RTU-DO8 – 8 Channel Digital Out
Modbus RTU Module

Documentation Issue 1.2

Features

- 8 Channel N.O. Relays rated for 250V AC or 30V DC with max 5A resistive rating
- Capable of driving external high power 24V relays
- Software Modbus registers for
    - Channel ON/OFF
    - Baud rate configuration setting
- Modbus Address selection via external “Push-On” jumper link setting
- Factory Reset Via “Push-On” link setting
- Integrated Watchdog and Power “Brown-Out” detect and correct

Safety and ESD Precautions

Before first use, refer to this manual.

Before first use, make sure that all cables are connected properly

Please ensure proper working conditions, according to the device specifications
e.g. Supply voltage, ambient temperature, maximum power consumption requirements.

Ensure all wiring and connector terminals are securely fastened so as to avoid short circuits or other such damage.

Before making any modifications to wiring connections or PCB settings, turn off the power supply.

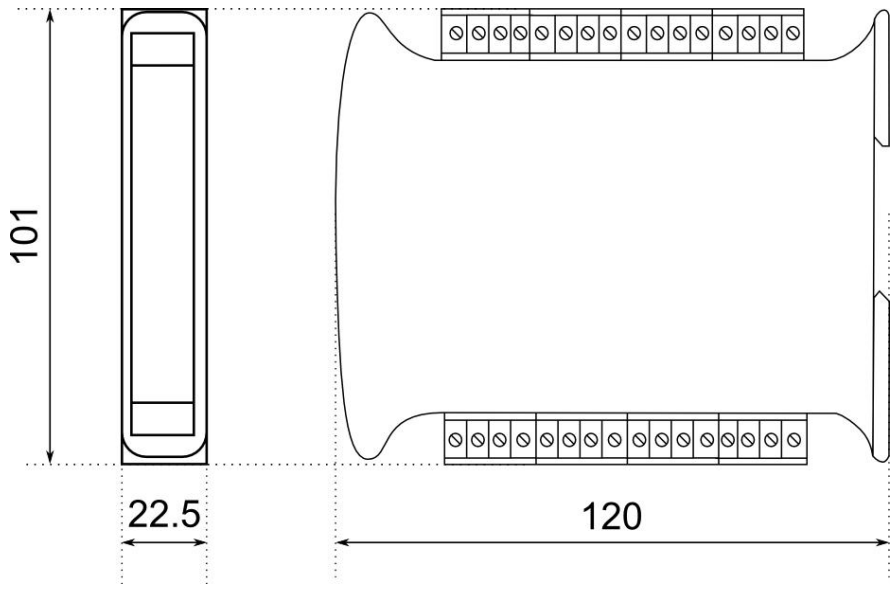
Caution - Component damage. Circuit boards contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the work environment can destroy the components located on these devices.

Do not touch the components without antistatic precautions, especially along the connector edges.

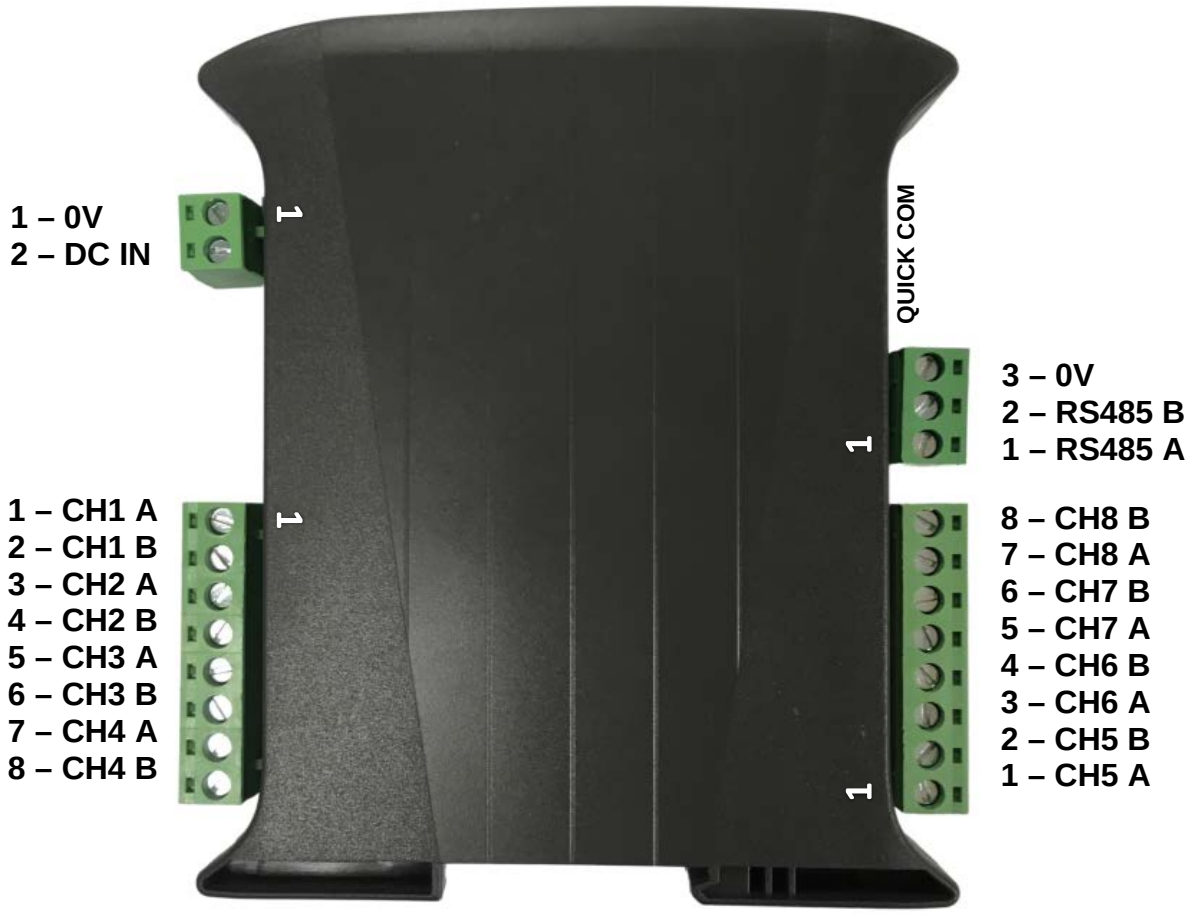
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Specifications

Power Supply	Voltage	6-28 VDC
	Maximum Current	170mA @12V Max
Digital Outputs	No of Outputs	8
	Relay Voltage Rating	30VDC / 250VAC
	Max Current (per channel)	5A (resistive)
	Output Type	Relay Normally Open Contact
Environmental Conditions	Operating Temperature	-20°C to +70°C
	Storage Temperature	-40°C to +85°C
	Humidity	0 .. 90 % (non-condensing)
Isolation	Isolation	Non-Isolated
Dimensions	Height/ Length	120x101 mm
Communication	Protocol	Modbus RTU
	Baud	9600-57600 (19200 Factory Default)
	Address	1-31
EMC	Rating	Class A (Industrial)
	Immunity	EN 61000-6-2
	Emissions	EN 61000-6-4
IP	IP Rating	IP20



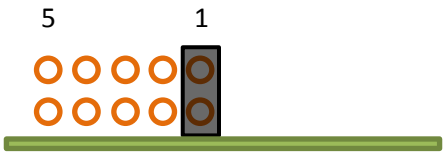
RTU Module Pin Out



Note that the system will fail safe to relay off state in the event of a power cycle or reset

Status LEDs & Modbus ID

Modbus Address ID Link Setting



Link No	Address Setting
1	Modbus Address +1
2	Modbus Address +2
3	Modbus Address +4
4	Modbus Address +8
5	Modbus Address +16
No Links	Use factory defaults*

Status LEDs

	Top	Bottom
Green	Power On	Modbus Rx
Red	-	Modbus Tx

* Factory Default setting :

- Address Id = 1
- Baud Rate = 19200 8N1

Modbus Address ID Selection Link

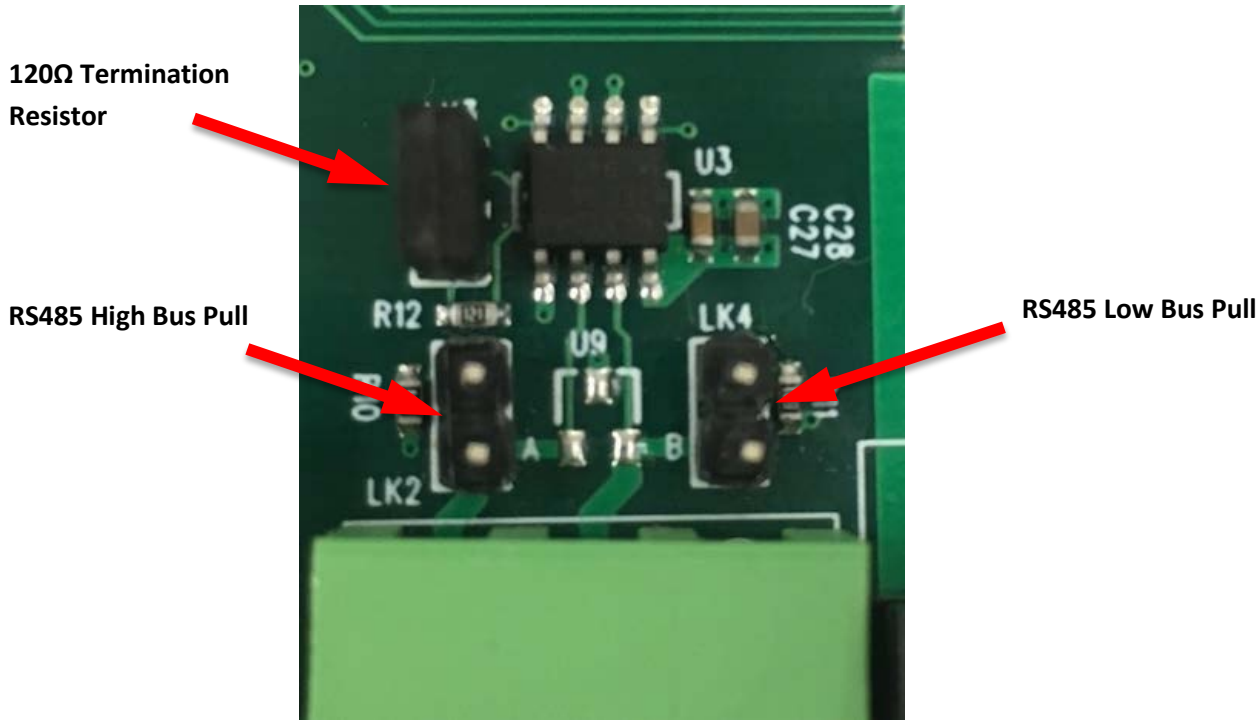
Addr	5	4	3	2	1
0*	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
19	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

* Invokes Factory Default setting:

- Address Id = 1
- Baud Rate = 19200 8N1

RS485 Bus Option Links

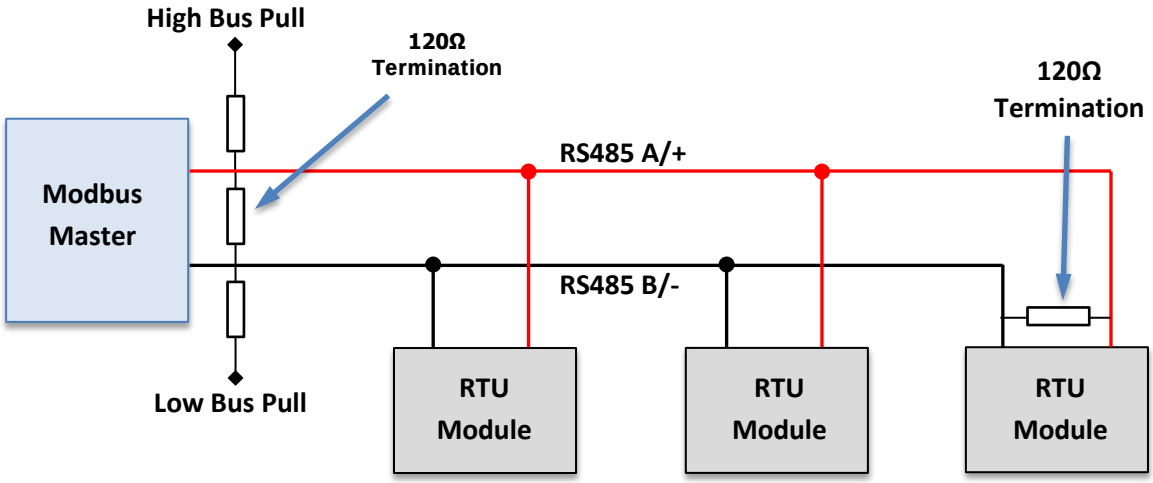
Fit links below to enable the function shown



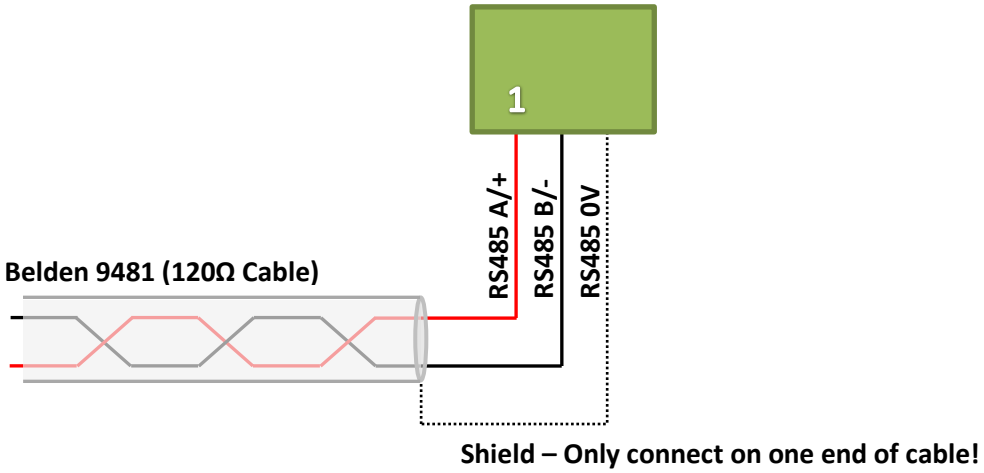
Important: Only one set of bus data line pulls should be active, either at the master side or on a single slave

Important: Termination resistors should only be enabled at far ends of bus

RS485 Bus Connection



RTU Plug RS485 Wiring



Modbus Registers – Readings

Register	Type	Read/Wite	Description
40001	16bit (Big Endian)	Read/Write	N.O. Relay Channel 1 State
40002	16bit (Big Endian)	Read/Write	N.O. Relay Channel 2 State
40003	16bit (Big Endian)	Read/Write	N.O. Relay Channel 3 State
40004	16bit (Big Endian)	Read/Write	N.O. Relay Channel 4 State
40005	16bit (Big Endian)	Read/Write	N.O. Relay Channel 5 State
40006	16bit (Big Endian)	Read/Write	N.O. Relay Channel 6 State
40007	16bit (Big Endian)	Read/Write	N.O. Relay Channel 7 State
40008	16bit (Big Endian)	Read/Write	N.O. Relay Channel 8 State

Values written to registers 40001-40008 will directly control the output relay driver.

A value of **1** is considered **ON** and a value of **0** is considered **OFF**

With the channel value set to **ON** the driver will be enabled, and the relay will be engaged connecting the two terminals for the channel together

With the channel value to **OFF** the driver will be disabled, the relay will be disengaged and the two terminals for the channel will be disconnected

For full technical specifications on the relay please refer to the below PDF

https://www.synapsertu.com/pdfs/ RTU-DO8-Relay-datasheet.pdf

Only function codes 0x03 (FC03) and 0x10 (FC16) are accepted by the module

To **read** one or more registers you should use Modbus function code 3 – Read holding registers (4x Range)

To **write** one or more registers you should use Modbus function code 16 – Write multiple registers

Note the state of all channels at power on or system reset is OFF

Modbus Registers – Configuration

Register	Type	Read/Wite	Description
40034	16bit (Big Endian)	Read/Write	Modbus RS485 Baud Rate
40035	16bit (Big Endian)	Read/Write	Configuration Register

40034 - Modbus Baud Rate

This sets the serial baud rate of the unit – Default setting is 19200

Register Value	Setting
0	19200
1	9600
2	14400
3	19200
4	38400
5	57600

40035 – Configuration Register

Writing **255** to this register will cause the system to save the current configuration for baud rate and channel mode and reboot the unit.

Register Value	Setting
255	Save Current Configuration Settings to EEPROM

Software Support

Open-Source code samples can be downloaded from the GitHub repositories below :

RTU-DO8 Software tool

https://github.com/synapsertu/rtd-do8

Multi RTU module Logger

https://github.com/synapsertu/rtu-log

Modbus Utilities

The following windows and Linux command line utilities are useful for development

Windows/Linux x86 Binary

https://www.modbusdriver.com/modpoll.html

Raspberry Pi/Linux

https://github.com/epsilonrt/mbpoll

*Note that mbpoll does not use FC16 for Modbus writes

*Note that mbpoll requires -0 setting to index registers from 0 not 1