ADB SAFEGATE | AIRFIELD

CORTEX ALCMS Compact
System Preliminary Description

ADB SAFEGATE

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2 Glossary

Abbreviation	Description
ADBSG	ADB Safegate
AGL	Airfield Ground Lighting
AGL – function	A group of AGL Lighting circuits that are always controlled simultaneously.
ALCMS	Airfield Lighting Control and Monitoring System
ATC	Air Traffic Control (tower).
Auxiliaries	All AGL Devices excepting those belonging to the series circuits.
AUX	Auxiliary
CCR	Constant Current Regulator.
DOV	Detailed Object View of an AGL equipment. This view regroups the status, alarm messages and individual control of this particular equipment.
EFD	Earth Fault Detection
Ethernet	Network protocol developed jointly by Xerox, Intel and Digital Equipment Corporation. Ethernet networks use CSMA/CD and run over a variety of cable types at 10 Mbps (megabits per second), 100 Mbps or 1Gbps (Gigabit per second).
HMI	Human/Machine Interface
Node	Single location where ALCMS components are installed (e.g.: ATC, Substation, Maintenance center).
PLC	Programmable Logic Controller
RVR	Runway Visual Range (Visibility measurement)
SAT	Site Acceptance Test.
SUB	AGL Substation
TCP/IP	Transmission Control Protocol Internetwork Protocol
UPS	Uninterruptible Power Supply

3 Introduction

3.1 Objective of this document

This document provides a Technical Description of ADB SAFEGATE's Airfield Lighting Control and Monitoring System (ALCMS).

This document is, for the purpose of this submission, to be considered as a clarification outline paper to identify and assess the development of the design definition requirements.

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3.3 Trademarks and Patent Rights

General notice: other product names used here are for identification purposes only and may be trademarks of their respective companies. The Man Machine Interface for Airport Traffic Control representation is protected for ADBSG, by patent US 6,246,342 B1 dated June 12, 2001.

3.4 About ADB Safegate

Being market leader in the field of Airfield Ground Lighting, ADBSG provides products, airside solutions and services for airports worldwide. Operating in over 150 countries, ADBSG strives to continue to set the standard in innovation and technology, while offering optimal solutions for ground traffic management at airports, through visual aids. By doing so, we support airports around the world in enhancing their airside safety, efficiency, availability and maintainability.

Quality of our products, solutions and services is of outmost importance – seeing the environment that they operate in, and the operational requirements on safety and reliability that they must sustain. Therefore high levels of quality management during design, engineering, manufacturing and shipping processes are continuously maintained, in accordance with our ISO 9001 procedures.

3.5 Applicable Documents

The most recent revision of the following documents form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of the program contractual documents shall be considered the superseding requirement followed by the contents of this system specification.

Reference	Title
[ICAO]	ICAO Annex 14, Volume 1 (Aerodromes)
[ICAO]	ICAO Manual of Surface Movement Guidance and Control System, Doc 9476-AN/927
[ICAO]	ICAO European Manual on Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Doc 9830 – AN/452 first edition 2004.
[ICAO]	Eurocae, WG 41: Minimum Aviation System Performance Standards for Advanced Surface Movement Guidance and Control Systems (A-SMGCS)
[ISO 9001]	Quality systems – Model for quality assurance in design, development, production, installation and servicing
[FAA]	FAA AC 150_5345_56b
[EASA]	CS-ADR-DSN

4 ADB Safegate's ALCMS philosophy

4.1 General purpose of an ALCMS

The primary goal of an Airfield Ground Lighting Control & Monitoring System (ALCMS) is to provide control and monitoring functionalities for visual aids to enhance safety, efficiency, maintainability and reliability of airside operations.

Practically, this means that the ALCMS is used to control and monitor all Airfield Ground Lighting (AGL) equipment installed on the airfield, and as such supports the efficient and safe maneuvering of all ground traffic at an airfield. This is achieved by using a series of Computers and/or Programmable Logical Controllers (PLCs) that will transfer the ATC operator's commands to the various devices in the field; monitor their status and provide the appropriate feedback to the operator and maintenance staff.

The ALCMS is part of a modular and scalable system platform – for both hardware and software. The purpose of this modular approach is to be capable of growing with the airport needs; as and when changes are required in the future, options may be added to extend the functionality.

4.2 Safety

Safety is of crucial importance in airside operations. This is also valid for any ALCMS being implemented at a live airport. Safety requirements are to be taken into consideration in the ALCMS design, development, installation, commissioning and training that comes along.

The general guidelines used are provided here:

- Competent development management: the ALCMS concept is based on ADBSG many years of experience in AGL products and systems development. Being an active member of several international regulatory organizations that define new standards for the AGL industry, ADBSG possesses long experience and thorough understanding of airside processes, their impact on AGL requirements, and the relevance of safety to that. This is reflected in safety being an integral part of the design process of ADBSG products and standards. Defining the concept of safety in individual designs, considering relevant fail-safe modes of operation, supporting the development of safety cases are important instruments in this respect.
- Selection of Hardware components and architecture design, in order to safeguard the availability of the ALCMS, the proposed architecture considers using high available components, typically industrial equipment, for the crucial parts of the system.
  Depending the level of availability required to ensure safe operations at the airport, the ALCMS design may consider redundancy for the most critical ALCMS components, ensuring the failure of one component will not compromise the operations.
- Ease of use, intuitive design, it is key to safety to have systems which are written to be easily comprehensible by the end users without requiring extensive training, the ADBSG delivered systems are developed over many years using feedback received by the wide range of Air Traffic Controllers and Maintenance team users that help us make the ALCMS easy to take up by airports.
- The use of logging mechanisms in the ALCMS is another safety-supporting functionality. This covers both the logging of operational events in the ALCMS, as well as a detailed logging of a range of technical parameters.

4.3 Design Philosophy

The ADBSG proposed solution for the new Airfield Ground Lighting Control & Monitoring System (ALCMS) will be designed to ensure a safe and user friendly method for the ATC operator interface fully in accordance with ICAO regulations and recommendations; and customer specified requirements.

The design for the ALCMS, gives due consideration to the relevant internationally accepted standards, ICAO Annexe 14, Aerodrome Design Manual Part-4 and Part-5, EASA CS-ADR-CSN or FAA AC150 L-890.

The architecture of the ALCMS is carefully chosen, with particular attention being paid to the following requirements:

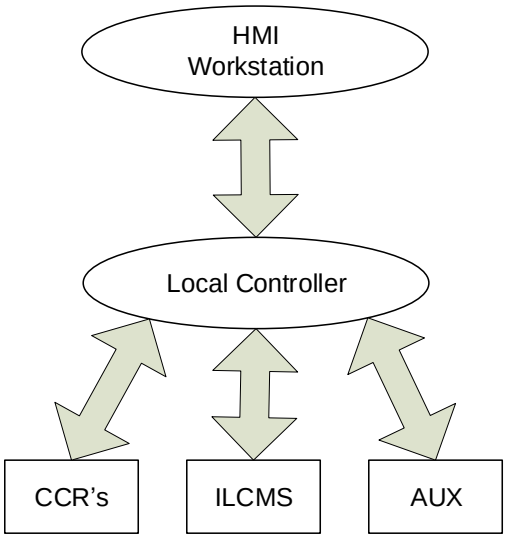
- System Reliability, Availability and Maintainability.
- Smooth transition of operation from the Design team to the airport facility operator.
- Provision of a modular design to facilitate "*ease of realization*" of any future "extensions" or "enhancements" of the system.
- Ease of maintaining the system.
- ATC HMI – visualization screens: developed with the benefit of end-user operator input.
- HMI realization using proven and reliable latest version tools and products.
- Industrial grade-based components for stability and robustness.
- Utilization of latest versions of software and hardware already in-use and proven in airports.
- System enhancement support.
- Integration with other 3rd party systems.

4.4 System Topology

The typical architecture of the complete ALCMS can be divided into three levels:

- Control level: Human-Machine Interface (HMI) computers for ATC operators and maintenance staff: the top-level HMIs for command and visualization provide control and monitoring functionality to the ATC operators and detailed graphical feedback of the airport's AGL equipment to the maintenance staff.
- Communication level: Dedicated communication network as a connecting intermediate between substation cabinets on all locations, HMI computers and I/O modules.
- Execution level: Substation controllers to which the field equipment is connected. It is this level that will execute the commands from the control level through the field.

At each of these levels, dedicated components are used to perform the level-specific tasks and achieve the required degree of performance.



4.5 Hardware Selection

To guarantee the availability of the system care is taken in the selection of the hardware components used within the Cortex ALCMS Product suite, selecting appropriately commercial and industrial off-the-shelf components to compose the Solution.

The selection of the hardware is also influenced by the customer requirements, e.g., while the proposed standard offering for HMI is standard commercial computers, to be installed in ATC Consoles, it is possible to use Industrial grade computers installed in racks when required by the airport.

All proposed cabinets are of industrial type and can be wall mounted or self-standing depending on the needs.
The manufacturing and cabling of the cabinets ensure a high level of quality and is delivered with its complete set of documentation to ease maintenance and troubleshooting.

The selection of the hardware is achieved by following a validation process where several considerations are taken regarding the usage of the components for the whole Solution:

- Hardware requirements related to Software needs to ensure the best performance.
- Lifetime of the hardware, MTBF as well as MTTR values are key to provide a solution that will continue working for a long time and that is easy to maintain or to replace in case of failure.
- Energy consumption to reduce the environmental impact of the selected hardware.
- Worldwide availability to ease spare parts management.

5 Functional description of the ALCMS HMI

5.1 Introduction

The operational HMI is based on a Graphical User Interface (GUI) with easy-access menus and screens displaying all the relevant information. This HMI is designed with intuitive look-and-feel and use of icons to facilitate operation. Care was taken during the design to always provide clear and unambiguous information to the operator and to facilitate the integration of the system in the tower, all the screens relevant to the ATC are specifically designed to be easily operable with a touch screen.

The system has 4 main users groups.

- ATC controller:
  The lighting control part is dedicated to the tower operations, containing all means related to the sending of command to the airfield ground lighting. This section can be split into Air Traffic Control (Runway, Approach, Papi lights…) and Surface Guidance Management (Taxiway, Lead-on and Stopbars lights control).

- Maintenance:
  The AGL monitoring and troubleshooting part is dedicated to the maintenance service team.

- Supervisor Controller:
  Can modify "ATC" system settings, change command.

- Supervisor MAINT:
  Can modify "MAINT" system settings, change command.

The system provided functionality depends on the login name and password of the user; this will grant access to certain functions while other functions will be blocked. When no user is logged in, the System will continue to provide view only functions.

5.2 User management

As for any control and monitoring system, the volume of information presented to each user must be carefully controlled to avoid overloading the operator with irrelevant information. Therefore, different user groups have been created, each of them having clearly defined access rights.

The ALCMS differentiates between ATC users and Maintenance users, offering the following two modes of operation.

ATC control is mainly dedicated to the tower operations, containing all control functionality related to commanding the airfield lighting circuits. This section can be split into a part serving ATC (approach, PAPI, runway and taxiway lead-on lighting) and a part dedicated to Surface Movement Guidance (taxiway, stopbars and floodlighting control – if applicable).

Maintenance operations for monitoring and troubleshooting: this part is meant to support the maintenance and service teams at the airport, enhancing the overall maintenance performance.

Additional user groups like the system supervisor are also available. They extend the maintenance features, offering the possibility to modify system-related or protected parameters.

The access to the ALCMS and thus the selection of a user group is restricted by log-in and password.

5.3 Control of operations

As indicated in the previous chapters, the overall ALCMS may comprise multiple computers, which result in the necessity to control the access to the airfield lighting equipment.

Indeed, controlling the equipment from two locations simultaneously could result in unexpected behavior for the operators if no clear control mechanisms are set in place.

The ALCMS system is configured in such a way that only one of the system computers is allowed to enter commands into the system at a specific point in time and for a specific area of responsibility.

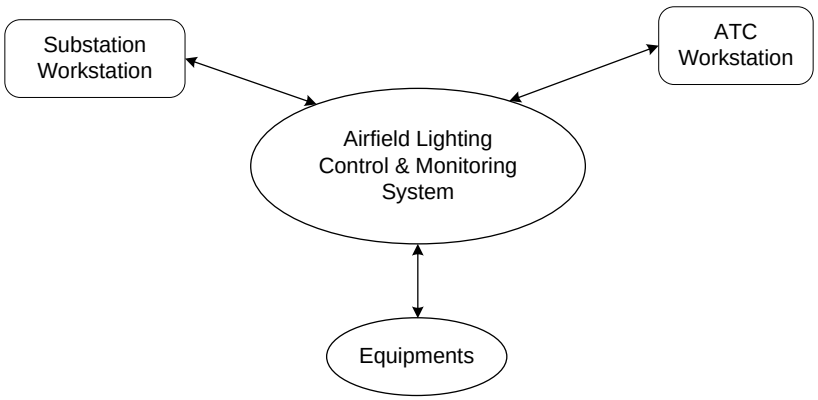
Mostly, the control will be granted to the ATC-HMI, used by the ATC operators, when multiple HMIs are available, a user having the required privileges will be allowed to request the control of the operations on any of those HMIs to become the unique user controlling the AGL infrastructure.

In case of need, this same control can be taken from a Maintenance HMI located in the Maintenance facility or in any substation.

Remark: It should be noted that a locally formalized procedure should be put in place at the airport for this purpose.

5.3.1 Context Diagram

The following diagram depicts the context of the Airfield Lighting Control and Monitoring system (ALCMS). It is foreseen that the interfaces mentioned in the diagram shall provide all necessary information for ensuring the system's performance.



All the systems requiring data exchange at the Airport shall be interconnected using the visual aids dedicated network, called the Common Data Network (CDN). Interfaces with other systems are made available via a secured connection via separate and dedicated router/switch.

5.3.2 AGL control philosophy

To facilitate the operational usage by the ATC controllers, the ALCMS is designed to provide two levels of control of the AGL infrastructure.

The first level of control is done by setting the Airport operational conditions, Landing Direction and Luminance level which will operate all AGL equipment to fit the operational needs in these conditions.

The second level of control allows the ATC controller to adapt the AGL intensities for each individual AGL function providing a finer graded control of the AGL infrastructure.

The usage of these controls is further explained in the following chapters.

5.4 The different HMI windows.

The following chapters provide a high-level description of the different screens the HMI will provide as well as the options that can enhance the solution and better fit the operational expectations.

5.4.1 Navigation Bar

To navigate through the various HMI windows, a Common "Navigation" bar is always present at the bottom of the HMI. The accessible HMI windows will depend on the user level.

This Navigation bar provides several buttons to navigate between the HMI windows, a menu button providing additional settings such as login, select the HMI themes, access the user manuals and a set of displays showing the actual date and time, the name of this HMI, and the user that is logged into the system.

5.4.2 Airport Overview Window

The ATC operators primarily use this window for the control and monitoring of the approach, runway and taxiway lighting while the Maintenance user can get an immediate status of the AGL conditions that could affect the operations.

The Airport Overview Window contains three main sections as described below.

5.4.2.1 *Global Control Section*

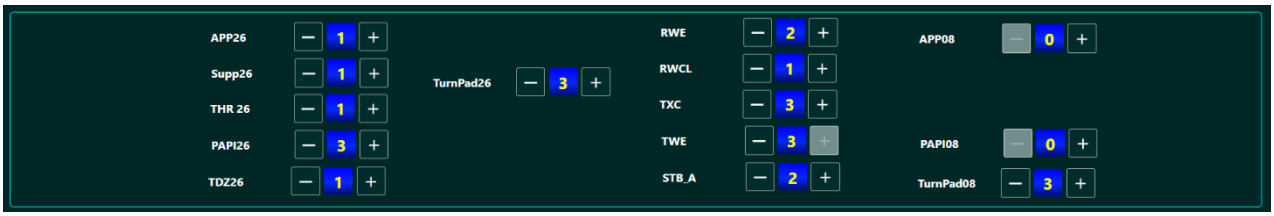
The upper part of the window provides a set of buttons allowing:

- To take the control of the operations on this HMI
- To set the Airport general conditions that will send commands to all lighting circuits in accordance with a modifiable pre-set table (the Brightness Table)
- To switch off all the AGL when e.g., closing the Airport

By setting the Landing Direction and the Luminance level, the ALCMS will operate the different AGL visual aids at the intensity level defined in the automatic brightness table.

5.4.2.2 *Individual AGL Functions Control Section*

The Individual Function Control section located at the bottom of the window will be used when the operator wants to deviate from the default configuration set by using the global control section to meet the immediate requirement of a pilot or sudden variation of weather. It will allow the user to control individually each of the available AGL Visual Aids.



For each function:

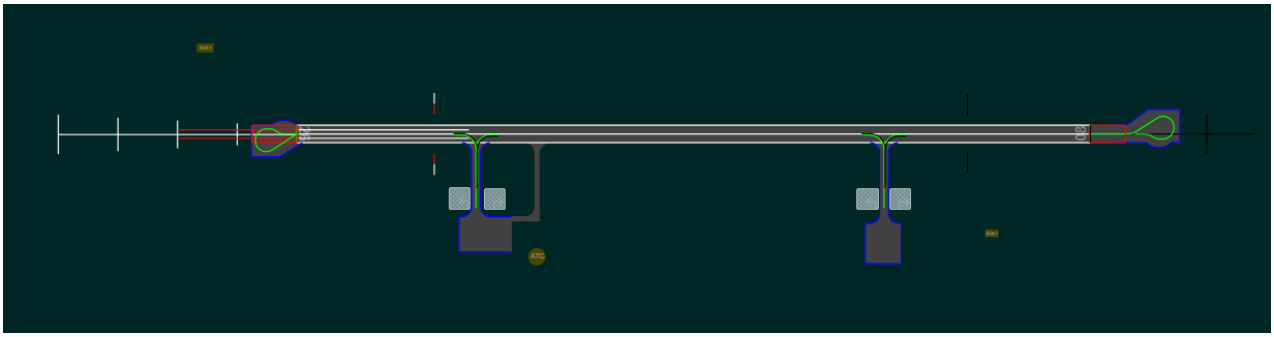
- A [+] and [-] buttons are available to increase/decrease the brightness of each equipment by one step. When doing so, a yellow rectangle will appear to show the newly requested intensity of functions, while the blue rectangle shows the status of the functions. The user must then validate the new request before it is executed.

- If the function CCRs are partially in maintenance, local or unserviceable, a yellow warning sign will appear on the button. This means that the ATC operator can continue controlling the remaining CCRs addressed by this function.

- A red warning sign will appear on the button if all corresponding CCRs are non-operational or in maintenance/local mode. While in this situation, the ATC operator has no control over this function.

5.4.2.3 *Graphical Feedback Section*

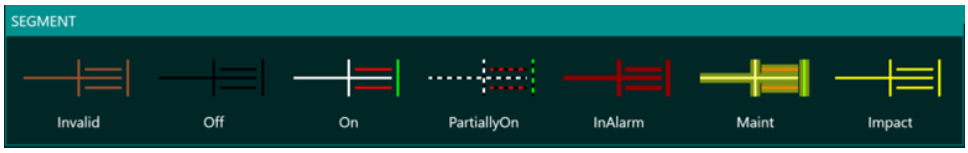
The "Graphical Feedback" section presents a "live" picture of the Runway providing immediate true status of the AGL visual aids by using colors and graphical behaviors.



Since this feedback is generated on AGL-function level (could be a group of regulators), it may be difficult to determine from this window which AFL-equipment has an error.

Therefore, the Equipment Overview window is available to get the additional details that the Maintenance team would need to maintain the AGL infrastructure.

The "Graphical Feedback" section depicts the airfield current situation through dynamic objects that represent true status feedback. This means that each object (represented lighting) can be represented in seven different states:



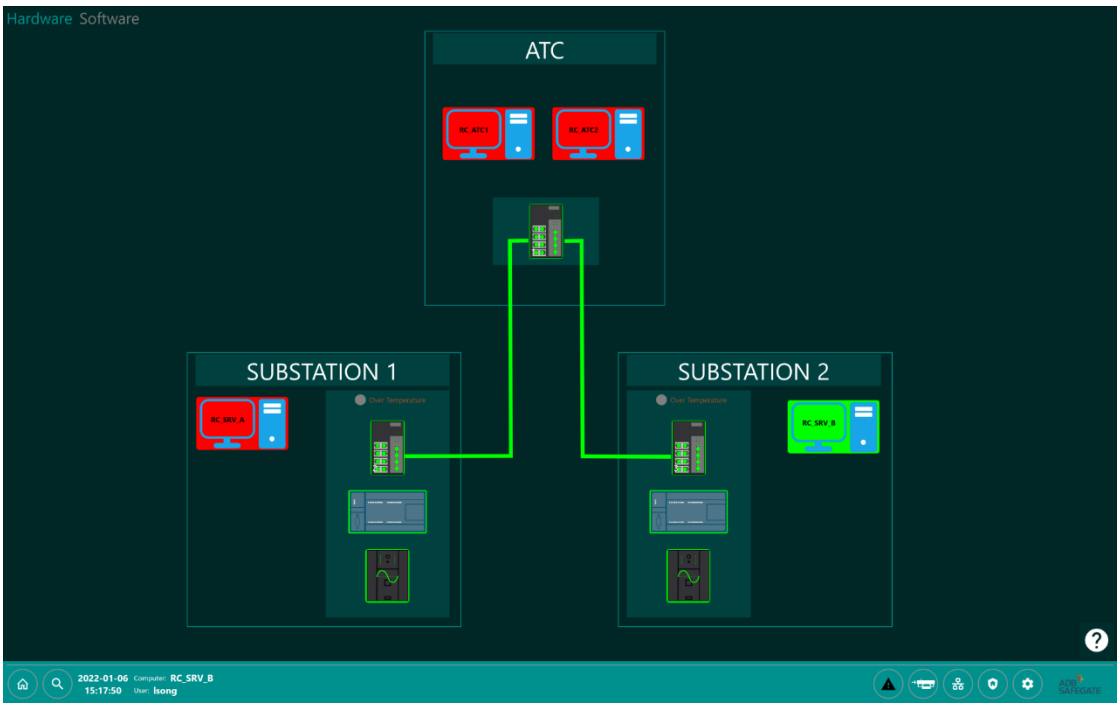
- Invalid: the system is loading and establishing connection with this set of segments.
- Off: the segment is turned Off.
- On: the segment is turned On; the actual color is shown.
- Partially On: the segment is partially on thanks to interleaving. Part of the CCRs powering the segments are unavailable.
- In Alarm: an alarm exists at the segment level.
- Maint: the segment is set in maintenance (at the segment level).
- Impact: the segment will be impacted by the current ATC requested commands.

A legend is always available using the [?] button on the lower right part of the screen.

5.4.3 System Status Window

The System Status Window provides a graphical representation of the different components of the ALCMS giving its actual status using colors.

This window is the starting point of maintenance and troubleshooting activity. It will typically display the status of HMIs, Servers, PLCs, network equipment and UPS.

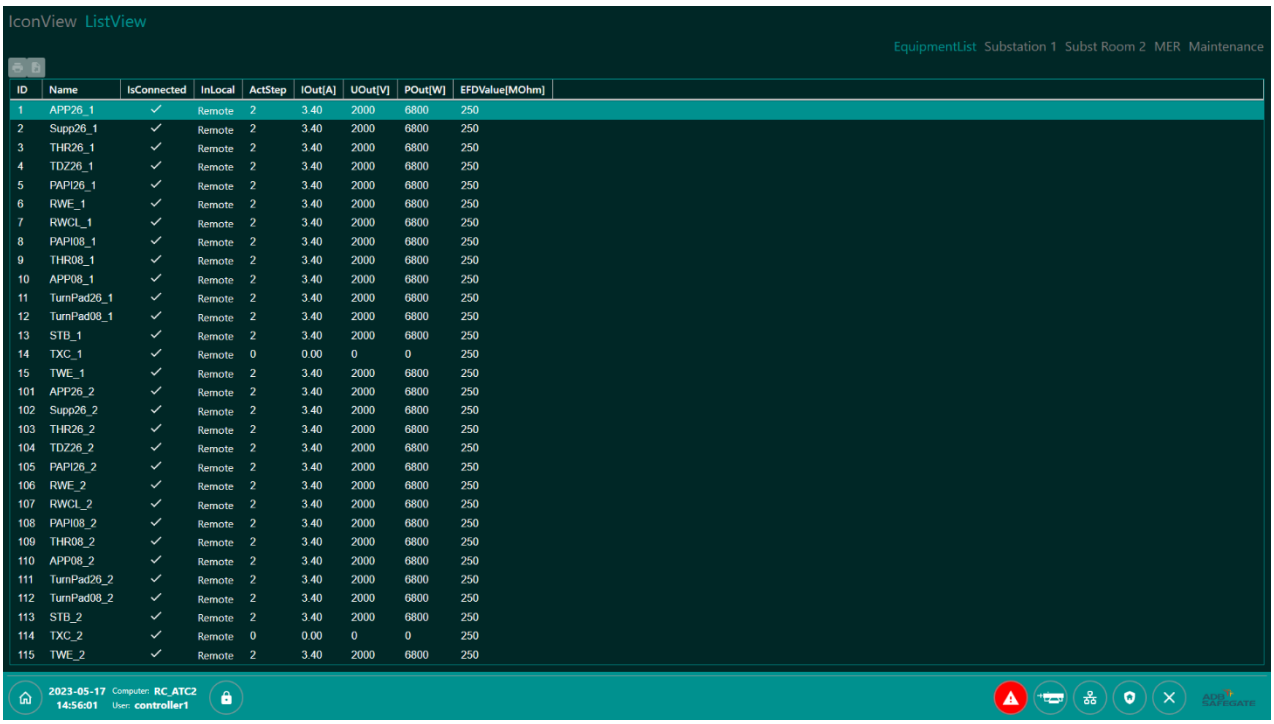


A set of icons and color code will be used to provide direct feedback on the actual status of the equipment ensuring a fast understanding of the situation.

5.4.4 Equipment Status Window

The Equipment Status Window provides a complete overview of the AGL equipment controlled and monitored by the ALCMS in a tabular form.

For each equipment, the System displays its current operational state (ON, OFF, Step, Remote, Local, Alarm) and the analogue information it provides, such as Output Current, Voltage, Power, and/or Isolation value.



ID	Name	IsConnected	InLocal	ActStep	IOut[A]	UOut[V]	POut[W]	EFDValue[MOhm]
1	APP26_1	✓	Remote	2	3.40	2000	6800	250
2	Supp26_1	✓	Remote	2	3.40	2000	6800	250
3	THR26_1	✓	Remote	2	3.40	2000	6800	250
4	TDZ26_1	✓	Remote	2	3.40	2000	6800	250
5	PAPI26_1	✓	Remote	2	3.40	2000	6800	250
6	RWE_1	✓	Remote	2	3.40	2000	6800	250
7	RWCL_1	✓	Remote	2	3.40	2000	6800	250
8	PAPI08_1	✓	Remote	2	3.40	2000	6800	250
9	THR08_1	✓	Remote	2	3.40	2000	6800	250
10	APP08_1	✓	Remote	2	3.40	2000	6800	250
11	TurnPad26_1	✓	Remote	2	3.40	2000	6800	250
12	TurnPad08_1	✓	Remote	2	3.40	2000	6800	250
13	STB_1	✓	Remote	2	3.40	2000	6800	250
14	TXC_1	✓	Remote	0	0.00	0	0	250
15	TWE_1	✓	Remote	2	3.40	2000	6800	250
101	APP26_2	✓	Remote	2	3.40	2000	6800	250
102	Supp26_2	✓	Remote	2	3.40	2000	6800	250
103	THR26_2	✓	Remote	2	3.40	2000	6800	250
104	TDZ26_2	✓	Remote	2	3.40	2000	6800	250
105	PAPI26_2	✓	Remote	2	3.40	2000	6800	250
106	RWE_2	✓	Remote	2	3.40	2000	6800	250
107	RWCL_2	✓	Remote	2	3.40	2000	6800	250
108	PAPI08_2	✓	Remote	2	3.40	2000	6800	250
109	THR08_2	✓	Remote	2	3.40	2000	6800	250
110	APP08_2	✓	Remote	2	3.40	2000	6800	250
111	TurnPad26_2	✓	Remote	2	3.40	2000	6800	250
112	TurnPad08_2	✓	Remote	2	3.40	2000	6800	250
113	STB_2	✓	Remote	2	3.40	2000	6800	250
114	TXC_2	✓	Remote	0	0.00	0	0	250
115	TWE_2	✓	Remote	2	3.40	2000	6800	250

5.4.5 Alarms Window

When the Alarm Window menu button is selected from the navigation section, the Alarm Window can be viewed. This page displays information about all the alarms currently active in the system and is a valuable tool for troubleshooting the system. Messages can be sorted, filtered, and printed and a clear color code is used to show the severity of the problems.

The handling of alarms is based on a defined workflow that ensures that all the alarms must be acknowledged by the users before they are cleared from the alarm browser.

Also, as several levels of alarms (and warnings) are available, the contents of the alarm window will be adapted to the currently logged-in user. This ensures that ATC users are presented with information directly relevant to them.

Note also that alarms are accompanied by an audible sound to attract the user's attention.

ID	ModelID	DateTime	AlarmType	Message	PointOfError	ModelType	EquipmentName	ModelAlarmType	State
3096512506626049	1	2022-01-07-16:55:11.888	Warning	Segment Warning Partially Availlable	System	Segment	BANA	Segment Warning Partially Availlable	InAck
3096516801593345	1	2022-01-07-17:00:23.311	Warning	Segment Warning Partially On	System	Segment	BANA	Segment Warning Partially On	In
3378017548107777	1	2022-01-07-17:00:23.311	Warning	Function Warning Partially On	System	Function	BANA	Function Warning Partially On	In
2814771241943141	101	2022-01-07-17:00:17.898	Warning	CCR In OOS Mode	Sub1	CCR	BANA 14	CCR In OOS Mode	In
3378021843075081	9	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	GLIDBANA 32	Function Warning Deviation	In
3378021843075080	8	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	INFLYGNING Li 32	Function Warning Deviation	In
3378021843075079	7	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	INFLYGNING Hi 32	Function Warning Deviation	In
3378021843075078	6	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	RGL	Function Warning Deviation	In
3378021843075077	5	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	TAXI	Function Warning Deviation	In
3378021843075076	4	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	GLIDBANA 14	Function Warning Deviation	In
3378021843075074	2	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	INFLYGNING Hi 14	Function Warning Deviation	In
17170896997318757	101	2022-01-07-16:09:20.745	Alarm	Cabinet DisConnected	Sub1	Cabinet	1_Cabinet	Cabinet DisConnected	In
3378021843075073	1	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	BANA	Function Warning Deviation	In
6755670023995423	31	2022-01-07-16:09:20.745	Alarm	Computer DisConnected	Sub1	Computer	RC_SRV_A	Computer DisConnected	In
6755670023995394	2	2022-01-07-16:09:20.745	Alarm	Computer DisConnected	ATC	Computer	RC_ATC2	Computer DisConnected	In
6755670023995393	1	2022-01-07-16:09:20.745	Alarm	Computer DisConnected	ATC	Computer	RC_ATC1	Computer DisConnected	In
3378021843075075	3	2022-01-07-16:09:20.745	Warning	Function Warning Deviation	System	Function	INFLYGNING Li 14	Function Warning Deviation	In
17170896997318857	201	2022-01-07-16:09:20.745	Alarm	Cabinet DisConnected	Sub2	Cabinet	2_Cabinet	Cabinet DisConnected	In

5.4.5.1 *Alarm and Event Log Window*

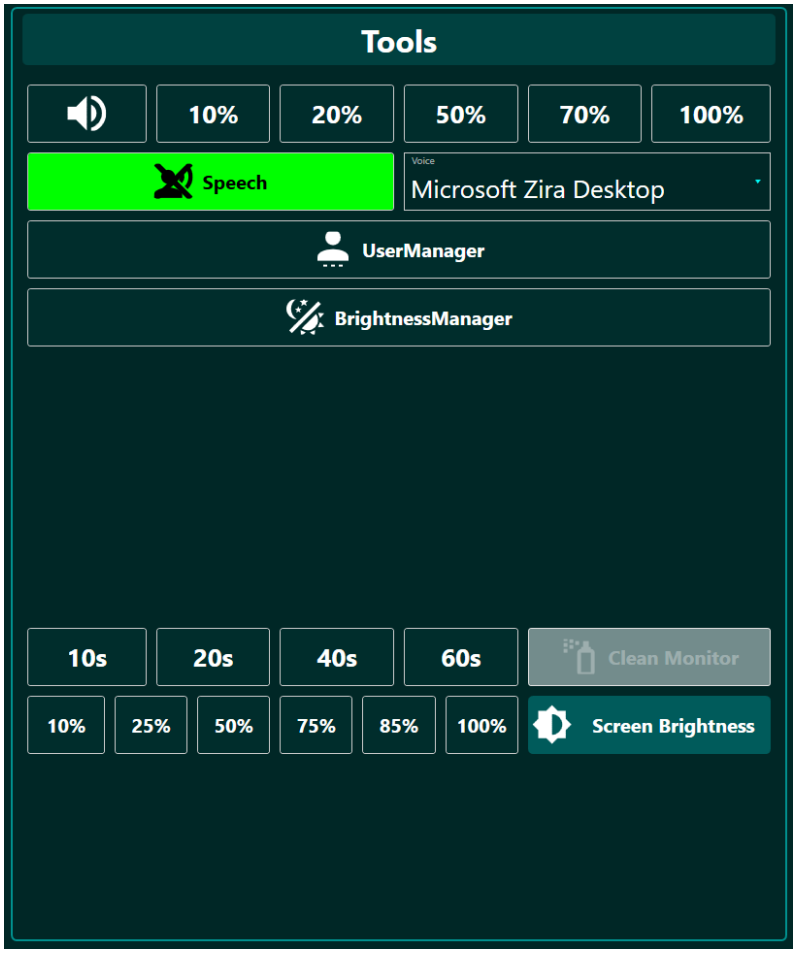
This window records the history of the alarms and events (operator major controls e.g., changing Landing Direction) that appeared on this machine and the system.

An advanced filter tool is provided by ADB SAFEGATE to select the required data. It is possible to sort and filter the alarm messages following several different rules.

5.4.6 Utility screens

The ALCMS provides several utilities for maintenance operators and system administrators:

- The User Configuration of the System restricted to power users.
- The ICAO Table screen from which the system administrator can modify the default conditions settings defined according to the requirement per ICAO Annex 14.
- The Manuals screen provides access to on-line documentation such as, ADB SAFEGATE's manuals for installation of AGL fixtures or AGL equipment.
- The Tools allowing the user to to set volume, screen brightness settings and cleaning the touchscreen..



5.4.7 Additional optional features

On top of the main functional package described in the previous chapters, the ALCMS can be enhanced with an additional set of functionalities that would provide the users with features which would ease their daily work, increase the amount of information received, and provide more detailed options to control and monitor the AGL infrastructure or interact with other Systems at the airport.

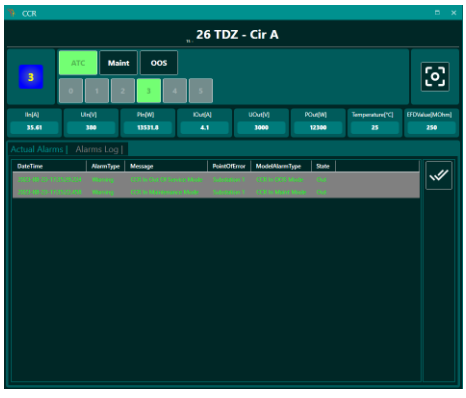
5.4.7.1 *Optional Substation Window*

As an optional feature, the ALCMS can be provided with an additional Substation View to be used for maintenance purposes and providing a view of the different components controlled and monitored by the ALCMS and distributed in the several substations. A window is provided per Substation to ease the navigation.

Each piece of equipment is represented by a graphical object which provides immediate status of the equipment using colors (ON/OFF) and icons (Step, Local, Alarm, Warning).

By clicking on the graphical object, the Equipment detailed view pops-up, displaying detailed information like current operational status, alarms and warnings, output current, voltage, power, earth fault measurements, operational times, several trends providing historical data, as well as providing the Maintenance user with tools to change the operational status of the equipment such as:

- Maintenance mode allows operation of the equipment without the need of taking over the operations from ATC but only getting the control of this equipment for testing purposes.
- Out of Service mode disables the equipment from ATC control while stopping all alarms and events during the maintenance activities.



5.4.7.2 *Digital I/Os Weather interface*

The Weather interface is meant to provide the Weather System with the actual status of the Runway Lights intensity to determine the visibility conditions of the Airport.

This option is made possible by a PLC located in the Tower which will have the following free voltage outputs:

- 5 outputs providing the actual Runway Edge intensity.
- 5 outputs providing the actual the Runway Centerline intensity.
- 2 outputs providing the actual Landing Direction in operation.

5.5 Future Capabilities

The CORTEX ALCMS is a platform that is meant to support the Airport growth of operational needs and can therefore be expanded as the Airport is.

The expansion could be structural, implying the growth of the System architecture by adding additional AGL Equipment, HMIs, electrical substations, ATC towers, Maintenance centers or any other location that the Airport would like to have capabilities in controlling or maintaining the AGL infrastructure. The CORTEX ALCMS was developed to ensure no limitations of the System Architecture, adding additional components is always possible.

Besides the structural growth, the operational needs may also demand additional functionalities to support the stakeholders in their daily activities, these functionalities may not be needed in first instance, but come with the expansions of the Airport. Therefore, the CORTEX ALCMS can be enhanced with features that would ease the operations of the Maintenance teams or Air Ground Traffic controllers while the Airport complexity grows.

The current proposal is not considering those additional features, therefore the herein description is not detailing all those additional features and functionalities the platform is supporting, feel free to contact us for additional details.

6 Cortex ALCMS Project Process description

ADB Safegate is worldwide leader in the delivery of AGL products and deployment of ALCMS solutions easing the operations at airports. ADB Safegate has more than 40 Engineers exclusively working on delivering Solutions to all airports in the world, these teams are in several geographical regions to better support our Customers.

All teams and Engineers work following the same process to ensure that the quality of our Solutions is the same regardless of the Region they are deployed.

The Cortex ALCMS Compact process follows this approach while simultaneously being lean enough to ensure cost effective Solutions can be provided to our Customers while maintaining high-quality and will therefore consist of the following main activities:

- Scope definition: this is the very first step in the realization of the Solution and consists of gathering the required information that is needed to configure the ALCMS, specifically for the Airport, during this step a questionnaire is to be compiled to gather the requirements in term of System Architecture and AGL infrastructure.

- With the provided information and the Functional set bought; a System Description is generated providing definition on the Solution that will be produced. The document will describe the hardware architecture as well as the functionalities included in the Solution, standardized views are used to explain the features of the provided Solution.

  This document does not require an approval but is provided with the intention to inform about the final solution that will be delivered.

  In case a full Design process is expected, this can be offered as a separate activity.

- The Solution is produced, the hardware is manufactured, and the software is configured for the Airport based on the received information.

  The complete setup is made in our premise, simulating as much as possible the real world, all cabinets are setup, interconnected using the same type of media that will be used on site, all computers, PLCs, network switches and UPS are connected to their respective end points and loaded with their respective software, finally simulators are used to verify the communication with the AGL equipment that will be available on site.

- The Solution is validated following our internal Formal Qualification Testing (FQT) procedure to verify that all requirements are achieved, and that the Solution is in accordance with the expectations.

- A remote demonstration is planned with the Customer to show the resulting Solution and verify the correctness of the functionalities and graphical views.

- The user documentation is generated and comprises:

  - Installation Manual that will help the local team to install the several components of the Solution in the various locations.

  - Architecture Manual describes the solution's architecture, its components, the equipment that are connected and how they are connected.
  - User Manual that describes the several functionalities and the way to operate them.
  - Maintenance Manual that describes the preventive and corrective maintenance procedures.
  - Shop drawings of the cabinets to support the Maintenance troubleshooting.
- The Solution is delivered to the site and physically installed by the installation company.
- The Solution is commissioned by an ADBSG expert that will verify and test:
  - The physical and electrical installation is in accordance with expectations.
  - Communication with all the equipment.
  - The network linking the distinct locations.
  - The different functionalities of the ALCMS in accordance with the System Description.
- SAT is performed with the customer to validate the Solution.
- Hands on training for ATC and Maintenance personnel.
- Release of the Solution to the customer and start of warranty period following terms of contract.