Status of US long term module testing

Patrick Gartung
University of California, Riverside

• DAQ Hardware
  • Requirements
  • Current setup
  • Needs
• DAQ Software
  • Status
  • Results
• Conclusions
Hardware requirements
for fully loaded cold box – 10 modules

- **1 PC with**
  - 4 PCI slots
    - 1 TSC
    - 1 FED
    - 1 FEC
    - 1 A1303 CAEN controller
  - 1 ISA slot
    - 1 DI/O card
  - 1 PCI or ISA slot for ethernet
  - 1 COM port for TRHX control
- **1 Vienna cold box**
- **1 Vienna cold box PS**
- **1 Torino interlock box**
- **1 Chiller (1.5 kW @ 6° C)**
- **1 TRHX control box**

- **1 NIM crate**
  - 3 electrometers (12 channels)
- **Standalone boards**
  - 1 TPO
  - 2 CCU
  - 10 PAACB
  - 10 VUTRI
  - 10 hybrid-to-vutri (version d)
  - 1 Fed-mux crate
  - 3 Fed-mux cards
  - 2 PAACB-to-TPO interface (backplane pulsing)
  - 1 LIMO to DI/O cable adapter
- **Power Supplies**
  - 1 SYS 127 CAEN crate
    - 1 A128HS CAENET interface
    - 3 A332 CAEN modules (12 high voltage channels)
  - low voltage supplies for TPO, VUTRI’s, CCU’s, FED-mux crate
Hardware requirements
for 4 modules per test cycle

- **1 PC with**
  - 4 PCI slots
    - 1 TSC
    - 1 FED
    - 1 FEC
    - 1 A1303 CAEN controller
  - 1 ISA slot
    - 1 DI/O card
  - 1 PCI or ISA slot for ethernet
  - 1 COM port for TRHX control

- **1 Vienna cold box**

- **1 Vienna cold box PS**

- **1 Torino interlock box**

- **1 Chiller (1.5 kW @ 6° C)**

- **1 TRHX control box**

- **1 NIM crate**
  - 1 electrometers (4 channels)

- **Standalone boards**
  - 1 TPO
  - 1 CCU
  - 4 PAACB
  - 4 VUTRI
  - 4 hybrid-to-vutri (version d)
  - 1 LIMO-to-DI/O cable adapter

- **Power Supplies**
  - 1 SYS 127 CAEN crate
    - 1 A128 HS CAENET controller
    - 1 A332 CAEN module (4 high voltage channels)
  - low voltage supplies for TPO, VUTRI’s, CCU’s, FED-mux crate
Hardware setup
## Hardware needs
with what we have on hand now

<table>
<thead>
<tr>
<th>Hardware</th>
<th>1 stand, 4 channels</th>
<th>2 stands, 4 channels</th>
<th>2 stands, 8 channels</th>
<th>2 stands, 10 channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer (4 PCI + 1 ISA)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TSC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FED</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TPO</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>FEC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Di/O CIO-DAS6402/12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MUX Crates</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MUX Boards</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>CCU</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VUTRI</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>hybrid-to-vutri (ver d)</td>
<td>3</td>
<td>7</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>PAACB</td>
<td>2</td>
<td>6</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>PAACB-TPO interface</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>LEMO-flat cable patch board</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>LV Distribution (Burnin)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HV Supply (Burnin)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Electrometers</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>HV controller</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>HV PC controller</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HV cable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HV Crowbar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Module Cold Box Plate</td>
<td>3</td>
<td>7</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Vienna Cold Box</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Torino Interlock Box</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Chiller</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*does not include ARC stand needs*
### Hardware needs

**with all hardware in route**

<table>
<thead>
<tr>
<th></th>
<th>1 stand, 4 channels</th>
<th>2 stands, 4 channels</th>
<th>2 stands, 8 channels</th>
<th>2 stands, 10 channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer (4 PCI + 1 ISA )</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TSC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FED</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TPO</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FEC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Di/O CIO-DAS6402/12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MUX Crates</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MUX Boards</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>CCU</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VUTRI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>hybrid-to-vutri (ver d)</td>
<td>1</td>
<td>5</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>PAACB</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>PAACB-TPO interface</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>LEMO-flat cable patch board</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>LV Distribution (Burnin)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HV Supply (Burnin)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Electrometers</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>HV controller</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HV PC controller</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HV cable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HV Crowbar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Module Cold Box Plate</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Vienna Cold Box</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Torino Interlock Box</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Chiller</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*does not include ARC stand needs*
Software status

**UCSB LT PC**
- Debian 3.0 Linux distribution installed (2.2.20 kernel)
- DAQ drivers compiled and verified to work
- Long term test software compiled and verified to work with the hardware we have now
  - Measured noise and pedestals using mainMonitor program
  - Monitored temperature and humidity sensors using ClientTools/test/bin programs
  - Cycled temperature of cold box using mainMonitor program
  - Compiled CAEN A1303 device driver and integrating into LT test software (/dev/a303→/dev/a1303)
- Xrod software compiled and verified to work
  - Measured noise and pedestals
  - Measured gain scan

**FNAL LT PC**
- RedHat 7.3 Linux distribution installed
- Compiling DAQ drivers (problems with 2.4.x kernel)
- Will try Debian 3.0 distribution (2.2.20 kernel)

**FNAL DAQ PC**
- Debian 2.0 Linux distribution installed
- Older DAQ drivers compiled and functionality verified
- Older DAQ version not compatible with current LT test software
Software results

- Pedestal and noise measured on a bare hybrid mounted on cold box plate and inserted into cold box slot.
- Measurements made using long term test software.
Software results

Same hybrid as before. Gain scan and noise measured using Xrod.
Thermal Cycling

Cold Box Temperatures

-25  -20  -15  -10  -5   0   5   10  15  20  25

degrees Celsius

Slotted Plate Temperature
Module Plate Temperature
Box Air Temperature

Time Tick

107  213  319  425  531  637  743  849  955 1061 1167 1273 1379 1485 1591 1697 1803 1909 2015 2121 2227 2333 2439 2545 2651 2757 2863

CMS Tracker Week – Module Test Meeting – April 2003 – Patrick Gartung
Conclusions

- Need a few more parts to begin testing modules and working out bugs at UCSB
- Software compiled and ready to be verified for real hardware on UCSB machine
- Stopping at Fermilab next week to get LT software running on LT machine
- With delivery of additional parts Fermilab can begin testing modules and working out bugs
Hardware requirements
for 8 modules per test cycle

- **1 PC with**
  - 4 PCI slots
  - 1 TSC
  - 1 FED
  - 1 FEC
  - 1 A1303 CAEN controller
- **1 Isa slot**
  - 1 DI/O card
  - 1 PCI or ISA slot for ethernet
  - 1 COM port for TRHX control

- **1 Vienna cold box**
- **1 Vienna cold box PS**
- **1 Torino interlock box**
- **1 Chiller (1.5 kW @ 6° C)**
- **1 TRHX control box**

- **1 NIM crate**
  - 2 electrometers (8 channels)

- **Standalone boards**
  - 1 TPO
  - 2 CCU
  - 8 PAACB
  - 8 VUTRI
  - 8 hybrid-to-vutri (version d)
  - 1 Fed-mux crate
  - 2 Fed-mux cards
  - 1 PAACB-to-TPO interface
  - 1 LIMO-to-DI/O cable adapter

- **Power Supplies**
  - 1 SYS 127 CAEN crate
    - 1 A128 HS CAENET controller
    - 2 A332 CAEN modules (8 high voltage channels)
  - low voltage supplies for TPO, VUTRI’s, CCU’s, FED-mux crate