Rubin Observatory - TMA

SOFTWARE

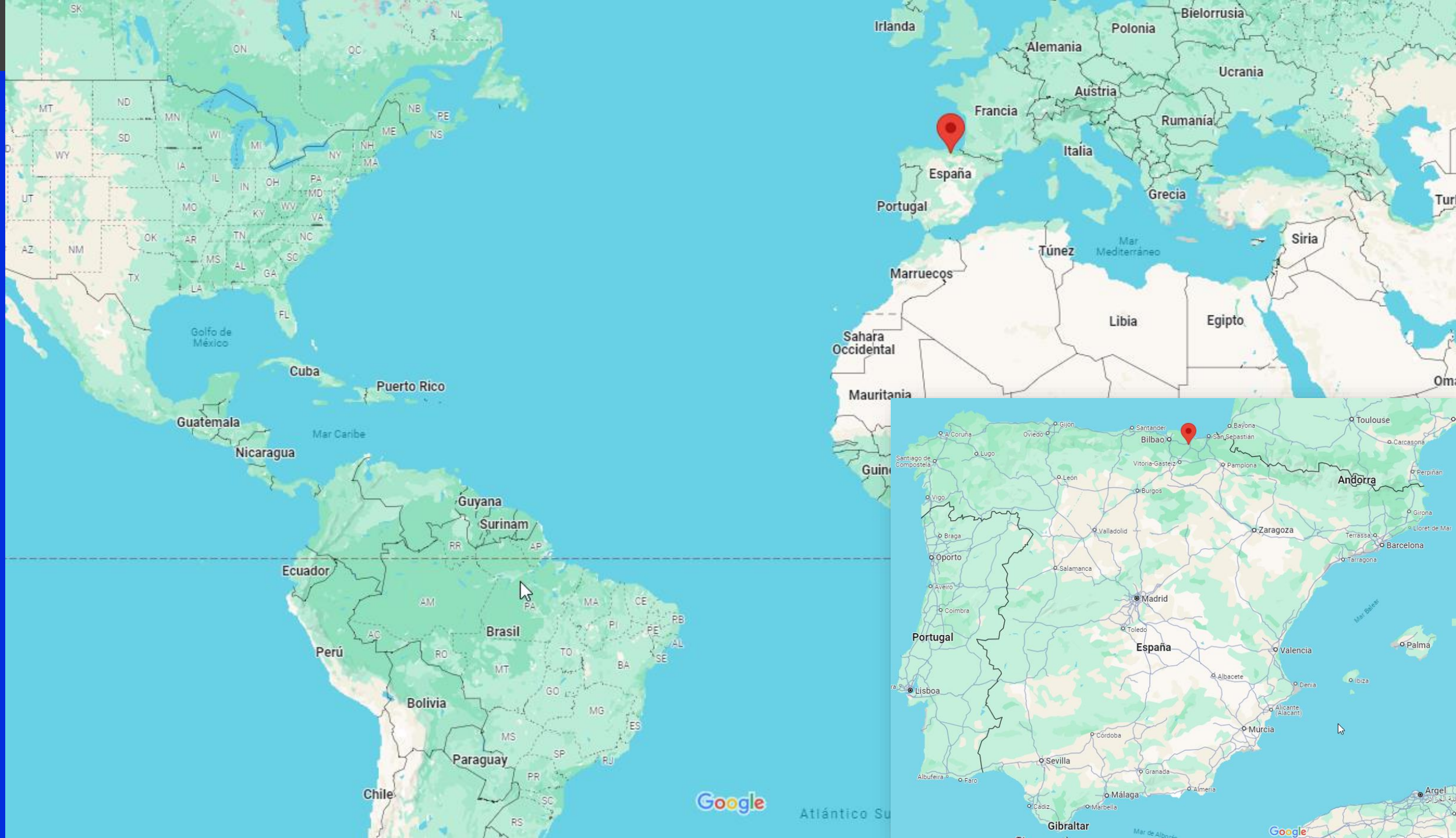
Julen Garcia | Tekniker | 24/09/2024

©Tekniker

Tekniker
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Julen Garcia

- Bilbao - Basque Country – Spain
- Degree in Engineering 2012 – 2016
  - Internship at Tekniker
- Masters in Engineering 2016 – 2018
  - Internship at Tekniker
- Researcher at Tekniker since 2018
  - Automation and Control Unit
- Skills
  - LabVIEW
  - MATLAB
  - Python
- Certification
  - **CLD-National Instruments Certified LabVIEW Developer**
- Contact: julen.garcia@tekniker.es


Irlanda
Bielorrusia
Polonia
Alemania
Ucrania
Austria
Francia
Rumanía
Italia
España
Grecia
Portugal
Túnez
Mar Mediterráneo
Siria
Marruecos
Libia
Egipto
Sahara Occidental
Mauritania
Golfo de México
Cuba
Puerto Rico
Guatemala
Mar Caribe
Nicaragua
Guyana
Surinam
Ecuador
Brasil
Perú
Bolivia
Paraguay
Chile
Google
Atlántico Su
Andorra
Toulouse
Carcasona
Perpiñán
Bilbao
San Sebastián
Santander
Bayona
Gijón
Oviedo
A Coruña
Lugo
Santiago de Compostela
Vitoria-Gasteiz
Pamplona
León
Burgos
Vigo
Girona
Lloret de Mar
Terrassa
Barcelona
Tarragona
Zaragoza
Valladolid
Braga
Oporto
Salamanca
Aveiro
Coimbra
Madrid
Toledo
Portugal
España
Valencia
Palma
Ibiza
Albacete
Denia
Lisboa
Alicante (Alacant)
Murcia
Córdoba
Sevilla
Granada
Albufeira
Faro
Málaga
Almería
Cádiz
Marbella
Gibraltar
Argel
Mar Balear
Google

©Tekniker

Tekniker
Tekniker
MEMBER OF BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

01

TEKNIKER

WHO WE ARE

R&D Centre
(not-for-profit Private Foundation) |
Applied research spanning 43 years

Our mission is to deliver growth and wellbeing to society at large via R&D&I and to further the competitiveness of the business fabric in a sustainable manner

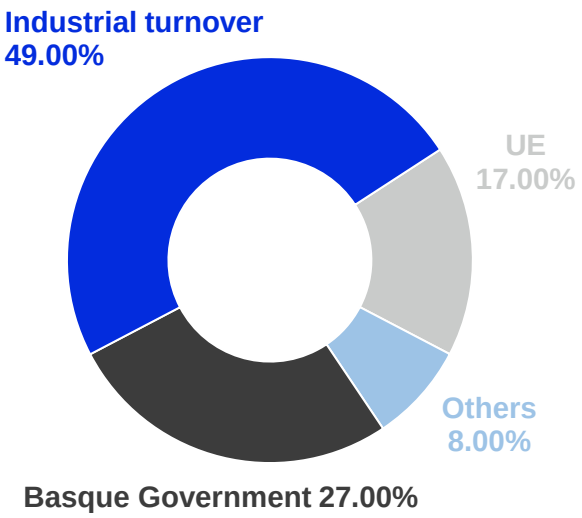
Specialised in **Manufacturing**

© Tekniker

TEKNIKER IN FIGURES

TOTAL REVENUE TEKNIKER
31,9 M€

PEOPLE TEKNIKER
279



37% Women
63% Men

PhD resources
70 doctors
24 doctoral students

81% university degrees

DATA 2023

TOTAL REVENUES **TEKNIKER + INVESTED COMPANIES**
51 M€

PEOPLE **TEKNIKER + INVESTED COMPANIES**
347

CURRENT PORTFOLIO OF SHAREHOLDINGS IN COMPANIES

Atten[2] Deep monitoring solutions
masermic
GMTK MAHER HOLDING
GOIALDE HIGH SPEED
H2GREEM GLOBAL SOLUTIONS
i-TRIBOMAT THE EUROPEAN TRIBOLOGY CENTRE

TOTAL REVENUES INVESTED COMPANIES
19,1 M€

PEOPLE INVESTED COMPANIES
68

TEKNIKER IN FIGURES

INDUSTRIAL PROJECTS

248 | Ongoing

START-UP´S

32 | Companies established

PATENTS

115 | Patents families

344 | Total filings

5 | First filings 2022

11 | Exploited families

DISTINCTION | PUBLICATIONS

59 | 2023 Indexed publications

31 | Scientific publications in Q1

27 | Publications in collaboration with RVCT agents

EUROPEAN PROJECTS HISTORY

292 | Projects

35 | Years of experience

20 % | Led projects

5,9 M€ | Annual average income

29 COLLABORATING ENTITIES OF TEKNIKER

The Collaborating Organisations seek to reinforce the COMPANY – Tekniker relationship, and to work to maintain this relationship in the long term so that the R&D&i result for the COMPANY can be maximised

14 of them are SMEs

AERNNOVA AEROSPACE	AEROTECNIC	AVS	AYESA	BIOLAN MICROBIOSENSORES	COMPAÑÍA ESPAÑOLA DE SISTEMAS AERONÁUTICOS	DOIMAK
EGILE	GRUPO ERREKA	FAGOR AUTOMATION	GIROA VEOLIA	PUNTEADOS DE PRECISIÓN GOIALDE	GOIZPER GROUP	GH - GRANES & COMPONENTS
ILINE MICROSYSTEMS	JUARISTI BORING & MILLING MACHINES	KUTXABANK	CONSTRUCCIONES MECÁNICAS JOSÉ LAZPIUR	MAHER HOLDING	MAIER	MICROELECTRÓNICA MASER
GRUPO NBI	OJMAR	ONA ELECTROEROSIÓN	ORIBAY GROUP AUTOMOTIVE	SENER	SIEMENS-GAMESA INNOVATION&TECHNOLOGY	ULMA HANDLING SYSTEMS
ZAYER						

©Tekniker

INDUSTRIAL SECTORS

AERONAUTICS

Automation and robotics.

Special equipment and test benches.

Predictive maintenance.

Coatings and new materials.

Inspection & measurement.

Electrification.

AUTOMOTIVE

Manufacturing processes.

Automation and industrial robotics.

Component surface modification.

Lightening and new materials.

Electronic products.

Test benches.

RAILWAYS

Advanced manufacturing.

Coatings and new materials.

Inspection and measurement.

Advanced mechatronic design.

Power electronics.

MACHINE TOOLS AND MANUFACTURING

Design, simulation, control, validation, automation and metrology.

Manufacturing resources and processes (additive manufacturing, laser, micromanufacturing, texturising,…).

Digital twin.

Connected machine tools: industry 4.0.

RENEWABLE ENERGY

Thermal solar energy.

Wind power.

Photovoltaic solar power.

Green hydrogen, generation and use.

Energy storage.

Energy efficiency.

INFRASTRUCTURES

Digitisation.

Sustainability.

Operation and maintenance.

Mobility.

THE SCIENCE INDUSTRY

Neutron sources.

Particle accelerators.

Fusion.

Astrophysics and space science.

Engineering and infrastructures. Large scientific facilities.

AGRIFOOD

Sensor devices.

Multifunctional surfaces.

Automation and industrial robotics.

Data analytics and traceability for chain safety and optimisation.

Circular economy.

HEALTH

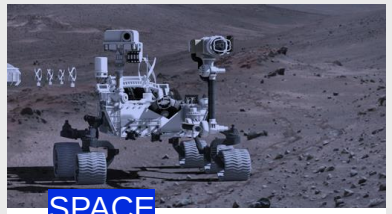
Developing medical devices. ISO-13485.

Biomarker identification and quantification.

Bioactive surfaces.

e-Health solutions.

Health industry equipment



SPACE

Outer space mechanisms.

Outer space mechatronic instrumentation, materials and structures.

Life support systems.

Space metrology.

Advanced manufacturing.

Space propulsion.

HYDROGEN

Generating green hydrogen

Storing green hydrogen

Transporting green hydrogen

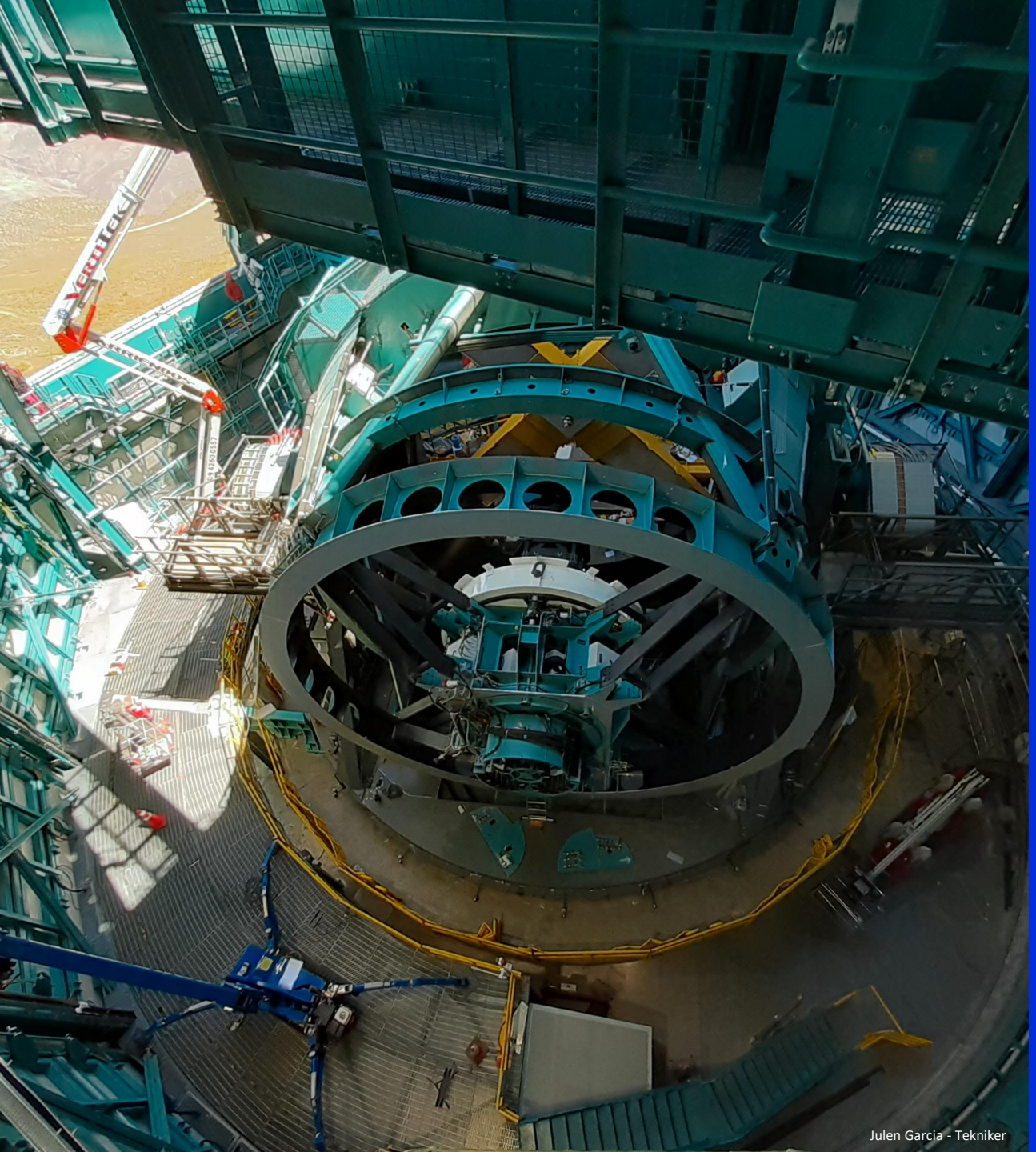
Mobility applications

Industrial applications

Tekniker for Vera C. Rubin Observatory

- 2015 – 2022 Tekniker worked as a subcontractor for the UTE
  - Design, development and implementation of the Main Control System (MCS) for the TMA, (both hardware and software)
  - Design, development and implementation of the Global Interlock System (GIS) for the Observatory
  - Design and manufacturing of the Camera Cable Wrap (CCW), including the control software
  - Design and manufacturing of the Azimuth Cable Wrap (CCW), including the control software
  - Design and manufacturing of the Mirror Covers, including the control software
- 2023 – Present
  - General support to Rubin (software changes, training, trouble shooting, …)
  - Camera Rotator control changes

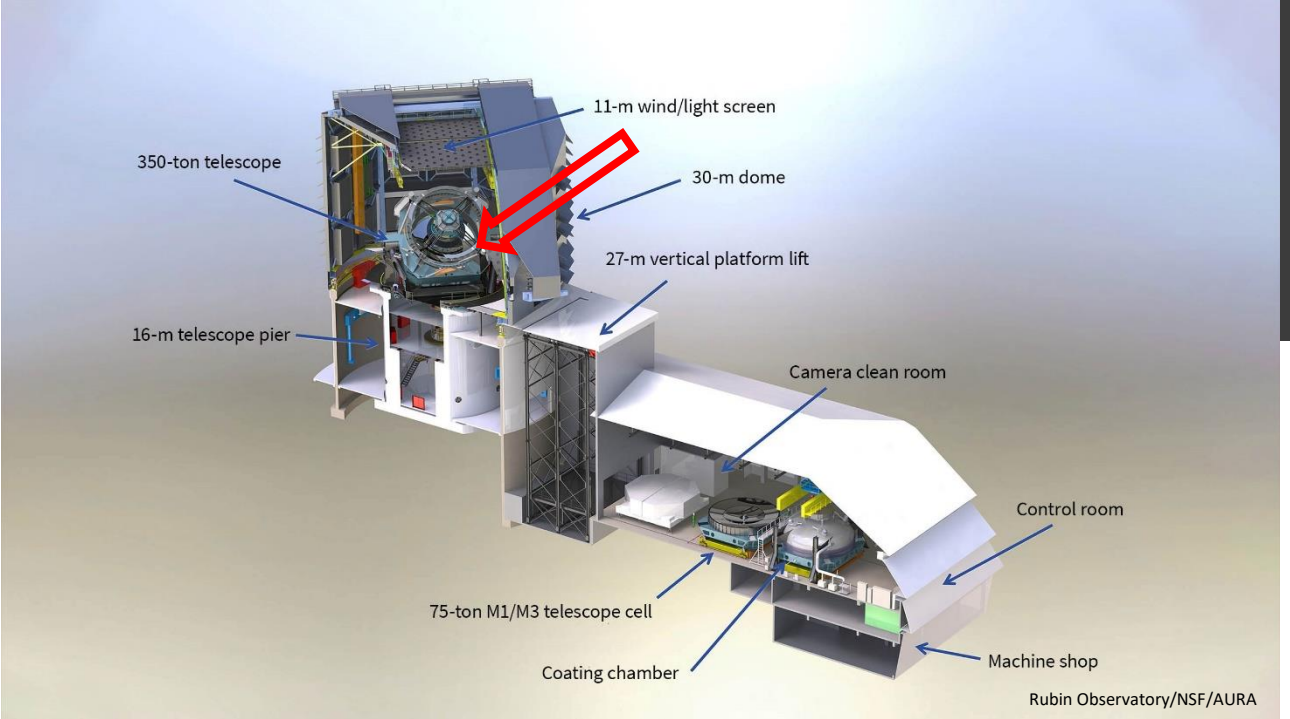
©Tekniker

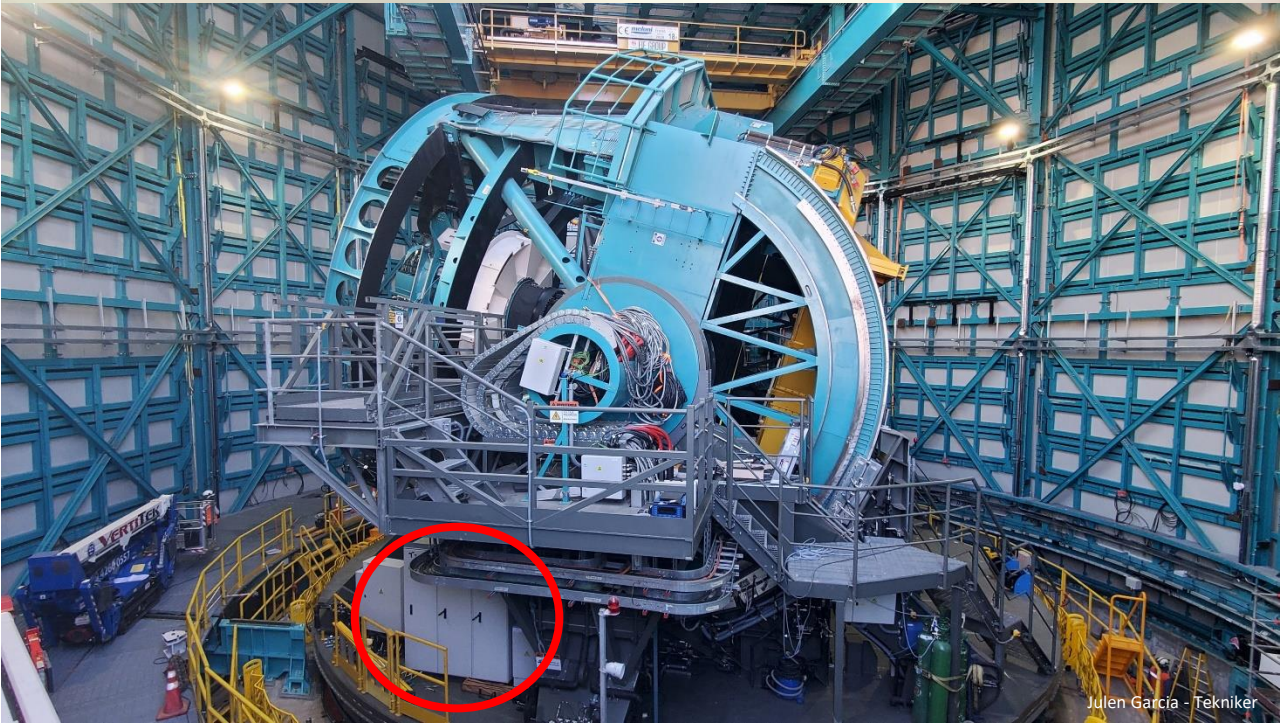


Julen Garcia - Tekniker

02

Telescope Mount Assembly (TMA) Software structure

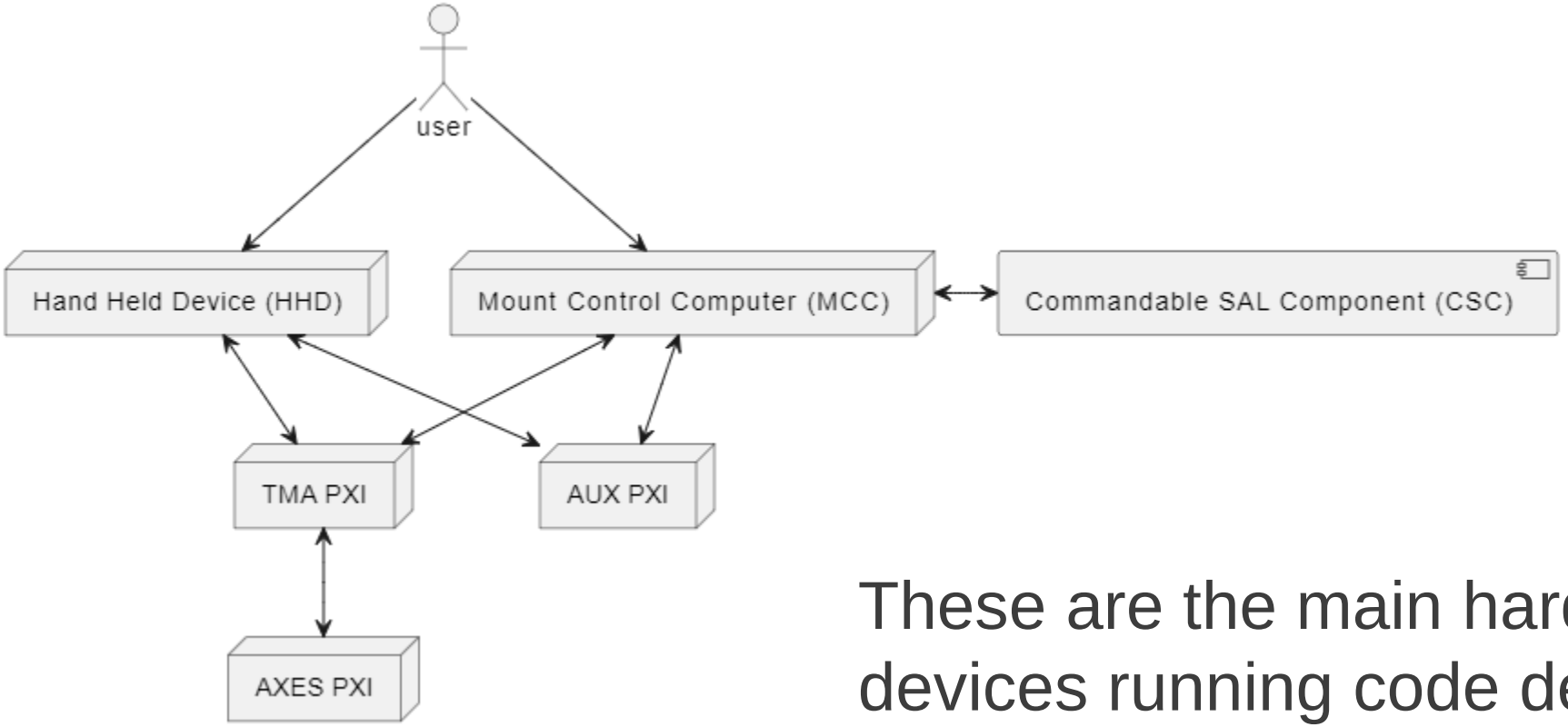




TMA – Telescope Mount Assembly

- Location: level 8
- Main controllers for the TMA:
  - PXIs: TMA, AUX and AXES
  - Bosch controller
  - Safety controller, TMA IS
  - Ethercat I/O module
  - Ethercat drives line start, cRIO
  - EIB, one for both AZ and EL
  - Thermal controllers

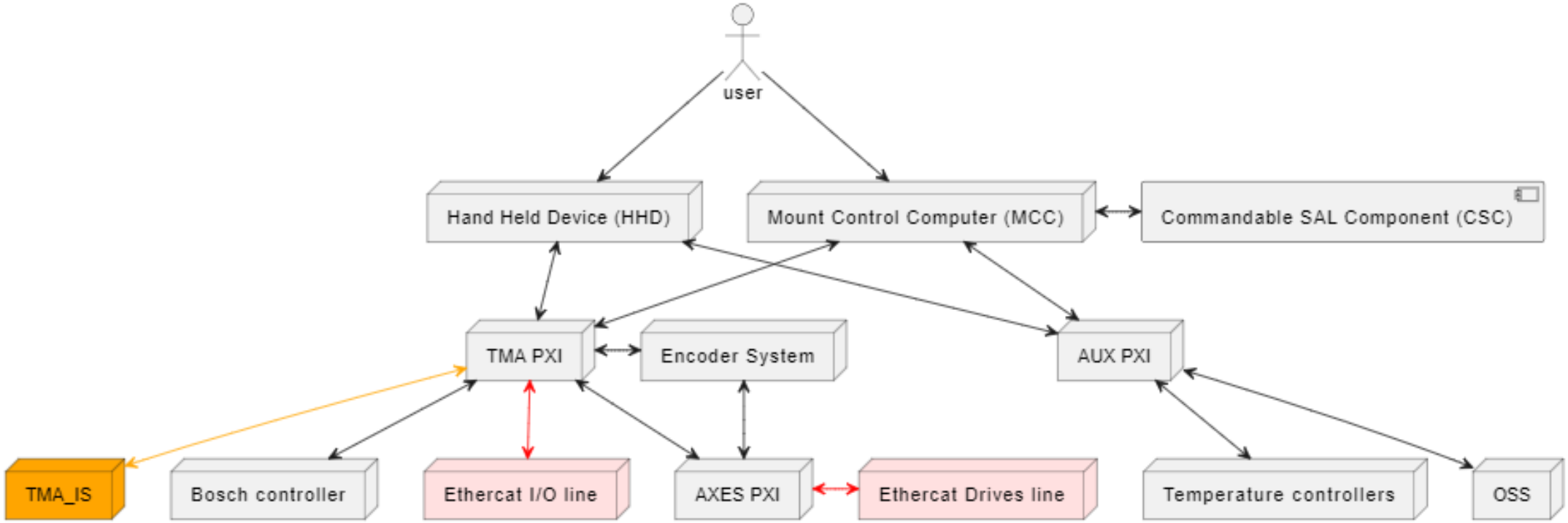
Main Hardware Structure



These are the main hardware devices running code developed by Tekniker (+ the CSC)

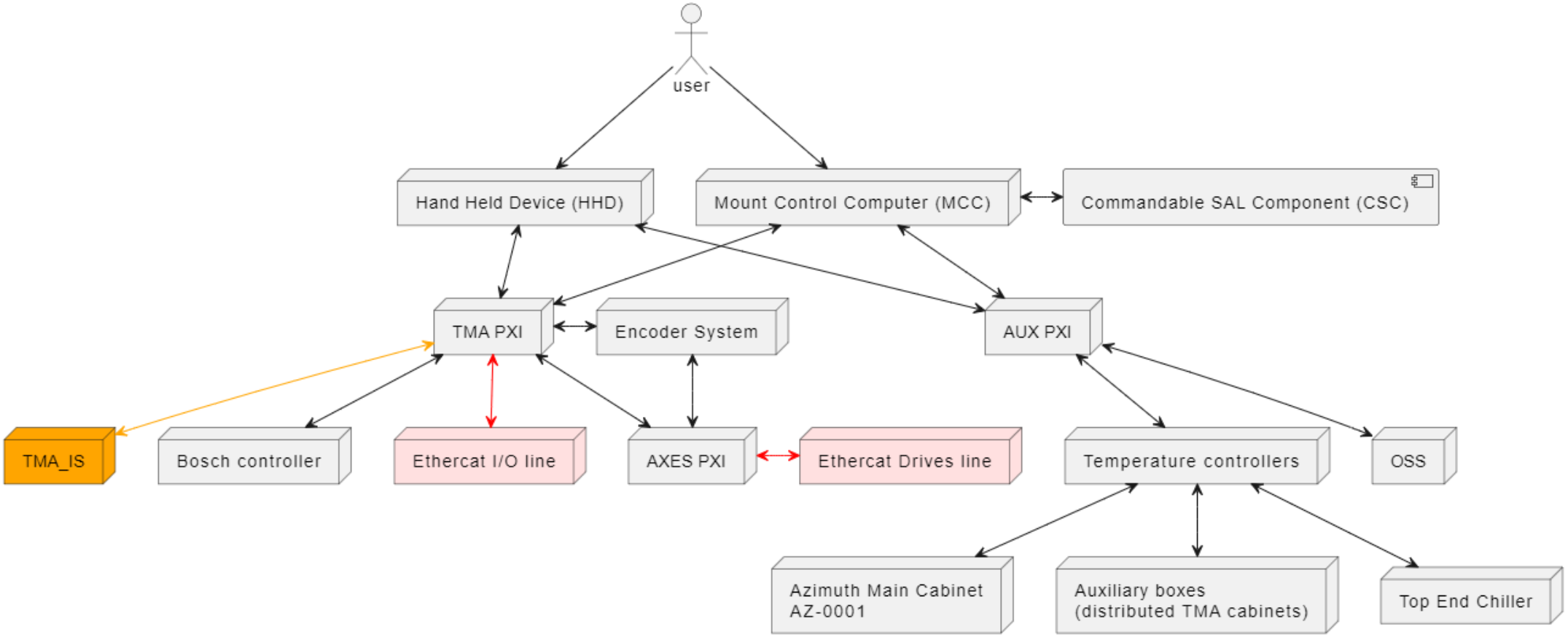
©Tekniker

Main Hardware Structure + main communicated devices



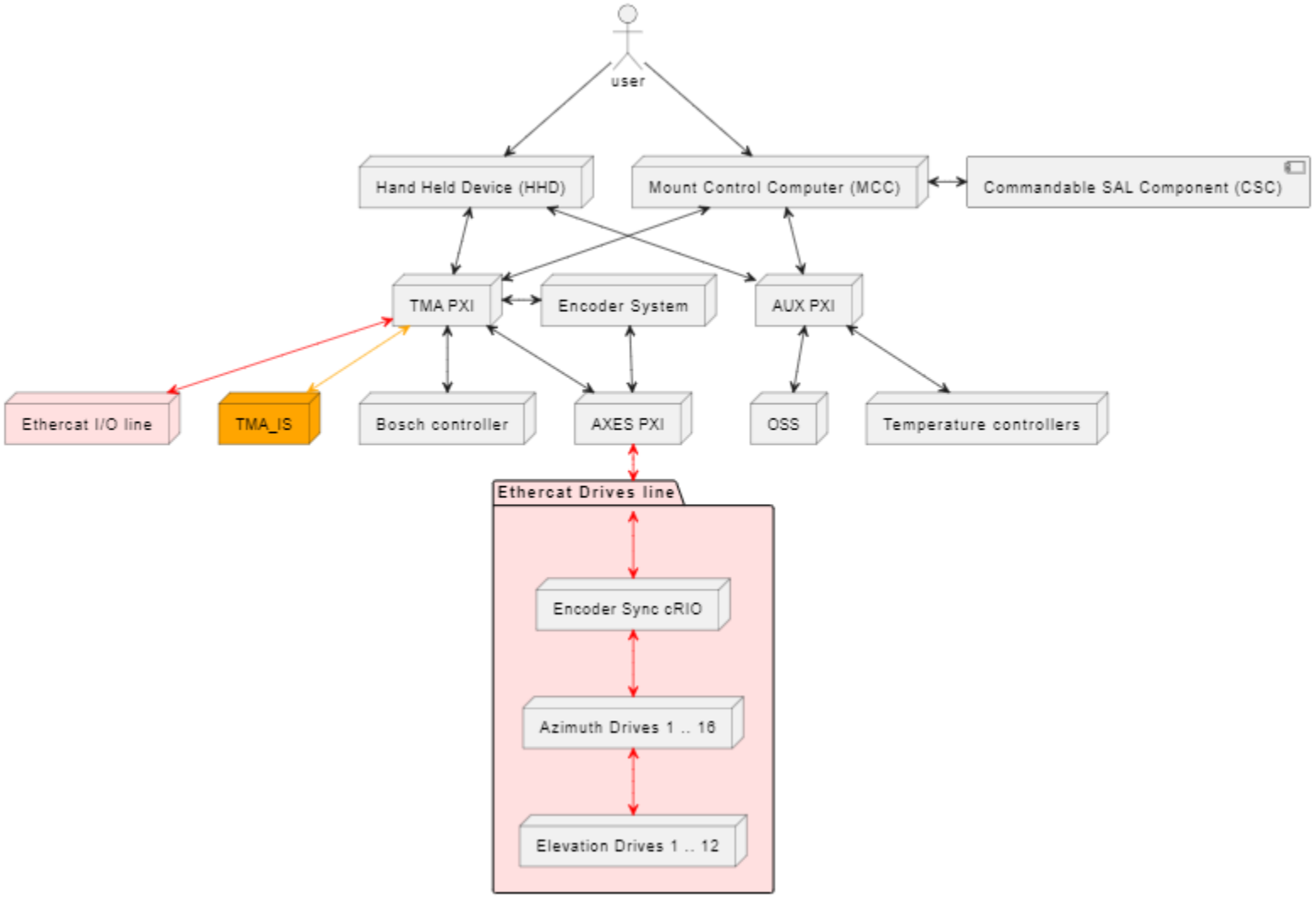
©Tekniker

Main Hardware Structure + communicated devices + temperature controller's detail



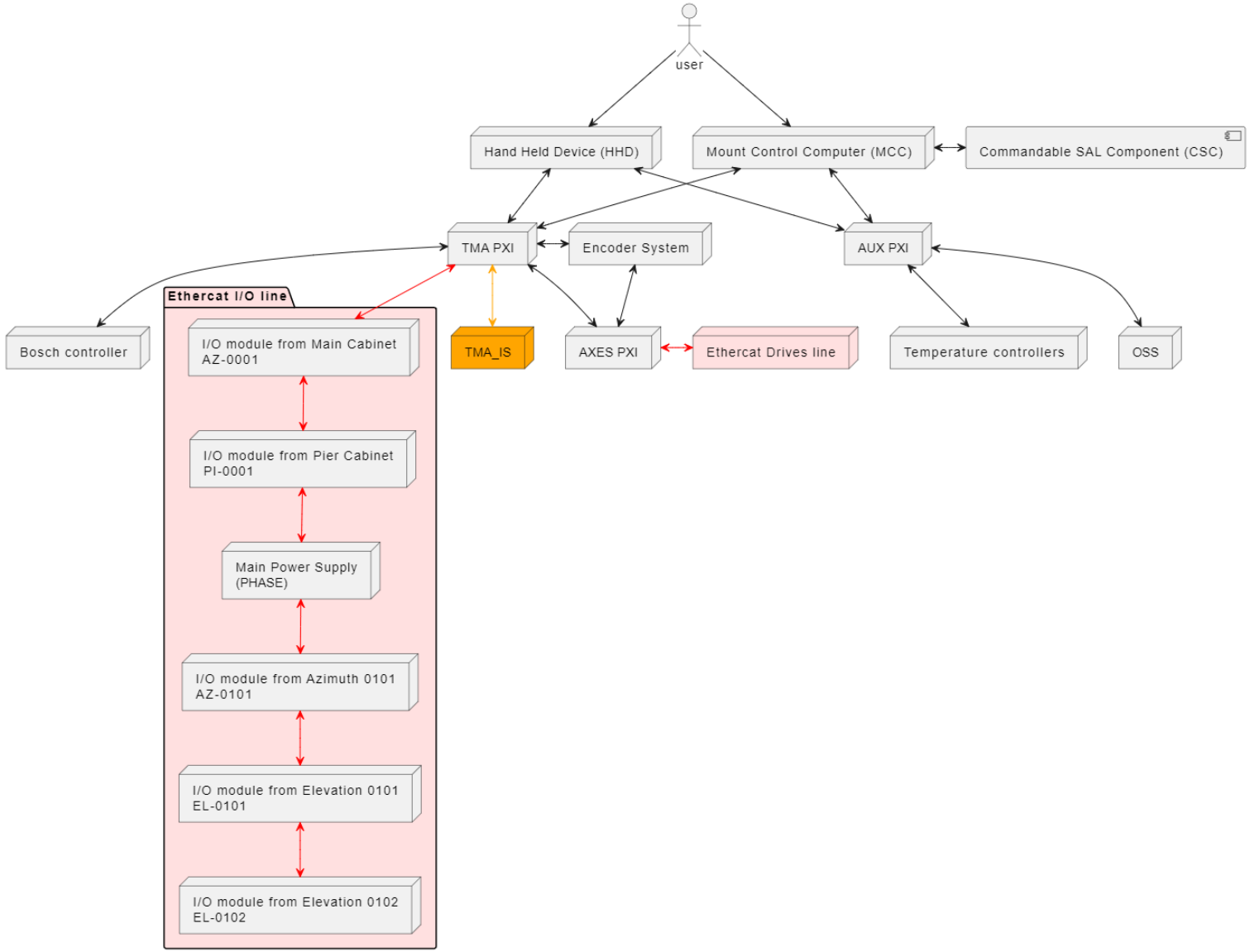
©Tekniker

Main Hardware Structure + communicated devices + ethercat drives line detail



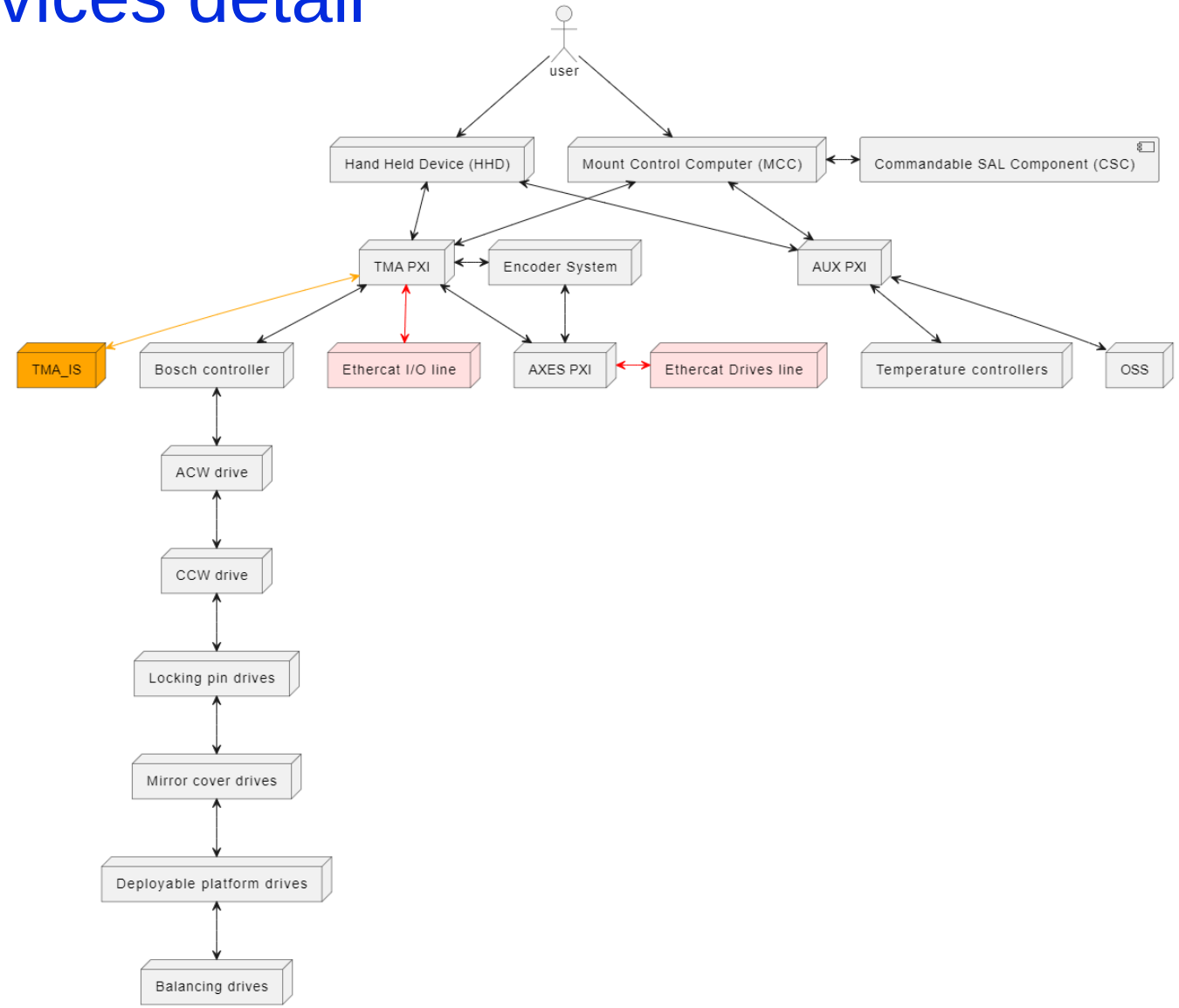
©Tekniker

Main Hardware Structure + communicated devices + ethercat I/O line detail



©Tekniker

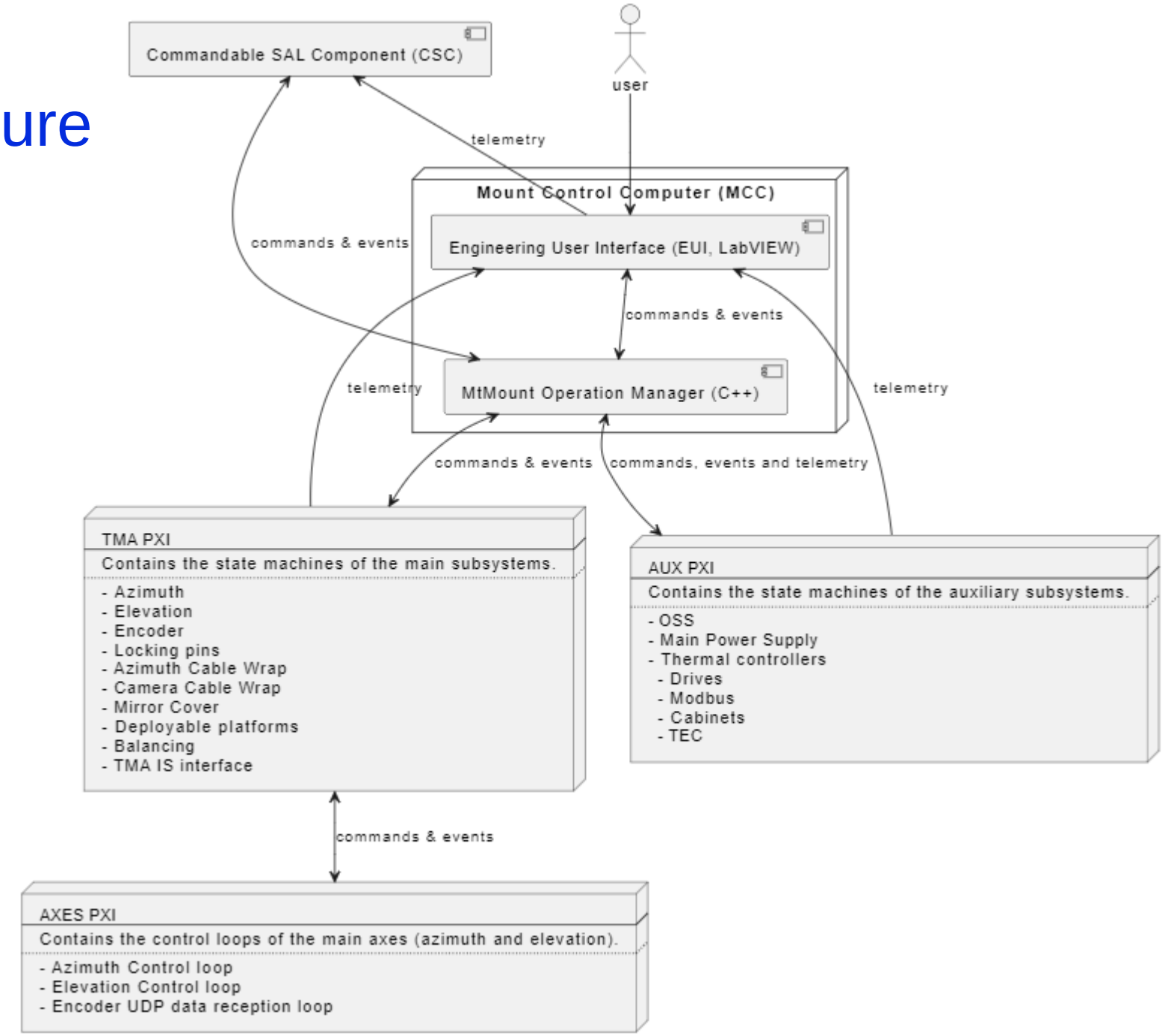
Main Hardware Structure + communicated devices + bosch devices detail



©Tekniker

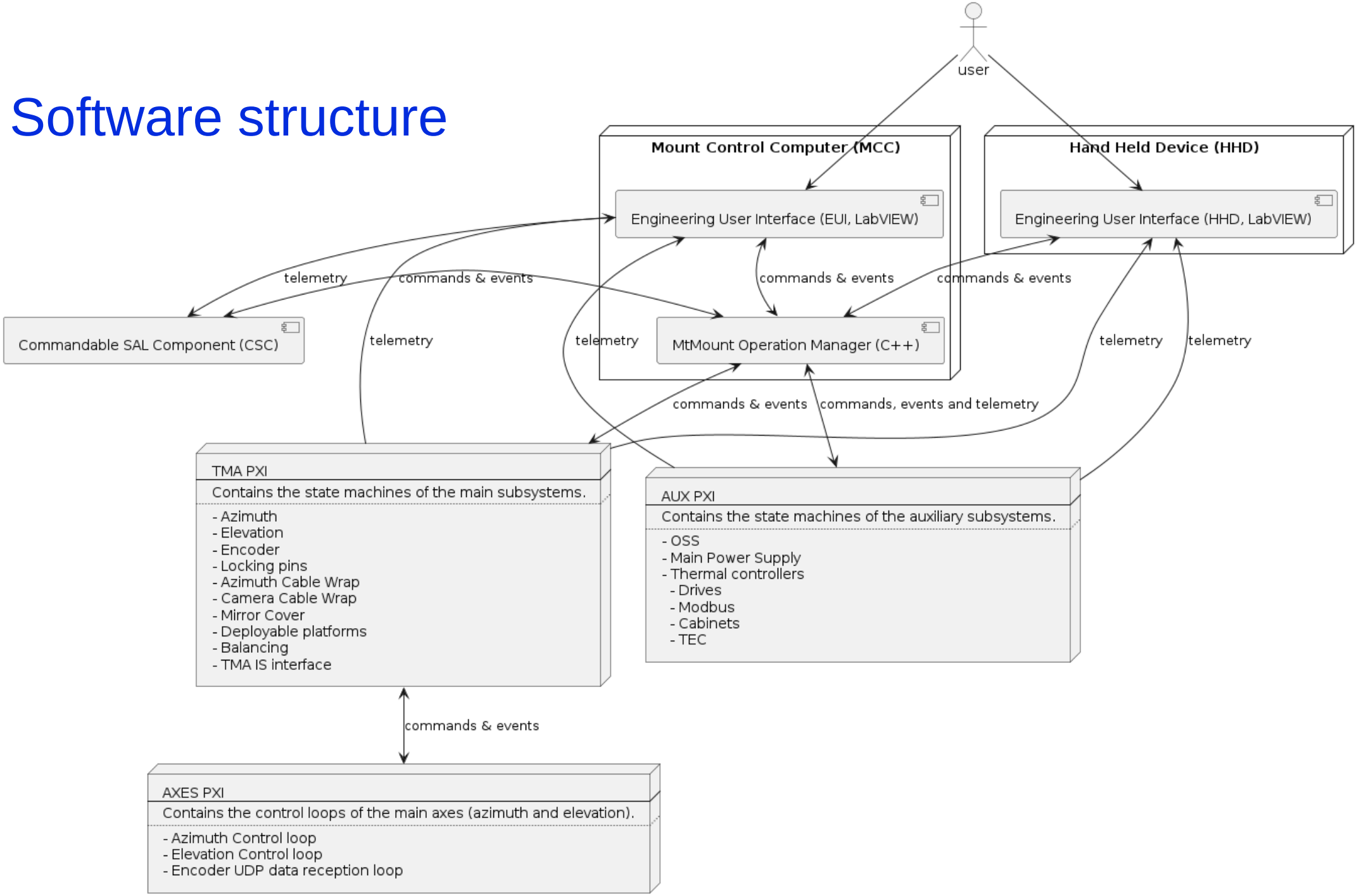
Software structure

Note: Hand Held Device omitted for simplicity



©Tekniker

Software structure



©Tekniker

03

EUI (Engineering User Interface)

EUI (Engineering User Interface)

- Overall review of the EUI
  - English Manual
- Users
- Relevant knowledge:
  - System interlocks
  - There is high frequency data stored locally for 2 days -> Telemetry Reading window
  - General commands after PXI reboot -> General Commands window
- Alarms
- Settings
- Pop ups

©Tekniker

9.2 c

GENERAL VIEW

HOME > MONITOR & CONTROL > GENERAL VIEW

OPERATION MANAGER
status: Enable

SAFETY SYSTEM
local GIS ETPB WD

Tekniker — MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
Rubi Observat

CCW

CCW
status: Idle
position (deg): -0.11

AUXILIARY SYSTEM

BALANCING SYSTEM
status: Idle

MIRROR COVER SYSTEM
status: Idle
open
closed

DEPLOYABLE PLATFORMS
status: Idle
extended
retracted

MAIN AXES

ELEVATION
status: Idle
position (deg): 89.81250002
setpoint (deg): 90.34026360

AZIMUTH
status: Idle
position (deg): 148.89501194
setpoint (deg): 148.78910039

LOCKING PINS
free
test
lock

OSS
status: Idle

POWER SUPPLY
status: Idle

ACW
status: Idle
position (deg): 148.93

OPERATION MANAGER
status: Enable
last CSC command: 120\n2402\n1\n1726665519.4577832

THERMAL CONTROL

AZIMUTH MOTORS
status: Enable
min (Cdeg): 8.4
max (C): 8.

ELEVATION MOTORS
status: Enable
min (Cdeg): 8.4
max (C): 8.

MAIN CABINET
status: TrackingAmbient
temperature (C): 13.

TOP END CHILLER
status: Enable
TEC temperature (C): 50.

GENERAL
LOCAL

LOCAL: THERE ARE NO ALARMS OR WARNINGS

©Tekniker

EUI – Operating modes

- The telescope has three operating modes:
  - EUI (Engineering User Interface): Controls all elements and changes the settings (depending on the user).
  - HHD (Hand Held Device): Aimed at portable devices, it has certain restrictions relating to the EUI.
  - CSC (Commandable SAL Components): Only allows screens to be viewed.
- Not configured state
  - In this state the TMA can’t be moved
  - There is no current commander

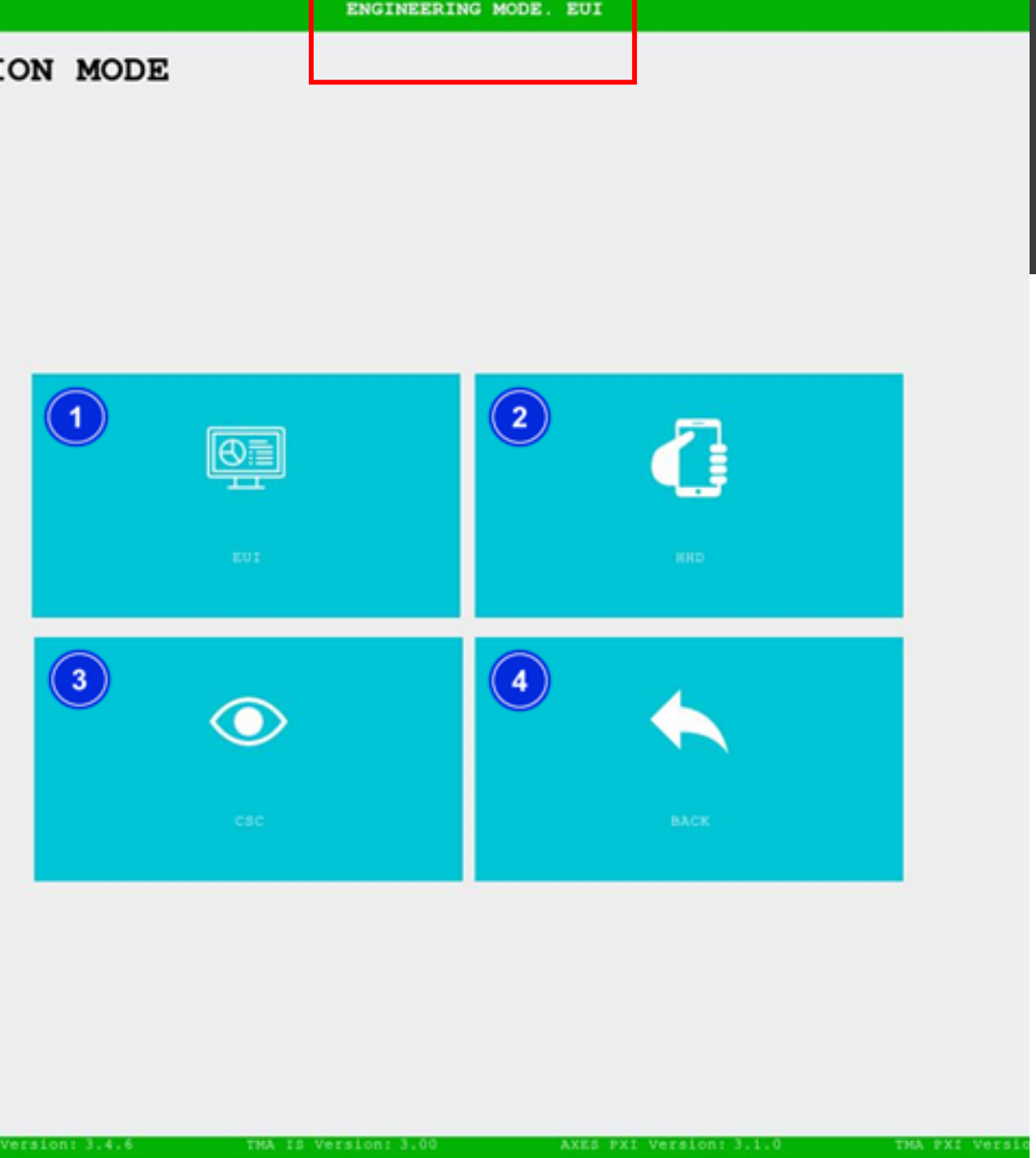
ENGINEERING MODE. EUI

OBSERVATION MODE. CSC

ENGINEERING MODE. HHD

NOT CONFIGURED

©Tekniker



EUI – Change Operating modes

1. Switches the control mode to EUI and returns to the “HOME” screen
2. Switches the control mode to HHD and returns to the “HOME” screen
3. Switches the control mode to CSC and returns to the “HOME” screen
4. Return to the previous screen “HOME”

9.7 c

HOME

HOME

Tekniker
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Rubi
Observat

MONITOR & CONTROL

SETTINGS

SIGN IN
AS DIFFERENT USER

CHANGE OPERATION MODE

CLOSE APLICATION

doc

©Tekniker

EUI Users

- The different capabilities in the EUI are shown in next list.
  - **View Data**. The users with these privilege can view data in the EUI, but they can't not move or make any other actions. They can't not send any command to the PXIs or any change settings.
  - **Send Commands**. The users with this privilege can send commands to the PXI to perform actions like, move or enable elements. This privilege does not allow to a change any setting.
  - **Change settings**. The users with this privilege can change some settings. Some settings are not shown for users with this privilege since they are considered as critical for telescope performance or integrity. Also this users can not save settings, they can only change settings temporarily.
  - **Full settings access**. The users with this privilege can change all the settings available and they can save them.
  - **Additional controls**. The user with this privilege see some additional controls that allow some special operations with the telescope.
- The are 4 user levels:
  - **A_Viewer**: these are viewer users. They are view only and cannot send commands to the telescope.
  - **B_Operator**: these are operator users. They can send commands to the telescope but cannot change the settings.
  - **C_Advance**: these are advanced users. They can send commands to the telescope and change the most basic settings, always within the preset limits for each of them. This type of user cannot save settings permanently and their changes are temporary.
  - **D_Maintenance**: these are maintenance users. They can perform all operations and set all settings within the limits pre-established for each of them.

A_Viewer
- Capabilities
  - View Data

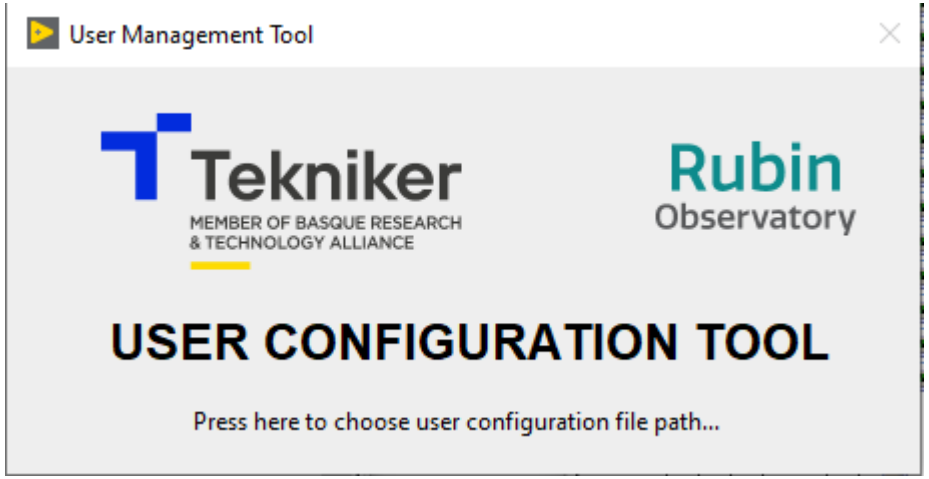
B_Operator
- Capabilities
  - View Data
  - Send Commands

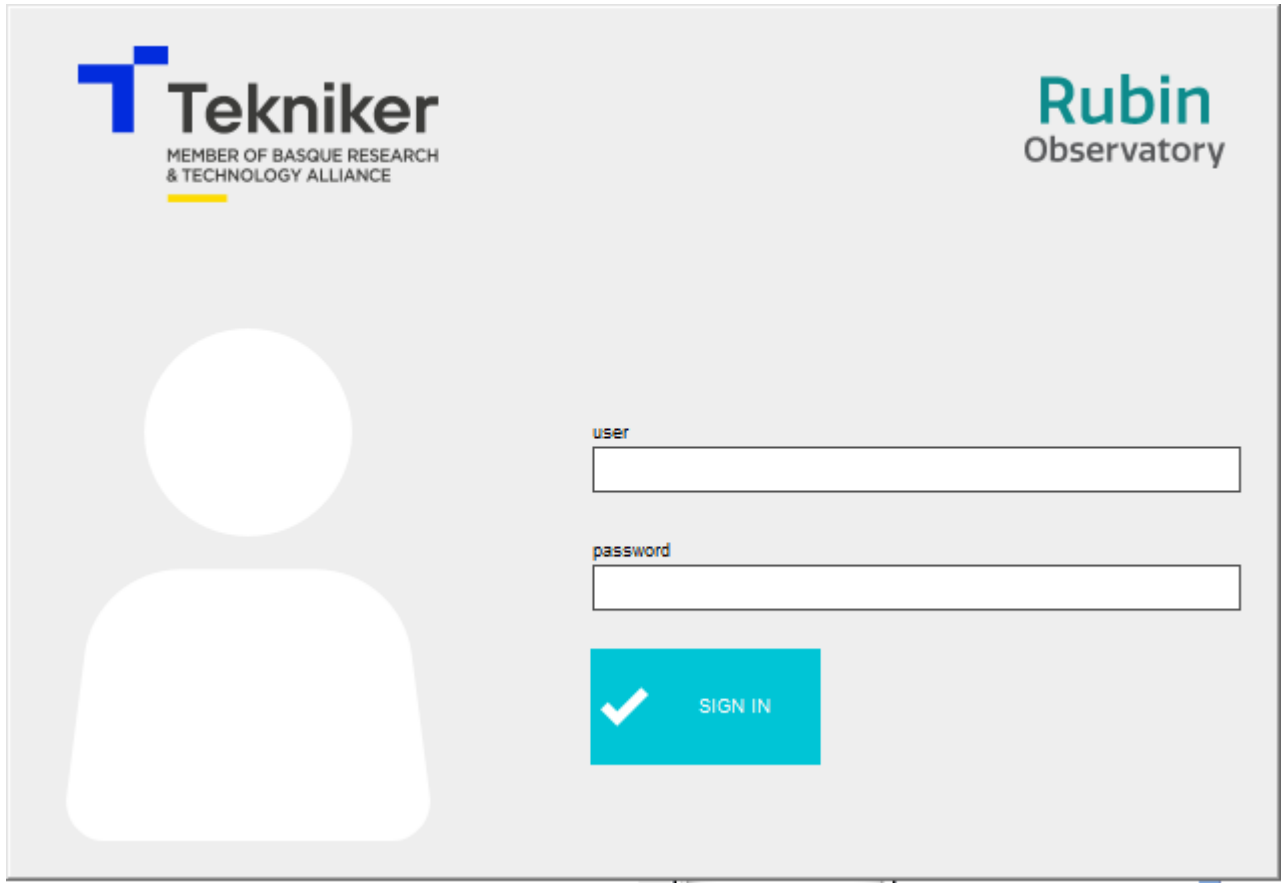
C_Advance
- Capabilities
  - View Data
  - Send Commands
  - Change Settings

D_Maintenance
- Capabilities
  - View Data
  - Send Commands
  - Change Settings
  - Full settings access
  - Additional Controls

©Tekniker

EUI Users Create/Modify -> HOW TO





©Tekniker

9.2 c

MONITOR & CONTROL

IN AXES NERAL VIEW

EVATION STEM

IMUTH STEM

STEM

ES ANSFER NCTION

ES ANSFER NCTION SULTS

NER PLY

PACITOR NKS

1/2

MAIN AXIS GENERAL VIEW

HOME > MONITOR & CONTROL > MAIN AXIS > MAIN AXIS GENERAL VIEW

OPERATION MANAGER

status: Enable

SAFETY SYSTEM

local | GIS | ETPB | WD

Tekniker — MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Rubi Observat

MONITORING

ELEVATION

status: Idle — not homed

drives +X -X

position (deg): 89.81250002

setpoint (deg): 90.34026360

AZIMUTH

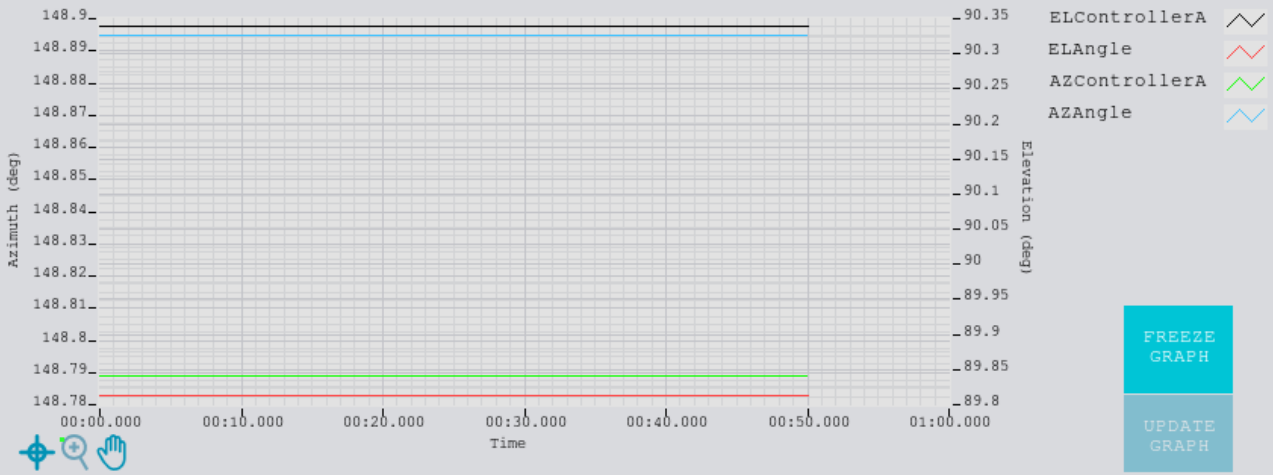
status: Idle — not homed

drives +X -X

position (deg): 148.89501194

setpoint (deg): 148.78910039

CURRENT MOVE | CURRENT MOVE XY | MOVE HISTORY



FREEZE GRAPH

UPDATE GRAPH

LOCKING PINS: free | test | lock

OSS: status: Idle

POWER SUPPLY: status: Idle

ACW: status: Idle — pos. (deg): 148.93

INTERLOCKS: active interlocks: STO

CONTROL

ON | OFF | RESET ALARM

HOME | STOP

POINTING

ELEVATION		AZIMUTH	
position (deg)	60	position (deg)	180
speed (deg/s)	0.999983	speed (deg/s)	3.99999
accel. (deg/s^2)	0	accel. (deg/s^2)	0
jerk (deg/s^3)	0	jerk (deg/s^3)	28

MOVE | STOP

TRACKING

track filename

LOAD | EXECUTE | STOP

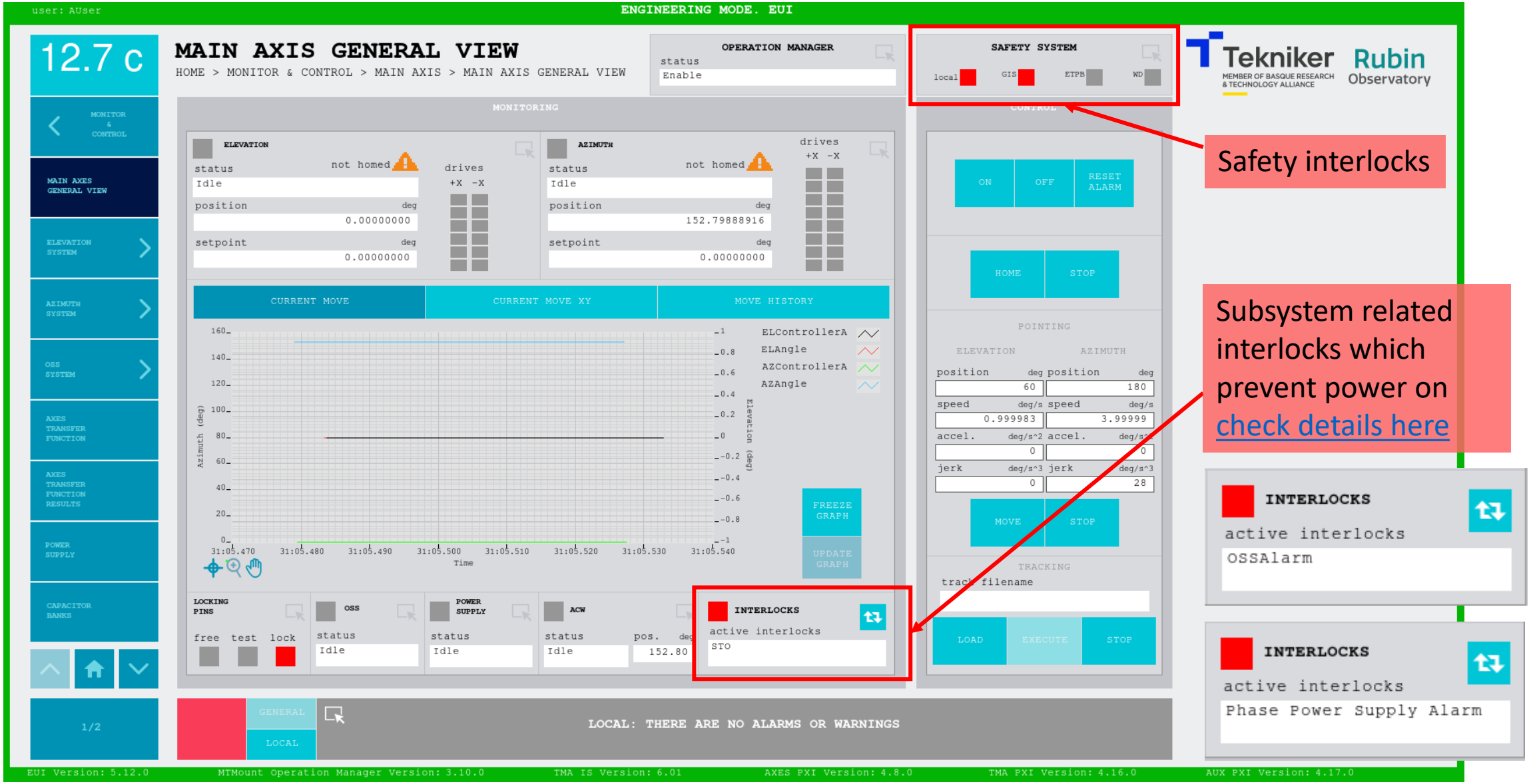
GENERAL | LOCAL

LOCAL: THERE ARE NO ALARMS OR WARNINGS

doc

©Tekniker

EUI -> Relevant knowledge -> Interlocks



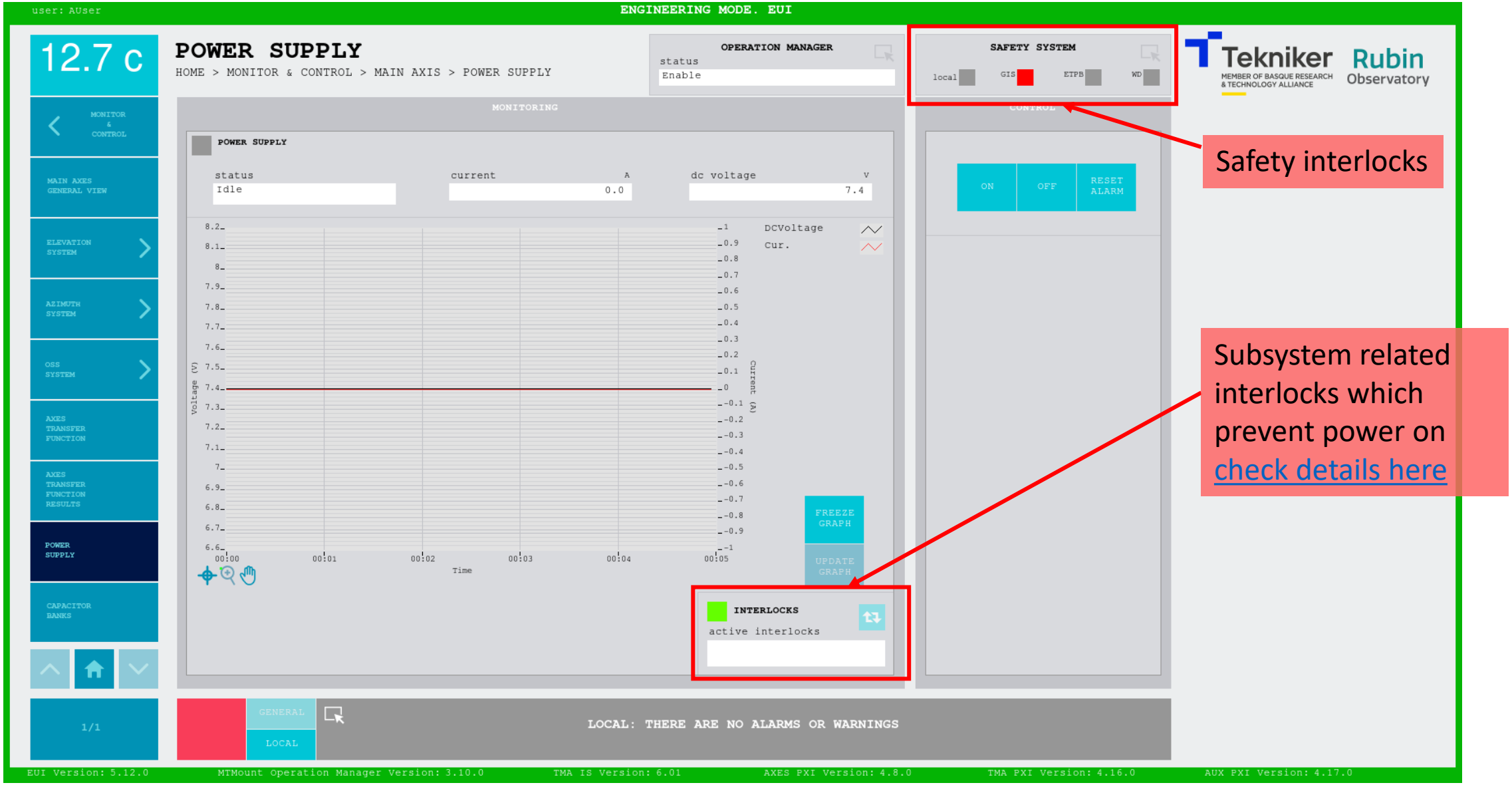
Safety interlocks

Subsystem related interlocks which prevent power on

check details here

©Tekniker

EUI -> Relevant knowledge -> Interlocks

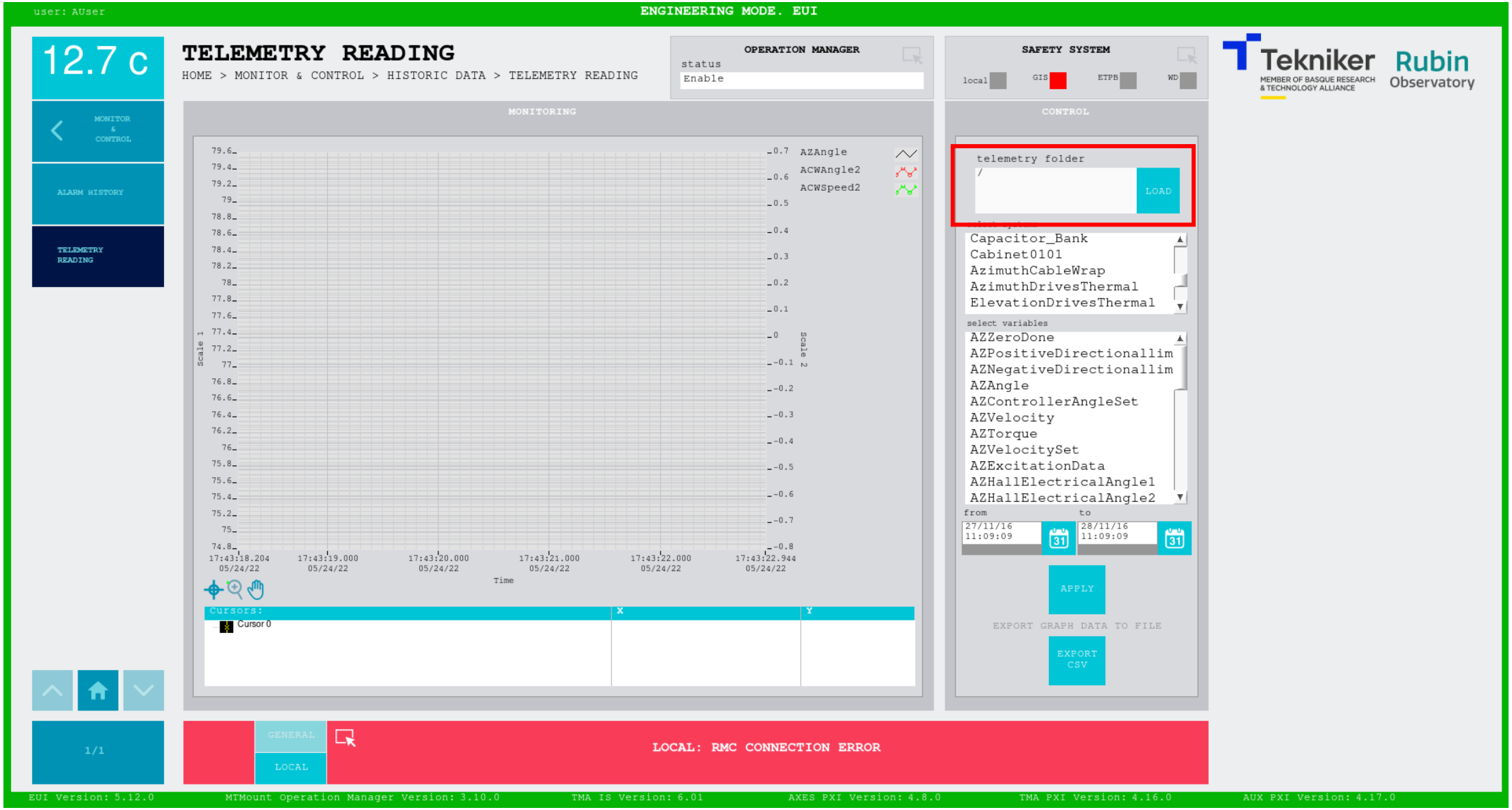


Safety interlocks

Subsystem related interlocks which prevent power on
check details here

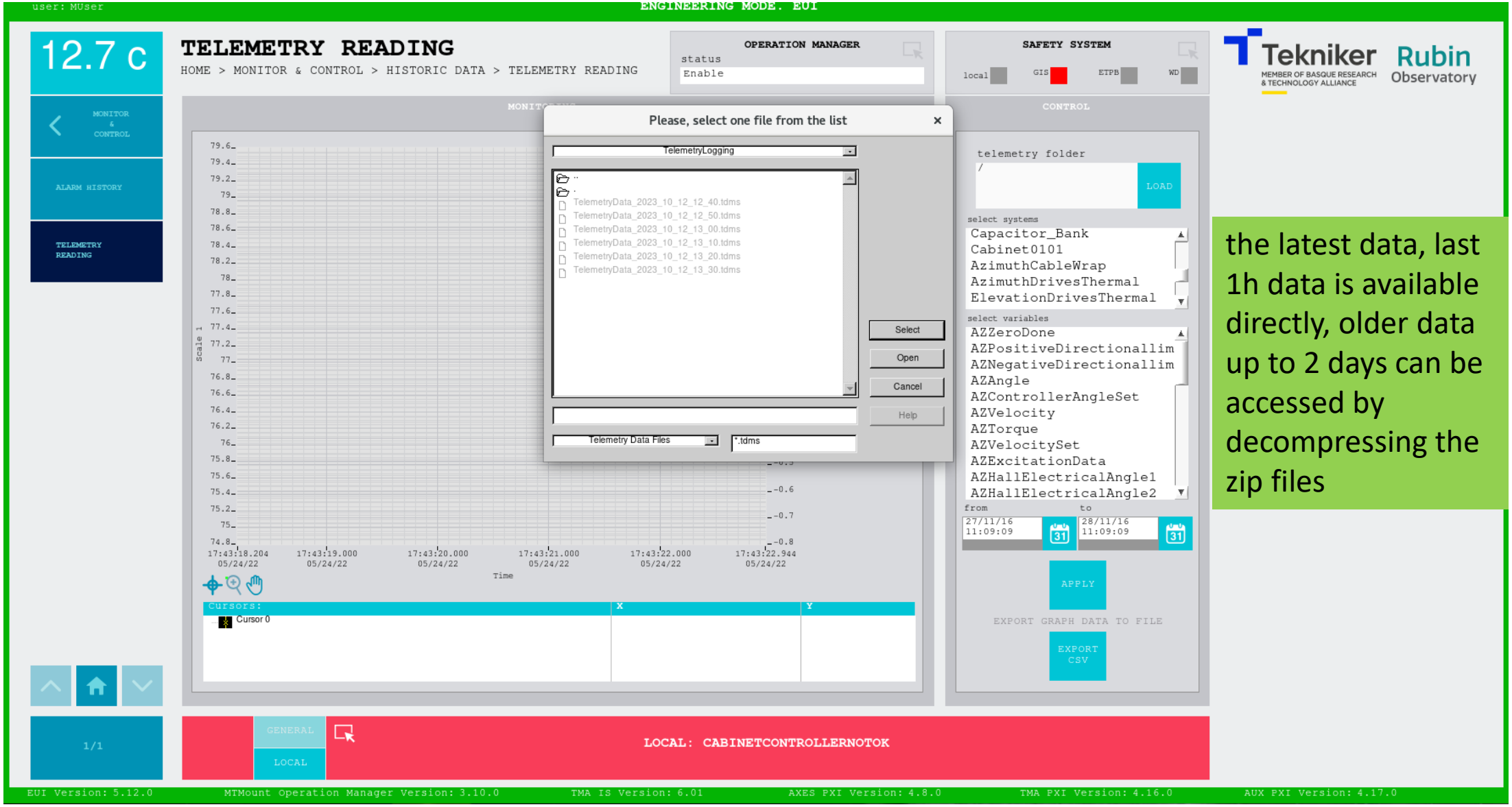
©Tekniker

EUI -> Relevant knowledge -> Historic data up to 2 days



©Tekniker

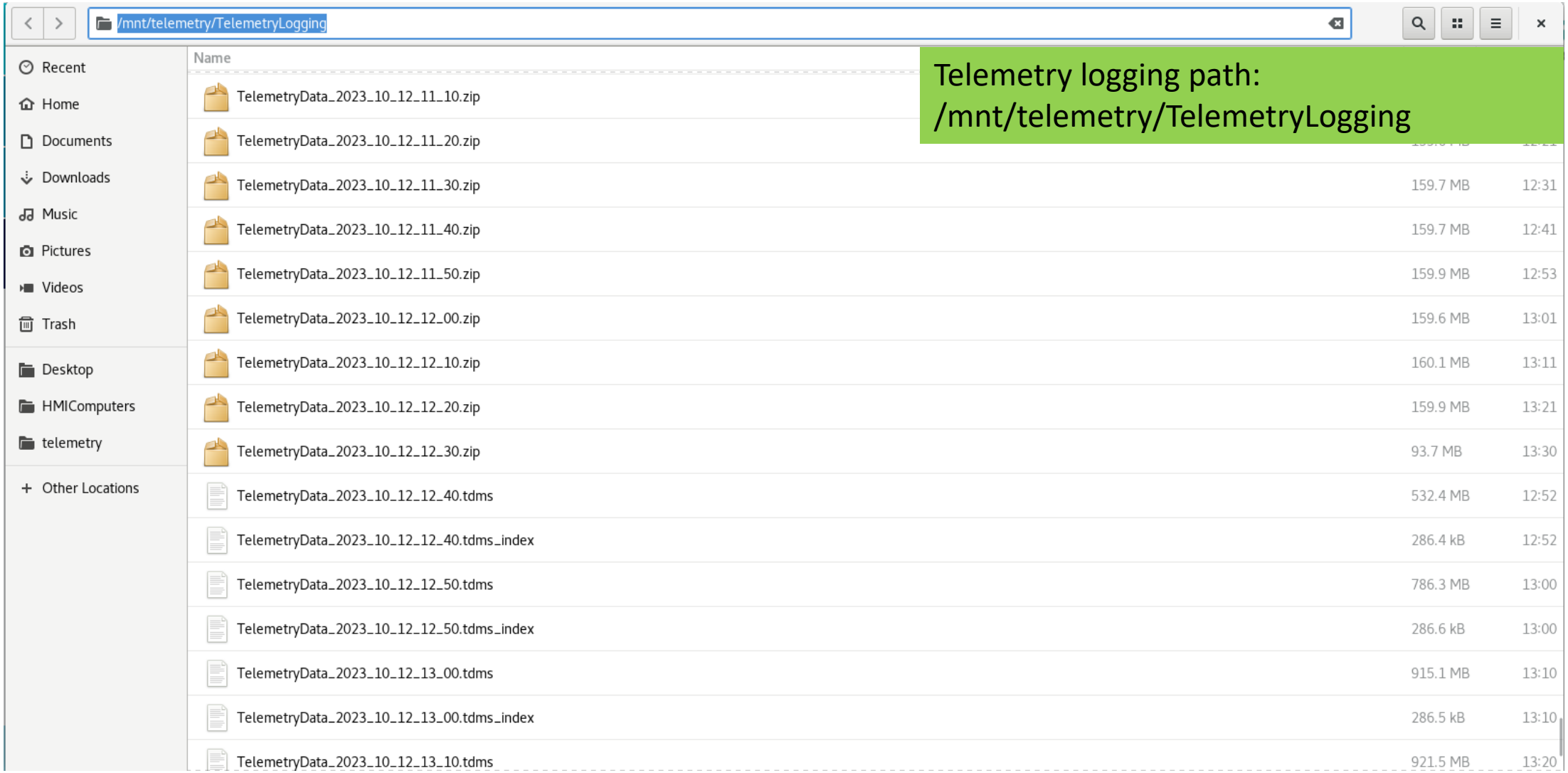
EUI -> Relevant knowledge -> Historic data up to 2 days



the latest data, last 1h data is available directly, older data up to 2 days can be accessed by decompressing the zip files

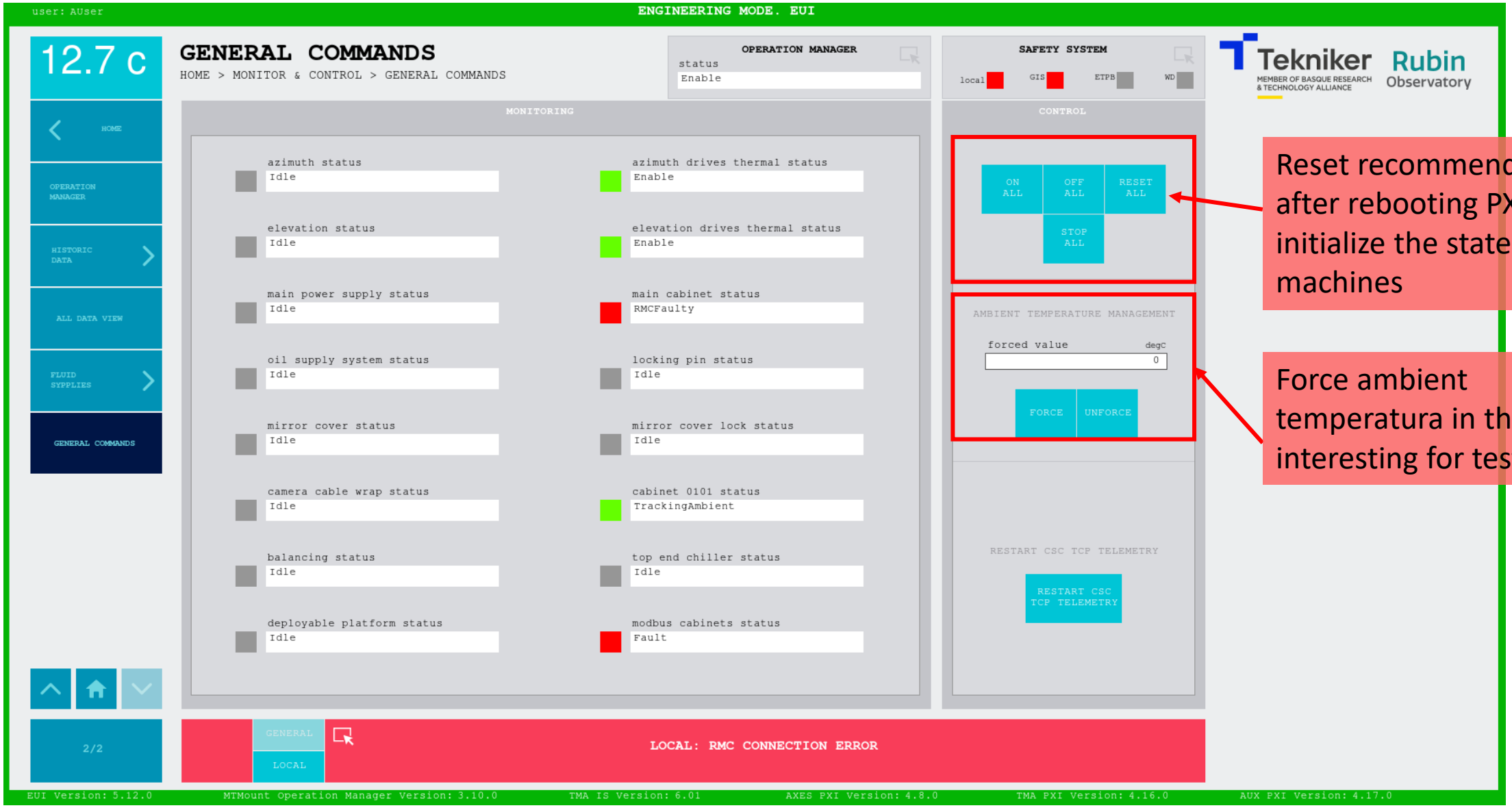
©Tekniker

EUI -> Relevant knowledge -> Historic data up to 2 days



©Tekniker

EUI -> Relevant knowledge -> General commands after PXI reboot

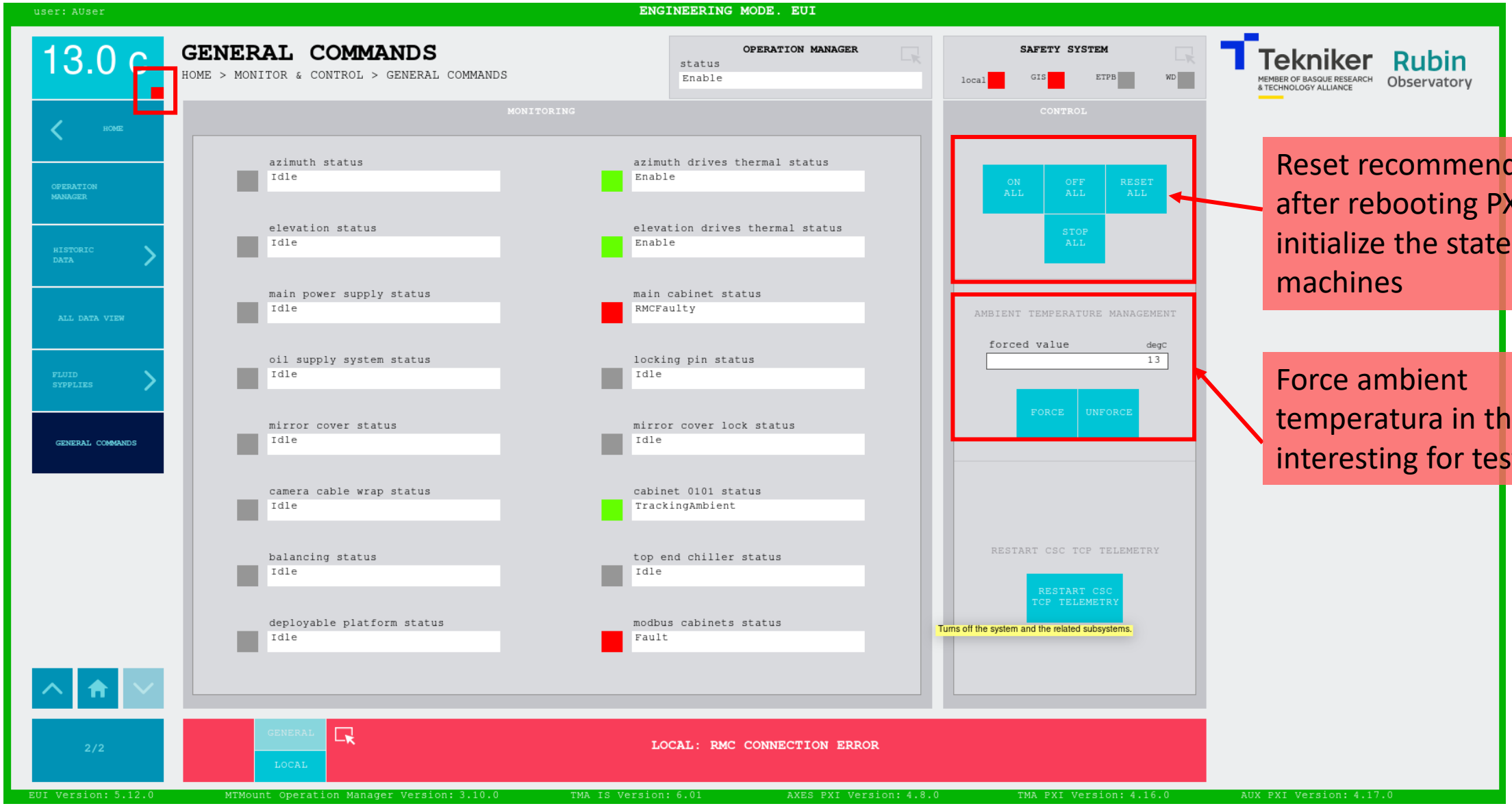


Reset recommended after rebooting PXIs to initialize the state machines

Force ambient temperatura in the EUI interesting for testing

©Tekniker

EUI -> Relevant knowledge -> General commands after PXI reboot

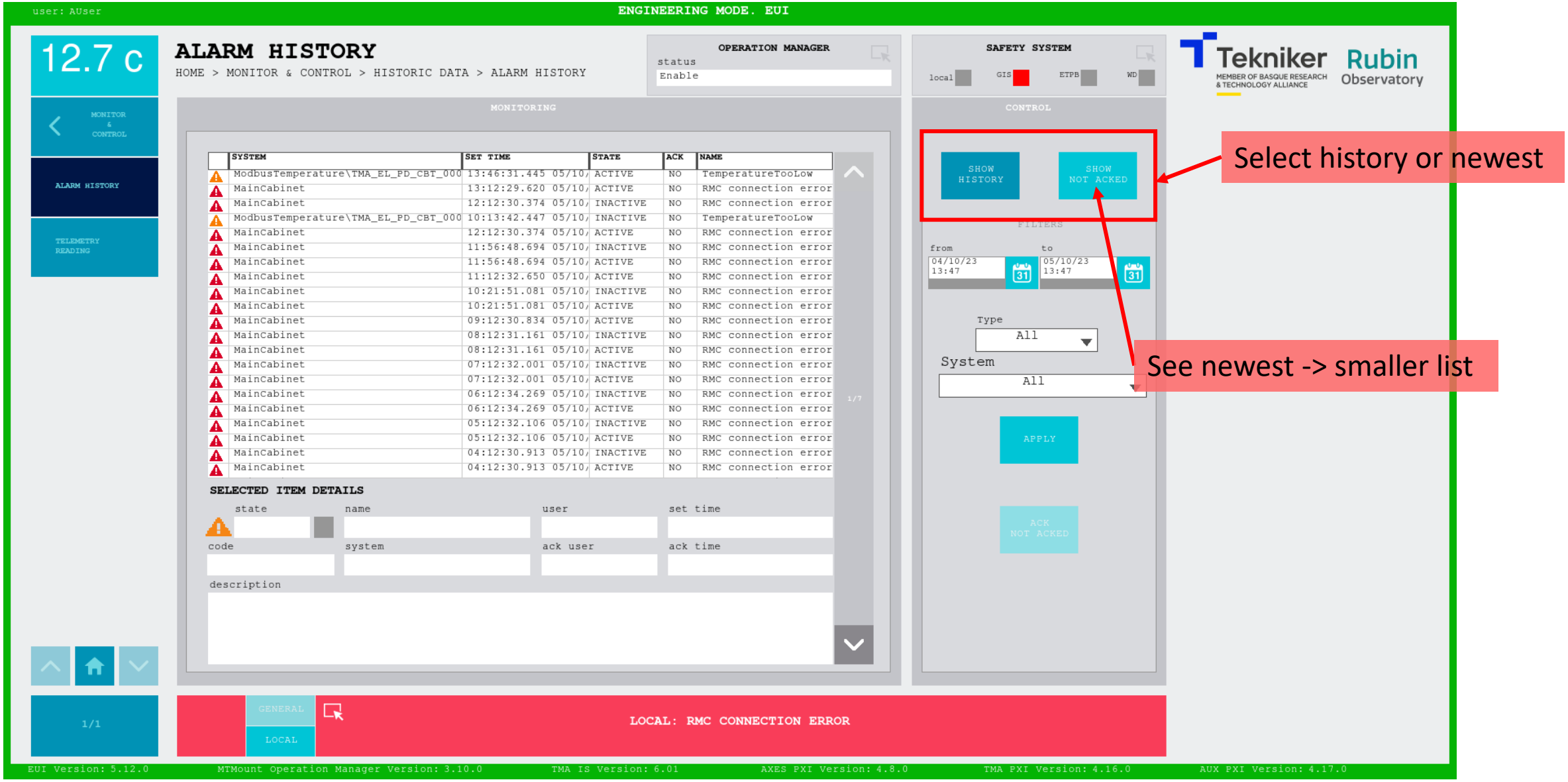


Reset recommended after rebooting PXIs to initialize the state machines

Force ambient temperatura in the EUI interesting for testing

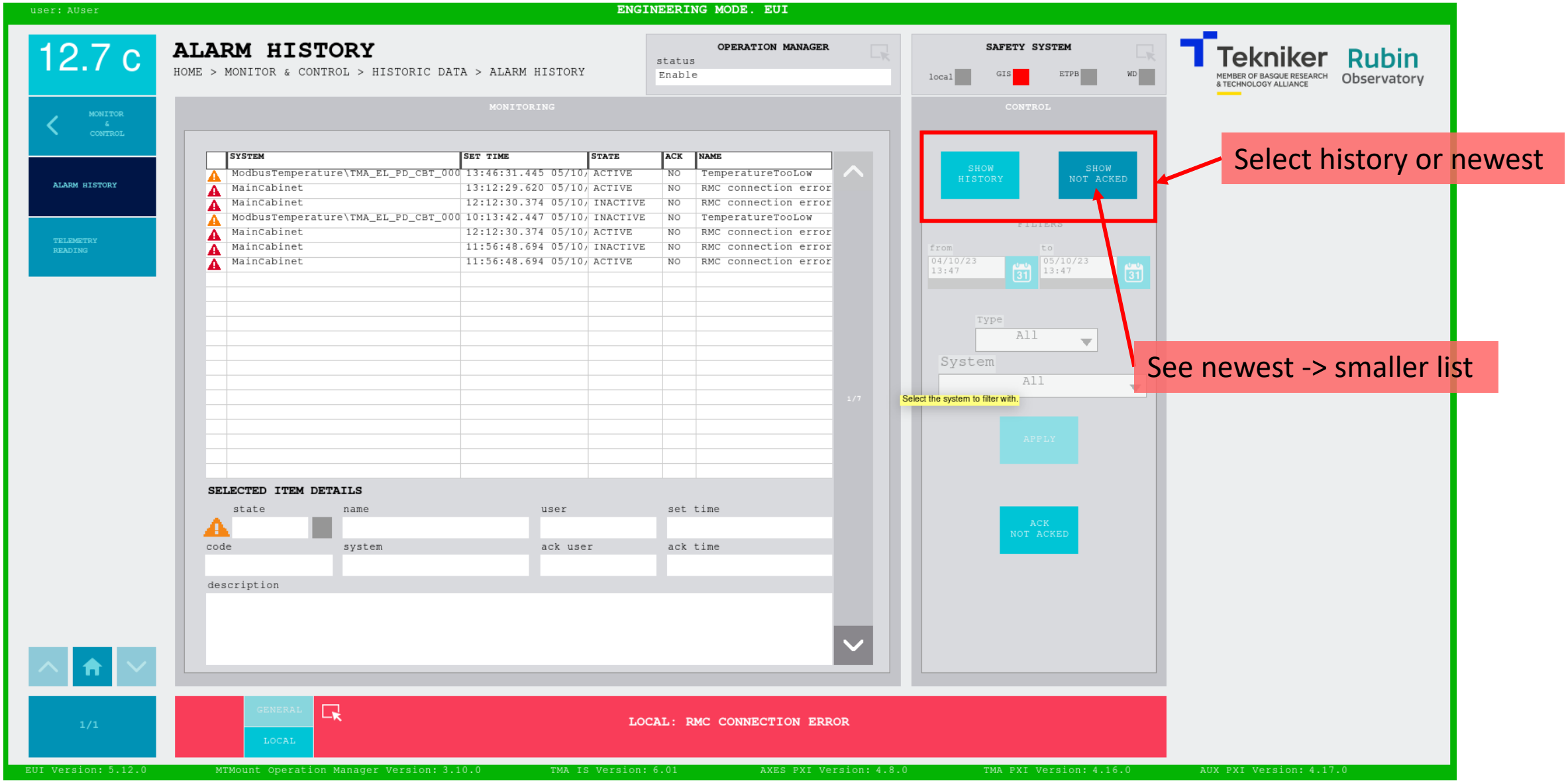
©Tekniker

EUI -> Alarms



©Tekniker

EUI -> Alarms



Select history or newest

See newest -> smaller list

©Tekniker

EUI -> Settings

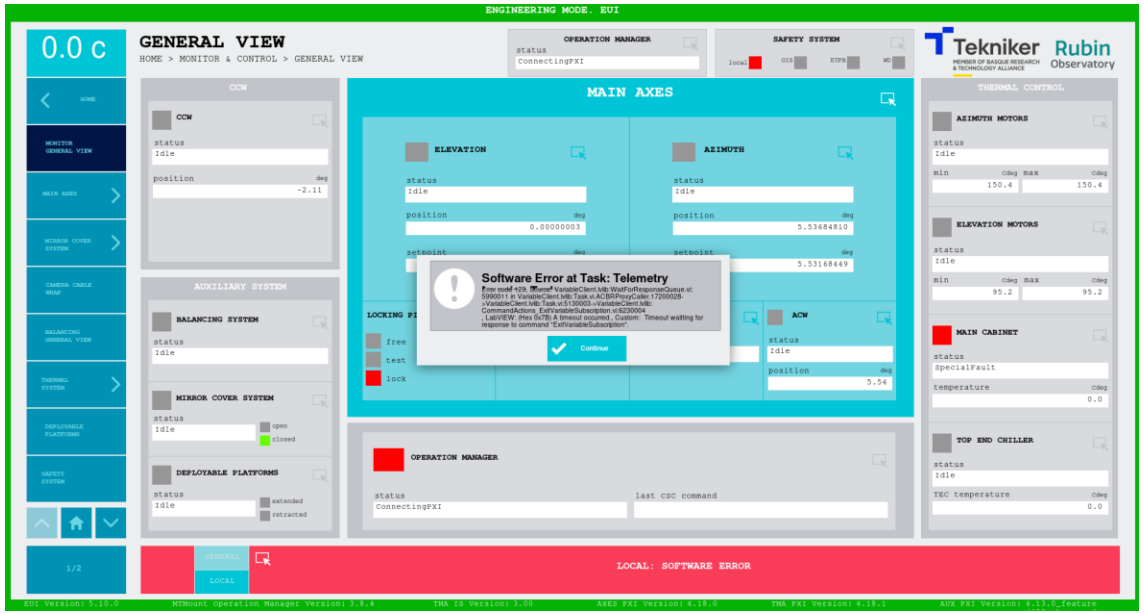
- List and description of the settings in manual
- Some relevant settings useful for maintenance:
  - Locking pins disable elevation angle check if the position is known, but for some reason doing home in elevation was not possible. HOW TO
  - Disable modbus temperature controllers when cabinets disabled e.g. when removing the Camera
  - Elevation parking, using the predefined setting sets.
  - Mirror cover stuck, disable collision checks, dangerous. HOW TO
- Setting sets

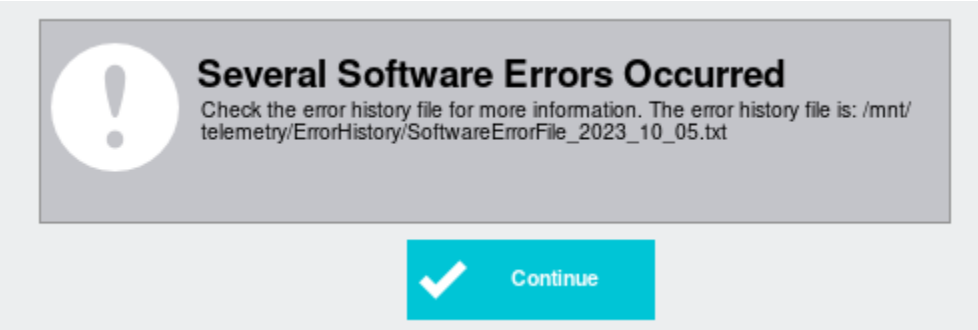
©Tekniker

Settings and events database

- MariaDB database
- Running on the MCC as a docker
- Daily backups using linux crontab
  - Local (full database) -> /home/lsst/LSST/mariadb-docker/backup
  - Remote (just changed values)-> https://github.com/lsst-ts/ts_llconfig_mtcs

©Tekniker

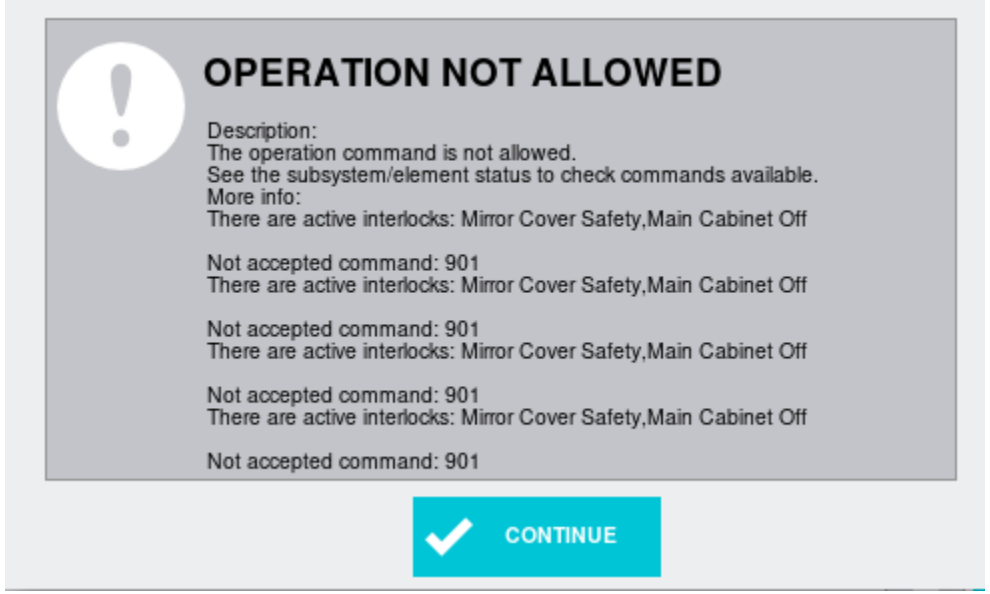




EUI -> Pop ups

- Software errors in the EUI:
  - usually due to communication issues with the PXIs
  - very common after a PXI reboot, if that is the case they are not relevant. They just mean that the task reading from the PXIs failed and will be launched again.
  - If persistent best choice relaunch the EUI
  - Stored at: /mnt/telemetry/ErrorHistory/SoftwareErrorFile_XXXX_XX_XX.txt

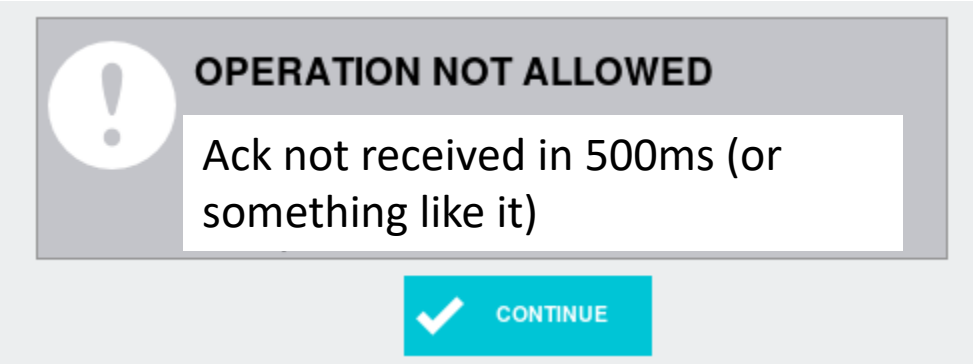
©Tekniker



EUI -> Pop ups

- Messages from the PXIs -> **Relevant**, as they tell the user meaningful information about the system, they could be:
  - *Rejected*: these are responses sent when a command request is rejected, for example a `power on` command is rejected for all the mirror covers, here the active interlocks are:
    - *Mirror cover safety*: there is safety interlock preventing the power on, check the safety matrix in the safety window
    - *Main Cabinet off*: the temperature controller for the main cabinet is in critical fault state, it must be reset for enabling the power on
    - *Bosch Power Supply Off*: the power supply for the bosch controllers is off, this means that the motor controlled by bosch can't be powered on.

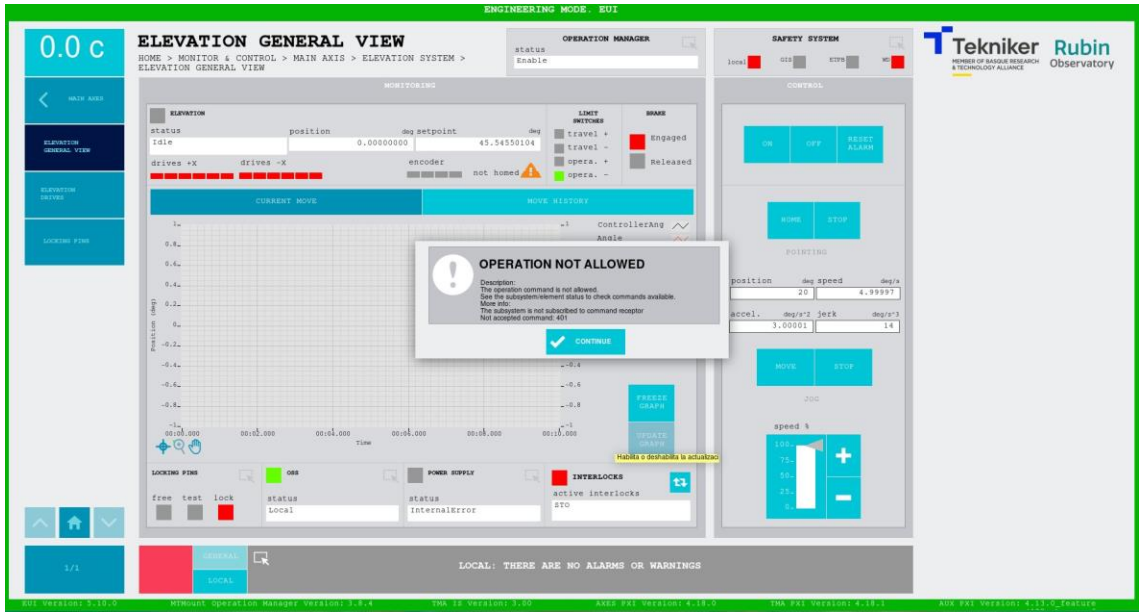
©Tekniker

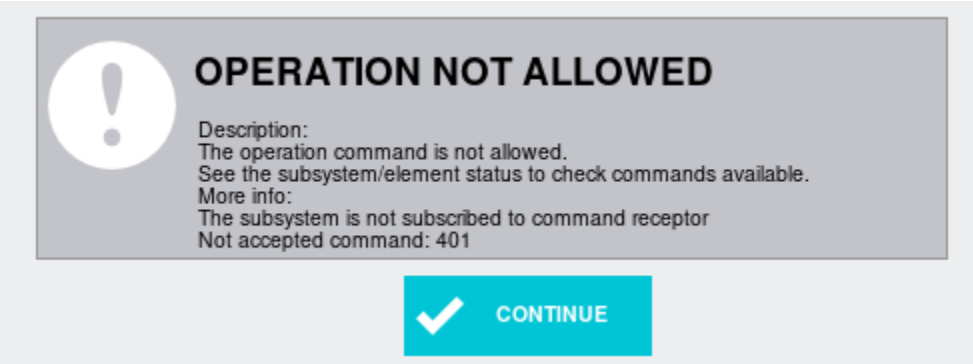


EUI -> Pop ups

- Messages from the PXIs -> **Relevant**, as they tell the user meaningful information about the system, they could be:
  - *Timeout acknowledge*: this response is common after a reboot, as each state machine needs to receive at least 1 command to be initialized properly. A recommended command for doing this at once after a PXI reboot would be `Reset All` from the General commands window.

©Tekniker



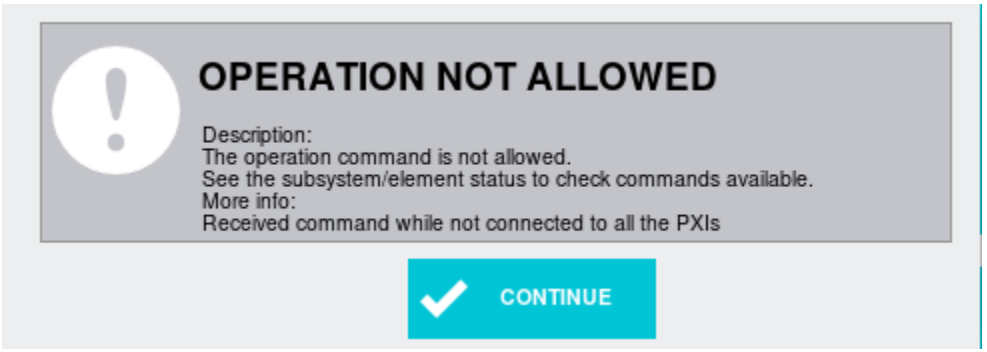


EUI -> Pop ups

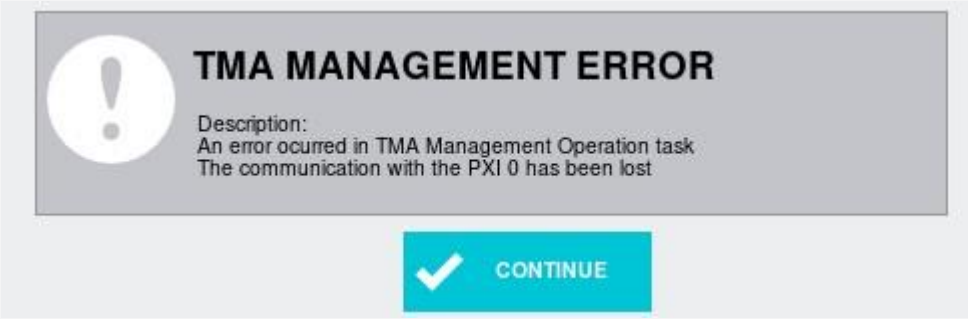
- Messages from the PXIs -> **Relevant**, as they tell the user meaningful information about the system, they could be:
  - *Subsystem not subscribed* to command receptor: this message means that the subsystem the user is trying to operate did not start properly.

©Tekniker

EUI -> Pop ups



- Messages from the PXIs -> **Relevant**, as they tell the user meaningful information about the system, they could be:
  - *Not connected to PXI*: this message means that at least one of the PXIs is not connected, not running properly or powering on, so the user must wait before trying again with the command.



©Tekniker

04

Safety system

https://shorturl.at/CPA5w

Understanding Safety systems

Consequences	Severity (Se)
Irreversible: death, losing an eye or arm	4
Irreversible: broken limb(s), losing a finger(s)	3
Reversible: requiring attention from a medical practitioner	2
Reversible: requiring first aid	1

Safety systems main target is **PROTECTING PEOPLE** (equipment damage is converted to people damage, as equipment is usually expensive and hard to replace). Is important to notice that safety systems are totally independent from the control devices, as in this project the PXIs that control the TMA are independent from the PILZ safety controllers.

Keeping this in mind, safety systems are designed to reduce human risks with a safety related function. One function for each possible risk obtained from a safety evaluation. The equipment or machine risk can be considered in the analysis but it must be converted to human risk for including it in the safety function.

©Tekniker

Safety matrix

ACRONYMS	DEFINITION	DESCRIPTION
N	Not Store	• cause active -> effect active • cause not active -> effect not active
S	Store	• cause active -> effect active and stored • cause not active, but stored -> effect active (the operator must manually reset it to clear it) • cause not active + reset done -> effect not active
V	Overridable	• cause active -> effect active • cause active + override -> effect not active (max override time 180s) • cause not active -> effect not active
R	Resettable and Overridable	Combination of the S and V: • cause active -> effect active and stored • cause not active, but stored -> effect active (the operator must manually reset it to clear it) • cause not active + reset done -> effect not active • cause active + override -> effect not active (max override time 180s, and requires reset after the override, as the cause was stored)

©Tekniker

Safety matrix

	STO Azimuth Drives Power and Engage Azimuth brakes	STO Elevation Drives Power and Engage Elevation brakes	STO Azimuth Cable Wrap Drives	STO Camera Cable Wrap Drives	STO Balancing System Drives	STO Mirror Cover Drives	STO Locking Pins Drives	STO Deployable Platforms Drives	Lock the Deployable Platform extension	Dc-Link Cut-off Power (Main Drives)	Discharge Capacitor Banks	HAS OSS (Fast pressure off)	SOS OSS (Slow pressure off)	Camera Cable Wrap Safety Device Actuated (GIS-Detection)	TMA ETPBs (GIS-Detection)	TMA Brakes NOT Engaged (GIS-Detection)	Failed MCS Watchdog or MCS Loss communication (GIS-Detection)
Azimuth axis CW travel limit AND topple block pos A	R(1)																
Azimuth axis CCW travel limit AND topple block pos B	R(1)																
Azimuth axis over-speed	S																
Azimuth brakes oil pressure loss	S(2)											S(2)					
Azimuth brake no engaged								N								N	
Elevation axis CW travel limit		R(1)															
Elevation axis CCW travel limit		R(1)															
Elevation axis over-speed		S															
Elevation brakes oil pressure loss		S(2)										S(2)					
Elevation brake no engaged							N	N								N	
Mirror cover NO retracted									N								
Mirror cover manual power cut-off switch						N											
Azimuth Cable Wrap CW travel limit	S																
Azimuth Cable Wrap CCW travel limit	S																
Inserted Elevation Locking Pins		N															
Test Position Elevation Locking Pins								N	N								
Retracted Elevation Locking Pins					N			N	N								
Azimuth Platform Hatch NO closed	S(5)	S(5)															

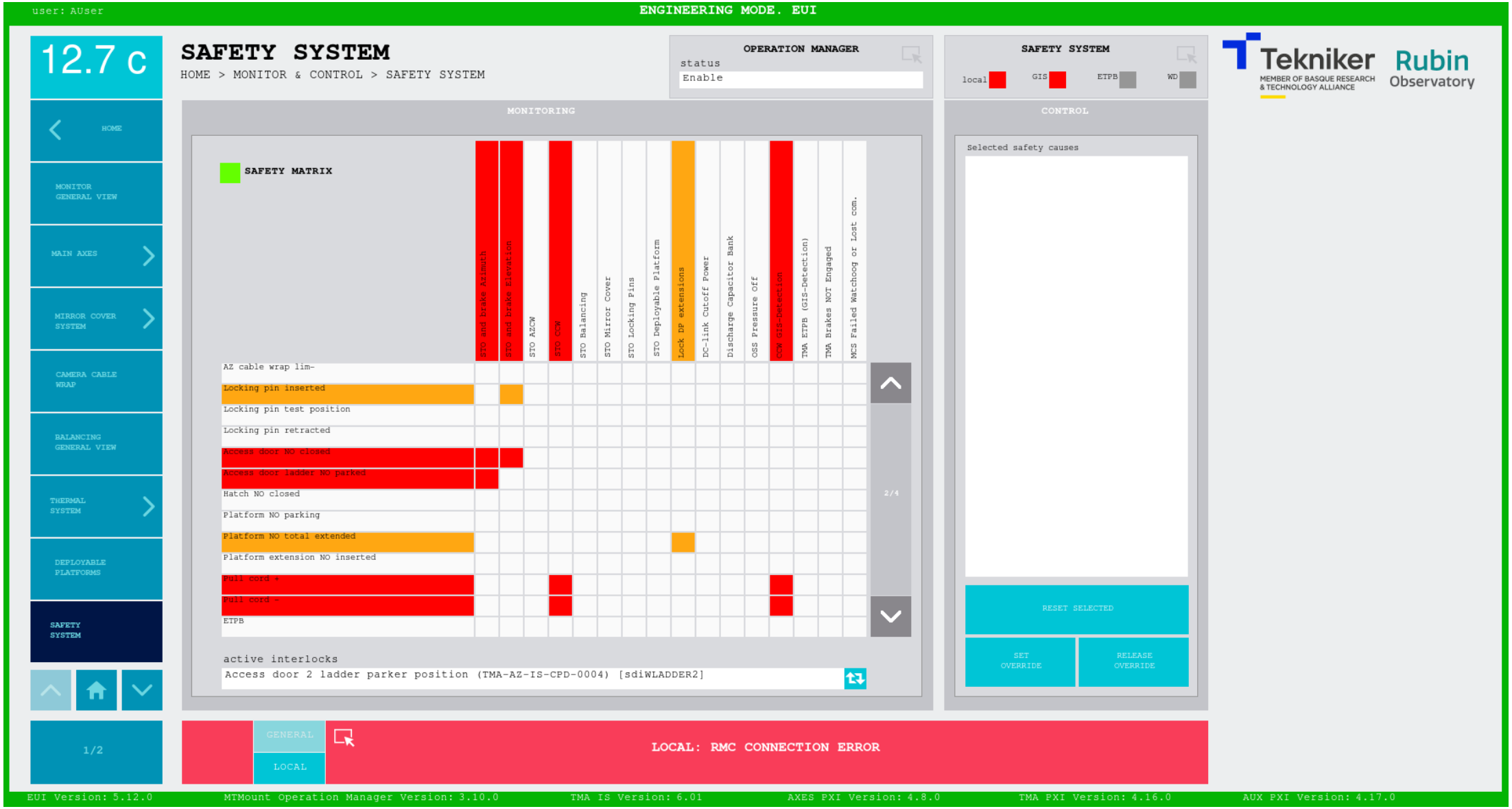
©Tekniker

Safety matrix

	STO Azimuth Drives Power and Engage Azimuth brakes	STO Elevation Drives Power and Engage Elevation brakes	STO Azimuth Cable Wrap Drives	STO Camera Cable Wrap Drives	STO Balancing System Drives	STO Mirror Cover Drives	STO Locking Pins Drives	STO Deployable Platforms Drives	Lock the Deployable Platform extension	Dc-Link Cut-off Power (Main Drives)	Discharge Capacitor Banks	HAS OSS (Fast pressure off)	SOS OSS (Slow pressure off)	Camera Cable Wrap Safety Device Actuated (GIS-Detection)	TMA ETPBs (GIS-Detection)	TMA Brakes NOT Engaged (GIS-Detection)	Failed MCS Watchdog or MCS Loss communication (GIS-Detection)
Access door ladder NO parked	S(4)																
Central Section Hatches NO closed	S(5)	S(5)			R(5)												
Platform NO fully retracted	N	N					N										
Platform NO total extended									N								
Platform extension NO inserted	N	N				N		N									
Camera Cable Wrap safety device lim CW PullCordLimP				R										S			
Camera Cable Wrap safety device CCW PullCordLimN				R										S			
TMA ETPBs	S	S	S	S	S	S	S	S		S		S			S		
Main Drives ETPB	S	S	S	S	S	S	S	S		S		S			S		
OSS malfunction	S	S															
Any Capacitor cabinet NO closed	S	S															
MCS watchdog	S	S	S	S	S	S	S	S		S							S
Loss communication	S	S	S	S	S	S	S	S		S							S
Unauthorized Pier access (from GIS)	N	N															
GIS Discharge Capacitors Bank											N						
GIS disable other equipment			N		N	N	N	N	N	N		N					
GIS Main drives-STO and engage the brakes	N	N															
GIS Camera cable wrap drives STO				N													

©Tekniker

Safety matrix in EUI



©Tekniker

https://shorturl.at/UqNfi

05

Troubleshooting

Error diagnosis

- Good knowledge of the TMA hardware and software structure
- Even with a good knowledge could be tricky
- Most common errors related with hardware are:
  - EtherCAT line failure
    - Small failure, communications not working properly but all devices connected
    - Big failure, communications not working and not all devices detected -> electronics team
  - Bosch controller failure
  - Encoder not being able to perform a reference, not homing, this has usually been due to dirt in the encoder tapes. Move somewhere else and try again, if not working, clean the tapes and try again.
  - Faults recoverable from EUI

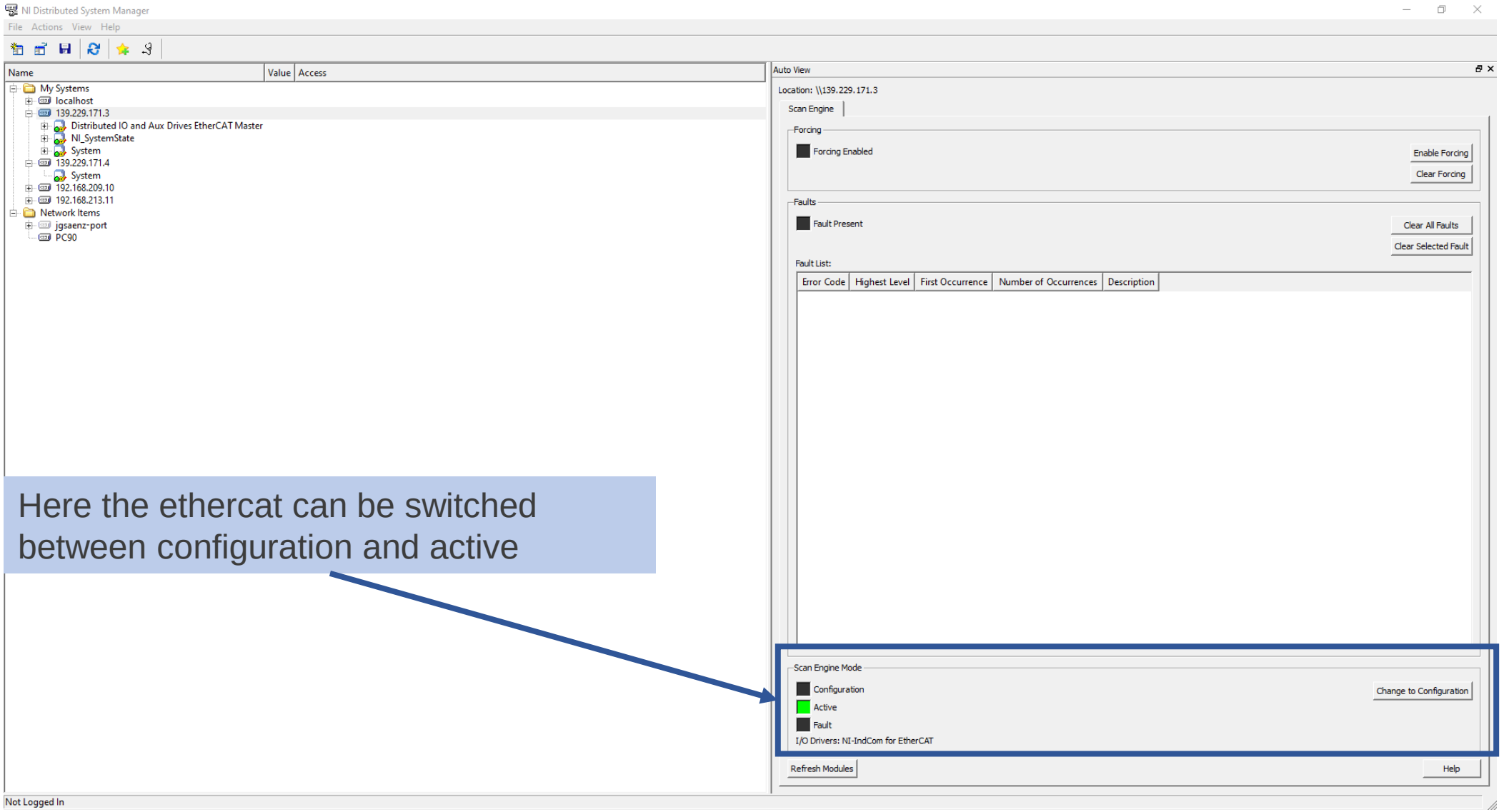
©Tekniker

EtherCAT line failure

- Send power off to all systems, could fault and enter a more complex situation
- Open NI Distributed System Manager
  - Tool created by National Instruments for PXI variables and remote target management
- Check the status of the PXIs that have ethercat (AXES and TMA)
- Change the scan engine mode to Configuration and back to active
  - Works, things should be OK
  - Returns an error -> Use twincat tool

©Tekniker

NI Distributed System Manager -> change mode

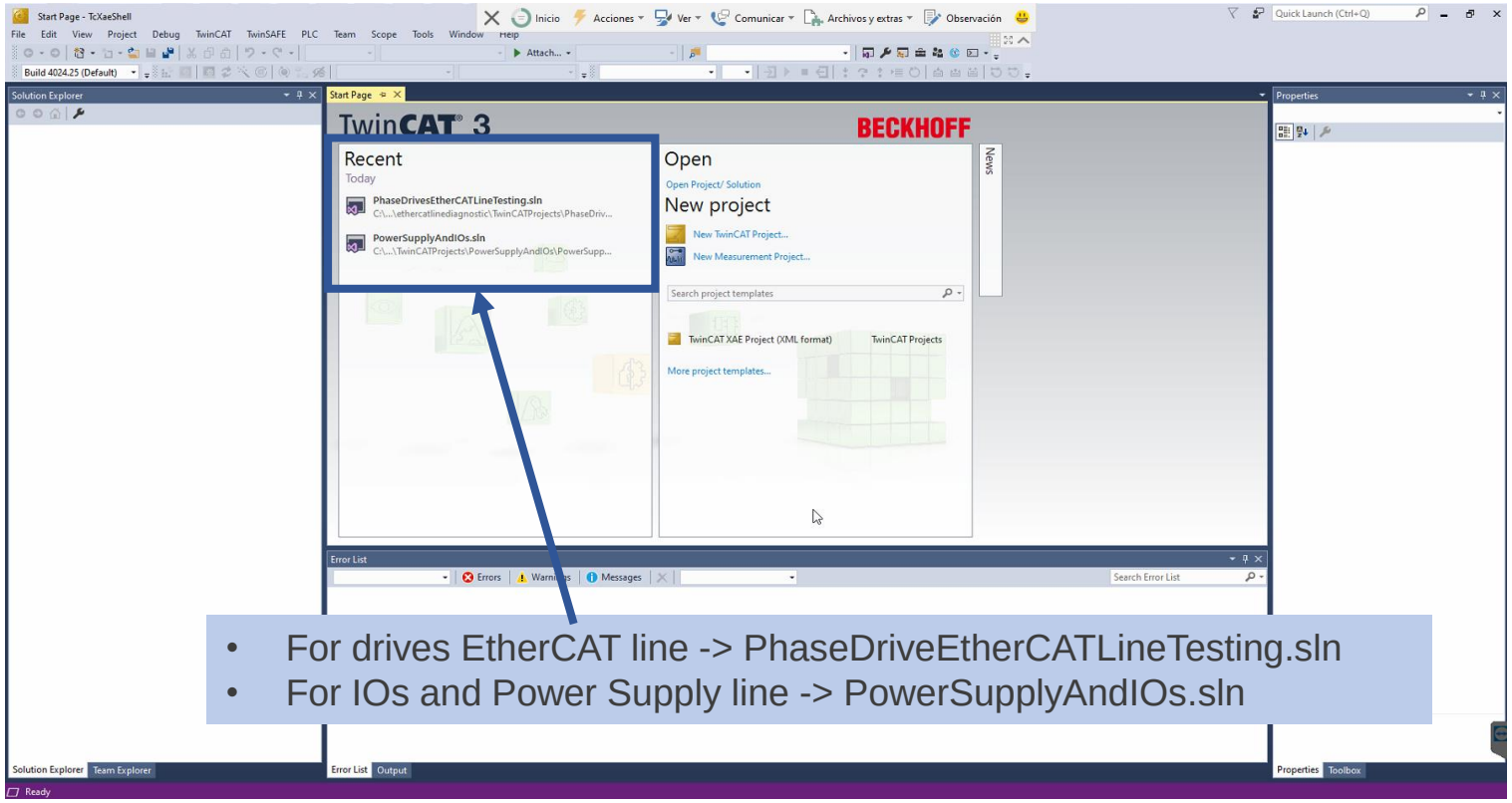


Here the ethercat can be switched between configuration and active

©Tekniker

EtherCAT diagnosis tool -> TwinCAT

- Use case, EtherCAT not working
  - Tool created by Beckhoff for the Beckhoff controllers
- Procedure here
  - Until step 10, if the counters count, then electronics team



- For drives EtherCAT line -> PhaseDriveEtherCATLineTesting.sln
- For IOs and Power Supply line -> PowerSupplyAndIOs.sln

©Tekniker

Bosch controller failure

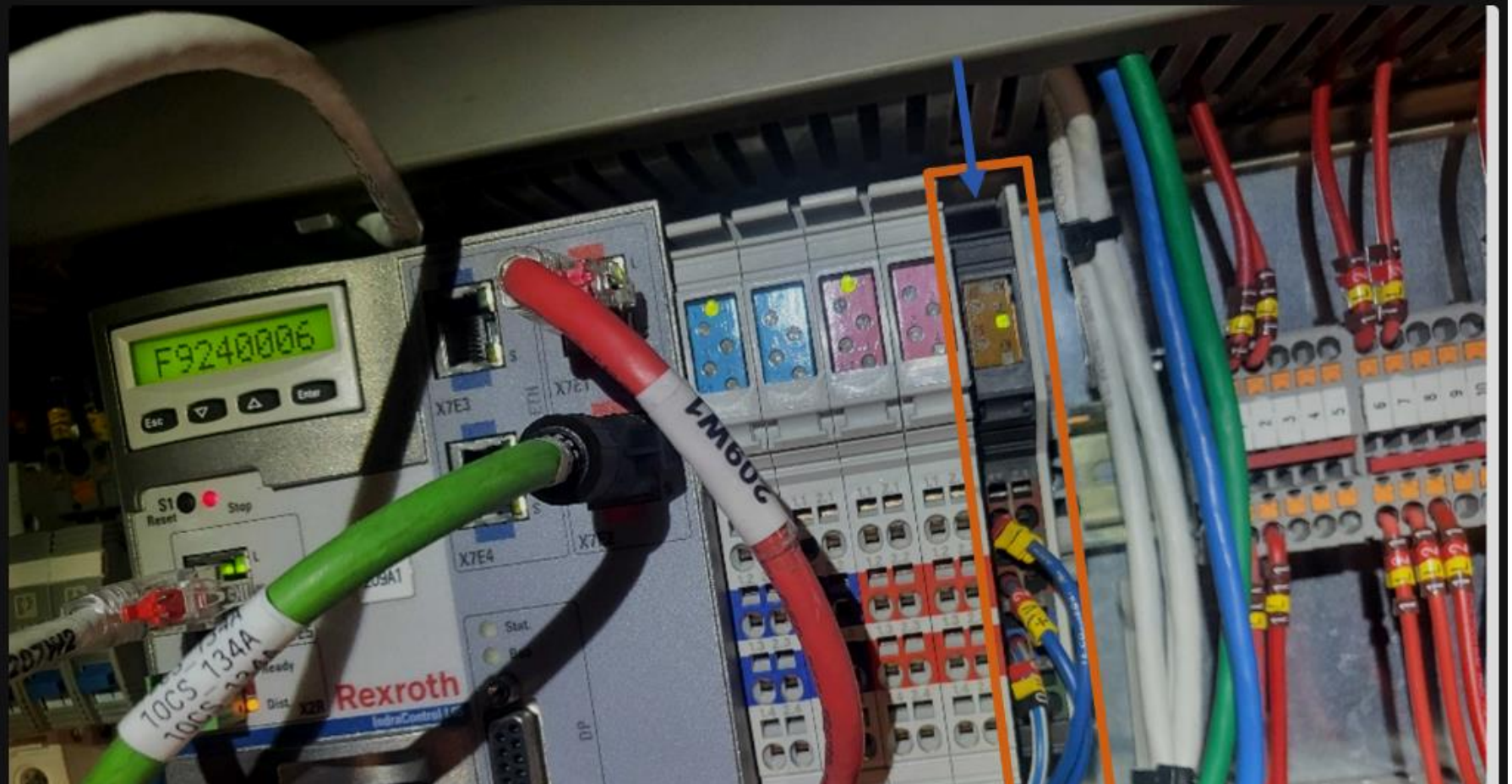
- Impossible to power on or control a bosch system (ACW, CCW, Balancing, Locking Pins, Mirror Cover, Deployable Platforms)
- Before moving forward, check that there are no safety interlocks or mayor PXI problems
- Power cycle the Bosch controller, located inside the main TMA cabinet, AZ platform

©Tekniker

Bosch controller failure

Rebooting the Bosch Controller and checkin the status

To remove power, take out the last module (orange one in next figure), pressing the flange marked with the blue arrow. The light from the control goes. After a few seconds, the module can be reallocated again to get the power for the controller again.



doc

©Tekniker

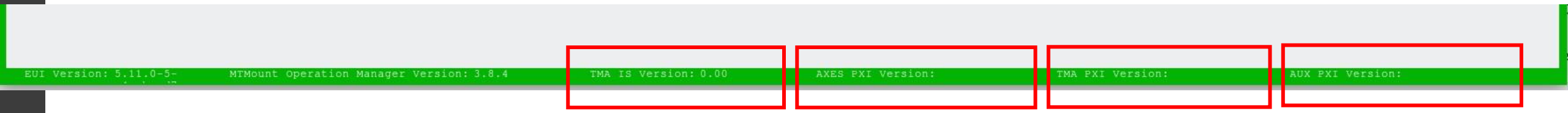
Faults recoverable from EUI -> TMA FAULT TREE

- Pressing a limit switch
- Moving too fast causing the system to fail due to over-speed
- Temperature alarms, if the system is too far above the setpoint
- Temperature warnings, if the system is too far below the setpoint
- Pressing an ETPB (emergency trip push button), which causes the system to stop
- Having safety interlocks that prevent the movement or activation of a subsystem. For example: trying to power on elevation axis with the locking pins at the inserted position.

©Tekniker

Problems with EUI, no versions from PXI -> problem with telemetry

- Need to check if the PXIs started properly, see startup log



©Tekniker

Log files -> MCC

- MCC (Main Control Computer): this is the device running the EUI and C++ MtMount Operation Manager. Is this device the logs can be found at:
  - Operation Manager log: */var/log/mtmount_operation_manager/log.log*
  - EUI logs: */mnt/telemetry/*
    - *AlarmHistory*: here the received alarms by the EUI are stored
    - *ErrorHistory*: here the software errors from the EUI are stored
    - *MemoryLogging*: here the memory usage of the EUI is stored
    - *TelemetryLogging*: here the high frequency telemetry received from the PXIs is stored
    - *WindowLogging*: here the high frequency telemetry stored during move commands from the EUI are stored

©Tekniker

Log files -> PXIs

- PXIs (AUX, TMA and AXES): all three PXIs follow the same structure for the logging. Here there are two type of logs:
  - Application startup log, this is stored using linux messages and the log file is `/var/log/messages` for accessing the startup information an alias is available in each PXI -> *$ labviewmessages*
    - *alias labviewmessages="cat /var/log/messages | grep LabVIEW_Custom“*
    - Recommended after reboot to check that everything started properly
  - Custom log, these are files generated by the LabVIEW application and are stored in */home/lvuser/log/* this log file is used for debugging

©Tekniker

Log files -> TMA-PXI -> labviewmessages

```
jgsaenz@jgsaenz-port:~$ tmapxi
NI Linux Real-Time (run mode)

Log in with your NI-Auth credentials.

Last login: Thu Oct 12 12:47:32 2023 from 139.229.171.5
```

TMA-PXI

```
admin@TMA-PXI:~# labviewmessages
2023-10-12T12:47:34.980+00:00 TMA-PXI LabVIEW_Custom_Log: Init RT_MCS_Main
2023-10-12T12:47:51.768+00:00 TMA-PXI LabVIEW_Custom_Log: StartingTCPTask
2023-10-12T12:47:53.714+00:00 TMA-PXI LabVIEW_Custom_Log: StartedTCPTaskAndDelaysSettingsReadDone
2023-10-12T12:47:53.854+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: DiscreteStateReporting MinimumCommand: 2501 MaximumCommand: 2599 QueueRefsValid: TRUE
2023-10-12T12:47:53.865+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: Safety MinimumCommand: 1801 MaximumCommand: 1899 QueueRefsValid: TRUE
2023-10-12T12:47:53.897+00:00 TMA-PXI LabVIEW_Custom_Log: SafetyTask_Started
2023-10-12T12:47:57.958+00:00 TMA-PXI LabVIEW_Custom_Log: BoschPowerSupplyTask started
2023-10-12T12:47:57.962+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: BoschPowerSupply MinimumCommand: 65535 MaximumCommand: 65535 QueueRefsValid: TRUE
2023-10-12T12:48:03.186+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: BoschTask MinimumCommand: 10357 MaximumCommand: 10357 QueueRefsValid: TRUE
2023-10-12T12:48:03.188+00:00 TMA-PXI LabVIEW_Custom_Log: BoschTask started.
2023-10-12T12:48:09.860+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: DeployablePlatform MinimumCommand: 1201 MaximumCommand: 1299 QueueRefsValid: TRUE
2023-10-12T12:48:09.865+00:00 TMA-PXI LabVIEW_Custom_Log: DP initialization actions completed
2023-10-12T12:48:09.869+00:00 TMA-PXI LabVIEW_Custom_Log: DP_Instance_Init_DeployablePlatform1
2023-10-12T12:48:09.870+00:00 TMA-PXI LabVIEW_Custom_Log: DP_Instance_Init_DeployablePlatform2
2023-10-12T12:48:09.927+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: CCW MinimumCommand: 1001 MaximumCommand: 1099 QueueRefsValid: TRUE
2023-10-12T12:48:10.123+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: Balancing MinimumCommand: 1101 MaximumCommand: 1199 QueueRefsValid: TRUE
2023-10-12T12:48:10.126+00:00 TMA-PXI LabVIEW_Custom_Log: Balancing init actions completed
2023-10-12T12:48:20.900+00:00 TMA-PXI LabVIEW_Custom_Log: CCW initialization actions completed
2023-10-12T12:48:20.986+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: LockingPin MinimumCommand: 1401 MaximumCommand: 1499 QueueRefsValid: TRUE
2023-10-12T12:48:20.990+00:00 TMA-PXI LabVIEW_Custom_Log: LockingPin init actions completed
2023-10-12T12:48:20.994+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: MirrorCoverLocks MinimumCommand: 1501 MaximumCommand: 1599 QueueRefsValid: TRUE
2023-10-12T12:48:20.997+00:00 TMA-PXI LabVIEW_Custom_Log: MCL initialization actions completed
2023-10-12T12:48:22.419+00:00 TMA-PXI LabVIEW_Custom_Log: MirrorCoverSequencerStarted
2023-10-12T12:48:23.237+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: MirrorCover MinimumCommand: 901 MaximumCommand: 999 QueueRefsValid: TRUE
2023-10-12T12:48:23.241+00:00 TMA-PXI LabVIEW_Custom_Log: MC initialization actions completed
2023-10-12T12:48:29.902+00:00 TMA-PXI LabVIEW_Custom_Log: DP MonitoringTask InitActions Completed
2023-10-12T12:50:00.162+00:00 TMA-PXI LabVIEW_Custom_Log: Main Axes Waiting Bosch
2023-10-12T12:50:00.366+00:00 TMA-PXI LabVIEW_Custom_Log: Start Main Axes
2023-10-12T12:50:54.905+00:00 TMA-PXI LabVIEW_Custom_Log: EIB Init
2023-10-12T12:50:59.934+00:00 TMA-PXI LabVIEW_Custom_Log: Waiting EIB and ACW
2023-10-12T12:51:00.705+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: Azimuth MinimumCommand: 101 MaximumCommand: 399 QueueRefsValid: TRUE
2023-10-12T12:51:00.709+00:00 TMA-PXI LabVIEW_Custom_Log: Initialized Azimuth
2023-10-12T12:51:00.709+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: EIB MinimumCommand: 701 MaximumCommand: 799 QueueRefsValid: TRUE
2023-10-12T12:51:00.756+00:00 TMA-PXI LabVIEW_Custom_Log: SubscribeSubsystem: Elevation MinimumCommand: 401 MaximumCommand: 599 QueueRefsValid: TRUE
2023-10-12T12:51:00.757+00:00 TMA-PXI LabVIEW_Custom_Log: Initialized Elevation
admin@TMA-PXI:~#
```

©Tekniker

Log files -> AUX-PXI -> labviewmessages

```
jgsaenz@jgsaenz-port:~$ auxpxi
NI Linux Real-Time (run mode)

Log in with your NI-Auth credentials.

Last login: Thu Oct 12 12:38:06 2023 from 139.229.171.5
```

AUX-PXI

```
admin@AuxSystems:~# labviewmessages
2023-09-25T07:10:46.000+00:00 AuxSystems LabVIEW_Custom_Log: Init AuxSystemsMain
2023-09-25T07:11:32.000+00:00 AuxSystems LabVIEW_Custom_Log: StartingTCPTask
2023-09-25T07:11:34.000+00:00 AuxSystems LabVIEW_Custom_Log: StartingSubsystems
2023-09-25T07:11:35.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: Settings MinimumCommand: 2401 MaximumCommand: 2499 QueueRefsValid: TRUE
2023-09-25T07:11:35.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: DiscreteStateReporting MinimumCommand: 2501 MaximumCommand: 2599 QueueRefsValid: TRUE
2023-09-25T07:11:42.000+00:00 AuxSystems LabVIEW_Custom_Log: Starting MainPowerSupply
2023-09-25T07:11:42.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: MainPowerSupply MinimumCommand: 601 MaximumCommand: 699 QueueRefsValid: TRUE
2023-09-25T07:11:42.000+00:00 AuxSystems LabVIEW_Custom_Log: MainPowerSupply Started
2023-09-25T07:11:47.000+00:00 AuxSystems LabVIEW_Custom_Log: Starting MainCabinet
2023-09-25T07:11:47.000+00:00 AuxSystems LabVIEW_Custom_Log: Launched MainPowerSupply task
2023-09-25T07:11:47.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: MainCabinet MinimumCommand: 1301 MaximumCommand: 1399 QueueRefsValid: TRUE
2023-09-25T07:11:47.000+00:00 AuxSystems LabVIEW_Custom_Log: Started MainCabinet
2023-09-25T07:11:52.000+00:00 AuxSystems LabVIEW_Custom_Log: Starting AZDriveThermal
2023-09-25T07:11:56.000+00:00 AuxSystems LabVIEW_Custom_Log: Starting Cabinet101
2023-09-25T07:11:58.000+00:00 AuxSystems LabVIEW_Custom_Log: Initializing AmbientTemperatureTrackning
2023-09-25T07:11:58.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: AmbientTemperatureTracking MinimumCommand: 2701 MaximumCommand: 2799 QueueRefsValid: TRUE
2023-09-25T07:11:58.000+00:00 AuxSystems LabVIEW_Custom_Log: AmbientTemperatureTrackning Initialized
2023-09-25T07:11:58.000+00:00 AuxSystems LabVIEW_Custom_Log: Starting ELDriveThermal
2023-09-25T07:12:16.000+00:00 AuxSystems LabVIEW_Custom_Log: Initialazing Telemetry
2023-09-25T07:12:16.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: OSS MinimumCommand: 801 MaximumCommand: 899 QueueRefsValid: TRUE
2023-09-25T07:12:16.000+00:00 AuxSystems LabVIEW_Custom_Log: OSS Initialized
2023-09-25T07:12:16.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: TopEndChiller MinimumCommand: 2201 MaximumCommand: 2299 QueueRefsValid: TRUE
2023-09-25T07:12:16.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: Cabinet010 MinimumCommand: 1901 MaximumCommand: 1999 QueueRefsValid: TRUE
2023-09-25T07:12:16.000+00:00 AuxSystems LabVIEW_Custom_Log: Started Cabinet101
2023-09-25T07:13:03.000+00:00 AuxSystems LabVIEW_Custom_Log: Started TEC. Error Ocurred. Error code 7, Source: Open File+.vi:Open File, LabVIEW: (Hex 0x7) File not found. The file might be in a different location or deleted. Use the comm
and prompt or the file explorer to verify that the path is correct.
2023-09-25T07:13:03.000+00:00 AuxSystems LabVIEW_Custom_Log: CMDManagement_class_CleanUp CommandQueue released for: SubsystemTopEndChiller.lvclass
2023-09-25T07:13:03.000+00:00 AuxSystems LabVIEW_Custom_Log: UnsubscribeSubsystem_TopEndChiller
2023-09-25T07:13:03.000+00:00 AuxSystems LabVIEW_Custom_Log: CMD_UnsubscribeSubsystem_TopEndChiller
2023-09-25T07:13:03.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: ElevationGroup MinimumCommand: 1701 MaximumCommand: 1799 QueueRefsValid: TRUE
2023-09-25T07:13:03.000+00:00 AuxSystems LabVIEW_Custom_Log: Started ELDriveThermal
2023-09-25T07:13:05.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: AzimuthGroup MinimumCommand: 1601 MaximumCommand: 1699 QueueRefsValid: TRUE
2023-09-25T07:13:05.000+00:00 AuxSystems LabVIEW_Custom_Log: Started AZDriveThermal
2023-09-25T07:13:06.000+00:00 AuxSystems LabVIEW_Custom_Log: Exited TEC. Error Ocurred. [0] Error code 7, Source: Open File+.vi:Open File, LabVIEW: (Hex 0x7) File not found. The file might be in a different location or deleted. Use the c
ommand prompt or the file explorer to verify that the path is correct., [1] Error code 1556, Source: ??? in ModbusServerToTekNSVs.lvlib:ReadAndDeleteDVR.vi:3650006->ModbusServerToTekNSVs.lvlib:CleanupTask.vi:7080005->TEC.lvlib:ExitAction
sTask.vi:2460001->TEC.lvlib:Task.vi->TEC.lvlib:Task.vi.ACBRProxyCaller.B8600060, LabVIEW: (Hex 0x614) The reference is invalid. This error might occur because the reference has been deleted., [2] Error code 1556, Source: ??? in ModbusSer
verToTekNSVs.lvlib:CleanupTask.vi:7080005->TEC.lvlib:ExitActionsTask.vi:2460001->TEC.lvlib:Task.vi->TEC.lvlib:Task.vi.ACBRProxyCaller.B8600060, LabVIEW: (Hex 0x614) The reference is invalid. This error might occur because the reference h
as been deleted., [3] Error code 1, Source: ??? in ModbusServerToTekNSVs.lvlib:CleanupTask.vi:7080005->TEC.lvlib:ExitActionsTask.vi:24600
2023-09-25T07:13:08.000+00:00 AuxSystems LabVIEW_Custom_Log: Telemetry Initialaized
2023-09-25T07:13:35.000+00:00 AuxSystems LabVIEW_Custom_Log: Initializing ModbusTemepratureControllers
2023-09-25T07:13:36.000+00:00 AuxSystems LabVIEW_Custom_Log: SubscribeSubsystem: ModbusCabinets MinimumCommand: 2601 MaximumCommand: 2699 QueueRefsValid: TRUE
2023-09-25T07:13:36.000+00:00 AuxSystems LabVIEW_Custom_Log: ModbusTemepratureControllers Initialized
2023-09-25T07:13:36.000+00:00 AuxSystems LabVIEW_Custom_Log: ModbusTemepratureController Initalized, Instance: TMA_AX_DZ_CBT_0001
2023-09-25T07:13:36.000+00:00 AuxSystems LabVIEW_Custom_Log: ModbusTemepratureController Initalized, Instance: TMA_AZ_PD_CBT_0001
2023-09-25T07:13:37.000+00:00 AuxSystems LabVIEW_Custom_Log: ModbusTemepratureController Initalized, Instance: TMA_EL_PD_CBT_0001
2023-09-25T07:13:37.000+00:00 AuxSystems LabVIEW_Custom_Log: ModbusTemepratureController Initalized, Instance: TMA_EL_PD_CBT_0002
admin@AuxSystems:~#
```

©Tekniker

Log files -> AXES-PXI -> labviewmessages

```
Last login: Wed Sep  4 12:15:27 2024 from 139.229.138.10

AXES-PXI

admin@AxesPXI:~# labviewmessages
2024-09-03T13:36:01.965+00:00 AxesPXI LabVIEW_Custom_Log: Version: 5.8.0.withoutEcatMonitor
2024-09-03T13:36:06.969+00:00 AxesPXI LabVIEW_Custom_Log: Main Started
2024-09-03T13:36:11.969+00:00 AxesPXI LabVIEW_Custom_Log: Main axes task launched
2024-09-03T13:36:11.969+00:00 AxesPXI LabVIEW_Custom_Log: Encoder task launched
2024-09-03T13:36:11.973+00:00 AxesPXI LabVIEW_Custom_Log: Timed Loops Processors: Control Loop Azimuth: 5
2024-09-03T13:36:11.977+00:00 AxesPXI LabVIEW_Custom_Log: Timed Loops Processors: Control Loop Elevation: 6
2024-09-03T13:36:12.624+00:00 AxesPXI LabVIEW_Custom_Log: Timed Loops Processors: Trajectory Loop Azimuth: 4
2024-09-03T13:36:15.526+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0001
2024-09-03T13:36:15.526+00:00 AxesPXI LabVIEW_Custom_Log: Timed Loops Processors: Trajectory Loop Elevation: 4
2024-09-03T13:36:15.532+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0002
2024-09-03T13:36:15.538+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0003
2024-09-03T13:36:15.543+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0004
2024-09-03T13:36:15.549+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0005
2024-09-03T13:36:15.554+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0006
2024-09-03T13:36:15.560+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0007
2024-09-03T13:36:15.566+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0008
2024-09-03T13:36:15.572+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0009
2024-09-03T13:36:15.578+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0010
2024-09-03T13:36:15.584+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0011
2024-09-03T13:36:15.589+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0012
2024-09-03T13:36:15.596+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0013
2024-09-03T13:36:15.601+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0014
2024-09-03T13:36:15.607+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0015
2024-09-03T13:36:15.613+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-AZM-0016
2024-09-03T13:36:15.619+00:00 AxesPXI LabVIEW_Custom_Log: Hall sensor EtherCAT slave name: MainDrives EtherCAT Master/AZ_HS
2024-09-03T13:36:15.624+00:00 AxesPXI LabVIEW_Custom_Log: Azimuth Active Damping filter: Type: Lowpass. High Cutoff: 0.000000. Order: 2. Low Cutoff: 35.000000
2024-09-03T13:36:15.625+00:00 AxesPXI LabVIEW_Custom_Log: Azimuth filter: Type: Lowpass. High Cutoff: 0.000000. Order: 1. Low Cutoff: 25.000000
2024-09-03T13:36:18.437+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0041
2024-09-03T13:36:18.442+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0042
2024-09-03T13:36:18.448+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0061
2024-09-03T13:36:18.454+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0062
2024-09-03T13:36:18.460+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0051
2024-09-03T13:36:18.466+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0052
2024-09-03T13:36:18.471+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0011
2024-09-03T13:36:18.477+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0012
2024-09-03T13:36:18.483+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0031
2024-09-03T13:36:18.489+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0032
2024-09-03T13:36:18.495+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0021
2024-09-03T13:36:18.500+00:00 AxesPXI LabVIEW_Custom_Log: Drive EtherCAT slave name: MainDrives EtherCAT Master/TMA-AZ-DR-ELV-0022
2024-09-03T13:36:18.506+00:00 AxesPXI LabVIEW_Custom_Log: Hall sensor EtherCAT slave name: MainDrives EtherCAT Master/ELXneg_HS
2024-09-03T13:36:18.510+00:00 AxesPXI LabVIEW_Custom_Log: Hall sensor EtherCAT slave name: MainDrives EtherCAT Master/ELXpos_HS
2024-09-03T13:36:18.514+00:00 AxesPXI LabVIEW_Custom_Log: Elevation filter: Type: Lowpass. High Cutoff: 0.000000. Order: 1. Low Cutoff: 10.000000
2024-09-03T13:36:19.207+00:00 AxesPXI LabVIEW_Custom_Log: Timed Loops Processors: Monitoring Loop 1: 2
2024-09-03T13:36:19.637+00:00 AxesPXI LabVIEW_Custom_Log: Timed Loops Processors: Encoder UPD Loop: 7
```

©Tekniker

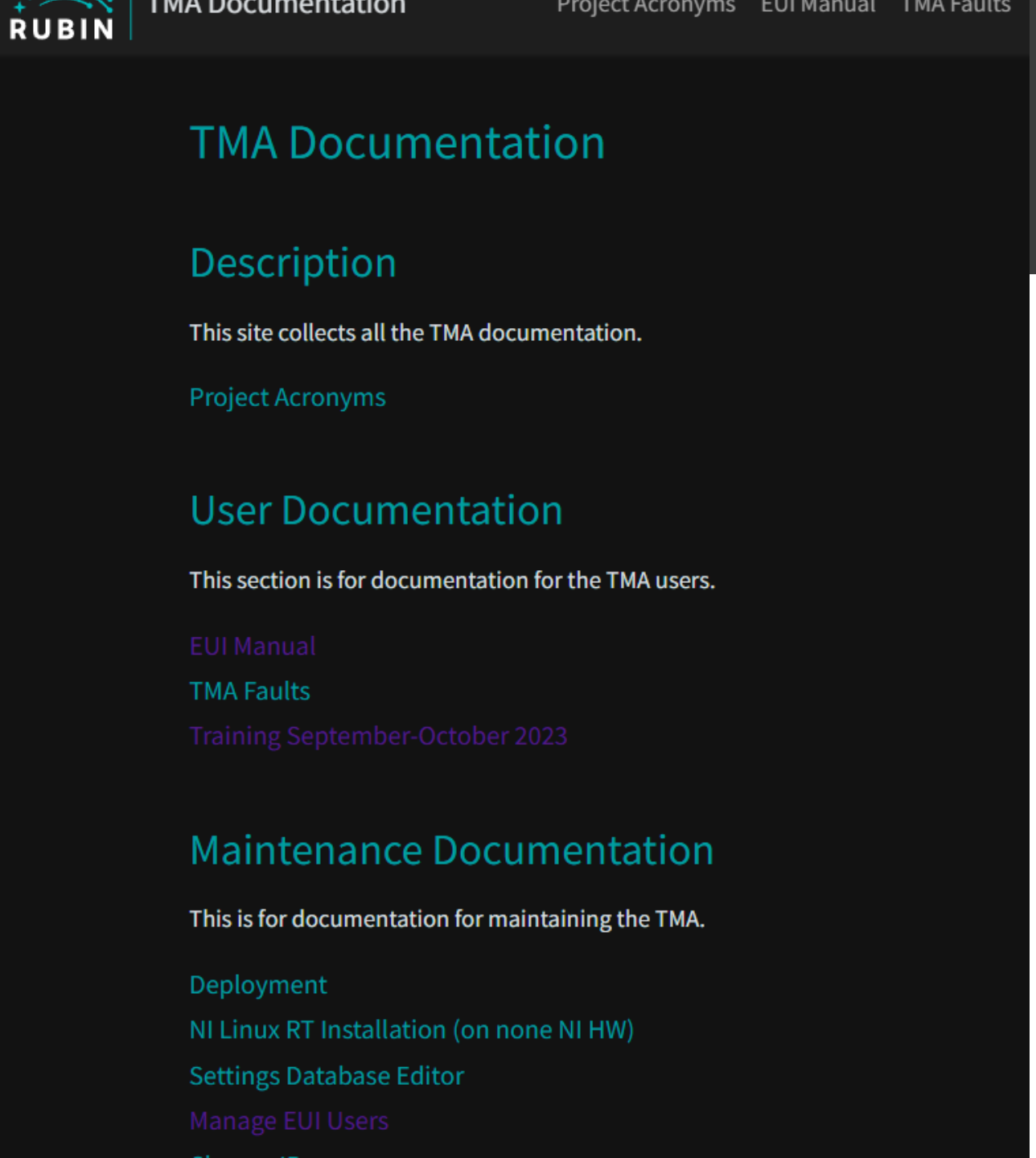
Error diagnosis -> reporting faults to Tekniker

- JIRA tickets sample ticket here
- Is very important to have details of what the sequence was
  - All the commands sent before the fault
  - Command that caused the fault
  - Command origin (CSC, EUI, HHD)
  - Time of the fault (UTC preferred)
- Not enough just randomly pasting logs
- Make an effort understanding the fault message before filling in the fault reporting form

©Tekniker

06

Additional Documentation



Online documentation

- https://ts-tma.lsst.io/
- If any problems are detected in this website, please enter to the github repo and create an issue

Change the Azimuth and Elevation home position offset

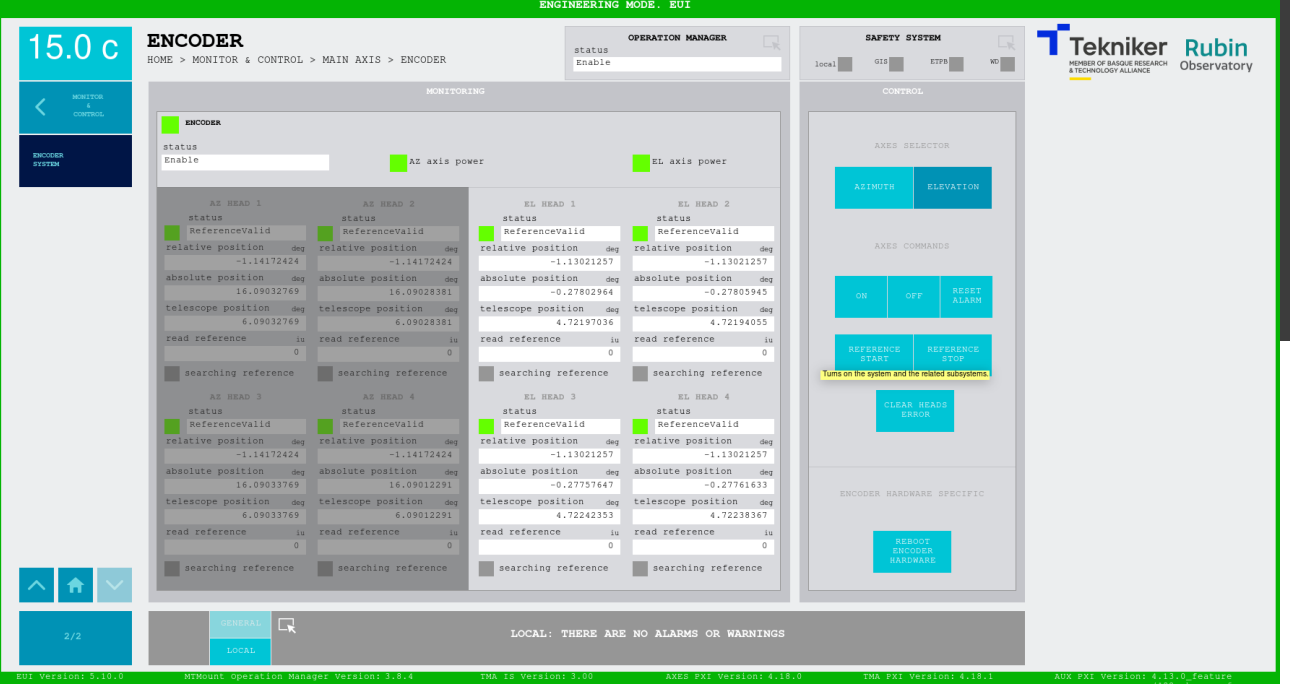
- HOW TO LINK
- There is a setting that allows changing the virtual zero position the telescope uses, for this purpose the following steps must be followed:
  - Steps for Azimuth:
    - Power Off both axis (AZ and EL)
    - Make sure you are logged in a user with *Maintenance* privileges
    - Go to the settings window for the Encoder: *ENCODERSYSTEM SETTINGS*
    - Modify the value of the setting *Azimuth Telescope Offset*, note that the value is subtracted from the calculated position, so for virtually moving the zero to positive, negative values must be used.
    - **Reboot the TMA-PXI**: this must be done only for azimuth but is **crucial**. If TMA PXI is not rebooted the ACW won't be centered with azimuth and the system can be damaged.
    - Power on the azimuth axis and make a reference, the new 0 value should be at the desired position.

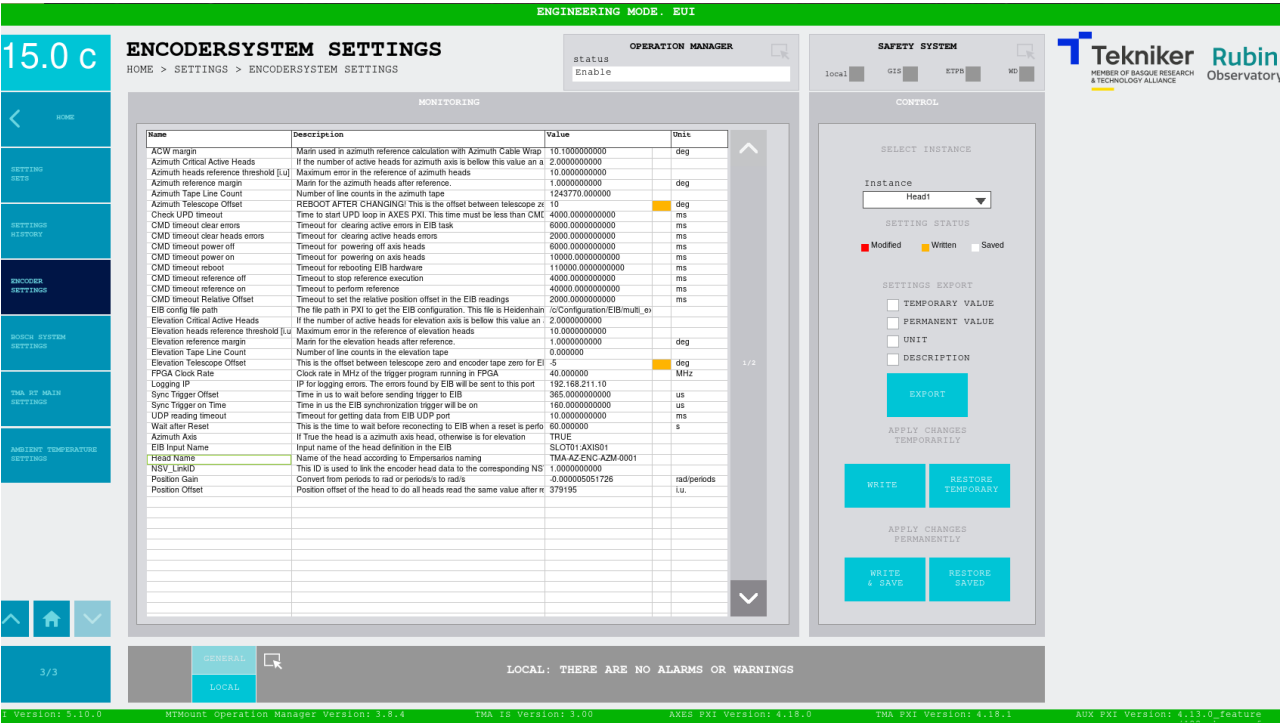
©Tekniker

Change the Azimuth and Elevation home position offset

- HOW TO LINK
- There is a setting that allows changing the virtual zero position the telescope uses, for this purpose the following steps must be followed:
  - Steps for Elevation:
    - Power Off both axis (AZ and EL)
    - Make sure you are logged in a user with *Maintenance* privileges
    - Go to the settings window for the Encoder: *ENCODERSYSTEM SETTINGS*
    - Modify the value of the setting *Elevation Telescope Offset*, note that the value is subtracted from the calculated position, so for virtually moving the zero to positive, negative values must be used.
    - Power on the elevation axis and make a reference, the new 0 value should be at the desired position.

©Tekniker





Change the Azimuth and Elevation home position offset -> Example

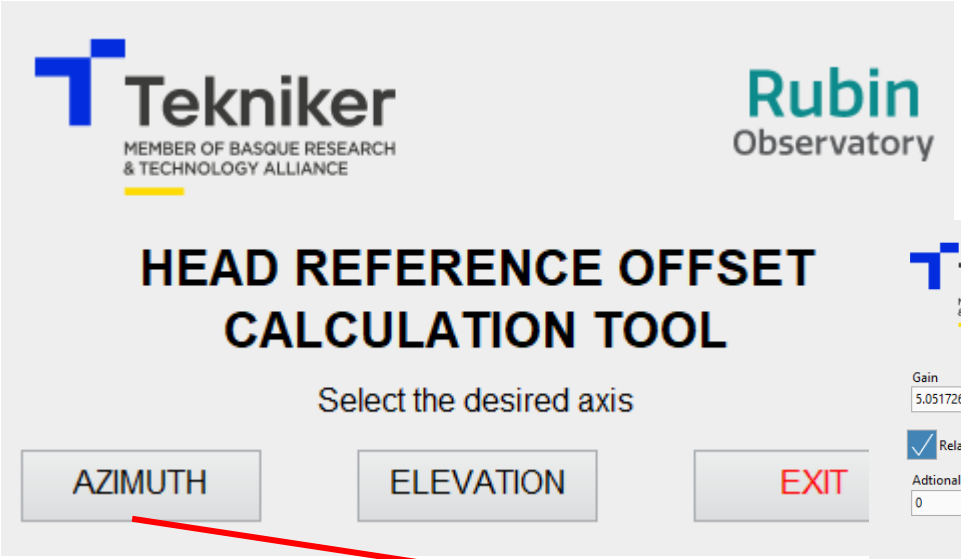
- HOW TO LINK
- Example with values:
  - *Azimuth Telescope Offset*: 10 deg
  - *Elevation Telescope Offset*: -5 deg

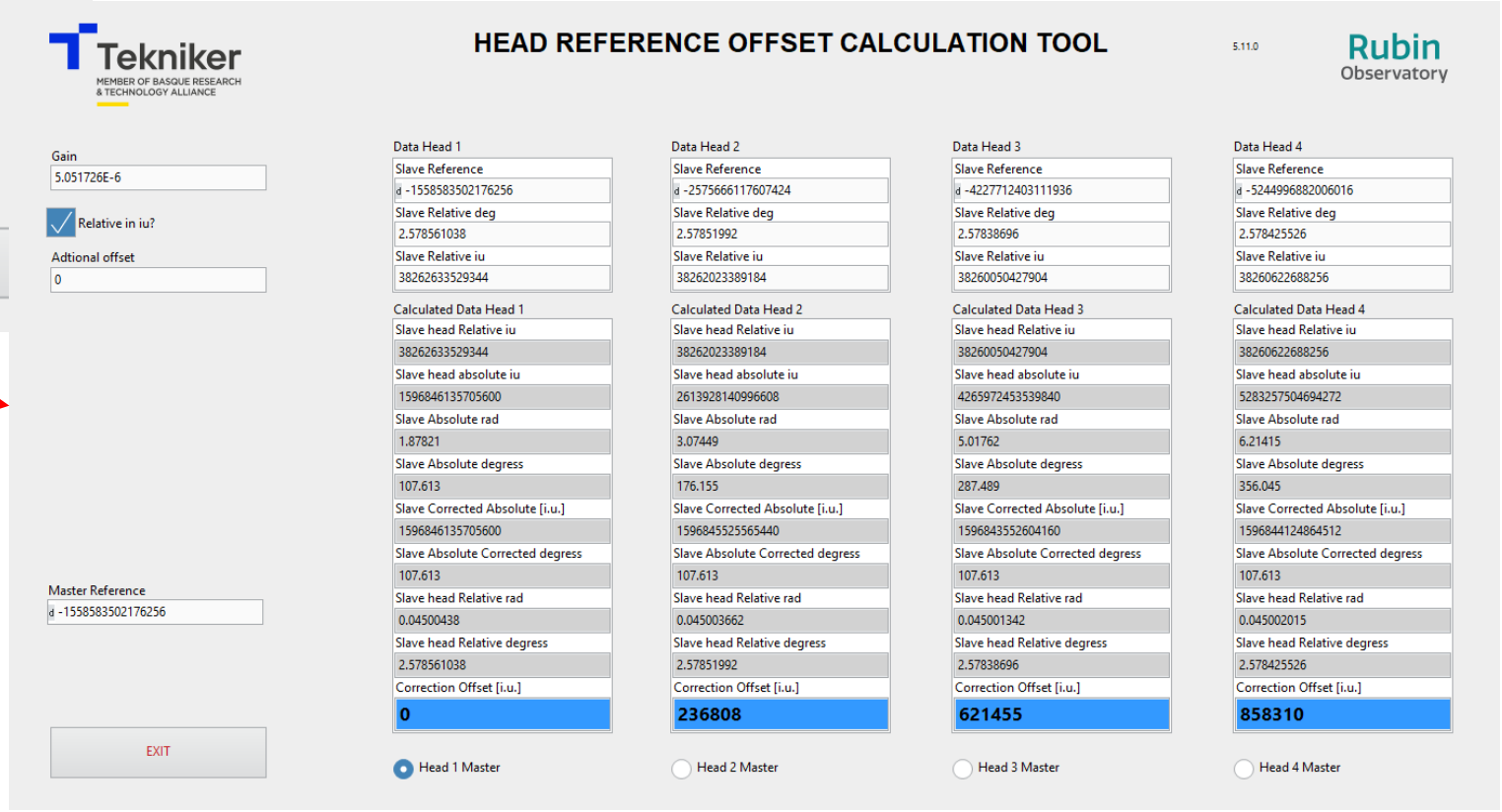
Head reference offset calculation

- HOW TO LINK
- ONLY when 1 or 2 head is replaced or moved, less than ~0.5deg
- Specific tool created for this purpose
- Installed in the MCC -> */usr/local/TMA_HeadReferenceOffsetCalculationTool*

©Tekniker

Head reference offset calculation -> tool





©Tekniker

Tekniker
Parke Teknologikoa
C/ Iñaki Goenaga, 5
20600 Eibar (Gipuzkoa)
Tel: +34 943 20 67 44
www.tekniker.es

©Tekniker