

SINGLE CHANNEL CONTROL PANEL



OPERATING MANUAL

Model Number: NCP-1P-240V-15A-1UARP REV00



Table of Contents

1.	INTRODUCTION	3
2.	WARRANTY AND LIABILITY	4
3.	SAFETY	4
4.	PRODUCT SPECIALITY AND FEATURES	5
	4.1 PRODUCT SPECIALITY	6
	4.2 PRODUCT SAFETY FEATURES	6
5.	WIRING AND INSTALLATION	7
	5.1 FIXING THE TAB TO THE PANEL	7
	5.2 FIXING THE MAIN POWER CABLE TO THE TERMINAL BOX	8
	5.3 FIXING THE HEATER POWER CABLE, THERMOSENSOR, ALARM AND SERIAL PORT	8
6.	GETTING STARTED	11
7.	SETTING THE PID CONTROLLER	12
	7.1 SELECTING A THERMOCOUPLE TYPE	12
	7.2 SELECTING AUTOTUNING OPTION	· 13
	7.3 SETTING CONTROL PERIOD	· 13
	7.4 FOR ALARM SETTINGS,	14
	7.5 TO STOP THE OPERATION IN BETWEEN BY USING PID CONTROLLER	· 14
	7.6 TO RUN THE OPERATION IN BETWEEN BY USING PID CONTROLLER	· 14
8.	OPERATIONAL PROCEDURE	15
9.	TROUBLESHOOTING	16
10	D. APPENDIX-I (WIRING DIAGRAM)	17
11	. APPENDIX-II (DETAILED PID CONTROLLER MANUAL)	18
12	2. APPENDIX-III INSTRUMENT COMMUNICATION PROTOCOL	43



1. INTRODUCTION

This Operating Manual is a part of the documentation for the portable control panel which can be used in variety of applications. The manual contains the operating instructions and procedure to operate and along with the safety instructions for the instruments.

The control panel is compactible for the below specifications

•	Controller Model number	NCP-1P-240V-15A-1UARP
•	Supply Voltage	Single Phase,110-240 Volt, 50-
		60HZ
•	Heater supply voltage	110-240V
•	Maximum Current Output	15 Ampere
•	Alarm output	Yes
•	Communication	RS485 to USB, RS485 (Raw)
•	Controller Input type	Thermocouple K, S, R, E, J,

and RTD Cu50, PT100

Enclosure Polyester enclosure

Fiberglass Rated for Nema 4X

B, N, T, B, WRe25, WRe5-WRe26,

vented.



Caution

Before operating the control panel, read this operating manual

This controller is intended to control the equipment under normal operating conditions. Failure or malfunction of the controller may lead to abnormal operating conditions, which may result in personal injury or damage to the equipment or other property. Devices (limit or safety controls) or systems (alarm or supervisory) intended to warn and protect against failure or malfunction of the controller must be incorporated into and maintained as part of the control system.



2. WARRANTY AND LIABILITY

- The manufacturer will not be liable for defects and damage caused by failure to follow the product installation and maintenance instructions.
- The control panel can only be used to control products which should be within the specification such as ampere rating for the heater, type of thermocouple etc
- Do not connect and disconnect the control panel connector while the panel is in running state.
- After the product is switched off, it should not be switched on again for at least 5–10 seconds.
- For safe product operation, after two unsuccessful attempts to start the product in a row, contact the service department for troubleshooting information.
- The warranty operating period of the control panel is 12months from the date of sale, provided the operation, transportation and storage rules are followed by the consumer.
- The warranty does not cover defects appearing as a result of:
 force major circumstances, including lightning strike, fire, flood,
 impermissible voltage surges or traffic accidents; failure to follow the rules
 for installation, operation, storage, and transportation specified in the
 Operating Manual, use of the control panel for purposes other than
 intended.

3. SAFETY

- Do not switch on and operate the product in locations where combustible vapours or gases or large amounts of dust can form (filling stations or petroleum, fuel, coal, timber or grain storage facilities). may lead to Explosion hazard.
- All wiring and component replacement to be made by qualified personnel only
- Do not use a faulty product. Injury hazard due to use of faulty device



- Do not switch on and operate the product in enclosed or non-ventilated premises. Hazard of poisoning and asphyxiation by exhaust gases.
- Do not switch on and operate the product if combustible materials or fluids are present in the exhaust gas which may lead to Fire hazard.

4. PRODUCT SPECIALITY AND FEATURES

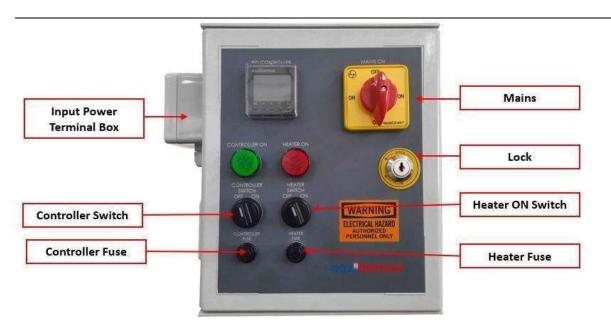


Figure 4-1 Control panel Side labelling



Figure 4-2 control panel side labelling



4.1 PRODUCT SPECIALITY

- Plug and play type with quick installation
- PV display with LCD screen for improved visibility
- Advanced artificial intelligence FUZZY+PID control
- Fastest response time up to 80mS
- Additional special features like Ramp mode, Soak mode programmable to control various state of the output process temperature.
- Control panel can be used with a universal input which support all kinds of thermocouples
- Alarm output for easy rectification of errors
- Dedicated output connector for heater, alarm and thermo sensor
- RS485 to USB serial converted output
- RS485 raw serial output.
- Additional special features like Ramp mode, Soak mode programmable to control various state of the output process temperature

4.2 PRODUCT SAFETY FEATURES

- Tough Plastic panel for Electrical shock proof
- Dedicated fuse for Heater and panel separately
- Controller can be programmed without turning on the heaters with its separate power switch.
- Door locking system with a key
- Lockable input and output panel mounted connectors for safe and stable operation
- 110 240V wide input voltage range to panel
- Separate Alarm output port.
- Separate Switch and LED indication for both Controller and Heater



5. WIRING AND INSTALLATION

5.1 FIXING THE TAB TO THE PANEL

Step1: Remove the bolt (all 4 bolts) from the panel by holding the nut inside

the panel



Figure 5-1 Removal of Bolt

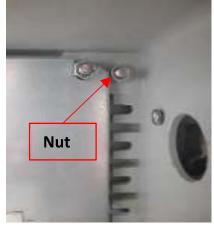


Figure 5-2Removal of nut

Step2: Place the tab as per the required orientation (horizontal/vertical) and insert the bolt and tight the nut which is present inside the panel box. And later fix the panel to the wall

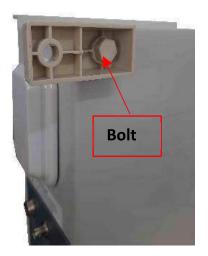


Figure 5-4 Fixing of tab



5.2 FIXING THE MAIN POWER CABLE TO THE TERMINAL BOX

Step1: Open the cover of the terminal box.

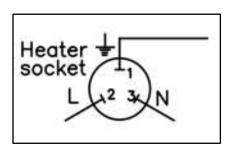
Step 2: Connect the wires Line, neutral and ground cable via cable gland and Make sure that the wire strands are properly connected and not touching anywhere.



Figure 5-2-1 Terminal Block

5.3 FIXING THE HEATER POWER CABLE, THERMOSENSOR, ALARM AND SERIAL PORT

Step1: Connect the heater wires as per the wiring diagram as below.

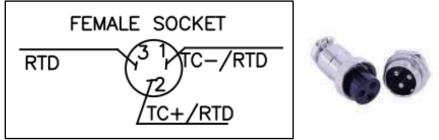




Hea	Heater Wiring details				
Pin no.	Туре				
Pin1	Ground				
Pin 2	Line (heater Power)				
Pin 3	Neutral (heater Power)				



Step 2: Connect the thermocouple leads as per the polarity.



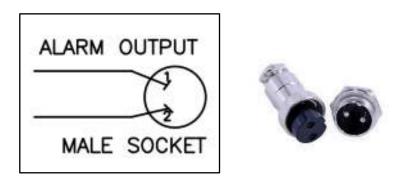
Thermocouple wiring details		
Sensor type	Connection details	
KSRTEJBN	Pin 1:TC -ve Pin 2:TC +ve Pin 3: N/A	
2 Wire RTD	2 Wire RTD Pin 1: RTD Pin 2: RTD Pin 3: N/A	
3 Wire RTD	3 Wire RTD Pin 1: RTD cable Pin 2: RTD cable Pin 3: RTD cable	



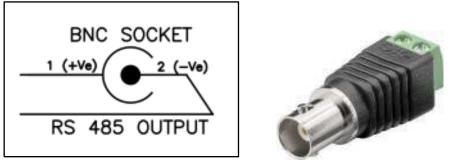
Step 3: Connect the alarm leads as per the requirement.

Alarm output type: NO

Alarm rated power: 5 Amps



Step 4: Connect the raw output data of serial connector (if multiple panels connected or to a PLC)



Serial Wiring details				
Pin no.	Туре			
Pin1	Serial cable +ve			
Pin 2	Serial cable -ve			

Step 5: Connect the USB cable provided with controller to the computer for controlling the temperature setting and data logging via software.

Note:

- Step 4 and step 5 is optional.
- To connect the panel via RS 485(Raw), then connect via BNC connector.
- To connect the panel via RS 485 to serial, then connect via USB cable



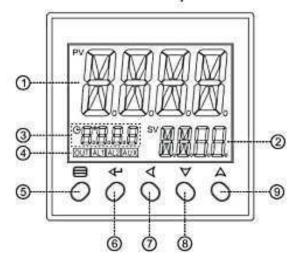
6. **GETTING STARTED**

- Connect the power input to the mains
- Solder the heater cable, alarm cable, temperature sensor cable and Serial output to the dedicated plugs provided (refer Pic 4.2)
- Before plugging to main socket, make sure that mains, controller and heater switch is in OFF position.
- Plug the main socket to the input rated power.
- Switch ON the mains
- Switch ON the controller switch and set the thermocouple type, heater set temperature, and alarm settings (optional) (Refer below in PID controller settings (Refer ins chapter 7))
- Switch ON the auto tuning in controller to set the PID values automatically (Refer below in PID controller settings) (For advanced users set the PID values in controller accordingly) (refer Appendix II for more details)
- Switch ON the Heater so that the controller will attain and set the required temperature.
- Before turning OFF the main power, make sure that heater switch, controller switch and Mains is in OFF position.



7. SETTING THE PID CONTROLLER

7. Front Panel Description



- No.1 display, PV or specified parameter
- (2) No.2 display, SP or specified parameter value
- (3) No.3 display MV
- Operation indicators: OUT ,AL1,AL2,AUX indicators
- Setup key: For accessing parameter table and conforming parameter modification.
- 6 Enter key:For Confirm and change to another parameter
- (7) Data shift key, start auto tuning
- (8) Data decrease key, and also run switch
- Data increase key, and also stop key

7.1 SELECTING A THERMOCOUPLE TYPE

Step 1: In the basic display state, press and hold for 2 sec

Step 2: Set LOC = 800 and then press <

Step 3: Select INT function and later select the temperature sensor as per the below table

Int	Input spec	Int	Input spec		
0	K (-50.0~+1300°C)	18	J (0~300.00°C)		
1	S	20	Cu50		
2	R	21	Pt100 (-200.0~+600.0		
3	T	: VAR	°C)		
4	E 2		Pt100 (-100~+300.00		
5	J		°C)		
6	В	25	0~75mV		
7	N	26	0~80Ω		
8	WRe3-WRe25	27	0~400Ω		
9	WRe5-WRe26	28	0~20mV		
10	Special custom input	29	0~100mV		
	specification	30	0~60mV		
12	F2 radiation type	31	0~1V		
	pyromter	32	0.2~1V		
15	Spare	33	1~5V (4~20mA)		
	V6	34	0~5V (0~20mA)		
16	Spare	35	-20~+20mV		
		36	-100~+100mV		
17	K (0~300.00°C)	37	-5V~+5V		





7.2 SELECTING AUTOTUNING OPTION

In basic display press of for 2 sec then 'At' parameter will appear, press to change the value from OFF to ON



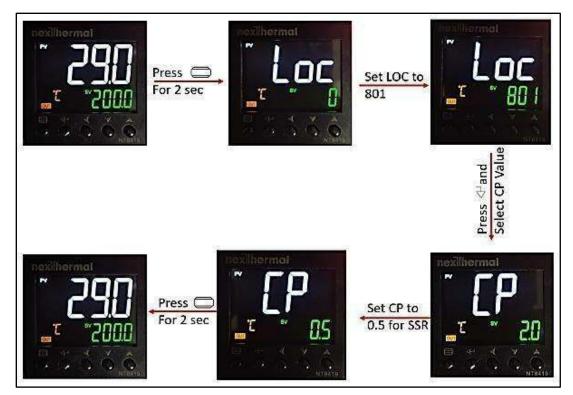
7.3 SETTING CONTROL PERIOD

Step 1: In the basic display state, press and hold for 2 sec

Step 2: Set LOC = 801 and then press key key

Step 3: Select CP function and later Set the period between 0.5 to 3 seconds for SSR control type





7.4 FOR ALARM SETTINGS,

please refer the appendix (II) i.e. function parameters and alarm settings.

7.5 TO STOP THE OPERATION IN BETWEEN BY USING PID CONTROLLER

In basic display press for 2 sec then stop screen blinks in the place of Set value.

7.6 TO RUN THE OPERATION IN BETWEEN BY USING PID CONTROLLER

In basic display press ∇ for 2 sec then run appears in the place of Set value.



8. OPERATIONAL PROCEDURE

- i. Make sure that the Main switch is off
- ii. Connect the main cord wire to the standard input
- iii. Connect the thermocouple and heater to the control panel
- iv. Switch ON the mains
- v. Switch ON the PID controller switch and make sure the PID controller is ON.
- vi. Select the type of the thermocouple in the PID controller refer Appendix III or section 6 for the PID settings
- vii. Set the required temperature in the PID controller
- viii. Switch ON the autotuning in PID controller refer Appendix III or section 6 for the PID autotuning settings
- ix. Switch ON the heater ON switch
- x. After the completion the process, kindly switch of the heater, controller switch and finally switch of the mains ON switch.

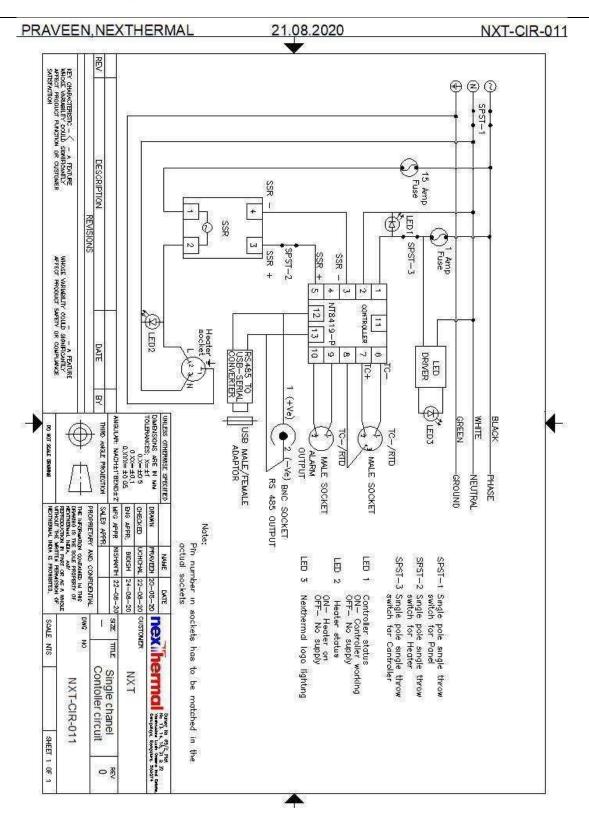


9. TROUBLESHOOTING

Problem	Possible Fault	Identification	Cause	Solution
Heater not working	Heater failed, Heater Fuse burning	Check the heater resistance and Check the fuse with multimeter	Over current or short circuit	Replace the Heater (or) fuse with similar specifications
Control panel not switching on	Fuse burning	Check the Controller fuse with multimeter	Over current or short circuit	Replace the fuse having similar rating
Sensor input is open	temperature sensor failed	Check the working of temperature sensor	Sensor might failed	Replace the temperature sensor having similar specifications
Heater temperature is continuously raising	PID controller may not working properly OR SSR may be faulty	check the PID controller and as well as SSR inside the panel	Internal failure of the PID or SSR	Replace the PID controller or SSR whichever is faulty with similar ratings and specifications (or) Contact Nexthermal
Software is not connecting to PC	driver of RS 485 might not installed or change the Comm port	check the driver and comm port is correct	Port error Convertor error OS issues Software error	Check software settings and guidelines For driver issues contact Nexthermal.



10. APPENDIX-I (WIRING DIAGRAM)





11. APPENDIX-II (DETAILED PID CONTROLLER MANUAL)

nex hermal

Operating instructions

NT8419/NT8419P High performance digital temperature controller

1.Main features

- White PV display and new higher contrast LCD with greatly improved visibility.
- Get practical patent Plastic waterproof type keys, Firm and never wear and Operation feet clear and smooth and Good waterproof performance.
- •Universal input: support all kinds of thermocouples,RTDs, linear current/voltage, resistance and radiation (infrared) thermometer signals are selectable.
- ■Use digital calibration technology for input measurement with input measurement accuracy F.S.0.15%, and achieving accurate and stable measurement, maximum resolution is 0.01℃.
- Use advanced modular structure, conveniently providing plentiful output options, able to satisfy the requirements of various applications.
- Use advanced artificial intelligent control algorithm, no overshoot and with the function of auto tuning (AT) and self-adaptation.
- Can provide up to Three alarm output and LBA control circuit disconnection alarm function.
- Support RS485 or RS232C communication interface, the use of advanced MODBUS RTU and FTBUS communication protocol.
- The measured value (PV) or a set value (SV) can be changed into a standard current signal output, which can be used as a temperature transmitter.
- ●Can Using OUt PID Control Output and AUX transmitter Output, A PID Control Output Assignment An auxiliary output is used as the transmitter output.
- Can manual / automatic switch control and manual auto Tuning function.

2. Technical Specification

Series model	NT8419	NT8419P			
Category	High performance temperature controller	Base on FT3419 added 50 segments programmable functions.			
Indication method	11-segment digital LCD displa	y and individual indicators			
Power supply voltage	AC/DC100~240V ,or AC/DC12	2-24V(-15%, +10%/50-60HZ)			
Power consumption	Approx. 5.2 VA at 100 to 240 V	to 240 VAC, Approx. 3 VA at 12 to 24 VDC			
Input type	5-+5V1V-+1V20mV-+20r Linear voltage(external precise sho	:u50, Pt100, /, 0.2-1V, 0-20mV, 0-60mV, 0-75mV, 0-100mV			
Instrument Input range K (-50-+1300°C) , S (-50-+1700°C) , R (-50-+1700°C) , T (-200-+350°C) E (0-800°C) , J (0-1000°C) , B (200-1800°C) , N (0-1300°C) , WRe3-WRe25 (0-2300°C) , WRe5-WRe26 (0-2300°C) , Cu50 (-50-+150°C) , Pt100(-200-+600°C) Linear Input: -9990 - 30000 defined by user					
Measurement accuracy	0.15% FS ± 1 measurement unit				
Resolution	0.1℃ for K, E, T, N, J, Cu50, Pt100; 1℃ for S,R				
Decimal point	0,0.0,0.00,0.000				
Response time	80mS(when digital filter parameter InF=0). Display response time<0.				



≤0.015%FS/C (typical value is 80ppm/C)
0.24~300.0 seconds selectable
one-stop regulating. Intelligent Fuzzy PID algorithm
3A/250VAC 5A/30VDC
12VDC/50mA(Used to drive SSR)
100~240VAC/0.2A (continuous), 2A (20mS instantaneous, repeat period > 5s)
Can trigger TRIAC of 5~500A, a pair of inverse paralleled SCRs or SCR power module.
0~20mA, 4~20mA can scaling by user. (Output voltage ≥ 10.5V maximum load resistor 500ohm, output precision 0.2%FS)
±4KV/5KHz according to IEC61000-4-4; 4KV according to IEC61000-4-5
Between power, relay contact or signal terminals ≥2300VDC; between isolated electroweak terminals ≥600V
Temperature:0-60°C; Humiditys90%RH

3.Ordering Code Definition

NT8419							
NT8419P				ш	ш		
14104101	3	2	3	(4)	(5)	(6)	

Code	Multiple function Input(MIO)
N	None
13	4-20mA/0-20mA input
14	4-20mA/0-20mA input, has a 24VDC/50mA power supply for a transmitter.
12	Switch / frequency signal input

(4)

Code	Auxiliary output (AUX)
N	None
R1	relay contact output(Normally open + normally close)
Q	SSR voltage output
×	0-20mA/4-20mA Linear current output
X5	0-5V/1-5V Linear voltage output
V24	24VDC voltage output
V12	12VDC voltage output
V10	10DC voltage output
U5	5DC voltage output

Code	Main output(OUT)
N:	None
R	relay contact output(Normally open + normally close)
Q	SSR voltage output
W1	TRIAC no contact normal open discrete output
W2	TRIAC no contact normal close discrete output
K1	Single-phase thyristor zero crossing trigger output
кз	Three-phase thyristor zero crossing trigger output
X	0-20mA/4-20mA Linear current output
X5	0-5V/1-5V Linear voltage output
X8	0-10V/2-10V Linear voltage output
K5	Single-phase thyristor phase-shift trigger output , suitable for 290-240/AC power
K6	Single-phase thyristor phase-shift trigger output suitable for 340~415VAC power

Code	Alarm (ALM)
N	None
R1	relay contact output(Normally open)
R2	Dual relay output (Dual Normally open)
Q	SSR voltage output
Q2	Dual SSR voltage driver

Code	Communication Interface (COMM)
N	None
s	RS485 communication interface
\$2	RS232C communication interface

Code	Instrument power supply
None	AC/DC100-240V
D	DC12~24V



NT8419/NT8419P By installing different modules, the controller can meet the requirements of different functions and output types.

Multiple function Input (MIO):

Can input signal from 2-wire transmitter4-20mA signal by installing I4 (current input) module and I4 module can provide 24VDC to transmitter. If a I2 (on-off signal input) module is installed, the instrument can switch between set points SV1 and SV2 by an external switch.

Main output (OUTP):

Commonly used as control output such as on-off control, and PID+FUZZY control. It can be used as retransmission output of process value (PV) or set point (SV). Installing R modular can realize Normally open + normally close relay contact output; installing X module can realize 0-20mA/4-20mA /0-10mA linear current output; installing Q module can realize SSR voltage output; installing W1 or W2 module can implement TRIAC no contact switch output.

Alarm (ALM):

Commonly used as alarm output. Support 1 normally open relay output (AL1) by installing R1 module or 2 normally open relay outputs (AL1+AL2) by installing R2 module.

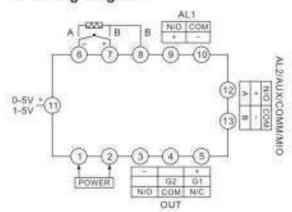
Auxiliary output (AUX):

In a heating/refrigerating dual output system, module X, R1, G, W1, W2 can be installed for the second control output. It can also output alarm by installing R1 module, and it can also be used as power supply for external sensor when equipped with a voltage output module.

Communication Interface (COMM):

Module S or S4 can be installed in for communicating with computer (RS485 communication interface).

4. Wiring diagram.

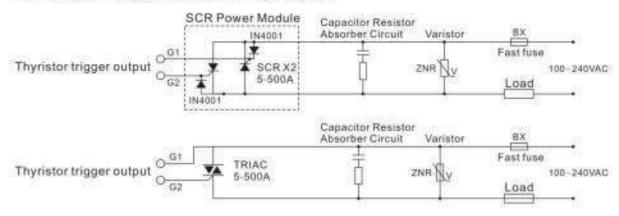


Note 1: For linear voltage input, if the range is below 500mV, connect to terminals 6 and 7. 0~5V or 1~5V signal can be inputted from terminals 6 and 11.

Note 2: 4~20mA linear current signal can change to 1~5V voltage signal by connecting a 250 ohm resistor, and then be inputted from terminals 6 and 11. If I3 module is installed in MIO slot, 4~20mA signal can be inputted from terminals 12* and 13-. If I4 module is installed in MIO slot, 4-20mA signal 2-wire transmitter can be inputted from terminals 12+ and 13-.

Note 3:If out is the SSR output, most can achieve up to threeroad alarm output.

Thyristor trigger output wiring diagram

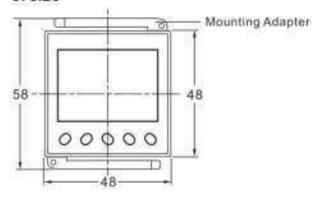


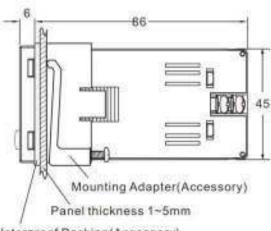


Note 1: According to the voltage and current of load, choose a suitable varistor to protect the thyristor. A resistor-capacitor circuit (RC circuit) is needed for inductance load or phase-shift trigger output. Note 2: SCR power module is recommended. A power module includes two SCRs, is similar to the above dashed square.

Note 3: K5 and K6 TRAIC trigger module only support 220~380VAC and 50Hz power.

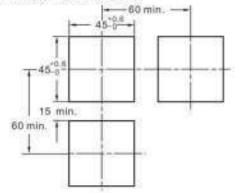
6. size



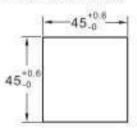


Waterproof Packing(Accessory)

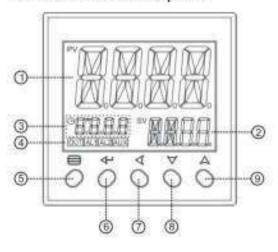
Multiple install Cutouts



Single install Cutout



7. Front Panel Description

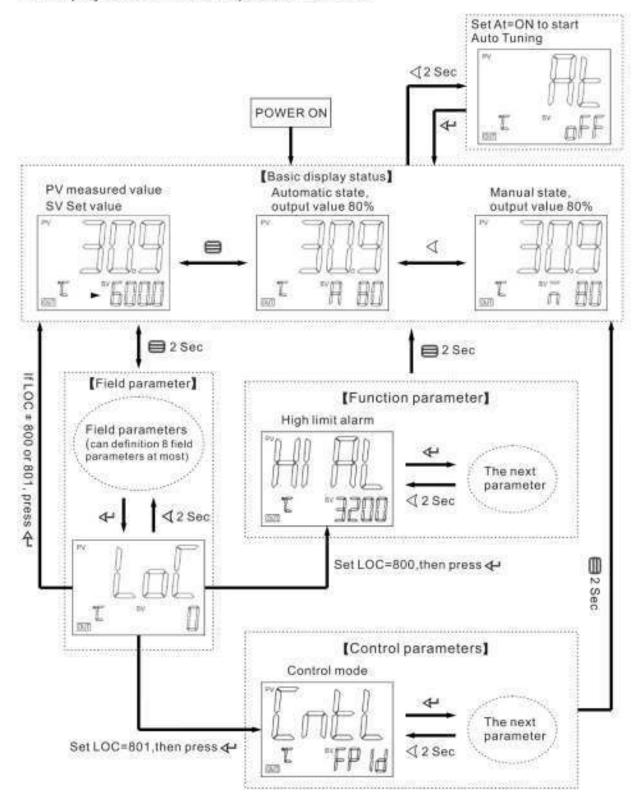


- (1) No.1 display, PV or specified parameter
- (2) No.2 display, SP or specified parameter value
- (3) No.3 display MV
- Operation indicators: OUT ,AL1,AL2,AUX indicators
- Setup key: For accessing parameter table and conforming parameter modification.
- 6 Enter key:For Confirm and change to another parameter
- (7) Data shift key, start auto tuning
- (8) Data decrease key, and also run switch
- (9) Data increase key, and also stop key



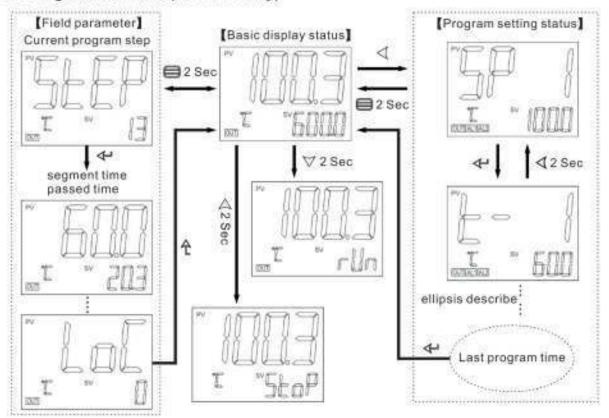
8. Parameter Setting Flow Chart and operation method description

8.1 display status and basic operation flow chart

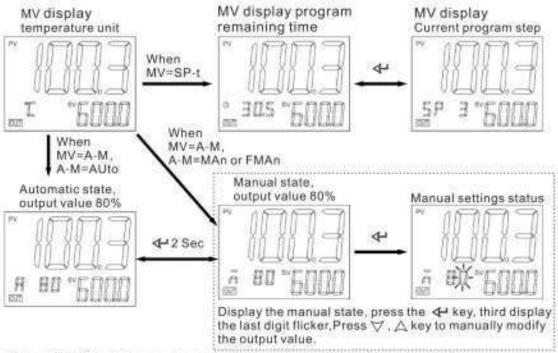




8.2 Program flow chart (NT8419P only)



8.3 No.3 display MV



When A-M=FMAn, For manual state only, no manual / automatic state switch.



8.4 Parameter Setting

8.5 Set Value Setting

In basal display status, if the parameter lock "Loc" isn't locked, we can set setpoint (SV) by pressing \triangleleft first, then can press \triangleleft , \triangledown or \triangle to adjust value. Press \triangledown key to decrease the value, \triangle key to increase the value, and \triangleleft key to move to the digit expected to modify. Keep pressing \triangledown or \triangle , the speed of decreasing or inscreasing value get quick. The range of setpoint is between the parameter SPL and SPH. The default range is -99~999.

8.6 Man/Auto mode switch(this function is enabled by the A-M parameter)

8.7 Run / Hold only (for NT8419P)

In basic display status, if the program is in stoP status ("StoP" is alternately displayed on the lower window), press and hold the ∀ key for about 2 seconds until the lower display window displays the "Run" symbol, the instrument then will start the program.

If parameter "PAF" set F=1, user can hold the

key for about 2 seconds, instrument will changes to hold status and lower display window displays the "HoLd" symbol. If parameter "PAF" set F=0, "Hold" status only can activate by parameter setting (Srun).

At Hold status, the program is still executing, and the process value is controlled same as set, but the timer stop working, and the running time and setpoint remains. At Hold status, press and hold the

key for about 2 econds until the lower display window displays the "Run" symbol, the instrument will back to run program.

8.8 Stop

Press and hold the A key for about 2 seconds in the basic display status, until the lower display window displays the "stoP" symbol, means the stoP operation is executed now, when program stopped, timer will be reset and stop. This operation forces the instrument to stop running, meanwhile, the StEP number will reset to 1, nd control output is also stopped.

8.9 Auto Tuning

When FUZZY+PID control method is chosen (CntL=FPId), the PID parameters can be obtained by running auto-tuning.

In basal display status, press < for 2 seconds, the "At" parameter will appear. Press to change the value of "At" from "oFF" to "on", then press ← to active the auto-tuning process. During auto tuning, the instrument executes on-off control. After 2-3 times of on-off action, the instrument will obtain the optimal control parameter value.

If you want to escape from auto tuning status, press and hold the < dilkey for about 2 seconds until the "At" parameter appear again. Change "At" from "on" to "oFF", press ← to confirm, then the auto tuning process will be cancelled. (P.S. If parameter "rAte" activate and the heating was running, then will stop the "At" until completed the heat up process.) If the controller was applied on heat/cooling duel output system, PID parameter need separate two group to process auto tuning. When the controller was cooling control from AUX, this time can enable auto tuning to obtain P2, I2, d2.



Note 1: If the setpoint is different, the parameters obtained from auto-tuning are possible different. So you'd better set setpoint to an often-used value or middle value first, and then start auto-tuning. For the ovens with good heat preservation, the setpoint can be set at the highest applicable temperature. Depending on the system, the auto-tuning time can be from several seconds to several hours.

Note 3: Parameter HYS (on-off differential, control hysteresis) has influence on the accuracy of auto-tuning. Generally, smaller value of HYS, will get higher precision of auto tuning result. Too large value of HYS, will made the controller out of control, so, HYS is recommended to be 2.0.

Note 4: NT84** series instrument has the function of self-adaptation. It is able to learn the process while working, he control effect at the first run after auto tuning is probably not perfect, but excellent control result will be obtained after a period of time because of self-adaptation.

9. Parameter list and function

9.1 Field parameter

In the basic display state, press and hold key 2 seconds, Enter the field parameters. Through the definition of FP field parameters, You can select 8 parameters as field parameters in the Field parameters.

Code	Name Description			
StEP	Current execution Program segment (applicable only to NT8419P)	indicating the currently executing program segment number. Modify this parameter, the program will immediately jump, for example: the current StEP=3, represent the program The runs to the third segment. If you set StEP=8, the program immediately jumps to the eighth segment execution. The settings range for StEP is limited by Prgd and Prg, example:Prgd=8, Prg=2, and so on The program is divided into 8 curves. Now the program performs second curves, Now the program executes the 2 curve, executed by the 11-20 segment program, and the StEP set range is limited to 11-20, and After the instrument is stopped running (StoP), the StEP is automatically set to 11. Another example: Prgd=0, Prg=0, PrSn=80, then the program does not group, then StEP settings range 1-80, and After the instrument is stopped running (StoP), the StEP is automatically set to 1.		
PrG	Curve group number (applicable only to NT8419P)	Display the currently executing curve group number. When Prgd set curve grouping, you can program multiple curves to deal with different technology to be Seeking, by choosing this parameter to choose to perform the appropriate curve. The PrG setting range is limited by the PrGd parameter: When PrGd = 0, the program is not grouped, PrG can not be set, PrG is fixed at 0. When PrGd = 4, the program is forcibly divided into 4 groups of curves, PrG setting range is 1-4. When PrGd = 8, the program is forcibly divided into 8 groups of curves, PrG setting range is 1-8. When PrGd is forced to group, you can pre program a number of different groups of curves. Then by setting PrG you can quickly and easily choose to execute the appropriate curve. For example: PrGd = 4, PrG = 2, then the program is forced		



		into four groups of curves, the current implementation of the second curve (ie, to implement the procedures in paragraphs 21-40). When the controller implement stop after, StEP is automatically set as the start of the 2nd curve (ie, 21 steps)	
25.0 10.0	Section setting time and already run time(applicable only to NT8419P)	For example: the current segment setting time is 25 minute, and the already running time is 10 minute.	
PIDn	PID parameter group number (applicable only to NT8419P)	indicating the currently running PID parameter group number. This parameter cannot be modified and can only be defined programmatically.	
	Custom field parameters	maximum 8 field parameters can be defined by FP1 ~ FP8 (The defined parameters will be transferred from the function parameters or control parameters to the field parameter)	
LOC	Password lock	Set the LOC=800 and then press the ← key to enter the function parameters. Set the LOC=801 and then press the ← key to enter the control parameters.	

9.2 Function parameter
In the field parameters, set Loc=800, Then press the ← key to enter the function parameters.

Code	Name	Description	Setting Range
HIAL	High limit alarm	Alarm on when PV>HIAL Alarm off when PV <hial-ahys, action="" alarm="" altd.<="" be="" by="" can="" defined="" disable="" function="" max.="" output="" parameter="" set="" td="" the="" this="" to="" value="" when="" will=""><td></td></hial-ahys,>	
LoAL	Low limit alarm	Alarm on when PV <loal; Alarm off when PV>LoAL+AHYS When the value set to Min. will disable this function</loal; 	
HdAL	Deviation high alarm	Alarm on when PV-SV>HdAL; Alarm off when PV-SV <hdal-ahys When the value set to Max. will disable this function</hdal-ahys 	
LdAL	Deviation low alarm	Alarm on when PV-SV <ldal; alarm="" off="" pv-sv="" when="">LdAL+AHYS When the value set to Min. will disable this function HdAL and LdAL can also be used as high limit and low limit alarms when needed.(Refer to the description of parameter SSCo)</ldal;>	
LbA	Control loop break off / shorted Alarm	When the instrument control output is equal to otL or otH, and the continuous time is greater than LBA setting time, And the PV measurement does not exceed 2 "C change, then determine the control loop failure, the output alarm. When LBA = 0, cancel the LBA Alarm function.	



ALtd	Alarm output definition	units represents AL1, the hundreds represents AUX represents the different a represents no alarm outp respectively represents to HIAL+LOAL (within the a	ten (,Th larr ut, ' o HI irea	e value of each bit 0 ~ 9 n function selection,0 1, 2, 3, 4, 5, 6, 7, 8,9	
		1	alue	Representative alarm function parameters	
		Altd=D D D D	0	Closing the alarm function	
		T # # # +	1	HIAL(High limit alarm)	
		↓ AUX AL2 AL1 empty	2	LoAL(Low limit alarm)	
		1000000	3	HdAL(Deviation high alarm)	
			4	LdAL(Deviation low alarm)	
		1	5	HIAL+LoAL(Outside the area)	
			6	HdAL+LdAL(Outside the area)	
		1	7	HIAL+LoAL(within the area)	
			8	HdAL+LdAL(within the area)	
			9	LBA(Control loop shorted Alarm)	
		It indicates that the High lim AL2 port has no alarm outp HiAL and LoAL are all outpout within the area High-Low lin	ut. ut by		
AHYS	Alarm hysteresis	Avoid frequent alarm on-	off a	ction because of the	
Adon	Alarm ON delay	Alarm ON action delay, un no alarm ON delay function		seconds,When Adon=0, will	
AdoF	Alarm OFF delay	Alarm OFF action delay, will no alarm OFF delay for		is seconds, When AdoF=0, ion.	
Adt	Alarm delay definition	0: no alarm delay function 1:AL1 alarm output has d 2:AL2 alarm output has d 3:AUX alarm output has d 4:empty 5:AL1, AL2 alarm output l 6:empty 7:AL1, AL2, AUX alarm output	elay elay lela has	y. delay.	
ALL	Definition of alarm self lock	remains self - locking, no changes. When the meas	ma	tes effect, the alarm output tter how the measured value I value does not conform to er supply is reopened, and	



		1:AL1 2:AL2 3:AU2 4:emp 5:AL1 6:emp	, AL2 alarm has self loc	k.	ζ,
ALE	Definition of First alarm exemptions	0: No 1: HIA 2: LoA 3: HdA 4: LdA 5: HIA 6: HdA	Power start, if the happ ption. First alarm exemptions L has First alarm exem AL has First alarm exem AL has First alarm exem L, LoAL has First alarm AL, LoAL has First alarm L, LoAL, HdAL, LdAL h	functi ptions ptions ptions ptions exem	on. s. s. aptions. aptions.
Int	Input	Int	Input spec	Int	Input spec
	specification Code	0	K (-50.0~+1300°C)	18	J (0~300.00°C)
	Code	1	S S	20	Cu50
		2	R	21	Pt100 (-200.0~+600.0
		3	Ť		*C)
		4	Ē	22	Pt100 (-100~+300.00
		5	1 40 U 02		*C)
		6	В	25	0~75mV
		7	N	26	0~80Ω
		8	WRe3-WRe25	27	0-400Ω
		9	WRe5-WRe26	28	0~20mV
		10	Special custom input	29	0~100mV
			specification	30	0~60mV
		12	F2 radiation type	31	0~1V
		10000	pyromter	32	0.2~1V
		15	4~20mA (installed I4	33	1-5V (4-20mA)
			module in MIO)	34	0~5V (0~20mA)
		16	0~20mA (installed I4	35	-20~+20mV
		7557.	module in MIO)	36	-100~+100mV
		17	K (0~300.00°C)	37	-5V~+5V
dp	Display Resolution	Note 0. 0 is When recon	formats (0, 0.0, 0.00 1: For thermocouples s selectable, and the S type thermocouple mended to be 0. If In upport display 0.0 or	or R1 intern is us p= 17	TD input, only 0 or all resolution is 0, 1.
InL	Signal scale low limit	Defin	e scale low limit of inp	ut. It	



InH	Signal scale high limit	Define scale high limit of input. It is also the high limit of retransmission output (CntL=Pvtr or Svtr) and light bar display.	
Sc	Input Shift Adjustment	Sc is used to shift input to compensate the error caused by transducer, input signal, or auto cold junction compensation of thermocouple. PV after compensation=PV before compensation + Sc It is generally set to 0. The incorrect setting will cause measurement inaccurate.	
InF	PV input filter	The value of InFt will determine the ability of filtering noise. When a large value is set, the measurement input is stabilized but the response speed is slow. Generally, it can be set to 1 to 3. If great interference exists, then you can increase parameter "InF" gradually to make momentary fluctuation of measured value less than 2 to 5. When the instrument is being metrological verified, "InF" s can be set to 0 or 1 to shorten the response time.	
du	temperature unit	°C: Centigrade. "F: Fahrenheit degree. thermocouples and RTDs only	
rSPL	Signal scale low limit for External input SV set value	Use the External input SV set value function to define the lower limit of the signal scale. Use the position proportional output function to define the lower limit of the valve position feedback signal, This parameter can be set automatically by the valve autotuning function.	
rSPH	Signal scale high limit for External input SV set value	Use the External input SV set value function to define the high limit of the signal scale. Use the position proportional output function to define the high limit of the valve position feedback signal, This parameter can be set automatically by the valve autotuning function. WARNING: Valve position auto-tuning values Do not modify rSPH and rSPL parameters unless you are a professional.	
AdrS	Communication address	In the same communication line, different instrument should be set to different address.	
bPS	Baud rate	bPS parameter defines the communication baud rate, which can be defined as the range of 1200 ~ 19200bit / s (19.2K). When the COM position is not used for the communication function, the COMM port function can be set by the bPS parameter as the PV retransmission output function; bPS = 3, the COMM port as 0 ~ 20mA PV measured value retransmission output function; bPS = 4, the COMM port as 4 ~ 20mA PV measured value retransmission output function.	



PArl	Communication verification	nonE:No verification odd:Odd number verification EVEn:Even number verification	
СоММ	Communication protocol	FBUS: instrument communication protocol for FTBUS. MBUS: instrument communication protocol for MODBUS.	
Evt	Event input type	When I2 module was installed, the meter have following functions: nonE: Disable event input function. reSt: Run / Stop switching function. Connected in short time, start to running program, keep connect more than 2 sec, program switch to stop. SP1.2: Switching between setpoint 1 and setpoint 2 when use FT3419 or PrSn=0 at FT3419P. MIO in open status, SV=SP1, when MIO in close status, SV=SP2. Pid2: Switching 1st PID and 2nd PID. When use as single direction control, MIO in open status, P, I, d and CP was active, when MIO in close status, P2, I2, d2 and CP2 was active.	
SSCo	Advanced system code	SSCo is used to select advanced function. The value of AF is calculated as below; AF=A×1+B×2+C×4+D×8+E×16+F×32+G×64+H×128 A=0, Normal application on HIAL and LoAL; A=1, HIAL AND LoAL will become to deviation high alarm and Deviation low alarm. B=0, HdAL and LdAL work as deviation high and low limit alarms; B=1, HdAL and LdAL work as high and low limit alarms, and the instrument can have two groups of high and low limit alarms. C=0, Alarm and control hysteresis work as unilateral hysteresis; C=1, As bilateral hysteresis. D=0, The SV set value is set by the instrument panel operation; D=1, The SV set value is external input and the external input signal is from the 5V input. E=0, The External input SV set value signal is 1-5V; E=1, The External input SV set value signal is 0-5V. F=0, The transmit output is defined scale with InL/InH; F=1, The transmit output is defined scale with rSPL/rSPH. G=0, normal input mode, G=1, linear input signal for rooting processing. H=0, Fine control mode, internal control resolution was demonstration's 10 times. When on linear input mode, biggest display value is 3200 units; H=1, Wide range display mode, This mode is selected when the linear input requires a maximum display value greater than 3200.	
SPL	Low limit of SV	Minimum value that SV is allowed to be.	



SPH	Upper limit of SV	Maximum value that SV is allowed to be.
SP1	Setpoint 1	For FT3419 meter or FT3419P parameters PrSn=0 or 1, normally Given value SV=SP1.
SP2	Setpoint 2	For FT3419 meter or FT3419P parameters PrSn=0 or 1, When I2 module installed in MIO position, SP1 and SP2 can be switched by an external switch. If the switch is off, SV=SP1; if the switch is on, SV=SP2.
Pont	Program run mode after power restart (applicable only to NT8419P)	Cont: Continue to run the program from the original break point. If STOP STATUS was activated before power cut, then it (the program) will keep stop status after power restart. StoP: Stop the program after power restart run1: Start to run the program from step 1 unless the instrument was in "stop" state before power cut. dASt: If these have deviation alarm after power resume, then stop the program, otherwise, continue run the program from the original break point. HoLd: Go into HOLD state after power on. If it is in StoP state before power cut, then keep in StoP State after power on.
PSYS	Program Running mode (applicable only to NT8419P)	The PSYS parameter is used to select the program control function, which is calculated as follows: PSYS = Ax1 + Bx2 + Cx4 + Dx8 + Ex16 + Fx32 When A=0, Disenable ready (rdy) function; A=1, Enable ready (rdy) function. B=0, Ramp mode; B=1, Soak mode. C=0, Time unit in Minute, the range is 0.1~3200; C=1, Time unit in Hour, the range is 0.1~3200. D=0, Disable PV start up function; D=1, Enable PV start up function. E=0, When work as program generator, upper windows display PV; E=1, When work as program generator, upper windows display the current step. F = 0, the standard operating mode; F = 1, the program running RUN operation will enter the pause state.
PrGd	Program grouping definition (applicable only to NT8419P)	When Prgd=0, no grouping. When the Prgd=4 is divided into 4 curves, each group has 20 segments program, SP1-20 segment procedures for the 1 curve group, SP21-40 segment procedures for the 2 curve group, SP41-60 segment procedures for the 3 curve group, SP61-80 segment procedures for the 4 curve group. When the Prgd=8 is divided into 8 curves, each group has 10 segments program. SP1-10 segment procedures for the 1 curve group.



- Colored		SP11-20 segment procedures for the 2 curve group, SP21-30 segment procedures for the 3 curve group, SP31-40 segment procedures for the 4 curve group, SP41-50 segment procedures for the 5 curve group, SP51-60 segment procedures for the 6 curve group, SP61-70 segment procedures for the 7 curve group, SP71-80 segment procedures for the 8 curve group.				
PrSn	No. of Program step (applicable only to NT8419P)	When Prgd=0. PrSn to define the number of program in use. PrSn= 0: disable the program running mode, then FT819P will same as NT8419, meanwhile, can set the parameter "rAte" to limit the ramp time. Pno=1~80: NT8419P working as normal programmable controller. When Prgd=4 or 8, the PrSn is fixed to 80.				
LoC2	Parameter Lock	Parameter was protected by LoC2 (Parameter LOCK) to prevent setting error. The function was shown as below: √: allow to modify data or execute X: not allow to modify data or execute Run, Stop, Hold. and Program Time & Temp. function just for NT8419P only				
		LOC	Field parameters	sv		Shortcut keys for run, stopp, or hold
		0	-V	d	×	V
		1	v.	d	ų.	×
		2	V	X	×	V
		3	1	X	×	×
		4	×	A.	4	4
		5	×	N.	N.	×
		6	X	Х	×	X
MV	No.3 display MV	OFF: off MV function, MV only as a temperature unit display. A-M: automatic / manual control will be displayed by MV. SP-t: MV will display the current program remaining time / block number.				
FP1- FP8	Field parameter definition	You can select 8 parameters in the function parameters or control parameters as field parameters. If there are no or less than 8 field parameters, the FP* value can be set to nonE.				



9.3 Control parameter
In the field parameters, set Loc=801, Then press the ← key to enter the control parameters.

Code	Name	Description	Setting Range
CntL	Control mode	onoF: on-off control. For situation not requiring high precision FPId: advanced artificial intelligence FUZZY+PID control. PVtr: Transmit PV. The instrument works as a temperature re-transmitter. SVtr: Transmit SV. The instrument works program generator.	
HYS	Control Hysteresis	HYS is used for on-off control to avoid frequent on-off action of relay. For a reverse acting (heating) system, when PV > SV, output turns off; when PV < SV-HYS, output turns on. For a direct acting (cooling) system, when PV < SV, output turns off; when PV > SV+HYS, output turns on.	
orEV	Acting method	onr: Reverse acting. Increase in measured variable causes a decrease in the output, such as heating control. ond: Direct acting. Increase in measured variable causes an increase in the output, such as refrigerating control.	
Srun	Running Status	run: Control or program was running, "RUN" led light on StoP: Control or program was stopped. Lower display keep flashing "StoP" and "RUN" led light off. HoLd: This only functioned on FT3419P, this will keeping temperature when this HoLd was appeared. If the parameter Pno=0(Non timing limitation mode), controller will functioning same at FT3419, if Pno>0 (in program mode), and Srun was set as "HoLd", means the timer stops and the temperature remains; user can resume the timer by pressing the "Hold" from panel.	
A-M	Auto / manual Control selection	OFF: no automatic / manual switching control function, the instrument for the automatic control of the state. Man: manually control the state, manually adjust the output of oUT, and can switch to automatic control Auto: automatic control state, oUT output determined by the CntL decision after the decision, and can switch to manual control. FMAn: fixed manual control state, this mode prohibits the direct operation from the front panel keys Change to automatic state.	
At	Auto tuning	oFF: Auto tuning function was off. on: Active auto turning function to calculate the values FoFF: Auto tuning function was off, cannot activate again by pressing key from panel.	
P	Proportional band (No.1 PID parameter)	Proportional band in FPID control. Instead of percentage of the measurement range, the unit is the same as PV. Generally, optimal P, I, D and CP can obtained by auto tuning. They can also be manually inputted if you already know the correct values.	



1	Time of ntegral (No.1 PID parameter)	No integral effect when I=0
đ	Time of Derivative (No.1 PID parameter)	No derivative effect when d=0
CP	Control period (No.1 PID parameter)	Small value can improve control accuracy. For SSR, thyristor or linear current output, it is generally 0.5 to 3 seconds. For Relay output or in a heating/refrigerating dual output control system, generally 15 to 40 seconds, because small value will cause the frequent on-off action of mechanical switch or frequent heating/refrigerating switch, and shorten its service life. CP is recommended to be 1/5 – 1/10 of derivative time. (It should be integer times of 0.5 second) When the parameter OUt or Aut = rELy, CP will be limited to more than 3 seconds. Auto tuning will automatically set CP to suitable value considering both control precision and mechanical switch longevity. When the parameter CntL = onoF, CP will used as timer to make delay time to avoid the power restart in short period. It suit for compressor protection. If the output for the control valve, recommended CP=3~15 seconds, taking into account the response speed and avoid the valveFrequent action.
P2	Proportional band 2 (No.2 PID parameter)	When the instrument uses the heating / cooling dual output adjustment, it is used as a cold output proportional band. When NT8419P can be used as the second group of PID proportional band.
12	Time of the instrument uses the heating / cooling dual output adjustment, it is used as a cold output time of ntegral. When NT8419P can be used as the second group of PID time of ntegral.	
d2	Time of Derivative 2 (No.2 PID parameter) When the instrument uses the heating / cooling dual output adjustment, it is used as a cold output time of Derivative. When NT8419P can be used as the second group of PID time of Derivative.	
Cp2	Control period 2 (No.2 PID parameter)	When the instrument uses the heating / cooling dual output adjustment, it is used as a cold output control period. When NT8419P can be used as the second group of PtD control period.
P3	Proportional band 3 (No.3 PID parameter)	applicable only to NT8419P



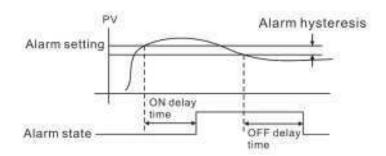
13	Time of ntegral 3 (No.3 PID parameter)	applicable only to NT8419P
d3	Time of Derivative 3 (No.3 PID parameter)	applicable only to NT8419P
CP3	Control period 3 (No.3 PID parameter)	applicable only to NT8419P
oUt	Main output type	SSr: Output SSr drive voltage or thyristor zero crossing trigger signal. rELy: Relay contact output 0-20: 0~20mA linear current output. 4-20: 0~20mA linear current output. PHA: Single-phase phase-shift output. PHA is only for 50Hz power supply, and don't support bidirectional control system. NFEd: no feedback signal position proportional output, direct control valve motor positive / reverse, Valve travel time defined by Vrtt parameters. FEd: position feedback signal output, the valve travel time should be more than 10 seconds, Feedback signal input from the 0~5V/1~5V input. Note: The External input SV set value function can no longer be used in this output mode. FEAt: auto-tuning valve position, the instrument will first close the valve will be feedback signal recorded in the rSPL parameters, and then fully open the valve memory valve feedback signal in the rSPH parameters, after completion Automatically returns the FEd control mode.
Aut	Auxiliary output SSr drive voltage or thyristor zero crossing trigger signal. (as a reLy: Relay contact output output. refrigeration output) 4-20: 0~20mA linear current output.	
otL	Output low limit	0~100%; OtL is the minimum output of OUT in single directional control system1~-110%: The instrument works for a bidirectional system, and has heating/refrigerating dual output. When orEV=onr or rbA, OUT (main output) works for heating, and AUX (Auxiliary output) works for refrigerating. When orEV=ond or dbA, OUT works for refrigerating, and AUX works for heating. In a bidirectional system, OtL for define the limitation of maximum cooling output. So, when the OtL=-100%, means no limitation on cooling output. If set OtL=-110%, it can made current output excess 10% on maximum output. When the output type is SSR output or relay output, maximum of cooling output should not set more than 100%



otH	Output upper limit	When the measured value PV is less than otEr, otH limits the maximum output value of the main output(oUt), and when PV is greater than otEr, the system correction output upper limit is 100%; In the non-feedback position proportional output (when oUt = nFEd), if otH is less than 100, the Controller Auto Tuning the valve position at power-on. If otH = 100, the Controller Auto Tuning the valve position when the output is 0% and 100%, Can shorten the power on time. otH setting must be greater than otL.	
Vrtt	Valve travel time	Defines the travel time of the valve rotation when the meter is the position proportional control output, If there is a valve feedback signal, the instrument will automatically select the valve control signal according to Vrtt's setting Of the hysteresis, the shorter the travel time, the greater the hysteresis, the valve positioning accuracy will be reduced. When using a valveless feedback signal mode or valve feedback signal to generate an Outrange malfunction, The instrument will be based on Strt travel time comparison output to determine the valve motor action time.	
otEr	Work range of OPH	When PV <oter, is="" limit="" of="" oph;="" outp="" pv="" the="" upper="" when="">otEr, the upper limit of OUTP is 100%. For example, to avoid that the temperature raises too quickly, under 150°C, a heater can work only under 30% of power, then we can set otEr=150.0 (°C), OtH=30 (%)</oter,>	
rAte	limit (applicable only to NT8419P)	Once rAte was set, if PV <sv by="" each="" effect="" first="" flashing.="" for="" had="" keep="" lamp="" limitation,="" limited="" mode,="" of="" on="" only.="" program="" ramp="" rate="" reach="" run="" slope="" soak="" start,="" step="" step.<="" sv,="" td="" temperature="" the="" this="" under="" until="" value="" when="" will=""><td></td></sv>	

10. Additional Remarks of Special Functions

10.1 Alarm delay
Alarm delay is a time delay setting for the alarm output, as shown in the diagram.
When powered-on alarm delay is also effective.





10.2 LBA Control loop break off / shorted Alarm

When the control output becomes otH or otL, At each interval LBA set time as a unit to monitor of changes in the PV value, According to the amount of change to determine whether there is any abnormal control circuit. The time unit of LBA is second and by AL1 alarm. The following conditions for the alarm status:

① When orEV is onr Reverse action: When the control output of the instrument continues to be otH, the increase of the measured value (PV) within the setting time of LBA is less than the change of LBA judgment (2°C).

When orEV is ond is positive: When the instrument control output continues to otH, the measured value (PV) decreases less than LBA judgment range (2°C) within the setting time of LBA.

② orEV is onr Inverse operation: When the instrument control output continues for otL, the measured value (PV) decreases less than the LBA judgment range (2°C) within the setting time of LBA.

When or EV is ond is in positive operation: When the instrument control output continues to otL, the measured value (PV) rises less than LBA judgment range (2°C) within the setting time of LBA.

10.3 First alarm exemptions

Sometimes the fault alarm may occur at the beginning of power on. In a heating system, at the beginning of power on, its temperature is much lower than the set point. If low limit and deviation low limit are set and the alarm conditions are satisfied, the instrument should alarm, but there is no problem in the system. Contrarily, in an refrigerating system, the unnecessary high limit or deviation high limit alarm may occur at the beginning of power on. Therefore, NT84** instruments offer the function of alarm blocking at the beginning of power on. When ALE is set to 1~7, the corresponding low or high alarms are blocked until the alarm condition first clears. If the alarm condition is satisfied again, the alarm will work.

10.4 Single-phase phase-shift trigger output

When OUt is set to PHA, installing a K5 or K6 module in OUT slot can single-phase phase-shift trigger a TRIAC or 2 inverse parallel SCRs. It can continuously adjust heating power by control the conduction angle of thyristor. With non-linear power adjustment according to the characters of sine wave, it can get ideal control. The trigger adopts self-synchronizing technology, so it can also work even when the power supplies of the instrument and the heater are different. Phase-shift trigger has high interference to the electric power, so user should pay attention to the anti-interference ability of other machines in the system. Now the K5 or K6 module can be only used in 50Hz power supply.

10.5 Setpoints switch

If an I2 module is installed in MIO slot. User can connect external on off switch to realize some control function. Set Evt = rust, can switching program run and stop. For NT8419, or NT8419P when its PrSn=0, set Evt = SP1.2, can switching between setpoint 1 and setpoint 2.

10.6 Communication function

S or S2 module can be installed at COMM slot to communicate with a computer. The instrument can be controlled by computer. NT84** instruments can be connected to the computer through RS485 or RS232 or USB communication port. Every communication port of a computer can connect up to 60 NT84** instruments, or 80 NT84** instruments if a repeater is installed. A computer with 2 communication ports can connect up to 160 instruments. Please note that every instrument connecting to the same communication line should be set to a unique communication address. If the number of instrument are enough, 2 or more computers can be used and a local network can be set up.



Nt84 ** support international standard industrial field bus protocol Modbus communication protocol and FTbus TMCON company its standard communication protocol, And with no authentication or odd and even verification options, Making the instrument has a wide range of compatibility.

10.7 Temperature re-transmitter / Program generator / Manual current output

Besides FUZZY+PID, and on-off control, if the output is defined as current output, the instrument can also retransmit PV (process value) or SV (setpoint) into linear current and output from OUTport. The precision of current output is 0.2%FS. Base on that ability, NT8419 can become temperature re-transmitter and NT8419P can become program generator. The corresponding parameters are set as below:

When CntL=Pvtr, PV is retransmitted to linear current, the instrument works as temperature re-transmitter.

When CntL=Svtr, SV is transmitted and outputted, and the instrument works as manual current output controller(NT8419) or prodram generator(NT8419).

OUt is used to choose output type, generally 4~20mA or 0~20mA output.

Parameter Int, InL, InH, and Sc are used for selecting input specification, setting low limit or high limit of PV and adjusting input.

For example, in order to retransmit temperature read from K thermocouple, range $0\sim400^{\circ}\text{C}$, to current $4\sim20\text{mA}$, the parameters are set as below: Int=0, InL=0.0, InH=400.0, OUt=4 ~20 , and X linear current module is installed in OUT slot. When the temperature is less than or equal to 0°C , the output is 4mA. When the temperature equals to 400°C , the output is 20mA.

11. Further description for the operation of NT8419P series instrument

FT3419P program type temperature controller is used in the application where the setpoint should be changed automatically with the time. It provides 50 segments program control which can be set in any slope and the function of jump, run, hold and stop can also be set in the program. Measurement startup function, preparation function and power-cut/power-resume event handling modes also provided.

11.1 Concepts and functions Program StEP:

The No. of the program Step can be defined from 1 to 50, and the current Step is the program Step being executing.

StEP time:

Total run time of the program step. The unit is minute and the available value range from 1 to 9999.

Running time:

The Time of current Step has run. As the running time reaches the Step time, the program will jump to the next Step automatically.

Jump:

The program can jump to any other steps in the range of 1 to 50 automatically as you programmed in the program Step, and realize cycle control.

Run/Hold:

When program is in the running status, timer works, and set point value changes according to the preset curve. When program is in the holding status, timer stops, and set point remains to make temperature hold also. The holding operation can be programmed into the program step.

Stop:

When the stop operation is activated, the program will stop, running time will be clear, event



output switch will reset and the output control will stop output. If run operation is activated when instrument is in the stop status, the program will start-up and run again from the set step no. The stop function can be programmed into the program Step. The stop operation can also be performed manually at any time. (After stop operation is done, the step no. will be set to 1, but user can modify it again). If the program ran the last step of "PrSn", program will stop automatically.

Power cut/resume event handling:

There are 5 events handling method selectable for power resume after power cut off. Please refer to parameter Pont.

PV startup and PV preparation function (rdy function):

At the beginning of starting a program, resuming a program after power cut or continuing to run a program after it is just modified, the PV (process value) are often quite different from the set point. PV startup function and PV preparation function can make PV and set point consistent, and avoid unexpected result. When PV startup function enabled, the instrument will adjust the running time automatically to make the expecte—d set point is the same as the current PV. For example, the program is set that the temperature will be raised from 25°C to 625°C in 600 minutes. But the current PV is 100°C, then the instrument will automatically to run this program start from 75 minutes, that mean changed the temperature raised from 100°C to 625°C in 525 minutes (600-75) min.

At the above situation (PV=100, SV=25, first step SV), when PV preparation function is enable, the alarm function will be blocked at that time, and PV will be adjusted to approach SV until the deviation alarm condition is released (PV is between SV-LdAL and SV+HdAL). After deviation alarm was off, the controller starts to run the program again. Preparation function (rdy Function) is helpful to keep the integrity of the program, but it will prolong the program time because the start of the program is postponed.

PV startup function is prior to PV preparation function. If both function are enabled, the system apply PV startup first, if PV startup function works, PV preparation function will not be activated.

Curve fitting:

Curve fitting is adopted as a kind of control technology for NT8419P series instrument. As controlled process often has lag time in system response, by the way of curve fitting the instrument will smooth the turning point of the linear heating-up, cooling-down and constant temperature curves automatically. The degree of the smooth is relevant with the system's lag time t (t=d+CP); the longer of the lag time, the curve will more smooth. On the opposite the smooth function will be weaker. Generally the shorter of the process lag time (such as temperature inertia), the better of the program control on effect. By the way of the curve fitting to deal with the program curves, will avoid overshoot. Note: The characteristic of the curve fitting will force the program control to generate fixed negative deviation during the linear heating-up and fixed positive deviation during the linear cooling-down, the deviation is direct proportional to the lag time and the speed of heating-up (cooling-down). This phenomenon is normal.

11.2 Programming and operation (For NT8419P only)

11.2.1 Ramp Mode(PSYS: B=0)

Programming of instrument has uniform format of temperature-time-temperature, which means temperature "A"(SP 1), passed Time "A"(t01), then reached Temperature "B"(SP 2). The unit of temperature set is "C and the unit of time set is minute. The following example includes 5 steps, which is linear temperature heating up, constant temperature, linear temperature cooling down, jump cycling, ready, Hold...



StEP1: SP 1= 100, t-1=-0.1; adopts No.1 PID parameters to control;

StEP2: SP 2=100, t-2=30.0 Start linear temperature heating up from 100°C, and the time needed 30 minutes to reach SP 2(400 degree).

StEP3: SP 3=400, t-3=60.0 Temperature raised to 400°C, slope of raising curve is

10°C/minute, The program take 60 minutes to raise temperature to SP3 (400 degree). It means keep the same temperature in 60 minutes.

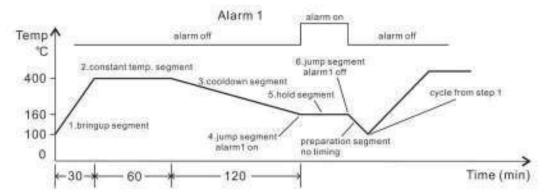
StEP4: SP 4=400, t-4=120.0 This is the step for temperature cooling down, slope of cooling curve is 2°C/minute, and the time needed is 120 minutes to reach SP4 (160 degree).

StEP5: SP 5=160, t-5=0.0 When temperature reached 160°C, the program get in Hold state. If need go to next step, it needed operator to executed the "run" for next step.

StEP6: SP 6=160, t-6=-1.0 Jump to StEP1 to start from beginning.

In this example, it is assumed that the deviation high alarm is set to 5°C. Because the temperature of StEP 5 is 160°C, and the temperature of StEP1 is 100°C, when program jumps from StEP 5 to StEP 1, the program will change to preparation state at first(if preparation mode "rdy" was enabled), i.e., Control the temperature until the deviation between setpoint and PV is

less than deviation high alarm value. After temperature is controlled to 105°C, the program will be started from StEP 1, and run the above steps again. The temperature control drawing was shown below.



11.2.2 Soak mode(PSYS: B=1)

Suitable for the process which does not need to establish the temperature slope, can simplify the programming and more effective. Each step also can set parameter "rAte" to define temperature raise slope, if "rAte=0" raising speed will set to maximum. Because cannot know the actual time which spend on temperature raising, user can enable "rdy" function to ensure the correct soak time.

11.2.3 Set the given value and time of the program

Each program includes a given value and time, the given value indicates the temperature value to be controlled, time in besides regard as running time, there are special control functions, when t is positive the value represents the running time, when t is negative value represents a jump + command, The meaning is as follows:

The scope of t:-122.0~3200

t-XX=0.1 ~ 3200 represents the run time value

t-XX=0.0 - -0.1 - -122.0 represents a jump + command



t's command:

0.0,represents that the controller enters the hold running state (HoLd) in this stage, and the program is suspended here and stops the timing.

- -121.0, the program executes the StOP operation and enters a stop state
- -XXX.1, represents that first group of PID parameters are specified
- -XXX.2, represents that second group of PID parameters are specified
- -XXX.3, represents that third group of PID parameters are specified
- -XXX.4, represents the AL1 action
- -XXX.5, represents the release of Al1
- -XXX.6, represents the action of AL1 and Al2
- -XXX.7, represents the release of AL1 and AI2

For example, if t- 1 = -0.1 is set, the first group of PID parameters will be executed and the PIDn parameter will be set to 1 automatically when running to the first-stage program. For another example, setting t- 7 = -11.2 means that when running reaches the program in the 7th stage, it will jump to the 11th stage to execute and specify the second group of PID parameters, and the PIDn parameter will be set to 2 automatically.

For example: Set t- 5 = -1.4, which means that when running to the fifth-stage program, AL1 action and jumps to the first-stage running.

Note: In addition to the implementation of the operation or switch on the power to meet the jump segment can continue to jump to run in the program run to allow up to 2 consecutive jumps, continuous 3 or more jumps the program automatically suspended execution (That is, the instrument automatically inserts a suspend operation for three consecutive jumps), an external running operation is required to release the suspended state. Note that if the jump segment is itself (for example, t-6 = -6), the pause state will not be able to be released because such a segment is meaningless.

Multi-group PID application case:

SP 1 = any value, t 1 = -0.1, the next paragraph, specify the first group of PID parameters (PIDn parameters automatically 1);

SP 2 = 100, t 2 = 30.0 at 100 °C, the linear temperature was raised to SP 3, the temperature rising time was 30 minutes and the temperature rising rate was 10 °C / minute;

SP 3 = 400, t 3 = 60.0, Reach 400 degrees and keep warm for 60 minutes;

SP 4 = 400, t 4 = -0.2, the next paragraph, specify the second group of PID parameters (PIDn parameters automatically 2);

SP 5 = 400, t 5 = 80, heated to 800 °C at 400 °C for 80 minutes and heated at a rate of 5 °C/ min;

SP 6 = 800, t 6 = 120.0, Reach 800 degrees and keep warm for 120 minutes;

SP7 = 800, t7 = -0.3, continue to the next paragraph, specify the third group of PID parameters (PIDn parameters automatically 3);

Sp8 = 800, t8 = 60.0, 800 °C to 1220 °C, the heating time is 60 minutes, the heating rate is 7 °C / min:

SP 9 = 1220, t 9 = 60, Reach 1200 degrees and keep warm for 60 minutes;

SP 10 = 1220, t 10 = -1.4, AL1 alarm action (the alarm delay function can be used to close the alarm after the alarm action), and jump to the first paragraph of the implement, from scratch loop to run.



11.2.4 Auto Tuning procedure setting method:

For example: Auto Tuning for first group of PID parameters, Auto Tuning target value 400°C: SP 1 = any value, t 1 = -0.1, the next paragraph, specify the first group PID;

SP 2 = 400, t 2 = 0.0, self-tuning target value 400°C, After the end of the auto tuning, enters the keep warm.

Again, For example: Auto Tuning for second group of PID parameters, Auto Tuning target value 800°C:

SP 1 = any value, t 1 = -0.1, the next paragraph, specify the second group PID;

SP 2 = 400, t 2 = 0.0, self-tuning target value 400°C, After the end of the auto tuning, enters the keep warm.

Note: After setting the auto tuning program, when the temperature of the equipment is close to room temperature, setting the At=ON will start auto tuning.

11.2.5 In addition to setting PrGd to group multiple curves outside, you can also use the program layout method flexible grouping multiple curves:

NT8419P has the advanced function of flexible program arrangement. Normally, when the program stops, the StEP will be automatically set to 1. Thus if StEP is not change to other value, a program will start from step 1. If multiple curves are defined, the control can jump to different curve by setting step 1 as jump segment.

For example: There are three curves with the length of 3 steps represent three groups of process parameter, they

are separately arranged on StEP2-StEP4, StEP5-StEP7, StEP8-StEP10. Settings are as follows:

- t- 1=-2.0 Execute the program of curve 1 (StEP2-StEP4)
- t- 1=-5.0 Execute the program of curve 2 (StEP5-StEP7)
- t- 1=-8.0 Execute the program of curve 3 (StEP8-StEP10)

Note: Can choose the curves by setting the value of StEP*t-1" set to -2.0, -5.0 or -8.0 before the program startup.

ne program startup.	



12. APPENDIX-III INSTRUMENT COMMUNICATION PROTOCOL

Instrument Communication Protocol

NT Series Smart Thermostat / Regulator Communication Interface Protocol Supports FTBUS and MODEBUS (FBUS / MBUS is selected by setting the parameter COMM). MODBUS communication comes with 16-bit sum correction code, reliable communication, and supports 1200,2400,4800,9600,19200 and other baud rates too. At 19200 baud rate, The upper computer to access an instrument the average time of only 20mS. The instrument allows up to 101 instruments to be connected to a RS485 communication interface (In order to ensure reliable communication, the number of meters more than 60 units, the need to add an RS485 repeater).

1:Interface Specifications

NT series of instruments apply asynchronous serial communication interface, and are RS485 compatible. The data structure is 1 start bit + 8 data bit (nonE / odd / even), parity bit (by setting the parameter PArI to select the check digit None, Odd, Even), 1 or 2 stops Bit. The communication baud rate are selectable from 1200 to 19200 bit/second, (baud rate of 19200 when the need to configure high-speed optocoupler communication module).

Instrument using multi-machine communication protocol, using RS485 communication interface, you can 1 $^{\sim}$ 101 The instrument of the station is connected to a communication interface at the same time.

The communication distance of RS485 can be longer than 1KM, multiple instruments only need to communicate with the computer through two lines. For the use of ordinary personal computer use the USB serial converted output from the panel output.

According to RS485 standard, a communication line can only connect maximum 32 of instruments or computers. Need to connect more instruments, the need for repeaters, can also choose to use 1/2 or 1/4



load chip communication interface to increase the number of instruments can be connected. The current production of the instrument communication interface using low load chip and a certain anti-lightning and anti-static function, no repeaters can connect about 60 instruments.

The RS485 communication interfaces of instruments apply electric isolation technology to separate the communication interface and the other part of the instrument circuit. When an instrument can work, it won't affect other instruments. If there is any problem with communication or with the computer, the instrument can still work well, and can be operated by its front panel. 16-bit check code not only to ensure data reliability, and to ensure that the communication is abnormal, such as the network has the same address of the instrument or other company products, the instrument and the computer can still work, will not produce data chaos, So the use of instrumentation composed of distributed control system with high reliability.

2: Communication Instruction:

Instructions and data of FT instruments are in hexadecimal structure. After optimization, the instructions are condensed to two: one is reading, another is writing. This is very simple but can full control the instrument.

The reading/writing instructions are as below:

READ: address code + 52H (82) + code of the parameter to be read + 0 + 0 + CRC check code.

WRITE: address code + 43H(67) + code of the parameter to be written + LSB of the value to be written + MSB of the value to be written + CRC check code.

For example, Read PV value

Code is: <u>01 04 00 00 00 01 31 CA</u>



1 2 3 4 5

- 1. Controller communication address Adrs.
- 2. Read instruction.
- 3. Parameter communication address, PV address is 00H.
- 4. The number of parameters read (i.e. word length), 00 01 is to read a parameter, if PV \sim ahys is read, then it is 6 parameters, then it is 00 06.
- 5. Check code, 01 04 00 00 01 the verification code is 31 CA.

Note: up to 10 parameters can be read at a time. If more parameters are read at a time,

different refresh times can be set

For example, Write SV value

Code is: <u>01 06 00 00 00 96 09 A4</u> 1 2 3 4 5

- 1. Controller communication address Adrs.
- 2. write instruction.
- 3. Parameter communication address, SV address is 00H.
- 4. To write a value, 00 96 is to write 150.
- 5. Check code. 01 06 00 00 00 96 the verification code is 09 A4.

Note: only one parameter can be written at a time

For example, Read SV value

Code is: <u>01 03 00 00 00 01 84 0a</u>

1 2 3 4 5

- 1. Controller communication address Adrs.
- 2. Read instruction.
- 3. Parameter communication address, SV address is 00H.
- 4. The number of parameters read (i.e. word length), 00 01 is to read a parameter.
- 5. Check code, 01 03 00 00 01 the verification code is 84 0a.

Note: up to 10 parameters can be read at a time. If more parameters are read at a time, different refresh times can be set

Address code:



Every instrument in the same communication line should have a unique address which is from 0 to 100 one communication line can connect to up to 101 instruments. The instrument address is defined by parameter "AdrS". The internal use of two repeat $128 \sim 228$ (hexadecimal $80H \sim E4H$) between the value to represent the address code, Since the number of more than 128 is not commonly used (such as ASC mode protocol is usually only between 0 to 127), Thus reducing the ikelihood of a conflict between data and address duplication. The instrument communication protocol specifies that the address code is two identical bytes, the value is (instrument address + 80H). For example: instrument parameters AdrS = 10 (hexadecimal number 0AH, 0AH + 80H = 8AH), then the instrument's address is expressed as:

8A 8AH

Parameter code:

The parameters of the instrument are represented by a parameter code of an 8-bit binary number (one byte, written as hexadecimal number). It indicates the name of the parameter to be read / written in the instruction.

Check the code: check code using 16-bit sum calibration method, which read the instruction check code calculation method is:

Read the code of the parameter \times 256 + 82 + AdrS

Write instructions the check code calculation method for the following formula to do 16-bit binary addition calculated the remainder (overflow part is not processed):

To write the parameter code \times 256 +67 + to write the parameter value + AdrS

AdrS is the instrument address parameter value, the range is 0-100 (note not to add 80H). CRC for the above number to do the binary 16-bit integer addition after the remainder (overflow part of the deal), the remainder of 2 bytes, the low byte in the previous, high byte in the post. The parameter values to be written are represented by 16-bit binary integers.

Return data: whether it is read or write, the instrument returns the following 10 bytes of data:

Measured value PV + setpoint SV + output value MV and alarm status + read / write parameter value + check code



Which PV, SV and read the parameters of the value of each occupied two bytes, representing a 16-bit binary signed complement integer, low byte in the previous high byte after the integer can not represent the decimal point, requiring the user in the host computer Processing; MV accounted for a byte, according to 8-bit signed binary number format, the value range -110 \sim +101, the alarm state accounted for a byte, check code accounted for 2 bytes, a total of 10 bytes.

Return Check Code: PV + SV + (Alarm Status * 256 + MV) + Parameter Value + AdrS The remainder after addition by integer addition. When calculating the check code, each of the two 8-bit bytes to form a 16-bit binary integer for the addition, the number of overflows, the remainder as the check code.

Alarm status: the use of binary code that the alarm signal, as follows:

Bit 0 is 0, the upper limit alarm (HIAL) is not established, and the upper limit alarm is established.

Bit 1 is 0, the lower limit alarm (LoAL) does not hold, and the lower limit alarm is established.

Bit 2 is 0 Positive offset alarm (HdAL) does not hold, 1 is positive deviation alarm set up.

Bit 3 is 0, the negative deviation alarm (LdAL) does not hold, and a negative deviation alarm is established.

Bit 4 is 0 to enter the overrange alarm (orAL) does not hold, for the 1 input overrange alarm set up. Bit 5 is AL1 and 0 is active

Bit 6 is AL2 state, 0 is action

Bit 7 is 0 MIO representative no signal input, and 1 is representative MIO has signal input.

"Table 1": Instrument readable(03H,52H) / written(06H,43H) parameter code: (FT819 / 819P /3419 / 3419P/815/3415)

Parameter Code	Parameter	Description	
00H(40001)	SV (setpoint)	Same unit as PV	



38110011310	at management	
01H(40002)	HIAL (High limit alarm)	Same unit as PV
02H(40003)	LoAL (Low limit alarm)	Same unit as PV
03H(40004)	HdAL (High deviation alarm)	Same unit as PV
04H(40005)	LdAL (Low deviation alarm)	Same unit as PV
05H(40006)	AHYS (Alarm hysteresis)	Same unit as PV
06H(40007)	CntL (Control mode)	0, ONOFF; 1, APID; 2 , nPID; 3, PoP; 4, SoP
07H(40008)	P (Proportional band)	Same unit as PV
08H(40009)	I (Time of intergral)	Second
09H(40010)	d (Time of derivative)	0.1 second
OAH(40011)	CP (Control Period)	0.1 second
OBH(40012)	Int (Input Spec.)	Refer to manual
OCH(40013)	dP (Decimal point)	0 -> 0, 1 -> 0.0, 2 -> 0.00, 3 -> 0.000. If the return value is larger than +128, it implies that all PV and parameter using the same unit (including temperature and linearsignal) have to be divided by 10 and round off to display. E.g.when dPt=128+1=129 , the 16-bit return PV and related parameters is 1000, the actual display should be 10.0. If dPt=1, the actual display should be 100.0; This parameter is writable but it is no need to add 128.



301IQL1 716C	at roundgement	The range is 0~3.
ODH(40014)	INL (Signal scale low limit)	Same unit as PV
OEH(40015)	INH (Signal scale high limit)	Same unit as PV
OFH(40016)	ALtd (Alarm allocation)	Refer to manual
10H(40017)	Sc (Input shift adjustment)	Same unit as PV
11H(40018)	Out(Main output type)	0, SSR; 1, rELy; 2, 0- 20; 3, 4-204,PHA
12H(40019)	OtL (Output low limit)	%
13H(40020)	Oth (Output high limit)	%
14H(40021)	SSCo (Advance function)	Refer to manual
15H(40022)	Instrument mode identity	
16H(40023)	AdrS	
	(Communication Address)	
17H(40024)	INF(PV input filter)	
18H(40025)**	A-M (Auto/manual selection)	0, MAN; 1, Auto; 2, FMAn; 3, OFF
19H(40026)	Loc (Parameter Lock)	
1AH(40027)**	MV (Manual output valve)	
1BH(40028)	Srun (Running Status)	0, run; 1, StoP; 2, HoLd
1CH(40029)	HYS (Control Hysteresis)	Same unit as PV
1DH(40030)	At (Auto-tuning)	0, OFF; 1, on; 2; FoFF
1EH(40031)	SPL (Low limit of SV)	Same unit as PV
1FH(40032)	SPH (High limit of SV)	Same unit as PV
20H(40033)	du (Power frequency and	0, OC;1,OF;
	temperature scale)	
21H(40034)	temperature scale) OtEr OPH (Work range of OPH)	Same unit as PV



23H(40036)**	MV(Window display selection)	0, OFF; 1, A-M; 2, SP-T
*		
24H(40037)	Aut (Auxiliary output type)	0, SSR; 1, rELy; 2, 0- 20; 3, 4-20
25H(40038)	P2 (Second proportional band)	Same unit as PV
26H(40039)	I2 (Second time of integral)	Second
27H(40040)	d2 (Second time of derivative)	0.1 second
28H(40041)	CP2 (Second control period)	0.1 second
29H(40042)	EVt (Event input type)	0, OFF; 1, rUSt; 2, SP1.2; 3, 2PId
2AH(40043)**	rAtE (Ramp Slope limit)	Unit of PV/minute (required process of unit)
2BH(40044)*	PrSn (No. of program step)	Integer
2CH(40045)*	Pont(Program run mode after power restart)	0, Cont; 1, StoP; 2, run1; 3, dASt; 4, HoLd
2DH(40046)*	PSYS (Program running mode)	Refer to manual
2EH(40047)*	STEP (Program step no)	Integer
2FH(40048)*	Time of program already run	0.1 minute or 0.1 hour, depending on PAF parameter
30H(40049)*	Event output status	0, No event output; 1, Event 1 (AL1) activated; 2, AL2 activated; 3, AL1 and AL2 activated
31H(40050)**	OPrt (Time of soft start)	
32H(40051)**	Vrtt (Valve rotating time)	Define valve rotating time required
33H(40052)**	rSPL (Low limit of external setpoint)	When external setpoint is used as valve feedback



3000,000,7105	at regnagement		
		signal, set	
		the valve position to 1.	
34H(40053)**	rSPH (High limit of	When external setpoint is	
	external setpoint)	used as valve feedback	
		signal, set	
		the valve position to 2.	
35H(40054)	Adt (Alarm delay definition)	Refer to manual	
36H(40055)	ALL(Definition of alarm self	Refer to manual	
	lock)		
37H(40056)	AdoN(Alarm ON delay)		
38H(40057)	AdoF(Alarm OFF delay)		
39H(40058)	LbA(Control loop break off /		
	shorted Alarm)		
3AH(40059)	CoMM(Communication	0,FBUS; 1,MBUS	
	protocol)		
3BH(40060)	P3(Proportional band 3)	Same unit as PV	
	(No.3 PID parameter)		
3CH(40061)	I3(Time of ntegral 3)	second	
	(No.3 PID parameter)		
3DH(40062)	d3	0.1second	
3EH(40063)	CP3	0.1second	
3FH(40064)	ALE(Definition of First alarm	Refer to manual	
	exemptions)		
40H~47H(4006	FP1~FP8(Field parameter		
5~ 40072)	definition)		
48H(40073)	PrG(Curve group number)	Refer to manual	
49H(40074)	PrGd(Program grouping	0,1 group; 1,4 group; 2, 8	
		group	
	definition)		
4AH~4FH	Spare		
50H~51H(4008	SP1, t-1	SP1 is first period Setting	
1~ 40082)		value, and t-1 is the first	
		period of	



		time
52H~(40083~)	SP2~	Program segment data, the number is defined by the PrSn parameter

MODBUS Compatible Command

Protocol format: 8 data bits, 1 stop bit, (no / odd / even) parity bit, send and receive data are in hexadecimal format

1. Send data format:

Send	1	2	3	4	5	6	7
bytes							
Meanin	addres	Read /	A1	A2	А3	A4	CRC
g	S	write					16
	Instru	03H,04H,0					Check
	ment	6H					code
	addres						
	S						

Description:

- a> The communication address of the parameter is indicated by a byte, corresponding to A2 position, A1 defaults to 00H;
- b> 03,04 instructions are read command, 06 for the write command, which 04 corresponding to read the data can not be written, 03 and 06 command corresponding to the address, a read, a write;
- c> A1, A2 and A3, A4 constitute two double-byte data, all the data are high in the former, low in the post; CRC check code is a double byte data, low in the front, high in the post;
- d> 03,04 instruction to read data, A1, A2 for the beginning to read the parameter address, A3, A4 is the number of continuous read data;

e>In the instruction, A1 and A2 need to write the parameter



address of the data. A3 and A4 indicate the data to be written.

2. Return the data format:

a>06 instruction to write data, send and return the same data.

b>The 03,04 instruction returns the data format

Return	1	2	3	4	5				
byte									
Meaning	address	03H	Returns	High	Low	High	Low	Low	High
		/04H	the	byte	byte	byte	byte	byte	byte
			number	Firs	t data	Nth	data	CR	C16
			of valid						
			bytes						
			of data						

Description:

The number of valid bytes for the return data is: $N \times 2$

3. 03,06 command parameter address see "Table 1"

4. 04 Instruction parameter address table

address	00H(3000	01H(300	02H(30003)	03H(300	04H(30	05H(3
	1)	02)		04)	005)	0006)
Meanin	PV	Alarm	MV output	Set value	Int	dP
g	measurem	status	value	SV		
	ents					

Example: Meter address AdrS is set to 1, read PV value Instruction

code: 01 04 00 00 00 01 31 CA When the PV value is 100.0

Return code: 01 04 02 03 E8 B9 8A "



Table 2": FT819P / FT3419P program readable / written parameter code:

		,	p 6
SP1	50H	t-1	51H
SP2	52H	t-2	53H
SP3	54H	t-3	55H
SP4	56H	t-4	57H
SP5	58H	t-5	59H
SP6	5A	t-6	5B
SP7	5C	t-7	5D
SP8	5E	t-8	5F
SP9	60H	t-9	61H
SP10	62H	t-10	63H
SP11	64H	t-11	65H
SP12	66H	t-12	67H
SP13	68H	t-13	69H
SP14	6A	t-14	6B
SP15	6C	t-15	6D
SP16	6E	t-16	6F
SP17	70H	t-17	71H
SP18	72H	t-18	73H
SP19	74H	t-19	75H
SP20	76H	t-20	77H
SP21	78H	t-21	79H
SP22	7A	t-22	7B
SP23	7C	t-23	7D
SP24	7E	t-24	7F
SP25	80H	t-25	81H

•	•		
SP26	82H	t-26	83H
SP27	84H	t-27	85H
SP28	86H	t-28	87H
SP29	88H	t-29	89H
SP30	8A	t-30	8B
SP31	8C	t-31	8D
SP32	8E	t-32	8F
SP33	90H	t-33	91H
SP34	92H	t-34	93H
SP35	94H	t-35	95H
SP36	96H	t-36	97H
SP37	98H	t-37	99H
SP38	9A	t-38	9B
SP39	9C	t-39	9D
SP40	9E	t-40	9F
SP41	AOH	t-41	A1H
SP42	A2H	t-42	АЗН
SP43	A4H	t-43	A5H
SP44	A6H	t-44	A7H
SP45	A8H	t-45	A9H
SP46	AA	t-46	AB
SP47	AC	t-47	AD
SP48	AE	t-48	AF
SP49	вон	t-49	B1H
SP50	B2H	t-50	взн



Industrial Heat Sources

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