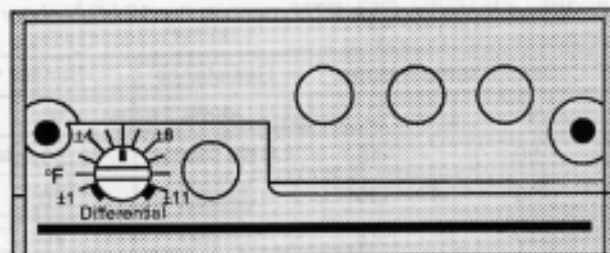


The tekmar[®] Boiler Control type 219 provides the basic regulation of the supply water temperature of a heating system as a function of the outdoor (and optionally indoor) air temperatures. The control has adjustments for the heating curve, 'sun' dial (parallel shift of the heating curve), 'moon' dial (amount of setback), and differential (difference between the cut-in and cut-out temperatures). The control does not have a timer, but a remote setback signal can be applied to set the supply water temperature down during periods when the building is unoccupied. A room temperature unit (type 301) can be added to this control to compensate for internal heat gains or losses in the building due to solar radiation, many occupants, a fireplace, etc.



5/8 actual size



Back of the control showing the differential adjustment.

type 219 includes:

1. Electronic Control
2. Plug-in socket
3. Sensor (type 311) and strap
4. Outdoor sensor (type 315)

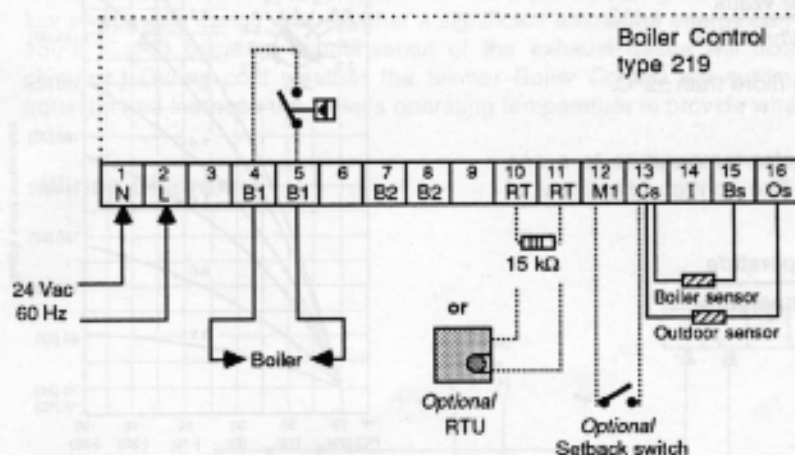
Installation

Mechanical:

The control's socket can be mounted on a DIN rail system or screwed to a flat surface.

Electrical:

The tekmar control terminates the wires in a plug-in socket; no wires are directly connected to the control. This plug-in system simplifies installation and troubleshooting procedures. Terminals N & L (1 & 2) of the socket must be connected to the secondary side of a 24 Vac class 2 transformer. The total load of the control is approximately 2 VA.



Technical Data

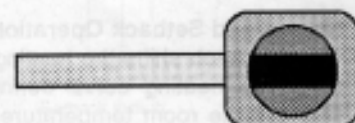
Dimensions	4-1/4" x 2-7/8" x 2-1/2" (108 x 73 x 64 mm)
Weight	0.7 lbs (0.3 kg)
Power Supply	24 Vac ± 10%, 60 Hz, 2 VA, Class 2 Transformer
Relay Capacity	4 A Ohmic SPST
Ambient Operating Conditions	30 - 120°F (0 - 50°C) <95% RH Non-condensing

Installation of the Sensors:

Note: The sensors are connected to the socket using a 2-conductor cable (eg. 2 x 18 AWG). The overall length of the cable can be 1700 ft. (500m) but the cable must not be run parallel to any power line or telephone cables.

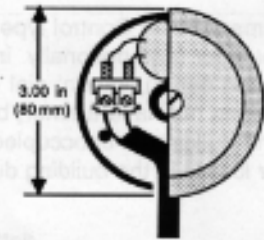
1. Boiler Sensor

Use the provided strap to fasten the boiler sensor to the (hot) boiler supply pipe approximately 20 in. (50 cm) beyond where the pipe exits the boiler. In order to obtain exact temperature measurements, the brass sensor surface must be in tight contact with the pipe. Connect this sensor's two wire cable to terminals 13 & 15 of the socket. **The strap-on sensor is not intended to be submerged in liquids.**

Strap-on sensor
type 311

2. Outdoor sensor

The outdoor sensor should be mounted on the side of the building where the main, occupied rooms are. It should not be mounted immediately above a window or ventilation opening. With two round or pan head screws, attach the black base of the sensor to the wall. The hole for the cable entry must face downward for proper moisture drainage. Connect a two conductor cable, from the outdoor sensor terminals to terminals 13 & 16 of the control's socket.



3. When installing the RTU, remove the 15 kΩ resistor.

Sensor temperature		Resistance	Sensor temperature		Resistance	Sensor temperature		Resistance
°F	°C	ohms	°F	°C	ohms	°F	°C	ohms
-50	-45	59,000	50	10	3,700	150	65	500
-30	-35	33,000	70	20	2,400	170	76	360
-10	-23	17,000	90	32	1,500	190	88	250
10	-12	10,000	110	43	1,000	210	100	180
30	0	5,600	130	54	720	230	110	140

Adjustments

1. Differential

The differential adjustment sets how much the actual supply water temperature may deviate from the desired temperature before the boiler is turned on or off. To prevent short cycling of the boiler, the differential should be set slightly higher than one half the temperature rise through the boiler.

Example

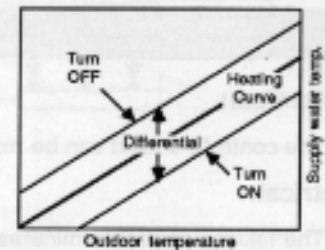
$$\text{Temperature Rise} = \frac{\text{Btu/hr}}{\text{US GPM} \times 500} \quad \text{Eg: } \frac{90,000 \text{ Btu/hr}}{9 \text{ US GPM} \times 500} \approx 20^\circ\text{F}$$

The temperature rise is 20°F, so set the differential to more than ±10°F.

Example

$$\text{Temperature Rise} = \frac{\text{Watts}}{\text{litres/hr} \times 1.16} \quad \text{Eg: } \frac{9000 \text{ Watts}}{2000 \text{ l/hr} \times 1.16} \approx 4^\circ\text{C}$$

The temperature rise is 4°C, so set the differential to more than ±2°C.



2. Heating Curve

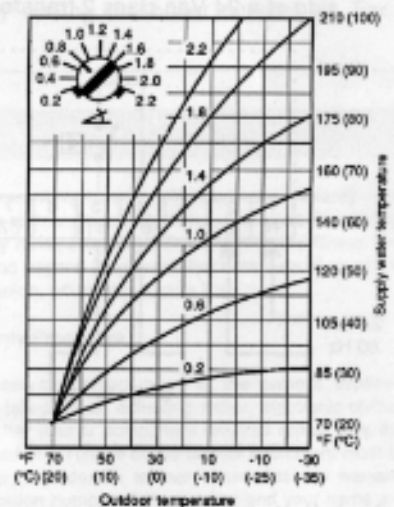
The heating curve is the ratio of increase in supply water temperature to a one degree decrease in the outdoor ambient temperature. The correct adjustment of the heating curve is defined by the following formula:

$$\text{Heating curve} = \frac{\text{design supply temp.} - \text{room temperature}}{\text{room temp.} - \text{design outdoor temperature}}$$

Example calculation

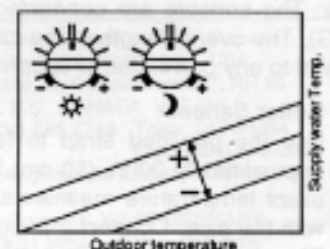
- Design outdoor temperature = -20°F (-30°C)
- Design room temperature = 70°F (20°C)
- Design supply temperature = 160°F (70°C)

$$\text{Boiler circuit heating curve} = \frac{160^\circ\text{F} - 70^\circ\text{F}}{70^\circ\text{F} - (-20^\circ\text{F})} = \frac{70^\circ\text{C} - 20^\circ\text{C}}{20^\circ\text{C} - (-30^\circ\text{C})} = 1.0$$

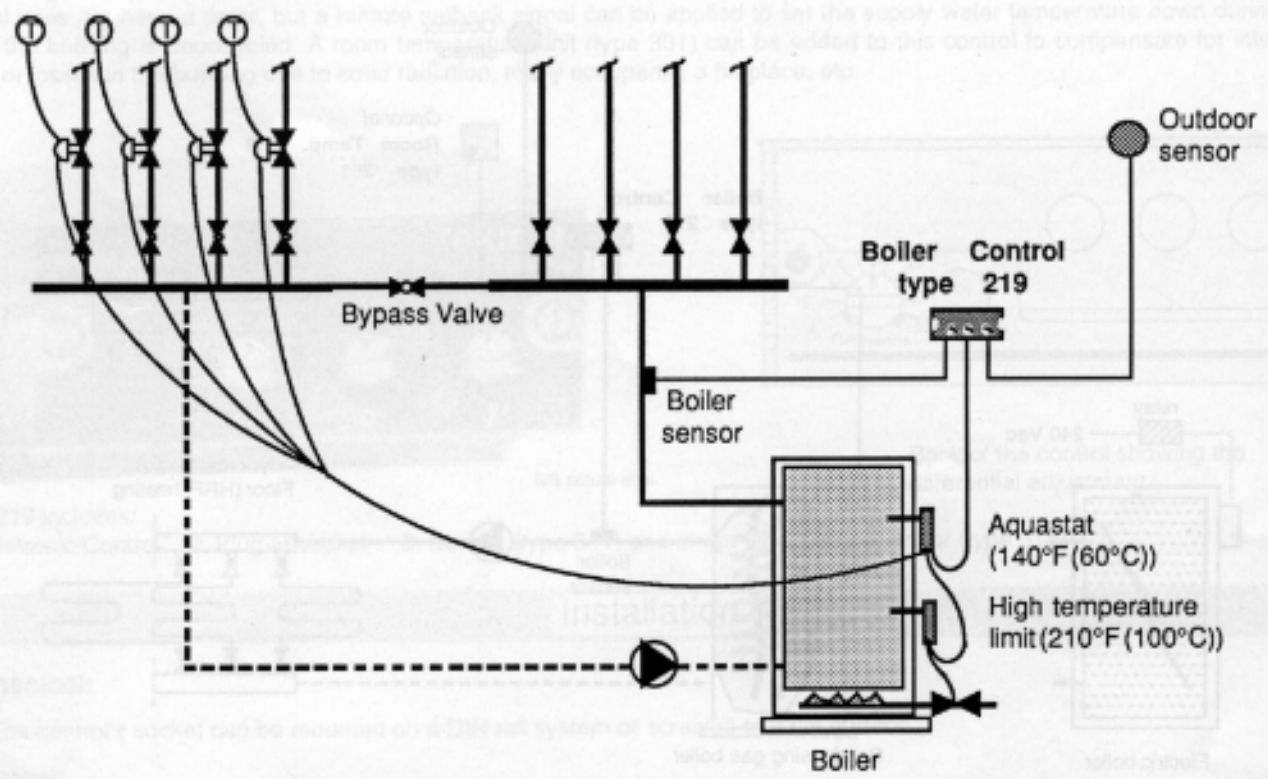


3. Normal and Setback Operation (Parallel shifts)

The ☀ knob shifts the heating curve during normal operation and the ☾ knob shifts the heating curve during setback operation. Shifting the heating curve changes the room temperature. The '||' settings correspond to the 'as designed' condition. Shorting terminals 12 & 13 will cause the control to be in the setback mode and will result in a supply water temperature 20°F (10°C) lower than normal operation. Adjusting the knobs toward '+' or '-' changes the supply water temperature by approximately 4°F (2°C) per division.

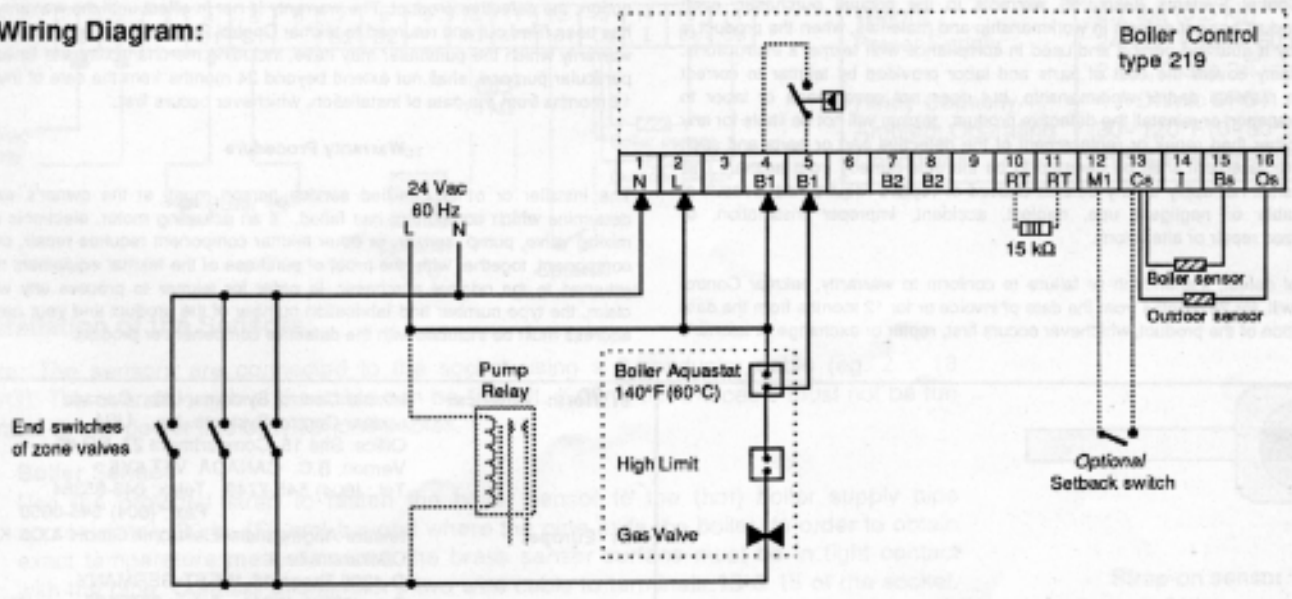


Application #1: Addition of the Boiler Control to a Conventional Heating System

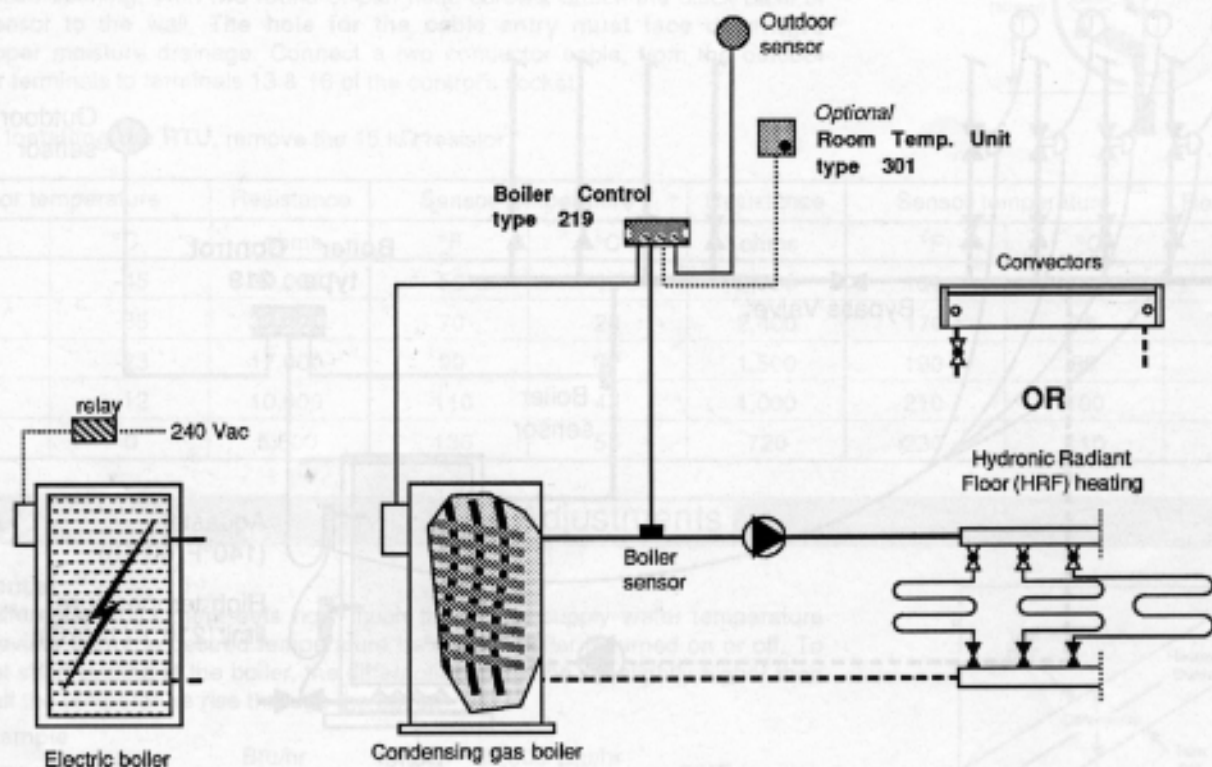


Function: During mild weather the heating system operates like any other conventional system: A thermostat causes a zone valve to open, which causes the boiler to fire. However, instead of operating the boiler at 200°F (90°C), this system will let the boiler cycle on its aquastat at 140°F (60°C) during mild weather. By keeping the boiler's operating temperature as low as possible during mild weather a significant amount of energy can be saved. (The boiler shouldn't be operated below 130°F (55°C) because condensation of the exhaust gases will occur, shortening the expected life of the boiler and chimney.) During cold weather the tekmar Boiler Control will automatically take over operation of the boiler from the aquastat and increase the boiler's operating temperature to provide what the heating system needs.

Wiring Diagram:



Application #2: The Boiler Control as a complete heating system control



Function: The Boiler Control precisely regulates the supply water temperature from the boiler as a function of the outdoor (and optionally indoor) air temperatures. The control regulates the supply water temperature by cycling the boiler on and off. For further information on the theory of operation, see brochure T01.

Limited Warranty

tekmar Control Systems (tekmar®) warrants to the original purchaser, each tekmar product against defects in workmanship and materials, when the product is installed by a qualified person and used in compliance with tekmar's instructions. This warranty covers the cost of parts and labor provided by tekmar to correct defects in material and/or workmanship, but does not cover parts or labor to remove, transport or reinstall the 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 Control Systems will, for 24 months from the date of invoice or for 12 months from the date of installation of the product, whichever occurs first, repair or exchange at tekmar's

option, the defective product. The warranty is not in effect until the warranty card has been filled out and returned to tekmar Control Systems. 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, whichever occurs first.

Warranty Procedure

The installer or other qualified service person must, at the owner's expense, determine which component has failed. If an actuating motor, electronic control, mixing valve, pump, sensor, or other tekmar component requires repair, only that component, together with the proof of purchase of the tekmar equipment must be returned to the original purchaser. In order for tekmar to process any warranty claim, the type number and fabrication number of the product and your name and address must be included with the defective component or product.

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