IntesisBox®

TO-RC-MBS-1 v.1.5

MODBUS RTU (EIA485) Interface for Toshiba air conditioners from the Digital Inverter & VRF lines.

User Manual

Issue Date: 01/2014

Order Codes: **TO-RC-MBS-1**

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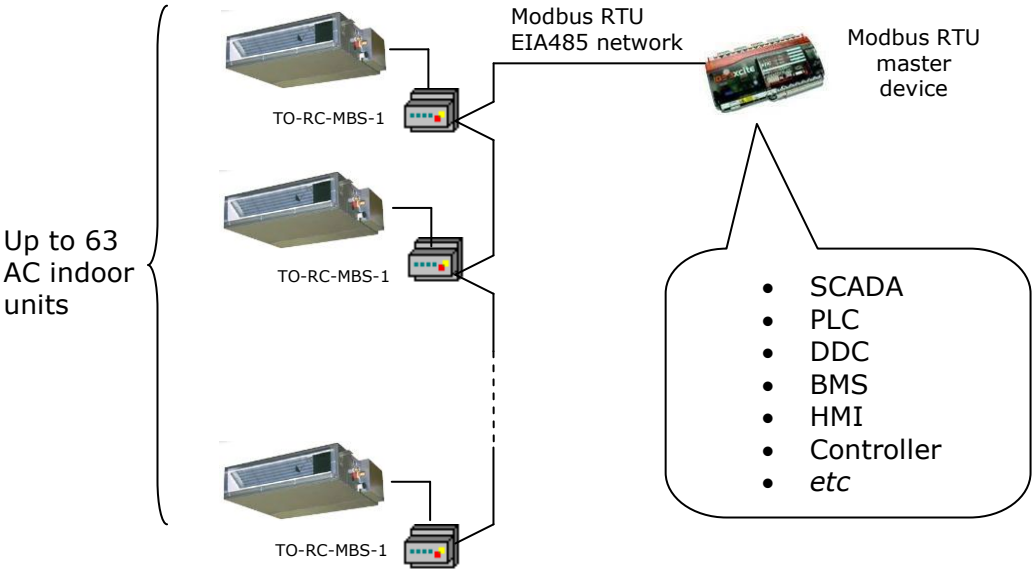
1. Presentation



The TO-RC-MBS-1 interface allows a complete and natural integration of ***Toshiba*** air conditioners into Modbus RTU (EIA485) networks.

The TO-RC-MBS-1 is compatible with the Toshiba Digital Inverter & VRF lines.

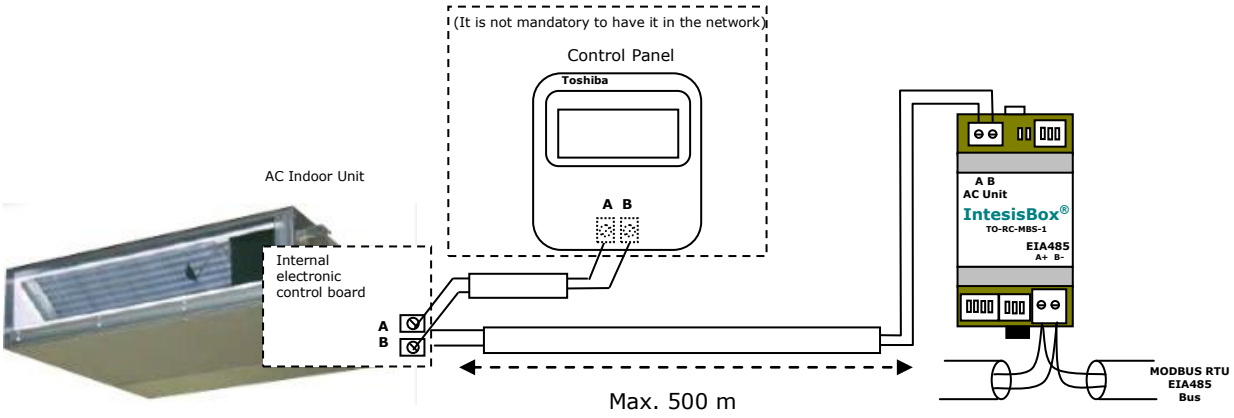
- Reduced dimensions. 93 x 53 x 58 mm.
- Quick and easy installation.
  Mountable on DIN rail, wall, or even inside the indoor unit in some models of AC.
- External power not required.
- Direct connection to MODBUS RTU (EIA485) networks.
  TO-RC-MBS-1 is a Modbus slave device.
- Direct connection to the AC indoor unit.
- Configuration from both on-board DIP-switches and MODBUS RTU.
- Total Control and Supervision.
- Real states of the AC unit's internal variables.
- Allows using simultaneously the control panel and MODBUS RTU.



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2. Connection

The interface comes with two plug-in terminal blocks of 2 poles for connection to a Modbus RTU EIA485 network and to the Toshiba AB bus.



2.1 Connect to the AC indoor unit

To connect the TO-RC-MBS-1 interface to the AC indoor unit follow these steps:

Disconnect mains power from the AC unit. Open the front cover of the indoor unit in order to have access to the electronic circuit. In the electronic circuit locate the socket connector marked as AB[1]:

Using a cable connect the interface to AB bus in any point of the bus. The AB bus is the bus that connects the AC indoor unit and the wired remote controller, is a two-wire bus connecting terminals AB of both and has no specific polarity. Respect the maximum distance of 500 m for the bus length.

2.2 Connection to the EIA485 bus

Connect the EIA485 bus wires to the plug-in terminal block (the one of two poles) of TO-RC-MBS-1, respect the polarity on this connection (A+ and B-). Respect the maximum distance of 1200 meters for the bus, no loop or star topologies are allowed for EIA485 bus, a terminator resistor of 120 Ω must be present at each end of the bus to avoid signal reflections and also a fail-safe biasing mechanism (see section 3.6 for more details).

[1] In some models, the AB connector is not present. Find the Control Panel (remote controller) bus and connect the cable coming from the IntesisBox gateway into these cables as if they were the AB connector.

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3. Modbus Interface Specification

3.1 Modbus physical layer

TO-RC-MBS-1 implements a MODBUS RTU (slave) interface, to be connected to an EIA485 line. It performs 8N2 (8N1-compatible) communication (8 data bits, no parity and 2 stop bit) with several available baudrates (2400 bps, 9600 bps -default-, 19200 bps and 57600 bps).

3.2 Modbus Registers

All registers are of type "16-bit signed Holding Register", in standard ModBus' big endian notation.

3.2.1 Control and status registers

Register Addr (protocol address)	Register Addr (PLC address)	R/W	Description
0	1	R/W	AC unit On/Off ▪ 0: Off ▪ 1: On
1	2	R/W	AC unit Mode ▪ 0: Auto ▪ 1: Heat ▪ 2: Dry ▪ 3: Fan ▪ 4: Cool
2	3	R/W	AC unit Fan Speed ▪ 0: Auto ▪ 1: Low ▪ 2: Mid ▪ 3: High
3	4	R/W	AC unit Vane Position ▪ 0: Vane Off (Stand-by) ▪ 1: POS1 (Horizontal) ▪ 2: POS2 (Horizontal) ▪ 3: POS3 (Med) ▪ 4: POS4 (Vert) ▪ 5: POS5 (Vert) ▪ 10: SWING
4	5	R/W	AC unit Temperature Setpoint (ºC/ºF) ▪ (ºC/x10ºC/F)[2] ▪ ***See section 3.2.3 below.***
5	6	R	AC unit Ambient Temperature (ºC/ºF) ▪ (ºC/x10ºC/F)[2] ▪ ***See section 3.2.3 below.***
6	7	R/W	Window Contact ▪ 0: Closed ▪ 1: Open
7	8	R/W	Modbus Command Disablement[3] ▪ 0: Modbus Commands enabled

[2] Magnitude for this register can be adjusted to Celsius x 1ºC, Celsius x 10ºC (default) or Fahrenheit through DIP switches
[3] Value of this register is stored in non-volatile memory (EEPROM)

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			(default) ▪ 1: Modbus Commands disabled (device in monitor-only mode)
8	9	R/W	Remote Command Disablement ▪ 0: Remote Command enabled ▪ 1: Remote Command disabled
9	10	R/W	AC unit Operation Time[3] ▪ 0..65535 (hours). Counts the time the AC unit is in "On" state.
10	11	R	AC unit Alarm Status ▪ 0: No alarm condition ▪ 1: Alarm condition
11	12	R	Error Code
22	23	R/W	Indoor unit ambient temperature from external sensor (at Modbus side) ▪ -32768: Default value. No temperature is being provided from an external sensor. ▪ Any other: (ºC/x10ºC/ºF)[4] ▪ ***See section 3.2.3 below.***
23	24	R	Current setpoint in AC indoor unit ▪ (ºC/x10ºC/F)[2] ▪ This read-only register shows the setpoint of the indoor unit: when register "indoor unit ambient temperature from external sensor" (23 in PLC addressing) is not used, value for register 24 and register 5 will be the same. ▪ ***See section 3.2.3 below.***

3.2.2 Configuration Registers

Register Addr (protocol address)	Register Addr (PLC address)	R/W	Description
12	13	R/W	Reserved
13	14	R/W	"Open Window" switch-off timeout ▪ 0..30 (minutes) ▪ Factory setting: 30 (minutes)
14	15	R	Modbus RTU baud-rate (bps) ▪ 2400 ▪ 4800 ▪ 9600 ▪ 19200
15	16	R	Device's Modbus slave address ▪ 1..63
21	22	R	Max number of fan speeds ▪ 3 (fixed value)
49	50	R	Device Identification TO-RC-MBS-1: 0x1500 (5376d)
50	51	R	Software version

[4] Magnitude for this register can be adjusted to Celsius x 1ºC, Celsius x 10ºC (default) or Fahrenheit through DIP switches S4

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All registers are of type "16-bit unsigned Holding Register", in standard ModBus big endian notation.

3.2.3 Considerations on TO-RC-MBS-1 temperature registers

TO-RC-MBS-1 implements four registers containing temperature values:

- **AC unit Temperature Setpoint (R/W)** (register 5 – in PLC addressing): This is the adjustable temperature setpoint meant to be required by the user. This register can be read (Modbus function 3 or 4) or written (modbus functions 5 or 16). A remote controller connected to the AB bus of the Toshiba indoor unit will report the same temperature setpoint value as this register only when no AC unit external reference is provided from TO-RC-MBS-1 (see detail for register 23 below).

- **AC unit ambient temperature temperature (R)** (register 6 – in PLC addressing): This register reports the temperature that is actually used by the Toshiba indoor unit as reference of its own control loop. Depending on the configuration of the indoor unit, this can be the temperature reported by the sensor in in the return path of the Toshiba indoor unit or the sensor of an additional remote controller in the AB bus. It is a read-only register (modbus functions 3 or 4).

- **AC unit external temperature reference (R/W)** (register 23 – in PLC addressing): This register allows providing an external temperature reference from modbus side. AB does not directly allow for devices like TO-RC-MBS-1 to directly provide a temperature to be used as reference of the control loop of the AC indoor unit. In order to overcome that limitation and enable usage of an external temperature sensor (i.e. in Modbus side), TO-RC-MBS-1 applies following mechanism (if and only if "external reference temperature" is being used):

    - After a couple of values are entered in the "AC unit external reference temperature" (register 23) and "AC unit temperature setpoint" (register 5), TO-RC-MBS-1 will calculate the temperature demand they imply. (e.g. if a "temperature setpoint (register 5)" of **22ºC**, and an "external temperature reference (register 23)" of **20ºC** are entered, TO-RC-MBS-1 will assume that the user is demanding a **+2ºC** increase in temperature).

    - By knowing at all times the ambient temperature actually used by the indoor unit to control its own operation (register 6), TO-RC-MBS-1 can calculate the required setpoint so to apply the demand desired by the user (following the example above, if TO-RC-MBS-1 reads an "ambient temperature" (register 6) of **24ºC** in the indoor unit, it will apply a final setpoint of **24ºC + 2ºC = 26ºC**).

    - From this point on, whenever TO-RC-MBS-1 detects that the ambient temperature reported by the indoor unit changes (register 6), it will also change the required setpoint accordingly, in order to keep the demand required by the user at any time (following the example above, if TO-RC-MBS-1 receives a new value for temperature coming from the indoor unit pf **25ºC**, TO-RC-MBS-1 will automatically adjust the setpoint required to the AC indoor unit to **25ºC + 2ºC = 27ºC**)

    - In general, TO-RC-MBS-1 is constantly applying the following formula:

$$S_{AC} = S_u - (T_u - T_{AC})$$

      Where:

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S_{AC} - setpoint actually applied to the indoor unit
S_u - setpoint written at modbus side / TO-RC-MBS-1 register 5
T_u - external temperature reference written at Modbus side / PA-RC-MBS-1 register 23
T_{AC} - ambient temperature that the indoor unit is using as reference of its own control loop register 6

Whenever TO-RC-MBS-1 detects a change in any of the values of $\{ S_u , T_u , T_{AC} \}$, it will send the new corresponding setpoint (S_{AC}) to the indoor unit.

- After startup, value for "external temperature reference" (register 23) has value -32768 (0x8000). This value means that no external temperature is being provided through TO-RC-MBS-1. In this scenario, setpoint shown or written in register 5 will always have same value as the actual setpoint of the indoor unit.

- Note that, using the "external temperature reference" (register 23) (i.e. writing a value different from -32768 / 0x8000 in it) has following relevant consequences:

  - Setpoint reported by any additional remote controller or monitoring device from Toshiba in AB, in general will be different from the one entered in register 5 of TO-RC-MBS-1, since the mechanism above is being applied.
  - User will not be able to change setpoint using any remote controller from Toshiba, as setpoint of the indoor unit will become exclusively controlled by the mechanism explained above (i.e. the setpoint obtained in that mechanism will always be enforced in the indoor unit).

- **Current setpoint in AC indoor unit (R)** (register 24 – in PLC addressing)**:** As detailed in previous point, actual setpoint in the indoor unit and setpoint requested from TO-RC-MBS-1 might differ (when a value in register 23 – "external temperature reference" is put). This register always informs of the actual setpoint being used by the indoor unit – this is also the setpoint that will show an additional remote controller from Toshiba in the AB bus.

Additionally, note that temperature values all these three registers are expressed according to the temperature format configured through its onboard DIP-Switches (See "3.3 - DIP-switch Configuration Interface"). Following formats are possible:

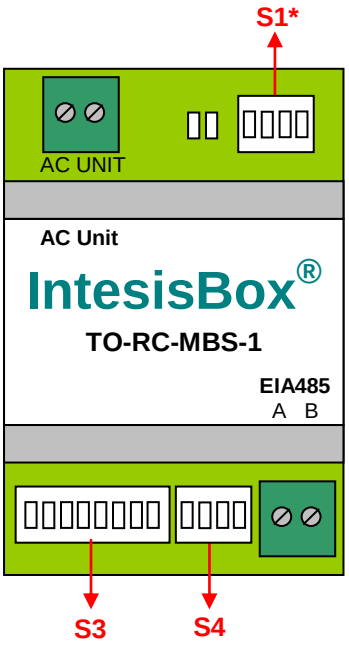
- Celsius value: Value in Modbus register is the temperature value in Celsius (i.e. a value "22" in the Modbus register must be interpreted as 22ºC)
- Decicelsius value: Value in Modbus register is the temperature value in decicelsius (i.e. a value "220" in the Modbus register must be interpreted as 22.0ºC)
- Fahrenheit value: Value in Modbus register is the temperature value in Fahrenheit (i.e. a value "72" in the Modbus register must be interpreted as 72ºF (~22ºC).

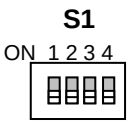
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3.3 DIP-switch Configuration Interface

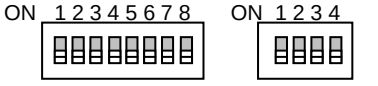
All configuration values on TO-RC-MBS-1 can be written and read from ModBus interface. Though, some of them can also be setup from its on-board DIP-switch interface.

They are DIP-switches S1*, S3* and S4 on the device, in the following location:





* DIP-Switch S1 is not used by current version of TO-RC-MBS-1



The following table applies for configuration of the interface through these DIP-switches:

S3 – Modbus protocol: Slave address and baudrate

Add	Switches 1 2 3 4 5 6 7 8	Add	Switches 1 2 3 4 5 6 7 8	Add	Switches 1 2 3 4 5 6 7 8	Add	Switches 1 2 3 4 5 6 7 8
0	↓ ↓ ↓ ↓ ↓ ↓ x x	16	↓ ↓ ↓ ↓ ↑ ↓ x x	32	↓ ↓ ↓ ↓ ↓ ↑ x x	48	↓ ↓ ↓ ↓ ↑ ↑ x x
1*	↑ ↓ ↓ ↓ ↓ ↓ x x	17	↑ ↓ ↓ ↓ ↑ ↓ x x	33	↑ ↓ ↓ ↓ ↓ ↑ x x	49	↑ ↓ ↓ ↓ ↑ ↑ x x
2	↓ ↑ ↓ ↓ ↓ ↓ x x	18	↓ ↑ ↓ ↓ ↑ ↓ x x	34	↓ ↑ ↓ ↓ ↓ ↑ x x	50	↓ ↑ ↓ ↓ ↑ ↑ x x
3	↑ ↑ ↓ ↓ ↓ ↓ x x	19	↑ ↑ ↓ ↓ ↑ ↓ x x	35	↑ ↑ ↓ ↓ ↓ ↑ x x	51	↑ ↑ ↓ ↓ ↑ ↑ x x
4	↓ ↓ ↑ ↓ ↓ ↓ x x	20	↓ ↓ ↑ ↓ ↑ ↓ x x	36	↓ ↓ ↑ ↓ ↓ ↑ x x	52	↓ ↓ ↑ ↓ ↑ ↑ x x
5	↑ ↓ ↑ ↓ ↓ ↓ x x	21	↑ ↓ ↑ ↓ ↑ ↓ x x	37	↑ ↓ ↑ ↓ ↓ ↑ x x	53	↑ ↓ ↑ ↓ ↑ ↑ x x
6	↓ ↑ ↑ ↓ ↓ ↓ x x	22	↓ ↑ ↑ ↓ ↑ ↓ x x	38	↓ ↑ ↑ ↓ ↓ ↑ x x	54	↓ ↑ ↑ ↓ ↑ ↑ x x
7	↑ ↑ ↑ ↓ ↓ ↓ x x	23	↑ ↑ ↑ ↓ ↑ ↓ x x	39	↑ ↑ ↑ ↓ ↓ ↑ x x	55	↑ ↑ ↑ ↓ ↑ ↑ x x
8	↓ ↓ ↓ ↑ ↓ ↓ x x	24	↓ ↓ ↓ ↑ ↑ ↓ x x	40	↓ ↓ ↓ ↑ ↓ ↑ x x	56	↓ ↓ ↓ ↑ ↑ ↑ x x
9	↑ ↓ ↓ ↑ ↓ ↓ x x	25	↑ ↓ ↓ ↑ ↑ ↓ x x	41	↑ ↓ ↓ ↑ ↓ ↑ x x	57	↑ ↓ ↓ ↑ ↑ ↑ x x
10	↓ ↑ ↓ ↑ ↓ ↓ x x	26	↓ ↑ ↓ ↑ ↑ ↓ x x	42	↓ ↑ ↓ ↑ ↓ ↑ x x	58	↓ ↑ ↓ ↑ ↑ ↑ x x
11	↑ ↑ ↓ ↑ ↓ ↓ x x	27	↑ ↑ ↓ ↑ ↑ ↓ x x	43	↑ ↑ ↓ ↑ ↓ ↑ x x	59	↑ ↑ ↓ ↑ ↑ ↑ x x
12	↓ ↓ ↑ ↑ ↓ ↓ x x	28	↓ ↓ ↑ ↑ ↑ ↓ x x	44	↓ ↓ ↑ ↑ ↓ ↑ x x	60	↓ ↓ ↑ ↑ ↑ ↑ x x
13	↑ ↓ ↑ ↑ ↓ ↓ x x	29	↑ ↓ ↑ ↑ ↑ ↓ x x	45	↑ ↓ ↑ ↑ ↓ ↑ x x	61	↑ ↓ ↑ ↑ ↑ ↑ x x
14	↓ ↑ ↑ ↑ ↓ ↓ x x	30	↓ ↑ ↑ ↑ ↑ ↓ x x	46	↓ ↑ ↑ ↑ ↓ ↑ x x	62	↓ ↑ ↑ ↑ ↑ ↑ x x
15	↑ ↑ ↑ ↑ ↓ ↓ x x	31	↑ ↑ ↑ ↑ ↑ ↓ x x	47	↑ ↑ ↑ ↑ ↓ ↑ x x	63	↑ ↑ ↑ ↑ ↑ ↑ x x

Table 3.1 Modbus Slave address

* Default value

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Binary value $b_0...b_8$	Decimal value	Switches 1 2 3 4 5 6 7 8	Description
xxxxxx00	0	x x x x x x ↓ ↓	2400bps
xxxxxx10	1	x x x x x x ↑ ↓	4800bps
xxxxxx01	2	x x x x x x ↓ ↑	9600bps (- default value)
xxxxxx11	3	x x x x x x ↑ ↑	19200bps

Table 3.2 Modbus baud rate

S4 – Other: Degrees/Decidegress (x10), temperature magnitude (ºC/ºF) and EIA485 termination resistor

Binary value $b_0...b_4$	Decimal value	Switches 1 2 3 4	Description
0xxx	0	↓ x x x	Temperature values in Modbus register are represented in degrees (x1) (default value)
1xxx	1	↑ x x x	Temperature values in Modbus register are represented in decidegrees (x10)
x0xx	0	x ↓ x x	Temperature values in Modbus register are represented in Celsius degrees (default value)
x1xx	1	x ↑ x x	Temperature values in Modbus register are represented in Fahrenheit degrees
xxx0	0	x x x ↓	EIA485 bus without termination resistor (default value)
xxx1	1	x x x ↑	Internal termination resistor of 120Ω connected to EIA485 bus**

Table 3.3 Temperature and termination configuration

3.4 Implemented Functions

TO-RC-MBS-1 implements the following standard MODBUS functions:

- 3: Read Holding Registers
- 4: Read Input Registers
- 6: Write Single Register
- 16: Write Multiple Registers (Although this function is allowed, the interface does not allow write operations on more than 1 register with the same request, this means that length field should always be 1 when using this function for writes)

** Only in the interfaces connected at both ends of the bus must be activated the termination resistor. More information in section 3.6

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3.5 Device LED indicator

The device includes two LED indicators to signal its different possible operational states. In this section their meaning is explained

L1 (yellow)			
Operation	**ON**	**OFF**	**Meaning**
Blinking	500 ms	500 ms	Communication error
Flashing	100 ms	1900 ms	Normal operation (configured and working)
L1 (yellow) & L2 (red)			
Operation	**ON**	**OFF**	**Meaning**
Pulse	5 sec	--	Device start-up
Alternate blinking	500 ms	500 ms	EEPROM failure

3.6 EIA485 bus. Termination resistors and Fail Safe Biasing mechanism

EIA485 bus requires a 120Ω terminator resistor at each end of the bus to avoid signal reflections.

In order to prevent fail status detections by the receivers *"listening"* the bus when all the transmitters outputs are in three-state (high impedance), it is also required a fail-safe biasing mechanism. This mechanism provides a safe status (a correct voltage level) in the bus when all the transmitters' outputs are in three-state.

The TO-RC-MBS-1 device includes an on-board terminator resistor of 120Ω that can be connected to the EIA485 bus by using DIP-switch P5 (see below).

Fail safe biasing of the EIA485 bus must only be supplied by one of the devices connected to the bus. The device providing fail safe biasing or terminator resistor should be the one connected at one end of the bus. At the other end of the bus, if there is also a TO-RC-MBS-1 device, select the 120Ω terminator resistor through DIP-switch P5, or if there is a master device not providing internal 120Ω terminator resistor, connect an external 120Ω resistor in the bus terminal block connection of such master device.

Some Modbus RTU EIA485 master devices can provide also internal 120Ω terminator resistor and/or fail safe biasing (consult the technical documentation of the master device connected to the EIA485 network in every case).

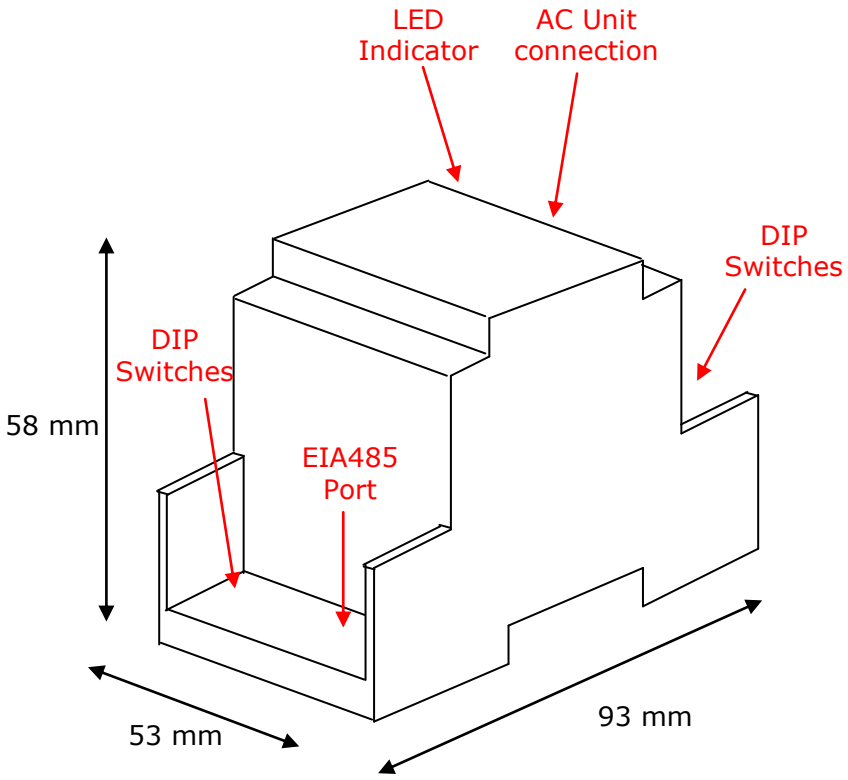
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4. Specifications

Dimensions:	*93 x 53 x 58 mm*
Weight:	*85 g*
Operating Temperature:	*0 . . . 40ºC*
Stock Temperature:	*0 . . . 40ºC*
Operating Humidity:	*<95% RH, non-condensing*
Stock Humidity:	*<95% RH, non-condensing*
Isolation voltage:	*1000 VDC*
Isolation resistance:	*1000 MΩ*
Modbus Media:	*Compatible with Modbus RTU - EIA485 networks*



5. List of supported AC Unit Types

A list of Toshiba indoor unit model references compatible with TO-RC-MBS-1 and their available features can be found in:

Toshiba:
http://www.intesis.com/pdf/IntesisBox_TO-RC-xxx-1_Compatibility.pdf

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6. Error Codes

Error Code	Error in Control Panel	Error category	Error Description
0	N/A	TO-RC-MBS-1	No active error
21	C01	Central Controller Issues	Duplicated setting of control address
22	C02		Central control number of units mis-matched
23	C03		Incorrect wiring of central control
24	C04		Incorrect connection of central control
25	C05		System Controller fault, error in transmitting comms signal, i/door or o/door unit not working, wiring fault
26	C06		System Controller fault, error in receiving comms signal, i/door or o/door unit not working, wiring fault, CN1 not connected correctly
2C	C12		Batch alarm by local controller
30	C16		Transmission error from adaptor to unit
31	C17		Reception error to adaptor from unit
32	C18		Duplicate central address in adaptor
33	C19		Duplicate adaptor address
34	C20		Mix of PAC & GHP type units on adaptor
35	C21		Memory fault in adaptor
36	C22		Incorrect address setting in adaptor
37	C23		Host terminal software failure
38	C24		Host terminal hardware failure
39	C25		Host terminal processing failure
3A	C26		Host terminal communication failure
3C	C28		Reception error of S-DDC from host terminal
3D	C29		Initialization failure of S-DDC
3F	C31		Configuration change detected by adaptor
41	E01	Addressing and Communication Problems	Remote control detecting error from indoor unit, Address not set/Auto address failed. Check interconnecting wiring etc. Re-address system.
42	E02		Remote detecting error from indoor unit,
43	E03		Indoor unit detecting error from remote,
44	E04		Indoor seeing error from outdoor. Qty of i/d units connected are less than qty set. Check; all i/d units are ON, reset turn off all units wait 5min power up
45	E05		Indoor unit detecting error from outdoor unit, Error in sending comms signal
46	E06		Outdoor unit detecting error from indoor unit, Error in receiving comms signal
47	E07		Outdoor unit detecting error from indoor unit, Error in sending comms signal
48	E08		Incorrect setting indoor/controller, Indoor address duplicated
49	E09		Incorrect setting indoor/controller, Remote address duplicated or IR wireless controller not disabled
4A	E10		Indoor unit detecting error from 'option' plug, Error in sending comms signal
4B	E11		Indoor unit detecting error from 'option' plug, Error in receiving comms signal
4C	E12		Auto addressing failed, Auto address connector CN100 shorted during auto addressing
4D	E13		Indoor unit failed to send signal to remote controller
4E	E14		Setting Failure, Duplication of master indoor units
4F	E15		Auto addressing failed, Number of indoor units connected are less than number set

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50	E16		Auto addressing failed, Number of indoor units connected are more than number set
51	E17		Group control wiring error, Main indoor unit not sending signal for sub indoor units
52	E18		Group control wiring error, Main indoor unit not receiving signal for sub indoor units
54	E20		Auto addressing failed, No indoor units connected
58	E24		Auto addressing failed, Error on sub outdoor unit
59	E25		Auto addressing failed, Error on outdoor unit address setting
5A	E26		Auto addressing failed, Quantity of main and sub outdoor units do not correspond to the number set on main outdoor unit P.C.B.
5D	E29		Auto addressing failed, Sub outdoor unit not receiving comms for main outdoor unit
5F	E31		Between units, Comms failure with MDC, does E31 remain after power is re-instated? If so replace PCB. & power PCB
61	F01	Sensor Faults	Indoor Heat Exch inlet temp sensor failure (E1)
62	F02		Indoor Heat Exch freeze temp sensor failure (E2)
63	F03		Indoor Heat Exch outlet temp sensor failure (E3)
64	F04		Outdoor Discharge temp sensor failure (TD) or (DISCH1)
65	F05		Outdoor Discharge temp sensor failure (DISCH2)
66	F06		Outdoor Heat Exch temp sensor failure (C1) or (EXG1)
67	F07		Outdoor Heat Exch temp sensor failure (C2) or (EXL1)
68	F08		Outdoor Air temp sensor failure (TO)
6A	F10		Indoor inlet temp sensor failure
6B	F11		Indoor outlet temp sensor failure
6C	F12		Outdoor Intake sensor failure (TS)
6D	F13		GHP - Cooling water temperature sensor failure
70	F16		Outdoor High pressure sensor failure
71	F17		GHP - Cooling water temperature sensor fault
72	F18		GHP - Exhaust gas temperature sensor fault
74	F20		GHP Clutch coil temperature fault
77	F23		Outdoor Heat Exch temp sensor failure (EXG2)
78	F24		Outdoor Heat Exch temp sensor failure (EXL2)
7D	F29		Indoor EEPROM error
7E	F30		Clock Function (RTC) fault
7F	F31		Outdoor EEPROM error
81	H01	Compressor Issues	Compressor Fault, Over current (Comp1)
82	H02		Compressor Fault, Locked rota current detected (Comp1)
83	H03		Compressor Fault, No current detected (Comp1)
85	H05		Compressor Fault, Discharge temp not detected (Comp1)
86	H06		Compressor Fault, Low Pressure trip
87	H07		Compressor Fault, Low oil level
88	H08		Compressor Fault, Oil sensor Fault (Comp1)
8B	H11		Compressor Fault, Over current (Comp2)
8C	H12		Compressor Fault, Locked rota current detected (Comp2)
8D	H13		Compressor Fault, No current detected (Comp2)
8F	H15		Compressor Fault, Discharge temp not detected (Comp2)
95	H21		Compressor Fault, Over current (Comp3)
96	H22		Compressor Fault, Locked rota current detected (Comp3)
97	H23		Compressor Fault, No current detected (Comp3)
99	H25		Compressor Fault, Discharge temp not detected (Comp3)
9B	H27		Compressor Fault, Oil sensor fault (Comp2)
9C	H28		Compressor Fault. Oil sensor (connection failure)
9F	H31		Compressor Fault. IPM trip (IMP current on temperature)
C1	L01	Incorrect Settings	Setting Error, Indoor unit group setting error
C2	L02		Setting Error, Indoor/outdoor unit type/model miss-matched
C3	L03		Duplication of main indoor unit address in group control

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C4	L04		Duplication of outdoor unit system address
C5	L05		2 or more controllers have been set as 'priority' in one system - shown on controllers set as 'priority'
C6	L06		2 or more controllers have been set as 'priority' in one system - shown on controllers not set as 'priority'
C7	L07		Group wiring connected on and individual indoor unit
C8	L08		Indoor unit address/group not set
C9	L09		Indoor unit capacity code not set
CA	L10		Outdoor unit capacity code not set
CB	L11		Group control wiring incorrect
CD	L13		Indoor unit type setting error, capacity
CF	L15		Indoor unit paring fault
D0	L16		Water heat exch unit setting failure
D1	L17		Miss-match of outdoor unit with different refrigerant
D2	L18		4-way valve failure
D3	L19		Water heat exch unit duplicated address
D5	L21		Gas type setup failure
E1	P01	Indoor Unit Problems	Indoor unit fault, Fan motor thermal overload
E2	P02		Outdoor unit fault, Compressor motor thermal overload, over or under voltage
E3	P03		Outdoor unit fault, Compressor discharge temperature too high (Comp1) over 111 ºC. Low on ref gas, exp valve, pipework damage.
E4	P04		Outdoor unit fault, High pressure trip
E5	P05		Outdoor unit fault, Open phase on power supply. Check power on each phase, inverter pcb, control pcb
E9	P09		Indoor unit fault, Ceiling panel incorrectly wired
EA	P10		Indoor unit fault, Condensate float switch opened
EB	P11		GHP - Water Heat exch low temp (frost protection) fault
EC	P12		Indoor unit fault, Fan DC motor fault
EE	P14		Input from leak detector (If fitted)
EF	P15		Refrigerant loss, high discharge temp and EEV wide open and low compressor current draw.
F0	P16		Outdoor unit fault, Open phase on compressor power supply
F1	P17		Outdoor unit fault, Compressor discharge temperature too high (Comp2) over 111 degC. Low on ref gas, exp valve, pipework damage.
F2	P18		Outdoor unit fault, By-pass valve failure
F3	P19		Outdoor unit fault, 4 way valve failure, i/door temp rises in cooling or fills in heating. Check wiring, coil, pcb output, valve operation.
F4	P20		Ref gas, high temp/pressure fault, heat exch temp high C2, 55-60 degC, cooling over-load, sensor fault.
F6	P22		Outdoor unit fan motor fault, fan blade jammed, check connections, does fan turn freely, motor resistance 30-40ohm on each pair, no fan fault, yes pcb fault.
FA	P26		Outdoor unit fault, Compressor overcurrent - check winding resistance, Inverter failure - check internal resistance term HIC + & - to UVW 200-300Kohm or more
FC	P29		Outdoor unit fault, Inverter circuit fault - Motor-current Detection Circuit (MDC) fault, check comp windings, sensors C1 & TS, if ok possible pcb failure.
FD	P30		Indoor unit fault, System controller detected fault on sub indoor unit
FF	P31		Simultaneous operation multi control fault, Group controller fault
65535 (-1)	N/A	TO-RC-MBS-1	Error in the communication of TO-RC-MBS-1device with the AC unit

☞ In case you detect an error code not listed, contact your nearest Toshiba technical support service.

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