# outlined

When the thermostat is used, you may encounter a situation where the output power does not meet the demanded power.

TCM series thermostats can realise parallel output with restricted conditions, and high power output can be temporarily achieved by parallel connection.

1. Parallel connection is achieved via RS232 serial port interconnection.
2. "Restricted" means that the power outputs of multiple thermostats cannot be directly paralleled; the output of each thermostat can still only drive a separate TEC string;
3. The temperature sensors of the slave thermostats are not connected and the voltage outputs of all slave thermostats are controlled by the master thermostat based on the temperature value it has collected, so all TEC strings can be used to temperature control the same target.

connection method

The two thermostats are wired as follows:

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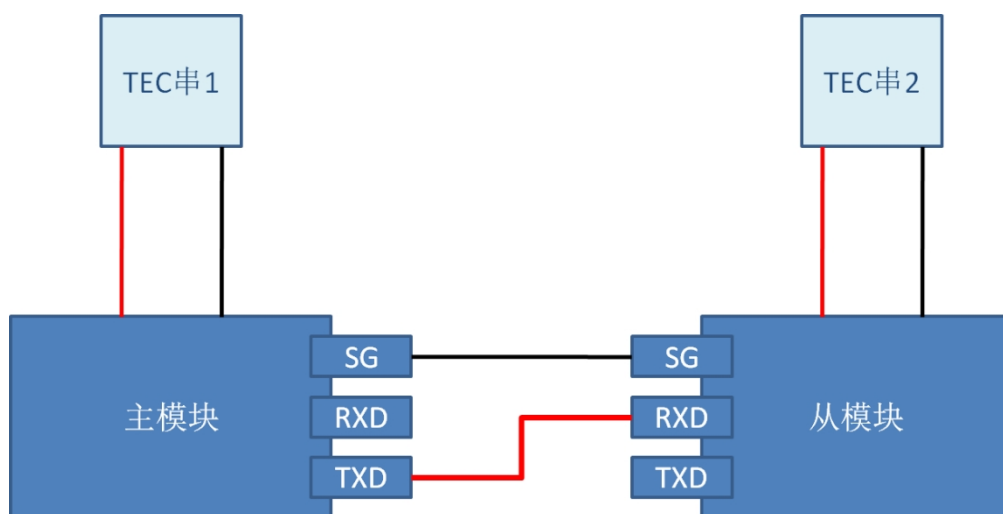
6 More thermostat connections:

If there is more than one slave thermostat, the slave thermostats can be connected in parallel or in series in sequence (each slave thermostat is the master thermostat for the next slave thermostat) In this case, the parallel connection method is illustrated below:
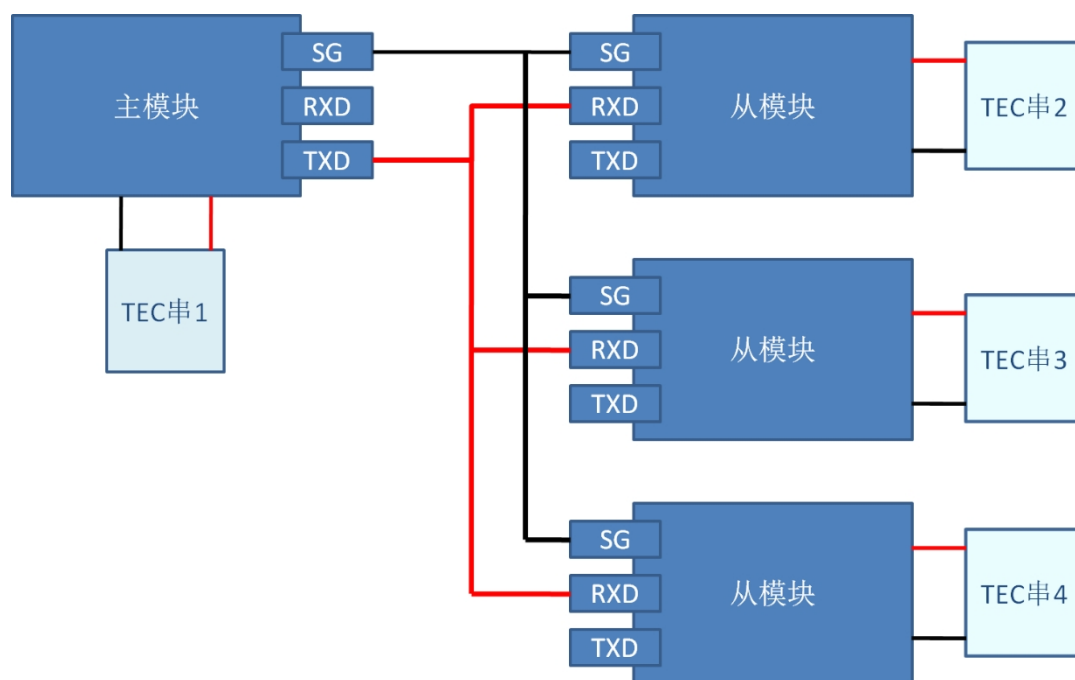
The RXD, TXD of the host and the RXD, TXD of the slave should be cross-connected; in the above figure, in order to avoid communication blockage and burnt interface, only the SG, RXD of the slave is connected to the SG, TXD of the host, and the TXD of the slave is not connected (because the slave does not need to return communication to the host, but only needs to receive passively, so the TXD of the slave is not connected to do not affect the use)

Serial multiplexing modules can also be used when connecting multiple slave thermostats in parallel. The downstream interface of the serial multiplexing module is connected directly to the slave module with a straight cable; the upstream interface is connected to the master thermostat module with a **crossover cable**.

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6 set up

	instructions
Main temperatur e control module	1. Select one TCM thermostat as the main thermostat; 2. One of the serial ports on the main thermostat is connected to a UIM or computer. 3. **The other 1** serial port of the main thermostat is turned on for active push[注1]. 4. Determine whether to switch on the automatic recovery function of the main temperature control module as required.
From temperatur e control module	1. Select multiple thermostats (as needed for power) as slave thermostats; 2. Select 1 serial port from the slave thermostat to be connected to the push serial port of the master thermostat; 3. Setting method 1). EasyHost: The parameter [PID Formula] in the PID Settings directory is set to slave mode. 2). or EasyUI: from the thermostat's menu TC1 Menu > PID > PID Cal needs to be set to Slave and saved beforehand. 4. When set to slave mode, the slave thermostat does not use its own collected temperature sensor values to calculate the output voltage, but instead accepts the external setting output directly through the serial port.

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From temperature control module Sensor open-circuit protection for	1. The temperature sensor from the thermostat can be left unconnected. 2. When the sensor is not connected, open-circuit protection is triggered, resulting in a disabled output. It is therefore possible to set an open circuit protection interval as large as possible (to include the actual temperature value from the time when the temperature control is not connected to the sensor) thus shielding the open circuit protection in a practical sense. 3. Similarly, over-temperature protection can be disabled in this way.
From temperature control module communications protection **(Very important)**	1. From the thermostat, the Td differential time in the PID parameter is used as the protection time, i.e. If a new voltage setting is not received for more than Td time, the output voltage will be set to 0 to prevent further damage caused by unexpected interruption of communication. A setting of 2-10 seconds is generally recommended.

Note 1: The serial port for push communication between the master and slave temperature control can no longer be used to communicate with the computer.

Note 2: Regardless of master and slave, each thermostat should have independent **over-voltage and over-current protection** settings according to the TEC strings they are connected to.

Note 3: Regardless of master or slave, each thermostat has an

independent **maximum output voltage** setting based on the TEC string to which it is connected. Therefore, each thermostat can drive a different TEC.

6 Active Push Setup Instructions

The version of the push programme has undergone 1 revision. In the old version, push was limited to individual commands. The new version has been improved.

Increased the range of parameters allowed to be pushed (4 numbers were used to set the index for this purpose);

(The old version only required 1 number to set the index)

Required parameters	Older settings	New version of the setup
push switch	SW	SW
push target address	Addr	Addr
Time interval between every two pushes	Interval	Interval
Index of pushed parameters	Index	Index1, Index2, Index3, Index4

Older push settings explained
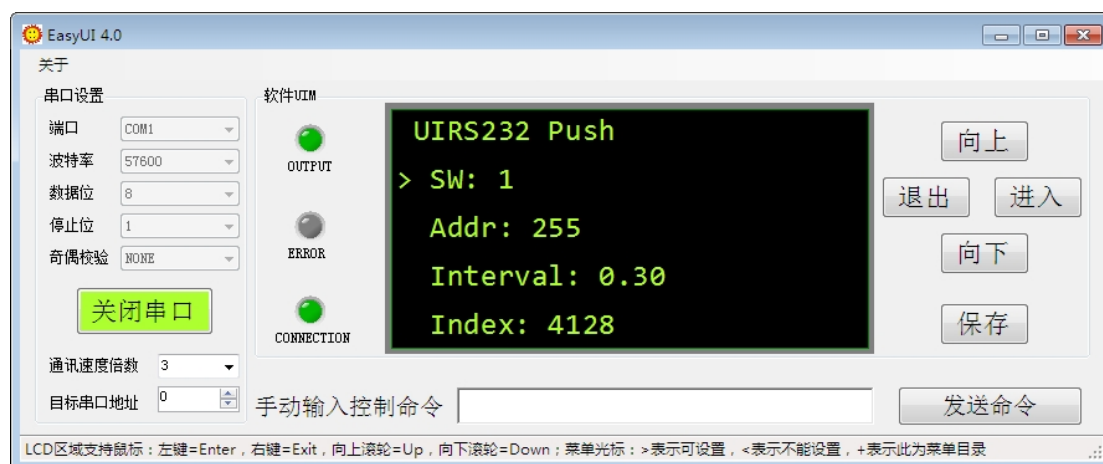
(Note: the above figure uses the UIRS232 port as an example; in fact, the port should be set to whichever port the user chooses to turn on push)

SW: Push switch; all of our thermostats do not actively send any

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information by default, and only when the push switch is turned on,
will they actively send commands.

Addr: push target address; the pushed parameter will be actively sent in
full command format. The sent string needs to have 1 address at the end.
If this address is the same as the address of the connected slave
thermostat, the slave thermostat responds to the command. 255 is the
broadcast address, i.e. the slave thermostat receives 255 as the target
even if the address is not 255.

The command will also respond to the In general, it is recommended to set it to 255.

Interval: push time interval; the thermostat sends commands at a certain time interval, the interval is too large to affect the density of push information, too small to cause serial communication problems. The interval is too big to affect the density of push message, too small will cause communication problem of serial port.

Index: the index of the pushed parameter; a port can push at most 1 to 4 parameters sequentially. The index of the parameter is between 1-255 (1 byte, which is a 2-bit number in hexadecimal). index is a 32-bit binary number, i.e., 4 bytes, which can represent at most 4 parameters; so we can set up to 4 parameters to be pushed with it. Bytes that are not used are set to 0.

The relationship between Index and the 4 parameter indexes set is as follows

$$\text{Index} = \text{Index}4 \times 256^3 + \text{Index}3 \times 256^2 + \text{Index}2 \times 256 + \text{Index}1$$

Below is an example of 2 parameters being pushed for setup:
We select TC1:TCSW and TC1:TCPIDDUTYRATIO as push parameters. The former can send the switch setting and the latter sends the output duty cycle setting. We only push 2 parameters, so Index4 and Index3 are 0.

Index = 16*256 + 32 = 4128

So we set Index to 4128.

Parameters of the old version	Index of old editions	Parameter Meaning
TC1: TCACTUALTEMP	1	actual temperature
TC1: TCADJUSTTEMP	2	Adjustment of temperature
TC1:TCSW	16	output switch
TC1:TCOE	17	output state

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TC1:LED	18	Output indicator
TC1:TCACTUALVOLTAGE	24	Actual Output Voltage
TC1:TCACTUALCURRENT	25	Actual output current
TC1:TCPIDDUTYRATIO	32	Output duty cycle for PID calculation
PCB:TMACTUALTEMP	200	Module Board Temperature
SYSTEM:SYSTIME	240	System run time (seconds)
ERROR:COUNT	255	Number of system errors

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6   We test the effect of the push port below. the PCRS232 serial port is connected to the computer, and then its push switch is turned on again:
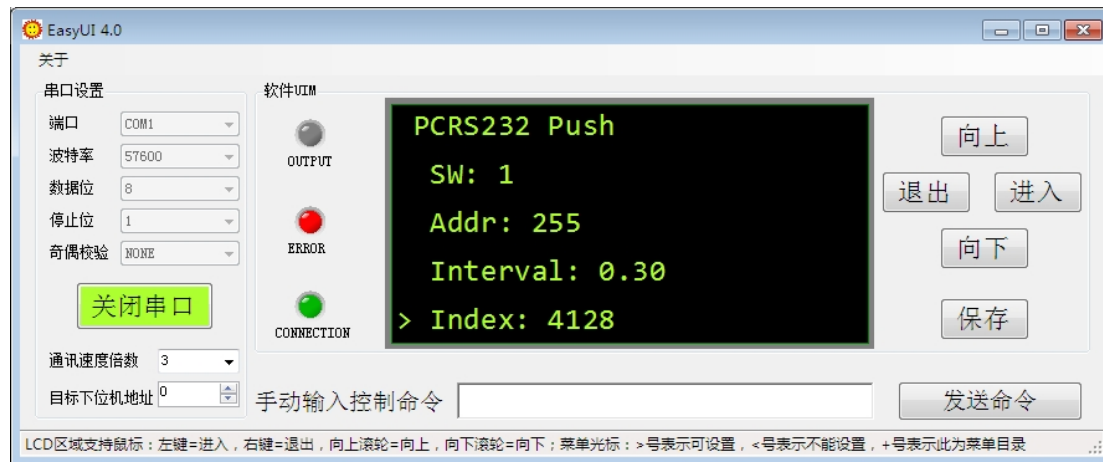
When we monitor the PCRS232 with the serial port assistant, we will find that it sends the setup command actively:
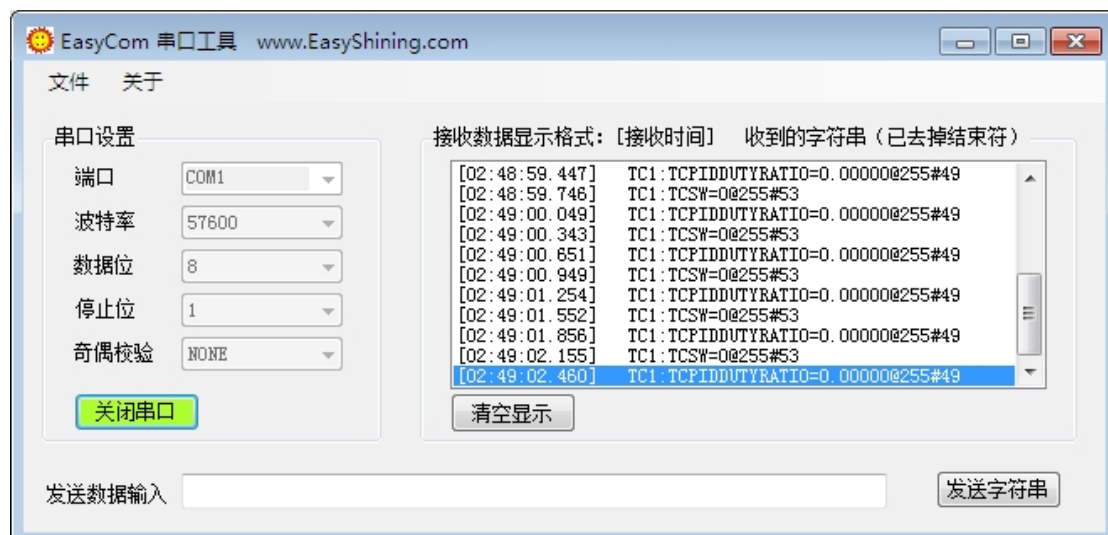
It sends the setting information of two parameters (TC1:TCSW, TC1:TCPIDDUTYRATIO) in turn, and the setting value is its own value. If other slave thermostats receive these two commands, they will be set according to the value; thus the master thermostat passes its own output settings to the slave thermostats, thus realising multiple thermostats controlling the temperature of the same object.

New push settings explained in detail

In the new version of the settings, there are no changes to the push

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switch, address, and internal settings. The index settings have changed.
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There are more pushable parameters in the new version, and the index of the parameters can be obtained by sending commands to the module. The command is PCRS232:COMPUSHLIST=1 or UIRS232:COMPUSHLIST=1.

From the above figure, we know that the indexes of TCSW and TCPIDDUTYRATIO are 4003 and 4004 respectively; the indexes of the four parameters being pushed are set by the parameters Index 1, Index 2, Index 3, and Index 4; as shown in the following figure.

Compatibility improvements between new and old versions

In the settings catalogue, the old push firmware is the one with Index, and the new push firmware is the one with 4 settings, namely Index1,Index2,Index3 and Index4. According to users' feedback, the latest firmware has improved compatibility, i.e. Index, Index1, Index2, Index3, and Index4 appear at the same time with a total of 5 settings.

If a user plans to use an older version of push, there are two ways to set it up:

1, the first way and the old version of the old way is exactly the same.

For example, directly set Index = 4128, then the system will recognise the user's settings for the old version of the way, automatically put Index1 = 32, Index2 = 16.

3

2, or the user directly set Index1 = 32, Index2 = 16, then the system will also identify the user's settings for the old version of the way, automatically calculated Index = 4128.

If the user plans to use the new version of push, it is straightforward to set Index1 to Index4 respectively, and the new indexes are all

If the number is greater than 255, the system will automatically recognise it and set Index to 0 to block it.

Meanwhile, due to the large number of new parameters, in the latest version of the firmware, we have reordered the new index of several important parameters to be placed at the top of the list, which will not be changed after being fixed.

New version parameters	Latest version of the index	Parameter Meaning
TC1: TCACTTEMP	3001	actual temperature
TC1:TCOE	3003	output state
TC1:LED	3004	Output indicator
TC1:TCACTVOL	3005	Actual Output Voltage
TC1:TCACTCUR	3007	Actual output current
TC1: TCADJTEMP	4001	Adjustment of temperature
TC1:TCSW	4003	output switch
TC1:TCPIDDUTYRATIO	4004	Output duty cycle for PID calculation

Newly developed products do not have the old index; upgrades to existing products will be compatible with both the old and new indexes.

If you find that the firmware does not match the description of this document and cause inconvenience, you can contact our customer service to update the firmware.

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