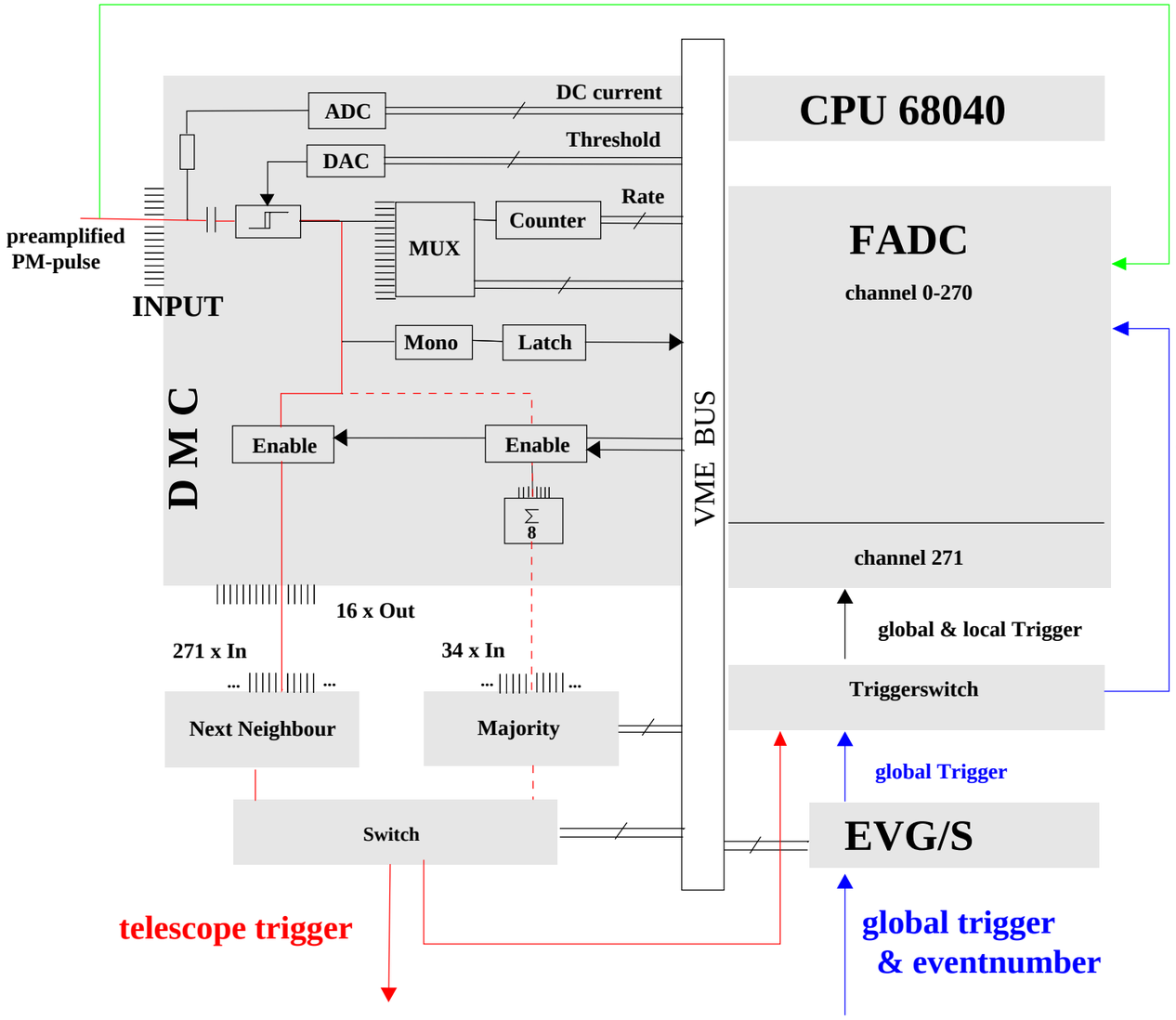
TELESCOPE TRIGGER AND READOUT ELECTRONICS



Each telescope of the stereoscopic system is equipped with the identical trigger and readout electronics. It is controlled by a local CPU. The trigger electronics of a telescope is built up from essentially 3 different kinds of logic modules: the Discriminator–Monitor Cards (DMC), a majority unit, and since spring 1997 an additional topological trigger unit. Each DMC provides 16 channels. They contain discriminators, a multiplexed scaler, ADCs for the measurements of the DC-currents of the PMTs , and a latch register, which is accessible by the VME–Bus and gives the information on which channels have triggered. The thresholds of the discriminators can be set independently by VME–access. By software control each single channel can be excluded independently from the trigger decision. This feature is used to disable single channels dynamically from the trigger, when they are affected by direct light from stars. The digital discriminator signals are summed up in groups of 8 channels on the discriminator cards, and routed to the majority unit, which releases the local telescope trigger. There the outputs of all DMCs are summed up and discriminated with a software adjustable threshold, corresponding to the minimal number of pixels required for the trigger. Alternatively, additional digital outputs of the discriminators are fed into a topological trigger, which requires at least two triggering pixels to be neighbors. The module of the neighbor trigger is based on programmable gate arrays. With this logic, accidental background triggers, caused by the light of the night sky, are reduced by a factor of about 48, while genuine γ–showers are maintained to more than 95 %, given a fixed threshold (Köhler et al. 1996) . The implementation of the neighbor trigger allows to lower the discriminator thresholds by about 25 % and to reduce the energy threshold of the telescopes, resulting in an increase of the detection rate for γ–showers. In the normal operation mode the topological trigger is used. However for special run modes the trigger can be switched automatically by software to the majority mode.

Presently the duration of the discriminator output signals is set to 15 nsec, resulting in an effective coincidence window of 12 nsec. The delay of the trigger signal with respect to the PMT–pulses amounts to 60 to 90 nsec, depending on the trigger mode. The local trigger signals of the telescopes are then routed to the central station, where the global trigger is formed and sent back to the telescopes.

Together with the global trigger a common eventnumber is recieved by the so called Eventgraderslave (EVG/S). This number is used later on to synchronize the datastream at the server. The global trigger stops the FADCs and starts the readout of the electronics. In systemmode the local and global trigger are recorded in the 272st-FADC-channel. This feature allows to reconstruct the relative telescope timing. For calibration it is possible to switch between system and single telescope trigger.