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Autonics sensors & controllers

Autonics
Sensors & Controllers

Programmable Counter/Timer

CT Series

USER MANUAL

For COMMUNICATION



CT Series

Thank you very much for selecting Autonics products.

For your safety, please read the following before using.

Preface

Thank you for purchasing an 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 our homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us on our homepage.

Communication Protocol

CT Series is accepted to Modbus RTU Protocol.

Users should be aware that it does not support a broadcast command.

User Manual 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 the instructions may lead to a serious injury or accident.
--	----------------	--

 Caution	Caution	Failure to follow the instructions may lead to a minor injury or accident.
--	----------------	--



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.
- 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 AWG20 (0.50mm^2) cables and make sure to tighten the terminal screw bolt above $0.74\text{N}\cdot\text{m}$ to $0.90\text{N}\cdot\text{m}$.
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 of communication manual are subject to change and some models
may be discontinued without notice.**

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1 Modbus RTU Protocol

1.1 Read coil status (Func 01-01H)

Read output (OX reference, Coil) ON/OFF status in the slave device.

(1) Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte
CRC16							

(2) Response (Slave)

Slave address	Function	Byte count	Data	Data		Error check (CRC16)	
				Low	High	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte
CRC16							

If read the 10 output status (ON: 1, OFF: 0) within coil 000001 (0000 H) to 000010 (0009 H) on Slave (Address 17) from Master.

- Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	01 H	00 H	00 H	00 H	0A H	## H	## H

If the values range from coil 000008 (0007 H) to 000001 (0000 H) on the Slave are “ON-ON-OFF-OFF-ON-ON-OFF-ON”, and the values from 000010 (0009 H) to 000009 (0008 H) are respectively “OFF-ON”.

- Response (Slave)

Slave address	Function	Byte count	Data (000008 to 000001)	Data (000010 to 000009)	Error check (CRC16)	
					Low	High
11 H	01 H	02 H	CD H	01 H	## H	## H

1.2 Read input status (Func 02-02H)

Read Input ON/OFF status (1X reference) in Slave device.

(1) Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

(2) Response (Slave)

Slave address	Function	Byte count	Data	Data		Error check (CRC16)	
				Data	Data	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

If read the 10 input status (ON: 1, OFF: 0) within range 100001 (0000 H) to 100010 (0009 H) in the Slave (Address 17) from the Master.

- Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	02 H	00 H	00 H	00 H	0A H	## H	## H

If the values range 100008 (0007 H) to 100001 (0000 H) on Slave are “ON-ON-OFF-OFF-ON-ON-OFF-ON”, and the values of 100010 (0009 H) and 100009 (0008 H) are respectively “OFF-ON”.

- Response (Slave)

Slave address	Function	Byte count	Data (100008 to 100001)	Data (100010 to 100009)	Error check (CRC16)	
					Low	High
11 H	02 H	02 H	CD H	01 H	## H	## H

1.3 Read holding registers (Func 03-03H)

Read the Binary data of Holding Registers (4X reference) in Slave device.

(1) Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

(2) Response (Slave)

Slave address	Function	Byte count	Data		Data		Data		Error check (CRC16)	
			High	Low	High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

If read the 2 values from Holding Register 400001 (0000 H) to 400002 (0001 H), in Slave (Address 17) from the Master.

- Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	03 H	00 H	00 H	00 H	02 H	## H	## H

If the value of 400001 (0000 H) on Slave is “555 (22B H)” and the value of 400002 (0001 H) is “100 (64 H)”.

- Response (Slave)

Slave address	Function	Byte count	Data		Data		Error check (CRC16)	
			High	Low	High	Low	Low	High
11 H	03 H	04 H	02 H	2B H	00 H	64 H	## H	## H

1.4 Read input registers (Func 04–04H)

Read the Binary data of Input Registers (3X reference) in Slave device.

(1) Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

(2) Response (Slave)

Slave address	Function	Byte count	Data		Data		Data		Error check (CRC16)	
			High	Low	High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

If read the 2 values within the range from Input Register 300001 (0000 H) to 300002 (0001 H) on Slave (Address 17) from Master.

- Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	04 H	00 H	00 H	00 H	02 H	## H	## H

If the values of 300001 (0000 H) and 300002 (0001 H) on Slave are respectively “10 (A H)” and “20 (14 H)”.

- Response (Slave)

Slave address	Function	Byte count	Data		Data		Error check (CRC16)	
			High	Low	High	Low	Low	High
11 H	04 H	04 H	00 H	0A H	00 H	14 H	## H	## H

1.5 Force single coil (Func 05–05H)

Turns ON (FF00 H) or OFF (0000 H) of single coil (0X reference) status within slave device.

(1) Query (Master)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte
← CRC16 →							

(2) Response (Slave)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte
← CRC16 →							

If Coil 000001 (0000 H) turns ON of Slave (Address 17) from Master.

- Query (Master)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	05 H	00 H	00 H	FFH	00 H	## H	## H

- Response (Slave)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	05 H	00 H	00 H	FF H	00 H	## H	## H

1.6 Preset single registers (Func 06-06H)

Read the Binary data of single Holding Registers (4X reference) in Slave device.

(1) Query (Master)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte
← CRC16 →							

(2) Response (Slave)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte
← CRC16 →							

If write "10(A H)" to Holding Register 40001(0000 H) on Slave(Address 17) from Master.

- Query (Master)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	06 H	00 H	00 H	00 H	0A H	## H	## H

- Response (Slave)

Slave address	Function	Starting address		Preset data		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	06 H	00 H	00 H	00 H	0A H	## H	## H

1.7 Preset multiple registers (Func 16-10H)

Write the Binary data of Holding Registers (4X reference) consecutively in Slave device.

(1) Query (Master)

Slave Address	Function	Starting Address		No. of register		Byte count	Data		Data		Error check (CRC16)	
		High	Low	High	Low		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	

CRC16

(2) Response (Slave)

Slave address	Function	Starting address		No. of register		Error check(CRC16)		
		High	Low	High	Low	Low	High	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

If write "10 (A H)" in common to the range of Holding Register 400001 (0000 H) to 400002 (0001 H) on Slave (Address 17) from Master.

- Query (Master)

Slave address	Function	Starting Address		No. of register		Byte count	Data		Data		Error check (CRC16)	
		High	Low	High	Low		High	Low	High	Low	Low	High
11 H	10 H	00 H	00 H	00 H	02 H	04 H	00 H	0A H	00 H	0A H	## H	## H

- Response (Slave)

Slave address	Function	Starting address		No. of register		Error check (CRC16)		
		High	Low	High	Low	Low	High	High
11 H	10 H	00 H	00 H	00 H	02 H	## H	## H	## H

Please use the Single Register Write function rather than Multi Register Write function if you use the slave (device) connecting with external devices such as PLC, Graphic Panel, except in the case of download that presets the minimum/maximum or basic value of parameter by Input specifications in PC Loader Program

1.8 Exception response-error code

If occurs an error, send a response command and transmit each Exception Code after set(1) the highest-level bit of received command (Function).

Slave address	Function +80 H	Exception code	Error check (CRC16)	
			Low	High
1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

- ILLEGAL FUNCTION (Exception Code: 01 H): A command that is not supported
- ILLEGAL DATA ADDRESS (Exception Code: 02 H)
 - : Starting address of queried data is inconsistent with transmittable address from the device.
- ILLEGAL DATA VALUE (Exception Code: 03 H)
 - : Numbers of queried data are inconsistent with the numbers of transmittable (transferable) data from the device.
- SLAVE DEVICE FAILURE (Exception Code: 04 H)
 - : Not properly completed the queried command (order).

Read the output status of non-existing coil 010001 (03E8 H) [ON: 1, OFF: 0] on Slave (Address 17) from Master.

- Query (Master)

Slave address	Function	Starting address		No. of points		Error check (CRC16)	
		High	Low	High	Low	Low	High
11 H	01 H	03 H	E8 H	00 H	01 H	## H	## H

- Response (Slave)

Slave address	Function +80 H	Exception Code	Error check (CRC16)	
			Low	High
11 H	81 H	02 H	## H	## H

2 Modbus Mapping Table

2.1 Reset/Output

No (Address)	Func	Explanation	Setting range	Notice
000001 (0000)	01/05	Reset ^{※1}	0: OFF 1: on	-
000002 (0001)	01	OUT2 output	0: OFF 1: on	-
000003 (0002)	01	OUT1 output	0: OFF 1: on	-
000004 (0003)	01	BATCH output	0: OFF 1: on	For BATCH output model
000005 (0004)	01/05	BATCH resets ^{※1}	0: OFF 1: on	For BATCH output model



Note

※1: For Reset/BATCH resets ON using Func.05, input FF00 H to DATA.

For more information, refer to '1.5 Force Single Coil (Func 05-05 H)'.

2.2 Terminal input status

No (Address)	Func	Explanation	Setting range	Notice
100001 (0000)	02	INA input status	0: OFF 1: on	Terminal input status
100002 (0001)	02	INB input status	0: OFF 1: on	Terminal input status
100003 (0002)	02	INHIBIT input status	0: OFF 1: on	Terminal input status
100004 (0003)	02	RESET input status	0: OFF 1: on	Terminal input status
100005 (0004)	02	BATCH RESET input status	0: OFF 1: on	Terminal input status

2.3 Product Information

No (Address)	Func	Explanation	Notice
300001 to 300100	04	Reserved	-
300101 (0064)	04	Product number H	Model ID
300102 (0065)	04	Product number L	
300103 (0066)	04	Hardware version	-
300104 (0067)	04	Software version	-
300105 (0068)	04	Model no. 1	"CT"
300106 (0069)	04	Model no. 2	"6M"
300107 (006A)	04	Model no. 3	"-2"
300108 (006B)	04	Model no. 4	"PT"
300109 (006C)	04	Reserved	-
300110 (006D)	04	Reserved	-
300111 (006E)	04	Reserved	-
300112 (006F)	04	Reserved	-
300113 (0070)	04	Reserved	-
300114 (0071)	04	Reserved	-
300115 (0072)	04	Reserved	-
300116 (0073)	04	Reserved	-
300117 (0074)	04	Reserved	-
300118 (0075)	04	Coil Status Start Address	0000
300119 (0076)	04	Coil Status Quantity	-
300120 (0077)	04	Input Status Start Address	0000
300121 (0078)	04	Input Status Quantity	-
300122 (0079)	04	Holding Register Start Address	0000
300123 (007A)	04	Holding Register Quantity	-
300124 (007B)	04	Input Register Start Address	0064
300125 (007C)	04	Input Register Quantity	-

2.4 Monitoring data

No (Address)	Func	Explanation	Setting range	Notice	
310001 (03E8)	04	BA.O LED display status	0: off 1: on	Bit 5	
		OUT2 LED display status	0: off 1: on	Bit 6	
		OUT1 LED display status	0: off 1: on	Bit 7	
		BA.S LED display status	0: off 1: on	Bit 10	
		LOCK LED display status	0: off 1: on	Bit 11	
		PRESET2 LED display status	0: off 1: on	Bit 12	
		PRESET1 LED display status	0: off 1: on	Bit 13	
		TMR LED display status	0: off 1: on	Bit 14	
		CNT LED display status	0: off 1: on	Bit 15	
310002 (03E9)	04	Present value of BATCH counter	0 to 999999	For BATCH output model	
310003 (03EA)					
310004 (03EB)	04	Present value of counter/timer	Counter 6-digit type: -99999 to 999999 4-digit type: -999 to 9999 Timer: within time setting range	Use counter and timer in common	
310005 (03EC)					
310006 (03ED)	04	Display unit	Counter : decimal point of display value Timer: time range	Counter: 400058 data Timer: 400102 data	
310007 (03EE)	04	PRESET2 setting value PRESET setting value	Counter 6-digit type: -99999 to 999999 4-digit type: -999 to 9999 Timer: within time setting range	Use counter and timer in common	
310008 (03EF)					
310009 (03F0)	04	PRESET1 setting value	Counter 6-digit type: -99999 to 999999 4-digit type: -999 to 9999 Timer: within time setting range		
310010 (03F1)					
310011 (03F2)	04	Setting value of BATCH counter	0 to 999999		
310012 (03F3)					
310013 (03F4)	04	Checking the input logic	0: nPn 1: PnP	-	

**Note**

Data format of 310001(03E8) address bit.

Bit	Explanation	Data
Bit 0	-	0
Bit 1	-	0
Bit 2	-	0
Bit 3	-	0
Bit 4	-	0
Bit 5	BA.O	0 or 1
Bit 6	OUT2	0 or 1
Bit 7	OUT1	0 or 1
Bit 8	-	0
Bit 9	-	0
Bit 10	BA.S	0 or 1
Bit 11	Lock	0 or 1
Bit 12	PRESET2	0 or 1
Bit 13	PRESET1	0 or 1
Bit 14	TMR	0 or 1
Bit 15	CNT	0 or 1

※2 words data format: upper data has high number address.

E.g.) 310004: present value (low word), 310005: present value (high word)

2.5 Preset value setting group

No (Address)	Func	Explanation	Setting range	Notice		
400001 (0000)	03/06/16	PRESET2 setting value	Counter 6-digit type: 0 to 999999 4-digit type: 0 to 9999 Timer: within time setting range	Use counter and timer in common		
400002 (0001)		PRESET setting value				
400003 (0002)	03/06/16	PRESET1 setting value				
400004 (0003)						
400005 (0004)	03/06/16	BATCH counter setting value	0 to 999999			
400006 (0005)						

2.6 Function setting mode

2.6.1 Counter group

No (Address)	Func	Explanation	Setting range	Notice
400051 (0032)	03/06/16	Counter/Timer [C-T]	0: CnUn 1: ET nE	Use counter and timer in common
400052 (0033)	03/06/16	Input mode [I n]	0: UP 5: dn-2 1: UP-1 6: Ud-R 2: UP-2 7: Ud-b 3: dn 8: Ud-C 4: dn-1	-
400053 (0034)	03/06/16	Indication mode [dI S.n]	0: EtRL 1: Hold	For the indicator
400054 (0035)	03/06/16	Output mode [oUt.n]	0: F 4: E 8: 5 1: n 5: P 9: E 2: L 6: Q 10: d 3: r 7: R	-
400055 (0036)	03/06/16	Max. counting speed [CP5]	0: I 2: 1E 4: 10E 1: 30 3: 5E	-
400056 (0037)	03/06/16	OUT2(OUT) output time [oUt2(oUt.E)]	0.0 I to 99.99	Unit: ×10ms
400057 (0038)	03/06/16	OUT1 output time [oUt I]	0.0 I to 99.99	
400058 (0039)	03/06/16	Decimal point [dP]	0: ----- 3: ----,--- 1: -----,- 4: ---,---- 2: -----,-- 5: ------	4-digit type 0: ----- 2: ---,--- 1: -----,- 3: -,---
400059 (003A)	03/06/16	Min. reset time [rSt]	0: I 1: 20	Unit: ms
400060 (003B)	03/06/16	Prescale decimal point position [SC.dP]	1: -----,- 4: ---,---- 2: -----,-- 5: ------ 3: -----	4-digit type 1: -----,- 3: -,---- 2: ---,-
400061 (003C)	03/06/16	Prescale value [SEL]	6-digit type : 0.0000 I to 99999.9 4-digit type: 0.00 I to 999.9	Connected with prescale decimal point position
400062 (003D)				
400063 (003E)	03/06/16	Start value [StEt]	6-digit type : 000000 to 999999 4-digit type: 0000 to 9999	Connected with decimal point position of display value
400064 (003F)				
400065 (0040)	03/06/16	Memory protection [dRtR]	0: Lr 1: rEc	Use counter and timer in common
400066 (0041)		Lock key [LoEc]	0: LoFF 2: LoE.2 1: LoE.1 3: LoE.3	

2.6.2 Timer group

No (Address)	Func	Explanation	Setting range	Notice
400101 (0064)	03/06/16	Count/Timer [E-E]	0: Coun 1: El nE	Use counter and timer in common
400102 (0065)	03/06/16	Time range [Hour/n/SEC]	4-digit type 0: 0.00 ls to 9.999s 1: 0.0 ls to 99.99s 2: 0. ls to 999.9s 3: ls to 9999s 4: ls to 99m59s 6-digit type 0: 0.00 ls to 999.999s 1: 0.0 ls to 9999.9s 2: 0. ls to 99999.9s 3: ls to 999999s 4: 0.0 ls to 99m59.99s 5: 0. ls to 999m59.9s 5: 0.1m to 999.9m 6: 1m to 9999m 7: 1m to 99h59m 8: 1h to 9999h	-
400103 (0066)	03/06/16	Up/Down mode [U-d]	0: UP 1: dn	-
400104 (0067)	03/06/16	Output mode [OUTn]	0: ond 1: ond.I 2: ond.2 3: FLR 4: FLR.I 5: FLR.2 6: Int 7: Int.I 8: Int.2 9: oFd 10: nFd 11: nFd.I 12: nInt	-
400105 (0068)	03/06/16	OUT2(OUT) output [OUT2(oUT.E)]	0.0 I to 99.99, 0 is HOLD.	Unit: ×10ms
400106 (0069)	03/06/16	OUT1 output time [OUT I]	0.0 I to 99.99, 0 is HOLD.	
400107 (006A)	03/06/16	Input signal time [I nt]	0: I 1: 20	Unit: ms
400108 (006B)	03/06/16	Memory protection [dRtR]	0: CLR 1: rEE	Use counter and timer in common
400109 (006C)	03/06/16	Lock key [LoCt]	0: LoFF 1: LoC.I 2: LoC.2 3: LoC.3	
400110 (006D)	03/06/16	Indication mode [dSP.n]	0: totRL 1: Hold 2: ontd	For the indicator

2.6.3 Communication group

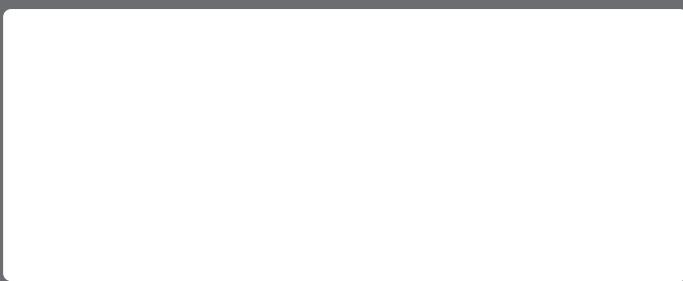
No (Address)	Func	Explanation	Setting range	Notice
400151 (0096)	03/06/16	Comm. Address [Addr]	1 to 127	-
400152 (0097)	03/06/16	Comm. Speed [bPS]	0: 24 3: 192 1: 48 4: 384 2: 96	Unit: ×100bps
400153 (0098)	03/06/16	Comm. parity bit [Parity]	0: none 1: Even 2: odd	-
400154 (0099)	03/06/16	Comm. stop bit [Stop]	0: 1 1: 2	-
400155 (009A)	03/06/16	Response waiting time [rSWE]	05 to 99	Unit: ms
400156 (009B)	03/06/16	Comm. writing [Comm]	0: Read 1: Write	-

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