

C-AD

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Radiation

Safety Minutes of RSC Subcommittee of January 31, 2011

Committee

Subject: Controlled Access for ACS with PLCs

Present: J. Reich, A. Etkin, C. Montag, C. Theisen, E.T. Lessard, R. Karol, M. Minty, D. Beavis, B. van Kuik, J. Sandberg

Motivation

A flaw in the system that dispatches resets and gate releases in the RHIC PLC system was found after several problems occurred starting Jan 13, 2011. The Department has requested that the RSC make recommendations that will reduce any potential risk. On Jan. 14, 2011 the Department suspended use of all remote access key trees pending understanding of the problem and implementation of any changes to the system.

Flaw in PLC communications¹ and Discovery of the Flaw

On Jan 13, 2011 a user approached the 2GE1 gate at 2 O'clock and entered with a Controlled Access key that had been signed out at MCR. At some time in the process of entering the IR the user became aware that the buzzer at the gate was continuing to buzz. This is the buzzer that notifies personnel preparing to enter a gate under Controlled Access that the simultaneous release for controlled entry has been issued by MCR. The user immediately reported the apparent problem to MCR.

The Operations Coordinator (OC) went to the gate to investigate. He immediately determined that the gate was not functioning properly, i.e. the gate release is continuously active. He had an MCR operator issue a release command and the gate simultaneous release system returned to normal operations. The OC proceeded to force a drop in the sweep for the 2 O'clock area.

Access Controls Group (ACG) personnel arrive at the gate within 30 minutes to begin investigating the problem. Initial assessment was that a relay at the gate was frozen causing the continuous simultaneous release. After it was determined that the gate was functioning properly the ACG personnel returned to pull prints and further investigate the sources of the problem and if their initial determination of the cause was correct.

By early afternoon it was determined that the only concern for access at gates was an increased risk if personnel and users disregarded the rules for Controlled Access. The investigation of the cause continued into the early evening. Careful examination of how power is routed through the relay for the simultaneous release to eventually allow the gate to open could only be available if the control PLC was issuing a release command to the gate. This led to the proper conclusion that the flaw was in the command PLC structure and not the gate hardware. This was communicated to Department Management immediately and on Jan. 14 the Department suspended use of Controlled Access with keys released from remote key trees. All personnel must come to MCR for a key ensuring operations is aware of all users with keys and their intended entry point. Requiring keys from MCR allows operators to communicate to the entrant to be vigilant about following the rules and notifying MCR of any unusual conditions.

On Jan. 16 the MCR has difficulty sending commands to the RHIC PASS peers. The RHIC PASS peers are the PLC machines in the field that provide the actual protection for an area at RHIC. Each sextant has a pair of independent PLC systems to provide protection. The ACG leader investigates and determines that there is a communications problem which does not allow commands (status) from (to) the touch screen to be sent through Peer21 to the RHIC PLCs.

On Jan. 19 the actual cause is determined to be an input buffer of Peer21 being full and not able to receive data from the touch screen server. Action was taken to ensure that the buffer does not become full in the future. Since that time no problems have occurred. The ACG leader obtained² information on the PLC systems and what can cause hung bits and how to reduce the duration of a hung bit.

On Jan 10, 2011 when a Controlled Access was made through 2GE1 the buffer was full and the fact that the operator had removed the simultaneous gate release was never sent to the local PLCs from Peer21. This left the gate with a continuous simultaneous release till the access on Jan 13, 2011 when the gate was placed in controlled access which allows the buzzer to provide it audible alert. The problem went unnoticed for days since the buzzer only sounds when the area is in Controlled Access. The gate could not have been entered and no reduction of safety occurred at this time. A Controlled Access key would have been required to enter the gate with the area placed into the Controlled Access State. All Controlled Access were accounted for when the incident occurred.

The responses of the user and the operations staff are commendable.

The input buffer full error became a problem this year was determined to be a result of updating the Peer21 software during the summer shutdown. When software is updated in the PLC there are parameters that are reset to factory defaults. Parameters related to the amount of information being transmitted went to factory defaults, which had long since be changed, most likely to eliminate this problem. The software of the communications PLCs is not configuration controlled at the level that the field PLC are. The update occurred in August/Sept. and there were indications that there were problems in the system.

The buffers are 32k and the largest available are 64k.

Recommended Changes and Discussion

The present recommendations to PLCs used for communications are short term, intended for the duration of this run. Long term corrective actions will be discussed at a later date.

Modify the PLC code such that a reset to bits that can hang are issued periodically limiting the duration to a hung bit. This is a common solution that is recommended in industry.

(CK-RHIC-2011-735) Install bit reset for gate release in Peer21.

(CK-RHIC-2011-736) Have the reset of the gate release bit occur every 60 seconds.

(CK-FY2011-RHIC-737) An alarm bit will be added that is latched and will notify operators that a stuck bit has been detected.

Too short of a time will make it difficult for workers carrying equipment. If 60 seconds is too short then a longer time will be considered. If an operator holds the release for more than 60 seconds the sweep will be lost. Users should be notified of these changes and the impact on access. Large groups going in on Controlled Access may need to be broken into smaller groups so that the 60 second limit is not exceeded and the sweep lost.

The chipmunk interlock reset is another potential problem. The actual functioning of the reset at the chipmunk needs to be examined. **(CK-RHIC-2011-738)**

If a stuck bit on the interlock reset could prevent a chipmunk from having another interlock then a similar change in the Peer21 must be implemented. Only the injection arcs at RHIC have interlocking chipmunks at this time. **(CK-RHIC-2011-739)**

(CK-FY2011_U-740) The U line ACS should be checked and similar actions taken.

(CK-FY2011-NSRL-741) The NSRL ACS needs to have similar changes as appropriate.

(CK-FY2011-ERL_742) The ERL ACS must have similar changes as needed.

(CK-FY2011-SRF-743) The SRF block house should have similar changes if needed.

CK-FY2011-PASS-744) A procedure must be written that controls the loading of software on the communication PLCs. There must be an attachment or attachments with a checklist of parameters that are required to be checked.

The changes for RHIC are expected to be ready by Thursday or Friday morning (Feb. 4, 2011).

The changes to Peer21 should occur while there is no beam in RHIC. Some testing should be conducted including a Controlled Access at a RHIC gate. **(CK-FY2011-RHIC-745)**

CK-FY2011-PASS-746) A long term solution should be developed and reported to the RSC Chair by June 1, 2011. The RSC Chair requests that A. Etkin head up the sub-committee with C. Theisen, J. Reich, and J. Sandberg as members.

Use of remote Controlled Access keytrees for the various areas is recommended after the short term improvements are completed.

References

1. J. Reich, [Timeline, facts, and discussion of 2GE1 release active event](#), January 24, 2011.
2. J. Reich, [2GE1 gate release active event: Solution for FY11 Run](#), January 25, 2011