T2500294-v1 CHETA Electronics Requirements

Slow controls, started by Daniel in D2500160:

Everything will go through feedthrough in CHETA enclosure.

Current Design includes:

- Beckhoff Ethernet connector in and out
- On/off switch for chassis?
- 24VDC/3A power in
- 2 x flippers in and out
- Rotation Stage Controller/Readback
- Linear Stage Controller/Readback
- Power monitor
- QPD Monitor

Changes to be made:

- Only need one flipper
- Add a second 24VDC supply to power motors so that they don't contaminate the Beckhoff signals.
- Where will we get 24VDC from? Is it better to have an AC to DC converter in the chassis?

Need to add:

- **Temperature sensor**: Does Beckhoff have off the shelf temp sensors we typically use? Platinum based probes. PT100 or TEC. Or copy/paste PEM sensor.
  Separate or coming on M12 connector

- Supply 12 V / 1 A for Laser cooling system, use to power on/off.
  - Might be good to supply separately to avoid interference (could plug into wall).
  - Relay to turn on or off the power supply.
- Monitor the current drawn by the Laser cooling system

- BNC TTL Input "Laser Enable In" 5 V Max
- BNC Laser Current Monitor "Analog CTL Out" 0 - 10 V
- Actual Temperature Deviation Output "Deviation Out" -5 to 5 V
- BNC TTL Temperature Monitor Output "Temp OK Out" 5 V

Separate board in chassis for (GV can work on if needed, what format to fit in chassis?):

- **2 x photodiode in: DB9** that supplies +/-15V and contains 4 fast readouts AC/DC POS/NEG. D2500105
- **1x photodiode out: DB9** that contains the 8 photodiode differential channels concentrated into four channels in one DB9 to later go to CDS ADC

Everything needed:

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Laser controller (ITC4005QCL):

- On/off, TTL control, break out pin on Laser Output 13W3 Mixed D-Sub Jack, digital output to controller
- Slow signals to acquire
    - Temperature, break out pin on TEC Output 17W2 Mixed D-Sub Jack, analog input to beckhoff
    - Current set point, BNC connected to **Analog CTL Out (BNC)**, analog output to controller
- Set modulation: BNC connected to **Modulation input "Modulation In" [-10 to 10 V]**, beckhoff analog output
    - Could add later, to CDS DAC, no need to implement now

Laser cooling system

- Provide 12 V / 1 A
- Power on and off
- Monitor current

Photodiode interface

- Provide stabilized +/- 15 V to PD board (D2500105)
- Concentrate 2x differential signals per PD from D2500105 into four channels in one DB9 to ADC: *do we do this in slow controls…?*

Beam path:

- 1x PM101 Power Meter Controller *[in design]*
- 1x PM102 QPD Controller *[in design]*
- 1x URS50BCC Rotation Stage Controller *[in design]*
- 1x ILS100CC Linear Translation Stage controller *[in design, maybe need separate 24V supply]*
    - This draws 2.2A (max 4A) and will be the largest Beckhoff current draw, and can have a separate 24V supply for the motors so that they don't contaminate the Beckhoff signals.
- 1x MFF101 Flipper Controller *[in design, only need one]*
    - Instructions for set up in T1700462)
- X and Y direction of picomotor *[Check for separate nearby pico controller]*

PEM (maybe):

- Temperature, use normal (room temp) temperature sensor somewhere inside the enclosure

Feedthrough:

We will need a feedthrough for all cables, the size of this electrical feedthrough panel should be made of two panels, each 9" x 4" with QTY 4 mounting hotels for 6-32 screws, to fit in the 3" x 18" hole in the enclosure. Ideally one panel will be left blank so that any future additions could be added to it.

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Picomotors:

Picomotor cables will go straight to the CO2 pico controllers that have 4 slots spare each.
This is ~30m straight shot so will be more like 40m after cable routing.
As noted in the picomotor cable resistance wiki, we'll need to aim to keep the lead resistance lower than 2ohms to keep the picomotor working as expected. A resistance higher than this will distort the waveform, meaning it won't turn so reliably, as these mirrors are out of vacuum this isn't a major issue.
Can use a thicker wire like 22 gauge to control the picomotor reliably at this distance. 22awg at 40m (130ft) = 2.1ohm.

Fast ADC/DAC:

ADC:

- 2x Photodoides AC OUT
- 2x Photodoides DC OUT

DAC:

- 1x Output that can be used for stabilization

Safety:

The safety systems are different at LLO and LHO.

- Enclosure panel sensors
- Emergency stop
    - Both a button that can be pressed and signal sent to the whole LVEA, and signal that comes from the master button to stop CHETA laser.

Cables:

- Ethernet
    - Beckhoff and safety signals are all via ethernet, ethernet cables are made in house, buy a new reel of ethernet cable for each site.
- ADC/DAC cables
    - Can be looped into a CO2 chassis, check what is the distance? And how we cna add them in,