SpaceLogic C-Bus Voltage Free Relays
User Guide

Information about features and functionality of the device

5516RVF
5508RVF
5504RVF

Release date 08/2024

5516RVF

5508RVF

5504RVF

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Schneider Electric

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Safety information

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that accompany this symbol to avoid possible injury or death.

⚡⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury. **Failure to follow these instructions will result in death or serious injury.**

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Safety Precautions

⚡⚠ **DANGER**
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
• This product must be installed and serviced by appropriately qualified and/or licensed professional in accordance with the local wiring rules.
• Isolate the electrical supply before doing any work on the product.
• Ensure that the product has been correctly installed and tested for safe operation before reconnecting the electrical supply.
• Do not use this product for any other purpose than specified in this instruction.
• Pay attention to the specifications and wiring diagrams related to the installation.
• Do not attempt to open the product casing or perform any action on the internal components of the product.
Failure to follow these instructions will result in death or serious injury.

⚠ **WARNING**
INCORRECT C-BUS CABLE INSTALLATION
The C-Bus network cabling is classified as Separated Extra-Low Voltage (SELV) wiring. To maintain this requirement, the approved C-Bus cable must be used.
• Ensure that adequate separation and/or segregation of the C-Bus cable from other wiring (for example Low Voltage wiring) is maintained throughout the entire installation.
• Ensure the C-Bus network cable is installed in accordance with the SELV wiring rules and regulations of the jurisdiction.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE
INCORRECT C-BUS INSTALLATION LOCATION
To prevent the possibility of intentional or unintentional interference with the configuration or operation of the C-Bus installation, this equipment should be installed in a location with appropriate access control.
Failure to follow these instructions can result in equipment damage.

Other Precautions

NOTICE
MEGGER TESTING
Megger testing must never be performed on any cable while connected to the product as it could degrade the performance of the product and/or the network.
Failure to follow these instructions can result in equipment damage.

NOTICE
MAXIMUM LOAD RATINGS APPLY
Ensure that the number of lighting loads connected to a single device does not exceed the maximum load rating of each channel.
Failure to follow these instructions can result in equipment damage.

Cybersecurity

At Schneider Electric, we believe that cybersecurity is an essential prerequisite. We are committed to providing reliable, stable, and secure products to minimize potential network risks and protect the safety of customers, property, and the environment.

Cybersecurity aims to prevent your system, communication networks, and devices from possible attacks, data tampering, or confidential information leakage.

In addition to the direct instructions in this document, observe and follow Schneider Electric's security recommendations. For details and assistance in protecting your installation, you can also contact your local Schneider Electric Industrial Cybersecurity Services organization or visit Cybersecurity Services on the Schneider Electric website.

Cybersecurity Services on the Schneider Electric Website:

Recommended Cybersecurity Best Practices	Proven cybersecurity procedures
Cyber security service	From conception to maintenance: certified experts advise and guide you through a holistic cybersecurity program.
Cybersecurity support portal	Security notifications, reporting a vulnerability, reporting an incident

Secure disposal

If a device needs to be disposed of, perform a factory reset so that all data, project data and programming is deleted from the device.

Make sure that it is secure to prevent its redeployment into your operational system or unauthorized use.

Cybersecurity vulnerabilities/incidents

You can review the Vulnerability Management Policies on Schneider Electric's Cybersecurity Vulnerabilities Portal (https://www.se.com/ww/en/work/support/cybersecurity/vulnerability-policy.jsp) or report potential cybersecurity vulnerabilities or incidents.

Disclosure

This documentation contains general descriptions and/or technical characteristics of the products contained herein. It is not intended to determine whether these products are suitable for specific applications or to determine their reliability. In order to determine whether the products are fit for any particular application or use, users or integrators must conduct the appropriate risk analysis, evaluation, and testing. Any misuse of the information contained herein will not be the responsibility or liability of Schneider Electric or any of its affiliates. If you have suggestions for improvements or amendments or have found errors in this publication, please notify us.

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The product must be installed and used in accordance with all applicable state, regional, and local safety regulations. In order to ensure safety and compliance with documented system data, only the manufacturer should perform component repairs.

Devices with technical safety requirements must follow the relevant instructions.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

About the Device

The 5516RVF, 5508RVF, and 5504RVF are new generation C-Bus Voltage Free Relays for general switching of lighting or small motor loads, designed for switchboard distribution applications.

The units are DIN rail mounted, with the 16-channel version measuring 12 modules wide, and the 8 and 4 channel models measuring 8 modules wide (1 module = 18mm).

C-Bus connection is achieved through the use of RJ45 connectors, allowing similar units to be looped together quickly.

Features:

- DIN Rail mount
- Integrated Switchable C-Bus Power Supply
- Latching relays to reduce energy consumption
- 230 / 110 V nominal voltage
- Advanced status information for monitoring unit health
- Warn Before Off function notifying users before lights are turned off for public spaces
- Configurable Interlock Sets for each channel, enabling priority of operation between channels
- Logic groups to organize and control relay channels together, flexibly
- Full configuration with SpaceLogic C-Bus Commission
- Programming via C-Bus connection without an energized mains line
- Firmware upgradeable
- 3 models:
    - 16 channel (5516RVF)
    - 8 channel (5508RVF)
    - 4 channel (5504RVF)

Compatible Loads

When designing an installation, it is important to consider the characteristics of the loads being controlled by the relay, as well as the intended duty (the number of operations per day and the interval between operations) when deciding how much load should be connected to a single relay channel.

The contact material of the relay component used in each channel of the relay units is chosen to be optimal for handling the high peak inrush currents commonly encountered when switching modern AC lighting loads such as Self Ballasted Compact Fluorescent or LED lamps ("SBL" loads) and LED drivers.

It may also be used for other traditional lighting load types such as Incandescent and Fluorescent Lamps, Extra Low Voltage lighting transformers (electronic or iron core), and small motors such as exhaust fans.

The different types of loads have different characteristics when switched, which can have a significant impact on the life of the relay contacts.

Resistive Loads

Loads such as heating elements have a predominantly resistive characteristic. Resistive loads do not present any adverse conditions when switching either on or off.

Note that wirewound heating elements may have a small amount of inductance but this is generally not a significant concern when switching.

Incandescent Lamps

Incandescent filament lamps are predominantly resistive, but have a significantly lower resistance when cold. When switching on the filament reaches its working temperature within several mains cycles, however during this time the current may be up to 10 times the running current, which causes additional stress on the relay contacts. The incandescent rating of the relay is based on the running current of the load and is therefore lower than the resistive load rating.

Capacitive/Electronic Loads

Loads with electronic convertors such as LED downlights, LED drivers, and Fluorescent Luminaires have a capacitance at their input, which must be charged up to its working voltage when the load is switched on.

This results in a high inrush current at switch on. Fluorescent lighting with iron-core ballasts and PFC capacitors have a lower inrush of a longer duration compared to more modern LED lighting convertors which can have an extremely high but relatively shorter inrush current.

This is not only more stressful on the relay contacts, but is often also a problem for the magnetic trip function in For this reason the rating for LED lamps (the "SBL" rating) is significantly lower than the rating for Fluorescent Lamps (the "AX" rating).

Inductive Loads

Loads with wound components on a magnetic core such as contactor coils, neon lamps with iron core ballasts, iron core ELV lighting transformers, and motors have an inductive characteristic. An inductive characteristic has a lagging power factor, meaning the current waveform lags the voltage waveform. When switching off an inductive load, the inductance causes a back EMF which can result in arcing across the contacts.

> **NOTE:** It is recommended not to use the relay to directly switch a load with a lagging power factor of lower than 0.6. In such cases, a suitable external contactor should be used.

Motor Loads

Motors are a special case of an inductive load. In addition to the inductance of the windings which cause arcing when switching off, the inertia of the rotor creates a higher current at startup.

Unlike the inrush for a capacitive load, the motor startup current is a lower magnitude (typically 5-6 times the run current) but much longer duration. In addition, switches for motor loads need to consider the possibility that the rotor may stall. When this happens the current can be 4-5 times the normal run current (this is referred to as the "locked rotor" current).

For these reasons the rated motor load for the relays is lower than the other switching ratings. For Australian /NewZealand installations, the M - rating of the relay channel refers to the maximum locked rotor current for an attached motor.

DC Loads

DC loads are not recommended, however the relay may be used with resistive DC loads up to 24Vdc.

Minimum Load

The contact material used in power relay contacts requires a minimum current flow when making or breaking the circuit to maintain a low-resistance contact. The minimum recommended load current is 100mA @ 12Vdc. Even though this current corresponds to a power of 24VA in a 240V system, in most cases the initial inrush current for lighting loads less than this is sufficient to maintain low contact resistance.

Dry-Contact Inputs

Whilst the relay contacts are voltage free, due to the minimum load requirement, they may not be suitable for low-current applications such as switching dry-contact inputs.

Ratings

The relay unit is certified according to the IEC Standard for Electronic Switches, IEC 60669-2-1. The ratings according to the certification to this standard are provided below.

Load Type	Maximum Load any channel
LED (Self Ballasted Lamp)	400 W (230 V) 150 W (110 V)
Incandescent Lamps	10 A
Fluorescent Lamps (Externally Ballasted Lamps)	16 AX
Inductive Loads (Power Factor ≥ 0.6)	10 A
Motors	5 A M.30

Whilst these ratings provide a way of comparing performance under standardized testing conditions, these conditions do not always reflect real-world usage expectations.

For example, the testing required to achieve the rating for externally ballasted lamps of 16 AX only requires that the relay achieves 5000 operations (2500 on/off cycles). In an application where this relay is switched multiple times per day, this may not be an acceptable lifespan.

Operating with a load that is at the limit of the rating, and/or the duty can significantly decrease the lifespan of the relay.
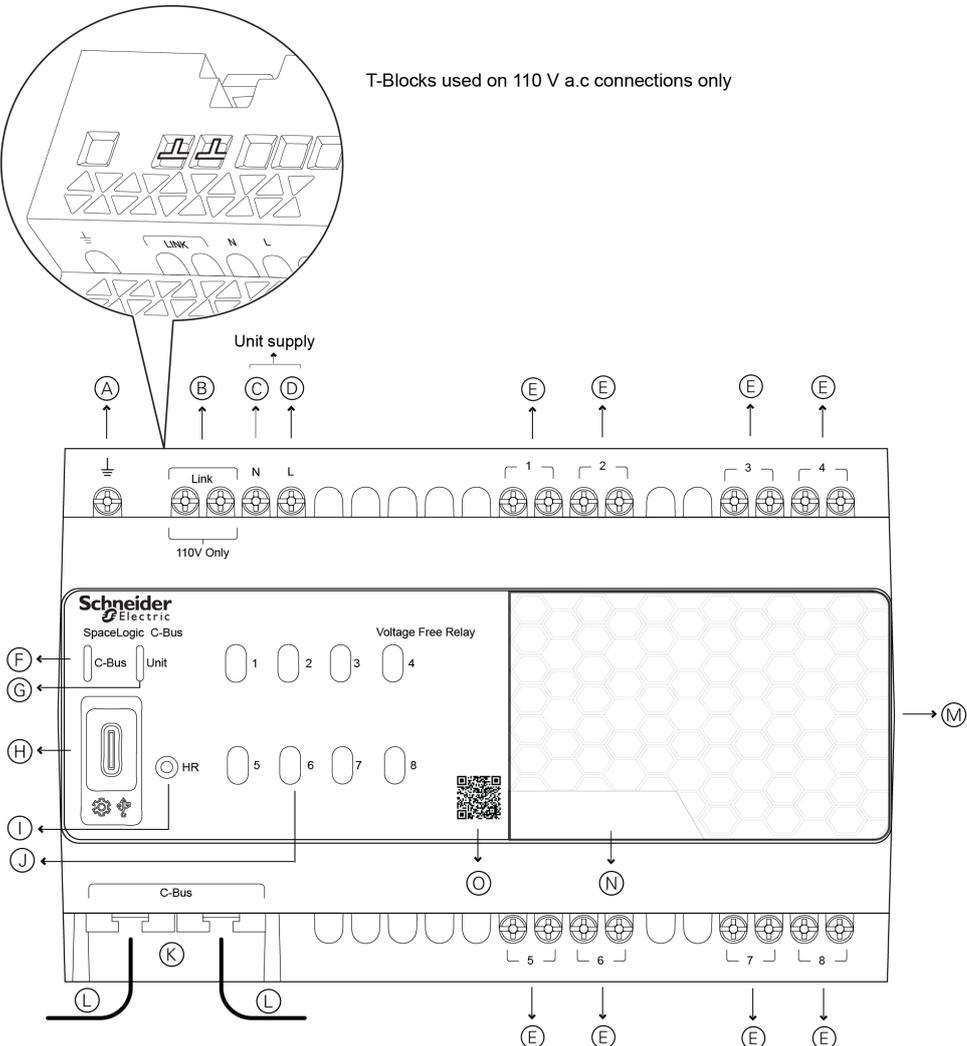
For example, with 400 W of Self-Ballasted LED lighting, the relay can achieve a life exceeding 20000 cycles, however if the load is reduced to 150 W, this increases to in excess of 100000 cycles.
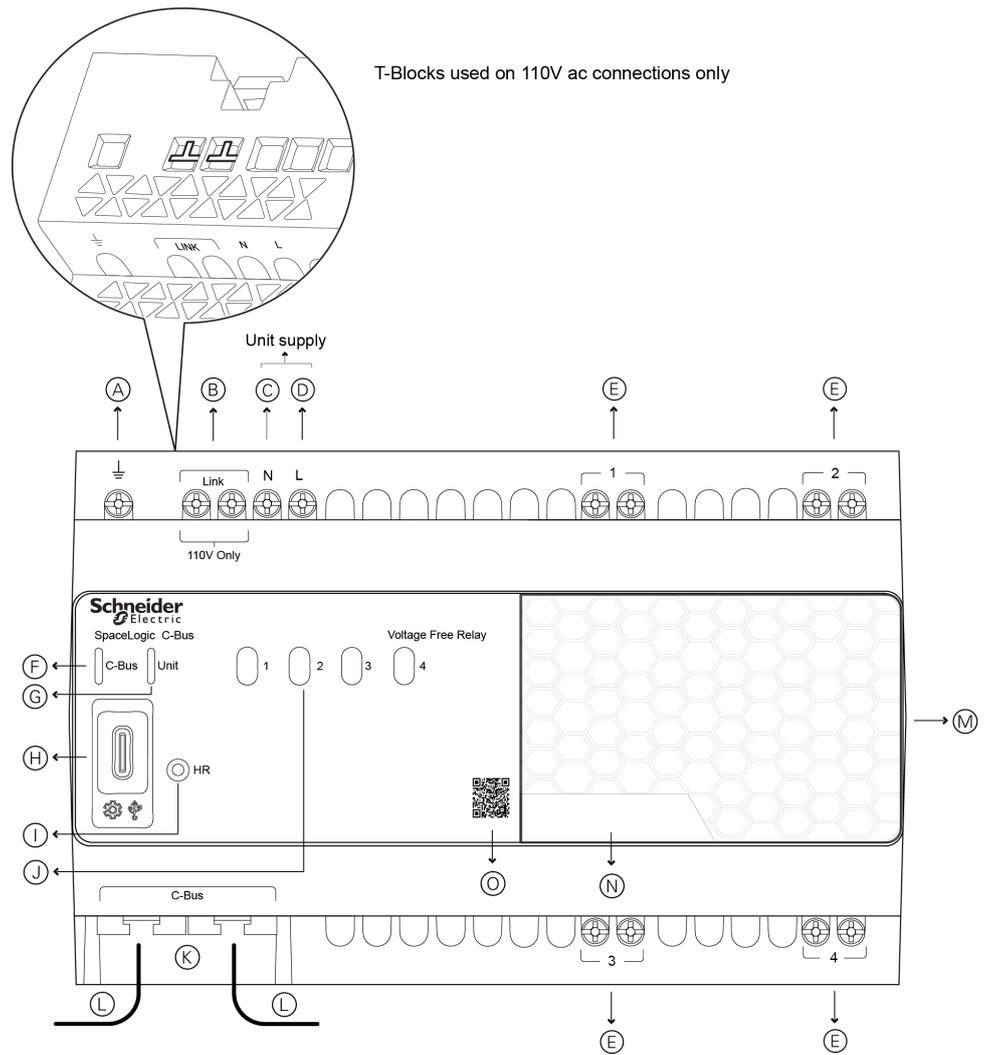
Hardware Description

16 Channel Voltage Free Relay

T-Blocks used on 110V AC connections only

8 Channel Voltage Free Relay
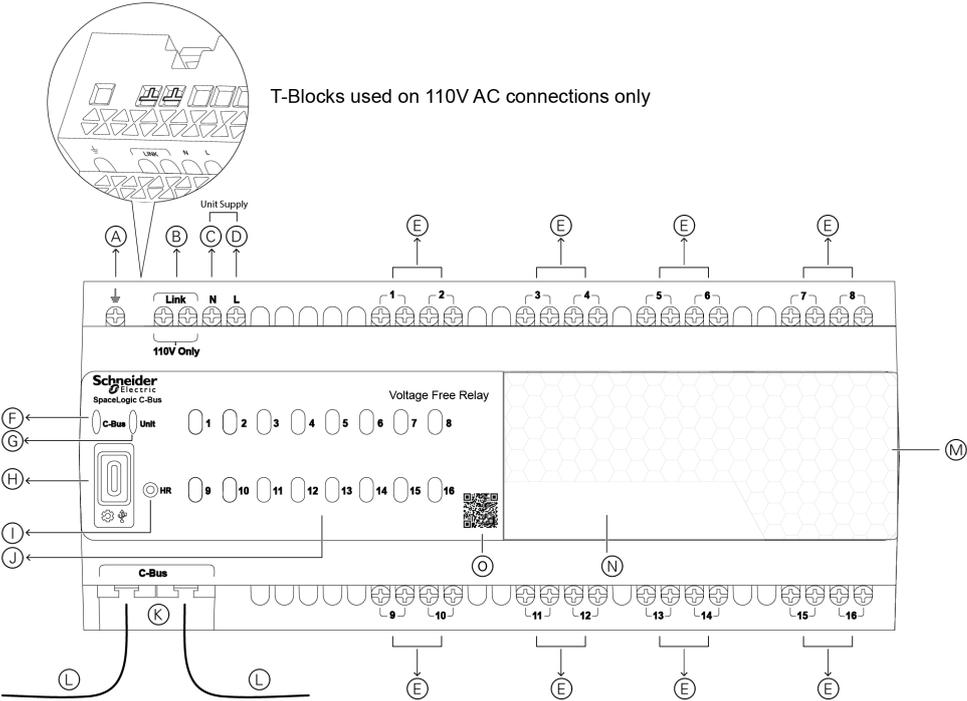
T-Blocks used on 110 V a.c connections only

4 Channel Voltage Free Relay

A: Earth

B: Wire Link Terminal for 110 V

C: Neutral

D: Active Line

E: Load Connections

F: C-Bus Indicator

G: Unit Indicator

H: USB (Type-C) Connector

I : Hard Reset Button

J: Channel Button Indicators

K: C-Bus Connectors 2x RJ-45

L: C-Bus Network Cable

M: Transparent Removable Cover

N: Space for Labelling

O: QR Code for Product Details and Serial Number

Project Design and Installation

Installation Requirements

The relay unit must be installed in a location where the operating environment (the air temperature immediately surrounding the relay unit) is maintained at or below the rated operating temperature, to ensure the internal components are maintained at temperatures which ensure long-term reliability. The operating environment must always be maintained below 55 °C.

To ensure reliable operation, airflow around the relay unit and the ventilation holes must not be restricted, and adequate ventilation should be provided in the enclosure to ensure that the temperature in the enclosure is maintained within the rated operating temperature range of the relay unit.

In order to maintain the operating environment within the rated operating temperature range, the operating calorific values and the heat load of all components contained within the distribution board must be considered when designing the distribution board.

The relay unit incorporates an internal temperature sensor and operating temperature of the relay unit can be monitored using the C-Bus Measurement Application. In addition, an over temperature alarm may be configured for monitoring abnormal conditions using the C-Bus Error Reporting Application.

Power Loss/Heat Load

The relay unit produces heat according to the following table. The amount of heat produced by the relay unit depends on various factors such as whether the C-Bus Power Supply is enabled, the load on the C-Bus Power supply, and the load current flowing in each channel.

The total heat output of the relay unit and all other devices contained within the distribution board must be considered when designing the distribution board, to ensure all devices within the distribution board are maintained within their rated operating temperature range.

-		Power Loss		
		W	BTU/hr	
Baseline Power (All loads off, C-Bus Power Supply Disabled)	-	1.3	4.436	-
C-Bus Power Supply Enabled	Adds	1	3.412	
C-Bus Power Supply fully loaded (200 mA)	Adds	2.9	9.895	
Relay Channel @ 1 A load current	Adds	0.0035	0.012	per channel
Relay Channel @ 5 A load current	Adds	0.0875	0.299	
Relay Channel @ 10 A load current	Adds	0.35	1.194	
Relay Channel @ 16 A load current	Adds	0.90	3.075	

Mounting and Wiring

Mounting

The relay unit should only be installed horizontally on the mounting rails (type DIN EN 50022 TS 35) inside a distribution board.

DIN EN 50022 TS 35
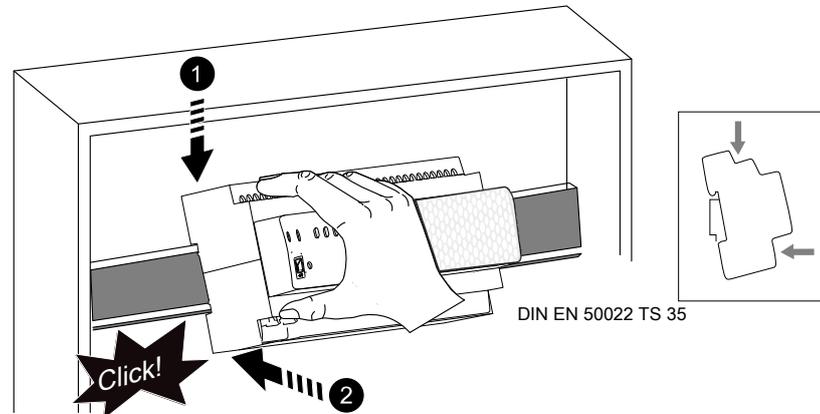
Electrical Connection

<div>

⚡⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This product must be installed and serviced by appropriately qualified and/or licensed professional in accordance with the local wiring rules
- Isolate the electrical supply before doing any work on the product
- Ensure that the product has been correctly installed and tested for safe operation before reconnecting the electrical supply
- Do not use this product for any other purpose than specified in this instruction
- Pay attention to the specifications and wiring diagrams related to the installation

Failure to follow these instructions will result in death or serious injury.

</div>

The relay unit requires mains power provided via the L/N/E connections at the top right in order to operate the relay channels.

Each relay channel is provided with a pair of terminals connected to the relay contacts. Each relay channel is isolated from the next, meaning adjacent channels may be connected to different phases.

The relay unit terminals for connection to each relay channel are suitable for cable up to 4 mm^2 when using bare cable or 2 x 2.5 mm^2 if using ferrules.

> **NOTE:** Relay channel wiring must be protected upstream with circuit protection with a rated current of no greater than 20 A.

NOTICE

EQUIPMENT DAMAGE HAZARD

As the relay channels use mechanically latching relays, and relay contacts may change state in transit, the state of the relay channel contacts is undefined at first power up.

Pay attention while powering up for the first time, mainly where the interlock function is used.

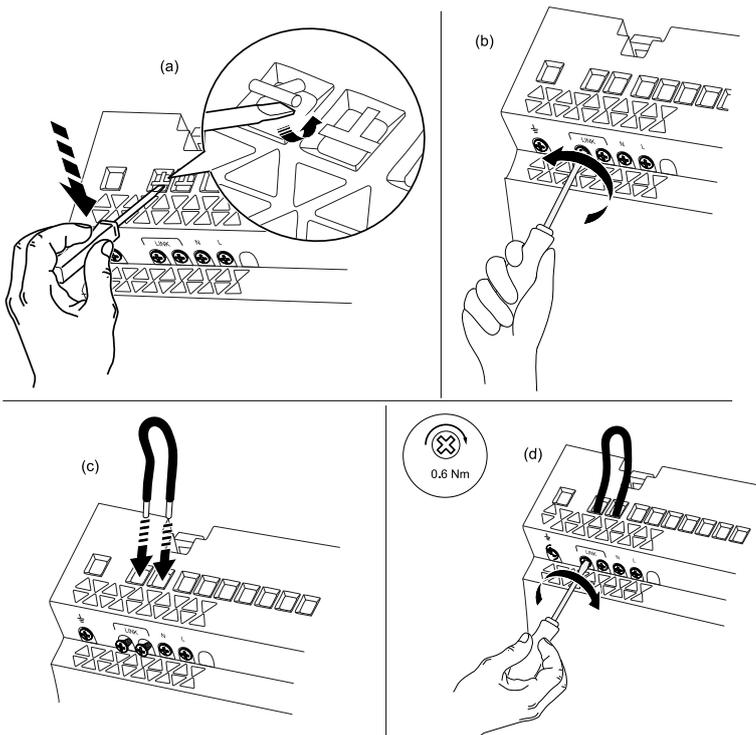**Failure to follow these instructions can result in equipment damage.**

Make sure while terminating cables into the terminals, that no loose strands of copper fall into unit or enter any aperture other than the terminal.

The terminals require a PH1 Phillips driver or a 0.8 x 40.0 flat blade screwdriver. Torque must not exceed 0.6 Nm when tightening terminal screws.

Rubber bungs are supplied for unused RJ45 connectors, to stop foreign bodies from entering the unit. Always install these bungs when the unit is mounted inside a mains rated enclosure.

110 V Electrical Wiring

To use the relay unit with a 110 V supply, break the T-Blocks covering the "Link" terminals using a flat blade screwdriver and connect an insulated wire link between the two terminals.

⚠ WARNING

EQUIPMENT DAMAGE HAZARD

Do not break T-Block terminal and/or insert a wire link unless using the relay with 110 V unit supply voltage.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE
EQUIPMENT DAMAGE HAZARD
When breaking the T-Block in the terminal, be careful not to damage other terminal blocks.
Failure to follow these instructions can result in equipment damage.

C-Bus Network Connection

Connection to the C-Bus network is made via one or both of the RJ45 connectors. The two RJ45 connectors are internally connected to allow the C-Bus network to be looped through the unit.
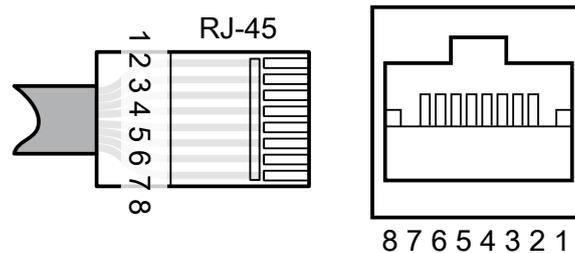
Use only C-Bus certified cable, which is identifiable by its pink sheath.

For C-Bus cable, refer:

- Catalogue number: 5005C305B (solid)
- Catalogue number: 5005C305BST (stranded)

The RJ45 connectors are internally connected. See below illustration for pinouts and cable conductor assignments.

Refer below illustration for pinouts and cable conductor assignments.

Pin	Wire Colour Compliance to TIA/EIA 568A wiring standard	Signal
1	Green & White	Remote ON
2	Green	Remote ON
3	Orange & White	C-Bus Negative (-)
4	Blue	C-Bus Positive (+)
5	Blue & White	C-Bus Negative (-)
6	Orange	C-Bus Positive (+)
7	Brown & White	Remote OFF
8	Brown	Remote OFF

C-Bus Power Requirements

Adequate C-Bus Power Supply Units must be installed or enabled to support the total consumption of all C-Bus devices connected to the C-Bus Network segment.

C-Bus Power Supplies are specially designed to share load when distributed around the C-Bus network. To achieve this the integrated C-Bus Power Supplies have an output impedance of approximately 32 Ω up to their maximum current of 200 mA. Once the maximum current is exceeded the output impedance increases sharply to limit the current to a safe level in the event of a fault in the C-Bus network wiring.

Output Voltage v/s Load Current
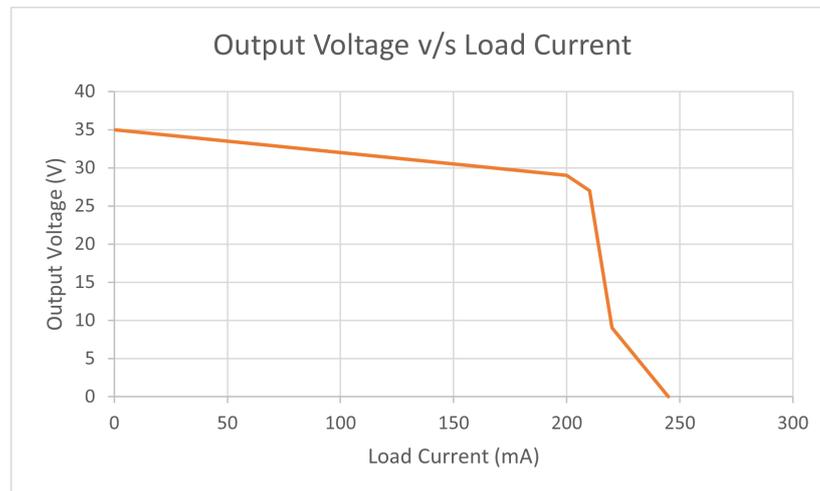
There must not be more than 2000 mA of total C-Bus Power Supply capacity enabled on a single C-Bus network segment as this is the limit of the current carrying capacity of the C-Bus network cable.

The relay unit includes a switchable inbuild C-Bus Power Supply, which can supply up to 200 mA to the C-Bus network when enabled. By default, the inbuilt power supply is disabled, but can be enabled (or disabled) via the front panel.

The SpaceLogic C-Bus Commission software provides information if the inbuilt power supply is enabled/disabled in each unit, as well as a summary of the total network power capacity and consumption. This can be helpful in determining the power supply requirements of a particular network.

> **NOTE:** The relays draw 20 mA from the C-Bus network when mains power is not connected.

Enable/Disable C-Bus Power Supply from the Front Panel

The integrated C-Bus Power Supply can be enabled or disabled via the front panel by performing a short press on the top right channel button whilst holding down the top left channel button to toggle the enabled state.
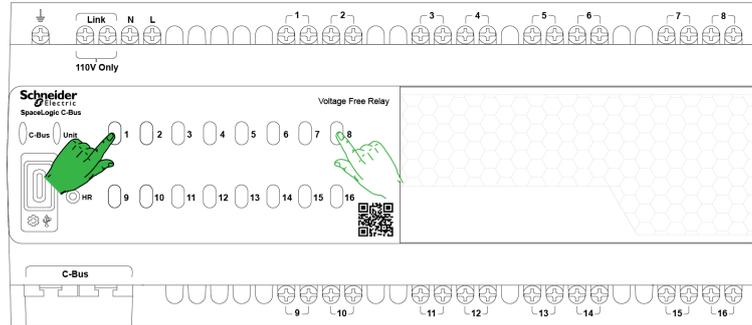
Once the desired setting for the C-Bus Power Supply has been made, the function to change the setting from the front panel may be disabled via the SpaceLogic C-Bus Commission software to prevent further changes.

> **NOTE:** Changing the power supply state will temporarily disrupt C-Bus network communications, which can take several seconds to recover, depending on the network configuration.

The enabled status of the integrated C-Bus power supply is shown by the color of the Unit Indicator.

Unit Indicator	Function
(Green)	C-Bus Power Supply is Enabled
(Yellow)	C-Bus Power Supply is Disabled

Refer, Unit indicator, page 26 color/states for more details.

The state of the network voltage is shown by the state of the C-Bus Indicator.

- If the C-Bus Indicator is flashing or off, the network voltage is too low, meaning there is insufficient C-Bus Power. additional power supplies may need to be enabled.
- If the C-Bus Indicator is steady, the network voltage is sufficient.

The state of the C-Bus system clock is shown by the color of the C-Bus Indicator.

| C-Bus Indicator	Function
or (Green or Yellow)	C-Bus clock signal has been detected
(Red)	No C-Bus clock signal has been detected

Refer, C-Bus Indicator, page 27 color/states for more details.

Enable/Disable C-Bus System Clock Generator from the Front Panel

A C-Bus clock signal is required to synchronize communication on the C-Bus Network. The relay unit (and most other C-Bus DIN Rail mounted devices) can be configured to generate the C-Bus system clock.

It is recommended that the C-Bus system clock generator function be enabled in three units on each network segment.

If a C-Bus system clock is required on the relay unit, it can be enabled or disabled from the front panel by performing a short press on the top second-to-right channel button whilst holding down the top left channel button. This toggles the enabled state of the C-Bus system clock generator in the unit.
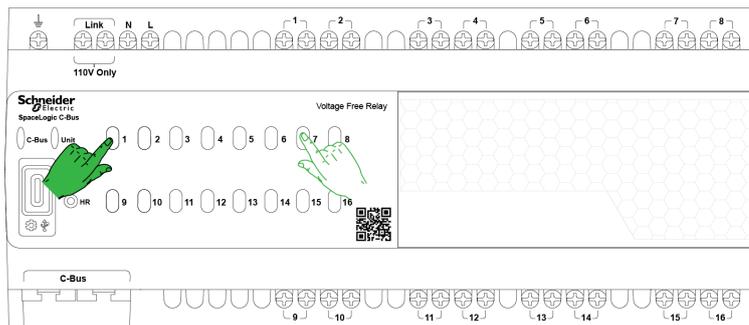
Once the desired setting for the C-Bus system clock generator, the function to change the setting from the front panel may be disabled via the SpaceLogic C-Bus Commission software to prevent further changes.

Using the Device

Power Up Load Status

While designing an installation, it is important to understand the power-up behavior of the system. With relay units it is important to consider the impact of the state of the relay channels at power-up.

The following points should be considered:

- The SpaceLogic C-Bus Commission software allows the relay channels to be configured to restore any fixed level, or restore to their previous level upon restoration of power.
  - By default, all channels are set to restore to their previous state, with the stored previous state being OFF.
- On restoration of power, the unit waits approximately 5 seconds for power to stabilize before restoring the channel states.
- To reduce power consumption during operation, the relay unit uses latching relays. This means that
  - Upon loss of power, relay contacts remain in the same state as they were in at the time of power loss, and
  - Upon resumption of power, the contacts will remain in this state and will be changed to their recovery setting only after the 5 sec. stabilization delay.
  - For channels with a Restrike Delay configured
    - If the channel is restoring to OFF, the restrike delay is applied before it will be allowed to turn ON.
    - If the channels is restoring to ON (either as a fixed level or restoring to previous level), the restrike delay is not applied.

NOTE: As the relay channels use mechanically latching relays, and relay contacts may change state in transit, the state of the relay channel contacts is undefined at first power up.

Relay Channel Control

The output state of a relay channel can be changed by:

- A lighting command from C-Bus
- Pressing one of the channel indicator buttons (local override)
- Changing the state of the remote override inputs

Priority of Operating Modes

The various sources of control listed above are describe in more detail. The relative priority of these sources in determining the final state of the relay channel is as shown below:

Function	Priority	Result
Remote off	1 (highest)	Forces channel Off
Interlock/Restrike Delay	2	Only the highest priority channel in an Interlock Set will be On Restrike Delay will hold channel Off whilst active
Remote On	3	Forces channel On
Local Override	4	Toggles the channel
C-Bus Level	5	Channel State after Logic, Warn Before Off, Turn -On Threshold

Control from C-Bus

In order to be used, a relay channel must be assigned a Group Address from one of the four available Lighting Application addresses that can be configured in the relay unit. The same Group Address can be assigned to multiple channels.

> **NOTE:** Unused channels should be left without a Group Address configured.

With default settings, the relay channel will turn on when the level of the Group Address is changed to any value greater than zero.

More advanced settings can be configured to modify the conditions required for the relay channel to turn on. The advanced settings are:

- Turn-On Threshold
- Logic
- Interlock
- Restrike Delay
- Warn Before Off

Turn-On Threshold

The Turn-On Threshold changes the level of the Group Address required for the relay channel to turn on. The level of the Group Address needs to be greater than the Turn-On threshold for the channel to turn on.

The Turn-On Threshold can be used to:

- Switch on more banks of lighting based as the level of the Group Address increases, by assigning the same Group Address to all banks, with increasing Turn-On threshold values in each bank.
- Stagger the turn on of a large amount of load by spreading it across multiple channels, assigning the same Group Address to those channels, staggering the Turn-On threshold settings for those channels, and using a ramp command when turning on.

Logic

The Logic feature allows the state of up to four additional "Logic" Group Addresses to be combined with the relay channel's primary Group Address to determine the final level that controls the relay channel's output state. There are four Logic Groups available in the relay unit, and each channel can be combined with any combination of these.

There are two types of logic function available:

- **AND** logic takes the **minimum** level of the primary Group Address for the relay channel and any Logic Groups that the relay channel is to be combined with.

  ◦ For example, if the relay channel is configured for AND logic and combined with Logic Groups 1 and 2, the level of all three Group Addresses must be greater than the Turn-On Threshold for the relay channel for the relay channel to be ON.

    Conversely, the relay channel will be OFF if any of the three Group Addresses is equal to or less than the Turn-On Threshold for the relay channel.

- **OR** logic takes the **maximum** level of the primary Group Address for the relay channel and any Logic Groups that the relay channel is to be combined with.

  ◦ For example if the relay channel is configured for OR logic and combined with Logic Groups 1 and 2, the relay channel will turn on if any one of the three Group Addresses is greater than the Turn-On Threshold for the relay channel.

    Conversely, all three Group Addresses must be less than or equal to the Turn-On Threshold value for the relay channel for the relay channel to turn off.

Restrike Delay

Certain types of lamp require a lock-out period between being switched off and being switched back on again. This can be achieved by configuring a Restrike Delay.

When the Restrike Delay for a relay channel is set to non-zero, the channel will be prevented from turning on for the specified time period after it has been turned off.

> **NOTE:** If a Restrike Delay is configured for a relay channel, the channel Interlock feature is not available for that relay channel.

Interlock

The Interlock feature can be used to ensure that only one relay channel out of a set is active at any one time. Any number of relay channels on a single relay unit may be interlocked, and there may be multiple, independent "Interlock Sets" configured. A relay channel may only be part of a single Interlock Set.

When adding relay channels to an Interlock Set, each relay channel is assigned a priority. When multiple relay channels within an Interlock Set are requested to be On at the same time, only the relay channel with the highest priority out of those will be switched on.

Interlock Priority is applied after considering Logic, Turn On threshold, and Warn Before Off. When the input to the Interlock Priority changes (for example the a higher priority relay channel is requested to turn on, or the current highest priority relay channel is requested to turn off), the active relay channel is turned off and a configurable "Interlock Delay" is applied before the newly prioritized channel is turned on.

> **NOTE:**
>
> - The Restrike Delay feature is not available for relay channels which are part of an Interlock Set.
>
> - When making changes to the settings of Interlocked Channels, it is advisable to isolate any connected loads, as the state of the relay outputs may change as their settings are changed.

Warn Before off

As with the SpaceLogic C-Bus Digital Dimmers and the SpaceLogic C-Bus DALI-2 Gateway, each relay channel can be configured to perform a Warn Before Off function.

Unlike those other products, as the relay cannot change the brightness as a warning, instead, relay channels configured for Warn Before Off simply delay turning off by the configured Warn Before Off Delay.

If using this feature, it is recommended that it only be used in a common area where there be multiple channels of lighting controlled by the same Group Address, and that only a subset of the relay channels have Warn Before Off configured.

This way, the warning function is achieved by only the channels with Warn Before Off configured turning off.

Local Override

The channel indicator buttons on the front of the unit toggle the corresponding channel on and off, providing a local override capability. This can be disabled in software.

Each button illuminates when its respective channel is in the ON state.

The channel indicator buttons perform different functions depending on how they are pressed.

Operation	Function
Short-press (<0.5 second)	A single short press toggles the state of a channel.
Double Short-press	Two short presses in series return the channel to the C-Bus network level.
Long-press (1–2 second)	A long press on any local indicator button for one second or more returns all channels to the C-Bus network level.

A long-press on any channel indicator button for one second or more returns all channels to the C-Bus network level.

NOTE: Double short-press and long-press operations only apply when the unit/channel is in local override mode.

By default, any C-Bus commands received by the unit will override local toggle changes. In this case, only the channel associated with the received commands will revert to the C-Bus network state. This option can be disabled in software.

Remote Override

The extra two pairs of the C-Bus network cable provide high priority override functions for most C-Bus Output units.

- The Green & Green/White pair is used for the Remote ON function
- The Brown & Brown/White pair is used for the Remote OFF function

Connecting either pair to the C-Bus negative pair activates the corresponding function.

Each relay channel can be individually included or excluded from either or both of the Remote On and Remote Off functions. By default, all channels are included in both.

This setting can be changed using the SpaceLogic C-Bus Commission Software.

The SpaceLogic C-Bus Network Automation and Application Controllers provide facilities to control these overrides.

IMPORTANT: During the installation, it is important to make sure these pairs are not left unterminated, as this may cause the override functions to be triggered by accident.
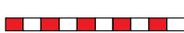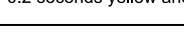
Indicators

Unit Indicator

Action	LED Indication	Status
Green LED is ON		• Unit powered • C-Bus power supply Enabled
Yellow LED is ON		• Unit powered • C-Bus power supply Disabled
LED OFF		No power to device
Red LED is ON		• Unit powered • Configuration Error
Slow Flash, Red/Green	0.5 seconds red and 0.5 seconds green	• Internal temperature has exceeded over-temperature threshold • C-Bus power supply enabled
Slow Flash Red, Yellow	0.5 seconds red and 0.5 seconds yellow	• Internal temperature has exceeded over-temperature threshold • C-Bus power supply disabled
Override Flash Red, Green	0.1 seconds red and 0.9 seconds green	• Internal temperature has exceeded over-temperature threshold • Override Active, C-Bus power supply enabled
Override Flash Red, Yellow	0.1 seconds red and 0.9 seconds yellow	• Internal temperature has exceeded over-temperature threshold • Override Active, C-Bus power supply disabled
Override Flash Off, Green	0.1 seconds off and 0.9 seconds green	• Override active • C-Bus power supply enabled
Override Flash Off, Yellow	0.1 seconds off and 0.9 seconds yellow	• Override active • C-Bus power supply disabled
Fast Flash, Green	0.2 seconds green and 0.2 seconds off	Secondary firmware update in progress

C-Bus Indicator

Action	LED Indication	Status
Solid(not flashing)		C-Bus Voltage OK
Steady Flash	Regardless of color	C-Bus Voltage marginal (15-20 V)
Short Flash		C-Bus Voltage critical (<15 V)
Red	🔴	No C-Bus clock detected, Host Online
Green	🟢	C-Bus clock detected, Host Online
Yellow	🟡	C-Bus clock detected, Host Offline
Off	⚪	No C-Bus voltage present or unit not powered

Channel Indicator

Action	LED Indication	Status
Short-Press on the channel	🟢	Channel On, Leading Edge mode
(< 05 second)	🟡	Channel On, Trailing Edge mode
Slow Flash, Red	0.5 seconds red and 0.5 seconds off	Channel shutdown due to incompatible load or mode error
Off	⚪	Channel off
On, Red	🔴	Channel Offline, Normally due to no mains supply to channel
Fast Flash, Red	0.2 seconds yellow and 0.2 seconds off	Channel shutdown due to over current
Fast Flash, Yellow	0.2 seconds yellow and 0.2 seconds off	Channel shutdown due to over temperature condition
Slow Flash, Yellow	0.5 seconds yellow and 0.5 seconds off	Channel operating at reduced setting due to over temperature condition

Configuring the Device

Configuration and Commissioning of the C-Bus unit is done by the C-Bus connection using the "SpaceLogic C-Bus Commission" software. To download the software click here

The unit must be powered for configuration, however power may be provided by the USB-C connection for programming via C-Bus (without an energized mains connection).

NOTE: Relay channels will not be functional when powered solely from the USB-C connection.

Firmware Update

The SpaceLogic C-Bus Commission software will notify if a firmware update is required.

The update requires a connection to the USB-C connector on the front end of the relay, and is performed using the SpaceLogic C-Bus Commission software.

All required firmware files will be included and authenticated as part of the latest SpaceLogic C-Bus Commission software release.

Measurement Application

The Measurement application is used for broadcasting values of physical parameters monitored by C-Bus devices.

The measured quantities can be displayed on devices with graphical user interfaces such eDLTs or Automation Controllers, and can be used as inputs to automation in SpaceLogic C-Bus Automation Controllers.

Measurement Application messages contain the following information :

- A Device ID to identify the unit which broadcast the message
- The channel number, which is used to differentiate between multiple measurements that the single device may produce
- The measured value
- The units of the measured value (example: Volts, Amperes, degrees)

The Voltage Free Relays provide measurements of the following values via the Measurement application which can be useful for monitoring the health of the unit, or for detecting abnormal conditions:

Channel number	Quantity	Units
0 - 15	Channel 1 -Channel 16 Lamp Running Time	Hours
252	Power Supply Load Current	Amperes
253	C-Bus Voltage	Volts
254	Unit Operating Temperature	°C

Measurements can be configured to broadcast periodically, by setting the Measurement Periodic Broadcast parameter. This can be set to an interval between 1 and 254 minutes.

> **NOTE:** If periodic broadcast is not required, a Trigger Group can be configured to request either individual channels (by using the Action Selector corresponding to the channel requested), or an Action Selector of 255 to request all channels to be updated. This can also be used in conjunction with a regular broadcast.

In addition, individual quantities may be excluded from the regular broadcast by de-selecting them in the 'Measurement Regular Broadcast' options parameter.

The Lamp Running Time measurements can be reset to zero by configuring a Trigger Group and sending a trigger event on that Trigger Group with the Action Selector set to the channel which is to be cleared, or an Action Selector of 255 to clear all channels simultaneously.

Error Reporting Application

The C-Bus Error Reporting application is used to notify and manage error of other status information detected by C-Bus devices.

C-Bus relay units can monitor various operational parameters, and can report error or warning conditions using the C-Bus Error Reporting application.

The reports consists of information on the source, severity and nature of the error or fault condition, and also allow independent tracking and acknowledgement of the most recent and most severe error conditions.

The error reports are monitored by a device such as a SpaceLogic C-Bus Automation Controller, which can:

- Display the status to the user
- Allow them to acknowledge reports
- Allow them to clear any latched errors

A SpaceLogic C-Bus Automation Controller can also make all of this available to a higher layer such as a BMS via BACnet.

There are 5 Error Reporting Modes, to control:

- Which error reports are generated
- When they are generated

The mode can either be fixed during commissioning time, or can be changed dynamically by assigning a control group on the Enable Control application. In addition to controlling the generation of error reports using the mode, a Trigger Group may be configured to request an update to ALL error channels at any time.

This can be useful to manage traffic in an installation, where a large number of Error Reporting devices or channels exist.

Mode	Error Level	Description
0	Off	In this mode, neither live reports nor regular reports are generated.
1	All Channels Most Recent Errors only	In this mode, live reporting is enabled, meaning a change in error state for any channel will be emitted when it occurs. In addition, if the Regular Reporting Interval parameter is configured, the current error state of all channels will be re-sent at the configured interval. Setting the Regular Reporting Interval to zero disables the regular reports, but live reporting remains active. This allows timely notification of error status changes but without the traffic overhead of additional regular reports.
2	All Channels Most Recent Errors and Most Severe Errors	This mode works the same as Mode 1, but also includes tracking of the Most Severe errors for each channel.
3	Minimum reporting Most Recent Errors only	This mode works the same as Mode 1, but excludes the individual channel reports. This can be useful to reduce the amount or traffic where there are a large number of channels or a large number of devices exist. The aggregate channel is included, which is a logical OR of all of the channel error bytes, which still allows channel errors to be monitored.
4	Minimum reporting Most Recent and Most Severe Errors	This mode works the same as Mode 2, but excludes the individual channel reports

The following channel error status information is available via the Error Reporting application:

Error Channel	Error Type	Error Data Format		
		Bit	**Name**	**Meaning**
0 - 15	Channel 1-16 Errors	0	Channel Offline	Channel is not responding to commands due to a configuration error
		1	Channel Overridden	The channel is not responding to C-Bus commands because the local override has been activated and C-Bus Priority is disabled
		2 - 7	Reserved	Unused
		NOTE: Error reports are only generated for channels which are in use (have a Group Address assigned).		
250	Power Supply	**Bit**	**Name**	**Meaning**
		0	Load Warning	The load current on the C-Bus Power Supply has exceeded the user-configurable warning threshold level
		1	Overload	The load current on the C-Bus Power Supply has exceeded the rated load current
		2	Current Limit Exceeded	The power supply is in current-limit mode, meaning the network communications are likely to be impaired
		3 - 7	Reserved	Unused
		The load warning and over-current errors are optional. If the warning threshold parameters are not configured, both these errors are disabled. Once the warning threshold parameters are configured, both errors are enabled. The Current Limit error is always enabled, however due to the nature of the fault, it may only ever appear when most severe errors are enabled, as the network communication may be impaired by this condition. **NOTE:** Power Supply Errors are only generated if the integrated C-Bus Power Supply is enabled.		
251	Aggregated Channel Errors	Same as channel error format This channel is the logical OR of the individual channel errors. When used in conjunction with Error Modes 3/4 and a Trigger event for requesting update, this can be useful to minimize Error Reporting traffic. To fetch detailed channel error information, configure the Error Reporting Request Trigger Group parameter, and send a Trigger event using Action Selector 255 to request all channels, or request individual channels by using the Action Selector corresponding to the Error Channel of interest.		
254	Unit Errors	**Bit**	**Name**	**Meaning**
		0	Config Invalid	The unit is not operating correctly because the configuration is not valid.
		1	Unit Over-Temperature	The unit's internal operating temperature has exceeded the configured temperature warning threshold.
		2	C-Bus Voltage Warning	The C-Bus Voltage has dropped below the user-configurable warning threshold.
		3	C-Bus Voltage Critical	The C-Bus Voltage has dropped below the user-configurable critical threshold.
		4 - 7	Reserved	Unused
		The thresholds for the Unit Over-Temperature, and C-Bus Voltage Warning and Critical are user configurable and should be set in accordance with the specific circumstances of the unit in question.		

Channel Errors

Channel Errors are error conditions relating to each individual channel. For the relay units, there are only two conditions that may be reported :

Channel Offline

This indicates that the channel is not operational due to a configuration error.

Channel Overridden

This indicates that the channel is in a state where it has been overridden by the Local Toggle, but C-Bus Priority has been disabled in its configuration, meaning it will not respond to C-Bus messages indefinitely, until the Local Override is cleared by user input on the unit itself.

Power Supply Errors

The Power Supply error channel reports on errors related to the inbuilt switchable C-Bus power supply. The load current and output voltage of the C-Bus power supply are monitored.

Once a C-Bus network is fully installed, the load on each power supply is very stable, however it will be different in different units depending on the distribution of power supplies, the number and distribution of units consuming power, and the cabling between them.

A change in the load on any given C-Bus power supply could be a result of additional units being added to the network, or a cable becoming disconnected, or a problem with power supply.

Load Warning and Overload

The load warning error is optional, and enabled by configuring values for the C-Bus Power Supply Warning Set Threshold and C-Bus Power Supply Warning Clear Threshold. These are settings in mA, corresponding to the load on the power supply.

Once these thresholds are configured, both the Load Warning and Overload error monitoring become active. If the load current exceeds the C-Bus Power Supply Warning Set Threshold value the Load Warning Error is raised, if the load also exceeds the rated current of 200 mA, then the Overload error is raised.

For the Overload error to be cleared, the load must drop below 195 mA. For the Load Warning error to be cleared, the load must drop below the C-Bus Power Supply Warning Clear Threshold.

Current Limit Exceeded

The Current Limit Exceeded error is always enabled, and is raised when the load has exceeded the rated current of 200 mA and the power supply output voltage has dropped more than 2 V below the normal level at full load.

This condition indicates a severe overload on the system, possibly due to a short on the C-Bus network, or a failed power supply. As network communication may not be possible under these conditions, this error message may not be observed until the network communication recovers, in which case it will only be reported if Error Mode 2 or 4 is activated.

Unit Errors

The unit error channel report errors relating to the unit itself. These conditions may indicate an issue with the performance of the unit itself or of the C-Bus network.

Config Invalid

This error means the unit is not operational as its stored configuration is incompatible with its firmware version. This can happen if the firmware has been updated with a new major release version, but the unit has not yet been reconfigured to suit using the SpaceLogic C-Bus Commission software.

Unit Over-Temperature Error

The unit has internal temperature monitoring. This is measuring the temperature at a location on the power-supply, and normally measures higher than the ambient temperature of the enclosure. If temperature exceeds the "Unit Over Temperature Set Threshold" (default set to 70 °C), the Unit Over Temperature error condition is set.

Once set, the temperature needs to drop below the "Unit Over Temperature Clear Threshold" to clear the error condition. The thresholds for the Unit Over Temperature error can be changed using the SpaceLogic C-Bus Commission software.

> **NOTE:** The Unit Over Temperature error condition does not change the operation of the unit and is provided for information only. It should be noted however that operating at excessive temperature reduces the life of the electronic components.

C-Bus Voltage Warning/Critical Errors

The unit can monitor the C-Bus Network Voltage and report error conditions based on the measurement.

Once a C-Bus network is fully installed, the network voltage is very stable, however it will be different at different points in the network depending on the distribution of power supplies, the number and distribution of units consuming power, and the cabling between them.

A change in the C-Bus network voltage could be a result of additional units being added to the network, or a cable becoming disconnected, or a problem with power supply.

As what is normal for each unit and installation may be different, each unit can have different thresholds configured to generate error messages if the C-Bus Voltage goes outside a desirable window of operation.

There are independent error thresholds and conditions for "Warning" and "Critical" levels. These operate independently, with the only constraint being that the threshold values for Warning must be higher than the threshold values for Critical.

> **NOTE:** These error conditions do not change the operation of the unit, they are for information only.

Technical Data

Parameter	16/8/4 Channel
Nominal Mains Voltage and Frequency	220-240 V a.c, 50 Hz 100-120 V a.c, 60 Hz
C-Bus Input Operating Voltage	20 - 36 V d.c
C-Bus Input Operating Current	20 mA
C-Bus Power Supply (if enabled)	200 mA at 27-35 V d.c
Operating Humidity	10-95% RH
Main Terminals	Accommodates 2 x 2.5 mm^2 or 1 x 4 mm^2 Screw driver used for the terminals is Phillips PH1.
C-Bus Connections	2 x RJ45 connectors
Relay Switching Parameters	
Inrush Current	Max. 800 A/200 µs Max. 165 A/20 ms
Mechanical Endurance	>3 × 10^6 operations
Minimum Load	12 V d.c/100 mA
Maximum rate of operation	6 operations per minute
Product Compliance	CE UKCA

Troubleshooting

Symptom	Possible Indication	Possible Causes	Solution
Channel does not respond to Local Override buttons	-	1. Local Override feature has been disabled by the System Integrator 2. Channel is interlocked with other higher priority channel(s) which is currently On 3. Restrike delay active on channel	1. Re-enable feature using SpaceLogic C-Bus Commission software 2. Turn off higher priority channel(s) 3. Wait for restrike delay to finish
Channel indicator responds to Local Override buttons but outputs do not switch	-	Relay contact damaged due to excessive load	Review load compatibility and ratings section and reduce load in accordance with ratings, or use relay to switch a contactor with a suitable rating.
Unit does not respond to C-Bus commands	**C-Bus indicator**: Solid Red	No C-Bus clock detected	Enable C-Bus system clock generator
	Unit indicator: Solid Red	Stored configuration is not compatible with firmware version Can occur after a major firmware version update	Redeploy the configuration of the unit using the latest version of SpaceLogic C-Bus Commission software
	Unit indicator: Blinking **Channel indicators**: All Off	1. Remote Off override is activated intentionally 2. Remote Off override is activated due to a wiring fault in the C-Bus cable	1. Deactivate Remote Off override 2. Check C-Bus network wiring for shorts from Remote Off pairs (Brown and Brown/White) to the C-Bus Negative pairs (Orange/White and Blue/White)
	Unit indicator: Blinking **Channel indicators**: All On	1. Remote On override is activated intentionally 2. Remote On override is activated due to a wiring fault in the C-Bus cable	1. Deactivate Remote On override 2. Check C-Bus network wiring for shorts from Remote On pairs (Green and Green/White) to the C-Bus Negative pairs (Orange/White and Blue/White)
Cannot scan the unit on the C-Bus network	-	Unit is in bootloader state	Cycle the power on the unit to exit bootloader
	Unit indicator: Off	No mains power supply	Check there is mains power to the unit
	C-Bus indicator: Off	C-Bus cable not connected	Check that the C-Bus cable is terminated correctly and connected properly
	C-Bus indicator: Solid Red	No C-Bus clock detected	Enable C-Bus system clock generator
Channel does not respond to C-Bus Commands	**Channel indicator**: Solid Red	Channel Offline due to invalid configuration	Redeploy the configuration of the unit using the latest version of SpaceLogic C-Bus Commission software
Unexpected Indicator Flashing	**Unit indicator**: Slow Flash, Red/Yellow	Internal temperature has exceeded over-temperature threshold (power supply currently disabled)	Improve enclosure ventilation to reduce ambient temperature
	Unit indicator: Slow Flash, Red/Green	Internal temperature has exceeded over-temperature threshold (power supply currently enabled)	Improve enclosure ventilation to reduce ambient temperature Consider disabling the C-Bus Power Supply in this unit and enabling it in a unit where the ambient temperature may be lower (for example a unit lower in the switchboard).
Cannot change the C-Bus Power supply state from the front panel	-	Front panel power supply toggle feature has been disabled by the System Integrator	Re-enable feature using SpaceLogic C-Bus Commission software
Cannot enable the C-Bus system clock from the front panel	-	Front panel system clock toggle feature has disabled by the System Integrator	Re-enable feature using SpaceLogic C-Bus Commission software
No C-Bus Power	**Unit indicator**: Off	No mains power supply	Check mains voltage
	-	C-Bus cable not connected	Check C-Bus cable
	-	Jumper link not fitted for 110 V	Check the jumper is fitted if using a 110 V supply
Low C-Bus Voltage	**C-Bus indicator**: Steady Flash	Overload on the network	Enable C-Bus Power supply in additional units or split network if 2000 mA limit has been reached

Symptom	Possible Indication	Possible Causes	Solution
	C-Bus indicator: Short Flash	1. Low mains voltage 2. Voltage drop over long distance of cable run	1. Advise to check mains voltage 2. Enable C-Bus Power supply in this unit
The lights connected to the output are flickering	-	If only occurring at specific, regular times, usually in the evening, there may be ripple signaling on the grid	Choose a different type of lamp which is less affected by ripple, install a ripple filter.
Unit does not work after firmware update	-	Interruption during firmware update	• Check the condition of the USB communication cable used between the laptop and the device and ensure good quality cable is used for firmware update • Try a shorter cable • Ensure update process is not interrupted, and wait for software to confirm process is complete before removing the cable • Check the USB cable connection and ensure it is fully inserted in the USB-C connector • If instructed by the software perform an extra-short press the "HR" reset button for recovery purposes

Compliance information for Green Premium products

Find and download comprehensive information about Green Premium products, including RoHS compliance and REACH declarations as well as Product Environmental Profile (PEP) and End-of-Life instructions (EOLI).

https://checkaproduct.se.com/

General information about Green Premium products

Click the link below to read about Schneider Electric's Green Premium product strategy.

https://www.schneider-electric.com/en/work/support/green-premium/

As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.

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