

EJ1

Temperature controller

EN

Instruction Manual

Thank you for purchasing the OMRON Product. To ensure the safe application of the Product, only a professional with an understanding of electricity and electric devices must handle it. Read this manual carefully before using the Product and always keep it close at hand when the Product is in use.

OMRON CORPORATION

©All Rights Reserved

5843149-9A

For detailed operating instructions, please refer to the *EJ1 Modular Temperature Controller User's Manual* (Cat. No. H142).

Safety Precautions

●Key to Warning Symbols

CAUTION

Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or property damage. Read this manual CAUTION carefully before using the product.

●Warning Symbols

CAUTION

Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock.

Use a power supply that complies with the reinforced insulation specified in IEC 60664 for the EJ1 external power supply or the power supply connected to the EJ1. If non-compliant power supplies are used, electric shock may occasionally result in minor injury.

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.

Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.

Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.

Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents.

Provide safety measures in external circuits (i.e., not in the Temperature Controller) to ensure safety in the system if an abnormality occurs due to malfunction or due to external factors. Not doing so may result in serious accidents due to incorrect operation.

Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

Provide measures in the communications system and programming to ensure safety in the overall system even if errors or malfunctions occur in serial communications, remote I/O communications, or other communications.

You must take fail-safe measures to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.

Tighten the terminal screws to between 0.5 and 0.6 N·m. Loose screws may occasionally result in fire.

A malfunction in the product may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the product, take appropriate safety measures, such as installing a monitoring device on a separate line.

Always consider the application conditions and use the product within the rated load. If the product is used past its life expectancy, burning may occasionally occur.

CAUTION - Risk of Fire and Electric Shock

a) This is the product UL Recognition as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.

b) More than one disconnect switch may be required to de-energize the equipment before servicing.

c) Signal inputs are SELV, limited energy.

d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits.*1

*1 A class 2 circuit is one tested and certified by UL as having the current and voltage of the secondary output restricted to specific levels.

Conformance to UL/CSA

Do not allow temporary overvoltage on the primary circuit to exceed the following values. Check the power supply voltage to the Temperature Controller.
Short-term overvoltage: 1,200 V + (Power supply voltage)
Long-term overvoltage: 250 V + (Power supply voltage)

The power supply terminals must be supplied from a SELV, limited-current source. A SELV (safety extra-low voltage) source is a power supply having double or reinforced insulation between the primary and the secondary circuits and having an output voltage of 30 V r.m.s. max. and 42.4 V peak max. or 60 V DC max.

Functional insulation is provided between the power supply, input, output, and communications terminals. If reinforced or double insulation is required, use a power supply that complies with the reinforced or double insulation standards specified in IEC 60664 for the EJ1 external power supply and for the power supply connected to the EJ1.

Always externally connect the recommended fuse that is specified in the Instruction Manual before you use the Temperature Controller.

Analog Input

• If you input an analog voltage or current, set the Input Type parameter to the correct input type.

• Do not use the Temperature Controller to measure a circuit with Measurement Category II, III, or IV.

• Do not use the Temperature Controller to measure an energized circuit to which a voltage that exceeds 30 V r.m.s. or 60 V DC is applied.

The protection provided by the Temperature Controller may be impaired if the Temperature Controller is used in a manner that is not specified by the manufacturer.

Due to UL Listing requirements, use the E54-CT1L or E54-CT3L current transformer with the factory wiring (internal wiring). Use a UL certified XGBA or XGBAT current transformer that is UL Listed for field wiring (external wiring) and not the factory wiring (internal wiring).

Conformance to EU Directives and UK legislations

This is a class A product. In residential environment areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

Precautions for Safe Use

1) The product is designed for indoor use only. Do not use the product outdoors or in any of the following locations.

- Places directly subject to heat radiated from heating equipment.
- Places subject to splashing liquid or oil atmosphere.
- Places subject to direct sunlight.
- Places subject to dust or corrosive gas (in particular, sulfide gas or ammonia gas).
- Places subject to intense temperature change.
- Places subject to icing or condensation.
- Places subject to vibration or strong shocks.

2) Use and store the product within the rated temperature and humidity ranges. Provide forced-cooling if required.

3) Do not block the ventilation holes on the product. Internal temperature rise may result in a shorter product service life.

4) Be sure to wire properly with correct polarity of terminals.

5) Use the wire sizes and stripping lengths given in the following table to prevent smoking and firing of the wiring material.

Terminal type	Recommended wires	Stripping length
Screw Terminals *1	• Basic Unit AWG24 to AWG18 (equal to cross-sectional area of 0.205 to 0.823 mm ²) • End Unit AWG24 to AWG16 (equal to cross-sectional area of 0.205 to 1.309 mm ²)	6 to 8 mm
Screw-Less Clamp Terminals *2	AWG24 to AWG16 (0.25 to 1.5 mm ²) Copper stranded or solid wires	8 mm
Screw Connector Terminals *3	AWG24 to AWG14 (equal to cross-sectional area of 0.205 to 2.081 mm ²)	—

*1 You can connect up to two wires of the same size and type, or two crimped terminals using M3, width 5.8 mm or less to a single terminal.
*2 You can connect only one wire to each terminal.
*3 You can connect up to two wires of the same size and type to a single terminal.

6) Do not connect anything to unused terminals.

7) To reduce inductive noise, keep the wiring for the product's terminal block away from power cables carrying high voltages or large currents. Also, do not wire power lines together with or parallel to product wiring. Using shielded cables and using separate conduits or ducts is recommended.

8) Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component).

9) Allow as much space as possible between the product and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.

10) Allow as much space as possible between the Temperature Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.

11) Use the product within the rated load and power supply.

12) Make sure that the rated voltage is attained within two seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.

13) Make sure that the product has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.

14) When executing self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.

15) The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for this unit.

16) Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.

17) Design the system (e.g., the control panel) allowing leeway for the delay required before product outputs are valid after turning ON power to the product.

18) The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data, e.g., through communications.

19) Never touch the electronic components, connectors, or patterns on product boards with your bare hands. Always hold the product by the case. Inappropriately handling the product may occasionally damage internal components due to static electricity.

20) Use suitable tools when taking the Temperature Controller apart for disposal. Sharp parts inside the Digital Controller may cause injury.

21) Do not exceed the communications distance that is given in the specifications and use the specified communications cable.

22) Do not turn the power supply to the Temperature Controller ON or OFF while the USB-Serial Conversion Cable is connected. The Temperature Controller may malfunction.

23) Do not bend the wiring cables past their natural bending radius. Do not pull on the wiring cables.

24) Mount the product to a DIN Rail mounted vertically to the ground.

25) Use a switch, relay, or other device with contacts to turn OFF the power supply quickly. Gradually lowering the voltage of the power supply may result in incorrect outputs or memory errors.

26) Do not touch the electronic components with your hands or subject them to shock when removing the terminal block.

27) Connect only the specified number of products in only a specified configuration.

28) Always turn OFF the power supply before wiring the product, replacing the product, or changing the product configuration.

29) Attach the enclosed cover seal to the connector opening on the left end product during installation.

30) Do not use port B on the End Units when using port C on Advanced Units.

31) Be sure to use the external fuse with the appropriate fusing characteristics, and the breaker with the appropriate tripping characteristics to ensure that the fuse does not melt and the breaker is not activated due to the inrush current. Be particularly careful when N units are linked together, the inrush current will be equal to N times that for one unit.

32) Do not use the port A connector and port A terminal of the End Unit at the same time.

33) Do not connect or disconnect the Conversion Cable or USB-Serial Conversion Cable while communications are in progress. The product faults or malfunction may occur.

34) Make sure that the metal components of the product are not touching the external power terminals.

35) Do not leave the Conversion Cable or the USB-Serial Conversion Cable connected constantly to the equipment. Noise may enter on the Conversion Cable or USB-Serial Conversion Cable, possibly causing equipment malfunctions.

36) Observe the following precautions when you wire the product models with screwless clamp terminal blocks.

- Follow the procedures given in *EJ1 Modular Temperature Controllers User's Manual* (Cat. No. H142).
- Do not wire anything to the operating holes.
- Do not tilt or twist a flat-blade screwdriver while it is inserted into a operating hole on the terminal block. The terminal block may be damaged.
- Insert a flat-blade screwdriver straight into the operating holes. The terminal block may be damaged if you insert the screwdriver at an angle.
- Do not allow the flat-blade screwdriver to fall out while it is inserted into a operating hole.

37) Use wires with heat resistance of 75°C min to wire the terminals because the maximum terminal temperature is 75°C.

Specifications

Power supply voltage	24 V DC 5A (at max. DC load)
Operating voltage range	85% to 110% of the rated voltage
Power consumption(V2.0)	Basic Unit TC4: 3 W max. (at max. DC load) TC2: 2.5 W max. (at max. DC load)
Indication accuracy(V2.0)	Thermocouple Input: (±0.3% of indication value or ±1°C, which is greater) ± 1 digit max. Platinum Resistance Thermometer Input: (±0.2% of indication value or ±0.8°C, which is greater) ± 1 digit max. Analog Input: (±0.2% F/S) ±1 digit max. CT Input: (±5% F/S) ±1 digit max.
Control output	Voltage output: 12 V DC, 21 mA max. Current output: 4 to 20 mA DC, 0 to 20 mA DC load of 500 Ω max. Transistor output: 30 V DC, 100 mA max. ON/OFF or advanced PID
Auxiliary output	Operating: -10 to 55°C
Control method	Storage: -25 to 65°C (with no freezing or condensation)
Ambient temperature	Operating: 25% to 85% Storage: 25% to 85%
Ambient humidity	Individual Unit: 15 A max.
Inrush current (POWER)	End Unit: 70 g
Weight(V2.0)	Basic Unit: 160 g
Degree of protection	Rear case, End Unit case: IP20
Installation environment	Terminal section: IP00
Altitude	Overvoltage category II, pollution degree 2 (as per IEC 61010-1)
Event inputs	2,000 m max.
	Output current: Approx. 4 mA
	Contact input ON: 1 kΩ max., OFF: 100 kΩ min.
	Non-contact input ON: Residual voltage of 1.5 V max., OFF: Leakage current of 0.1 mA max.
	Single-phase, 100 A (AC)
	Non-volatile memory
	Number of writes: 100,000
	T4A 125V time-lag low-braking capacity

Wiring

Dimensions (mm)

[EJ1□-TC: Basic Unit]
(Component: Basic Unit, Instruction Manual)

(Screw Terminals)

(Screw-Less Clamp Terminals)

31

31

95.4

90

27.0

35.4

27.6

Screw Terminals: 109

Screw-Less Clamp Terminals: 104.85

[EJ1C-EDU: End Unit]
(Component: End Unit, Instruction Manual, End Plate, Cover Seal)

(Screw Terminals)

(Connector Terminals)

15.7

15.7

95.4

90

27.0

35.4

27.6

Screw Terminals: 76.2

Connector Terminals: 79.7

Display

Names of Parts on Front Panel

Operation Indicators
COM1
COM2
COM3

SW1

SW2

Operation Indicators
PWR 1
RUN 2
ERR 3
ALM 4

Connections

EJ1□-TC4□-□□

Voltage output

12 V DC

OUT1

OUT2

12 V DC

B1

B2

B3

ch2

A

B

TC

B4

B5

B6

ch1

A

B

TC

B7

B8

B9

Analog input

Pt input

TC input

EJ1□-TC2□-□QNH

Voltage output

12 V DC

OUT1

OUT2

12 V DC

B1

B2

B3

ch2

A

B

TC

B4

B5

B6

ch1

A

B

TC

B7

B8

B9

Analog input

Pt input

TC input

EJ1□-TC2□-□CNB

Current output

4 to 20 mA DC

OUT1

OUT2

4 to 20 mA DC

B1

B2

B3

ch2

A

B

TC

B4

B5

B6

ch1

A

B

TC

B7

B8

B9

Analog input

Pt input

TC input

EJ1C-EDUA-FLK

Port A (Connector)

Port A

RS-485

B(+)

A(-)

Transistor output *1

COM

A1

A2

A3

A4

EV2

A5

EV1

A6

(-)

A7

A8

A9

DO NOT USE

Port B

B(+)

RS-485

A(-)

Transistor output *2

SUB2

SUB1

COM

24 V DC

Input power supply

EJ1C-EDUC-□FLK

Port A

1

2

3

4

5

6

7

8

9

10

B(+)

A(-)

SUB2

COM

SUB1

COM

B(+)

A(-)

Port B

24 V DC

Connecting to the G3ZA (EJ1□-TC□□-□□□□)

Transistor output *2

CN1

Connect the G3ZA harness to the CN1 connector on the bottom of the Unit.

G3ZA

Set SW 2 to 3 (57.6 kbps).

Connect the black line with a white stripe to terminal 7 on the G3ZA and the black line with no stripe to terminal 8.

EJ1C-CBA050 (sold separately)

Length of cable: 5 m

Installation

Connecting Units

1. Align the connector and connect the Units to each other. Connect and End Unit to the Unit on the right end. (Up to 16 Units can be connected side by side.)

2. Slide the yellow sliders on the tops and bottoms of the Units until they click into place.

3. Attach the cover seal to the connector on the Unit on the left end.

Lock

Slider

Cover seal

Removing the Terminal Block

1. Press down the terminal block levers.

2. Pull out the terminal block.

Lower the lever.

Lower the lever.

Precautions for Correct Use

• Do not connect an End Unit directly to an Advanced Unit.

• Always connect an End Unit to the right side of a Basic Unit.

• You cannot use an EJ1 Controller as a CJ-series Unit.

• When removing the terminal block and replacing the Unit, make sure that the new Unit matches the original Unit.

Mounting to the DIN Rail

<Mounting>

Insert the hooks on the top of the EJ1 into the DIN Rail and press the EJ1 until the hooks lock into place.

2. Insert the upper hooks into the DIN Rail.

3. Press in on the EJ1.

1. Lower the hooks.

<Dismounting>

Pull down on the hooks with a flat-blade screwdriver and lift up on the EJ1.

Flat-blade Screwdriver

Removing the Terminal Block

1. Press down the terminal block levers.

2. Pull out the terminal block.

Lower the lever.

Lower the lever.

Precautions for Correct Use

• Do not connect an End Unit directly to an Advanced Unit.

• Always connect an End Unit to the right side of a Basic Unit.

• You cannot use an EJ1 Controller as a CJ-series Unit.

• When removing the terminal block and replacing the Unit, make sure that the new Unit matches the original Unit.

Specification Settings

Switch Operation

- Check that the EJ1 is turned OFF before operating the switches. Settings are valid only when power is supplied.
- Set the switches with a small flat-blade screwdriver. Do not set the switches midway between settings.
- SW 1 is set to 1 and SW 2 pins are all set to OFF in the default settings.

Setting the Unit Number

SW 1 and SW 2 can be used together to set the unit number to between 00 and 63. The factory setting is unit number 01.

SW2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
OFF	OFF	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ON	OFF	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
OFF	ON	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
ON	ON	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63

SW1

SW2

Setting SW 2

SW2	Description
Pin 3	Set to ON when using the Modbus communications protocol for port B. OFF: The setting for port B communications protocol is used. ON: Modbus is used.
Pins 4 and 5	Set the baud rate for port B. 4 = OFF, 5 = OFF: Use port B baud rate setting (default: 9.6 kbps). 4 = ON, 5 = OFF: 19.2 kbps 4 = OFF, 5 = ON: 38.4 kbps 4 = ON, 5 = ON: 115.2 kbps
Pin 6	Set to ON to display the output status on the operation indicators. OFF: The operation status is displayed (PWR, RUN, ERR, and ALM). ON: The output status is displayed (outputs 1, 2, 3, and 4). Note: Normally keep this pin set to OFF so that the operation status can be checked.
Pin 7	Set to ON when using the G3ZA.
Pin 8	Used when using an Advanced Unit and distributed installation. (Refer to the User's Manual for details.)

OMRON Corporation (Manufacturer)

Shiokoji Horikawa, Shimogyo-ku, Kyoto, 600-8530 JAPAN
Contact: www.ia.omron.com

Regional Headquarters

■ **OMRON EUROPE B.V. (Importer in EU)**
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

■ **OMRON ELECTRONICS LLC**
2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

■ **OMRON ASIA PACIFIC PTE. LTD.**
438B Alexandra Road, #08-01/02
Alexandra Technopark,
Singapore 119968
Tel: (65) 6835-3011/Fax: (65) 6835-3011

■ **OMRON (CHINA) CO., LTD.**
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-6023-0333/Fax: (86) 21-5037-2388

Note: Specifications subject to change without notice.