

Delta Temperature Controller

User Manual



Foreword

The user manual details the process of using Delta DT series temperature controllers step by step for beginners to easily set up all kinds of parameters in a short time.

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CHAPTER 1: DEFAULT SETTINGS OF PARAMETERS









1.1 Default Settings in Temperature Controller




DTA		DTB		DTC	
Model: DTA4896R1		Model: DTB4896RR		Model: DTC1000R	
PV	SV	PV	SV	PV	SV
no	Cont	no	Cont	Not connected to sensor	0.0
Press SET for more than 3 seconds to enter initial setting mode		Press SET for more than 3 seconds to enter initial setting mode		Set up control modes	
Cont	Pt2	Cont	Pt	Control mode	PID control
				Run/stop	Run
EPUn	C	EPUn	C	Output 1	Heating
				Output 2	Heating
EP-H	5000	EP-H	5000	Status of key	Normal
				Auto-tuning	End
EP-L	-200	EP-L	-999	Set up temperature	
				Input type	PT100
Ctrl	Pt2	Ctrl	Pt2	Input unit	°C
				Set value	0.0
S-HC	HEAT	S-HC	HEAT	Maximum input temperature	600.0
				Minimum input temperature	-20.0
ALAI	0	ALAI	0	Position of decimal point	1 digit after decimal point
				Set up PID parameter	
ALAI2	0	ALAI2	0	Proportional band (P)	47.6
				Integral time (I)	260
CoSH	oFF	ALAI3	0	Derivative time (D)	41
				Control cycle 1	20
C-no	1	SALA	oFF	Integral default value	0.0
				Control cycle 2	20

DTA		DTB		DTC	
Model: DTA4896R1		Model: DTB4896RR		Model: DTC1000R	
PV	SV	PV	SV	PV	SV
6PS	9600	LoSH	oFF	Adjust temperature	
				Input compensation	0.0
LEn	7	E-SL	ASCI	Password of DTC	
				Level 1 password	Disabled
Prty	EuEn	E-no	1	Level 2 password	Disabled
				Level 3 password	Disabled
StoP	1	6PS	9600		
 Back to top					
		LEn	7		
					
		Prty	EuEn		
					
		StoP	1		
		 Back to top			

1.2 How to Return to Default Settings in DTA





Display		Explanations
PV	SV	
		Status of the temperature controller
LoL	r1	Temporary display when DTA is switched on: r1 = relay output with RS-485 communication.
250	00	Example displayed values
 		Press  twice
LoL	oFF	Key-locked function
		
LoL	LoL1	Select Lock 1
		
 + 		Press “up” and “down” keys together for 1 second.
LoL	276	Default value
		



















Display		Explanations
PV	SV	Status of the temperature controller
ECU0	-136	Default value
		
PA55	4321	
		
PA55	1357	Press “down” key continuously until the value reaches 1357 <u>(please DO NOT modify this value; otherwise system confusion may occur).</u>
SBT		
PA55	4321	
SBT + 		Press the two keys together once to return to main screen.
25.0	00	Main screen
Switch off DTA and re-power it.		
Cont	rl	
no	Cont	Return to default value. The default sensor is PT100, which will be displayed when DTA is not connected to a sensor or thermocouple.




The model adopted in this example is: DTA4896R1 with firmware V3.50.





Communication

1. Make sure RS-485 hardware communication cable in DTA has been connected to the computer.
2. Make sure the communication parameters in DTA are consistent with those in the computer.

Display		Explanations
PV	SV	Status of the temperature controller
25.0	00	Example displayed values
Press SBT for more than 3 seconds to enter initial setting mode		
Cont	Pt2	Example displayed value: PT100 Sensor
Press  continuously for 8 times		
Cont	off	ON/OFF of communication write-in
		
Cont	on	OFF: communication write-in disabled ON: communication write-in enabled

Display		Explanations
PV	SV	Status of the temperature controller
		
		Communication address
		
		Communication speed
		
		Data length (in bits)
		
		Parity bit
		
		Stop bit
	Back to top	Return to the first item in the initial setting mode: 
		Return to PV/SV screen in the operation mode











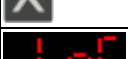




DTCOM Software	Explanations
	Execute DTCOM Software
	Select "SINGLE COMMAND TEST"
<p>SINGLE COMMAND TEST (HEX FORMAT)</p> <p>ADDRESS <input type="text" value="01"/></p> <p>COMMAND <input type="text" value="Write One Wr"/></p> <p>FUNC ADDR <input type="text" value="471B"/></p> <p>WRITE DATA <input type="text" value="1234"/></p> <p>LRC <input type="text" value="51"/></p> <p>SEND <input type="text" value=":0106471B123451"/></p> <p>RECEIVED <input type="text" value=":0106471B123451"/></p> <p><input type="button" value="Send"/> <input type="button" value="Repeat"/> <input type="button" value="Clear Result"/> <input type="button" value="Close"/></p> 	<p>Function address = 471B; Write data =1234.</p> <p><u>(Please DO NOT modify this value; otherwise system confusion may occur.)</u></p>




DTCOM Software	Explanations
<p style="text-align: center;">SINGLE COMMAND TEST (HEX FORMAT)</p> <p>ADDRESS <input type="text" value="01"/></p> <p>COMMAND <input type="text" value="Write One Wr"/></p> <p>FUNC ADDR <input style="border: 2px solid red;" type="text" value="4724"/></p> <p>WRITE DATA <input style="border: 2px solid magenta;" type="text" value="1234"/></p> <p>LRC <input type="text" value="48"/></p> <p>SEND <input type="text" value=":01064724123448"/></p> <p>RECEIVED <input type="text" value=":01064724123448"/></p> <p> <input type="button" value="Send"/> <input type="button" value="Repeat"/> <input type="button" value="Clear Result"/> <input type="button" value="Close"/> </p> 	<p>Clear the user's settings. Function address = 4724; Write data = 1234 <u>(Please DO NOT modify this value; otherwise system confusion may occur.)</u></p>
	<p>After the above procedures are completed, DTA will display the information on the left hand side, representing that DTA has return to default settings successfully.</p>
<p>Switch off DTA and re-power it.</p> 	
	<p>Return to default value. The default sensor is PT100, which will be displayed when DTA is not connected to a sensor or thermocouple.</p>

The model adopted in this example is: DTA4896R1 with firmware V3.50.

1.3 How to Return to Default Settings in DTB






Display		Explanations
PV	SV	Status of the temperature controller
		Temporary display when DTB is switched on:  = firmware V1.50;  = relay output for OUT1/OUT2
		Example displayed value
		Press  for 3 times
		Key-locked function
		
		Select Lock 1
		
		Press "up" and "down" key together for 1 second.
























Display		Explanations
PV	SV	Status of the temperature controller
SHd0	OFF	
		
PA55	4321	
		
PA55	1357	Press “down” key continuously until the value reaches 1357 <u>(please DO NOT modify this value; otherwise system confusion may occur).</u>
SBT		
SHd0	OFF	
SBT + 		Press the two keys together once to return to main screen.
250	00	Main screen
Switch off DTB and re-power it.		
6150	rr	
na	Cont	Return to default value. The default sensor is PT100, which will be displayed when DTB is not connected to a sensor or thermocouple.



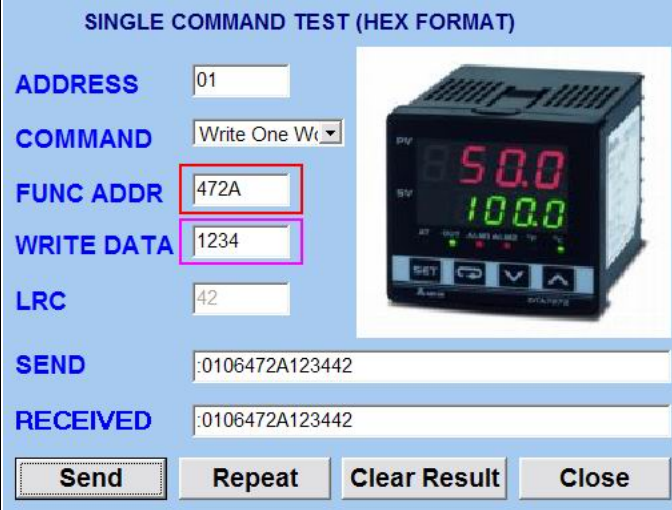
The model adopted in this example is: DTB4896RR with firmware V1.50.





Communication

1. Make sure RS-485 hardware communication cable in DTB has been connected to the computer.
2. Make sure the communication parameters in DTB are consistent with those in the computer.

Display		Explanations
PV	SV	Status of the temperature controller
250	00	Example displayed value
Press  for more than 3 seconds to enter initial setting mode		
Cont	PT	Example displayed value: PT100 Sensor
Press  continuously for 10 times		
Cont	OFF	ON/OFF of communication write-in
		

Display		Explanations
PV	SV	Status of the temperature controller
		OFF: communication write-in disabled ON: communication write-in enabled
		
		ASCII or RTU
		
		Communication address
		
		Communication speed
		
		Data length (in bits)
		
		Parity bit
		
		Stop bit
 back to top		Return to the first item in the initial setting mode: 
		Return to PV/SV screen in the operation mode

DTCOM Software	Explanations
	Execute DTCOM Software
	Select "SINGLE COMMAND TEST"
 <p>SINGLE COMMAND TEST (HEX FORMAT)</p> <p>ADDRESS: 01</p> <p>COMMAND: Write One W</p> <p>FUNC ADDR: 472A</p> <p>WRITE DATA: 1234</p> <p>LRC: 42</p> <p>SEND: :0106472A123442</p> <p>RECEIVED: :0106472A123442</p> <p>Buttons: Send, Repeat, Clear Result, Close</p>	<p>Function address = 472A; Write data =1234</p> <p><u>(Please DO NOT modify this value; otherwise system confusion may occur.)</u></p>



DTCOM Software	Explanations
<p align="center">SINGLE COMMAND TEST (HEX FORMAT)</p> <p>ADDRESS <input type="text" value="01"/></p> <p>COMMAND <input type="text" value="Write One Wt"/></p> <p>FUNC ADDR <input type="text" value="474E"/></p> <p>WRITE DATA <input type="text" value="1234"/></p> <p>LRC <input type="text" value="1E"/></p> <p>SEND <input type="text" value=":0106474E12341E"/></p> <p>RECEIVED <input type="text" value=":0106474E12341E"/></p> <p><input type="button" value="Send"/> <input type="button" value="Repeat"/> <input type="button" value="Clear Result"/> <input type="button" value="Close"/></p> 	<p>Clear the user's settings. Function address = 474E; Write data = 1234 <u>(Please DO NOT modify this value; otherwise system confusion may occur.)</u></p>
	<p>After the above procedures are completed, DTB will display the information on the left hand side, representing that DTB has return to default settings successfully.</p>
<p>Switch off DTB and re-power it.</p> 	
	<p>Return to default value. The default sensor is PT100, which will be displayed when DTC is not connected to a sensor or thermocouple.</p>


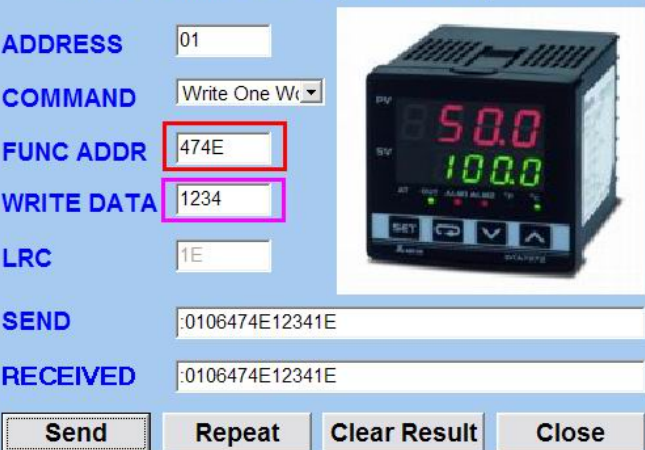
The model adopted in this example is: DTB4896RR with firmware V1.50.

1.4 How to Return to Default Settings in DTC

Communication

1. Make sure RS-485 hardware communication cable in DTC has been connected to the computer.
2. Make sure the communication parameters in DTC are consistent with those in the computer.

DTCOM Software	Explanations
	Execute DTCOM Software
	Select "SINGLE COMMAND TEST"

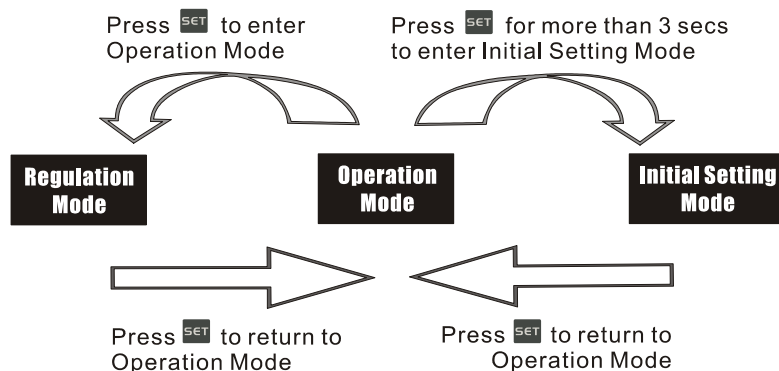
DTCOM Software	Explanations
<p>SINGLE COMMAND TEST (HEX FORMAT)</p> <p>ADDRESS: 01</p> <p>COMMAND: Write One Wr</p> <p>FUNC ADDR: 472A</p> <p>WRITE DATA: 1234</p> <p>LRC: 42</p> <p>SEND: :0106472A123442</p> <p>RECEIVED: :0106472A123442</p> <p>Buttons: Send, Repeat, Clear Result, Close</p> 	<p>Function address = 472A; Write data = 1234 (Please DO NOT modify this value; otherwise system confusion may occur.)</p>
<p>SINGLE COMMAND TEST (HEX FORMAT)</p> <p>ADDRESS: 01</p> <p>COMMAND: Write One Wr</p> <p>FUNC ADDR: 474E</p> <p>WRITE DATA: 1234</p> <p>LRC: 1E</p> <p>SEND: :0106474E12341E</p> <p>RECEIVED: :0106474E12341E</p> <p>Buttons: Send, Repeat, Clear Result, Close</p> 	<p>Clear the user's settings. Function address = 474E; Write data = 1234 (Please DO NOT modify this value; otherwise system confusion may occur.)</p>
<p>Switch off DTC and re-power it.</p>	<p>Return to default settings</p>















The model adopted in this example is: DTC1000R with firmware V1.40.

CHAPTER 2: CONTROL MODES IN DTA

2.1 ON/OFF

There are three control modes in DTA: ON/OFF, MANUAL and PID. First, press **SET** for 3 seconds to enter the "initial setting" mode. See below for how to switch between each mode:



Display		Explanations
PV	SV	Status of the temperature controller
no	Cont	Message displayed when DTA has not yet been connected to a sensor.
Press SET for more than 3 seconds to enter initial setting mode		
TYPE	PT100	Select the sensor connected. Default = PT100
		
TEMP	0	Temperature unit. Default = °C
		
TEMP-H	5000	Upper limit of temperature range
		
TEMP-L	-200	Lower limit of temperature range
		
CTRL	auto	The control modes include: PID, ON/OFF, MANUAL. Default = PID. Select "ON/OFF" here.
		
S-MC	HEAT	Select heating or cooling mode. Default = heating
		
ALARM1	0	Set up Alarm mode 1. Default = alarm output disabled
		
ALARM2	0	Set up Alarm mode 2. Default = alarm output disabled
		
COMM	OFF	ON/OFF of communication write-in. Default = OFF
		
ADDR	1	Communication address
		
BPS	9600	Communication speed
		
LEN	7	Data length (in bits)
		
PARITY	EVEN	Parity bit
		
STOP	1	Stop bit
 Back to top		

■ **Parameters relevant to ON/OFF control**

Press **SBT** in the main screen of DTA to enter the “regulation mode”.

Display		Explanations
PV	SV	Status of the temperature controller
HE5 or CO CE5	00	Set up hysteresis. Default = heating hysteresis. Can be set as cooling hysteresis as well. Both default values are “0”.

2.2 MANUAL

Press **SBT** for 3 seconds in the main screen to enter the “initial setting mode”. Press **↶** several times until the parameter **Ctrl** is displayed.

Display		Explanations
PV	SV	Status of the temperature controller
Ctrl	MANU	The control modes include: PID, ON/OFF, MANUAL. Default = PID. Select “MANUAL” here.
SBT Back to top		Press SBT to return to the main screen.

■ **Parameters relevant to MANUAL control**

Press **SBT** in the main screen of DTA to enter the “regulation mode”.





Display		Explanations
PV	SV	Status of the temperature controller
HEPd or COPd	20	Set up heating or cooling control cycle. Default = heating, 20 seconds per cycle.

Press **↶** in the main screen of DTA to enter the “operation mode”.

Display		Explanations
PV	SV	Status of the temperature controller
r-s	run	Run/stop
↶		
LoC	off	Key-locked function
↶		
out	0	Manually adjust the output percentage. Assume the percentage value = 50 and the cycle = 20 seconds plus heating control, the system will conduct heating output for 10 seconds and stop for the other 10 seconds.






















2.3 PID

Press **SBT** for 3 seconds in the main screen to enter the “initial setting mode”. Press **↶** several times until the parameter **Ctrl** is displayed.









Display		Explanations
PV	SV	Status of the temperature controller
		The control modes include: PID, ON/OFF, MANUAL. Default = PID. Select "PID" here.
 Back to top		Press  to return to the main screen.

■ **Parameters relevant to PID control**

Press  in the main screen of DTA to enter the "regulation mode".

Display		Explanations
PV	SV	Status of the temperature controller
		ON/OFF of auto-tuning
		
		Default value for proportional control
		
		Default value for integral control
		
		Default value for derivative control
		
		Default integral value
		
		Heating/cooling control cycle
		
		Temperature inaccuracy adjustment value
		

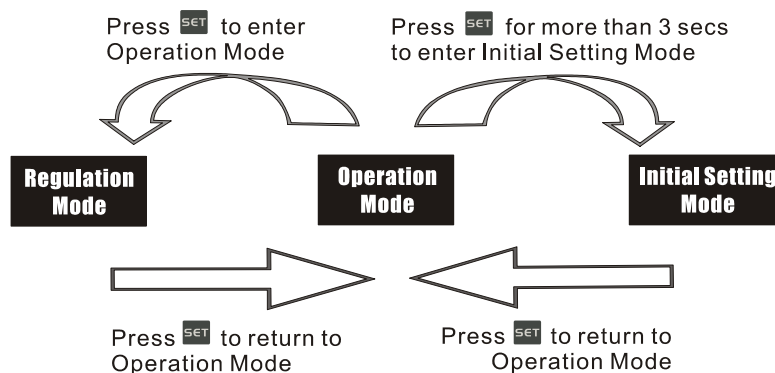
Press  in the main screen of DTA to enter the "operation mode".

Display		Explanations
PV	SV	Status of the temperature controller
		Run/stop
		
		Key-locked function
		
		Output volume. In PID control mode, this is a read-only parameter and cannot be modified.












CHAPTER 3: CONTROL MODES IN DTB

3.1 ON/OFF

There are four control modes in DTB: ON/OFF, MANUAL, PID and PID PROG. To switch to ON/OFF mode, first press **SET** for 3 seconds to enter the “initial setting” mode. See below for how to switch between each mode:



Display		Explanations
PV	SV	Status of the temperature controller
no	Cont	Message displayed when DTB has not yet been connected to a sensor.
Press SET for more than 3 seconds to enter initial setting mode		
TYPE	PT	Select the sensor connected. Default = PT100
↺		
TEMP	C	Temperature unit. Default = °C
↺		
EP-H	6000	Upper limit of temperature range
↺		
EP-L	-999	Lower limit of temperature range
↺		
Ctrl	onof	The control modes include: ON/OFF, MANUAL, PID and PID PROG. Default = PID. Select “ON/OFF” here.
↺		
S-HC	HEAT	Select heating/cooling/heating 1 cooling 2/heating 2 cooling 1. Default = heating
↺		
ALARM	0	Set up Alarm mode 1. Default = alarm output disabled.



Display		Explanations
PV	SV	Status of the temperature controller
		
ALR2	0	Set up Alarm mode 2. Default = alarm output disabled.
		
ALR3	0	Set up Alarm mode 3. Default = alarm output disabled.
		
SALA	OFF	Set up system alarm
		
CoSH	OFF	ON/OFF of communication write-in. Default = OFF
		
C-SL	ASCII	Select communication format
		
C-no	1	Communication address
		
bPS	9600	Communication speed
		
LEN	7	Data length (in bits)
		
Prty	Even	Parity bit
		
Stop	1	Stop bit
 Back to top		

■ **Parameters relevant to ON/OFF control**

Press  in the main screen of DTB to enter the “regulation mode”.

Display		Explanations
PV	SV	Status of the temperature controller
HEH or CHE	00	Set up hysteresis. Default = heating hysteresis. Can be set as cooling hysteresis as well. Both default values are “0”.

3.2 MANUAL

Press  for 3 seconds in the main screen to enter the “initial setting mode”. Press  several times until the parameter **Ctrl** is displayed.

Display		Explanations
PV	SV	Status of the temperature controller
Ctrl	MANU	The control modes include: ON/OFF, MANUAL, PID and PID PROG. Default = PID. Select "MANUAL" here.
Back to top		Press to return to the main screen.

■ **Parameters relevant to MANUAL control**

Press in the main screen of DTB to enter the "regulation mode".

Display		Explanations
PV	SV	Status of the temperature controller
HEPd or CLPd	20	Set up heating or cooling control cycle. Default = heating, 20 seconds per cycle.

Press in the main screen of DTB to enter the "operation mode".

Display		Explanations
PV	SV	Status of the temperature controller
r-s	run	Run/stop
SP	1	Set up the position of decimal point. 1 = value with decimal point; 2 = value without decimal point
LoC	off	Key-locked function
OUT 1	00	Manually adjust the output percentage. Assume the percentage value = 50 and the cycle = 20 seconds plus heating control, the system will conduct heating output for 10 seconds and stop for the other 10 seconds.




























3.3 PID

Press for 3 seconds in the main screen to enter the "initial setting mode". Press several times until the parameter **Ctrl** is displayed.





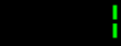






Display		Explanations
PV	SV	Status of the temperature controller
Ctrl	PID	The control modes include: ON/OFF, MANUAL, PID and PID PROG. Default = PID.
Back to top		Press to return to the main screen.

■ **Parameters relevant to PID control**


Press in the main screen of DTB to enter the "regulation mode".











Display		Explanations
PV	SV	Status of the temperature controller
		ON/OFF of auto-tuning
		
		The 0 th PID parameter. There are 4 groups of PID parameters built in DTB. When the parameter is set as PID4, the system will automatically adopt the PID value of the current temperature closest to PID0 ~ 3.
		
		The 0 th SV
		
		The 0 th default value for proportional control
		
		The 0 th default value for integral control
		
		The 0 th default value for derivative control
		
		The 0 th default integral value
		
		Heating/cooling control cycle
		
		Temperature inaccuracy adjustment value
		

Press  in the main screen of DTB to enter the “operation mode”.




Display		Explanations
PV	SV	Status of the temperature controller
		Run/stop
		
		Set up the position of decimal point
		
		Key-locked function
		
		Output volume. In PID control mode, this is a read-only parameter and cannot be modified.

3.4 PID PROG

Press **SBT** for 3 seconds in the main screen to enter the “initial setting mode”. Press  several times until the parameter **Ctrl** is displayed.









Display		Explanations
PV	SV	Status of the temperature controller
Ctrl	Prog	The control modes include: ON/OFF, MANUAL, PID and PID PROG. Default = PID. Select “PID PROG” here.
		
PRtn	0	DTB offers 8 patterns and 8 steps for each pattern, totaling 64 steps. Range of a pattern: OFF ~ 7. OFF = the function disabled.
		
SP00	00	Temperature SV for pattern 0 and step 0
		
ET00	0000	Time SV for pattern 0 and step 0
		
SP01	00	Temperature SV for pattern 0 and step 1
		
ET01	0000	Time SV for pattern 0 and step 1
...
...
SP07	00	Temperature SV for pattern 0 and step 7
		
ET07	0000	Time SV for pattern 0 and step 7
		
PS00	7	Actual number of steps executed in pattern 0
		
LY00	0	Actual number of loops executed in pattern 0
		
LN00	0	Pattern linked after the execution of pattern 0 is completed. OFF = end of linking patterns
		Return to PRtn
SBT Back to top		Press SBT to return to the main screen.

Return to the main screen to switch to the functions below.

Display		Explanations
PV	SV	Status of the temperature controller
250	r-tc 	Remaining time in the current step
	5P 	Target temperature for the current execution
	P-5t 	The pattern currently executed










■ **Parameters relevant to PID PROG control**

Press  in the main screen of DTB to enter the “regulation mode”.

Display		Explanations
PV	SV	Status of the temperature controller
PID0	00	The 0 th PID parameter. There are 4 groups of PID parameters built in DTB. When the parameter is set as PID4, the system will automatically adopt the PID value of the current temperature closest to PID0 ~ 3.
		
SV0	00	The 0 th SV
		
PD	475	The 0 th default value for proportional control
		
DI	260	The 0 th default value for integral control
		
DD	41	The 0 th default value for derivative control
		
CoFD	00	The 0 th default integral value
		
HEPd	20	Heating/cooling control cycle
		
EPoF	00	Temperature inaccuracy adjustment value
		

Press  in the main screen of DTB to enter the “operation mode”.

Display		Explanations
PV	SV	Status of the temperature controller
r-S	Stop / rUn	Stop/run/program stop/program hold ◦
	PStP / PHod	Program stop: Run the system again, and DTB will start from the initial step. Program hold: Run the system again, and DTB will follow and start from the previous step.

Display		Explanations
PV	SV	Status of the temperature controller
		
		Set up the position of decimal point
		
		Key-locked function
		
		Output volume. In PID PROG control mode, this is a read-only parameter and cannot be modified.

CHAPTER 4: CONTROL MODES IN DTC

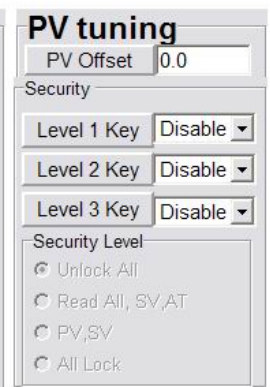
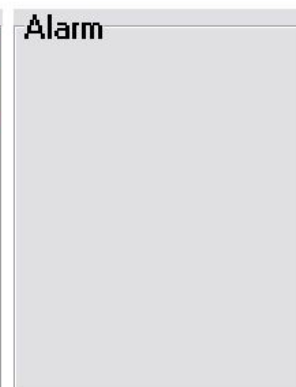
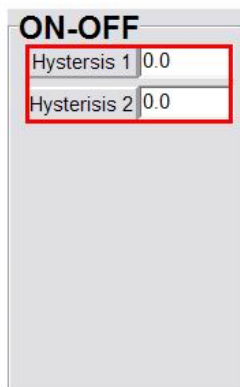
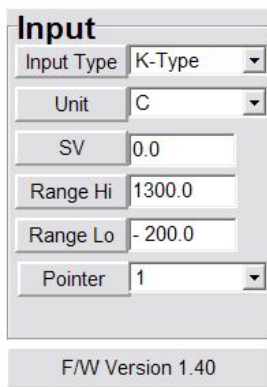
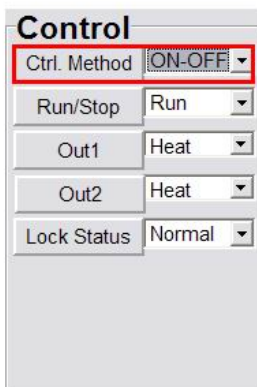
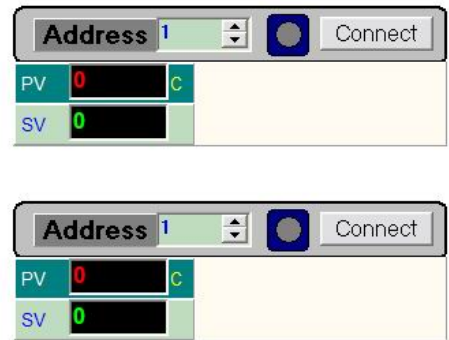
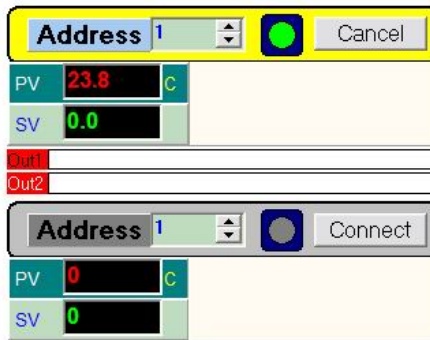
4.1 ON/OFF

There are four control modes in DTC: ON/OFF, MANUAL, PID and PID PROG. Due to that DTC has no display panel, the settings and monitoring of parameters have to rely on communication.

Therefore, you have to check the following 2 items to ensure normal communication.

1. Make sure RS-485 hardware communication cable in DTC has been connected to the computer.
2. Make sure the communication parameters in DTC are consistent with those in the computer.

Next, open DTCOM Software and switch to ON/OFF control mode.



- Set up hysteresis. Default = heating hysteresis. Can be set as cooling hysteresis as well. Both default values are "0".

4.2 MANUAL

Switch the control mode to MANUAL mode.

The screenshot displays the Delta Temperature Controller software interface. At the top is a 'Monitor' window with a menu bar (FILE, DEVICE, PARAMETERS, VIEW, EXIT). Below it are four panels showing the current state of the controller:

- Physical Controller:** A digital display showing PV (Process Variable) at 24.7 and SV (Setpoint) at 0.0. Below the display are buttons for AT, OUT1, OUT2, ALM1, ALM2, ALM3, and a numeric keypad.
- Address 1 Panel (Top Left):** Shows 'Address 1' with a green indicator light and a 'Cancel' button. Below it, PV is 24.7 and SV is 0.0.
- Address 1 Panel (Top Right):** Shows 'Address 1' with a blue indicator light and a 'Connect' button. Below it, PV is 0 and SV is 0.
- Address 1 Panel (Bottom Left):** Shows 'Address 1' with a blue indicator light and a 'Connect' button. Below it, PV is 0 and SV is 0.
- Address 1 Panel (Bottom Right):** Shows 'Address 1' with a blue indicator light and a 'Connect' button. Below it, PV is 0 and SV is 0.

Below the physical controller is a table showing output percentages:

Out1	0%
Out2	0%

At the bottom of the interface are five main control panels:

- Control:** 'Ctrl. Method' is set to 'Manual' (highlighted with a red box). Other settings include Run/Stop (Run), Out1 (Heat), Out2 (Heat), and Lock Status (Normal).
- Input:** 'Input Type' is K-Type, 'Unit' is C, 'SV' is 0.0, 'Range Hi' is 1300.0, 'Range Lo' is -200.0, and 'Pointer' is 1.
- Manual:** 'Output 1 %' is 0.0 (highlighted with a red box), 'Ctrl. Period1' is 4 (highlighted with a red box), 'Output 2 %' is 0.0 (highlighted with a red box), 'Ctrl. Period2' is 20 (highlighted with a red box), 'Tune Out High' is 0 (highlighted with a red box), and 'Tune Out Low' is 0 (highlighted with a red box).
- Alarm:** This panel is currently empty.
- PV tuning:** 'PV Offset' is 0.0. Under 'Security', 'Level 1 Key', 'Level 2 Key', and 'Level 3 Key' are all set to 'Disable'. The 'Security Level' is set to 'Unlock All'.

- Set up heating or cooling control cycle. Default = heating, 20 seconds per cycle.
- Manually adjust the output percentage. Assume the percentage value = 50 and the cycle = 20 seconds plus heating control, the system will conduct heating output for 10 seconds and stop for the other 10 seconds.

4.3 PID

Switch the control mode to PID mode

The screenshot displays the Delta Temperature Controller software interface. At the top is a menu bar with 'FILE', 'DEVICE', 'PARAMETERS', 'VIEW', and 'EXIT'. Below the menu bar is a 'Monitor' window showing a digital display with 'PV 25.1' and 'SV 0.0'. To the right of the display are four connection panels, each with 'Address 1' and 'Connect' buttons. Below the Monitor window is a table showing 'Out1' and 'Out2' at 0%.

Below the Monitor window are several parameter configuration panels:

- Control:** 'Ctrl. Method' is set to 'PID'.
- Input:** 'Input Type' is 'K-Type', 'Unit' is 'C', 'SV' is '0.0', 'Range Hi' is '1300.0', 'Range Lo' is '-200.0', and 'Pointer' is '1'.
- PID Parameter:** 'Pb' is '47.6', 'Ti' is '260', 'Td' is '41', 'Ctrl. Period1' is '4', 'I Offset' is '0.0', and 'Ctrl. Period2' is '4'.
- Alarm:** This panel is currently empty.
- PV tuning:** 'PV Offset' is '0.0'. Under 'Security Level', 'Unlock All' is selected.

- You can conduct auto-tuning on the default PID parameters according to the environment where your equipment is in or its temperature control capability, allowing the temperature controller to generate relevant PID parameters by itself in order to achieve an accurate temperature control.

4.4 PID PROG

Switch the control mode to PID PROG mode

The screenshot displays the 'Monitor' software window with the 'Ramp Soak programmer' interface. The physical controller's display shows a current temperature of 25.4°C and a setpoint of 00:00:00. The software interface includes several panels:

- Control Panel:** Shows 'Ctrl. Method' set to 'Ramp Soak', 'Run/Stop' set to 'Run', and 'Auto tuning' set to 'Stop'.
- Input Panel:** Shows 'Input Type' as 'K-Type', 'Unit' as 'C', and 'SV' set to 'Time Left'.
- PID Parameter Panel:** Shows parameters: Pb = 47.6, Ti = 260, Td = 41, Ctrl. Period1 = 4, I Offset = 0.0, and Ctrl. Period2 = 4.
- Ramp Soak programmer Table:** A table with columns for Step Max., Set Value, and Execute Time across five patterns. The 'Step Max.' column is highlighted in red, showing a value of 7 for all patterns.

- The 64 steps come from the combination of 8 patterns and 8 steps for each pattern. You can establish maximum 64 steps according to different systems in use.
- There are 8 steps in each pattern. You can define the step, loop and link pattern in each pattern.