

SmartControl

The Next Generation AGL Control System



smartcontrol - atg airports puts you in control



Photo: Robert Harding Picture Library



Heathrow Ground Movement Desk

Air traffic has increased dramatically over the last decade and the skies are forecast to get more congested. To prepare for this anticipated high traffic volume, measures to increase airfield safety and efficiency must be taken.

smartcontrol

- An AGL control system that can cater for all airport requirements from a simple CAT I system right through to a CAT III B Advanced A-SMGCS
- A system that maximises aircraft throughput using existing runways and taxiways featuring dynamic and preconfigured routing
- Systems in operational service using a proven Windows/Unix/PLC architecture
- System engineered by AGL specialists
- The system can easily be modified and upgraded by the client, independent of atg airports

why atg airports?

As well as being a market leader in the manufacture of high quality AGL luminaires for over 60 years, atg airports is also one of the largest suppliers of advanced airfield control systems around the world.

compliance with standards

ICAO	Annex 14
FAA	SMGCS, A-SMGCS
UK CAA	CAP168
IEC	61508

features

- **Control and monitoring across a full range of CCR functionality via hardware, Profibus, dual Profibus, or ethernet:**
 - Up to eight steps of brilliancy
 - Primary circuit current monitoring
 - Resistance monitoring
 - Earth fault detection
 - Percentage lamp failure detection
- **Provides conventional desk or touchscreen operation with remote brilliancy selection and control:**
 - Approach
 - Supplementary approach
 - Threshold
 - Runway edge
 - Runway end
 - Runway centreline
 - PAPI
 - Apron
 - Taxiway edge and centreline
- **Switching and monitoring of LED lighting**
- **Supports multiple runway control, runway end selection and taxiway to runway conversion**
- **Provides full SMGCS routing:**
 - Runway stopbar control and monitoring
 - Runway incursion detection via inductive loops
 - Automatic Lead-On switching in accordance with FAA practice
 - Full taxiway guidance with full "follow the green" implementation
 - Adjacent lamp failure detection
- **Suitable for configurations ranging from one lighting substation/vault to ten or more.**
- **Full atg airports after-sales service.**

benefits

In designing this new generation of control system, the [atg airports](#) design team achieved 7 key factors:

- **Performance:**

Reliable, high speed operation, including switching of field circuits via addressable Smart Switches in accordance with FAA switching requirements (auto-switching time less than 500ms).

- **Safety:**

Fully compliant with IEC 61508, the international safety standard for safety related control systems.

- **Reliability:**

[atg airports](#)' vast experience in industrial control, coupled with the use of proven hardware in a modular fashion, ensures high reliability.

- **Ease of use:**

Well engineered, reliable systems, with clear, easy to understand human interfaces means SmartControl can quickly establish itself with air traffic control and maintenance alike, as an easy to use system.

- **Easy to install:**

The modular nature of SmartControl, coupled with the flexibility of SmartSwitch and SmartCard, means it can easily be installed alongside existing systems, thus enabling a smooth and simple changeover.

- **Easy to modify and upgrade:**

The use of a topological database means that modifications can be done simply, easily and safely by airport engineers without any need for costly software changes.

- **Quality:**

[atg airports](#)' compliance with ISO 9001 ensures that the design process, manufacturing and testing regimes are rigorously observed and documented in all cases.

main elements

SmartControl is a modular control system, which consists of standard elements, each of which is repeatable and 'plugged together' in a standard manner in various combinations to achieve the individual system architecture best suited to a specific airport. This is generally influenced by the type of control interface required, the number of substations and the required level of redundancy.

- The main elements of SmartControl are:
- The user interface (desk and colour graphical screens)
- The real time interface (RTI)
- The level 1 control (PLC)
- The maintenance interface
- The engineering interface
- The topology database
- The SmartHardware (SmartSwitch, SmartMonitor, SmartCard)

- **User interface**

Full control and monitoring ATC functions are available, ranging from simple on/off and brilliancy control with back indication, to complete taxiway routing desks.

Typically, ATC functions are provided by either desk lamps and push buttons or by colour graphical touchscreens.

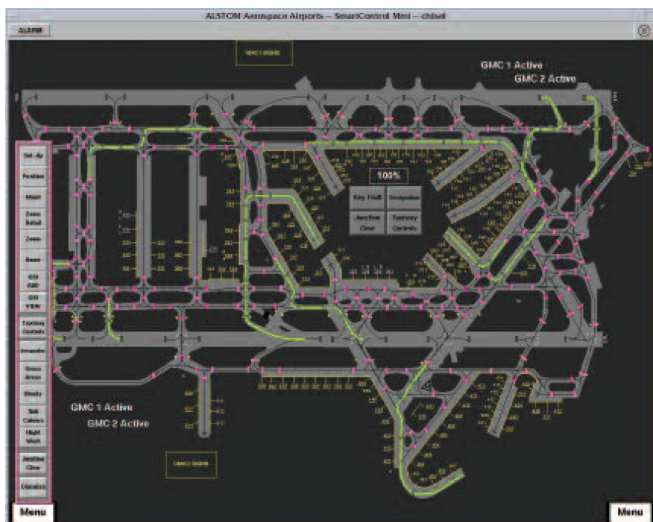
- **Real time interface (RTI)**

The RTI software hosted on workstations is the main 'control engine' of the system. It monitors desk or button presses and interprets what lighting change is required, based on the information provided to it from the topology database. It issues the necessary commands to the control system PLCs to implement the change and monitors the feedback from the PLCs to ensure the change was implemented correctly. Then it logs the completed transaction into the "Black Box" log which is available for review by the engineering staff. The RTI provides redundancy by running in a "hot standby" mode on multiple Unix workstations.

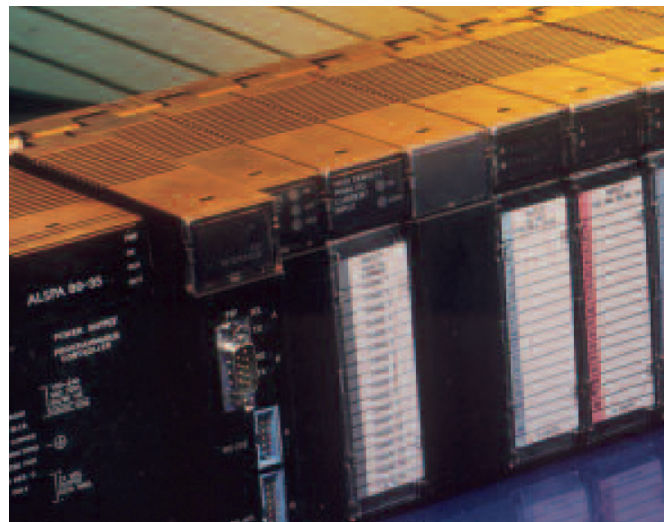
- **Level 1 control (PLCs)**

The highly reliable GE Fanuc PLC range is used by SmartControl for its base level of control automation.

These industrial control processors are built for high availability and long life in harsh industrial environments. GE Fanuc PLCs are modular in construction, allowing very rapid changeover in the unlikely event of a unit failure.



Heathrow Taxiway Mimic



ALSPA 80-35 PLC

- **Maintenance interface**

SmartControl provides a user friendly colour graphical maintenance interface. This includes an overall airfield mimic with screen 'buttons' for selecting/deselecting services and a substation mimic for each substation showing the status of the PLCs and CCRs. Equipment is shown as green when healthy and red when unhealthy. Clicking on items of equipment (where appropriate), can reveal further information to identify the exact cause of a fault rapidly and intuitively.

- **Maintenance statistics**

Comprehensive maintenance data and statistics are available from the maintenance workstation.

The information accumulated includes:

- Hours run
- Hours failed
- Brilliancy hours run (for each level)
- I2t value
- Number of switching operations

Since the information is logged into an Oracle database, powerful relational database queries can be easily performed, such as:

'How many centreline segments had an impaired fault over the last two weeks?'

'What is the average repair interval for a severe stopbar fault?'

'How many segments have exceeded 90% of their design life?'

'Number of hours equipment failed in the last month?'

- **Engineering interface**

The engineering interface is provided for the system manager, and handles housekeeping and "Black Box" log interrogation.

Housekeeping includes such activities as database saving/retrieving and archiving.

Black Box log interrogation includes the ability to call up the stored logs of every control system activity. Individual button presses can be traced right through the command cycle, including back indications.

- **Topology database**

Conventional control systems bury the information about the system configuration, such as which lights are adjacent, CCR configuration etc, making changes difficult and risky.

SmartControl eliminates this problem by adopting an Oracle based topology database. This powerful tool holds all the airport specific information in a user friendly environment. This allows the user to edit this information in a safe manner and automatically cross checks it to prevent errors.

This means that extra circuits and CCRs can be easily added by airport staff, using user friendly forms, without requiring any software changes.

- **Control equipment**

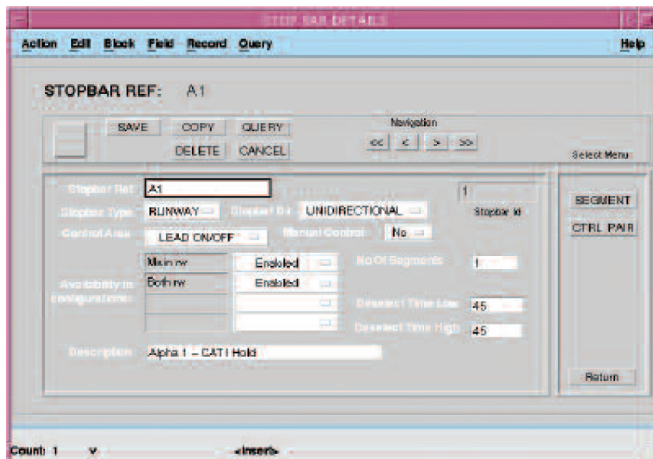
The Windows or Unix based workstations are distributed around the lighting substations for enhanced security and are linked together by a highly reliable "self healing ring" of optical fibre. Each individual substation has the capability of controlling the entire system.

- **SmartHardware**

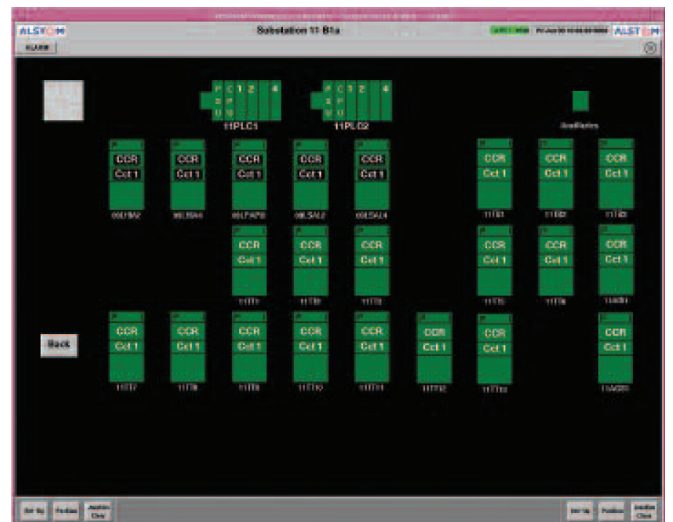
The hardware used in SmartControl is a blend of proven, powerful workstations, PLCs and SmartControl Failsafe I/O.



Alarm Display



Database Forms Menu



Typical Substation Mimic

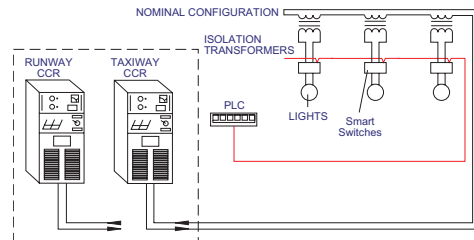
smartswitch

SmartSwitch is designed to be an essential component of surface movement guidance control systems (SMGCS). It offers real time individual lamp control and monitoring of runway, taxiway, stopbar and lead-on lights.

- Lamp monitoring includes lamp status, lamp out, open circuit and short circuit detection and secondary RMS current measurement
- Controls a single lamp or a group of lamps
- Rugged unit is fully encapsulated to enhance reliability
- User configurable fail safe modes: on,off, freeze/on, freeze/off
- The system immediately recovers on fault clearance, avoiding the need to reset at substation
- Address and default configuration user configurable with a PC
- Communications via dedicated multi-drop serial link is completely independent of primary loop equipment. High speed screened single twisted pair fieldbus cable insulated to 5 kV
- Communications based on ESP, asynchronous half duplex (2- wire), using RS485 signal levels with a data rate up to 19.2kB
- Up to 200 elements can be multidropped on a single link
- CCR circuits can accommodate any mix of SmartSwitched and non-SmartSwitched fixtures
- Low power consumption, less than 2W
- Capable of being installed in FAA L-867/L-868 deep bases
- Switching and monitoring of LED lighting



SmartSwitch Lamp Control and Monitoring Unit

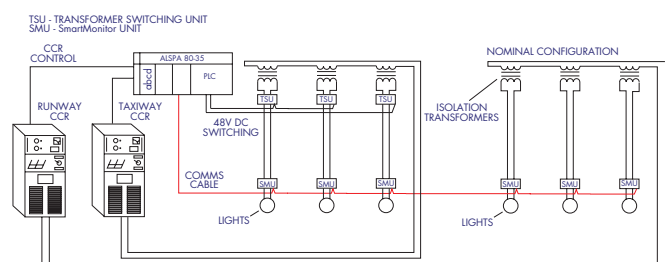


SmartSwitch Remote Intelligent Lamp Switching & Monitoring Unit

smartmonitor (smu)

The SmartMonitor unit (SMU) is a cost-effective alternative to SmartSwitch for monitoring only applications. It offers true back indication for safe individual monitoring of centreline, TDZ and runway edge lights. The SMU is particularly suited for applications where switching is unnecessary or in combination with the transformer switching unit.

- Capable of providing adjacent lamp fault detection
- Lamp monitoring includes lamp status and secondary RMS current measurement
- Rugged unit is fully encapsulated to enhance reliability
- System immediately recovers on fault clearance, avoiding the need to reset at substation
- Fully fail safe: failure of SmartMonitor has no effect on lamp or switching
- Address and default configuration user configurable with a PC
- Unmatched communications speed and reliability - dedicated multi-drop serial link is completely independent of primary loop equipment. High speed screened single twisted pair fieldbus cable insulated to 5 kV
- Communications based on ESP, asynchronous half duplex (2-wire), using RS485 signal levels with a data rate up to 19.2kB
- Up to 200 elements can be multidropped on a single link. CCR circuits can accommodate any mix of SmartMonitored and non-SmartMonitored fixtures
- Low power consumption, less than 2W
- Capable of being installed in FAA L-867/868 deep bases
- Monitoring of LED lighting

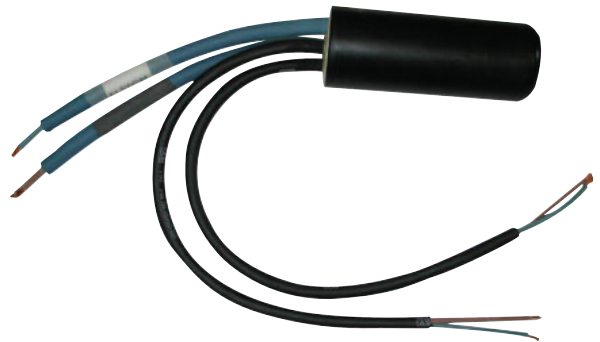


SmartMonitor Remote Intelligent Lamp Monitoring Unit

transformer switching unit (tsu)

The transformer switching unit (TSU) may be used in place of the SmartSwitch for individual lamp control of runway, taxiway, stopbar and lead-on lights. The unit does not have the SmartSwitch's individual lamp monitoring ability, but can be purchased at a significant cost saving.

- Controls a single lamp or a group of lamps
- Rugged solid state electronic switch is fully encapsulated to enhance reliability
- Low power consumption, less than 2W
- Unmatched speed and reliability
- Substantially reduces premature lamp failure caused by surge currents during lamp start-up by allowing a small current to preheat the lamp when suppressed
- Capable of being installed in FAA L-867/L-868 deep bases.



Transformer Switching Unit

inductive loop incursion detection

Automatic runway and stop bar incursion is provided by inductive loops laid into the pavement surface. Inductive loops at each location are terminated in a multichannel loop detection module. Each loop detection module is connected to a remote monitor unit located in the lighting substation, via a RS485 serial link.

The incursion system is self-tuning and detects all aircraft and vehicle movements crossing the loop.



Loop Detector Module

