Instruction Manual

Model: PXE

Micro-controller X

Fuji Electric Co., Ltd.

INP-TN1PXEa-E

Thank you for your purchasing "Fuji Digital Temperature Controller." Please check that the product is exactly the one you ordered and use it according to the following instructions. (Please refer to a separate operation manual for details.) Dealers are cordially requested to ensure the delivery of this Instruction Manual to hands of the end-users.

Safety Precautions

Before using this product, the user is requested to read the following precautions carefully to ensure the safety. Safety precautions must be taken by every user to prevent accidents.
Failure to comply with the instructions contained in this manual may reduce the safety of the instrument.
The safety requirements are classified into "Warning" and "Caution" according to the following interpretations :

⚠ Warning	Suggesting that the user's mishandling can result in personal death or serious injury.
⚠ Caution	Suggesting that the user's mishandling can result in personal injury or damage to the property.

1. ⚠Warning

1.1 Installation and wiring

• This controller designed to be installed at the following conditions.

Operating temperature	–10 to +50 [°C]	
Operating humidity	90%RH or less (Non condensation)	
Installation category	II	Conforming to IEC61010-1
Pollution degree	2	

• The controller must be installed such that with the exception of the connection to the mains, creepage and clearance distances shown in the table below are maintained between the temperature probe and any other assemblies which use or generate a voltage shown in the table below.
Failure to maintain these minimum distances would invalidate the EN 61010 safety approval.

Voltage used or generated by any assemblies	Clearance (mm)	Creepage (mm)
Up to 50Vrms or Vdc	0.2	1.2
Up to 100Vrms or Vdc	0.2	1.4
Up to 150Vrms or Vdc	0.5	1.6
Up to 300Vrms or Vdc	1.5	3.0
Above 300Vrms or Vdc	Contact with our sales office.	

• If the voltage shown above exceeds 50Vdc (i.e. hazardous voltage), the basic insulation is required between all terminals of this controller and the ground, and supplementary insulation is required for the alarm output.
Isolation class of this controller is as shown below. Be sure to check that the isolation class of the controller satisfies your requirements before installation.

Basic insulation ------ Non-insulation

Mains (Power source)	Measured value input
Control output (relay output)	Internal circuit
Alarm output (AL1)	SSR/SSC driving output
Alarm output (AL2)	Loader

• If there is a danger of a serious accident resulting from a failure or a defect in this unit, provide the unit with an appropriate external protective circuit to prevent an accident.
• The unit is normally supplied without a power switch and fuses.
Make wiring so that the fuse is placed between the main power supply switch and this controller. (Main power supply: 2 pole breaker, fuse rating: 250V, 1A)
• A switch (or a circuit-breaker) must be included in the installation.
• A switch (or a circuit-breaker) must be suitably located and easily reached.
• A switch (or a circuit-breaker) must be marked as the disconnecting device for this equipment.
• Supply wiring shall be prepared by installers in accordance with national regulations.
• When wiring the power supply terminal, use vinyl insulated 600 volt cable or equivalent.
• To avoid the damage and failure of controller, supply the power voltage fitting to the rating.
• To avoid an electric shock and controller failure, do not turn ON the power before all wiring is completed.
• Be sure to check that the distance is kept to avoid electric shock or firing before turning the power ON.
• Keep away from terminals while the circuit is energized in order to avoid an electric shock and a malfunction.
• Never attempt to disassemble, fabricate, modify, or repair this unit because tampering with the unit may result in a malfunction, electric shock, or a fire.
• Output relay is the part has a limited life.
• When output relay contact comes to the end of its life, it might remain on-state, or off-state. For safety, use a protective circuit outside.

1.2 Maintenance precautions

• Be sure to turn off the power before this controller is installed or removed in order to avoid an electric shock, malfunction, and fault.
• Regular maintenance is recommended a longer service life of this controller. Some parts of this controller have a limited life span, or they will be deterio-rated with the lapse of time.
• One-year warranty is guaranteed for this unit including accessories, provided that the controller is properly used.

2. ⚠Caution

2.1 Cautions on installation

Avoid the following places for installation.
• a place where the ambient temperature may reach beyond the range of from 0 to 50°C while in operation.
• a place where the ambient humidity may reach beyond the range of from 45 to 85% RH while in operation.
• a place where a change in the ambient temperature is so rapid as to cause condensation.
• a place where corrosive gases (sulfide gas and ammonia gas, in particular) or combustible gases are emitted.
• a place where the unit is subject directly to vibration or shock.
(Vibration or shock may cause output relay malfunction.)
• a place exposed to water, oil, chemicals, steam and vapor.
(if immersed with water, take the inspection by sales office to avoid an electr-ical leakage and firing)
• a place where the unit is exposed to dust, salt air, or air containing iron par-ticles.
• a place where the unit is subject to intereference with static electricity, mag-netism, and noise.
• a place where the unit is exposed to direct sunlight.
• a place where the heat may be accumulated due to the radiation of heat.

2.2 Caution on installation on panel

• Insert the mounting bracket (accessory) from the rear side until the main unit is securely fit into the panel. If there are some gaps, tighten two screws until the gaps are eliminated. (Do not tighten the screws excessively because the mounting bracket can be removed from the stopper by the force.)
• The front side of this controller conforms to NEMA4X (equivalent with IP66). To ensure the waterproofness between the instrument and the panel, use packings that are provided as accessories in the following manner: (The improper fitting of packings will ruin the waterproofness.)
① As shown in Figure 1, fit a packing to the case of the unit and then insert it in the panel.
② Tighten screws on the fixing frame or fixtures so that no gaps are given between the front of controller and packing and between panels. Check that there are no deformation of packing as shown in Fig.3.
• If panel strength is weak, it may causes a gap between the packing and the panel, thus impairing water resistance.

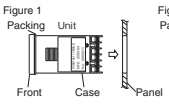
Figure 1


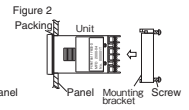
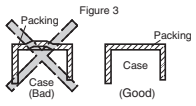
Figure 2


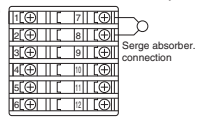
Figure 3


2.3 Precautions in wiring connection

• For the thermocouple sensor type, use thermocouple compensation wires for wiring.
For the RTD type, use a wiring material with a small lead wire resistance and no resistance differentials among three wires.
• Keep input lines away from power line and load line to avoid the influence from noise induced.
• For the input and output signal lines, be sure to use shielded wires and keep them away from each other.
• If a noise level is excessive in the power supply, the additional installation of an insulating transformer and the use of a noise filter are recommended.
Make sure that the noise filter is installed to a place such as a panel that is properly grounded. The wiring between the noise filter output terminal and the instrument power supply terminal should be made as short as possible. None of fuses or switches should be installed to the wiring on the noise filter output side because the filter effect will be degraded by such a installation.
• A better anti-noise effect can be expected by using stranded power supply cable for the instrument. (The shorter the stranding pitch is, the better the anti-noise effect can be expected.)
• A setup time is required for the contact output when the power is turned on. If the contact output is used as a signal for an external interlock circuit, use a delay relay at the same time.
• Use the auxiliary relay since the life is shortened if full capacity load is connected to the output relay. SSR/SSC drive output type is preferred if the output operations occur frequently.
[Proportional interval] relay output: 30 seconds or more, SSR/SSC: one second or more
• If inductive load such as magnetic switches connected as a relay output load, it is recommended to use serge absorber to protect a contact from switching serge and keep a longer life.
Recommended spec · of serge absorber

		Varistor voltage
Voltage	100V	240V
	200V	470V

Where to install: Connect it between contacts of the relay control output.

Example)


2.4 Requirement for key operation/operation in abnormalities

• Prior to the operation, be sure to check alarm functions, since a failure in the proper setting will result in a failure in the proper output of an alarm in case of an abnormality.
• A display of UUUU or LLLL will appear in case of a break in the input. Be sure to turn off the power when a sensor is replaced.

2.5 Others

• Do not use organic solvents such as alcohol and benzine to wipe this controller. Use a neutral detergent for wiping the controller.

1. Model Code Configuration

	4	5	6	7	8		9	10	11	12	13		14
PXE	4	T		Y	1	-		Y	0	0	0	-	E

Digit	Specification	Note
4	**<Front dimensions>**	
	48 X 48mm	4
5	**<Input signal>**	
	Thermocouple · Resistancabulb (°C)	T
	Thermocouple · Resistancabulb (°F)	R
6	**<Control output>**	
	Relay contact output	A
	SSR/SSC driving output	C
7	—	Y
8	**<Revision code>**	1
9	**<Optional specifications>**	
	Alarm (1 pc.)	1
	Alarm (2 pc.)	2
10	**<Power supply voltage, Instruction manual>**	
	100 to 240V AC, Japanese/English/Chinese	Y

Input signal, measurement range, and set value at the time of deliver are as follows.
Thermocouple K, Measurement range; 0 to 400°C, Set value; 0C
Input signal of the thermocouple and the resistance bulb can be switched by key operation on the front panel.

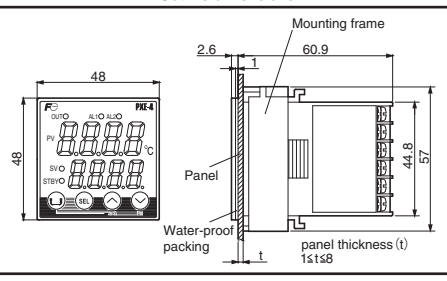
2. Scope of Delivery

Temperature controller ....1 unit
Instruction manual .....1 copy
Mounting bracket .....1 pcs
Watertight packing .....1 pcs

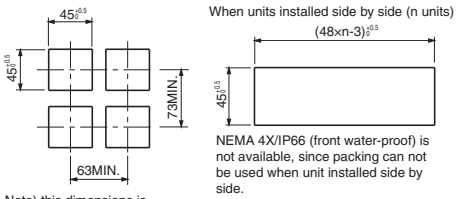
*: Additionally, refer to the operation manual.
Operation manual is available for download from Fuji's home page.
(http://www.fujielectric.co.jp/products/instruments/)

3. Outline and Panel Cutout Dimensions

Outline dimensions



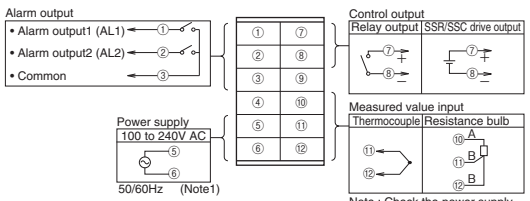
Panel cut



Note) this dimensions is including paint thickness

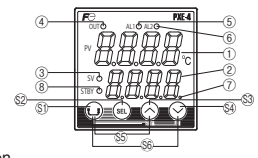
Note) Panel coating procedure must be taken into account, for the panel cutout dimension should still conform with the dimensions listed.
Caution on side-by-side installation:
• Maximum ambient temperature is at 45°C when the power supply is at 200VAC or more. When the PXR4 controller is tightly fixed in vertical and upright direction, the use of 100V AC power supply is recommended .
(Installation of fan is recommended as a heat release measure)
• Make sure the controller is installed more than 30mm away, when there is an instrument of more than 70mm depth or a wall on the right side of the controller.
• Side-by-side installation may sacrifice the controller's waterproof property.
Caution on wiring
• Terminals at the left hand side (from No.1 to 6) should be used first.
• Crimp terminals with matching screw size should be used. Tightening torque value should be approx. 0.8N · m.
• Do not connect anything to the terminals that are not used. (Do not use as relay terminal)

4. Terminal Connection Diagram



Note : Check the power supply voltage before installation.

5. Name of Functional Parts and Functions



Operation section

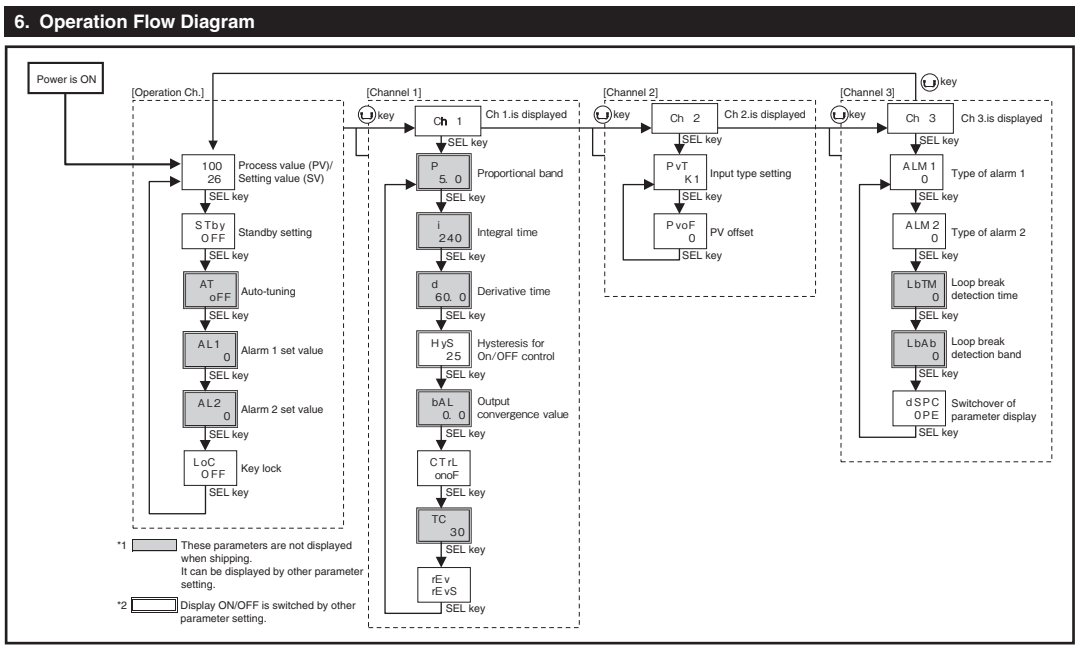
	Name	Function
S1	Block key	Switches parameter block
S2	Select key	Switches the parameters
S3	Up key	Changes the setting value and increases numerical value
S4	Down key	Changes the setting value and decreases numerical value
S5	Block+Up key	Switches RUN/Stand-by with holding down for 3 seconds
S6	Block+Down key	Executes the auto-tuning Start/Stop with holding down for 3 seconds

Operation section

	Name	Function
①	Process value (PV)	Displays a process value (PV) or the parameter symbols.
②	Setting value (SV)	Displays a set value (SV) or a parameter set value.
③	SV lamp	Lamp is lit when a set value is displayed at lower line.
④	Output lamp	Lamp is lit while control output is ON. Lamp is OFF while control output is OFF.
⑤	Alarm 1 lamp	Lamp is lit while alarm is ON.
⑥	Alarm 2 lamp	Lamp is OFF while alarm is OFF.
⑦	Auto-tuning lamp	Lamp is brink during auto-tuning Lamp is OFF while control is being operated. Note 1
⑧	Standby lamp	Lamp is lit while control is standby (or stop) Lamp is OFF while control is being operated.

Note1) Alarm 2 function is optional

6. Operation Flow Diagram

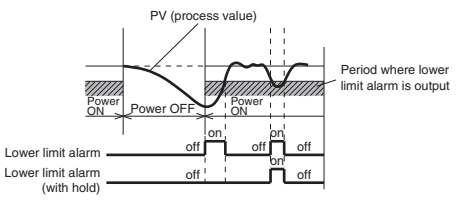


7. List of Alarm Type

Type	Alarm No.	Alarm type	Action diagram
	0	No alarm	PV
Absolute value alarm	1	Upper limit	ALn, PV
	2	Lower limit	ALn, PV
	3	Upper limit (with hold)	ALn, PV
	4	Lower limit (with hold)	ALn, PV
Deviation alarm	5	Upper limit	ALn, SV, PV
	6	Lower limit	ALn, SV, PV
	7	Upper/Lower limit	ALn, ALn, SV, PV
	8	Upper limit (with hold)	ALn, SV, PV
	9	Lower limit (with hold)	ALn, SV, PV
	10	Upper/Lower limit (with hold)	ALn, ALn, SV, PV
Zone alarm	11	Upper/Lower limit	ALn, ALn, SV, PV
Break	12	Loop break alarm	

Point What is alarm with hold?

The alarm is not turned ON immediately even when the process value is in the alarm band. It turns ON when it goes out the alarm band and enters again.



Note) • When alarm action type code is changed, alarm set value may also become different from previous settings.
Please check these parameters, turn off the power once, and then re-start the controller, before starting control.
• ALn means alarm set value (AL1, AL2).

8. List of Setting Parameter

Operation parameter

	Parameter display symbol	Parameter	Description of contents	Default setting	Note
1	—	PV/SV display	Displays a process value/setting value.	–	
2	SrbY	Standby settings	Switches RUN or Standby of the control ON : Control standby (output: OFF, alarm: OFF) OFF : Control RUN (output of control/alarm is normal operation)	OFF	
3	AT	Auto-tuning	Starts and stops the auto-tuning oFF : Stop on : normal auto-tuning L-on : Low PV auto-tuning	OFF	a
4	AL1	Alarm 1 set value	Sets the operation point for alarm 1. Setting is available within input ranges	2.5% of the range	b1,e
5	AL2	Alarm 2 set value	Sets the operation point for alarm 2. Setting is available within input ranges	2.5% of the range	b2,e
6	LoC	Key lock	Specifies whether or not parameter setting can be changed. OFF : Change of setting is available. ALL : All parameters can not be changed. Invalid of AT (Block key + Down key) and standby switchover (Block key + Up key) PArA : Only SV setting can be changed. Invalid of AT (Block key + Down key) and standby switchover (Block key + Up key)	OFF	

Channel 1 parameter

	Parameter display symbol	Parameter	Description of contents	Default setting	Note
7	P	Proportional band	Sets the proportional band (setting range: 0.1 to 999.9%)	5.0%	a
8	i	Integral time	Sets the integral time (setting range: 0 to 3200 seconds)	240 seconds	a
9	d	Derivative time	Sets the derivative time (setting range: 0.0 to 999.9 seconds)	60.0 seconds	a
10	HyS	Hysteresis for ON/OFF control	Setting range : 0.00 to 50.00%FS	0.25% of the range	c
11	bAL	Output convergence value	Setting range : –100.0 to 100.0%	0.00%	a
12	CTrL	Control method	Selects the control method. onoF : ON/OFF control PId : Normal PID operation FUZZY : Fuzzy control	onoF	
13	TC	Cycle time (control output)	Sets the cycle time of control output. (setting range: 1 to 150 seconds)	Relay: 30 seconds SSR: 2 seconds	a
14	rEv	Setting of Normal /Reverse action	Sets the control action. revS : Reverse action normal: Normal action	revS	

Channel 2 parameter

	Parameter display symbol	Parameter	Description of contents	Default setting	Note
15	PvT	Setting of input type	Type of input	K1	h
16	PvoF	PV offset	Shifts the display of process value(PV). (setting range: –10.00 to 10.00%FS)	0.00% of the range	

Channel 3 parameter

	Parameter display symbol	Parameter	Description of contents	Default setting	Note
17	ALM1	Type of alarm 1	Setting type of alarm action. (setting range: 0 to 12)	5	g
18	ALM2	Type of alarm 2	Setting type of alarm action. (setting range: 0 to 12)	No alarm output: 0 Alarm output 2points: 9	g
19	LbTM	Loop break detection time	Specifies the time until control loop break is detected. (setting range: 0 to 9999 seconds)	0 second	d
20	LbAb	Loop break detection band	Sets the temperature range to detect the loop break. (setting range: 0.00 to 100.00%FS)	2.50% of the range	d
21	dSPC	Changeover of parameter display	Detailed setting parameter of the temperature controller can be displayed. Refer to Operation manual for details. oPE : Operator level ENG : Engineer level	oPE (everytime power is turned on, operator level is always set as default)	f

Note: a Displayed when control method (CTrL) is PID, Fuzzy.
b1 not displayed when alarm type 1 (ALM1) is set to "0".
b2 not displayed when alarm type 2 (ALM2) is set to "0".
c Displayed when control method (CTrL) is set to "onoF"
d Displayed when Loop break alarm is selected at alarm type 1 or 2 (ALM1/ALM2).
e Setting range: 0 to 100%FS (when absolute value alarm) , –100 to 100%FS (when deviation alarm)
f Returns to operator level,everytime power is turned OFF.
g Refer to item7. List of alarm type.
h Refer to item10. Measuring input signal.

9. Error Indications

This controller has a display function to indicate several types of error code shown below.
If any of the error codes is displayed, please eliminate the cause of error immediately.
After the cause is eliminated, turn off the power once, and then re-start the controller.

Error code	Possible cause	Control output
UUUU	① Thermocouple burnt out. ② RTD (A) line burnt out. ③ PV value exceeds P-SU by 5% FS.	OFF
LLLL	① The RTD line (B or C) burnt out. ② The RTD line (between A and B or A and C) short. ③ PV value is below P-SL by 5% FS.	
LLLL	① PV value < –199.9 Note) In case of RTD input, "LLLL" is not displayed even if the temperature becomes below –150 C.	Control is continued until the value reaches –5% FS or less, after turn OFF.
Err (SV indication flickers)	Incorrect range setting (P-SL/P-SU).	OFF

10. Measuring Input Signal

Input signal type		Setting value	Range [°C]	Range [°F]
RTD (IEC)	JPt100	JPT1	–200 to 600 [°C]	–300 to 1100 [°F]
		JPT2	–199.9 to 500.0 [°C]	–199.9 to 800.0 [°F]
	Pt100	PT1	–200 to 850 [°C]	–300 to 1500 [°F]
		PT2	–199.9 to 500.0 [°C]	–199.9 to 800.0 [°F]
Thermocouple	J	J1	0 to 800 [°C]	0 to 1500 [°F]
		J2	0.0 to 400.0 [°C]	0.0 to 700.0 [°F]
	K	K1	0 to 400 [°C]	0 to 700 [°F]
		K2	–200 to 1200 [°C]	–300 to 2200 [°F]
		K3	0.0 to 400.0 [°C]	0.0 to 700.0 [°F]
	T	T1	–200 to 400 [°C]	–300 to 700 [°F]
		T2	–199.9 to 400.0 [°C]	–199.9 to 700.0 [°F]
	R	R	0 to 1600 [°C]	0 to 2900 [°F]
	B	B	0 to 1800 [°C]	0 to 3200 [°F]
	S	S	0 to 1600 [°C]	0 to 2900 [°F]
	E	E	–200 to 800 [°C]	–300 to 1400 [°F]
	N	N	0 to 1300 [°C]	0 to 2300 [°F]
	PL-Ⅱ	PL-2	0 to 1300 [°C]	0 to 2300 [°F]

(±0.5% of process value or 1°C whichever is greater ±1digit±1°C
Thermocouple -100°C or less : (±2% of process value) 1digit±1°C
Correct indication is not ensured within a range from 0 to 500°C for R type thermocouple and from 0 to 400°C for B type thermocouple.

11. Specification

Power voltage	100 (–15%) to 240V AC (+10%), 50/60Hz
Power consumption	5VA or less (at 100V AC), 6VA or less (at 220V AC)
Relay contact output	SPST contact 220V AC/30V DC 3A (resistive load)
SSR/SSC driving output	ON: 10.2 to 15V DC 20mA or less
(Voltage pulse output)	OFF: 0.5V DC or less
Alarm output (up to 2 outputs)	SPST contact 220V AC/30V DC 1A (resistive load)
Preservation temperature	–10 to 60°C 90%RH or less
Operating ambient temperature	
	–10 to 50°C 90%RH or less (1year warranty if used under normal conditions)
	–10 to 45°C 90%RH or less (when side by side installation)

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