

# PD500

SuperNova PID Process & Temperature Controllers

Quick Start Guide

This Quick Start Guide is intended to provide basic information about the SuperNova controllers. A complete instruction manual is available for download at [www.predig.com](http://www.predig.com).



PD530



PD520






PD510

## Features

- 1/16, 1/8 (V), and 1/4 DIN Auto-Tuning PID Process & Temperature Controllers
- Reverse Polarity Three-Color LCD: -1999 to 9999
- Thermocouple and RTD Inputs
- DC Voltage and Current Inputs (1-5 V, 0-5 V, 0-10 V, 0-50 mV, 0-100 mV; 4-20 mA with Resistor)
- 250  $\Omega$  Resistor(s) Included Standard
- High Accuracy Auto-Tuning PID
- High Durability IP65 Front with Hard Plastic Pushbuttons
- Large Easy to Read 14-Segment PV Display up to 1.1" (29 mm)
- Input Power 100-240 VAC
- Heating, Cooling, and Heating & Cooling Control
- Primary Control Output Options: 4-20 mA (SCR), Voltage Pulse (SSR), or Relay
- Secondary Control Output Relay Standard on All Models
- Easily Switch Between Auto and Manual Control Modes
- Up to 2 Alarm Relays & 4-20 mA Retransmit Outputs
- Remote Set Value 1-5 V Input Option (4-20 mA with External Resistor)
- Digital Input Set Value Selection
- RS-485 Serial Communications Option
- Modbus® RTU/ASCII Communications
- Mini-USB Port Standard
- FREE Programming and Monitoring Software
- Shallow Depth Case Extends Only 2.5" (63 mm) Behind Panel
- UL & C-UL Recognized Process Control Equipment, Electrical – Component

## Safety Information

Installation and service should be performed only by trained service personnel. Electrical wiring should be performed in accordance with all applicable national, state, and local codes to prevent damage to the controller and ensure personnel safety. Read complete instructions prior to installation and operation of the controller.

 <b>DANGER</b>	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
 <b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
 <b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, may result in minor injury or property damage

### **DANGER**

- The input/output terminals are subject to electric shock risk and should never come in contact with personnel or conductive substances.
- Use 18 AWG to 24 AWG copper wire with 60°C or 60/75°C insulation for all line voltage and relay connections.

### **WARNING**

- This product is not recommended for life support applications or applications where malfunctioning could result in personal injury or property loss. Anyone using this product for such applications does so at his/her own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.
- Additional protective devices or circuits should be installed with this controller to prevent serious consequences should it malfunction.
- Install a power switch or fuse rated at 250 VAC, 0.5 A.
- Complete all wiring before applying power to prevent electric shocks.
- This product should not be used in locations with flammable or explosive gases.
- This product should not be disassembled, modified, improved or repaired.

### **CAUTION**

- The contents of this quick start guide may be changed without prior notification.
- Inspect the product prior to use for damage or other abnormalities.
- This product is intended for use in the following environments:
  - o Indoors.
  - o Within the ambient temperature and humidity ranges indicated in the instruction manual.
  - o Areas where corrosive gases (especially harmful gases, ammonia, etc.) and flammable gases are not present.

### **CAUTION**

- The contents of this quick start guide may be changed without prior notification.
- Inspect the product prior to use for damage or other abnormalities.
- This product is intended for use in the following environments:
  - o Indoors.
  - o Within the ambient temperature and humidity ranges indicated in the instruction manual.
  - o Areas where corrosive gases (especially harmful gases, ammonia, etc.) and flammable gases are not present.
  - o Areas where vibration and impact are not directly applied to the product.
  - o Areas where liquids, oils, chemicals, steam, dust, salt, iron, etc. (pollution degree 1 or 2) are not present.
  - o Areas where large inductive interference, static electricity, magnetic noise are not generated.
  - o Areas not subject to heat accumulation caused by direct sunlight, radiant heat, etc.
  - o Areas below elevation of 2000 meters.
- Screw terminal connections should be tightened to torque of 5 lb-in (0.56 Nm).
- Do not wipe the product with organic solvents such as alcohol, benzene, etc. (use neutral detergents).
- Use non-grounded thermocouples (using a grounded sensor may cause malfunctions to the device due to short circuits).
- Remove power before replacing the sensor.
- The proportional cycle should be set to at least 20 seconds when using an electromagnetic switch.
- Unused terminals should remain free of any wiring.
- This product should receive regular maintenance to ensure its continuous safe use.
- Check the temperature deviation between the PV value of the temperature controller and the actual temperature before use and make any needed adjustments.
- The relay outputs of the device may change states during power up or take time to follow normal programing. If outputs are being used for safety interlock purposes, or other safety measures, an intermediary relay with state delay is recommended.
- The USB loader is intended for programming the device only and not for control or monitoring.

 **WARNING**  
Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Disclaimer**  
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## Ordering Guide

Model	Model Number Digits						Description
PD5	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	PID Process & Temperature Controller
Size	10						(1/16 DIN) 1.9" x 1.9"x 2.5" (48 x 48 x 63 mm) (W x H x D)
	20						(1/8 DIN) 3.8" x 1.9" x 2.5" (48 x 96 x 63 mm) (W x H x D)
	30						(1/4 DIN) 3.8" x 3.8" x 2.5" (96 x 96 x 63 mm) (W x H x D)
Control & Alarm Outputs	A						Control OUT 1 = Current output (4-20 mA current output for PID control) Control OUT 2 = Relay output 2 SUB alarm relay outputs
	R						Control OUT 1 = Relay output for On/Off or time-proportional PID Control Control OUT 2 = Relay output 2 SUB alarm relay outputs
	S						Control OUT 1 = Voltage pulse output for On/Off or time-proportional SSR PID Control Control OUT 2 = Relay output 2 SUB alarm relay outputs
Communication (RS485)							None
	C						RS-485 communication
Retransmission Output (RET)							None
	T						Retransmission output (4-20 mA)
Digital Input (DI)							None
	D						2 digital inputs (DI 1-2)
Remote Input (REM)							None
	R						1 input, 4-20 mA (1-5 VDC)

Model	Main Control Output	Additional Features	Power
<b>PD510 1/16 DIN Controllers</b>			
PD510-A	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD510-A-CD	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays, RS-485, 2 Digital Inputs	100-240 VAC
PD510-A-CTR	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 4-20 mA SV Input	100-240 VAC
PD510-S	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD510-S-CD	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays, RS-485, 2 Digital Inputs	100-240 VAC
PD510-S-CTR	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 4-20 mA SV Input	100-240 VAC
PD510-R	Relay (On/Off)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD510-R-CD	Relay (On/Off)	Relay Control Output, 2 Alarm Relays, RS-485, 2 Digital Inputs	100-240 VAC
PD510-R-CTR	Relay (On/Off)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 4-20 mA SV Input	100-240 VAC
<b>PD520 1/8 DIN Vertical Controllers</b>			
PD520-A	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD520-A-CTD	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs	100-240 VAC
PD520-A-CTDR	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs, 4-20 mA SV Input	100-240 VAC
PD520-S	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD520-S-CTD	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs	100-240 VAC
PD520-S-CTDR	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs, 4-20 mA SV Input	100-240 VAC
PD520-R	Relay (On/Off)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD520-R-CTD	Relay (On/Off)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs	100-240 VAC
PD520-R-CTDR	Relay (On/Off)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs, 4-20 mA SV Input	100-240 VAC
<b>PD530 1/4 DIN Controllers</b>			
PD530-A	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD530-A-CTD	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs	100-240 VAC
PD530-A-CTDR	4-20 mA (SCR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs, 4-20 mA SV Input	100-240 VAC
PD530-S	Voltage Pulse (SSR)	Relay Control Outputs, 2 Alarm Relays	100-240 VAC
PD530-S-CTD	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs	100-240 VAC
PD530-S-CTDR	Voltage Pulse (SSR)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs, 4-20 mA SV Input	100-240 VAC
PD530-R	Relay (On/Off)	Relay Control Output, 2 Alarm Relays	100-240 VAC
PD530-R-CTD	Relay (On/Off)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs	100-240 VAC
PD530-R-CTDR	Relay (On/Off)	Relay Control Output, 2 Alarm Relays, RS-485, 4-20 mA Retransmit, 2 Digital Inputs, 4-20 mA SV Input	100-240 VAC

## Accessories

Models	Description
PDX-RES2	250 ohm 0.1% Precision Resistor for SuperNova 4-20 mA Input
PDA7485-I	RS-232 to RS-485 Isolated Converter
PDA8485-I	USB to RS-485 Isolated Converter
PD9501	Multi-Function Calibrator
PDA-LH	Light / Horn Accessory
PDA-MINIUSB	USB Cable for SuperNova Series, Type A Male to Type Mini-B Male
PDX6901	Suppressor (snubber): 0.01 $\mu$ F/470 $\Omega$ , 250 VAC
PDA1024-01	24 VDC Power Supply for DIN Rail

## Signal Splitter & Conditioner Accessories

Models	Description
PD659-1MA-1MA	Signal Isolator with One 4-20 mA Input and One 4-20 mA Output
PD659-1MA-2MA	Signal Splitter with One 4-20 mA Input and Two 4-20 mA Outputs
PD659-1V-1MA	Signal Conditioner with One 0-10 VDC Input and One 4-20 mA Output
PD659-1MA-1V	Signal Conditioner with One 4-20 mA Input and One 0-10 VDC Output






## Enclosures

Models	# Controllers	Description
<b>Enclosures for PD510 1/16 DIN Controllers</b>		
PDA2301-16	1	Plastic NEMA 4X Hinged
PDA2302-16	2	Plastic NEMA 4X Hinged
PDA2801-16	1	Low Cost Plastic NEMA 4X
PDA2802-16	2	Low Cost Plastic NEMA 4X
PDA2811-16	1	Low Cost Plastic NEMA 4X
PDA2812-16	2	Low Cost Plastic NEMA 4X
PDA2813-16	3	Low Cost Plastic NEMA 4X
PDA2814-16	4	Low Cost Plastic NEMA 4X
<b>Enclosures for PD520 1/8 DIN Vertical Controllers</b>		
PDA2301-V	1	Plastic NEMA 4X Hinged
PDA2302-V	2	Plastic NEMA 4X Hinged
PDA2303-V	3	Plastic NEMA 4X Hinged
PDA2304-V	4	Plastic NEMA 4X Hinged
PDA2305-V	5	Plastic NEMA 4X Hinged
PDA2306-V	6	Plastic NEMA 4X Hinged
PDA2801-V	1	Low Cost Plastic NEMA 4X
PDA2811-V	1	Low Cost Plastic NEMA 4X
PDA2812-V	2	Low Cost Plastic NEMA 4X
<b>Enclosures for PD530 1/4 DIN Controllers</b>		
PDA2301-4	1	Plastic NEMA 4X
PDA2302-4	2	Plastic NEMA 4X
PDA2811-4	1	Low Cost Plastic NEMA 4X
PDA3408	1	Plastic NEMA 4X w/Clear Cover
<b>Enclosures for PD560 3/4 DIN Controllers</b>		
PDA2600 <sup>1</sup>	1-6	Stainless Steel NEMA 4X
PDA2700 <sup>2</sup>	1-6	Painted Steel NEMA 4











1. See [LDS2600](#) data sheet for details.

2. See [LDS2700](#) data sheet for details.

## Front Key Description & Functions



	Key	Operation mode		Menu mode	
		Control/Monitoring	SV change	Programming Menu	Change parameters
Mode		Hold to enter programming mode	-	Hold to return to run mode display	-
Set		Enter a new SV	Save SV value	Change a parameter or enter group	Move to next parameter after saving value
Shift		-	Shift digit position	-	Shift digit position
Down		-	Decrease value	Move among parameters or groups	Decrease numeric value of change parameter
Up			Increase value		Increase / change value

## Front Key Operation

Function	Front Key Operation
Enter programming menu	Press and hold  for 1 second
Lock / unlock front panel buttons	Press and hold  +  for 3 seconds
Change between automatic and manual output mode	Press and hold  +  for 3 seconds
Begin auto tuning (AT) / Stop auto tuning	Press and hold  +  for 3 seconds
Change between run and stop output modes	Press and hold  for 1 second
Acknowledge latching alarms	Press  or 

## Specifications

For a complete list of Specifications, refer to the instruction manual available at [www.predig.com](http://www.predig.com).

<b>Input</b>	Thermocouple	K, J, E, T, R, B, S, L, N, U, W, PLII
	RTD	JPT100, PT100
	DC voltage / current	1-5 V (4-20 mA with resistor), 0.5 V, 0-10 V, 0-50 mV, 0-100 mV
	Sampling cycle	50 ms
<b>Control Output</b>	Relay output	<ul style="list-style-type: none"> <li>Rated resistive load switching capacity: 5 A, 250 VAC; 5 A, 30 VDC</li> <li>Max switching power: 750 VA, 90 W</li> <li>Max switching voltage: 250 VAC, 110 VDC</li> <li>Max switching current: 5 A</li> <li>Mechanical life: 20 million cycles (at 180 CPM)</li> <li>Recommended minimum cycle time: 20 sec</li> </ul>
	Current SCR output	4-20 mA linear current output, Load resistance: 600 Ω maximum ± 0.2% of FS ± 1 digit
<b>Control</b>	Control type	ON/OFF, PID control
	Output operation	Programmable for reverse or direct action.
<b>USB Loader</b>	Communication method	USB 2.0 Standard, Compliant
	Protocol	Protocol: PC-LINK
	Communication distance	16.4 ft (5 m) maximum
<b>Option</b>	Sub output	Relay 1 & 2 outputs, rated switching capacity: 5 A 250 VAC, 5 A 30 VDC
	Digital input	2 digital inputs; Logic levels: On: 1.5 V, Off: 0.1 V Input current: Approximately 2 mA each contact Input impedance: On: 1 kΩ max, Off: 100 kΩ min Open contact voltage: Open contact voltage approximately 5 VDC
	Retransmission output	4-20 mA ±0.2% of FS ±1 digit, load resistance: max. 600 Ω
	Remote input	4-20 mA (1-5 VDC)
	RS-485 Connection	RS-485, 2-wire half-duplex
<b>Power</b>	Voltage	100 - 240 VAC ±10%, 50 / 60 Hz, 8.5 VA max.
	Insulation resistance	20 MΩ minimum, 500 VDC
	Dielectric strength	3,000 VAC 50/60 Hz for 1 minute across power terminals
	Power consumption	Max. 9.0 VA
<b>Environment</b>	Operating temperature	-10 to 50°C (14 to 122°F)
	Storage temperature	-25 to 65°C (-40 to 185°F)
	Relative humidity	35 to 85% non-condensing
<b>Approval</b>	  E171428	
	<ul style="list-style-type: none"> <li>Electrostatic discharge (ESD): KN61000-4-2</li> <li>EFT(RS): KN61000-4-3</li> <li>Conductive RF (CS): KN61000-4-6</li> <li>SURGE: KN61000-4-5</li> </ul>	
	IP65 (front panel)	
<b>Basic components</b>	Main body, bracket, 250 Ω resistor (1%), rubber gasket, quick start guide	
<b>Front panel</b>	IP65	
<b>Warranty</b>	1 Year. See Precision Digital's website for complete details.	



## Front Panel Indicators and Messages

### STATUS INDICATORS

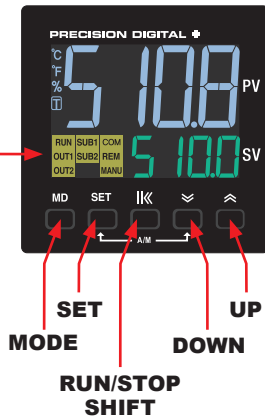
- RUN:** RUN or STOP status.  
Turns on during control.
- OUT1:** Control output 1 status.  
Blinks proportionally for 0-100% output.
- OUT2:** Control output 2 status.  
Blinks proportionally for 0-100% output.
- SUB1:** Sub output 1 status.  
Turns on when sub output 1 is on.
- SUB2:** Sub output 2 status.  
Turns on when sub output 2 is on.
- COM:** Communications status.  
Blinks during active serial communications.
- REM:** Remote input status.  
Turns on when remote input is active.
- MANU:** Manual control mode status.  
Turns on when manual output is on.
- TUNE (T):** Auto-tuning status.  
Blinks during the auto-tuning process.
- LOCK:** Lock setting status.  
Turns on when lock is set.

### MANIPULATED/OUTPUT VALUE

Control output value in operating mode.

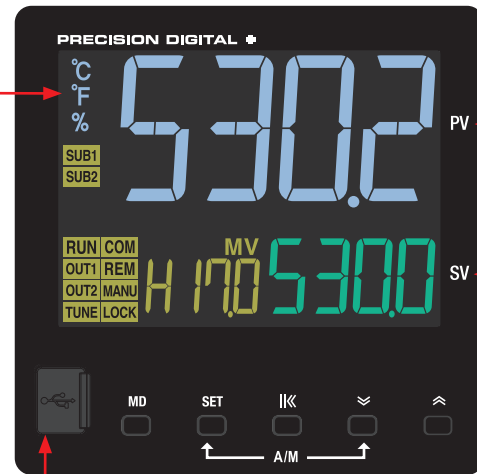
### UNIT

Displays °C, °F, %, or no unit depending on set value unit.



### USB PORT

The USB port for the PD510 is located on the top of the unit.



### SET VALUE OR OUTPUT VALUE

Displays SV or control output value in operating mode, displays parameter set value in menu mode.

### PROCESS VALUE

Displays PV value in operating mode, displays parameter name in menu mode.

## ERROR Message Display

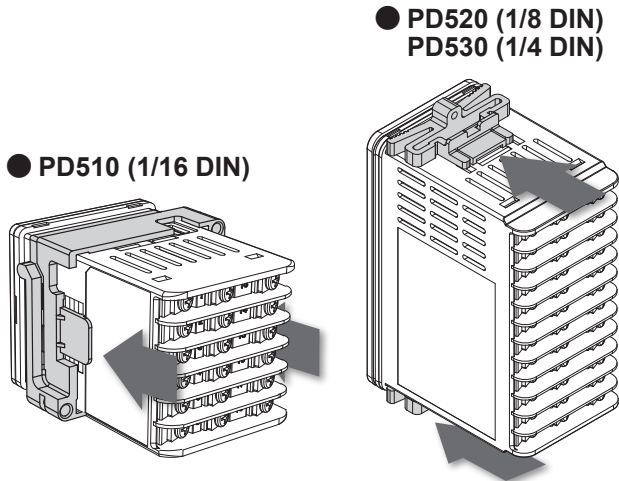
Display	Error	Cause and Action
BOU	Burn out	Check sensor wiring status (check for disconnection) Check the sensor settings (check input type parameters (INP)) If the input is exceeded by more than ± OVER
OVR	+Over	Check the sensor settings (if the input is exceeded within +5% of sensor input range)
-OVR	-Over	Check the sensor settings (if the input is exceeded within -5% of sensor input range)

Error messages are displayed on PV display window.

For a complete list of error messages, refer to the instruction manual available at [www.predig.com](http://www.predig.com).

## Installation & Connections

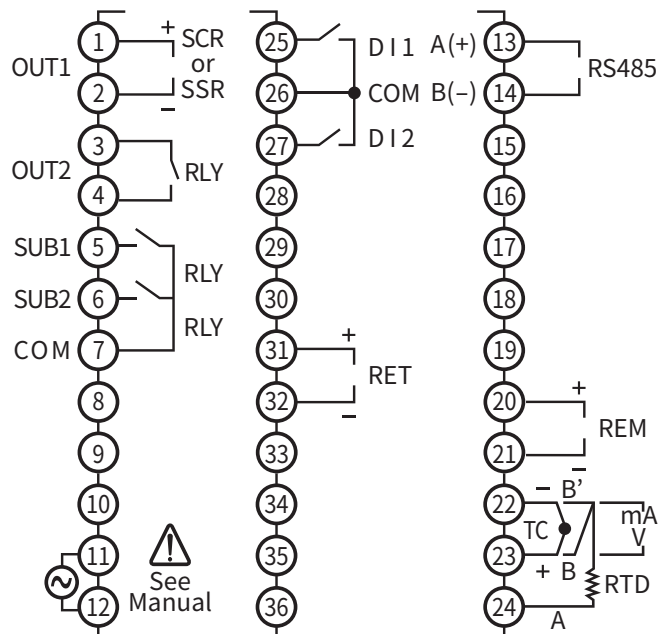
### Install Panel Mount Brackets



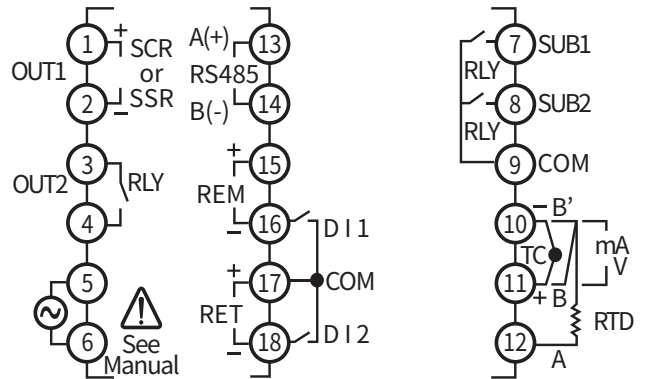
### 4-20 mA Input Connections

To achieve the highest accuracy with a 4-20 mA input to the controller, connect a 250 Ω (0.1% or higher precision) resistor across the input terminals. The 250 Ω (1%) resistor included with the product is not a precision resistor. For precision resistor, order PDX-RES2.

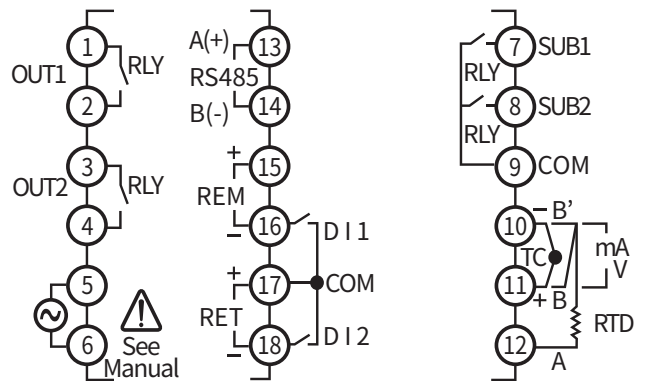
### PD520-A or -S (1/8 DIN)



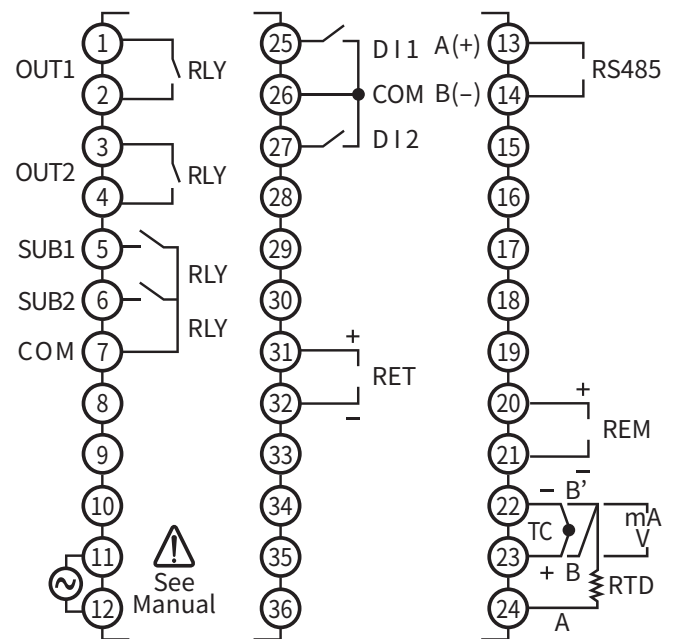
### PD510-A or -S (1/16 DIN)



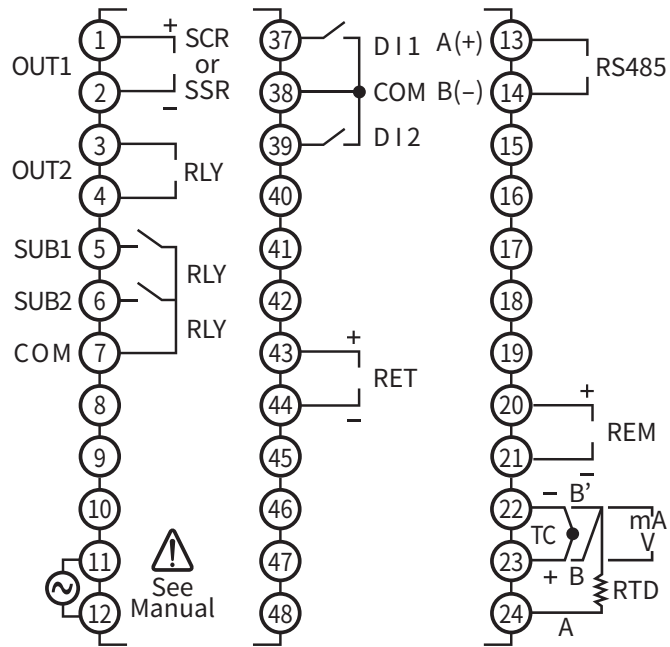
### PD510-R (1/16 DIN)



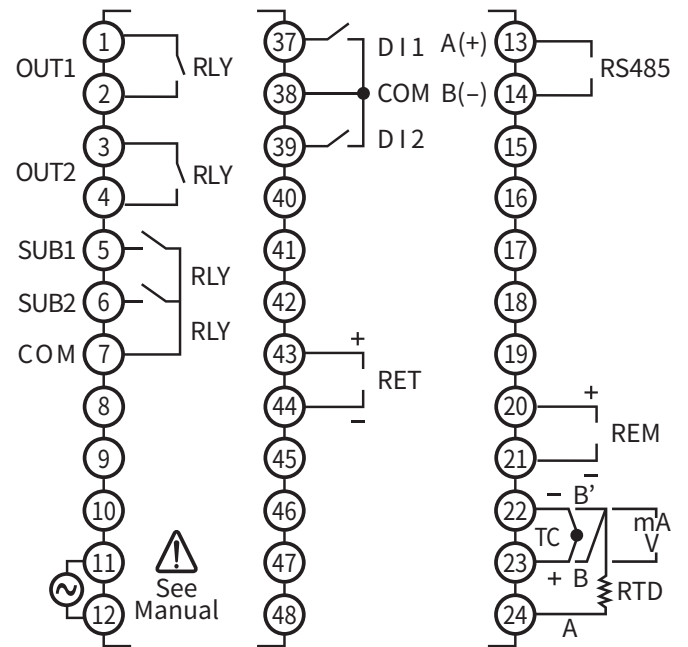
### PD520-R (1/8 DIN)



■ PD530-A or -S (1/4) DIN



■ PD530-R (1/4) DIN



## Input Sensor Types and Ranges

### ● Thermocouple and RTD

Input Device	Type	Parameter set value	Temperature range		Tolerance
		Screen display	°C	°F	
Thermocouple	K	K0	-200 to 1370	-328 to 2498	±0.2% of FS ±1 digit
		K1	-100.0 to 500.0	-148 to 932	
	J	J0	-200 to 1200	-328 to 2192	
		J1	-199.9 to 900.0	-328 to 1652	
	E	E1	-199.9 to 900.0	-328 to 1652	
	T	T1	-199.9 to 400.0	-328 to 752	
	R	R0	0 to 1700	32 to 3092	
	B	B0	100 to 1800	212 to 3272	±0.2% of FS ±1 digit 100-200°C: ±2.0% of FS ±1 digit
	S	S0	0 to 1700	32 to 3092	±0.2% of FS ±1 digit
	L	L1	-199.9 to 900.0	-328 to 1652	
	N	N0	-200 to 1300	-328 to 2372	
	U	U1	-199.9 to 400.0	-328 to 752	
	W	W0	0 to 2300	32 to 4172	
PLII	PL0	0 to 1300	32 to 2372		
RTD	JPt100	JPt0	-200 to 500	-328 to 932	±0.2% of FS ±1 digit
		JPt1	-199.9 to 500.0	-328 to 932	
	Pt100	Pt0	-200 to 640	-328 to 1184	
		Pt1	-199.9 to 640.0	-328 to 1184	

### ● Direct Current and Voltage

Classification	Type	Parameter set value	Range	Tolerance
		Screen display		
Direct current (Current Input)	4-20 mA <sup>(1)</sup>	1-5 V	-1999 to 9999	±0.2% of FS ±1 digit
	0-20 mA <sup>(1)</sup>	5 V		
Direct voltage (VDC / mV DC)	1-5 V	1-5 V		
	0-5 V	5 V		
	0-10 V	10 V		
	0-50 mV	0.05 V		
	0-100 mV	0.1 V		

(1) To achieve the highest accuracy with a 4-20 mA input to the controller, connect a 250 Ω (0.1% or higher precision) resistor across the input terminals. The 250 Ω (1%) resistor included with the product is not a precision resistor. For precision resistor, order PDX-RES2.

## Alarm Type (An.TY) and Alarm Operation Description

The light grey area represents the alarm deadband, An.DB. ▲: AL-n Alarm value. This is the specific PV value, or for deviation alarms the deviation amount from the SV, when the alarm activates. △: Set value. For deviation alarms only. Alarm types in parenthesis ( ) include standby sequence.

An.TY No.	Alarm type	Alarm operation	Absolute alarm	Deviation alarm
0	Alarm off	-	-	-
1	High absolute		O	
(7)	High absolute with standby sequence			
2	Low absolute		O	
(8)	Low absolute with standby sequence			
3	High deviation			O
(9)	High deviation with standby sequence			
4	Low deviation			O
(10)	Low deviation with standby sequence			
5	High-Low deviation			O
(11)	High-Low deviation with standby sequence			
6	High-Low range			O
(12)	High-Low range with standby sequence			
13	Sensor error	Burn-out	O	

## Quick Start Programming Instructions

### 1. Select Input Type

- A. Press & hold the MD button for 1 second to enter the programming menu.

*Programming note: In programming mode, the PV display shows the setup parameter group, and the SV display shows the group # (GP##), for reference during navigation.*

- B. Press the DOWN arrow button to navigate to the Input group (G.IN, GP09)
  - i. Press the SET button to enter the Input group.
- C. Displayed parameter INP is used to select the input type.
  - i. Press SET to change the input type.
  - ii. Use the UP and DOWN arrow buttons to select the desired input type. See the table on page 1 under Input Type Parameters (INP), Input Sensor Types and Ranges, and select the desired input type by choosing the appropriate Screen display for the desired input type.
  - iii. Programming note: Changing the INP parameter may change other settings in the controller!

*Example 1: To select a high temperature range J type thermocouple input, press the UP arrow several times until J0 is displayed and blinking in the SV window. Then press the SET button.*

*Example 2: To select a 4-20 mA input, press the UP arrow several times until 1-5V is displayed and blinking in the SV window. Then press the SET button.*

*Programming note: Current inputs require a 250-ohm resistor across the input terminals.*

- iv. Press the SET button to confirm the blinking input type and proceed to the next parameter.
- D. Displayed parameter UNIT is used to select the temperature units.
  - i. Press SET to change the temperate units to °F or °C.
  - ii. Use the UP and DOWN arrows to select the desired unit.
  - iii. Press the SET button to confirm the desired unit.

*Programming note: Temperature units may be selected even when using a voltage or current input for a PV that is not temperature. In this case, the temperature units will have no impact on programming or operation.*

- E. If voltage or current inputs were selected, set the decimal point and scale them appropriately.
  - i. After selecting the unit type above, the displayed parameter is DP-P.
    - a. Press SET to change the number of displayed decimal places.
    - b. Use the UP and DOWN arrow to select how many decimal places (0-3) will be used for the scaled PV.
    - c. Press SET to confirm the number of decimal places.

*Displayed parameter SL-H is used to scale the high input limit display value.*

- d. Press SET to change the high input display value.
- e. Use the UP, DOWN, and LEFT arrows to select a digit, and change the value to set the desired display value at the high input limit.
- f. Press Set to confirm this new value.
- ii. Displayed parameter SL-L is used to scale the low input limit display value.
  - a. Press SET to change the low input display value.
  - b. Use the UP, DOWN, and LEFT arrows to select a digit, and change the value to set the desired display value at the low input limit.
  - c. Press Set to confirm this new value.

*Example: When using a 4-20 mA input, with parameter INP set to 1-5V and an external resistor installed, the following settings would be used to display 0.0 at 4 mA and 250.0 at 20 mA.*

Parameter	Setting Value	Description
INP (Input)	1-5V	1-5V for use with 4-20 mA inputs
DP-P (Decimal Place)	1	1 decimal place in PV and SV scaling.
SL-H (Scale – High)	250.0	Display 250.0 at 20 mA
SL-L (Scale – Low)	0.0	Display 0.0 mA at 0 mA

### 2. Configure the Control Output – Output 1

- A. Setup 4-20 mA PID Output (PD5X0-A Models)

*Most settings are configured by default to use Output 1 (CNT1) as a 4-20 mA output for PID control. By default, Output 1, the 4-20 mA output for PID control, is set for Reverse acting. This means the output will increase to drive up the PV (E.g. Heating).*

*To set the output for direct acting, so the output will increase to drive down the PV (E.g. Cooling), follow the steps below.*

- i. Press & hold the MD button for 1 second to enter the programming menu.
- ii. Press the DOWN arrow two times to navigate to the Output group (G.OUT, GP08).
- iii. Press the SET button to enter the Output group. Press the DOWN arrow once to display the CNT2 parameter.
- iv. Press the SET button to change the CNT2 parameter.
- v. Press the DOWN arrow several times until the setting is NONE.
- vi. Press the SET button to change the CNT2 parameter to none.
- vii. Press the DOWN arrow several times to navigate to the O.ACT parameter.
- viii. Press the SET button to change the O.ACT setting.
- ix. Press the UP arrow to select DIR.
- x. Press the SET button to select direct acting.

#### B. Setup Relay or SSR for On/Off Output (PD5X0-R or PD5X0-S Models)

*Output 1 is configured by default for time-proportional PID control. This process will program Output 1 (Solid State Relay (SRR) or Relay) to be used for On/Off control, and disable PID control.*

- i. Press & hold the MD button for 1 second to enter the programming menu.
- ii. Press the DOWN arrow several times to navigate to the Output group (G.OUT, GP08)
- iii. Press the SET button to enter the Output group.
- iv. Press the SET arrow to change the CNT1 parameter.
- v. Press the DOWN arrow to change the parameter to ONOF.
- vi. Press the SET button to confirm on/off control.
- vii. Press the DOWN arrow one or two times to navigate to the HYS parameter.
- viii. Press the SET button to change the HYS setting.
- ix. Use the UP, DOWN, and LEFT arrows to enter the hysteresis value (or deadband) for On/Off control around the Set Value.
- x. Press the SET button to confirm the hysteresis value.

*By default, Output 1, the On/Off control relay, is set for Reverse acting. Use Reverse acting mode if the output turning on will drive up the PV (E.g. Heating). To change the operating direction of the output, see above.*

#### C. Setup SSR Time-Proportional PID Output (PD5X0-S Models)

*Most settings are configured by default to use Output 1 (CNT1) as a time-proportional output for PID control.*

- i. Press & hold the MD button for 1 second to enter the programming menu.
- ii. Press the DOWN arrow several times to navigate to the Output group (G.OUT, GP08)
- iii. Press the SET button to enter the Output group.
- iv. Press the DOWN arrow several times to navigate to the CP parameter.
- v. Press the SET button to change the CP setting.
- vi. Use the UP, DOWN, and LEFT arrows to enter the Control Period – the total time for one On/Off cycle, in seconds.
- vii. Press the SET button to confirm the Control Period value.

*By default, Output 1, the SSR output for PID control, is set for Reverse acting. This means the output will increase to drive up the PV (E.g. Heating). To change the operating direction of the output, see above.*

### 3. Configure Alarms & SUB Relays

*Configuring relay alarms is a two-step process. First, configure the alarms themselves. Then, assign those alarms to relays SUB1, SUB2, etc. By default, alarm 1 (ALM1) is assigned to relay SUB1, etc. The following instructions explain how to configure alarm 1 (ALM1) in the Alarm group (G.ALM) and SUB Output group (G.SUB).*

- A. Press & hold the MD button for 1 second to enter the programming menu.
- B. Press the UP arrow two times to navigate to the Alarm group (G.ALM, GP03)
- C. Press the SET button to enter the Alarm group.
- D. Press the SET arrow to change the Alarm 1 Type A1.TY parameter.
- E. Press the UP and DOWN arrows to select the alarm type number that corresponds to the desired alarm type. See Alarm Type and Alarm Operation Description in this Quick Start Guide for details.
  - i. Setup a High Alarm for SUB1 Relay

*The following setup instructions will program alarm 1 as a high alarm which is assigned by default to SUB1 relay.*

- a. Select alarm type number 1 at the A1.TY parameter to select the High absolute value alarm type.
- b. Press the SET button to confirm alarm type 1.
- c. Press the SET button to change parameter alarm value parameter AL-1.
- d. Use the UP, DOWN, and LEFT arrows to program the value for the high alarm in the engineering units of the PV.
- e. Press the SET button to confirm the new absolute alarm set point.
- f. Press the SET button to change parameter alarm deadband A1.DB.
- g. Use the UP, DOWN, and LEFT arrows to program the value for the high alarm deadband in the engineering units of the PV. This is not the reset value, but the difference between the alarm set point and the reset point.
- h. Press the SET button to confirm the new value for the deadband.

### 4. Auto-Tune (PID Control Models Only, Not Applicable for On/Off Control)

*Programming Note: Beginning an auto-tune should be the last step in programming. Program all other parameters that impact the input, PV, SV, and output configuration before engaging auto-tune.*

- A. From the run mode screen, use the UP, DOWN, and LEFT arrows to program a set value (SV) in the range of what is expected during normal operation.
- B. Press and hold the SET and UP keys together for 3 seconds to initiate auto-tuning.

*Programming Note: The auto-tuning cycle consists of several cycles; each causing the PV to overshoot and undershoot the SV. The PID output will switch between 0 and 100% during auto-tuning. It will only begin controlling with other output levels after the auto-tuning process is complete.*

# Parameter Configuration

**How to Read Parameters Listed Below**

Parameter name

<0100> SV/NO Set value (SV) number  
>[1, 1-4]

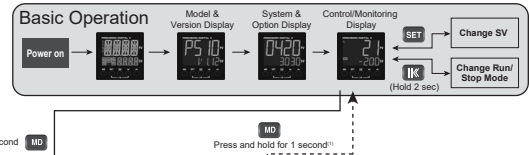
<Modbus address> [Default value; setting options]

**How to Change Parameter Values**

Enter programming menu

Menu Programming: Use buttons to change parameter value.

Save parameter value and move to next parameter



**Programming Menu: press and hold MD for 1 second**

SV group	CONTROL group	ALARM group	TRANS group	SUB group
<0100> SV/NO Set value (SV) number >[1, 1-4] <0101> SV/H Set value (SV) high limit >[1370, refer to input range] <0102> SV/L Set value (SV) low limit >[-200, refer to input range] <0103> SV/1 Set value 1 (SV 1) >[-200, refer to input range] <0104> SV/2 Set value 2 (SV 2) >[-200, refer to input range] <0105> SV/3 Set value 3 (SV 3) >[-200, refer to input range] <0106> SV/4 Set value 4 (SV 4) >[-200, refer to input range]	<0200> ATM Auto-tuning mode >[STND, STND or LOW] <0207> AT Auto-tuning (AT) >[OFF, OFF or ON] <0208> ARW Anti-reset wind-up (ARW) >[Auto, Auto or 50.0-200.0] <0209> ALP Alpha >[50, 0-100] <0210> P1PID 1.PID group <0219> P2PID 2.PID group <0228> P3PID 3.PID group <0237> P4PID 4.PID group <0246> RPH Ramp-up >[OFF, refer to input range] <0247> RPT Ramp-up time >[01.00, 00.01-99.99] <0248> RPD Ramp-down >[OFF, refer to input range] <0249> RPTD Ramp-down time >[01.00, 00.01-99.99] <0250> MBV MV Bumpless >[ON, OFF or ON]	<0300+(n-1)x4> ALN Alarm n type >[0-13] <0301+(n-1)x4> ALN Alarm n value <0302+(n-1)x4> ALN Alarm n deadband >[1] <0303+(n-1)x4> ALN Alarm n output hold status >[RST, RST or SET] <0316> LBA Loop break alarm time >[480, 0-7200] <0317> LBS Loop break alarm set value >[2, EUS 0.0-5.0%] <0318> LBD Loop break alarm deadband >[2, EUS 0.0-5.0%] <0319> LBO Loop break alarm output hold status >[RST, RST or SET] <0320> HBA1 Heater break alarm 1 set value >[OFF, 1.0-50.0] <0321> HBA1D Heater break alarm 1 deadband >[0.5, 0.1-50.0] <0322> HBA2 Heater break alarm 2 set value >[OFF, 1.0-50.0] <0323> HBA2D Heater break alarm 2 deadband >[0.5, 0.1-50.0] <0324> HBAO Heater break alarm output hold status >[RST, RST or SET]	<0400> RETT Retransmission output type >[PV, PV/SV/MV] <0401> THH Retransmission output high limit >[1370] <0402> TLL Retransmission output low limit >[-200] <0403> TPA Retransmission output high adjust. value >[0] <0404> TPL Retransmission output low adjust. value >[0] <0405> REIE Enable remote input >[OFF, OFF or ON] <0406> REIH Remote input high limit >[5.000, 1.000-5.000] <0407> REL Remote input low limit >[1.000, 1.000-5.000] <0408> REHS Remote input high scale value >[1370] <0409> RELS Remote input low scale value >[-200] <0410> REHA Remote input high adjust. value >[0] <0411> RELA Remote input low adjust. value >[0]	<0500> SUB1 Sub 1 output type >[ALM1] <0501> SUB2 Sub 2 output type >[ALM2] <0502> SUB3 Sub 3 output type >[ALM3] <0503> SUB4 Sub 4 output type >[ALM4] <0504+(n-1)x4> ALN Alarm n ON delay time >[0, 0-999] <0505+(n-1)x4> ALN Alarm n OFF delay time >[0, 0-999] <0506+(n-1)x4> ALN Alarm n contact type >[N.O, N.O or N.C] <0507+(n-1)x4> ALN Alarm n output hold >[OFF, OFF or ON] <0520> LBAO Loop break alarm ON delay time >[0, 0-999] <0521> LBAO Loop break alarm OFF delay time >[0, 0-999] <0522> LBAO Loop break alarm contact type >[N.O, N.O or N.C] <0523> LBAO Loop break alarm output hold >[OFF, OFF or ON] <0524> HBAO Enable heater break alarm 2 >[OFF, OFF or ON] <0525> HBAO Heater break alarm ON delay time >[0, 0-999] <0526> HBAO Heater break alarm OFF delay time >[0, 0-999] <0527> HBAO Heater break alarm contact type >[N.O, N.O or N.C] <0528> HBAO Heater break alarm output hold >[OFF, OFF or ON]

INPUT group	OUTPUT group	SET group	COMM group
<0900> INP Input type >[K0] <0901> INU Unit >[°C] <0904> INP Decimals point position >[1] <0905> INH Scale high limit >[100.0, -1999 to 9999] <0906> INL Scale low limit >[0.0, -1999 to 9999] <0907> INFC Reference junction compensation >[ON, OFF or ON] <0908> INF Input filter >[OFF, OFF or 1-120] <0909> INBI Input bias >[0]	<0800> CNT1 OUT1 control mode >[PID, ON/OFF or PID] <0801> CNT2 OUT2 control mode >[PID, NONE/ON/OFF/ PID] <0802> OPR Control direction >[REV, REV or DIR] <0803> CP Control cycle (OUT1) <0804> CPC Control cycle (OUT2) <0805> HOH ON/OFF control hysteresis (OUT1) >[1] <0806> HOC ON/OFF control hysteresis (OUT2) >[1] <0807> EO Emergency output (OUT1) >[0.0] <0808> EOC Emergency output (OUT2) >[0.0] <0809> OHL Control output high limit >[100] <0810> OLL Control output low limit >[0.0]	<0700> DIG Digital input mode >[OFF, OFF or ON] <0701> POM Operation mode after power on >[RUN, STOP or RUN] <0702> PIN Parameter initialization >[OFF, OFF or ON] <0703> LOK Parameter set value lock >[0, 0-2] <0704> EOP EEPROM lock during operation >[OFF, OFF or ON] <0041> SYSD System data >[0000-FFFF] <0042> OPTD Option data >[0000-FFFF] <0045> FVER Firmware version >[V0.00-Vx.xx]	<0600> PCK Communication protocol >[PCK] <0601> BRD Baud rate >[9.6K] <0602> PRB Parity bit >[NONE] <0603> STP Stop bit >[1, 1 or 2] <0604> DLEN Data length >[8, 7 or 8] <0605> ADDR Address >[1, 1-99] <0606> RPD Response delay time >[0, 0-10]

(1) To exit the programming menu, hold MD for 1 second.

(2) To return to the Group menu when displaying programming parameters, press MD.



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