LX5V-2TC-BD BD Module Manual

1 Installation

- Before installation, it must be ensured that the PLC host and the related device of the BD module terminal wiring are powered off reliably. The shell is inserted into the BD module slot of PLC host, and then locked with two standard screws for fixation.
- Two standard terminal heads are equipped with this BD module. After connecting the wiring, insert them into its terminal. After confirming that the host, BD module, wiring, etc. are installed correctly, it can be powered on for use.
- ✎**Note:**
  - Please install the BD module firmly and fix it on PLC. Poor contact may lead to failure.
  - Tightening torque for fixing BD module or PLC top cover is 0.3N.m to0.6N.m. Please tighten it firmly to avoid malfunction.
- **Warning: Cut off the power before installing, removing or wiring the BD module to avoid electric shock or product damage.**

2 Appearance and terminal

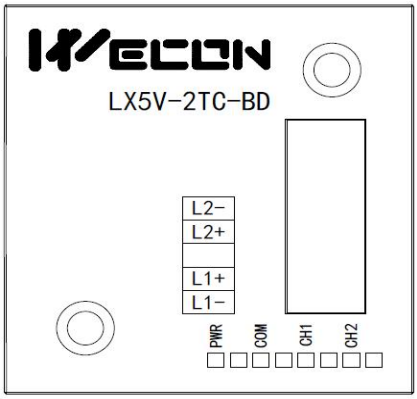


Table1Terminal distribution

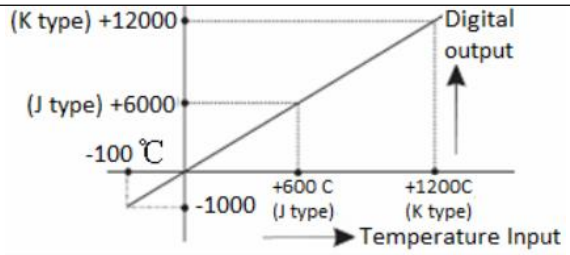
2-wire K/J thermocouple	
L2-	Channel 2 sensor signal input negative
L2+	Channel 2 sensor signal input positive
	NC
L1+	Channel 1 sensor signal input positive
L1-	Channel 1 sensor signal input negative

Table2LED lamp function description

Indicator lamp	Description
PWR	ON when power-on (when the program is running, it will be ON).
COM	It flashes when communicating with PLC normally, and it is OFF when timeout.
CH1	Channel 1 lamp: Always on in range; Flashing outside the range (type K: -100℃ to 1200℃; type J: -100℃ to 600 ℃); Off when the channel is closed.
CH2	Channel 2 lamp: Always on in range; Flashing outside the range (type K: -100℃ to 1200℃; type J: -100℃ to 600℃); Off when the channel is closed.

3 Specification

(1) General specification: Same as PLC main unit. (Please refer to the accompanying manual of the PLC main unit.)
(2) Power supply specification: The power supply is provided internally by PLC
(3) Performance specifications:

Project	Description	
Digital circuit	5VDC, 90mA (from the internal circuit of the main unit)	
Analog input signal	Thermocouple: Type K or J (both types can be used per channel)	
Sensor current	1mA	
Rated temperature range	Type K: -100℃ to 1200℃	Type J: -100℃ to 600℃
Digital output	Type K: -1000 to 12000	Type J: -1000 to 6000
	12-bit conversion, 11 data bits +1 sign bit	
Measurement accuracy	Type K: 0.4℃	Type J: 0.3℃
Total accuracy	Full range±0.5% (full range + 1℃)	
Conversion speed	2-channel 700ms	
Conversion features		

4 Wiring

Warning
Cut off the power before installing, removing or wiring the BD module to avoid electric shock or product damage.

✎Note:

- Do not place signal cables near high voltage power cables or in the same trunk line. Otherwise, it may be disturbed or surged. Keep a safe distance between signal cable and power cable, at least 100mm.
- Ground the shielding of shielded wire or shielded cable. But the ground point and high voltage line cannot be the same.
- Never weld any cable ends. Ensure that the number of connecting cables does not exceed the designed number of units.
- Do not connect cables whose dimensions are not allowed to avoid poor contact or damage to products.
- Fix the cable so that no force directly acts on the terminal line or cable connection area.
- The tightening torque of terminal is 0.5Nm to 0.6N.m. Please tighten it to prevent malfunction.
- Do not use empty terminals.

4.1 Applicable cables

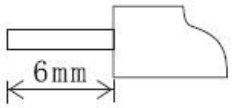
(1) AWG25-16 is used for connection with output device.

(2) Maximum terminal tightening torque is 0.5N.m to 0.6N.m.

(3) Using different types of cables may cause poor contact with terminals. Please use pressfit terminals for good contact.

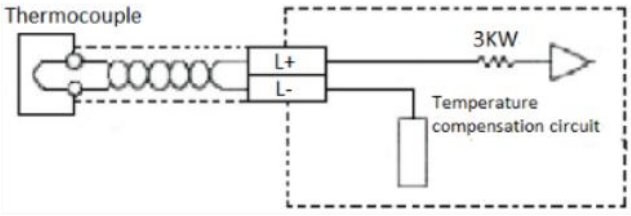
Line number and cross-sectional area

Line number	Cross-sectional area (mm^2)	End processing
AWG26	0.1288	Stranded cable: Strip off the sheath, rub the core wire, and then connect the cable. Single-core cable: Strip off the sheath and connect the cable.
...	...	
AWG16	1.309	



4.2 I/O Mode

Thermocouple input mode



5 Description of PLC device

(1) When connected to LX3 series PLC, please refer to LX3 series BD module manual.

(2) When connected to LX5 series PLC, if the firmware version of PLC is lower than 2.051 (excluding 2.051), or BD module is not configured by host computer, it can be controlled by the following system devices:

Table3Device allocation

PLC model	BD model	Device	Expansion port 1 description	Device	Expansion port 2 description
LX5V	2TC	SM2010	CH1: Input mode switch flag OFF: Thermocouple type K ON: Thermocouple type J	SM2030	CH1: Input mode switch flag OFF: Thermocouple type K ON: Thermocouple type J
		SM2011	CH2: Input mode switch flag OFF: Thermocouple type K ON: Thermocouple type J	SM2031	CH2: Input mode switch flag OFF: Thermocouple type K ON: Thermocouple type J
		SD2010	The temperature of CH1 at 0.1°C (Type K: -100℃ to 1200℃: -1000 to 12000; Type J: -100℃ to 600℃: -1000 to 6000)	SD2030	The temperature of CH1 at 0.1°C (Type K: -100℃ to 1200℃: -1000 to 12000; Type J: -100℃ to 600℃: -1000 to 6000)
		SD2011	The temperature of CH2 at 0.1°C (Type K: -100℃ to 1200℃: -1000 to 12000; Type J: -100℃ to 600℃: -1000 to 6000)	SD2031	The temperature of CH2 at 0.1°C (Type K: -100℃ to 1200℃: -1000 to 12000; Type J: -100℃ to 600℃: -1000 to 6000)

(3) You can select device through I/O mapping to use the configuration function of new BD module. For details, please refer to "6.1 Parameter configuration".

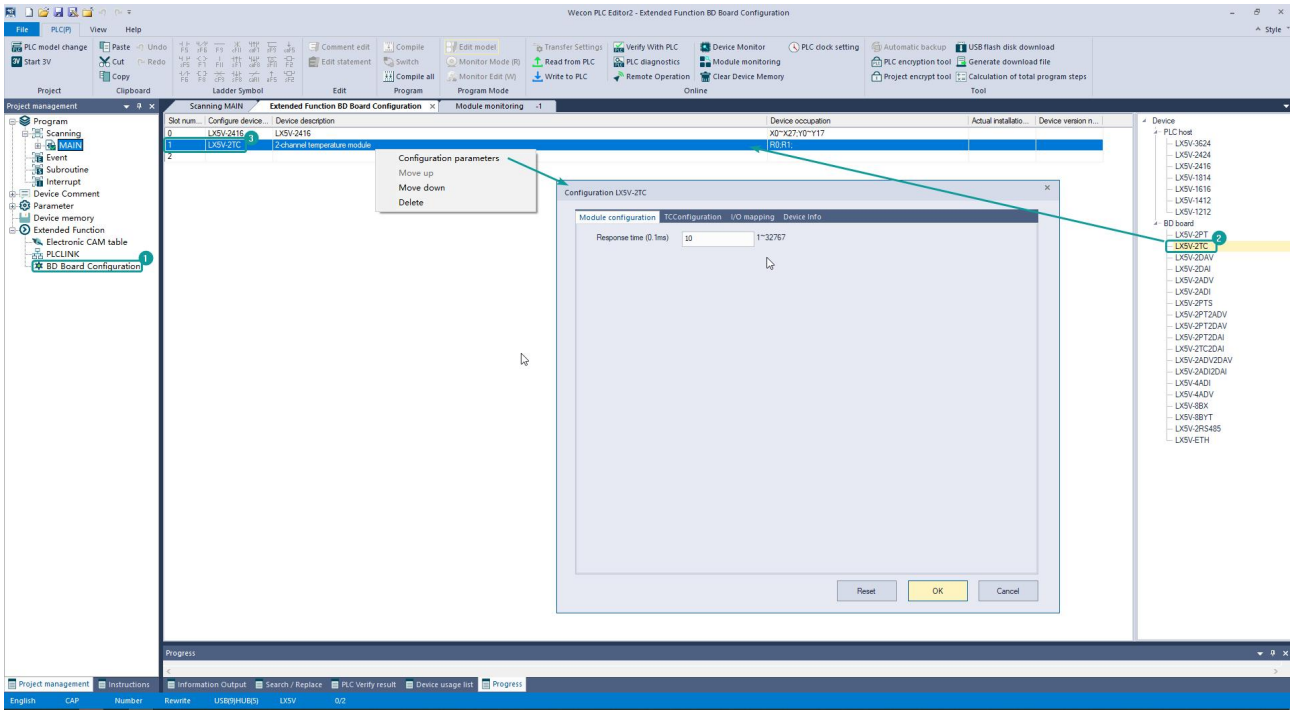
6 Instructions

6.1 Parameter configuration

① Open the host computer software and create a new project, double-click “Project Manager” → “Extended Function” → "BD Module Configuration" Note to enter “BD settings” interface;

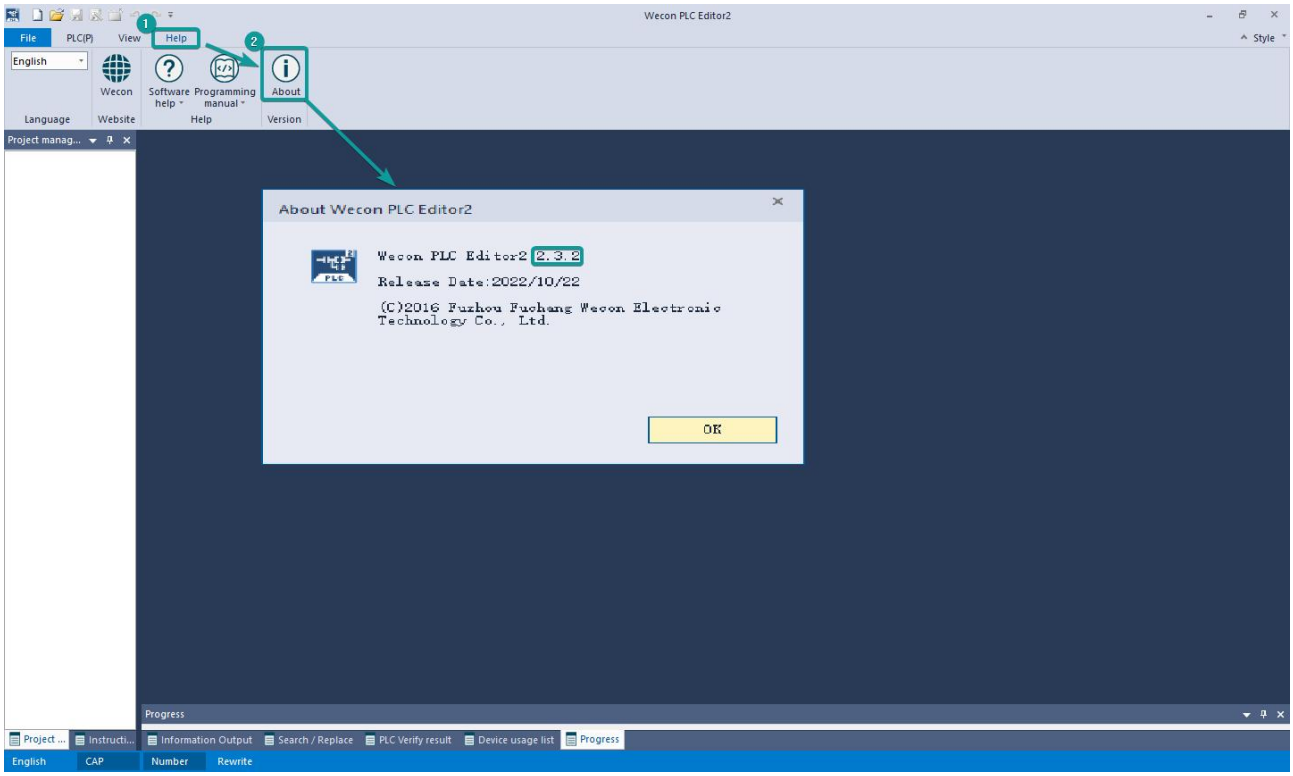
② Configure the currently connected PLC (take the LX5V-2416 model as an example) and BD module model on the BD module configuration interface: Select “LX5V-2TC" in the device bar on the right side of the BD module configuration interface and double-click to add it to the corresponding slot position of PLC (slot number 1 or 2, the software will select slot 1 by default, and right-click to move down to slot 2);

③ After adding the BD module to the slot, double-click or right-click to select configuration parameters to enter LX5V-2TC-BD configuration parameters interface, as shown in the following figure. Configure related parameters on this interface.

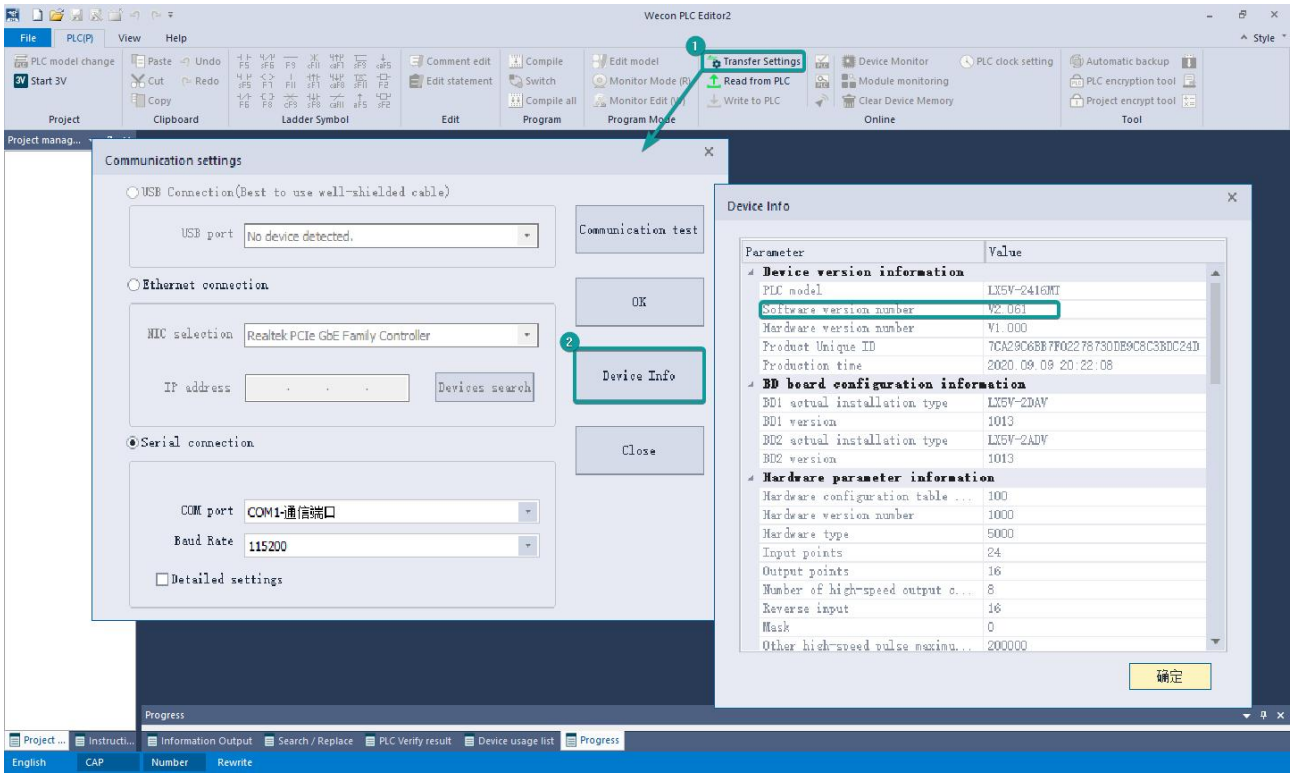


Note: This function is only supported in the following versions of host computer, slave computer and BD module:

(1) Supported host computer versions: Wecon PLC Editor2 2.1.204 and above, as shown in the following figure:



(2) Supported slave computer versions: 2.051 and above, as shown in the following figure:



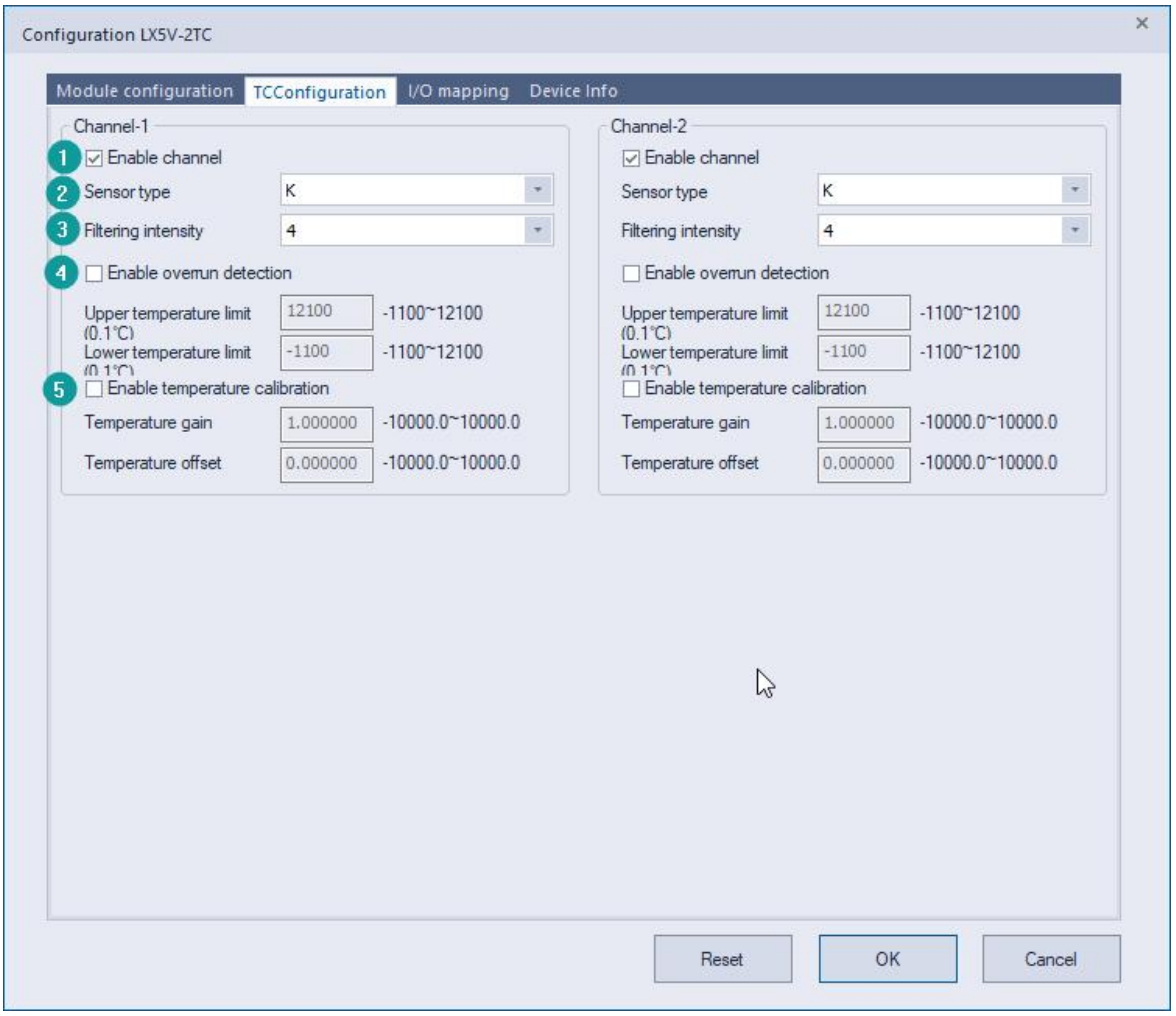
(3) Supported BD module version number: 1013 and above, as shown in the following figure:

Slot num...	Configure device...	Device description	Device occupation	Actual installatio...	Device version n...
0	LX5V-2416	LX5V-2416	X0~X27;Y0~Y17	LX5V-2416MT	V2.061
1	LX5V-2TC	2-channel temperature module	R0;R1;	LX5V-2TC	1014
2					

The parameter configuration interface is as below:

1、Module setting: Set response time (The response time is the interval time between PLC acquisition of BD module data. Range: 0.1ms to 3276.7ms).

2、TC configuration:



① Check enable channel to set whether to enable the current BD module channel.

② Sensor type: The default sensor type is K thermocouple (Type K and J are optional, and you can set through the drop-down box).

③ Setting the filtering intensity can reduce the jitter of BD channel value. The default configuration of filter intensity is 4. Level 0 is the lowest and level 9 is the highest. The filter intensity can be adjusted according to actual use.

④ Check enable overrun detection to judge that when the upper and lower limits of temperature exceed the current setting temperature, the host computer will prompt an error.

✎Note: Different types of thermocouples can measure different temperature ranges.

⑤ Check enable calibration, you could calculate the gain offset according to the following formula to

convert the corresponding channel value:

Channel value = actual temperature value × gain value + offset value

When the channel value deviates from the actual temperature value, the channel can be calibrated by setting the gain offset, for example:

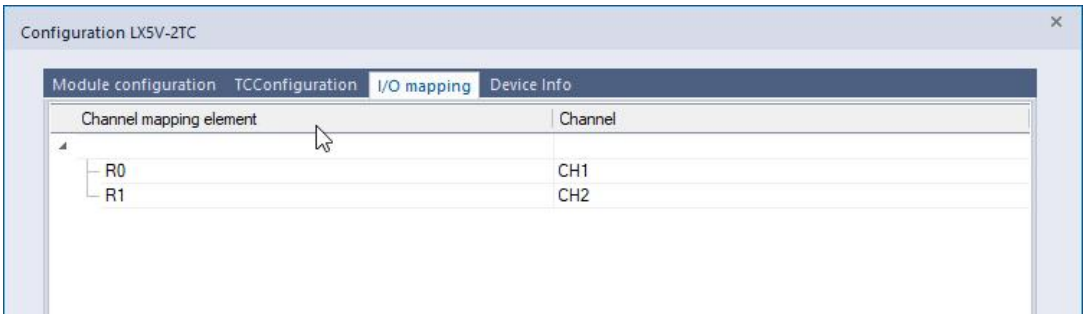
If the type of thermocouple connected to the current channel is K:

- The input temperature of control channel is 0℃, the value of acquisition channel is 50 (unit: 0.1℃), and the actual channel value should be 0 (unit: 0.1℃).
- The input temperature of control channel is 1100℃, the value of acquisition channel is 11100 (unit: 0.1℃), and the actual channel value should be 11000 (unit: 0.1℃)

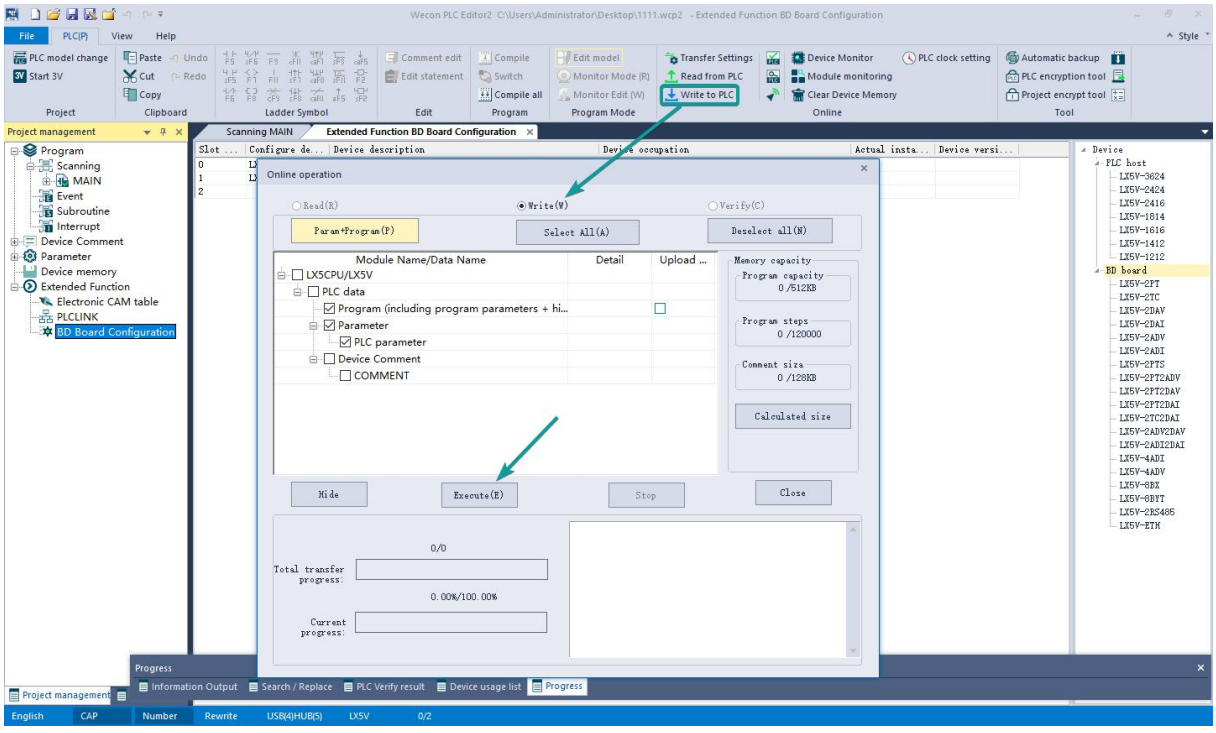
Suppose the gain is a, and the offset is b, then $\begin{cases} 0 = 50 * a + b \\ 11000 = 11100 * a + b \end{cases}$,

Solve and get $\begin{cases} a = 0.995475 \\ b = -49.7738 \end{cases}$ The calibration can be completed by setting the corresponding gain offset to the current channel.

3、Set I/O mapping. The channels are mapped to R device according to the current number of BD module channels by default. As shown in the following figure, BD module CH1 to CH2 is mapped to device R0 to R1.

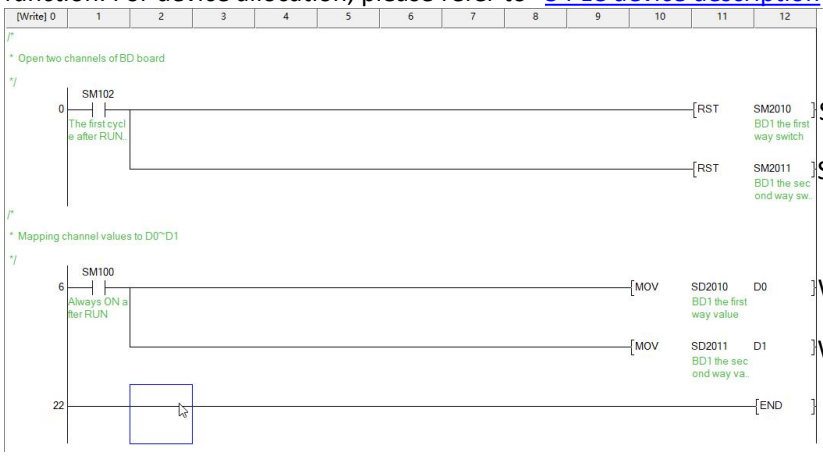


4、After the above configuration is completed, check the program, download the configuration to PLC, and STOP→RUN configuration takes effect.



6.2 Ladder Diagram

1、Programming example that does not use the host computer software "BD module configuration" function. For device allocation, please refer to "5 PLC device description".



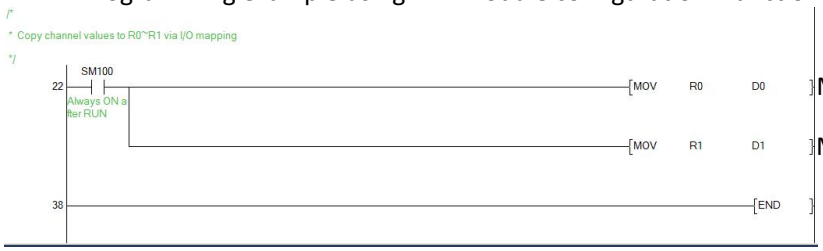
Switch CH1 to type K thermocouple

Switch CH2 to type K thermocouple

Write the temperature value of CH1 to register D0

Write the temperature value of CH2 to register D0

2.Programming example using "BD module configuration" function of host computer software:

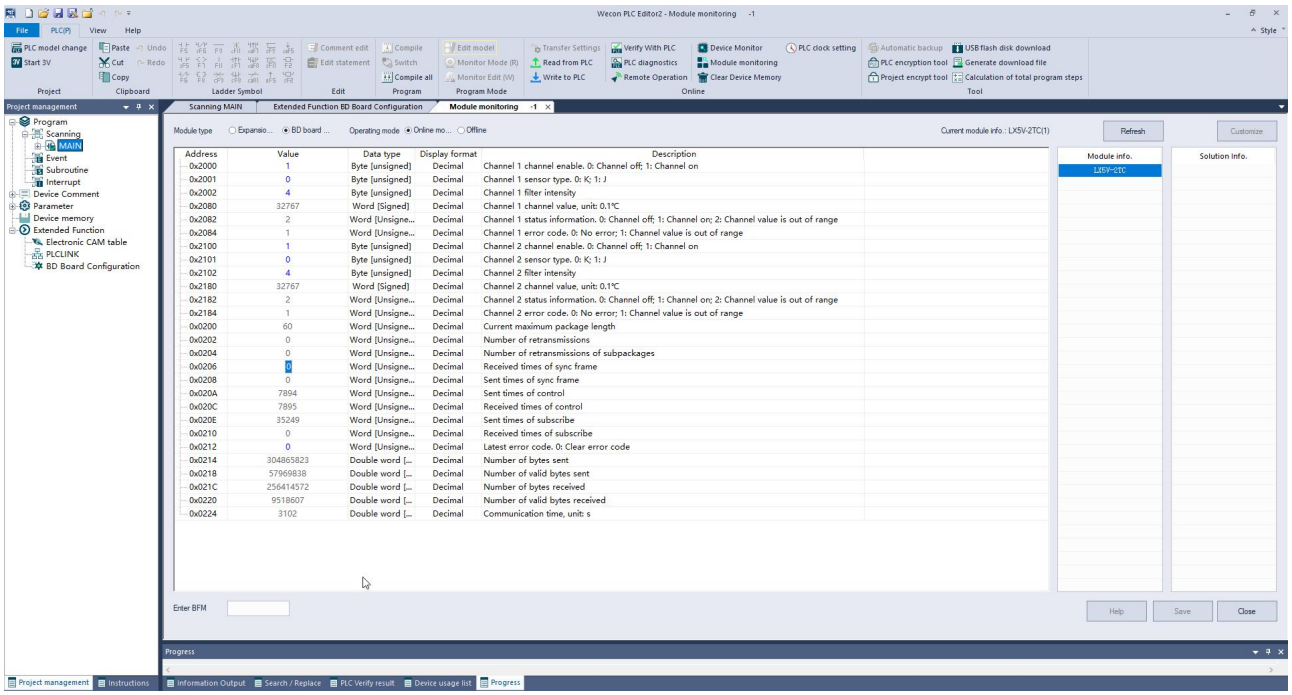


Map CH1 into R0 device

Map CH2 into R1 device

6.3 BD monitoring interface and buffer memory

Open the module monitoring interface, select BD module, select LX5V-4ADI from the list of BD modules on the right to monitor it online, and check the current BD module communication status and error information in time.



① TC buffer memory (BFM): used for BD module status monitoring.

BFM addres	Power -off	Read-write	Memory name	Default	Range	Description

s	hold					
0x2000	×	R/W	Channel 1 channel enable	1	0 to 1	0: Channel closed; 1: Channel open
0x2001	×	R/W	Channel 1 sensor type	0	0 to 1	0: Type K thermocouple; 1: Type J thermocouple
0x2002	×	R/W	Channel 1 filter intensity	4	0 to 9	0: Minimum filter strength; 9: Maximum filter strength
0x2080	×	R	Channel 1 channel value	32767	-32768 to 32767	Unit: 0.1℃
0x2082	×	R	Channel 1 status information	1	0 to 2	0: Channel closed; 1: Channel opened 2: Channel value exceeds the range
0x2084	×	R	Channel 1 error code	0	0 to 1	0: No error; 1: Channel value exceeds the range
0x2100	×	R/W	Channel 2 channel enable	1	0 to 1	0: Channel closed; 1: Channel open
0x2101	×	R/W	Channel 2 sensor type	0	0 to 1	0: Type K thermocouple; 1: Type J thermocouple
0x2102	×	R/W	Channel 2 filter intensity	4	0 to 9	0: Minimum filter strength; 9: Maximum filter strength
0x2180	×	R	Channel 2 channel value	32767	-32768 to 32767	Unit: 0.1℃
0x2182	×	R	Channel 2 status information	1	0 to 2	0: Channel closed; 1: Channel opened 2: Channel value exceeds the range
0x2184	×	R	Channel 2 error code	0	0 to 1	0: No error; 1: Channel value exceeds the range

② Universal buffer memory (BFM): used to diagnose the communication status of the currently connected BD module.

BFM address	Power-off hold	Read-write Function	Memory name	Default	Range	Description
0x200	×	R	Current maximum package length	0	0 to0xFFFF	The maximum length of the currently sent package
0x202	×	R	Number of retransmissions	0	0 to0xFFFF	Number of retransmissions
0x204	×	R	Number of retransmissions of subpackages	0	0 to0xFFFF	Number of retransmissions of subpackages
0x206	×	R	Received times of sync frames	0	0 to0xFFFF	Received times of sync frames
0x208	×	R	Sent times of sync frames	0	0 to0xFFFF	Sent times of sync frames
0x20A	×	R	Control the number of transmissions	0	0 to0xFFFF	Control the number of transmissions
0x20C	×	R	Control the number of receptions	0	0 to0xFFFF	Control the number of receptions
0x20E	×	R	Number of subscriptions sent	0	0 to0xFFFF	Number of subscriptions sent
0x210	×	R	Number of subscriptions received	0	0 to0xFFFF	Number of subscriptions received
0x212	√	R/W	Latest error code	0	Only 0 can be written.	Protocol internal error code, write 0 to clear
0x214	×	R	Number of bytes sent	0	0 to 0xFFFFFFFF	Number of bytes sent
0x218	×	R	Number of valid bytes sent	0	0 to 0xFFFFFFFF	Number of valid bytes sent
0x21C	×	R	Number of bytes received	0	0 to 0xFFFFFFFF	Number of bytes received
0x220	×	R	Number of valid bytes received	0	0 to 0xFFFFFFFF	Number of valid bytes received
0x224	×	R	Communication time (unit s)	0	0 to 0xFFFFFFFF	Normal communication time since the BD module is powered on