

MISUMI

Economical Temperature Controller

This manual describes the function, performance and usage of the product. Please note the following before using this product:

- Sufficient knowledge about electrical system is required to use this product.
- Understand the contents of this manual before using this product.
- Pay attention to and observe the prohibited items of this product when using it.
- The examples given in the manual and other technical materials are for the user's reference only.
- Confirm that this product complies with the relevant specifications and usage when it is used in combination with other products.

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A2 Usage Warnings



Warning

- ① Do not touch the AC power terminals after the controller is powered on to avoid electric shock
- ② Confirm that the power supply voltage complies with the controller's specifications before the controller is powered on, otherwise the controller may be damaged
- ③ Never disassemble, modify or repair this product or touch any of its internal components
- ④ The contacts will sometimes melt and burn if the output relay exceeds the expected service life
- ⑤ Tighten the terminal screws with a torque of 0.74—0.90 N.m, otherwise loose screws may cause fire
- ⑥ To avoid the damage or failure of the instrument, select the proper fuse to protect the power line and input/output line from current impact
- ⑦ To prevent fire, explosion, or damage to the instrument, it is forbidden to use the product in places exposed to flammable and explosive gases or where steam is discharged
- ⑧ This product has been strictly inspected before leaving the factory. If there is a quality problem, the company guarantees it for one year. The responsibility it bears is limited to the product itself, and it is not responsible for any other joint and several liabilities. Damage caused by self-disassembly or improper use is not covered by the warranty.

A2 Precautions

- ① Do not block the ventilation hole of the product and allow the heat to dissipate
- ② Do not install the controller in a place exposed to high frequency interference, corrosive gas, high temperature and high humidity, freezing and condensation, liquid or oil and gas splashing
- ③ Allow as much space as possible between the controller and devices that generate a high frequency or surge
- ④ Confirm that the connection between the wiring and the device terminal is correct
- ⑤ Use the product under the correct rated load and power supply
- ⑥ Do not clean this product using paint thinner or similar chemicals
- ⑦ Read the information provided in the catalog and manual carefully before connecting the control output unit
- ⑧ Stop using this product immediately if its housing is broken

A3 Electrical Specifications

Rated voltage	100V-240VAC, 50Hz
Power consumption	≤5VA
Working environment	Ambient temperature: 0°C-50°C Relative humidity: 35%-85% RH (with no condensation)
Storage temperature	-25°C-65°C (with no freezing or condensation)
Resolution	1°C, 0.1°C (adjustable)
Wiring method	Wiring terminal
Measurement accuracy	±0.5%FS
Memory protection	Non-volatile memory
Installation environment	Installation category II, pollution degree 2
Relay output	Relay contact AC220V/DC30V, 5A
Logic level output	When ON: DC12V; When OFF: DC0.5V or less; Maximum current: 30mA, load resistance ≥1K

A4 Product Selection

- ① Main output 1: Model: C-MTCTRS (relay + solid state relay)
2: Model: C-MTCTRST (relay + solid state relay+RS485)
* Refer to B4 for the switching mode of relay and solid state output.
The default factory setting is relay output.
* C-MTCTRS has no communication interface

② Input signal

Name	K	J	R	S	B	E	N	T	PT	CU	O.K	0-50	0-5V	1-50
Code	ㄎ	ㄐ	ㄨ	ㄨ	ㄅ	ㄷ	ㄴ	ㄹ	PT	CU	o.k	0-50	0-5v	1-50

③ Alarm output 1

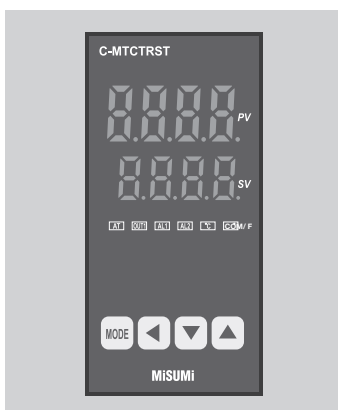
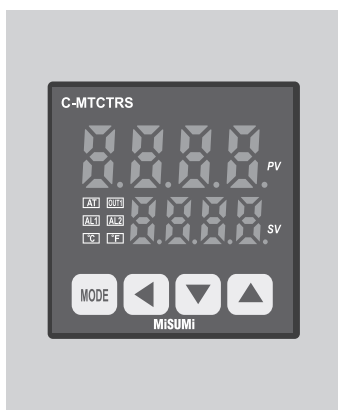
Value of AL1T Value of AL2T	Meaning
0	No alarm, AL1 and AL2 menus will not be displayed by default
1	Absolute value upper limit alarm
2	Deviation upper limit alarm (default value of 1st alarm)
3	Absolute value lower limit alarm (default value of 2nd alarm)
4	Deviation lower limit alarm
5	Out-of-band (out-of-range) alarm
6	In-band (in-range) alarm
P-1	Absolute value upper limit alarm with power-on hold function
P-2	Deviation upper limit alarm with power-on hold function
P-3	Absolute value lower limit alarm with power-on hold function
P-4	Deviation lower limit alarm with power-on hold function

- ④ Alarm output 2 is consistent with alarm output 1

A5 Table of Outline Dimensions and Hole Dimensions

• C-MTCTRS

• C-MTCTRST (including RS485 communication)

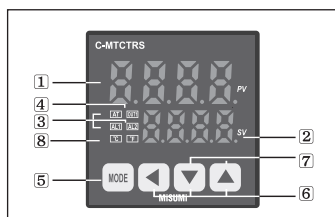


Unit: mm

Model	Panel size	Housing size L x W x H	Hole size
C-MTCTRS	48×48	45×45×75	45×45
C-MTCTRST	48×96	45×92×75	45×92

B1 Functional description of operation panel

■ Name of each part



- 1 Display (red) of current value (PV)
The current measured value (PV) is displayed in the operation mode, and the internal parameter name is displayed in the setting mode.
- 2 Display (green) of set value (SV)
The set value (SV) of the control target is displayed in the operation mode, and the current set value of the parameter is displayed in the setting mode.

3 Control/alarm output indicators

- Auto-tuning indicator: the AT light flashes in a cycle of 1 second when auto-tuning is performed.
- * In case of cycle/phase control of SSR drive output, it will turn ON when MV is over 3.0%.
- AL1/AL2: lights up when Alarm 1/Alarm 2 output is ON.

4 OUT: Lights up when the Main Control Output is ON.

5 MODB key: used to enter the parameter group setting, return to the operation mode, switch the parameter group, and save the set value.

6 Direction keys: used to enter the setting value change mode or move the digits, and change the value up/down.

7 Function keys: Press the \square + \triangle keys simultaneously for 3 seconds to start the [DI-K] digital input key function (run/stop, alarm clear, auto-tuning) setting.

8 Temperature unit indicator (°C/°F): Displays the current temperature unit.

B2 Description of Main Menu Display

Description of main menu display (press and hold the MODE key for 3 seconds to enter the main menu interface)

1. User parameters

In the normal measurement and control state, press the MODE key once to enter the user parameter setting. Press it again to enter the next user parameter setting until all parameters are set.

Code	Designation	Parameter meaning	Description	Setting range	Default	Display condition
SV	SV	Temperature setting	Temperature set value	SLL-SLH	150°C	The manual function is turned off. The percentage of control power is displayed when the manual function is turned on
ST	ST	Set the operating time of the instrument	This parameter exists only when the timing function is enabled (ET=1,2,3). See the timing section for details. When the unit is minutes, the last digit of the parameter setting displays a decimal point, indicating minutes.	0-9999s/m	60	Cod = 40 Ton = 1000 ET != 0

2. Engineer parameters

Press and hold the MODE key for 3 seconds to enter the engineer parameter setting state. To exit, press MODE for 1 second. To set the next parameter, press MODE once.

Engineer parameters are described in the table below

Code	Designation	Parameter meaning	Description	Setting range	Default	Display condition
AL1	AL1	1st alarm	There are 12 alarm modes, which are determined by AL1T.	-1999-9999	30	AL1!=0
AL2	AL2	2nd alarm	There are 12 alarm modes, which are determined by AL2T.	-1999-9999	50	AL2!=0
SC	SC	Displayed value allowance	Make displayed value = Pb value + internal measured value;	-50-50	0	1
P	P	Proportional band	If it is 0, it is position control, and the I and D menus will not be displayed at this time, but the HY menu will be displayed.	0-9999	30	1
OH	OH	Position control bottom hysteresis	Hysteresis of the main control when the main control is 2-position control (P=0), operates when PV < SV-OHL	0-200	2	P=0
OHH	OHH	Position control top hysteresis	Hysteresis of the main control when the main control is 2-position control (P=0), and OFF when PV < SV+OHL	0-200	0	P=0
I	OHH	Integral time constant	If it is set to zero, the integral control action is canceled	0-9999	240	P != 0
d	I	Derivative time constant	If it is set to zero, the derivative action is canceled	0-9999	60	P != 0
T	D	Control cycle	Action cycle of main control	0-100	20	P != 0
PC	Pc	Proportional band (cooling side)	1-200% of proportional band	Heating/cooling PID action	50	Dir=H-C
TC	Tc	Proportional cycle cooling side	1-100 sec. (cannot be set to 0)	Heating/cooling PID action	20	Dir=H-C
db	db	Dead band	Temperature input, setting dead band for control action between the (heating side) proportional band and the (cooling side) proportional band, overlapping for negative set values	-1999-9999	0	Dir=H-C
AR	AR	Integral limiter	Used as integral limiter	0-100	100	P != 0
ATU	ATU	Auto-tuning switch	OFF: close; ON: open Press and hold the SW key for 3 seconds to enter quickly	OFF/ON	OFF	P != 0
CTH	CTH	Current detector input 1	0-9999A When the value input is 100, it means the calibration point signal is 100A	0-100%	100	CTon = 1
ACT	ACT	Heater disconnection alarm	0-9999A When it is detected that the current of the CT terminal is less than that of ACT, it will output an alarm through AL2	Refer to the input value of the current detector for the alarm value	0	CTon = 1
LCK	Lck	Parameter lock	0: Unlocked 1: User parameters locked 2: All parameters locked	0-2	0	1

B3 Manufacturer Parameters

Press and hold the MODE key and the left shift key simultaneously until Cod(\overline{Cod}) is displayed. In this state, enter 0010 and then press the MODE key to access the following menu. After setting, press the MODE key again to return to Cod(\overline{Cod}). The parameters at this level only apply to instrument engineers or manufacturers, and common users should not use them.

Code	Designation	Parameter meaning	Description	Setting range	Default	Display condition
<i>AL1t</i>	AL1T	1st alarm Alarm mode selection	See the Alarm Mode Description Table	0-5,P1-P5	2	1
<i>AL2t</i>	AL2T	2nd alarm Alarm mode selection	See the alarm mode description table. AL2 function is not available if the current alarm time function is enabled	0-5,P1-P5	2	1
<i>AH1</i>	AH1	1st alarm relay hysteresis	Alarm relay hysteresis	0-200	1	1
<i>AH2</i>	AH2	2nd alarm relay hysteresis	Alarm relay hysteresis	0-200	1	1
<i>AH</i>	AH	Overheat shutdown deviation	Turn off the output in case of PV>SP+AH	0-999	30	
<i>FP</i>	FP	Proportional band adjustment	Move the proportional band down by FP degrees, effectively reducing or eliminating the overshoot of the first temperature rise	0-100	5	1
<i>SLL</i>	SLL	Minimum set value setting	The minimum set value that can be set by the user	Full scale	0	1
<i>SLH</i>	SLH	Maximum set value setting	The maximum set value that can be set by the user	Full scale	1370	1
<i>PL</i>	PL	Minimum power limit	Limit the minimum output power that the instrument can output	0-30%	0%	1
<i>PH</i>	PH	Maximum power limit	OUT=0: The maximum output power of the instrument after the measured temperature enters the proportional band OUT=1,2: The maximum output power of the instrument	30-100%	100%	1
<i>dLY</i>	DLY	Minimum time interval for main control action during cooling	Prevent the compressor from starting and stopping frequently, which leads to compressor damage or overload protection circuit action	0-200s	0	1
<i>PSL</i>	PSL	Displayed value at zero position of linear input	This parameter is only used when the input is a linear signal (voltage, current, etc.)	-1999-9999	0	1
<i>PSH</i>	PSH	Displayed value at full scale of linear input	This parameter is only used when the input is a linear signal (voltage, current, etc.)	-1999-9999	1370	1
<i>dP</i>	dP	Decimal point position for linear input	The decimal point is only valid for linear input (5V, 5V), and invalid for thermocouple and thermal resistance signals	0-3	0	1
<i>DF</i>	DF	Filter coefficient	The larger the SL6, the better the filtering effect and the more stable the display	0-250	200	
<i>tSL</i>	TSL	Adjust the zero position of conversion output	If the measured value is less than TSL, the conversion output enters the state according to the value output, and is only related to TSL	0-9999	00	1
<i>tSH</i>	TSH	Adjusting the full scale of conversion output	If the measured value is greater than TSH, the conversion output enters the state according to the value output, and is only related to TSH	0-9999	400	1
<i>Addr</i>	Addr	Communication address	Instrument communication address	1-250	1	Con=100
<i>bPS</i>	bps	Communication baud rate	Set the communication rate, i.e. the baud rate	300-38400	19200	Con=100
<i>Et</i>	ET	Timing function enabled	0: No timing 1: Main control output timing. When the AL1 reaches the timing temperature, the timing starts. After the timing ends, turn off the control output, and wait for the operation; the 4 decimal points of the SP digital tube flash every half a second, indicating that the timing ends and the output is turned off. Turn on AL2 according to the BL setting. 2: One-shot timing. When the AL1 reaches the timing temperature, the timing starts. After the timing ends, the control output is not turned off, but only serves as a reminder. Turn on AL2 according to the BL setting. Stop timing after AL2 timing ends. 3: Cycle timing. When the AL1 reaches the timing temperature, the timing starts. After the timing ends, the control output is not turned off, but only serves as a reminder. Turn on AL2 according to the BL setting. After the AL2 timing ends, the timing restarts after the AL1 reaches the temperature, and the cycle repeats. 4: The main control starts to output after delaying the ST time when the timing startup is completed.	0, 1, 2, 3, 4	0	Ton=1000
<i>tIE</i>	TIE	Timing time unit	0: seconds 1: minutes	0.1	0	Ton=1000
<i>ALt</i>	ALT	Deviation temperature triggered by timer	In case of ET=1,2,3, the instrument starts to count down when the temperature reaches the SP-AL T value. If the value of ALT is big, the countdown can be started as soon as the instrument is powered on.	0-9999°C	1°C	Ton=1000
<i>BL</i>	BL	The time for the 2nd alarm relay to operate when the timing ends	0: The 2nd alarm relay does not operate when the timing ends 250: The 2nd alarm relay always operates when the timing ends 1-249: The time for the timing alarm relay to operate (seconds) when the timing ends	0-250s	5s	Ton=1000

计时说明:

After the timing function is turned on when the set temperature is reached, press the left shift key and the Down key simultaneously to check the timing status. The SV position displays the timing status. When the timing is not started, the set time is displayed. When the unit is minutes, the last digit displays the decimal point. During the process of timing, the countdown is displayed. When the unit is minutes, the last decimal point flashes every half a second, and 0000 is displayed when the timing ends. In the non-menu status, long press the left shift key and the Up key to reset the timing and restart the state (whether the timing is underway or ends). If the timing parameters are modified, the timing state is also reset. In case of Timing Status 2, the heating starts after the timing ends.

B4 Description of Setting Parameters

Press and hold the MODE key and the left shift key simultaneously until Cod(\overline{Cod}) is displayed. In this state, modify the state of Cod(\overline{Cod}) =0020 by Up/Down keys.

Code	Designation	Meaning	Other Description	Range	Default Value
<i>Sn</i>	SN	Select the sensor input signal	Different input models need to match different input resistances.	K, J, R, S, B, E, N, T, PT, Cu, O.K, 0-50, 0-5V, 1-50	K
<i>unit</i>	Unit	Unit selection	°C: Celsius; °F: Fahrenheit	°C, °F	°C
<i>out</i>	OUT	Output mode	RLY: switch relay output SSR: DC12V output	RLY	RLY
<i>dir</i>	Dir	Control direction	HOT: heating control, that is, reverse control; COL: cooling control, that is, forward control; H-C: Simultaneous control of heating and cooling HOT/COL mode output control is OUT1 H-C mode. OUT1 is heating control output. OUT2 is cooling control output.	Description of HOT, COL, H-C: For COL and H-C control modes, only RLY mode is applicable	HOT
<i>tT</i>	Tt	Temperature tracking amount	Make the displayed temperature approach the set value within the range of the set value±Tt	0-10	6
<i>Hnd</i>	Hnd	Whether manual control is enabled	0: Manual control disabled; 1: Manual control enabled When the manual control is enabled, the shift key can be used to enter and exit the manual control state in which the Up/Down keys can be used to control the output power percentage of the instrument.	0.1	0
<i>FAC</i>	FAC	Overheat display limit	0-Off function For other values, after exceeding the set value, the exceeded portion is displayed proportionally Display value = SV+ (PV-SV)/FAC	0-100	0

COD=0040: Enter factory parameter 4

- CTON = 1000: You can directly modify the SU value through the Up/Down keys. The upper row does not display SU = 0001: CT function is available
- TON = 0000: Alarm 1 is an excitation alarm
0001: Alarm 1 is a non-excitation alarm
= 0000: Alarm 2 is an excitation alarm
0010: Alarm 2 is a non-excitation alarm
= 1000: ET timing function is available
- CON = 0001: You can manually turn on and off the output. Power on and enter the state of turning off the output, and press the shift key to turn on the output
0100: Communication function is available
1000: You can turn on the self-adaptive function

COD=0060: Enter factory parameter 5

- LBAT output fault monitoring time
- LBAB output fault monitoring width
LBAT heating output monitoring time in seconds.
LBAB heating output monitoring width with the unit same as PV value.
If the PV measured temperature change is less than LBAB after the full cycle heating output or the full cycle off output and the duration is LBAT time, the heating fault will be prompted.
If the change is greater than LBAB, the heating fault will not be prompted.
SV=EER1 indicates a heating fault.
- RLRS solid state and relay selection output
SrrL Select whether the heating type is relay or solid state signal output
=0 Relay heating =1 Solid state heating

COD=1168: Restore factory settings

C1 Function of Error Display

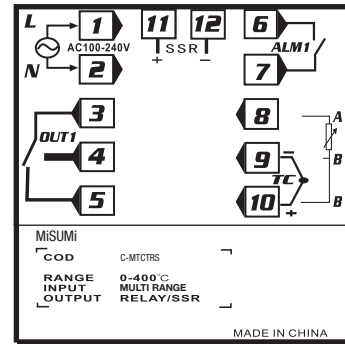
The instrument will display a message after self-diagnosis if it cannot work properly.

Message	Description	Troubleshooting
UUUU	Input disconnection, reverse polarity or out of input range	Check if the input signal is wrong
0000	Input disconnection, reverse polarity or out of input range	Check if the input signal is wrong

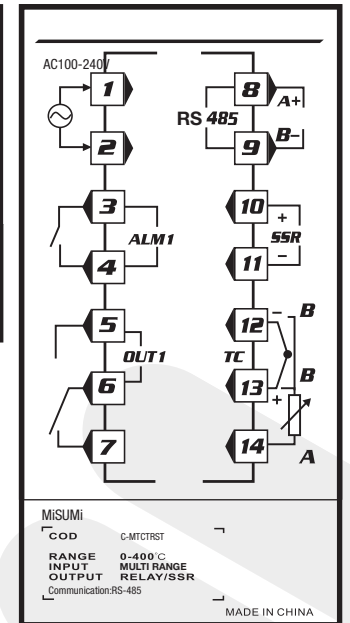
C2 Diagram of Wiring Examples

The following wiring diagram is only for wiring instructions, and the actual wiring is subject to the wiring diagram of the instrument housing.

Model: C-MTCTRS

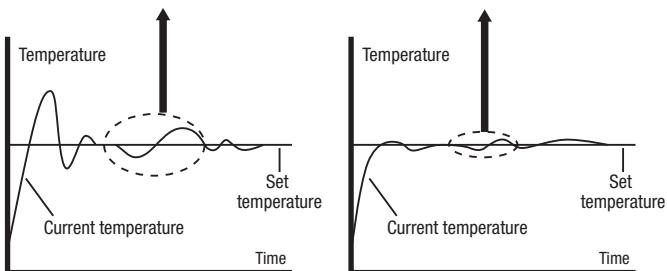
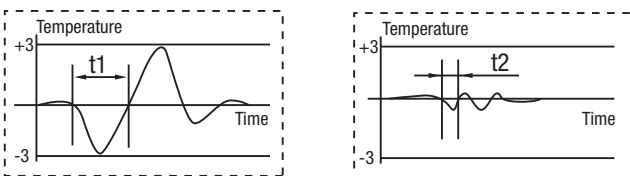


Model: C-MTCTRST (including RS485 communication)



B5 Other Information

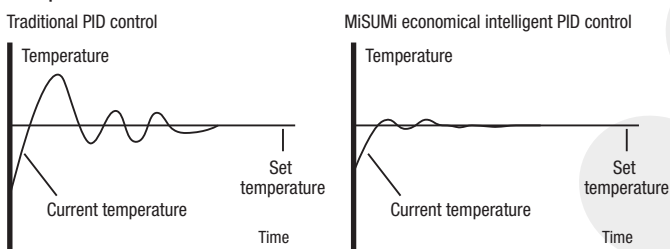
1. Comparison of anti-disturbance performance



Market circulation products: large temperature drop, long recovery time

MISUMi economical products: small temperature drop, quick recovery

2. Comparison of first overshoot



Products circulated on market

MISUMi economical series temperature control instrument

C3 Instrument Simple Troubleshooting and Maintenance

- Connect the instrument correctly before powering on. The PV window displays the measured value, and the SV window displays the control value.
- There is neither display nor output action after the instrument is powered on.
 - First check whether the power supply wiring of the instrument is correct.
 - Check whether the power supply of the instrument is consistent with that of the input.
 - Use the instrument to measure whether the input power is abnormal.
- After the instrument is powered on, the PV window shows "UUUU" or "0000" abnormal display.
 - The display of "UUUU" or "0000" indicates that the signal input part of the instrument is abnormal.
 - First check whether the signal input wiring of the instrument is correct.
 - Check whether the sensor specifications are consistent with the instrument input specifications.
 - Check whether the sensor is connected reversely or damaged (open circuit or short circuit).
- There is no output after the instrument is powered on, but the corresponding indicators display normally.
 - First check whether the output wiring of the instrument is correct.
 - Check whether the output mode of the instrument matches the external load.
 - Check whether the external load of the instrument is damaged (open circuit or short circuit).
- The display or control of the instrument is abnormal.
 - First check whether the wiring of the instrument is correct.
 - Check whether the parameter settings of the instrument are reasonable.

Description of Communication Protocol for C-MTCTRST

Addr	Communication address	Instrument communication address	1—250	1	Con=100
bps	Communication baud rate	Set the communication rate, i.e. the baud rate	300—38400	19200	Con=100

Communication supports Modbus protocol, using Modbus RTU (1 start bit, 8 data bits, 1 stop bit). Only Modbus Read Register Command 03 and Write Register Command 06 are supported.

The data of the registers are described as follows:

Address	Designation	Description	Read/Write
0000H	PV	Measured value	R
0001H	LED	LED display status ①	R
0002H	SV	Set value	R/W
0003H	OOT	Output percentage	R
0004H	AT	Auto-tuning switch	R/W
0005H	AL1	Alarm value 1	R/W
0006H	AL2	Alarm value 2	R/W
0007H	HY1	Alarm hysteresis 1	R/W
0008H	HY2	Alarm hysteresis 2	R/W
0009H	P	Proportional term	R/W
000AH	I	Integral term	R/W
000BH	D	Derivative term	R/W
000CH	AR	Integral overshoot suppression percentage	R/W
000DH	T	Control cycle	R/W
000EH	PB (SC)	Measured value correction	R/W
000FH	HY	Main control hysteresis (valid when P = 0)	R/W
0010H	AL1T	Alarm mode 1	R/W
0011H	AL2T	Alarm mode 2	R/W
0012H	PC	Output 2 proportional term	R/W
0013H	TC	Output 2 control cycle	R/W
0014H	DB	Dead band	R/W
0015H	CTH	Current detector input	R/W
0016H	ACT	Disconnection alarm value	R/W
0017H	TON	Timing function switch ②	R
0018H	ET	Timing mode setting ③	R/W
0019H	TIE	Timing time unit ③	R/W
001AH	ALT	Timing temperature hysteresis ③	R/W
001BH	BL	Alarm time after timing ends ③	R/W
001CH	ST	Timing time setting ③	R/W
001DH	TIM	Current timer value (TIE=0 second; TIE=1 minute)	R
001EH	TIS	Current timer seconds value (Valid when TIE=1, timing seconds value) BL count value (AL2 output time)	R