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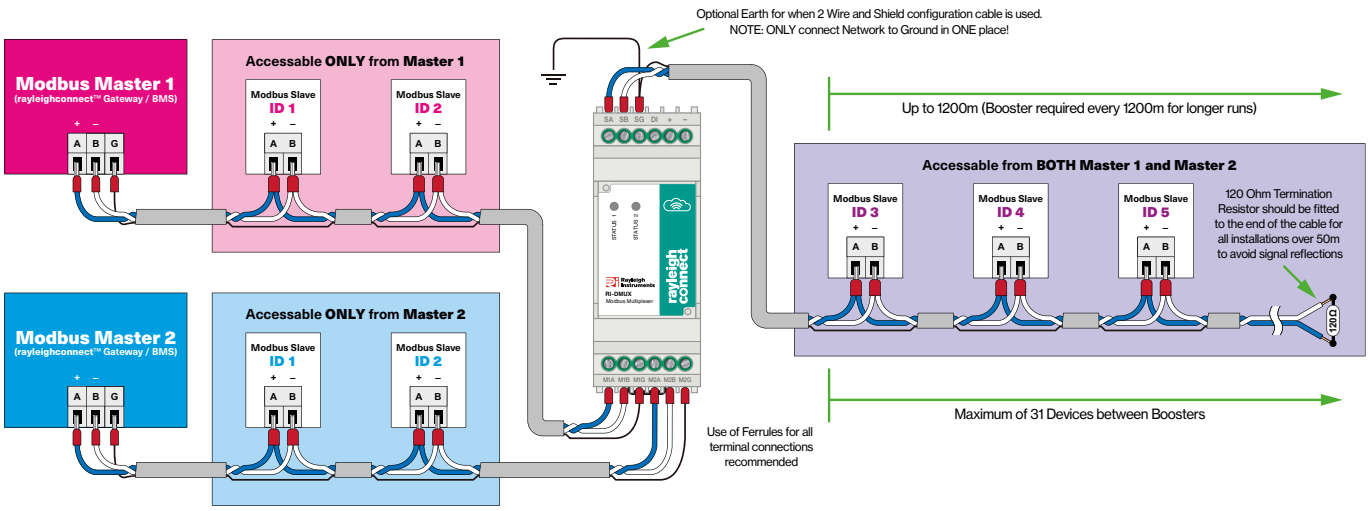
RI-DMUX Series

Modbus RTU Multiplexer (2 x Masters on Single bus)

- Compact size - 2 module (35mm width) DIN Rail mounting
- Supports 2 x RS-485 RTU Modbus Masters
- Supported baud rates 9600, 19200, 38400, 57600, 115200
- Master devices can share or have private devices
- 1 x Digital Input
- 5VDC/1.5A Auxiliary Supply
- Compatible with **rayleighconnect**™ cloud system



Product Description

The RI-DMUX is a Modbus RTU multiplexer that allows for two masters on a single RS-485 bus and forms part of a growing family of **rayleighconnect**™ products.

Requests from two Modbus RTU masters are queued and forwarded to Modbus RTU slave devices ensuring no data transmission conflicts. Once a response is received it is sent to the master that sent the request.

The second master does not receive the requests or responses initiated by the first master.

General Specification

Power Supply	Stabilised +5VDC, min 100mA
Enclosure	DIN Rail mounted - 2 Modules wide (35mm)
Connectors	Terminal blocks (raster 5.08mm, 30-12 AWG0
Operating temperature	–20°C to +65°C

Configuration and Registers - Modbus Functions

Supported read functions	Read Holding Registers (FC=03 – 0x03)
Supported write functions	Preset Multiple Registers (FC=16 – 0x10)

Note: The above functions apply to configuration registers only. The RI-DMUX also supports the forwarding other Modbus RTU functions.

Data Types

Configuration registers use the following data types.

u16	Unsigned 16 bit integer
u32	Unsigned 32 bit integer

Unlocking configuration registers

Making configuration changes requires unlocking of the device.

• To unlock the device write the maintenance or administration password to the 0x000C register.

• Writing the incorrect password to the 0x000C register will change the access level to 0 (guest).

Reading Enter Password register will return the current access level.

Setting	Default value	Unit	Register Address	Type
Enter Password	0	enum: **0** - guest **2** - maintenance **4** - administrator	0x000C	u16

Note: The device will automatically return to 0 (guest) access level within 24 hours.

Passwords

The Mobus unit number ("address") is by default set to 252 (0xFC).

Setting	Default value	Register Address	Type
Set maintenance password	0x0001	0x000D	u16
Set admin password	Hidden	0x000E	u16

Unit Number

Passwords can be changed using the following registers.

Setting	Default value	Register Address	Type
Unit number (Address)	252 (0xFC)	0x0007	u16

Note: Requests sent to this address will not be forwarded to the **OUT** port.

Response Delay

Setting	Default value	Unit	Register Address	Type
Minimal response delay	100	ms	0x000B	u16

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RS-485 port configuration

To change the setting of the currently used port (**IN1** or **IN2**) use following registers.

Setting	Default value	Unit	Register Address	Type
Baud rate	9600	bps [1]	0x0008, 0x0009	u32
Mode	1 (8N1)	enum [2]	0x000A	u16

[1] Supported baud rate values: 9600, 19200, 38400, 57600, 115200

[2] Mode enum values: **1**: 8N1, **2**: 8E1, **3**: 8O1, **4**: 8N2, **5**: 8E2, **6**: 8O2

Each port can also be configured independently using the following registers

Port IN1 (Master 1)

Setting	Default value	Unit	Register Address	Type
Baudrate	9600	bps [1]	0x0140, 0x0141	u32
Mode	1 (8N1)	enum [2]	0x0142	u16
Max wait [3]	2000	ms [3]	0x0143	u16
Enable	1	enum [4]	0x0144	u16
Debug messages [5]	1	enum [5]	0x0145	u16

[3] **Max wait** specifies how long the IN master waits for the response. Allowed values: 500 – 5000ms.

For the best performance, max wait should be:-

- **IN Ports** - slightly smaller than a time that a Modbus master waits for the response before sending another request on the given IN port.
- **OUT Port** - slightly greater than the max response time of the slowest Modbus device connected to the OUT port.

[4] **0**: Port disabled (Modbus requests are not forwarded to the OUT port), 1: Port enabled.

[5] Debug messages are sent by the RI-DMUX device, on behalf of the Modbus target devices, to the Modbus masters when the communication with the given Modbus target device is currently not possible. Values:-

- **0** – no debug messages, the device just does not respond.
- **1** – 0x06 Modbus error code is sent if the OUT port is busy and the Modbus request hasn't been forwarded.
- **2** – 0x0B Modbus error code is if the target Modbus device is filtered out.

Port IN2 (Master 2)

Setting	Default value	Unit	Register Address	Type
Baudrate	9600	bps [1]	0x0160, 0x0161	u32
Mode	1 (8N1)	enum [2]	0x0162	u16
Max wait [3]	2000	ms [3]	0x0163	u16
Enable	1	enum [4]	0x0164	u16
Debug messages [5]	1	enum [5]	0x0165	u16

Port OUT

Setting	Default value	Unit	Register Address	Type
Baudrate	9600	bps [1]	0x0180, 0x0181	u32
Mode	1 (8N1)	enum [2]	0x0182	u16
Max wait [3]	2000	ms [3]	0x0183	u16

Querying port number

The Master can read which port it is connected to by reading the following register.

Setting	Default value	Unit	Register Address	Type
Port ID	N/A	enum: **1** - port 1, **2** - port 2	0x0100	u16

Port Priority

RI-DMUX can be configured to prioritize one of the IN ports.

Setting	Default value	Unit	Register Address	Type
Port Priority	0 (equal)	enum: **0** - equal, **1** - port 1, **2** - port 2	0x0101	u16

Modbus filtering

When the RI-DMUX receives **response** on one of the IN ports (instead of OUT port) it will add the Modbus unit number (address) to the filtering list.

All subsequent requests addressed to the filtered devices will NOT be forwarded to the OUT port.

This feature enables more advanced RS-485 bus topologies where e.g.:-

• only part of the RS-485 bus is shared with second master

• each master has private devices, which can use the same unit numbers (addresses)

When there is no **response** from the filtered device on any of the IN ports for more than 120 seconds it is removed from the filtering list.

Filtering time can be adjusted by writing to 0x0103 register.

Setting	Default value	Unit	Register Address	Type
Modbus filtering	120	s [6]	0x0103	u16

[5] Allowed values: 10 - 65535

Advanced filtering configuration

We advise to use default automatic filtering.

Setting	Default value	Unit	Register Address	Type
Filter Mode	1 (auto)	enum: **0** - disabled **1** - auto **2** - manual	0x0102	u16

Note: Automatic filtering is supported for function codes 0x03, 0x04 and 0x10 only.

However if required, filtering can be configured manually using 256 bit mask to mark the units that should be filtered.

Mask is divided into eight 32 bit registers. E.g.: Writing 0x00000012 to register 0x0104 will disable forwarding of requests to addresses (unit numbers) 0x01 and 0x04.

Setting	Register Address	Type
Filter mask	0x0104	u32
Filter mask	0x0106	u32
Filter mask	0x0108	u32
Filter mask	0x010A	u32
Filter mask	0x010C	u32
Filter mask	0x010E	u32
Filter mask	0x0110	u32
Filter mask	0x0112	u32

Note: In automatic mode filter mask registers can be read to view current filtering status.

Modbus statistics

The RI-DMUX provides the following bus statistics that can be used in troubleshooting.

Each register contains a count of messages (requests or responses).

Note: Statistics reset every 24 hours.

Port IN1

Message type	Register address	Type
Correct	0x01A0	u16
Filtered	0x01A1	u16
Rejected	0x01A2	u16
Invalid request	0x01A3	u16
Invalid response	0x01A4	u16
No response	0x01A4	u16

Port IN2

Message type	Register address	Type
Correct	0x01B0	u16
Filtered	0x01B1	u16
Rejected	0x01B2	u16
Invalid request	0x01B3	u16
Invalid response	0x01B4	u16
No response	0x01B4	u16

Device Information

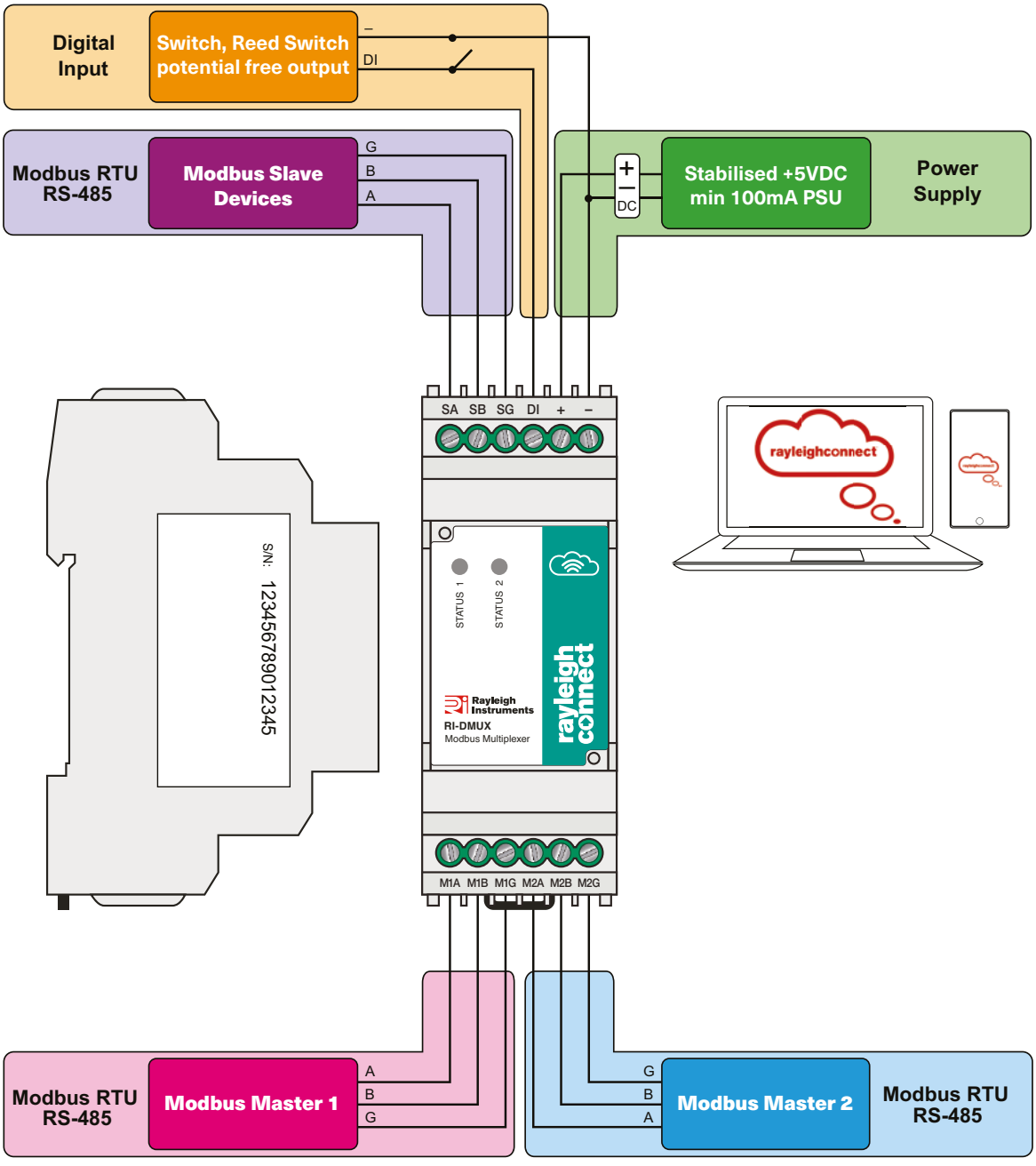
Name	Register Address	Type
Status 1	0x0000	u16
Status 2	0x0001	u16
Protocol version	0x0002	u16
Serial number	0x0003, 0x0004	u32
Hardware version	0x0005	u16
Firmware version	0x0006	u16

Factory Reset

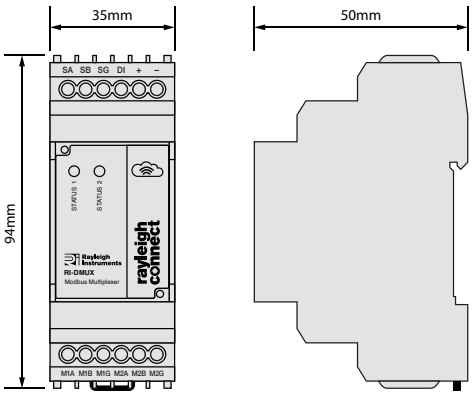
WARNING: Writing to this register will reset the device to factory settings.

Name	Register Address	Type
Factory reset	0x001F	u16

Connection Example



Dimensions (mm)



Model Selection Table

Communications	Model
Modbus RTU Multiplexer	RI-DMUX

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