

C-Bus Application Note

Office

Overview

Lighting control plays an important role within commercial offices by providing a comfortable working environment. A well designed lighting control system should be intuitive and functional for the people working within the space while also achieving energy efficiency.

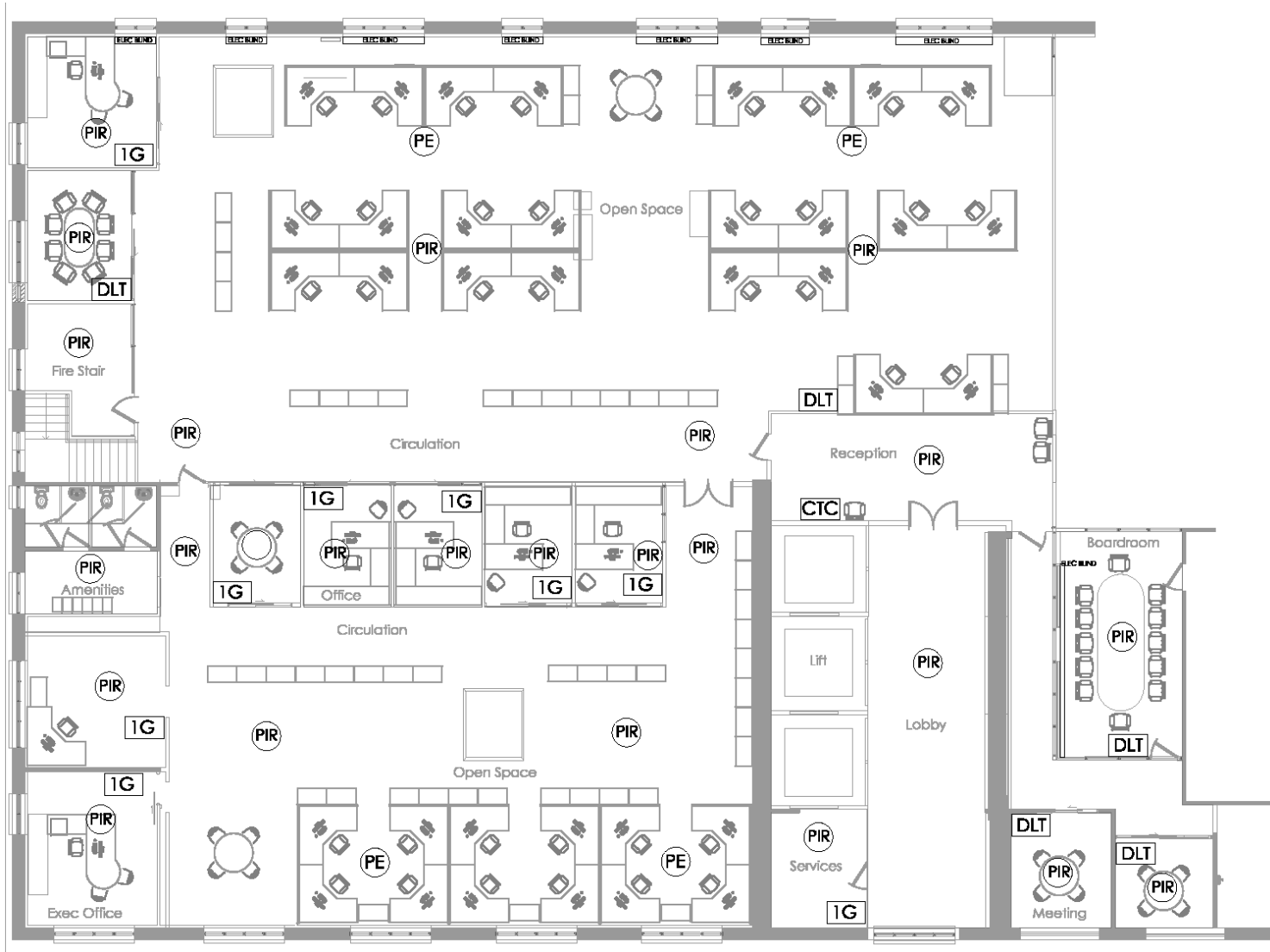
Lighting can be one of the biggest contributors to commercial energy usage. With the rising cost of energy and a greater emphasis on sustainability, reducing a building's environmental footprint is not only desirable, but is now mandatory in all new commercial offices.

With the correct lighting control strategy, energy savings can be achieved by utilising natural light while maintaining uniform illumination throughout the tenancy, and providing a safe and comfortable working environment for staff.

Further savings and benefits can be achieved through integrating to Building Management and Security systems.

All of this can be achieved using a Clipsal C-Bus system.

Example Area Layout & Features



Features:

- Master Switching
- Local control
- Time Scheduled events
- C-Bus PIR Occupancy Control
- C-Bus Colour Touch screen
- Security interfacing
- High level Building Management integration
- High level third party AV integration

LEGEND	
	C-BUS DYNAMIC LABELLING SWITCH
	C-BUS COLOR TOUCH SCREEN
	C-BUS 360° MULTI-SENSOR
	C-BUS 360° PIR MOTION SENSOR
	PROJECTOR
	ELECTRIC BLIND
	PROJECTOR SCREEN

Control Strategy – Office

- **Local Control**

Local control is typically required within enclosed office spaces. A “Manual On, Auto Off” scenario can be utilised whereby manually switching lighting on/off/dim will also enable an occupancy detector located in the room. Lighting then remains on or to a set level while the room is occupied and motion detected. Manually switching the lights off will also disable the occupancy sensor. If the room is left unoccupied and no movement is detected for a set period of time the lighting will automatically switch off.

- **Master Control**

A C-Bus touch screen located at reception or a central point will enable the user to control the entire lighting control system from one point. A C-Bus touch screen offers a graphical interface to C-Bus and a real time clock for automatic scheduling of events. Touch screen pages can be setup with password protection to restrict user access.

- **Open Offices**

An open office strategy can include “Start of Day / End of Day Zone Latching”. This control philosophy is based on first movement detected and requires correct positioning of motion detectors at the main entry and exit points to the tenancy removing the need of automatic scheduling each morning. When an entry motion detector is activated during nominated work hours (Start of Day) the circulation area or corridor is switched on, and in turn, the adjacent or nominated open office lighting zone is switched on. Motion detectors are re-enabled at a nominated “End of Day” time allowing for normal occupancy detection throughout the evening.

- **Corridor Linking**

When office workers arrive in the morning, motion detectors are activated and corridor lighting is switched on. When any office is occupied the system is configured to maintain corridor lighting on, providing an appropriate access and exit path. As the last office becomes unoccupied office lights are switched off and a lighting sequence is initiated allowing occupants to leave the building with corridor lighting still illuminated. Once occupancy is no longer detected within the corridor all lighting switches off after a predetermined time.

- **Perimeter Dimming**

Work areas located within close proximity to windows can be affected by large amounts of natural light reducing the need for artificial lighting. Perimeter dimming of fluorescent lighting is an effective way of saving energy, by dimming lighting located next to places of high natural light levels. This control strategy is described in the Building Code of Australia (BCA) 2011 Section J. Perimeter dimming can be achieved using C-Bus light level sensors or C-Bus Multi-Sensor which incorporates occupancy and light level detection. Sensors placed in the correct position measure ambient light levels, when the desired light level is achieved the nominated light fittings dim or switch off providing power savings and can assist in reducing eye strain.

- **Air Conditioning Zones**

A high level interface to the Building Management System (BMS) can be configured (i.e. BACnet, OPC) to integrate C-Bus to the buildings air-conditioning system. Alternately a low level contact output from a C-Bus relay can be used. The BMS can then monitor a lighting zone and control the A/C accordingly. A local C-Bus switch can also be used as a timed after hour AC override on the floor.

- **Time Schedules**

Touch screens include a real time astronomical clock for automatic scheduling of events. Schedules can be based on the time of day, week, month or year, sunrise, sunset and daylight savings. A Schedule may include an after hour “all lighting off” function or control of external lighting.

Time Schedules can be modified easily by a user at a device such as a C-Bus touch screen which can utilise password restrictions.

- **AV Equipment**

Audio Visual devices in meeting and board rooms such as DVD players and data projectors, can be controlled either directly from the C-Bus touch screen or through a third party device using high level integration methods, such as the RS232 or TCP/IP protocols.

- **Blind or curtain control**

Clipsal C-Bus shutter relays can connect to motorised blinds, which can then be controlled from one button on any C-Bus switch or touch screen. Blinds can help reduce the effect of the outside environment on the thermal heating or cooling of a room. Blinds can be controlled manually or automatically when used in conjunction with a C-Bus Light Level Sensor or time schedules.

- **Screen Control**

Projector screens in meeting and board rooms can be manually controlled from a touch screen or DLT switch, or as part of a scene for presentation mode. When connected to a Clipsal C-Bus shutter relay.

- **Control Strategy Matrix**

Key	Strategy	Key	Strategy
AT	After Hours Timer	LLM	Light level management
AOS	After hours occupancy sensing only	MAO	Manual on/auto off
CL	Corridor linking	OS	Occupancy sensing
D	Dimming	TS	Time/schedule control
LCP	Local control panel		

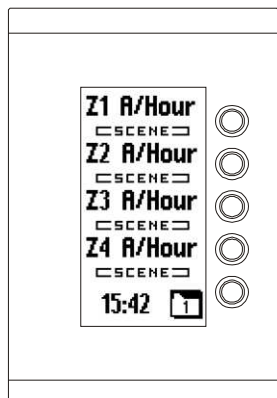
Table 1 – Abbreviations defined above in the Control Strategy Matrix

Area	Control Strategy								
	AT	AOS	CL	D	LCP	LLM	MAO	OS	TS
Inner open office	X	X	X						X
Perimeter open office	X	X	X	X		X			X
Offices/enclosed rooms	X	X	X	X	X		X	X	X
Corridors and circulation	X	X	X		X				X
Storeroom								X	X
Reception		X	X						X

Typical Scene Configuration

SCENE	LIGHTING					Motion Detectors	A/C	Time Period
	North Area	East Area	South Area	West Area	Circulation			
Open Office Z1 Override	ON	-	-	-	ON	DISABLED	OFF	
Open Office Z2 Override	-	ON	-	-	ON	DISABLED	OFF	
Open Office Z3 Override	ON	-	ON	-	ON	DISABLED	OFF	
Open Office Z4 Override	-	-	-	ON	ON	DISABLED	OFF	
Cleaners Override	ON	ON	ON	ON	ON	ENABLED	ON	Timed 40 mins
Security Scene	50%	50%	50%	50%	ON	ENABLED	OFF	Timed 10 mins
After Hours A/C	-	-	-	-	-	ENABLED	ON	Timed 60 mins

Example DLT Switch Function and Labelling



Clipsal 'DLT'

Wall Switch

Page 1 Functions

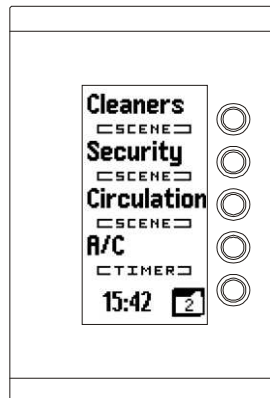
Button 1: Zone 1 After Hours Override

Button 2: Zone 2 After Hours Override

Button 3: Zone 3 After Hours Override

Button 4: Zone 4 After Hours Override

Next Page Button



Clipsal 'DLT'

Wall Switch

Page 1 Functions

Button 1: Cleaners Scene

Button 2: Security Scene

Button 3: Circulation Scene

Button 4: After Hours A/C

Next Page Button

*Note: Labelling and functionality is customisable to suit the project and client

Typical Screen Layouts

Touch Screen Main Page



Zone Status Page



Lighting Override



After Hours Control



Schedules Page

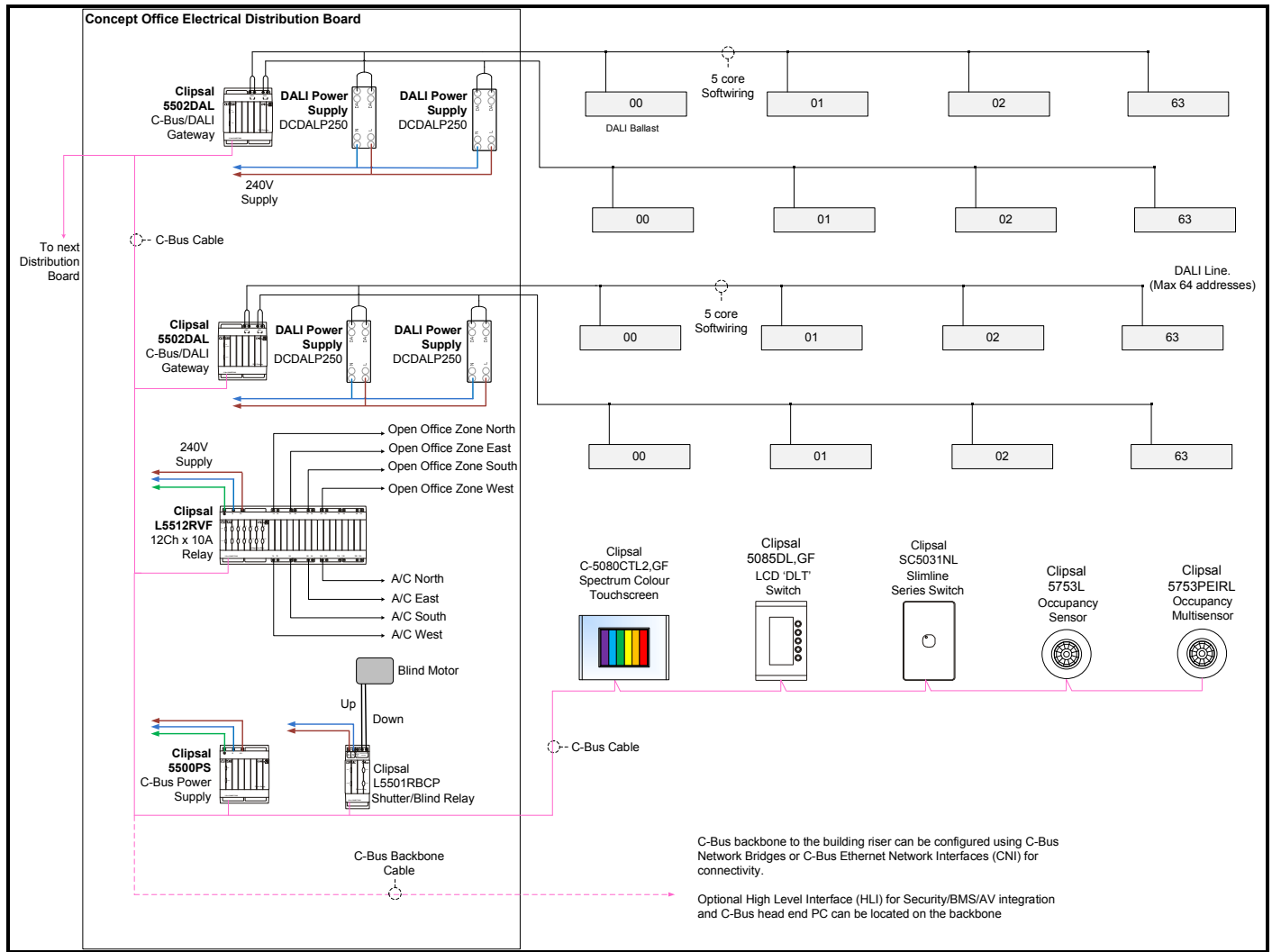


Note: Screen layouts are customisable to suit each project and client.

Touch Screen pages can be given specific user access with the use of password protection.

After page time out a screen saver can be displayed

Office Single Line Diagram



*In order to provide ease of modification and expansion DALI Lines can be wired using a five-wire mains rated soft-wiring system. Luminaires are then connected to the DALI Line via a 5-core fly lead and T-connector.

Cable characteristics include:

Marking	Conductor Size	Wire Colour	Description
N	2.5 mm ²	Blue	20A Neutral Conductor
Earth Symbol	2.5 mm ²	Green/Yellow	Protective Earth
L	2.5 mm ²	Brown	20A Active Conductor
DA-	1.5 mm ²	Grey	DALI Control Wire
DA+	1.5mm ²	Orange	DALI Control Wire

**Dimming of fluorescent lighting is dependent on the type of ballast used. Alternate C-Bus modules such as the DSI gateway (L5508DSI) or 0-10V output module (L5504AMP) can be used.

***If LED lighting is not 240V dimmable (Phase Control) then other common methods of control can be used including 0-10V/ DSI/ DALI/ DMX provided that the LED controller type is compatible.

Third Party Integration

- **AMX & Crestron** AV equipment can communicate with C-Bus via a Clipsal PC Interface (PCI) using the RS232 protocol or a Clipsal Network Interface (CNI) using TCP/IP. This connection allows the third party AV equipment to control C-Bus Group Addresses at a high level.
- **DALI** light fittings are a common inclusion to any modern energy conscious building design. The Clipsal C-Bus/DALI gateway enables the mapping of C-Bus Group Addresses to DALI Groups allowing for C-Bus devices to control DALI lighting ballasts. DALI configuration is relatively simple & any future reconfiguration of switching groups is achieved via software changes without the need for physical re-wiring. Clipsal offer a C-Bus/DALI gateway to take advantage of specific features available to C-Bus and DALI. C-Bus messages can report their status on the network, meaning a key input installed can display whether it is on or off.
- **Building Management Systems (BMS)** can be integrated to the C-Bus system at a low level using simple contact closures to communicate a state change. High level integration can be offered using a BACnet gateway (5000BACNET) or OPC server software license (5000SDINST/*) allowing multiple software applications to share C-Bus data, and achieve a high level interface between the C-Bus Lighting Control System and Building Management System (BMS). The synergy of both C-Bus and BMS systems can provide energy efficiency gains when scheduling services such as HVAC and lighting.
- **Security** systems are commonly interfaced to a C-Bus control system, to enable security events such as “armed”, “disarmed” and “alarm” to trigger lighting events. An event can be when the “Alarm” is triggered other events such as “All Light” is turned on as a result, to provide the security cameras a clearer view of the area.

Security events can include:

- Disarmed: Start of business welcome lighting sequence (Entry Scene)
- Armed: All lighting and A/C switched off (Exit scene)
- Alarm mode: All lighting to switch On (Alarm scene)

Low level interfacing: Achieved using the alarm panel relays connected to a C-Bus Bus coupler or Auxiliary Input Unit.

High level interfacing: Specific security panels support an on board C-Bus interface or support RS232 for high level integration. The panel must have the provision for one of these methods to interface to C-Bus.

- **TCP/IP** is a standard Ethernet protocol which can be used for integration using a Clipsal Network Interface (5500CN2).
- **RS232** is a common protocol used when integrating third party products. RS232 integration can be achieved using a Clipsal PC Interface (5500PC), C-Bus touch screens and the Pascal Automation Controller (5500PACA).
- **Infra-red Control** can be achieved using a C-Bus NIRT 5034NIRT transmitter which maps C-Bus Group Addresses to IR commands.

Typical Equipment

Part Number	Description	Quantity
5502DAL2PS	Clipsal C-Bus/DALI Gateway, complete with two DALI power supplies	1
L5512RVF	Clipsal DIN Rail 250V AC 10A per Ch Relay , inc 200mA C-Bus P/Supply	1
5500PS	Clipsal C-Bus Power Supply	1
L5501RBCP	Clipsal Shutter Relay Unit	2
C-5080CTL2,GF	Clipsal 'Spectrum' Colour Touch screen	1
5753PEIRL	Clipsal 360 Degree Occupancy Multi-sensor	4
5753L	Clipsal 360 Degree Occupancy sensor	22
5085DL,GF	Clipsal LCD Dynamic Labelling Switch	4
SC5031NL,WE	Clipsal C-Bus, Slimline SC2000 Series, 1 Button	8

DB Output Channel Schedule

Output unit	Channel or Ballast Number	Description	Load Type	Control Gear	Number of Fittings
C-Bus / DALI Gateway	Ch 1 / DALI Ballast 0-4 (DALI Group 1)	Meeting Room 1	2x28W Fluro	DALI Ballast	5
	Ch 1 / DALI Ballast 5-10 (DALI Group 2)	Meeting Room 2	-	-	5
	Ch 1 / DALI Ballast 11-16 (DALI Group 3)	Meeting Room 3	-	-	5
	Ch 1 / DALI Ballast 17-30 (DALI Group 4)	Open Office	-	-	21
	Ch 1 / DALI Ballast 31-50 (DALI Group 5)	Open Office	-	-	19
	Ch 2 / DALI Ballast 0-4	Meeting Room 4	-	-	5

	(DALI Group 6)				
	Ch 2 / DALI Ballast 5-10 (DALI Group 7)	Meeting Room 5	-	-	5
	Ch 2 / DALI Ballast 11-16 (DALI Group 8)	Meeting Room 6	-	-	5
	Ch 2 / DALI Ballast 17-30 (DALI Group 9)	Open Office	-	-	13
	Ch 2 / DALI Ballast 31-50 (DALI Group 10)	Open Office	-	-	19
12 Ch 10A Relay	1	North Zone Inner Office	2x28W Fluro	HF Ballast	20
	2	East Zone Inner Office	2x28W Fluro	-	20
	3	South Zone Inner Office	2x28W Fluro	-	20
	4	West Zone Inner Office	2x28W Fluro	-	20
	5	Spare			
	6	Spare			
	7	Spare			
	8	Spare			
	9	North Zone A/C On/Off	240V Supply	A/C	N/A
	10	East Zone A/C On/Off	240V Supply	A/C	-
	11	South Zone A/C On/Off	240V Supply	A/C	-
	12	West Zone A/C On/OFF	240V Supply	A/C	-
Shutter Relay	1	Up	Motor	1A AC Motor	N/A
	2	Down	Motor		-

Resource Links

For further information including Product Datasheets, Installation Instructions and Downloads visit

<http://www.clipsal.com/cis>

It is recommended that a Clipsal C-Bus trained specialist is engaged for large integration projects for design programming and commissioning. This should be a C-Bus Approved installer, Clipsal PointOne systems Integrator or a Clipsal Platinum partner depending on the size of the project and level of integration required.

C-Bus Platinum partners are skilled in commercial projects covering areas such as TCP/IP, lighting control design, building management systems, lighting principles, as well as sound understandings of Building Code of Australia Section J, Australian Standards, NABERS and Green Star Ratings.

In addition, C-Bus Platinum members will provide professional detailed documentation and specifications for projects including handover training to the client.

Engaging a Clipsal Platinum Partner provides key benefits to the contractor, consultant and the end user including the manufacturers support from project design through to completion.

C-Bus Platinum Partner can also offer extended C-Bus product warranty from the standard 2 years to 4 years subject to the site being inspected and becoming a certified C-Bus Approved site.

For further information on the Clipsal Platinum Partner program visit

<http://www.clipsal.com/platinum>

Schneider Electric (Australia) Pty Ltd

33-37 Port Wakefield Road, Gepps Cross,
South Australia 5094

PO Box 132, Enfield Plaza,
South Australia 5085

National Customer Care Enquiries:
1300 2025 25

clipsal.com

Website: clipsal.com
Contact us: clipsal.com/feedback

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