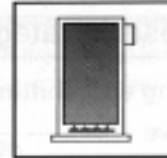


tekmar® - Data Brochure

One Stage Boiler Control 250



D 250

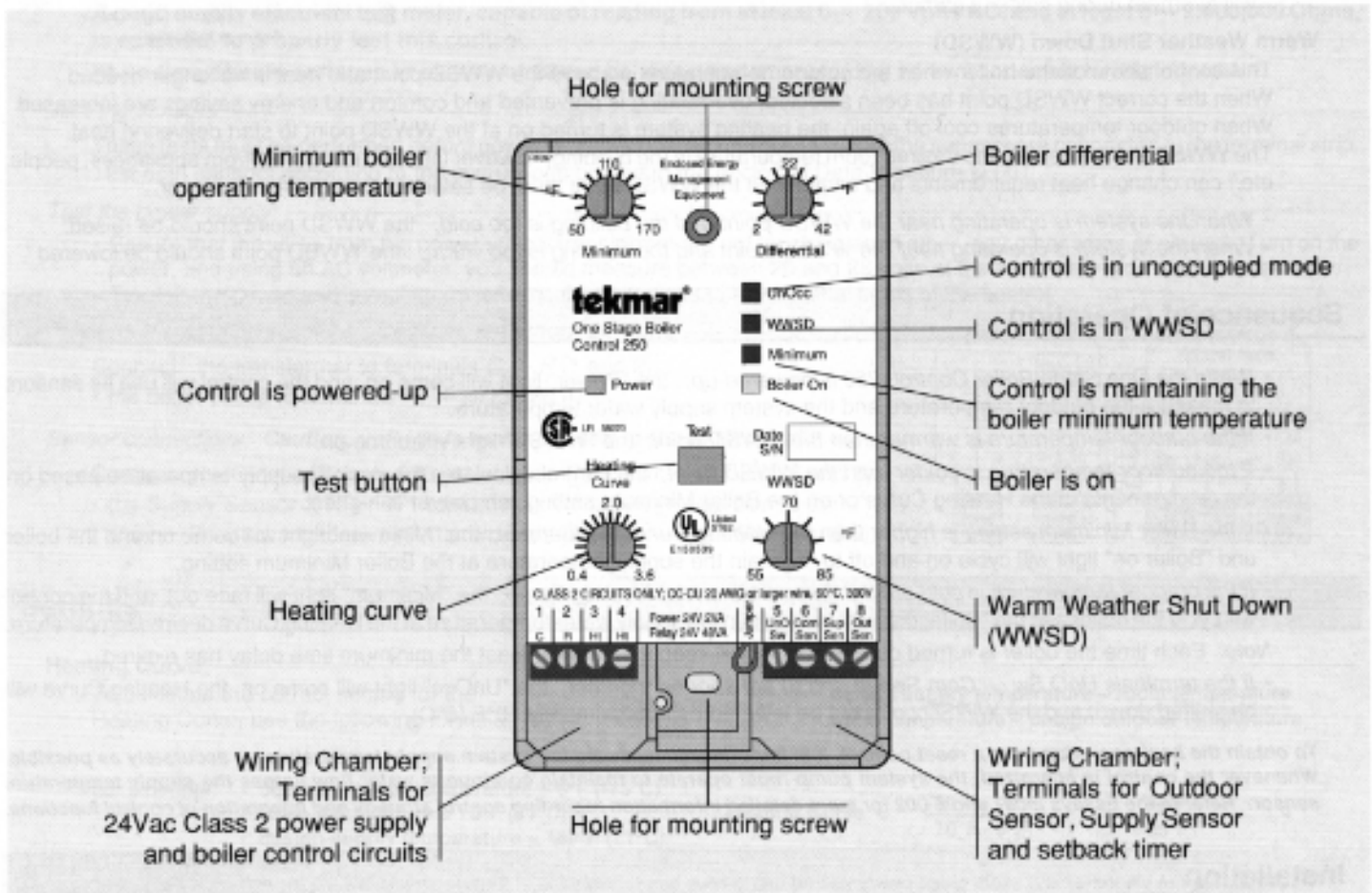
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The tekmar One Stage Boiler Control 250 is an electronic outdoor reset control that is designed to regulate the supply water temperature from a single boiler based on the outdoor air temperature.

This reliable and versatile control has settings for heating curve, differential, minimum boiler operating temperature, and warm weather shut down temperature. Also included are indicator lights, a test button and a selectable time delay between firing cycles.

The One Stage Boiler Control 250 is a cost effective answer for outdoor reset in many single boiler applications.



Technical Data

Technical specifications

Dimensions	— 2-7/8" x 4-3/4" x 7/8" (74 x 120 x 22 mm)
Weight	— 1 lb (450g)
Ambient	— 30 to 120° F (0 to 50° C) < 90% RH non-condensing
Power supply	— 20 to 28Vac Class 2, 2VA
Relay capacity	— 24V Class 2, 48VA
Sensors	— 10 kΩ @ 77°F (25° ± 0.2°C), curve 3, NTC thermistor accurate with up to 500 ft. (150 m) of 18 gauge wire
Control accuracy	— ± 0.5° F (± 0.3°C)

Features

Indicator lights	— Power, UnOcc, WWSD, Minimum, Boiler On
Setback timer input	— dry contacts required
Unoccupied temperature	— Occupied -10°F (6°C)
Delay between firing cycles	— 30 seconds or 3.3 minutes
Test button	— turns on boiler and resets the time delay

Adjustments

Heating curve	— 0.4 to 3.6
Minimum temperature	— 50 to 170°F (10 to 77°C)
Boiler differential	— 2 to 42°F (1 to 23°C)
WWSD temperature	— 55 to 85°F (13 to 29°C)

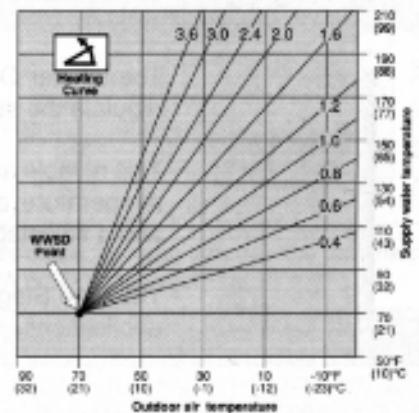
Outdoor Reset Strategy

Correct setting and shifting of the Heating Curve... the key to More Comfort and Energy Savings.

Heating Curve

As outdoor temperatures become colder, heat losses from a building increase, requiring that more heat be added to prevent the indoor temperature from also becoming colder. This tekmar reset control measures the outdoor temperature and as it becomes colder, the heat loss is balanced by making the heating supply water hotter. The Heating Curve is used to calculate exactly how hot to make the supply water at different outdoor temperatures. It determines the number of degrees the supply water temperature is raised for each degree the outdoor temperature falls.

- If the Heating Curve selected is too low; the heating system will not be able to raise the supply temperature high enough to keep the room temperature warm during colder weather.
- If the Heating Curve selected is too high; too much heat is delivered and the building will overheat during colder weather.



Warm Weather Shut Down (WWSD)

This control shuts off the boiler when the outdoor temperature is above the WWSD point and heat is no longer needed. When the correct WWSD point has been selected, overheating is prevented and comfort and energy savings are increased. When outdoor temperatures cool off again, the heating system is turned on at the WWSD point to start delivering heat. The WWSD point is usually the desired room temperature in the building, however internal heat gains (from appliances, people, etc.) can change heat requirements and sometimes the WWSD point must be selected through trial and error.

- When the system is operating near the WWSD point and the building is too cold; the WWSD point should be raised.
- When the system is operating near the WWSD point and the building is too warm; the WWSD point should be lowered.

Sequence of Operation

- When the One Stage Boiler Control 250 is powered-up; the "Power" light will come on, and the control will use its sensors to measure the outdoor temperature and the system supply water temperature.
- If the outdoor temperature is warmer than the WWSD point; the "WWSD" light will come on.
- If the outdoor temperature is colder than the WWSD point; the control calculates the desired supply temperature based on the requirements of the Heating Curve or on the Boiler Minimum setting, whichever is highest.
- If the Boiler Minimum setting is higher than the Heating Curve requirement; the "Minimum" light will come on and the boiler and "Boiler on" light will cycle on and off to maintain the supply temperature at the Boiler Minimum setting.
- If the outdoor temperature is cold enough to operate on the Heating Curve; the "Minimum" light will fade out, and the control will cycle the boiler and the "Boiler on" light to maintain the supply water temperature at the Heating Curve desired temperature.

Note: Each time the boiler is turned off, the control will keep it off until at least the minimum time delay has expired.

- If the terminals UnO Sw — Com Sen (5 and 6) are shorted together; the "UnOcc" light will come on, the Heating Curve will be shifted down, and the WWSD point will be lowered by approximately 10°F (6°C).

To obtain the best operation from a reset control, it is important to measure the system supply temperature as accurately as possible. Whenever the control is energized, the system pump must operate to maintain continuous water flow across the supply temperature sensor. Refer to the Essays E 001 and E 002 for more detailed information regarding control strategy and integration of control functions.

Installation

Caution

Improper installation and operation of this control could result in damage to equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed according to all applicable codes and standards.

Step One — Getting ready

Check the contents of this package. If any of the contents listed are missing or damaged, please refer to the Limited Warranty and Product Return Procedure on the back of this brochure and contact your wholesaler or tekmar sales agent for assistance.

Type 250 includes: • One Control 250 • One Outdoor Sensor 070 • One Supply Sensor 075 or 071
• One Data Brochure D 250 • One Data Brochure D 001 • One Application Brochure A 250

Other information available: • Essay E 001 • Essay E 002

Read Application Brochure A 250 and select the correct Application for your job.

Note: Carefully read the details of the Application, and the Sequence of Operation section in this brochure to ensure that you have chosen the proper control, and understand its functions within the operational requirements of your system.

Step Two — Mounting

The control is mounted in accordance with the instructions in the Data Brochure D 001.

Step Three **■** Rough-in wiring **■**

All electrical wiring terminates in the two wiring chambers at the bottom front of the control. If the control is to be mounted on an electrical box, the wiring can be roughed-in at the electrical box prior to installation of the control (see Brochure D 001). Standard 18 AWG solid wire is recommended for all low voltage wiring to this control.

Caution: Power should not be applied to any of the wires during this rough-in wiring stage.

- Install the Outdoor Sensor 070, and the Supply Sensor 075 or 071, according to the instructions in Data Brochure D 001 and run the wiring back to the control.
- Install a 24Vac Class II transformer with a minimum 5VA rating close to the control, and run the wiring from the transformer to the control. *A Class II transformer must be used. Do not connect any of the transformer terminals to ground.*
- Install the wiring from the boiler control circuit to the control, conforming to the boiler manufacturer's instructions.
- *Option;* Install a setback timer and run the wiring to the control.

Step Four **■** Testing and connecting the wiring **■**

Caution

These tests are to be performed using standard testing practices and procedures and should only be carried out by a properly trained and experienced technician.

A good quality electrical test meter, capable of reading from at least 0 — 200 Volts AC, and at least 0 — 2,000,000 Ohms, is essential to properly test this control.

At no time should voltages in excess of 28Vac be measured at any of the wires connected to this control.

Test the sensors

These tests must be performed *before* power is applied to the control and *before* the sensors are connected to the terminal strip. Test both sensors according to the instructions printed in the enclosed Data Brochure D 001.

Test the power supply

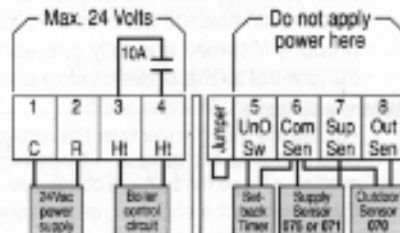
- Ensure that the wires from the power supply transformer are not touching each other, any other wires or ground. Turn on the power, and using an AC voltmeter, you should measure between 20 and 28 volts at the secondary side of the transformer.
- Turn off the power and complete the electrical connections to the terminal strips of the control.

Power and output connections; **Caution, Maximum 24 Volts**

- Connect: the transformer to terminals *C — R* (1 and 2).
- the boiler circuit to terminals *Ht — Ht* (3 and 4).

Sensor connections; **Caution, voltage is never applied to these terminals**

- Connect: the Outdoor Sensor 070 to terminals *Com Sen — Out Sen* (6 and 8).
- the Supply Sensor 075 or 071 to terminals *Com Sen — Sup Sen* (6 and 7).
- *Option;* Connect a setback timer to terminals *UnO Sw — Com Sen* (5 and 6).



Settings

Heating Curve

To calculate the correct setting for the Heating Curve, use the following formula:

$$\text{Heating Curve} = \frac{\text{design supply temperature} - \text{room temperature}}{\text{room temperature} - \text{design outdoor temperature}}$$

- For example:
- design outdoor temperature = 5°F (-15°C)
 - room temperature = 70°F (21°C)
 - design supply temperature = 160°F (71°C)

$$\text{Heating Curve} = \frac{160^{\circ}\text{F} - 70^{\circ}\text{F}}{70^{\circ}\text{F} - 5^{\circ}\text{F}} = \frac{90^{\circ}\text{F}}{65^{\circ}\text{F}} = 1.4$$

If the system design supply water temperature is unknown, a trial setting can be calculated using these typical supply temperatures:

- Fan coils ...180° to 210°F (82° to 99°C)
- Convectors ...160° to 190°F (71° to 88°C)
- Hydronic radiant floors ...100° to 130°F (38° to 54°C).

Warm Weather Shut Down (WWSD)

The WWSD dial can be adjusted from 55 to 85°F and its function is covered under the Outdoor Reset Strategy section on page 2.

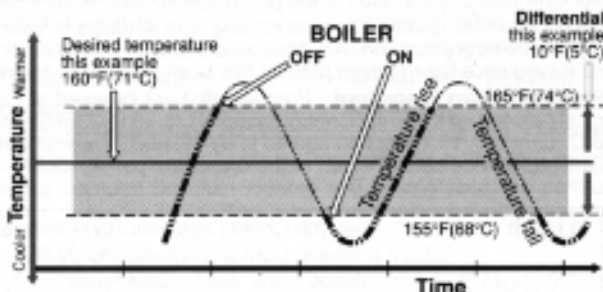
Differential and Time Delay

The differential adjustment sets how far the actual supply water temperature may deviate from the desired temperature before the boiler is turned on or off, and is determined by the flow rate through the boiler relative to the amount of heat produced. To prevent short boiler cycles, the control has a minimum time delay of 30 seconds between firing cycles, which can be lengthened to 3.3 minutes by cutting the jumper wire beside terminal 5.

$$\text{Differential} = \frac{\text{Btu/hr}}{\text{US GPM} \times 500}$$

$$\text{For example: } \frac{100,000 \text{ Btu/hr}}{20 \text{ US GPM} \times 500} = 10^{\circ}\text{F} (6^{\circ}\text{C})$$

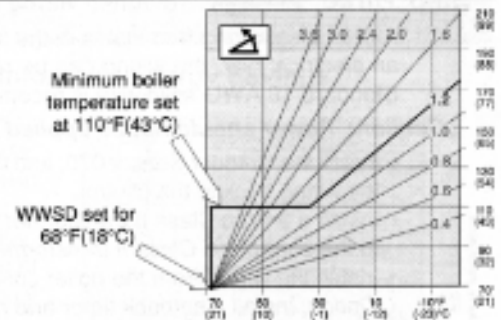
In this example, the boiler will turn on when the actual temperature falls 5°F (3°C) below the desired temperature and will turn off when the actual temperature rises 5°F (3°C) above the desired temperature.



Minimum Boiler Operating Temperature

This dial should be set according to the requirements specified by the boiler manufacturer. Many boilers require a minimum operating temperature to prevent corrosion from flue gas condensation. The control raises the supply temperature to the Minimum when the outdoor temperature drops below the WWSD setting, and holds it there until the outdoor temperature becomes cold enough to require operation on the heating curve.

Typical Minimum Boiler Operating Temperatures: • Steel Tube Boilers ...140° to 180°F (60° to 82°C) • Cast Iron Boilers ...130° to 150°F (54° to 66°C) • Copper Tube Boilers ...105° to 150°F (41° to 66°C) • Condensing or Electric Boilers ...50°F (10°C)



Setback Timer Input

An optional setback timer can be connected to the type 250. When the timer contacts close, shorting together the terminals *UnO Sw — Com Sen* (5 and 6), the control will enter a setback mode and lower the WWSD temperature by 10°F (6°C).

Testing and Troubleshooting

There are five LEDs on the front of the control that will aid in testing and troubleshooting.

The LEDs indicate the following functions:

- **Power light on** — The 24Vac power source has been connected and the control is energized.
- **UnOcc. light on** — The terminals *UnO Sw — Com Sen* (5 and 6) are shorted together, the control is in setback and the WWSD point will be lowered by 10°F (6°C).
- **WWSD light on** — The control is in Warm Weather Shut Down, the outdoor temperature is higher than the WWSD setting and the heat source will stay off.
- **Minimum light on** — The control is maintaining minimum boiler operating temperature. Not cold enough for heating curve operation.
- **Heat light on** — The internal relay is on, closing the terminal *Ht — Ht* (3 and 4) contacts. The heat source should be on.
- In addition to the LEDs, this control has a test button which checks the operation of the internal relay and the boiler circuit.

When the test button is pushed and held down for at least one second, the internal relay is energized, causing the "Boiler on" light to come on and the boiler to operate. If the "Boiler on" light comes on but the boiler does not, check to see that all components are properly installed and fully operational, and that there is power to the boiler. Check the wiring from terminals *Ht — Ht* (3 and 4) of the control to the boiler control circuit and consult the boiler manufacturer's installation and troubleshooting instructions.

Before you leave

- Install the wiring cover over the wiring chamber and secure it with the screw provided.
- Place the front cover on the control to cover the setting dials and snap it into place.
- Place this brochure, and all other brochures relating to the installation, in the protective plastic bag supplied with the control.
- Place the bag in a conspicuous location near the control for future reference.
- It is important to explain the operation of this control within the system to the end user, and anyone else who may be operating the system.

Limited Warranty and Product Return Procedure

Limited Warranty: tekmar warrants to the original purchaser each tekmar product against defects in workmanship and materials when the product is installed and used in compliance with tekmar's instructions. This limited warranty covers the cost of parts and labour provided by tekmar to correct defects in materials and/or workmanship. Returned products that are fully operational are not considered a warranty case. tekmar also does not cover parts or labour to remove, transport or reinstall a defective product. tekmar will not be liable for any damage other than repair or replacement of the defective part or parts and such repair or replacement shall be deemed to be the sole remedy from tekmar. This warranty shall not apply to any defects caused or repairs required as a result of unreasonable or negligent use, neglect, accident, improper installation, or unauthorized repair or alterations. In case of defect, malfunction or failure to conform to warranty, tekmar will, for a warranty period of 24 months from the date of invoice to the original purchaser or 12 months from the date of installation of the product, whichever occurs first, repair, exchange or give credit for the defective product. Any express or implied warranty which the purchaser may have, including merchantability and fitness for a particular purpose, shall not extend beyond 24 months from the date of invoice or 12 months from the date of installation of the product, whichever occurs first.

Replacements: tekmar can send replacement products if requested. All replacements are invoiced. Any possible credit for the replacement will only be issued once the replaced product has been returned to tekmar.

Product Return Procedure: Products that are believed to have failed must be returned to tekmar Control Systems Ltd. 4611-23rd Street, Vernon B.C. Canada V1T 4K7 when agreed to by tekmar. The installer or other qualified service person must, at the owner's expense, determine which component has failed. The product must be returned complete with

all of its components (sensors, base, etc.). Products must be returned together with the proof of purchase to the original purchaser who then returns the product to tekmar after receiving a Return Goods Authorization (RGA) number from tekmar.

Please include the following information with the product. The full address of the original purchaser, the RGA number and a description of the problem.

From the U.S.A., in order to avoid customs charges, products must be returned via US Post with the package clearly marked with the RGA number, product type and the statement "Canadian Product returned for repair". For shipping purposes the product can be valued at one half list price.

- 1) If returned during the warranty period and the product is defective, tekmar will issue full credit for the returned product less cost of missing parts.
- 2) If returned during the warranty period and the product is fully operational, tekmar will return the product to the original purchaser for a testing cost of \$30.00 plus postage.
- 3) If returned during the warranty period and the product is not damaged and is fully operational, tekmar can take back the product for a return charge of 40% of the product's net value. This request has to be specified otherwise the product will be returned with a testing cost of \$30.00 plus postage.
- 4) If returned after the warranty period and the product needs repair, tekmar will repair and return the product. Repair and postage costs will be invoiced. tekmar's repair costs are calculated at \$30.00 / hour plus the cost of parts. If the repair costs will be more than \$60.00 a repair estimate will be sent to the original purchaser.

In North America:	tekmar Control Systems Ltd., Canada tekmar Control Systems, Inc., U.S.A. Head office: 4611 - 23rd Street Vernon, B.C. Canada V1T 4K7 Tel. (604) 545-7749 Fax. (604) 545-0650
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