

Airfield Lighting Control & Monitoring System (ALCMS)

Liberty Airport Systems *Freedom Series*™ ALCMS is the result of over 21 years experience in airfield lighting controls using programmable logic controller (PLC) and microprocessor based technologies. What separates the *Freedom Series*™ ALCMS from all other systems, is the reliability and longevity of a fully redundant PLC based system, with all of the advanced distributed control and SMGCS features that others claim can only be provided with a PC based system.

The *Freedom Series*™ ALCMS sets the standard in system performance, reliability, and availability while providing the airport with an open architecture system and the freedom to modify the system as operational requirements change.

Standards Compliance

- FAA Advisory Circular 150/5345-56, Spec L-890 Available in all Classification types L890-X-Y where:
 - X = A - Control Only
 - B - Basic Monitoring
 - C - Advanced Monitoring
 - D - SMGCS (Individual Lamps Out)
 - Y = A - Preset Failsafe
 - B - Last State - Latching Failsafe
- FAA Advisory Circular 150/5340-30, Design and Installation Details for Airport Visual Aids.
- FAA Advisory Circular 120-57A, Surface Movement Guidance and Control System.
- ICAO Annex 14, Volume 1, Aerodrome Design and Operations.
- ICAO Aerodrome Design Manual Doc 9157, Part 5.
- ICAO SMGCS Manual Doc 9476-AN/927.
- Transport Canada Aerodrome Standards and Recommended Practices, Volume 1, TP-312E.
- Canadian Department of National Defence Standards.

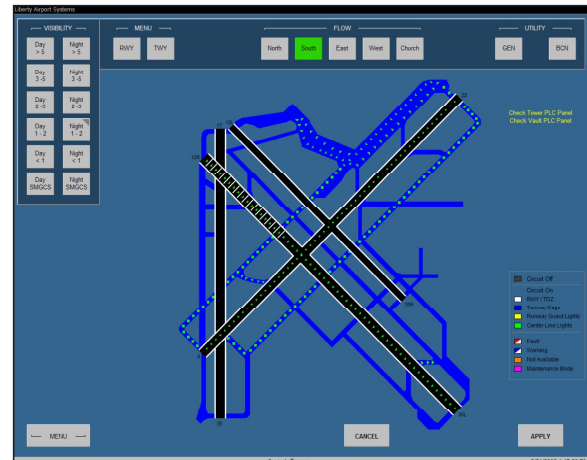


Fig. 1: Control Tower touch-screen graphic showing status of airfield lighting circuits. Visibility and automated routing control (flow) buttons provide the ability for Air Traffic Controllers to operate efficiently in low visibility conditions.

System Application

The *Freedom Series*™ ALCMS is a modular, expandable system designed for CAT I to CAT IIIB commercial or military airports. The most complex airport requirements including Surface Movement and Guidance Control (SMGCS) applications are easily handled.

- Control and monitoring of runway and approach lighting, Land and Hold Short (LAHSO), rotating beacon, wind cone, apron floodlighting.
- Control and monitoring of taxiway lighting including runway guard lights, controllable stopbars, lead-on lights and SMGCS taxiway routing.
- Control and monitoring of individual lamps on the airfield (including monitoring of CAT II / III adjacent lamp failures) using powerline carrier communication technology.
- Central De-Icing Facility individual lamp guidance control and monitoring as well as glycol recovery process control and automation.
- Full monitoring and control of power distribution equipment, diesel-generator and automatic transfer systems.

Technology Benefits

Computerized or PC based control systems are often replaced in as little as three to five years due to component failures, obsolescence and costly service from the manufacturer. In comparison, our PLC based systems, using industrial and utility grade components, have resulted in reliable systems that are easily maintained and upgraded (not replaced).

The fact that systems installed since 1988 remain in operation today, is testimony to the quality, expandability and our commitment to customer service and support.

Benefits include:

- Reliability, simplicity and longevity of a PLC based system with all the features, capabilities and performance of a high end distributed control or computerized control system.
- Critical control logic is provided by PLCs designed for twenty year life and 24 / 7 operation in harsh industrial environments.
- Embedded industrial controllers with no hard drives, fans or moving parts provide critical touch-screen operator interface graphics.
- Full component redundancy options eliminate all single points of failure, providing the highest availability of any system on the market.
- Competitively priced against commercial grade PC systems. The airport receives rugged industrial technology and the benefit of reliability and extended system life without the additional expense.
- Designed for ease of expansion over a ten to twenty year period. No need to disrupt airport operations every five years to replace PC based systems.
- Fully distributed processing assures the airport will never outgrow the system. Additional processors can simply be plugged in if faster performance or more capabilities are required.
- Off-the-shelf hardware and software ensures long-term support is always available. The airport is protected from any unforeseen supplier changes.

Control Capabilities

The *Freedom Series™* ALCMS is provided with enhanced control capabilities that can be modified or enabled as required. This allows the airport to modify the operation of the control system on a daily basis during construction, as incremental field changes are completed. Capabilities include:

- Control of multiple regulators, circuit selectors, diesel generators, and other equipment in multiple vaults and locations.
- Control of individual lamps and segments of lamps on the airfield for SMGCS applications.
- Independent or simultaneous control from various locations including control tower, maintenance shop, electrical vaults, operation center, Flight Service Station (FSS) or maintenance vehicle.
- Photocell and air-to-ground control are provided for unattended operation.
- Numerous operational features including site configurable automated control capabilities using RVR settings, full manual on / off / brightness control, runway flash and blackout capability, adjustable soft-start and on-delay.
- A transfer control procedure is provided, allowing control to be transferred from the tower to other locations as required.
- Utilities include lock screen, touch-screen calibration and background dimming.

Monitoring Capabilities

The *Freedom Series™* ALCMS can interface with a wide variety of off-the-shelf and custom I/O devices allowing the airport to expand the system without requiring OEM hardware. The system also supports direct serial or Ethernet communication to regulators and monitoring devices from various manufacturers. Monitoring capabilities are described in Descriptive Bulletin LAS-DB-004. Capabilities include:

- Monitoring of electrical equipment operation, performance, failures and potential failures, analog and digital variables.
- Monitoring of individual lamps for CAT II / III compliance.
- Monitoring of ALCMS performance, including communications, redundant hardware, primary and secondary power sources and batteries.

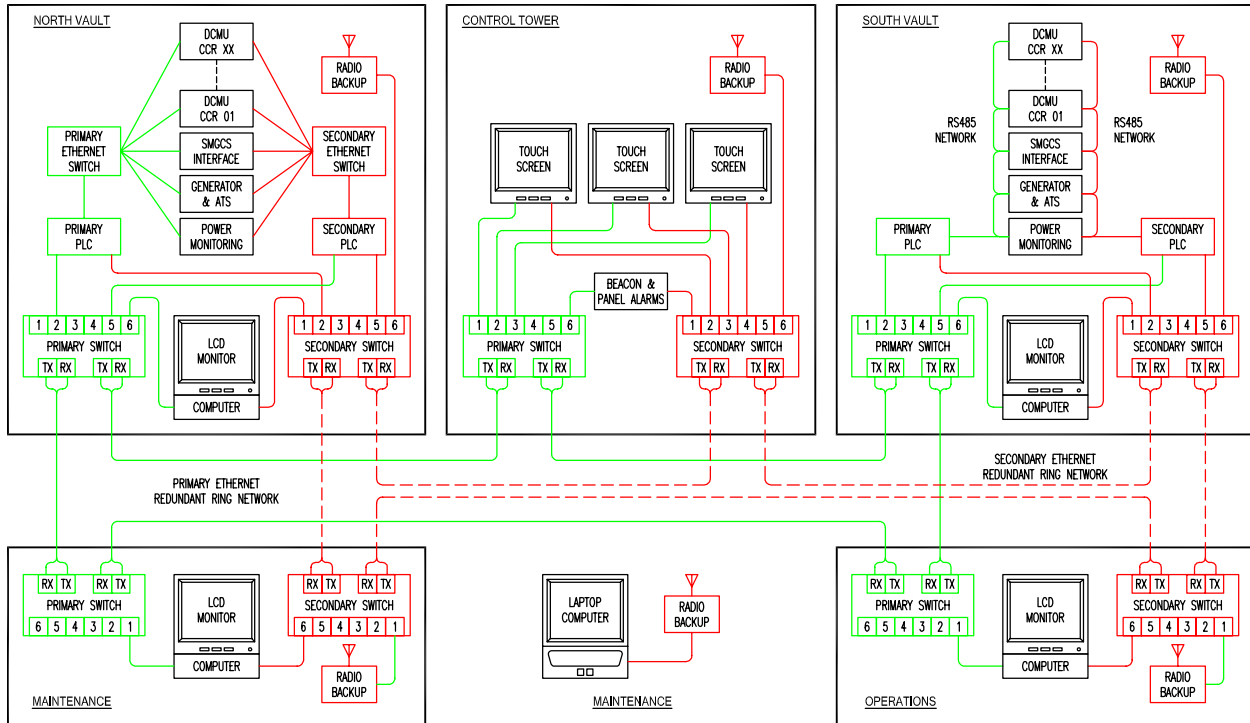


Fig 2: Fully redundant ALCMS with two 100MB Ethernet redundant ring fiber optic networks plus 54MB Ethernet backup radio network. North Vault features redundant Ethernet communications to Distributed Control and Monitoring Units (DCMU) located at each regulator (CCR). South Vault features redundant RS-485 communications to the DCMUs. Additional locations, touch-screens, computers, monitoring capabilities, or equipment can be added as required.

Communication Technology

Liberty is a market leader in communication technology with experience in developing and applying systems using standard and custom protocols including: Ethernet/IP, TCP/IP, Modbus/TCP, Modbus, DH+, DF1, ControlNet, Profibus, and Interbus-S. Strengths include development and implementation of redundancy schemes as well as custom protocol conversion from customer proprietary systems. The *Freedom Series™* ALCMS includes the following communication capabilities:

- Redundant networks designed using standard 100MB Ethernet from the operator level to the field device level. Web enabled components allow diagnostics using a standard web browser.
- Extensive media options include point-to-point fiber, redundant ring fiber, dual redundant ring fiber, wireless radio, RS485 shielded cables, CAT5 cables and DSL capable telephone lines.
- Direct network communication to constant current regulators (CCR) and other intelligent devices using Ethernet (Ethernet/IP), or RS485 (DF1 or Modbus protocols). Traditional parallel wiring is no longer required.
- Redundant Ethernet or serial interface support for any manufacturer's make or model of regulator or other product using the *Freedom Series™* DCMU. Refer to Descriptive Bulletin LAS-DB-004.
- Redundant Ethernet interface to control and monitor addressable single lamp control devices using powerline carrier technology. Refer to Descriptive Bulletin LAS-DB-005.
- Remote access via high-speed internet, cell network, dialup, or wireless access point provides the ability to remotely upgrade the system or assist maintenance personnel. This can also be used for emergency control from a temporary location in the event of an earthquake or other disaster.

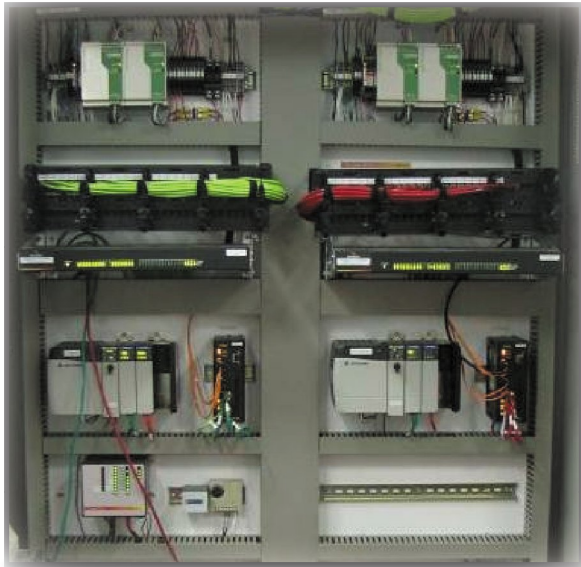


Fig. 3: Fully redundant Freedom Series vault panel.

Maintenance Functions

Monitoring information is gathered by the ALCMS and presented in concise formatted reports for management and maintenance personnel. Real-time data and current alarm conditions are displayed to assist in troubleshooting problems, and to verify correct system operation. Historical data, alarms and events are logged to disk, providing the ability to analyze the information at a later date. This can be useful in troubleshooting intermittent problems or identifying incorrect operational procedures. Features include:

- User-configurable alarm displays and logging. Alarms can be independently filtered for display at tower, operations, and maintenance locations.
- Remote messaging capability provides automatic notification of alarms via pager, E-mail or telephone to a user-defined priority contact list based on personnel schedules and availability.
- Operator actions and responses are logged in event files. In the event of an incursion or critical situation, the logs can be reviewed to verify that procedures were followed and that the equipment responded correctly.
- Alarm and event data can be sorted, filtered and presented in various standard or custom report formats.

- Data values can be logged to disk and can be viewed, analyzed and plotted in a trend plot for analysis over time.
- Features are provided to allow quick replacement of failed regulators or other equipment on the fly, allowing full control and monitoring capability using spare hardware.
- Field circuits, regulators, hardware, and monitoring features can all be independently enabled, disabled or configured by maintenance personnel.
- Several security measures are provided including operating system level security, site assignable ALCMS usernames and passwords, data encryption on remote access or wireless connections, disabling of system functions.

Ordering Information

Due to the flexibility and extensive options available with the *Freedom Series™* ALCMS, it is recommended to contact us for assistance. Basic information that will be needed is as follows:

- Type of system: non-redundant, fully redundant, or redundant communication only. Specify fiber, dual ring fiber, radio, desired specifications and routing.
- Desired locations for control, view only or maintenance capability. Desired equipment at each location: monitor or touchscreen (and sizes), type and grade of computers.
- Make, type and quantity of regulators and other equipment, monitoring and control requirements, vault network type (RS485 or Ethernet).



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