Modbus 2CH NL Relay & 2CH NL Relay+ iSENSE Datasheet

1 Introduction

Modbus 2CH Non-Latching (NL) Relay and Modbus 2CH Non-Latching (NL) Relay + iSENSE incorporate 2 relay controllers that have high load current handling capacity of 16A. These relays can switch both AC and DC loads. The Modbus 2CH NL Relay + iSENSE version has 2 additional current sensors which can each monitor up to 20A of current. The non-latching feature of these relays are ideal in applications where relays have to switch back to their initial state for electrical safety.

The Modbus 2CH NL Relay controllers are ideal for usage in forward and reverse motor control applications, switching on and off high-power loads and additionally perform load sensing simultaneously (iSENSE option).

1.1 Features

- 2 Channel single coil non-latching SPDT Relay
- Supports up to 16A load per relay channel
- Current sense monitoring up to ±20A (iSENSE option)
- Supports both AC (250V) and DC (300V) load switching
- Implements Modbus RTU protocol
- Low power consumption
- Operating temperature range: 0°C to +55°C
- Flush mount and DIN Rail mounting options

Visit https://brtsys.com/resources/ for more information.

2 Part Numbers/Ordering Information

Part Number	Description
MC-0113-01A	Modbus 2CH Non-Latching Relay
MC-0103-01A	Modbus 2CH Non-Latching Relay + iSENSE
MA-0102-01A	Modbus RS485-RJ11 Cable (30cm)
LA-1201-01A	LDSBus DIN Rail Mount Set

Table 1 - Part Numbers/Ordering Information

Table of Contents

3 Specifications

Features	Interface	RS485 Modbus RTU
	System Status Indicator	1x RGB LED
	Relay Status Indicator	2x Red LEDs
	Power/Sensing Indicator*	1x Green LED
	Mounting	Flush Mount
		DIN Rail Mount
Power	Modbus Voltage	9-24V DC Bus Power
	Device Input Voltage	5V DC
	Power (Relay+ iSENSE*)	Typ:834.3mW Max:972.8mW
	Power (Relay)	Typ:650.24mW Max:793.6mW
Relay	Number of Relay Channel	2
	Relay Type	SPDT, Dual Coil Non-Latching
	Contact arrangement	1 Form C SPDT-CO
	Rated voltage	≤ 250VAC
	Max. switching voltage	400VAC
	Rated current	16A
	Limiting continuous current	16A, UL**:20A
	Mechanical endurance	>30x10^6 operations
	Max. DC load breaking capacity	Refer to Figure 1
	Electrical endurance	Refer to Figure 1
Current Sense*	Number of Current Channel	2
	Type of current for monitoring	AC/DC
	Primary current (Ipm)	-20A ~ 20A
	Measurable line frequency	50Hz/60Hz
	Resolution	0.2A
	Accuracy	Typ ±5% For 0A ~ ±2A, Accuracy typ ±0.2A
	Current Output Quiescent (No current flowing through IP)	-120mA ~ 120mA
	Thermal Offset Drift	Max: ±120mA; Referred to TA=25°C, IP = 0A
Physical Characteristics	Colour	White
	Housing	Polycarbonate
	Dimension	L138.2mm x W76.0mm x H31.9mm
Environmental Limits	Operating Temperature	0 to 55°C
	Storage Temperature	-20 to 85°C
	Ambient Relative Humidity	5 to 95% (non-condensing)
Package Contents	Device	1x Modbus 2CH NL Relay / 1x Modbus 2CH NL Relay + iSENSE
	Wire Assembly	1X Modbus RS485-RJ11 Cable(30cm)
Optional	Mounting Accessories	1x LDSBus DIN Rail Mount set

Table 2 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE Specifications

*Only for Modbus 2CH NL Relay + iSENSE
**UL standards are safety benchmarks developed by Underwriters Laboratories (UL), a global safety science company, to ensure products, systems, and services are safe for consumers and the environment.

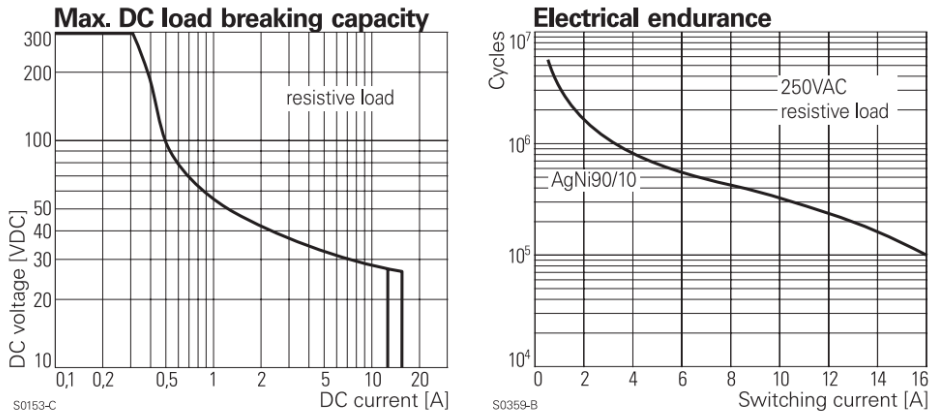


Figure 1 - Max. DC Load Breaking Capacity and Electrical Endurance

4 FCC Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) These devices may not cause harmful interference, and

(2) These devices must accept any interference received, including interference that may cause undesired operation.

NOTE: The equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF exposure guidelines, at least 20cm of separation distance between the device and the user's body must be always maintained.

FCC Radiation Exposure Statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and consider removing the no-collocation statement.

Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

5 Hardware Features

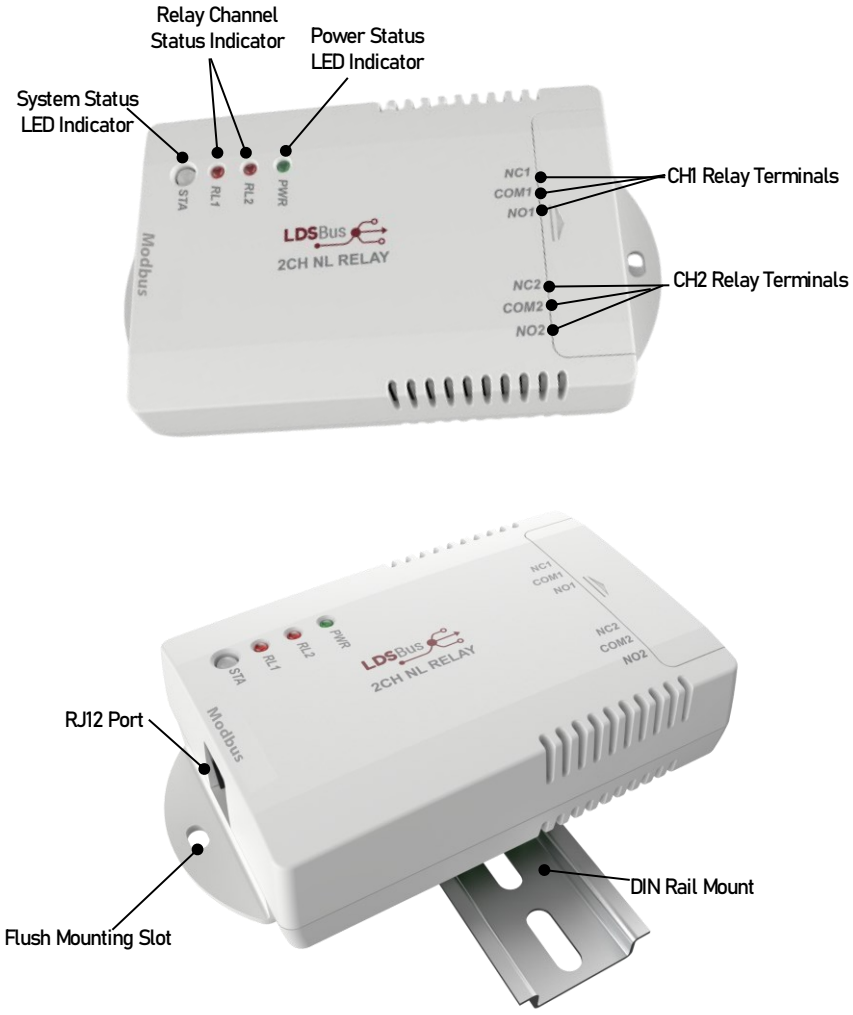
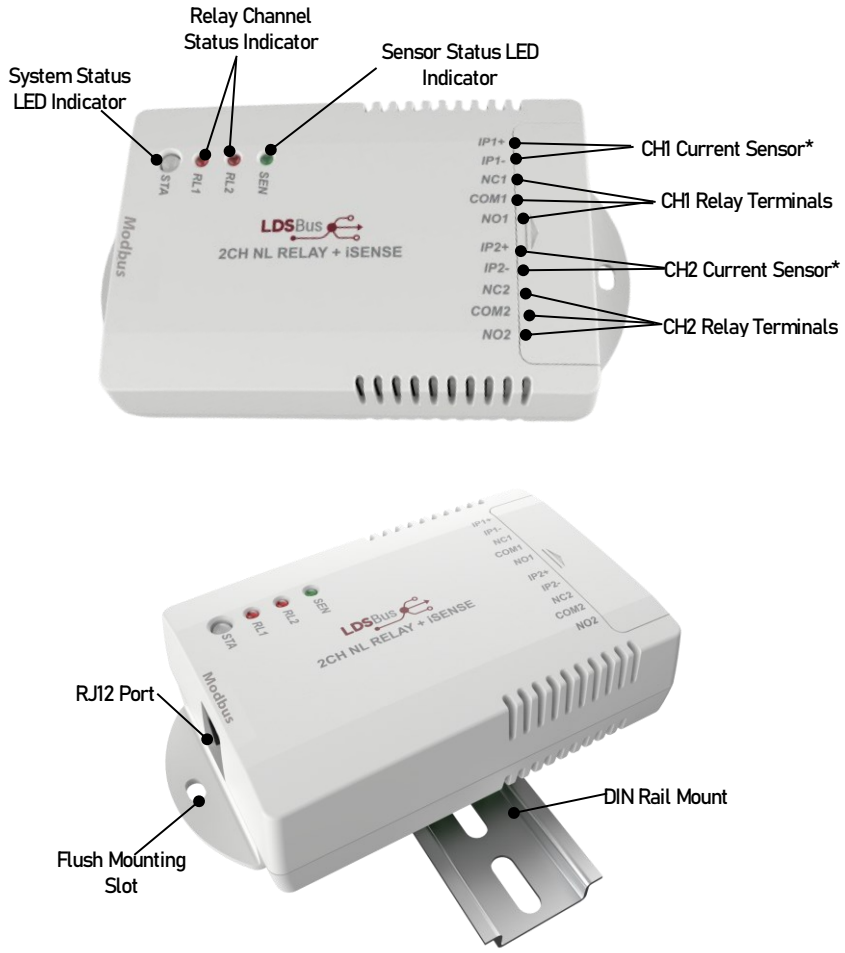


Figure 2 - Modbus 2CH NL Relay Hardware Features



*Applicable only for Modbus 2CH NL Relay + iSENSE Model

Figure 3 - Modbus 2CH NL Relay + iSENSE Hardware Features

Function	Labels	Description	Modbus 2CH NL Relay	Modbus 2CH NL Relay + iSENSE
CH1 Relay Terminals	COM1	Channel 1 Relay Common Terminal	Yes	Yes
	NC1	Channel 1 Relay Normally Closed Terminal	Yes	Yes
	NO1	Channel 1 Relay Normally Open Terminal	Yes	Yes
CH2 Relay Terminals	COM2	Channel 2 Relay Common Terminal	Yes	Yes
	NC2	Channel 2 Relay Normally Closed Terminal	Yes	Yes
	NO2	Channel 2 Relay Normally Open Terminal	Yes	Yes
CH1 Current Sensor	IP1+	Channel 1 Current Sensor Positive Terminal*	No	Yes
	IP1-	Channel 1 Current Sensor Negative Terminal*	No	Yes
CH2 Current Sensor	IP2+	Channel 2 Current Sensor Positive Terminal*	No	Yes
	IP2-	Channel 2 Current Sensor Negative Terminal*	No	Yes
Sensor Status LED Indicator	SEN	Power and iSENSE Status LED	No	Yes
Power Status LED Indicator	PWR	Power status LED	Yes	No
Relay Channel Status Indicator	RL1	Relay 1 status LED	Yes	Yes
	RL2	Relay 2 status LED	Yes	Yes
System Status LED Indicator	STA	Modbus status LED	Yes	Yes
RJ12 Port	Modbus	Modbus data and power interface port. The physical port is RJ12. The connection interface can be RJ11/RJ12.	Yes	Yes

Table 3 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE Hardware Features

6 NL Relay Configuration and Installation

Please visit https://brtsys.com/resources/software/utility-tools to access the Modbus Configuration Utility guide on how to configure the device name, device address and termination settings before using it for your specific application.

6.1 Connection Diagram for Standard Modbus Power Supply

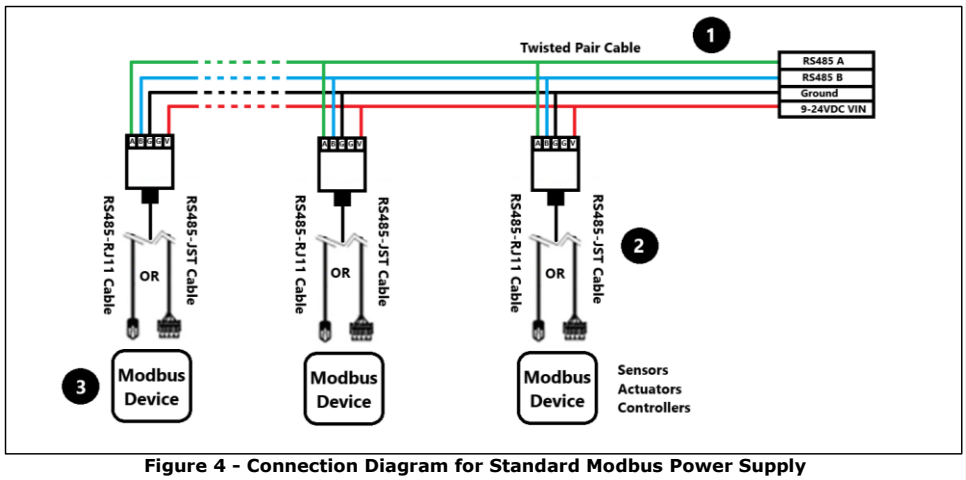


Figure 4 - Connection Diagram for Standard Modbus Power Supply

Setup Instructions:

1. Use a Cat5e/Cat6e RJ45 Twisted Pair Cable to connect the Modbus controller (Host) to the network for RS485 communication and power.

2. Connect each Modbus device to the network using either an RS485-JST cable or an RS485-RJ11 cable, as provided with the device.

3. BRTSys Modbus devices have built-in bus termination resistors. These resistors can be enabled or disabled by using the BRTSys Modbus Configuration Utility. When installing the device as the last device on the bus, these terminations may be used to terminate the bus.

6.2 RS485-RJ11 Cable(30cm)

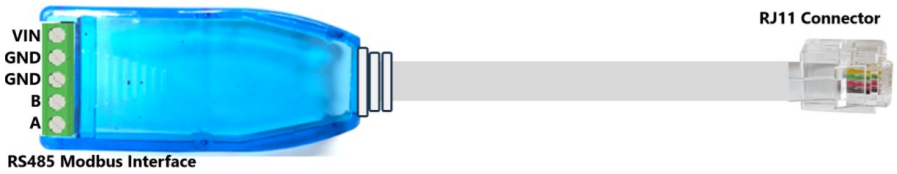


Figure 5 - RS485-RJ11 Cable(30cm)

PIN Legend	Function
VIN	Modbus Input Voltage 9-24VDC
GND	Ground
GND	Ground
B	RS485-B
A	RS485-A

Table 4 - RS485-RJ11 Cable(30cm) Pin Configuration

7 Mounting Options

7.1 Flush Mount

The device can be flush mounted directly on a wall or any flat surface using 2 x M3.5*16mm (thread) screws.

Figure 6 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE Flush Mount

7.2 DIN Rail Mount

The device can be mounted on a DIN Rail using the DIN Rail Mount set. This set is optional and includes the bracket and mounting screws.

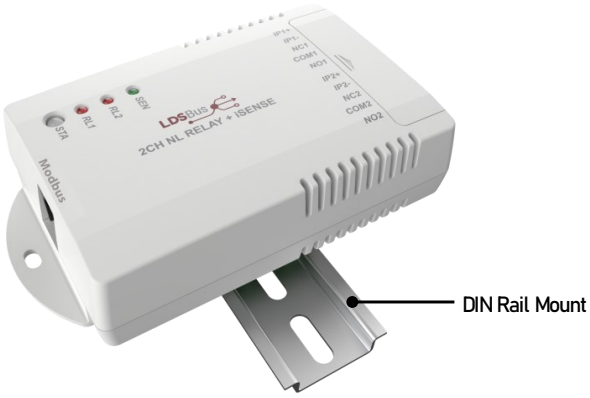


Figure 7 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE DIN Rail Mount

8 Terminal Wiring Instruction NL Relay Channel/ iSENSE Channel

Connections are made with Push-in CAGE CLAMP technology. If using solid conductor wire / clamp with insulation ferrule, the stripped conductor is easily inserted into the clamp until it hits the backstop without the need for a screwdriver. To remove cable from connector, only use flat head screwdriver to press the push buttons and pull out the wire as shown in Figure 8.

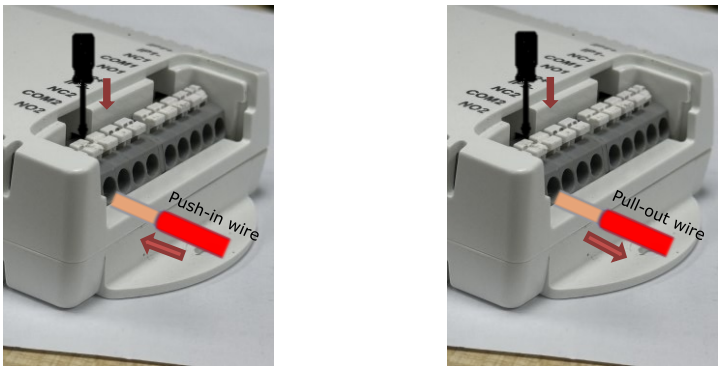


Figure 8 - Push-in wire & Pull-out wire

Table 5 provides a list of American Wire Gauges (AWGs) that can be used in Terminal Blocks.

Conductor Type	Wire dimeter/AWG
Solid conductor	0.25~2.5mm²/20~12 AWG
Stranded conductor	0.25~2.5mm²/20~12 AWG
Stranded conductor; with insulated ferrule	0.25~1.5mm²

Table 5 - AWG to use in Terminal Block

As shown in Figure 9, the wire strip is 8mm to 12mm long.

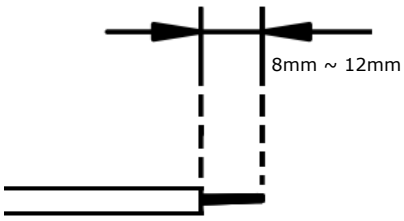


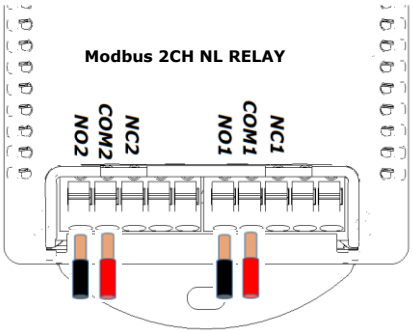
Figure 9 - Wire Strip Length

8.1 Non-Latching Relay (RL1-RL2) Setup

The Non-Latching Relay (RL1-RL2) support AC and DC loads and can manage 250V/16A rating AC load per relay. The following are the two connection options:

Devices Normally Open (NO)

Commented [BM1]: I have updated to Normally Open (NO).



Use AWG 20~12; A RED wire indicates that it comes from an AC/DC Source

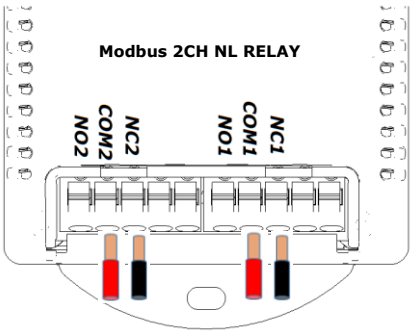
→ Connect to the COM PIN

Use AWG 20~12; The BLACK wire indicates that it comes from an electrical device

→ Connect to NO PIN

Devices Normally Closed (NC)

Commented [BM2]: I have updated to Normally Closed (NC).



Use AWG 20~12; A RED wire indicates that it comes from an AC/DC Source

→ Connect to the COM PIN

Use AWG 20~12; The BLACK wire indicates that it comes from an electrical device

→ Connect to NC PIN

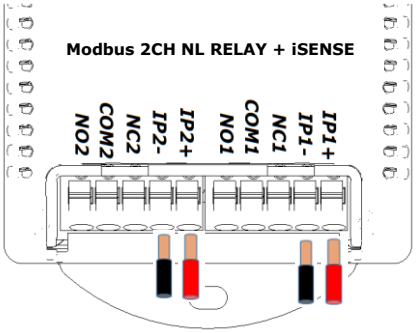
WARNING: When wiring, always TURN OFF the Power Supply.

8.2 iSENSE (SEN1~SEN2) Setup

iSENSE supports bi-directional current sense monitoring up to -20A~+20A per channel. The following are the three connections options:

Note: Each channel is independent and so Channel 1 and Channel 2 can use a different configuration.

Standalone Sensing Monitoring



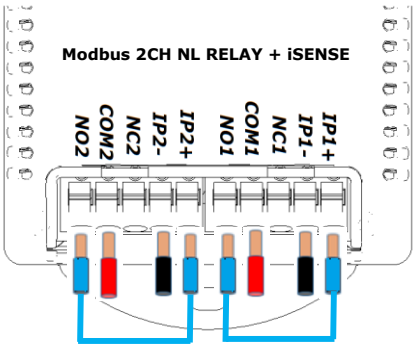
Use AWG 20~12; A RED wire indicates that it comes from an AC/DC Source

→ Connect to the IP+ PIN

Use AWG 20~12; The BLACK wire indicates that it comes from an electrical device

→ Connect to IP- PIN

Sensing Monitoring with RELAY Devices Normally Open (NO)



Use AWG 20~12; A RED wire indicates that it comes from an AC/DC Source

→ Connect to the COM PIN

Use AWG 20~12; The BLACK wire indicates that it comes from an electrical device

→ Connect to IP- PIN

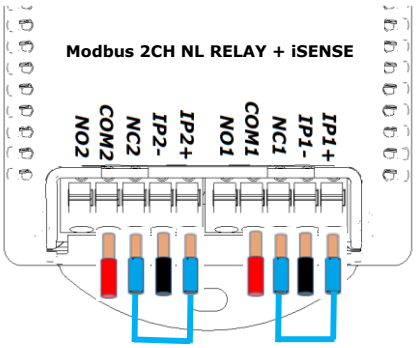
Use AWG 20~12; BLUE

Connect to NO PIN

→ Connect to IP+ PIN

Sensing Monitoring with RELAY Devices Normally Closed (NC)

Commented [BM3]: I have updated to Normally Closed (NC)



Use AWG 20~12; A RED wire indicates that it comes from an AC/DC Source

→ Connect to the COM PIN

Use AWG 20~12; The BLACK wire indicates that it comes from an electrical device

→ Connect to IP- PIN

Use AWG 20~12; BLUE

Connect to NC PIN

→ Connect to IP+ PIN

For more information on the connection/wiring diagrams, refer to Relay Controller Application Note.

9 Modbus Registers

9.1 2CH NL Relay Modbus Registers

Parameter	Starting Address	Quantity of Registers	Supported Function Code	Parameter Range and Description	Default
Address(1)	0000H	1	0x03/0x10	1 to 126	126
****RS485 Termination(1)**	0001H	1	0x03/0x10	0 - Termination OFF 1 - Termination ON	Termination OFF
Baud Rate(1)	0002H	1	0x03/0x10	0 - 1200 bps 1 - 2400 bps 2 - 4800 bps 3 - 9600 bps 4 - 19200 bps 5 - 38400 bps 6 - 115200 bps	9600 bps
Parity(1)	0003H	1	0x03/0x10	0 – None 1 - Odd 2 - Even	Even
Status LED Enable(1)	0004H	1	0x03/0x10	0 - LED OFF 1 – LED ON	LED ON
Reserved	0005H	1	N/A	N/A	N/A
Relay CH1 Control	0006H	1	0x03/0x10	Relay 1 control 0 - Deactivate 1 - Activate	0x00FF
Relay CH1 Mode	0007H	1	0x03/0x10	Relay 1 mode 0 – Level Mode 1 – Pulse Mode	0x0000 (Level Mode)
Relay CH1 Start/Stop Polarity	0008H	1	0x03/0x10	Start/stop polarity for relay 1 0 – Negative Polarity 1 – Positive Polarity	0x0001 (Positive Polarity)
Relay CH1 Deactivation Mode	0009H	1	0x03/0x10	Deactivation mode for relay 1 0 - Deactivation None 1 - Immediate 2 - Immediate After T1(2)	0x0000 (Deactivation None)
Relay CH1 T1 Timing	000AH	1	0x03/0x10	Relay 1 T1(2) Timing in seconds	0x0000 (0 Second)
Relay CH1 T2 Timing	000BH	1	0x03/0x10	Relay 1 T2(3) Timing in seconds	0x0000 (0 Second)
Relay CH1 Number of Cycles	000CH	1	0x03/0x10	Number of cycles for relay 1 (write 1 always)	1
Relay CH2 Control	000DH	1	0x03/0x10	Relay 2 control 0 - Deactivate 1 - Activate	0x00FF
Relay CH2 Mode	000EH	1	0x03/0x10	Relay 2 mode 0 – Level Mode 1 – Pulse Mode	0x0000 (Level Mode)
Relay CH2 Start/Stop Polarity	000FH	1	0x03/0x10	Start/stop polarity for relay 2 0 – Negative Polarity 1 – Positive Polarity	0x0001 (Positive Polarity)
Relay CH2 Deactivation Mode	0010H	1	0x03/0x10	Deactivation mode for relay 2 0 - Deactivation None 1 - Immediate 2 - Immediate After T1*	0x0000 (Deactivation None)
Relay CH2 T1 Timing	0011H	1	0x03/0x10	Relay 2 T2(2) Timing in seconds	0x0000 (0 Second)

Relay CH2 T2 Timing	0012H	1	0x03/0x10	Relay 2 T2[3] Timing in seconds	0x0000 (0 Second)
Relay CH2 Number of Cycles	0013H	1	0x03/0x10	Number of cycles for relay 2 (write 1 always)	1
Device UUID	0026H	8	0x03	MCxxxxxxxxxxxxyy where x is ASCII character and yy is 16-bit running number	N/A
Device Firmware Version	002EH	1	0x03	0xXXMN XX – Not concerned M – Major N - Minor	N/A
Device Part Number	002FH	1	0x03	Device ID	0xC003
Reserved	0030H	N/A	N/A	Reserved	N/A
Relay CH1/CH2 Status	0031H	1	0x03	Relay 1 and relay 2 statuses; if the status is 0xFFFF the relay is non functional	N/A
Reset	0150H	1	0x06	Write 1 to reset	N/A
Reserved	0152H	N/A	N/A	Reserved	N/A
Identify	0154H	1	0x06	Write 1 to start blinking the device @1Hz for 10 seconds	N/A

Table 6 - 2CH NL Relay Modbus Registers

[1] This indicates that any updates to these communication/status register(s) will only take effect after the device has been rebooted.
[2] T1 – Enabled duration of the control signal in pulse mode
[3] T2 – Disabled duration of the control signal in pulse mode

9.2 2CH NL Relay + iSENSE Modbus Registers

Parameter	Starting Address	Quantity of Registers	Supported Function Code	Parameter Range and Description	Default
Address[1]	0000H	1	0x03/0x10	1 to 126	126
RS485 Termination[1]	0001H	1	0x03/0x10	0 - Termination OFF 1 - Termination ON	Termination OFF
Baud Rate[1]	0002H	1	0x03/0x10	0 - 1200 bps 1 - 2400 bps 2 - 4800 bps 3 - 9600 bps 4 - 19200 bps 5 - 38400 bps 6 - 115200 bps	9600 bps
Parity[1]	0003H	1	0x03/0x10	0 - None 1 - Odd 2 - Even	Even
Status LED Enable[1]	0004H	1	0x03/0x10	0 - LED OFF 1 – LED ON	LED ON
Reserved	0005H	1	N/A	N/A	N/A
Relay CH1 Control	0006H	1	0x03/0x10	Relay 1 control 0 - Deactivate 1 - Activate	0x00FF
Relay CH1 Mode	0007H	1	0x03/0x10	Relay 1 mode 0 – Level Mode 1 – Pulse Mode	0x0000 (Level Mode)
Relay CH1 Start/Stop Polarity	0008H	1	0x03/0x10	Start/stop polarity for relay 1 0 – Negative Polarity 1 – Positive Polarity	0x0001 (Positive Polarity)
Relay CH1	0009H	1	0x03/0x10	Deactivation mode for relay 1	0x0000 (Deactivation None)

Deactivation Mode				0 - Deactivation None 1 - Immediate 2 - Immediate After T1[2]	
Relay CH1 T1 Timing	000AH	1	0x03/0x10	Relay 1 timing T1[2]	0x0000 (0 Second)
Relay CH1 T2 Timing	000BH	1	0x03/0x10	Relay 1 timing T2[3]	0x0000 (0 Second)
Relay CH1 Number of Cycles	000CH	1	0x03/0x10	Number of cycles for relay 1 (write 1 always)	1
Relay CH2 Control	000DH	1	0x03/0x10	Relay 2 control 0 - Deactivate 1 - Activate	0x00FF
Relay CH2 Mode	000EH	1	0x03/0x10	Relay 2 control 0 - Deactivate 1 - Activate	0x0000 (Level Mode)
Relay CH2 Start/Stop Polarity	000FH	1	0x03/0x10	Start/stop polarity for relay 2 0 – Negative Polarity 1 – Positive Polarity	0x0001 (Positive Polarity)
Relay CH2 Deactivation Mode	0010H	1	0x03/0x10	Deactivation mode for relay 2 0 - Deactivation None 1 - Immediate 2 - Immediate After T1[2]	0x0000 (Deactivation None)
Relay CH2 T1 Timing	0011H	1	0x03/0x10	Relay 2 timing T1[2]	0x0000 (0 Second)
Relay CH2 T2 Timing	0012H	1	0x03/0x10	Relay 2 timing T2[3]	0x0000 (0 Second)
Relay CH2 Number of Cycles	0013H	1	0x03/0x10	Number of cycles for relay 2 (write 1 always)	1
Device UUID	0026H	8	0x03	MCxxxxxxxxxxxxyy where x is ASCII character and yy is 16-bit running number	N/A
Device Firmware Version	002EH	1	0x03	0xXXMN XX – Not concerned M – Major N - Minor	N/A
Device Part Number	002FH	1	0x03	Device ID	0xC003
Reserved	0030H	N/A	N/A	Reserved	N/A
Relay CH1/CH2 Status	0031H	1	0x03	Relay channel 1 and 2 statuses	N/A
Relay CH1 iSENSE	0032H	1	0x03	Relay 1 current (mA)	N/A
Relay CH2 iSENSE	0033H	1	0x03	Relay 2 current (mA)	N/A
Reset	0150H	1	0x06	Write 1 to reset	N/A
Reserved	0152H	N/A	N/A	Reserved	N/A
Identify	0154H	1	0x06	Write 1 to start blinking the device @1Hz for 10 seconds	N/A

Table 7 - 2CH NL Relay + iSENSE Modbus Registers

[1] This indicates that any updates to these communication/status register(s) will only take effect after the device has been rebooted.
[2] T1 – Enabled duration of the control signal in pulse mode
[3] T2 – Disabled duration of the control signal in pulse mode

10 Mechanical Dimensions

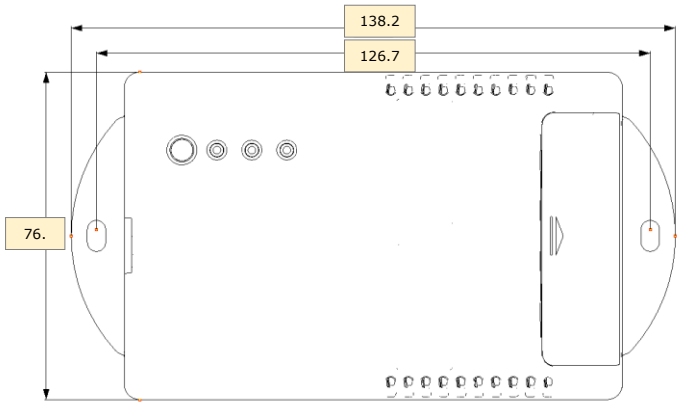


Figure 10 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE Dimension – Top View

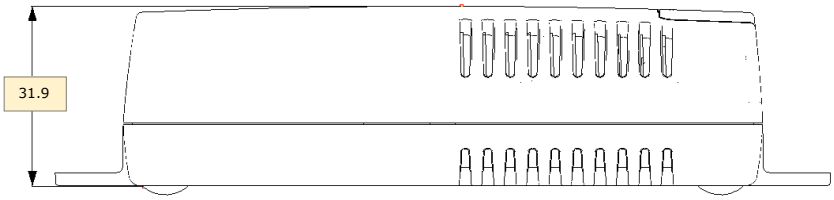


Figure 11 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE Dimension – Side View

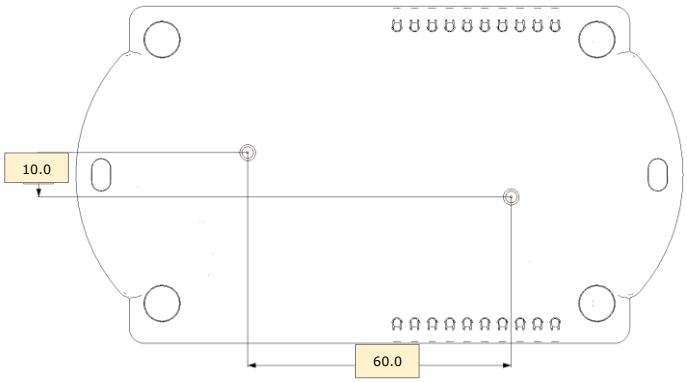


Figure 12 - Modbus 2CH NL Relay & 2CH NL Relay + iSENSE Dimension – Bottom View

Note: All dimensions are in millimetres.

11 System Status LED Indicators

Device Status	LED Color		Flashing Frequency	Description
Termination ON	BLUE		Steady – Non-flashing	
Termination OFF	GREEN		Steady – Non-flashing	
Device Configuration Error	RED		Steady – Non-flashing	Device configuration error
Communication	RED/GREEN/ BLUE/YELLOW	-	Blink twice (Short blink)	Device in communication
Firmware update	YELLOW		Steady – Non-flashing	Device firmware update.

Table 8 - System Status LED Indicators

Note:

1. For reliable communication, ensure that the power supply and the RS485 termination settings are correct.
2. Ensure that the Modbus address and baud rate are configured correctly before deployment.

12 NL Relay Channel Status LED Indicators

There are 2 channel status LEDs. RL1 indicates the status of NL relay channel 1 and RL2 indicates the status of NL relay channel 2.

Device Status	LED Color		Description
RL1	OFF		COM-NC
	Red		COM-NO
RL2	OFF		COM-NC
	Red		COM-NO
PWR	Green		2CH NL Relay Power is ON
SEN*	Green		2CH NL Current Sensing is ON

Table 9 - NL Relay Channel Status LED Indicators

*Applicable only for Modbus 2CH NL Relay + iSENSE Model

Commented [BM4]: Table is updated according to 2CH Relay

13 Contact Information

Refer to https://brtsys.com/contact-us/ for contact information.

Appendix A - References

Document References

Modbus Configuration Utility User Guide

Relay Controller Application Note

Acronyms and Abbreviations

Terms	Description
AC	Alternating Current
AWG	American Wire Gauges
DC	Direct Current
IoT	Internet of Things
LED	Light Emitting Diode

Appendix B - List of Figures and Tables

List of Figures

List of Tables

Appendix C – Revision History

Document Title: Modbus 2CH Non-Latching Relay + iSENSE Datasheet
Document Reference No.: BRTSYS_000183
Clearance No.: BRTSYS#104
Product Page: https://brtsys.com/product-category/actuators/
Document Feedback: Send Feedback

Revision	Changes	Date
Version 1.0	Initial Release	18-06-2025
Version 1.1	Added a note (under Modbus Registers table) to highlight that that any updates to some of the communication/status register(s) will only take effect after the device has been rebooted.	09-07-2025
Version 1.2	Updated the following section Section 3 – Specifications – Resolution - Updated the Resolution from 51.6mA to 0.2A Limiting continuous current - UL: 20A Added the description for UL** **UL standards are safety benchmarks developed by Underwriters Laboratories (UL), a global safety science company, to ensure products, systems, and services are safe for consumers and the environment.	25-07-2025