

DAVE card status & availability

Digital Atlas Vme Electronics Card

- Originally intended as a “NIM crate replacement” for support of standalone tests
- Evolved into a powerful generic logic card
- Duplication of CTP functionality to replicate CTP trigger conditions in standalone
 - Uses same firmware as CTP
 - Provides you with your “own” CTP in standalone

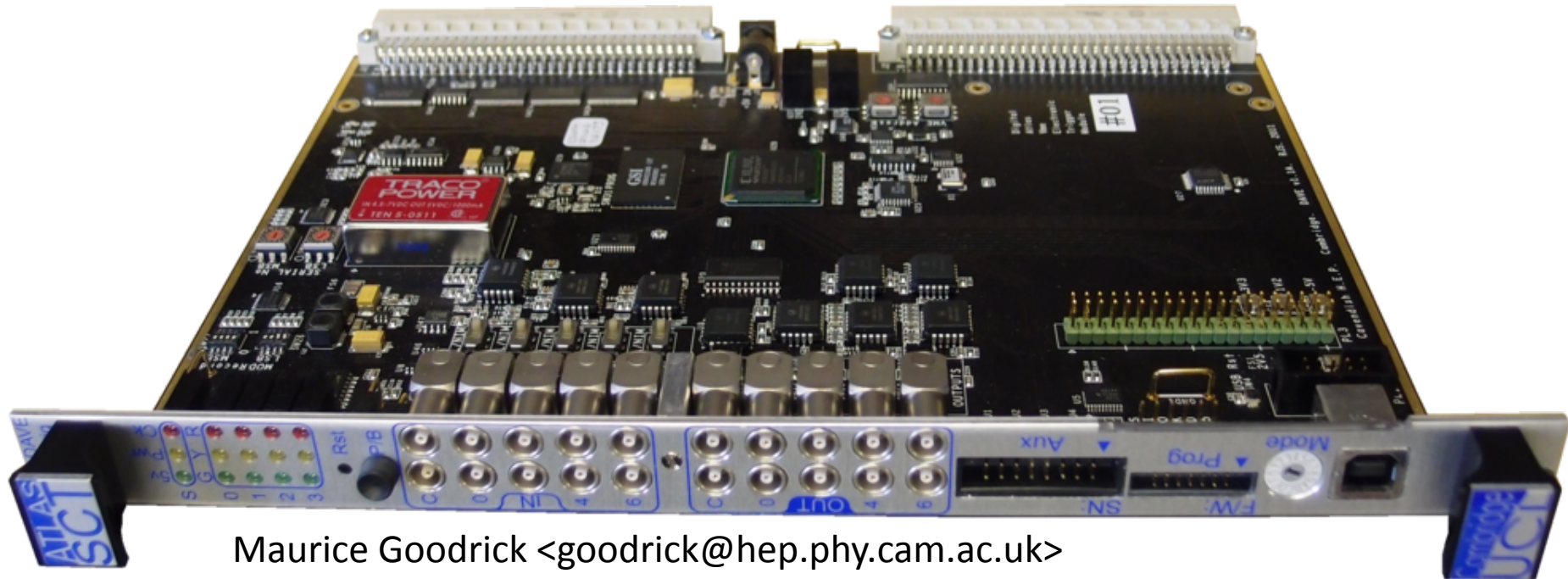
<https://twiki.cern.ch/twiki/bin/viewauth/Atlas/DAVEUserGuide>

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DAVE Module Development

An SCT Project



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Firmware: Matt (CTP f/w from Stefan Haas)

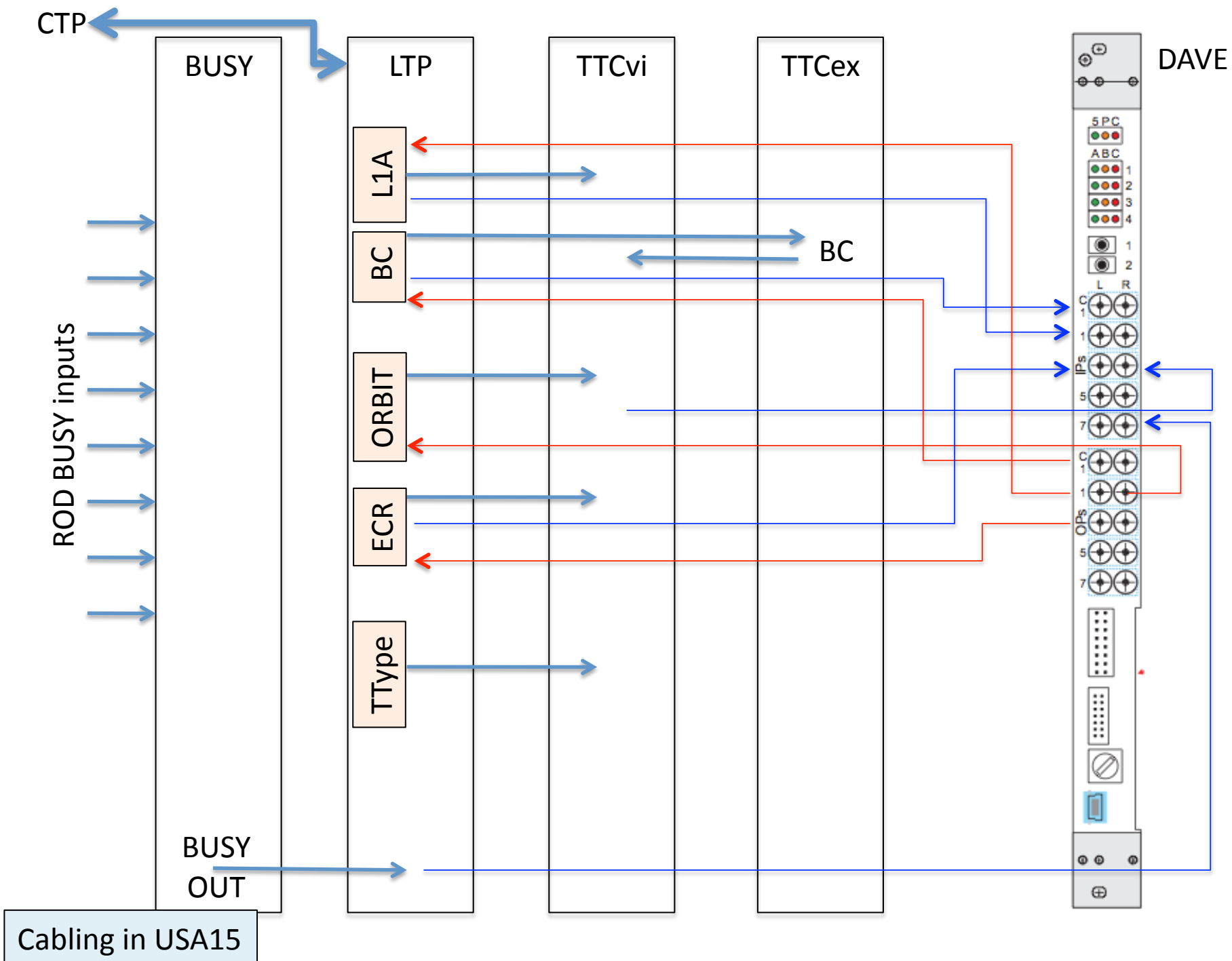
Software: Bruce, Matt, Dave, Vakhtang

Discussions/Ideas: Thilo, Iskander, Bruce H,
Andrej, Carolina

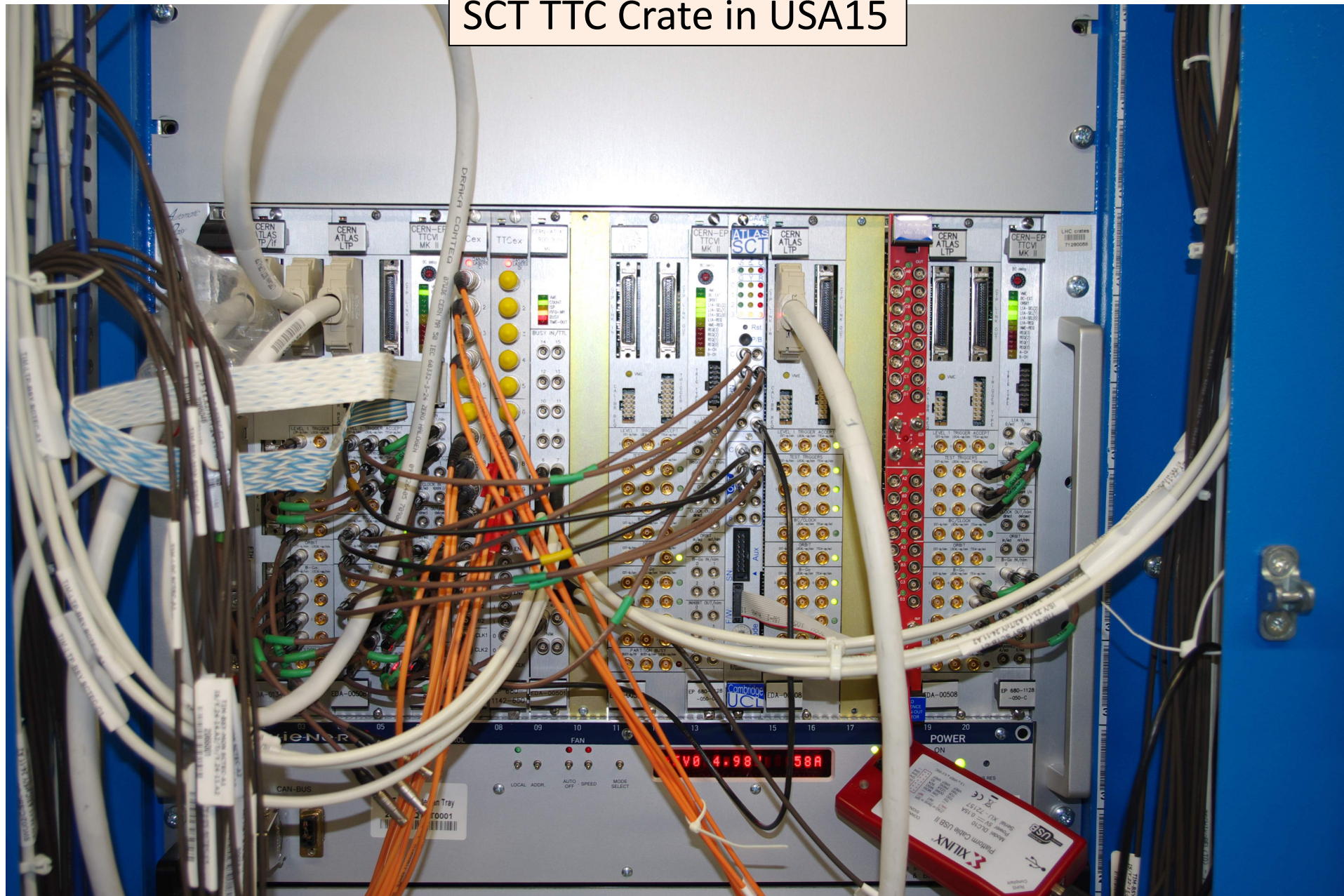
Key Functionalities

(at present)

- Driver for LTP
 - replacement for CTP in standalone
 - Use internal random trigger generator or external NIM/TTL inputs
- Recording of trigger conditions
 - In ATLAS partition or standalone running
 - Sequence of L1As, BCRs, ECRs, BUSY
 - Can record time history of up to 4 million such events
- Playback of recorded trigger conditions
 - Eg drive the SCT in standalone with exactly the same trigger conditions recorded during physics running!



SCT TTC Crate in USA15



Configuration: DaveModuleTest utility

Status registers

```
0: 0xdaf6 56062 Sanity 0xdaf6
1: 0x0000 0
2: 0x0026 38 Firmware Version
3: 0x88c0 35008 Board + hardware Version
4: 0x7f04 32516 Board status
5: 0x113f 4415 FP LEDs
6: 0x0080 128 Lemo Input status
7: 0x0000 0 Lemo Output status
8: 0xb48f 46223 L1ID Lo
9: 0x7c2a 31786 L1ID Hi
10: 0xa30c 41740 Seq add Lo
11: 0x005d 93 Seq add Hi
12: 0x0000 0 Seq count Lo
13: 0x0000 0 Seq count Hi
14: 0x0000 0
15: 0x7777 30583
```

Register block

```
0: 0x0080 128 Lemo input enables
1: 0x0103 259 Lemo output enables
2: 0x0000 0 Internal enables
3: 0x1971 6513 Random seed lo
4: 0x0112 274 Random seed hi
5: 0x0001 1 Random rate
6: 0x0005 5 Simple dead-time
7: 0x0004 4 Complex dead-time level
8: 0x019f 415 Complex dead-time rate
9: 0x00c4 196 BCID offset
10: 0x0000 0 Lemo inputs invert
11: 0x0000 0 Lemo outputs invert
12: 0xa30c 41740
13: 0x005d 93
14: 0x0187 391
15: 0x0000 0
```

Delay25 I2C register: 0

Dave card access

Select an option:

- 1 Load Default config
- 2 Read register
- 3 Write register
- 4 Print registers
- 5 Dump registers to file
- 6 Dump SRAM to file (32-bit sink)
- 7 Dump SRAM to file (16-bit sink)
- 8 Load SRAM from file (16-bit sink)
- 9 Execute SRAM
- 10 Load Colliding BCIDs
- 11 Enable SRAM recording
- 12 Disable SRAM recording
- 13 Print SRAM (16-bit)
- 14 Print SRAM Decoded (32-bit sink)
- 0 Exit menu

```
145,3147,
,3177,317
99,3201,3
203,3205,3207,3209,3211,3213,3215,3217,3219,3221,3223,3225
,3227,3229,3231,3233,3243,3245,3247,3249,3251,3253,3255,32
57,3259,3261,3263,3265,3267,3269,3271,3273,3275,3277,3279,
3281,3283,3285,3287,3289,3291,3293,3295,3297,3299,3301,330
3,3305,3307,3309,3311,3313,3323,3325,3327,3329,3331,3333,3
335,3337,3339,3341,3343,3345,3347,3349,3351,3353,3355,3357
,3359,3361,3363,3365,3367,3369,3371,3373,3375,3377,3379,33
81,3383,3385,3387,3389,3391,3393]
```

```
0 5540 0055 0000 0000 AAAA AAAA AAAA AAAA 00AA AAAA
10 AAAA AAAA AAAA 00AA AAAA AAAA AAAA AAAA 00AA AAAA
20 AAAA AAAA AAAA 00AA 0000 5000 5555 5555 5555 5555
30 5005 5555 5555 5555 5555 5005 5555 5555 5555
40 5005 5555 5555 5555 5555 0005 0000 0000 5550 5555
50 5555 5555 0555 5550 5555 5555 5555 0555 0000 8000
60 AAAA AAAA AAAA AAAA 802A AAAA AAAA AAAA AAAA 802A
70 AAAA AAAA AAAA AAAA 802A AAAA AAAA AAAA AAAA 002A
80 0000 5400 5555 5555 5555 5555 5401 5555 5555 5555
90 5555 5401 5555 5555 5555 5555 5401 5555 5555 5555
100 5555 0001 0000 0000 5554 5555 5555 1555 0140 5554
110 5555 5555 1555 0000 0000 A000 AAAA AAAA AAAA 00AA
120 A00A AAAA AAAA AAAA 00AA A00A AAAA AAAA AAAA 00AA
130 A00A AAAA AAAA AAAA 00AA 0000 0000 5500 5555 5555
140 5555 5005 5500 5555 5555 5555 5005 5500 5555 5555
150 5555 5005 5500 5555 5555 5555 0005 0000 0000 5550
160 5555 5555 5555 0555 5550 5555 5555 5555 0555 0000
170 8000 AAAA AAAA AAAA AAAA 802A AAAA AAAA AAAA AAAA
180 802A AAAA AAAA AAAA AAAA 802A AAAA AAAA AAAA AAAA
190 002A 0000 5400 5555 5555 5555 5555 5401 5555 5555
200 5555 5555 5401 5555 5555 5555 5555 5401 5555 5555
210 5555 5555 0001 0000 0000 0000 0000 0000 0000 0000
220 0000 0000
Fill 1380 loaded.
```

Dave card access

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- 0 Exit menu

Status of Use by SCT

- Now in active use by SCT in USA15 and SR1
 - Drives SCT in standalone physics runs, eg with same conditions (SDT, CDT, BGS etc) as in ATLAS
 - NIM crates are off ☺
- Recorded many trigger sequences
 - Including those that desynchronise the SCT
 - Using same conditions as those in LHC fill 2186 (3 short bunch trains with 25ns bunches)
- Can provoke SCT desynchronisation in playback!

Trigger Sequence Examples

0x008003cc: 0x1000010d: 269 Trigger
0x008003d0: 0x100001d4: 468 Trigger
0x008003d4: 0x10000015: 21 Trigger
0x008003d8: 0x100003c9: 969 Trigger
0x008003dc: 0x100004ec: 1260 Trigger
0x008003e0: 0x10000140: 320 Trigger
0x008003e4: 0x200000fa: 250 BCR
0x008003e8: 0x1000000a: 10 Trigger
0x008003ec: 0x10000013: 19 Trigger
0x008003f0: 0x1000017c: 380 Trigger
0x008003f4: 0x100001a6: 422 Trigger
0x008003f8: 0x100000bf: 191 Trigger
0x008003fc: 0x100000ba: 186 Trigger
0x00800400: 0x10000306: 774 Trigger
0x00800404: 0x1000023f: 575 Trigger
0x00800408: 0x100001f0: 496 Trigger
0x0080040c: 0x10000029: 41 Trigger
0x00800410: 0x10000059: 89 Trigger
0x00800414: 0x20000171: 369 BCR

0x00915340: 0x20000509: 1289 BCR
0x00915344: 0x10000217: 535 Trigger
0x00915348: 0x20000bd3: 3027 BCR
0x0091534c: 0x20000deb: 3563 BCR
0x00915350: 0x20000deb: 3563 BCR
0x00915354: 0x20000deb: 3563 BCR
0x00915358: 0x20000deb: 3563 BCR
0x0091535c: 0x20000deb: 3563 BCR
0x00915360: 0x20000deb: 3563 BCR
0x00915364: 0x20000deb: 3563 BCR
0x00915368: 0x20000deb: 3563 BCR
0x0091536c: 0x20000deb: 3563 BCR
0x00915370: 0x20000deb: 3563 BCR
0x00915374: 0x40000692: 1682 ECR <--- ECR
0x00915378: 0x20000758: 1880 BCR
0x0091537c: 0x20000deb: 3563 BCR
0x00915380: 0x20000deb: 3563 BCR
0x00915384: 0x20000deb: 3563 BCR
0x00915388: 0x20000deb: 3563 BCR
0x0091538c: 0x20000deb: 3563 BCR
0x00915390: 0x20000deb: 3563 BCR
0x00915394: 0x20000deb: 3563 BCR
0x00915398: 0x20000deb: 3563 BCR
0x0091539c: 0x20000deb: 3563 BCR
0x009153a0: 0x20000deb: 3563 BCR
0x009153a4: 0x20000deb: 3563 BCR
0x009153a8: 0x100005bf: 1471 Trigger
0x009153ac: 0x1000004e: 78 Trigger
0x009153b0: 0x1000008b: 139 Trigger

Pending Issues

- Playback is hampered by limitations of standalone systems
 - TTC2LAN imposes dead-time “on top of” playback sequence and limits rate to $\sim 10\text{kHz}$
 - DAVE firmware already available to enable TTC2LAN to use DAVE instead of LTP (to get L1ID following a ECR), but effort needed to update TTC2LAN to exploit this firmware
 - Better using ROS in data driven mode, but need to run with just one ROD to reach 20-30kHz
- Further consolidation of firmware/software still underway (but very useable in current state)
 - Eg implement in RCD to configure within DAQ
- USB readout issue still under investigation
 - Effects readout of SRAM via USB (ok with VME)

Availability and Tools

- 4 production cards available at CERN for other subsystems (in addition to the 2 used now by SCT)
 - with several more in pipeline
- Simple command line utility available for configuration/setup
 - Or you can write your own 😊
(register description is on the Twiki)