New EMMI Calibration Unit  
Control Electronics Concept

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The new ESO Multi Mode Instrument (EMMI) calibration unit requires VLT standard driving and monitoring electronics for the control functions:

1) Thorium Lamp on/off.
2) Lamp’s light output monitoring via photo-diode sensor.
3) Integrating sphere shutter close/open.
4) Achromat lens in/out.

Additionally the functions, when desired, shall be controlled locally, at a control box by the flip of a switch. All the electronics will be housed inside the control box. The control and monitoring will be accomplished via the EMMI LCU ACRO I/O bits.

Figure 1: EMMI Calibration Unit Electronics Block Diagram
**EMMI Calibration Unit Control Box**

The control box will be a commercial 483 mm width, 41 mm height and 140mm depth unit, to be installed somewhere over the EMMI rotator. Over the front panel the box will comprise necessary manual control switches together with indicator LEDs showing the state of the various status signals. Additionally the front panel will incorporate a mechanical hour meter for keeping track of the lamp usage. Please refer to Figure 1 for details.

At the back panel the box will include four connectors:

1) Fused and EMI filtered 220V mains inlet.
2) Switched 220V outlet for powering the Thorium lamp power supply.
3) Connector for the LCU interfacing.
4) Connector for the calibration unit interfacing.

**Lamp Control**

The 220V mains to the lamp power supply will be switched by a relay commanded both via an ACRO output bit when set to remote or via the control box toggle switch when set to local.

**Lamp Monitoring**

A strategically located photo-diode sensor will monitor the lamp’s light output. The sensor’s output will be amplified and conditioned into a binary signal for interfacing to an ACRO input bit. The gain of the amplifier and the comparator’s threshold and hysterisis will be adjustable at the PCB board level, by the aid of trim pots, for assuring reliable operation with the installed lamp, or when replacing the lamp.

**Sphere Shutter Drive and Driving Circuit**

The shutter drive mechanism will be implemented by a bi-stable mechanism, with stable mechanical stops, loaded by a spring and driven by a DC motor/gear head combination. Double mechanical micro-switches will both, sense the open or close states and stop the motor at the end of travel.
A single 24VDC supply connected to the motor via a polarity inversion relay combined with limit switches will comprise the driving circuit. The relay will be commanded via the ACRO or via the local front panel switch.

**Achromat Lens Drive and Driving Circuit**

The achromat lens drive mechanism will be implemented by a linear carriage, with stable mechanical stops and driven by a DC motor/gear head/screw combination. Double mechanical micro-switches will both, sense the in or out states and stop the motor at the end of travel.

A single 24VDC supply connected to the motor via a polarity inversion relay combined with limit switches will comprise the driving circuit. The relay will be commanded via the ACRO or via the local front panel switch.

**Please note:**

- This document is only a conceptual design, still necessary to write a complete document for the electronic design including detailed schematics for both the circuits and the whole cabling, among other details.
- In the “LED/Optics NTT New EMMI Calibration Unit Conceptual Design – 2.0” document, in section 4 is stated that the electronic design, integration and test will need 80 hrs of electronic resources. I would say that this needs a reevaluation. Additionally the cost is not the ACRO module alone.