



IntesisBox[®] Modbus Server

Samsung NASA compatible Outdoor Units

User Manual

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Gateway for the integration of Samsung NASA compatible systems into Modbus (RTU and TCP) systems.

Order code:

IBMBSSAM004O000, 4 indoor units
IBMBSSAM008O000, 8 indoor units
IBMBSSAM016O000, 16 indoor units
IBMBSSAM064O000, 64 indoor units

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1. Description

1.1 Introduction

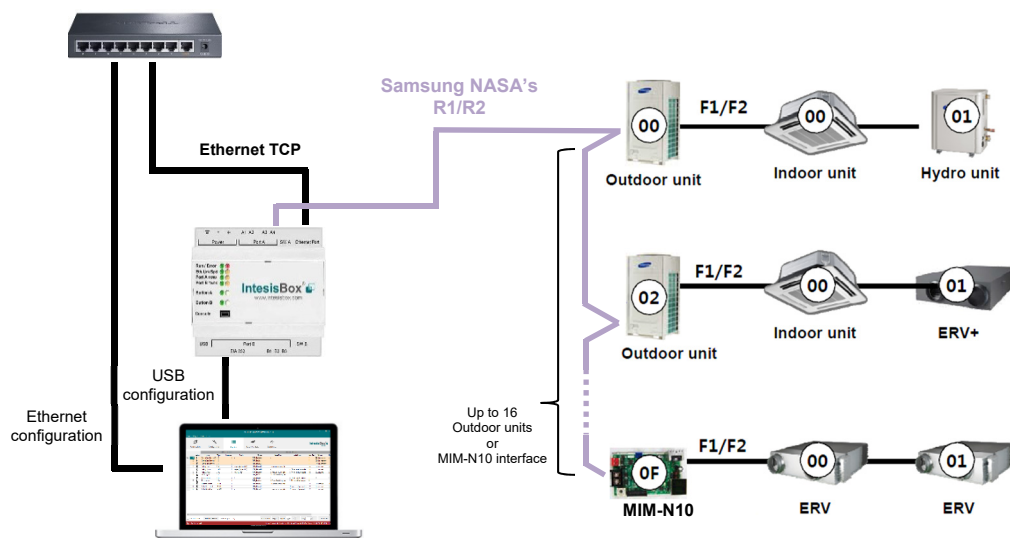
This document describes the integration of Samsung NASA compatible air conditioning systems into Modbus compatible devices and systems using using gateway the IntesisBox Modbus Server to Samsung NASA AC communication gateway.

The aim of this integration is to monitor and control Samsung NASA air conditioning systems, remotely, from a Control Center using any commercial SCADA or monitoring software that includes a Modbus Master driver (RTU and/or TCP). To do it so, IntesisBox performs as a Modbus Server, allowing poll and write requests from any Modbus master device.

IntesisBox makes available the Samsung NASA air conditioning system indoor units' datapoints through independent Modbus registers.

Up to 64 indoor units supported, depending on product version.

This document assumes that the user is familiar with Modbus and Samsung technologies and their technical terms.



Integration of Samsung NASA's compatible systems into Modbus systems



NOTE: Take following considerations into account for Samsung's NASA R1/R2 network:

- Samsung NASA AC network allows for both automatic and manual addressing. **Manual addressing of both indoor and outdoor units must be setup by Samsung installer in order that IntesisBox communicates properly.** Manual addressing is setup by means of DIP switches in outdoor unit, and using the remote controller or DIP switches in the indoor unit.
- Samsung NASA indoor units **need to be configured to accept 'central control'**. To do so, they need to be configured with so-called 'installation option code' in which segment 5 of this code needs to be set to value '1' to allow central control.

1.1 Functionality

IntesisBox® continuously monitors Samsung's NASA R1/R2 network for all configured signals and keeps the updated status of all of them in its memory. It triggers updates on configured group addresses to KNX network on value change.

Commands toward the R1/R2 indoor unit communication adaptor are permitted.

Each indoor unit is offered as a set of MBS objects.

Element	Object supported
Outdoor Unit	<ul style="list-style-type: none">• Communication status• Addressing status
Indoor Unit	<ul style="list-style-type: none">• Status• Command• Communication status
General signals (all units)	<ul style="list-style-type: none">• Command

1.2 Capacity of IntesisBox

Element	Max.	Notes
Number of indoor units	64 *	Number of indoor units that can be controlled through IntesisBox
Number of Objects	1124 *	Number of Samsung NASA objects available into IntesisBox. (36 global signals + 64 x 17 individual unit signals)

* There are different models of *IntesisBox MBS – Samsung NASA AC* each one with different capacity. The table above shows the capacity for the top model (with maximum capacity).

Their order codes are:

- IBBSSAM004O000: Model supporting up to 4 indoor units
- IBBSSAM008O000: Model supporting up to 8 indoor units
- IBBSSAM016O000: Model supporting up to 16 indoor units
- IBBSSAM064O000: Model supporting up to 64 indoor units

2. Modbus interface

In this section, a common description for all IntesisBox Modbus series gateways is given, from the point of view of Modbus system which is called from now on *internal system*. Connection with the Samsung NASA R1/R2 system is also called from now on *external system*.

1.3 Functions supported

This part is common for Modbus RTU and TCP.

Modbus functions 03 and 04 (*Read Holding Registers* and *Read Input Registers*) can be used to read Modbus registers.

Modbus functions 06 and 16 (*Single Multiple Holding Registers* and *Write Multiple Holding Registers*) can be used to write Modbus registers.

Configuration of poll records is possible between Modbus addresses 0 and 20000. Addresses that are not defined in section 2.2 (Modbus map of the device) are read-only and will always report 0.

Modbus error codes are supported, they will be sent whenever a non-valid Modbus address is queried.

All registers are 16-bit signed integer, in standard Modbus Big Endian (MSB/LSB) format.

IntesisBox supports Modbus RTU and Modbus TCP and both interfaces can be used simultaneously.

1.4 Modbus RTU

Both EIA485 and EIA232 physical layers are supported. Only the lines RX, TX and GND of the EIA232 connector are used (TX and RX for EIA485).

Baud rate can be selected between 1200, 2400, 4800, 9600, 19200, 38400, 56700 and 115200. Parity (none, even or odd) and stop bits (1 or 2) can be selected as well.

Modbus slave number must be configured and the physical connection (RS232 or RS485) can also be selected

1.5 Modbus TCP

TCP port to use (default is 502) and keep alive period must be configured.

IP settings of IntesisBox (DHCP status, own IP, net mask and default gateway) must be configured as well

1.6 Modbus Address Map

Modbus address from the formula is expressed in link layer format. This is, first register address is 0.

Available signals depend on unit type, which must be selected in MAPS configuration tool:

- IU: Indoor Unit
- HE: Hydro Heatpump system
- HT: Hydro Cascade cycle Heatpump system
- EHS: Eco-Heating-System, Air-to-Water Heatpump
- AHU: Air Handling Unit
- ERV: Energy Recovery Ventilation
- ERV+: Energy Recovery Ventilation Plus
- Chiller: Water/liquid circulating Cool/heatpump system

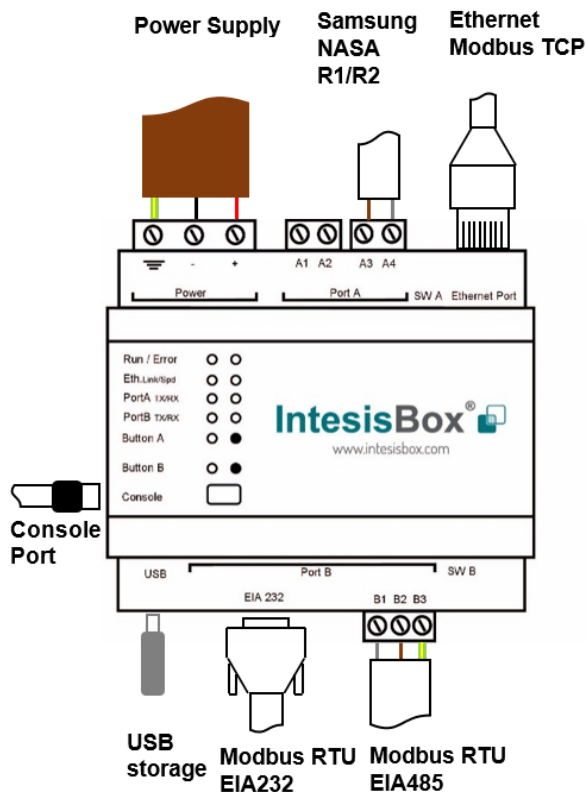
Modbus Address First Address is 0	IU	HE	HT	EHS	AHU	ERV	ERV+	Chiller	Read /Write	Register/signal name	Possible values
OU OU = Outdoor Unit address and ranges from 0 to 15.	X	X	X	X	X	X	X	X	R	Communication Error OU	0-No Error, 1-Communication error
16	X	X	X	X	X	X	X	X	R	OU Addressing Error	0-OU Addressing OK; 1-Manual Addr in OU required
20	X	X	X	X	X	X	X	X	W	On (all the units)	1-Set all the units On
21	X	X	X	X	X	X	X	X	W	Off (all the units)	1-Set all the units Off
22	X	X	X	X	X	X	X	X	W	Operation Mode Auto (all the units)	1-Set Auto Mode
23	X	X	X	X	X	X	X	X	W	Operation Mode Heat (all the units)	1-Set Heat Mode
24	X	X	X	X	X	X	X	X	W	Operation Mode Dry (all the units)	1-Set Dry Mode
25	X	X	X	X	X	X	X	X	W	Operation Mode Fan (all the units)	1-Set Fan Mode
26	X	X	X	X	X	X	X	X	W	Operation Mode Cool (all the units)	1-Set Cool Mode
27	X	X	X	X	X	X	X	X	W	Operation Mode Cool Storage (all the units)	1-Set Cool Storage Mode
28	X	X	X	X	X	X	X	X	W	Operation Mode Heat Storage (all the units)	1-Set Heat Storage Mode
29	X	X	X	X	X	X	X	X	W	Fan Speed Auto (all the units)	1-Set Fan Speed Auto
30	X	X	X	X	X	X	X	X	W	Fan Speed Low (all the units)	1-Set Fan Speed Low
31	X	X	X	X	X	X	X	X	W	Fan Speed Mid (all the units)	1-Set Fan Speed Mid
32	X	X	X	X	X	X	X	X	W	Fan Speed High (all the units)	1-Set Fan Speed High
33	X	X	X	X	X	X	X	X	W	Vane position Swing On (all the units)	1-Set Swing On
34	X	X	X	X	X	X	X	X	W	Vane position Swing Off (all the units)	1-Set Swing Off
35	X	X	X	X	X	X	X	X	W	Temperature Setpoint (all the units)	Cool: 18..30°C; Heat: 16..30°C; (x10°C)
36	X	X	X	X	X	X	X	X	W	Vent. On (all the units)	1-Set Vent. On
37	X	X	X	X	X	X	X	X	W	Vent. Off (all the units)	1-Set Vent Off
38	X	X	X	X	X	X	X	X	W	Hot Water On (all the units)	1-Set Hot Water On
39	X	X	X	X	X	X	X	X	W	Hot Water Off (all the units)	1-Set Hot Water Off

(Ui*100)+0 <small>Ui stands for Unit index number as found in the Units Configuration tab and ranges from 1 to 64.</small>	X	X	X	X	X		X	X	R/W	On/Off	0-Off, 1-On
(Ui*100)+1	X				X				R/W	Operation Mode IH/AHU	0-Auto, 1-Heat, 2-Dry, 3-Fan, 4-Cool
(Ui*100)+1		X							R/W	Operation Mode HE	1-Heat, 4-Cool
(Ui*100)+1				X			X		R/W	Operation Mode EHS/ERV+	0-Auto, 1-Heat, 4-Cool
(Ui*100)+1								X	R/W	Operation Mode CHILLER	1-Heat, 4-Cool, 5-Cool Storage, 6-Heat Storage
(Ui*100)+2	X								R/W	Fan Speed	0-Auto, 1-Low, 2-Mid, 3-High
(Ui*100)+3	X								R/W	Vane position Swing	0-Swing Off, 1-Swing On
(Ui*100)+4	X			X					R/W	Temperature Setpoint	Cool:18..30°C; Heat:16..30°C; (x10°C)
(Ui*100)+5	X			X					R	Ambient Temperature	-41..100°C
(Ui*100)+6	X								R/W	Discharge Setpoint Temp. Cool IU	8..18°C; (x10°C)
(Ui*100)+7					X				R/W	Discharge Setpoint Temp. Cool AHU	8..25°C; (x10°C)
(Ui*100)+8	X								R/W	Discharge Setpoint Temp. Heat IU	30..43°C; (x10°C)
(Ui*100)+9					X				R	Discharge Setpoint Temp. Heat AHU	18..43°C; (x10°C)
(Ui*100)+10	X				X				R	Discharge Current Temp.	...°C; (x10°C)
(Ui*100)+11	X	X	X	X	X	X	X	X	R	Unit Error code	0-No Error, x-Error (100..999)
(Ui*100)+12								X	R	Error of Slave Chiller Unit	0-No Error, x-Error (100..999)
(Ui*100)+13								X	R	Slave Chiller Unit I Error	b0: 1-Error Unit 0, ...b7: 1-Error in Unit 7 b8: --Error unit 8; ...b15: 1-Error in Unit 15
(Ui*100)+14	X				X	X	X		R	Filter Alarm	0-Normal, 1-Alarm
(Ui*100)+15	X					X	X		W	Filter Alarm Reset	1-Reset
(Ui*100)+16	X	X	X	X	X	X	X	X	R	Communication Status	b0-Exist, b1-Ready, b2-Data Updated, b3-Type OK
(Ui*100)+17	X	X	X	X	X	X	X	X	R/W	Remote Control Disablement	0-Not disabled, 1-Disabled
(Ui*100)+18	X								W	Buzzer Sound On	1-Set Buzzer Sound On
(Ui*100)+19	X								W	Buzzer Sound Off	1-Set Buzzer Sound Off
(Ui*100)+20	X	X	X	X	X	X	X	X	R	Unit Type	0-Not Defined, 1-IU, 2-HE, 3-HT, 4-AHU, 5-ERV, 6-ERV+, 7-EHS, 8-Master CHILLER

(Ui*100)+21		X	X	X						R/W	Hot Water On/Off	0-Off, 1-On
(Ui*100)+22		X	X							R/W	Hot Water Mode HE/HT	0-Eco, 1-Standby, 2-Power
(Ui*100)+23				X						R/W	Hot Water Mode EHS	0-Eco, 1-Standby, 2-Power, 3-Force
(Ui*100)+24		X								R/W	Hot Water Setpoint Temp. HE	30..75°C; (x10°C)
(Ui*100)+25			X							R/W	Hot Water Setpoint Temp. HT	30..75°C; (x10°C)
(Ui*100)+26				X						R/W	Hot Water Setpoint Temp. EHS	30..70°C; (x10°C)
(Ui*100)+27		X	X	X						R	Hot Water Current Temp.	...°C; (x10°C)
(Ui*100)+28		X	X	X						R	Water in Temp.	...°C; (x10°C)
(Ui*100)+29		X	X	X						R	Water Out Temp.	...°C; (x10°C)
(Ui*100)+30		X								R/W	Water Out Setpoint Temp. HE	Cool: 5..25°C; Heat: 15..50°C; (x10°C)
(Ui*100)+31			X							R/W	Water Out Setpoint Temp. HT	25..80°C; (x10°C)
(Ui*100)+32				X						R/W	Water Out Setpoint Temp. EHS	Cool: 5..25°C; Heat: 15..55°C; (x10°C)
(Ui*100)+33									X	R/W	Water Out Setpoint Temp. CHILLER	Cool: 5..25°C; Heat: 15..55°C; (x10°C)
(Ui*100)+34									X	R	Water Out Average Temp.	...°C; (x10°C)
(Ui*100)+35						X	X			R/W	Ventilation On/Off	0-Off, 1-On
(Ui*100)+36						X	X			R/W	Ventilation Operating Mode	0-ByPass, 1-HeatEx., 2-Sleep, 3-Auto
(Ui*100)+37						X	X			R/W	Ventilation Fan Speed	0-Low, 1-High, 2-Turbo

3. Connections

Find below information regarding the IntesisBox connections available.



Power Supply

Must use NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply.

If using DC power supply:

Respect polarity applied of terminals (+) and (-). Be sure the voltage applied is within the range admitted (check table below). The power supply can be connected to earth but only through the negative terminal, never through the positive terminal.

If using AC power supply:

Make sure the voltage applied is of the value admitted (24 Vac). Do not connect any of the terminals of the AC power supply to earth, and make sure the same power supply is not supplying any other device.

Ethernet

Connect the cable coming from the IP network to the connector ETH of the gateway. Use an Ethernet CAT5 cable. If communicating through the LAN of the building, contact the network administrator and make sure traffic on the port used is allowed through all the LAN path (check the gateway user manual for more information). Default IP is 192.168.100.246. DHCP is enabled by default.

PortA / R1/R2 Samsung NASA

Connect the R1 (+) R2 (-) bus of Samsung NASA Outdoor Units to the connectors A3 (+) A4 (-) of gateway's PortA. Respect the polarity.

PortB / Modbus-RTU RS485

Connect the EIA485 bus to connectors B1 (B+), B2 (A-) and B3 (SNGD) of gateway's PortB. Respect the polarity. Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω . Bus biasing and termination resistor for EIA485 can be enabled for PortB by means of a dedicated DIP:

SW1:

ON: 120 Ω termination active

OFF: 120 Ω termination inactive (Default setting).

SW2+3:

ON: Polarization active

OFF: Polarization inactive (Default setting).

If the gateway is installed in one bus end make sure that termination is active.

Console Port

Connect a mini-type B USB cable from your computer to the gateway to allow communication between the Configuration Software and the gateway. Remember that Ethernet connection is also allowed. Check the user manual for more information.

USB

Connect a USB storage device (not a HDD) if required. Check the user manual for more information.

Ensure proper space for all connectors when mounted (see section 6).

1.7 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 5). 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.

1.8 Connect to Samsung NASA installation

Use the PortA connector in the top corner of the IntesisBox device in order to connect Samsung NASA bus to the IntesisBox. Remember to follow all safety precautions indicated by Samsung.

To properly communicate with the IntesisBox, take into account following considerations:

- Samsung NASA AC network allows for both automatic and manual addressing. **Manual addressing of both indoor and outdoor units must be setup by Samsung installer in order that IntesisBox communicates properly.** Manual addressing is setup by means of DIP switches in outdoor unit and using the remote controller or DIP switches in the indoor unit.
- Samsung NASA indoor units **need to be configured to accept 'central control'**. To do so, they need to be configured with so-called 'installation option code' in which segment 5 of this code needs to be set to value '1' to allow central control.

Connect the Samsung NASA bus to connectors A3 (R1/+), A4 (R2/-) of gateway's PortA. Respect the polarity.

1.9 Connection to Modbus

1.9.1 Modbus TCP

The gateway's Ethernet port connection is used for Modbus TCP communication. Connect the communication cable coming from the network hub or switch to the Ethernet port of Intesisbox. The cable to be used shall be a straight Ethernet UTP/FTP CAT5 cable.

TCP port to use (default 502) and keep alive period must be configured.

IP settings of the gateway (DHCP status, own IP, netmask and default gateway) must be configured as well.

1.9.2 Modbus RTU

Connect the communication cable coming from the modbus network to the port marked as Port B of the Intesisbox. Connect the EIA485 bus to connectors B1 (-), B2 (+) and B3 (SNGD) of gateway's PortB. Respect the polarity.

Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices (without repeaters) connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω . The gateway has an internal bus biasing circuit that incorporates the termination resistor. Bus biasing and termination resistor for EIA485 can be enabled for PortB by means of a dedicated DIP switch.

1.10 Connection to PC (Configuration tool)

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

- **Ethernet:** Using the Ethernet port of IntesisBox.
- **USB:** Using the console port of IntesisBox, connect a USB cable from the console port to the PC.

4. Set-up process and troubleshooting

1.11 Pre-requisites

It is necessary to have the Modbus RTU or TCP master/client device (BMS side device) operative and properly connected to the corresponding port of the gateway. It is also required to have a Mitsubishi Centralized Controller with Ethernet connected to the gateway.

Connectors, connection cables, PC for the Configuration Tool usage and other auxiliary material, if needed, are not supplied by Intesis for this standard integration.

Items supplied by Intesis Software for this integration are:

- IntesisBox gateway.
- Link to download the configuration tool.
- USB Console cable to communicate with IntesisBox.
- Product documentation.

1.12 IntesisBox MAPS. Configuration & monitoring tool for IntesisBox Modbus series

1.12.1 Introduction

IntesisBox MAPS is a Windows® compatible software developed specifically to monitor and configure IntesisBox new generation gateways.

The installation procedure and main functions are explained in the *IntesisBox MAPS User Manual*. This document can be downloaded from the link indicated in the installation sheet supplied with the IntesisBox device or in the product website at www.intesisbox.com

In this section, only the specific case of Samsung NASA to Modbus systems will be covered.

Please check the IntesisBox MAPS User Manual for specific information about the different parameters and how to configure them.

1.12.2 Connection

To configure the IntesisBox connection parameters press on the **Connection** button in the *menu bar*.

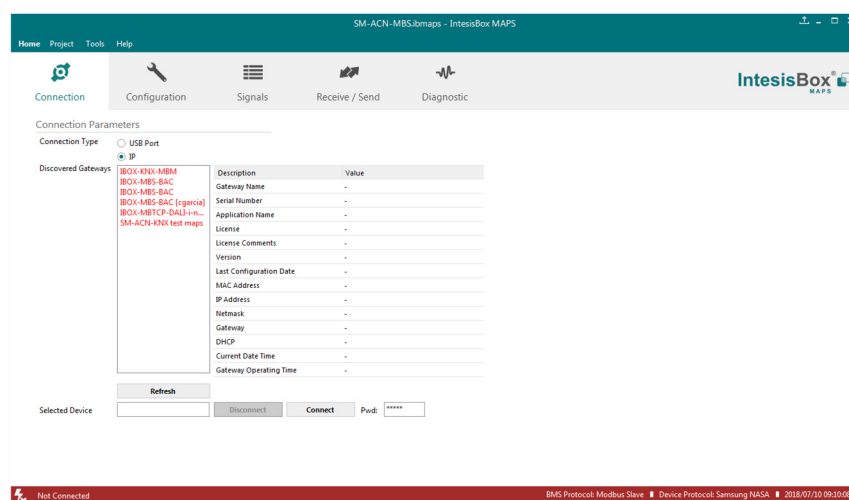


Figure 4.1 MAPS connection

1.12.3 Configuration tab

Select the **Configuration** tab to configure the connection parameters. Three subsets of information are shown in this window: General (Gateway general parameters), Modbus Slave (Modbus interface configuration) and Samsung NASA (Samsung NASA interface parameters).

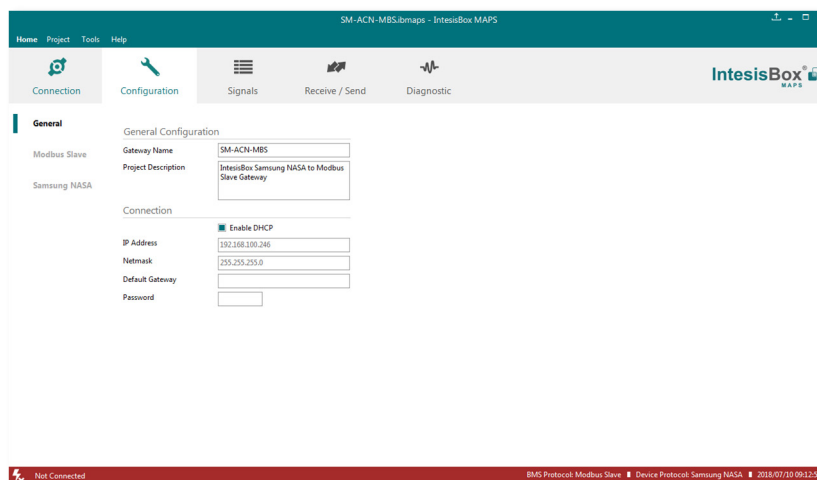


Figure 4.2 IntesisBox MAPS configuration tab

1.12.4 Modbus Slave configuration

Set parameters of Modbus Slave interface of IntesisBox.

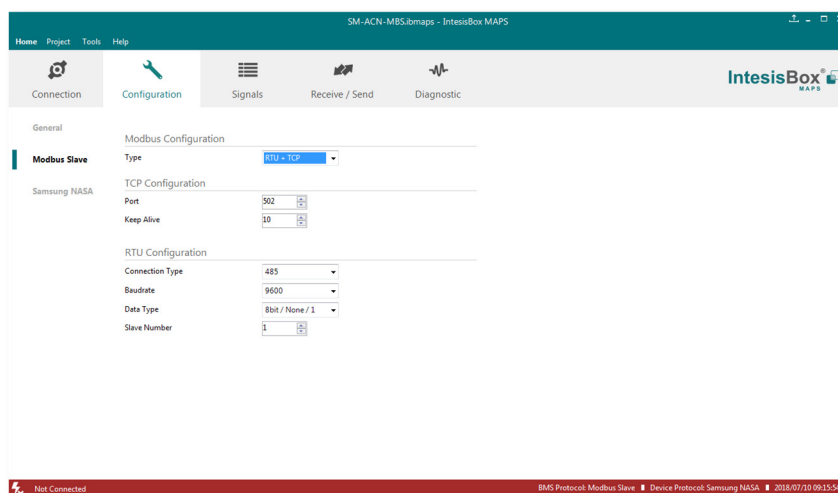


Figure 4.3 IntesisBox MAPS Modbus configuration tab

1. Modbus Configuration

1.1. Modbus type selection. Select RTU, TCP or simultaneous RTU and TCP communication.

2. TCP Configuration.

2.1. Modbus TCP Port: Modbus TCP communication port setting. Default port 502.

2.2. Keep Alive. Set the time of inactivity to send a keep Alive message. Default 10 minutes.

3. RTU Configuration.

3.1. RTU bus connection type. Select the RTU connection type serial bus RS485 or 232.

3.2 Baudrate. Set the RTU bus communication speed. Default: 9600 bps.

- Available values: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps.

3.3 Data Type. Set the Data-bit/parity/stop-bit. Default: 8bit/None/1.

- Available selection: 8bit/None/1, 8bit/Even/1, 8bit/Odd/1, 8bit/None/2.

3.4 Slave Number. Set the Modbus Slave address. Default slave address: 1.

- Valid address: 1..255.

1.12.5 Samsung NASA configuration

Set parameters for connection with Samsung NASA's installation.

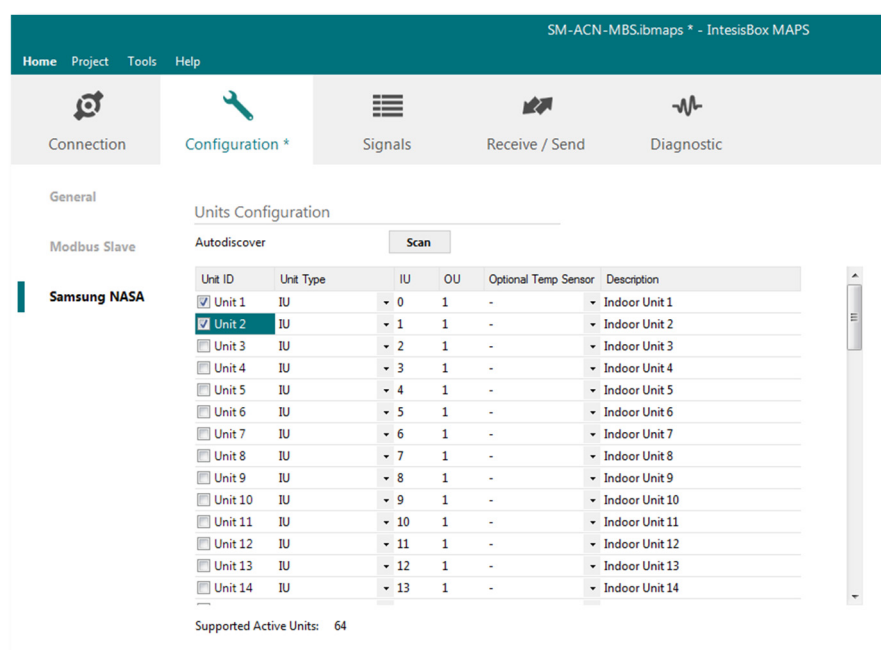


Figure 4.4 IntesisBox MAPS Samsung NASA configuration tab

In Units Configuration section you need to enter, for each unit:

- **Active.** If it's active (checkbox at Unit xx), ranging from 1 to 64 indoor units that will be integrated (maximum number of units will depend on IntesisBox model)
- **Unit type.** Type can be one of the following: IU, HE, HT, EHS, AHU, ERV, ERV+, CHILLER. Available signals will vary according to unit type.
- **IU address.** Address 0..63 of Unit in Samsung NASA R1/R2 bus. Remember that manual addressing of Samsung indoor units is required.
- **OU address.** Address 0..15 of Outdoor Unit in Samsung NASA R1/R2 bus. Remember that manual addressing of Samsung indoor units is required.
- **Description.** Descriptive name to ease identification of the unit (for example, 'living room floor 1 unit', etc).

Additional to manual entry of each unit, autodiscover of present units in an R1/R2 installation is possible. To do so, click the button **Scan**. The following window will appear:

Figure 4.5 IntesisBox MAPS Scan Samsung Units window

By pressing the **Scan** button, connected Samsung NASA R1/R2 bus will be scanned for available units. An Error window will appear if there is a problem in the connection with R1/R2 bus (units not powered, bus not connected, ...).

A progress bar will appear during the scan, which will take up to a few minutes. After the scan is completed, the detected units will be shown in available units as follows:

Add	OU	IU	Model
<input checked="" type="checkbox"/>	01	00	IU
<input checked="" type="checkbox"/>	01	02	HE
<input checked="" type="checkbox"/>	01	03	HT
<input checked="" type="checkbox"/>	02	01	EHS
<input checked="" type="checkbox"/>	02	02	AHU
<input checked="" type="checkbox"/>	03	01	ERV
<input checked="" type="checkbox"/>	03	02	ERV+

Figure 4.6 IntesisBox MAPS Scan Samsung Units window with scan results

Select with its checkbox units to add (or replace) in installation, according to selection **Replace Units** / **Add Units**. After units to be integrated are selected, click button **Apply**, and changes will appear in previous **Units Configuration** window.

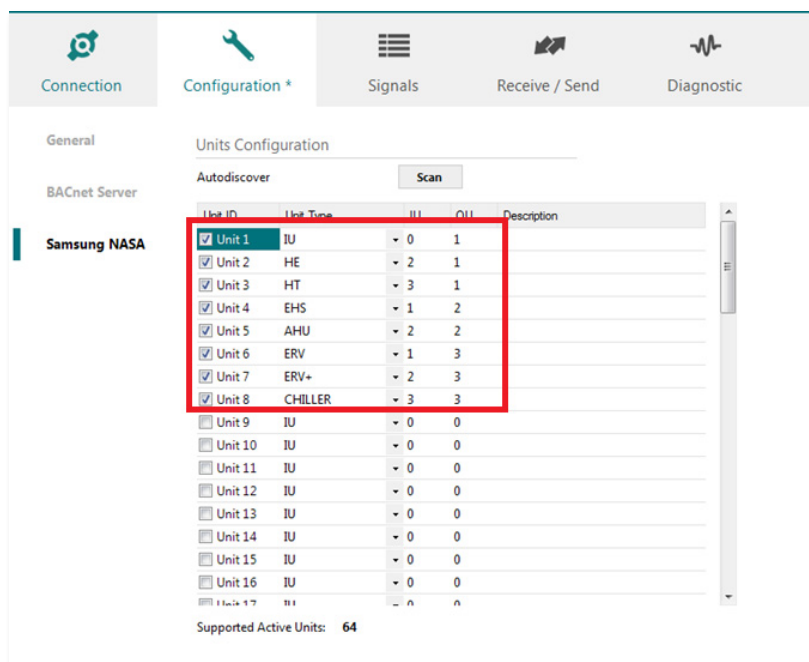


Figure 4.7 IntesisBox MAPS Samsung NASA configuration tab after importing scan results

1.12.6 Signals

All available KNX objects, its corresponding description and other main parameters are listed in the signals tab.

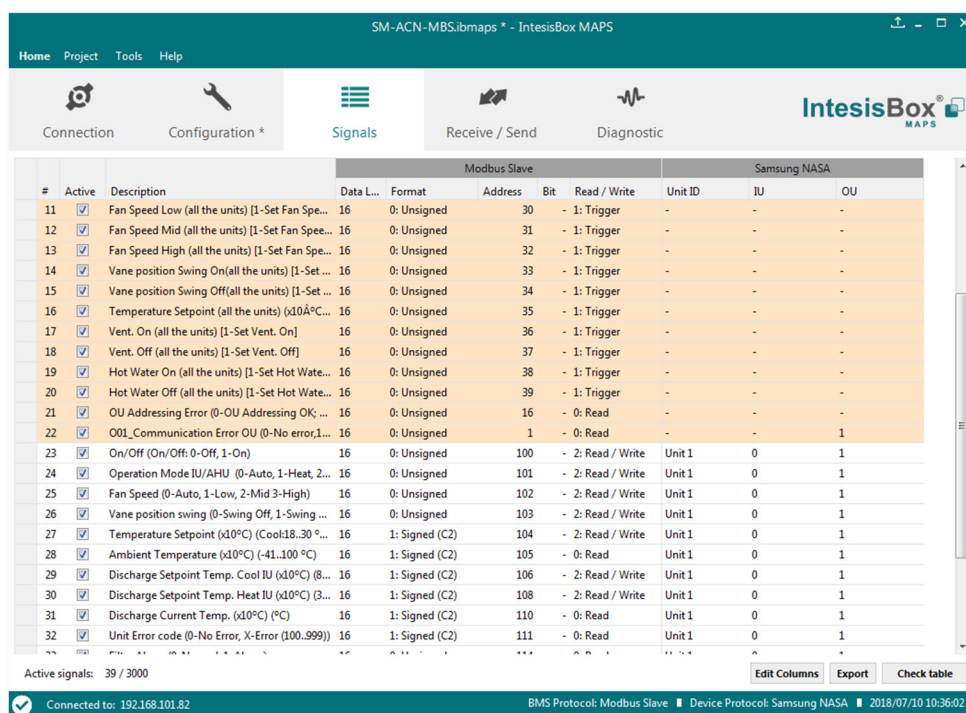


Figure 4.8 IntesisBox MAPS Signals tab

1.12.7 Sending the configuration to IntesisBox

When the configuration is finished, follow the next steps.

- 1.- Save the project (Menu option **Project->Save**) on your hard disk (more information in IntesisBox MAPS User Manual).

2.- Go to tab '**Receive / Send**' of MAPS, and in **Send** section, press **Send** button. IntesisBox will reboot automatically once the new configuration is loaded.

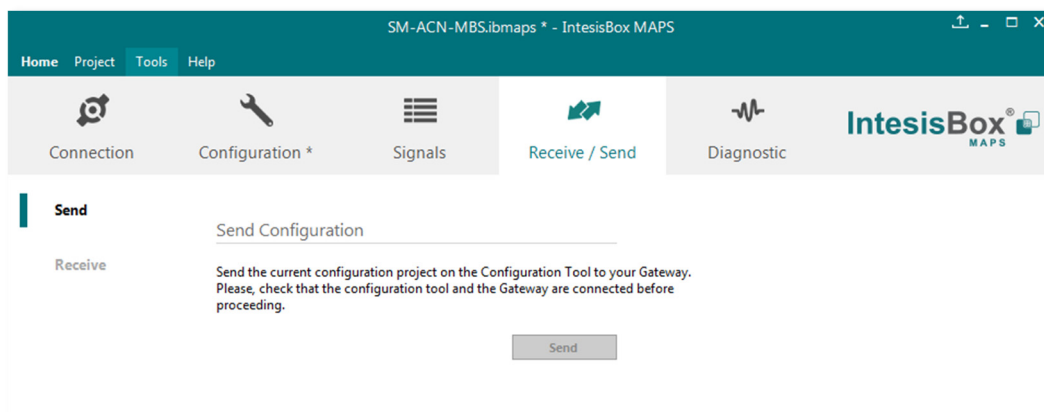


Figure 4.9 IntesisBox MAPS Receive/Send tab

After any configuration change, do not forget to send the configuration file to the IntesisBox using the Send button in the Receive / Send section.

1.12.8 Diagnostic

To help integrators in the commissioning tasks and troubleshooting, the Configuration Tool offers some specific tools and viewers.

In order to start using the diagnostic tools, connection with the Gateway is required.

The Diagnostic section is composed by two main parts: Tools and Viewers.

- **Tools**

Use the tools section to check the current hardware status of the box, log communications into compressed files to be sent to the support, change the Diagnostic panels' view or send commands to the gateway.

- **Viewers**

In order to check the current status, viewer for the Internal and External protocols are available. It is also available a generic Console viewer for general information about communications and the gateway status and finally a Signals Viewer to simulate the BMS behavior or to check the current values in the system.

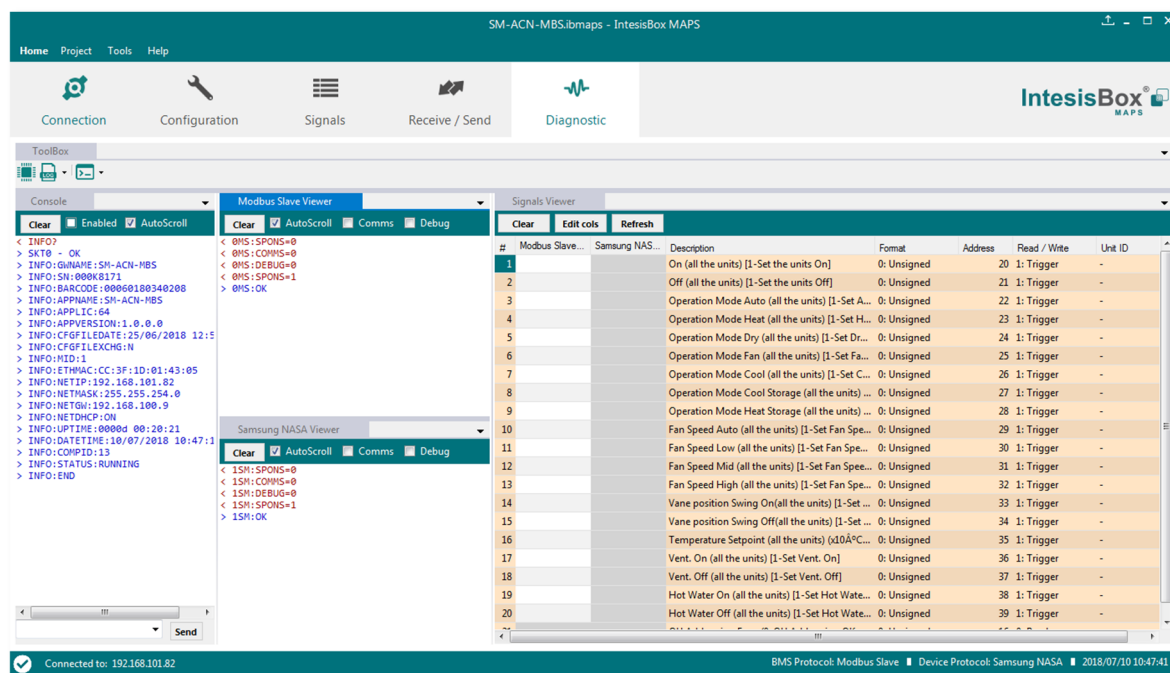


Figure 4.10 Diagnostic

More information about the Diagnostic section can be found in the Configuration Tool manual.

1.12.9 Set-up procedure

1. Install IntesisBox MAPS on your laptop, use the setup program supplied for this and follow the instructions given by the Installation wizard.
2. Install IntesisBox in the desired installation site. Installation can be on DIN rail or on a stable not vibrating surface (DIN rail mounted inside a metallic industrial cabinet connected to ground is recommended).
3. If using Modbus RTU, connect the communication cable coming from the EIA485 port of the Modbus RTU installation to the port marked as Port B of IntesisBox (More details in section 3).

If using, Modbus TCP, connect the communication cable coming from the Ethernet port of the Modbus TCP installation to the port marked as Ethernet Port of IntesisBox (More details in section 3).

4. Connect the communication cable coming from the Samsung NASA R1/R2 installation to the port marked as Port A of IntesisBox (More details in section 3).
5. Power up IntesisBox. The supply voltage can be 9 to 36 Vdc or just 24 Vac. Take care of the polarity of the supply voltage applied.

WARNING! In order to avoid earth loops that can damage IntesisBox 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.

6. If you want to connect using IP, connect the Ethernet cable from the laptop PC to the port marked as Ethernet of IntesisBox (More details in section 3).

If you want to connect using USB, connect the USB cable from the laptop PC to the port marked as Console of IntesisBox (More details in section 3).

7. Open IntesisBox MAPS, create a new project selecting a copy of the one named **IBOX-MBS-SM**.
8. Modify the configuration as desired, save it and download the configuration file to IntesisBox as explained in the IntesisBox MAPS user manual.
9. Visit the Diagnostic section, enable COMMS () and check that there is communication activity, some TX frames and some other RX frames. This means that the communication with the Centralized Controller and Modbus Master devices is OK. In case there is no communication activity between IntesisBox and the Centralized Controller and/or Modbus devices, check that those are operative: check the baud rate, the communication cable used to connect all devices and any other communication parameter.

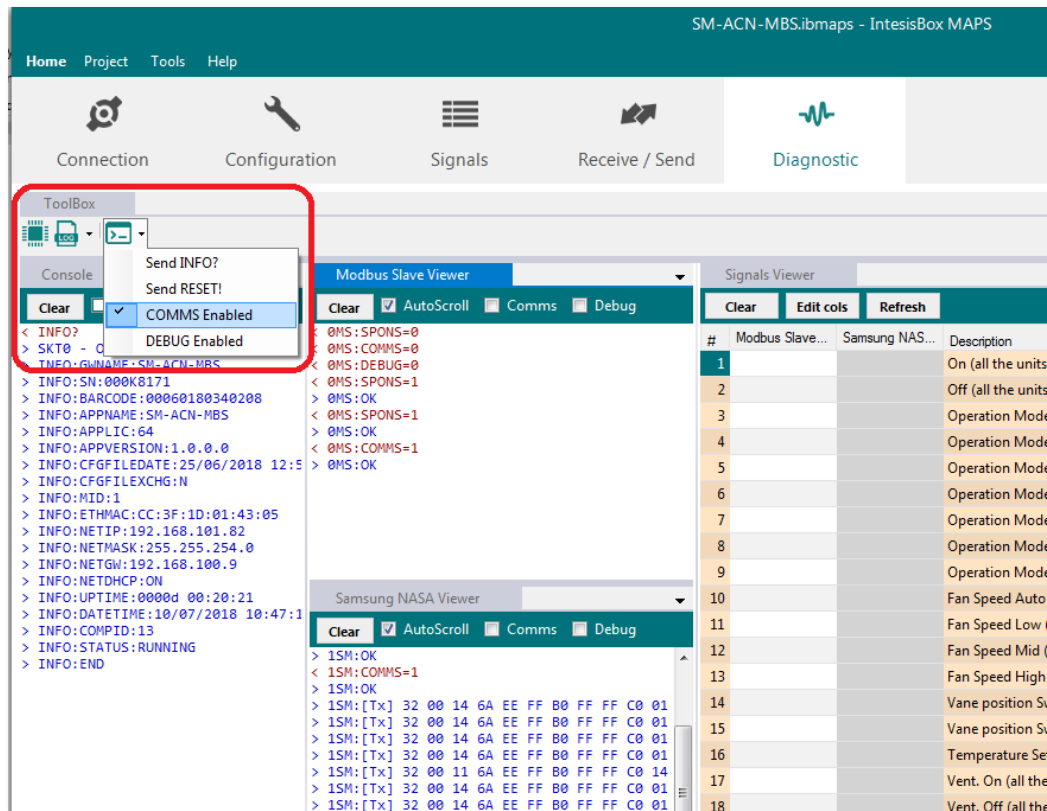


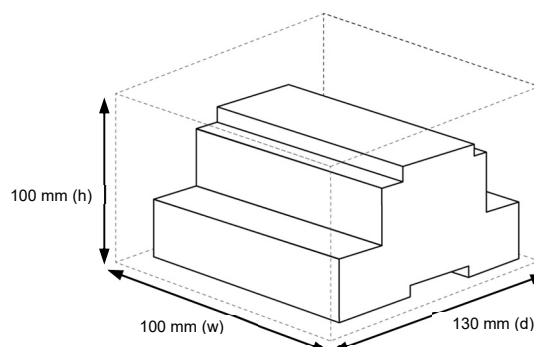
Figure 4.11 Enable COMMS

5. Electrical & Mechanical Features

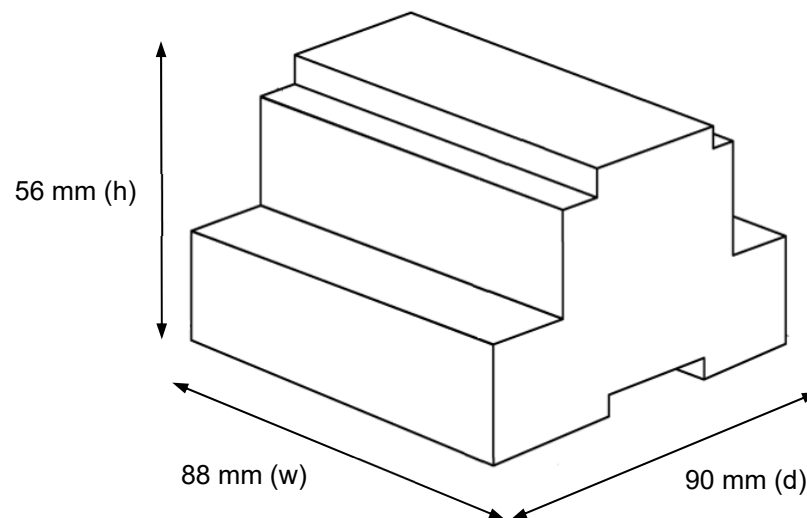


Enclosure	Plastic, type PC (UL 94 V-0) Net dimensions (dxwxh): 90x88x56 mm Recommended space for installation (dxwxh): 130x100x100mm Color: Light Grey. RAL 7035
Mounting	Wall. DIN rail EN60715 TH35.
Terminal Wiring (for power supply and low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: 0.5mm ² ... 2.5mm ² 2 cores: 0.5mm ² ... 1.5mm ² 3 cores: not permitted If cables are more than 3.05 meters long, Class 2 cable is required.
Power	1 x Plug-in screw terminal block (3 poles) 9 to 36VDC +/-10%, Max.: 140mA. 24VAC +/-10% 50-60Hz, Max.: 127mA Recommended: 24VDC
Ethernet	1 x Ethernet 10/100 Mbps RJ45 2 x Ethernet LED: port link and activity
Port A	1 x Samsung NASA port Plug-in screw terminal block orange (2 poles) R1 R2 (Samsung Nasa) 1500VDC isolation from other ports 1 x Plug-in screw terminal block green (2 poles) Reserved for future use
Switch A (SWA)	1 x DIP-Switch for PORTA configuration: Reserved for future use (leave OFF, default)
PORT B	1 x Serial EIA232 (SUB-D9 male connector) Pinout from a DTE device 1500VDC isolation from other ports (except PORT B: EIA485) 1 x Serial EIA485 Plug-in screw terminal block (3 poles) A, B, SGND (Reference ground or shield) 1500VDC isolation from other ports (except PORT B: EIA232)
Switch B (SWB)	1 x DIP-Switch for serial EIA485 configuration: Position 1: ON: 120 Ω termination active Off: 120 Ω termination inactive (default) Position 2-3: ON: Polarization active Off: Polarization inactive (default)

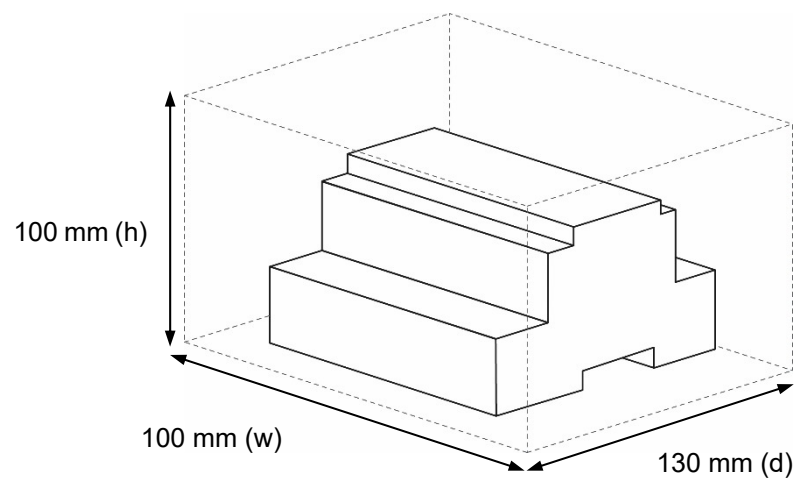
Battery	Size: Coin 20mm x 3.2mm Capacity: 3V / 225mAh Type: Manganese Dioxide Lithium
Console Port	Mini Type-B USB 2.0 compliant 1500VDC isolation
USB port	Type-A USB 2.0 compliant Only for USB flash storage device (USB pen drive) Power consumption limited to 150mA (HDD connection not allowed)
Push Button	Button A: Not used Button B: Not used
Operation Temperature	0°C to +60°C
Operational Humidity	5 to 95%, no condensation
Protection	IP20 (IEC60529)
LED Indicators	10 x Onboard LED indicators 2 x Run (Power)/Error 2 x Ethernet Link/Speed 2 x Port A TX/RX 2 x Port B TX/RX 1 x Button A indicator 1 x Button B indicator



6. Dimensions



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



7. AC Unit Types compatibility

A list of Samsung unit model references compatible with SM-ACN-KNX-4/8/16/64 and their available features can be found in:

http://intesis.com/pdf/IntesisBox_SM-ACN-xxx-MIU_AC_Compatibility.pdf

8. Error codes for Indoor and Outdoor Units

This list contains all possible values shown in Modbus register for “Error Code” for each indoor unit and outdoor unit.

It must be taken into account that Outdoor Units are only able to reflect a single error for each indoor / outdoor unit in the system. Thus, a unit having two or more active errors from that list will only report a single error code – the one of the first error that has been detected.

Error Code	Description
101	Indoor unit communication error. Indoor unit can not receive any data from outdoor unit.
102	Communication error between indoor unit and outdoor unit. Displayed in indoor unit.
108	Error due to repeated address setting (When 2 or more devices has same address within the
110	Communication error between Hydro unit HT(Main PBA) and Control kit PBA(Detection from the Control kit)
121	Error on indoor temperature sensor of indoor unit (Short or Open)
122	Error on EVA IN sensor of indoor unit (Short or Open)
123	Error on EVA OUT sensor of indoor unit (Short or Open)
128	EVA IN temperature sensor of indoor unit is detached from EVA IN pipe
129	EVA OUT temperature sensor of indoor unit is detached from EVA OUT pipe
130	Heat exchanger in/out sensors of indoor unit are detached
135	RPM feedback error of indoor unit's cleaning fan
151	Error due to opened EEV of indoor unit (2nd detection)
152	Error due to closed EEV of indoor unit (2nd detection)
153	Error on floating switch of indoor unit (2nd detection)
154	RPM feedback error of indoor unit
161	Mixed operation mode error of indoor unit; When outdoor unit is getting ready to operate in cooling (or heating) and some of the indoor unit is trying to operate in heating (or cooling) mode
162	EEPROM error of MICOM (Physical problem of parts/circuit)
163	Indoor unit's remote controller option input is Incorrect or missing. Outdoor unit EEPROM data error
180	Simultaneous opening of cooling/heating MCU SOL V/V (1st detection)
181	Simultaneous opening of cooling/heating MCU SOL V/V (2nd detection)
185	Cross wiring error between communication and power cable of indoor unit
186	Connection error or problem on SPi
190	No temperature changes in EVA IN during pipe inspection or changes in temperature indoor unit with wrong address
191	No temperature changes in EVA OUT during pipe inspection or changes in temperature is seen in indoor unit with wrong address
198	Error due to disconnected thermal fuse of indoor unit
201	Communication error between indoor and outdoor units (installation number setting error, repeated indoor unit address, indoor unit communication cable error)
202	Communication error between indoor and outdoor units (Communication error on all indoor unit, outdoor unit communication cable error)
203	Communication error between main and sub outdoor units
205	Communication error on all PBA within the outdoor unit C-Box, communication cable error
206	E206-C001: HUB PBA communication error / E206-C002: FAN PBA communication errorE206-C003:INV1 PBA communication error / E206-C004: INV2 PBA communication error
211	When single indoor unit uses 2 MCU ports that are not in series.
212	If the rotary switch (on the MCU) for address setting of the indoor unit has 3 or more of the same address

213	When total number of indoor units assigned to MCU is same as actual number of installed indoor units but there is indoor unit that is not installed even though it is assigned on MCU
214	When number of MCU is not set correctly on the outdoor unit or when two or more MCU was installed some of them have the same address
215	When two different MCU's have same address value on the rotary switch
216	When indoor unit is not installed to a MCU port but the switch on the port is set to On.
217	When indoor unit is connected to a MCU port but indoor unit is assigned to a MCU and the switch on the port is set to Off
218	When there's at least one or more actual number of indoor unit connection compared to number of indoor units assigned to MCU
219	Error on temperature sensor located on MCU intercooler inlet (Short or Open)
220	Error on temperature sensor located on MCU intercooler outlet (Short or Open)
221	Error on outdoor temperature sensor of outdoor unit (Short or open)
231	Error on COND OUT temperature sensor of main outdoor unit (Short or Open)
241	COND OUT sensor is detached
251	Error on discharge temperature sensor of compressor 1 (Short or Open)
257	Error on discharge temperature sensor of compressor 2 (Short or Open)
262	Discharge temperature sensor of compressor 1 is detached from the sensor holder on the pipe
263	Discharge temperature sensor of compressor 2 is detached from the sensor holder on the pipe
266	Top sensor of compressor 1 is detached
267	Top sensor of compressor 2 is detached
269	Suction temperature sensor is detached from the sensor holder on the pipe
276	Error on top sensor of compressor 1 (Short or Open)
277	Error on top sensor of compressor 2 (Short or Open)
291	Refrigerant leakage or error on high pressure sensor (Short or Open)
296	Refrigerant leakage or error on low pressure sensor (Short or Open)
308	Error on suction temperature sensor (Short or Open)
311	Error on temperature sensor of double layer pipe/liquid pipe(sub heat exchanger) (Short or Open)
321	Error on EVI (ESC) IN temperature sensor (Short or Open)
322	Error on EVI (ESC) OUT temperature sensor (Short or Open)
323	Error on suction sensor 2 (Short or Open)
346	Error due to operation failure of Fan2
347	Motor wire of Fan2 is not connected
348	Lock error on Fan2 of outdoor unit
353	Error due to overheated motor of outdoor unit's Fan2
355	Error due to overheated IPM of Fan2
361	Error due to operation failure of inverter compressor 2
364	Error due to over-current of inverter compressor 2
365	V-limit error of inverter compressor 2
366	Error due to over voltage /low voltage of inverter PBA2
367	Error due to unconnected wire of compressor 2
368	Output current sensor error of inverter PBA2
369	DC voltage sensor error of inverter PBA2
374	Heat sink temperature sensor error of inverter PBA2
378	Error due to overcurrent of Fan2
385	Error due to input current of inverter 2
386	Over-voltage/low-voltage error of Fan2
387	Hall IC connection error of Fan2
389	V-limit error on Fan2 of compressor
393	Output current sensor error of Fan2

396	DC voltage sensor error of Fan2
399	Heat sink temperature sensor error of Fan2
400	Error due to overheat caused by contact failure on IPM of Inverter PBA2
407	Compressor operation stop due to high pressure protection control
410	Compressor operation stop due to low pressure protection control or refrigerant leakage
416	Compressor operation stop due to discharge temperature protection control
425	Phase reversal or phase failure (3Ø outdoor unit wiring, R-S-T-N), connection error on 3 phase input
428	Compressor operation stop due abnormal compression ratio
438	EVI (ESC) EEV leakage or internal leakage of intercooler or incorrect connector insertion of EVI (ESC) EEV
439	Error due to refrigerant leakage
440	Heating mode restriction due to high air temperature
441	Cooling mode restriction due to low air temperature
442	Refrigerant charging restriction in heating mode when air temperature is over 15 °C
443	Operation prohibited due to the pressure drop
445	CCH is deatched
446	Error due to operation failure of Fan1
447	Motor wire of Fan1 is not connected
448	Lock error on Fan1
452	Error due to ZPC detection circuit problem or power failure
453	Error due to overheated motor of outdoor unit's Fan1
455	Error due to overheated IPM of Fan1
461	Error due to operation failure of inverter compressor 1
462	Compressor stop due to full current control or error due to low current on CT2
464	Error due to over-current of inverter compressor 1
465	V-limit error of inverter compressor 1
466	Error due to over voltage /low voltage of inveter PBA1
467	Error due to unconnected wire of compressor 1
468	Output current sensor error of inverter PBA1
469	DC voltage sensor error of inver PBA1
474	Heat sink temperature sensor error of inverter PBA1
478	Error due to overcurrent of Fan1
485	Error due to input current of inverter 1
486	Error due to over voltage/low voltage of Fan
487	Hall IC error of Fan1
489	V-limit error on Fan1 of compressor
493	Output current sensor error of Fan1
496	DC voltage sensor error of Fan1
499	Heat sink temperature sensor error of Fan1
500	Error due to overheat caused by contact failure on IPM of Inverter PBA1
503	Error due to alert the user to check if the service valve is closed
504	Error due to self diagnosis of compressor operation
505	Error due to self diagnosis of high pressure sensor
506	Error due to self diagnosis of low pressure sensor
560	Outdoor unit's option switch setting error (when inappropriate option switch is on)
563	Error due to module installation of indoor unit with old version (Micom version needs to be checked)
573	Error due to using single type outdoor unit in a module installation
601	Communication error between remote controller and the DVM Hydro unit / Hydro unit HT
602	Communication error between master and slave remote controller

604	Tracking error between remote controller and the DVM Hydro unit / Hydro unit HT
618	Error due to exceeding maximum numbers of Hydro unit installation (16 units)
627	Error due to exceeding maximum numbers of wired remote controller installation (2 units)
633	Error caused by installing mixed models
653	Remote controller's temperature sensor is disconnected or has problem
654	Data error on remote controller (Memory read/write error)
702	Error due to closed EEV of indoor unit (1st detection)
703	Error due to opened EEV of indoor unit (1st detection)
901	Error on the sensor of water inlet pipe (Short or Open)
902	Error on the sensor of water outlet pipe (Short or Open)
904	Error on water tank (Short or open)
907	Error due to pipe rupture protection
908	Error due to freeze prevention(Re-operation is possible)
909	Error due to freeze prevention(Re-operation is impossible)
910	Water temperature sensor on water outlet pipe is detached
911	Flow switch off error, When the switch is turned off within 10 seconds after a pump starts its operation(Re-operation is possible)
913	Six times detection for Flow Switch Error(Re-operation is not possible)
914	Error due to incorrect thermostat connection
915	Error on DC fan(Non-operating)
573	Error due to using single type outdoor unit in a module installation
601	Communication error between remote controller and the DVM Hydro unit / Hydro unit HT
602	Communication error between master and slave remote controller
604	Tracking error between remote controller and the DVM Hydro unit / Hydro unit HT
618	Error due to exceeding maximum numbers of Hydro unit installation (16 units)
627	Error due to exceeding maximum numbers of wired remote controller installation (2 units)
633	Error caused by installing mixed models
653	Remote controller's temperature sensor is disconnected or has problem
654	Data error on remote controller (Memory read/write error)
702	Error due to closed EEV of indoor unit (1st detection)
703	Error due to opened EEV of indoor unit (1st detection)
901	Error on the sensor of water inlet pipe (Short or Open)
902	Error on the sensor of water outlet pipe (Short or Open)
904	Error on water tank (Short or open)
907	Error due to pipe rupture protection
908	Error due to freeze prevention(Re-operation is possible)
909	Error due to freeze prevention(Re-operation is impossible)
910	Water temperature sensor on water outlet pipe is detached
911	Flow switch off error, When the switch is turned off within 10 seconds after a pump starts its operation(Re-operation is possible)
913	Six times detection for Flow Switch Error(Re-operation is not possible)
914	Error due to incorrect thermostat connection
915	Error on DC fan(Non-operating)