WCNOC Maintenance Plan, Rev. 1

ADVANCED LOGIC SYSTEM (ALS)

CLASS 1E CONTROLS

MAINTENANCE PLAN

REVISION 1

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Revision Control

Rev #	Approval	Approval Date	Description of Change(s)
0	GWC	5/29/2007	Initial Revision
1	GWC	1/21/2008	Document overhaul for generic application at Wolf Creek for ALS Class 1E Controls. Added revision table. Added wording regarding the stocking of blank FPGA boards.

Table of Content

1 Maintenance Plan

The purpose of the Maintenance Plan is to discuss the roles and responsibilities, key project deliverables critical to maintenance, implementation characteristics, maintenance procedures, maintenance challenges, and spare components stocked in the warehouse for the ALS Class 1E Controls replacement projects at WCGS.

1.1 Roles and Responsibilities

The following sections outline the roles and responsibilities for the maintenance of ALS Class 1E Controls at WCGS.

1.1.1 WCNOC

WCNOC is the system owner and is ultimately responsible for the on-going maintenance of ALS Class 1E Controls. The WCNOC Maintenance Department, specifically the Instrumentation and Controls (I&C) group, has direct responsibility for maintaining the equipment. The WCNOC System Engineering group has the overall ownership of the equipment to ensure it is operating and maintained properly.

1.1.2 Class 1E Controls Supplier

The Class 1E Controls Supplier does not have day to day responsibilities for the maintenance of the equipment. The Class 1E Controls Supplier shall provide expertise for the ALS platform on an as needed basis throughout the operational life of the equipment. The Class 1E Controls Supplier shall provide system documentation to be utilized by WCNOC in the development of the maintenance procedures and preventative maintenance schedules. The Class 1E Controls Supplier has the 10 CFR 50, Appendix B, Part 21 responsibility for the ALS Class 1E Controls.

1.2 Project Deliverables Critical to System Maintenance

The following outputs from an ALS Class 1E Controls project are critical to ensure WCNOC has the information and tools required to maintain the system:

- Outline Drawings
- Control Logic Diagram
- Assembly Drawings
- Wiring Diagrams
- Handling, Shipping, and Storage Procedures
- Repair Parts List
- Installation, Operations and Maintenance Manual
- ALS Service Unit (ASU)

1.3 Implementation Characteristics

The ALS Class 1E Controls are a rack-based hardware system consisting of several circuit cards inserted into a card rack. The individual cards each have a specific function within the system. The cards are "hot swappable," which means they can be inserted and removed without powering down the rack. The troubleshooting of the rack is intended to be at the circuit card level. The ALS Class 1E Controls allocate all functions to hardware--none of the system functionality has been implemented in software. The ALS Class 1E Controls will be treated the same as other hardware-based systems in the plant. Therefore, the existing procedures for controlling plant equipment can be employed "as-is." The Figure 2-1 below shows the configuration of a typical ALS Class 1E Controls system.

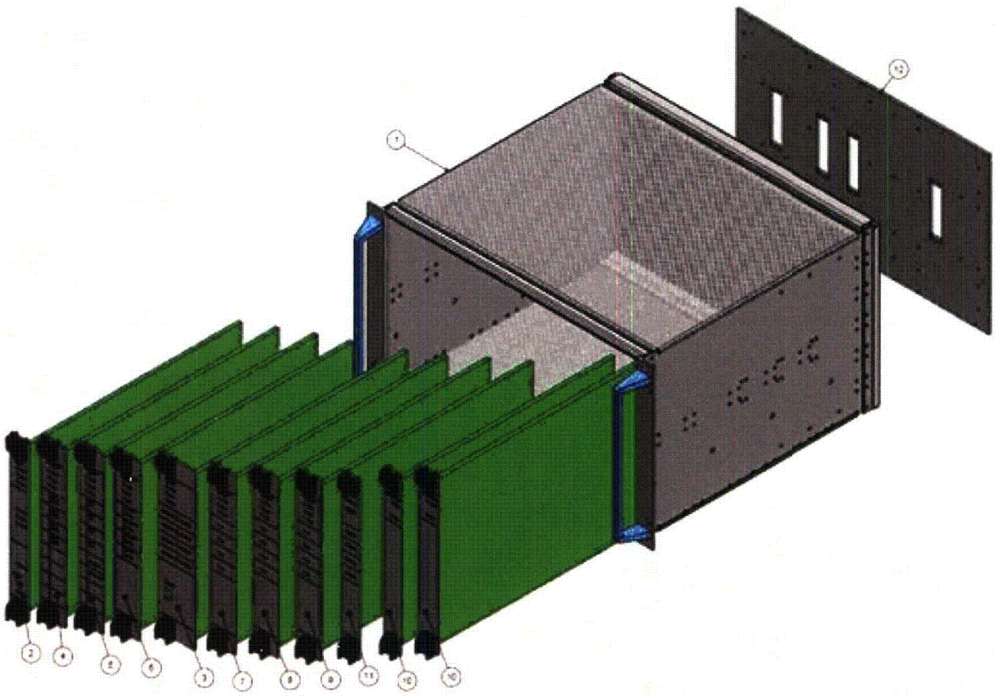

Figure 2-1: Typical Configuration; ALS Class 1E Controls

The ALS supports several advanced diagnostic techniques which are accessed and applied using the ALS Service Unit (ASU). The ASU is a dedicated laptop computer provided by the Class 1E Controls Supplier for troubleshooting and maintenance of the ALS . The ASU is connected to the ALS via a front panel USB port, and allows the technician to view internal states such as the status of each board and event recorder data.

1.4 Maintenance Procedures

Any specific procedures required for maintenance of the ALS Class 1E Controls shall be generated (or existing procedures revised) as a part of the WCNOC Plant Modification Process. The Installation, Operations and Maintenance Manual for a particular ALS Class 1E Controls system shall be the source document for generating or revising maintenance and troubleshooting procedures.

1.5 Maintenance Challenges

As discussed above, the ALS Class 1E Controls equipment will be treated the same as other hardware-based systems in the plant. Although the board designs consist almost entirely of surface mount components, this will not be an issue for I&C as spare boards will be stocked and all troubleshooting and replacement will be at the board level only. ESD precautions and procedures shall be provided in the I&C training class and reiterated in the maintenance procedures. The remaining system components consist of cables, connectors, fuse holders, and terminal boards which are essentially the same as other I&C equipment. Instruction on the primary ALS Class 1E Controls diagnostic tool, the ASU, shall be provided in the I&C training classes.

1.6 Spare Components

The initial order to the Class 1E Controls Supplier, for a particular system replacement, shall include sufficient spare components for 20 years of operation. As more systems are replaced with the ALS Class 1E Controls there will be more available common spares in the warehouse, and a reduced number of these common spares will be required in the initial system orders. Spare circuit boards shall include only pre-configured boards which only require a "set point" or configuration change which does not affect the FPGA logic.

The ALS Class 1E Controls main board, Core Logic Module, is specific to the particular application in the plant. WCNOC shall not stock blank Core Logic Modules at this time. If in the future WCNOC decides to stock blank Core Logic Modules the appropriate processes and procedures shall be employed to control the activity of "burning" a blank FPGA with a controlled logic image. WCNOC shall rely on separate spares stocked in the warehouse and/or the Class 1E Controls Supplier for the spare Core Logic Modules.