

DTC1 Series

Intelligent Temperature/Humidity PID Controller with 60 Step Program Control

User Manual V 1.0

Thank you for purchasing Fastron DTC series PID Temperature/Humidity Controller. This manual explains how to install and operate your new PID Controller. Before operation, please read this manual first to fully understand the operation of this product. This controller should be installed by a qualified Electrical Engineer, Technician or Electrician. For specific technical support please contact your agent or representative.



Safety Warning

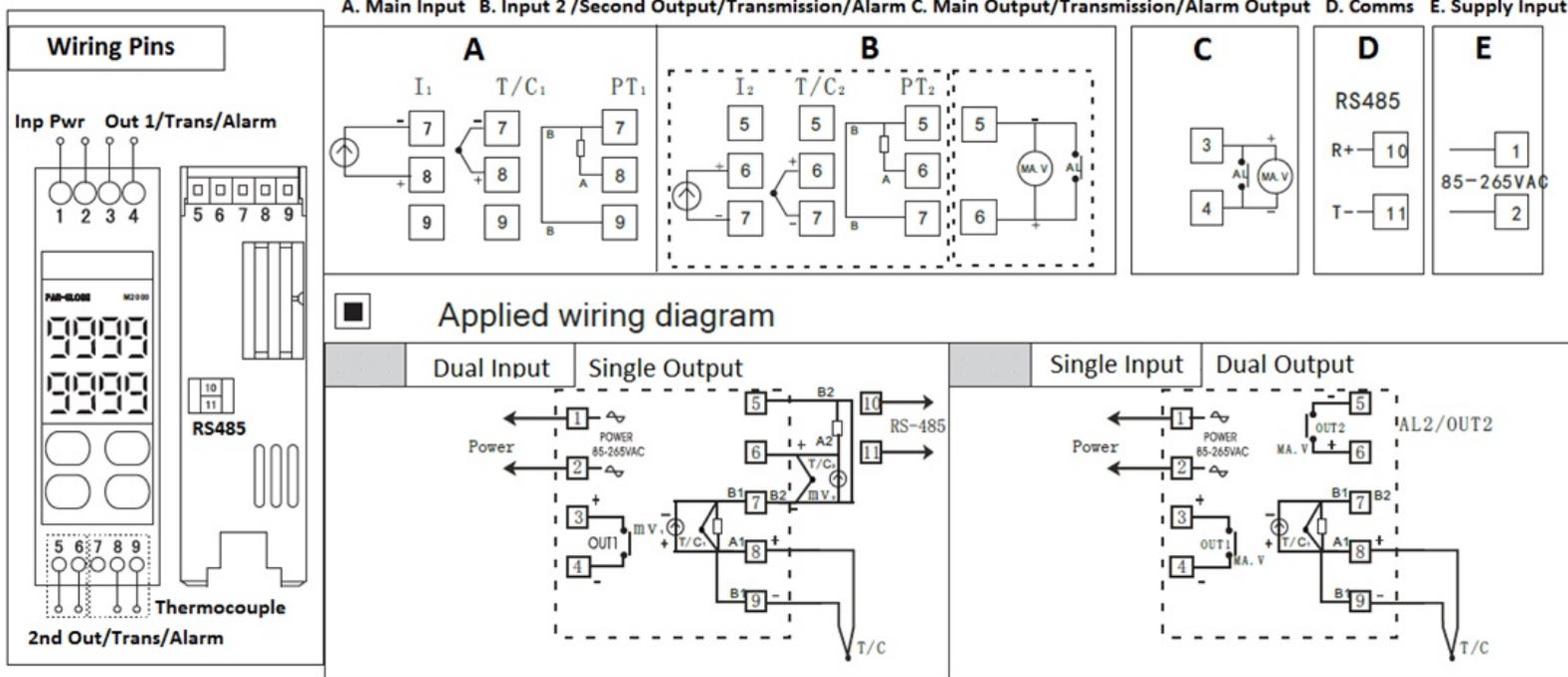
Improved Features

- 1a) Avoid touching the AC power terminals after the controller is powered on.
- 1b) Always ensure the supply power is off first before connecting any wires.
- 1c) Do not operate this instrument in places full of explosive and combustible gases.
2. Incorrect Connection of the Power Supply can cause permanent damage.
3. The maximum torque of the terminals should not exceed 8KN.
4. Please do not use in the following circumstances:
 - where the temperature changes dramatically
 - Places where humidity is too high (~85%) and water is produced
 - Where vibration or impact is high
 - Where corrosive gases or dust are present
 - splash of water, oil and chemicals
6. All Wiring should be kept away from high-voltage, high-current power

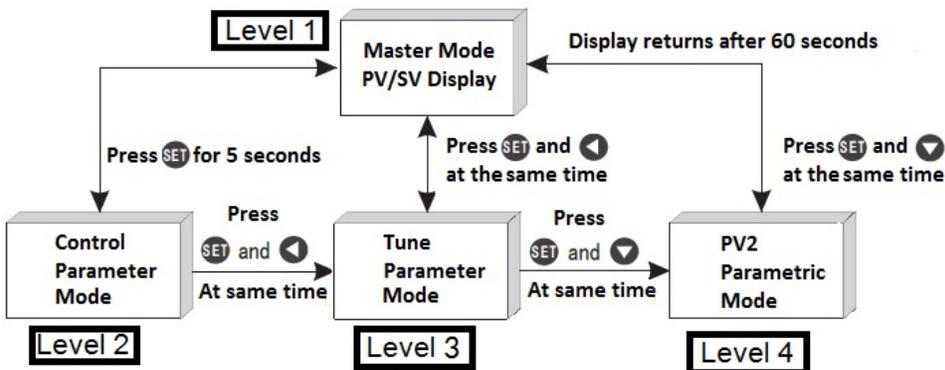
- (1) Slope value offset compensation.
- (2) 2 in (input) 2 out (output) : 1 to 2 isolated transmission, 2 to 1 isolated transmission (Optional)
- (3) Multiple alarm modes
- (4) Transmission of PV, SV and MV: forward, reverse and difference value in 8 ways.
- (5) Output soft start function.
- (6) Dehumidification function.
- (7) Servo Motor Control (Optional)
- (8) Optional 60 Segment, Multi Sequence, Program Control

Information	Instructions	Solution
	The first sensor is disconnected, polarity reversed or out of range. The first set of input signals were higher than Higher Scaling Limit	Please check the input signal/sensor for errors and wiring
	The first set of input signals is lower than Lower Scaling Limit	Please check the input range
	Normal temperature compensation failure	Please check the temperature compensation diode
	Open T/C circuit	Please check T/C or compensating wire

Wiring Configuration



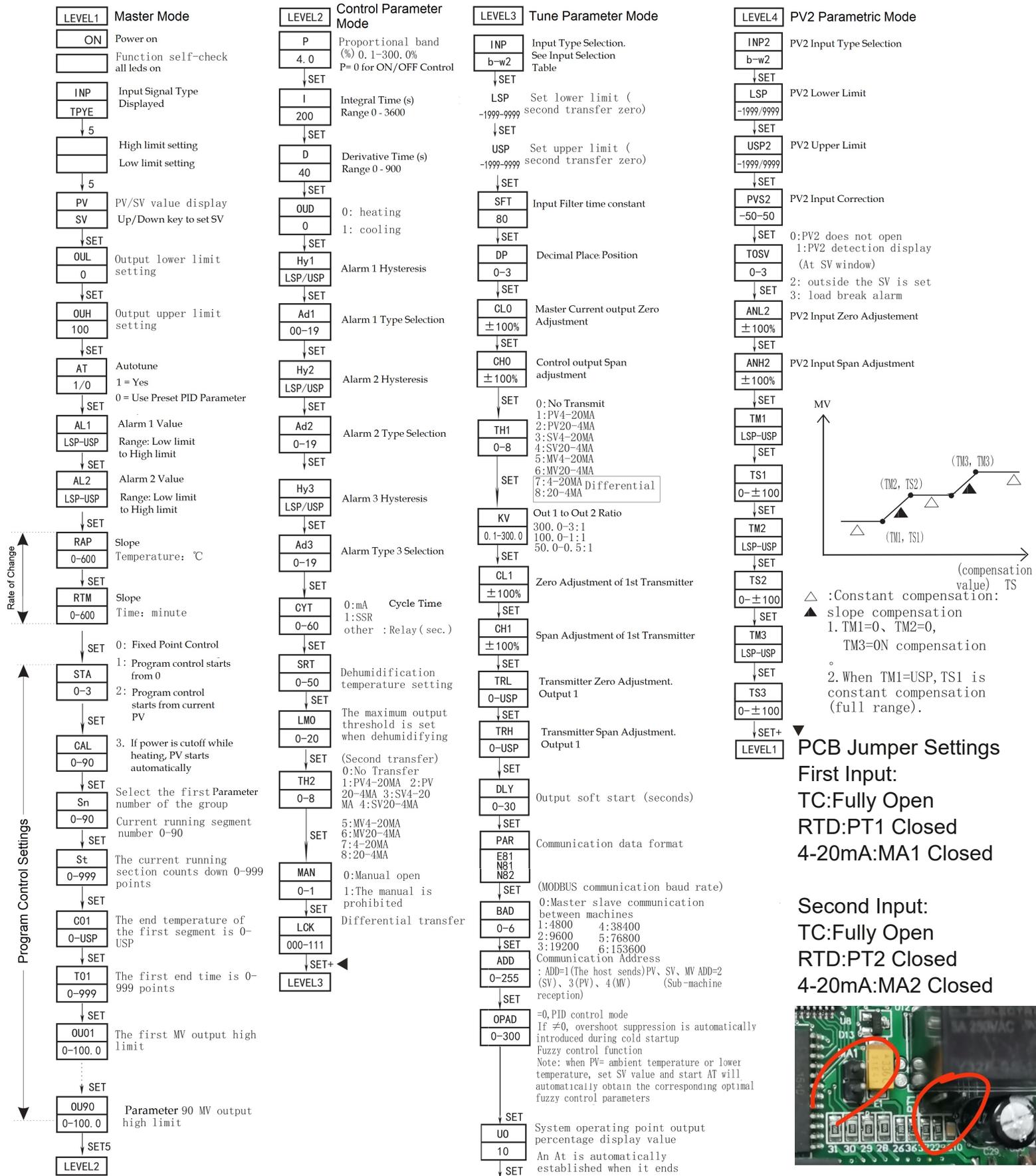
Programming Menu



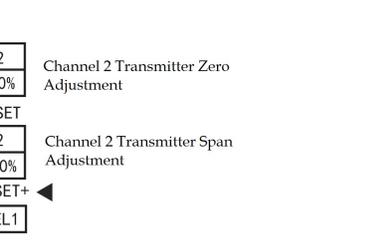
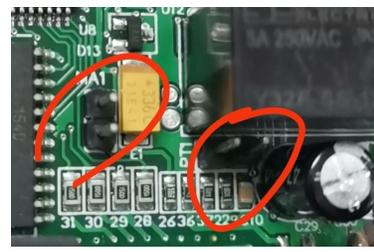
Code	AL1, AL2 Action
0	High Limit Alarm (PV Deviation from SV)
1	Low Limit Alarm (PV Deviation from SV)
2	Process High Alarm (PV Absolute Value)
3	Process Low Alarm (PV Absolute Value)
4	Intraregional Alarm (Inside Deviation value)
5	High/Low Limit Range Alarm
6	Low Limit Alarm with Standby (2nd Crossing)
7	Process Low Alarm with Standby (2nd Crossing)
8	Loop Break Alarm
9	High/Low Limit Range Alarm with Standby (2nd Crossing)
10	Program Control Overrange Alarm
11	Pattern End Output (End of Program)
12	Constant Temperature and Timing Alarm

For application notes and examples please visit <https://fastron.com.au/blogs/pid-temperature-controllers>

DTC1 Operational Flow Chart



Note 1: When the program is running, press the key ▼ once in the MV window
 Online display optional:
 P- output percentage, - current running segment number, t- current
 Running segment countdown
 Press the key ▼ for 5 seconds to display or back to the fixed point display.
 * note:
 SET2 = Default Setting, for AL3 Setting, requires SET2 = 000, otherwise 100 = TH1 setting



1. Sensor Type Setting

- A. Press SET + ◀ key to enter LEVEL3
- B. Once you reach INP Press ◀ and the SV display will blink
- C. Press ▼ or ▲ select the input type (refer to the signal input selection table). Press SET to confirm
- E. At the same time, press SET + ◀ to return to LEVEL1

Step (3): Set alarm value AL1/AL2

- See AL1 and AL2 in alarm mode Table
- A. Press SET key several times to access AL1 selection, and then press ◀ to enable the selection.
 - B. Press ▲ or ▼ to SET the value, and then press the ◀ key to move to the next digit and do Both AL1 and AL2 can choose alarm mode from 0 to 10, which can the same setting .
 - C. After setting, press SET key to confirm. Pattern End output can be selected as Alarm mode 11. There is also a constant temperature and timing alarm mode 19
 - D. Press SET to return to LEVEL1 setting and test the alarm function or pattern end output.

2. AL1/AL2 Alarm mode setting

- A. Press SET for 5 seconds to enter LEVEL2
- B. Press SET several times to access AD1, then press the ◀ key and the display will start to flash.
- C. Press ▼ or ▲ select the alarm type (see alarm selection table)
- D. Press SET to confirm
- E. Press SET to return to LEVEL 1

Step (5): Autotuning(AT) Function

- A. Once installed in the field, carry out self-tuning to allow the controller to determine the optimum AT parameters.
- B. AT calculation will choose the optimum PID Parameters based on the controllers auto tuning algorithm.
- C. The maximum value of the process curve should be about 80% of the range of instrument detection.
- D. Before the program begins (fixed value control STA=0), it is better to carry out AT around the maximum value of the process curve (SV=0.3).
- E. In LEVEL1 press SET key several times to reach AT option, then press ▲ and ▼ key to put "1" to start AT calculation.
- F. This machine is used as a fixed value control when STA = "0", and as a program controller when STA = 1, 2, 3.
- G. Once the controller is powered on, as long as STA is set to any value other than 0, the program will not start.

Soft Start Function

Output Soft Start

To enable simple soft start feature set the SV as follows;
 Set SV value -> In level3 press SET key to reach DLY, SET the output soft start value in seconds (I.e. if DLY is set to 10, then the soft start time will be 10 seconds). Exit the menu by pressing set until you return to the main screen. Now the soft start function is activated when the control is set to begin heating.

Rate of Change/Slope Temperature Limit

When your system needs a soft start (SV preset slope heating), please operate in the following order:
 SET SV value → at LEVEL1, press SET key to find RAP, SET slope temperature value, and → then press SET key to find RTM to SET slope time in minutes (for example, SET slope to 10°C/ min, RAP to 10.0, RTM to 001.0) → after setting, SV value will be SET immediately from the current PV value to 10°C/ min, until reaching the SV setpoint value.

Slope heating process PRO The output percentage of normal temperature LED flashing control process is automatically controlled by PID.

Case 6. Temperature compensation setting

Non-linear control parameter: TM1, TS1, TM2, TS2, TM3, TS3

TM1 The first point is to set LSP ~ USP	TM2 The 2nd point is to set LSP~USP	TM3 The 3rd point is to set LSP~USP
TS1 The first compensation value is set at 0+ - 100	TS2 The 2nd compensation value is set at 0+~100	TS3 The 3rd compensation value is set at 0+~100

As shown in the left picture:
 The temperature controller adopts:
 constant value compensation
 Slope compensation

Conditions :
 1. TM1=0, TM2=0, TM3=0
 No Compensation

◁ Constant value compensation ▲ Slope compensation TS (Compensation value)

Troubleshooting

Information	Instructions	Solution
UUUJ	The first sensor is disconnected, polarity reversed or out of range. The first set of input signals were higher than Higher Scaling Limit	Please check the input signal/sensor for errors and wiring
nnni	The first set of input signals is lower than Lower Scaling Limit	Please check the input range
UJCE	Normal temperature compensation failure	Please check the temperature compensation diode
UUUU	Open T/C circuit	Please check T/C or compensating wire

DTC1 C5 Communications Manual

Address	Function code	Data	CRC Inspection
8bit	8bit	Nx8bit	16bit

- 1.Scope of selection: **Fastron Electronics DTC Series fitted with RS485 Modbus RTU "C5" Option**
- 2.Work realization: data exchange between instrument and host computer (instrument can only be used as slave to receive interrogation and reply)
- 3.Serial transmission mode: RTU
- 4.Transmission interface: RS485
- 5.Communication medium: shielded twisted pair
- 6.Communication stack number: 1~255. The upper limit of the number of connecting meters is related to the load capacity of the host, typically over 15 or 31 meters require signal Isolator/amplifier.
- 7.Function code implementation: read hold register (03), write single register (06), write multiple registers (10)
- 8.Data length:
 - 8a) When writing data to the controller, a maximum of 16 consecutive instructions (32 bytes) can be written at one time.
 - 8b) When reading the menu data inside the machine, the non-programmed menu can read 16 consecutive menus at a time (the unrealized address outside the parameter address table is 0), while the programmed menu can only read 16 consecutive menus at a time
9. Numerical format: signed 16-bit binary complement; The data read is 10.0 times larger; Before writing the data, enlarge the data 10.0 times before sending it; Notice the transition.

Table 1 - Function code 03 (read the set value SV =100.0)

Request		Response	
Field name	(Hexadecimal)	Field name	(Hexadecimal)
Number	1	Number	1
Function code	3	Function code	3
Start Address Hi	0	Byte count	2
Start Address Low	4	Register value Hi	3
Register number Hi	0	Register value Low	E8
Register number Low	1	CRC Low	B8
CRC Low	C5	CRC Hi	FA
CRC Hi	CB		

Input Type	Symbol	Range
K	Y	0-1370°C/0-2498°F
J	U	0-1200°C/0-2192°F
R	r	0-1760°C/0-3216°F
S	S	0-1760°C/0-3216°F
B	h	0-1820°C/0-3308°F
E	E	0-1000°C/0-1832°F
T	t	0-600°C/0-1112°F
Pt100	PE	-199.9-600°C/-327.8-1112°F
Cu50	CU50	0-150°C/0-302°F
LN	Ln	Linear analogue Signal 4-20mA, 0-1V, 0-50mV, 0-5V
N	n	0-1300°C/0-2372°F
W1	W1	0-2000°C/0-3632°F
W2	W2	0-2320°C/0-4208°F

RS485 MODBUS RTU communication protocol

Baud rate :4800, 9600, 19200, 38400, 76800, 153600 bps
Start position: 1
Data bit: 8
Check bit: E(even), N(none) Stop bits: 1, 2
Frame check method: (CRC16)
Message format: (N=2)

Communication Application Notes

1. Read AM and AM1(cold control manual) menus,0 represents manual state,1 represents automatic state.
2. RAP is the program control menu, read, return 0X0000 represents the program control close, return 0X0001 represents the program control start: write 0X0000 to close the program control, write 0X0001 to start the program control, write 0X0002 to stop the program control, write 0X0002 to end the suspension, continue to run the program control.
3. Before writing the program-controlled menu, please write 0x0000 to RAP to close the program-controlled menu.
- 4.Before writing MV/MV1 threshold, please first write 0x0000 to AM/AM1 to make the system switch to manual control.
- 5.When the multiplier is 10, the returned data is magnified 10 times.
- 6.PV1 and PV2 are read-only parameters.
- 7.There should be a 150ms+ time interval between write instructions, no matter the same address or not not.instrument failure, and the time interval should be no less than 150 milliseconds.



- Power Semiconductors
- Electrical Measurement
- Process Control

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DTC1 Series C5 Communication Manual



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Table 2 - Function code 06(read the set value SV=100.0)

Request		Response	
Field name	(Hexadecimal)	Field name	(Hexadecimal)
Number	1	Number	1
Function code	6	Function code	6
Start Address Hi	0	Start Address High	0
Start Address Low	4	Start Address Low	4
Register number High	3	Register value High	3
Register number Low	E8	Register value Low	E8
CRC Low	C8	CRC Lo	C8
CRC High	B5	CRC Hi	B5

Signed parameter address allocation table (" NC "means the address is empty)

Parameter name	Address		Read /write state	Ratio	Range
	Hexadecimal	Decimal			
MV	00H	0	R/W	10	0~100
MV1	01H	1	R/W	10	0~100
PV1	02H	2	R	10	LSP~USP
PV2	03H	3	R	10	LSP2~USP2
SV	04H	4	R/W	10	LSP~USP
NC	05H	5	R/W	10	
AD1	06H	6	R/W	1	0-11
AL1	07H	7	R/W	10	-1999 ~9999
AD2	08H	8	R/W	10	0-11
NC	09H	9	R/W	1	
NC	0AH	10	R/W	1	
P	0CH	11	R/W	10	0.1~3600
I	0DH	12	R/W	10	0~3600
D	0EH	13	R/W	10	0~3600
P _c	0FH	14	R/W	10	0.1~ 3600
I _c	10H	15	R/W	10	0~3600
D _c	11H	16	R/W	10	0~3600
LSP	12H	17	R/W	10	-1999 ~9999
USP	13H	18	R/W	10	-1999 ~9999
LSP2	14H	19	R/W	10	-1999 ~9999
USP2	15H	20	R/W	10	-1999~9999
HY1	16H	21	R/W	10	LSP~USP
HY2	17H	22	R/W	10	LSP~ USP
OUL	18H	23	R/W	10	0~100
OUH	19H	24	R/W	10	0~100
OU3	1AH	25	R/W	10	0~100
OU4	1BH	26	R/W	10	0~100
KV	1CH	27	R/W	10	0.1~300
TH	1DH	28	R/W	10	0~6
TRL	1EH	29	R/W	10	LSP~ USP
TRH	1FH	30	R/W	10	LSP~ USP
PVOS	20H	31	R/W	10	-50~50

Table 3 Function code 10(read the set value SV=100.0)

Request		Response	
Field name	(Hexadecimal)	Field name	(Hexadecimal)
Number	1	Number	1
Function code	10	Function code	10
Start Address High	0	Start Address High	0
Start Address Low	4	Start Address Low	4
Register number High	0	Register number High	0
Register number Low	1	Register number Low	1
Byte count	2	CRC Low	40
Register value High	3	CRC High	8
Register value Low	E8		
CRC Lo	A7		
CRC Hi	6A		

Address assignment table for unsigned parameters

Parameter name	Address		Read /write state	Ratio	Range
	Hexadecimal	Decimal			
AM	80H	128	R/W	1	0~1
RAP	81H	129	R/W	1	0~2
AT	82H	130	R/W	1	0~1
C_0	83H	131	R/W	1	0~3
PMA	84H	132	R/W	1	0~ 180
KO	85H	133	R/W	1	0~255
SFT	86H	134	R/W	1	0~99
DP	87H	135	R/W	1	0~ 3
DSP2	88H	136	R/W	1	0~1
INP	89H	137	R/W	1	0~9
INP2	8AH	138	R/W	1	0~ 9
MAN	8BH	139	R/W	1	0/ 1
ODU	8CH	140	R/W	1	0/1
PTW	8DH	141	R/W	1	80 ~ 250
OFT	8EH	142	R/W	1	0 ~2
AM1	8FH	143	R/W	1	0~1

Parameter	Address		Read /write state	Ratio	Range
	Hexadecimal	Decimal			
PVS2	20H	32	R/W	10	-50.0 ~50.0
WB	21H	33	R/W	10	0~3600
KP	22H	34	R/W	10	0.1~10
EK	23H	35	R/W	10	0~3600
RE	24H	36	R/W		0~250
STA	25H	37	R/W	10	0~3
CAL	26H	38	R/W	1	1~90
SN	27H	39	R/W	1	1~90
DIE(701A)	28H	40	R/W	1	0.5~5.0
DIE(701)	29H	41	R/W	10	0.5~ 5.0
STP	2AH	42	R/W	10	1.0~20.0
CYT	2BH	43	R/W	10	0~200
CYT2	2CH	44	R/W	10	0~200
GAP	2DH	45	R/W	10	-50~ 50

Program menu address: $CX=(X-1)*12+256$, X = segment #:C90,X=90,Inp Range LSP~USP;

$TX=(X-1)*12+260$,Input Range (0~9999)

$OUX=(X-1)*12+264$, Input Range (0~100)

INP(INP2)Enter corresponding form

b	0	j	5
s	1	k	6
r	2	pt	7
t	3	cu	8
e	4	ln	9
n	10	w1	11
w2	12		

Note: in mode 701A, the CYT input range = 1.0~200.