PLC Support Software at Jefferson Lab

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- PLC introduction
- PLCs at Jefferson Lab
- New PLC support software
- Conclusions







Electromagnetic Relay

Encyclopedia Britannica:

Relays (in electricity) are electromagnetic devices for remote or automatic control of electric current in one (relay) circuit, using the variation in current in another (energizing) circuit.











Relay based control panels (sequential relay circuits) were typical industrial process controllers in 1960's .







First computer based industrial process controller was created in 1968 for General Motors Company. It was called the Programmable Logic Controller or PLC.











Basic P L C control operations





PLC works by looking at its inputs and, depending upon their state, turning its outputs on or off.











PLCs

- very cheap
- very reliable
- can easily be programmed by instrumentation engineers









PLCs at Jefferson Lab







Recent evolution towards fast processors and a wide

variety of compatible I/O modules have made PLCs very

attractive for new control applications at Jefferson Lab.





PLC basic line at Jefferson Lab



Direct Logic Products from Automation Direct





Direct Logic family of products:



- supports the serial DirectNet data network point-to-point (RS-232) or multi-drop (RS-422)
- uses the DirectNet communication protocol and operates asynchronously at speeds up to 38.4 K baud.

The data network is controlled by a master station that issues network commands to individual slave stations.







Group













Andrew Johnson, ANL, January 2002 "Serial (RS-232) directNet PLC support via MPF" www.aps.anl.gov/asd/people/anj/ directNet/dnMpf.html































Group





















Has successfully been working for the beam dump systems at Jefferson Lab since April, 2002.





Does not require any extra coding for connecting a new PLC to the control system.

All that you have to do to add a new PLC to your system is to create the corresponding EPICS database with the use of a number of examples provided and run it together with the PLC support software.





initSerialHardware(carrier_board_type)

serialPortConfig(carrier, slot, port, baud, parity, stop, bits, flow, int_numb)
initSerialPLC("PLC_NAME", carrier, slot, port)

As it was mentioned above, for each PLC, the PLC support software is activated with the use of only a limited number of basic library calls.





The software activation calls for each control computer can be put into one configuration file residing in a standard directory and can be downloaded into this computer during the startup time. This makes it much easier to keep the track of all PLCs involved into the accelerator control.





Recommendations on the use of PLCs







>> High availability of interlock control is required

>> Maintenance of control capability is required even during the control computer reboot

>> Complex control algorithms are not required







>> For high level sequences

>>>> For some I/O modules VME can be less expensive







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