DLS Standard PLC System

- Tendering led to a single PLC supplier for all system
- 400 Small modular Omron CJ Series PLC's looking after various Machine protection tasks across the 3 accelerators and beamlines.
- The group support 3 different modular processors plus a smaller brick PLC for simple interlocking provision (CJ1M-CPU 12, CJ1M-CPU43H CJ2M-CPU 33 and CP1L).
- PLC's are programmed using CX Programmer except NS series with Embedded Motion which use Sysmac suite.
- Most PLC are involved in Equipment protection normally for Vacuum systems. Often the vacuum protection will also monitor critical flows and temperatures increasingly through the use remote IO as this is quick and easy to add as required.
- Standard IO templates and code are utilised to ensure a consistent approach across the whole machine.
- Best practice guidelines are followed to ensure the same look and feel across system.
- 4 people write all of the code and provide all of the on call and operational support for all installed PLC systems.

Turn Key Equipment Siemens system

Siemens S7 PLC's integrated into suppliers Turn Key solutions are also supported by the group.
They include:-

- Electron Gun system
- Linac Klystron and Wave guides for RF stage.
- RF Cryo control system
- RF Cavity control system (x3)
- Cryo plant for individual Beamlines.
- Beamline sample manipulation stages (I12)

The team hold coded up ready to go complete replacement system plus a selection of common cards for all of the accelerator critical systems.

Embedded Motion Control system

Distributed Motion and PLC system trialled on VMXi to look after sample delivery and manipulation in a cold storage facility.

- The team chose an Omron NS platform to control a sample load lock & 3 axis grab which is used along with a traditional Mitsubishi Robot to deliver multiple sample trays from a fridge system into a storage area within the beamline shielding to allow rapid manipulation, delivery to the Gonio and subsequent scanning of samples as part of a GDA fully Automated package.
- The PLC has embedded Motion control cards for the 3 axes, Barcode readers, Remote IO & Vision all running over an Ethercat remote IO network. The Remote IO is used to interface to the robot, control the pneumatics for the load lock rotation and linear movement and the Vision system detects the presence of trays and storage sleeves.
- EPICS acts as the SCADA package and GDA then interface via EPICS to trigger pre arranged PLC sequences. GDA then ties up the detector data and sample identification allowing results to be emailed to the remote user.

Getting a scientist to commit to a Functional Design spec up front.

- This is definitely our biggest problem. Most cases the design of the hardware has to be started early to meet delivery date and at this point the finer points of the operation have not been substantiated. We try to capture the initial requirements in a document and get the Scientist to sign it. Some are not keen as they worry that it ties them to a design that they know will have to evolve as issues have to be overcome. Often the requirements creep and of course this has to be accommodated. This invariably leads to jobs taking a lot longer than originally predicted. This in itself is not a problem unless you have other customers waiting for you to get to them.

PLC Revision Control

We use a proprietary revision control system for PLC code called MDT Autosave. It allows us to store PLC code, Remote IO configurations, HMI code and Vision system set up files. The system provides a full audit trail and version control. We can store 600 pieces of software in the package we have purchased.