

Motion Control Standards

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Why are standards important?

- Ensure consistency of implementation
- Reduce effort in development
- Reduce errors in implementation
- Capturing organizational knowledge
- Simplified procurement process
- Provide a single source of information



Motion control standards

- Coordinate system definition
- Interface definitions
- Hardware standards
- Cabling standards
- Programming standards



Coordinate system definition

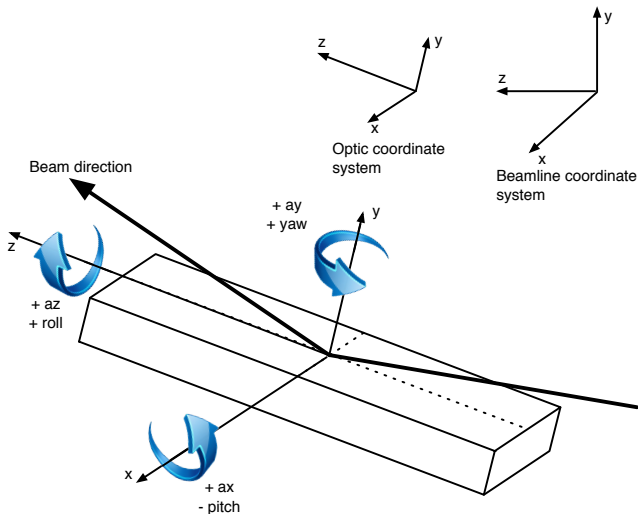


Figure 1: Mirror coordinate system example

Coordinate system definition

- Define standard for x, y, z axis directions
- Define standard for rotations: refer to rotation around x, y, z or pitch, roll, yaw?
- Use right-handed or left-handed convention?
- Consider optics orientation
 - ▶ vertical and horizontal orientation
 - ▶ reflection direction
 - ▶ transmission optics
- Define what is positive
- Decide if positive/negative definitions can change at different levels in control system:
 - ▶ physical
 - ▶ low level controls
 - ▶ user controls
- Identify any special cases and exceptions



Interface definitions

- Identify common instrumentation interfaces at equipment and control rack locations
- Define connector types for each part of the connection
- Define pinouts for each cable
- Consider using common conventions, either from other facilities or manufacturers
- Select connector gender to avoid live pin contacts
- Select connectors to avoid possibility of accidental incorrect connections
- Define use of patch panels at equipment end and rack end
- Provide clear scope for vendors who are developing equipment



Motion control hardware definitions

- Define standard components to be used on equipment
 - ▶ Motors (type, manufacturer)
 - ▶ Encoders (absolute or incremental, protocol, manufacturer)
 - ▶ Switches (limits, overtravels, datums)
- Define standard motion controller(s)
- Define standard motor drives
- Identify areas where non-standard controllers can be used
- Power supply standards for motor controllers and amplifiers
- Rack standards
- Rack layout standards



Cabling standards

- Provide specification for standard cable functions
 - ▶ Motor cable
 - ▶ Encoder cable
 - ▶ Limit switch cable
 - ▶ General IO cable
- Identify conductor size, count, pairing, insulation and jacket colour, shielding
- Consider any local electrical standards - insulation requirements, jacket materials (e.g., low-smoke, zero halogen)
- Decide if commercially available cables can be used or if custom cables are needed
- Cable weight, bending radius
- Capture information in drawings, tables, documents



Motion controller programming standards

- Used for advanced programmable motor controllers
- Allocate motor controller resources for standard functions
- May be dictated by control system software interface (e.g., EPICS motor record driver for Delta Tau PMAC)
- Identify controller resources that can be used for custom applications
- Create a standard configuration for use as a starting point
- Programming standards will be specific to a controller model



Thank you



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Backup slides



Other things to consider

- Standards can develop over time
- Backwards-compatibility is important
- Someone needs to own the standards
 - ▶ Definition
 - ▶ Maintenance
 - ▶ Implementation
- Definition of standards can come from a range of sources
 - ▶ Other facilities
 - ▶ Users and staff
 - ▶ Legal and regulatory requirements
 - ▶ Vendors and manufacturers
 - ▶ Existing organisational standards

The only thing worse than a bad standard is no standard at all.



Who will use the standards?

- Facility staff
- Vendors
- Partner developers - external user groups
- Other facilities - use as starting point for development

