TOSHIBA
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Modbus INTERFACE

Specifications Manual

Modbus Protocol Conversion Interface

Model name:

TCB-IFMB641TLE

Contents

1 System overview

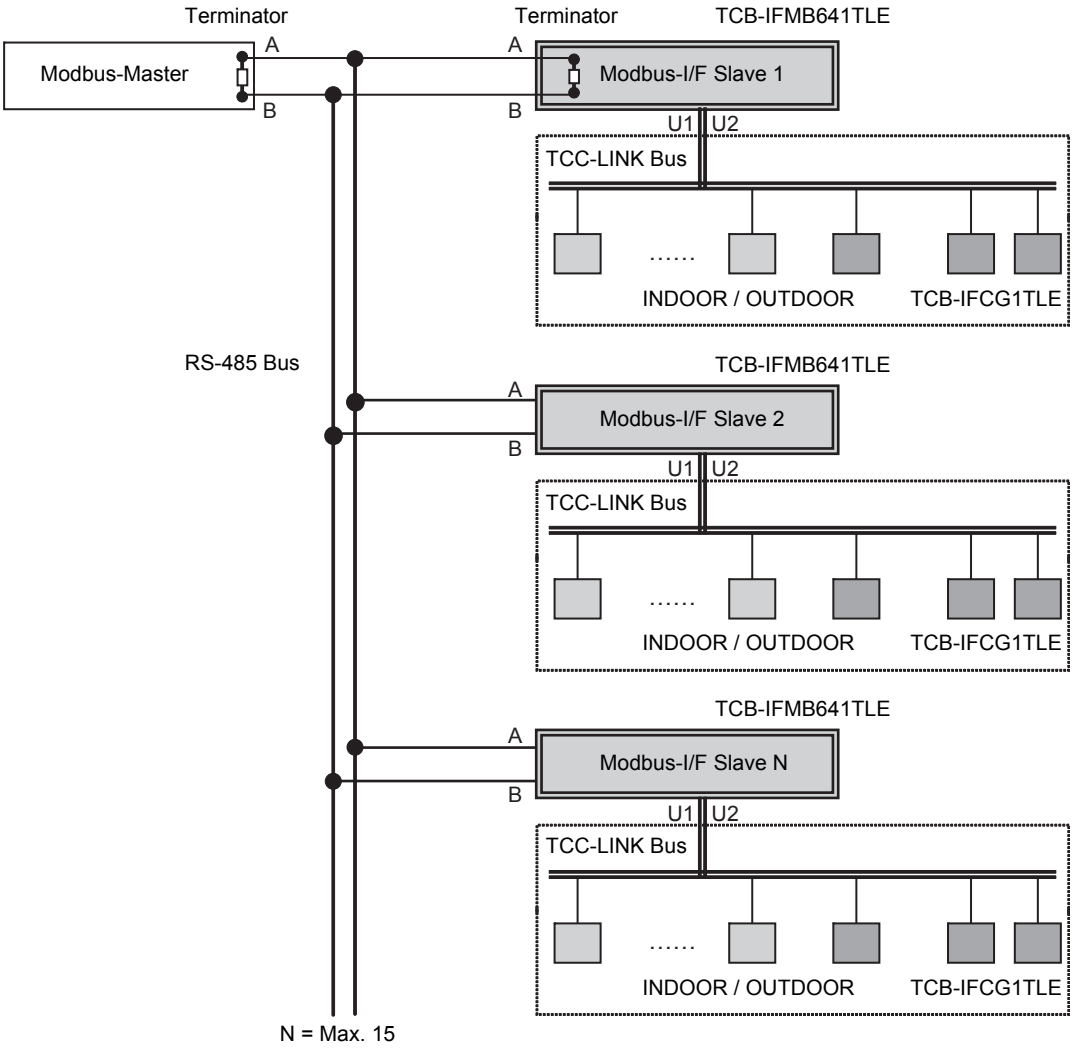
This manual describes Modbus* protocol implementation specifications of TCB-IFMB641TLE. TCB-IFMB641TLE is equipped with the Modbus Slave function. Specifications that are not detailed in this manual conform to the following Modbus specifications.

- Modbus APPLICATION PROTOCOL SPECIFICATION V1.1b
- Modbus over Serial Line Specification and Implementation Guide V1.01
  http://www.modbus.org/

This implementation specification specifies the operation of Modbus that works on the RS485 serial line, where a slave device sends a response to a request from the master device. Multiple slave devices are connected to the RS485 bus. Modbus uses the Modbus RTU mode with the frame format shown below.

START	SLAVE ADDRESS	FUNCTION	DATA	CRC	END
>=3.5 characters	8 bits	8 bits	N*8 bits (N = 252 max.)	16 bits	>= 3.5 characters

Each slave device is connected to the TCC-LINK main bus. The internal data and operation of indoor units and TCB-IFCG1TLE units (general purpose interface) to which central control addresses 1 to 64 are assigned are controlled by the master device. Up to 15 slave devices may be connected to the master device.
A broadcast message will be sent when the slave address 0x00 is specified in a request, and all slave devices will receive the request but send no response including exception response. The figure below shows an example of the connection of the master device, slave devices, and air conditioners.



* “Modbus” is a registered trademark of Schneider Electric SA.

2 RS 485 communication parameters

RS 485 communication parameters are shown below.

- Character length = 11 bits, Data = 8 bits, Parity Check = even, Start bit =1 bit low, Stop bit = 1bit high
- Communication: 9600/19200/38400 bps selected manually.
- Bit transmission order: LSB first (b0, b1….). Bit data is transmitted sequentially from the LSB.
- Byte transmission order: Big Endian. 0x1234 -> 0x12 then 0x34. Byte data is transmitted in the big endian order.
- Half duplex, 2 wires. 120 Ω termination. A: Non-inverted input, B: Inverted input
- After receiving a packet, a response is permitted after at least 3.5 characters.
- Connecter: 2 terminals

3 Applied function codes

The following function codes are implemented.

Function code	Sub function code	Function name
0x01	None	Read coils
0x02	None	Read Discrete input
0x03	None	Read holding register
0x04	None	Read Input register
0x05	None	Write single coil
0x06	None	Write single holding register
0x08	0x00, 01, 02, 04, 0A, 0B, 0C, 0D, 0E, 0F, 11, 12, 14	Diagnostics
0x0B	None	Get Comm Event Counter
0x0C	None	Get Comm Event Log
0x0F	None	Write multiple coils
0x10	None	Write multiple holding registers
		Exception

The relationship between the start address specified in a request from the master device and the value shown by “Modbus-address for registers” in the address assignment table is as follows:

- For Coil
  Start address = (Value of Modbus-address for registers) - 1
- For Discrete input
  Start address = (Value of Modbus-address for registers) - 10001
- For Input register
  Start address = (Value of Modbus-address for registers) - 30001
- For Holding register
  Start address = (Value of Modbus-address for registers) - 40001

4 Exception response

Except for Broadcast, the master device issues a request expecting a normal response from a slave device. Slave units return a normal response when no error is detected, but return no response when an error occurs during the parity check or CRC check. Slave units must return an exception response when they receive a request which has been sent correctly but contains an error that applies to any of the following exception codes.

Exception code	Name
0x01	Illegal function A request of illegal function that is not supported by this specification is received
0x02	Illegal data address An illegal address that does not exist in section 7 of this manual. Address Assignment table or a data request size larger than 249 octets is specified. An address is specified for two or more devices.
0x03	Illegal data value Illegal data other than that defined in section 7 of this manual Address Assignment table is specified.
0x04	Slave device failure Slave device internal processing is not correct (When any error occurs during booting or reading the RAM).
0x05	ACK A slave device returns response ACK when it received a request while it is acquiring response data during the slave device initial data acquisition process.
0x06	Slave device busy When a slave device is busy and cannot return response data, this code is returned.
0x07	When a master's request is about an indoor unit which does not respond to the request. (However, the master's request is sent to the indoor unit.)

5 Counters and registers

TCB-IFMB641TLE is equipped with the following counters and registers that are cleared by a power-on reset, restart process, or a counter reset command.

Register/Counter	Description
Coils (R/W)	For air-conditioner database
Discrete input (R)	For air-conditioner database
Input register (R)	For air-conditioner database
Holding register (R/W)	For air-conditioner database
Event counter	Counted when a slave device has processed a received message correctly. This counter is not incremented when the exception command or 0B command is received.
Message counter	Retains the number of messages sent by the slave device.
Diagnostics register	A 16-bit register that retains the content of diagnosis. 0x0000: Normal 0x0001: CRC error 0x0002: EEPROM checksum error Other: Reserved
Bus Communication Error Count	Total number of CRC errors detected by slave devices
Exception Error Count	Total number of exception errors detected by slave devices
Slave Message Count	Total number of messages received by the corresponding slave device
No Response Count	Total number of messages received by the corresponding slave device, which are not accompanied by response
Busy Count	Total of Busy Count (exception error) detected by the corresponding slave device
Bus Character Overrun Count	Number of character overrun errors (failure in receiving part of the data) detected in messages to the corresponding slave device

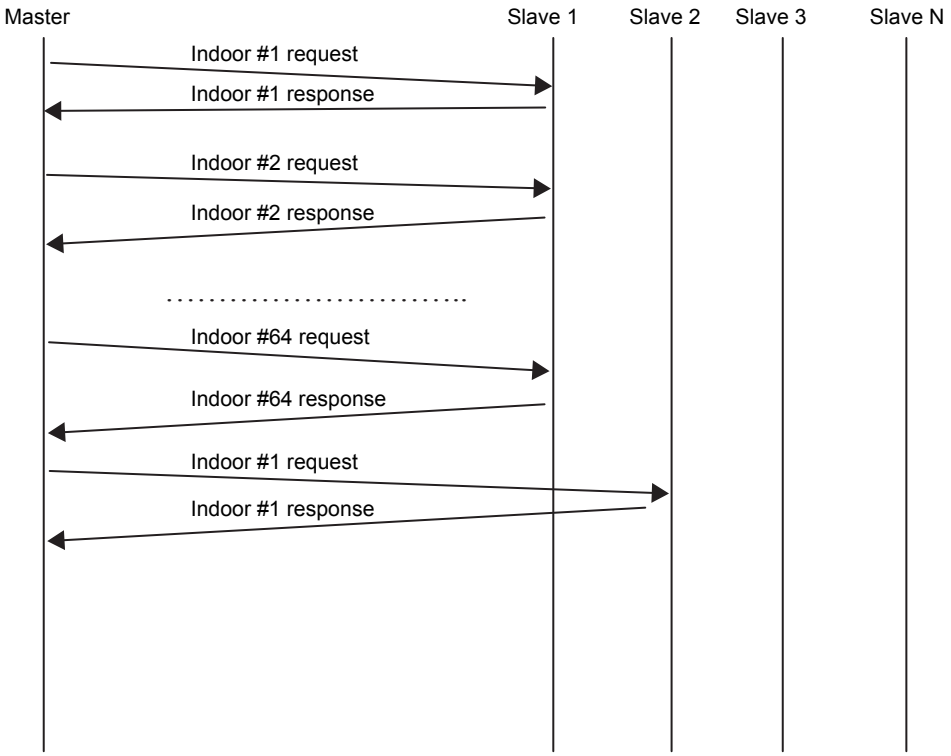
6 Sequence

The master device sends a request sequentially to each slave device, and gets response data from each slave device. A slave device returns a response to a request from the master device within one second (see the diagram below). When a slave device receives a data read request, the slave device returns the data stored in the register.

It is recommended that the master device collects specific information such as air conditioner models, addresses, unique numbers, and operation setting range when the master device accesses the air conditioning system for the first time.

When writing to air conditioners, the master device must read the operation range for, operation mode, fan speed and setting temperature from each air conditioner and write values within the operation range. Pay attention to the sequence of simultaneous setting for writing to air conditioners because it requires time for processing on the slave device side. Furthermore, because no response or exception response with respect to the writing for broadcast message is sent from slave devices, it is recommended that data written to slave devices be checked on the master device side as required. It is recommended to confirm whether a master's request is reflected by reading the read register after appropriate time once a communication is completed, because indoor units may not be able to receive a normal request from the mater due to TCC-LINK communication condition.

In addition, it is also recommended that data be requested at appropriate intervals so that the alarm data that is output from air conditioners is properly reflected in the discrete input register.



7 Address assignment table

Total 42368 octets (9728*2/8 + 9984*2*2). The data of the address assignment table is cleared during initialization. Indoor number corresponds to central control address.

▼ TCB-IFMB641TLE

Modbus description	Indoor number	Modbus register	Data name	Length	Explanation
Coils (R/W)	1	1	ON/OFF setting	1bit	1=On, 0=Off
		2	Filter sign reset setting	1bit	1=reset, others=no action
		3 - 40	Reserved	-	
		41	Relay 1ch output for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit output see manual of TCB-IFCG1TLE
		42	Relay 2ch output for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit output see manual of TCB-IFCG1TLE
		43	Relay 3ch output for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit output see manual of TCB-IFCG1TLE
		44	Relay 4ch output for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit output see manual of TCB-IFCG1TLE
		45	Local operation prohibit for TCB-IFCG1TLE	1bit	1=prohibit, 0=permit
		46-152	Reserved	-	
	2	153	ON/OFF setting	1bit	
		154	Filter sign reset setting	1bit	
		155 - 192	Reserved	-	
		193	Relay 1ch output for TCB-IFCG1TLE	1bit	
		194	Relay 2ch output for TCB-IFCG1TLE	1bit	
		195	Relay 3ch output for TCB-IFCG1TLE	1bit	
		196	Relay 4ch output for TCB-IFCG1TLE	1bit	
		197	Local operation prohibit for TCB-IFCG1TLE	1bit	
		198 - 304	Reserved	-	
	n	152*n-151	ON/OFF setting	1bit	
		152*n-150	Filter sign reset setting	1bit	
		(152*n-149)-(152*n-112)	Reserved	-	
		152*n-111	Relay 1ch output for TCB-IFCG1TLE	1bit	
		152*n-110	Relay 2ch output for TCB-IFCG1TLE	1bit	
		152*n-109	Relay 3ch output for TCB-IFCG1TLE	1bit	
		152*n-108	Relay 4ch output for TCB-IFCG1TLE	1bit	
		(152*n-107)	Local operation prohibit for TCB-IFCG1TLE	1bit	
		(152*n-106)-(152*n)	Reserved	-	
	64	9577	ON/OFF setting	1bit	
		9578	Filter sign reset setting	1bit	
		9579 - 9616	Reserved	-	
		9617	Relay 1ch output for TCB-IFCG1TLE	1bit	
		9618	Relay 2ch output for TCB-IFCG1TLE	1bit	
		9619	Relay 3ch output for TCB-IFCG1TLE	1bit	
		9620	Relay 4ch output for TCB-IFCG1TLE	1bit	
		9621	Local operation prohibit for TCB-IFCG1TLE	1bit	
		9622 - 9728	Reserved	-	
	-	9729 - 10000	Reserved	-	

Modbus description	Indoor number	Modbus register	Data name	Length	Explanation
Discrete input (R)	1	10001	ON/OFF setting status	1bit	1=On, 0=Off
		10002	Filter sign status	1bit	1=abnormal, 0=normal
		10003	Alarm status	1bit	1=abnormal, 0=normal
		10004 - 10056	Reserved	-	
		10057	ON/OFF input for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit input see manual of TCB-IFCG1TLE
		10058	Alarm input for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit input see manual of TCB-IFCG1TLE
		10059	Din2 input for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit input see manual of TCB-IFCG1TLE
		10060	Din3 input for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit input see manual of TCB-IFCG1TLE
		10061	Din4 input for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit input see manual of TCB-IFCG1TLE
		10062	Din1 input for TCB-IFCG1TLE	1bit	TCB-IFCG1TLE bit input see manual of TCB-IFCG1TLE
		10063 - 10152	Reserved	-	
	2	10153	ON/OFF setting status	1bit	
		10154	Filter sign status	1bit	
		10155	Alarm status	1bit	
		10156 - 10208	Reserved	-	
		10209	ON/OFF input for TCB-IFCG1TLE	1bit	
		10210	Alarm input for TCB-IFCG1TLE	1bit	
		10211	Din2 input for TCB-IFCG1TLE	1bit	
		10212	Din3 input for TCB-IFCG1TLE	1bit	
		10213	Din4 input for TCB-IFCG1TLE	1bit	
		10214	Din1 input for TCB-IFCG1TLE	1bit	
		10215 - 10304	Reserved	-	
	n	10001+152*(n-1)	ON/OFF setting status	1bit	
		10002+152*(n-1)	Filter sign status	1bit	
		10003+152*(n-1)	Alarm status	1bit	
		(10004+152*(n-1))-(10056+152*(n-1))	Reserved	-	
		10057+152*(n-1)	ON/OFF input for TCB-IFCG1TLE	1bit	
		10058+152*(n-1)	Alarm input for TCB-IFCG1TLE	1bit	
		10059+152*(n-1)	Din2 input for TCB-IFCG1TLE	1bit	
		10060+152*(n-1)	Din3 input for TCB-IFCG1TLE	1bit	
		10061+152*(n-1)	Din4 input for TCB-IFCG1TLE	1bit	
		10062+152*(n-1)	Din1 input for TCB-IFCG1TLE	1bit	
		(10063+152*(n-1))-(10152+152*(n-1))	Reserved	-	
	64	19577	ON/OFF setting status	1bit	
		19578	Filter sign status	1bit	
		19579	Alarm status	1bit	
		19580 - 19632	Reserved	-	
		19633	ON/OFF input for TCB-IFCG1TLE	1bit	
		19634	Alarm input for TCB-IFCG1TLE	1bit	
		19635	Din2 input for TCB-IFCG1TLE	1bit	
		19636	Din3 input for TCB-IFCG1TLE	1bit	
		19637	Din4 input for TCB-IFCG1TLE	1bit	
		19638	Din1 input for TCB-IFCG1TLE	1bit	
		19639 - 19728	Reserved	-	
	-	19729 - 20000	Reserved	-	

Modbus description	Indoor number	Modbus register	Data name	Length (octet)	Explanation
Input register (R)	1	30001	Room temperature	2	unit:°C Data type:signed integer Ten times level of temperature Example:20°C→0x00C8 -5°C→0xFFCE
		30002	Setting temperature status	2	unit:°C Data type:signed integer Ten times level of temperature Example:20°C→0x00C8 -5°C→0xFFCE
		30003 - 30006	Alarm code	8	30003 upper header indoor unit: 00 when no alarm occurs 30003 lower follower indoor unit 1: 00 when no alarm occurs …… 30006 upper follower indoor unit 6: 00 when no alarm occurs 30006 lower follower indoor unit 7: 00 when no alarm occurs
		30007 - 30014	Model name	16	16 characters by 16 ASCII codes
		30015 - 30022	Serial number	16	16 characters by 16 ASCII codes
		30023	Indoor unit capacity	2	Unit ability octet expression
		30024	Indoor unit type	2	Octet expression 0x00**
		30025 - 30028	Analog input for TCB-IFCG1TLE	8	4-channel analog input for TCB-IFCG1TLE address=30025 CH1, address=30026 CH2 • • •
		30029 - 30030	Reserved	-	
		30031	Operation mode / Fan range	2	RS FM Operation mode and air volume can be set
		30032	Cooling temperature range	2	CT CB Temperature setting upper and lower limits in cool mode
		30033	Heating temperature range	2	HT HB Temperature setting upper and lower limits in heat mode
		30034	Dry temperature range	2	DT DB Temperature setting upper and lower limits in dry mode
		30035	Auto temperature range	2	FT FB Temperature setting upper and lower limits in auto mode
		30036	Operation mode	2	0x0000=invalid, 0x0001=heat, 0x0002=cool, 0x0003=dry, 0x0004=fan, 0x0005=auto heat, 0x0006=auto cool, 0x0007=unfix
		30037	Fan speed	2	0x0000=invalid, 0x0001=Fan Sop, 0x0002=Auto, 0x0003=High, 0x0004=Medium, 0x0005=Low, 0x0006=Ultra Low, 0x0007=unfix
		30038	Louver	2	0x0000=invalid, 0x0001=swing, 0x0002=f1, 0x0003=f2, 0x0004=f3, 0x0005=f4, 0x0006=f5, 0x0007=stop
		30039	Remote controller permit / Prohibit	2	Remote controller on/off prohibit setting(bit0) Remote controller mode prohibit setting(bit1) Remote controller setpoint prohibit setting(bit2) Remote controller louver prohibit setting(bit3) Remote controller fan speed prohibit setting(bit4) 1=prohibit 0=permit
		30040 - 30156	Reserved	-	
	2	30157	Room temperature	2	
		30158	Setting temperature status	2	
		30159 - 30162	Alarm code	8	
		30163 - 30170	Model name	16	
		30171 - 30178	Serial number	16	
		30179	Indoor unit capacity	2	
		30180	Indoor unit type	2	
		30181 - 30184	Analog input for TCB-IFCG1TLE	8	
		30185 - 30186	Reserved	-	

Modbus description	Indoor number	Modbus register	Data name	Length (octet)	Explanation
		30187	Operation mode / Fan range	2	
		30188	Cooling temperature range	2	
		30189	Heating temperature range	2	
		30190	Dry temperature range	2	
		30191	Auto temperature range	2	
		30192	Operation mode	2	
		30193	Fan speed	2	
		30194	Louver	2	
		30195	Remote controller permit / Prohibit	2	
		30196 - 30312	Reserved	-	
	n	30001+156(n-1)	Room temperature	2	
		30002+156(n-1)	Setting temperature status	2	
		(30003+156(n-1))-(30006+156(n-1))	Alarm code	8	
		(30007+156(n-1))-(30014+156(n-1))	Model name	16	
		(30015+156(n-1))-(30022+156(n-1))	Serial number	16	
		30023+156(n-1)	Indoor unit capacity	2	
		30024+156(n-1)	Indoor unit type	2	
		(30025+156(n-1))-(30028+156(n-1))	Analog input for TCB-IFCG1TLE	8	
		(30029+156(n-1))-(30030+156(n-1))	Reserved	-	
		30031+156(n-1)	Operation mode / Fan range	2	
		30032+156(n-1)	Cooling temperature range	2	
		30033+156(n-1)	Heating temperature range	2	
		30034+156(n-1)	Dry temperature range	2	
		30035+156(n-1)	Auto temperature range	2	
		30036+156(n-1)	Operation mode	2	
		30037+156(n-1)	Fan speed	2	
		30038+156(n-1)	Louver	2	
		30039+156(n-1)	Remote controller permit / Prohibit	2	
		(30040+156(n-1))-(30156+156(n-1))	Reserved	-	
	64	39829	Room temperature	2	
		39830	Setting temperature status	2	
		39831 - 39834	Alarm code	8	
		39835 - 39842	Model name	16	
		39843 - 39850	Serial number	16	
		39851	Indoor unit capacity	2	
		39852	Indoor unit type	2	
		39853 - 39856	Analog input for TCB-IFCG1TLE	8	
		39857 - 39858	Reserved	-	

Modbus description	Indoor number	Modbus register	Data name	Length (octet)	Explanation
		39859	Operation mode / Fan range	2	
		39860	Cooling temperature range	2	
		39861	Heating temperature range	2	
		39862	Dry temperature range	2	
		39863	Auto temperature range	2	
		39864	Operation mode	2	
		39865	Fan speed	2	
		39866	Louver	2	
		39867	Remote controller permit / Prohibit	2	
		39868 - 39984	Reserved	-	
	-	39985 - 39992	Software version	16	TCB-IFMB641TLE is expressed in ASCII codes followed by the version number.
		39993 - 40000	Reserved	-	

Modbus description	Indoor number	Modbus register	Data name	Length (octet)	Explanation
Holding register (R/W)	1	40001	Setting temperature	2	unit:°C Data type:signed integer Ten times level of temperature Example:20°C→0x00C8 -5°C→0xFFCE
		40002	Accumulated operation time	2	unit: hour Monitor on/off of the discrete input register to check the on/off state of all air conditioners every 15 minutes. When the register state is on, add 15 minutes. The register data is retained even during power-off.
		40003-40004	Analog output for TCB-IFCG1TLE	4	2-channel analog output for TCB-IFCG1TLE (See manual of TCB-IFCG1TLE) see Note2
		40007	Operation mode	2	0x0000=unfix, 0x0001=heat, 0x0002=cool, 0x0003=dry, 0x0004=fan, 0x0005=auto
		40005-40006	Reserved	-	
		40008	Fan speed	2	0x0000=Invalid, 0x0002=Auto, 0x0003=High, 0x0004=Medium, 0x0005=Low, 0x0007=unfix
		40009	Louver	2	0x0000=invalid, 0x0001=swing, 0x0002=f1, 0x0003=f2, 0x0004=f3, 0x0005=f4, 0x0006=f5, 0x0007=stop
		40010	Remote controller permit / Prohibit	2	Remote controller on/off prohibit setting(bit0) Remote controller mode prohibit setting(bit1) Remote controller setpoint prohibit setting(bit2) Remote controller louver prohibit setting(bit3) Remote controller fan speed prohibit setting(bit4) 1=prohibit 0=permit
		40011 - 40156	Reserved	-	
	2	40157	Setting temperature	2	
		40158	Accumulated operation time	2	
		40159-40160	Analog output for TCB-IFCG1TLE	4	
		40161-40162	Reserved	-	
		40163	Operation mode	2	
		40164	Fan speed	2	
		40165	Louver	2	
		40166	Remote controller permit / Prohibit	2	
		40167 - 40312	Reserved	-	
	n	40001+156*(n-1)	Setting temperature	2	
		40002+156*(n-1)	Accumulated operation time	2	
		(40003+156*(n-1))-(40004+156*(n-1))	Analog output for TCB-IFCG1TLE	4	
		(40005+156*(n-1))-(40006+156*(n-1))	Reserved	-	
		40007+156*(n-1)	Operation mode	2	
		40008+156*(n-1)	Fan speed	2	
		40009+156*(n-1)	Louver	2	
		40010+156*(n-1)	Remote controller permit / Prohibit	2	
		(40011 + 156*(n-1))-(40156 + 156*(n-1))	Reserved	-	
	64	49829	Setting temperature	2	
		49830	Accumulated operation time	2	
		49831 - 49834	Analog output for TCB-IFCG1TLE	8	
		49835	Operation mode	2	
		49836	Fan speed	2	
		49837	Louver	2	
		49838	Remote controller permit / Prohibit	2	
		49839 - 49984	Reserved	-	
	-	49985 - 50000	Reserved	-	

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Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Octet Order	Explanation
Coills (R/W)	1	1-8	On/Off setting	1 octet	1	1=On, 0=Off (address=1)
			Filter sign reset setting			1=reset, others=no action (address=2)
			Reserved			
		9-16	Operation mode setting	1 octet	2	0x00=unfix, 0x01=heat, 0x02=cool, 0x03=dry, 0x04=fan, 0x05=auto (address=9LSB, address=16MSB)
		17-24	Fan speed setting	1 octet	3	0x00=Invalid, 0x02=Auto, 0x03=High, 0x04=Medium, 0x05=Low, 0x07=unfix (address=17LSB,address=24MSB)
		25-32	Louver setting	1 octet	4	0x00=invalid, 0x01=swing, 0x02=f1, 0x03=f2, 0x04=f3, 0x05=f4, 0x06=f5, 0x07=stop (address=25LSB, address=32MSB)
		33-40	Remote controller on/off prohibit setting	1 octet	5	Remote controller on/off prohibit setting (address=33) Remote controller mode prohibit setting (address=34) Remote controller setpoint prohibit setting (address=35) Remote controller louver prohibit setting (address=36) Remote controller fan speed prohibit setting (address=37) 1=prohibit 0=permit
		41-48	Relay 1ch output for TCB-IFCG1TLE	1 octet	6	TCB-IFCG1TLE bit output see manual of TCB-IFCG1TLE
			Relay 2ch output for TCB-IFCG1TLE			
			Relay 3ch output for TCB-IFCG1TLE			
			Relay 4ch output for TCB-IFCG1TLE			
			Local operation prohibit for TCB-IFCG1TLE			1=prohibit 0=permit
			Reserved			
		49-152	Reserved	104bit	7-19	
	2	153-160	On/Off setting	1 octet	20	1=On, 0=Off (address=153)
			Filter sign reset setting			1=reset, others=no action (address=154)
			Reserved			
		161-168	Operation mode setting	1 octet	21	0x00=unfix, 0x01=heat, 0x02=cool, 0x03=dry, 0x04=fan, 0x05=auto (address=161LSB, address=168MSB)
		169-176	Fan speed setting	1 octet	22	0x00=Invalid, 0x02=Auto, 0x03=High, 0x04=Medium, 0x05=Low, 0x07=unfix (address=169LSB, address=176MSB)
		177-184	Louver setting	1 octet	23	0x00=invalid, 0x01=swing, 0x02=f1, 0x03=f2, 0x04=f3, 0x05=f4, 0x06=f5, 0x07=stop (address=177lsb, address=184MSB)
		185-192	Remote controller on/off prohibit setting	1 octet	24	Remote controller on/off prohibit setting (address=185)
		193-200	Relay output for TCB-IFCG1TLE	1 octet	25	TCB-IFCG1TLE bit output (See manual of TCB-IFCG1TLE)
		201-304	Reserved	104bit	26-38	

Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Octet Order	Explanation
	n	(152*n -151)-(152*n -144)	On/Off setting	1 octet	19*n –18	
			Filter sign reset setting			
			Reserved			
		(152*n –143)-(152*n –136)	Operation mode setting	1 octet	19*n –17	
		(152*n –135)-(152*n –128)	Fan speed setting	1 octet	19*n –16	
		(152*n –127)-(152*n –120)	Louver setting	1 octet	19*n –15	
		(152*n –119)-(152*n –112)	Remote controller on/off prohibit setting	1 octet	19*n –14	
		(152*n –111)-(152*n –104)	Relay output for TCB-IFCG1TLE	1 octet	19*n –13	TCB-IFCG1TLE bit output See manual of TCB-IFCG1TLE
		(152*n –103)-152*n	Reserved	104 bits	19*n –12—19*n	
	64	9577-9584	On/Off setting	1 octet	1198	1=On, 0=Off1 (address=9577)
			Filter sign reset setting			1=reset, others=no action (address=9578)
			Reserved			
		9585-9592	Operation mode setting	1 octet	1199	0x00=unfix, 0x01=heat, 0x02=cool, 0x03=dry, 0x04=fan, 0x05=auto (address=9585LSB, address=9592MSB)
		9593-9600	Fan speed setting	1 octet	1200	0x00=Invalid, 0x02=Auto, 0x03=High, 0x04=Medium, 0x05=Low, 0x07=unfix (address=9593 LSB, address=9600MSB)
		9601-9608	Louver setting	1 octet	1201	0x00=invalid, 0x01=swing, 0x02=f1, 0x03=f2, 0x04=f3, 0x05=f4, 0x06=f5, 0x07=stop (address=9601LSB, address=9608MSB)
		9609-9616	Remote controller on/off prohibit setting	1 octet	1202	Remote controller on/off prohibit setting (address=9609) Remote controller mode prohibit setting (address=9610) Remote controller setpoint prohibit setting (address=9611) Remote controller louver prohibit setting (address=9612) Remote controller fan speed prohibit setting (address=9613) 1=prohibit 0=permit
		9617-9624	Relay output for TCB-IFCG1TLE	1 octet	1203	TCB-IFCG1TLE bit output (See manual of TCB-IFCG1TLE)
		9625-9728	Reserved	104 bits	1204-1216	

Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Octet Order	Explanation
Discrete input (R)	1	10001-10004	On/Off setting status	1 octet	1	1=On, 0=Off (address=10001)
			Filter sign status			1=abnormal, 0=normal (address=10002)
			Alarm Status			1=abnormal, 0=normal (address=10003)
			Reserved			
		10005-10008	Reserved			
		10009-10016	Operation mode status	1 octet	2	0x00=invalid, 0x01=heat, 0x02=cool, 0x03=dry, 0x04=fan, 0x05=auto heat, 0x06=auto cool, 0x07=unfix (address=9LSB, address=16MSB)
		10017-10024	Fan speed set status	1 octet	3	0x00=Invalid, 0x01=Fan stop, 0x02=Auto, 0x03=High, 0x04=Medium, 0x05=Low, 0x06=Ultra Low, 0x07=unfix (address=10017 LSB, address=10024MSB)
		10025-10032	Louver setting status	1 octet	4	0x00=invalid, 0x01=swing, 0x02=f1, 0x03=f2, 0x04=f3, 0x05=f4, 0x06=f5, 0x07=stop (address=10025LSB, address=10032MSB)
		10033-10040	Remote controller on/ off prohibit setting status	1 octet	5	Remote controller on/off prohibit setting (address=10033) Remote controller mode prohibit setting (address=10034) Remote controller setpoint prohibit setting (address=10035) Remote controller louver prohibit setting (address=10036) Remote controller fan speed prohibit setting (address=10037) 1=prohibit 0=permit
		10041-10048	Reserved	1 octet	6	
		10049-10056	Reserved	1 octet	7	
		10057-10064	On/Off input for TCB-IFCG1TLE	1 octet	8	TCB-IFCG1TLE bit input See manual of TCB-IFCG1TLE
			Alarm input for TCB-IFCG1TLE			
			Din2 input for TCB-IFCG1TLE			
			Din3 input for TCB-IFCG1TLE			
			Din4 input for TCB-IFCG1TLE			
			Din1 input for TCB-IFCG1TLE			
			Reserved			
		10065-10152	Reserved	88 bits	9-19	

Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Octet Order	Explanation
	2	10153-10156	On/Off setting status	1 octet	20	1=On, 0=Off (address=10153)
			Filter sign status			1=abnormal, 0=normal (address=10154)
			Alarm Status			1=abnormal, 0=normal (address=10155)
			Reserved			
		10157-10160	Reserved			
		10161-10168	Operation mode status	1 octet	21	0x00=invalid, 0x01=heat, 0x02=cool, 0x03=dry, 0x04=fan, 0x05=auto heat, 0x06=auto cool, 0x07=unfix (address=10161LSB, address=10168MSB)
		10169-10176	Fan speed set status	1 octet	22	0x00=Invalid, 0x01=Fan stop, 0x02=Auto, 0x03=High, 0x04=Medium, 0x05=Low, 0x06=Ultra Low, 0x07=unfix (address=10169LSB, address=10176MSB)
		10177-10184	Louver setting status	1 octet	23	0x00=invalid, 0x01=swing, 0x02=f1, 0x03=f2, 0x04=f3, 0x05=f4, 0x06=f5, 0x07=stop (address=10177LSB, address=10184MSB)
		10185-10192	Remote controller on/ off prohibit setting status	1 octet	24	Remote controller on/off prohibit setting (address=10185) Remote controller mode prohibit setting (address=10186) Remote controller setpoint prohibit setting (address=10187) Remote controller louver prohibit setting (address=10188) Remote controller fan speed prohibit setting (address=10189) 1=prohibit 0=permit
		10193-10200	Reserved	1 octet	25	
		10201-10208	Reserved	1 octet	26	
		10209-10216	On/Off input for TCB-IFCG1TLE	1 octet	27	TCB-IFCG1TLE bit input See manual of TCB-IFCG1TLE
		10217-10304	Reserved	88 bits	28-38	
	n	152*n+9849 -152*n+9856	On/Off setting status/ etc	1 octet	19*n –18	
		152*n+9857 -152*n+9864	Operation mode status	1 octet	19*n –17	
		152*n+9865 -152*n+9872	Fan speed set status	1 octet	19*n –16	
		152*n+9873 -152*n+9880	Louver setting status	1 octet	19*n –15	
		152*n+9881 -152*n+9888	Remote controller on/ off prohibit setting status	1 octet	19*n –14	
		152*n+9889 -152*n+9896	Reserved	1 octet	19*n –13	
		152*n+9897 -152*n+9904	Reserved	1 octet	19*n –12	
		152*n+9905 -152*n+9912	On/Off input for TCB-IFCG1TLE/ETC	1 octet	19*n –11	TCB-IFCG1TLE bit input See manual of TCB-IFCG1TLE
		152*n+9913 - 152*n+10000	Reserved	88 bits	19*n – 10-19*n	

Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Octet Order	Explanation
	64	19577-19580	On/Off setting status	1 octet	1198	1=On, 0=Off (address=19577)
			Filter sign status			1=abnormal, 0=normal (address=19578)
			Alarm Status			1=abnormal, 0=normal (address=19579)
			Reserved			
		19581-19584	Reserved			
		19585-19592	Operation mode status	1 octet	1199	0x00=invalid, 0x01=heat, 0x02=cool, 0x03=dry, 0x04=fan, 0x05=auto heat, 0x06=auto cool, 0x07=unfix (address=19585LSB, address=19592MSB)
		19593-19600	Fan speed set status	1 octet	1200	0x00=Invalid, 0x01=Fan stop, 0x02=Auto, 0x03=High, 0x04=Medium, 0x05=Low, 0x06=Ultra Low, 0x07=unfix (address=19593LSB, address=19600MSB)
		19601-19608	Louver setting status	1 octet	1201	0x00=invalid, 0x01=swing, 0x02=f1, 0x03=f2, 0x04=f3, 0x05=f4, 0x06=f5, 0x07=stop (address=19601LSB, address=19608MSB)
		19609-19616	Remote controller on/off prohibit setting status	1 octet	1202	Remote controller on/off prohibit setting (address=19609)
						Remote controller mode prohibit setting (address=19610)
						Remote controller setpoint prohibit setting (address=19611)
						Remote controller louver prohibit setting (address=19612)
						Remote controller fan speed prohibit setting (address=19613)
						1=prohibit 0=permit
		19617-19624	Reserved	1 octet	1203	
		19625-19632	S-code Status	1 octet	1204	
		19633-19640	On/Off input for TCB-IFCG1TLE/ETC	1 octet	1205	TCB-IFCG1TLE bit input (See manual of TCB-IFCG1TLE)
		19641-19728	Reserved	88 bits	1206-1216	

Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Explanation
Input register (R)	1	30001	Room temperature	2 octets	unit:°C SEEEEMMM MMMMMMMM Temperature = $(-1)^S \times (0.01 \times M) \times 2^{(E)}$ s: sign (s = 1: -, s = 0: +), M: -2048 to +2047 Range:-671088.64-----670760.96 unit: °C
		30002	Setting temperature status	2 octets	Same as Room temperature
		30003-30006	Alarm code	8 octets	30003 upper header indoor unit: 00 when no alarm occurs 30003 lower follower indoor unit 1: 00 when no alarm occurs …… 30006 upper follower indoor unit 6: 00 when no alarm occurs 30006 lower follower indoor unit 7: 00 when no alarm occurs
		30007-30014	Model name	16 octets	16 characters in 16 ASCII codes
		30015-30022	Peculiar number	16 octets	16 characters in 16 ASCII codes
		30023	Ability	2 octets	Unit ability Octet expression
		30024	Indoor Type	2 octets	Octet expression 0x00**
		30025-30028	Analog input for TCB-IFCG1TLE	2 octets*4CH	4-channel analog input for TCB-IFCG1TLE (See manual of TCB-IFCG1TLE) address=30025 CH1, address=30026 CH2 etc. see Note
		30029-30030	Reserved	2 octets	
		30031	OperationMode/ Fan	2 octets	RS FM Operation mode and air volume can be set
		30032	Cool temp range	2 octets	CT CB Temperature setting upper and lower limits in cool mode
		30033	Heat temp range	2 octets	HT HB Temperature setting upper and lower limits in heat mode
		30034	Dry temp range	2 octets	DT DB Temperature setting upper and lower limits in dry mode
		30035	Auto temp range	2 octets	FT FB Temperature setting upper and lower limits in auto mode
		30036-30156	Reserved	126*2 octets	
	n	29845+156*n	Room temperature	2 octets	
		29846+156*n	Setting temperature status	2 octets	
		29847+156*n -29850+156*n	Alarm code	8 octets	
		29851+156*n -29858+156*n	Model name	16 octets	
		29859+156*n -29864+156*n	Peculiar number	16 octets	
		29865+156*n	Ability	2 octets	
		29868+156*n	Indoor Type	2 octets	
		29869+156*n-29872+156*n	Analog input for TCB-IFCG1TLE	2 octets*4CH	4-channel analog input for TCB-IFCG1TLE (See manual of TCB-IFCG1TLE)
		29873+156*n-29874+156*n	Reserved	2 octets	
		29875+156*n	OperationMode/ Fan	2 octets	RS FM Operation mode and air volume can be set
		29876+156*n	Cool temp range	2 octets	CT CB Temperature setting upper and lower limits in cool mode
		29877+156*n	Heat temp range	2 octets	HT HB Temperature setting upper and lower limits in heat mode
		29878+156*n	Dry temp range	2 octets	DT DB Temperature setting upper and lower limits in dry mode
		29879+156*n	Auto temp range	2 octets	FT FB Temperature setting upper and lower limits in auto mode
		29880+156*n-30000+156*n	Reserved	126*2 octets	

Modbus-description	Indoor-number	Modbus-address for registers	Data name	Length	Explanation
	64	39829	Room temperature	2 octets	
		39830	Setting temperature status	2 octets	
		39831-39834	Alarm code	8 octets	
		39835-39842	Model name	16 octets	
		39843-39850	Peculiar number	16 octets	
		39851	Ability	2 octets	
		39852	Indoor Type	2 octets	
		39853-39856	Analog input for TCB-IFCG1TLE	2 octets*4CH	4-channel analog input for TCB-IFCG1TLE See manual of TCB-IFCG1TLE
		39857-39858	Reserved	2 octets	
		39859	OperationMode/ Fan	2 octets	RS FM Operation mode and air volume can be set
		39860	Cool temp range	2 octets	CT CB Temperature setting upper and lower limits in cool mode
		39861	Heat temp range	2 octets	HT HB Temperature setting upper and lower limits in heat mode
		39862	Dry temp range	2 octets	DT DB Temperature setting upper and lower limits in dry mode
		39863	Auto temp range	2 octets	FT FB Temperature setting upper and lower limits in auto mode
		39864-39984	Reserved	126*2 octets	
		39985-39992	Software version	16 octets	TCB-IFMB641TLE is expressed in ASCII codes followed by the version number.
Holding register (R/W)	1	40001	Temperature setting value	2 octets	Same as Room temperature Valid range: 0 to 92, unit: 1, fractions rounded off
		40002	Accumulated operation time	2 octets	Octet expression unit: hour ex) 255hours=0xFF Unit: hour. Monitor on/off of the discrete input register to check the on/off state of all air conditioners every 15 minutes. When the register state is on, add 15 minutes. The register data is retained even during power-off.
		40003-40004	Analog output for TCB-IFCG1TLE	2 octets*2CH	2-channel analog output for TCB-IFCG1TLE (See manual of TCB-IFCG1TLE) see Note 2
		40005-40006	Reserved	2 octets	
		40007-40156	Reserved	150*2 octets	
	2	40157	Temperature setting value	2 octets	
		40158	Accumulated operation time	2 octets	
		40159-40160	Analog output for TCB-IFCG1TLE	2 octets*2CH	
		40161-40162	Reserved	2 octets	
		40163-40312	Reserved	150*2 octets	
	n	39845+156*n	Temperature setting value	2 octets	
		39846+156*n	Accumulated operation time	2 octets	
		39847+156*n-39848+156*n	Analog output for TCB-IFCG1TLE	2 octets*2CH	
		39849+156*n-39850+156*n	Reserved	2 octets	
		39851+156*n-40000+156*n	Reserved	150*2 octets	
	64	49829	Temperature setting value	2 octets	
		49830	Accumulated operation time	2 octets	
		49831-49832	Analog output for TCB-IFCG1TLE	2 octets*2CH	
		49833-49834	Reserved	2 octets	
		49835-49984	Reserved	150*2 octets	

Note 1

- Analog In (2 channels, thermistor) reading
  Received TCC-LINK value is retained in this register with two bytes.
  The received 2-byte data is a two's complement and is converted to as an absolute measurement temperature by dividing it by 100.
- Example) Received value 0xFE97 -> x0169 (converted to two's complement) -> 361 -> converted to 3.61 (K) (divided by 100) The Celsius temperature is obtained by subtracting 273.15 from 3.61.
- Analog In (4CH 0-10VDC)
  Received TCC-LINK value is retained in this register with two bytes. The true value is a two's complement, and the value obtained by dividing the true value by 1000 becomes the board input value.
  Example) Received value 0xD8F1 -> converted to 0x270F (two's complement) -> 9999 -> converted to 9.999V (divided by 1000)

Note 2

- TCB-IFCG1TLE Analog Out 4-channel writing
  The master device writes a 2-byte two's complement that is 1000 times of the transmit value.
  The TCB-IFCG1TLE board value is obtained by dividing a two's complement of 2-byte received value by 3000. A level in accordance with the value is output from the MPU treating 3.333 as 256 levels. The MPU output value is multiplied by 3 in the external circuit, and the TCB-IFCG1TLE board output value equals the transmit value.

Example 1) A value 9.999V calculated by the master device is sent -> -> 9999 (1000 times) -> 0x270F---> 0x D8F1 (two's complement) This value is written.

Calculation at the receiver (TCB-IFCG1TLE board) 0xD8F1- -> 0x270F (two's complement) -> 9999 -> 3.333V (divided by 3000)- -> 256 levels = 0xFF (3.333V) is DA output. A value 3.333*3 = 9.999V is output from "Analog Out" on the TCB-IFCG1TLE board.

Example 2) A value 3.000V calculated by the master device is sent -> 3000 (1000 times) -> 0x0BB8-- -> 0xF448 (two's complement) This value is written to the register.

Calculation at the receiver (TCB-IFCG1TLE board) 0xF448 -> 0x0BB8 (two's complement) -> 3000 -> 1V (divided by 3000) - -> 77 levels = 0x4D (1.00V) is DA output. A value 1.00*3 = 3.00V is output from "Analog Out" on the TCB-IFCG1TLE board.

Note 3

- Unused bits can be read and written. No data can be written to reserved areas. If a reserved area is read, 00 is always returned.

Note 4

- The meaning of RS/FM (operation mode, fan speed), CT/CB (temperature setting upper and lower limits in cool mode), HT/HB (temperature setting upper and lower limits in heat mode), DT/DB (temperature setting upper and lower limits in dry mode), and FT/FB (temperature setting upper and lower limits in auto mode) in the Input register (R) is shown below. The master device must read the following values from each air conditioner in advance, and must set values within this range when specifying operation data.

Bits of RS	Meaning
b7, b6	00 All operation modes enabled 01 Cooling/drying disabled 10 Heating disabled 11 Fan only enabled
b5	1: Auto mode enabled, 0: Auto mode disabled
b4	1: Ventilation enabled, 0: Ventilation disabled
b3	1: Heating mode enabled, 0: Heating mode disabled
b2	1: Drying mode enabled, 0: Drying mode disabled
b1	1: Cooling mode enabled, 0: Cooling mode disabled
LSB	1: Fan mode enabled, 0: Fan mode disabled

Bits of FM	Meaning (fan speed)
b3	1: High fan speed enabled, 0: disabled
b2	1: Medium fan speed enabled, 0: disabled
b1	1: Low fan speed enabled, 0: disabled
b0	1: Ultra-low fan speed enabled, 0: disabled

Upper-limit / lower-limit temperature	Meaning
CT CB	Temperature setting upper-limit value in cool mode Temperature setting lower-limit value in cool mode
HT HB	Temperature setting upper-limit value in heat mode Temperature setting lower-limit value in heat mode
DT DB	Temperature setting upper-limit value in dry mode Temperature setting lower-limit value in dry mode
FT FB	Temperature setting upper-limit value in auto mode Temperature setting lower-limit value in auto mode

The upper-limit and lower-limit values in the table above are converted to Celsius temperatures using the following formula.
Celsius temperature (°C) = -35 + (decimal read value / 2)

Note 5

• Temperature is transformed below. (TCB-IFMB640TLE)

Case 1) 28 °C S=0, E=1, M=1400 → 0X0D78
Case 2) 24 °C S=0, E=1, M=1200 → 0X0CB0
Case 3) 23 °C S=0, E=1, M=1150 → 0X0C7E
Case 4) 18 °C S=0, E=1, M=900 → 0X384

Note 6

• Operation mode setting example. (TCB-IFMB640TLE)

Case 1) heat (0X01)
register address 9 → 1
register address 10 to 16 → 0
Case 2) cool (0X02)
register address 10 → 1
register address 9, 11 to 16 → 0
Case 3) dry (0X03)
register address 9, 10 → 1
register address 11 to 16 → 0

Note 7

• Fan speed setting. (TCB-IFMB640TLE)

Case 1) Fan stop (0X01)
register address 17 → 1
register address 18 to 24 → 0
Case 2) Ultra low (0X06)
register address 18, 19 → 1
register address 17, 20 to 24 → 0

Note 8

• When air conditioners are added, deleted, or DN is changed, it is necessary to restart the Modbus Interface.

8 Appendix

Converted Capacity Values

Hexadecimal converted capacity values corresponding to TCC-LINK return values are used as response data.
Example) A value acquired as 0x03 (decimal 3) is converted to 28 as capacity.

Return value (decimal)	Converted capacity value (decimal)	Return value (decimal)	Converted capacity value (decimal)
0	Invalid	21	224
1	22	22	250
2	25	23	280
3	28	24	340
4	32	25	355
5	36	26	450
6	40	27	500
7	45	28	560
8	50	29	600
9	56	30	630
10	63	31	670
11	71	32	710
12	80	33	800
13	90	34	840
14	100		
15	112		
16	125		
17	140		
18	160		
19	180		
20	200		

MEMO

MEMO