TOSHIBA
Leading Innovation

Modbus INTERFACE

Installation Manual

Modbus Interface

Model name:

TCB-IFMB641TLE

- Thank you very much for purchasing this TOSHIBA Modbus Interface.
- Please read this manual carefully beforehand for proper installation of the Modbus Interface.

Contents

1 Precautions for safety

- Read these “Precautions for Safety” carefully before installation.
- The precautions described below include important items regarding safety. Observe them without fail. Understand the following details (indications and symbols) before reading the body text, and follow the instructions.
- After the installation work has been completed, perform a test run to check for any problems. Explain how to use and maintain the unit to the customer.
- Ask customer to keep this Manual at accessible place for future reference.

Indication	Meaning of Indication
⚠WARNING	Text set off in this manner indicates that failure to adhere to the directions in the warning could result in serious bodily harm (*1) or loss of life if the product is handled improperly.
⚠CAUTION	Text set off in this manner indicates that failure to adhere to the directions in the caution could result in serious bodily injury (*2) or damage (*3) to property if the product is handled improperly.

*1: Serious bodily harm indicates loss of eyesight, injury, burns, electric shock, bone fracture, poisoning, and other injuries which leave aftereffect and require hospitalization or long-term treatment as an outpatient.
*2: Bodily injury indicates injury, burns, electric shock, and other injuries which do not require hospitalization or long-term treatment as an outpatient.
*3: Damage to property indicates damage extending to buildings, household effects, domestic livestock, and pets.

Symbols	Meaning of Symbols
	“⃠” Indicates prohibited items. The actual contents of the prohibition are indicated by a picture or text placed inside or next to the graphic symbol.
	“❗” Indicates compulsory (mandatory) items. The actual contents of the obligation indicated by a picture or text placed inside or next to the graphic symbol.

⚠WARNING	
	• **Ask an authorized dealer or qualified installation professional to install or reinstall this unit.** Inappropriate installation may result in electric shock or fire. • **Electrical work must be performed by a qualified electrician in accordance with this installation manual.** **The work must satisfy all local, national and international regulations.** Inappropriate work may result in electric shock or fire. • **Be sure to turn off all main power supply switches before starting any electrical work.** Failure to do so may result in electric shock.
	• **Do not modify the unit.** A fire or an electric shock may occur.

⚠CAUTION	
	• **Do not install this unit where flammable gas may leak.** If gas leaks and accumulates around the unit, it may cause a fire.
	• **Perform wiring correctly in accordance with specified the current capacity.** Failure to do so may result in short-circuiting, overheating or fire. • **Use predefined cable and connect them certainly. Keep the connecting terminal free from external force.** It may cause an exothermic or a fire.

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2 Introduction

■ Applications / Functions / Specifications

Applications

- The Modbus Interface is used to connect air conditioners (with TCC-LINK installed) and TCB-IFCG1TLE to Modbus* system.

Functions

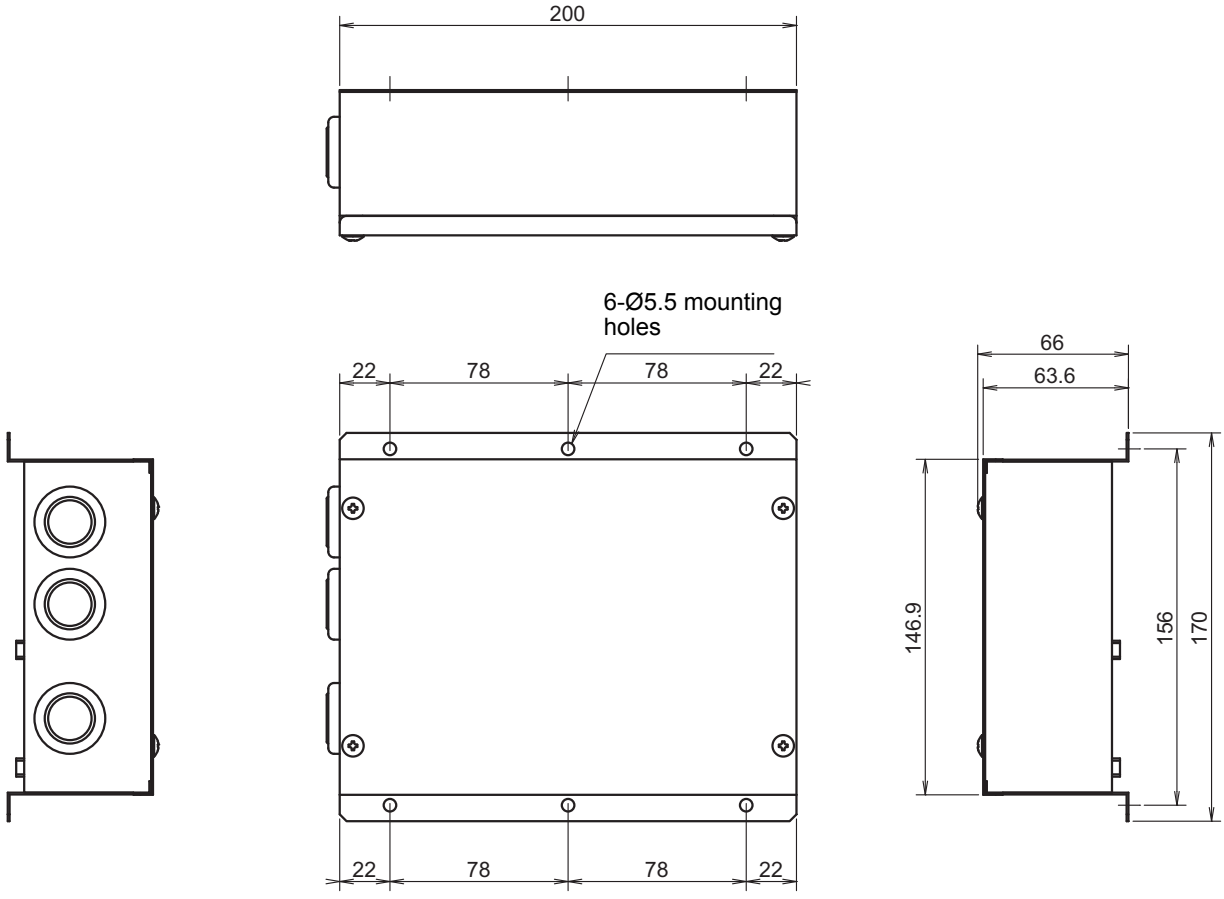
- The Modbus Interface converts signals between TCC-LINK and Modbus Master.

Specifications

Power supply	220 - 240 VAC, 50/60 Hz
Power consumption	3 W
Operating temperature / humidity	0 to 40 °C, 10 to 90 % RH (no condensation)
Storage temperature	-20 to +60 °C
Chassis material	Galvanized sheet metal 0.8 t (no coating)
Dimensions	66 (H) x 170 (W) x 200 (D) mm
Mass	1.1 kg

* Note) “Modbus” is a registered trade mark of Schneider Electric SA.

■ External view



3 Before installation

Check the following package contents.

No.	Item	Quantity	Remarks
1	Modbus Interface	1	
2	Installation Manual	1	
3	Screw	4	M4 x 12 mm tapping screws
4	Cable clamp	1	
5	Clamp filter	1	
6	Tie-wrap	1	For fixing the clamp filter
7	CD-R	1	

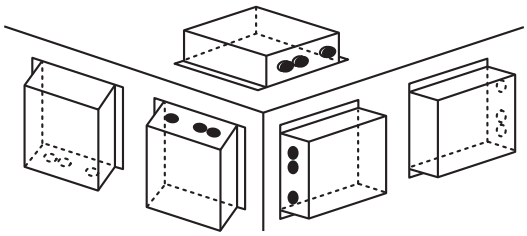
Use the following wiring materials to connect the communication cables and power cables. (locally procured)

No.	Line	Description	
1	For TCC-LINK	Type	2-core shielded wires
		Wire size	1.25 mm^2, 1000 m max. 2.00 mm^2, 2000 m max. (total length including air conditioner area)
		Length	
2	For RS-485	Type	2-core shielded wires
		Wire size	1.25 mm^2, 500 m max. (total length)
		Length	
3	For power	Type	H07 RN-F or 245IEC66 0.75 mm^2, 50 m max.
		Wire size	

4 Installation

■ Modbus Interface installation method and orientation

There are five installation methods for this Modbus Interface as shown below: surface mount and wall mounts. Use the attached screws.



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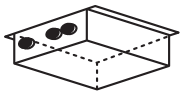


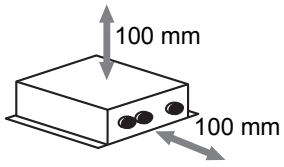
REQUIREMENT

Do not install the unit in any of the following places.

- Humid or wet place
- Dusty place
- Place exposed to direct sunlight
- Place where there is a TV set or radio within one meter
- Place exposed to rain (outdoors, under eaves, etc.)

■ Installation space and maintenance space

A side space for connecting through cable inlets and an upper space for maintenance must be reserved before installation.
The other sides can be adjacent to surrounding objects.



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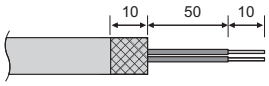
5 Connection of power cables / earth wires / communication cables

⚠ CAUTION

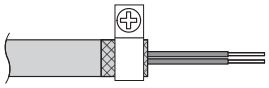
- The RS-485 communication cables have polarity. Connect A(+) to A(+), and B(-) to B(-). If connected with incorrect polarity, the unit will not work.
- The TCC-LINK communication cable have no polarity.

Connect power cables, earth wires, and communications cables to the specified terminals on the terminal block.

Length of stripped RS-485 communication cable (not shielded wire ends)

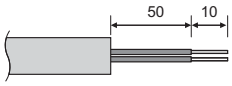


Clamping RS-485 communication cable (address 1)

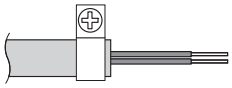


The RS-485 communication cable must be earthed on address 1 (Modbus Interface address SW=1) Modbus Interface. Fix the shielded wire of RS-485 communication cable with metal cable clamp and screw it to the chassis to earth it.

Length of stripped RS-485 (Shielded wire ends) and TCC-LINK communication cable

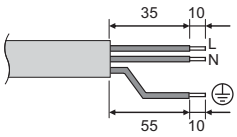


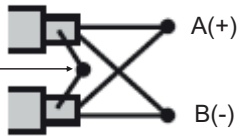
Clamping communication cable



Do not connect the shield wire to the earth. It should be open and insulated.

Length of stripped power cable



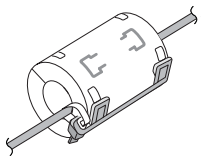


The shielded wires must be crimped with closed end connectors on interfaces with address of other than 1 and not shielded wire ends.

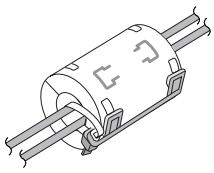
Attach the provided Clamp filter to the communication cable.

- Attach the Clamp filters to the RS-485 communication cable as shown below. Fix them to the communication cables with cable ties.

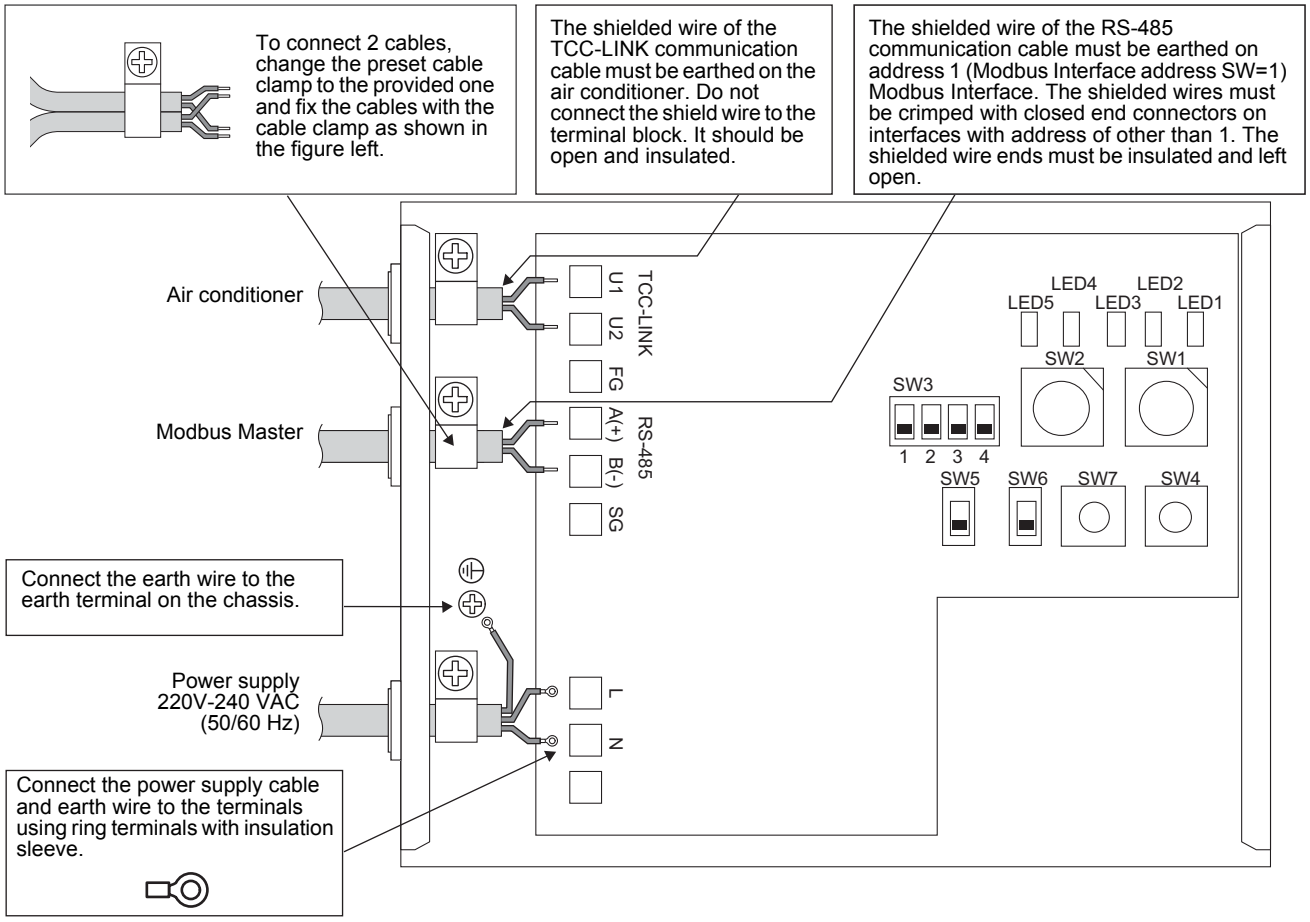
To connect 1 cable



To connect 2 cables



- Attach the Clamp filters as close as possible to the Modbus Interface unit.



REQUIREMENT

Disconnect the appliance from the main power supply.
This appliance must be connected to the main power supply by a circuit breaker or switch with a contact separation of at least 3 mm.
Fasten the screws to the terminal with torque of 0.5 Nm.

■ Wiring connection

The following describes a connection example when two or more Modbus Interface units are used.

Terminator resistor setting (See “6 Setting” for the setting method.)

- Set the RS-485 terminator resistor to “120 ohm” for address1 (Modbus Interface address SW1=1) Modbus Interface unit, and set to “open” for other units.
- Set the TCC-LINK terminator resistor to “open” as it is set on the air conditioner side.

Shield earthing

- The shielded wire of the RS-485 communication cable must be earthed on address 1 (Modbus Interface address SW=1) Modbus Interface. Fix the shielded wire of RS-485 communication cable with metal cable clamp and screw it to the chassis to earth it. The shielded wires must be crimped with closed end connectors on interfaces with address of other than 1. The shielded wire ends must be insulated and left open.
- Do not connect the shield wire to the terminal block. It should be open and insulated. The shielded wire of the TCC-LINK communication cable must be earthed on the air conditioner.

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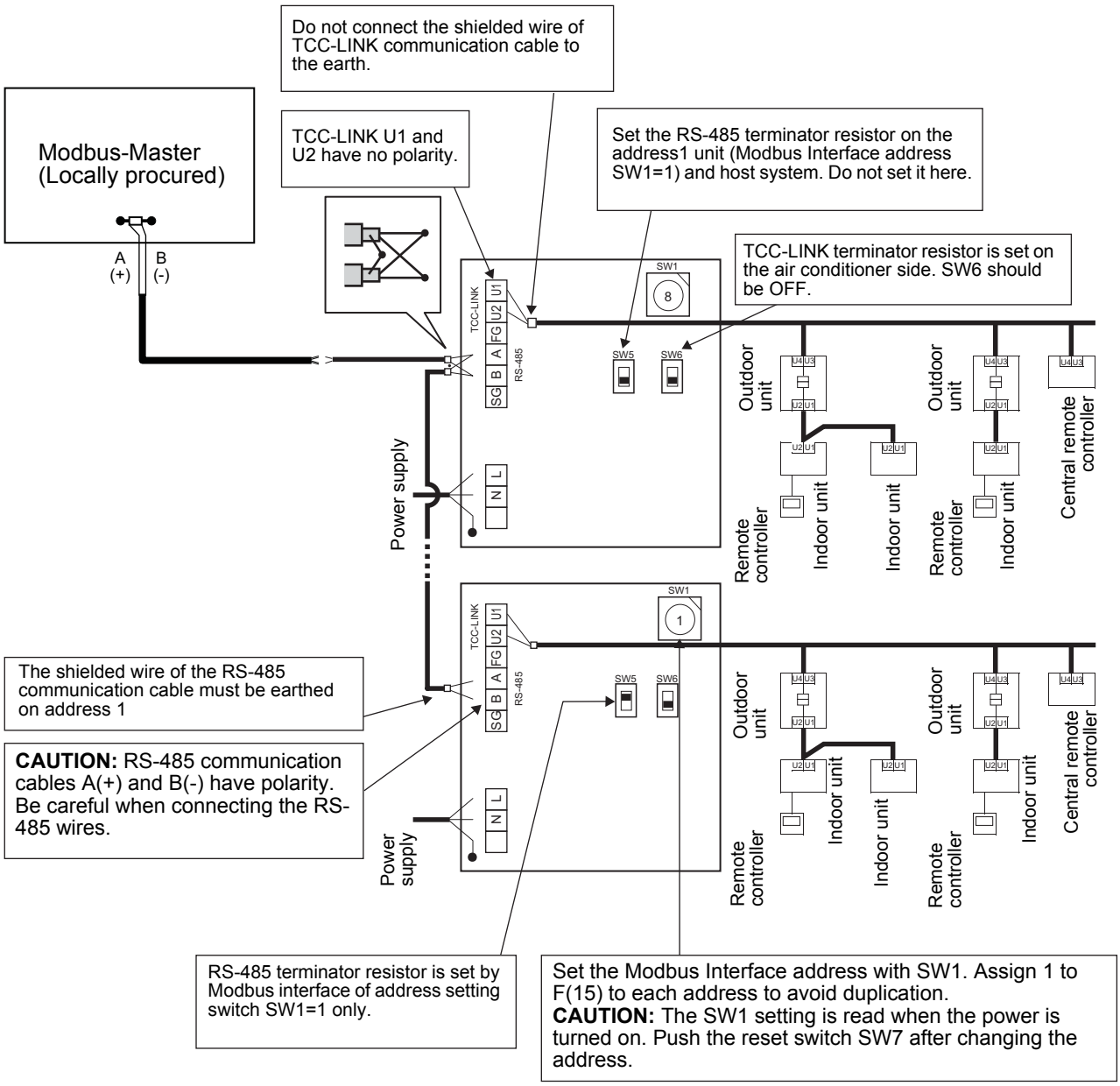

Do not connect the shielded wire of TCC-LINK communication cable to the earth.
Modbus-Master (Locally procured)
A (+)
B (-)
TCC-LINK U1 and U2 have no polarity.
Set the RS-485 terminator resistor on the address1 unit (Modbus Interface address SW1=1) and host system. Do not set it here.
TCC-LINK terminator resistor is set on the air conditioner side. SW6 should be OFF.
TCC-LINK
U1
U2
FG
A
B
SG
RS-485
SW1
SW5
SW6
Power supply
N
L
Outdoor unit
Indoor unit
Remote controller
Central remote controller
The shielded wire of the RS-485 communication cable must be earthed on address 1
CAUTION: RS-485 communication cables A(+) and B(-) have polarity. Be careful when connecting the RS-485 wires.
RS-485 terminator resistor is set by Modbus interface of address setting switch SW1=1 only.
Set the Modbus Interface address with SW1. Assign 1 to F(15) to each address to avoid duplication.
CAUTION: The SW1 setting is read when the power is turned on. Push the reset switch SW7 after changing the address.

6 Setting

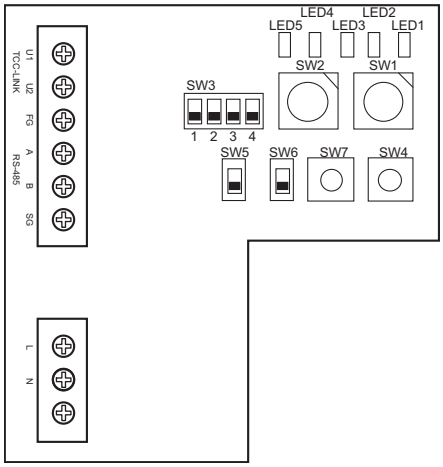
The following settings are necessary to use Modbus Interface.

- SW1 Modbus Interface address set switch
  When two or more Modbus Interface are used, set a different address for SW1 to avoid address duplication. Assign addresses in an ascending order.

⚠ CAUTION

- **For the Modbus Interface whose address SW1=1, perform terminator resistor setting.**
- **When the SW1 setting has been changed, press the reset switch SW7. The new address setting is read.**
- **To clear all accumulated operating values to 0, set SW2 to 3 and press the reset switch SW7, and then set SW2 to 0 and press the reset switch SW7 again.**
- **To set the delayed response mode, set SW2 to 4 and press the reset switch SW7. With this mode, a slave delays responding to the requests from the master for 250ms.**
  Leave SW2 set to 4 to keep the response mode set as delayed response mode.
- **When the setting of bit3 and bit4 of SW3 has been changed, press the reset switch SW7. The new set value is read.**

- SW2 Test switch — Not used during operation. Set these switches to zero (0) or "all OFF".
- SW3 Test switch — Bit1: Switches the Modbus Interface software.
  Bit2: Switches the LED5 display for test runs.
  Bit3, 4: RS-485 baud rate setting (9600/19200/38400) bps.
- SW4 Test switch — Not used during operation.
- SW5 RS-485 terminator resistor select switch
  Set "120 ohm" only when the Modbus interface address SW=1, and set "open" for other Modbus interfaces.
- SW6 TCC-LINK terminator resistor select switch
  The TCC-LINK terminator resistor is set on the air conditioner side. Set SW6 to "open".
- SW7 Reset switch
  When performing an address setting with SW1, push this reset switch after the address setting to read the set value.



SW1	Modbus Interface address set switch		
	1-F	Modbus Interface address	
	0	Not used	
SW2	Test switch (0 usually)		
SW3	Bit1: Switches variable specification. OFF TCB-IFMB641TLE mode, ON TCB-IFMB640TLE mode. Bit2: Switches the LED5 display for test runs. OFF RS-485 communication status indicator. ON TCC-LINK communication status indicator. Bit3, 4: RS-485 baud rate setting (9600/19200/38400) bps. 3 OFF, 4 OFF 9600 bps, 3 ON, 4 OFF 19200 bps, 3 OFF, 4 ON 38400 bps, 3 ON, 4 ON 19200 bps.		
SW4	Test switch		
SW5	RS-485 terminator resistor select switch	ON 120 ohm	ON Open
SW6	TCC-LINK terminator resistor select switch	ON 100 ohm	ON Open
SW7	Reset switch		
LED1	Power indicator		
LED2	RS-485 communication status indicator		
LED3	TCC-LINK Communication status indicator		
LED4	TCC-LINK Communication error indicator		
LED5	Test indicator		

REQUIREMENT

- **RS-485 terminator resistor select switch SW5.**
  Set "120 ohm" only when the Modbus Interface address SW=1, and set "open" for other Modbus interfaces.
- **The TCC-LINK terminator resistor is set on the air conditioner side. Set SW6 to "open".**

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7 Test run check

■ Before starting test run

- Set the indoor unit central control address so that it does not match any other indoor unit addresses.
- Be sure to press the reset switch SW7 on the Modbus Interface when the indoor unit central control address setting has been changed or added.

■ Test run

(1) Check the communication status between Modbus Interface and indoor unit or TCB-IFCG1TLE with LED5.
Check that the communication between Modbus Interface and each indoor unit or TCB-IFCG1TLE connected is normally performed by selecting an indoor unit or TCB-IFCG1TLE using SW1 to SW3.

Confirming procedure:

- Set bit2 of SW3 to “ON” during normal operation.
- Set the central control address of the target indoor unit with SW1 and SW2. Set SW1 and SW2 according to the “Indoor unit central control address and SW1/SW2 setting” table below.
- Communication status is displayed by LED5.

Communication status with indoor unit	LED5	Remarks
Normal	Lighting	
Error	Blinking	Communication with the indoor unit was established previously, but is disabled currently.
Invalid indoor unit	Light off	Communication with the indoor unit has never been established.

(Example) Check the communication status of indoor unit with a central control address of 41.
Set bit1 of SW3 to “ON”, SW2 to “2” and SW1 to “8”.

Indoor unit or TCB-IFCG1TLE central control address and SW1/SW2 setting

Indoor unit central control address	SW2	SW1	Indoor unit central control address	SW2	SW1	Indoor unit central control address	SW2	SW1	Indoor unit central control address	SW2	SW1
1	0	0	17	1	0	33	2	0	49	3	0
2	0	1	18	1	1	34	2	1	50	3	1
3	0	2	19	1	2	35	2	2	51	3	2
4	0	3	20	1	3	36	2	3	52	3	3
5	0	4	21	1	4	37	2	4	53	3	4
6	0	5	22	1	5	38	2	5	54	3	5
7	0	6	23	1	6	39	2	6	55	3	6
8	0	7	24	1	7	40	2	7	56	3	7
9	0	8	25	1	8	41	2	8	57	3	8
10	0	9	26	1	9	42	2	9	58	3	9
11	0	A	27	1	A	43	2	A	59	3	A
12	0	B	28	1	B	44	2	B	60	3	B
13	0	C	29	1	C	45	2	C	61	3	C
14	0	D	30	1	D	46	2	D	62	3	D
15	0	E	31	1	E	47	2	E	63	3	E
16	0	F	32	1	F	48	2	F	64	3	F

(2) Perform the communication status checking between Modbus Interface and Modbus Master.
Check that the communication with Modbus Master is normally performed.
When bit2 of SW3 is set to “OFF”, the communication status with the Modbus Master is displayed by LED5.

Communication status with Modbus Master	LED5	Remarks
Normal reception	Lighting	Lights for one second
Error	Light off	A communication error occurred or no data has been received.

■ LED indication during normal operation

LED		Description
LED1	Power indicator	Lights while the power is on.
LED2	RS-485 communication status indicator	Blinks during RS-485 communication.
LED3	TCC-LINK communication status indicator	Blinks during TCC-LINK communication.
LED4	TCC-LINK communication error indicator	Lights temporarily when TCC-LINK is busy.
LED5	TEST indicator	Used in the test mode.

8 TCB-IFMB640TLE product replacement

This product can be used as TCB-IFMB640TLE variable specification mode.

■ TCB-IFMB641TLE installation

Turn off the power and remove the TCB-IFMB640TLE and then install the TCB-IFMB641TLE. Install the TCB-IFMB641TLE according to “4 Installation” and “5 Connection of power cables / earth wires / communication cables” in this manual.

■ TCB-IFMB641TLE setting

Set the RS-485 baud rate and the address switches of the TCB-IFMB641TLE according to “6 Setting”, the same as the installed TCB-IFMB640TLE. (For address 1, set the terminator of the RS-485)

■ Switching variable specification

To switch from the TCB-IFMB641TLE variable specification to the TCB-IFMB640TLE variable specification, set bit1 of SW3 to ON. When the power is turned on in this configuration, operation will be the same as the TCB-IFMB640TLE.

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