

Beam Modulation Control and Hardware

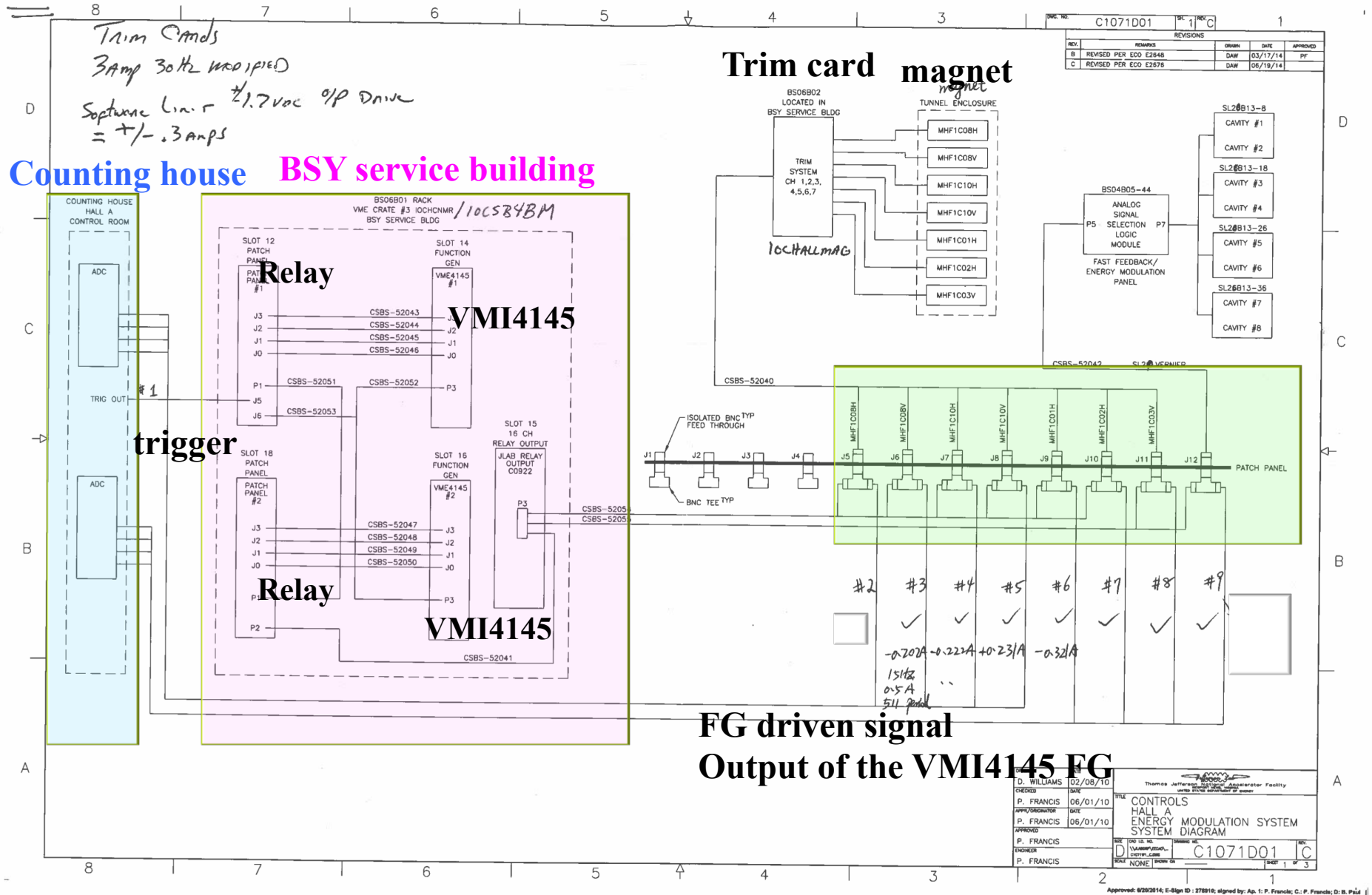
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02/16/2019

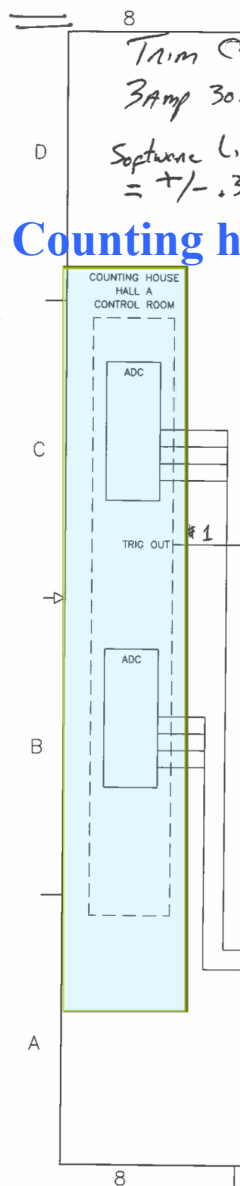
Beam Modulation Updates

- ✓ BSY service building Hall A beam modulation cables that are connected to the counting house and have been labeled. (with help from Pete)
- ✓ Trim card and corresponding wires are rechecked and the issues were solved by Pete.
- ✓ The trim card controlled modulation magnet and the corresponding feedback singles were checked with the software trigger and external trigger.
- ✓ Beam modulation CODA (run but not as expected)

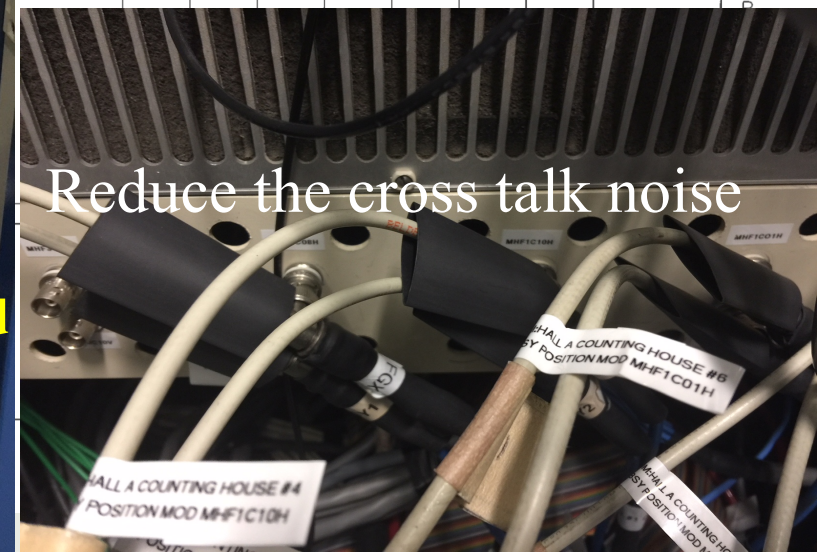
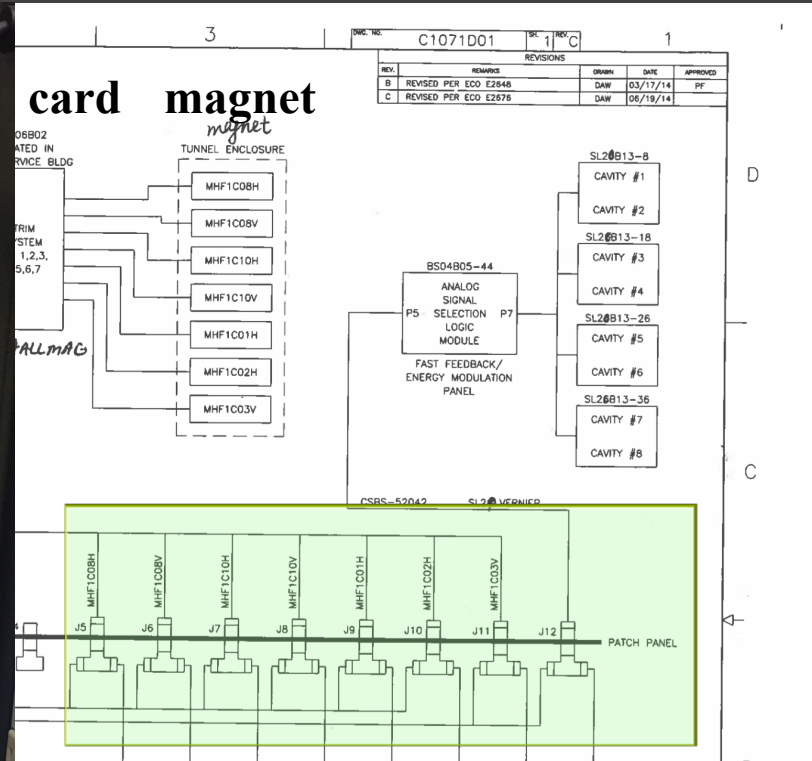
HallA Beam Modulation Hardware and Cables



HallA Beam Modulation Hardware and Cables



Cables are Labeled
1 trigger cable
8 FG driven signal
2 spares



HallA Beam Modulation Software Trigger Test

Call MCC to access I0CSB4BM and I0CHCNmR

The screenshot displays the JMenu-2.5 software interface. The main menu on the left includes: Operations, Injector, System Expert (highlighted), Beam Setup, StartOfShift, Plots, DT Manager, JELI, Utilities, Standalone Menus, and Help Menu. The System Expert sub-menu is open, showing: Beam Dumps, Control System, Cryogenics, BPM, Current Monitors, Global Diagnostics, Viewers, Harps, Modulation (highlighted), Hall A, EES Diag Tools, and Facilities. The Modulation sub-menu is also open, showing: Fast Feedback and Position/Energy Modulation Controls (highlighted). The Position/Energy Modulation Controls window is open, showing a MODULATION OFF button and a table of modulation parameters.

Parameter	Value	Unit
MHF1C01H	0.000	Amps
MHF1C02H	-0.001	Amps
MHF1C03V	-0.000	Amps
MHF1C08H	-0.000	Amps
MHF1C08V	0.000	Amps
MHF1C10H	-0.000	Amps
MHF1C10V	0.000	Amps
SL Zone 20	0.000	

At the bottom of the Modulation Menu, there is a User Guide button and a Manual Control button.

VMI4145 Waveform Generator Card: BMOD1

Channel 0 MHF1C08H

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

16.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Channel 1 MHF1C08V

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

15.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Channel 2 MHF1C10H

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

15.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Channel 3 MHF1C10V

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

15.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Issue was Fixed

Channel 0 Status

Channel 1 Status

Channel 0 Status

Channel 1 Status

Channel 0 **MHF1C01H**

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

15.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Channel 0 Status

Channel 1 **MHF1C02H**

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

10.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Channel 1 Status

Channel 2 **MHF1C03V**

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

15.000 Frequency (Hz)

0.500 Amplitude (Amps)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Channel 2 Status

Channel 3 **SL20VERNIER**

Load Waveform Data

0.000 Amplitude (Volts)

Load Test Waveform

15.000 Frequency (Hz)

0.178 Amplitude (MeV)

511 No. Periods

Load Sine Waveform

2046 Number Waveform Words Loaded

Waveform Controls

Enter Trigger State

Software Trigger

Leave Trigger State

Expert Config

Waveform Status

MODULATION OFF

OFF STATE Wave State

0x0 VCR Register

0.000 Trigger Peak Volts Out

Update Engine Status

Channel 3 Status

FG Board Operation

States:

- **Modulation OFF** the Relays to the Trim cards will be set to ground.
- **CONFIG** can set amplitude, N periods, frequency. Relays are open.
- **Trigger** with initiate function on front panel trigger. The relay for the FG to Trim card is connected.
- **Test States**

Counting House Trigger Signal

3.7.3 External Trigger

Each channel has an external input for a user-supplied trigger. If the user decides on using an external trigger instead of a software trigger, the user must guarantee this trigger is within the specifications of voltage and period. It must also meet the setup and hold times specified below. See Figure 3.7.3-1.

External Trigger:

Voltage: CMOS TTL Compatible (Low <0.8 VDC, High >3.15 VDC)
tp Trigger Period: 500 nanosecond period (minimum)
ts Setup Time: >50 nanoseconds
th Hold Time: >100 nanoseconds
Trigger Latency: 300 nanoseconds
ta Clock edge to Analog value change: 200 nanoseconds (maximum)

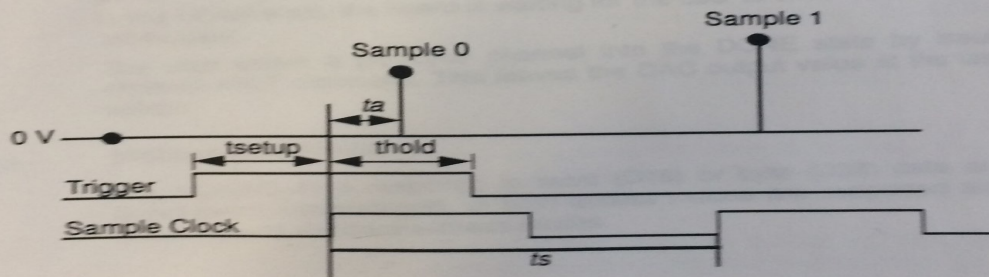


Figure 3.7.3-1 External Trigger

Trigger signal
specification

Voltage: TTL

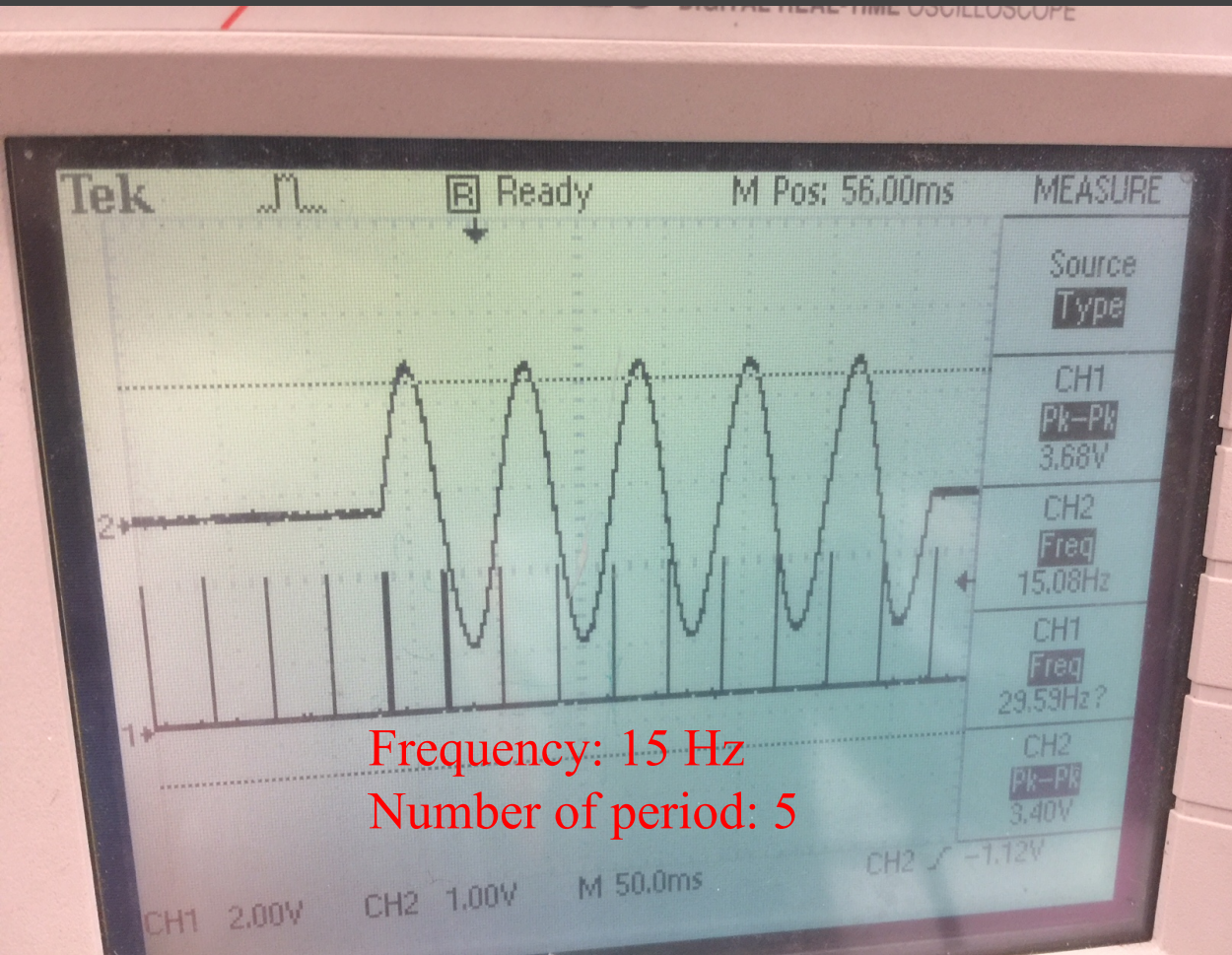
low < 0.8 VDC

High > 3.15 VDC

Trigger Period: 500 ns

Test TTL trigger signal: trigger formed in CH by coincidence of MPS and FlexIO signal

Feedback Signal with External Trigger



Sine Waveform:

- Frequency range: 10~250Hz
- Amplitude is set -0.3~0.3Amps
- Number of periods: 1~511

511 cause the hardware to run continuously

External Trigger and FG driven signal work as it should be!

BMW Control Code Debugging

Vxworks Script

Start supercycle ----- complete unit of dithering: a series of up to 8 sequences

Pause FFB

Loop over “sequence”-----single step of dithering, composed of 1 or 2 magnets

 configure first sequence

 set FG to Trigger

 request trigger

 count sequence+buffer time

 set FG to CONFIG

End loop

Count till next supercycle

Words in data stream

- 8 channels of FG readout
- Bmw_cycle (arbitrary cycle count, usefu for indexing)
- Bmw_object (which sequence number is running)
- Bmw_active (Vxwork script thinks this sequence is stll active)

CODA Status for the Beam Modulation

Test Run 1112

Xcefdmp

Data Source: /ata1/apar/parity_CH_1112.dat

Dictionary: /adaqfs/coda/2.6.2/common/lib.

Tag Name:

Event Number: 116

1

Event Number Slider

Decimal Dump Hex Dump

Enable Dictionary Disable Dictionary

Click to disable dictionary

View File Spy Event

View Next View Previous

Reserved Quit

Info -> To start, enter an object name and a tag name (value)
 Info -> Load file
 \$CODA/common/lib/evTags as a dictionary.
 Info -> To start, enter a file name
 Info -> Number of events is at least 2000
 Info -> Data source name is
 /adaq2/data1/apar/parity_CH_1112.dat
 Info -> Number of events is at least 2000

Data Source Dictionary View Options

type_1_physics_event

- header
- ROC23
 - 0x1
 - 0x2
 - 0x3
 - 0x4
 - 0x5

```

*rol->dabufp++ = 0xffffbd000; /* Header for timing board info */
*rol->dabufp++ = getDataHAPTBO;
*rol->dabufp++ = getRampDelayHAPTBO;
*rol->dabufp++ = getIntTimeHAPTBO;
*rol->dabufp++ = (getOverSampleCurrentHAPTBO << 8) +
                  getOverSampleHAPTBO;
*rol->dabufp++ = getDACHAPTBO(2); /* DAC16 */
*rol->dabufp++ = getDACHAPTBO(1); /* DAC12 */

```

if(bmwscan==1) {

```

*rol->dabufp++ = 0xfdacf000; // Header for daqflags
*rol->dabufp++ = localBMWphase; //record where we are in a sinewave
*rol->dabufp++ = localBMWperiod; //record where we are in a sinewave
*rol->dabufp++ = localBMWobj; //record the last-moved object
*rol->dabufp++ = localBMWfreq; // record the value of the last-moved object
*rol->dabufp++ = localBMWcycnum; // record the number of this supercycle

/* Scan words next */
*rol->dabufp++ = getCleanSCAN();
*rol->dabufp++ = getDataSCAN(1);
*rol->dabufp++ = getDataSCAN(2);

/* Now the vxWorks Clock and software event increment*/
*rol->dabufp++ = iocTime;
*rol->dabufp++ = ncnt;

```

0x4:

0xffffbd000	0x00000000	0x00000028	0x00003390	0x00000000	0x00000000
0x00000bb3	0xfdacf000	0x0126aff0	0x00114044	0x00000000	0x0126afb0
0x00000005	0x00000000	0x00000000	0x00000000	0x0002c8e2	0x0126afb0

Run but no as expected

iocLogClient: EPICS environment variable
 "EPICS_IOC_LOG_INET" undefined
 iocLogClient: logging disabled

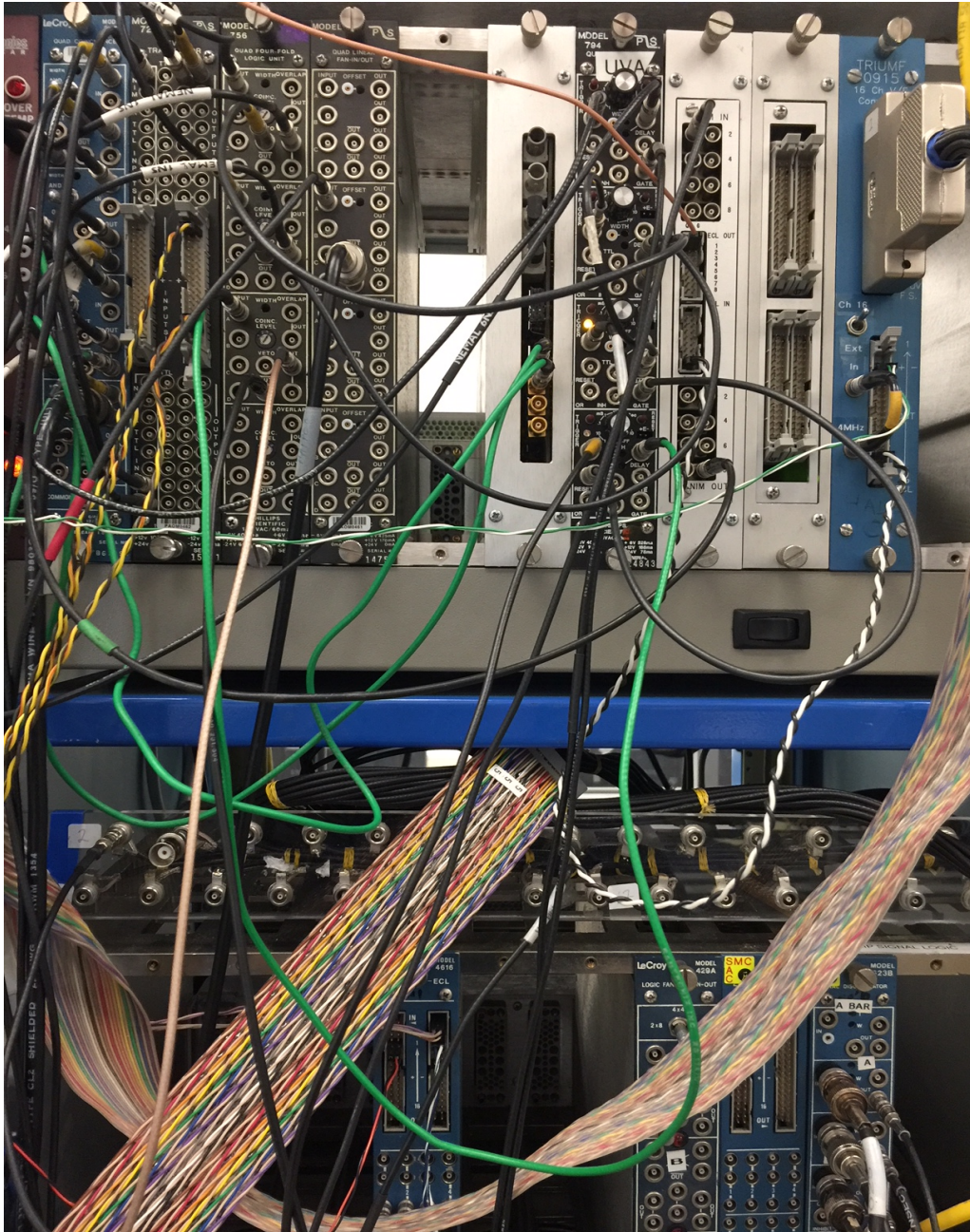
To-do List

- Connect the FG driven signals to V2F/scalars.
- Debug `bmwClient.C`
- Run CODA to test BMW process during the APEX is safe!

Any comments and suggestions ?

Back Up

Counting House BMW Trigger Setting



trigger formed in CH by coincidence
of MPS and FlexIO signal

