

Stepper Motor Control, PLC vs VME



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Step2 Driver



Driver



Step 2



VME-Based Stepper Motor Usage

Cryomodule Cavity Tuner Controls

- Implemented by Los Alamos National Lab
- Pro-Dex (OMS) VME 58-8 stepper motor controller
- EPICS driver and motor record
- Motor inside cryomodule near 2 K cavity
 - Minimize heat released inside cryomodule

- Wiring near silicon diodes
 - Minimize electrical noise
- Phytron SINCOS stepper motor drives
- Custom interface boards





SNS Cryomodule Cavity Tuner







SNS Tuner Custom Boards





Rear of VME

Motor Driver Interface Chassis





VME-Based Stepper Motor Usage

Foil and Scraper Motion Control

- Implemented by Brookhaven National Lab
- Pro-Dex (OMS) VME 58-8 stepper motor controller
- EPICS driver and motor record
- Accurately position foils and scrapers
 - Scrape part of the beam
 - Strip electrons
- Position feedback potentiometer
- Position limit switches
- Custom interface board





SNS Foil and Scraper Drive







SNS Motion Control Rack



Rear





PLC-Based Stepper Motor Control

- Many problems with initial operation of VME based stepper motors
- No existing VME crate to house VME modules
- Cryomodule Test Facility Cavity Tuner Controls
 - Implemented by SNS
 - AMCI 3204 stepper motor controller
 - PLC based driver
 - EPICS records
 - Motor inside cryomodule near 2 K cavity
 - Wiring near silicon diodes
 - Phytron SINCOS stepper motor drives





PLC-Based Stepper Motor Driver

- Initialize AMCI module on power-up
- Initialize channels
- Check module status
- Check for errors
- If position error, update present position
- If limit switch activated, switch to manual mode
 - AMCI module assumes limit switch activation is not an expected event.





PLC-Based Stepper Motor Driver (cont)

- Check for new status commands
 - Motor Enable
 - Reset
 - Preset
 - Control Mode Auto/Manual
- Check for new movement commands
 - Jog
 - Absolute
 - Relative
- Format commands and send to AMCI module





PLC-Based Stepper Motor Screen

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PLC-Based Stepper Motor Rack

Front

Rear





Custom Interface Board





Comparison

- PLC Advantages
 - Fewer custom modules
 - Less cabinet wiring
 - Accepts 24 vdc limit switch signals
 - Simplifies integration of motion control and interlock logic
 - 'Safer' limit switch response
- VME advantages
 - More complete and flexible software driver
 - Higher density modules (8 channel vs. 4)
 - Faster EPICS updates
 - Auxiliary outputs on VME module





Summary

- Both VME and PLC motion control solutions work well
- Availability of PLC and/or VME chassis is a big cost driver
- Trade off custom hardware for the VME module vs. custom software for the PLC module
- Stand-alone motion control equipment with ethernet interface should be considered



