Step2 Driver
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

- Cavity
- Tuner Motor
- Beam Line
SNS Tuner Custom Boards

Rear of VME Chassis

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

- Beam Line
- Foil Position Limit Switches
- Scraper Potentiometer
- Chain and dummy foils
SNS Motion Control Rack

Front

- VME Chassis
- Motor Drives

Rear

- Relays to interface limit switches
- Lots of interconnection wiring
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
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