

# Relay replacement hardware conceptual design specification

J. Reich 5/12/2008

The project task is to eliminate the original relay based Access Controls Systems for LINAC, Booster, and the AGS. This is motivated by a few factors: Age and complexity of system, MCR move/upgrade project(need digital system for new MCR), and increased safety and reliability.

This document represents the Conceptual Design of the proposed system.

The approach is to replace the relay based system with a parallel PLC (Allen/Bradley Guardlogix platform. Utilizing its compliment of safety aspects and discreet Safety I/O. Once in place and tested the old system will be decommissioned and the new will become the operational system.

See Figure 1.

The proposed system will utilize the [ControlLogix/Guardlogix](#) safety processors and parent processor platform to perform all safety functions inputs and outputs.

This will be accomplished with separate redundant processors and physically separate command and read back chains, ADIV and BDIV.

Each sub-system i.e., LINAC,BOOSTER,AGS will have two A and B Division processors with its associated appropriate I/O for a total of Six (6) processors for the entire system. See Fig 2.

The communications network used to accomplish this will be a Common industry protocol (CIP) SAFETY Ethernet network. This is a safety rated protocol See two links for more detailed information.

1. [AB LINK CIP](#)
2. [LINK\(CIP\)](#)

There will be a total of 5 five separate isolated exclusive Ethernet networks configured with different Subnet values. 130.199.31... (Information and command network)

130.199.100...130.199.101...ADIV critical device /emergency stop device network and the Gate and sweep device network.

130.199.102... and 130.199.103...BDIV critical device / emergency stop network and the Gate and sweep device network.

**CLICK HIGHLIGHTED LINKS FOR MORE DETAILED INFORMATION**

The processors used for both A and B divisions subsystems will be identical.

Module [1756-L61S](#)-Safety Rated Processor

Module [1756-LSP](#)-Safety Partner Processor

The communication Scanners/modules will be:

Module [1756-ENBT](#)

The I/O modules for the Gate and sweep I/O will be

Module [1732E-OB16M12](#) this will perform indicator light functions i.e., modes, gate release active etc.

Module [1791ES-IB16](#) this will receive status of gate switches and key switches.

The I/O modules for the critical devices and emergency stop sub-system will be:

Module [1791ES-IB8XOBV4](#) this will receive status from critical devices and crash operators and chipmunk interlock statuses, as well as enabled outputs to allow critical device enables and Crash activation alarms etc.

[Safety Grade relays](#) will be utilized when required.

Magnetic locks will be utilized on all gates.

Sealed magnetic switches will be used on all gates.

Data display and commands will be accomplished utilizing the existing RSViewSE HMI server running on the SafetyNetwork 130.199.31...Data will be sent and received via a separate Ethernet module 1756-ENBT for each of the A&B Divisions

Figure 1 example subsystem



