

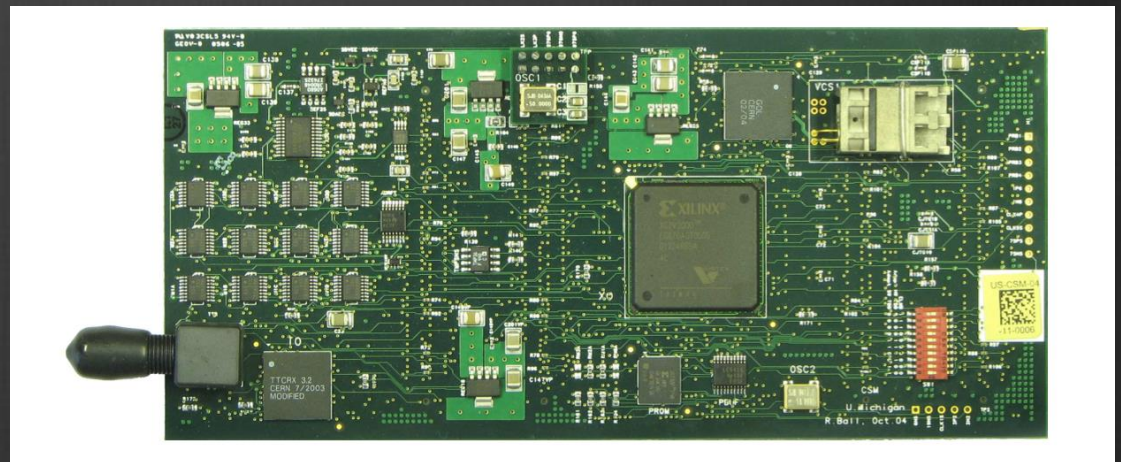
ATLAS RPC Electronics

Adrian Sanchez

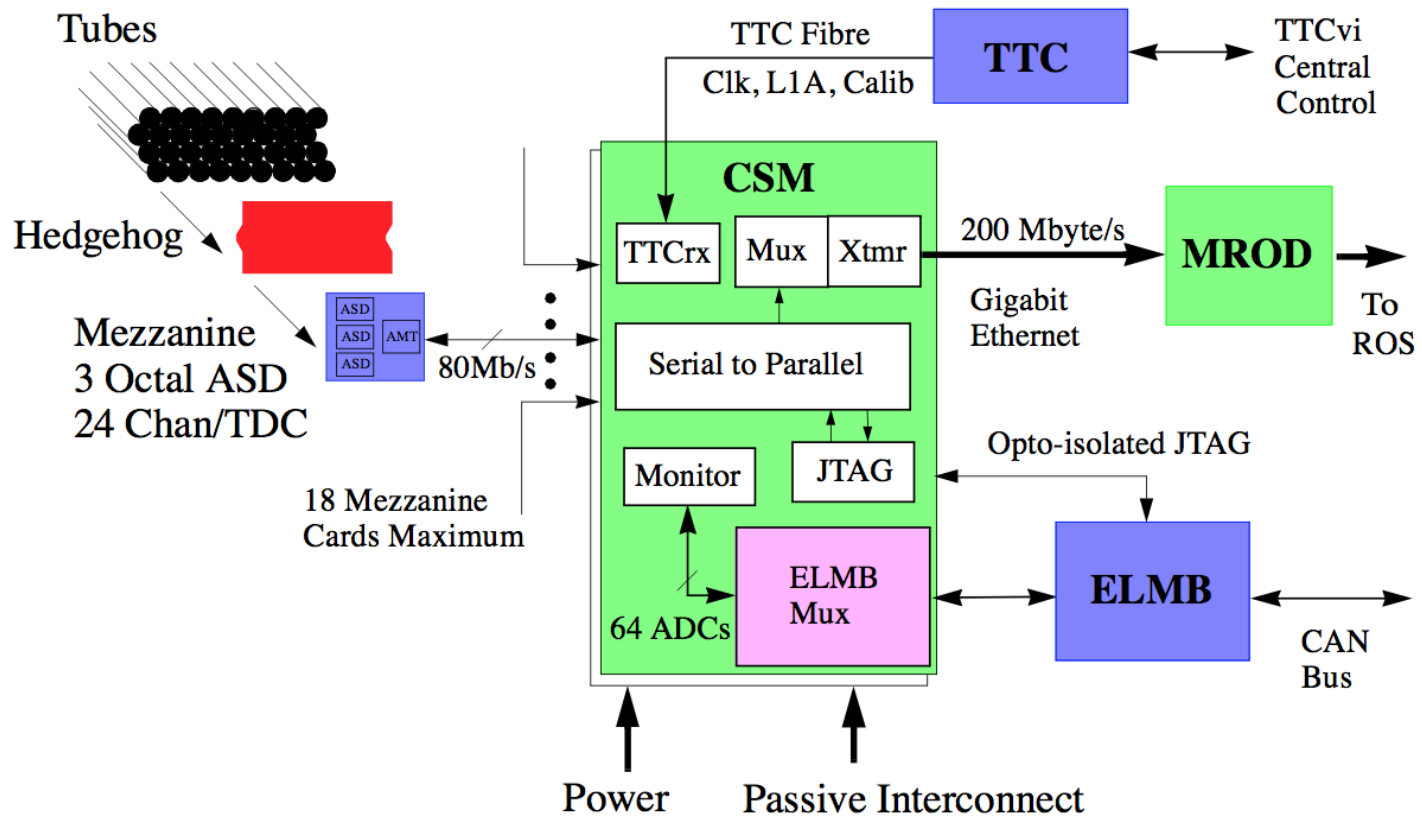
CSM Firmware

- ❶ Switch from 2010012209 (old) to new CSM firmware
- ❷ Parity errors were encountered with new firmware
- ❸ Ran many tests to find if the parity errors were derived from hardware or firmware

CSM



Hardware

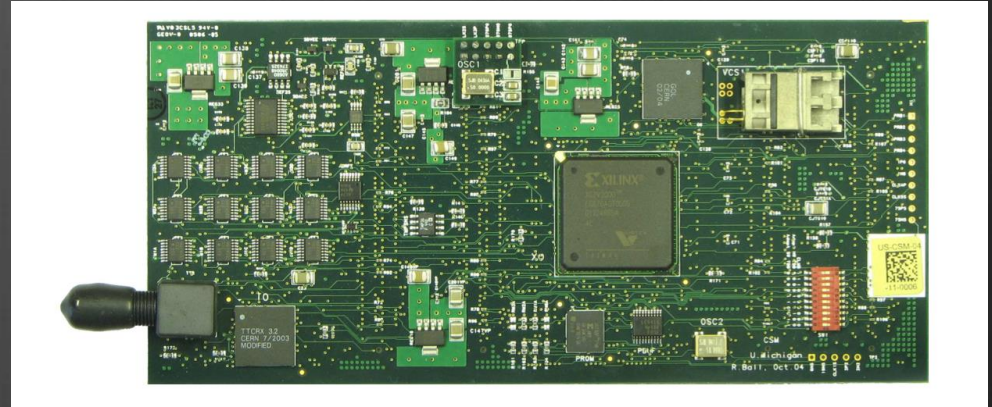


Hardware

Mezzanine



CSM

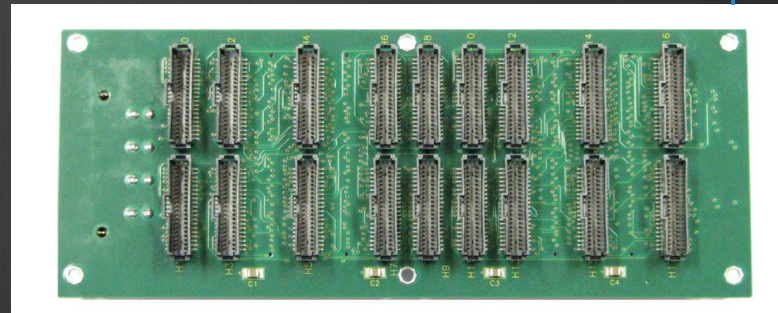


Cable

18 Mezzanines to 1
CSM Motherboard

Direct
Connection

CSM Motherboard



CSM Firmware Results

⊗ Problem is in the new firmware

CSM Motherboard port with parity errors using 2014091614 firmware	2014091614 firmware	2010012209 firmware	Replicated parity error with 2014091614 firmware?	Did Shut down and extra force reduce parity error?	Did Shut down and disconnect/reconnect reduce parity error?
2	parity error	no error	Yes	No	No
5	parity error	no error	Yes	No	No
8	parity error	no error	Yes	No	No
11	parity error	no error	Yes	No	No
15	parity error	no error	Yes	No	No

CSM Firmware Results

⊗ The parity errors vary across differing CSMs

CSM Motherboard Port	US-CSM-01-16-0229	US-CSM-04-16-0001	EU-CSM-04-15-0300
0	parity error	parity error	parity error
1	no error	no error	no error
2	no error	no error	no error
3	no error	parity error	parity error
4	no error	no error	parity error
5	parity error	parity error	no error
6	no error	no error	parity error
7	no error	no error	no error
8	no error	parity error	parity error
9	no error	parity error	parity error
10	no error	no error	no error
11	parity error	parity error	parity error
12	no error	no error	parity error
13	parity error	parity error	parity error
14	no error	no error	no error
15	no error	no error	no error
16	no error	no error	no error
17	parity error	parity error	parity error

CSM Firmware Results

- ❁ Parity error depends on length of cable between mezzanine and motherboard

CSM Motherboard Port	1.4 meter cable	1 meter cable
0	no error	no error
1	parity error	no error
2	parity error	no error
3	parity error	parity error
4	parity error	parity error
5	parity error	no error
6	no error	no error
7	no error	no error
8	no error	parity error
9	parity error	parity error
10	no error	no error
11	parity error	parity error
12	parity error	no error
13	parity error	no error
14	parity error	no error
15	parity error	no error
16	no error	no error
17	parity error	parity error

CSM Firmware Summary

- ⊗ It is believed problem lies in the firmware
 - This is why when we switch to the old firmware, the errors are no longer produced
 - Manipulating hardware did not help
- ⊗ Reason parity error varies across CSMs is because the hardware is not absolutely identical
- ⊗ Signal is being measured near its edges and producing parity errors
 - This is why when we switch the cable length, parity error behavior changes.

TDC Shift

- Found TDC Shift between old firmware and new firmware

```
All Units are in nanoseconds
Difference is 2014032615(new) - 2010012209(old)

                2010012209      2014032516      Difference
Mezzanine 00:  208.205032      210.711349      2.506317
Mezzanine 01:  208.639832      212.345718      3.705887
Mezzanine 02:  211.210266      211.019455      -0.190811
Mezzanine 03:  207.519714      209.393082      1.873367
Mezzanine 04:  209.815796      210.183411      0.367615
Mezzanine 05:  210.641602      209.953384      -0.688217
Mezzanine 06:  208.115677      209.843857      1.728180
Mezzanine 07:  207.956497      209.733948      1.777451
Mezzanine 08:  212.072708      211.992294      -0.080414
Mezzanine 09:  207.192459      212.233383      5.040924
Mezzanine 10:  213.013489      212.797470      -0.216019
Mezzanine 11:  211.656479      209.112732      -2.543747
Mezzanine 12:  212.041428      210.782852      -1.258575
Mezzanine 13:  211.996506      208.964035      -3.032471
Mezzanine 14:  211.932556      210.317383      -1.615173
Mezzanine 15:  211.801254      210.370956      -1.430298
Mezzanine 16:  209.094223      211.822708      2.728485
Mezzanine 17:  209.491165      209.925232      0.434067
```

Learning About ATLAS DCS

The screenshot displays the ATLAS DCS monitoring interface. The top left shows navigation buttons and the date/time (06-11-2014 18:36:06). The top right shows the LHC status (READY) and a table of objects with their times.

MDT Status Table:

MDT	Status	Warning
MDT BA	STANDBY	OK
MDT BC	STANDBY	OK
MDT EA	STANDBY	WARNING
MDT EC	STANDBY	WARNING
INFRASTRUCTURE	NOT_READY	WARNING

Monitored Drift Tubes: The central part of the interface shows diagrams of drift tubes for EC, BC, BA, EA, EO, EM, EE, EI, and JTAG. A legend below indicates their states: READY (nom. HV), STANDBY (safe HV), LV ON, HV OFF, SHUTDOWN, RAMPING, NOT READY (MIX), UNKNOWN, and Status.

MUON SYSTEMS: The bottom left shows a detailed status table for various muon systems.

System	Status	Warning
CSC	E	
End-A	E	
End-C	OK	
INF	W	
MUON	F	
CSC	E	
MDT	W	
RPC	F	
TGC	F	
MUO	W	
BIS	OK	
Caen	OK	
MDT	W	
Bar-A	OK	
Bar-C	OK	
End-A	W	
End-C	W	
INF	W	
RPC	F	
Bar-A	W	
Bar-C	W	
End-A	F	
End-C	F	
INF	F	
RPC	W	
Bar-A	W	
Bar-C	W	
End-A	F	
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Bar-A	W	
Bar-C	W	
End-A	F	
End-C	F	
INF	F	
RPC	W	
Bar-A	W	

Learning About ATLAS DCS

Back Home daits 06-11-2014 18:35:21

LHC
 LHC READY W
 No Beam
 Energy: 449.8 GeV
 Injection Permit
 ATLAS is beam-safe ?
 Stable Beams Flag ?
 Handshake

S	Object	Time	
W	MDT INNER:SECTOR13	2014.11.06 17:35:01	W
W	MDT OUTER:SECTOR04	2014.11.06 18:06:30	E
W	MDT DISTRIBUTION-RACK69	2014.11.06 18:08:36	S
W	MDT DISTRIBUTION	2014.11.06 18:08:36	D
W	MDT ENDCAP-BRANCH10	2014.11.06 18:10:25	U
W	MDT ALIGNMENT BC	2014.11.06 18:29:46	

EOL1C01 INITIALIZED OK ✓

Zoom: 100

3D View All connected

MUON SYSTEMS

CSC	MDT	TGC	RPC
CSC	MDT	TGC	RPC
End-A	Bar-A	End-A	Bar-A
End-C	Bar-C	End-C	Bar-C
INF	INF	INF	INF
End-A	End-A	Sys	Gas
End-C	End-C		Lvl1
INF	INF		DDC
			Caen
			Rack
			DQ

ATLAS-LHC

ATLAS	U	Stable Beam OFF
LHC	W	dump
MuonBG	W	adjust
DCS BE	E	injection

Chamber JTAG Initialization Status EOL1C01

INITIALIZED OK

MDM Node: EOL1C01

Dig IO (asynchronous update on change)

 CSM Error (0x10) I2C Fail(0x20) GOL/TTC not ready (0x4) DigIO word 0.0

Reply Status

 LEN error AMT Phase Error
 CSM error AMT Phase
 GOL error AMT Status
 AMT error ASD error
 ASD error

Results

MezzMask: 0x3FFF
replyStatus: 0x00000000
csmVersion: 0x25
csmVersionDate: [2010 1 22 9]
csmErrorStatus: 0x0
csmStatus: 0x10007
dllVersion: 0x13060600

InitMode: Pulse(55) Pulse(AA)

Custom Threshold: none

MezzMask error: x00000

CSM Status

 GOL@50MHz
 80 MHz
 DAQ On
 Db-ASD-Offsets
 Db-AMT-Phases
 GOL50@25
 Single Mezz Init Mode

CSM Error Status

 GOL not ready CSM error
 TTC not ready GOL not locked
 Clock not locked State not idle
 TTC load error Sample Phase Error
 I2C failure CSM Cmd Readback
 TTC I2C Comp error

AMT Phase Settings

phaseErrors: 0x0

8	8	8	8	8	8	8	8	8	8
8	8	8	8	8	-	-	-	-	-

Misc.

Def. MezzMask: 0x3FFF Def.VersionDate: Vref: 2.500 V

Low Level Diagnostics and Expert Actions

Scan AMT
Scan ASD
Init Single
Phase Resample
SeqInfo
DebugMode

Initialization Messages: FE Eltx Monitoring

6.11.2014 17:25 INFO: EOL1C01: initialized

System (MDMFSM): MDM5

Chamber LV: ON OK

Vmon 4.20 V Imon 12.70 A

MDMELMB node state:

MDM state 0.0 Heartbeat 133.0

0: OK. 1: UNKNOWN. 2: EMG. 4: DEAD. 8: PreOperational

DAQ State Information (for MDT chamber):

Dropped: NO Dropped Mezz: NO

Pathologic: NO Mezzanines: --

Reincluding: NO Request Reinclude

Misc.

Next Init: Pulse(55) Pulse(AA)

CustomThreshold **Value:**

Learning About ATLAS DCS

The screenshot displays the ATLAS DCS control interface. At the top, the status bar shows 'LHC READY W' and 'No Beam Energy: 449.9 GeV'. The left sidebar contains navigation tabs for 'ATLAS', 'MDT', 'INFRASTRUCTURE', 'FE ELECTRONICS', and 'EC'. A central 3D model of the detector chamber is shown with a zoom level of 100. The main panel is divided into several sections:

- Chamber Information:** Chamber: EOL1C07, Belongs to System: ATLMDTMDM5, In canbus: EO_C05-08, No of Mezz Cards: 14, Low Voltage is: ON.
- CSM Info Table:**

CSM info	Value
CSM 2.5 V reference value	2.50
CSM temperature	36.46
CSM 1.5 V value	1.51
CSM 2.5 V value	2.51
CSM half plus 5 value	5.09
CSM half minus 5 value	-5.01
CSM 2.5 V reference B value	2.50
CSM 3.3V value	3.31
CSM 1.8 V B value	1.80
CSM V cc value	3.63
- Monitoring Grid:** A 2x7 grid of status boxes for digital inputs (Vdigi) and analog/digital values (Vanal, Temp). Box 5 is highlighted in yellow, indicating a warning.
- Histograms:** Three plots showing the distribution of Temperature, Analog Voltage, and Digital Voltage, all showing a sharp peak at the setpoint.
- MUON SYSTEMS:** A detailed status panel for various detector components (CSC, MDT, TGC, RPC, Gas, Lvl, DDC, Caen, Back, DC) with status indicators (OK, W, F, E).

Learning About TDAQ

ATLAS TDAQ SOFTWARE - Partition part_MDT_all

File Commands Access Control Settings Logging Level Help

Commit & Reload Load Panels

RUN CONTROL STATE RUNNING

Run Control Commands

SHUTDOWN INITIALIZE

UNCONFIG CONFIG

STOP START

HOLD TRG RESUME TRG

Beam Stable ●

Run Information & Settings

Lumi Block

	Number	Rate
Level 1	<input type="text" value="1571741"/>	<input type="text" value="998.00 Hz"/>
HLT	<input type="text" value="1575203"/>	<input type="text" value="998.00 Hz"/>
Recorded	<input type="text" value="1575183"/>	<input type="text" value="998.00 Hz"/>

Information Counters Settings

Run Control Segments & Resources Dataset Tags

Segments & Resources

- MDT enabled
- MDT-MDA-Monitoring enabled
- MDTBarrelA enabled
- MDTBarrelC enabled
- MDTEndcapA enabled
- MDTEndcapA-TTC-RCD-Standalone enabled
- MDT-EA-ddc-RCD enabled
- MDT-EA-Crates enabled
- MDT-EA-01 enabled
- MDT-EA1-RCD enabled
- TIM-EA1 enabled
- MROD-S00-EA1-07 enabled
- MROD-S01-EA1-08 enabled
- MROD-S01-EA1-12 enabled
- MDT-S01-EA1-12-T16 enabled
- EIL2A01 enabled
- EML3A01 enabled

Subscription criteria WARNING ERROR FATAL INFORMATION Expression Subscribe

TIME	SEVERITY	APPLICATION	NAME	MESSAGE
18:22:26	WARNING	MDT-BC4-RCD	MDT-message	MROD-BC4-18-T39 Input 4 BML6C15: 1 TDC MROD Memory Partition Full occurrences (see TDC Readout Off; check your BUSY/TDC-masks)
18:22:26	WARNING	MDT-BC4-RCD	MDT-message	MROD-BC4-18-T39 Input 4 BML6C15: TDC Readout OFF, Mezz Mask 00010
18:17:38	WARNING	MDT-EA1-RCD	MDT-message	MROD-EA1-19-T40 Input 1 EMS1A02: 1 TDC Max Evtdata Size Exceeded occurrences (see TDC Readout OFF)
18:17:38	WARNING	MDT-EA1-RCD	MDT-message	MROD-EA1-19-T40 Input 1 EMS1A02: TDC Readout OFF, Mezz Mask 00040
18:17:12	WARNING	MDT-EC4-RCD	MDT-message	MROD-EC4-11-T15 Input 2 EES1C16: 1 TDC MROD Memory Partition Full occurrences (see TDC Readout OFF; check your BUSY/TDC-masks)
18:17:12	WARNING	MDT-EC4-RCD	MDT-message	MROD-EC4-11-T15 Input 2 EES1C16: TDC Readout OFF, Mezz Mask 00040
18:16:42	WARNING	MDT-EC4-RCD	MDT-message	MROD-EC4-17-T38 Input 5 EOL3C13: TDC Readout OFF, Mezz Mask 00400
18:16:42	WARNING	MDT-EC4-RCD	MDT-message	MROD-EC4-17-T38 Input 5 EOL3C13: 584 TDC Parity errors (total >= 584), Mezz Mask 00400
18:16:42	WARNING	MDT-EC2-RCD	MDT-message	MROD-EC2-11-T15 Input 4 EOL2C05: TDC Readout OFF, Mezz Mask 00200
18:16:42	WARNING	MDT-BA2-RCD	MDT-message	MROD-BA2-10-T10 Input 5 BOS1A06: TDC Readout OFF, Mezz Mask 04000
18:16:42	WARNING	MDT-EC4-RCD	MDT-message	MROD-EC4-14-T23 Input 3 EOL4C15: TDC Readout OFF, Mezz Mask 00020
18:16:40	WARNING	MDT-EC2-RCD	MDT-message	MROD-EC2-18-T35 Input 4 EOL2C07: 1 TDC MROD Memory Partition Full occurrences (see TDC Readout OFF; check your BUSY/TDC-masks)

Clear Message format ERROR DEBUG Visible rows Current ERS subscription sev=ERROR or sev=WARNING or sev=FATAL