

# Slow Control

# Slow Control

## HADES RICH

RICH700 Meeting – GSI Darmstadt – 23.06.2016  
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# Status of development

- Low Voltage Power Supply
  - TDK LAMBDA
  - EPICS IOC
  - GUI
- High Voltage Power Supply
  - ISEG Crate
  - EPICS IOC / Databases
  - GUI
- RICH temperature Sensors
  - HadCon2 + DB18B20 1-Wire Sensors
  - RaspberryPi

# Low Voltage Power Supply

- TDK Lambda Genesys **Gen60-40 LAN**
- Communication via TCP
  - needs IP Address and Protocol file
  - Send SCPI commands to PORT 8003
- At the moment:
  - default IP Address (169.254.238.214)
  - default Netmask (255.255.0.0)
  - default Gateway (0.0.0.0)
- Use Switch for communication between Computer/EPICS and Power Supply



# Low Voltage Power Supply

The screenshot displays a web-based control interface for a power supply, titled "CSS". The main content area is titled "Lambda Power Supply" and includes the following information:

- Device Information:** LAMBDA GEN60-40-LAN S/N:619A196-0001 1U2K:5.1.1-LAN:2.1
- Status:** ON (indicated by a green light and a black button with "ON" in green text)
- Calculated Power:** 0,00
- DC Voltage:** 0,997 V. Control buttons: SET 0,000 V (range 1,000 V), max. Voltage 0,000 V (range 64,900 V).
- DC Current:** 0,000 A. Control buttons: SET 0,000 A (range 0,300 A).
- Operational Data:** quest 0x0, event 0x0, oper 0x5. Status indicators: NoFault (green light), CV (green light).
- Protection:** Foldback protection OFF (highlighted in red), ON, OFF. A "Clear Errors" button is also present.
- Debug:** A text input field for debugging.

# Low Voltage Power Supply

IDN: Typ, Serial Number, ...

HADES:RICH:LV:TDKLambda:CR1

LAMBDA GEN60-40-LAN S/N:619A196-0001 1U2K:5.1.1-LAN:2.1

ON

Calculated Power 0,00

DC Voltage 0,997 V

DC Current 0,000 A

SET 0,000 V 1,000 V

max. Voltage 0,000 V 64,900 V

SET 0,000 A 0,300 A

quest 0x0

event 0x0

oper 0x5 NoFault CV

Foldback protection OFF ON OFF

Clear Errors

debug

Internal Name

<Experiment>:<Detector>:<PowerSupply>:<Device>:<#Device/Crate>

# Low Voltage Power Supply

Switch Power Supply On/Off

The screenshot displays the CSS interface for a Lambda Power Supply. The main window title is "LV LAMBDA - HADES:RICH:LV:TDKLambda:CR1". The interface includes a menu bar (File, Edit, Search, CSS, Window, Help) and a toolbar with various icons. The main content area is divided into several sections:

- Power Status:** A green indicator light and a black button labeled "ON" are circled in red.
- Calculated Power:** A black box displays "0,00".
- DC Voltage:** A grey box shows "0,997 V". Below it, a "SET" field is set to "0,000 V" with a range of "1,000 V" and "max. Voltage" set to "0,000 V" with a range of "64,900 V".
- DC Current:** A grey box shows "0,000 A". Below it, a "SET" field is set to "0,000 A" with a range of "0,300 A".
- Foldback protection:** A section with buttons for "OFF", "ON", and "OFF" (the second "OFF" is highlighted in red).
- Clear Errors:** A blue button.
- Operational Data:** A section with "quest 0x0", "event 0x0", and "oper 0x5 NoFault CV" with a green indicator light.
- debug:** A text input field.

Red arrows point from the "SET" fields to the text "Set new Voltage or Current" at the bottom of the image.

Set new Voltage or Current

# Low Voltage Power Supply

Diagram of Power, Voltage and Current

Possible Faults and/or Modes

The screenshot displays the CSS interface for a Lambda Power Supply. The main window title is "LV LAMBDA - HADES:RICH:LV:TDKLambda:CR1". The interface includes a menu bar (File, Edit, Search, CSS, Window, Help) and a toolbar. The main content area shows the following details:

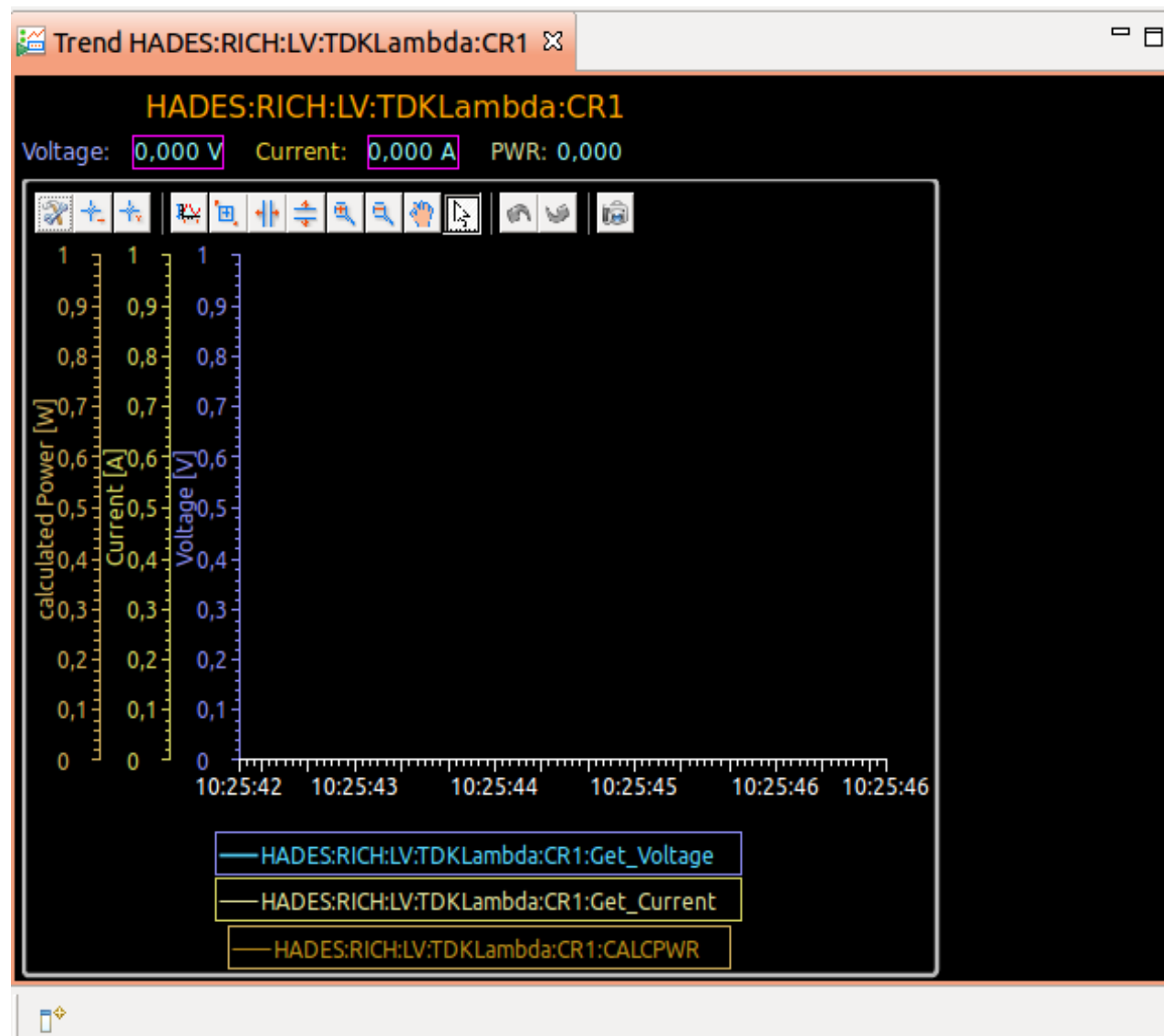
- Power Supply Information:** LAMBDA, GEN60-40-LAN, S/N:619A198-0001, I/O2K.5 1.1-LAN:2.1
- Status:** ON (indicated by a green light and a black button with "ON" in green)
- Calculated Power:** 0,00
- DC Voltage:** 0,997 V (with a "Trend..." button circled in red)
- DC Current:** 0,000 A
- Settings:** SET 0,000 V (range 1,000 V), max. Voltage 0,000 V (range 64,900 V); SET 0,000 A (range 0,300 A)
- Fault/Status Indicators:** quest 0x0, event 0x0, oper 0x5, NoFault (green light), CV (green light)
- Foldback protection:** OFF (blue button), ON (blue button), OFF (red button)
- Clear Errors:** (blue button)
- debug:** (text input field)

Measured Voltage or Current

Foldback Protection

# Low Voltage Power Supply

- Click on Trend ...





# High Voltage Power Supply

- ISEG Crate ECH 44A
- CC 24 Master
  - EPICS on board
- EHS F620n-F\_SHV modules
  - 6 modules
  - à 16 channels



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- In use for development:
    - ISEG ECH 244
    - CC24
    - 1x EHS F620n Module



# High Voltage Power Supply

- CC24 has iCS access
  - Use Browser → Upload .db and .sub files
  - Just up to 5 .db files and 1 sub file (!!!!)
  - ISEG tries to give us a SSH connection
- EPICS Code
  - Set and get all important values from all channels of all modules
  - Group behaviour is implemented
    - “VarGB” :
      - For every module you can select channels you want
      - Set values for these channels
      - Switch On/Off these channels
    - “fixed GB” :
      - Fixed channels from all modules will get the value you want to set
  - All Settings run completely independent

# High Voltage Power Supply

## CBM\_RICH HV Control

### Section 1

Main Switch

Main Status

Fan Speed Control [rpm]

Save /Load all values of  
all single channels

Switch On/Off all channels  
of all Modules



Get

19

SAVE

LOAD



Modul 0 Modul 1 GROUPING

### Section 2

Channel	Set Voltage [V]	Set Current [A]	Measured Voltage [V]	Measured Current [A]	Trip Time [ms]	Power	VoltageBounds	CurrentBounds	Emergency	Status	ON/OFF
<input type="checkbox"/> CH 0	100 V	1,000E-4 A	0 V	7,174E-11 A	0 s	0	0 V	0,000 A			
<input type="checkbox"/> CH 1	200 V	1,000E-4 A	0 V	1,635E-10 A	0 s	0	0 V	0,000 A			
<input type="checkbox"/> CH 2	200 V	1,000E-4 A	-0 V	1,828E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/> CH 3	0 V	1,000E-4 A	-0 V	1,073E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/> CH 4	0 V	1,000E-4 A	-0 V	2,342E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/> CH 5	0 V	1,000E-4 A	-0 V	2,772E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/> CH 6	0 V	1,000E-4 A	-0 V	1,977E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/> CH 7	0 V	1,000E-4 A	-0 V	1,748E-10 A	0 s	-0	0 V	0,000 A			

InputError  
isOn  
isVoltageRamp  
isEmergency  
isSCC  
isCV  
isCurrentBound  
isVoltageBound  
isEventInhibit  
isTrip  
isCurrentLimit  
isVoltageLimit

Modul	Temperatur	Event Status	VoltageRampSpeed [%*Vnom/s]	CurrentRampSpeed [%*Inom/s]	VoltageLimit	CurrentLimit	SampleRate	V_Nom	I_Nom
	27 C		1 %/s	50 %/s	102 %	102 %	50 SPS	6,000 V	0,0010 A

On/Off All channels  
of Module



Group behaviour	Set Voltage [V]	Set Current [A]	Trip Time [ms]	Voltage Bounds	Current Bounds	Emergency	ON/OFF
	0 V	0,000E0 A	0 s	0	0,000E0		

# High Voltage Power Supply

## CBM\_RICH HV Control

Main Switch

Main Status

Fan Speed Control [rpm]

Save /Load all values of all single channels

Switch On/Off all channels of all Modules

Get

19

SAVE

LOAD



Modul 0 Modul 1 **GROUPING**

Channel	Set Voltage [V]	Set Current [A]	Measured Voltage [V]	Measured Current [A]	Trip Time [ms]	Power	VoltageBounds	CurrentBounds	Emergency	Status	ON/OFF	
<input checked="" type="checkbox"/>	CH 0	300 V	1,000E-4 A	301 V	1,431E-10 A	0 s	0	0 V	0,000 A			
<input checked="" type="checkbox"/>	CH 1	300 V	1,000E-4 A	301 V	1,112E-9 A	0 s	0	0 V	0,000 A			
<input checked="" type="checkbox"/>	CH 2	300 V	1,000E-4 A	300 V	1,253E-10 A	0 s	0	0 V	0,000 A			
<input type="checkbox"/>	CH 3	0 V	1,000E-4 A	-0 V	1,420E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/>	CH 4	0 V	1,000E-4 A	-0 V	2,639E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/>	CH 5	0 V	1,000E-4 A	-0 V	2,871E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/>	CH 6	0 V	1,000E-4 A	-0 V	2,027E-10 A	0 s	-0	0 V	0,000 A			
<input type="checkbox"/>	CH 7	0 V	1,000E-4 A	-0 V	1,946E-10 A	0 s	-0	0 V	0,000 A			

InputError  
isOn  
isVoltageRamp  
isEmergency  
isCC  
isCV  
isCurrentBound  
isVoltageBound  
isEventInhibit  
isTrip  
isCurrentLimit  
isVoltageLimit

Modul	Temperatur	Event Status	VoltageRampSpeed [%*Vnom/s]	CurrentRampSpeed [%*Inom/s]	VoltageLimit	CurrentLimit	SampleRate	V_Nom	I_Nom
	28 C		1 %/s	50 %/s	102 %	102 %	50 SPS	6.000 V	0,0010 A

On/Off All channels of Module

Group behaviour	Set Voltage [V]	Set Current [A]	Trip Time [ms]	Voltage Bounds	Current Bounds	Emergency	ON/OFF
	300 V	0,000E0 A	0 s	0	0,000E0		

# High Voltage Power Supply

## CBM\_RICH HV Control

Main Switch

Main Status



Fan Speed Control [rpm]

Get 19

Save /Load all values of all single channels

SAVE

LOAD

Switch On/Off all channels of all Modules



Modul 0

Modul 1

GROUPING

Set Voltage

Set Current

Set Trip Time

Set Voltage Bounds

Set Current Bounds

Emergency

On/Off

Group G1

300 V

0,0000 A

0 s

0 V

0,0000 A



Group G2

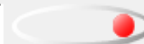
0 V

0,0000 A

0 s

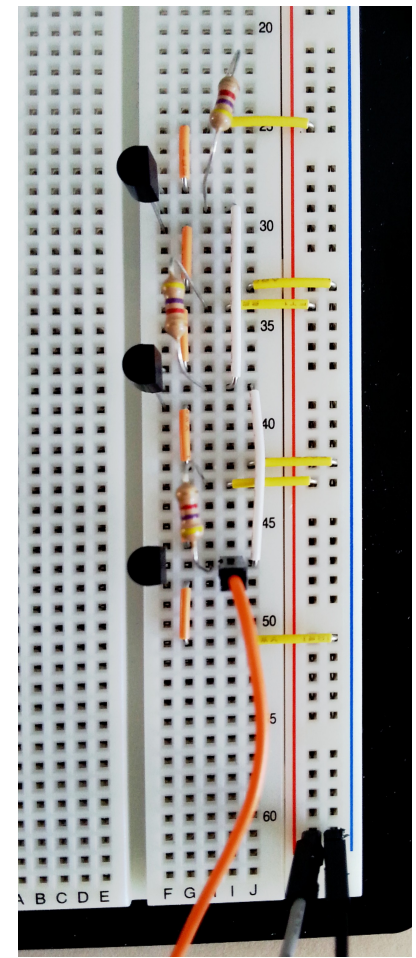
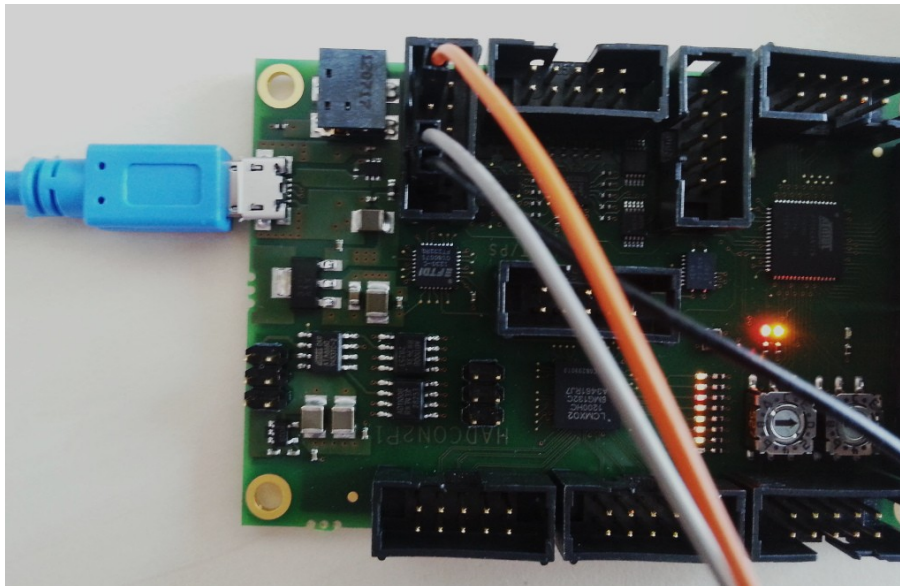
0 V

0,0000 A

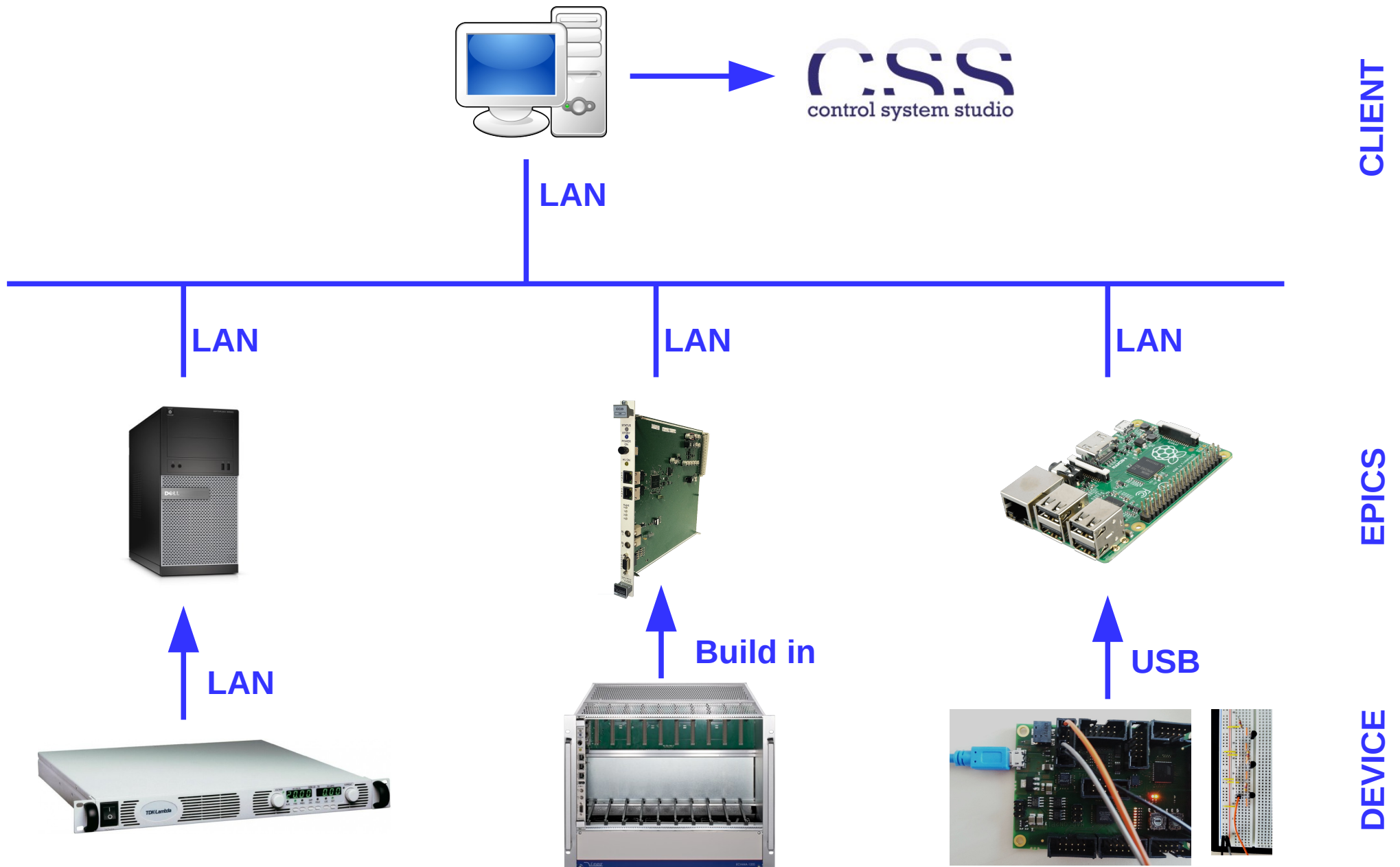


# RICH700 Temperature

- Use Raspberry Pi with EPICS
  - Connect HadCon2
  - Use DS18B20 Temperature Sensors (1-wire) (connected to HadCon2)
  - EPICS gets Temperature from HadCon2 (via OWTP)



# Overview



Thank you for your  
attention !