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The initialization and control system of the ATLAS Level-1 Muon Barrel Trigger System

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The ATLAS Level-1 Barrel system is devoted to identify muons crossing the two outer Resistive Plate Chambers stations of the Barrel spectrometer, passing a set of programmable pT thresholds, to find their position with a granularity of Delta EtaX Delta Phi=0.1X0.1, and to associate them to a specific bunch crossing number. The system sends this trigger information to the Central Trigger Processor within a fixed latency of about one microsecond. The system is also responsible to record Resistive Plate Detector hits, for monitoring purposes and to provide muon track position with a spatial resolution of about 1 cm to higher level triggers and to refine precision chambers' data. The system is hardware based but its high level of programmability and its deployment in the cavern poses many requirements to its control data path. The control system has to be reliable, it has to survive to an amount of radiation comparable to space equipment, and has to connect to about 800 on-detector processor destination boxes spread over a large area. The choice which has been implemented uses a CANbus based system, with microcontroller-based destination nodes taking care of initialize and control local devices accessible via JTAG, I2C and SPI local buses. Sixty-four CAN chains of up to 16 nodes make up the LVL1 Barrel control system. Configuration data is stored locally for fast initialization running in parallel over all nodes. Linux-based PCs, integrated in the ATLAS TDAQ system, run initialization and control applications reading configuration data from an Oracle database. A detailed description of the hardware and software organization of the system is done, with results from the setups used for chamber commissioning.

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