

C-Bus Application Note

Warehouse

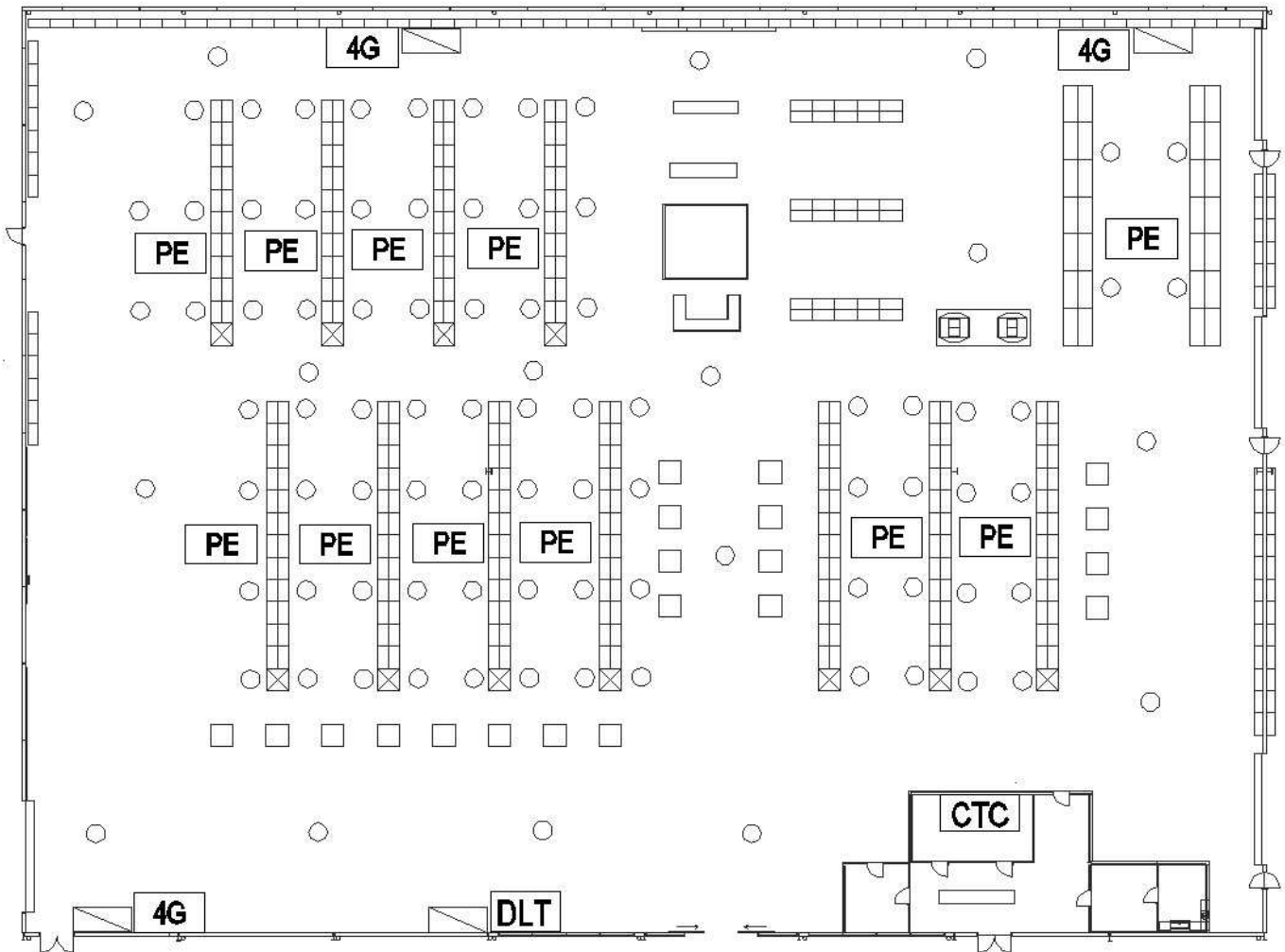
Overview

Warehouses can be used for a variety of purposes, from general storage areas to busy industrial distribution centres. The building's work space areas can be illuminated by a combination of natural light (including skylights and open roller doors), supplemented by artificial lighting. Warehouses can consume a large amount of energy from mechanical and electrical services, with a large portion of the power consumption attributed to lighting.

A C-Bus lighting control system in a warehouse can improve the energy efficiency of the facility, through incorporating schedules, dimmers, sensors and interfacing with security systems. With the correct lighting control strategy, energy savings can be achieved within the warehouse, while at the same time maintaining a uniform illumination across the warehouse floor. For instance, by automatically switching off, or reducing the power consumption of the light fittings when desired light levels are met, the lamp life can be extended, and can assist towards energy and cost saving associated with maintenance.

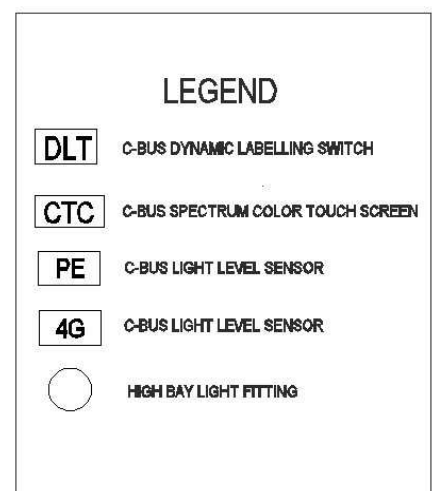
All of this can be achieved using a Clipsal C-Bus system.

Example Area Layout & Features



Features:

- Bi Level high bay dimming
- Light level sensors
- Time Scheduled events
- Master switching
- Local control
- Occupancy Control
- Security interfacing



Control Strategy – Warehouse

- **Local Control**

A warehouse is typically illuminated by high output metal halide high bay light fittings. A common control philosophy is to allocate individual lighting circuits into zones of lighting control. Each zone is capable of operating independently of each other, and can be controlled locally if required via a C-Bus switch or touch screen.

- **Master Control**

A C-Bus touch screen provides a graphical interface to the lighting control system. Positioned in the warehouse manager's office or administration area, this can enable the user to control or override the lighting control system from a central point. Touch screen pages can be set up with password protection to restrict users access levels.

- **High bay Lighting Dimming**

Natural light from skylights, open roller doors and large open access points supplement the artificial lighting within the warehouse. C-Bus light level sensors placed in the correct position, measure the ambient light and when the desired level is achieved, can switch the nominated lighting to a step dimmed level or off completely. A dead band or margin can be programmed into the light level sensor so that rapid changes in natural lighting, such as cloud shadows, will not inadvertently switch the high bays on/off.

C-Bus can also be set up so that high bay lights remain off for at least 15 minutes, even if the lighting is re-activated. This provides time for heat up/cool down procedures to occur in the light fitting, ensuring lamp life is optimised.

Typical dimming control philosophies within a warehouse have high bay light fittings controlled in conjunction with a C-Bus light level sensor. Three common ways to reduce power consumption to the high bay light fittings include;

1. Bi level switching or 2 stage step dimming. This is achieved when the high bay is fitted with a step dim type control gear. When the desired ambient light level is achieved a secondary contact is engaged that can reduce power to the light fitting by up to 30-40%. The benefit of this control method, is when lighting is required to switch back to 100%, there is no re-strike delay.
2. Dual lamp high bays generally include a high output lamp and a quick start lamp. When the desired ambient light is achieved, the high output lamp is switched off.
3. Bank switching is achieved when warehouse lighting is configured into control zones. Lighting control zones are setup to operate on three settings: "All High Bays On", "Half High Bays On" and "All High Bays Off". This method is more commonly suited to a retro-fit installation.

These three dimming control philosophies, when implemented correctly, can ensure an overall energy reduction of the lighting services within the warehouse environment.

- **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 (A/C) system. The BMS can monitor when a lighting zone is on, then control the A/C accordingly, providing energy efficiency gains. Alternately, a low level contact output from a C-Bus relay can be used. Local overrides can be configured on a C-Bus switch, providing manual after-hours control over the A/C within a zone.

- **Fans**

The use of fans within a warehouse environment can assist with air movement. Fans can be controlled by a C-Bus system with the use of either a C-Bus Fan Controller, or by using relay outputs. On, off and speed selection can be made available at any control point.

- **Occupancy Detection**

Control strategies can also include occupancy detectors, located at the entry points to storage racking in low traffic areas. Occupancy detectors, as the name suggests, detect movement or vacancy and turn overhead lighting on or off accordingly. They can be installed in isles to operate isle level fluorescent task lighting for additional and instant illumination when occupancy has been detected, reducing the amount of high bay fittings needed in these areas. They can also be incorporated into carpark areas and general warehouse spaces to activate path lighting when presence is detected, to ensure safe passage to the desired space.

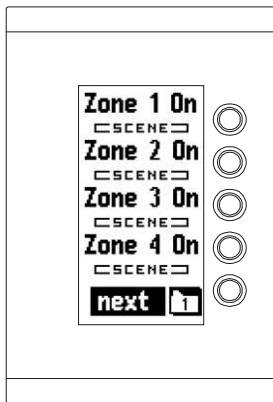
- **Time Schedules**

Touch screens include a real time astronomical clock for automatic scheduling of events including sunrise, sunset and daylight savings based on the time of day, week, month or year. This can also be used as an after hour “all lighting off” function providing energy saving benefits. External lighting and signage can also be controlled by the touch screen time schedules, as well.

Typical Scene Configuration

SCENE	<i>High bays Zone 1</i>	<i>High bays Zone 2</i>	<i>High bays Zone 3</i>	<i>High bays Zone 4</i>	<i>Fans (All areas)</i>	<i>A/C (All areas)</i>
Zone 1 On	100%	-	-	-	-	-
Zone 2 On	-	100%	-	-	-	-
Zone 3 On	-	-	100%	-	-	-
Zone 4 On	-	-	-	100%	-	-
Fans On	-	-	-	-	ON/OFF	-
A/C After Hours	-	-	-	-	-	Timed ON
All Off	OFF	OFF	OFF	OFF	OFF	OFF

Example DLT Switch Function and Labelling

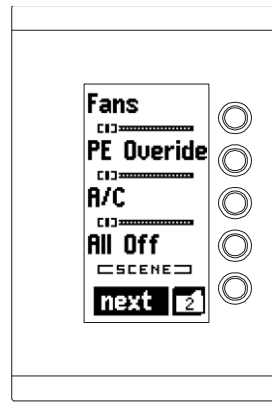


Clipsal DLT

Stainless Switch

Page 1 Functions

- Button 1: Zone 1 Lighting On
- Button 2: Zone 2 Lighting On
- Button 3: Zone 3 Lighting On
- Button 4: Zone 4 Lighting On
- Next Page Button



Clipsal DLT

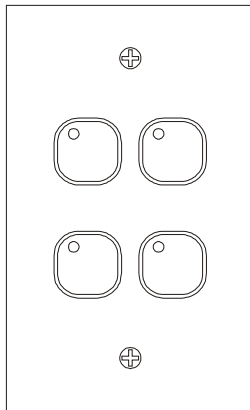
Stainless Switch

Page 2 Functions

- Button 5: All Fans On/Off
- Button 6: Disable light level sensors
- Button 7: After Hours A/C Control
- Button 8: All Off, lighting, Fans, A/C
- Previous Page Button

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

Example C-Bus Metal Plate Wall Switch, "B" Style Flat Plate - Stainless Steel



Clipsal 4 Gang

Functions

Button 1: Zone 1 Lighting On

Button 2: Zone 1 Fans On/Off

Button 3: Zone 1 Light Level Sensor Override

Button 4: Zone 1 After Hours zone Air-conditioning (2hr Timed Extension)

'B' Style B5034NL,WE

*Note: C-Bus stainless steel inputs maybe used in hard wearing industrial environments for local control. More industrial rated switches from the Clipsal range of products can be used, such as the Clipsal 56 series push button switch, which can be connected via C-Bus Auxiliary input units or C-Bus Bus couplers.

Typical Touch Screen Layouts

Touch screen Main Page



Lighting Zone Control Page



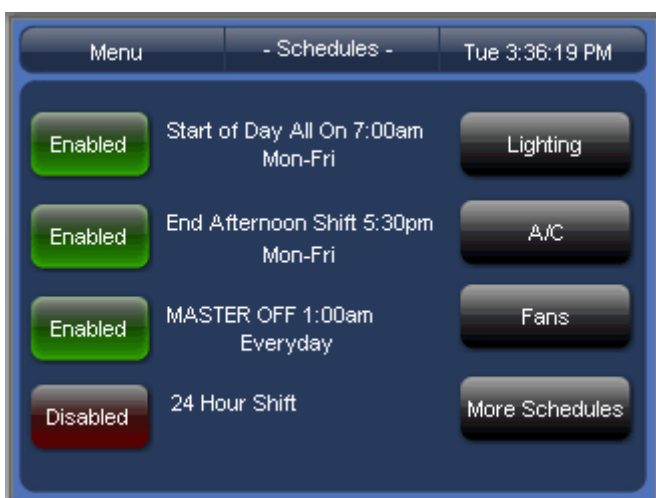
Fan Control Page



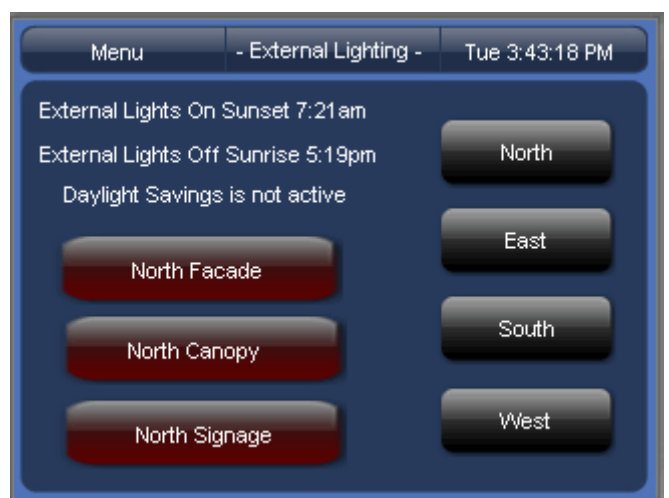
AC Control Page



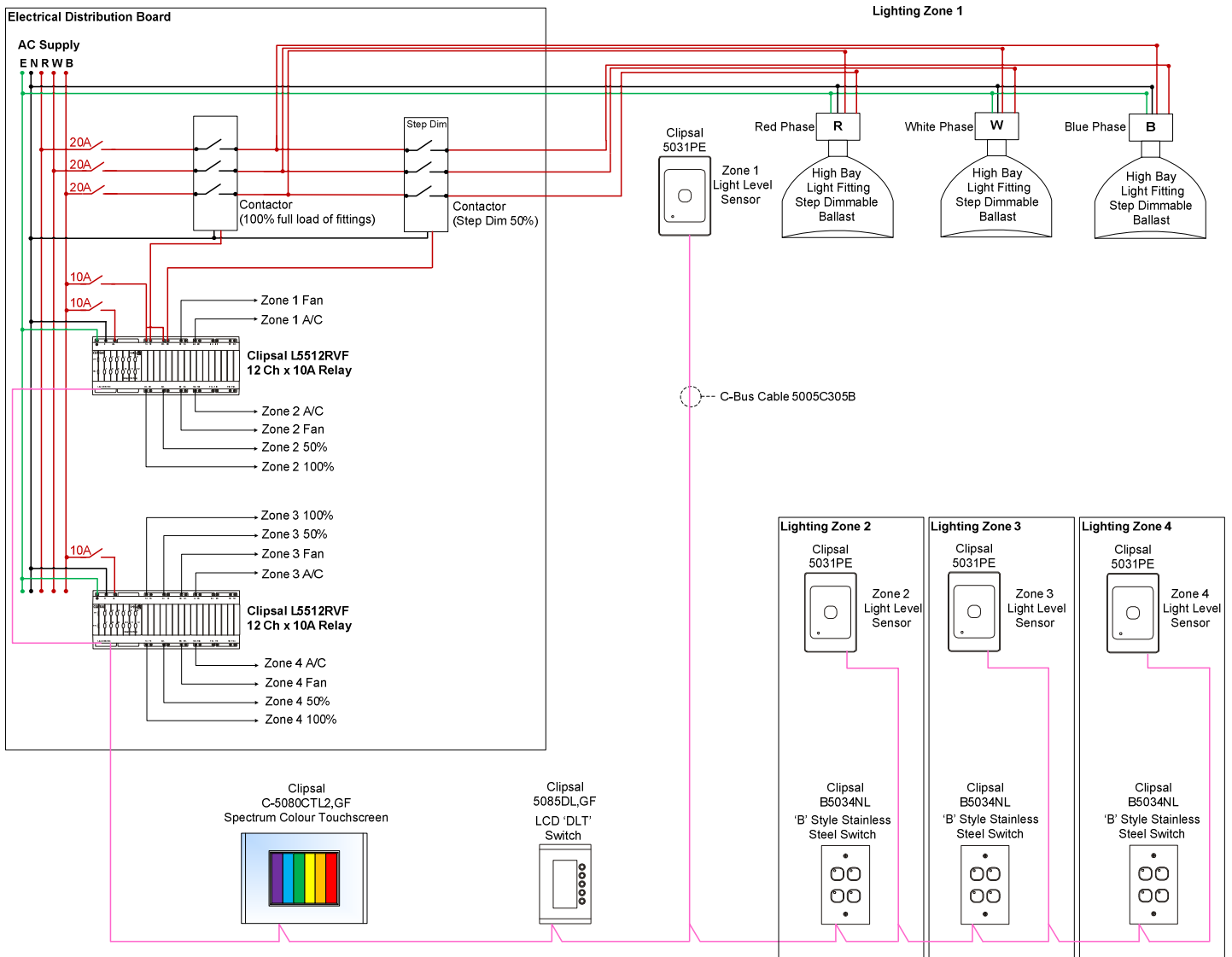
Schedules Page



External Lighting Page



Warehouse Single Line Diagram



*Note: Clipsal offer DIN rail mounted relay output units 20A per channel L5504RVF20

Third Party Integration

- **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.

- **DALI** ballasts are available in selected high output fittings for use within a warehouse environment. Advantages include control (on, off or level dim) of individual lights, groups and DALI Lines. 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. C-Bus can be setup with a graphical interface on a PC or touch screen.
- **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.
- **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).

Typical Equipment

Part Number	Description	Quantity
L5512RVF	Clipsal 12 Ch Relay 10A	2
B5034NL	Clipsal C-Bus 'B' Style Stainless Steel switch	4
5085DL,J80	Clipsal LCD Dynamic Labelling Stainless Switch	1
5031PE,WE	Clipsal Light Level Sensor	11
C-BS5080CTL2	Clipsal 'Spectrum' Colour Stainless touch screen	1

DB Output Channel Schedule

Output unit	Channel Number	Description	Load Type	Control Gear	Number of Light Fittings
12 Ch 10A Relay	1	Zone 1 Lighting 100% load	High Bay	Contactors	20
	2	Zone 1 Lighting Step Dim	High Bay	Contactors	20
	3	Zone 1 Fan On/Off	240v Supply	Fan Motor	N/A
	4	Zone 1 A/C On/Off	240v Supply	A/C	N/A
	5	Spare			
	6	Spare			
	7	Zone 2 Lighting 100% load	High Bay	Contactors	6
	8	Zone 2 Lighting Step Dim	High Bay	Contactors	6
	9	Zone 2 Fan On/Off	240v Supply	Fan Motor	N/A
	10	Zone 2 A/C On/Off	240v Supply	A/C	N/A
	11	Spare			
	12	Spare			

12 Ch 10A Relay	1	Zone 3 Lighting 100% load	High Bay	Contactator	20
	2	Zone 3 Lighting Step Dim	High Bay	Contactator	20
	3	Zone 3 Fan On/Off	240v Supply	Fan Motor	N/A
	4	Zone 3 A/C On/Off	240v Supply	A/C	N/A
	5	Spare			
	6	Spare			
	7	Zone 4 Lighting 100% load	High Bay	Contactator	10
	8	Zone 4 Lighting Step Dim	High Bay	Contactator	10
	9	Zone 4 Fan On/Off	240v Supply	Fan Motor	N/A
	10	Zone 4 A/C On/Off	240v Supply	A/C	N/A
	11	Spare			
	12	Spare			

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 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>

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SEAU 26925 September 2013