Mini-Drift Tube Cabling Layout for the D0 Forward Muon System

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1 Introduction

This brief note describes the scheme we have chosen for laying out the cables for the mini-drift tube (MDT) detectors which are the tracking detectors for the D0 Forward Muon System. Cables for A-, B- and C-layer planes are all discussed. Also included is a plan for connecting these cables to the VME crates containing the MDC readout electronics and the high voltage fan-outs located in the trusses.

2 Layout on the detector planes

Recall that our convention is to label octants 0-7 in counterclockwise order from the X-(East) axis. Three items about the layout are noteworthy:

- **A-layer octants have 4 planes, while B- and C-layer octants have only three planes.** This means that there is a one-to-one correspondence between MDT number and ADB number for A-layer, but a staggered correspondence for B- and C-layers.
- **The amplifier-discriminator boards (ADB's) are placed along the diagonals of each octant.** We will order the readout to proceed from the innermost part of the detector towards the outermost part. Thus signals from innermost ADBs will be processed first. Within an ADB, the signals go from the plane closest to the interaction point to the plane furthest from the interaction point. In order to maintain the order from most-inner channel of MDT towards most-outer channel as the signals enter the MDC's, the internal 8-wire cable which goes from the MDT to the ADB for left-hand octants has to be flipped relative to the way it is oriented for right-hand octants.
- **The readout electronics (MDC's) have provision for six input cables per module.** It was assumed in the electronics design that all signals on all six cables arrive with equal delays, so that there are no individual channel-by-channel delay adjustments within the MDC.

Type	Name	Description	Octants
VME Crates:	MDNATE	(Muon MDT North A Top East)	NA0,NA1
	MDNATW	(Muon MDT North A Top West)	NA2,NA3
	MDNABW	(Muon MDT North A Bottom West)	NA4,NA5
	MDNABE	(Muon MDT North A Bottom East)	NA6,NA7
	MDSATE	(Muon MDT South A Top East)	SA0,SA1
	MDSATW	(Muon MDT South A Top West)	SA2,SA3
	MDSABW	(Muon MDT South A Bottom West)	SA4,SA5
	MDSABE	(Muon MDT South A Bottom East)	SA6,SA7
	MDNBTE	(Muon MDT North B Top East)	NB0,NB1
	MDNBTW	(Muon MDT North B Top West)	NB2,NB3
	MDNBBW	(Muon MDT North B Bottom West)	NB4,NB5
	MDNBBE	(Muon MDT North B Bottom East)	NB6,NB7
	MDNBTE	(Muon MDT South B Top East)	SB0,SB1
	MDNBTW	(Muon MDT South B Top West)	SB2,SB3
	MDSBBW	(Muon MDT South B Bottom West)	SB4,SB5
	MDSBBE	(Muon MDT South B Bottom East)	SB6,SB7
	MDNCTE	(Muon MDT North C Top East)	NC0,NC1
	MDNCTW	(Muon MDT North C Top West)	NC2,NC3
	MDNCBW	(Muon MDT North C Bottom West)	NC4,NC5
	MDNCBE	(Muon MDT North C Bottom East)	NC6,NC7
	MDSCTE	(Muon MDT South C Top East)	SC0,SC1
	MDSCTW	(Muon MDT South C Top West)	SC2,SC3
	MDSBBW	(Muon MDT South C Bottom West)	SC4,SC5
	MDSCBE	(Muon MDT South C Bottom East)	SC6,SC7

Table 1: A-, B- and C-layer Crate Names.

3 Layout in the trusses

For every layer, there is one VME crate located near each of the four corners of the EF steel (A- and B-layers) or in the EMC truss (C-layer), times two for North and South. Thus each VME crate services two octants. The names for these twenty-four crates as well as the octants they service are given in Table 1.

Table 2 shows the layout of a VME Crate.

For A-layer, there are 32 ADBs per octant (32 individual MDTs in 4 planes per octant). Six ADBs are connected to a single MDC. This means that 6 MDCs are needed for each octant, so that the VME crates each contain 12 MDCs, as they service two octants. So, for example, octant NA0 has ADBs 1-6 connected to the MDC in slot 5, ADBs 7-12 connected to the MDC, etc, as shown in more detail in Table 3. The other VME crates for A-layer are similarly arranged.

Slot	Module
1	68040
2	x
3	MDRC
4	x
5	MDC
6	MDC
7	x
8	MDC
9	MDC
10	x
11	MDC
12	MDC
13	x
14	MDC
15	MDC
16	x
17	MDC
18	MDC
19	x
20	MDC
21	MDC

Table 2: Slot Assignments for the MDT VME Crates.

Octant	ADBs	VME Slot
NA0	1- 6	5
	7-12	6
	13-18	8
	19-24	9
	25-30	11
	31-32	12
NA1	1- 6	14
	7-12	15
	13-18	17
	19-24	18
	25-30	20
	31-32	21

Table 3: Layout for VME Crate MDNATE and other A-layer crates.

Octant	ADBs	VME Slot
NB0	1- 6	5
	7-12	6
	13-18	8
	19-24	9
	25-30	11
	31-33	12
NB1	1- 6	14
	7-12	15
	13-18	17
	19-24	18
	25-30	20
	31-33	21

Table 4: Layout for VME Crate MDNBTE, and other Top B-layer crates.

Octant	ADBs	VME Slot
NB4	1- 6	5
(SB4)	7-12	6
	13-18	8
	19-24	9
	25-30	11
	31-33	12
NB5	1- 6	14
(SB5)	7-12	15
	13-18	17
	19-23	18

Table 5: Layout for VME Crates MDNBBW and MDSBBW.

B- and C-layer MDT octants have only 3 planes of MDTs, so that each ADB will service more than one MDT number. For B-layer, the top 6 octants have 44 MDTs in 3 planes, serviced by a total of 33 ADBs. The bottom two octants have 30 MDTs in 3 planes, which are serviced by a total of 23 ADBs. Typical crate layouts for B-layer are given in Table 4, Table 5 and Table 6.

For C-layer, the top 6 octants have 48 MDTs in 3 planes, serviced by a total of 36 ADBs. The bottom two octants have 30 MDTs in 3 planes, which are serviced by a total of 23 ADBs. Typical crate layouts for C-layer are given in Table 7, Table 8 and Table 9.

For high voltage, each octant has one HV power supply connected, but for reliability reasons, we have 4 (A-layer), or 3 (B- and C-layer) high voltage cables running to the octants from fanouts. For each layer, there is a single Reynolds cable running out to the layer and

Octant	ADBs	VME Slot
NB6	1- 6	5
(SB6)	7-12	6
	13-18	8
	19-23	9
NB7	1- 6	14
(SB7)	7-12	15
	13-18	17
	19-24	18
	25-30	20
	31-33	21

Table 6: Layout for VME Crates MDNBBE and MDSBBE.

Octant	ADBs	VME Slot
NC0	1- 6	5
	7-12	6
	13-18	8
	19-24	9
	25-30	11
	31-36	12
NC1	1- 6	14
	7-12	15
	13-18	17
	19-24	18
	25-30	20
	31-36	21

Table 7: Layout for VME Crate MDNCTE and other Top C-layer crates.

then a 1-to-4-fold fanout for each of the eight octants. The name of the six 1-to-4-fold fanouts are given in Table 10.

Octant	ADBs	VME Slot
NC4	1- 6	5
(SC4)	7-12	6
	13-18	8
	19-24	9
	25-30	11
	31-36	12
NC5	1- 6	14
(SC5)	7-12	15
	13-18	17
	19-23	18

Table 8: Layout for VME Crates MDNCBW and MDSCBW.

Octant	ADBs	VME Slot
NC6	1- 6	5
(SC6)	7-12	6
	13-18	8
	19-23	9
NC7	1- 6	14
(SC7)	7-12	15
	13-18	17
	19-24	18
	25-30	20
	31-36	21

Table 9: Layout for VME Crates MDNCBE and MDSCBE.

Type	Name	Description
HV Fan-outs:	MDNAHV	(Muon MDT North A)
	MDSAHV	(Muon MDT South A)
	MDNBHV	(Muon MDT North B)
	MDSBHV	(Muon MDT South B)
	MDNCHV	(Muon MDT North C)
	MDSCHV	(Muon MDT South C)

Table 10: A-, B- and C-layer HV fanout Names.