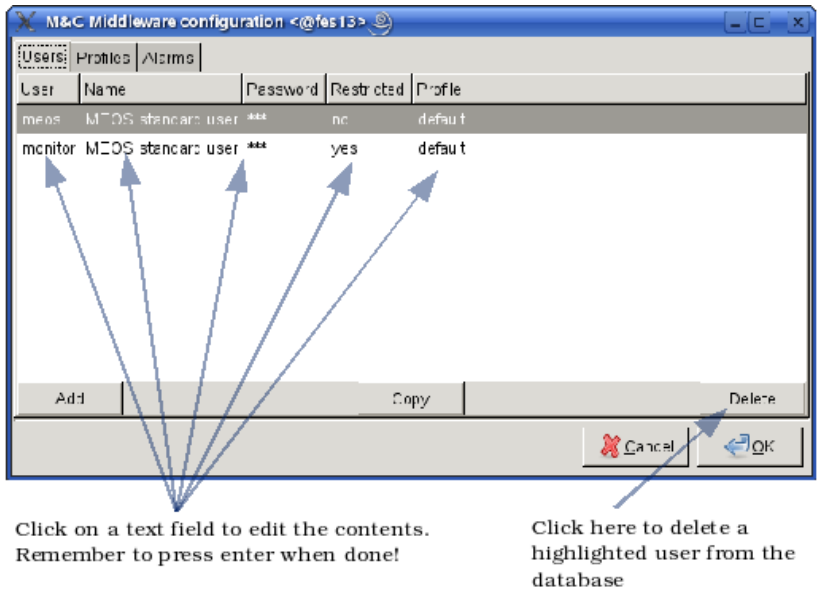


Figure 73: User Editor

9.5 MEOS Control configuration

9.5.1 Scheduling

For the MEOS Control System, the only configuration files which may require changes are the small ruby scripts located under "**/etc/meos/dfep/scripts**".

These decide the configuration to be used for the MEOS Capture HRDFEP and, if needed, the MEOS Capture HRTG.

The file name of this file is used when passes are scheduled through the external XML interface, as well as from the GUI.

An example for Sentinel 1A is shown below:

```
#!/usr/bin/env ruby

require 'pathname'

require "#{File.dirname(Pathname.new(__FILE__).realpath)}/Sentinel"

class SENTINEL1A < Sentinel

  def initialize

    super('TEST')

    schedule_hrdfep('SENTINEL1A.scf')

    schedule_hrtg('S1A/SENTINEL1A.rb')

  end

end
```

The two lines, **schedule_hrdfep** and **schedule_hrtg**, indicates which configuration to be used on the two systems when scheduled.

On the HRTG, the referred file is located under **/etc/meos/activities/**

On the HRDFEP, the referred file is located under **/home/mcapture/configs**

Note that **schedule_hrtg** is only for test puposes, using the MEOS Capture HRTG for data output. Under nominal operations, data will be acquired from the satellites.

9.5.2 Site information

Site information is specified in **/etc/meos/dfep/dfep_identity.xml,** and can be editied using **xmled**.

mxmled /etc/meos/dfep/dfep_identity.xml

It has the following fields:

- <file_class>TEST/OPER</file_class>
- <unit>1</unit>
- <site>SITE</site>

9.6 MEOS Capture HRTG configuration

9.6.1 Flow

All replay activities result in a **schedule_activity** command to the MC Middleware, which takes the following arguments:

- Activity/configuration file
- Satellite
- Orbit
- Start time (AOS)
- Stop time (LOS)
- Data file to replay on modulator card #1 (datafile1)
- Data file to replay on modulator card #2 (datafile2)

The activity files are located in the **/etc/meos/activities/** directory, and there is a sub-directory for each satellite, e.g. for Sentinal 1A:

/etc/meos/activities/S1A/SENTINEL1A.rb

that is used for replaying data matching the Sentinel 1A satellite configuration (see figure 74).

```
require "/etc/meos/activities/Modulator.rb"
class SENTINEL1A < Modulator
   def initialize()
      super("SENTINEL1A_C1", "SENTINEL1A_C2")
   end
end
```

Figure 74: SENTINEL1A.rb script

These activity files are Ruby scripts, and they usually are just thin wrappers around larger scripts that do the actual work. For instance, the **SENTINEL1A.rb** file depends on the satellite-independent

/etc/meos/activities/Modulator.rb

to perform modulator playback of Sentinel 1A data. The **SENTINEL1A.rb** script just tells the **Modulator.rb** script which configuration file to use. These XML configuration files are located under **/etc/meos/configs/**, and as with the **activities/** directory, there is one sub-directory for each supported satellite.

The **SENTINEL1A.rb** file points to two configuration files (see figure 75 for example):

- SENTINEL1A_C1: **/etc/meos/configs/S1A/SENTINEL1A_C1.xml**
- SENTINEL1A_C2: **/etc/meos/configs/S1A/SENTINEL1A_C2.xml**

This means that **Modulator.rb** will use the C1 file for modulator card #1, and the C2 file for modulator card #2.

The logic of the Modulator.rb is as follows:

1. It starts the modulator subsystem **MEOS.TG1.MOD_IF** with the **SENTINEL1A_C1.xml** configuration file
2. It looks at the **dataSource** parameter in the configuration file to see if the modulator's data source should be a file. If so, it will:
    1. Start the **MEOS.OUTPUT.SELECT** subsystem to configure the modulator card to take its input from the loopback subsystem.

2. Start the **MEOS.TG1.MOD_LOOPBACK** subsystem with the **SENTINEL1A_C1.xml** configuration. If we got a **datafile1** parameter in the original command, this file is used instead of the **source** parameter specified in **SENTINEL1A_C1.xml**

3. Steps 1 and 2 are then repeated for the second modulator card, but then using subsystems in the **MEOS.TG2** group, and the **SENTINEL1A_C2.xml** file with **datafile2** as a possible **source** override.
4. When either the loopback subsystems stops (because the file replays are completed), or the LOS time specified in the **schedule_activity** command, all other subsystems are stopped as well.
5. Reports are then generated, and a **reportCreated** trigger is sent.

```
 <MOD_IF>
   <ifFrequency>792.5</ifFrequency>
...
   <outputLevel>-30</outputLevel>
   <bitRate>336</bitRate>
...
   <modulationType>8PSK</modulationType>
...
   <convEncoder>TCM 10/12 rate</convEncoder>
...
 </MOD_IF>

 <MOD_LOOPBACK>
...
   <inputPath>/disk1/testdata/</inputPath>
   <inputType>clear</inputType>
   <source>NOISE_200001,S1_C1.dat,S1A_FILLVCDU</source>
...
 </MOD_LOOPBACK>
```

Figure 75: The SENTINEL1A_C1.xml configuration file

9.6.2 Changing configuration

The most likely files to edit are located under **/etc/meos/configs/**:

- **S1A/SENTINAL1A_C1.xml**
  - Settings for Sentinel 1A, channel 1 output
- **S1A/SENTINAL1A_C2.xml**
  - Settings for Sentinel 1A, channel 2 output
- **S2A/SENTINAL2A_C1.xml**
  - Settings for Sentinel 2A, channel 1 output
- **S2A/SENTINAL2A_C1.xml**
  - Settings for Sentinel 2A, channel 1 output
- **S3A/SENTINAL3A_C1.xml**
  - Settings for Sentinel 3A, channel 1 output
- **S3A/SENTINAL3A_C1.xml**
  - Settings for Sentinel 3A, channel 1 output

Values with tags can be edited, but new tags cannot be inserted.

If editing is necessary, always make a copy of the file first! Also make sure that only legal values are used. If not, the system may stop working!

Changes will take effect when the next activity is started, no system restart is necessary.

9.7 MEOS Capture HRDFEP configuration

9.7.1 Idle configuration files

Parts of the system (e.g. demodulator) are always running with a default configuration.

- When a contact is scheduled it loads a contact/mission specific configuration
- when a contact is complete, it loads the idle configuration again.

The configuration files used when the system is idle are:

Path	Description
/home/mcapture/configs/IDLE/	
channel_1.xml	Idle settings for channel 1
channel_2.xml	Idle settings for channel 2 (if present)

Typical settings are:

- Demodulator input selection
- Demodulator frequency
- Demodulator modulation type
- ...

9.7.2 Mission configuration files

There are several configuration files for a mission, and a good starting point for understanding the configuration files are to start with the “Users Commands” parts of the GUI.

The menu selections in this part of the GUI matches the files under the directory:

/home/mcapture/configs/MENU_CONFIG

```
.
|-- S1A
|   |-- SENTINEL1A.scf -> ../../SENTINEL1A.scf
|   |-- SENTINEL1A_BER.scf -> ../../SENTINEL1A_BER.scf
|   |-- SENTINEL1A_C1.scf -> ../../SENTINEL1A_C1.scf
|   |-- SENTINEL1A_C1_BER.scf -> ../../SENTINEL1A_C1_BER.scf
|   |-- SENTINEL1A_C1_SERIAL.scf -> ../../SENTINEL1A_C1_SERIAL.scf
|   |-- SENTINEL1A_C2.scf -> ../../SENTINEL1A_C2.scf
|   |-- SENTINEL1A_C2_BER.scf -> ../../SENTINEL1A_C2_BER.scf
|   |-- SENTINEL1A_C2_SERIAL.scf -> ../../SENTINEL1A_C2_SERIAL.scf
    `-- SENTINEL1A_SERIAL.scf -> ../../SENTINEL1A_SERIAL.scf
```

Figure 76: S1A configurations

- The directory name (e.g. S1A) is used as satellite name, and must be defined in **/home/mcapture/sysconf/meos_satellites.conf**
- The .scf files here are soft-links to the actual files used.
- There will be a .scf file with the same name in the directory **/home/mcapture/configs**

E.g. when **S1A->SENTINEL1A** is selected from «User commands», a contact is scheduled with satellite name **S1A**, and using configuration file **SENTINEL1A.scf.**

The .scf files are Satellite Configuration Files and contains information about

- Which instructions to run
- There can be several instruction per .scf file.
- When to run the instructions (relative to start and stop time)
- Configuration files to be used (for each subsystem involved in the activity)
- Defines parameters which can be used in template files.

9.7.2.1 Satellite Configuration File – SCF

The Satellite Configuration Files (SCF) define instructions, configuration files, start/stop time and parameters.

```
start_rel_aos       0                                                   NUM
stop_rel_los        0                                                   NUM
use_exec_time       yes                                                 HIDDEN
use_template        nsp://SCS_TEMPLATE_DIR/hrdem.sct  FILE_SEL
name_postfix        HRDEM                                               HIDDEN
hrdem_config        nsp://SCS_CONF_DIR/SENTINEL1A/SENTINEL1A_C1_TF.xml              FILE_SEL
SessionId_p         T012CAP%2y%j%h%m%e00                        HIDDEN

start_rel_aos       0                                                   NUM
stop_rel_los        0                                                   NUM
use_exec_time       yes                                                 HIDDEN
use_template        nsp://SCS_CONF_DIR/SENTINEL1A/sct/ingest_TF_ch1.sct FILE_SEL
name_postfix        S1A_C1_TF                                           HIDDEN
fep_config          nsp://SCS_CONF_DIR/SENTINEL1A/SENTINEL1A_C1_TF.xml  FILE_SEL
nrt_distribute_VCDU_p false                                     ENUM{false=0,true=1}
TF_user             SENTINEL1A_TF                               HIDDEN
sat_p               %S                                          HIDDEN
orbit_p             %O                                          HIDDEN
filename_good_p     S1A_TEST_STO_VCDU_S_KSPT_%y%t%dT%h%m%e_V%y%t%dT%h%m%e_%Y%T%DT
%H%M%E_C1_S001.RAW          HIDDEN
filename_bad_p      S1A_TEST_STO_VCDU_S_KSPT_%y%t%dT%h%m%e_V%y%t%dT%h%m%e_%Y%T%DT
%H%M%E_C1_S001.BAD          HIDDEN
nrt_distribute_TF_p true                                            ENUM{false=0,true=1}
process_TF_p        true                                        ENUM{false=0,true=1}
SessionId_p         T012CAP%2y%j%h%m%e00                        HIDDEN
Site_p              MeosCapture                                 HIDDEN
Antenna_p           MeosAntenna                                 HIDDEN
Channel_p           C1                                          HIDDEN

start_rel_aos       0                                                   NUM
stop_rel_los        0                                                   NUM
use_exec_time       yes                                                 HIDDEN
use_template        nsp://SCS_CONF_DIR/SENTINEL1A/sct/ingest_CADU_ch1.sct       FILE_SEL
name_postfix        S1A_C1_CADU                                         HIDDEN
fep_config          nsp://SCS_CONF_DIR/SENTINEL1A/SENTINEL1A_C1_CADU.xml FILE_SEL
nrt_distribute_VCDU_p false                                     ENUM{false=0,true=1}
CADU_user           SENTINEL1A_CADU_C1                          HIDDEN
sat_p               %S                                          HIDDEN
orbit_p             %O                                          HIDDEN
filename_p          S1A_TEST_STO_CADU___KSPT_%y%t%dT%h%m%e_V%y%t%dT%h%m%e_%Y%T%DT
%H%M%E_C1_S001_%O.RAW                   HIDDEN
```

General description:

- There are three blocks, resulting in three separate instructions. In the example the three instructions are for:
  - Running the demodulator part
  - Running ingest of C1 Transfer Frames.
  - Running ingest of C1 CADUs.
- Each block has a start_rel_aos and stop_rel_los field. This states when the instruction shall start/stop.
  - «start_rel_aos 60» means 60 seconds after AOS.
  - «start_rel_aos -60» means 60 seconds before AOS.
  - start_rel_aos can be replaced with start_rel_los
  - stop_rel_los can be replaced with stop_rel_aos
- Then a .sct file is referenced. This is a «satellite configuration template» file. Will be covered later.
- The name_postfix can be omitted, but is nice to have in order to differentiate instructions from each other (in the schedule display in the GUI, and some files on disk).
- Then parameters are defined.
  - Reference to configuration files
  - Other parameters

Two parameters are automatically set, and can be used in the instruction template.

- aos_t AOS time,
- los_t LOS time.

Some parameters can be expanded automatically at schedule time (e.g. date and time of scheduled start and stop time). A summary of these special fields can be found in the appendixes.

Some of the paths used are expanded automatically:

Path	Actual path
nsp://SCS_TEMPLATE_DIR	/home/mcapture/templates/
nsp://SCS_CONF_DIR	/home/mcapture/configs/

The .scf files are ASCII files, and can be edited by a text editor (e.g. vi, xemacs)

9.7.2.1.1 Special parameters in SCF files

Parameter	Expands to
%S	Satellite name
%O	Orbit number
%A	Start time of the pass (AOS) %xA is expanded to the start time with offset «x» seconds.
%L	Stop time of the pass (LOS)

Parameter	Expands to
	%xL is expanded to the stop time with offset «x» seconds.
%y	Year of the start time. %2y can be used to output the two last digits of the year only.
%j	Julian day of the start time.
%d	month day of the start time.
%n	first three characters of the start time month, e.g. «jan».
%b	first three characters of the start time month in capital letters, e.g. «JAN».
%t	two digits start time month number.
%h	the hour of the start time
%m	the minute of the start time
%e	the second of the start time
%Y	year of the stop time. %2Y can be used to output the two last digits of the year only.
%J	Julian day of the stop time
%D	month day of the stop time
%N	first three characters of the stop time month, e.g. «jan».
%B	first three characters of the stop time month in capital letters, e.g. «JAN»
%T	two digits stop time month number
%H	hour of the stop time

Parameter	Expands to
%M	minute of the stop time
%E	second of the stop time
%%	converted into a single %

9.7.2.2 SCF files and instruction templates

For a more detailed explanation of SCF files and instruction templates we will use the third instruction from the example in the previous section.

```
start_rel_aos          0                                                    NUM
stop_rel_los           0                                                    NUM
use_exec_time          yes                                                          HIDDEN
use_template           nsp://SCS_CONF_DIR/SENTINEL1A/sct/ingest_CADU_ch1.sct        FILE_SEL
name_postfix           S1A_C1_CADU                                                  HIDDEN
fep_config             nsp://SCS_CONF_DIR/SENTINEL1A/SENTINEL1A_C1_CADU.xml         FILE_SEL
nrt_distribute_VCDU_p  false                                        ENUM{false=0,true=1}
CADU_user              SENTINEL1A_CADU_C1                           HIDDEN
sat_p                  %S                                           HIDDEN
orbit_p                %O                                           HIDDEN
filename_p             S1A_TEST_STO_CADU___KSPT_%y%t%dT%h%m%e_V%y%t%dT%h%m%e_%Y%T%DT%H%M
%E_C1_S001_%O.RAW            HIDDEN
SessionId_p            T012CAP%2y%j%h%m%e00                         HIDDEN
Site_p                 MeosCapture                                  HIDDEN
Antenna_p              MeosAntenna                                  HIDDEN
Channel_p              C1                                           HIDDEN
```

This part will run the commands defined in the Satellite Configuration Template **nsp://SCS_CONF_DIR/SENTINEL1A/sct/ingest_CADU_ch1.sct** from scheduled start time to scheduled stop time (both start_rel_aos and stop_rel_los is 0).

This file looks like this:

```
run INPUT_2:FEP (command:="run", system:="INPUT_2",
            config:=fep_config,
                start:=aos_t, stop:=los_t,
                mplug_session_id:=SessionId_p,
                out_destination:=filename_p)
>> {

          TERM distribute POST_DISTRIBUTE:DIST_MANAGER (command:="distribute",
                              system:="POST_DISTRIBUTE",
                              subsys:="DIST_MANAGER",
                              sat:=sat_p,
                              orb:=orbit_p,
                              session:=SessionId_p,
                              name:=CADU_user)
}
```

This instruction starts the second FEP (Front-End Processor) in the system, with the configuration file

nsp://SCS_CONF_DIR/SENTINEL1A/SENTINEL1A_C1_CADU.xml

The actual configuration file is defined as a parameter (*fep_config*) in the SCF file, and used in the template file.

The example also shows file name generation using special SCF file parameters. *filename_p* is defined in the SCF file as both fixed fields and fields which are depending on scheduled time.

After the FEP has completed, the resulting files are given to the post pass distribution part of the system. It is instructed to deliver the file to the (logical) user *SENTINEL1A_CADU_C1*. Again, this is parameterized in the SCF file.

The .sct files are ASCII files, and can be edited by a text editor (e.g. vi, xemacs).

9.7.2.3 Mission configuration files – overview

File(s)	Description
/home/mcapture/sysconf/	
meos_satellites.conf	Satellite name is defined here.
/home/mcapture/stationconf/	
nrt_distribution_1.cfg	Distribution host/port for NRT distribution.
/home/mcapture/stationconf/distribution_sites	
<mission>.xml	User configuration for MEOS Distribute.
/home/mcapture/configs/MENU_CONFIG	
<mission>/<mission>.xml	For «User cmds» part of MCS GUI.
/home/mcapture/configs/Missions.d	
<mission>.xml	Mission defintion file (VCIDs, APIDs etc).

File(s)	Description
	Used when data report is created.
/home/mcapture/configs	
<mission>.scf	Mission SCF files
/home/mcapture/configs/<mission>	
<mission>_C[1|2]_BER.xml	BER configuration files for channel 1/2.
<mission>_C[1|2]_TF.xml	Transfer Frame ingest file for channel 1/2
<mission>_C[1|2]_TF_SERIAL.xml	Serial/ECL Transfer Frame ingest file for channel 1/2
<mission>_C[1|2]_CADU_SERIAL.xml	Serial/ECL CADU ingest file for channel 1/2
ISP_OUTPUT_C[1|2].xml	NRT Distribution of ISPs for channel 1/2
TF_OUTPUT_C[1|2].xml	NRT Distribution of Transfer Frames for channel 1/2
/home/mcapture/configs/sct/	
*	Mission instruction templates (used by mission SCF files).
/etc/meos/mcapture/NRT_Dist_1/SCF/	
<mission>.scf	SCF file for VCDU/frame distribution, channel 1
/etc/meos/mcapture/NRT_Dist_2/SCF/	
<mission>.scf	SCF file for ISP distribution, channel 1
/etc/meos/mcapture/NRT_Dist_3/SCF/	
<mission>.scf	SCF file for VCDU/frame distribution, channel 2
/etc/meos/mcapture/NRT_Dist_3/SCF/	

File(s)	Description
<mission>.scf	SCF file for ISP distribution, channel 2
/home/mcapture/stationconf/	
nrt_distribution_1.cfg	Host/port for MDIS Sender (VCDU/frame)
/home/mcapture/configs/Missions.d	
<mission>.xml	Mission definition file (VCIDs, APIDs etc). Used when data report is created.
MissionSnooper.VCDU.d/	
<mission>.xml	Mission definition file used for mission detection in data-driven mode. The descriptions in this directory matches data which has been partly processed (i.e.de-scrambling and Reed-Solomon processing performed).
MissionSnooper.CADU.d/	
<mission>.xml	Mission definition file used for mission detection in data-driven mode. The descriptions in this directory matches data which has not been processed.

9.7.3 Configuring demodulator

The following table shows which files to edit to change demodulator settings, with typical candidate parameters in the right-most column.

Note that the File section refers to Sentinel 1A. Substitute with 2A/3A for other Sentinels.

What?	File	Parameter(s)
Channel 1 – Demodulator - Input connector selection	/home/mcapture/configs/SENTINEL1A/ SENTINEL1A_C1_TF.xml	inputSel
Channel 2 - Demodulator - Input connector selection	/home/mcapture/configs/SENTINEL1A/ SENTINEL1A_C2_TF.xml	inputSel
Channel 1 - Demodulator - Center frequency	/home/mcapture/configs/SENTINEL1A/ SENTINEL1A_C1_TF.xml	ifFrequency
Channel 2 - Demodulator - Center frequency	/home/mcapture/configs/SENTINEL1A/ SENTINEL1A_C2_TF.xml	ifFrequency

9.7.4 Configuring Transfer Frame acquisition

The following table shows which files to edit to change transfer frame acquisition settings, with typical candidate parameters in the right-most column.

Note that the File section refers to Sentinel 1A. Substitute with 2A/3A for other Sentinels.

What?	File	Parameter(s)
Channel 1 – Ingest - TF file VCID selection	/home/mcapture/configs/SENTINEL1A/ SENTINEL1A_C1_TF.xml	out_2_VCIDs
Channel 2 – Ingest - TF file VCID selection	/home/mcapture/configs/SENTINEL1A/ SENTINEL1A_C2_TF.xml	out_2_VCIDs

9.7.5 Configuring ISP generation

The following table shows which files to edit to change ISP generation settings, with typical candidate parameters in the right-most column.

Note that the File section refers to Sentinel 1A. Substitute with 2A/3A for other Sentinels.

What?	File	Parameter(s)
Channel 1 – ISP Gen - Enable/disable VCID/APID check. (APID legal for given VCID)	/home/mcapture/configs/SENTINEL1A/ RECONSTRUCT_C1.xml	ApidVcidCorrelation
Channel 2 – ISP Gen - Enable/disable VCID/APID check. (APID legal for given VCID)	/home/mcapture/configs/SENTINEL1A/ RECONSTRUCT_C2.xml	ApidVcidCorrelation
Channel 1 – ISP Gen - Rate limitation	/home/mcapture/configs/SENTINEL1A/ RECONSTRUCT_C1.xml	rate
Channel 2 – ISP Gen - Rate limitation	/home/mcapture/configs/SENTINEL1A/ RECONSTRUCT_C2.xml	rate

9.7.6 Configuring Transfer Frame distribution

9.7.6.1 General description

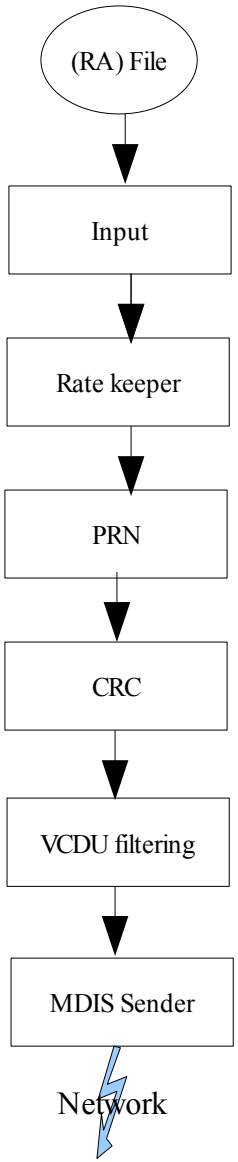


Figure 78: The VCDU_OUTPUT subsystem

9.7.6.1.1 Input

Most parameters will be set automatically (by command/ trigger).

Note that the other plug-ins expects one VCDU w/PCD, so this plug-in must be configured to have the frameSize parameter equal to VCDU/frame size + PCD added by input card.

9.7.6.1.2 Rate keeper

After the input plug-in, there is a rate keeper plug-in. The purpose of this plug-in is to limit the rate for the subsystem disk reads. It is not meant for limiting the output rate.

Since the subsystem can discard data (in the VCDU filtering plug-in), the rate limitation in the output plug-in is not suitable for limiting disk access.

9.7.6.1.3 PRN

The VCDUs/frames can be de-scrambled before passed being processed further. This feature can be useful for some missions and settings.

9.7.6.1.4 CRC

The VCDUs/frames can be checked for CRC errors, and discarded based on the outcome. This can be useful for some missions and settings.

9.7.6.1.5 VCDU filtering

Filtering plug-in tailored for VCDU output. Can output data based on

- SCID
- VCID
- Quality flags (CRC, Reed-Solomon)
- Replay flag in VCDU header

Parts of data can also be discarded (e.g. Reed-Solomon check symbols, synch words, ...)

9.7.6.1.6 How to configure the VCDU filtering.

First, inform it about the VCDU «layout». Please note that you do not have to specify a frame length...

standard	• None • CCSDS_AOS • CCSDS_PT
synchBytes	Number of synchronization words (in bytes)
rsSymbolBytes	Number of Reed-Solomon symbols (in bytes)

Then, tell it what has been added by the input card:

rsStatusBytes	Number of Reed-Solomon status bytes
fsStatusBytes	Number of frame synch status bytes
tsStatusBytes	Number of acquisition time stamp bytes

Decide which VCDUs shall be output:

SCIDs	List of SCIDs to output (-1 for all)
VCIDs	List of VCIDs to output (-1 for all)
replay	Only for CCSDS AOS, discard/write data based on replay flag in VCDU header. ● All ● Replay ● RealTime
saveRS	Reed-Solomon error detection/correction status: ● All ● Good ● Bad
saveCRC	CRC error detection status: ● All ● Good ● Bad

Now we have the VCDUs we want. But which parts of them?

keepSynch	Keep or remove the syncronization words? ❑ false/true

keepRsSymbols	Keep or remove the Reed-Solmon check symbols? ❑ false/true
keepTsStatus	Keep or remove the acquisition time stamp? ❑ false/true
keepFsStatus	Keep or remove the frame synch status PCD bytes? ❑ false/true
keepRsStatus	Keep or remove the Reed-Solomon status PCD bytes? ❑ false/true

9.7.6.1.7 MDIS Sender

The MDIS Sender plug-in is a general purpose plug-in for sending data over the network.

This plug-in does not modify the data.

MDIS Sender protocol

The plug-in can send data using the MDIS Sender protocol, or without any header/trailer. Configuration parameter:

sendHdrTrl	User header/trailer? ❑ false/true

Destination host name and port numbers

There are two methods for deciding destination host name/IP-address and port numbers.

Either by an index into a global destination configuration file, or set directly in the configuration file:

DestIndex	Where to send header/data. Index into the destination list. If set to 0, mdis_destination below is used.
TrlDestIndex	Where to send trailer. Index into the destination list. If set to 0, mdis_trl_destination below is used.
mdis_destination	Destination URL for header/data (tcp://port@host)
mdis_trl_destination	Destination URL for trailer (tcp://port@host)

Connection retries and retry interval

If the MDIS Sender plug-in is unable to obtain a connection, it can either try again later or give up.

This is governed by the following configuration parameters:

ConnectAttemptDelta	In case of retries, the interval between each connection attempt. (seconds)
ConnectionAttempts	Number of times to connect to output destination before giving up.

Checksum

The MDIS Sender plug-in can compute a checksum over the data sent, and provide the value in the trailer. This can be used to check data integrity on the receiver side, or for future reference.

- If compression is enabled, the checksum is computed before compression.
- The header is not part of checksum computation.

Checksum	Checksum type to use, or “NA”. The checksum type can be any of the message digest types supported by the OpenSSL library. E.g. “md5”.

Compression

The data can be compressed before being sent. This can be useful for some network topologies, in order to speed up overall data transfer.

- The header/trailer is not compressed.

CompressionType	Compression to use: • none • compress • gzip
CompressionLevel	Compression level (1-9).

Rate limitation

The MDIS Sender plug-in can limit the output rate. This can be useful for some network topologies.

outputByteRate	Rate to use (to limit transfer speed). Unit is Bytes/s. Set to 0 to disable rate limitation.

9.7.6.1.8 Distribution index file

The destinations for NRT distribution can be set in one configuration file:

/home/mcapture/configs/stationconf/nrt_distribution_1.cfg

This makes it easier for

- getting information about where data is sent
- change destinations, e.g.
  - have one file for nominal mode
  - have one file for contingency mode.

Example content:

```
!
! S E N T I N E L  1 A
!

! Sentinel-1A CHANNEL 1 Transfer Frames
:DataDest_1=tcp://33333@localhost
:TrlDest_1=tcp://33334@localhost

! Sentinel-1A CHANNEL 2 Transfer Frames
:DataDest_2=tcp://33335@dga10g
:TrlDest_2=tcp://33336@dga10g

! Sentinel-1A CHANNEL 1 ISP
:DataDest_13=tcp://33337@dga10g
:TrlDest_13=tcp://33338@dga10g

! Sentinel-1A CHANNEL 2 ISP
:DataDest_14=tcp://33339@dga10g
:TrlDest_14=tcp://33340@dga10g
```

The format for header/data destination is:

:DataDest_<index>=tcp://<port>@<host>

and for trailer destination:

:TrlDest_<index>=tcp://<port>@<host>

This file is in ASCII format, and can be edited with a text editor (e.g. vi, xemacs).

9.7.6.2 Configuration

The following table shows which files to edit to change transfer frame distribution settings, with typical candidate parameters in the right-most column.

Note that the File section refers to Sentinel 1A. Substitute with 2A/3A for other Sentinels.

What?	File	Parameter(s)
Channel x – TF NRT - Header/data host and port	/home/mcapture/stationconf/nrt_destinations_1.cfg	DataDest_x (see comments in file for finding correct index x)
Channel x – TF NRT - Trailer host and port	/home/mcapture/stationconf/nrt_destinations_1.cfg	TrlDest_x (see comments in file for finding correct index x)
Channel 1 – TF NRT - Connection attempts and connection retries	/home/mcapture/configs/SENTINEL1A/ TF_OUTPUT_C1.xml	ConnectionAttempts ConnectionAttemptDelta
Channel 1 – TF NRT - Connection attempts and connection retries	/home/mcapture/configs/SENTINEL1A/ TF_OUTPUT_C1.xml	ConnectionAttempts ConnectionAttemptDelta
Channel 1 – TF NRT -	/home/mcapture/configs/SENTINEL1A/	VCIDs

What?	File	Parameter(s)
VCID selection	TF_OUTPUT_C1.xml	
Channel 2 – TF NRT - VCID selection	/home/mcapture/configs/SENTINEL1A/ TF_OUTPUT_C2.xml	VCIDs
Channel 1 – TF NRT - Rate limitation	/home/mcapture/configs/SENTINEL1A/ TF_OUTPUT_C1.xml	Rate, unit is Bytes/s. Set to 0 to disable rate limitations
Channel 2 – TF NRT - Rate limitation	/home/mcapture/configs/SENTINEL1A/ TF_OUTPUT_C2.xml	Rate, unit is Bytes/s. Set to 0 to disable rate limitations

9.7.7 Configuring ISP distribution

The following table shows which files to edit to change ISP distribution settings, with typical candidate parameters in the right-most column. See section 9.7.6.1 for more information.

Note that the File section refers to Sentinel 1A. Substitute with 2A/3A for other Sentinels.

What?	File	Parameter(s)
Channel x – ISP NRT - Header/data host and port	/home/mcapture/stationconf/nrt_destinations_1.cfg	DataDest_x (see comments in file for finding correct index x)
Channel x – ISP NRT - Trailer host and port	/home/mcapture/stationconf/nrt_destinations_1.cfg	TrlDest_x (see comments in file for finding correct index x)

What?	File	Parameter(s)
Channel 1 – ISP NRT - Connection attempts and connection retries	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C1.xml	ConnectionAttempts ConnectionAttemptDelta
Channel 1 – ISP NRT - Connection attempts and connection retries	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C1.xml	ConnectionAttempts ConnectionAttemptDelta
Channel 1 – ISP NRT - VCID selection	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C1.xml	VCIDs
Channel 2 – ISP NRT - VCID selection	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C2.xml	VCIDs
Channel 1 – ISP NRT - APID selection	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C1.xml	APIDs
Channel 2 – ISP NRT - APID selection	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C2.xml	APIDs
Channel 1 – ISP NRT - Rate limitation	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C1.xml	rate
Channel 2 – ISP NRT - Rate limitation	/home/mcapture/configs/SENTINEL1A/ ISP_OUTPUT_C2.xml	rate

9.7.8 Configuring Post-pass distribution (FTP)

Configuration files for post-pass distribution by (S)FTP are located in the directory:

/home/mcapture/stationconf/distribution_sites/

All files in this directory are used, and by convention there is one file per mission.

Example file for Sentinel-1A, containing one distribution user (SENTINEL1A_CADU_C1):

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<Users_Config xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="/usr/share/meos/xsd/distribution_users.xsd">

 <User_Entry>
   <Name>SENTINEL1A_CADU_C1</Name>
   <Tmp_Prefix>.</Tmp_Prefix>
   <Tmp_Postfix>.done</Tmp_Postfix>
   <Num_Retries>5</Num_Retries>
   <Use_Tmp>1</Use_Tmp>
   <Destination>ftp://user:password@hostname/path/</Destination>
   <Status_File>0</Status_File>
 </User_Entry>
</Users_Config>
```

The files normally contain several user entries, one per type of data.

The files in this directory are in XML format and can be edited by the mxmled tool.

After file(s) in this directory has been changed, the system must be either re-started or a manual command must be issued from the GUI (Setup->Distribution menu), for the changes to take effect.

9.7.9 Configuring reports

The VCIDs and APIDs, names etc. showing up in the data report are configurable. This report is based on the data and the information found in

/home/mcapture/configs/Missions.d/<mission>.xml

Structure:

VcidInformation			
	VcidInfo		
		ApidInformation	
			ApidInfo
			ApidInfo
			….
	….		
	VcidInfo		

9.7.9.1 Disabling gap detection for a VCID.

- Locate the mission definition file
- Locate the VcidInfo for the VCID of interest.
- Add a GapDetection node.

Example for disabling gap detection for VCID 6:

```
<VcidInfo VCID="6" name="RT_HALF_SCENE_1">
  <Description>Real Time Mission Data (Half Scence 1)</Description>
  <GapDetection>false</GapDetection>
  …
</VcidInfo>
```

9.7.9.2 Disabling gap detection for a APID.

- Locate the mission definition file.
- Locate the VcidInfo for the VCID of interest
- Locate the ApidInfo for the APID of interest
- Add a GapDetection node.

Example for disabling gap detection for VCID 6/APID 12:

```
<VcidInfo VCID="6" name="RT_HALF_SCENE_1">
  <Description>Real Time Mission Data (Half Scence 1)</Description>
  …
  <ApidInformation>
    ...
    <ApidInfo APID="0x00c" name="SWIR_VCM0_D0_WICOM0_B12_20m">
      <Description>SWIR, VCM 0, Detector 0, WICOM 0, Band 12, 20m</Description>
      <GapDetection>false</GapDetection>
    </ApidInfo>
    ...
  </ApidInformation>
</VcidInfo>
```

9.7.9.3 Enabling/disabling Packet Error Control

- Locate the mission definition file
- Locate the VcidInfo for the VCID of interest
- Locate the ApidInfo for the APID of interest
- Add/remove the PacketErrorControl node

Example for Packet Error Control for VCID 4/APID 0:

```
<VcidInfo VCID="4" name="NOM_HALF_SCENE_1">
 <Description>Nominal Mission Data (Half scene 1)</Description>
 <ApidInformation>
  <ApidInfo APID="0x000" name="VNIR_VCM0_D0_WICOM0_B1_60m">
   <Description>VNIR, VCM 0, Detector 0, WICOM 0, Band 1, 60m</Description>
   <PacketErrorControl type="CRC-CCITT" offset="0"/>
   …
  </ApidInfo>
 …
 </ApidInformation>
</VcidInfo>
```

The *type* attribute can have the following values:

- "CRC-16"
  - $x^{16} + x^{15} + x^2 + 1$
  - initialized to all-zeroes
- "CRC-32 ": CRC polynomial
  - $x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$
  - initialized to all-ones
- "CRC-CCITT"
  - $x^{16} + x^{12} + x^5 + 1$
  - initialized to all-ones

- "CRC-CCITT2"
  - $x^{16} + x^{12} + x^5 + 1$
  - initialized to all-zeroes
- "VPC" : Vertical Parity Checksum
- "None" : Packet Error Control disabled

The *offset* attribute gives the offset from packet start for where to start error control code calculation.

10System Operation

This section describes normal operation of the system, both nominal and contingency, along with some handy operational procedures.

The DFEP Overview GUI shows important parameters for all embedded systems, and is used as the entry point in the following sections.

10.1 Nominal mode

Nominal mode means that the DG&A is used both for long-time file storage and to forward realtime data streams to the final recipient, i.e. PDGS. In addition, the DG&A is used as the source for overall reporting.

10.1.1 Monitoring system readiness

As the system is up and running all the time, a number of checks can be performed prior to data acquisition to verify system readiness.

There are two components, the MEOS Capture HRDFEP and DG&A Realtime, crucial to correct operations. Both have separate blocks in the DFEP Overview GUI, named MEOS Capture HRDFEP and Data Gate and Archive – Realtime.

Important observation points are described in the following:

10.1.1.1 MEOS Capture HRDFEP

The MEOS Capture HRDFEP is responsible for data acquisition and first level processing, and can be operated in two different modes:

10.1.1.1.1 Scheduled operations

In this mode, all activities are based on schedules, received from the MEOS Control system (either from an external planning system or based on schedule

prediction).

The following steps can be performed to verify system readiness:

- ❑ Make sure that the HRDFEP is up and running by inspecting System Status field in the sidebar. The first line should be:

Green LED – HRDFEP – valid IP address

A black LED, or a unknown IP address indicates that the HRDFEP system is not online, and must be further investigated (see section 11).

- ❑ Verify that there is a green frame around the MEOS Capture HRDFEP box in the Overview GUI.
If not, this indicates that the HRDFEP is not running. See section 11.
- ❑ Also verify that the two last lines in the System Status field reflect nominal mode and scheduled operations.
If this is not the case, use the administrator GUI to correct faulty setting(s). See section 7.
- ❑ Verify that the current time field in the sidebar is correct.
If not, this may indicate that the client computers time is off. The time of all systems should be verified.
- ❑ Verify that the connection field in the sidebar shows a green LED and valid hostname.
If this is not the case, the GUI is not connected to the DFEP, and the information shown cannot be trusted. Try to reconnect using the System->Reconnect. If the situation does not improve, see section 11.
- ❑ The three icons in the System Health field in the sidebar should all be gray. Placing the mouse-pointer over an icon should indicate normal behavior.
If one or more of the icons are flashing yellow or red, this needs to be further investigated before verifying system readiness (see section 11).
- ❑ Open the System Health tab in the GUI. Inspect the different systems and verify that both CPU and load are within normal values. An idle system should have less than 25% CPU usage and load < 3.
- ❑ Open the Events tab, and verify that there are no recent error or warning events.
If there are, this must be investigated based on the messages.
- ❑ If the system has been scheduled, verify that issued schedules are in the schedule list, i.e. the Schedule tab. All issued schedules should be present here, listed by satellite, orbit, AOS and LOS.

10.1.1.1.2 Automatic (data-driven) operations

In automatic operations, the same checks as for scheduled mode should be performed, except that for item 3, automatic operations should be enabled.

In addition, automatic operations requires that IF input, TF acquisition and CADU acquisition should be running, i.e. green frames around these functions.

If this is not the case, inspect the Events log for possible causes. The HRDFEP will not work properly if these are not running in automatic mode.

10.1.1.2 DG&A Realtime

The DG&A is responsible for forwarding realtime data received from the HRDFEP to the PDGS, and is independent of the scheduling mode. In input part, Direct Data Capture (DDS) 1/2 for both channels are working in data-driven mode, and should always be active and ready to receive data:

- ❑ Make sure that the DG&A Realtime is up and running by inspecting System Status field in the sidebar. The third line should be:
  - ❑ Green LED – DGA – valid IP address
  - ❑ A black LED, or a unknown IP address indicates that the DGA system is not online, and must be further investigated (see section 11).
- ❑ Verify that there is a green frame around the Data Gate and Archive - Realtime box in the Overview GUI.

If not, this indicates that the DG&A is not running. See section 11.

- ❑ Verify that the frames around all DDS are green.

If this is not the case, inspect the Events log for possible causes.

- ❑ Verify that all DDS LEDs are yellow, indicating listening mode.

10.1.2 Pre-pass activities

The steps listed in section 10.1.1 will give a good indication of system readiness prior to data acquisition. However, in some cases it might be needed to run testdata through the system for verification purposes.

One way of doing this is as follows:

- ❑ MEOS Capture HRDFEP
  - ❑ If the system is set for automatic operations, no actions are necessary on the HRDFEP.

- If it is set for scheduled operations, schedule the system for pre-pass testing
  - In the DFEP GUI, select an appropriate command from the User Commands pull-down in the sidebar (see figure 79). F.eks. Selecting SENTINEL1A will schedule the system to receive S1A data, using IF input (SENTINAL1A_SERIAL will use ECL input).
  - A new window will pop up as shown in figure 80. Set the orbit number (making sure it is unique), and the desired duration. Click OK when done.
  - Inspect the DFEP Overview, and verify that IF Input, TF acquisition and CADU acquisition become active for both channels.
  - The HRDFEP is now ready to receive data
- MEOS Capture HRTG
  - Open the HRTG GUI from the DFEP GUI by selecting Windows->MEOS Capture HRTG-> Launch HRTG GUI
  - When the HRTG GUI shows up, select a corresponding commands from the User Command pull-down in the sidebar, as shown in figure 81. Make sure to select the same satellite as above.
  - A new window will pop up as shown in figure 80. Set the orbit number to the same number as above, and a matching duration. Click OK when done.
  - Select the Overview tab, and verify that data is being sent

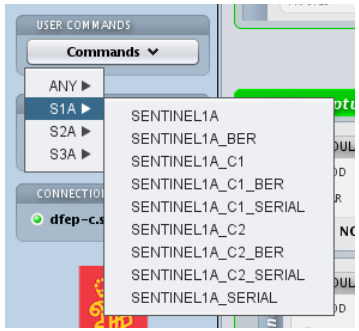


Figure 79: Selecting satellite in DFEP GUI

Figure 80: Schedule details

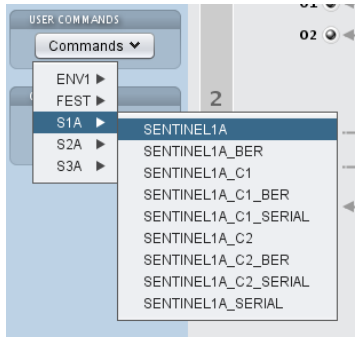


Figure 81: Selecting satellite in HRTG GUI

Refer to section 10.1.3 for following the progress.

10.1.3 In-pass activities

When data is running through the system, the following inspection points can be used to verify correct system behavior.

10.1.3.1 MEOS Capture HRDFEP

- IF Input
  - Green frame
  - Green Lock LED

- TF acquisition
- CADU acquisition
  - Green frame
  - Steady green Lock LED
    Flickering between yellow and green may indicate bad data quality
  - Steady green data quality LED
    Flickering between yellow and green may indicate bad data quality, except in the beginning and at the end of a pass
  - Increasing Frames and Acquired.
  - High R-S numbers may indicate bad data quality
- ISP generation
  - Green frame
  - Increasing VCDU/ISP counters
  - Low discarded values
    A high number here may indicate bad data quality
- ISP/VCDU distribution
  - Green frame
  - Green Auto LED indicating automatic distribution
  - Increasing Sent counter

10.1.3.2 DG&A Realtime

- DDS 1/2
  - Green frame
  - Green LED indicating processing
  - Stream and satellite as expected

- SDP 1/2
  - Valid PDGS server address
  - Green LED indicating processing
  - increasing packet counter

In addition, the realtime arrows between the HRDFEP and DG&A should be solid green. A red arrow indicates error and a dotted gray no activity.
Also, solid green arrows from the SDP to the PDGS icon. A red arrow indicates error and a dotted gray no activity.

10.1.3.3 MEOS Capture HRTG (if running test data)

If the HRTG is used to send testdata, the following inspection points are valid:

- MEOS Capture HRTG frame should be green
- Modulator
  - Green frame
  - Modulation and carrier LEDs should be green
  - Correct modulation and bitrate
- Replay
  - Green frame
  - Correct rate
  - Increasing sent number

10.1.4 Post-pass activities

10.1.4.1 CADU transfer

After data acquisition, CADU files will be transferred from the HRDFEP to the DG&A using file transfer mechanisms.

- In the DFEP GUI, switch to the DFEP Overview tab.
- Between Channel 1 and Channel 2 in the MEOS Capture HRDFEP part, there is a part named Post Pass Distribution.
  - Verify that both channels are being sent, by
    - See that the Status field for both channels changes to WORKING
    - See that the progress is increasing for both channels
    - Verify that the destination is correct, and that files belonging to channel 1 and 2 are transferred in parallel
    - Verify that the rate is as expected, and that Sent increases
  - Verify that the arrows to the DG&A turn solid green when WORKING.
  - When a transfer is complete, the Status should change to COMPLETE, and that the contents are dimmed after a while.
  - If a transfer fails, the Status should change to FAILED, all fields should turn red and the arrows to the DG&A should turn solid red as well.
    - If a transfer fails, the status will be marked as error (fields and arrows) until the next transfer.
    - Investigate the error cause by inspecting the Events log.

10.1.4.2 Reports

When a pass is over, reports can be retrieved from the DG&A for inspection purposes.

Reports will also be generated for pre-pass testing.

10.2 Contingency mode

Operations in contingency mode is similar to in nominal mode, except that the DG&A is not present.

10.2.1 Monitoring system readiness

Same steps as for nominal mode, except the DG&A is not present.

10.2.2 Pre-pass activities

Same steps as for nominal mode.

10.2.3 In-pass activities

Same steps as for nominal mode, except the DG&A is not present and that the arrows from the HRDFEP will always stay dotted gray.

10.2.4 Post-pass activities

There are no defined post-pass activities in this mode. Reports must be obtained from MEOS Control for inspection.

10.3 Miscellaneous procedures

10.3.1 Uploading test-data to the MEOS Capture HRTG

As a general rule, the described mechanism should be used whenever test-data needs to be uploaded to the HRTG.

- Make sure the test data file names includes “C1” or “C2” to distinguish the channels.
- Place the files under /disk3/ftp on the HRTG, either by using FTP or any other mechanism.
- Always transfer files using a “.” in front of the filename to ensure atomic behavior.
- Once the transfer is complete, rename the files removing the preceding “.”.

The HRTG will monitor this directory, and according to C1/C2, put the files in the correct place.

10.3.2 Replay of data from the MEOS Capture HRTG

There are several ways to initiate a test generator playback from the HRTG GUI:

- The “Replay File” menu option
- Right-clicking on a file in the Rolling Archives view, and selecting one of the “Replay modulator” options
- Selecting a predefined configuration file from the “USER COMMAND” drop-down

10.3.3 Replay of data to the PDGS

See the DG&A User Manual and Operations [R-3].

10.3.4 Transferring data from the MEOS Capture HRDFEP

Both CADU and ISP files on the HRDFEP can be transferred to the DG&A manually.

- Open the HRDFEP GUI
- Switch to the Data Archives tab
- A number of archives are available
  - INGEST Channel 1
    - Holding CADU, good VCDU and bad VCDU files for channel 1
  - INGEST Channel 2
    - Holding CADU, good VCDU and bad VCDU files for channel 2
  - ISP
    - Holding ISPs for both channels
- Select the file to be transferred, and click the right mouse-button. The select redistribute and appropriate targets (see figure 82).

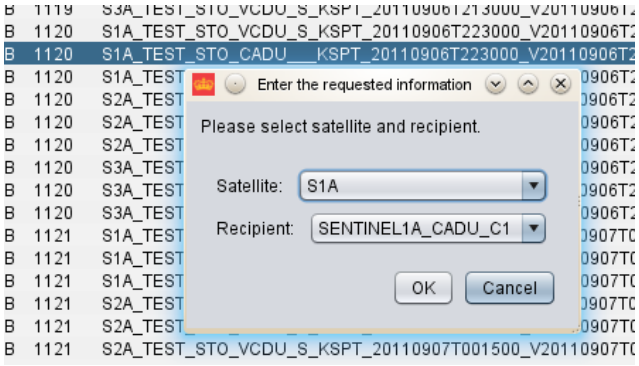


Figure 82: Redistribution

10.3.5 Uploading data to DG&A

The mount points (inbox of Data Manager) are:

- CADU: **/raid0/opdfep/From_HRDFEP_CADU_ISM**

The system receives only data with right naming convention having HDR and DBL files.

Under these condition the system import data like nominal condition.

- ISP: **/DM_Cache/drop**

Limitation: The ISP telemetry data are not stored inside the ISM so there is no backup available nor possibility to retrieve them from ISM after the the removal from cache.

The user is **opdfep** with **12qwas** as password at moment.

10.3.6 Cleaning procedure

These procedures shall only be used for test purpose and they are not for operational use. To clean the system the following steps should be performed:

1. DFEP:
   - Log on the MEOS Control as dfep
   - Issue the command “dfep-test-clean-all”

   At this point everything is cleaned on the HRDFEP, HRTG, Control and the middleware database Is cleaned on the DG&A.
2. DG&A (in addition a procedure need to be run on the DG&A specifically):
   - Log on DG&A as root and issue the following command “service ism stop”.
   - Log on DG&A as opdfep and issue the command “DGACleanAll”.
   - Log on DG&A as root and issue the following command “service ism stop”.

At this point everything is cleaned on the DFEP so these procedures have to be used only for test purpose.

11 Troubleshooting

11.1 Hardware problems

11.1.1 Computer

11.1.1.1 Temperatures

All systems monitor a number of temperatures within the system itself. If temperatures exceed limits (as defined by the manufacturer), this will be indicated to the operator (see section 11.3).

If such situations occur, first open the System Health overview in the GUI. This will provide a better view of the overall situation:

- Is the outside temperature within normal limits?
- Are all fans working?

Make sure that the outside temperature is within normal limits. Shut down the system while waiting for the outside to reach normal temperatures (see section 11.4).

If the outside temperature is ok, shut down the system while investigating the source of the problem, possibly replacing faulty fans.

11.1.1.2 Power supplies

Systems are normally equipped with double power supplies. Although the system will work fine with only one power supply, having two will make it more robust.

If a power supply fails (see section 11.3), this must be investigated. This includes checking cables.

Replace faulty power supply.

11.1.1.3 Fans

Systems are equipped with a number of internal fans to keep temperatures within operating range, and the status of these fans are monitored (see section 11.3).

Failure of one or more fans may also result in increasing temperatures, and should be investigated.

If temperatures rise, the system must be shut down (see section 11.4) and faulty fans must be replaced.

11.1.2 IO Card temperatures

For systems including KSPT IO cards (MEOS Capture), the following limits are used:

- Warning (yellow): >= 70°C
- Error (red): >= 80°C

Temperature errors and warnings should always be checked. If such situations occur, first open the System Health overview in the GUI. This will provide a better view of the overall situation:

- Is the outside temperature within normal limits
- Are all fans working?

Warnings may not necessarily be critical, but should be monitored closely. If it does not improve, the affected system should be shut down for further investigation (see section 11.4).

Errors should be regarded as critical, and the affected system should be shut down for further investigation (see section 11.4).

11.2 System problems

All MEOS systems include an internal component called *Middleware*. This component is responsible for connections to GUIs, other MEOS systems and external systems, in addition to handling all internal status and configuration parameters within the system itself.

11.2.1 Connection refused

The Middleware is normally up and running at all times. If the GUI refuses to connect to the system, this is an indication that the middleware is not running normally.

Please have a look in the log files (see section 11.4.1). If this does not indicate a problem, then the Middleware is probably not running or it is in an unknown state. To rectify the situation, restart the Middleware (see section 12.4).

Should the log file indicate that there is a database error, this may be caused by a full disk, or a disk problem. In this case, see section 11.4.2.1 on how to repair the database.

11.2.2 Lost connections

Within the DFEP system, a number of inter-system connections must be present for the system to work as intended. The status of these connections are shown in the DFEP GUI.

11.2.2.1 GUI

The DFEP GUI is connected to the MEOS Control system, and the status is shown in the Connection part of the sidebar, as:

`LED IP-address`

It is used as follows:

- Green LED ip-address: Connction in ok.

- Black LED – NOT CONNECTED: Connection is not ok.

If the connection is broken, this will be clearly indicated in the GUI, with options to reconnect or cancel.

- If the GUI connection is broken, the contents of the GUI cannot be trusted!
- A reconnection can be forced using Reconnect from the Systems menu.

For further investigating GUI connection problems, please refer to section 11.4.2).

11.2.2.2 Systems

All systems are connected to MEOS Control, and the statuses are shown in the GUI (see section 11.3).

11.3 GUI indications

The GUI uses different mechanism to alert operators. These are explained in the following.

11.3.1 System status

The system status part of the side bar shows the status of the different systems in the top part, in format:

```
LED Name IP-address
```

Normally, the LED should be green, and the IP-address set.

However, if a system is not running, the LED will be black, and the IP-address will not be present. This situation will also be indicated by flashing LEDs in the system health part for the corresponding system.

The consequences of failed systems are:

- HRDFEP: The DFEP will not be able to acquire data.

- HRTG: Test data cannot be looped through the system. May not be critical for normal operations, as it does not affect acquisition of data.
- DG&A: In nominal mode, this may be critical as:
  - Realtime data will not be sendt to the end receiver (i.e. PDGS)
  - Data will not be transferred from the HRDFEP to the DG&A for archiving purposes
- To fix the situation, inspect the logs in the Events overview. In no reason can be found, start the GUI of the faulty system, and check the logs.
- If no obvious reason can be found, see section 11.4.

11.3.2 System health

The system status part of the side bar shows the health of the different systems:

- TEMP
  - Host computer: Warnings and errors are reported as set by the host computer manufacturer. See section 11.1.1.1.
  - IO cards: Warnings and errors are reported as detailed in section 11.1.2.
- DISK
  - Both MEOS Capture and MEOS Control has automatic storage management, where disk usage should be within pre-configured limits. However, if these limits are exceeded, warnings/errors will be flagged:
    - Warning (yellow): >= 90% usage
    - Error (red): >= 95% usage
  - Warnings/errors may not be urgent, but indicates that something is wrong and should be further investigated (see section 11.4).
  - *Note! A common reason for this to happen is that datafiles are manually placed on the systems, for testing or other purposes. Such manual operations will bypass the automatic storage management, and should never be done.*
- MISC
  - This parts cover the following:
    - FANs: Error will be shown if a fan stops working, which may also be followed by temperature warnings. See section 11.1.1.3.

- Power Supplies: An error will be issued if a PSU is not working, even though the system will work fine with only one PSU. See section 11.1.1.2.
- TLE management (if present): If the system includes TLE management, warnings will be issued if the TLEs are older than a pre-configured threshold.
  Normally TLEs are fetched automatically, check the TLE source for validity.

11.3.3 Frame color

In the DFEP Overview tab, the different systems (MEOS Capture HRTG, MEOS Capture HRDFEP, DG&A RT and DG&A Post-pass) are modeled as framed boxes, where colors are used to indicate different situations.

Red frames are used to catch the operators attention.

- MEOS Capture HRDFEP
  - The frame is red if the system is not running. Without the HRDFEP, the system is not able to acquire data. The cause can be found by inspecting warning/error messages in the Events tab.
    If no obvious reason can be found, see section 11.4.
  - Sub-frames:
    - IF Input, TF acquisition, CADU acquisition: Red if not running when in automatic (data-driven) mode. These functions must be running in automatic mode in order to acquire data. The cause can be found by inspecting warning/error messages in the Events tab.
      If no obvious reason can be found, see section 11.4.
- DG&A Realtime
  - If in nominal mode, the frame is red if the system is not running. Without the DG&A Realtime, the system is not able to send data to the PDGS. The cause can be found by inspecting warning/error messages in the Events tab.
    If no obvious reason can be found, see section 11.4.
- MEOS Capture HRTG
  - The frame is gray if the system is not running. A stopped HRTG will not affect data acquisition from the satellites.
- DG&A Postpass

- If in nominal mode, the frame is gray if the system is not running. A stopped DG&A Postpass will not affect the realtime data flow.

11.3.4 Red arrows

Arrows are used in the DFEP Overview tab to indicate dataflows between the different systems.

A red arrow indicates that an error has occurred in the corresponding dataflow. The arrow will stay red until the next activity involving the same dataflow, and the cause can be found by inspecting warning/error messages in the Events tab.

11.4 Troubleshooting procedures

11.4.1 Logfile inspection

In case of problems, the cause of the problem can normally be found by inspecting the log files.

11.4.1.1 MEOS Capture HRDFEP

There are two log files locations to be inspected:

- **/var/log/mcmw**

This logfile location contain logs relevant for middleware problems, i.e. connection problems, scheduling, etc. There is one main logfile,**mcmwd.log**, which points to the latest log. Older logfiles will also be present, on the following format:
mcmw_»YEAR»-»MONTH»-»DAY»T»HH»:»MM»:»SS».log
e.g. **mcmw_2011-09-15T12:24:50.log**

- /var/log/mcapture

This logfile location contain logs relevant for processing problems. There is one main logfile,**mcf_soft_event_log.log**, which is similar to the log shown in the GUIs Events view.

In addition, there are logfiles per processing function, on the following format:

«proc»_»instance».txt|output[.#]

e.g.

- fep_1|2|5|6.txt[.nn]

  Front End Processor(fep)

  - .txt is a timestamped log, identifying overall activities for current or latest run
  - .nn is a number, identifying older logs. It is not present for current or latest run
- fep_1|2|5|6.output[.nn]

  Front End Processor(fep)

  - numbers as above
  - .txt is a freetext log, identifying details for current or latest run
  - .nn is a number, identifying older logs. It is not present for current or latest run

The following table maps the most used «proc» names to the processing functions.

Proc name	Processing function
fep	Front End Processor – responsible for acquiring data. • 1: Channel 1 TF acquisition • 2: Channel 1 CADU acquisition

Proc name	Processing function
	• 5: Channel 2 TF acquisition • 6: Channel 2 CADU acquisition
hrdr_demod	Demodulator • 1: Channel 1 • 2: Channel 2
reconstruct	ISP generation • 1: Channel 1 – first instance • 2: Channel 1 – second instance • 3: Channel 2 – first instance • 4: Channel 2 – second instance
distribute	Post pass distribution • 1: Instance 1 • 2: Instance 2
isp_output	ISP realtime distribution • 1: Channel 1 • 2: Chanel 2
vcdu_output	VCDU realtime distribution • 1: Channel 1 • 2: Chanel 2

11.4.1.2 *MEOS Capture HRTG*

There is one log file locations to be inspected:

- **/var/log/mcmw**

This logfile location contains logs relevant for middleware problems, i.e. connection problems, scheduling, etc., and processing. There is one main logfile,mcmwd.log, which points to the latest log. Older logfiles will also be present, on the following format:
mcmw_»YEAR»-»MONTH»-»DAY»T»HH»:»MM»:»SS».log
e.g. ***mcmw_2011-09-15T12:24:50.log***

In addition, there are logfiles per processing function, on the following format:

«proc»_»instance».txt|output[.#]

e.g.

- mod_if_1|2.txt[.nn]

  Modulator IF

  - .txt is a timestamped log, identifying overall activities for current or latest run
  - .nn is a number, identifying older logs. It is not present for current or latest run

- mod_if_1|2.output[.nn]

  Front End Processor(fep)

  - numbers as above
  - .txt is a freetext log, identifying details for current or latest run
  - .nn is a number, identifying older logs. It is not present for current or latest run

The following table maps the most used «proc» names to the processing functions.

Proc name	Processing function
mod_if	Modulator IF • 1: Channel 1 IF output • 2: Channel 2 IF output
mod_loopback	Data output • 1: Channel 1 data output • 2: Channel 2 data output

11.4.1.3 *MEOS Control*

There is one log file locations to be inspected:

- **/var/log/mcmw**

This logfile location contains logs relevant for middleware problems, i.e. connection problems, scheduling, etc., and processing. There is one main logfile,mcmwd.log, which points to the latest log. Older logfiles will also be present, on the following format:
mcmw_»YEAR»-»MONTH»-»DAY»T»HH»:»MM»:»SS».log
e.g. ***mcmw_2011-09-15T12:24:50.log***

11.4.2 Middleware

11.4.2.1 Database repair and recovery

The database may require repair for a number of reasons. For instance this will be needed if the disk partition where database is located becomes 100% full, someone/something has corrupted the database files, or you have had a disk crash.

If the disk is completely dead and you have done a reinstall, then just follow the instructions from the beginning of this document. If you have one or more backup files available, you may restore them afterward. This is done via the **psql** program as the user that owns the database. Here is an example:

psql < backup.txt

Once this is done you should be able to start the MC Middleware with the restored data in place.

If the database is still present, but corrupted, you have a few options:

- The brute force approach is to delete the database directory as the root user. Begin by stopping the middleware and postgres if those are running. Then delete the entire database directory, typically **/var/lib/pgsql/data**. Restart postgres and follow the instructions from the beginning of this document. You may restore any backup files as needed afterward.
- If the database structure itself is OK, you may drop the database using the **drop_mw_database.sql**. Then either run **create_mw_database.sql** and/or restore backup files as described above.
- Attempt to repair the database. For PostgreSQL you may try to go into stand-alone mode and run vacuum:
  - **service postgres stop**
  - **postgres -D /var/lib/pgsql/data/ <username>**
- From the backend**>** prompt, run:
  - **vacuum full**

and exit postgres standalone mode by pressing ctrl-D. You may now restore any backup files as needed.

11.4.2.2 Tuning the number of file descriptors

The MC Middleware uses many file descriptors (mostly pipes), especially on systems with a high number of connected clients. The clients are

GUIs and other programs and scripts. Because of this, the middleware will refuse to start unless it is able to set the maximum number of file descriptors for the process to at least 2048.

This is a tunable system variable in UNIX-like systems. Under Linux, this may be changed a a hard limit in **/etc/limits.conf** or **/etc/security/limits.conf** . Under Solaris, it is set in **/etc/system**. On OS X it is set in **/etc/sysctl.conf** and so on. Please refer to the documentation for your OS on how to do this.

After changing the parameter you may have to reboot to make the change take effect.

12 Maintenance Procedures

12.1 First Level Maintenance

12.1.1 Hardware

First level maintenance:

- Perform regular check of equipment fans that they work properly
- Clean air filters regularly
- Clean equipment panels only with a water-based cleaner
- Connectors: Perform regular inspections for broken, loose and bent connectors on all backend equipment
- Cables: Inspect cables for damage and loose connectors. Replace damaged cables.
- Replace equipment with failure with spare unit.

12.1.2 Software

12.1.2.1 Middleware Database

The middleware database is automatically maintained by a perl script. The script deletes the oldest events and status measurements in the database every day, according to the settings in /etc/meos/mc-middleware.xml.

It may still be a good idea to check the disk use of /var/lib/pgsql/data every once in a while to make sure the disk use remains stable. It is normal for the disk

use to vary, but not more than the amount of data produced in a day. The amount of disk space used is depending on the number of passes handled and how many subsystems are involved.

12.1.2.2 Disk Use

The directory structure contains several directories where temporary data files are placed. Some of them use rolling archives, where old files are removed automatically by the applications. Others are plain file directories where cron jobs are cleaning up:

- tmp
- instructions/outbox
- instructions/backup
- log
- serverlog

12.1.2.3 Mails

The system itself does not send out any mails. But your crontab jobs may cause mail messages to be sent out, if they are not correctly set up. It is a good idea to check the mail inbox of the user once a month to avoid filling the disk with periodic mails.

12.2 Anomaly Handling

12.2.1 GUI Communication Loss

The GUI system may disconnect from the system due to communication errors. When this happens there will be a warning saying the system "disconnected " and there will be loss of telemetry and a reconnect dialogue box will be shown. When the communication is restored the system will continue to update.

Forced reconnect can be manually done from the System Menu.

12.3 Activating cold spare DFEP unit

The cold spare unit is preconfigured for the Sentinels and the network interfaces are already configured. Before activating the cold spare unit the currently operational unit to be replaced should be powered off.

To activate the cold spare DFEP unit follow these steps:

- The cold spare DFEP unit is powered off.
- Connect the IF-cable from the X-band antenna system to cold spare DFEP unit
- Insert the license USB keys in the USB port for:
  - MEOS Control
  - MEOS Capture HRDFEP
  - MEOS Capture HRTG
  - (nothing to do for the DG&A)

Start the system by following the start up procedure for the DFEP unit.

12.4 Maintenance Procedures

12.4.1 Middleware Database backup routines

Depending on how important you feel that the middleware database contents is for your operations, you may want to backup parts of or the entire database. A script (that will only work for PostgreSQL) called **mcmw-backup-database** is provided for this purpose. It is found under

/usr/sbin or the equivalent location. The script is typically run as a cron job.

The backup script can be used to backup just the main structure of the database, with its users etc. This will result in a very small backup, without any event messages and subsystem status. To run the script this way, use only **--main** as argument. The disadvantage is of course that the events/status will be lost on e.g. a disk crash. Here is an example:

/usr/sbin/mcmw-backup-database --main > backup.txt

To make a backup of all event messages and status, something like this can be done:

/usr/sbin/mcmw-backup-database --events --status=2 > measurements_backup.txt

This example dumps status for two days to the file. The two examples above may also be combined to store all the information in one file.

12.4.2 System stopping

All systems are configured to stop all processes when using the normal shutdown procedure. However, stopping the main processes can also be done manually, without performing a complete system shutdown.

12.4.2.1 MEOS Capture HRDFEP stop procedure

From the GUI:

System->Stop

From a terminal:

mcmw-stop-scs

as the **mcapture** user

service mcmwd stop

as the **root** user.

12.4.2.2 MEOS Capture HRTG stop procedure

From a terminal:

service mcmwd stop

as the **root** user.

12.4.2.3 MEOS Control stop procedure

From a terminal:

service mcmwd stop

as the **root** user.

12.4.3 System starting/restarting

All systems are configured to start all processes when when booting/powering up the system. However, starting the main processes can also be done manually, in case they are stopped manually.

12.4.3.1 MEOS Capture HRDFEP start procedure

From the GUI:

System->Start

From a terminal:

mcmw-start-scs

as the **mcapture** user to start the system.

mcmw-stop-scs;sleep 40;mcmw-start-scs

as the **mcapture** user to restart the system.

service mcmwd start

as the **root** user to start the system.

service mcmwd restart

as the **root** user to restart.

12.4.3.2 MEOS Capture HRTG start procedure

service mcmwd start

as the **root** user to start the system.

service mcmwd restart

as the **root** user to restart.

12.4.3.3 MEOS Control start procedure

service mcmwd start

as the **root** user to start the system.

service mcmwd restart

as the **root** user to restart.

12.4.4 System power-off / shutdown

| To power-off the DFEP system, follow the following steps.

12.4.4.1 MEOS Capture HRDFEP power-off

- ❑ Make sure that the system is idle (not acquiring, processing or distributing data),
- ❑ Open a shell on the system, and change user to "root" (e.g. using the "su" command)
- ❑ Enter the "shutdown" command

The system will start the power-off sequence, and finally power off.

Figure 83 shows the front power panel of the MEOS Capture HRDFEP. When the power-off sequence has completed, the power LED will turn orange (if the main power is connected).

Figure 83: The MEOS Capture/DGA server front power panel

12.4.4.2 MEOS Capture HRTG power-off

- ❑ Make sure that the system is idle
- ❑ Open a shell on the system, and change user to "root" (e.g. using the "su" command)
- ❑ Enter the "shutdown" command

The system will start the power-off sequence, and finally power off. When the power-off sequence has completed, the power LED will turn orange (if the main power is connected), see figure 83.

12.4.4.3 MEOS Control power-off

- ❑ Make sure that the system is idle
- ❑ Open a shell on the system, and change user to "root" (e.g. using the "su" command)
- ❑ Enter the "shutdown" command

The system will start the power-off sequence, and finally power off.

Figure 84 shows the front power panel of the MEOS Control.

When the power-off sequence has completed, the power LED will turn orange (if the main power is connected).

Figure 84: The MEOS Control front power panel

12.4.4.4 DG&A power-off

Power-off the DG&A server:

- ❑ Make sure that the system is idle
- ❑ Open a shell on the system, and change user to “root” (e.g. using the “su” command)
- ❑ Enter the “shutdown” command

The system will start the power-off sequence, and finally power off. When the power-off sequence has completed, the power LED will turn orange (if the main power is connected), see figure 83.

Power-off the disk cabinet by using the power button on the rear, see figure 85.

Power-off the tape drive by using the power button as shown in figure 86.

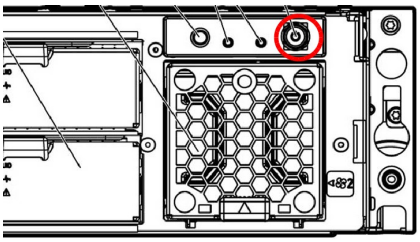


Figure 85: Rear-right view of disk cabinet, with power button marked in red.

Figure 86: Tape drive power button

12.4.4.5 Other equipment power-off

The rest of the DFEP equipment, switch and TFT console, does not have a dedicated power-off function. To power them off, either unplug the power cable to the unit, or remove the rack power.

12.4.5 System power-on / boot

To power-on the DFEP system, follow the following steps.

12.4.5.1 MEOS Capture HRDFEP power-on

Power-on the MEOS Capture HRDFEP by pressing the power switch on the front, as shown in figure 83.

12.4.5.2 MEOS Capture HRTG power-on

Power-on the MEOS Capture HRTG by pressing the power switch on the front, as shown in figure 83.

12.4.5.3 MEOS Control power-on

Power-on the MEOS Control by pressing the power switch on the front, as shown in figure 84.

12.4.5.4 DG&A power-on

- ❑ Power-on the tape drive by using the power button as shown in figure 86.
- ❑ Power-on the disk cabinet by using the power button on the rear, see figure 85.
- ❑ Power-on the DG&A server by pressing the power switch on the front, as shown in figure 83.

12.4.5.5 Other equipment power-on

The rest of the DFEP equipment, switch and TFT console, does not have a dedicated power-on function. To power them on, either plug the power cable to the unit, or plug in the rack power.

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