Debuncher BPMs

Dennis Nicklaus

Updated July, 2004

I. Introduction

The Debuncher Beam Position Monitor (BPM) project currently has six front end nodes, with two each located at AP10, AP30, and AP50. The nodes are called DBPM10, 20, 30, 40, 50, and 60, corresponding to their locations in the debuncher beamline. They all run on a PowerPC 2401 VME processors in VME crates.

II. Hardware Configuration

An Acromag PMC330 is used for A/D input and an Acromag PMC470 is used for digital I/O for the project. Familiarity with these PMC cards and their operation is required to understanding the Debuncher PBM software.

There are no spare 330 or 470 PMC cards for this project at Fermilab that I know of. The PBar folks (e.g. Mark Dilday) may have some.

Any of our standard PowerPC-2401 or 2434 processors with vxWorks installed could be used as a spare processor.

The system runs the MOOC software platform and is built out of two CVS projects: debbpm and ipacromag.

The startup script is located on nova at:
    /fecode-bd/vxworks_boot/fe/debbpm/startup.cmd

III. Software Operations

At the lowest level, the PMC330 card is set up to acquire data from 20 channels and interrupt the CPU when the data is ready. The CPU reads the data out, and then toggles a digital switch on the PMC470 card to switch between the BPM A and B plates (selecting which of the pair of BPM plates is input to a Pre-amp in the beam tunnel). The PMC330 channels are read at approximately 1440 Hz, yielding a 720 Hz rate for the combined pair of plates.

The software also switches between a pair of digital settings for several other bits of the PMC470 card when the plate select switch is toggled. The digital bit settings are in the devices D:BPMV0n and D:BPMV1n, where n=1...6 to select the house.

At startup time, a self-calibration of the PMC470 card is also run.

Once the analog channels are read into the CPU, they are handled in several different ways. The raw data is kept available, but each channel is also accumulated and box-car averaged, and calibrations applied. The data is available to ACNET/mooc devices in several forms, including the raw plate data, the averaged data, calibrated data, and the intensity and position data, which are produced by combining the data from two matching plates. Each of these types of data is also made available for Fast Time Plotting at up to 720 hz. Normally, there are only devices for the intensity and position values, but by creating new devices with the proper SSDNs, you can select other types of readouts.

IV. Debuncher BPM Acnet Devices

```
This section describes the Acnet devices which have been created for
control and readout of the debuncher BPMS.

Each of the device names is of the form
                                D:BPMxxN
where N=1,2,3,4,5,6, corresponding to debuncher sectors 10, 20, 30, 40, 50, 60.
and XX are two characters which describe the functionality of the device

Here are the devices and a brief description of each
Primary readouts:
d:bpmadN intensity reading in dBm. array of 20 readings
d:bpmaiN intensity reading in Volts. array of 20 readings
d:bpmapN position reading in Volts. array of 20 readings

Data Acquisition Control and Setting devices
d:bpmtsN single acquisition test control
d:bpmtcN continuous acquisition  control
d:bpmtlN calibration control (run a A/D card calibration sequence)
d:bpmmdN switching mode control (turn on/off switching)
d:bpmswN switch current reading/setting.
d:bpmtiN timer (sets sampling frequency)
d:bpmpsN timer prescale (combines to set sampling frequency)
d:bpmcsN channel start for data acquisition (0--19) (typically 0)
d:bpmceN channel end for data acquisition (0--19) (typically 19)
d:bpmgaN A/D Gain for all channels
d:bpmfiN filter (box) size for data acquisition


Digital control bits

d:bpmv0N switched value 0 (DB0-11)
d:bpmv1N switched value 1 (DB0-11)


d:bpmuxN reading/setting for MUX bits and OSCPWRON



! For a given DEBBPM device the SSDN encodes information as follows:
! for all properties and is encoded as given below.
! MOOC vacuum SSDN encoding:
!              (xxnn/0iii/0000/tt00)
!               |||| |||| |||| ||-->>> tt is the type:
                                      For iii=20, For setting properties
                                                  tt=01 = CS devices
                                                  tt=02 = CE devices
                                                  tt=03 = GA devices
                                                  tt=04 = PS devices
                                                  tt=05 = TI devices
                                                  tt=07 = FI devices
                                                  For basic control properties
                                                  note also diffs in status ON attribute
                                                  tt=00 = TS devices
                                                  tt=01 = TC devices
                                                  tt=02 = TL devices
                                                  tt=03 = MD devices
                                                  For reading properties
                                                  tt=0A = AD devices
                                                  tt=01 = AI devices
                                                  tt=00 = AP devices
                                                  other values of tt are supported
                                                  by the front end software for
                                                  debugging, but not usually implemented
```

```
                                for operational devices, including:
                                tt=02, raw reading A plate
                                tt=03, raw reading B plate
                                tt=04, calibrated reading A plate
                                tt=05, calibrated reading B plate
                                tt=06, averaged, uncalibrated A
                                tt=07, averaged, uncalibrated B
                                tt=08, averaged, calibrated A
                                tt=09, averaged, calibrated B
     -->>>>>>>>>>>>>iii is the OID: Selects type of device access
                       20 selects the analog card
                       21 selects the PMC470 digital card
                          and reads the switch status (SW device).
                       40 V0 devices
                       41 V1 devices
                       44 UX devices
-->>>>>>>>>>>>>xxnn are the trunk and node of the Front End.
```