
Summary of the connections for the Mode Cleaner servo in the E2E model.
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Mode-Cleaner Controller (MCC) has several functions and, therefore,
there are several inputs and outputs of MCC.

The 1st feedback loop serves its primary function - to lock the Mode-Cleaner.

This loop can be described as follows:

- 1) Mode-Cleaner (MC) reflects the light which has the leakage light from inside the Mode-Cleaner. The leakage light carries information about the MC length.
- 2) The MC reflected light is collected by the RF-tuned photodiode, which is a part of the Pound-Drever locking scheme of MC.
- 3) The output of the RF-tuned photodiode is mixed with the signal from the local oscillator, which has the same frequency as the corresponding EOM (side-band generator) on the IOO table. The demodulated signal is sent to the input of MCC.
- 4) Inside MCC the signal is properly shaped by the transfer function of the MCC. This filtering is implemented in the E2E model using digital filter module. (The parameters for this module will be given to me by Dale Oimett later this week.)
- 5) The filtered output of MCC, MC length error correction signal, is sent to the suspension controller (SC) of the Mode-Cleaner vertex mirror. This output is summed with the LSC frequency control inside the suspension controller. The result becomes the input (x-control force) for dynamics of the mirror position. The actual x-control force is a sum of the above and the x-control force of the local damping system.
- 6) The damper is a sum of two filters: velocity-proportional and 10-pole Chebyshev filter. In the suspension controller the control voltages are transformed into the corresponding degrees of freedom. The MC SC produces the three degrees of freedom: POSITION, PITCH and YAW.
- 7) The three degrees of freedom are supplied to the mirror module to become the mirror's degrees of freedom in E2E.

All the above corresponds to just 1 output of MCC.

The second function of the MCC is to correct the offset of the PSL laser frequency stabilization system (FSS).

MCC also forms another output - Wide-Band Signal (WBS).
The bandwidth of this 2d output is 2Hz - 100 kHz.
This signal is sent to the VCO (voltage-controlled oscillator) of the PSL.
The output of VCO is sent to the AOM of the PSL.

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There are also two more inputs to the MCC from outside IOO:

The first is the Additive Offset (700Hz - 15kHz) from the LSC.
The second is parameter setting from VME control (also belong to LSC).

