Suggested Specification: LINC 360

Overall System

The system shall be able to control and monitor individual lamps or groups of lamps and interface to local field devices such as sensors. The control system itself shall consist of three types of main components only – Remotes, Controller and a supervisory computer. The first component is a decentralized lamp control field unit (Remote) capable of independently switching one or two lamps or I/O devices that interface to field sensors. The second component is the series circuit communication interface (Controller), which is installed in the substation. The Controller is connected between the constant current regulator and the airfield series circuit. The last component, the supervisory computer is installed in the substation. The PC functions as a gateway between Controller and ALCS (Airfield Lighting and Control System). Commands coming from the ALCS will be transferred as single or block commands (a block command addresses various Remotes with the same command) to the Controller, feedback signals will be transferred to the ALCS. All configuration, commissioning and maintenance tasks will be carried out on the PC as well. A comprehensive overview about all process status as well as the possibility to carry out various commands is ensured by the GUI.

Communication

Communication to the Remote shall be accomplished using advanced RF techniques imposed on the existing high voltage airfield series circuit. To eliminate negative impact due to crosstalk (attenuation between circuits less than 30 dB), the overall system shall provide different time synchronized communication channels.

These shall be individually programmable for each circuit. Fixed repeaters or amplifiers (which compensate for changes in temperature, moisture and aging) are not permitted. In order to eliminate loss of communication to long sections of airfield devices in case of Remote failure, Remote communication amplification on an individual airfield circuit shall be self-configuring. The failure of any Remote shall not affect the communication to the next Remotes on the circuit. Robust Forward Error Correction methods shall be used to ensure a high degree of data integrity and reliable communication performance.

It shall be possible to install and individually operate up to 300 Remotes with a maximum of 6 I/O devices in a circuit under specified conditions. It shall be possible to communicate on airfield circuits with a maximum roundtrip length of 15 km. Existing ICAO or IEC grounding concepts shall be implemented at the airport.

Features of the Remote

It shall be possible to independently switch and monitor up to two lamps with one Remote unit. The typical consumption of a Remote unit shall be less than 15 W. A short-term power loss of less than 1.5 seconds on the series circuit shall not lead to a reset or new start of the Remote. The Remote unit shall be ready to operate within 1 second following power-on. It shall be possible to install the Remote using standard FAA-L823 connectors without requiring further modification between isolation transformer and lamp. The Remotes input and output shall be equipped with lightning protection rated 20 kA. A Remote shall functionally operate at turn-on even if the lamp has failed. It shall be possible to configure the Remote to pre-defined Power Up and Fail Safe modes. In order to simplify the spare parts inventory, clearly defined preconfigured versions of Remotes shall be provided for single channel and dual channel applications. It shall be possible to set configuration parameters in the substation after the Remote has been installed in the airfield.

Features of the Controller

The Controller shall be able to independently execute data exchange with the connected Remotes. In order to minimize Controller communication load, Remote replies shall only be transmitted to the PC if a status change occurs. The Controller shall have two major functions, to transmit and receive the RF signal on the serial circuit and to filter out harmonics coming from thyristor controlled constant current regulators to smoothen the waveform.

Switching and monitoring

It shall be possible for each Remote to be part of different groups, allowing a group of Remotes to be controlled using only one command. This will enable fast lighting operation at complex intersections. It shall be possible for each channel of a two channel Remote to belong to different groups. After every group switching command, each Remote shall transmit its current state to the Controller. This safeguards the accurate feedback of lamp status. The system shall not infer the status of a lamp based on the previously monitored lamp state. Optional RGL Remotes shall be available, which start and execute net-synchronous RGL Wig-Wag function independently from the Controller.

Local field devices such as sensors can be optionally integrated into each power line circuit. For local power supply to the field devices, optional Power Remotes shall be provided. Monitoring of sensor status shall be done via separate I/O Remotes using the same power line communication as the lamp Remotes. A minimum of 6 I/O Remotes shall be allowed per circuit.