

tekmar® - Data Brochure

One Stage Steam Control 269



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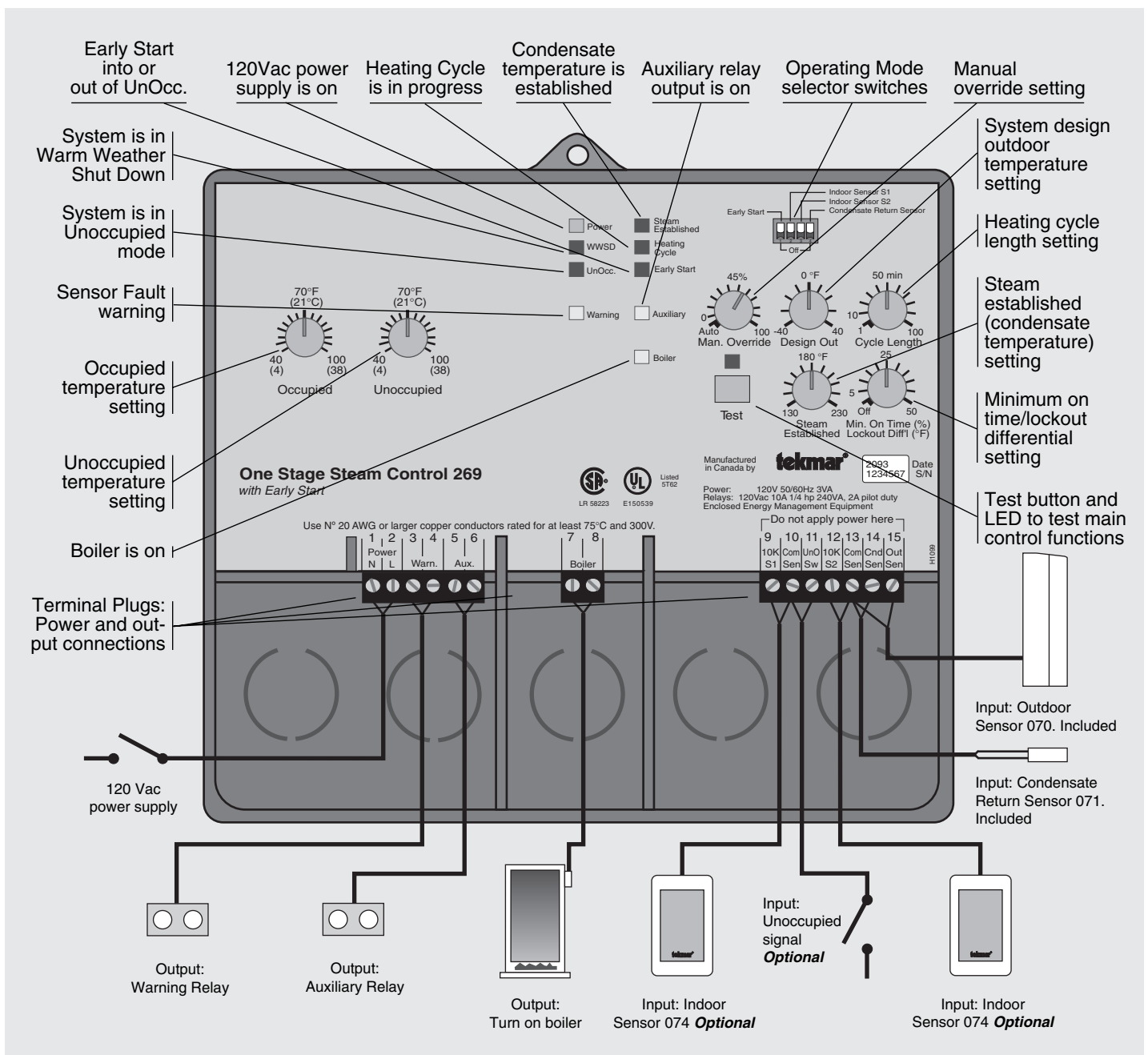
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The tekmar One Stage Steam Control 269 is a microprocessor-based control which regulates the firing time of a steam boiler based on user settings, outdoor air temperature, condensate return temperature, and optionally, the indoor air temperature(s). The steam boiler can be operated in the outdoor reset mode, or in Manual Override mode based on dial settings. The control has built-in diagnostics for sensor checking with a Warning output for error reporting. Other control operation features include Auxiliary relay output, Steam Established and Lockout Differential temperatures, and Early Start with setback limit when using the Unoccupied input.

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Outdoor Reset Strategy

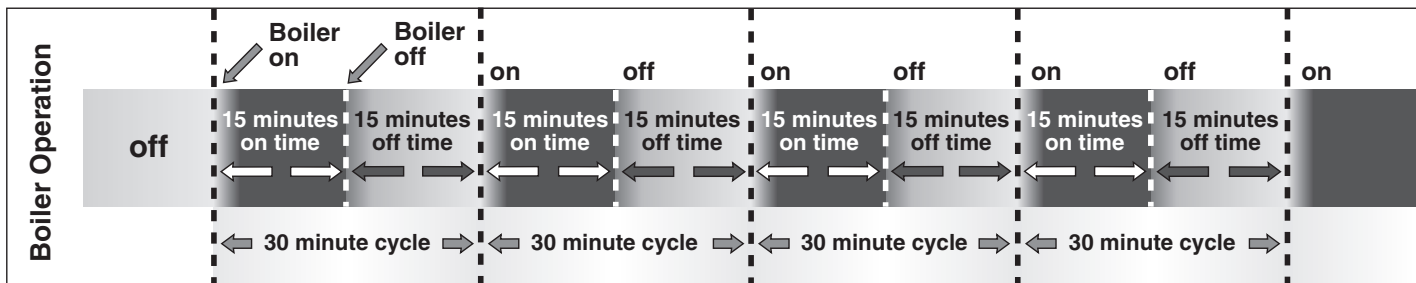


Figure 1. 50% on time with a 30 minute heating cycle

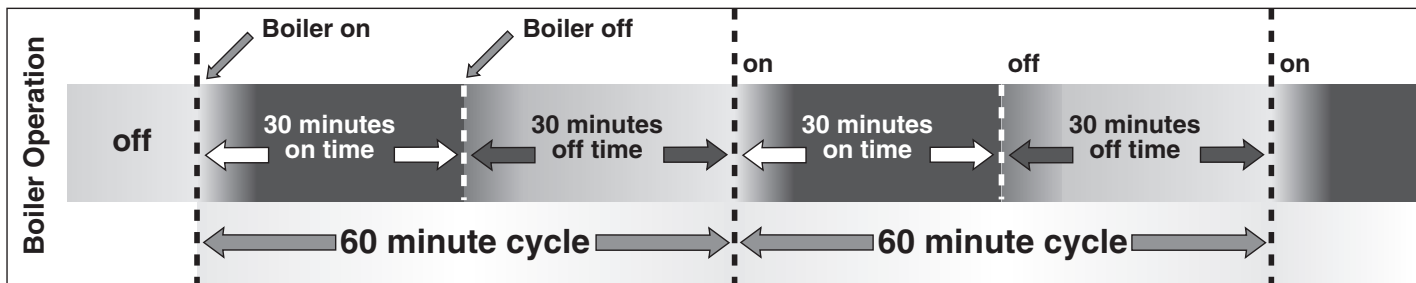


Figure 2. 50% on time with a 60 minute heating cycle

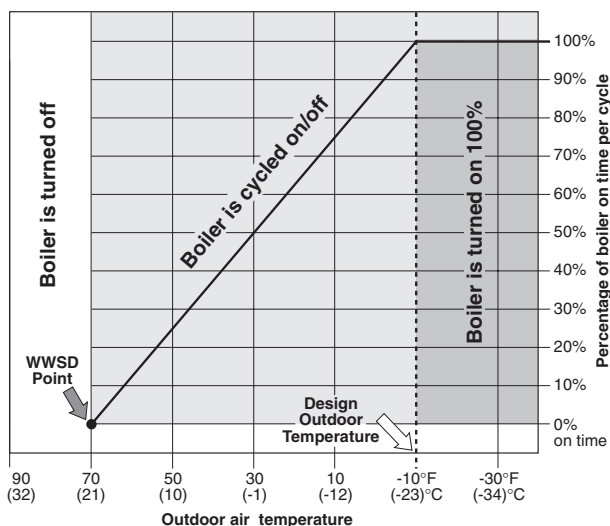


Figure 3. Outdoor Reset of boiler % on time

Most residential and small commercial steam systems can only produce heat at a fixed rate and are either **on** (100% output), or **off** (0% output). When 100% output is not required (warmer weather), the boiler must be cycled on and off in order to prevent overheating. Figures 1 and 2 illustrate the operation of two heating systems with different heating cycle times.

Cycle times are selected based on the operating characteristics of each individual heating system. Figure 1 shows a system where a 30 minute cycle is required, and Figure 2 shows a system where a 60 minute cycle is required. In both examples the heating plant output is exactly the same at 50%.

As the outdoor temperature changes, the % on time of the boiler should be changed to match the changing heat losses of the building. Figure 3 illustrates how Outdoor Reset of a steam boiler changes the % on time from 0% at the Warm Weather Shut Down point, to 100% at design outdoor conditions (coldest day of the year). Applying this chart to the system represented in Figure 1, we see that the outdoor temperature would be at 30°F with the 50% on time that is illustrated, and if the outdoor temperature warmed up to 50°F, the system would operate with a 25% on time as illustrated in Figure 4. Using outdoor temperature to reset the % on time in this manner can help minimize the overheating and wide temperature swings found in many systems that use only room temperature control.

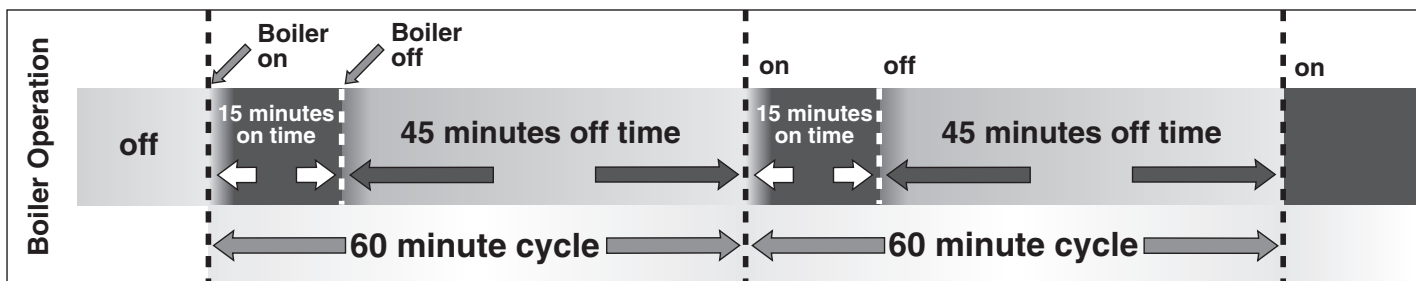


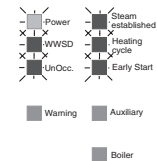
Figure 4. 25% on time with a 60 minute cycle time

Before adding this control to a steam system, it is very important that the installer examine the *complete* system and how it works. In order to properly install and setup this control, the installer must know: the optimum cycle length and minimum on time of the system, the outdoor temperature at which 100% boiler on time will be required, and the best locations to install sensors. In addition to examining the boiler operation, *all other* system components such as steam traps, air vents, radiators, piping, etc. should be examined for correct operation to ensure that the system is working at its peak efficiency. If there are existing faults that degrade the operation of the system, it is quite likely that the addition of this control could allow those faults to have an even greater effect, making it important to correct such faults or at least point them out to the end user.

Sequence of Operation

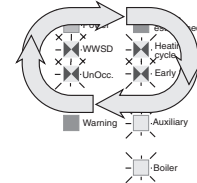
Start-up

When the One Stage Steam Control 269 is powered-up, the "Power" light and all of the red lights will come on. After 5 seconds the red lights will go out and the control will enter the operating mode. If there is a sensor error detected, the control will display an error message (see "Error Messages", page 11).



Manual Override function

If the "Man. Override" dial is turned up from the "Auto" position, the WWSD, Heating Cycle, Early Start and UnOcc. lights will cycle on and off in a clockwise, circular sequence and the control will continually operate the system at the % on time setting of the "Man. Override" dial position. In this mode, the only two dial adjustments that will have any influence on the control's operation will be the "Man. Override" and the "Cycle Length" dials, and the control will cycle the boiler on and off as illustrated in Figures 1, 2 and 4 on page 2. Outdoor or room temperatures will have no effect on the operation of the control when it is in "Man. Override" mode.



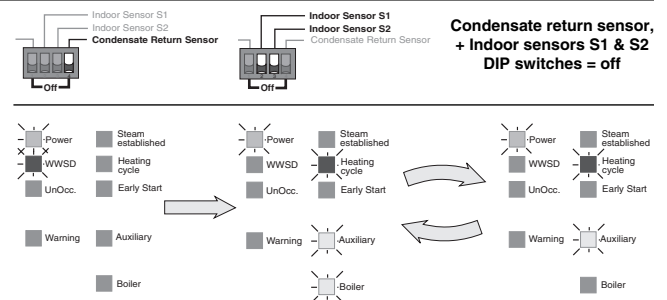
Auto (reset) function

If the "Man. Override" dial is set to the "Auto" (Outdoor Reset) operating mode, the control uses the Outdoor Sensor 070 to continually monitor the outdoor temperature. As options, a Condensate Return Sensor 071 can continually monitor the temperature of the condensate return line and one or two Indoor Sensors 074 can continually monitor the indoor air temperature. DIP switches for Condensate Return Sensor and Indoor sensors must be switched on when these sensors are connected. *An Error Message will be displayed if these switches are in the on position without sensors installed.*

While monitoring all of these temperatures, the control recognizes the following inputs and will respond as described. During operation, the lights of the control will indicate operational status as illustrated.

Outdoor Sensor 070 only

When an Outdoor Sensor 070 is connected to the control and the "Design Out" dial set to the correct setting, the control will cycle the boiler on and off based on the outdoor temperature and the settings on the "Cycle Length" and "Min. On Time (%)" dials as shown in Figure 5. *The "Min. on time (%)" dial must be set to at least the minimum time required for the boiler to produce steam and add heat to the building.* As soon as the outdoor temperature drops below the setting of the "Occupied" dial (WWSD point), the "WWSD" light will go out and the "Heating Cycle" and "Auxiliary" lights will come on. The "Boiler" light will come on and the boiler will fire for at least the time set on the "Min. On Time (%)" dial, and then shut off for the remainder of the time set on the "Cycle length" dial. This cycle will be repeated until the outdoor temperature becomes warmer than the "Occupied" dial setting, putting the control back into WWSD. Adjusting the "Occupied" dial shifts the WWSD point and heating curve up or down as shown in Figure 6, and the indoor air temperature will be affected accordingly. The "UnOccupied" dial works the same way as the "Occupied" dial when the control has been put into the UnOccupied mode, except the design outdoor temperature is also shifted down.



Indoor Sensor 074 function

When Indoor Sensor 074s are connected to this control, the control will still operate the boilers based on outdoor temperature, but will also use one 074 sensor input, or the lower reading of two 074s to prevent overheating. With these sensors, the "Occupied" and "UnOccupied" dial settings become the desired indoor air temperatures. *The control will not allow the curve to be shifted up, if windows or doors are left open.* Figure 7 shows how an Indoor Sensor will shift the heating curve and the WWSD point down to prevent overheating, especially in milder weather when a Minimum On Time may cause overheating.

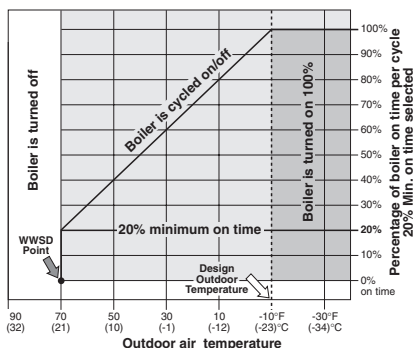
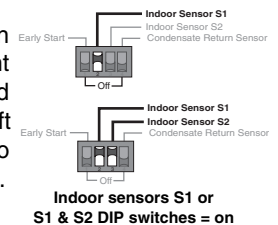


Figure 5. Outdoor Reset with a 20% Minimum On Time setting

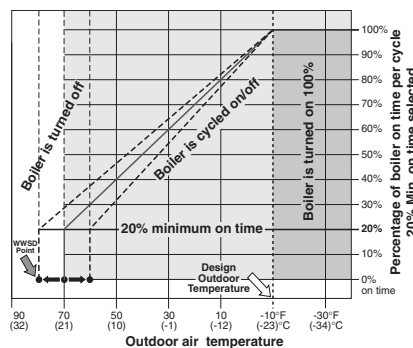


Figure 6. Shifting the heating curve with the Occupied dial

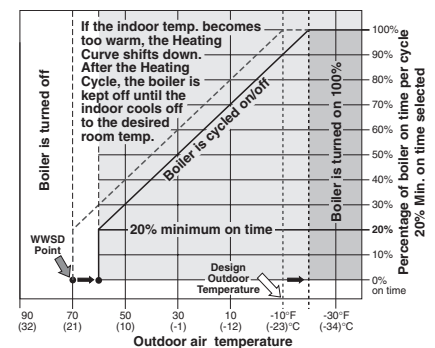


Figure 7. Temporary shift to UnOccupied mode or by Indoor Sensor 074 room temperature feedback

Condensate Return Sensor 071 function

Setting a Minimum On Time for a steam system can become problematic because a system takes more time to reach operating temperature from a cold start than when it is hot from a previous cycle. Use of the Condensate Return Sensor included with the control is highly recommended since the "Steam Established" dial can then be set to match the operating characteristics of the system. The control will turn on its "Boiler" light and fire the boiler for a warm-up period, modifying the cycle to operate as in Figure 8.



Condensate return sensor
DIP switch = on

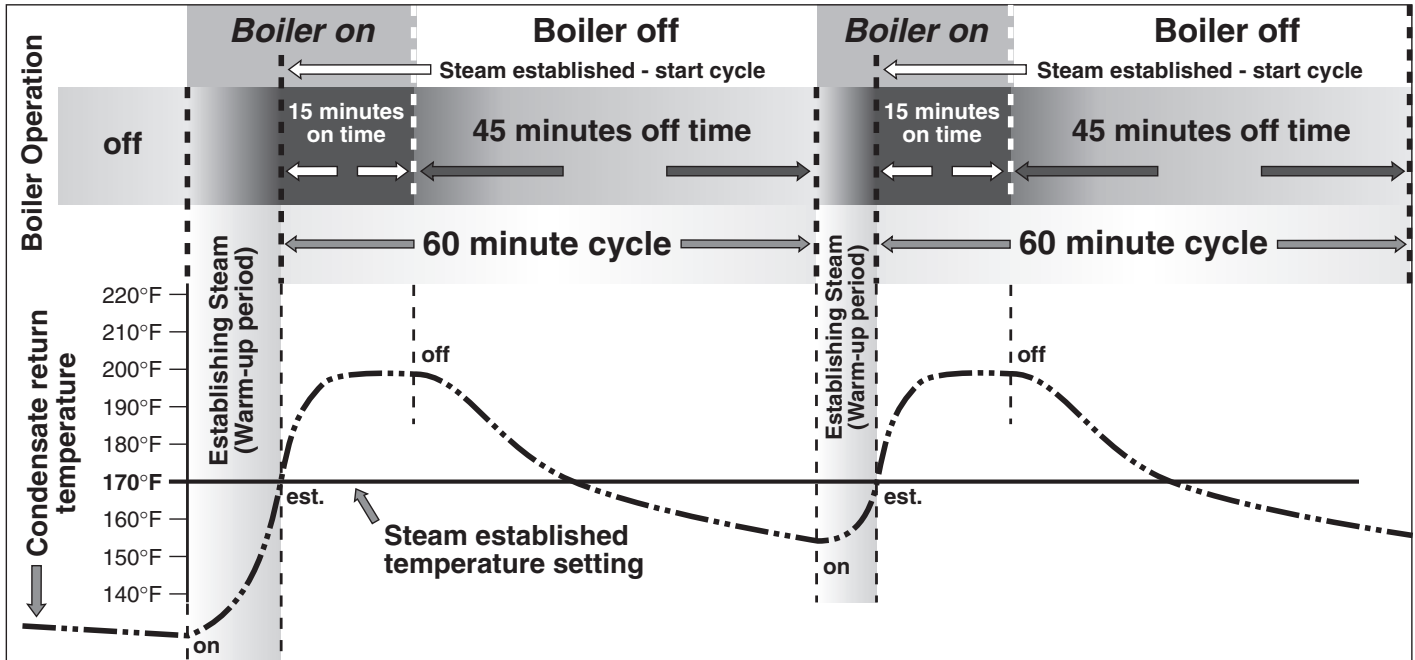
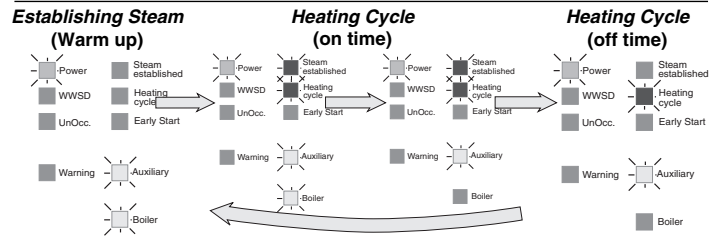


Figure 8. 25% on time with Condensate Return Sensor and "Steam Established" dial set to 170°F

The control will not start to time out the Heating Cycle until the Condensate Return Sensor reaches the temperature set on the "Steam Established" dial. When this occurs, the "Steam Established" light will come on and the control will operate the boiler until the on time of the Heating Cycle has elapsed. This function ensures that steam has been established throughout the system before the Heating Cycle is started. In a two pipe system, most installers will place the Condensate Sensor on the condensate return line of the radiator furthest from the boiler. In one pipe systems the best location is usually on the pipe just before it enters the last radiator. These locations are usually good, but in some larger systems with long runs it may be necessary to place the sensor closer to the boiler so that the first rooms in the system do not overheat. Again, it is important to ensure that the system components are all working properly, since in a properly vented and drained system, steam is established quickly throughout the system during each cycle, and sensor placement is not as critical as in some "problem" systems.

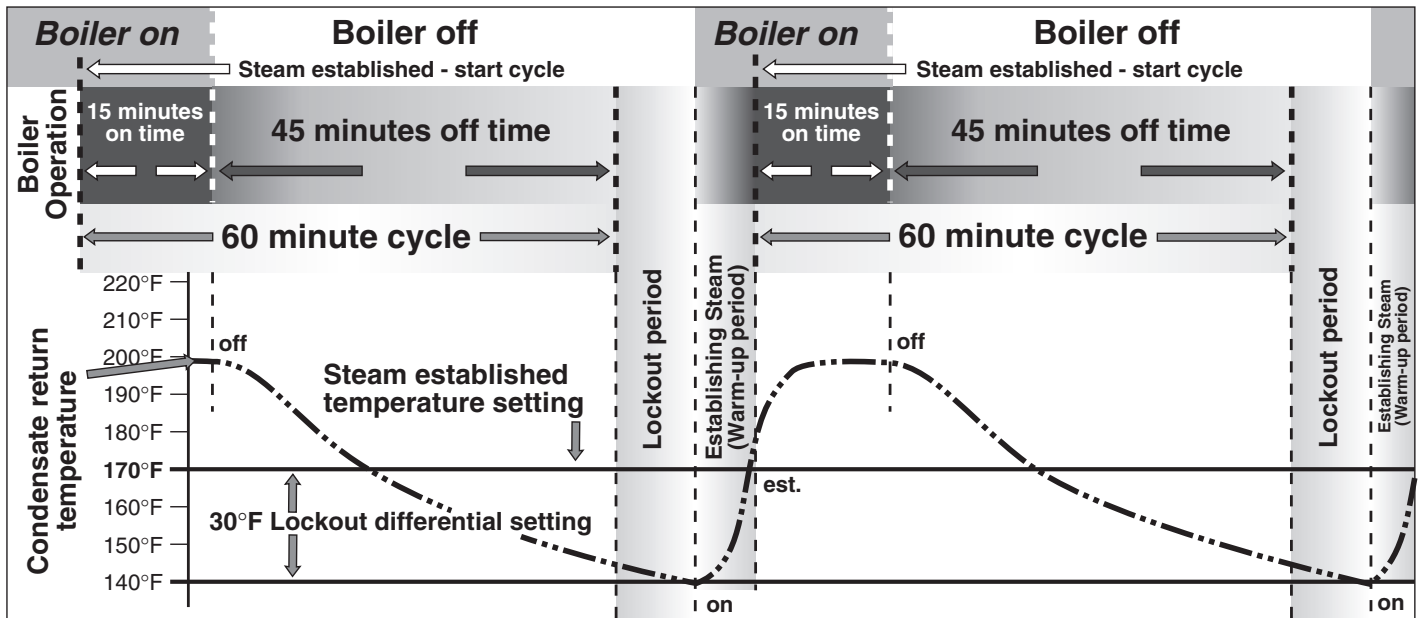
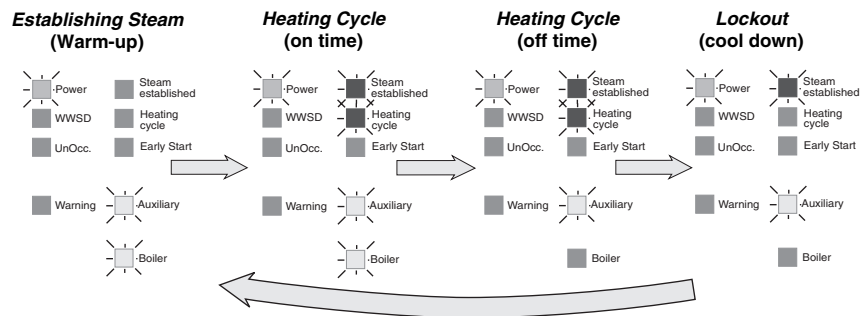


Figure 9. 25% on time with Condensate Return Sensor, "Steam Established" dial set to 170°F and "Lockout Diff'l" set to 30°F

Lockout Differential function

Many steam systems require a Lockout (cool down) period before each on cycle to ensure that any remaining steam in the system condenses and the condensate has time to return to the boiler. This increases the efficiency of the system by removing the latent heat from steam remaining after the burner shutdown, and lengthening the cycle so that the remaining heat is allowed to radiate into the building. When using a Condensate Sensor, the "Min. On Time (%)" dial becomes the "Lockout Diff'l (°F)" dial, and if the Condensate Return temperature has not dropped to the "Steam Established" temperature minus the setting of the "Lockout Diff'l (°F)" dial, the control will keep the boiler off and leave the "Steam Established" light on, modifying the cycle as illustrated in Figure 9.



Auxiliary Relay function

The control turns on the "Auxiliary" light and closes the "Aux." relay contacts whenever it is not in WWSD. This relay can be used for a variety of functions such as turning on a condensate pump or other auxiliary device(s), disconnecting power to the burner for the summer and/or signalling to remote monitoring equipment that the heating system is enabled.

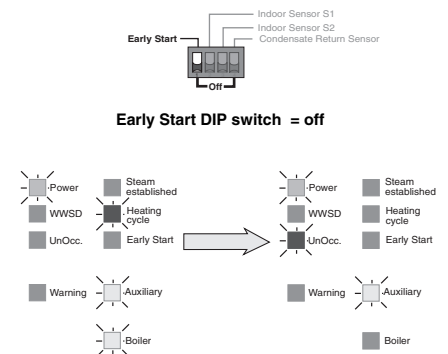
Warning Relay function

The control turns on the "Warning" light and closes the "Warn." relay contacts whenever an error message is generated due to sensor failure. This relay can be used to turn on an alarm or other auxiliary device(s) or signal to remote monitoring equipment that the control system has a fault and is in need of repair.

UnOccupied Options

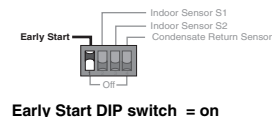
Without Early Start feature

The control turns on its "UnOcc." light and starts to go into the UnOccupied mode whenever terminals *Com Sen — UnO Sw* (10 and 11) are shorted together. When there are no Indoor Sensor 074s connected to the control, the "UnOccupied" dial setting becomes the WWSD point. When one or two Indoor Sensors are connected, the "UnOccupied" dial setting is still the WWSD point, but the Heating Curve and WWSD point can be shifted down by the room temperature feedback in order to prevent overheating. See *Indoor Sensor 074 function*, and *Figures 6 and 7, page 3*. **Note: When the outdoor temperature gets close enough to the design outdoor temperature (approximately 85% on time), the control is prevented from going into the UnOccupied mode in order to avoid long pick-up times. If the control is already in the UnOccupied mode and the outdoor temperature drops below the setback limit, it will switch back into the Occupied mode.**



With Early Start feature

When the "Early Start" DIP switch is in the up position, the control must receive an UnOccupied signal 4 hours before the building is to be in UnOccupied mode and the UnOccupied signal must be removed 4 hours before the building is to be back up to the Occupied temperature.



Going into Unoccupied

After receiving the Unoccupied signal, the control will calculate when to turn on its "Early Start" light based on the Cycle Length setting. During the Early Start period, the boiler will be kept off so that the room temperature will begin to fall by the time the Unoccupied period begins. At the beginning of the Unoccupied period, the "UnOcc." light will turn on and the "Early Start" light will turn off. The "UnOccupied" dial setting becomes the new WWSD point. When one or two Indoor Sensors are connected, the "UnOccupied" dial setting is still the WWSD point, but the Heating Curve and WWSD point can be shifted down by the room temperature feedback to prevent overheating. See *Indoor Sensor 074 function*, and *Figures 6 and 7, page 3*. When the outdoor temperature is above the UnOccupied dial setting, the control will go into WWSD when put into the UnOccupied mode, and the WWSD light will come on.

Going out of Unoccupied

When the UnOccupied signal is removed from terminals *Com Sen — UnO Sw* (10 and 11), the control will calculate when to start bringing the building out of setback based on the outdoor temperature and the amount and duration of the setback. At the time the control has calculated for the "Early Start" period to begin, it will turn on its "Early Start" light and operate the boiler for an increased % on time in order to have the building up to temperature at the start of the Occupied period. Four hours after the UnOccupied signal has been removed, the control will turn off the "Early Start" and "UnOcc." lights and resume a normal % on time based on the outdoor temperature. See Figure 10 on page 6. If one or two Indoor Sensor 074s are connected to the control, and the indoor temperature is above the "Occupied" dial setting, the boiler will not be turned on for an Early Start period as Early Start will not be needed. In colder weather the boiler may run almost continually during the Early Start period in order to recover the building temperature.

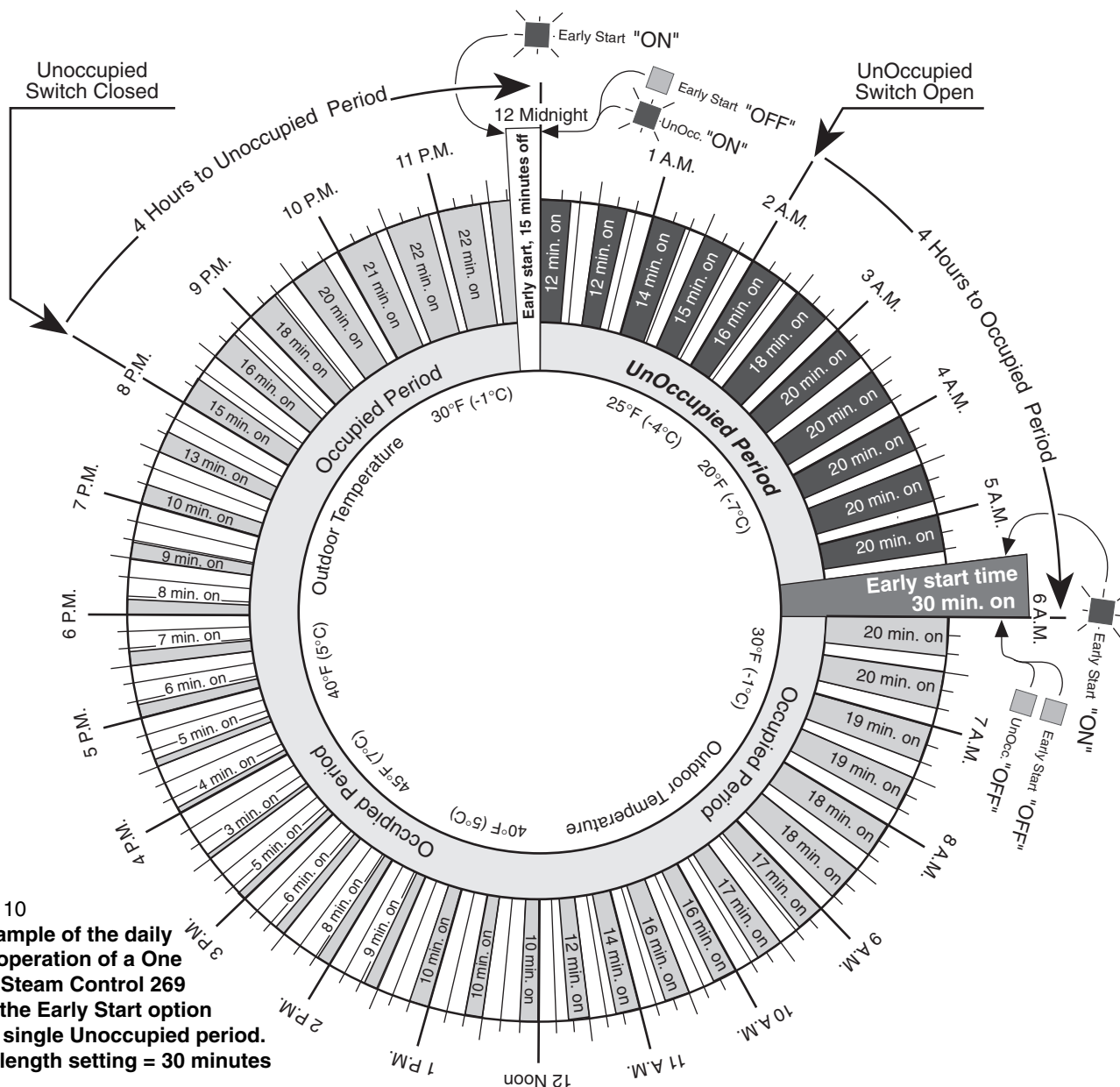


Figure 10
An example of the daily cycle operation of a One Stage Steam Control 269 using the Early Start option with a single Unoccupied period. Cycle length setting = 30 minutes

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 269 includes:

- One Control 269 • One Outdoor Sensor 070 • One Condensate Return Sensor 071
- One Data Brochure D 269 • One Data Brochure D 001 • Application Brochures A 269-1 & 2

Other information available: • Essay E 001

Read Application Brochure A 269-1 and A 269-2 and select the correct Application for your job.

Note:

Carefully read the details of the Application, and the Sequence of Operation sections in all applicable brochures to ensure that you have chosen the proper control, and you understand its functions within the operational requirements of your system.

Step Two ■ Mounting the base ■

The control should be removed from its base by pressing down on the release clip in the wiring chamber and sliding upwards on the control. The base is then mounted in accordance with the instructions in the Data Brochure D 001.

Step Three **Rough-in Wiring**

All electrical wiring terminates in the control base wiring chamber. It has standard 7/8" (22mm) knockouts that will accept common wiring hardware and conduit fittings. Before breaking out the knock-outs, check the wiring diagram and select those sections of the chamber with common voltages, since the safety dividers will later prevent wiring from crossing between sections. Use N° 20 AWG to N° 14 AWG copper wire rated for at least 60°C and 300 volts.

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

- Install the Outdoor Sensor 070, Condensate Return Sensor 071, according to the instructions in the Data Brochure D 001 and run the wiring back to the control.

Option: Indoor Sensor(s) 074, can also be connected. See individual sensor instructions.

- Install the wiring from the other system components (Boiler, Warning device, Auxiliary device) to the base.

Step Four **Electrical connection to the control**

Power and output connections

The installer should test to confirm that no voltage is present at any of the wires.

- Install the control into the base, sliding it down until it snaps into place.
- All electrical connections are made directly to the plug terminals.
- Connect the 120 Vac power supply to terminals *N* — *L* (1 and 2).

1	2	3	4	5	6
Power					
N	L	Warn.		Aux.	

Warning relay connection

Connect the Warning device to terminals *Warn* (3 and 4). These terminals lead to a dry relay contact which closes when the control detects a sensor fault.

1	2	3	4	5	6
Power					
N	L	Warn.		Aux.	

Auxiliary relay connection

Connect the Auxiliary device to terminals *Aux.* (5 and 6). These terminals lead to a dry relay contact which closes when the control is operating in manual mode, is not in WWSD, or the Outdoor Sensor is short or open circuited.

1	2	3	4	5	6
Power					
N	L	Warn.		Aux.	

Boiler connection

If the boiler has a 120 Vac control circuit, make sure the safety divider is installed in the space between the boiler terminals and sensor terminals;

Connect the boiler circuit to terminals *Boiler* (7 and 8). These terminals lead to a dry relay contact which closes when the control requires boiler operation.

7	8
Boiler	

Sensor and unpowered input connections

Power should never be applied to these terminals. Damage to the control will result.

Outdoor Sensor connection

Connect the two wires from the Outdoor Sensor 070 to *Com Sen* — *Out Sen* (13 and 15).

9	10	11	12	13	14	15
10K S1	Com Sen	UnO Sw	10K S2	Com Sen	Cnd Sen	Out Sen

Condensate Return Sensor connection

Connect the wires from the Condensate Return Sensor (071) to terminals *Com Sen* — *Cnd Sen* (13 and 14).

9	10	11	12	13	14	15
10K S1	Com Sen	UnO Sw	10K S2	Com Sen	Cnd Sen	Out Sen

Option: Occupied/Unoccupied switch input

Connect the two wires from the Occupied/Unoccupied dry contact switch (eg. tekmar 030 Timer) to terminals *Com Sen* — *UnO Sw* (10 and 11).

9	10	11	12	13	14	15
10K S1	Com Sen	UnO Sw	10K S2	Com Sen	Cnd Sen	Out Sen

Option: Indoor temperature feedback Sensor Room 1

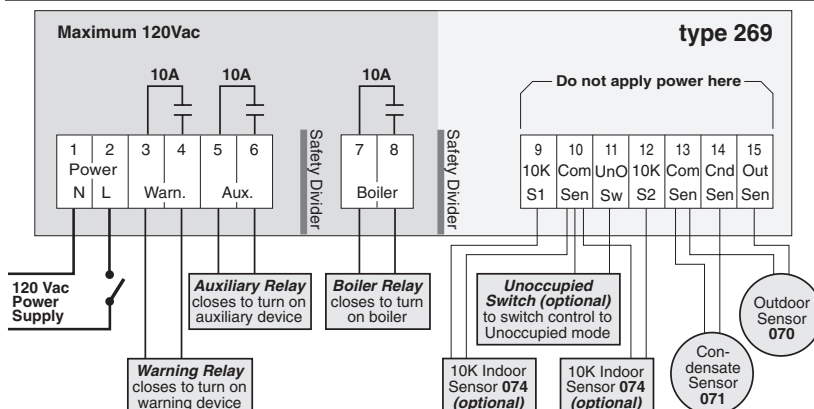
Connect the two wires from an Indoor Room Sensor 074 to terminals *10K S1* — *Com Sen* (9 and 10).

9	10	11	12	13	14	15
10K S1	Com Sen	UnO Sw	10K S2	Com Sen	Cnd Sen	Out Sen

Option: Indoor temperature feedback Sensor Room 2

Connect the two wires from an Indoor Sensor 074 to terminals *10K S2* — *Com Sen* (12 and 13).

9	10	11	12	13	14	15
10K S1	Com Sen	UnO Sw	10K S2	Com Sen	Cnd Sen	Out Sen



Electrical connections to the terminal plugs of the 269 control. The control's relays are shown in their "power down" condition.

Note: This is not a wiring diagram. For a detailed wiring schematic of your specific application, refer to the Application Brochure A 269.

Step Five ■ Testing 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.
- Before applying power to the control for testing, each terminal plug must be unplugged from its header on the control. Pull straight down to unplug.
- A good quality electrical test meter, capable of reading from at least 0 — 200 Volts AC, and at least 0 — 1,000,000 Ohms, is essential to properly test this control during installation.

Test the Sensors

- These tests must be made *before* turning on the power supply, and with the terminals unplugged.
- The sensors are to be tested according to the instructions in Brochure D 001.

Test the Power supply

Make sure exposed wiring or bare terminals are not in contact with any other wires or grounded surfaces. Turn on the power to the control and use an AC voltmeter to measure the voltage between terminals *N—L* (1 and 2). Between 105 and 125 Volts AC should be measured at these terminals.

Test the Warning device

If a Warning device is connected to the *Warn.* (3 and 4) terminals; make sure power to the circuit is off and install a jumper in the terminal plug between terminals 3 and 4. When the Warning device circuit is powered-up, the Warning device should operate. If it does not come on, check the circuit wiring for errors and ensure that it is powered up and the voltage is correct. If the Warning device operates properly when the circuit is powered up, disconnect the power, remove the jumper and proceed to the next step.

Test the Auxiliary device

If an Auxiliary device is connected to the *Aux.* (5 and 6) terminals; make sure power to the circuit is off and install a jumper in the terminal plug between terminals 5 and 6. When the Auxiliary device circuit is powered-up, the Auxiliary device should operate. If it does not come on, check the circuit wiring for errors and ensure that it is powered up and the voltage is correct. If the Auxiliary device operates properly when the circuit is powered up, disconnect the power, remove the jumper and proceed to the next step.

Test the Boiler

Make sure power to the Boiler circuit is off and install a jumper in the terminal plug between the *Boiler* (7 and 8) terminals. When the Boiler circuit is powered-up, the Boiler should operate. If it does not come on, check the circuit wiring for errors and ensure that it is powered up and the voltage is correct. Check the devices in the circuit (limits, low water cut off, etc.) for faults. If the Boiler operates properly when the circuit is powered up, disconnect the power, remove the jumper and proceed to the next step.

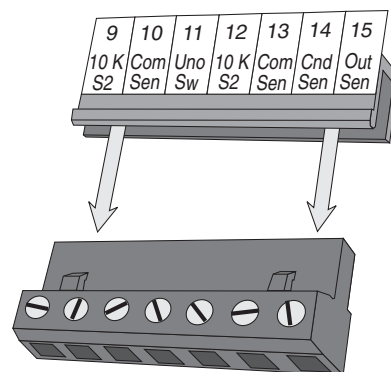
Connect the control

Turn the power off and make sure all test jumpers have been removed from the plugs.

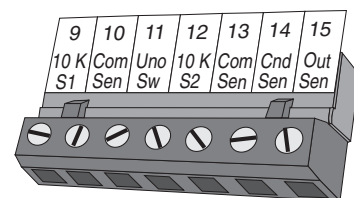
Connect the plugs to the control by carefully aligning them with their respective headers and pushing them upwards into the headers. The plugs should snap firmly into place. The control is now ready for setup and operation.

Caution

The tekmar One Stage Steam Control 269 is an operating control and is not certified or intended for use as a safety device. Under no circumstances should safety limit devices be left disconnected after installation of this control. The installer shall check all applicable code requirements and obtain necessary inspections to ensure that the installation is in compliance with those requirements.



Terminal plug disconnected from its header on the control



Terminal plug pushed into its header on the control

Settings

Step Six ■ Essential control settings

For specific application details refer to Application Brochure A 269-1 or A 269-2.

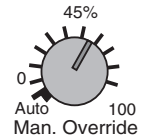
Cycle Length dial

This dial is used to set the length of the Heating Cycle from 1 to 100 minutes. The installer must have knowledge of the system operating characteristics in order to determine the optimum Cycle Length. If the Heating Cycle is too short, the system may not come up to operating pressure or temperature before it is shut down, causing inefficient operation of the boiler and uneven heating through the system since the furthest radiators from the boiler may not get hot enough. Too long of a Cycle Length will lead to wider air temperature swings in the building, creating discomfort for the occupants. In most systems, trial and error is the only way that the correct Cycle Length can be determined, and the installer must be willing to manually operate the system through a number of cycles before this setting can be finalized. A cycle time of between 30 and 60 minutes should be used as a trial setting (*settings below 10 minutes are for testing purposes only*).



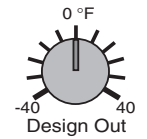
Man. Override dial

When testing the operation of the control or setting up the system, the "Man. Override" dial can be set to a fixed % On Time. When this dial is turned up from the *Auto* position, the only other dial setting that has any effect on the control operation will be the "Cycle Length" dial. Reset operation will resume when the dial is turned all the way back down to the *Auto* position.



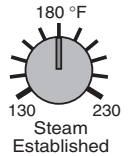
Design Out dial

This dial is to be set to the design outdoor temperature of the heating system. A heating system should have originally been designed and sized to meet the heating requirements of the building on all but the very coldest of days. Unfortunately, in many older systems the calculations used to come up with a design outdoor temperature (if any were actually done) were based on either sheer fantasy or on mathematical principles long since lost to science. Once again, the installer may have to use trial and error to find this number. If the building starts to become cold as the outdoor temperature gets colder, the dial should be turned up, and if it becomes too hot as the outdoor temperature gets colder, the dial should be turned down.



Steam Established dial

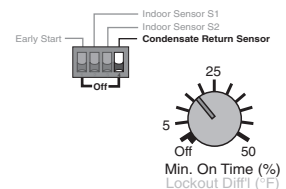
When a Condensate Return Sensor is installed, the control monitors the sensor temperature and will keep the Heating Cycle from starting until the sensor temperature rises to the temperature of the "Steam Established" dial. To set this dial, turn off power to the 269 and allow the boiler to cool off if it has been running. Set the "Steam Established" dial up to 230°F and power the control back up. The control will operate the boiler, making the system temperature rise as it tries to establish steam. Monitor the temperature of the Condensate Return Sensor (for sensor placement see *Condensate Return Sensor Function*, page 4), until the system has come up to operating temperature. Reduce the setting on the "Steam Established" dial until the "Steam Established" light comes on. If the Steam Established dial is set too low, system efficiency will suffer and uneven heating will result as the boiler shuts down before heat reaches all of the radiators. If the dial is set too high, the building will overheat during the milder weather unless an Indoor Sensor 074 is connected.



Min. On Time (%) — Lockout Diff'l (°F) dial

Without Condensate Return Sensor, this dial = Min. On Time (%)

When there is no Condensate Sensor installed to the control, this dial sets the minimum on time for the boiler each heating cycle. The "Condensate Return Sensor" DIP switch must be in the off position or an error message will occur. To set this dial, allow the boiler to cool off if it has been running, and set the control on Manual Override with the maximum % On Time and maximum Cycle Length. Locate the radiator that is the last one in the system to heat up and monitor its temperature while you allow the boiler to fire. Time how long it takes for the radiator to get up to operating temperature and use that time as the Minimum On Time trial setting. Set the "Man. Override" dial back to *Auto* and the "Cycle Length" dial back to its proper setting. If the Minimum On Time is set for too short a time, system efficiency will suffer and uneven heating will result as the boiler shuts down before heat reaches all of the radiators. If the dial is set too for too long, the building will overheat during the milder weather unless an Indoor Sensor 074 is connected.

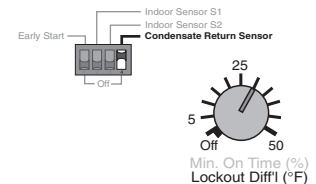


To calculate Min. on time %
If: cycle = 30 minutes
Min on time = 5 minutes

$$\frac{5}{30} \times 100 = 17\% \text{ Min. on time}$$

With Condensate Return Sensor, this dial = Lockout Diff'l (°F)

When there is a Condensate Return Sensor installed to the control, the control monitors the sensor temperature and will prevent the Establishing Steam (warm-up) period from starting until the temperature drops to the "Steam Established" dial setting temperature minus the "Lockout Diff'l" dial setting temperature. To set this dial, turn it all the way up to 50°F during a cycle on time and wait until the boiler shuts down. Monitor the temperature of the Condensate Return Sensor (for sensor placement see *Condensate Return Sensor Function*, page 4), and when the system cools down to the point where the useful heat has been extracted, turn the dial down until the "Steam Established" light turns off. If this setting is too low, the system will lose efficiency by not extracting all of the heat from each cycle, and if it is too high, there will be temperature swings and uneven heating in the building as the system is kept off for too long.



To calculate Lockout Diff'l (°F)
If: Steam Established dial = 170°F
System cool down temp. = 140°F
170 – 140 = 30°F Lockout Diff'l

Testing the Control Functions

Indicator lights

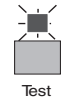
There are ten LEDs on the front of the control that will aid in testing and troubleshooting. During normal operation, these lights indicate the following functions:

- | | |
|-----------------------------|---|
| <i>Power light on</i> | • the 120 Vac power supply has been connected and the control is energized. |
| <i>WWSD light on</i> | • the control has calculated that the outdoor temperature is warm enough to not require heat. |
| <i>Unoccupied light on</i> | • the control is in the Unoccupied (setback) mode. |
| <i>Steam Established</i> | • the condensate temperature is hotter than the setting of the Steam Established dial. |
| <i>Heating Cycle</i> | • the system is operating in a normal Heating Cycle. |
| <i>Early Start light on</i> | • the control is in transition into or out of the Unoccupied (setback) mode. |
| <i>Boiler light on</i> | • the Boiler relay is on, closing the contacts between the <i>Boiler</i> (7 and 8) terminals. |
| <i>Warning</i> | • the Warning relay is on, closing the contacts between the <i>Warn.</i> (3 and 4) terminals. |
| <i>Auxiliary light on</i> | • the Auxiliary relay is on, closing the contacts between <i>Aux.</i> (5 and 6) terminals. |
| <i>Test light on</i> | • the control is going through the Test routine. |

Step Seven Operational test of control functions - Test button

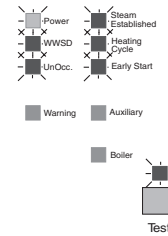
Test Button

The One Stage Steam Control 269 has a Test button which can be used to test all of the main control functions at any time. When the Test button is pushed the control automatically runs through the following test procedure.



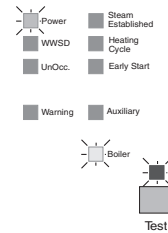
All red lights on

On power-up, and at the start of each test routine, all of the red status lights are switched on for approximately 5 seconds. During this time the control searches for sensor faults and, if no faults are found, proceeds to the next step. If a sensor fault exists, the control exits the test routine and indicates the fault by flashing a combination of lights. These Error Messages are listed on page 11.



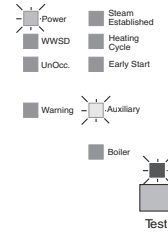
Power light on — Boiler light on

The control turns on the Boiler relay for 10 seconds and proceeds to the next step or; if during the 10 seconds the Test button is pressed, the test routine will be halted, the "Test" light will flash, and the control will be held in a pause mode for 5 minutes. After the 5 minutes, the control will automatically exit the test routine and return to normal operating mode. Pushing the Test button during the 5 minute pause will allow the control to proceed to the next step of the test routine.



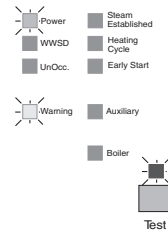
Power Light on — Auxiliary light on

The control turns on the Auxiliary relay for 10 seconds and proceeds to the next step or; if during the 10 seconds the Test button is pressed, the test routine will be halted, the "Test" light will flash, and the control will be held in a pause mode for 5 minutes. After the 5 minutes, the control will automatically exit the test routine and return to normal operating mode. Pushing the Test button during the 5 minute pause will allow the control to proceed to the next step of the test routine.



Power Light on — Warning light on

The control turns on the Warning relay for 10 seconds and proceeds to normal operation mode, or if during the 10 seconds the Test button is pressed, the test routine will be halted, the "Test" light will flash, and the control will be held in a pause mode for 5 minutes. After the 5 minutes, the control will automatically exit the test routine and return to normal operating mode. Pushing the Test button during the 5 minute pause will allow the control to proceed to the normal operation mode.



Power Light on — Test light off

The control has exited the test routine, entered operating mode and will function according to the sequence of operation described on pages 2 to 6. *One or more of the indicator lights may be on.* Refer to pages 3 to 5 for a description of the possible indicator light combinations under operating conditions.

Step Eight Troubleshooting

As in any troubleshooting procedure, it is important to isolate a problem as much as possible before proceeding. The Error Messages and Test button greatly simplify troubleshooting of the One Stage Steam Control 269.

If a fault occurs during operating mode or during the test routine and the control is flashing an Error Message, identify the fault from the look-up table on the next page and then follow standard testing procedures to confirm the problem.

If you suspect a wiring fault, return to steps four and five and carefully check all external wiring and wiring connections.

During normal operation, if the Outdoor Sensor develops either a short circuit or an open circuit, the control will cycle the boiler 50% on at a rate determined by the Cycle Length dial. Also, the Warning relay will turn on to indicate there is a fault and the appropriate error lights will be flashing.

During normal operation, if one Indoor Sensor develops either a short circuit or an open circuit when two Indoor Sensors are used, the control will use the operational Indoor Sensor reading. If one Indoor Sensor is installed, and it develops either a short circuit or an open circuit, the control will default to the Occ./UnOcc dial setting. The Warning relay will turn on to indicate there is a fault and the appropriate error lights will be flashing.

If a Condensate Return Sensor has been installed, and the sensor has become either short circuited or open circuit, the control will not operate with any Steam Established /lockout functions. The control will default to the "Min. On Time (%)" dial setting. The warning relay will turn on to indicate there is a fault and the appropriate error lights will be flashing.

After any repair has been completed, press the Test button to allow the control to cycle through the test routine. This will allow you to confirm that correct operation has been restored.

Step Nine Before you leave

Install the wiring cover over the wiring chamber and secure it to the base with the two screws provided. Place the front cover on the control to cover the setting dials and snap it into place. Install a lock if security is required.

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 and maintenance of this control and of the system to the end user and anyone else who may be operating the system.
























Error Messages

Whenever a fault is detected in any of the sensors, the indicator lights will flash in specific ways to indicate the problem and the Warning relay will close to signal to the user that a fault has occurred.

The following look-up table describes each error condition and shows the flashing light sequence that results.

After repairing the problem, press the Test button to cycle the control through the test routine. This will confirm that the fault has been repaired and that correct control action has been restored.

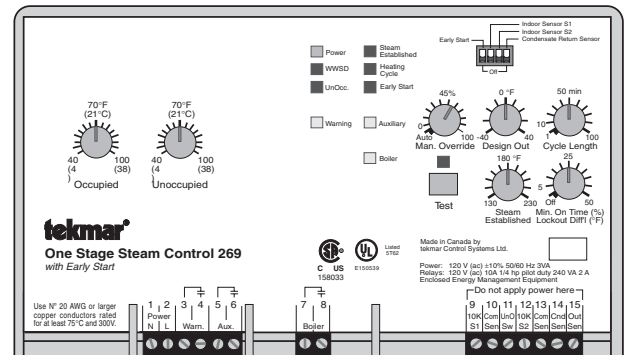
For detailed sensor testing instructions see Data Brochure D 001.

 Light on continually  Light flashing  Light off	Indoor Sensor S1 open circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test	Indoor Sensor S1 short circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test
Indoor Sensor S2 open circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test	Indoor Sensor S2 short circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test	Outdoor Sensor open circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test
Outdoor Sensor short circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test	Condensate Return open circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test	Condensate Return short circuit (see trouble-shooting notes)  Power  Steam Established  WWSD  Heating Cycle  UnOcc.  Early Start  Warning  Auxiliary  Boiler  Test

Technical Data

One Stage Steam Control 269

Literature	—	D 269, A 269's, D 001, D 070.
Control	—	Microprocessor control; This is not a safety (limit) control .
Packaged weight	—	3.1 lb. (1400 g), Enclosure A, blue PVC plastic
Dimensions	—	6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
Approvals	—	CSA C US, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	—	Indoor use only, 30 to 120°F (0 to 50°C), < 95% RH non-condensing.
Power supply	—	120 V (ac) ±10% 50/60 Hz 3 VA
Relay capacity	—	120 V (ac) 10 A 1/4 hp, pilot duty 240 VA 2 A
Sensors included	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892 Outdoor Sensor 070 and Universal Sensor 071.
Optional devices	—	tekmar type #: 031, 071, 076, 077.
<i>Occupied</i>	—	40 to 100°F (4 to 38°C)
<i>Unoccupied</i>	—	40 to 100°F (4 to 38°C)
<i>Manual Override</i>	—	Auto, 0 to 100% of boiler on time during Heating Cycle
<i>Design Out</i>	—	-40 to 40°F (-40 to 4°C)
<i>Cycle Length</i>	—	1 to 100 minutes
<i>Steam Established</i>	—	130 to 230°F (54 to 110°C)
<i>Min. On Time (%)</i>	—	Off, 5 to 50% on
<i>Lockout Diff'l (°F)</i>	—	Off, 1 to 50°F (Off, 3 to 28°C)



The installer must ensure that this control and its wiring are isolated and/or shielded from strong sources of electromagnetic noise. Conversely, this Class B digital apparatus complies with Part 15 of the FCC Rules and meets all requirements of the Canadian Interference-Causing Equipment Regulations. However, if this control does cause harmful interference to radio or television reception, which is determined by turning the control off and on, the user is encouraged to try to correct the interference by reorienting or relocating the receiving antenna, relocating the receiver with respect to this control, and/or connecting the control to a different circuit from that to which the receiver is connected.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Caution The nonmetallic enclosure does not provide grounding between conduit connections. Use grounding type bushings and jumper wires.

Attention Un boîtier nonmétallique n'assure pas la continuité électrique des conduits. Utiliser des manchons ou des fils de accord spécialement conçus pour la mise à la terre.

Limited Warranty and Product Return Procedure

Limited Warranty The liability of tekmar Control Systems Ltd. and tekmar Control Systems, Inc. ("tekmar") under this warranty is limited. The purchaser, by taking receipt of the tekmar product ("product"), acknowledges receipt of the terms of the warranty and acknowledges that it has read and understands same.

tekmar warrants each tekmar product against defects in workmanship and materials, if the product is installed and used in compliance with tekmar's instructions. The warranty period is for a period of twenty-four (24) months from the production date if the product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

The liability of tekmar under this warranty shall be limited to, at tekmar's sole discretion: the cost of parts and labor provided by tekmar to repair defects in materials and/or workmanship of the defective product; or to the exchange of the defective product for a replacement product; or to the granting of credit limited to the original cost of the defective product, and such repair, exchange or credit shall be the sole remedy available from tekmar, and, without limiting the foregoing in any way, tekmar is not responsible, in contract, tort or strict product liability, for any other losses, costs, expenses, inconveniences, or damages, whether direct, indirect, special, secondary, incidental or consequential, arising from ownership or use of the product, or from defects in workmanship or materials, including any liability for fundamental breach of contract.

This warranty applies only to those products returned to tekmar during the warranty period. This warranty does not cover the cost of the parts or labor to remove or transport the defective product, or to reinstall the repaired or

replacement product. Returned products that are not defective are not covered by this warranty.

This warranty does not apply if the product has been damaged by negligence by persons other than tekmar, accident, fire, Act of God, abuse or misuse; or has been damaged by modifications, alterations or attachments made subsequent to purchase which have not been authorized by tekmar; or if the product was not installed in compliance with tekmar's instructions and the local codes and ordinances; or if due to defective installation of the product; or if the product was not used in compliance with tekmar's instructions.

This warranty is in lieu of all other warranties, express or implied, which the Governing Law (being the law of British Columbia) allows parties to contractually exclude, including, without limitation, warranties of merchantability, fitness for a particular purpose, durability or description of the product, its non-infringement of any relevant patents or trademarks, and its compliance with or non-violation of any applicable environmental, health or safety legislation; the term of any other warranty not hereby contractually excluded is limited such that it shall not extend beyond twenty-four (24) months from the production date, to the extent that such limitation is allowed by the Governing Law.

Product Return Procedure Products that are believed to have defects in workmanship or materials must be returned, together with a written description of the defect, to the tekmar representative for that territory. If the address of the representative is not known, please request it from tekmar at the telephone number listed below.



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