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The Monitoring Board for the Calibration System of the Muon $g-2$ Experiment

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The new Muon $g-2$ Experiment (E-989) at Fermilab will measure the muon anomalous magnetic moment, $a_\mu = \frac{g-2}{2}$, to an unprecedented precision of 0.14 parts per million (ppm). To achieve a statistical uncertainty of 0.1 ppm, the redesigned experiment will benefit from upgraded detectors and data acquisition electronics that will handle the larger volumes of data. Moreover, the 24 calorimeter stations used to measure the energy and arrival time of the decay positrons will require a continuous calibration and monitoring of their gain which can vary on both the millisecond and hour long timescale. This correction is handled by a laser source and light distribution system which provides light pulses directly into each PbF_2 crystal of a 6×9 calorimeter matrix. Silicon photomultipliers along with other optical detectors are used to read the output signal and to monitor the laser along its transmission path. A custom electronic board has been designed to provide the detector's bias and high voltages, stabilize the gain with respect to environmental parameter variations and process the output signals needed to perform the data readout. The architecture of this monitoring board as well as the performance of a preliminary implementation will be presented.

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