



C-Bus Professional Series Dimmers Installation Instructions

5104D5, 5102D10, 5101D20 Series

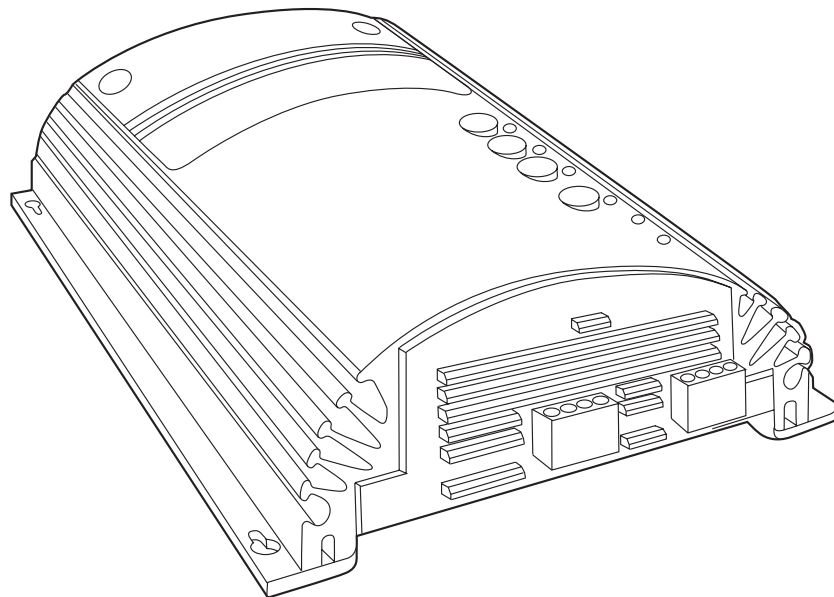


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1. Product Range

5104D5	C-Bus Professional Series Four Channel 5-Amp Dimmer (220-240V, 50-60Hz)
5102D10	C-Bus Professional Series Two Channel 10-Amp Dimmer (220-240V, 50-60Hz)
5101D20	C-Bus Professional Series Single Channel 20-Amp Dimmer (220-240V, 50-60Hz)
E5104TD5	C-Bus Professional Series Four Channel 5-Amp Dimmer (110-120V, 50-60Hz)
E5102TD10	C-Bus Professional Series Two Channel 10-Amp Dimmer (110-120V, 50-60Hz)
E5101TD20	C-Bus Professional Series Single Channel 20-Amp Dimmer (110-120V, 50-60Hz)

2. General Description

The Professional Series Dimmers are C-Bus controlled high power single phase dimmers for incandescent & low-voltage lighting applications (iron core and electronic transformer).

Dimming is achieved via the highly efficient leading edge phase control technique, utilizing Triacs in four channel units (5104D5 series) and rugged SCRs in both dual channel (5102D10 series) and single channel (5101D20 series) units.

EMC compliance is maintained by advanced electronic control of the load current waveform, eliminating the requirement for bulky EMI filtering inductors.

Common wall mounting aluminium extruded enclosures are used for all models, incorporating local control buttons and status indicators for ease of installation.

A built-in auxiliary relay with normally-open contact indicating presence of AC supply voltage is provided for emergency lighting applications.

3. Features

- Individual load channel over-current shutdown at 20% above rated channel output.
- Over-temperature shutdown of all channels at approx. 50°C ambient (at full load) or greater (for smaller loads).
- Soft load turn-on characteristic to reduce mechanical stress on lamp filaments.
- Load brightness level held constant when AC supply voltage varies while unit actively dimming.
- Current dimming output levels stored at loss of AC supply voltage.
- Adjustable power-up delay of previously set dimming levels.
- Linear output load power variation, versus input control C-Bus group address level.
- Low unloaded load terminal voltage and loaded load terminal leakage current with input control C-Bus group address level status off.
- Load brightness during dimming remains relatively unaffected by the presence of typical AC-supply ripple control signals.
- Remote inputs on multiple units can be paralleled for single master override control.
- Established dimming levels not affected by electrical or physical status of C-Bus network i.e. powered, unpowered, shorted or disconnected network.
- Built in standard C-Bus interface via plug-in connector for network controllable dimming level and operating configuration.
- Front panel LED indicator for C-Bus network connection status.
- Average load current per channel measurement available via C-Bus network.
- C-Bus network voltage measurement available via C-Bus network.
- Built in 60mA C-Bus power supply to power associated C-Bus units on network.
- Built in selectable C-Bus network burden and network clock generator for simple network installations.
- C-Bus interface functional without AC supply voltage present, allowing C-Bus parameter configuration with C-Bus network connection only.

4. Compatible Loads

The Professional Series Dimmers are capable of dimming several categories of lighting loads.

1. Resistive loads, eg. incandescent and tungsten halogen lamps.
2. Inductive loads, eg. iron core transformers for LV lighting, ceiling sweep fans.
3. Electronic loads compatible with phase control, eg. electronic transformers for LV lighting and some electronic ballasts for fluorescent lighting.

Control of ceiling sweep fans with typical phase control devices can result in audible noise from the fan motor. Careful selection of fan make and model is necessary if this effect is to be minimised.

Inductive-Input Electronic Transformers – full load rating

Electronic transformers for LV lighting incorporating an input series inductor (e.g. ATCO TEC series electronic transformer) are most suitable for phase control dimming due to the inductive loading presented to the dimmer unit.

The full load rating of the C-Bus Professional Series Dimmers applies when using these types of electronic transformers and also iron core transformers.

Capacitive-Input Electronic Transformers – limited load rating

Electronic transformers for LV lighting without an inbuilt series input inductor (e.g. OSRAM HTM series electronic transformer) are less preferred for phase control dimming due to the capacitive loading presented to the dimmer unit.

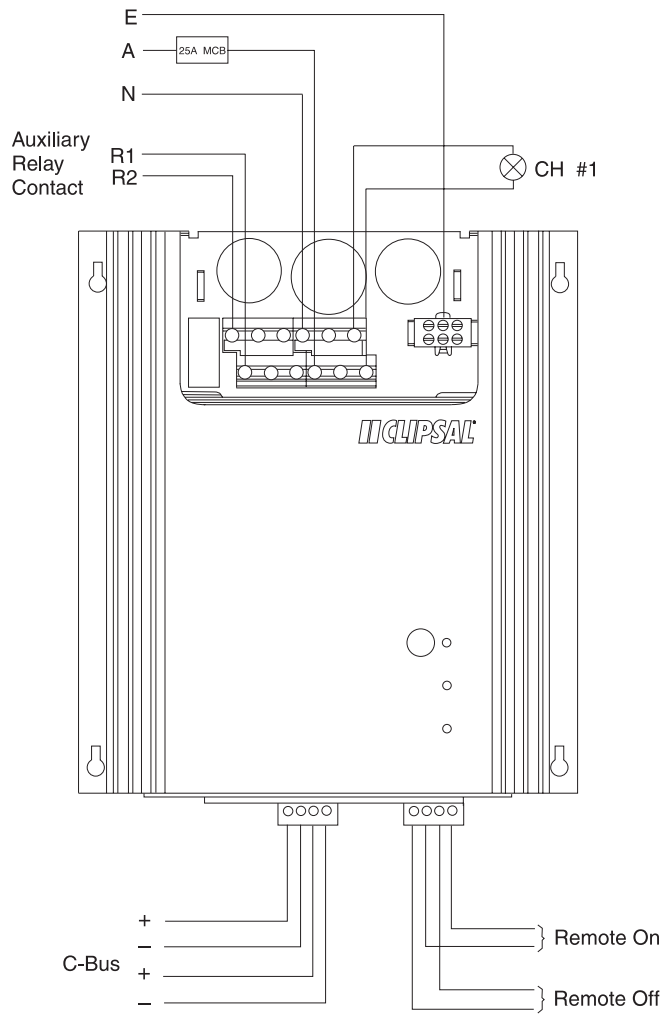
Consequently the maximum quantity of low voltage lighting that can be controlled with these types of electronic transformers is limited to **1000W per channel** (equivalent to 4 ampere loading, applies to 5104D5, 5102D10 & 5101D20 series dimmers). The remaining dimmer channel capacity e.g. 1 ampere for 5104D5 unit, can be still be utilized for the compatible loads described above.

Note: Exceeding the loading limit for this type of electronic transformer may result in excessive EMI emissions or cause damage to the dimmer unit channel.

Fluorescent Lighting Control

The dimmer output may be configured to **switch only** (i.e. not dim) low power iron-core-ballasted fluorescent lighting, provided the load power factor correction capacitance does not exceed 1.0 micro-farad per channel. This limit applies to all C-Bus Professional Series Dimmer models.

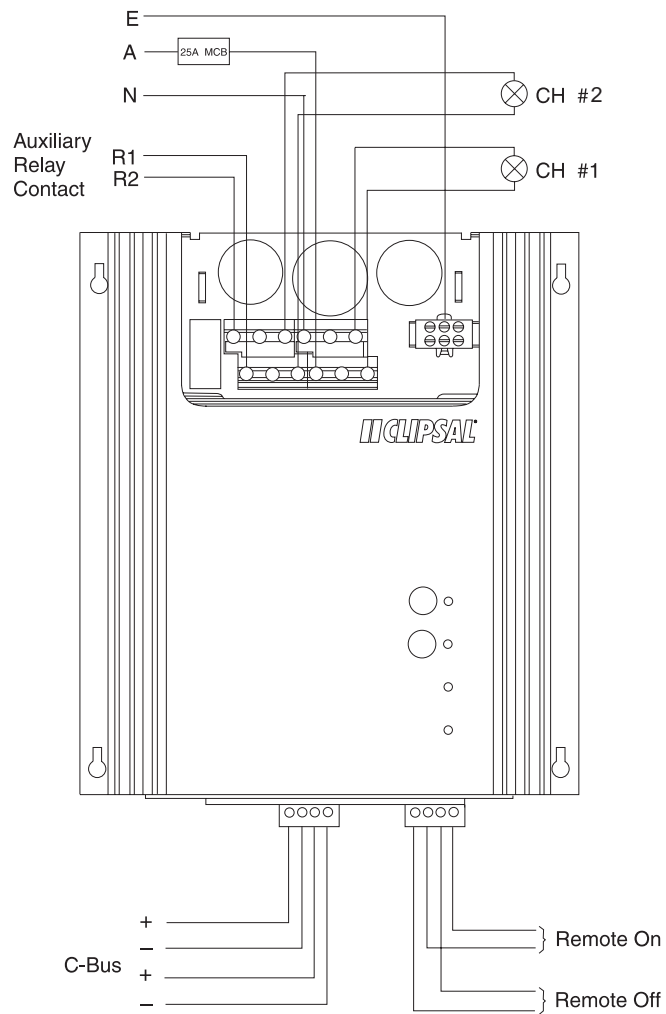
5. Wiring Instructions



5101D20 & E5101TD20

WARNING

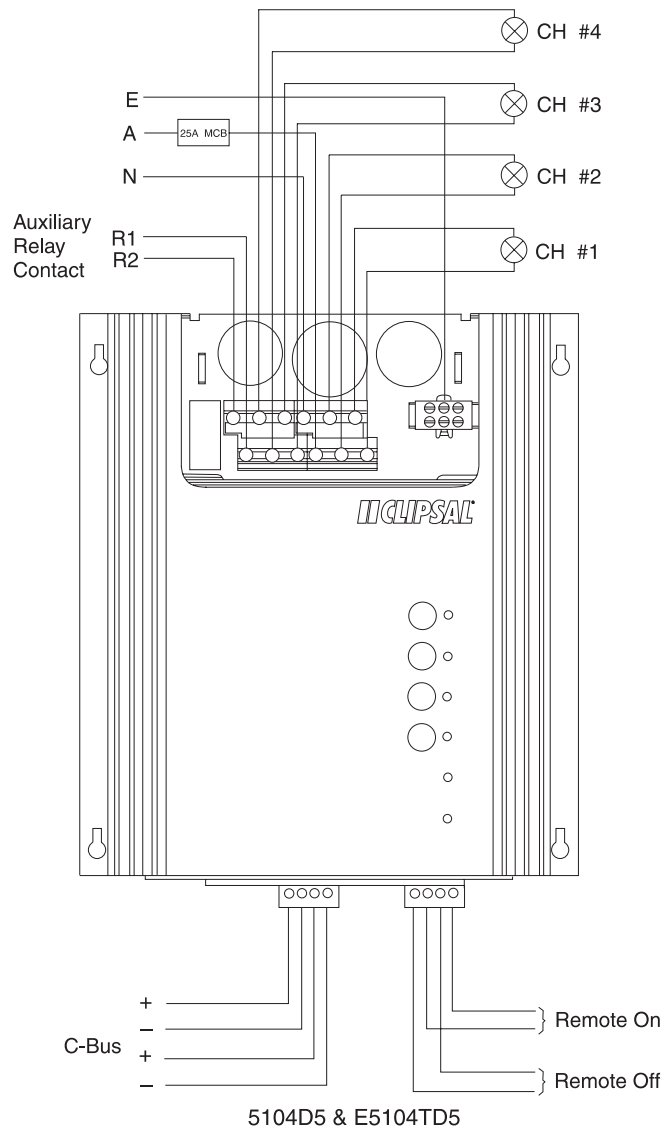
1. Load terminals are not isolated when the output is in the OFF state.
2. A maximum of 30 Professional Series Dimmers can be connected to a single C-Bus Network.
3. Do not short dimmer channel output to neutral or earth.



5102D10 & E5102TD10

WARNING

1. Do not wire dimmer channels in parallel.
2. Load terminals are not isolated when the output is in the OFF state.
4. A maximum of 30 Professional Series Dimmers can be connected to a single C-Bus Network.
5. Do not short dimmer channel output to neutral or earth.



WARNING

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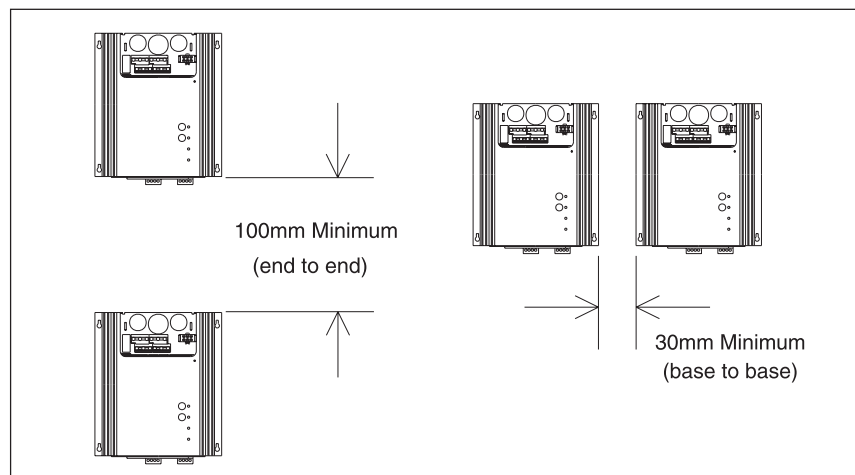
6. Recommended Mounting Orientations

The C-Bus Professional Series Dimmers supply high currents when controlling full rated loads, which requires the units to dissipate a significant amount of heat. It is recommended that the C-Bus Professional Series Dimmers be mounted vertically with mains wiring at the top. If mounting the dimmer in an enclosure, ensure adequate ventilation, to optimise operating reliability. At no time should the internal temperature of the enclosure exceed 45°C.

Warning

Installing the C-Bus Professional Series Dimmers in environments not specified will void the equipment's warranty.

In installations where multiple dimmers are used, the minimum distance between units should be 30mm side by side (measured base to base) and 100mm end to end, whilst observing all wiring safety regulations.



Mounting in other orientations requires the capacity of each channel to be de-rated by 20% (eg., a de-rated 5102D10 can only supply a maximum of 8 amps/channel). Poor ventilation may cause automatic thermal shut down.

Cat. Number	Rated Current per Channel (A)	De-rated Current per Channel (A)
5104D5/E5104TD5	5	4
5102D10/E5102TD10	10	8
5101D20/E5101TD20	20	16

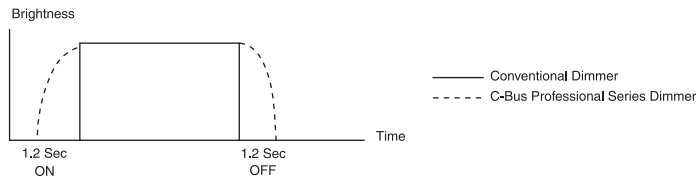
De-rating Table (45°C at nominal operating voltage), for non-standard mounting orientations.

7. C-Bus Professional Series Features

The C-Bus Professional Series Dimmers incorporate a micro-controller which provides many specialised features, detailed below.

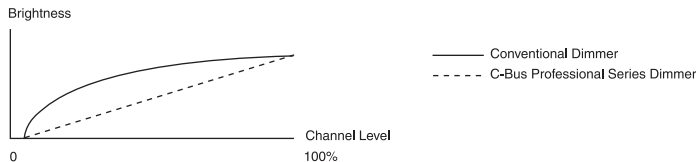
7.1 Soft Turn On and Soft Turn Off

Unlike conventional devices, where abrupt changes in brightness occur whenever a channel is switched ON or OFF, the micro-controller controls the rate of brightness change. This results in a soft brightness change, and is referred to as “Soft Turn On” and “Soft Turn Off”. This feature helps to prolong the life of incandescent light fittings.



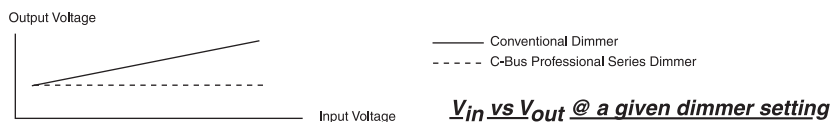
7.2 Linearised Brightness Control

In conventional phase control dimmers, as the light is being dimmed, the rate of change of power delivered to the load is not linear. The result is a change in brightness more apparent when the light is at a lower brightness settings. The micro-controller in the C-Bus Professional Series Dimmer uses an algorithm to ensure that this change in brightness is uniform throughout the control range.



7.3 Voltage Compensation

The C-Bus Professional Series Dimmers continually monitor the incoming mains voltage. To compensate for incoming mains voltage variations, the micro-controller automatically adjusts the output drive to the load. This minimises the change in brightness often associated with typical phase control dimmers during mains variations. Compensation covers the operating voltage range(s) 190-265V~ (220-240V~) and 90-130V~ (110-120V~).



Note: At full brightness (100%) the C-Bus Professional Series Dimmers do not compensate for mains voltage variations.

7.4 Automatic Mains Frequency Adjustment

The C-Bus Professional Series Dimmer constantly tracks the mains frequency. Whenever a frequency shift is detected, the micro-controller automatically adjusts the dimmer to ensure synchronisation to the mains is maintained. The C-Bus Professional Series Dimmer will operate over a wide range of frequencies, provided the mains frequency drift rate is less than 3Hz per minute or a step change 0.1Hz.

7.5 On/Off Mode

Under poor quality mains supply conditions, where line frequency is unstable eg., some portable AC generating equipment, the dimmer may automatically switch to "On/Off" mode of operation. In this case the loads can only be switched on or off and are not dimmable. Once set in this mode the dimmer can only be reset to normal dimming mode by briefly removing mains power to the unit.

7.6 Local Override Buttons

The buttons located on the front of the unit provide a means to toggle each channel locally. Each button has an associated LED indicator which is illuminated when the respective channel is in the ON state.

Button Operation	Function
Short Press	Toggle
Double Click (two short presses within 2 seconds)	Returns this channel only to the C-Bus network level
Long Press (a press longer than 2 seconds on any local override button)	Returns ALL channels to C-Bus network level

Note: Double Click and Long Press operations will only occur if the unit/channel is already in override mode.

By default, C-Bus commands received by the unit will override local toggle changes. In this case only the channels associated with the received commands will revert to the current C-Bus network state. This option may be disabled via Installation Software. Please refer to Section 8, Priority of Operating Modes.

In the absence of a C-Bus network, the dimmer can function as a stand-alone scene controller, provided the channels are programmed with preset levels.

7.7 Remote Override Facility

The C-Bus Professional Series Dimmer has the facilities for the connection of 2 remote switches, which provide Remote Override On and Off functions. Activation of the remote inputs corresponds to contact closure of the switch mechanism.

When one of these inputs is activated, all channels of the dimmer will be set to either ON or OFF accordingly. In the event, the Remote On and Remote Off functions are activated simultaneously, the Remote Off has priority.

The remote switches can be located up to 1000 metres from the dimmer unit. Multiple switches can be connected in parallel to the same remote input, allowing the C-Bus Professional Series Dimmer to be controlled remotely from different locations using any type of cable. Similarly, a single switch can be used to remotely control up to 30 different C-Bus Professional Series Dimmers, within the same C-Bus network or between multiple networks.

External voltage sources are not required and must not be connected to either remote inputs of the dimmer.

7.8 Current Sensing and Channel Overload Protection

The C-Bus Professional Series Dimmer measures average current in each load. The user can use the C-Bus Installation Software to monitor load currents in each channel.

Channel overloading (at full brightness setting) exceeding 20% of rated load current results in over current shutdown of the affected channel. After a five second delay the channel is reinstated to the C-Bus determined brightness level. If the resulting current magnitude is still excessive, continuous on/off cycling of the load occurs until the overload condition is removed.

Pressing, a Key on a C-Bus Input Unit, a Local Override button or a Remote Switch during this period will be ignored.

7.9 Thermal Shutdown

Thermal shutdown of all output channels is an indication of insufficient air ventilation to the dimmer unit under heavy load conditions. This occurs when the internal operating temperature of the unit exceeds approximately 75°C. Once the dimmer unit has cooled sufficiently, channel levels can be reinstated by toggling associated C-Bus levels or via front panel channel buttons.

8. Priority of Operating Modes

Loads connected to the C-Bus Professional Series Dimmer are controlled by a combination of C-Bus keys, Local Override Buttons and/or Remote Switch functions. Loads are also turned off when the dimmer overheats or during overload conditions. The table below shows priority ranking of the control inputs:

* Local Override has priority over normal C-Bus commands received on the bus (such as those generated by pressing a C-Bus Key). By default, if any channel is in Local Override mode and a C-Bus command is received for that channel, the C-Bus command state will be imposed ("Enable C-Bus Priority" option). This feature can be disabled in software such that all relevant C-Bus commands will be ignored by the unit whilst in Local Override Mode. Please refer to the C-Bus Manual (or C-Bus Manual Addendum V211A: C-Bus DIN and PRO Series) for further information relating to the programming of DIN Rail Dimmer units.

Mode	Priority	Function
Current Overload	1 (Highest)	Channel OFF
Thermal Shutdown	2	All Channels OFF
Remote OFF	2	Turns all channels OFF
Remote ON	3	Turns all channels On
Local Override	4 *	On/Off/C-Bus
C-Bus Input Unit (key, PIR, etc.)	5 * (Lowest)	Controls the channel

9. Status Indicators

9.1 C-Bus Indicators

This indicator shows the status of the C-Bus Network at this unit. If sufficient network voltage and a valid C-Bus clock signal are present the "OK" signal will be displayed. If a network is connected which demands more current than the power supplies can support, this indicator will flash meaning marginal network voltage. If there is no C-Bus clock present the indicator will not light. When the unit is powered from C-Bus only for stand-alone programming, this indicator does not function.

Indicator Status	Meaning
On	C-Bus network operational
Flashing	Insufficient power to support network
Off	No C-Bus clock present; No mains connection

Further debugging of possible network problems can be achieved with the Clipsal C-Bus Network Analyser tool (5100NA).

9.2 Unit/Mains Indicator

This indicator shows the mains presence and the channel mode. Continuous illumination indicates the mains power is connected. If the indicator is flashing with a 90% On duty cycle, it means that any one of the four channels has been toggled (using the override facility) into a state different to the C-Bus network. This applies to either Local or Remote Override inputs. This indicator does not function when the unit is powered from C-Bus only for stand-alone programming.

Indicator Status	Meaning
On	Normal Operation
Flashing	Unit in override mode
Off	No mains power connected

10. Auxiliary Relay Output

The C-Bus Professional Series Dimmer provides a set of voltage free auxiliary relay contacts, which can be used to indicate the status of the unit's mains supply. In the event of a power failure the auxiliary relay is de-energised and its contacts open. For emergency lighting applications the auxiliary contacts should be wired to a separate voltage source. Cables connected to this auxiliary relay contacts should be double insulated and current rated to suit the application.

11. Power Up Load Status

All C-Bus units have an on board non-volatile memory, which can be used to store the operating state of the unit in case of power loss. These settings can be programmed using the C-Bus Installation Software to define the state of each channel following Power-up. On power-up there is an initial delay of approximately 5 seconds before the C-Bus Professional Dimmer takes control of the loads. During this initial 5 second delay the dimmer loads remain OFF, the unit synchronises with the mains and preset levels are established. An indication of the load status will be displayed on the channel status indicator LEDs.

Please refer to the C-Bus Manual (or C-Bus Manual Addendum V211A: C-Bus DIN and PRO Series) for further information relating to programming of Professional Series Dimmers.

12. C-Bus Power Requirements

A C-Bus Professional Series Dimmer, not connected to the mains, will draw 18mA from the C-Bus network. A C-Bus Professional Series Dimmer connected to the mains will supply up to 60mA to the C-Bus network, which can provide power for up to three C-Bus input units (on the same network), i.e. Key Input Units.

Clipsal recommends the use of the C-Bus calculator to verify network design before proceeding.

13. Stand Alone Programming

The C-Bus Professional Series Dimmers can be programmed without a mains connection. The unit can be connected to any operational C-Bus network with spare capacity to support one or more additional C-Bus units (18mA current required). The unit can be configured using C-Bus Installation Software.

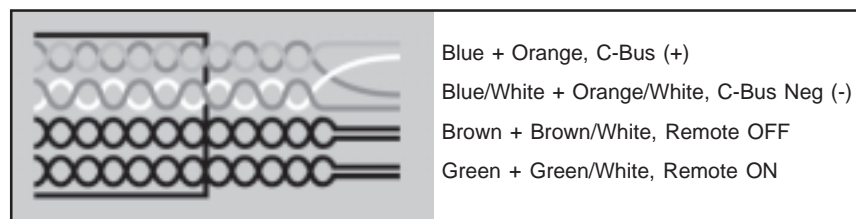
Indicators will not function without a mains connection.

14. C-Bus Network Connection

Installation of the C-Bus Professional Series Dimmers, requires connections to the unshielded twisted pair C-Bus Network Cable. It is recommended that Category 5 data cable is used, Clipsal catalogue number 5005C305B. This connection is polarity sensitive and clearly marked on the terminal block of the dimmer.

The illustration below shows the recommended technique for cable termination to give the best electrical performance. Bootlace crimps may be used to provide a high reliable connection.

A maximum of 30 C-Bus Professional Series Dimmers can be safely connected to a single network.



Note: The mutual twist of solid and dotted conductors of opposing coloured conductors, which ensures a good electrical termination, with favourable common mode noise rejection characteristics.

Note: The use of non-specified cable for C-Bus, or failing to ensure the correct conductor pairs are used to make the C-Bus connection, will void the warranty of the system.

15. Programming Requirements

As with other C-Bus units, the Dimmer Units must be programmed to set their unique identification and the mode of operation on the C-Bus Network. The C-Bus Installation Software can be used to configure all operational parameters including the specification of control sources, mode and power up options. Please refer to the C-Bus Manual (or the C-Bus Manual Addendum V211A: C-Bus DIN and PRO Series) for further information relating to the programming of the DIN Rail Dimmer Units.

16. Power Surges and Short Circuit Conditions

Although the C-Bus Professional Series Dimmers have been designed to comply with the stringent requirements of Australian and International standards relating to power surges, the mains voltage supply must still be limited to the range specified. Each unit incorporates transient protection circuitry, however additional external power surge protection devices can be used to enhance system's immunity.

To prevent damage to the dimmers due to short circuit load conditions, a 25A circuit breaker must be installed in the active supply to the units.

To prevent damage to the dimmers due to overvoltage conditions, overvoltage protection devices such as the Clipsal 970 series, may be installed across the active supply to the units.

17. Megger Testing

Megger testing of an electrical installation incorporating C-Bus units, will not cause any damage to the C-Bus units. Since C-Bus units contain electronic components, the installer should interpret megger readings with due regard to the nature of the circuit under test.

Clipsal Integrated Systems recommends C-Bus Professional Dimmers are disconnected from the mains, before megger testing.

18. Important Notes

The use of any non C-Bus Software in conjunction with the hardware installation without the written consent of Clipsal Integrated Systems will void any warranties applicable to the hardware.

19. Standards Complied

The C-Bus Professional Series Dimmers are fully compliant with all relevant Australian and International safety and EMC standards:

Standard	Title
AS/NZS 3100:1997	General Requirements for Electrical Equipment
AS/NZS 3108:1994 IEC 742: 1983	Requirements for Safety Extra Low Voltage
AS/NZS 1044:1995 IEC/CISPR 14:1993 BS/EN 55014: 1994	RFI Emissions Standard
AS/NZS 4051:1998 IEC/CISPR 15:1996 BS/EN 55015: 1994	RFI Emissions Standard
IEC 669-2-2 BS/EN 60669-2-2	Particular Requirements for Remote Control Switching Devices
BS/EN 61000-4-2	Immunity to Electrostatic Discharge
BS/EN 61000-4-3	Immunity to Radio Frequency Interference
BS/EN 61000-4-4	Immunity to Electrical Fast Transients
BS/EN 61000-4-5	Immunity to Surge Voltages
BS/EN 61000-4-11	Immunity to Voltage Dips and Interruptions
89/336/EEC	Electromagnetic Compatibility Directive
97/32C/EEC	Low Voltage Directives

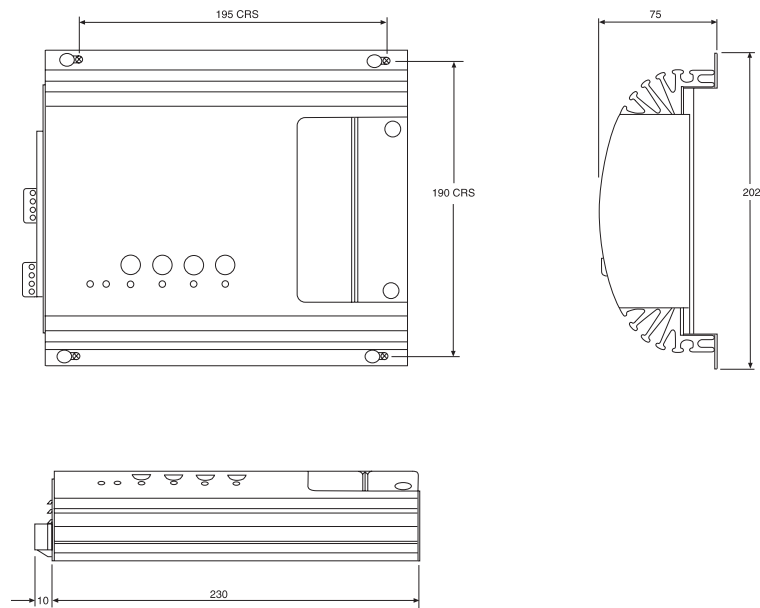
20. Product Specifications

Cat. Number	5104D5	5102D10	5101D20	E5104TD5	E5102TD10	E5101TD20
General Limits						
AC Supply Voltage	220 – 240V~			110-120V~		
AC Supply Freq.	47 – 53Hz and 57 – 63Hz					
Frequency Drift	3Hz/minute (maximum) for normal operation – if exceeded, unit reverts to ON/Off mode					
Frequency Step Change	0.1Hz (maximum) for normal operation – if exceeded, unit reverts to ON/Off mode					
Max. Load RMS Current per Channel	5A	10A	20A	5A	10A	20A
Operating Ambient Temperature	0 – 45°C					
Operating Humidity Range	0 – 95% RH					
Auxiliary Relay Contact Rating	2.5A @ 240VAC, Normally open voltage free contacts					
Peak Non-repetitive Half Cycle Surge Current	300A	550A	550A	300A	550A	550A
RMS Surge (Non-repetitive) I ² t for Fusing (8.3mSec Period)	500A ² Sec	1750A ² Sec	1750A ² Sec	500A ² Sec	1750A ² Sec	1750A ² Sec
Peak Repetitive Half Cycle Current	17A	35A	44A	17A	35A	44A
Max. Load Shunt Capacitance	1µF	1µF	1µF	1µF	1µF	1µF
Maximum Number of Units on a single C-Bus Network	30 (safety limit to restrict maximum C-Bus network current available)					
Compatible Loads	Suitable for incandescent, low voltage lighting and ceiling sweep fans (contact manufacturer). Suitable for electronic transformers compatible with leading edge dimmers.					
Minimum Load	100 Watts/channel					
General Levels						
Off State Power Consumption	<10 Watts					
Off State AC Supply Current	40mA			80mA		
Controlled Load Voltage dv/dt	10V/µS					
Load Terminal Off State Leakage Current	<1mA					
Load Terminal Off State Voltage	<5V					
Over Current Cut-off Level RMS	6A	12A	24A	6A	12A	24A
Current Measurement	5% Accuracy (Sinusoidal Waveform), Range 5-100% of Rated Load					
Power Control Range	2-98%					
Warm Up Time	5 seconds					
Power-up Delay	33 minutes and 30 seconds – software selectable					

Intelligent Building Series C-Bus Professional Series Dimmers Installation Instructions

Cat. Number	5104D5	5102D10	5101D20	E5104TD5	E5102TD10	E5101TD20
C-Bus Power Supply						
Line Regulation	Unregulated					
Unloaded Output Voltage	36V @240VAC Supply Voltage					
Loaded (60mA) Output Voltage	24V @240VAC Supply Voltage					
C-Bus to Mains Isolation Voltage	3750VAC RMS					
Useable Output Current	60mA					
Output Current Limit	<100mA					
C-Bus Interface						
Network Operating Voltage Range	15-36V					
Non AC Powered Unit Input Current	18mA					
C-Bus Line to Earth Impedance	940kΩ Shunted with 56pF (Balanced)					
Voltage Measurement Accuracy	5%					
Network Clock	Software Selectable, 2mSec between Clock Pulses, Amplitude ± 2.5V					
Network Burden	Software Selectable (Unit address 01 only), 1kW AC coupled					
C-Bus Connection	4 way removable terminal block					
Remote Inputs						
Open-state Voltage (On/Off Input)	4V					
On-Input Closed-state Current	40µA					
Off-Input Closed-state Current	150µA					
Switch + Cable Resistance Limit	1kΩ					
Cable Capacitance Limit	100nF					
Remote Input to C-Bus Isolation Voltage	1500VAC RMS					
Remote Override Input	4 way removable terminal block, max. 1000M to switch, inputs can be paralleled					
Status Indicators	C-Bus Status	Clock Present	No Clock Present			
	Voltage ≥ 20V DC	On	Off			
	Voltage < 20V DC	Flashing	Off			
	Voltage < 15V DC	Off	Off			
	Unit Status	Mains Power	Conditions			
	On	Present	Normal Operation			
Flashing	Present	At least one channel in local or remote override mode				
Off	Fail	Mains power not available				
Load Indicators (1 - 4)	Load indicator is On when dimmer output is On at any C-Bus determined dimming level.					
Mains Terminals	Accommodates 2 x 2.5mm ² or 1 x 4mm ²					
Dimensions	240 x 202 x 75mm					
Weight	2.2kg (packaged)					

19. Mechanical Specifications



All dimensions are in millimetres.
No user serviceable parts inside.

Technical Support and Troubleshooting

For further assistance in using C-Bus Scene Master, please consult your nearest Clipsal Integrated Systems Sales Representative or Technical Support Officer.

Technical Support E-mail techsupport.cis@clipsal.com.au

Sales Support E-mail sales.cis@clipsal.com.au

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