

**Sydney Opera House** NEW SOUTH WALES

C-Bus Control and Management System

*Case Study* <sup>15</sup>



## An energy efficient C-Bus Solution

*Long regarded as Australia's most recognisable building, the Sydney Opera House now houses more than just the performing arts. A Clipsal C-Bus Control and Management System installed by MW Bartley has delivered an energy efficient and intelligent management system, incorporating the latest C-Bus C-Lution Software to shed some light on this Australian icon.*

### The Requirements

The Sydney Opera House embarked on an upgrade to its existing lighting control system as part of redevelopment to the Stage Door facility. The existing control system incorporated a wall size (7 metres in width) mimic panel which represented all general area lighting loads. This wall incorporated lamps and manual buttons to provide all control and monitoring facilities. This archaic solution had obvious inherent limitations and was unable to satisfy all the current or any future requirements the SOH may have. It needed to be replaced with a new control system that could offer more features than the current system plus be totally expandable, flexible and ultimately transparent to the end user.



## Sydney Opera House



### Specifications

Electrical consultants E.Shelmerdine and Partners Engineering Pty Ltd were enlisted by the SOH to design a control system to meet their requirements. The Clipsal C-Bus Control and Management System was their choice. The system specification called for the following features to be provided;

1. Easy and intuitive operation by non technical personnel
2. Graphical representation of all associated levels, areas and individually controlled loads
3. All information was to represent true status of loads in real-time
4. Control and monitoring of the entire installation from one location
5. All changes to the system configuration needed to be made from the one location
6. Incorporating existing key operated manual buttons, which were distributed around the installation, into the final solution
7. Monitoring of mains power to each distribution board individually
8. Monitoring of emergency lighting from each distribution board
9. Incorporating an existing light level sensor to control all external lights
10. Any future high level interfacing to other services such as air conditioning, stage lighting, security and access control, fire services etc needed to be available and easily achievable
11. The solution needed to be expandable to meet any future requirements
12. Reliability and cost effectiveness

## The Solution

A Clipsal C-Bus control system was commissioned by Clipsal Integrated Systems Pty Ltd, who worked very closely with the installing contractor MW Bartley. The solution incorporated a C-Lution software package running on a head end touch screen PC to control and monitor the underlying C-Bus Control System. The main features and benefits of the solution are:

- All controlled areas and loads are represented across multiple pages on the PC. Navigating through these pages utilises a menu driven interface designed to suit the requirements of the SOH. By labelling all respective pages, areas and loads with naming conventions that were established by the SOH, the human interface to the underlying technology is very intuitive.
- The status of every load is represented on the screen in real time. All the necessary information relating to each load is available at the touch of a button. The end user can determine if a load is on, off, dimmed to a particular level or being automatically controlled via the light level sensor. The status of each load can then be changed again by the touch of a button.



## Features and Benefits

- All outdoor lighting is automatically controlled via one light level sensor. Each load can be manually controlled at any time if desired. As an additional safety requirement, it was necessary to ensure that any outside lights that were manually controlled would automatically be placed back under the control of the light level sensor when it became dark. This ensured that any lights turned off manually would turn on when the light level sensor deemed it to be dark.
- Mains power to each distribution board is monitored individually. Loss of mains power to any board would raise a visible and audible alarm at the PC. This would allow the user to determine which board was affected. These alarms can be acknowledged, ignored and reset again from the PC.
- Distribution boards which have switched to Emergency power as a result of a loss to mains power are also monitored. Again, this raises an alarm which can be acknowledged, ignored or reset.
- All outdoor lights can be switched between manual (ie PC) or automatic (ie light level sensor) control. The light level sensor will only turn off lights in automatic mode but will turn on all lights, as mentioned above.
- Certain areas controlled from the PC also incorporate key operated manual override switches. During normal operations the PC provides control of these areas. When required, these areas may need to be overridden. Consequently, when these key switches are operated the PC control of these areas is disabled. A message indicating this appears on the screen if a user attempts to control these overridden areas.
- The C-Lution software incorporates multi-level password access. This allows the general users of the system control and monitoring access, while access to configuration pages is restricted by other passwords.
- The C-Lution package has inbuilt drivers, allowing it to be interfaced with most building services such as air conditioning, stage lighting, security and access control, fire services etc.
- The C-Bus Control System can be expanded to incorporate more areas throughout the SOH. All modifications to the underlying C-Bus system can then be easily incorporated into the C-Lution software head-end package. The C-Bus Control System consequently forms a very powerful solution for the SOH now and in the future.

## The Software



### C-Lution Software

Clipsal C-Lution is an end user software application that provides a complete solution for real-time control and monitoring of Clipsal C-Bus using clear and concise graphic images. C-Lution provides a software platform on which a customizable, graphical Windows interface to a C-Bus system can be built. A multi-windowed, point and click environment can therefore be designed and tailored to completely suit client's requirements. The user can create sophisticated animation to display the operating status and performance of the electrical services in the premises. A history log ensures that specified parameters and events are logged with historical and real-time trending available in graphical form.

C-Lution can be used to produce periodic and event driven reports. C-Lution can be used to monitor, control and log all alarms. The integrity of the installation may be tested by C-Lution. An alarm can be programmed to alert the user if a C-Bus device is removed or added to the system.

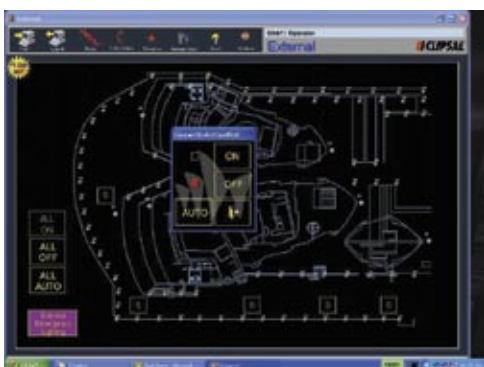
The user can also program a multi-layered security system that allows personnel access to the areas of a building's electrical services within their control. The C-Lution package includes a driver library to interface with proprietary equipment such as Building Management Systems (BMS), Programmable Logic Controllers (PLC), Remote Terminal Units (RTU), etc. Over 130 protocols are available. The Clipsal C-Lution environment is primarily based on Client/Server architecture allowing for a bundled purchase of both server based licenses and client display licenses. Client licenses are operable through TCP/IP network connections allowing for advanced central systems monitoring and information gathering.

### C-Gate Server Software

Clipsal C-Gate Server is a software suite that monitors and controls a Clipsal C-Bus system. C-Gate has been produced to allow software developers and systems integrators to interface to a Clipsal C-Bus system. C-Gate server software is run on a PC and uses industry-standard TCP/IP interfaces. Using TCP/IP opens the ability to control, connect to, monitor and Internet-enable a C-Bus system.

To connect to a C-Bus network, C-Gate opens a connection to a C-Bus PC Interface through a local serial port or a C-Bus CNI (model 5500CN) through a TCP/IP socket connection. Once connected, C-Gate scans each C-Bus network and builds an object model of the network and the network's C-Bus units. This model is the base that C-Gate uses for control and monitoring and allows C-Gate to rapidly give up-to-date information about the status of C-Bus without having to poll individual C-Bus devices.

C-Gate can be used to control C-Bus loads, collect and use information from C-Bus networks, or provide a monitoring and control interface for a separate building management system. Software applications or building management systems connect to C-Gate's Command Interface and can issue commands (such as ON, OFF and RAMP) and query the status of any object (using the GET and SET commands) in C-Gate's model of each network. C-Gate provides several interfaces to allow third party applications or building management systems to receive a continuous real-time list of events that have occurred on the C-Bus networks that C-Gate is managing.



## Installation Data



<b>C-Bus Project</b>	Sydney Opera House
<b>C-Bus Installer</b>	MW Bartley
<b>C-Bus Products Used</b>	52 x 5104AUX (Auxiliary Input unit) 21 x 5104RVF/20L (4 x 20 Amp relay) 4 x 5100PS (C-Bus power supply) 2 x 5100PC (PC Interface) 1 x 5032N (2 gang key input unit)
<b>Consultant</b>	E. Shelmerdine and Partners Engineering Pty Ltd
<b>Software Head-End</b>	Clipsal C-Lution



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