Multi Channel Temperature Controller

ARTM 8

ARTM16

Operation Manual

Version: 20090316

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1. General

1.1 Introduction

ARTM series multi-input temperature controller can measure and control multi temperature signals. It can be used in power stations.

1.2 Features

- ✧ ARTM8, ARTM16 can measure 8 channels and 16 channels of thermocouple. Also you can just use their several channels.
- ✧ Each input can be corresponding to 2 alarms, whose value and direction can be set.
- ✧ 2 relay outputs as alarm.
- ✧ with RS485 communication(MODBUS-RTU protocol) to transfer the measured data;
- ✧ The working parameters can be set by the keys on the front.
- ✧ the auxiliary power can be 85 ~ 270V DC or AC;

1.3 Technical Feathers

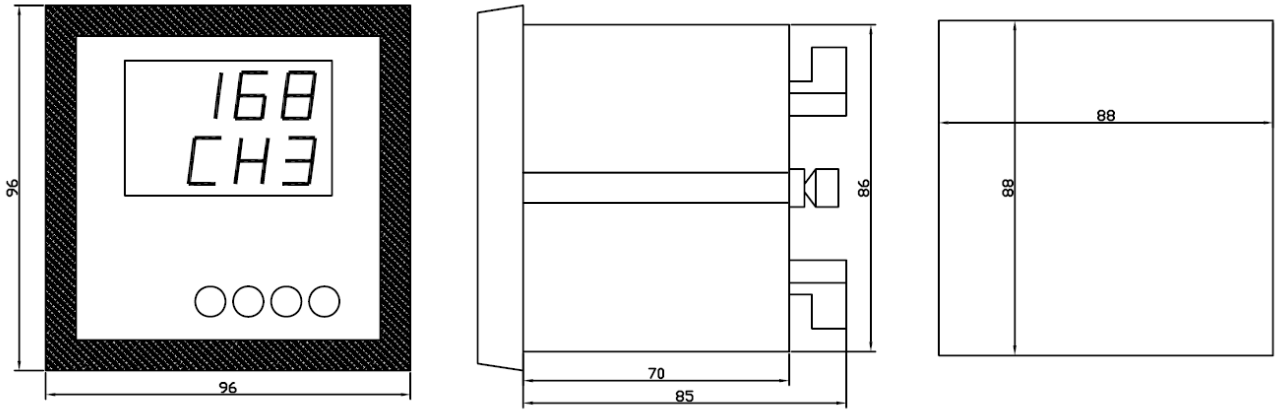
Features / Function		ARTM8	ARTM16
Channels		8	16
Inputs		Pt100, Cu50	Pt100, Cu50
Accuracy		0.5s	
Power supply	**Voltage**	AC, DC 110V, 220V, 85 ~ 270V	
	Consumption	≤2W	
Alarm	**Channels**	2	2
	Capacity	AC250V/5A, DC30V/5A, NC	
RS485	**Protocol**	MODBUS-RTU	
	Speed	1200, 2400, 4800, 9600, 19200	
Isolation		2kV/1min	
ENV	**Temperature**	Working: -10 ~ +55C, Storage: -25 ~ +70C	
	Humidity	≤95%	
	Altitude	≤2000m	

1.4 Installation and fixing

1.4.1Outlines

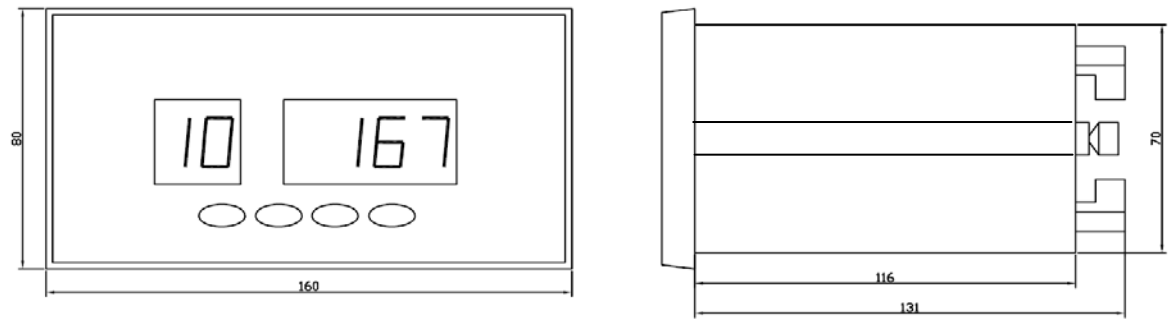
ARTM8:

Front **Side** **Cut**

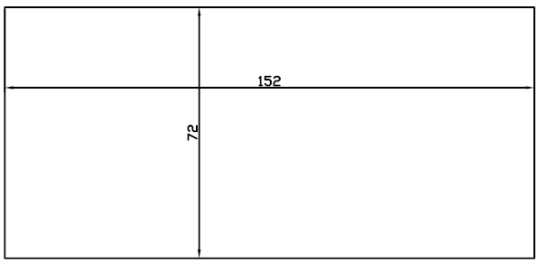


ARTM16:

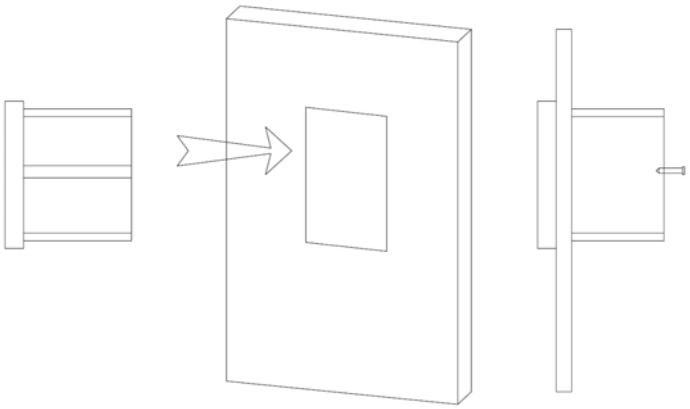
Front **Side**



Cut

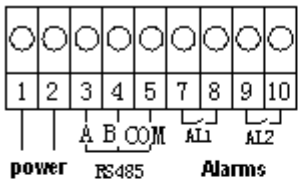


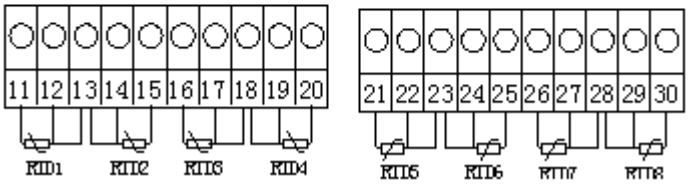
1.4.2 Installation



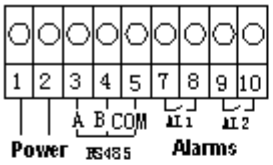
1.4.3 Fixing

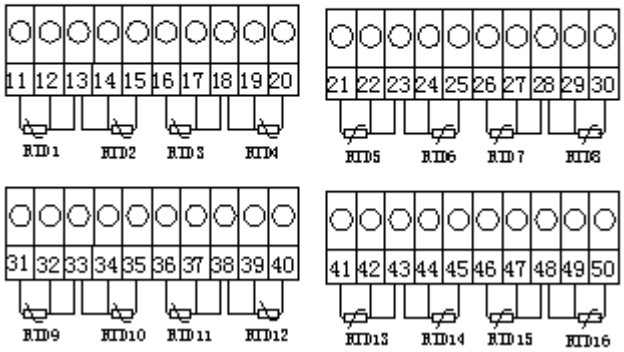
ARTM8:





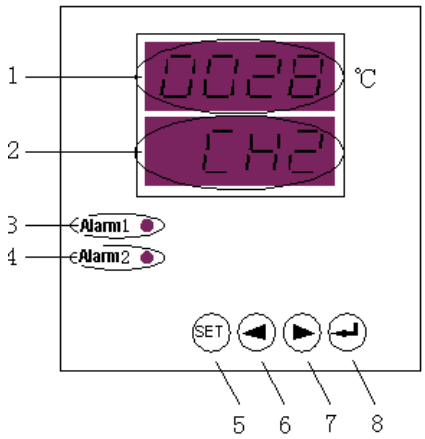
ARTM16:





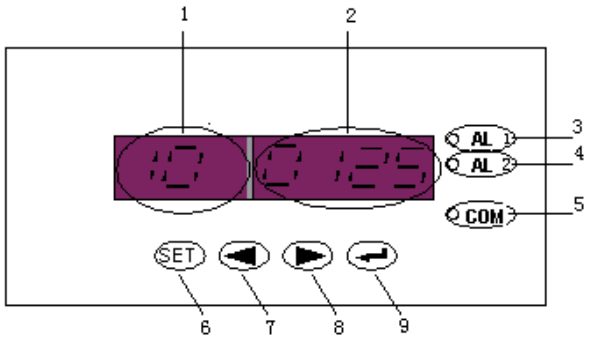
2 Display explanation

ARTM8



NO	Name	Explanation
1	LEDA	Display the temperature value, unit C, 4 digitals, resolution±1C
2	LEDB	Display the No of measured channel
3	LT_AL1	Alarm 1 LED
4	LT_AL2	Alarm 2 LED
5	SET	Enter the programming menu or return previous menu
6	Left key	Choose menu or reduce number
7	Right key	Choose menu or add number
8	ENTER key	Enter the menu or confirm

ARTM16



NO	Name	Explanation
1	LEDA	Display the No of measured channel
2	LEDB	Display the temperature value, unitC, 4 digitals, resolution±1C
3	LT_AL1	Alarm 1 LED
4	LT_AL2	Alarm 2 LED
5	LED_COM	The LED of communication of RS485
6	SET	Enter the programming menu or return previous menu
7	Left key	Choose menu or reduce number
8	Right key	Choose menu or add number
9	ENTER key	Enter the menu or confirm

3 Programming

3.1 The menu explanation

Prog **Programming mode**

code **Enter password**

PASS **Enter programming mode**

Err **the password is wrong**

Set **set the alarm point**

- **CH1**…**CH8** **Choose the measured channel**
  - **CH1 ON** **turn on the 1st channel**
  - **CH1 OFF** **turn off the 1st channel**
- **AL1**…**AL2** **Choose the alarm**
  - **AL1 HI** **the maximal alarm value**
  - **AL1 Lo** **the minimal alarm value**

HyS **Set the hysteresis and delay**

- **HyS1** **Set alarm 1 hysteresis**

HyS2 **Set alarm 2 hysteresis**

dEL **set alarm delay (0~10 times).**

For example, it's 4, the alarm will active when ARTM measures this value 4 times.

dISP **set display**

cyc **set the interval of loop display (0~20s)**

bUS **set RS485 communication**

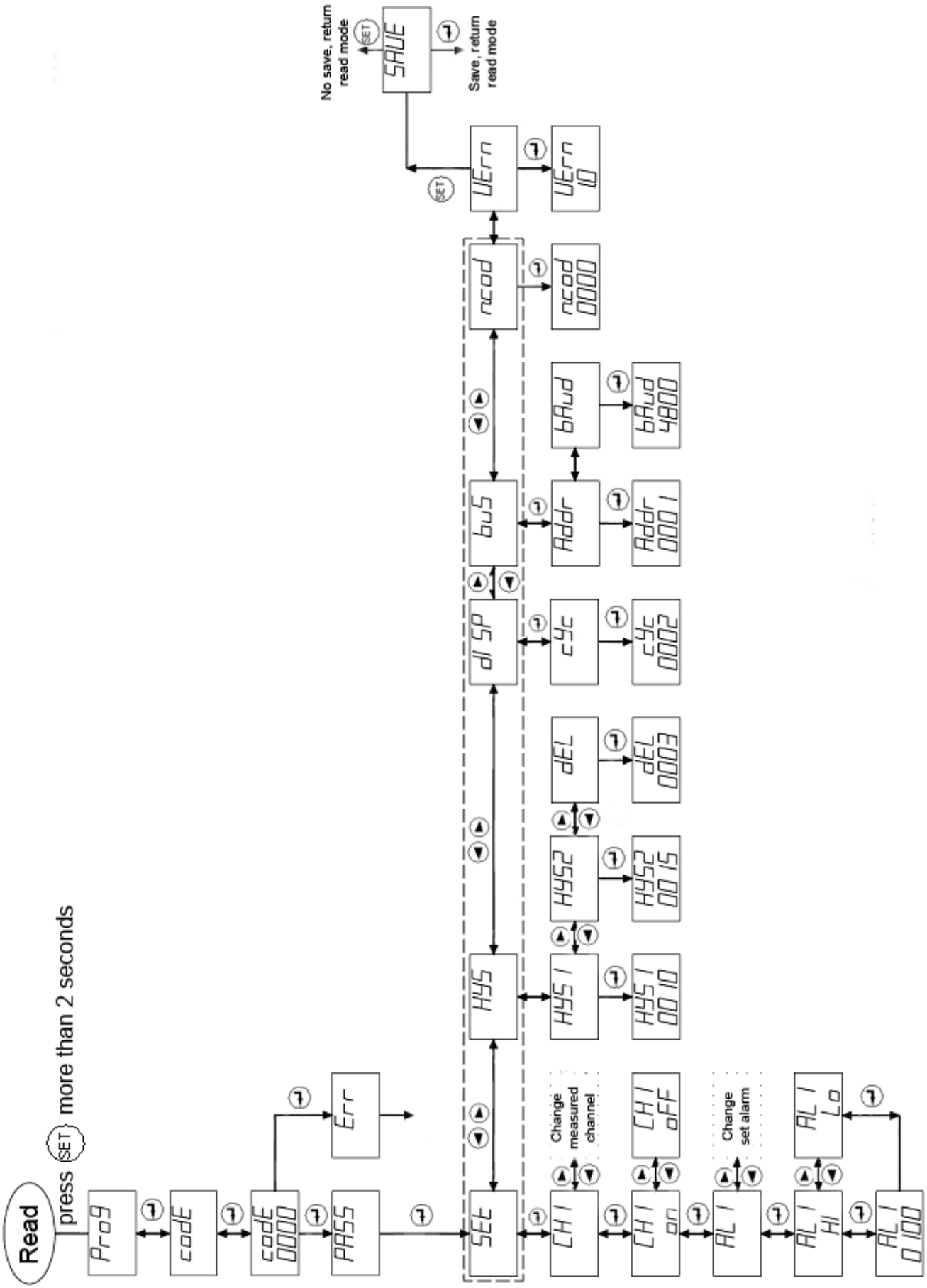
- **Addr** **set the slave address**
- **bAud** **set the communication speed**

n.cod **re set the enter password**

UErn **display the version of software of ARTM**

SAUE **to save the setting**

3.2 The programming chart



4 Communication

4.1 The protocol explanation

4.1.1 Transmission format

- 1 start bit
- 8 data bits
- Parity: without
- 1 stop bits

Address	Function	Data	Check
8-bits	8-bits	N×8-bits	16-bits

4.1.2 Address code:

The Address is at head of the data, and it has 1 byte. The decimal is 0 ~ 255. In ARTM, it just uses 1 ~ 247. It stores the slave address. And each slave address is unique.

4.1.3 Function code:

The function code stores the functions of slave.

Code	Meaning	Action
03 or 04	Read/hold register	Get the current binary value from one or multi hold register
16	multiregister	Put the binary value into multi hold register.

4.1.4 Data code:

The data code includes the measured data and the data of specified function. These data can be value, parameter address or setting.

4.1.5 Check code

This code allows the error of transmission between the master and slave. Sometimes, there will be the errors when a data transferred from equipment to another in the interference. The check code can make the slave not to answer the error data in the transmission.

4.1.6 Check mode:

CRC occupies 2 bytes. It is got by the transmission equipment, and than it is added in the data frame. The master will re calculate the CRC value, and then it compares the value to that received. If 2 values is not same, there must be error.

4.2 Communication example

Addr	Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of reg lo	CRC16 lo	CRC16 hi
01H	03H	00H	00H	00H	03H	05H	CBH

Addr: slave address
Fun: function code
Data start reg hi: the start of data code, the high byte
Data start reg lo: the start of data code, the low byte
Data #of reg hi: the number of data, the high byte
Data #of reg lo: the number of data, the low byte
CRC16 hi: check data the high byte
CRC16 lo: check data, the low byte
Read data(function code 03/04)

4.2.1 Read the data frame

This function allows the user to get the data measured and registered by slave and its system parameters. There is not the asking limit, but the data can not exceed the defined code domain.

For example, the 3 data (T1, T2, T3) is red by slave NO.01. Each code in the data frame has 2 bytes. T1 is 0006H; T2 is 0007H, T3 is 0008H.

Addr	Fun	Data start Addr hi	Data start Addr lo	Data #of Reg hi	Data #of Reg lo	CRC16 lo	CRC16 hi
01H	03H	00H	06H	00H	03H	E5	CA

The answer data frame
The answer data frame includes slave address code, function code, data number code, the measured data code and CRC code.
The example as below: T1, T2, T3(T1=016AH, T2=016BH, T3=0169H)

Addr	Fun	Byte Count	Data1 Hi	Data1 Lo	Data2 Hi	Data2 Lo	Data3 Hi	Data3 Lo	CRC16 Lo	CRC16 Hi
01H	03H	06H	01H	6AH	01H	6BH	01H	69H	89H	33H

4.2.2 Multi register

The research frame
The function code 16 allows user to change the content in the register. The system parameters of ARTM can be changed by this code.
The example as below, set the interval of loop display is 4 seconds; and turn off temperature input channel 1 and channel 2. The code of display control word is 0003H, the code of state of ON and OFF is 0004H.

Addr	Fun	Data start hi	Data start lo	Data #of reg hi	Data #of reg lo	Byte Count	Value1 Hi	Value1 Lo	Value2 Hi	Value2 Lo	CRC16 Lo	CRC16 hi
01H	10H	00H	03H	00H	02H	04H	00H	04H	FFH	FCH	B3H	CAH

The answer data frame
the slave address, function code, the data star code, data number and CRC code.

Addr	Fun	Data start Addr hi	Data start Addr lo	Data #of Reg hi	Data #of Reg lo	CRC16 lo	CRC16 hi
01H	10H	00H	03H	00H	02H	B1H	C8H

4.3 Parameters list:

Code	Parameter	r/w	value	format
0000H High byte	The type of ARTM	R	1: ARTM8; 2: ARTM16	word
0000H Low byte	The type of sensor	R	1: Pt100; 2: Cu50	
0001H	Password	R/W	0000 ~ 9999	word
0002H High byte	Slave address	R/W	0001 ~ 0247	word
0002H Low byte	Communication speed	R/W	0-4: for 1200, 2400, 4800, 9600, 19200	
0003H	Display setting	R/W	0 ~ 20, 0 normal display; the others is the interval of loop display	word
0004H High byte	9 ~ 16 channel state: ON/OFF (just for ARTM16)	R/W	Each bit corresponds one channel: 0 - OFF, 1 - ON	word
0004H Low byte	1 ~ 8 channel: ON/OFF	R/W	Each bit corresponds one channel: 0 - OFF, 1 - ON	
0005H High byte	9 ~ 16 channel sensor state ON/OFF(just for ARTM16)	R	Each bit corresponds one sensor: 0 - OK, 1 - ERRO	word
0005H Low byte	1 ~ 8 channel sensor state	R	Each bit corresponds one sensor: 0 - OK, 1 - ERRO	
0006H	Temperature value T1	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0007H	Temperature value T2	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0008H	Temperature value T3	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0009H	Temperature value T4	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
000AH	Temperature value T5	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
000BH	Temperature value T6	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
000CH	Temperature value T7	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
000DH	Temperature value T8	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
000EH	Temperature value T9 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
000FH	Temperature value T10 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0010H	Temperature value T11 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0011H	Temperature value T12 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0012H	Temperature value T13	R	Pt100: -200 ~ 600;	word

	(just for ARTM16)		Cu50: -50 ~ 150	
0013H	Temperature value T14 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0014H	Temperature value T15 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0015H	Temperature value T16 (just for ARTM16)	R	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0016H High byte	9^{th} ~ 16^{th} channel AL1 alarm trend (just for ARTM16)	R/W	Each bit corresponds one channel AL1 0 - low alarm; 1 - high alarm	word
0016H Low byte	1^{st} ~ 8^{th} channel AL1 alarm trend	R/W	Each bit corresponds one channel AL1 0 - low alarm; 1 - high alarm	
0017H High byte	9^{th} ~ 16^{th} channel AL2 alarm trend (just for ARTM16)	R/W	Each bit corresponds one channel AL2 0 - low alarm; 1 - high alarm	word
0017H Low byte	1^{st} ~ 8^{th} channel AL2 alarm trend	R/W	Each bit corresponds one channel AL2 0 - low alarm; 1 - high alarm	
0018H	Setpoint of AL1 for 1^{st} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0019H	Setpoint of AL2 for 1^{st} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
001AH	Setpoint of AL1 for 2^{nd} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
001BH	Setpoint of AL2 for 2^{nd} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
001CH	Setpoint of AL1 for 3^{rd} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
001DH	Setpoint of AL2 for 3^{rd} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
001EH	Setpoint of AL1 for 4^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
001FH	Setpoint of AL2 for 4^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0020H	Setpoint of AL1 for 5^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0021H	Setpoint of AL2 for 5^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0022H	Setpoint of AL1 for 6^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0023H	Setpoint of AL2 for 6^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0024H	Setpoint of AL1 for 7^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0025H	Setpoint of AL2 for 7^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0026H	Setpoint of AL1 for 8^{th} channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0027H	Setpoint of AL2 for 8^{th} channel	R/W	Pt100: -200 ~ 600;	word

			Cu50: -50 ~ 150	
0028H	Setpoint of AL1 for 9th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0029H	Setpoint of AL2 for 9th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
002AH	Setpoint of AL1 for 10th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
002BH	Setpoint of AL2 for 10th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
002CH	Setpoint of AL1 for 11th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
002DH	Setpoint of AL2 for 11th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
002EH	Setpoint of AL1 for 12th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
002FH	Setpoint of AL2 for 12th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0030H	Setpoint of AL1 for 13th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0031H	Setpoint of AL2 for 13th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0032H	Setpoint of AL1 for 14th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0033H	Setpoint of AL2 for 14th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0034H	Setpoint of AL1 for 15th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0035H	Setpoint of AL2 for 15th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0036H	Setpoint of AL1 for 16th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0037H	Setpoint of AL2 for 16th channel	R/W	Pt100: -200 ~ 600; Cu50: -50 ~ 150	word
0038H	The hysteresis of AL1	R/W	0 ~ 100	word
0039H	The hysteresis of AL2	R/W	0 ~ 100	word
003AH	The delay of alarm	R/W	0 ~ 10	word
003BH ~ 003FH	Reserved	- -	- -	5 words
0040H High byte	9th ~ 16th AL1 state	R	Each bit corresponds one channel AL1: 0 - no, 1 - active	word
0040H Low byte	1 ~ 8 AL1 state	R	Each bit corresponds one channel AL1: 0 - no, 1 - active	
0041H High byte	9 ~ 16 AL2 state	R	Each bit corresponds one channel AL1: 0 - no, 1 - active	word
0041H Low byte	1 ~ 8 AL2 state	R	Each bit corresponds one channel AL1: 0 - no, 1 - active	