

## Microprocessor-Based Digital Controls

### Series 980/985

For versatility and space saving advantages, you can now order the horizontally-oriented Series 980, or its twin, the vertical Series 985. Either way, these 1/2 DIN controllers have all of the most popular control features: single input, dual output, auto-tuning, a wide range of inputs and outputs, and both auto and manual modes with bumpless transfer from auto to manual.

The 980/985 operates in heat, cool, and alarm modes, with ON/OFF, P, PI, PD, PID control. Sensor inputs include five thermocouple types, RTD and scaleable process input. Range limiting of the set point variable matches the control to the application.

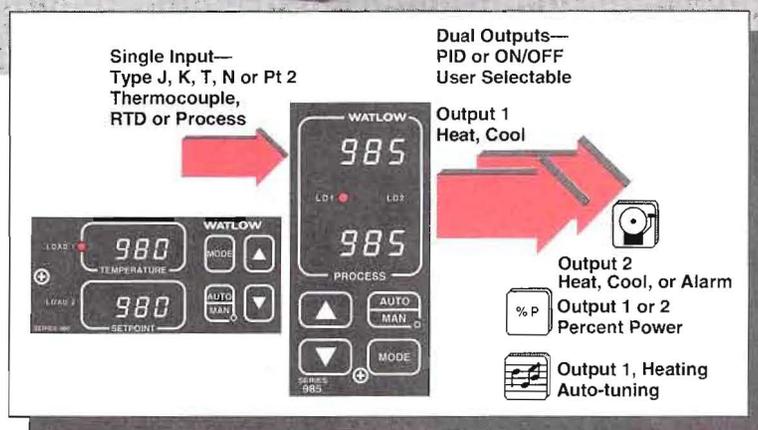
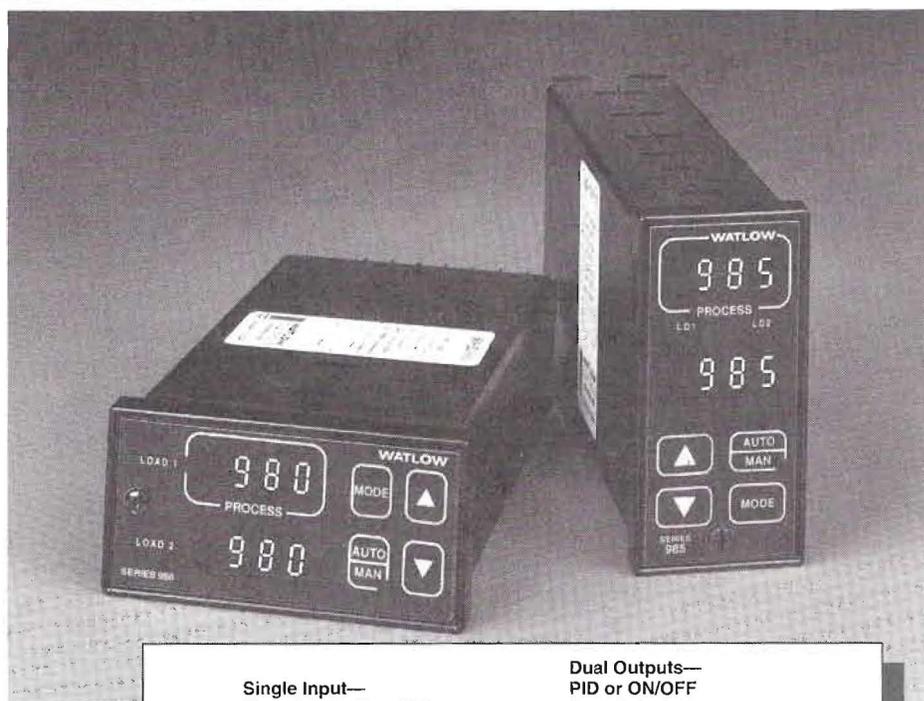
Like all of Watlow's temperature controls, the 980/985 is designed to operate in even the most hostile environments and is backed by a three-year warranty.

#### Performance Capabilities

- Accuracy to 0.1 percent of span
- Operating environment 32° to 130°F (0° to 55°C)

#### Features

- **Scaleable process input** allows you to control different variables.
- **Dual digital display** provides simultaneous viewing of set point and actual temperature.
- **Auto/manual operation for percent power** allows bumpless transfer with open sensors.
- **Auto-tuning of primary output PID parameters** allows easy set up and tuning.
- **Horizontal or vertical 1/2 DIN** available for space conserving panel layouts.
- **Multiple levels of operator lockout** guard against unwanted changes
- **Three year warranty\*** provides Control Confidence®.



#### Applications

- Furnaces and ovens
- Plastics processing
- Food service

#### Specifications

##### Control Mode

- Single set point, non-ramping
  - Single input, dual outputs
  - Control outputs: User selectable as: Heat, Heat/Heat, Heat/Cool, Cool, Cool/Cool, Heat/Alarm, Cool/Alarm
- Outputs independent, or related via deadband for Heat/Cool.
- ON/OFF: 3°F or 1.7°C switching

hysteresis or 0.3°F or 0.17°C for 0.1° units.

PID parameters:

Proportional band: 0 to 999°F/0 to 555°C (3 digit)

0 to 999°F/0 to 555°C or 0 to 99.9°F/0 to 55.5°C (3 or 4 digit).

Reset: 0.00 to 9.99 repeats per minute.

Rate: 0.00 to 9.99 minutes.

Cycle time: 1 to 60 seconds.

Deadband: ±99°F, ±99 units or ±55°C

(±9.9°F, ±9.9 units or ±5.5°C for 0.1 decimal units)

\*Electromechanical relay output warranted to 100,000 cycles.

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### Specifications

Continued

- Alarms, latching or non-latching. Process or deviation.
- Separate high and low values.
- Alarm silencing (inhibit) on power up.

### Operator Interface

- Membrane front panel
- Three or four digit 0.3 in (8 mm) LED displays

- MODE, AUTO/MANUAL, UP, and DOWN keys
- Dual digital displays
- Horizontal (980) or vertical (985) ½ DIN front panel

### Input

- Thermocouple, RTD, and electrical process input.
- Automatic cold junction compensation for thermocouple.
- RTD input 2 or 3 wire, platinum, 100 ohm @ 0°C user selectable, calibrate to JIS curve #3916 (0.003916 Ω/Ω/°C). DIN curve #3850 (0.003850 Ω/Ω/°C).
- Sensor break protection de-energizes control output to protect system or selectable bumpless transfer to manual operation.
- Grounded or ungrounded sensors.
- °F, °C, or process variable units are user selectable.
- Operating ranges user selectable.

### Range Information

Thermocouple		
J t/c (3 Digit)	32 to 999°F	(0 to 750°C)
(4 Digit)	32 to 1382°F	(0 to 750°C)
K t/c	-328 to 2282°F	(-200 to 1250°C)
T t/c	-328 to 662°F	(-200 to 350°C)
N t/c	32 to 2282°F	(0 to 1250°C)
Pt 2 (Platinel 2)	32 to 2543°F	(0 to 1395°C)

RTD		
1° RTD	-328 to 1112°F	(-200 to 600°C)
0.1° RTD	-99.9 to 392.0°F	(-99.9 to 200.0°C)

Process	
0-5VDC	-500 to 3500 units
4-20mA	-500 to 3500 units

### Primary Output (Heating or Cooling)

- Solid state relay, 0.5A @ 24VAC min., 253VAC maximum, opto-isolated, zero cross switching.
- Electromechanical relay, Form C, 6A @ 115/230VAC, 6A @ 28VDC, ½ hp @ 115VAC, 125VA @ 115VAC.

- Open collector, switched DC signal provides a minimum turn ON voltage of 3VDC into a minimum 500Ω load; maximum ON voltage not greater than 32VDC into an infinite load.
- 4-20mA reverse acting into a 600Ω maximum load.

### Secondary Output (Heat, Cool or Alarm)

- Solid state relay, 0.5A @ 24VAC min., 253VAC maximum, opto-isolated, zero cross switching.
- Electromechanical relay, Form A, 6A @ 115/230VAC, 6A @ 28VDC, ½hp @ 115VAC, 125VA @ 115VAC.

- Open collector, switched DC signal provides a minimum turn ON voltage of 3VDC into a minimum 500Ω load; maximum ON voltage not greater than 32VDC into an infinite load.

### Accuracy

- Calibration Accuracy: ±0.1% of span, ±1 LSD, 77°F ± 5°F (25°C ± 3°C) ambient and rated line voltage ± 10%.

- Accuracy Span: 1000°F or 540°C minimum.
- Temperature Stability: 0.1°F/°F (0.1°C/°C) change in ambient.
- Voltage Stability: ±0.01% of span per percent of rated line voltage.

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### Agency Approvals

- UL recognized, File #E43684, UL873
- CSA, File #LR30586

### Terminals

- #6 compression type screw terminals

### Power

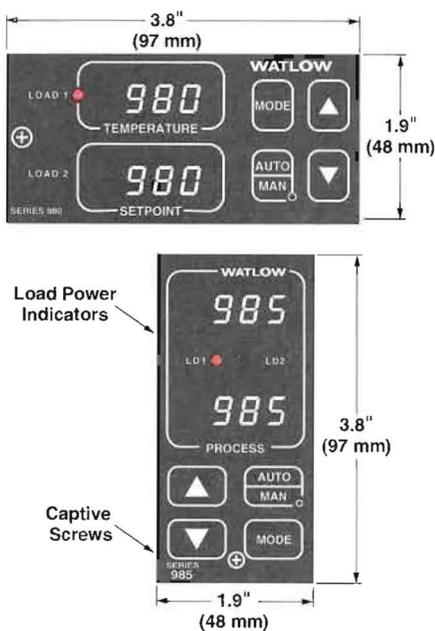
- 115/230VAC +10%, -15%, 50/60Hz, ±5%
- 10VA maximum
- Data retention upon power failure via nonvolatile memory

### Operating Environment

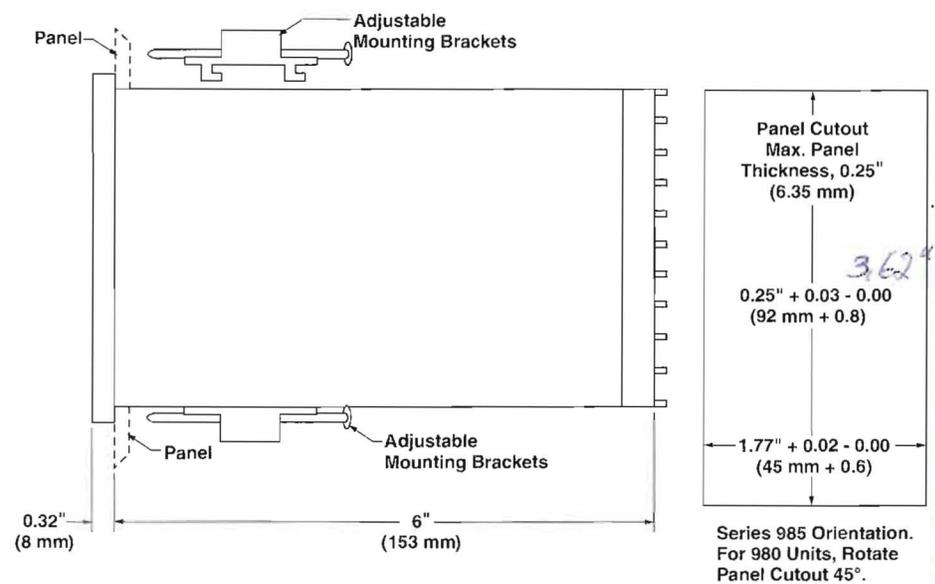
- 32 to 130°F/0 to 55°C
- 0 to 90% RH, non-condensing

### Weight

- 0.9 lb (0.4 kg)



### Dimensions



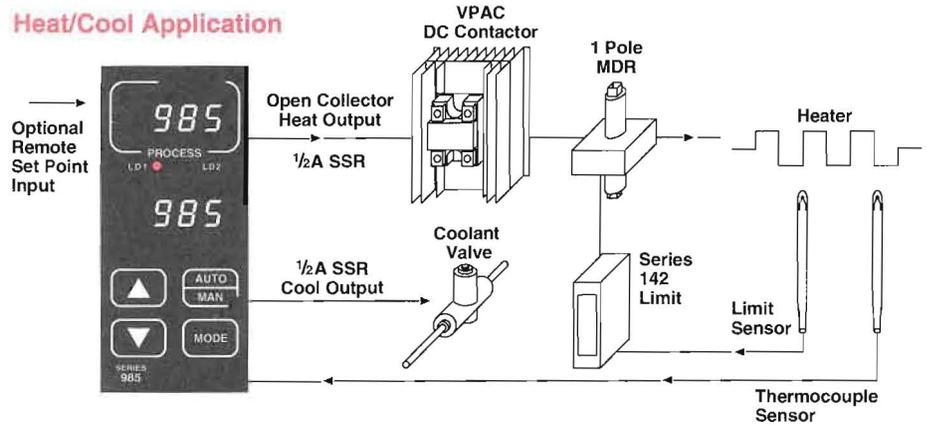
Controls

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## Series 980/985

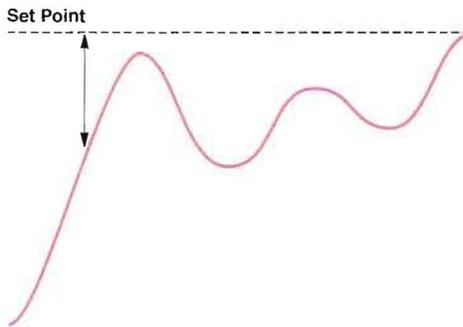
### Wiring Examples

#### Heat/Cool Application



### Feature Highlights

#### Auto-Tuning

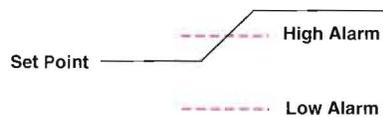


Auto-tune: Series 733, 942, 945, 965 and 980/985 controls provide easy-to-use automatic tuning.

- Operator initiates auto-tune
- Control auto-tunes 10 percent below set point, reducing potential for damaging overshoots.

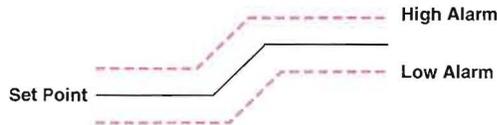
### Alarms

#### Process Alarm



Independent high and low alarms register regardless of set point.

#### Deviation Alarm



Independent high and low alarms follow set point.

Watlow Series 733, 942, 945, 965 and 980/985 control family alarms offer user-selectability for process (fixed) or deviation (delta) values.

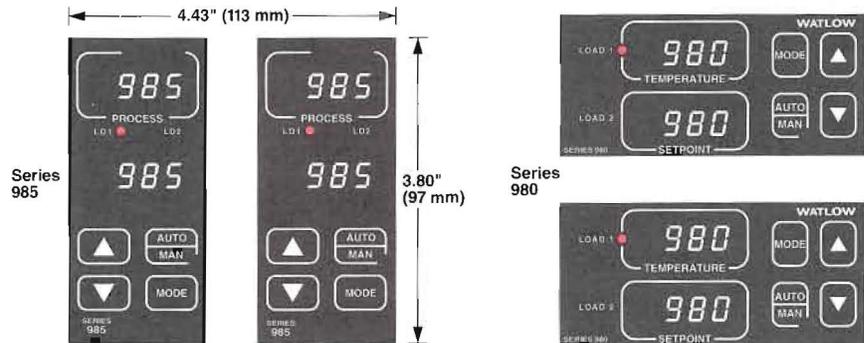
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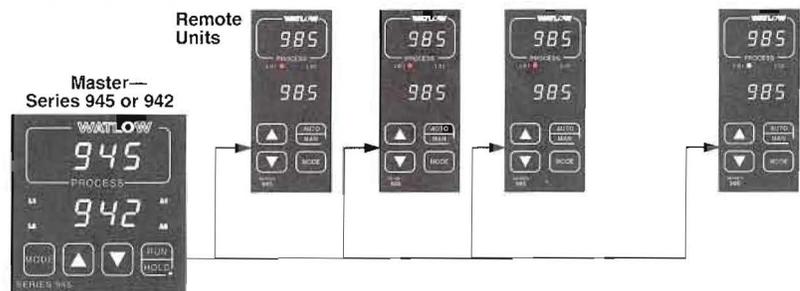
#### Horizontal and Vertical Orientation

- Horizontal and vertical versions accommodate various mounting and viewing requirements.

- Compact 1/8 DIN size provides easy operator access, yet minimizes panel space.



#### Remote Setpoint Operation



- Remote set point input accepts 0-5V or 4-20mA signal.
- Up to 10 Series 980/985 controls can operate as remote or cascade controls from a Watlow Series 945 or 942 control.
- Each remote unit precisely and independently controls its own zone.

### Controlling Military Ordinance Target Temperature

A military ordinance range needed a target to stay at the same temperature deviation from the surrounding outside ambient air as the air heated and cooled through its daily cycle.

Watlow's solution was to modify a Series 945 with an input from a Type T thermocouple through a Watlow control signal conditioner. This enabled the control to provide a floating point reference (ambient temperature) from -40 to 60°C with

a control range setable from 0 to 100°C away from the floating reference. The application also used Watlow tubular stock and modified stock heaters.

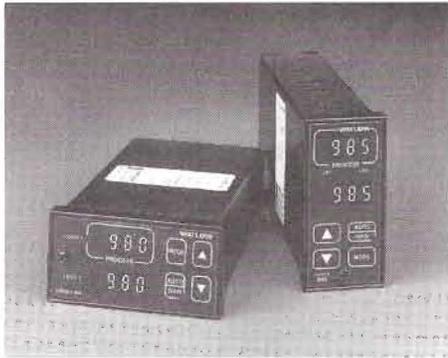
The distributor sales engineer and the customer worked closely with the factory to determine the exact control specification. The factory then met an extremely fast prototype deliver date.

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F.O.B.: Winona, Minnesota

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### Ordering Information



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Process	
0-5VDC	-500 to 3500 units
4-20mA	-500 to 3500 units

To order, complete the model number to the right with the information below:

9 8 A - 0 - 0 0

#### Category and Details

##### Control

Series 980/985 = Dual output, microprocessor-based 1/2 DIN

##### Mounting

0 = Horizontal  
5 = Vertical

##### Input

1 = Type J thermocouple (3 digit)  
2 = Type J, K, T, N, Pt 2 thermocouple;  
RTD 1°, 4-20mA, 0-5VDC (4 digit)  
3 = Type J, K, T, N, Pt 2 thermocouple;  
RTD 0.1°, 4-20mA, 0-5VDC (4 digit)

##### #1 Output

B = Solid state relay, Form A, 0.5A, RC suppression  
C = Switched DC, open collector, non-isolated  
D = Electromechanical relay, Form C, 6A  
(Warranted to 100,000 cycles)  
F = Process, 4-20mA, non-isolated  
K = Solid state relay, Form A, 0.5A,  
without contact suppression

##### #2 Output

A = None  
B = Solid state relay, Form A, 0.5A, RC suppressed  
C = Switched DC, open collector, non-isolated  
D = Electromechanical relay, Form A, 6A  
(Warranted to 100,000 cycles)  
K = Solid state relay, Form A, 0.5A,  
without contact suppression  
L = Electromechanical relay, Form B, 6A  
(Warranted 100,000 cycles)

##### Front Panel

00 = Standard  
XX = Special label; artwork private label charge. Consult Watlow representative.

### Availability

**Stock:** Same day shipment

**Assembly Stock:** Four day shipment