8-Channel K-type Thermocouple Acquisition Module

Hello dear customer:

Please read the operating instructions and precautions carefully before starting to use to reduce accidents.

The personnel responsible for installation and operation should strictly follow the safety regulations. The safety problems in the instructions do not represent all of them.

It only represents a supplement to each safety precaution.

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Chapter 1: Hardware Parameters

1：Analog Acquisition Module

Technical parameter	Description
Number of input channels	8-Channel K thermocouple
Temperature measurement range	-200~1370℃
Refresh rate	0.5s 8 channels refresh once
Working voltage	DC 8V~35V（with reverse polarity protection）
Working current	<200mA
Signal input method	K thermocouple 2 wires
Resolution	24 bits
Accuracy class	Better than ±0.2℃
Communication interface	RS485 hardware isolation, network port
Communication protocol	Standard Modbus RTU/TCP protocol
Communication baud rate	1200/2400/4800/960/19200/38400/57600/115200bps
Communication data format(485)	8 data bits, 1/2 stop bits, parity check, no check can be set
Communication distance(485)	>800meters
Ethernet	10M/100M adaptive
Network mode	TCP server + TCP client
Number of network channels	6 different IPs can be connected at the same time
Protection measures	Power input polarity protection, communication error indication
Installation method	Standard 35mm U-rail
Environmental requirements	Temperature range: -10~65℃, humidity range: 0~85% without condensation

Chapter 2: Setting of Communication Way (DIP switch)

Note: For all 485 communication modules of our company, the gear of the DIP switch must be configured before the first use. Each time the DIP switch is changed, its settings will take effect after the next power cycle.

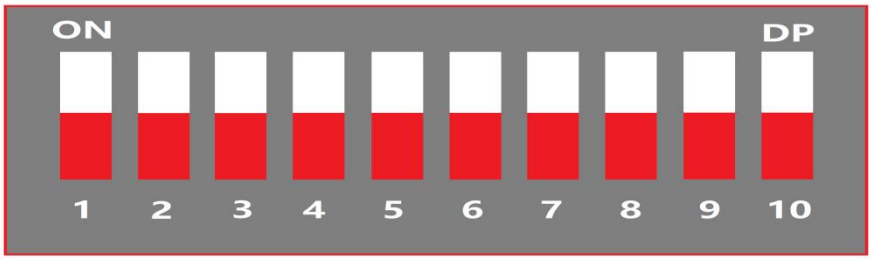
Factory default:

Device address: 1

Baud rate: 9600bps

Data format: 8 data bits, 1 stop bit, no parity;

Communication timeout: 10 seconds



Data verification of communication port	S1	S2
No verification	0FF	OFF
Odd verification	OFF	ON
Even verification	ON	ON

Baud rate options	S3	S4	S5
1200	OFF	OFF	OFF
2400	OFF	OFF	ON
4800	OFF	ON	OFF
9600	OFF	ON	ON
19200	ON	OFF	OFF
38400	ON	OFF	ON
57600	ON	ON	OFF
115200	ON	ON	ON

Setting of module hardware address	S6	S7	S8	S9	S10
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
29	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

Chapter 3: Register Information

1："8-Channel K-Thermocouple Analog Acquisition" Register Information

Input port	Register address (hexadecimal)	PLC register address	Remark	Attributes
Input channel 0	0x0064	40101	**Actual temperature=collected value/10** **E.g:** **The collection is 0x00FF (255), then the temperature = 25.5 degrees.** If it is negative, it is expressed in two's complement form.	Read only
Input channel 1	0x0065	40102		Read only
Input channel 2	0x0066	40103		Read only
Input channel 3	0x0067	40104		Read only
Input channel 4	0x0068	40105		Read only
Input channel 5	0x0069	40106		Read only
Input channel 6	0x006A	40107		Read only
Input channel 7	0x006B	40108		Read only

2：Communication Timeout Register

Timeout register	Register address (hexadecimal)	Register address (decimal)	Remark	Attributes
High-bit	0x7530（Power-off save）	30000	**Communication timeout (default 10 seconds)**	Read/write
Low-bit	0x7531（Power-off save）	30001		Read/write

Timeout register description:
If the communication is interrupted for some reason, and the failure time is greater than the time set in the timeout register, it is considered that the communication has timed out (the fault indicator on the module will be always on, and it will not go out until the communication is normal)
Example: If the timeout is set to 3 seconds, two registers need to be written:
Because 3 seconds = 3000 milliseconds; 3000 (decimal) = 0x0bb8 (hexadecimal)
So 7530H=0x0000 and 7531H=0x0bb8
Analysis: [0x0000 (high 16 bits) *65536] + 0x0bb8 (low 16 bits) = 0x0bb8 (ie 3000mS)

Chapter 4: Modbus-RTU Communication Implementation

1：Modbus-RTU Function Code

Function code	Function	Attributes	Related products
0x03	Read single or consecutive multiple registers	Read	K thermocouple temperature acquisition moduleacquisition module
0x06	Write to a single holding register	Write	K thermocouple temperature acquisition moduleacquisition module
0x10	Write multiple holding registers consecutively	Write	K thermocouple temperature acquisition moduleacquisition module

2：03 function code read single or consecutive multiple registers

Note: Non-existent holding registers or discrete registers cannot be read, otherwise the module will respond with an error message.
Example: The master requests to read the value of 1 holding register starting from address 0x0064

1） Main station demand.

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x03	0x03
Initial address	2 bytes		0x0064
Input quantity	2 bytes	0x0001～0x0004	0x0001
CRC verification	2 bytes		0xC5D5

2） Slave station normal response message

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x03	0x03
Number of valid bytes	1 byte		0x02
Data collected	2*N bytes	Return length：input quantity(N) * 2	0x00FF
CRC verification	2 bytes		0xF804

Palindrome analysis: There are 1 data collected, respectively.

are the input channel Ai1

Ai1=0x00FF (decimal 255) ie 255/10=25.5℃

If the return code is 0xEEEE (invalid value), it means that the acquisition module has not collected the data of the K pair. It is necessary to check whether the connection of the K pair is correct, or whether the cable is broken or short-circuited.

3） The abnormal response from the sub-station.

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte		0x83
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（the initial address is out the range of the module）	
		0x03（the register is not within the specified sphere）	
		0x04（data verification error）	
CRC verification	2 bytes		0x80F0

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

3：06 function code write to a single holding register

Attention: The holding register designated in the demand must exist and is editable. Otherwise, the module will give an error response.

1） The main station demand

Example: Change the high-order register of the K-thermocouple timeout time.

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x06	0x06
Initial address	2 bytes		0x7530
Register value	2 bytes		0x0000
CRC verification	2 bytes		0x93C9

2） Normal response from the sub-station

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x06	0x06
Initial address	2 bytes		0x7530
Register value	2 bytes		0x0000
CRC verification	2 bytes		0x93C9

3） The abnormal response from the sub-station

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte		0x86
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（the initial address is out the range of the module）	
		0x03（the register is not within the specified sphere）	
		0x04（data verification error）	
CRC verification	2 bytes		0x83A0

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

3：10 Function code write to a single holding register

Attention: The holding register designated in the demand must exist and is editable. Otherwise, the module will give an error response.

1） The main station demand

Example: Change the high-order register (0x7530) and low-order register (0x7531) of the K-even timeout time.

Demand contents	Length	Scope	Example	
Sub-station address	1 byte	0x00～0x1F	0x01	
Function code	1 byte	0x10	0x10	
Initial address	2 bytes		0x7530	
Number of registers	2 bytes	N	0x0002	
Byte quantity	1 byte	2*N	0x04	
Register value	2*N bytes		0x0000	
			0x2710	
CRC verification	2 bytes		0xB015	

2） **The normal response from the sub-station**

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x10	0x10
Initial address	2 bytes		0x7530
Register value	2 bytes		0x0002
CRC verification	2 bytes		0x5BCB

3） **The abnormal response from the sub-station**

Demand contents	Length	Scope	Example
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte		0x90
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（initial address is out the range of the specification）	
		0x03（the coil quantity is out the range of the specification）	
		0x04（data verification error）	
CRC verification	2 bytes		0x8DC0

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

Chapter 5: Modbus-TCP Communication Implementation

1：Modbus-TCP Function Code

Function code	Function	Attributes	Related products
0x03	Read single or consecutive multiple registers	Read	K thermocouple temperature acquisition moduleacquisition module
0x06	Write to a single holding register	Write	K thermocouple temperature acquisition moduleacquisition module
0x10	Write multiple holding registers consecutively	Write	K thermocouple temperature acquisition moduleacquisition module

2：03 Function code read single or consecutive multiple registers

Note: Non-existent holding registers or discrete registers cannot be read, otherwise the module will respond with an error message.
Example: The master requests to read the value of 2 holding registers starting at address 0064H.

1） Main station demand.

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0006
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x03	0x03
Initial address	2 bytes		0x0064
Input quantity	2 bytes	0x0001～0x0010	0x0002

2） Abnormal Response from sub-station

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0007
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x03	0x03
number of valid bytes	1 byte		0x04
Data collected	2 bytes		0x00FF
	2 bytes		0x01F4

Palindrome analysis: There are 2 pieces of data collected,

They are the input channels Ai1, Ai2

Ai1=0x00FF (decimal 255) ie 255/10=25.5℃

Ai2=0x01F4 (decimal 500) ie 500/10=50.0℃

If the return code is 0xEEEE (invalid value), it means that the acquisition module has not collected the data of the K pair. It is necessary to check whether the connection of the K pair is correct, or whether the cable is broken or short-circuited.

3） The abnormal response from the sub-station.

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0003
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte		0x83
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（Initial address is out the range ）	
		0x03（the register is not within the specified sphere）	
		0x04（data verification error）	

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

3：06 function code write to a single holding register

Attention: The holding register designated in the demand must exist and is editable. Otherwise, the module will give an error response.

1）The main station demand

Example: The value of the master request write-through timeout register (high bit) is 0x0000

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0006
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x06	0x06
Initial address	2 bytes		0x7530
Register value	2 bytess		0x0000

2） Normal response from the sub-station

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0006
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte		0x06
Initial address	2 bytes		0x7530
Register value	2 bytes		0x0000

3） The abnormal response from the sub-station

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0003
Sub-station address	1 byte	0x00～0x1F	0x01

Function code	1 byte		0x86
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（Initial address is out of range）	
		0x03（the register is not within the specified sphere）	
		0x04（data verification error）	

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

4：10 function code write to a single holding register

Attention: The holding register designated in the demand must exist and is editable. Otherwise, the module will give an error response.

1） The main station demand

Example: The master requests to write 2 holding registers starting at address 30000. Among them, the 30000 and 30001 holding registers represent the timeout time parameter, and its value is 0x00002710, which is 10000mS

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x000B
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x10	0x10
Initial address	2 bytes		0x7530
Number of registers	2 bytes	N	0x0002
Number of byte	1 byte	2*N	0x04
Register value	2*N byte		0x0000
			0x2710

2） Slave station normal response message

Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0006
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte	0x10	0x10
Initial address	2 bytes		0x7530
Number of registers	2 bytes		0x0002

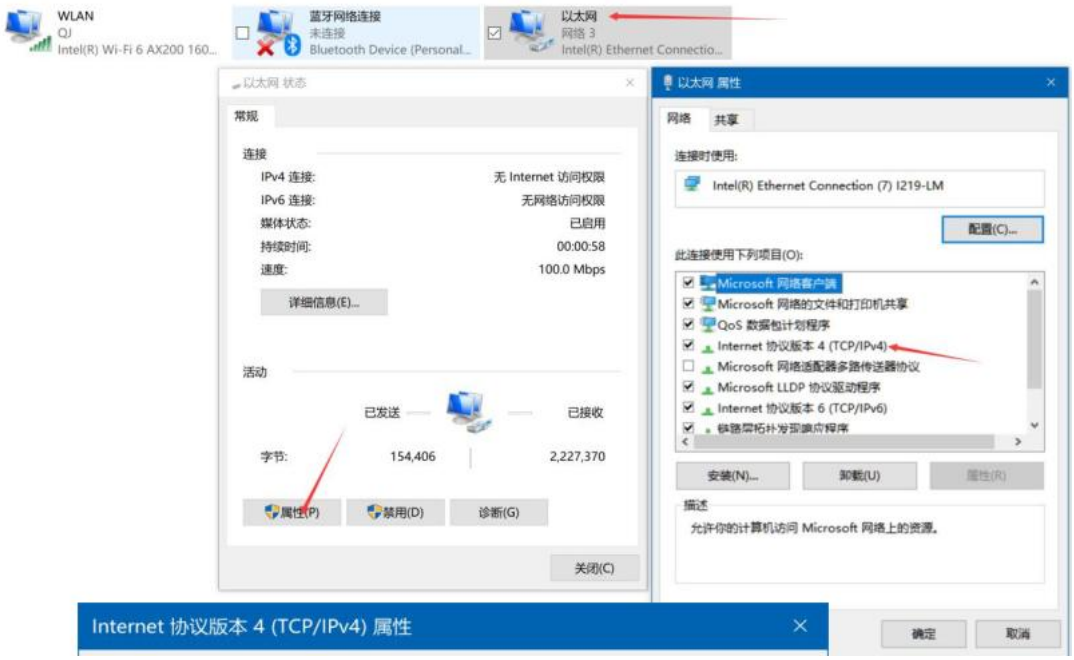
3） Slave station abnormal response message

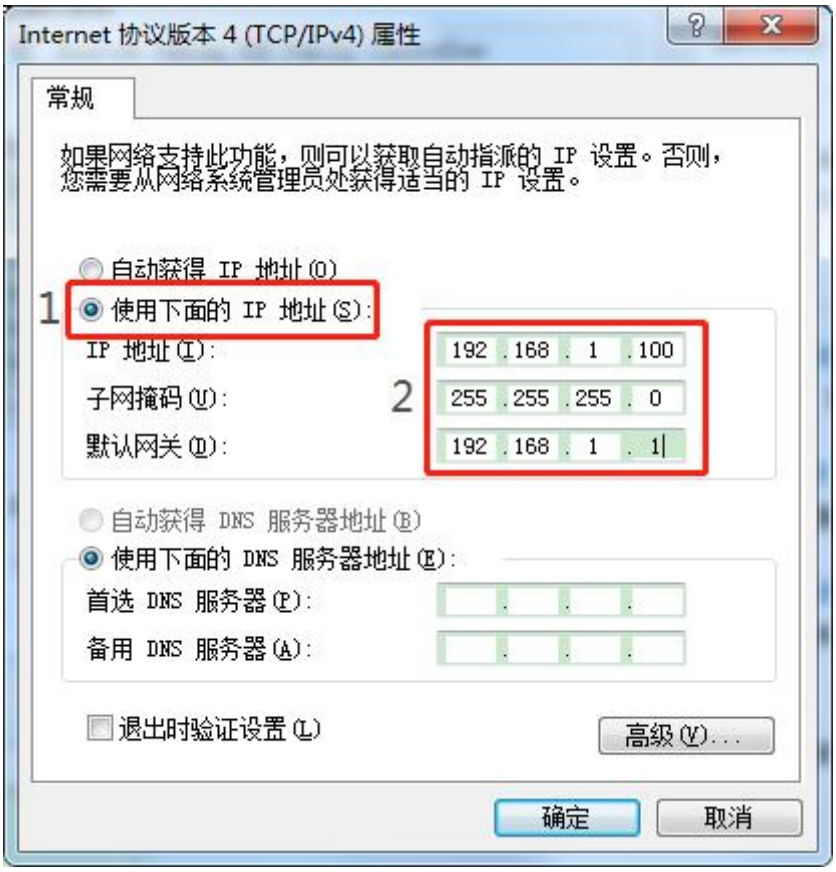
Demand contents	Length	Scope	Example
Transaction identifier	2 bytes	unlimited	0x0000
Protocol identifier	2 bytes	unlimited	0x0000
Length	2 bytes	The total length of the following data to add	0x0003
Sub-station address	1 byte	0x00～0x1F	0x01
Function code	1 byte		0x90
Error code	1 byte	0x01（not a supported function code）	0x01
		0x02（Initial address is out of range）	
		0x03（the register is not within the specified sphere）	
		0x04（data verification error）	

If the acquisition module replies to this message, you need to troubleshoot one by one according to the error code in the response.

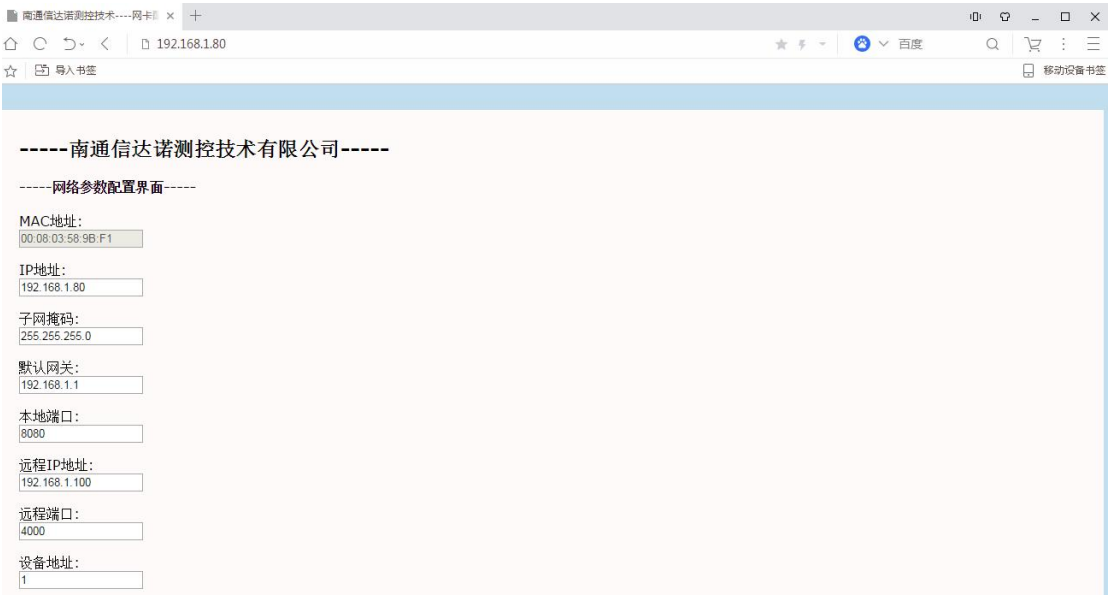
Chapter 6: Communication Mode Settings

If the user chooses a product with a network port, he can connect the module to the computer with a network cable, and then set the computer's IP address, subnet mask, and default gateway as shown in the figure below: (applicable to products with a network port)





Then open the browser: enter 192.168.1.80 in the address bar to directly access the configuration page for configuration.



Chapter 7: Description of Module Indicators

System indicator

There are 3 system indicators ("power indicator", "communication indicator", "timeout indicator")

Power indicator: When the module is connected to the working voltage, the power indicator will be lit.

Communication indicator light: When the module detects that there is satisfactory data on the 485 bus, the light will flash, otherwise it will go out. When the speed of the data is fast, the flashing speed of the light will be faster, and even the effect will be always on.

Timeout indicator: When the module loses communication and the disconnection time exceeds the time specified by the timeout register, the timeout indicator will be lit, otherwise, if the communication is normal, the indicator will be off.

The demos of all brands of PLCs and configuration software of touch screens and the solutions are available in our company. Please contact us without hesitation if you want to know more details about the products.

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