

TRIKOUPIS Nikolaos

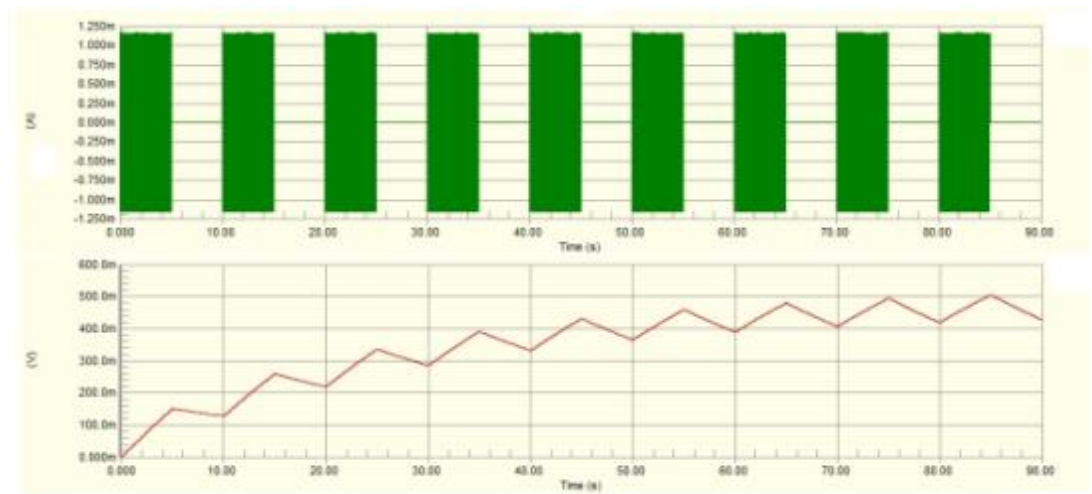
Specifications and available protection mechanisms of the Beam Screen Heater electronic card

Content

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 - Power on-load, AC/DC modes
 - Protections mechanisms
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- **Presentation:** Integration of the Electrical Heaters in the control system, by Enrique
- **Discussion:**
 - AC/DC modes of operation
 - Automatic enabling
 - I/O error, temporary and full stops

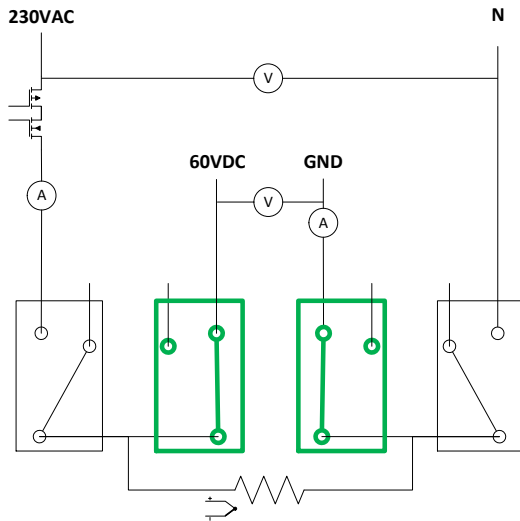
Power on-load

Specifications	Value
Modes of operation	DC or AC (Approx. 4 seconds for switching between modes)
DC power output	0-30W, Linear voltage 0-55V
DC power feedback	Valid immediately (after 2 seconds)
AC power output	0-200W, Pulse-Width-Modulation of AC over 10 sec
AC power feedback	Stable after $3\tau \sim 36$ sec. Updated every 10 seconds.

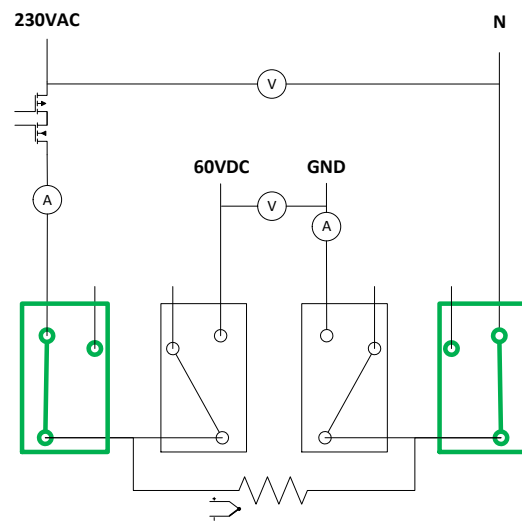


AC power measurement

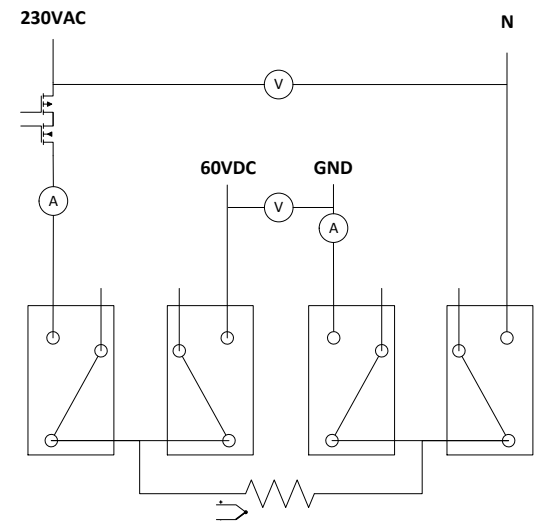
DC/AC mode of operation



DC mode of operation
Load: Connected



AC mode of operation
Load: Connected



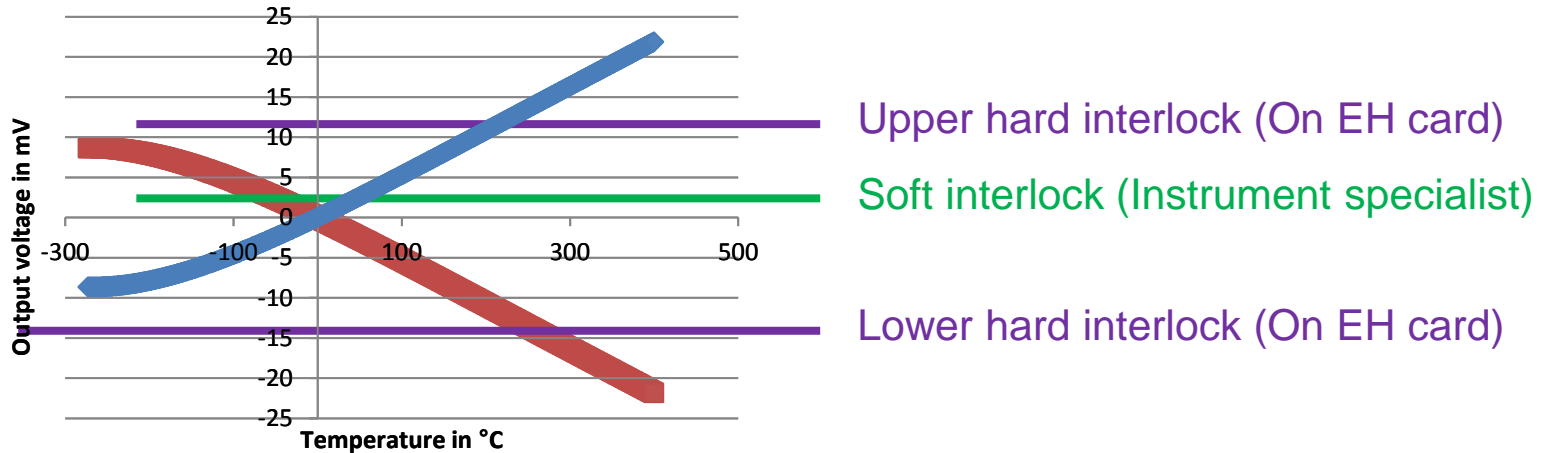
DC/AC mode of operation
Load: Disconnected

AC/DC or DC/AC transitions last max 4.2 sec

Protections

Channel disabled when:	Auto recovery	Comments
Crate power-ON	No	
Reset	No	
Overtemperature of the heater	No	Diagnostic error is stored until acknowledged by an "Enable" command
Communication loss for > 10 sec	No	Diagnostic error is stored until acknowledged by an "Enable" command
Channel "Disable" command	No	
Channel "Disconnect" command	No	
Card heatsink overtemperature	No	Diagnostic error is stored until acknowledged by an "Enable" command
Relays malfunction (on DC->AC or AC->DC transition)	No	Diagnostic error is stored until acknowledged by an "Enable" command
PCB card reference out of bounds	Yes	As long as error is present, no min/max time
PCB signal digitization malfunction	Yes	Minimum 5 seconds on error, then automatic reset attempt
PCB backpanel unstable setpoint	Yes	As long as error is present, no min/max time
PCB backpanel unstable address	Yes	As long as error is present, no min/max time
Thermocouple reference out of bounds	Yes	This protection is managed by CIET and not the card

Overtemperature protection



Blue: ThC correct polarity

Red: ThC *inverse* polarity

- The **soft interlock** is set by the **instrument specialist** through the communication card
Soft interlock is currently set to 40°C.
- The **hard interlocks** are set on the EH card by jumpers
- The 3 protections trigger an “Overtemperature” protection.

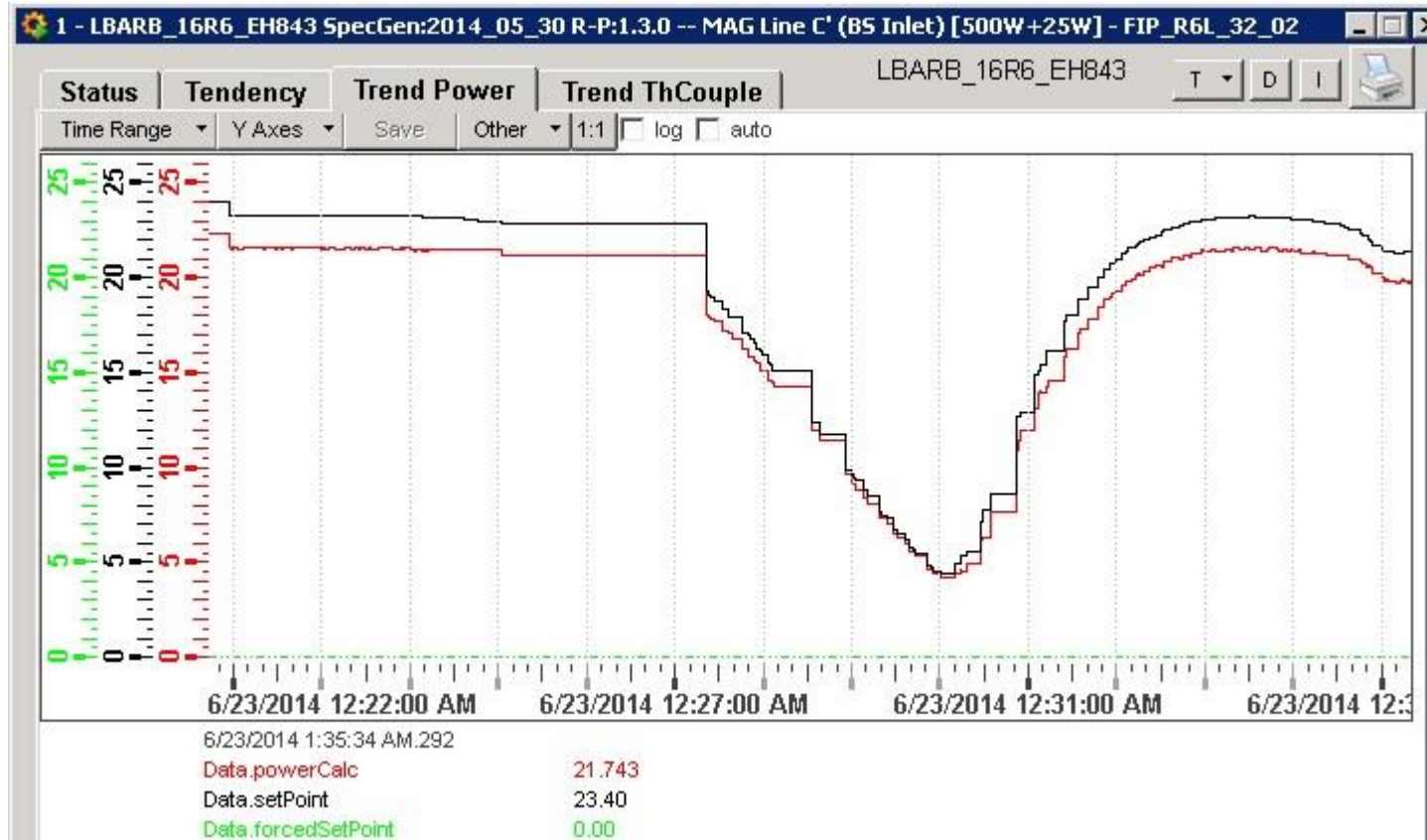
Operation of the EHBS card

Commands			Result
Channel Enable/Disable	Load Connect/Disconnect	Mode DC/AC	
Enable	Connect	DC	Channel enabled, load connected to DC, delivering DC power
Disable	Connect	DC	Channel disabled, load connected to DC, no DC power
Enable	Disconnect	DC	Channel disabled, load disconnected to DC, no DC power
Disable	Disconnect	DC	Channel disabled, load disconnected to DC, no DC power
Enable	Connect	AC	Channel enabled, load connected to AC, delivering AC power
Disable	Connect	AC	Channel disabled, load connected to AC, no AC power
Enable	Disconnect	AC	Channel disabled, load disconnected to AC, no AC power
Disable	Disconnect	AC	Channel disabled, load disconnected to AC, no AC power
Enable	Connect	DC->AC or AC->DC	Channel enabled, mode transition, load connected to AC/DC
Disable	Connect	DC->AC or AC->DC	Channel disabled, mode transition, load connected to AC/DC
Enable or Disable	Disconnect	DC->AC or AC->DC	Channel disabled, relays do not move, relay error

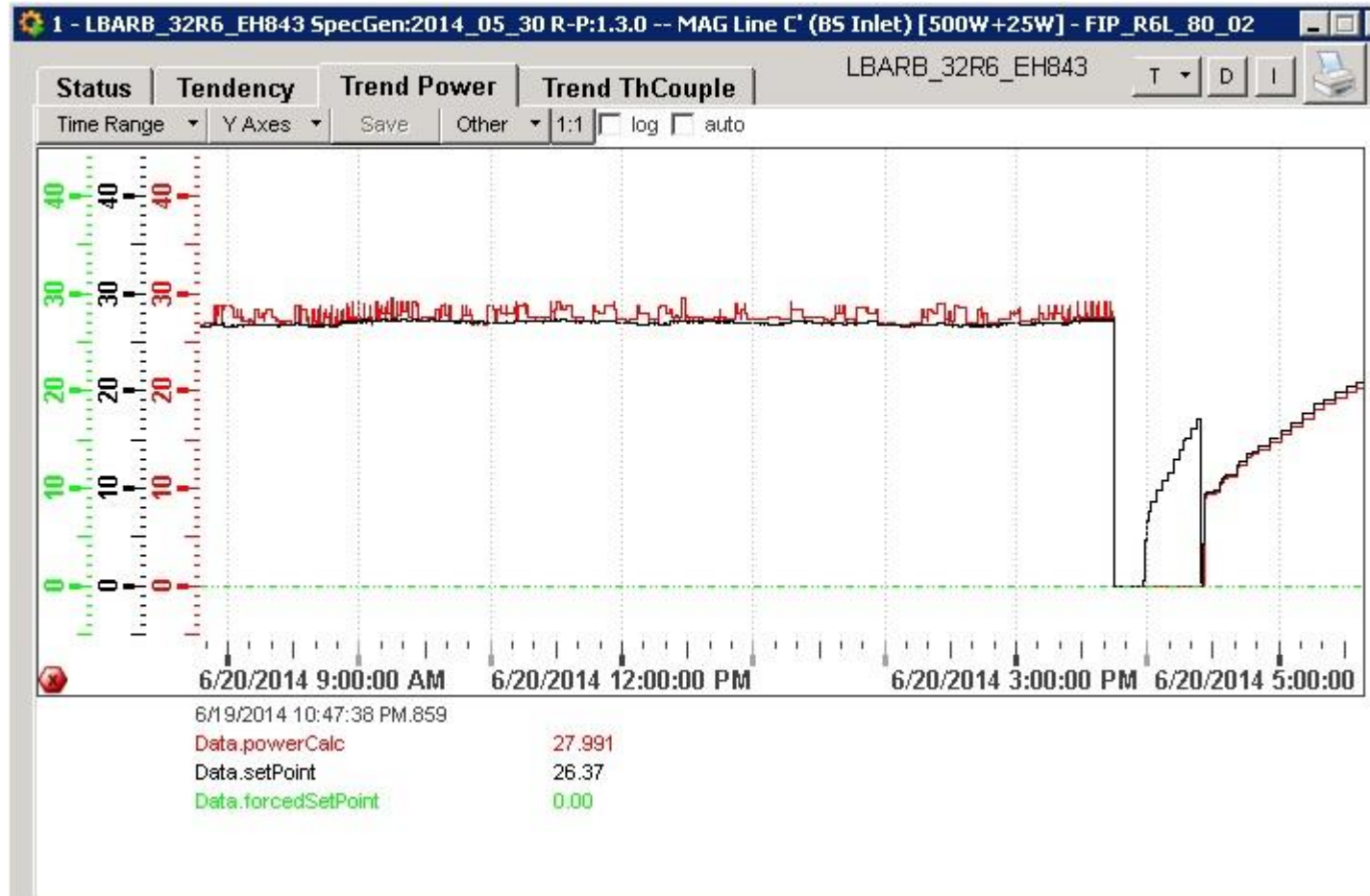
Enable command: '0' for 15 sec and then '1' for 15 sec

Disable command: '1' for 15 sec and then '0' for 15 sec

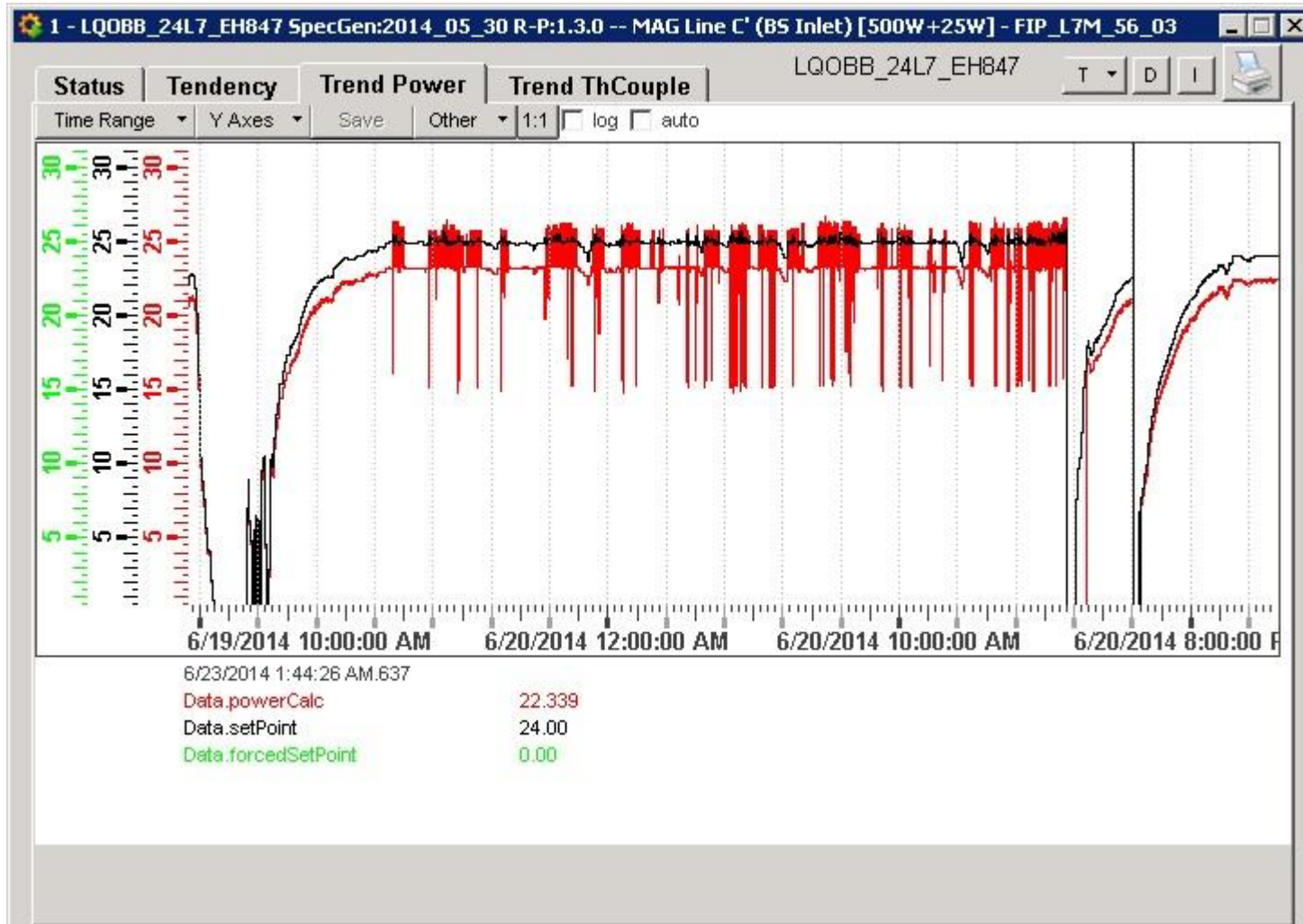
Power DC precision



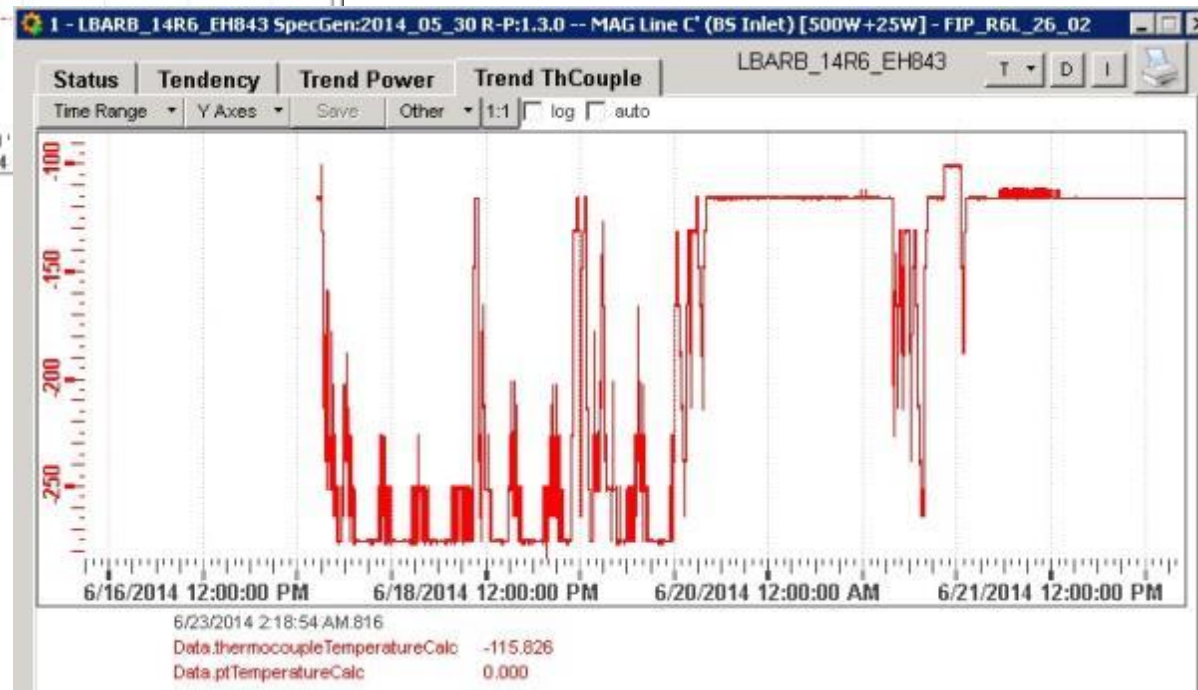
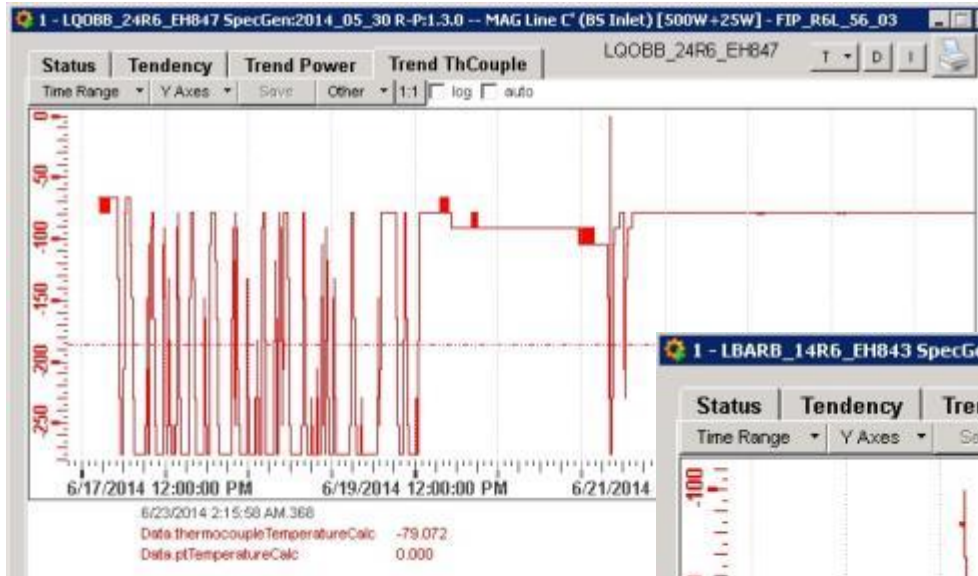
Power AC precision



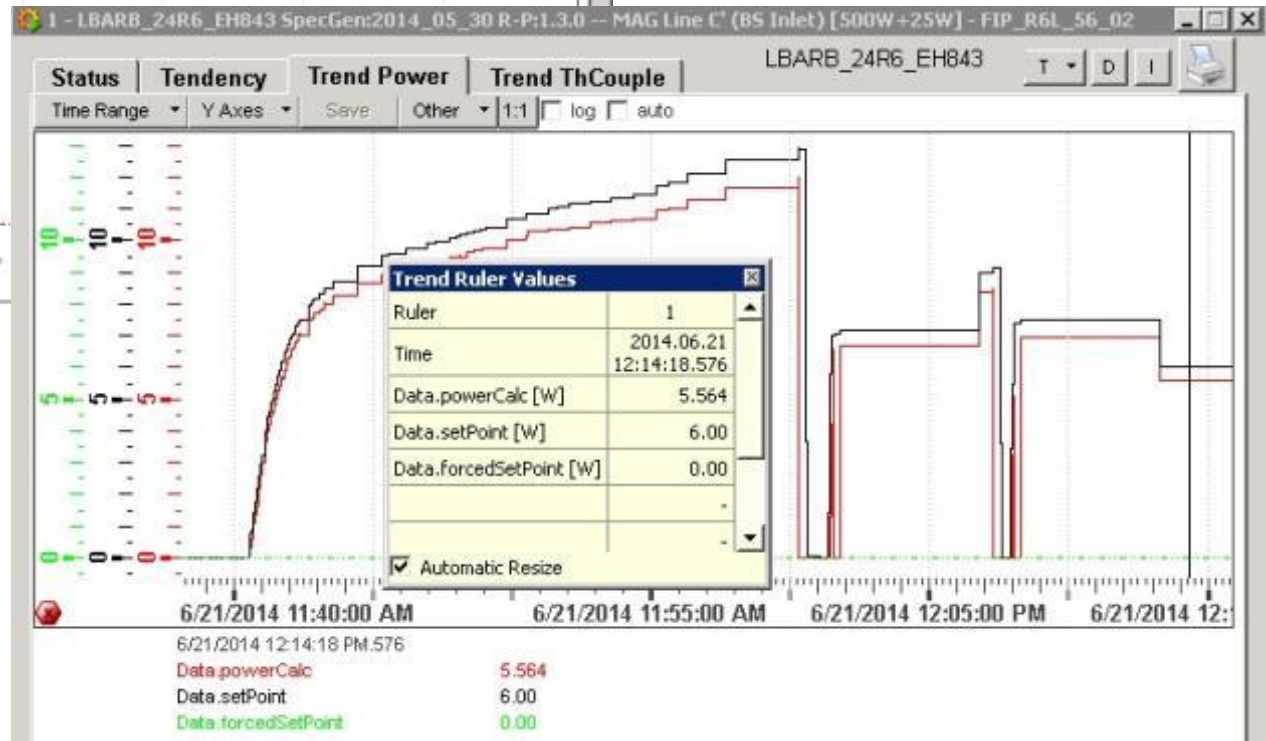
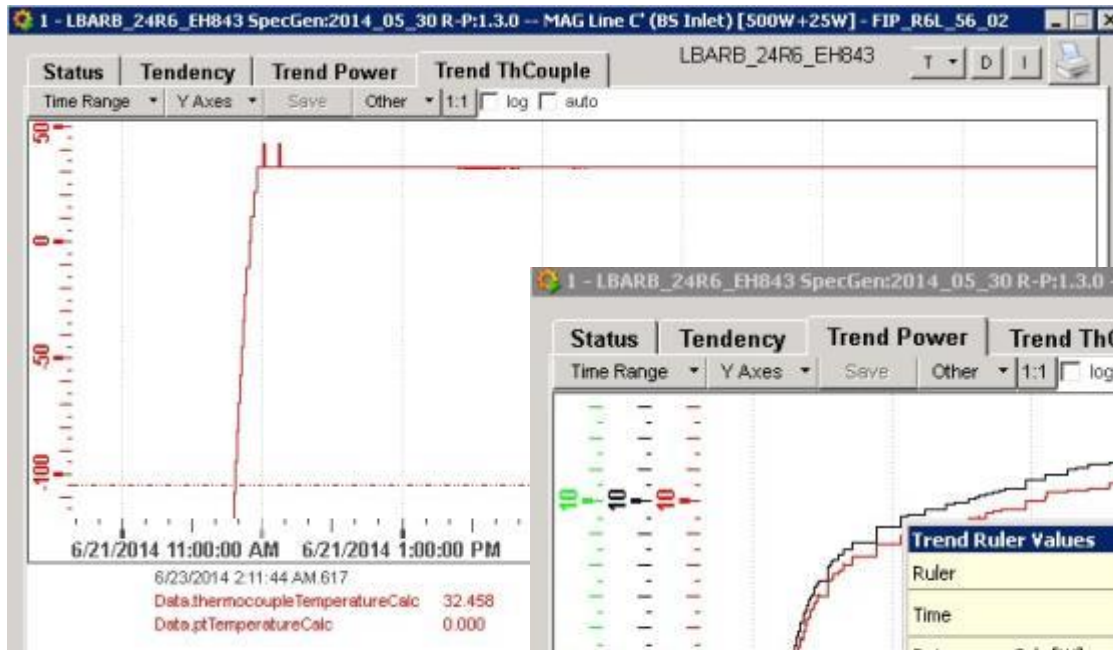
Power setpoint of 25W



Typical thermocouple reading



LBARB_24R6_EH843



Questions?



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