

User Manual for Communication

Temperature Controllers

TF3 Series

MCT-TF3C1-V1.3-EN

Thank you for purchasing an Autonics product.

This user manual contains information about the product and its proper use,
and should be kept in a place where it will be easy to access.

Preface

Thank you for purchasing Autonics product.

Please familiarize yourself with the information contained in the Safety Precautions section before using this product.

This user manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

User Manual Guide

Please familiarize yourself with the information in this manual before using the product.

- This manual provides detailed information on the product's features. It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- A user manual is not provided as part of the product package. Visit our web site (www.autonics.com) to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice. Upgrade notice is provided through out homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our homepage.

Communication Protocol

TF3 Series is accepted to Modbus RTU Protocol.

Broadcast command is not supported.

User Manual for Communication Symbols

Symbol	Description
 Note	Supplementary information for a particular feature.
 Warning	Failure to follow instructions can result in serious injury or death.
 Caution	Failure to follow instructions can lead to a minor injury or product damage.
 Ex.	An example of the concerned feature's use.
※1	Annotation mark.

Safety Precautions

- Following these safety precautions will ensure the safe and proper use of the product and help prevent accidents, as well as minimizing possible hazards.
- Safety precautions are categorized as Warnings and Cautions, as defined below:

	Warning	Warning	Failure to follow these instructions may result in serious injury or death.
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	Caution	Caution	Failure to follow these instructions may result in personal injury or product damage.
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Warning

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, fire, or economic loss.
- The unit must be installed on a device panel before use.
Failure to follow this instruction may result in electric shock.
- Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in electric shock.
- Check the terminal numbers before connecting the power source.
Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit. Please contact us if necessary.
Failure to follow this instruction may result in electric shock or fire.



Caution

- Do not use the unit outdoors.
Failure to follow this instruction may result in shortening the life cycle of the unit, or electric shock.
- When connecting the power input and relay output cables, use AWG 12 to 28 cables. Make sure to tighten the relay output terminal screw bolt 0.4N·m and the others communication and power terminal screw bolt 0.5N·m. When connecting the sensor input cables, use AWG 14 to 30 cables and make sure to tighten the terminal screw bolt 0.2N·m.
Failure to follow this instruction may result in fire due to contact failure.
- Use the unit within the rated specifications.
Failure to follow this instruction may result in shortening the life cycle of the unit, or fire.
- Do not use loads beyond the rated switching capacity of the relay contact.
Failure to follow this instruction may result in insulation failure, contact melt, contact failure, relay broken, or fire.
- Do not use water or oil-based detergent when cleaning the unit. Use dry cloth to clean the unit.
Failure to follow this instruction may result in electric shock or fire.

- Do not use the unit where flammable or explosive gas, humidity, direct sunlight, radiant heat, vibration, or impact may be present.
Failure to follow this instruction may result in fire or explosion.
- Keep dust and wire residue from flowing into the unit.
Failure to follow this instruction may result in fire or product damage.

The specifications and dimensions of this manual are subject to change and some models may be discontinued without notice.

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1 Modbus RTU Protocol

Modbus is an industrial protocol developed in 1979 for serial communication between devices. Its functionality has gradually expanded to allow implementation in TCP/IP and UDP environments, and it is now widely used for simple, stable, and efficient communication in various network environments. This protocol has become the standard communication method in industrial automation systems, SCADA (Supervisory Control and Data Acquisition systems), and other industrial networks.

Modbus RTU transmits data in a continuous binary format, making it more efficient and faster than ASCII transmission. The frame structure does not clearly distinguish the start and end, but defines the start and end by leaving a silent interval (3.5 character times) between frames.



For more detailed information about Modbus protocol, refer to the documentation provided by the developer.

1.1 Function Code Frame Structure

1.1.1 01 (0x01) Read Coil Status

Reads the ON/OFF status of output (0X reference, coil) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x01 (Read Coil Status)
Starting address	2-byte	Starting address of the coil to be read
Quantity of coils	2-byte	Number of coils
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of coils		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x01 (Read Coil Status)
Byte count	1-byte	Number of bytes in the returned data
Coil status	N-byte	The status of the requested coils is represented. Each coil's status is represented by 1 bit, and 8 coil statuses are grouped into 1 byte. N = number of coils / 8 If the remainder is not zero when divided by 8: N = N + 1
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Coil status	CRC check	
1-byte	1-byte	1-byte	N × byte	Low	High
				1-byte	1-byte
CRC-16					

1.1.2 02 (0x02) Read Input Status

Reads the ON/OFF status of input (1X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x02 (Read Input Status)
Starting address	2-byte	Starting address of the input to be read
Quantity of inputs	2-byte	Number of inputs
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of inputs		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x02 (Read Input Status)
Byte count	1-byte	Number of bytes in the returned data
Input status	N-byte	The status of the requested inputs is represented. Each input's status is represented by 1 bit, and 8 input statuses are grouped into 1 byte. N = number of inputs / 8 If the remainder is not zero when divided by 8: N = N + 1
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Input status	CRC check	
1-byte	1-byte	1-byte	N × byte	Low	High
				1-byte	1-byte
CRC-16					

1.1.3 03 (0x03) Read Holding Registers

Reads the binary data of holding registers (4X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x03 (Read Holding Registers)
Starting address	2-byte	Starting address of the first register to be read
Quantity of registers	2-byte	Number of registers
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of registers		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x03 (Read Holding Registers)
Byte count	1-byte	Number of bytes in the returned data (Number of registers read × 2-byte)
Register value	N × 2-byte	The values of the requested registers are represented. Each register is represented by 2 bytes. N is determined by the number of requested registers.
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Register value		CRC check	
1-byte	1-byte	1-byte	High	Low	Low	High
			1-byte	1-byte	1-byte	1-byte
CRC-16						

1.1.4 04 (0x04) Read Input Registers

Reads the binary data of input registers (3X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x04 (Read Input Registers)
Starting address	2-byte	Starting address of the first input register to be read
Quantity of input registers	2-byte	Number of input registers
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Starting address		Quantity of input registers		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x04 (Read Input Registers)
Byte count	1-byte	Number of bytes in the returned data (Number of registers read × 2-byte)
Register value	N × 2-byte	The values of the requested input registers are represented. Each register is represented by 2 bytes. N is determined by the number of requested registers.
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Byte count	Register value		CRC check	
1-byte	1-byte	1-byte	High	Low	Low	High
			1-byte	1-byte	1-byte	1-byte
CRC-16						

1.1.5 05 (0x05) Force Single Coil

Forces a single coil (0X reference) to either ON (0xFF00) or OFF (0x0000) status in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x05 (Force Single Coil)
Coil address	2-byte	Address of the coil to be forced
Force data	2-byte	Sets or resets the coil. (0xFF00 = ON, 0x0000 = OFF)
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Coil address		Force data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x05 (Force Single Coil)
Coil address	2-byte	Address of the coil that was forced
Force data	2-byte	The status of the coil is represented. (0xFF00 = ON, 0x0000 = OFF)
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Coil address		Force data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

1.1.6 06 (0x06) Preset Single Register

Writes the binary data to a single holding register (4X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x06 (Preset Single Register)
Register address	2-byte	Address of the register to be preset
Preset data	2-byte	Value to be preset
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave address	Function code	Register address		Preset data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x06 (Preset Single Register)
Register address	2-byte	Address of the register that was preset
Preset data	2-byte	Value preset to the register
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Register address		Preset data		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

1.1.7 16 (0x10) Preset Multiple Registers

Writes the binary data continuously to multiple holding registers (4X reference) in the slave device.

Request frame (master)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x10 (Preset Multiple Registers)
Starting address	2-byte	Starting address of the first register to be preset
Quantity of registers	2-byte	Number of registers to be preset
Byte count	1-byte	Number of bytes for the register values to be preset (Number of registers to be preset × 2-byte)
Register values	N × 2-byte	The values of the registers to be preset are represented. N is determined by the number of registers to be preset.
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a request frame

Slave addr.	Func. code	Starting addr.		Quantity of registers		Byte count	Register values		CRC check	
1-byte	1-byte	High	Low	High	Low	1-byte	1-byte	1-byte	High	Low
		1-byte	1-byte	1-byte	1-byte		1-byte	1-byte	1-byte	1-byte
CRC-16										

Response frame (slave)

Frame element	Data size	Description
Slave address	1-byte	Address of the slave device
Function code	1-byte	0x10 (Preset Multiple Registers)
Starting address	2-byte	Starting address of the first register that was preset
Quantity of registers	2-byte	Number of registers that were preset
CRC check	2-byte	Adds a CRC-16 checksum at the end of the frame to verify data integrity.

Example of a response frame

Slave address	Function code	Starting address		Quantity of registers		CRC check	
1-byte	1-byte	High	Low	High	Low	Low	High
		1-byte	1-byte	1-byte	1-byte	1-byte	1-byte
CRC-16							

Except when downloading parameters with predefined minimum, maximum, or default values based on the input specifications in the PC loader program, it is recommended to use Preset Single Register rather than Preset Multiple Registers when connecting to external devices such as PLCs or graphic panels.

1.2 Exception Handling

In case of a communication error, the slave device sets the highest bit of the received function code to 1 in its response. It then sends only the exception code, without including any data related to the original request.

Exception response frame

Slave address	Function code + 0x80	Exception code	CRC check
1-byte	1-byte	1-byte	2-byte
CRC-16			

Exception codes

Exception code	Code name	Description
01	ILLEGAL FUNCTION	If the command is not supported.
02	ILLEGAL DATA ADDRESS	If the requested data address is invalid. (e.g. The data address does not exist or the address range is incorrect.)
03	ILLEGAL DATA VALUE	If the requested data value is invalid. (e.g. The data value is out of the allowable range.)
04	SLAVE DEVICE FAILURE	If the parameter is locked, communication write is prohibited, or the command cannot be processed correctly.
06	SLAVE DEVICE BUSY	If the device is in a state where it cannot execute the requested command.

2 Modbus Mapping Table

2.1 Read Coil Status.(Func 01) / Force Single Coil(Func 05) [Func: 01/05, R/W: R/W]

No(Address)	Parameter	Description	Setting range	Unit	Factory default	Note
000001(0000)	Enable AUX Output	Auxiliary output ON/OFF	0: OFF, 1: ON	-	1	
000002(0001)	Enable Comp Output	Compressor output ON/OFF	0: OFF, 1: ON	-	1	
000003(0002)	Parameter Initialize	Parameter reset	0: NO, 1: YES	-	0	
000004 to 000050	Reserved					

2.2 Read Input Status.(Func 02) [Func: 02, R/W: R]

No(Address)	Parameter	Description	Setting range	Unit	Factory default	Note
100001(0000)	°C indicator	Unit indicator	0: OFF, 1: ON	-	-	
100002(0001)	°F indicator	Unit indicator	0: OFF, 1: ON	-	-	
100003(0002)	COMP indicator	Compressor output indicator	0: OFF, 1: ON	-	-	
100004(0003)	DEF indicator	Defrost output indicator	0: OFF, 1: ON	-	-	
100005(0004)	FAN indicator	Evaporation-fan output indicator	0: OFF, 1: ON	-	-	
100006(0005)	AUX indicator	Auxiliary output indicator	0: OFF, 1: ON	-	-	
100007(0006)	▲ indicator	Deviation indicator	0: OFF, 1: ON	-	-	
100008(0007)	■ indicator	Deviation indicator	0: OFF, 1: ON	-	-	
100009(0008)	▼ indicator	Deviation indicator	0: OFF, 1: ON	-	-	
100010(0009)	DI input	Digital input	0: OFF, 1: ON	-	-	
100011 to 100050	Reserved					

2.3 Read Input Register.(Func 04)

[Func: 04, R/W: R]

No(Address)	Parameter	Description	Setting range	Unit	Factory default	Note
300001(0000) to 300100(0063)	Reserved					
300101(0064)	-	Product number H	-	-	0	
300102(0065)	-	Product number L	-	-	2563	
300103(0066)	-	Hardware version	-	-		
300104(0067)	-	Software version	-	-		
300105(0068)	-	Model name 1	-	-	"TF"	
300106(0069)	-	Model name 2	-	-	"3□"	
300107(006A)	-	Model name 3	-	-	"-□"	
300108(006B)	-	Model name 4	-	-	"□□"	
300109(006C)	-	Model name 5	-	-	"-□"	
300110(006D)	-	Model name 6	-	-	" "	
300111(006E)	-	Model name 7	-	-	" "	
300112(006F)	-	Model name 8	-	-	" "	
300113(0070)	-	Model name 9	-	-	" "	
300114(0071)	-	Model name 10	-	-	" "	
300115(0072)	-	Reserved	-	-	-	
300116(0073)	-	Reserved	-	-	-	
300117(0074)	-	Reserved	-	-	-	
300118(0075)	-	Coil status Start Address	-	-	0000	
300119(0076)	-	Coil status Quantity	-	-	0	
300120(0077)	-	Input status Start Address	-	-	0000	
300121(0078)	-	Input status Quantity	-	-	0	
300122(0079)	-	Holding Register Start Address	-	-	0000	
300123(007A)	-	Holding Register Quantity	-	-	0	
300124(007B)	-	Input Register Start Address	-	-	0000	
300125(007C)	-	Input Register Quantity	-	-	0	
300126(007D)	-	Channel Quantity	-	-	0	
300127(007E) to 300200(00C7)	Reserved					

No(Address)	Parameter	Description	Setting range	Unit	Factory default	Note
301001(03E8)	PV	Present value	SV low limit to SV high limit, 30001: 0PEH 30000: HHHH (High) -30000: LLLL (Low)	°C/°F	-	
301002(03E9)	SV	SV setting value	SV low limit to SV high limit	°C/°F	0	
301003(03EA)	DPLE	Display selection	0: 5 1, 1: 5 2, 2: 5 3, 3: 0 5	-	0	
301004(03EB)	Unit	TemperatureUnit	0: °C, 1: °F	-	0	
301005(03EC)	Mon.t	Monitoring time	0 to 100	Hour	-	
301006(03ED)	H.P.L	Max. temperature value	SV low limit to SV high limit	°C/°F	-	
301007(03EE)	L.P.L	Min. temperature value	SV low limit to SV high limit	°C/°F	-	
301008(03EF)	°C indicator	Unit indicator	0: OFF, 1: ON	-	-	Bit 0
	°F indicator	Unit indicator	0: OFF, 1: ON	-	-	Bit 1
	COMP indicator	Compressor output indicator	0: OFF, 1: ON	-	-	Bit 2
	DEF indicator	Defrost output indicator	0: OFF, 1: ON	-	-	Bit 3
	FAN indicator	Evaporation-fan output indicator	0: OFF, 1: ON	-	-	Bit 4
	AUX indicator	Auxiliary output indicator	0: OFF, 1: ON	-	-	Bit 5
	▲ indicator	Deviation indicator	0: OFF, 1: ON	-	-	Bit 6
	■ indicator	Deviation indicator	0: OFF, 1: ON	-	-	Bit 7
	▼ indicator	Deviation indicator	0: OFF, 1: ON	-	-	Bit 8
	DI input	Digital input	0: OFF, 1: ON	-	-	Bit 9
301009	S1_Temperature	Input sensor 1 temperature value	SV low limit to SV high limit	°C/°F		
301010	S2_Temperature	Input sensor 2 temperature value	SV low limit to SV high limit	°C/°F		
301011	S3_Temperature	Input sensor 3 temperature value	SV low limit to SV high limit	°C/°F		
301012	Virtual temperature	Virtual temperature value	SV low limit to SV high limit	°C/°F		
301013	Decimal point	Decimal point position	0: 0, 1: 0.0			
302001	TFD_1st digit data	Data value of TFD_10 ³		-	-	
302002	TFD_2nd digit data	Data value of TFD_10 ²		-	-	
302003	TFD_3rd digit data	Data value of TFD_10 ¹		-	-	
302004	TFD_output data	TFD output indicator data value		-	-	

2.4 Read Holding Register(Func 03) / Preset Single Register(Func 06) / Preset Multiple Registers(Func 16) [Func: 03/06/16, R/W: R/W]

2.4.1 SV setting group

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400001(0000)	SV	SV setting	SV low limit value to SV high limit value	0	°C/°F	
400002(0001)	DPLE	Display selection	0: 5 1, 1: 5 2, 2: 5 3, 3: 5 5	0	-	
400007 to 400050	Reserved					

2.4.2 Parameter User Group (Parameter 0 Group)

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400051(0032)	MON	Monitoring time	0 to 100	-	Hour	
400052(0033)	HPL	Max. value	SV low limit value to SV high limit value	-	°C/°F	
400053(0034)	LPL	Min. value	SV low limit value to SV high limit value	-	°C/°F	
400054 to 400100	Reserved					

2.4.3 Parameter 1 Setting Group

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400101(0064)	<i>i n t</i>	Input type	0: <i>n5H</i> , 1: <i>n5L</i> , 2: <i>n1H</i> , 3: <i>n1L</i> , 4: <i>dPH</i> , 5: <i>dPL</i>	0	-	
400102(0065)	<i>52</i>	Input sensor 2 ON/OFF	0: <i>oFF</i> , 1: <i>oN</i>	0	-	
400103(0066)	<i>53</i>	Input sensor 3 selection	0: <i>dI</i> , 1: <i>t5</i>	0	-	
400104(0067)	<i>u t r</i>	Virtual temperature rate	0 to 100	0	%	
400105(0068)	<i>U n t</i>	Temperature unit	0: <i>°C</i> , 1: <i>°F</i>	0	-	
400106(0069)	<i>i b.1</i>	Input correction 1	-40 to 400	0.0	°C/°F	
400107(006A)	<i>i b.2</i>	Input correction 2				
400108(006B)	<i>i b.3</i>	Input correction 3				
400109(006C)	<i>d5.t</i>	Delay display period	0.5 to 100	0.5	Sec	
400110(006D)	<i>5dR</i>	Defrost/Auxiliary output	0: <i>dEF</i> , 1: <i>RUH</i>	0	-	
400111(006E)	<i>RUH</i>	Auxiliary output	0: <i>oFF</i> , 1: <i>FRn</i> , 2: <i>RLn</i>	0	-	
400112(006F)	<i>bUz</i>	Buzzer	0: <i>oFF</i> , 1: <i>oN</i>	1	-	
400112 to 400150	Reserved					

2.4.4 Parameter 2 Setting Group

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400151(0096)	oFt	Compressor output mode	0: L, 1: H	0	-	
400152(0097)	HY5	Hysteresis	1 to 5 (0.5 to 5.0)	1	°C	
			2 to 10 (2.0 to 10.0)		°F	
400153(0098)	oF5	Offset	0 to 5 (0.0 to 5.0)	0	°C	
			0 to 10 (0.0 to 10.0)		°F	
400154(0099)	H5u	SV high limit value	(SV low limit +1 digit) to high limit value of input type	99	°C/°F	
400155(009A)	L5u	SV low limit value	Low limit value of input type to (SV high limit -1 digit)	-40	°C/°F	
400156(009B)	nñd	Night mode	0: oFF, 1: t1 ñ, 2: d1	0	°C/°F	
400157(009C)	n5u	Night mode SV correction	-20 to 20 (-20 to 20.0)	1	°C	
			-50 to 50 (-50 to 50.0)		°F	
400158(009D)	nHY	Night mode hysteresis	1 to 5 (0.5 to 5.0)	1	°C	
			2 to 10 (2.0 to 10.0)		°F	
400159(009E)	noF	Night mode offset	0 to 5 (0.0 to 5.0)	0	°C	
			0 to 10 (0.0 to 10.0)		°F	
400160(009F)	n5H	Night mode start hour	0 to 23	0	Hour	
400161(00A0)	n5ñ	Night mode start min	0 to 59	0	Min	
400162(00A1)	nEH	Night mode end hour	0 to 23	8	Hour	
400163(00A2)	nEñ	Night mode end min	0 to 59	0	Min	
400164(00A3)	Eño	Temperature monitoring	0: oFF, 1: 51, 2: 52, 3: 53, 4: u5	0	-	
400165(00A4)	5dL	Compressor start-up delay time	0 to 60	0	Min	
400166(00A5)	L5L	Compressor min. operation cycle	0 to 60	0	Min	
400167(00A6)	r dL	Compressor restart delay time	0 to 60	0	Min	
400168(00A7)	oñt	Compressor min. operation time	0 to 60	0	Min	
400169(00A8)	L L	Compressor continuous operation	0 to 24	0	Hour	
400170(00A9)	RdL	Alarm delay time after continuous operation	0 to 24	2	Hour	
400171(00AA)	L L E	Compressor operation cycle when sensor break	0 to 100	0	Min	
400172(00AB)	dUt	Compressor duty rate when sensor break	0 to 100	50	%	
400173 to 400250	Reserved					

2.4.5 Parameter 3 Setting Group

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400201(00C8)	<i>dEF</i>	Defrost method & operation	0: $H\bar{E}\bar{N}$, 1: $\bar{G}\bar{E}\bar{N}$, 2: $H\bar{E}\bar{E}$, 3: $\bar{G}\bar{E}\bar{E}$	0	-	
400202(00C9)	<i>dIn</i>	Defrost cycle	0 to 24, 0 to 100	4	Hour	
400203(00CA)	<i>r.dI</i>	Real-time defrost cycle	0: $\bar{o}\bar{F}\bar{F}$, 1: $\bar{o}\bar{n}$	0	-	
400204(00CB)	<i>dH1</i>	Real-time defrost cycle 1: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400205(00CC)	<i>dñ1</i>	Real-time defrost cycle 1: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400206(00CD)	<i>dH2</i>	Real-time defrost cycle 2: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400207(00CE)	<i>dñ2</i>	Real-time defrost cycle 2: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400208(00CF)	<i>dH3</i>	Real-time defrost cycle 3: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400209(00D0)	<i>dñ3</i>	Real-time defrost cycle 3: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400210(00D1)	<i>dH4</i>	Real-time defrost cycle 4: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400211(00D2)	<i>dñ4</i>	Real-time defrost cycle 4: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400212(00D3)	<i>dH5</i>	Real-time defrost cycle 5: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400213(00D4)	<i>dñ5</i>	Real-time defrost cycle 5: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400214(00D5)	<i>dH6</i>	Real-time defrost cycle 6: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400215(00D6)	<i>dñ6</i>	Real-time defrost cycle 6: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400216(00D7)	<i>dH7</i>	Real-time defrost cycle 7: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400217(00D8)	<i>dñ7</i>	Real-time defrost cycle 7: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400218(00D9)	<i>dH8</i>	Real-time defrost cycle 8: hour	0 to 23, 24: $\bar{o}\bar{F}\bar{F}$	24	Hour	
400219(00DA)	<i>dñ8</i>	Real-time defrost cycle 8: min	0 to 59, 60: $\bar{o}\bar{F}\bar{F}$	60	Min	
400220(00DB)	<i>dEt</i>	Defrost time	1 to 100	30	Min/Sec	
400221(00DC)	<i>P.d.d</i>	Pump down delay time	0.00 to 9.99 (0 min. 00 sec. to 9 min. 59 sec.)	0.00	Min.Sec	
400222(00DD)	<i>d.r.t</i>	Defrost end delay time	0.00 to 9.99 (0 min. 00 sec. to 9 min. 59 sec.)	1.00	Min.Sec	
400223(00DE)	<i>E.d.t</i>	Defrost end temperature	-40 to 99	4	°C	
			-40 to 212		°F	
400224(00DF)	<i>dHY</i>	Defrost hysteresis	1 to 5 (0.5 to 5.0)	1	°C	
			2 to 10 (2.0 to 10.0)		°F	
400225(00E0)	<i>P.dE</i>	Defrost when power ON	0: $\bar{o}\bar{F}\bar{F}$, 1: $\bar{o}\bar{n}$	0	-	
400226(00E1)	<i>d.dE</i>	Defrost delay when power ON/manual defrost	0 to 60	0	Min	
400227(00E2)	<i>dGr</i>	Defrost group	0: $\bar{o}\bar{F}\bar{F}$, 1: $\bar{n}\bar{A}\bar{S}$, 2: $\bar{S}\bar{L}\bar{u}$	0	-	
400228(00E3)	<i>P.dC</i>	Parameter copy	0: $\bar{o}\bar{F}\bar{F}$, 1: $\bar{o}\bar{n}$	0	-	
400229(00E4)	<i>dPr</i>	Prior defrost selection	0: $\bar{o}\bar{F}\bar{F}$, 1: $\bar{o}\bar{n}$	0	-	
400230(00E5)	<i>U.dE</i>	Defrost time unit	0: $H\bar{G}\bar{H}$, 1: $\bar{L}\bar{o}\bar{U}$	0	-	
400231(00E6)	<i>R.d.d</i>	Alarm delay after defrost/door open	0 to 24	1	Hour	
400232(00E7)	<i>t.dE</i>	Temperature display during defrosting	0: $\bar{o}\bar{F}\bar{F}$, 1: $\bar{o}\bar{n}$	0	-	
400233(00E8)						

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400234 to 400250	Reserved					

2.4.6 Parameter 4 Setting Group

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400251(00FA)	<i>AL</i>	Alarm operation mode	0: <i>OFF</i> , 1: <i>ALd</i>	1	-	
400252(00FB)	<i>ALt</i>	Alarm option	0: <i>ALR</i> , 1: <i>ALb</i> , 2: <i>ALC</i> , 3: <i>ALd</i> , 4: <i>ALe</i> , 5: <i>ALF</i>	0	-	
400253(00FC)	<i>ALH</i>	Alarm high-limit deviation	-F.S to F.S	139	°C	
				252	°F	
400254(00FD)	<i>ALL</i>	Alarm low-limit deviation	-F.S to F.S	139	°C	
				252	°F	
400255(00FE)	<i>ALH</i>	Alarm hysteresis	1 to 5 (0.5 to 5.0)	1	°C	
			2 to 10 (2.0 to 10.0)		°F	
400256(00FF)	<i>RoN</i>	Alarm ON delay time	0 to 60	0	Min	
400257(0100)	<i>RoF</i>	Alarm OFF delay time	0 to 60	0	Min	
400258(0101)	<i>ERd</i>	External alarm delay time	0 to 60	0	Min	
400259(0102)	<i>Ro</i>	Alarm output method	0: <i>no</i> , 1: <i>nC</i>	0	-	
400260(0103)	<i>FtY</i>	Evaporation-fan operation	0: <i>FRn</i> , 1: <i>dEF</i>	0	-	
400261(0104)	<i>Ft</i>	Evaporation-fan control temperature	-40 to 99	4	°C	
			-40 to 212		°F	
400262(0105)	<i>FHY</i>	Evaporation-fan hysteresis	1 to 5 (0.5 to 5.0)	1	°C	
			2 to 10 (2.0 to 10.0)		°F	
400263(0106)	<i>FRn</i>	Evaporation-fan mode	0: <i>EF1</i> , 1: <i>EF2</i> , 2: <i>EF3</i> , 3: <i>EF4</i> , 4: <i>EF5</i>	0	-	
400264(0107)	<i>Pdr</i>	Evaporation-fan start-up delay time	0.00 to 9.99	0.00	Min.Sec	
400265 to 400300	Reserved					

2.4.7 Parameter 5 Setting Group

No(Address)	Parameter	Description	Setting range	Factory default	Unit	Note
400301(012C)	CUH	Current hour	0 to 23	Random hour	Hour	
400302(012D)	$\text{CU}\bar{n}$	Current min	0 to 59	Random min.	Min	
400303(012E)	dI	Digital input	0: oFF , 1: 5tP , 2: $d5\bar{U}$, 3: $n\bar{n}d$, 4: EAL , 5: $E.dF$, 6: $\bar{n}dF$	0	-	
400304(012F)	LbA	Loop break alarm monitoring time	0 to 100	0	Min	
400305(0130)	Rdr	Communication address	01 to 99	01	-	
400306(0131)	$bP5$	Communication speed	0: 24, 1: 48, 2: 96, 3: 192, 4: 384	2	bps	
400307(0132)	Prt	Communication parity bit	0: non , 1: Eun , 2: odd	0	-	
400308(0133)	$5tP$	Communication stop bit	0: 1, 1: 2	1	-	
400309(0134)	$r\bar{U}t$	Communication response wait time	5 to 99	20	ms	
400310(0135)	$\text{Co}\bar{U}$	Communication write	0: $E\bar{n}A$, 1: $d5A$	0	-	
400311(0136)	USr	User level	0: $5t\bar{d}$, 1: HGH	0	-	
400312(0137)	LSu	SV setting group lock	0: oFF , 1: on	0	-	
400313(0138)	$\text{Ld}\bar{U}$	Front key lock	0: oFF , 1: on	0	-	
400314(0139)	LP0	Parameter 0 group lock	0: oFF , 1: on	0	-	
400315(013A)	$\text{LP}\bar{U}$	Parameter user group lock	0: oFF , 1: on	0	-	
400316(013B)	$\text{LP}1$	Parameter 1 group lock	0: oFF , 1: on	0	-	
400317(013C)	$\text{LP}2$	Parameter 2 group lock	0: oFF , 1: on	0	-	
400318(013D)	$\text{LP}3$	Parameter 3 group lock	0: oFF , 1: on	0	-	
400319(013E)	$\text{LP}4$	Parameter 4 group lock	0: oFF , 1: on	0	-	
400320(013F)	$\text{LP}5$	Parameter 5 group lock	0: oFF , 1: on	0	-	
400321(0140)	$P\bar{U}d$	Password	000: Password OFF 002 to 999: Password ON	000	-	
400322 to 400350	Reserved					

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* Dimensions or specifications on this manual are subject to change and some models may be discontinued without notice.