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OMRON

Model

CJ1W-TS561

Thermocouple input unit

INSTRUCTION SHEET

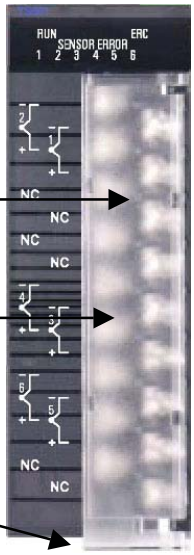
Thank you for purchasing an OMRON product. Read this instruction sheet thoroughly and familiarise yourself with the functions and characteristics of the product before using it. To ensure safe and correct use of this Unit, also read the Operation- and Programming Manuals for your CJ1 PLC system.

Keep this instruction sheet for future reference.

■ Unit Description

The CJ1W-TS561 is a 6-channel input unit for K-type and J-type thermocouples. It can be installed in any CJ1-series PLC system.
It is classified as a basic I/O unit, occupying 48, 64 or 96 I/O points, depending on the number of activated inputs.
Always verify that the maximum I/O capacity of the CJ1 CPU is sufficient for the number of required I/O points.

■ Nomenclature



Unit status indicators
- RUN (green)
- ERC (red)

Sensor error indicators
- 1 - 6 (red)

Removable Terminal Block
- Connections for Thermocouples 1 - 6
- CJ1W-TS561: screw terminal
- CJ1W-TS561 (SL): screwless terminal

DIP switches
(remove terminal block for access)
- Select input types (K-type/J-type)
- Select filter functions
- Select number of active inputs (1-6)

Terminal Block latch
- Slide down to remove
- Slide up to lock

■ Wiring

- Keep the thermocouple wiring as short as possible to avoid electrical interference. Shielded wiring is recommended.
- When extending input wiring, always use compensation wires appropriate for the thermocouple type.
- For activated but unused inputs, short-circuit the + and - terminals, to prevent unstable readout on the other inputs.
- Keep the input wiring away from power lines including AC power supply lines and high-power lines. Do not run the I/O lines in the same duct or conduit as power lines.
- The input circuits are galvanically isolated from the PLC's I/O bus, but there is no galvanic isolation between individual inputs.
- Always ground the ⏚ terminal on the Power Supply Unit of the PLC. In case of shielded sensor wiring, connect the shields to the same grounding point as the PLC.

■ General Specifications

Unit classification	CJ-series Basic I/O Unit
Compatible Racks	CJ-series CPU Rack or CJ-series Expansion Rack
Max. number of Units	10 Units/Rack max. (This requires a CJ1G or CJ1H CPU)
CPU Unit data area for inputs	Basic I/O area CIO0000 – 0999 (3, 4 or 6 words allocated in IO Table)
Insulation resistance	20 MΩ min. (at 500 V DC) between input terminals and PLC I/O bus.
Dielectric Strength	500 V AC, 50/60 Hz for 1 min. (detection current: 1 mA), between Input terminals and PLC I/O bus.
Internal current consumption	220 mA max., 5 V DC, from the PLC I/O bus.
Dimensions	31 x 90 x 65 mm (W x H x D)
Weight	150 g max.
Other	Other general specifications conform to the CJ-series general specifications. See Operation Manual W393.

■ Characteristics

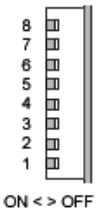
Thermocouple input	K-type or J-type (IEC 60584)
Number of inputs	1 to 6
Measurement range	K-type: -200.0 to +1300.0 °C J-type: -100.0 to +850.0 °C
Indication resolution	0.1 °C
Cold junction compensation - Accuracy	Internal measurement of terminal temperature, once in each scan cycle. ± 2.0 °C in a stable temperature environment (no direct heat or airflow).
Temperature value Data representation	16-bit signed integer in units of 0.1 °C: #F830 = -200.0 °C, #32C8 = +1300.0 °C
Indication accuracy * over full operational range (0 – 55 °C ambient temperature)	± 0.5 % of indicated value or ± 0.7 °C (whichever is larger) ± 1 digit max. ±2.0 °C ± 1 digit max. using a K-type thermocouple below –100 °C.
Input response time (per active input)	40 ms (100 Hz suppression) 67 ms (60 Hz suppression) 80 ms (50 Hz suppression) 400 ms (50+60 Hz suppression)
Input update cycle time (all active inputs)	[number of active inputs + 1] x [input response time] + 40 ms
I/O refresh time (influence on PLC cycle time)	1-3 inputs (48pt mode): 0.008 ms 4 inputs (64pt mode): 0.011 ms 5-6 inputs (96pt mode): 0.016 ms

* Indication accuracy is guaranteed with the supplied terminal block. Do not replace the supplied terminal block by a different model (e.g. screw type by screwless type or vice versa).

■ LED indicators

Name	State	Description
RUN (Green)	OFF	Fatal error or no power supply. • Check the host PLC's CPU status, and the status of other I/O units. If all other units function normally, replace the Unit.
	ON	Unit functions normally.
ERC (Red)	**OFF**	No fatal errors.
	ON	Incorrect DIP switch setting Fatal error in the Unit. • Check the CPU unit for error codes. • Re-start the PLC system. • If the ERC LED is still lit, replace the unit.
Sensor Error 1 – 6 (Red)	**OFF**	• Measurement of the corresponding channel is within range, or • Channel has been deactivated by DIP switch settings
	ON	• Measured temperature out-of-range, or • Thermocouple broken wire
	All ON	Calibration data not found or incorrect. The Unit should be returned to OMRON for calibration.

■ DIP switches



8 DIP switches are accessible after removing the front terminal block. Switch settings are processed at time of power ON, and should not be changed while the unit is powered.

Default (ex-factory) setting is all switches ON, i.e. all 6 inputs are active and set to K-type thermocouple, with filtering at n x 100 Hz. Be sure to adjust the settings to your requirements before use.

SW 1, 2 and 3 : Input type selection

Any combination of input types (different numbers of K-type/J-type sensors) can be set.

SW	State	Input type selection
1	OFF	Input channel 1 is J-type
	ON	Input channel 1 is K-type
2	OFF	Input channels 2 and 3 are J-type
	ON	Input channels 2 and 3 are K-type
3	OFF	Input channels 4, 5 and 6 are J-type
	ON	Input channels 4, 5 and 6 are K-type

SW 4 + 5 : Input filtering (valid for all active input channels)

Use filtering if the measured value is affected by the mains frequency or other sources of electrical interference.

SW4	SW5	Filtering	Response time
OFF	OFF	n x 10 Hz suppression	400 ms each input
OFF	ON	n x 50 Hz suppression	80 ms each input
ON	OFF	n x 60 Hz suppression	67 ms each input
ON	ON	n x 100 Hz suppression	40 ms each input

SW 6+7+8 : Input activation

To prevent broken wire indication for unused inputs, and to reduce the number of input channels occupied in CIO memory, the number of required inputs can be set by SW 6+7+8.

Input words are allocated in the PLC's CIO area as Basic I/O Unit, i.e. sequentially starting at the leftmost unit. See CJ1-series Operation Manual W393 for details.

Create the I/O table in the PLC after changing the switch settings, to register the correct number of input words in the PLC CPU. The unit is registered as 48-point, 64-point, or 96-point input unit, depending on the number of 16-bit CIO words it occupies.

SW6	SW7	SW8	Active inputs	Occupied input words
OFF	OFF	OFF	Not valid, ERC indicator will be ON	
ON	OFF	OFF	1	3 CIO words (1 used)*
OFF	ON	OFF	1, 2	3 CIO words (2 used)*
ON	ON	OFF	1, 2, 3	3 CIO words
OFF	OFF	ON	1, 2, 3, 4	4 CIO words
ON	OFF	ON	1, 2, 3, 4, 5	6 CIO words (5 used)*
OFF	ON	ON	1, 2, 3, 4, 5, 6	6 CIO words
ON	ON	ON	1, 2, 3, 4, 5, 6	6 CIO words

* In these cases, more CIO words will be occupied than required for the active inputs. The remaining occupied CIO words will be filled with 0's, and cannot be used as work bits.

■ Data representation

Measured temperatures are indicated in °C. Each input value occupies one word (16 bits) in the CIO area and is encoded as a signed integer, with a resolution of 0.1 °C.

Examples: #0300 = 768 (dec) = 76.8 °C
#FF85 = -123 (dec) = -12.3 °C

Measured values are updated in CIO memory in each I/O refresh cycle. The following values are to be interpreted as error codes:

Value	Description
#7AAA	Calibration data invalid or error detected at start-up, e.g. cold junction temperature out of range.
#7BBB	Sensor error, broken wire
#7CCC	Measured value out of range (over max. Temperature)
#8CCC	Measured value out of range (under min. Temperature)

During initialisation after power ON, data of active inputs will be #0000 until the "Not Ready' flag turns OFF.

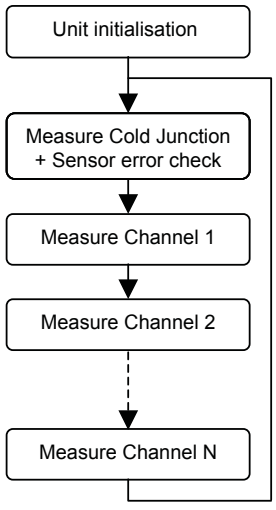
■ 'Not Ready' flag

During initialisation after power-on, and in case of internal failure, a 'Not Ready' flag will be set in the PLC memory area A050 to A069 (Basic I/O Unit information area, refer to CJ1 Operation Manual W393 for details).
The lower bit of each unit is the Not Ready flag; the error code indicated in the remaining bits is relevant for repair purposes only. While this flag is ON, the temperature sensor data indicated by the unit in the CIO area is invalid.

Address	Bit	When Bit = ON
A050	00	Unit in rack 0, slot 0 is not ready
	08	Unit in rack 0, slot 1 is not ready
A051	00	Unit in rack 0, slot 2 is not ready
	…	…
A055	00	Unit in rack 1, slot 0 is not ready
	…	…
A069	00	Unit in rack 3, slot 9 is not ready
	08	Unit in rack 3, slot 10 is not ready

■ Unit cycle time

The internal processing time for all measurements by the unit is determined by the number of active channels and the filter type.



The cold junction compensation measurement and one sensor error check are executed each cycle.

The cold junction measurement time depends on the input filter setting, whereas the sensor error check takes a fixed 40 ms.

Example:
If 4 inputs are active, and filtering is set to n x 50 Hz (response time = 80 ms):

Each measurement cycle takes (4+1) x 80 + 40 ms = 440 ms.

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