

## DTE10T Series Temperature Controller Instruction Sheet

Thank you very much for choosing Delta DTE series temperature controller. Please read this instruction sheet carefully before using your DTE to ensure proper operation. Keep this instruction sheet handy for quick reference.

### ■ Precaution



#### **DANGER! Caution! Electric Shock!**

DTE is an OPEN-TYPE device and therefore should be installed in an enclosure free of airborne dust, humidity, electric shock and vibration. The enclosure should prevent non-maintenance staff from operating the device (e.g. key or specific tools are required for opening the enclosure) in case danger and damage on the device may occur.



#### **WARNING!**

1. Prevent dust or metallic debris from falling into the device and cause malfunctions. DO NOT modify or uninstall the circuit board of DTE without being permitted. DO NOT use empty terminals.
2. Keep away from high-voltage and high-frequency environment during the installation in case of interference. Prevent using the device in premises which contain:
  - (a) dust or corrosive gas; (b) high humidity and high radiation; (c) shock and vibration.
3. The power has to be switched off when wiring or changing the temperature sensor.
4. When installing the circuit board of the accessory, please make sure the power of the main unit is switched off and insert the accessory into the correct slot on the main unit.
5. Make sure to use compensation wire which matches the thermocouple or platinum resistance when extending or connecting the thermocouple or platinum resistance.
6. Keep the wire as short as possible when wiring a sensor to the controller. Separate the power cable and load wire in order to prevent interference and induced noise.
7. Make sure the power cables and signal device are installed correctly before switching on the power; otherwise serious damage may occur.
8. DO NOT touch the terminal or repair the device when the power is on; otherwise an electric shock may occur.
9. Please wait for 1 minute after the power is switched off to allow the capacitor to discharge and DO NOT touch the internal wiring within this period.
10. DO NOT touch the internal terminal when DTE is either switched on or off in case you may damage the circuit.
11. Please place DTE with other heating objects (e.g. power supply) within proper distance while installing DTE.

### ■ Ordering Information

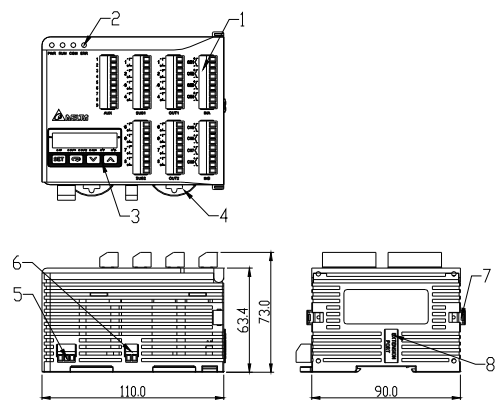
**DTE** 1 2 3 - 4

| Series name                                                                                                                                                                                       | DTE: Delta E series temperature controller |                                                                                                                                                                                                                                                                     |                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <span style="border: 1px solid black; padding: 0 2px;">1</span> Device type                                                                                                                       | 1: main unit                               | 2: accessory                                                                                                                                                                                                                                                        |                                               |
| <span style="border: 1px solid black; padding: 0 2px;">2</span> <span style="border: 1px solid black; padding: 0 2px;">3</span> - <span style="border: 1px solid black; padding: 0 2px;">4</span> | OT: 4-channel TC<br>OP: 3-channel PT       | OT: 4-channel TC<br>OV: 4 channels of voltage pulse output<br>OC: 4 channels of linear current output<br>OR: 4 channels of relay output<br>OL: 4 channels of linear voltage output<br>CT: 4 channels of current transformer sensors<br>DS: Display and setup module | OP: 3-channel PT<br>OD: 8-channel EVENT input |

## ■ Specifications

|                               |                                                                                                                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power input                   | 24 VDC, isolated switching power supply                                                                                                                         |
| Voltage range                 | 90 to 110% rated voltage                                                                                                                                        |
| Power consumption             | Max. 10 W + 3 W × number of DTC2000 controllers connected in parallel (Max. 7)                                                                                  |
| Input sensor                  | Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK<br>Platinum resistance: Pt100, JPt100, Cu50                                                                     |
| Sampling cycle                | Thermocouple or platinum resistance: 1.0 second/all input                                                                                                       |
| Control method                | PID, PID programmable, manual, ON/OFF                                                                                                                           |
| Output accessories (optional) | Relay output: SPST, Max. 250 VAC load, 3 A resistive load                                                                                                       |
|                               | Voltage pulse output: 12 VDC, Max. 40 mA current output                                                                                                         |
|                               | Current output: DC 4 to 20 mA output (resistive load < 500Ω); for OUT1 and OUT2 only                                                                            |
|                               | Analog voltage output: 0 to 10V (resistive load > 1,000Ω); for OUT1 and OUT2 only                                                                               |
| Output functions              | Control output, alarm output or proportional output (proportional output is only applicable in the model with linear voltage and current output for OUT1, OUT2) |
| Alarm modes                   | 13 alarm modes available                                                                                                                                        |
| Communication                 | RS-485 digital communication; supports baudrate 2,400 to 115,200bps                                                                                             |
| Communication protocol        | Supports Modbus ASCII/RTU                                                                                                                                       |
| Extension port                | The extension port transmits 24V power supply and communication signals to extension module DTC2000.                                                            |
| Vibration resistance          | 10 to 55Hz 10m/s <sup>2</sup> 3 axes 10mins                                                                                                                     |
| Shock resistance              | Max. 300m/s <sup>2</sup> 3 axes 6 directions, 3 times each                                                                                                      |
| Ambient temperature           | 0 to +50°C                                                                                                                                                      |
| Storage temperature           | -20 to +65°C                                                                                                                                                    |
| Operation altitude            | < 2,000m                                                                                                                                                        |
| Ambient humidity              | 35 to 85% RH (non-condensing)                                                                                                                                   |
| Pollution degree              | 2                                                                                                                                                               |

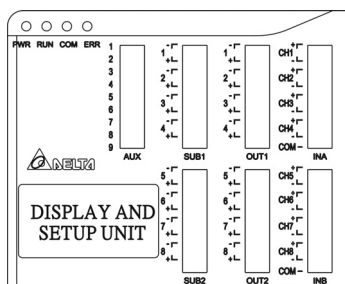
## ■ Product Profile & Outline



### DTE10T

|   |                              |
|---|------------------------------|
| 1 | I/O terminals                |
| 2 | Status LED                   |
| 3 | Display and setup unit       |
| 4 | DIN rail clip                |
| 5 | Power input port             |
| 6 | RS-485 communication port    |
| 7 | Extension module fixing clip |
| 8 | Extension port               |

## ■ Panel Layout



## ■ Input

The standard DTE main unit is attached with 4 channels of inputs. You can purchase additional DTE20T or DTE20P to expand the number of input channels. DTE supports maximum 8 channels of inputs which belong to group INA and group INB. Each group possesses 4 input channels.

DTE series supports the following input sensors:

| Input Sensor Type                         | Register Value | Range          |
|-------------------------------------------|----------------|----------------|
| For DTE10P / DTE20P                       |                |                |
| Temperature measurement resistance (Cu50) | 13             | -50 ~ 150°C    |
| Platinum resistance (Pt100)               | 12             | -200 ~ 600°C   |
| Platinum resistance (JPT100)              | 11             | -20 ~ 400°C    |
| For DTE10T / DTE20T                       |                |                |
| Thermocouple TXK type                     | 10             | -200 ~ 800°C   |
| Thermocouple U type                       | 9              | -200 ~ 500°C   |
| Thermocouple L type                       | 8              | -200 ~ 850°C   |
| Thermocouple B type                       | 7              | 100 ~ 1,800°C  |
| Thermocouple S type                       | 6              | 0 ~ 1,700°C    |
| Thermocouple R type                       | 5              | 0 ~ 1,700°C    |
| Thermocouple N type                       | 4              | -200 ~ 1,300°C |
| Thermocouple E type                       | 3              | 0 ~ 600°C      |
| Thermocouple T type                       | 2              | -200 ~ 400°C   |
| Thermocouple J type                       | 1              | -100 ~ 1,200°C |
| Thermocouple K type                       | 0              | -200 ~ 1,300°C |

Note: The default setting in DTE10T is "thermocouple K type". The default setting in DTE10P is "Pt100".

Communication address: Input sensor types at H10A0 ~ H10A7; input upper limits at H1010 ~ H1017; input lower limits at H1018 ~ H101F.

## ■ Output

DTE supports maximum 16 channels of outputs, belonging to output groups OUT1, OUT2, SUB1 and SUB2, each group with 4 channels. See the explanations below for how input channels correspond to output groups.

- Without group INB (4 channels of input): Every channel corresponds to 2 groups of output and 2 groups of alarms. OUT1 and SUB1 are for control output, and OUT2 and SUB2 are fixed for alarm output.
- With group INB (8 channels of input): Every channel is paired with 2 groups of outputs. OUT1 and OUT2 are used for control output or proportional output of CH1 ~ CH8. SUB1 and SUB2 are used for control output or alarm output.

See Table 1 for the relations between input and output.

| Output Group | 4 channels of input                        | 8 channels of input                        |                                            |
|--------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|
|              | INA (CH1 ~ CH4)                            | INA (CH1 ~ CH4)                            | INB (CH5 ~ CH8)                            |
| OUT1         | Main control output or proportional output | Main control output or proportional output | No corresponding output                    |
| OUT2         | Alarm 1 output                             | No corresponding output                    | Main control output or proportional output |
| SUB1         | Control output                             | Control output or alarm output             | No corresponding output                    |
| SUB2         | Alarm 2 output                             | No corresponding output                    | Control output or alarm output             |

Table 1

Note: SUB1 and SUB2 do not support DTE20L and DTE20C. Please install the optional output modules you purchase into the correct slot.

### ● Communication Address of Output & How to Set up Parameters

See Table 2 for the communication addresses of output and Table 3 for the definition of the value in the address.

|            | INA   |       |       |       | INB   |       |       |       |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
|            | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
| OUT1, OUT2 | H10A8 | H10A9 | H10AA | H10AB | H10AC | H10AD | H10AE | H10AF |
| SUB1, SUB2 | H10B0 | H10B1 | H10B2 | H10B3 | H10B4 | H10B5 | H10B6 | H10B7 |

Table 2

|              | Value = 0       | Value = 1       | Value = 2           | Value = 3      |
|--------------|-----------------|-----------------|---------------------|----------------|
| OUT1, OUT2** | Heating control | Cooling control | Proportional output | Disable output |
| SUB1, SUB2** | Heating control | Cooling control | Alarm output*       | Disable output |

Table 3

\*When there are only 4 channels of inputs, SUB1 cannot be used for alarm output but heating/cooling control only.

\*\*When there are only 4 channels of inputs, OUT2 and SUB2 cannot be set up by the user but set up automatically as "alarm output" by the controller.

## • Control Output

DTE offers PID control, ON/OFF control, manual control and programmable PID control. Control output methods are set at address H10B8 ~ H10BF (default = 0: PID), PID parameters at H1028 ~ H105F, ON/OFF parameters at H1058 ~ H106F, and manual control parameters at H1070 ~ H107F.

## • Alarm Output

DTE offers 13 alarm modes. The alarm modes are set up at address H10C0 ~ H10C7, upper limits at H1080 ~ H1087 and lower limits at H1088 ~ H108F.

| SV | Alarm Mode                                                                                                                                                                          | Alarm Output Operation |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 0  | No alarm                                                                                                                                                                            | Off                    |
| 1  | Alarm output is enabled when the temperature reaches upper and lower limits: The alarm will be enabled when PV exceeds SV + AL-H or falls below SV – AL-L.                          |                        |
| 2  | Alarm output will be enabled when the temperature reaches the upper limit: The alarm will be enabled when the PV exceeds SV + AL-H.                                                 |                        |
| 3  | Alarm output will be enabled when the temperature reaches the lower limit: The alarm will be enabled when the PV falls below SV – AL-L.                                             |                        |
| 4  | Alarm output will be enabled when the PV is between SV + AL-H and SV – AL-L.                                                                                                        |                        |
| 5  | Alarm output will be enabled when the temperature reaches the absolute value of the upper and lower limits: The alarm will be enabled when the PV exceeds AL-H or falls below AL-L. |                        |
| 6  | Alarm output will be enabled when the temperature reaches the absolute value of the upper limit: The alarm will be enabled when the PV exceeds AL-H.                                |                        |
| 7  | Alarm output will be enabled when the temperature reaches the absolute value of the lower limit: The alarm will be enabled when the PV falls below AL-L.                            |                        |
| 8  | Upper/lower limit standby alarm: The alarm will be enabled when the PV reaches SV and further exceeds SV + AL-H or falls below SV – AL-L.                                           |                        |
| 9  | Upper limit standby alarm: The alarm will be enabled when the PV reaches SV and further exceeds SV + AL-H.                                                                          |                        |
| 10 | Lower limit standby alarm: The alarm will be enabled when the PV reaches SV and further falls below SV – AL-L.                                                                      |                        |
| 11 | Upper limit hysteresis alarm: The alarm will be enabled when the PV exceeds SV + AL-H. The alarm will be disabled when the PV falls below SV + AL-L.                                |                        |
| 12 | Lower limit hysteresis alarm: The alarm will be enabled when the PV falls below SV – AL-H. The alarm will be disabled when the PV exceeds SV – AL-L.                                |                        |
| 13 | CT alarm: The alarm will be enabled when the CT value exceeds AL-H or falls below AL-L.                                                                                             |                        |

## ■ LED Display

PWR: On ⇒ DTE is powered.

RUN: On ⇒ Any of the channel is executing.

COM: Flashing ⇒ Communication in progress

ERR: Indicating errors (red)

ERR LED is on indicates one of the following errors occur, and the output has to be disabled.

1. Memory EEPROM error.
2. Any of the input points is not connected.
3. Any of the input points exceeds the setup range.
4. Any of the input temperatures has not been stabilized.

## ■ Synchronous Communication Protocol & Auto ID Setup

This function allows the auto setup of communication protocol in extension module DTC2000 and DTC2001 following the communication protocol set in the DTE main unit. The station IDs of DTC decrease. See below for the steps.

1. Set the auto communication ID of DTE as "1" (communication address: H10F8).
2. Switch off DTE. Connect DTE with extension module DTC2000, DTC2001 and switch on DTE again.
3. Default communication protocol: 9,600bps, 7 bits, Even, 1 stop bit, communication address = 01.
4. This function will consume 3 ~ 5 seconds more when you switch on DTE.

## ■ CT (Current Transformer)

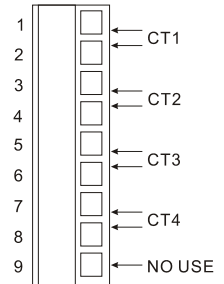
### • Function

DTE10T offers maximum 4 channels of CT (CT1 ~ CT4), responsible for monitoring the current in INA.

Each CT group can be set up independently. With alarm outputs, when the detected current value is beyond the allowed range, the corresponding alarm will be enabled.

Slot INA offers 4 channels of input, and CH1 ~ CH4 correspond to the current detected at CT1 ~ CT4.

Hardware requirement: Accessory DTE2CT inserted in the slot AUX.



### • How to Operate

1. Enable the CT function: Write 1234H into the address 47F1H and then 0004H into address 4824H.

| bits in 4824H | Bit7 | Bit6               | Bit5          | Bit4 | Bit3  | Bit2 | Bit1  | Bit0 |
|---------------|------|--------------------|---------------|------|-------|------|-------|------|
| Flag          | --   | Hot runner control | Slope control | --   | Latch | CT   | EVENT | --   |

Notes:

- The flag to enable CT is at bit2 of 4824H. Write 0004H to bit2 to set it on.
  - If the "multistate" function is enabled, for example, writing in 0024H means enabling bit5 and bit2 at the same time.
  - You can only choose to use either the CT or EVENT function.
  - If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.
2. When you use INA input or INA + INB input, set up relevant parameters using the table below.  
INA input:

| INA                           | CH1   | CH2   | CH3   | CH4   |
|-------------------------------|-------|-------|-------|-------|
| OUT1 control mode             | 10A8H | 10A9H | 10AAH | 10ABH |
| OUT2 control mode             | 10B0H | 10B1H | 10B2H | 10B3H |
| Alarm 1 output mode           | 10C0H | 10C1H | 10C2H | 10C3H |
| Alarm 2 output mode           | 10C4H | 10C5H | 10C6H | 10C7H |
| Upper bound of Alarm 1 output | 1080H | 1081H | 1082H | 1083H |
| Lower bound of Alarm 1 output | 1088H | 1089H | 108AH | 108BH |
| Upper bound of Alarm 2 output | 1084H | 1085H | 1086H | 1087H |
| Lower bound of Alarm 2 output | 108CH | 108DH | 108EH | 108FH |
| CT value (latch)              | 19A0H | 19A1H | 19A2H | 19A3H |
| CT value (dynamic)            | 19A4H | 19A5H | 19A6H | 19A7H |

INA + INB input:

| INA+INB                       | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| OUT1 control mode             | 10A8H | 10A9H | 10AAH | 10ABH | 10ACH | 10ADH | 10AEH | 10AFH |
| Alarm 1 output mode           | 10C0H | 10C1H | 10C2H | 10C3H | 10C4H | 10C5H | 10C6H | 10C7H |
| Upper bound of Alarm 1 output | 1080H | 1081H | 1082H | 1083H | 1084H | 1085H | 1086H | 1087H |
| Lower bound of Alarm 1 output | 1088H | 1089H | 108AH | 108BH | 108CH | 108DH | 108EH | 108FH |
| CT value (latch)              | 19A0H | 19A1H | 19A2H | 19A3H | --    | --    | --    | --    |
| CT value (dynamic)            | 19A4H | 19A5H | 19A6H | 19A7H | --    | --    | --    | --    |

- OUT1 control mode has to be set to "0" (heating) or "1" (cooling). It cannot be set to "2" (proportional output).
- You can select Alarm 1 or Alarm 2 to be the output contact. The output mode has to be set to "13" (000DH).
- Adjust the upper/lower bound of the alarm output.
- The CT value will only be measured when there is OUT1 executing. If OUT1 does not exist, the previous CT value measured will be displayed.

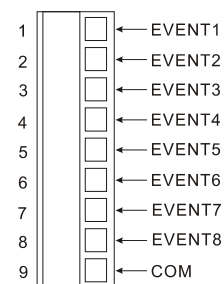
## ■ EVENT Input

### • Function

DTE10T offers 8 channels of EVENT input (EV1 ~ EV8), and each EVENT can be set up independently. Slot number 1 ~ 8 in AUX on DTE10T correspond to EV1 ~ EV8.

EV1 to EV8 can be short-circuited individually with slot number 9 to switch functions.

Hardware requirement: Accessory DTE20D inserted in the slot AUX.



### • How to Operate

- Enable the EVENT function: Write 1234H into the address 47F1H and then 0002H into address 4824H.

| bits in 4824H | Bit7 | Bit6               | Bit5          | Bit4 | Bit3  | Bit2 | Bit1  | Bit0 |
|---------------|------|--------------------|---------------|------|-------|------|-------|------|
| Flag          | --   | Hot runner control | Slope control | --   | Latch | CT   | EVENT | --   |

Notes:

- The flag to enable EVENT is at bit1 of 4824H. Write 0002H to bit1 to set it on.
  - If the "multistate" function is enabled, for example, writing in 0022H means enabling bit5 and bit1 at the same time.
  - You can only choose to use either the CT or EVENT function.
  - If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.
- Each channel can be set up individually for specific functions.

Addresses:

| CH                             | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Address for the EVENT function | 1998H | 1999H | 199AH | 199BH | 199CH | 199DH | 199EH | 199FH |

Functions:

| Set value | 0   | 1                                          | 2                                         | 3                                             | 4                                               |
|-----------|-----|--------------------------------------------|-------------------------------------------|-----------------------------------------------|-------------------------------------------------|
| Function  | N/A | RUN (open circuit)<br>STOP (short circuit) | SV1 (open circuit)<br>SV2 (short circuit) | Auto (open circuit)<br>Manual (short circuit) | Execute (open circuit)<br>Pause (short circuit) |

Definitions:

- RUN/STOP: To enable or disable the output.
- SV1/SV2: To switch between set values.
- Auto/manual: To switch between the PID and manual controls.
- Execute/pause: To execute or pause the counting time when in programmable PID control.

Example: If you would like the function of EVENT1 at CH1 to be "SV1/SV2", write 0002H into address 1998H.

## ■ Slope

### • Function

The temperature rises according to the slope set. Unit: 0.1°C/min.

Example: Suppose the slope is set to "50" and SV "200.0°C", then the temperature will rise at 5°C per minute until it reaches 200.0°C.

## • How to Operate

1. Enable the slope function: Write 1234H into the address 47F1H and then 0020H into address 4824H.

| bits in 4824H | Bit7 | Bit6               | Bit5          | Bit4 | Bit3  | Bit2 | Bit1  | Bit0 |
|---------------|------|--------------------|---------------|------|-------|------|-------|------|
| Flag          | --   | Hot runner control | Slope control | --   | Latch | CT   | EVENT | --   |

Notes:

- The flag to enable slope function is at bit5 of 4824H. Write 0020H to bit5 to set it on.
- If the “multistate” function is enabled, for example, writing 0022H means enabling bit5 and bit1 at the same time.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

2. Set up relevant parameters using the table below.

| CH                 | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Set value (SV)     | 1008H | 1009H | 100AH | 100BH | 100CH | 100DH | 100EH | 100FH |
| Slope (unit: 0.1°) | 1970H | 1971H | 1972H | 1973H | 1974H | 1975H | 1976H | 1977H |

Note: To stabilize the control, first execute auto-tuning when the slope function is selected. When auto-tuning is being executed, the slope control will stop.

## ■ Programmable PID Latch Function

### • Function

DTE10T offers programmable PID latch function. When the power is off and on again, the status before the power is cut off can be retained.

### • How to Operate

1. Enable the programmable PID latch function: Write 1234H into the address 47F1H and then 0008H into address 4824H.

| bits in 4824H | Bit7 | Bit6               | Bit5          | Bit4 | Bit3  | Bit2 | Bit1  | Bit0 |
|---------------|------|--------------------|---------------|------|-------|------|-------|------|
| Flag          | --   | Hot runner control | Slope control | --   | Latch | CT   | EVENT | --   |

Notes:

- The flag to enable PID latch is at bit3 of 4824H. Write 0008H to bit3 to set it on.
- If the “multistate” function is enabled, for example, writing in 0028H means enabling bit5 and bit3 at the same time.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

## ■ Opposite Output

### • Function

The 8 channels on DTE10T can be set to opposite output, that is, when the output is set to 0, the actual output will be 1.

### • How to Operate

To set CH1 and CH3 to opposite output, first write 1234H into the address 47F1H and then 0005H into address 4821H to set on CH1 (bit0) and CH3 (bit2).

| CH8  | CH7  | CH6  | CH5  | CH4  | CH3  | CH2  | CH1  |
|------|------|------|------|------|------|------|------|
| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |

## ■ Delayed Alarm

### • Function

When the set condition for alarms is met, the alarm will be enabled after a pre-set period of time.

### • How to Operate

Set up the time using the table below. Unit: second

| CH                        | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Address for delayed alarm | 1990H | 1991H | 1992H | 1993H | 1994H | 1995H | 1996H | 1997H |

## ■ Output Limits

### • Function

The output is limited between the maximum and minimum percentages.

### • How to Operate

Set up relevant parameters using the table below.

| CH              | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Max. output (%) | 1980H | 1981H | 1982H | 1983H | 1984H | 1985H | 1986H | 1987H |
| Min. output (%) | 1988H | 1989H | 198AH | 198BH | 198CH | 198DH | 198EH | 198FH |

Note: When the output volume is limited at 20 to 80%, it means the output volume 0 to 100% calculated by the controller is corresponding to the actual output 20 to 80%.

## ■ Programmable Control Time Unit

### • Function

The unit of programmable control time can be “minute” or “second”.

### • How to Operate

Write 0 to the address to set the time unit to “minute” (default) or write 1 to set it to “second”.

| CH                    | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Address for time unit | 1978H | 1979H | 197AH | 197BH | 197CH | 197DH | 197EH | 197FH |

## ■ Input Filter

### • Function

To avoid unstable PV display due to interferences, DTE10T offers the filter function. Instead of averaging the values, the filter function here calculate the weighted average value of the “current PV” and “previous PV”.

**The filter equation: PV (displayed value) = [previous PV x (filter times – 1) + current PV] / filter times**

The bigger the filter times, the bigger the weight of the previous PV, and the smoother the temperature display, which is a good way to suppress interferences.

### • How to Operate

Set up relevant parameters using the table below.

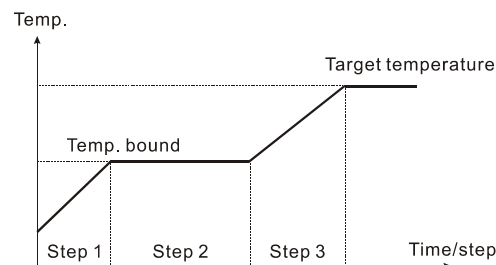
| Parameter    | Address | Default value | Range      |
|--------------|---------|---------------|------------|
| Filter times | 10F7H   | 8             | 0 ~ 50     |
| Filter range | 10F9H   | 1.0           | 0.1 ~ 10.0 |

## ■ Hot Runner Control

### • Function

The hot runner control includes 3 steps:

1. Heating up by constant output volume
2. Timed PID control (Soak)
3. Slope heating to the target temperature (SV)



### • How to Operate

1. Enable the hot runner control function: Write 1234H into the address 47F1H and then 0060H into address 4824H.

| bits in 4824H | Bit7 | Bit6               | Bit5          | Bit4 | Bit3  | Bit2 | Bit1  | Bit0 |
|---------------|------|--------------------|---------------|------|-------|------|-------|------|
| Flag          | --   | Hot runner control | Slope control | --   | Latch | CT   | EVENT | --   |

Notes:

- The flag to enable hot runner control is at bit6 of 4824H (and bit5 as to be enabled at the same time). Write 0060H to set both bits on.



- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.
2. Set up relevant parameters using the table below.

| CH                                  | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
|-------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Temp. bound (unit: 0.1°)            | 1960H | 1961H | 1962H | 1963H | 1964H | 1965H | 1966H | 1967H |
| Constant output volume (unit: 0.1%) | 1968H | 1969H | 196AH | 196BH | 196CH | 196DH | 196EH | 196FH |
| Timed time (unit: min.)             | 19B0H | 19B1H | 19B2H | 19B3H | 19B4H | 19B5H | 19B6H | 19B7H |
| Target temperature (unit: 0.1°)     | 1008H | 1009H | 100AH | 100BH | 100CH | 100DH | 100EH | 100FH |
| Slope (unit: 0.1°)                  | 1970H | 1971H | 1972H | 1973H | 1974H | 1975H | 1976H | 1977H |

### • Example

Assume the temperature bound is 100.0, constant output volume is 35.0, timed time is 15, target temperature is 200.0 and slope is 20.0, thus

1. The heater outputs by the 35% constant volume and waits for the temperature to rise to 100 degrees,
2. When the temperature hits 100 degrees, switch to the PID soak mode and retain the temperature constantly for 15 minutes.
3. When the time is up, switch to the slope control mode, executing the condition of a 20 degree temperature rise every minute.
4. When the heating achieves 200 degrees, the hot runner control is completed.

## ■ RS-485 Communication

1. DTE supports baudrates 2,400/4,800/9,600/19,200/38,400/57,600/115,200 bps and does not support communication format 7, N, 1/8, E, 2/8, O, 2. Communication protocol = Modbus ASCII or RTU.
2. Function codes: H03 = read maximum 8 words in the register; H06 = write 1 word into the register.
3. Address and contents: Every parameter has 2 communication addresses. One is numbered by the function of the parameter, and the other is by the order of channel (as shown in the table below).

| Content                                                | Explanation                             | INA              |                  |                  |                  | INB              |                  |                  |                  |
|--------------------------------------------------------|-----------------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                                                        |                                         | CH1              | CH2              | CH3              | CH4              | CH5              | CH6              | CH7              | CH8              |
| Present temperature value/input error code             | Unit: 0.1<br>See Table 5                | H1000<br>(H1100) | H1001<br>(H1200) | H1002<br>(H1300) | H1003<br>(H1400) | H1004<br>(H1500) | H1005<br>(H1600) | H1006<br>(H1700) | H1007<br>(H1800) |
| Set temperature value                                  | Unit: 0.1                               | H1008<br>(H1101) | H1009<br>(H1201) | H100A<br>(H1301) | H100B<br>(H1401) | H100C<br>(H1501) | H100D<br>(H1601) | H100E<br>(H1701) | H100F<br>(H1801) |
| Max. temperature value                                 | Disabled when higher than default value | H1010<br>(H1102) | H1011<br>(H1202) | H1012<br>(H1302) | H1013<br>(H1402) | H1014<br>(H1502) | H1015<br>(H1602) | H1016<br>(H1702) | H1017<br>(H1802) |
| Min. temperature value                                 | Disabled when lower than default value  | H1018<br>(H1103) | H1019<br>(H1203) | H101A<br>(H1303) | H101B<br>(H1403) | H101C<br>(H1503) | H101D<br>(H1603) | H101E<br>(H1703) | H101F<br>(H1803) |
| Error temperature value                                | -999 ~ +999<br>Unit: 0.1°C              | H1020<br>(H1104) | H1021<br>(H1204) | H1022<br>(H1304) | H1023<br>(H1404) | H1024<br>(H1504) | H1025<br>(H1604) | H1026<br>(H1704) | H1027<br>(H1804) |
| Proportional band value (Pb)                           | 0 ~ 9,999<br>Unit: 0.1                  | H1028<br>(H1105) | H1029<br>(H1205) | H102A<br>(H1305) | H102B<br>(H1405) | H102C<br>(H1505) | H102D<br>(H1605) | H102E<br>(H1705) | H102F<br>(H1805) |
| Ti value                                               | 0 ~ 9,999                               | H1030<br>(H1106) | H1031<br>(H1206) | H1032<br>(H1306) | H1033<br>(H1406) | H1034<br>(H1506) | H1035<br>(H1606) | H1036<br>(H1706) | H1037<br>(H1806) |
| Td value                                               | 0 ~ 9,999                               | H1038<br>(H1107) | H1039<br>(H1207) | H103A<br>(H1307) | H103B<br>(H1407) | H103C<br>(H1507) | H103D<br>(H1607) | H103E<br>(H1707) | H103F<br>(H1807) |
| Integration default                                    | 0.0 ~ 100.0%<br>Unit: 0.1%              | H1040<br>(H1108) | H1041<br>(H1208) | H1042<br>(H1308) | H1043<br>(H1408) | H1044<br>(H1508) | H1045<br>(H1608) | H1046<br>(H1708) | H1010<br>(H1808) |
| Proportional control offset error value, when Ti = 0   | 0.0 ~ 100.0%<br>Unit: 0.1%              | H1048<br>(H1109) | H1049<br>(H1209) | H104A<br>(H1309) | H104B<br>(H1409) | H104C<br>(H1509) | H104D<br>(H1609) | H104E<br>(H1709) | H104F<br>(H1809) |
| Proportional band coefficient of output 1 and output 2 | 0.01 ~ 99.99<br>Unit: 0.01              | H1050<br>(H110A) | H1051<br>(H120A) | H1052<br>(H130A) | H1053<br>(H140A) | H1054<br>(H150A) | H1055<br>(H160A) | H1056<br>(H170A) | H1057<br>(H180A) |
| Dead band of control output 1 & output 2.              | -99.9 ~ 999.9                           | H1058<br>(H110B) | H1059<br>(H120B) | H105A<br>(H130B) | H105B<br>(H140B) | H105C<br>(H150B) | H105D<br>(H160B) | H105E<br>(H170B) | H105F<br>(H180B) |
| Hysteresis for output 1                                | 0 ~ 9,999<br>Unit: 0.1%                 | H1060<br>(H110C) | H1061<br>(H120C) | H1062<br>(H130C) | H1063<br>(H140C) | H1064<br>(H150C) | H1065<br>(H160C) | H1066<br>(H170C) | H1067<br>(H180C) |
| Hysteresis for output 2                                | 0 ~ 9,999<br>Unit: 0.1%                 | H1068<br>(H110D) | H1069<br>(H120D) | H106A<br>(H130D) | H106B<br>(H140D) | H106C<br>(H150D) | H106D<br>(H160D) | H106E<br>(H170D) | H106F<br>(H180D) |

| Content                                 | Explanation                                                                   | INA                       |                                           |                                       |                               | INB                           |                               |                   |                             |
|-----------------------------------------|-------------------------------------------------------------------------------|---------------------------|-------------------------------------------|---------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------|-----------------------------|
|                                         |                                                                               | CH1                       | CH2                                       | CH3                                   | CH4                           | CH5                           | CH6                           | CH7               | CH8                         |
| Read/write output 1 value               | Unit: 0.1 %                                                                   | H1070<br>(H110E)          | H1071<br>(H120E)                          | H1072<br>(H130E)                      | H1073<br>(H140E)              | H1074<br>(H150E)              | H1075<br>(H160E)              | H1076<br>(H170E)  | H1077<br>(H180E)            |
| Read/write output 2 value               | Unit: 0.1 %                                                                   | H1078<br>(H110F)          | H1079<br>(H120F)                          | H107A<br>(H130F)                      | H107B<br>(H140F)              | H107C<br>(H150F)              | H107D<br>(H160F)              | H107E<br>(H170F)  | H107F<br>(H180F)            |
| Upper limit for alarm output            | Alarm enabled when temperature exceeds upper limit                            | H1080<br>(H1110)          | H1081<br>(1210)                           | H1082<br>(H1310)                      | H1083<br>(H1410)              | H1084<br>(H1510)              | H1085<br>(H1610)              | H1086<br>(H1710)  | H1087<br>(H1810)            |
| Lower limit for alarm output            | Alarm enabled when temperature falls below lower limit                        | H1088<br>(H1111)          | H1089<br>(H1211)                          | H108A<br>(H1311)                      | H108B<br>(H1411)              | H108C<br>(H1511)              | H108D<br>(H1611)              | H108E<br>(H1711)  | H108F<br>(H1811)            |
| Tuning for upper limit of analog output | Current (4 ~ 20mA) or voltage output tuning                                   | H1090<br>(H1112)          | H1091<br>(H1212)                          | H1092<br>(H1312)                      | H1093<br>(H1412)              | H1094<br>(H1512)              | H1095<br>(H1612)              | H1096<br>(H1712)  | H1097<br>(H1812)            |
| Tuning for lower limit of analog output | Current (4 ~ 20mA) or voltage output tuning                                   | H1098<br>(H1113)          | H1099<br>(H1213)                          | H109A<br>(H1313)                      | H109B<br>(H1413)              | H109C<br>(H1513)              | H109D<br>(H1613)              | H109E<br>(H1713)  | H109F<br>(H1813)            |
| Input sensor type                       | See "Input" section                                                           | H10A0<br>(H1114)          | H10A1<br>(H1214)                          | H10A2<br>(H1314)                      | H10A3<br>(H1414)              | H10A4<br>(H1514)              | H10A5<br>(H1614)              | H10A6<br>(H1714)  | H10A7<br>(H1814)            |
| Output function for output 1            | 0: heating<br>1: cooling<br>2: proportional output                            | H10A8<br>(H1115)          | H10A9<br>(H1215)                          | H10AA<br>(H1315)                      | H10AB<br>(H1415)              | H10AC<br>(H1515)              | H10AD<br>(H1615)              | H10AE<br>(H1715)  | H10AF<br>(H1815)            |
| Output function for output 2            | 0: heating (default)<br>1: cooling<br>2: alarm                                | H10B0<br>(H1116)          | H10B1<br>(H1216)                          | H10B2<br>(H1316)                      | H10B3<br>(H1416)              | H10B4<br>(H1516)              | H10B5<br>(H1616)              | H10B6<br>(H1716)  | H10B7<br>(H1816)            |
| Control method                          | 0: PID<br>1: ON-OFF<br>2: manual<br>3: PID programmable                       | H10B8<br>(H1117)          | H10B9<br>(H1217)                          | H10BA<br>(H1317)                      | H10BB<br>(H1417)              | H10BC<br>(H1517)              | H10BD<br>(H1617)              | H10BE<br>(H1717)  | H10BF<br>(H1817)            |
| Alarm 1 output mode                     | See "Alarm Output" section                                                    | H10C0<br>(H1118)          | H10C1<br>(H1218)                          | H10C2<br>(H1318)                      | H10C3<br>(H1418)              | H10C4<br>(H1518)              | H10C5<br>(H1618)              | H10C6<br>(H1718)  | H10C7<br>(H1818)            |
| Alarm 2 output mode                     | See "Alarm Output" section                                                    | H10C4<br>(H1518)          | H10C5<br>(H1618)                          | H10C6<br>(H1718)                      | H10C7<br>(H1818)              |                               |                               |                   |                             |
| Heating/cooling cycle for output 1      | 1 ~ 99 seconds<br>0 = 0.5 second                                              | H10C8<br>(H1119)          | H10C9<br>(H1219)                          | H10CA<br>(H1319)                      | H10CB<br>(H1419)              | H10CC<br>(H1519)              | H10CD<br>(H1619)              | H10CE<br>(H1719)  | H10CF<br>(H1819)            |
| Heating/cooling cycle for output 2      | 1 ~ 99 seconds<br>0 = 0.5 second                                              | H10D0<br>(H111A)          | H10D1<br>(H121A)                          | H10D2<br>(H131A)                      | H10D3<br>(H141A)              | H10D4<br>(H151A)              | H10D5<br>(H161A)              | H10D6<br>(H171A)  | H10D7<br>(H181A)            |
| Run/Stop the control                    | 0: stop<br>1: executing<br>2: program stops<br>3: program pauses              | H10D8<br>(H111B)          | H10D9<br>(H121B)                          | H10DA<br>(H131B)                      | H10DB<br>(H141B)              | H10DC<br>(H151B)              | H10DD<br>(H161B)              | H10DE<br>(H171B)  | H10DF<br>(H181B)            |
| Status of PID auto-tuning               | 0: stop<br>1: executing                                                       | H10E0<br>(H111C)          | H10E1<br>(H121C)                          | H10E2<br>(H131C)                      | H10E3<br>(H141C)              | H10E4<br>(H151C)              | H10E5<br>(H161C)              | H10E6<br>(H171C)  | H10E7<br>(H181C)            |
| Positive/negative proportional output   | 0: positive<br>1: negative (slope)                                            | H10E8<br>(H111D)          | H10E9<br>(H121D)                          | H10EA<br>(H131D)                      | H10EB<br>(H141D)              | H10EC<br>(H151D)              | H10ED<br>(H161D)              | H10EE<br>(H171D)  | H10EF<br>(H181D)            |
| Other statuses                          | Other statuses                                                                | H10F0<br>Temperature unit | H10F1<br>Open special function<br>(H1234) | H10F2<br>Return to default<br>(H1357) | H10F3<br>Reserved             | H10F4<br>Reserved             | H10F5<br>Reserved             | H10F6<br>Reserved | H10F7<br>Reserved           |
| Communication specifications            | See Table 4                                                                   | H10F8<br>Auto ID setup    | H10F9<br>Reserved                         | H10FA<br>Baudrate                     | H10FB<br>ASCII = 0<br>RTU = 1 | H10FC<br>8 bits=0<br>7 bits=1 | H10FD<br>2 stop=0<br>1 stop=1 | H10FE<br>Parity   | H10FF<br>Address<br>1 ~ 247 |
| LED status                              | b1: Alarm 2; b2: °C;<br>b3: °F; b4: Alarm 1;<br>b5: OUT2; b6: OUT1;<br>b7: AT | H1124                     | H1224                                     | H1324                                 | H1424                         | H1524                         | H1624                         | H1724             | H1824                       |

## • Communication Parameter Setting

| Content    | 0        | 1        | 2        | 3         | 4         | 5         | 6          |
|------------|----------|----------|----------|-----------|-----------|-----------|------------|
| Baudrate   | 2,400bps | 4,800bps | 9,600bps | 19,200bps | 38,400bps | 57,600bps | 115,200bps |
| Parity bit | None (N) | Even (E) | Odd (O)  |           |           |           |            |

Table 4

## • Error Codes

The error codes can be read from address H1000 ~ H1007. When the input operation is in normal status, H1000 ~ H1007 are for input values. When input error occurs (except for stable status and input exceeding the range), DTE will read error codes in H8001 ~ H8002.

|       |                                |
|-------|--------------------------------|
| H1000 | Error description              |
| H8001 | EEPROM cannot be written in.   |
| H8002 | Input sensor is not connected. |
| H8003 | Group INB is not connected.    |

Table 5

**Analog output current tuning scale:** 1μA/scale

**Analog output voltage tuning scale:** 1mV/scale

**Returning to Default Value:** Write H1234 into address H10F1 and H1357 into address H10F2. Restart DTE.

## • Programmable Communication Parameter Setting

| Content                             | Explanation | INA   |       |       |       | INB   |       |       |       |
|-------------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                     |             | CH1   | CH2   | CH3   | CH4   | CH5   | CH6   | CH7   | CH8   |
| Read remaining time of the step     | Unit: sec   | H111E | H121E | H131E | H141E | H151E | H161E | H171E | H181E |
| Read remaining time of the step     | Unit: min   | H111F | H121F | H131F | H141F | H151F | H161F | H171F | H181F |
| Read the NO. of the current pattern | 0 ~ 7       | H1120 | H1220 | H1320 | H1420 | H1520 | H1620 | H1720 | H1820 |
| Read the NO. of the current step    | 0 ~ 7       | H1121 | H1221 | H1321 | H1421 | H1521 | H1621 | H1721 | H1821 |
| NO. of start pattern                | 0 ~ 7       | H1122 | H1222 | H1322 | H1422 | H1522 | H1622 | H1722 | H1822 |
| NO. of start step                   | 0 ~ 7       | H1123 | H1223 | H1323 | H1423 | H1523 | H1623 | H1723 | H1823 |

## • Programmable Parameter Setting

| Content                                     | Explanation                                                               | Pattern 0 | Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 | Pattern 5 | Pattern 6 | Pattern 7 |
|---------------------------------------------|---------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Max. number of steps in the pattern         | 0 ~ 7 = N: The pattern executes from step 0 to N.                         | H2068     | H2069     | H206A     | H206B     | H206C     | H206D     | H206E     | H206F     |
| Number of cycles of pattern 0 ~ 7 execution | 0 ~ 199: The pattern has been executed for 1 ~ 200 times                  | H2070     | H2071     | H2072     | H2073     | H2074     | H2075     | H2076     | H2077     |
| NO. of current link pattern                 | 0 ~ 8: 8 refers to end of program; 0 ~ 7 refer to the NO. of next pattern | H2078     | H2079     | H207A     | H207B     | H207C     | H207D     | H207E     | H207F     |

| Address       | Default | Content                                                           | Explanation                 |
|---------------|---------|-------------------------------------------------------------------|-----------------------------|
| 2000H ~ 203FH | 0       | Target temperatures for pattern 0 ~ 7<br>Pattern 0: 2000H ~ 2007H | Unit: 0.1°C                 |
| 2080H ~ 20BFH | 0       | Execution time for pattern 0 ~ 7<br>Pattern 0: 2080H ~ 2087H      | Time: 0 ~ 900 (Unit: 1 min) |

4. Communication format: H03 = read bit data; H06 = write bit data

## • ASCII Mode

| Read Command                       |     | Read Response Message          |     | Write Command      |     | Write Response Message |     |
|------------------------------------|-----|--------------------------------|-----|--------------------|-----|------------------------|-----|
| Start word                         | ':' | Start word                     | ':' | Start word         | ':' | Start word             | ':' |
| Machine address 1                  | '0' | Machine address 1              | '0' | Machine address 1  | '0' | Machine address 1      | '0' |
| Machine address 0                  | '1' | Machine address 0              | '1' | Machine address 0  | '1' | Machine address 0      | '1' |
| Command 1                          | '0' | Command 1                      | '0' | Command 1          | '0' | Command 1              | '0' |
| Command 0                          | '3' | Command 0                      | '3' | Command 0          | '6' | Command 0              | '6' |
| Read start address of data/bit     | '1' | Length of response data (byte) | '0' | Data address       | '1' | Data address           | '1' |
|                                    | '0' |                                | '4' |                    | '0' |                        | '0' |
|                                    | '0' | Data content in H1000          | '0' |                    | '0' |                        | '0' |
|                                    | '0' |                                | '1' |                    | '1' |                        | '1' |
| Read length of data/bit (word/bit) | '0' |                                | 'F' | Write data content | '0' | Write data content     | '0' |
|                                    | '0' |                                | '4' |                    | '3' |                        | '3' |
|                                    | '0' | Data content in H1001          | '0' |                    | 'E' |                        | 'E' |
|                                    | '2' |                                | '0' |                    | '8' |                        | '8' |
| LRC1 check                         | 'E' |                                | '0' | LRC1 check         | 'F' | LRC1 check             | 'F' |
| LRC0 check                         | 'A' |                                | '0' | LRC0 check         | 'D' | LRC0 check             | 'D' |
| End word 1                         | CR  | LRC1 check                     | '0' | End word 1         | CR  | End word 1             | CR  |
| End word 0                         | LF  | LRC0 check                     | '3' | End word 0         | LF  | End word 0             | LF  |
|                                    |     | End word 1                     | CR  |                    |     |                        |     |
|                                    |     | End word 0                     | LF  |                    |     |                        |     |

## • LRC Check

Sum up the contents from "machine address" to "data content", e.g.  $H01 + H03 + H10 + H00 + H00 + H02 = H16$ . Obtain 2's complement H EA.

## • RTU Mode

| Read Command                   |     | Read Response Message          |     | Write Command      |     | Write Response Message |     |
|--------------------------------|-----|--------------------------------|-----|--------------------|-----|------------------------|-----|
| Machine address                | H01 | Machine address                | H01 | Machine address    | H01 | Machine address        | H01 |
| Command                        | H03 | Command                        | H03 | Command            | H06 | Command                | H06 |
| Read start address of data     | H10 | Length of response data (byte) | H04 | Write data address | H10 | Write data address     | H10 |
|                                | H00 |                                |     |                    | H01 |                        | H01 |
| Read length of data (bit/word) | H00 | Data content 1                 | H01 | Write data content | H03 | Write data content     | H03 |
|                                | H02 |                                | HF4 |                    | H20 |                        | H20 |
| CRC low byte                   | HC0 | Data content 2                 | H03 | CRC low byte       | HDD | CRC low byte           | HDD |
| CRC high byte                  | HCB |                                | H20 | CRC high byte      | HE2 | CRC high byte          | HE2 |
|                                |     |                                |     |                    |     |                        |     |
|                                |     | CRC low byte                   | HBB |                    |     |                        |     |
|                                |     | CRC high byte                  | H15 |                    |     |                        |     |

**CRC (Cyclical Redundancy Check) is obtained by the following steps:**

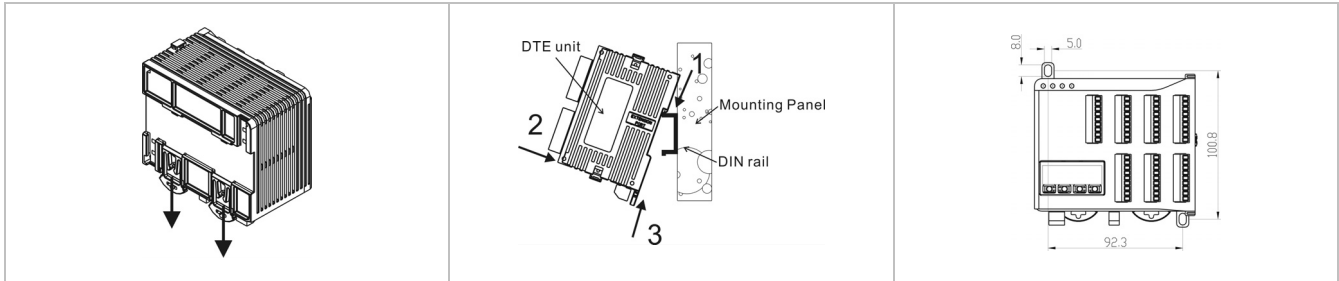
```

unsigned int reg_crc = 0xffff;
i = 0;
while (length--)
{
    reg_crc ^= RTUData[i];
    i++;
    for (j = 0; j < 8; j++)
    {
        if (reg_crc & 0x01)
            reg_crc = (reg_crc >> 1) ^ 0xA001;
        else
            reg_crc = reg_crc >> 1;
    }
}
return(reg_crc);

```

**Software for Setting up Communication on PC:** Download the free software on Delta's website.

## ■ How to Mount & DIN Rail Size



Connect maximum 7 DTC2000 or DTC2001 controllers to DTE by using DIN rail.

