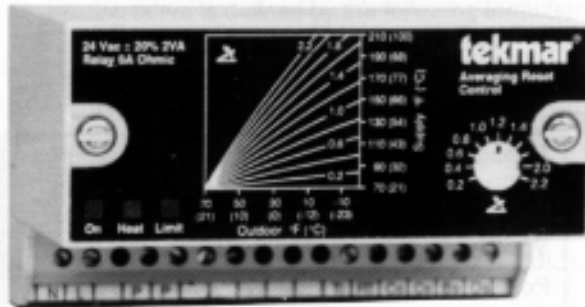
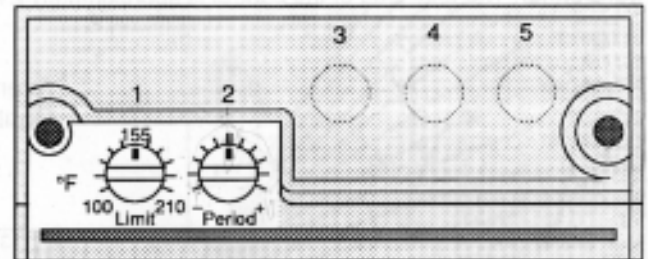


The tekmar<sup>®</sup> Averaging Reset Control regulates the supply water temperature of a small hydronic heating system as a function of the outdoor and optionally indoor temperature by operating a two way zone valve. The regulation of heat delivered is accomplished by varying the length of time the zone valve is on versus the length of time it is off (pulse width modulation). The control also includes an adjustable supply water temperature limit for protection of plastic piping in HRF systems. When the supply water temperature reaches this limit, the zone valve will close (spring return) and a high limit light will come on.



50 Actual size



**type 245 includes:**

- 1. Electronic Control
- 2. Plug-in base
- 3. Supply sensor (type 318) and strap
- 4. Outdoor sensor (type 317)

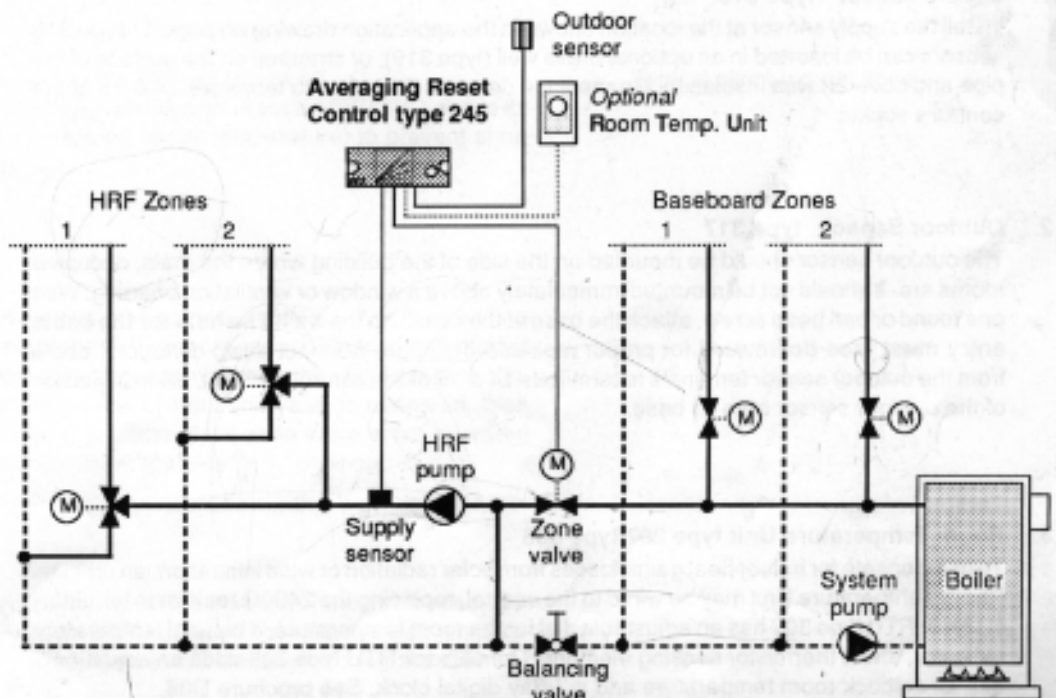
**Features:**

Type	245
Control output signal	24Vac On/Off
Plug-in system	yes
System status indicator lights	Power, heat, limit
Heating Curve (adjustable)	0.2 to 2.2
Room Temperature Unit	type 307 or 308
Cycle length (adjustable)	yes, depends on system
Supply water temperature limit (adjustable)	100 to 210°F (38 to 100°C)
Optional night setback input	yes
Maximum wire length to the sensors	500ft (150 m) 18AWG

**Application:**

**Note:**

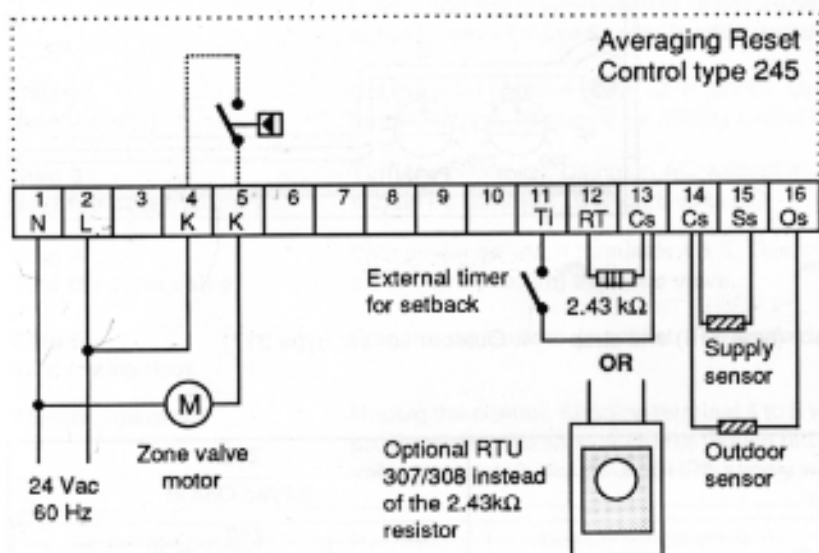
Zoning in the HRF system must be done with 3-way zone valves in order to maintain constant water circulation past the supply sensor for proper control operation.



## Installation

### Electrical:

Connection wires are terminated in a plug-in base; 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 2VA.



### Technical Data

Dimensions	Width: 4-1/4" (108 mm) Height: 2-1/2" (64 mm) Depth: 2-7/8" (73 mm)
Weight	1.1 lbs (0.5 kg)
Power Supply	24 Vac $\pm$ 30%, 60 Hz, 2 VA, Class 2 Transformer
Relay Capacity	6 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 500 ft. (150 m) but the cable must not be run parallel to any power line or telephone cables.

#### 1. Supply Sensor type 318

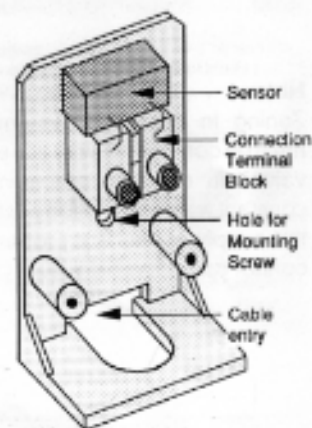
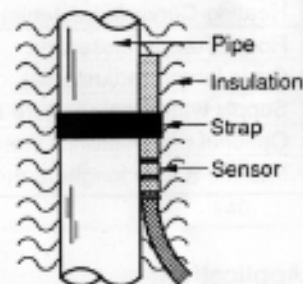
Install the supply sensor at the location shown in the application drawing on page 1. Type 318 sensors can be inserted in an optional brass well (type 319), or strapped on the surface of the pipe and covered with insulation. Connect the sensor's two wires to terminals 14 & 15 of the control's socket.

#### 2. Outdoor Sensor type 317

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 one round or pan head screw, attach the 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 14 & 16 of the control's socket. Slide the cover of the outdoor sensor onto its base.

#### 3. Room Temperature Unit type 307/type 308

To compensate for indoor heat gains/losses from solar radiation or wind infiltration, an optional Room Temperature Unit may be wired to the control, replacing the 2430Ω resistor in terminals 12 & 13. RTU type 307 has an adjustable dial for the room temperature, a bimetal temperature indicator, and a thermistor sensing element. The setback RTU type 308 adds an adjustment dial for setback room temperature and a 7-day digital clock. See brochure D06.



## Adjustments

### 1. Heating Curve (Δ)

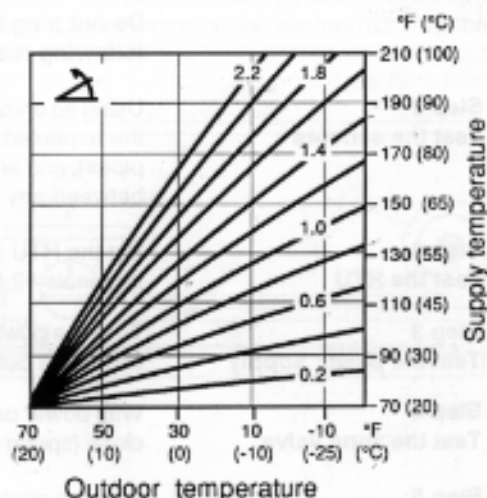
The heating curve is the ratio of increase in supply water temperature to a one degree decrease in the outdoor ambient temperature. The correct adjustment of the heating curve is defined by the following formula:

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

#### Example

- Design outdoor temperature = -20°F (-30°C)
- Design room temperature = 70°F (20°C)
- Design supply temperature = 120°F (50°C)

$$\text{Heating curve} = \frac{120^{\circ}\text{F} - 70^{\circ}\text{F}}{70^{\circ}\text{F} - (-20^{\circ}\text{F})} = 0.6 \quad \text{OR} \quad \frac{50^{\circ}\text{C} - 20^{\circ}\text{C}}{20^{\circ}\text{C} - (-30^{\circ}\text{C})} = 0.6$$



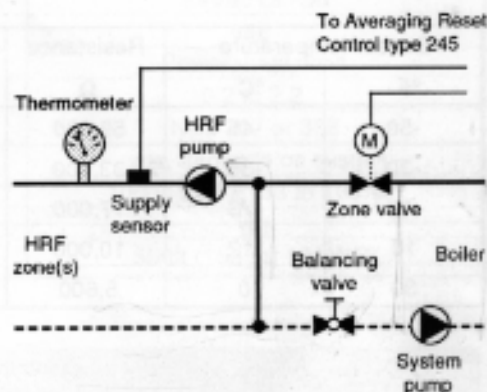
Heating curves

### 2. Supply Temperature Limit (Limit)

This adjustment limits the supply water temperature entering the HRF piping. When the supply water temperature exceeds this limit, the zone valve will close and the high limit light will come on.

#### Balancing the system:

- Turn on both pumps and the boiler.
  - Close the balancing valve.
  - Manually open the zone valve. (Don't wire the control to the zone valve motor.)
  - Set the supply water temperature limit on the back of the control to the HRF design supply water temperature. (Typically this is less than 120°F (50°C).)
  - Plug the control into its socket. The power light should turn on and the limit light must be off.
- 
- Over a 3 minute period, slowly open the balancing valve until the limit light turns on.
  - Let the system stabilize.
  - Close the balancing valve slowly until the limit light turns off.
  - Unplug the control. Set the supply temperature limit at least 10°F (6°C) above its present setting (the systems' design supply water temperature) to prevent short cycling of the zone valve on cold days.



Typical plumbing per zone

### 3. Cycle Length (Period)

The length of time the zone valve stays on and how frequently it comes on is a function of both the response time of the HRF zone(s) and the Period adjustment on the control. Normally the Period adjustment can be set in the middle of its range. If unreasonably short or frequent operation of the zone valve is observed, then increase the adjustment towards its '+' position. If the zone valve is not operated often enough then decrease the adjustment towards its '-' position.

### 4. Timer Input (TI)

The terminal Ti (11), when shorted to Cs (13), forces the control into a setback mode. If a Room Temperature Unit (RTU) type 307 is installed then the room air temperature will be lowered 10°F (5°C). If an RTU is not connected then the room air temperature is lowered 30°F (15°C).

## Testing

**Do not plug the control in the socket until the following tests have been performed. If any of the following tests fail, check the wiring to and from the socket.**

**Step 1  
Test the sensors**

Using an ohmmeter, measure the resistance between terminals 14 & 15 and 14 & 16. The table below lists the expected resistance values at various sensor temperatures. The resistance between ground (the pipes), and any of terminals 9 to 16 should be greater than 1,000,000 ohms. No voltage should be present between any of these terminals and ground.

**Step 2  
Test the RTU**

Set the RTU (if installed) to 68°F (20°C). Using an ohmmeter, the resistance of RTU type 307 between terminals 12 & 13 should be 2000Ω to 3000Ω. RTU type 308 cannot be tested with an ohmmeter.

**Step 3  
Test the power supply**

Turn the power on. Using an AC voltmeter, measure the voltage between terminals 1 & 2. The voltage should be between 16 and 28 volts AC.

**Step 4  
Test the zone valve**

With power on, short terminals 4 & 5. This should cause the zone valve to open. Removing the short will close (spring return) the zone valve.

**Step 5  
Test the control**

Plug the control into its socket. The power lamp "On" should illuminate.

**Manual operation**

Unplug the control. Shorting terminal 4 to 5 will cause the zone valve/pump connected here to open/turn on. Removing the short will close (spring return) the zone valve or turn the pump off. Adjust the balancing valve to maintain the desired HRF supply water temperature.

Sensor temperature		Resistance	Sensor temperature		Resistance	Sensor temperature		Resistance
°F	°C	Ω	°F	°C	Ω	°F	°C	Ω
-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

## 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 materials 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, 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 who in turn returns the component to tekmar after receiving a Return Goods Authorization (RGA) number from tekmar. In order to process any warranty claim, the type number and fabrication number of the product, description of the problem, and return name and address must be included with the defective component or product.

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	<p><b>In Europe:</b> tekmar Angewandte Elektronik GmbH Dückerstraße 4 D-4300 Essen 16, WEST GERMANY Tel.: (0201) 49841 Fax., (0201) 492258</p>