Instruction Manual (Installation)

e-Front runners

Multi-loop module type Temperature Controller

Analog IO/I/O Module

Model : PUMV/N/T

Fuji Electric Co., Ltd. INP-TN1PUMVb-E

Thank you for purchasing the Fuji module type temperature controller.
Once you have confirmed that this is the product you ordered, please use it in accordance with the following instructions.
For detailed information on operating this equipment, please refer to the separate user's manual.
In addition, please keep this instruction manual within easy reach of the actual person using this equipment.

CAUTION

The contents of this manual are subject to change without notice.
This manual is complied with possible care for the purpose of accuracy, however, Fuji Electric Systems shall not be held liable for any damages, including indirect damage, caused by typographical errors,
absence of information or use of information in this manual.

Confirming Specifications and Accessories

Before using the product, confirm that it matches the type ordered.
(For model code, please refer to page 4.)
Confirm that all of the following accessories are included.

Temperature Controller Analog IO/I/O Module	1 Unit
Instruction Manual	1 copy
I/V unit (250 ohm resistance)	1 unit per voltage/current input

Related Information

Refer to "Module Type Temperature Controller Analog IO/I/O Module User's Manual" for details about the items described in this manual.

Content	Material name	Material No.
Specification	Catalog	ECNO 1162
Operating instruction	Analog IO/ I/O Module User's manual	INP-TN5A0203-E
Tool	PUM parameter loader	INP-TN5A0201-E

Please Read First (Safety Warnings)

Please read this section thoroughly before using and observe the mentioned safety warnings fully.
Safety warnings are categorized as "Warning", "Caution" or "Risk of Electrical Shock".

⚠ Warning	Improper use of the equipment may result in death or serious injuries.
⚠ Caution	Improper use of the equipment may cause injury to the user or property damage.
⚠ Risk of Electrical Shock	Indicates that a risk of electrical shock is present and the associated warning should be observed.

1 ⚠ Warning

1-1 Installation and Wiring

- This equipment is intended to be used under the following conditions.

Ambient temperature	-10 to 50 degree C
Ambient humidity	90% RH or below (with no condensation)
Vibration	10 to 70Hz less than 9.8m/s² (1G)
Warm-up time	30 min. or more
Installation category	IEC1010-1: class II
Pollution level	IEC1010-1: degree 2

- Between the temperature sensor and the location where the voltage reaches or generates the values described below, secure clearance space and creepage distance as shown in the table below.
  If such space cannot be secured, the EN61010 safety compliance may become invalid

Voltage used or generated by any assemblies	Clearance Space [mm]	Creepage Space [mm]
Up to 50 Vrms or Vdc	0.2	1.2
Up to 100 Vrms or Vdc	0.2	1.4
Up to 150 Vrms or Vdc	0.5	1.6
Up to 300 Vrms or Vdc	1.5	3.0
Above 300 Vrms or Vdc	Please consult our distributor	

- For the above, if voltage exceeds 50Vdc (called danger voltage), basic insulation is required between the earth and all terminals of the equipment.
  Note that the insulation class for this equipment is as follows. Before installing, please confirm that the insulation class for the equipment meets usage requirements.

Power	Ai1
Loader Communication RS-485 Communication	Ai2
	Ai3
	Ai4
	OUT1 (Current)
	OUT2 (Current)
	OUT3 (Current)
	OUT4 (Current)

═══ Functional insulation (AC1000V) ——— Functional insulation (AC500V)

- In cases where damage or problems with this equipment may lead to serious accidents, install appropriate external protective circuits.
- To prevent damage and failure of the equipment, provide the rated power voltage.
- To prevent electric shock and equipment failure, do not turn the power ON until all wiring is complete.
- Before turning the power ON, confirm that clearance space has been secured to prevent shock or fire.
- Do not touch the terminal while the machine is ON. Doing so risks shock or equipment errors.
- Never disassemble, convert, modify or repair this equipment. Doing so risks abnormal operation, shock or fire.
- All of the wiring should be class 1 type wiring or the low voltage wires are routed separately from the hazardous voltage wires to ensure separation of circuits.
- When using a AWG-16 cable, you should use the crimp terminal that material thickness is 0.9mm or less.

1-2 Maintenance

- When installing or removing the equipment, turn the power OFF. Otherwise, shock, operational errors or failures may be caused.
- Periodic maintenance is recommended for continuous and safe use of this equipment.
- Some parts installed on this equipment have a limited life and/or may deteriorate with age.
- The warranty period for this unit (including accessories) is one year, if the product is used properly.

2 ⚠ Caution

2-1 Cautions when Installing

For install in UL listed enclosure only.
Please avoid installing in the following locations.
- Locations in which the ambient temperature falls outside the range of 0 to 50 degrees C when equipment is in use.
- Locations in which the ambient humidity falls outside the range of 45 to 85% RH when equipment is in use.
- Locations with rapid temperature changes, leading to dew condensation
- Locations with corrosive gases (especially sulfide gas, ammonia, etc.) or flammable gases.
- Locations with vibration or shock directly.
- Locations in contact with water, oil, chemicals, steam or hot water.
  (If the equipment gets wet, there is a risk of electric shock or fire, so have it inspected by Fuji distributor.)
- Locations with high concentrations of atmospheric dust, salt or iron particles.
- Locations with large inductive interference, resulting in static electricity, magnetic fields or noise.
- Locations in direct sunlight.
- Locations that build up heat from radiant heat sources, etc.
- A switch or circuit Breaker shall be included in the building installation.
  Please be it in close proximately to the equipment and within easy reach of the operator, and mark it as the disconnecting device for the equipment.

2-2 Cautions when Mounting to Cabinets / DIN rails

- In case of mounting the temperature controllers to DIN rails, remember to push up the locking tabs to fasten the controllers onto DIN rail.
- To connect controllers, first release all locking tabs. Then, connect controllers and push up all locking tabs. Make sure that all locking tabs are fastened.
- Never fail to turn the power OFF, before detaching the terminal block or removing the main unit from the base part.
- In order to aid heat dissipation, do not block the top and the bottom of the equipment.
- When mounting / dismounting controllers to / from DIN rails, 30mm of clearance above and under the controllers should be provided.
- Use terminal screws in this product only.

2-3 Cautions for Wiring

- For thermocouple input, use the designated compensation lead. For resistance bulb input, use wires with small lead wire resistance and without any resistance difference among three wires.
- To avoid the influence of inductive noise, signal wires should be separated from electric power lines or load lines.
- Input signal wire and output signal wire should be separated from each other. And both should be shielded.
- To comply with CE marking (EMC), we recommend to attach ferrite core to communication cable and power cable.
- For wiring to the terminal block, apply crimp type terminals size M3.
  Screw size : M3 x 7 (with square washer)
  Screw tightening torque : 0.78N-m (8kgf-cm)

2-4 Error Operation

- The alarm function does not work properly when an error occurs unless the settings are made correctly. Always verify its setting before operation.
- In case of error input, PWR LED will flash. When replacing the sensor, make sure to turn the power OFF.

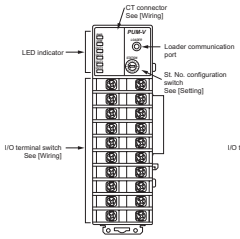
2-5 Others

- Please do not wipe the equipment with organic solvents such as alcohol or benzene, etc. If wiping is necessary, use a neutral cleaning agent.
- Do not use mobile phones near this equipment (within 50cm). Otherwise a malfunction may result.
- Malfunctions may occur if the equipment is used near a radio, TV, or wireless device.
- This equipment requires approx. 20 seconds before it starts to output.
- Before installing and wiring, take necessary measures for electrostatic discharge (ESD).

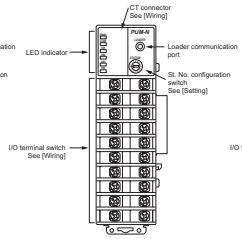
Part names and Functions

- Main unit

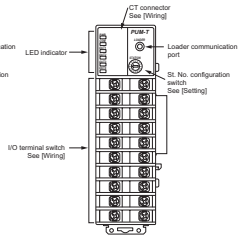
- Analog I/O module



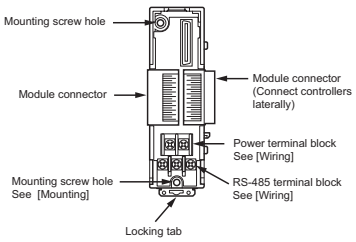
Analog Input module



Analog Output module



- Base part



LED indicator

LED (6 points) indicates the operation status.

■Analog I/O module

LED	LED Status	Color	Operational condition
PWR	ON	Green	Normal operation (Slave station of internal communication)
	Blinking	Green	Normal operation (Master station of internal communication)
	ON	Red	System FAULT (A/D converter error, internal communication error)
	Blinking	Red	Input error
COM	ON	Green	RS-485 being received
	ON	Orange	RS-485 being sent
OUT1 to 4	ON	Green	Corresponding channel outputting
	ON	Red	Corresponding channel input error

- Actions to be displayed for COM and OUT1 to 4 can be allocated by programming.

■Analog input module

LED	LED Status	Color	Operational condition
PWR	ON	Green	Normal operation (Slave station of internal communication)
	Blinking	Green	Normal operation (Master station of internal communication)
	ON	Red	System FAULT (A/D converter error, internal communication error)
	Blinking	Red	Input error
COM	ON	Green	RS-485 being received
	ON	Orange	RS-485 being sent
IN1 to 4	ON	Red	Corresponding channel input error

- Actions to be displayed for COM and IN1 to 4 can be allocated by programming.

■Analog output module

LED	LED Status	Color	Operational condition
PWR	ON	Green	Normal operation (Slave station of internal communication)
	Blinking	Green	Normal operation (Master station of internal communication)
	ON	Red	System FAULT (A/D converter error, internal communication error)
COM	ON	Green	RS-485 being received
	ON	Orange	RS-485 being sent
OUT1 to 4	ON	Green	Corresponding channel outputting

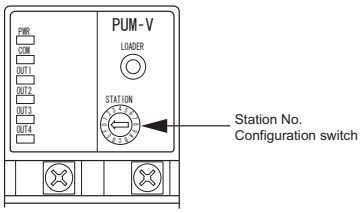
- Actions to be displayed for COM and OUT1 to 4 can be allocated by programming.

Setting

- Setting Station No.

Set Station No. of each controller before mounting.
Apply a fine tip flat-head screwdriver to turn the Station No. configuration switch.

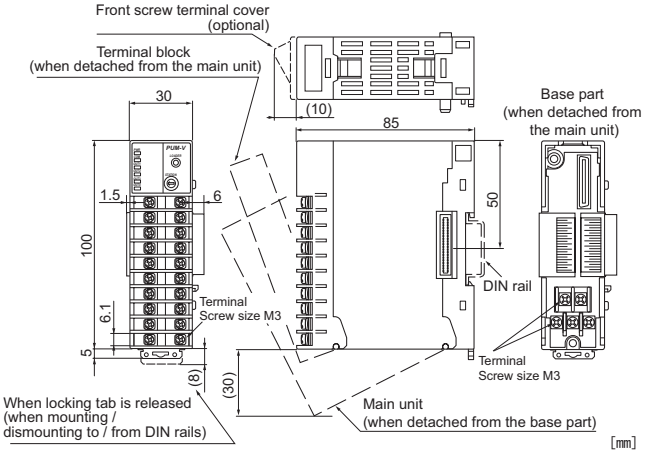
SW setting	Station No.
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
A	11
B	12
C	13
D	14
E	15
F	16



- Each of connected controllers must have a different Station No. from other controllers. Duplicate Station No. may cause malfunction of the equipment.

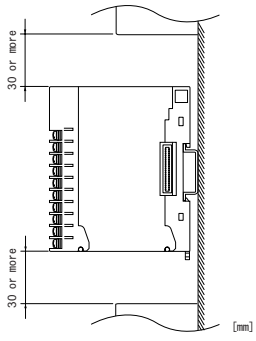
Mounting

- Dimensions



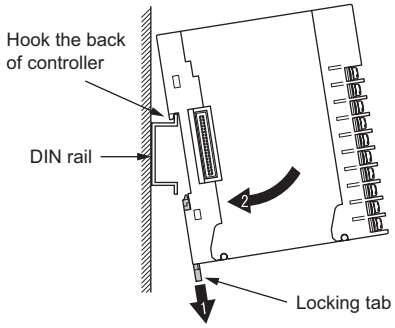
Cautions when mounting

In order to aid heat dissipation, 30mm of clearance (50mm recommended) above and under the controllers should be provided.



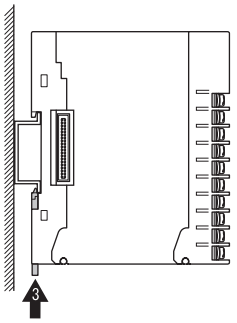
- Mounting to DIN rails

1. Pull down the locking tab of the base part. Hook the back of the controller onto the upper part of DIN rail.
2. Push the controller in the direction of arrow 2.



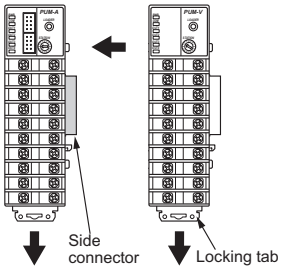
3. Push up the locking tab to fasten the controller onto DIN rail.

- When connecting controllers after mounting to DIN rail, push up the locking tab after doing so.

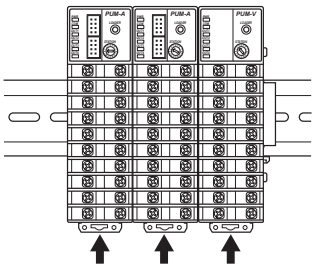


- Connecting controllers

1. Check that locking tabs are pulled down (released).
2. Connect controllers with each other using side connectors.

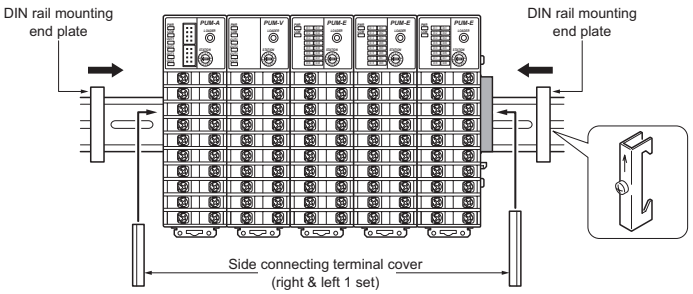


3. After mounting controllers onto DIN rail, make sure to push up all locking tabs. Controllers are fastened to DIN rail and to each other.
4. All connected controllers are connected to power supply and RS-485 via side connectors if one of controllers is directly connected to them.



- Attaching end plates

When mounting controllers to DIN rails, we recommend to attach side connecting terminal covers (right and left 1set), then end plates (optional) to the ends of the rightmost and leftmost controllers.

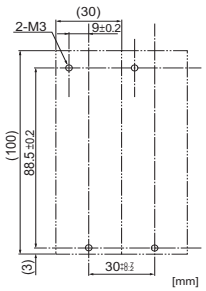


- Fixing with screws

When mounting controllers inside a cabinet with screws, connect the base parts of controllers first.

- Fixing screws are not included. Please prepare screws as required.

1. Refer to the figure below for the mounting screw hole size to decide the mounting position.

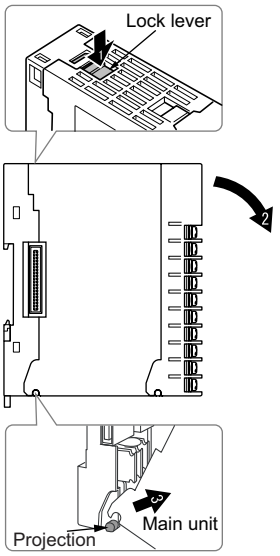


2. Remove the main unit from the base part. See [How to detach the base part]
3. Connect base parts. Push up to fasten all the locking tabs.
4. Fixate the base parts onto the mounting position inside the cabinet with screws.
5. Attach the main unit to the base parts.

How to detach the base part

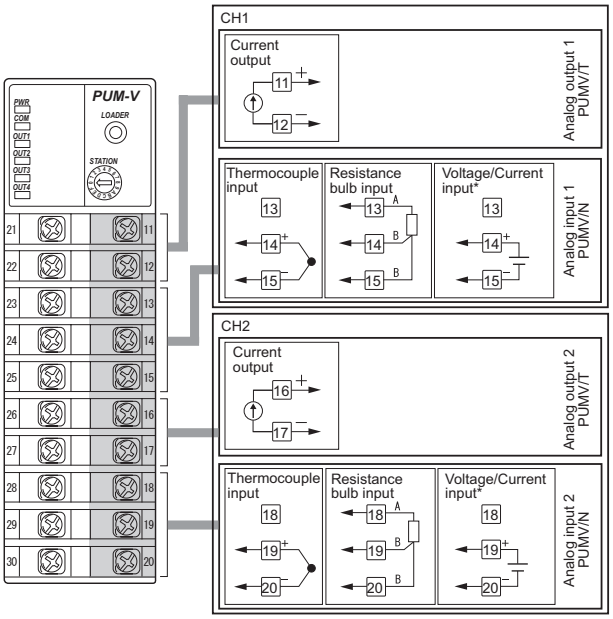
1. Press the lock lever on the top of the main unit.
2. Pull down the upper part of main unit.
3. Detach the cutout on the lower end of back of main unit from the projection on the base part.

- When attaching the main unit to the base part, take the reverse procedure to removing the main unit from the base part.
- Make sure that the lock lever of the main unit is fitted into the base part.



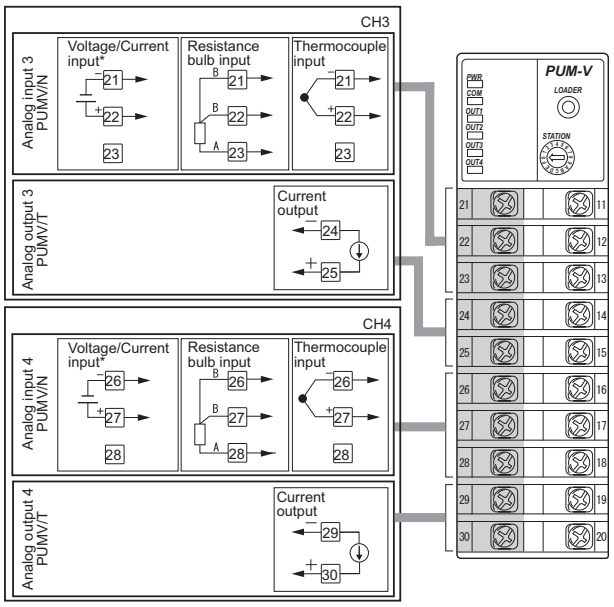
Wiring

- Front terminal block (1ch type / 2ch)



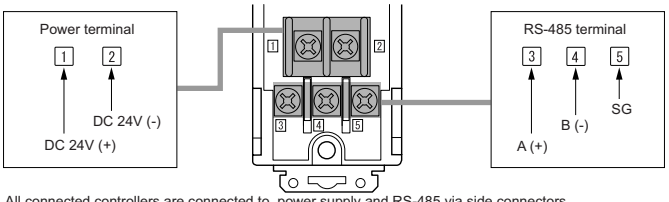
*In case of currenet input, attach I/V unit which comes with the controller to the voltage input terminal.

- Front terminal block (3ch, 4ch)



*In case of currenet input, attach I/V unit which comes with the controller to the voltage input terminal.

- Base part (power terminal, RS-485 terminal)



All connected controllers are connected to power supply and RS-485 via side connectors if one of controllers is directly connected to them.

Specification

General Specification

Power Supply	:	DC24V±10%
Power Consumption	:	Maximum 3.2W (135mA) [when DC24V is applied]
Dimensions	:	30 (W)×100 (H)×85 (D) mm (excluding terminal cover and projection)
Weight	:	Approx.200g
Installation method	:	DIN rail mounting or mounting inside a cabinet with M3 screws
Ambient temperature*	:	-10 to 50 degrees C
		* "Ambient temperature" is the temperature underneath the controller inside the equipment or the cabinet where the controller is installed.
Ambient humidity	:	90% RH or less (non condensing)
System maximum modules	:	Up to max. 17 modules of any Model PUMA/B/C/CL/CM/V/N/T plus to max 16 modules of Model PUME
System power	:	24V dc, 100W maximum, Class 2

Analog input (PUMV/N)

No. of input	:	4 points	
Input signal	:	Thermocouple K, J, T, E, R, B, S, N, PL-II	
		Resistance bulb Pt100, JPt100	
		DC voltage or DC current	: 0 to 5Vdc, 1 to 5Vdc, 0 to 10Vdc, 2 to 10Vdc, 0 to 20mAdc, 4 to 20mAdc
Input impedance	:	Thermocouple input, voltage input	: 1M ohm or more
	-	Voltage input (V)	: Approx. 1M ohm
	-	Current input	: 250 ohm
Signal source resistance	-	Thermocouple	: 0.3%FS ± 1 digit per 100 ohm
	-	Voltage input (V)	: 0.3%FS ± 1 digit per 500 ohm
Allowable wiring resistance	-	Resistance bulb input	: 10 ohm or less per wire

Analog output (PUMV/T)

No. of output	:	4 points	
Control output behavior	:	Re-transmission output or distribution output	
Output type	:	Current output (4-20mAdc, 0-20mAdc)	
	-	Actual output range	: 0mA to 20.6mAdc
	-	Accuracy	: ±0.3%FS (1mA or less : ±5%FS)
	-	Linearity	: ±0.3%FS (1mA or less : ±5%FS)
	-	Resolution	: 5000 or more
	-	Ripple current	: P-P0.3mA or less
	-	Load resistance	: 300 ohm or less

Analog re-transmission output

No. of output	:	4points
Output type	:	Current output (4-20mAdc, 0-20mAdc)

Communication functions

RS-485 interface		
Communication standard	:	RS-485
Communication, synchro method	:	Two-wire, half-duplex, asynchronous cycle
Communication speed	:	9.6k, 19.2k, 38.4k, 115.2kbps
Data form	:	data bit ; 8, parity ; even/odd/none
Communication distance	:	1km (38.4kbps or less), 250m (115.2kbps)
Connectable units	:	33 units (both master and slave units included) (32 units if any modules other than PUM series is included in slaves)
Protocol	:	Modbus RTU compatible
Loader (RS-232C) interface		
Communication standard	:	RS-232C
Communication, synchro method	:	Half-duplex, asynchronous cycle
Communication speed	:	19.2kbps (fixed)
Data form	:	data bit 8, no parity
Protocol	:	Modbus RTU compatible

Crimp terminal size

Please prepare cables and crimp terminals of the size indicated below.
When using a AWG-16 cable, you should use the crimp terminal that material thickness is 0.9mm or less.

Cable type	Size
Thermocouple (Compensation lead wire)	0.25 to 1.25mm^2 (AWG 22 to 16)
Power supply, output, others	0.25 to 1.25mm^2 (AWG 22 to 16)

Crimp terminal

Cable size	Screw tightening torque
0.25 to 1.25mm^2 (AWG 22 to 16)	0.8Nm

Model code

Analog IO/I/O module

1	2	3	4	5	6	7	8		9	10	11	12	13	Contents
P	U	M					1	–	0		0	0	0	Module type
			V											Analog I/O module AI4/AO4
			N											Analog Input module AI4
			T											Analog Output module AO4
				T										Input type
				A										Thermocouple/resistance bulb
				C										Voltage/current
														Thermocouple/resistance bulb [ch1, 2] Voltage/current [ch3, 4]
				Y										Analog output module
					Y	Y								Output type
					E	E								None
														Current output 4 to 20mA
														Operation Manual
										A				Japanese
										B				English

Accessories (optional)

1	2	3	4	5	6	7	8	Contents
P	U	M	Z	*				
					A	0	1	RS-485 terminating resistance
					A	0	2	DIN rail mounting end plate
					A	0	3	Side connecting terminal cover (right & left 1 set)
					A	0	4	Front face screw terminal cover
					L	0	1	Loader connecting cable (RS-232C)

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