IntesisBox® Modbus TCP Server

Modbus RTU Master

User Manual

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Intesis

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Gateway to communicate with Modbus RTU slaves remotely using several Modbus TCP masters.

Order code:

IBOX-MBS-TCP2RTU

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1. Description

1.1 Introduction

Communicate with Modbus RTU slaves remotely using Modbus TCP, with the advantage of having various Modbus TCP masters accessing the same RTU slaves simultaneously.
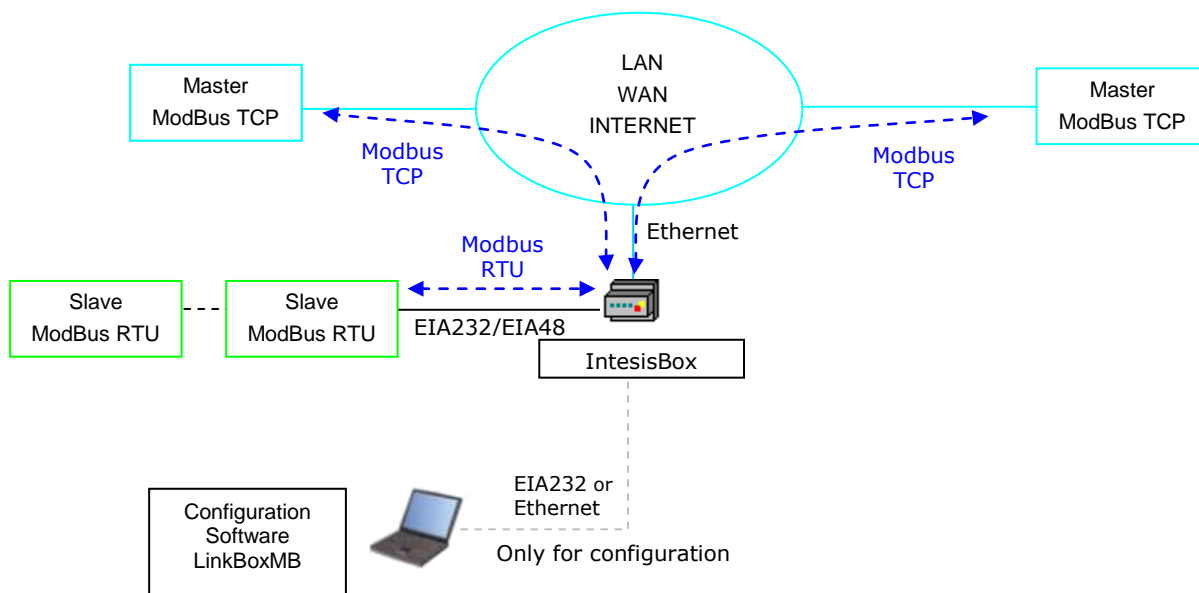
Figure 1.1 Modbus Server – Up to four Master system overview

Transparent operation: the Modbus TCP telegrams are converted to Modbus RTU and vice-versa transparently.

When more than one Modbus TCP master is connected, the queries of each master are appropriately alternated, handling the waiting queues and RTU bus access.

Simple configuration: only the IP address, Net Mask, EIA232 or EIA485, baud rate, parity and stop bits are needed. All is done using LinkBoxMB software for windows, provided with the gateway without additional cost, quickly and easily.

The Modbus TCP port acts as a slave, the Modbus RTU port acts as a master.

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1.2 Functionality

This gateway allows communicating with Modbus RTU slave devices from any Modbus TCP master. The gateway behaves as a Modbus TCP slave device.

The procedure of configuration of IntesisBox is as simple as following these steps:

- Introduction of the communication parameters for Modbus ports

- Once this configuration has been done with the configuration software tool LinkBoxMB, you have to download this configuration to IntesisBox via a serial or Ethernet connection and IntesisBox will reboot with the new configuration working.

1.3 Capacity of IntesisBox

Element	Max.	Notes
Number of TCP masters	32	IntesisBox can handle up to 32 TCP Masters, all of them connected to the same Ethernet port.
Number of RTU slaves	32[1]	IntesisBox can handle up to 32 Modbus slave devices

Ref.: IBOX-MBS-TCP2RTU

2. Modbus interfaces of IntesisBox

2.1 Modbus TCP

IntesisBox Modbus TCP communication uses the Ethernet port of the gateway with standard Ethernet configuration.

2.2 Modbus RTU

IntesisBox Modbus RTU communication can work with both EIA232 and EIA485. The baud rate, parity and polling time can be configured.

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[1] IntesisBox could handle up to 255, but it is strongly recommended not use more than 32 RTU slave devices to avoid communication problems and to ensure integration stability.

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3. Quick Setup

1. Install LinkBoxMB Details in section 5

2. Install IntesisBox in the desired installation site (DIN rail mounting inside a metallic industrial cabinet connected to ground is recommended).

3. Power up and connect the communication cables. Details in section 4

4. Open LinkBoxMB, open a project or create a new one. Details in section 5.

5. Connect to the IntesisBox (details in section 5)

6. (optional) Configure the IntesisBox. Details in section 5.1

7. Check if there is communication in both Modbus TCP and Modbus buses (section 5).

8. The IntesisBox is ready to be used in your system.

4. Connection

The device uses a standard enclosure allowing DIN EN60715 TH35 rail mounting. Its plastic meets standard PC UL 94 V0.
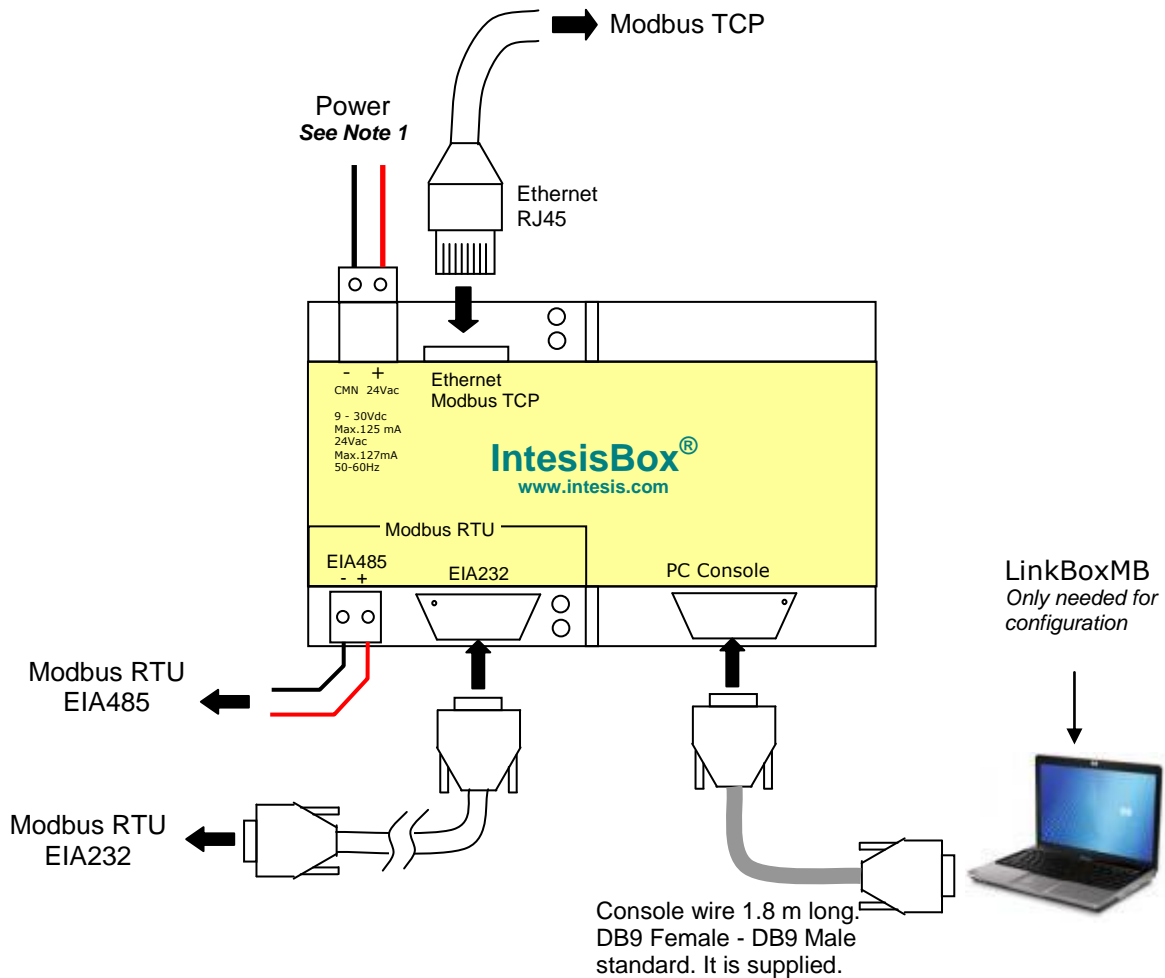

Figure 4.1 Device connection diagram

Ensure proper space for all connectors when mounted.

The items supplied by Intesis Software for this integration are:

- IntesisBox Modbus Server – Modbus RTU hardware

- Console cable. Standard DB9F-DB9M cable 1.8 meter long.

- Installation sheet, containing a link to the LinkBoxMB software and this manual.

4.1   Power device

The first step to perform is to power up the device. To do so a power supply working with any of the voltage range allowed is needed (check section 6). Once connected the ON led will turn on.

WARNING! In order to avoid earth loops that can damage the gateway and/or any other equipment connected to it, we strongly recommend:

- The use of DC power supplies, floating or with the negative terminal connected to earth. **Never use a DC power supply with the positive terminal connected to earth**.
- The use of AC power supplies only if they are floating and not powering any other device.

4.2   Connect to Modbus RTU

Connect the communication cable coming from the Modbus RTU network to the port marked as Modbus RTU of IntesisBox (Figure 4.1). Two methods to connect to the Modbus network can be used:

- The EIA485 port if the network is EIA485 2-wire. Connect the + and the – to the respective ports in the slave devices (polarity matters)

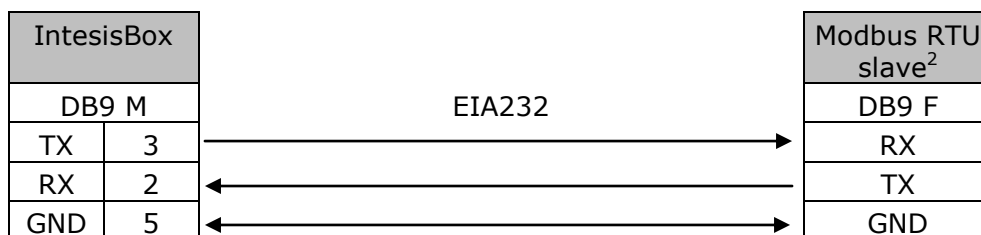- The EIA232 port if the connection is point to point to one single slave.

IntesisBox		EIA232	Modbus RTU slave[2]
DB9 M			DB9 F
TX	3	→	RX
RX	2	←	TX
GND	5	←	GND

Table 4.1 Modbus EIA232 cable pin out

How to check if there is communication with the Modbus bus is explained in the LinkBoxMB Manual (section 5).

4.3   Connect to Modbus TCP

Connect the communication cable coming from the network hub or switch to the ETH port (Figure 4.1) of IntesisBox. The cable to be used depends on where the IntesisBox is being connected:

- Connecting directly to a Modbus TCP master device: crossover Ethernet UTP/FTP CAT5 cable

- Connecting to a hub or switch of the LAN of the building: a straight Ethernet UTP/FTP CAT5 cable

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[2] Check your Modbus device's user's manual provided by its respective manufacturer to know more details about pin out.

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In case there is no communication with the IntesisBox IntesisBox, check that the Modbus TCP devices they are operative and reachable from the network connection used by IntesisBox. Check the IntesisBox Ethernet interface sending Pings to its IP address using a PC connected to the same Ethernet network.

4.4 Connect to PC (LinkBoxMB)

This action allows the user to have access to configuration and monitoring of the device (more information can be found in the LinkBoxMB User Manual [section 5]).Two methods to connect to the PC can be used:

- Ethernet: Using the ETH port (Figure 4.1) of IntesisBox. How to check connectivity is explained in section 4.3.

- Serial cable: To connect the device to the PC the serial cable supplied should be plugged to the PC console port (Figure 4.1).

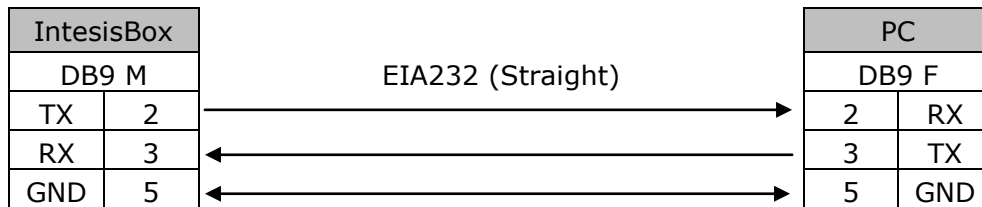 The cable is an EIA232 straight cable and its pin out is at explained in Table 4.2.

IntesisBox		EIA232 (Straight)	PC	
DB9 M			DB9 F	
TX	2	→	2	RX
RX	3	←	3	TX
GND	5	↔	5	GND

Table 4.2 Configuration serial cable pin out

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5. LinkBoxMB. Configuration & monitoring.

How to install and use the LinkBoxMB is explained in its Manual. It can be found in the installation folder (if the Software is already installed) or it can be downloaded from the link that can be found in the installation sheet supplied with the IntesisBox.

In this section only the specific project configuration for IntesisBox Modbus Server – Modbus RTU Master is going to be explained.

The External Protocol in this IntesisBox is Modbus RTU.

5.1 Project configuration

To configure the integration connection parameters, and the points list, click on *Config* in the *Button Bar.* The Modbus *Configuration* window will be opened. For integrations with a large number of points an alternative CSV based configuration method is explained in in the LinkBoxMB Manual.

5.1.1 Connection configuration

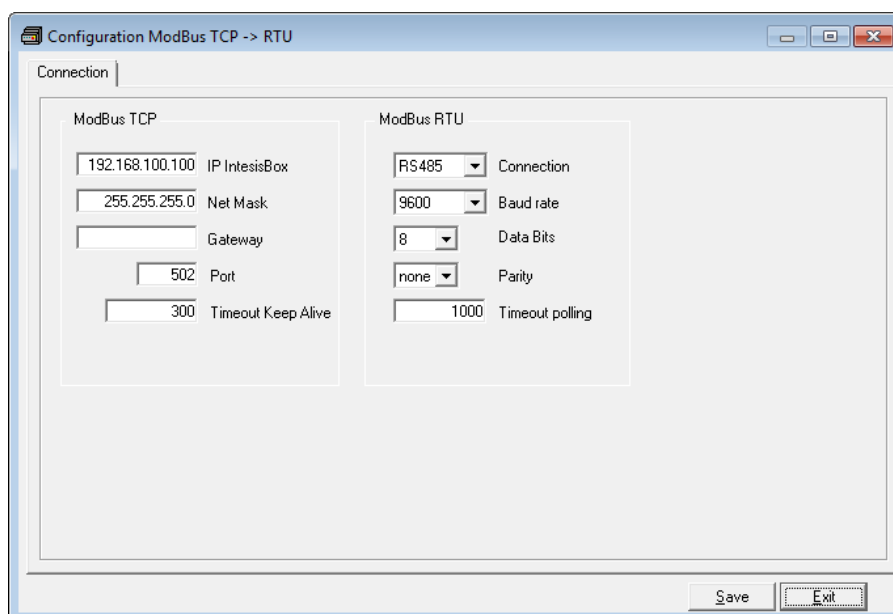In this tab both the parameters for Modbus TCP and Modbus RTU are configured.

Figure 5.1 Connection tab
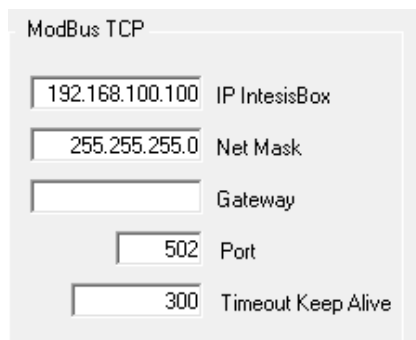
Modbus TCP configuration:

Figure 5.2 Modbus TCP interface configuration.

- **IP IntesisBox:** Enter the IP address for IntesisBox.

- **Net Mask:** Enter the IP net mask for IntesisBox.

- **Gateway:** Enter the default router address to use by IntesisBox, leave blank if there is no need of router address.

- **Port:** Enter the TCP port to use, by default 502.

- **Timeout Keep Alive:** Enter the Keep Alive Timeout (in seconds). This is the time without Modbus TCP traffic after which IntesisBox will send a Keep Alive packet to the master(s) connected to it; this is to maintain alive the TCP connection.
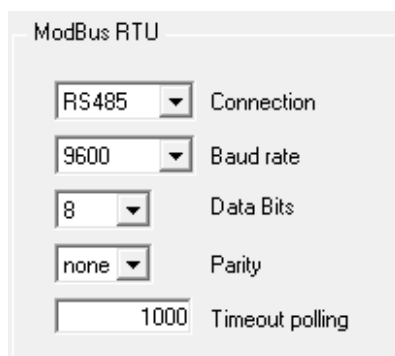
Modbus RTU configuration:

Figure 5.3 Modbus RTU interface configuration

- **Connection:** Select the port to use (EIA232 or EIA485).

- **Data Bits:** Data bits

- **Baud rate:** Select the baud rate to use

- **Parity:** Select the parity.

- **Slave:** Enter the Modbus slave number for IntesisBox.

5.1.2   Saving the configuration

When the configuration of the project is finished follow the next steps:

1. Click the button *Save.* Once accepted the pop-up message, that will save the project in the folder on hard disk (more information in LinkBoxMB Manual).

2. You will be prompted to generate the configuration file to be sent to the gateway,

   a. If *YES* is selected, the binary file (Modbus.LBOX) containing the configuration for the gateway will be generated and saved also into the project folder.

   b. If *NO* is selected the binary file needs to be created before following the next steps. To do so open the Configuration window (section 5.1) and restart from step 1

3. Once in the configuration window again, click on exit. The configuration is ready to be sent to the IntesisBox (check LinkBoxMB Manual)

The configuration cannot be received from the gateway to LinkBoxMB, it can only be sent.

6. Mechanical & electrical characteristics

Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Color	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10%, Max.: 125mA. 24Vac +/-10% 50-60Hz, Max.: 127mA Must use a NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply. Plug-in terminal block for power connection (2 poles).
Terminal wiring (for power supply and low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: $0.5mm^2$… $2.5mm^2$ 2 cores: $0.5mm^2$… $1.5mm^2$ 3 cores: not permitted
Mounting	Wall. DIN rail EN60715 TH35.
Modbus RTU ports	1 x Serial EIA232 (DB9 male DTE). SELV 1 x Serial EIA485 (Plug-in screw terminal block 2 poles). SELV
Modbus TCP port	1 x Ethernet 10Base-T RJ45.
LED indicators	1 x Power. 2 x Serial port (Modbus RTU) activity (Tx, Rx). 2 x Ethernet port (Modbus TCP) link and activity (LNK, ACT).
Console port	EIA232. DB9 female connector (DCE). SELV
Configuration	Via console port.[1]
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +70°C
Operational humidity	5% to 95%, non-condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Norms and standards	CE conformity to EMC directive (2004/108/EC) and Low-voltage directive (2006/95/EC) EN 61000-6-2, EN 61000-6-3, EN 60950-1, EN 50491-3

[1] Standard cable DB9male-DB9female 1,8 meters long is supplied with the device for connection to a PC COM port for configuring and monitoring the device. The configuration software, compatible with Windows® operating systems, is also supplied.

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7. Dimensions
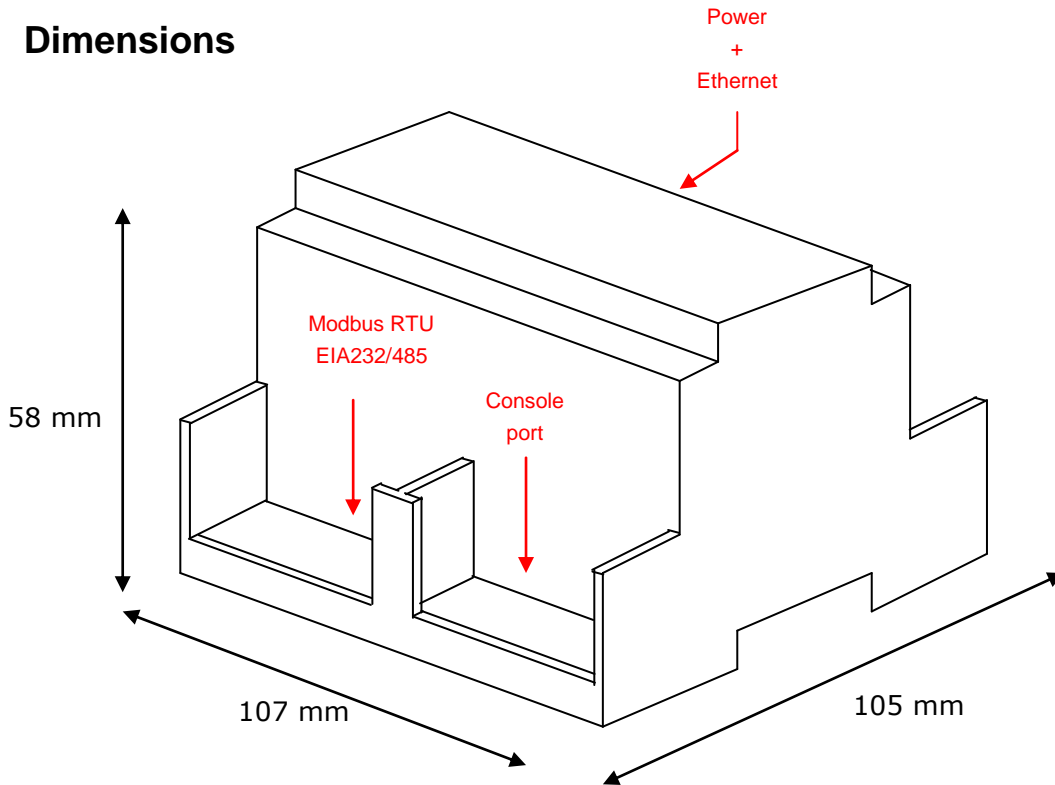
Recommended available space for its installation into a cabinet (wall or DIN rail mounting), with space enough for external connections