

DSPR-5 User Manual

Ver 0.9 (June 6, 2023)

1. Specifications

Input sensor type	Thermocouple: K RTD (Resistance Temperature Detector): PT100, PT1000 NTC Thermistor (Negative Temperature Coefficient): 50K at 25°C
Accuracy	± 0.2% of full scale
Sensor input range	Thermocouple Type K: 0°F ~ 2372°F, -17°C ~ 1300°C RTDs: 0°F ~ 932°F, -17°C ~ 500°C NTC Thermistor 50K: 32°F ~ 392°F, 0°C ~ 200°C
Response time	≤ 0.5 s
Display resolution	1°C or °F
Control mode	Automatic (PID, ON/OFF), manual
Timer range (HH:MM)	00 H 00 M to 99 H 59 M
Main output voltage	12 VDC for solid-state relay
Power supply	85 V ~ 260 V AC / 50 ~ 60 Hz
Power consumption	≤ 5 Watt
Working ambient temperature	32°F ~ 122°F, 0°C ~ 50°C
Dimensions	48 x 48 x 120 mm (W x H x D)
Mounting cutout	45 x 45 mm

2. Front Panel

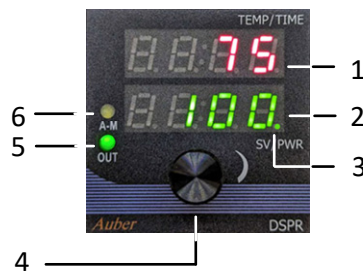


Figure 1. Front panel of DSPR-5.

Descriptions

1. PV window. Display the probe reading (and timer if the timer function is enabled).
2. SV window. Display the set value in either temperature or in power percentage.

3. Editing Indicator. If this dot light up, the set value has been changed by the user and has not been saved.
4. Rotary knob. Rotate to adjust values. Press down to confirm selection or to access menus.
5. OUT indicator. To indicate the output status from the controller.
6. A-M indicator. Auto/manual indicator. The yellow LED turns on in manual control mode.

3. Terminal Assignment

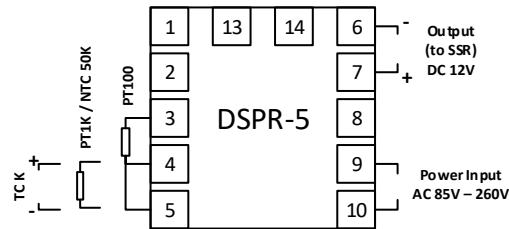


Figure 2. Terminal assignment of DSPR-5.

4. Getting Started

Before you connect the power to this controller or install it to a control panel, please read the manual thoroughly to understand how the controller works. You should understand the following before you start using the controller:

1. Identify the correct terminals for connecting the power supply, the temperature sensor, the output to drive external solid-state relays.
2. Understand what information will be conveyed by each of the display window and each indicator.
3. Familiar with how to change the set temperature or power percentage on the controller.
4. Familiar with how to access the menus and understand what each parameter does.

5. Connecting the Controller

5.1. Power Input

The controller requires an AC power supply in either 120VAC or 230VAC. The input AC power should be connected to #9 and #10.

5.2. Sensor Input

This controller can accept a few commonly used temperature sensors: type K thermocouple, PT1000 RTD, NTC 50Kohm thermistor, and PT100 RTD.

- **Type K:** connector the positive lead to #4 and the negative lead to #5.
- **PT1000 RTD:** connect sensor leads to #4 and #5. No polarity.
- **NTC 50Kohm thermistor:** connect sensor leads to #4 and #5. No polarity.
- **PT100 RTD:** connect two wires of the same color to #4 and #5; connect the other lead to #6.

The input sensor type on the controller, parameter “Sn” (S_n), must be set to match the actual sensor type that is connected. By factory default, the controller is set to ready type K thermocouple (K). Please see section 8.2 for details.

5.3. Control Output

The output signal from this controller is a 12VDC signal, which can be used to drive solid-state relays. The output status is indicated by the green OUT LED on the front panel.

6. Changing the Set Value

The default Set Value (SV) is 100°F. To change the Set Value:

1. Turn the knob and a flashing dot will appear on the lower right corner of the SV window.
2. Turn the knob to clockwise to increase the SV; turn the knob counter-clockwise to decrease the SV. Once get to the desired SV, press down the knob to save the new value. Otherwise, the old SV will be restored.
3. Once the new SV is confirmed, the dot in the lower right corner will go away.
4. The SV can be changed continuously between the temperature value and the power percentage value. Please see the next section for details.
5. If the SV is set to a percentage value, the lower window will show letter “P” on the left window. The A-M LED diode turns on to indicate that the controller is working in manual control mode. (Figure 3)

7. Switching between Auto Mode and Manual Mode

One of the most convenient features in DSPR-5 is that the SV can be changed continuously between a temperature value (0°F to 932°F) and a power percentage value (0% to 100%), and the corresponding control mode between changed as well between the Auto Control Mode and the Manual Control Mode.

Auto Control Mode

When the SV is a temperature value, the controller works in automatic control mode, which means the controller will automatically adjust the output power to bring the temperature to the target value. The lower window will just show a number without any letter. The yellow A-M indicator should be off.

Manual Control Mode

When the SV is set to a percentage value, the controller works in manual control mode, which means the controller will send the power percentage determined by the user. The lower window will show letter “P” on the left to indicate the SV is a percentage value. The yellow A-M indicator should be on.



Figure 3. Compare the differences of the display on a DSPR-5 in Auto Control Mode with the SV set at 100°F (left) and the controller in Manual Control Mode with the SV set at 100% output (right).

Please see the two images in Figure 3, which show a controller in Auto Mode on the left, and a controller in Manual Mode on the right. The controller in Manual Mode has the A-M indicator turning on and the letter “P” (P) in the lower window.

To switch between Auto Mode and Manual Mode:

1. Simply turn the knob to change the SV to either a temperature (auto mode) or a percentage value (manual mode). The SV can be changed continuously from 0% to 100% to 0°F to 932°F.
2. As the SV value transits between percentage value “P 100” and temperature value “0” degree, the lower window to prompt either “TEMP” (TEMP) or “PCT” (PCT) briefly to indicate the new SV will be a temperature value or a percentage value.
3. When the SV is set to a percentage value, the lower window will show letter “P” on the left and the A-M indicator will turn on.
4. When the SV is set to a temperature value, the lower window will only show a number and the A-M indicator will turn off.

8. Access the Menu

Press down the knob and hold it for 2 seconds to bring up the menu. The top window will show “go to” (GO TO). Turn the knob to change the lower window to “CTRL” (CTRL) or “SYST” (SYST), then press down the knob shortly to enter next level of menu. When the controller is in the menu system, if there is no action for 30 seconds from the user, the controller will automatically return to the normal operating mode.

8.1. Control Configuration (CTRL)

Table 1. Parameters in CTRL menu.

Name	Symbol	Description	Range	Default	Details
P	P	Proportional band	0 ~ 9999	20	Unit in degrees. Larger the value, wider the band, weaker action from the proportional control. If P = 1, I = 0, D = 0, it is ON/OFF control mode.
I	I	Integral time	0 ~ 9999	100	Unit in seconds. Larger the value, weaker/slower the action from the integral control.
D	d	Derivative time	0 ~ 9999	10	Unit in seconds. Larger the value, stronger the action from the derivative control.
T	t	Control cycle time	2 - 120	2	Unit in seconds.
Hy	Hy	Hysteresis band	0 ~ 999	2	Hysteresis band. Only applies to the ON/OFF control mode (i.e., when P = 1, I = 0, D = 0).
OUTL	$OUTL$	Output low-limit	0 ~ 100	0%	Minimum output level. Only applies to auto control mode
OUTH	$OUTH$	Output high-limit	0 ~ 100	100%	Maximum output level. Only applies to auto control mode
AT	AT	Auto-tuning	N, Y	N	Start auto-tuning PID parameters. Only applies to auto control mode
TF	TF	Timer function	OFF, ON	OFF	OFF: disable the timer function ON: enable timer function
TIME	$TIME$	Timer setting	00:00 ~ 99:59	01:00	Timer unit in HH:MM
EO	EO	Ending output	OFF, ON	OFF	Weather to enable output after the count-down timer has been reached. OFF: disable output at the end of the timer count-down. ON: enable output the end of the timer count-down.

8.2. System Configuration (SYST)

Table 2. Parameters in SYST menu.

Name	Symbol	Description	Range	Default	Details
Sn	Sn	Input sensor type	K, PT1K, P100, N50K	PT1K	K: type K thermocouple; PT1K: PT1000 RTD; P100: PT100 RTD; N50K: 50K NTC thermistor.
Pb	Pb	Probe offset	-20 ~ +20	0	Add an offset to the temperature input signal from the sensor.
C-F	$C-F$	Temperature unit	°C, °F	°F	Display the temperature in Celsius or in Fahrenheit.
PMOD	$PMOD$	Output signal type	TP, BF	TP	TP: time-proportional; BF: burst-firing mode.

MMOL	⎯ ⎯ ⎯ ⎯	Manual mode open-loop	Y, N	N	Enable output in open-loop situation (sensor failure or no sensor is connected). Only applies to manual mode. N: disable output in open-loop situation (i.e., no sensor is connected). Y: enable output in open-loop situation.
mSV	⎯ 5 ⎯	Maximum Set Value	0 ~ 2372	932	The upper limit of temperature SV.
VER	⎯ E r	Firmware version			Firmware version number. Display only. (Current firmware ver1.2.1)
RST	r 5 ⎯	Factory reset	N, Y	N	N: no action. Y: reset all parameters to factory default values.

9. Reset the Timer

Important Note: this operation is only available to situations:

- 1) when the timer function is enabled (i.e., parameter “TF” is set to “on”) AND
- 2) when the account-down timer has been triggered (i.e., after the PV has reached the SV).

To reset the timer, press down the knob briefly, the controller will show “⎯ r 5 ⎯” in the top window and show “r” in the lower window. Turn the knob to change the letter in the lower window to “5” and then press down the knob to reset the timer.

Timer Reset (“⎯ r 5 ⎯”)

Name	Symbol	Description	Range	Default	Note
TRST	⎯ r 5 ⎯	Timer reset	N, Y	N	N: No action. Y: reset the timer.

(End)

Auber Instruments, Inc.

5755 North Point Parkway, Suite 99,
Alpharetta, GA 30022, USA.

www.auberins.com

E-mail: info@auberins.com

Tel: 770-569-8420

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