

10	Deviation lower-limit with standby sequence: This alarm output operates when PV value reaches the set point (SV value) and the reached value is lower than the setting value SV-(AL-L).	
11	Hysteresis upper-limit alarm output: This alarm output operates if PV value is higher than the setting value SV+(AL-H). This alarm output is OFF when PV value is lower than the setting value SV+(AL-L).	
12	Hysteresis lower-limit alarm output: This alarm output operates if PV value is lower than the setting value SV-(AL-H). This alarm output is OFF when PV value is higher than the setting value SV-(AL-L).	
13	CT alarm output: This alarm operates when the current measured by transformer (CT) is lower than AL-L or higher than AL-H (This alarm output is available only for the controller with current transformer).	
14	When program control is end status, alarm output is ON.	
15	When RAMP UP status happens to PID program control, alarm output is ON.	
16	When RAMP DOWN status happens to PID program control, alarm output is ON.	
17	When SOAK status happens to PID program control, alarm output is ON.	
18	When RUN status happens to PID program control, alarm output is ON.	

(Note: AL-H and AL-L include AL1H, AL2H, AL3H and AL1L, AL2L, AL3L.)

9 Current Transformer (CT) Function

The Current Transformer (CT) function is used with the alarm output. When using a current transformer (CT) with the controller, change the corresponding alarm output mode to mode 13 (alarm output set value is 13), then turn to operation mode and set the current lower-limit and current upper-limit. You can set current alarm range between 0.5A ~ 30A, display resolution is 0.1A and measure accuracy is +/- 0.5A.

10 EVENT Inputs Function

There are two optional event inputs (contact inputs) supported (EVENT1 and EVENT2) in DTB series.
EVENT1 : RUN/STOP operation can be executed by RUN/STOP parameters (Operation Mode) or via the communication. User also can control RUN/STOP operation by EVENT 1 in DTB series. The control output is ON if the circuit of EVENT 1 is open when the controller is operating. Otherwise, the controller will stop output if the circuit of EVENT 1 is short or when the system parameter of the controller is set to STOP mode.
EVENT2 : DTB series allows user can switch two temperature setting value by changing the status (open/short) of EVENT 2. Each temperature setting value has independent control parameters.

11 PID Program Control (Ramp/Soak Program Control)

Description of Function and Parameters Setting:
 PID program control by 8 patterns (Pattern No. 0~7) is supported in DTB series. Each pattern contains 8 steps (step No. 0 ~ 7), one Link Pattern parameter, one Cycle parameter and one Actual Step parameter

Start Pattern : P_{Start} is in operation mode and it is used to set the Start Pattern of PID program control (This parameter appear in mode only).

Steps : Include set point X and execution time T, these two parameters setting. The set point (SV) should reach temperature X after the period of execution time T. If the set point is the same as the result of the previous setting, then it is called Soak program control. If not, then it is called Ramp program control. Therefore, PID program control is also called Ramp/Soak program control.
 The default of step No. 0 in this controller is Soak program control. The controller will control the temperature (PV) to reach the set point X and then keep the temperature at set point X. The period of execution time is time T which provided by step No. 0.

Link Pattern Parameter : For example, when set $L_{Pattern}$ to 2, it indicates that pattern No. 2 will execute next after the execution of pattern No. 0. If set to L_{OFF} , it indicates the program will stop after executing the current pattern and the temperature will keep at the set point of the last step.

Cycle Parameter : Additional execution cycle number. For example, when set C_{Cycle} to 2, it indicates that pattern No. 4 should execute twice in addition. Include origin one time execution, total execute three times.

Actual Step Parameter : Execution step number per pattern (can set to 0 ~ 7). For example, when set A_{Step} to 2, it indicates that pattern No 7 will not execute other steps than step 0 to step2.

Execution : When r_{-5} is set to r_{-0n} , the program will start to execute in order from the step 0 of start pattern.
 When r_{-5} is set to S_{Stop} , the program will stop and the control output is disabled.
 When r_{-5} is set to P_{Stop} , the program will stop and the temperature at that time will be controlled at the set point before program stop.
 Select r_{-0n} again, then the program will restart and execute from step 0 of start pattern.
 When r_{-5} is set to P_{Hold} , the program will hold and the temperature at that time will be controlled at the set point before program hold.
 Select r_{-0n} again, then the program will follow the step before hold and start to execute through the rest of the time.
Display : During PID program control, the SV default display is P-XX, P indicates the current execution pattern and XX indicates the current execution step. Press \checkmark to change the display item.
 After select S_{Stop} press \checkmark key, and then the temperature set point of the current execution step will display on SV display.
 After select r_{-0n} press \checkmark key, and then the residual time of the current execution step will display on SV display.

12 PID Control

One group can be selected from any one of 4 groups PID parameters (P, I, D, IOF) for PID control. After AT, PID value and temperature setting will be stored in the selected one group.

P_{-d0} ~ P_{-d4} : PIDn, n=0~4 from which 0~3 correspond to each PID parameter. P_{-d4} : n=4, auto PID parameter. Program will automatically

select a most useful PID parameter based on current temperature setting. Displayed SV values correspond to S_{u0} ~ S_{u3} . Temperature setting corresponded to the selected PID parameter via user-defined or AT.

Valve Control:
 When use valve control as output control, there are 2 Relay outputs for motor forward/reverse control, one (output 1) for valve open the other (output 2) for valve close. The output volume is controlled by valve open/close and it can be set with feedback function enabled or disabled. When feedback is disabled, output 1 will keep output while valve fully opens and output 2 will keep output while valve fully closes. But if feedback is enabled, please follow the parameter setting for valve control as follows:

w_{Rt} : Time for valve from full close to full open.
 w_{dE} : Dead Band setting of valve. The value of current valve output minus previous one must be greater than Dead Band value; otherwise, valve will remain OFF.

w_{FB} : Signal feedback setting, ON for enabling feedback and OFF for disabling feedback.

- When w_{FB} set to "1", it means signal feedback function is activated and will come up selections as follows:
- w_{RL} : Upper/Lower limit of valve feedback by auto-tuning. r_{-5} must set to S_{Stop} for showing up this selection.
 - w_{RL} : D/A value when valve fully opens. Set w_{RL} to be "1" for auto setting or "0" for manual setting.
 - w_{RL} : D/A value when valve fully closes. Set w_{RL} to be "1" for auto setting or "0" for manual setting.

Note: If feedback function setting is with problem, program will see the setting as feedback disabled.

13 RS-485 Communication

- Supporting transmission speed: 2400, 4800, 9600, 19200, 38400bps
- Non-supported formats: 7, N, 1 or 8, O, 2 or 8, E, 2
- Communication protocol: Modbus (ASCII or RTU)
- Function code: 03H to read the contents of register (Max. 8 words). 06H to write 1 (one) word into register. 02H to read the bits data (Max. 16 bits). 05H to write 1 (one) bit into register.

Address	Content	Explanation
1000H	Process value (PV)	Measuring unit is 0.1, updated one time in 0.4 second The following reading value display indicates error occurs: 8002H : Initial process (Temperature value is not got yet) 8003H : Temperature sensor is not connected 8004H : Temperature sensor input error 8006H : Cannot get temperature value, ADC input error 8007H : Memory read/write error
1001H	Set point (SV)	Unit is 0.1, °C or °F
1002H	Upper-limit of temperature range	The data content should not be higher than the temperature range
1003H	Lower-limit of temperature range	The data content should not be lower than the temperature range
1004H	Input temperature sensor type	Please refer to the contents of the "Temperature Sensor Type and

Parameter	Setting	Temperature Range* for detail
1005H	Control method	0: PID, 1: ON/OFF, 2: manual tuning, 3: PID program control
1006H	Heating/Cooling control selection	0: Heating, 1: Cooling, 2: Heating/Cooling, 3: Cooling/Heating
1007H	1st group of Heating/Cooling control cycle	0~99, 0:0.5 sec
1008H	2nd group of Heating/Cooling control cycle	0~99, 0:0.5 sec
1009H	PB Proportional band	0.1 ~ 999.9
100AH	TI Integral time	0~9999
100BH	Td Derivative time	0~9999
100CH	Integration default	0~100%, unit is 0.1%
100DH	Proportional control offset error value, when Ti = 0	0~100%, unit is 0.1%
100EH	The setting of COEF when Dual Loop output control are used	0.01 ~ 99.99
100FH	The setting of Dead band when Dual Loop output control are used	-999 ~ 9999
1010H	Hysteresis setting value of the 1st output group	0 ~ 9999
1011H	Hysteresis setting value of the 2nd output group	0 ~ 9999
1012H	Output value read and write of Output 1	Unit is 0.1%, write operation is valid under manual tuning mode only.
1013H	Output value read and write of Output 2	Unit is 0.1%, write operation is valid under manual tuning mode only.
1014H	Upper-limit regulation of analog linear output	1 Unit = 2.8uA(Current Output) = 1.3mV(Linear Voltage Output)
1015H	Lower-limit regulation of analog linear output	1 Unit = 2.8uA(Current Output) = 1.3mV(Linear Voltage Output)
1016H	Temperature regulation value	-999~+999, unit: 0.1
1017H	Analog decimal setting	0 ~ 3
1018H	Time for valve from full open to full close	0.1~999.9
1019H	Dead Band setting of valve	0~100%; unit: 0.1%
101AH	Upper-limit of feedback signal set by valve	0~1024
101BH	Lower-limit of feedback signal set by valve	0~1024
101CH	PID parameter selection	0~4
101DH	SV value corresponded to PID value	Only valid within available range, unit: 0.1 scale
1020H	Alarm 1 type	Please refer to the contents of the "Alarm Outputs" for detail
1021H	Alarm 2 type	Please refer to the contents of the "Alarm Outputs" for detail
1022H	Alarm 3 type	Please refer to the contents of the "Alarm Outputs" for detail
1023H	System alarm setting	0: None (default), 1~3: Set Alarm 1 to Alarm 3
1024H	Upper-limit alarm 1	Please refer to the contents of the "Alarm Outputs" for detail
1025H	Lower-limit alarm 1	Please refer to the contents of the "Alarm Outputs" for detail
1026H	Upper-limit alarm 2	Please refer to the contents of the "Alarm Outputs" for detail
1027H	Lower-limit alarm 2	Please refer to the contents of the "Alarm Outputs" for detail
1028H	Upper-limit alarm 3	Please refer to the contents of the "Alarm Outputs" for detail
1029H	Lower-limit alarm 3	Please refer to the contents of the "Alarm Outputs" for detail
102AH	Read LED status	b0: Alm3, b1: Alm2, b2: F, b3: CT, b4: Alm1, b5: OUT2, b6: OUT1, b7: AT
102BH	Read pushbutton status	b0: Set, b1: Select, b2: Up, b3: Down, 0 is to push
102CH	Setting lock status	0: Normal, 1: All setting lock, 11: Lock others than SV value
102DH	CT read value	Unit: 0.1A
102FH	Software version	V1.00 indicates 0x100
1030H	Start pattern number	0 ~ 7
1040H~1047H	Actual step number setting inside the correspond pattern	0 ~ 7 = N, indicate that this pattern is executed from step 0 to step N
1050H~1057H	Cycle number for repeating the execution of the correspond pattern	0 ~ 99 indicate that this pattern has been executed for 1 ~ 100 times
1060H~1067H	Link pattern number setting of the correspond pattern	0 ~ 8, 8 indicates the program end, 0~7 indicates the next execution pattern number after executing the current pattern
2000H~203FH	Pattern 0~7 temperature set point setting Pattern 0 temperature is set to 2000H~2007H	-999 ~ 9999
2080H~208FH	Pattern 0~7 execution time setting Pattern 0 time is set to 2080H~2087H	Time 0 ~ 900 (1 minute per scale)

14 Panel Cutout and Terminals Identification

Panel Cutout (dimensions are in mm) Terminals Identification

DTB4824

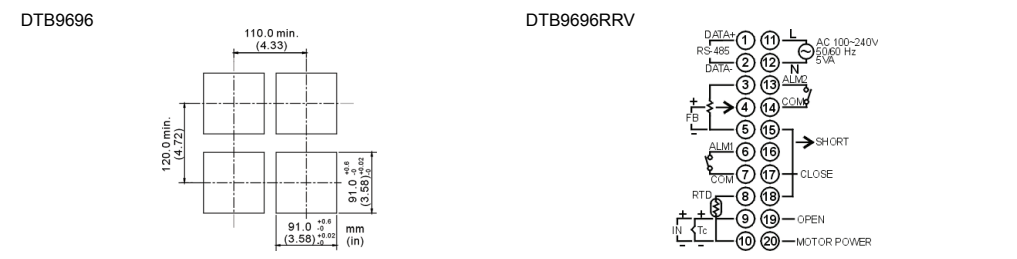
DTB4824

DTB4848

DTB4848

DTB4896

DTB4896/DTB9696



15 External Dimensions

Dimensions are in millimeter (inch)

DTB4824

DTB4848

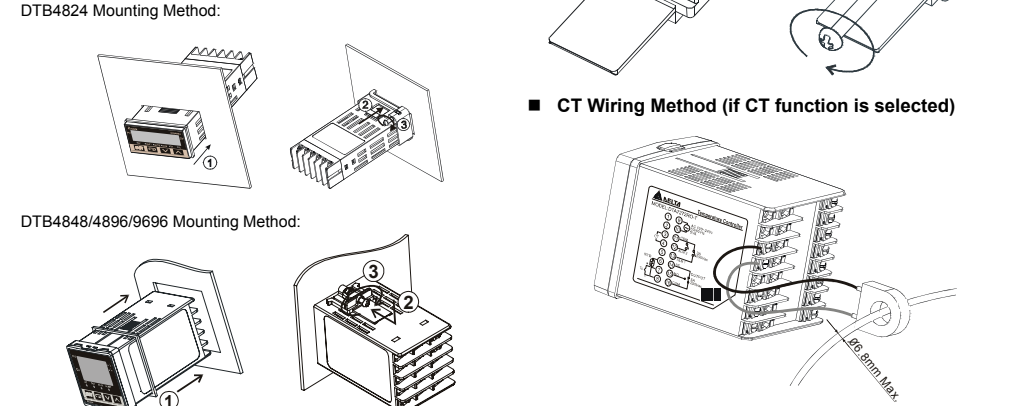
DTB4896

DTB9696

16 Mounting

Mounting Method Mounting Bracket Installation

- Step 1 : Insert the controller through the panel cutout.
- Step 2 : Insert the mounting bracket into the mounting groove at the top and bottom of the controller
- Step 3 : Push the mounting bracket forward until the bracket stops at panel wall.
- Step 4 : Insert and tighten screws on bracket to secure the controller in place. (The screw torque should be 0.8kgf-cm to 1.5kgf-cm)



17 Error Acknowledge and Display

Communication error code response description:

Error Status 102EH / 4750H	PV read back 1000H / 4700H	Error status
0001H	M/A	PV unstable
0002H	8002H	Re-initial, no temperature at this time
0003H	8003H	Input sensor did not connect
0004H	8004H	Input signal error
0005H	N/A	Over input range
0006H	8006H	ADC fail
0007H	N/A	EEPROM read/write error

Display message:

Power ON	Normal display
PV b150	DTB Series, Firmware V1.50
SV urE	Output VR type with Event option
Sensor didn't connect Input error	
PV no	No
SV Cont	Connect
EEPROM error Input over range	
PV Err	Error
SV Pron	EEPROM