8/13/96
B.Baldin
S.Hansen

D0 MUON READOUT ELECTRONICS FOR RUN II

1. INTRODUCTION

The Muon Readout Electronics is that part of the Muon Electronics residing in the D0 Moveable Counting House (MCH). The other part, the Front-End Electronics resides on the detector platform and is detector dependent. The design of the D0 Muon Readout Electronics for the Run II is based on the following assumptions:

- use of existing VME 9U crates and custom backplanes for the readout electronics in the MCH

- use of existing cabling including 50 cond. twisted and flat cables and Astro ribbon coaxial cables for data transfer and timing control

- use of existing cabling and hardware for D0 monitoring and control system

The Muon Readout Electronics design is intended to provide data readout for all muon detectors. The Muon Readout Electronics resides in the 9U VME crates in MCH3. Each crate represents a Geographic Sector (GS) and consists of the following VME based 9U modules: Muon Readout Card (MRC), Muon Fanout Card (MFC), VME Buffer Driver (VBD), Vertical Interconnect module (VI) and VME Master, a Motorola 680xx based microcomputer. The MFC handles the communication between the D0 Trigger Framework (TFW) and the front-ends and distributes all the necessary timing and control signals over an auxiliary bus using uncommitted lines on the VME J2 connector. The MRC communicates with the on-platform electronics of various muon detectors including the mini-drift chambers, A-stub counters, CF scintillation counters, EF pixel counters, muon Level 1 trigger system and WAMUS drift chambers. The connection to the on-platform electronics uses the existing 50 conductor twist and flat cables and coaxial ribbon Astro cables. Only MFC and MRC require any design effort. The rest of the modules are either commercially available or are exisiting D0 DAQ modules. The conceptual design of MFC and MRC is described as follows:

- housed in 9U 280 mm deep single width VME based modules

- VME Slave interface with 16/32 bit data transfers

- interrupt logic to provide communication to 68xxx VME Master

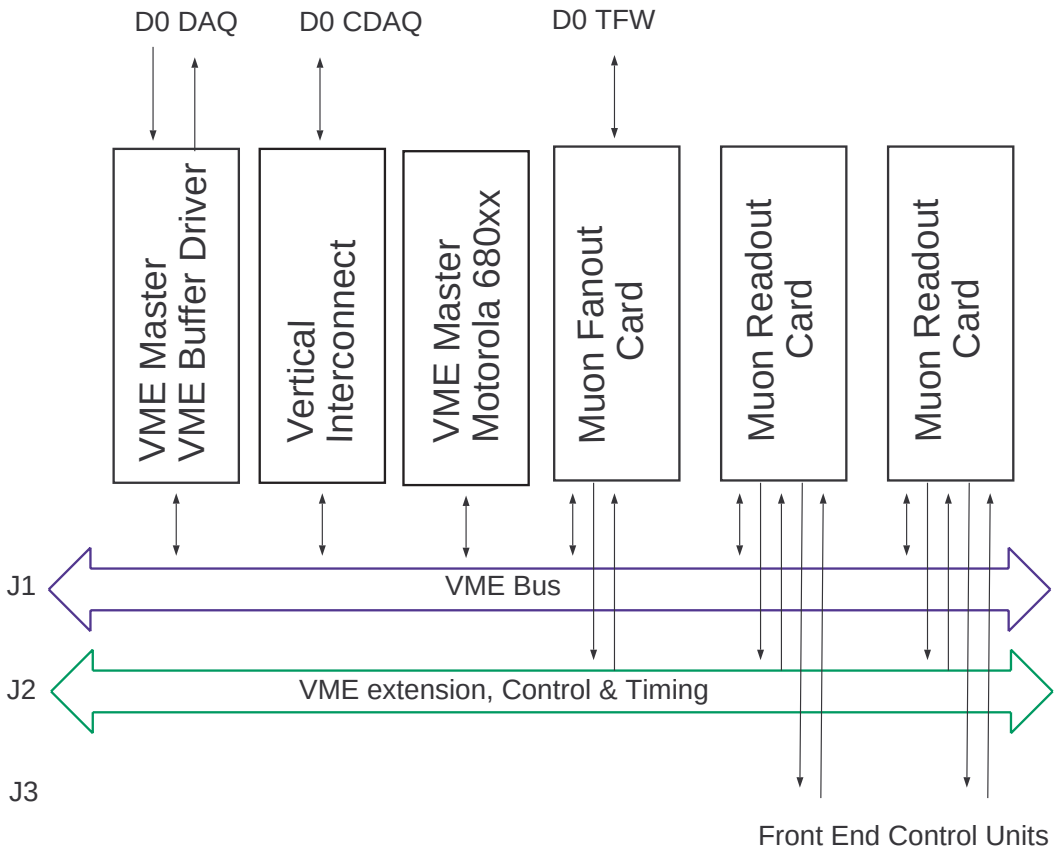
- wide bandwidth coaxial cable connections for timing and data using adaptive cable equalizers and twisted ribbon cable connections for slow control signals using single op amp signal recovery

- Cypress high speed serial links to transfer data to MRC @ 160 Mbit/s

- bi-directional asynchronous links to front-end modules to provide control and communication with DSP

- stand-alone calibration and test capabilities

For additional information see D0 Notes 2370, 2705, 2888.



2. DESIGN GOALS.

There are up to 17 Readout Crates in the Muon system. Each crate consists of one MFC and several MRC modules (see figure above). The maximum number of MRCs in the crate is 12. The total number of MRC modules is about 100. The total number of MFC modules is about 20. The Muon Fanout Card has the following functions:

- receives data from Trigger Framework (TFW) using a D0 standard SCL daughter card and distributes it to Muon Readout Cards (MRCs) via auxilliary J2 VME connector lines

- interrupts the VME Master in the Processor Module upon receiving corresponding signals from Front End (FE) Boards, MRC or internal logic

- implements hardware logic to provide stand alone and local test capabilities and data consistency checks.

The Muon Readout Card has the following functions:

- receives data from the Front End Electronics (FE) and stores it in an internal dual ported RAM

- communicates with the Digital Signal Processor (DSP) in the FE via a Universal Asynchronous Receiver/Transmitter (UART)

- transfers timing and control signals from the Muon Fanout Card (MFC) to the FE and status information from the FE to the MFC.

Detailed specifications of the MRC and MFC are available upon request. The first prototype MRC board is partially assembled and tested. There is a preliminary schematic design for MFC module.