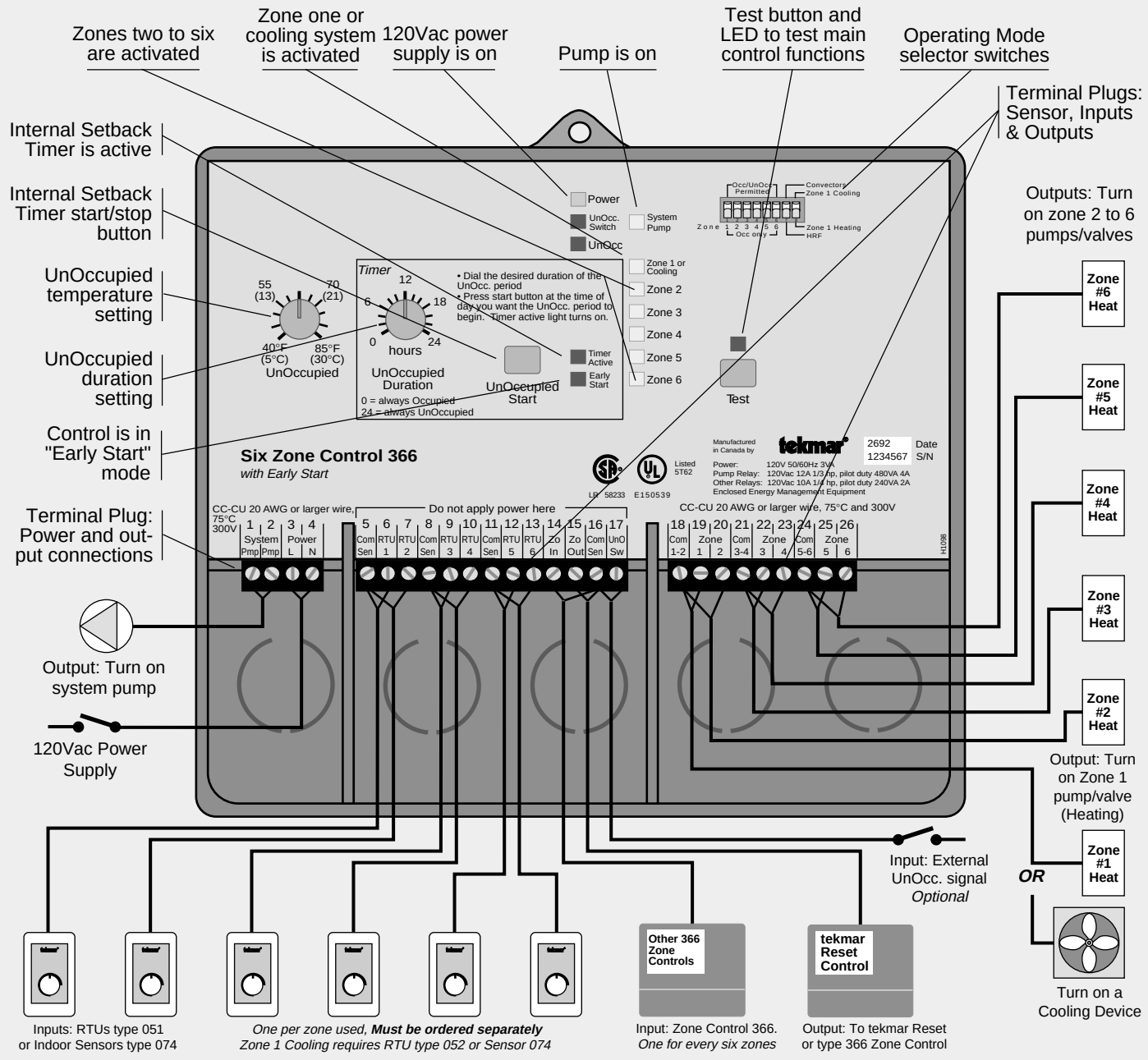
tekmar® - Data Brochure

Six Zone Control 366

D 366

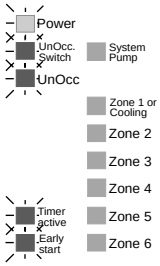
12/93

The tekmar Six Zone Control 366 is a microprocessor-based control that will operate zone valves or pumps for six separate zones. This control can integrate its zones with a tekmar Reset Control and can be connected together with other type 366 controls if more than six zones are to be controlled. The built in timer in the control can be used for setback operation, or an external timer or other setback signalling device can be used. One tekmar type 051 RTU (Room Temperature Unit) or Indoor Sensor 074 must be ordered separately for each zone used. Zone 1 can be dedicated to operate a cooling system with the addition of a type 052 RTU or Indoor Sensor 074.



Sequence of Operation

When the Six Zone Control 366 is powered-up, the "Power" light and all of the red LEDs are turned on for 5 seconds as the relays are held open. If there are shorted wires in the connection of the RTUs, an error message will flash. If there are no error messages the control will enter the operating mode with the "Power" light remaining on. During operation, the lights of the control will indicate operational status as illustrated.



Once in operating mode, the control monitors and operates each zone that has an RTU connected to it. This control must have either an RTU type 051 or an Indoor Sensor type 074 connected to each active heating zone. Information for the 074 is located in data brochure D 001.

All 051 & 052 RTUs or 074 Indoor Sensors must be ordered separately.

Control in Occupied mode

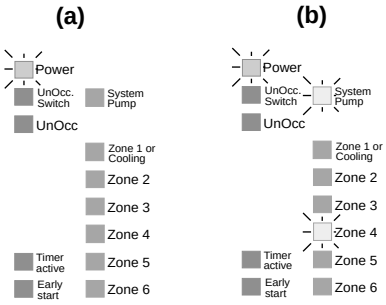
(a) – All zone RTUs satisfied

When all of the zones are satisfied (room temperatures above the RTU dial settings), the control will not take any further action. When an Indoor Sensor type 074 is used for a zone, that zone will be maintained at 70°F during Occupied.

(b) – Heat required by the zones

When one or more zones require heat, the "System Pump" light will come on and the control will switch on the System Pump. The control will also turn on the zone valves or pumps (turning on the appropriate "Zone #" light) to provide heat to the zones requiring it.

The zone control, if it is connected to a tekmar reset control that has a 10kΩ input, will determine the zone with the highest heat demand and will shift the heating curve of the reset control to meet that demand and fire the boiler.



Unoccupied mode

When the Six Zone Control 366 is put into the UnOccupied mode, it first reads the six *Occ/UnOcc permitted* DIP switches. The control will continue to operate each zone set for *Occ only*, in the Occupied mode. Those zones set to *Occ/UnOcc permitted* will be operated at the temperature setting of the UnOccupied dial.

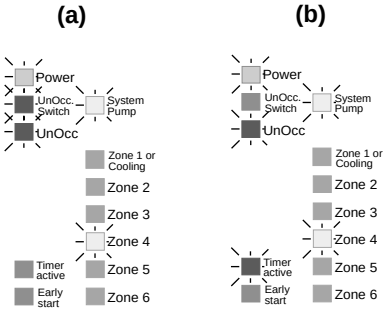
The control can enter the Unoccupied mode in two ways:

(a) – External Unoccupied signal

Connect (short circuit) terminals *Com Sen — UnO Sw* (16 and 17) together. The control will operate the selected zones at the temperature set on the UnOccupied dial.
(See important details on page 4; *Unoccupied Options — External Timer)*

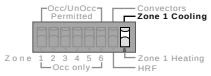
(b) – Using the tekmar built–in timer

Push the UnOccupied start/stop button. If the control is in Occupied mode, the "Timer active" light will come on and the control will enter UnOccupied and remain so for the time duration set on the UnOccupied duration dial. The control will enter the UnOccupied mode at the same time every 24 hours unless the start/stop button is pushed again.
(See important details on page 3; *Unoccupied Options — tekmar built–in timer)*



Control in Cooling mode

To operate in the Cooling mode, the DIP switch *Zone 1 – cooling/heating* must be in the "Zone 1 cooling" position. The control can operate a cooling system in two ways:

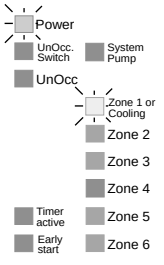


(a) – <u>Without</u> RTU 052 or Indoor Sensor 074 connected to Zone 1 input

When there is no RTU 052 or Indoor Sensor 074 connected to the zone 1 input, the control will switch its Cooling relay on to ***enable an independently controlled cooling system*** when there has been no call for heat for at least 1 hour.

(b) – <u>With</u> RTU 052 or Indoor Sensor 074 connected to Zone 1 input

When there is an RTU 052 or Indoor Sensor 074 connected to the zone 1 input, the control will cycle the Cooling relay to ***operate a cooling device in order to cool the room containing the 052 or 074*** when: **(a) –** there has been no call for heat for at least 1 hour, and **(b)** – the room temperature is above the setpoint. The 074 has a fixed setpoint of 77°F (25°C), and the 052 RTU has a dial setting range that will allow a setpoint ranging from 74 to 86°F (23 to 30°C). The cooling device will be cycled on and off *– PWM, 30 minute cycle, ± 2°F diff., 1 minute minimum on time, 2 minutes minimum off time –* at the setpoint unless there is a call for heat from one of the heating zones (one or more heating RTUs are set higher than the cooling RTU).
If a call for heat occurs when cooling is also required, an error message will be generated by the control and both the cooling and heating functions will be interrupted until the situation is corrected.



UnOccupied Options

tekmar built-in timer — Settings and Sequence of Operation

The 366 has a 24 hour setback timer built into the control. To operate the timer, the user must answer these 4 questions:

(1) Which zones are to go into the UnOccupied mode? *Switch those zone DIP switches up to "Occ/UnOcc permitted".*
(2) What UnOccupied temperature is desired? *Set the "UnOccupied" temperature dial to the desired temperature.*
(3) When do you want the UnOccupied period to begin? *Push the "UnOccupied start" button at that time.*
(4) When is the UnOccupied period to be over? Add up the number of hours to find the time span between the UnOccupied start time and the time of day when the UnOccupied period is to end. *Set the "UnOccupied duration" dial to the desired time span.*

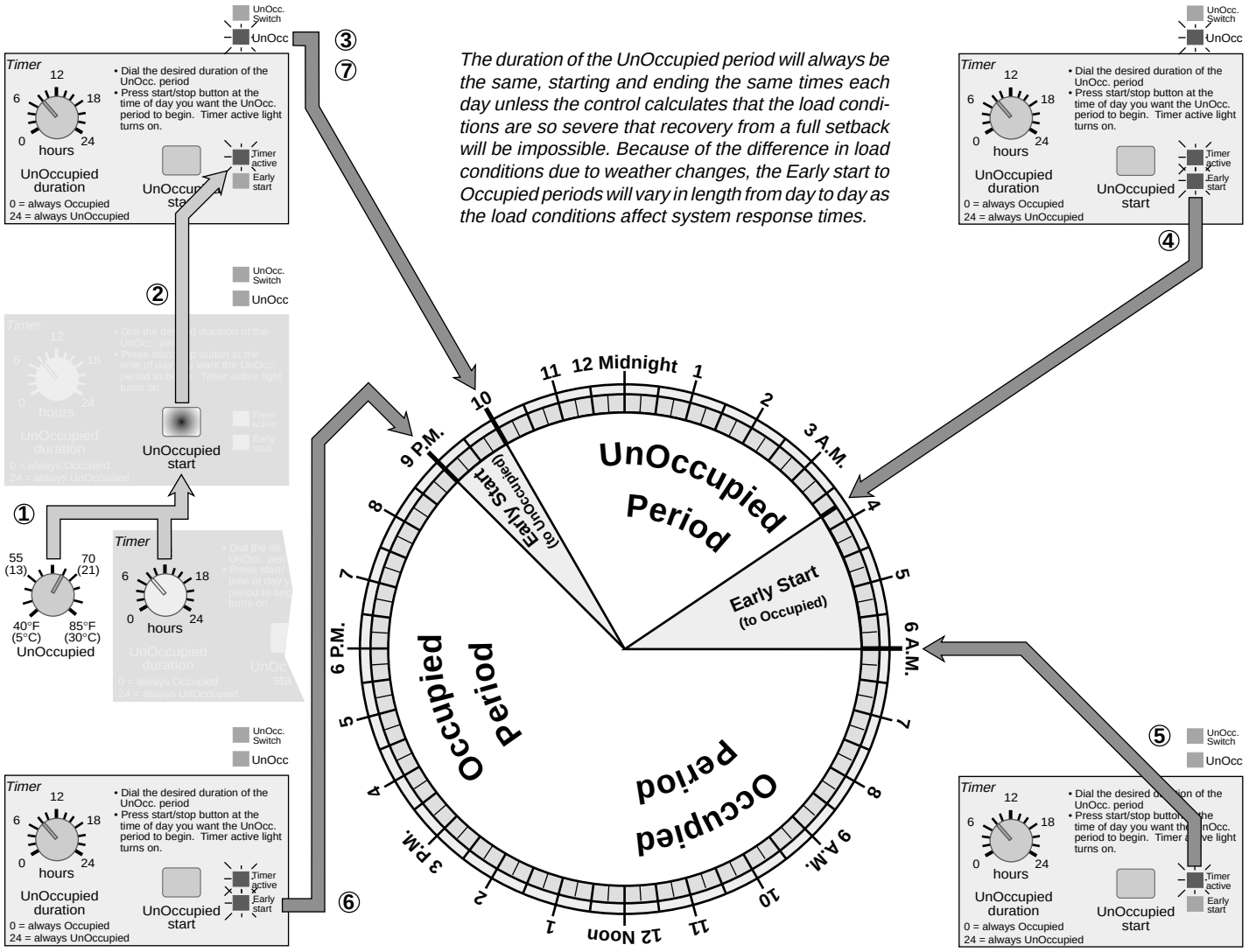
① Set the dials for the desired Unoccupied temperature and for the duration of UnOccupied period.
② Push the "UnOccupied Start" button at the time you want the system to be in setback each day.
③ The "Timer active" and "UnOcc" lights will come on immediately and the "Occ/UnOcc permitted" zones will be dropped down to and controlled at the UnOccupied temperature.

Once the timer has been activated by pushing the button, it will continue to operate and the "Timer active" light will remain on until either the "UnOccupied Start" button is pushed again, or an external signal is received at terminals Com Sen — UnO Sw (16 & 17).

If the UnOccupied temperature dial setting is higher than the setting on any RTU dial, the control will continue to operate those zones at the temperature of the RTU settings (rather than raise the room temperature during the UnOccupied periods).

④ The control calculates when to start bringing the system out of setback based on the load on the system. The "Early start" Light will come on and the control will ramp up the temperature of the UnOccupied zones in order to have them up to the Occupied temperature *at the beginning of the Occupied period.*
⑤ During the Occupied period, only the "Timer active" light will be on. If the "HRF" DIP switch is selected, an *Early start* to UnOccupied will occur 1 hour before the time the button was pushed. If the "Convector" DIP switch is selected, an *Early start* to UnOccupied will occur 15 minutes early.
⑥ The "Early start" Light will come on and the control will operate the "Occ/UnOcc permitted" zones so that *at the beginning of the UnOccupied period* the room air temperature will begin to drop down to the UnOccupied temperature.
⑦ The "UnOcc" Light will be on and the control will operate the "Occ/UnOcc permitted" zones at the UnOccupied temperature until the next calculated *Early start* into Occupied. **The control will cycle from step 4 to step 5,6,7 and back to step 4 every day.**

The duration of the UnOccupied period will always be the same, starting and ending the same times each day unless the control calculates that the load conditions are so severe that recovery from a full setback will be impossible. Because of the difference in load conditions due to weather changes, the Early start to Occupied periods will vary in length from day to day as the load conditions affect system response times.



External timer — Settings and Sequence of Operation

The Six Zone Control 366 can be set back by an external timer dry contact closure to terminals *Com Sen - UnO Sw (16 & 17)* .
To properly utilize an external timer, the user must answer these 4 questions:

(1) Which zones are to go into the UnOccupied mode? *Switch those zone DIP switches up to "Occ/UnOcc permitted".*
(2) What UnOccupied temperature is desired? *Set the "UnOccupied" temperature dial to the desired temperature.*
(3) When do you want the UnOccupied period to begin? *The external signal (a short between terminals Com Sen — UnO Sw 16 & 17) must be given **4 hours before** the actual UnOccupied period is to begin.*
(4) When is the UnOccupied period to be over? *The external signal (remove the short between terminals Com Sen – UnO Sw 16 & 17) must be given **4 hours before** the actual Occupied period is to begin.*

The control is able to calculate its "Early start" when given the external timer signal 4 hours before the actual event is to occur.

① Set the dial for the desired Unoccupied temperature.

② When the control receives an external signal, the "UnOcc Switch" light will come on.

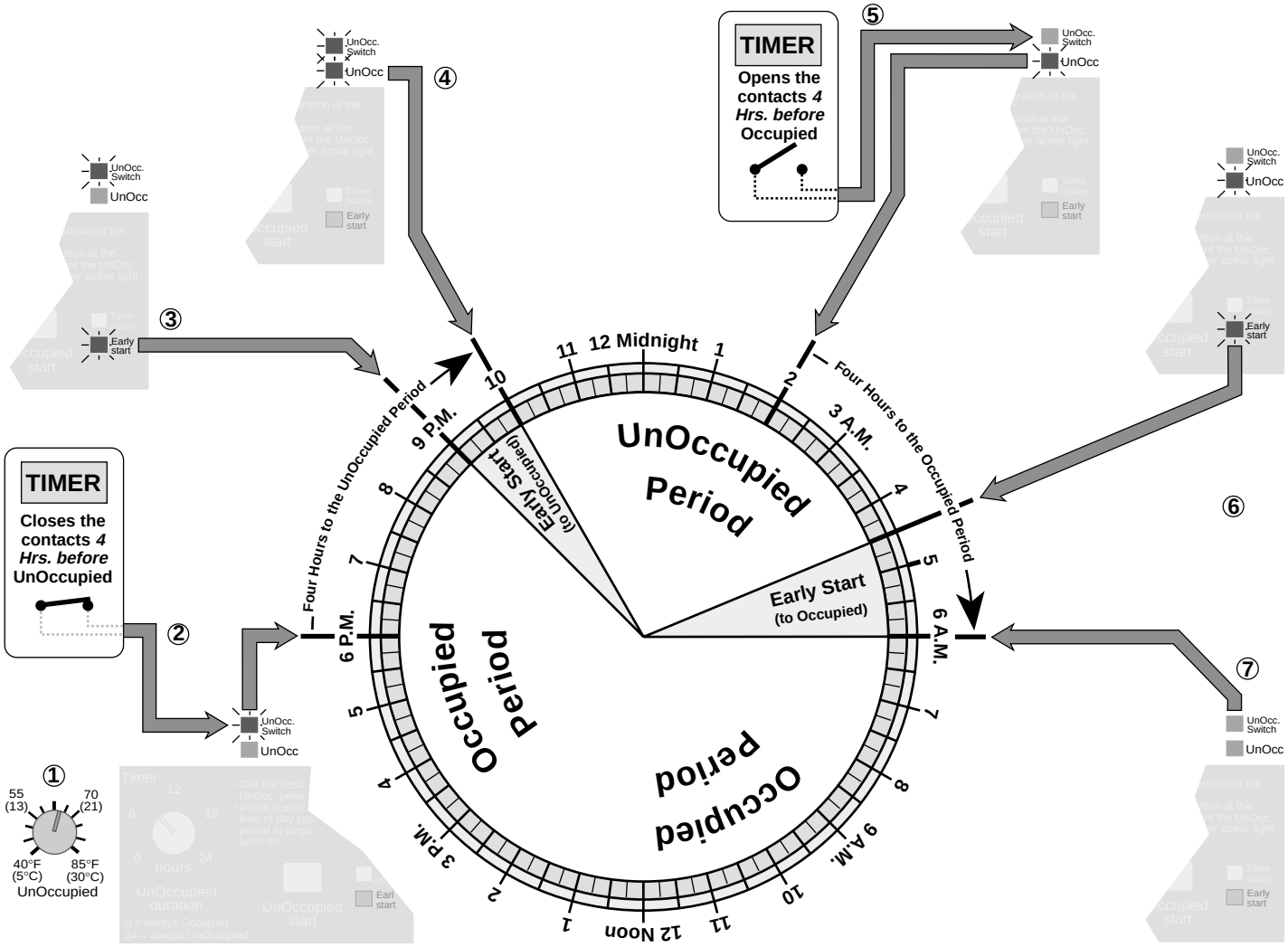
③ If the "HRF" DIP switch is selected, an "Early start" to UnOccupied will occur 3 hours after the control receives the UnOcc. signal. If the "Convector" DIP switch is selected, an "Early start" to UnOccupied will occur 3 hours and 45 minutes after the control receives the UnOcc. signal.

④ 4 hours after the UnOcc. signal is received, the "UnOcc." light comes on and the "Occ/UnOcc permitted" zones will be controlled at the temperature of the "UnOccupied" dial setting.

⑤ When the UnOccupied signal is removed from terminals 16 & 17, the control calculates when to start bringing the system out of setback based on the load on the system.

⑥ The "Early start" Light will come on and the control will ramp up the temperature of the UnOccupied zones so they will be up to the Occupied temperature *at the beginning of the Occupied period, 4 hours after the UnOccupied signal was removed.*

⑦ The control will remain in the Occupied mode until it receives another UnOcc. signal



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 366 includes: • One Control 366 • One Data Brochure D 366 • One Data Brochure D 001 • One Application Brochure A 366-1 • One Application Brochure A 366-2

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

Read Brochure A 366 for wiring examples.

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 understand its functions within the operational requirements of your system.

Step Two — Mounting of 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) knock-outs 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.

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

- Install the zone RTUs and/or Indoor Sensors and run the wiring back to the base, *being careful to label each pair at the base* so as to not mix them up before making the terminations. **Do not run RTU wires immediately adjacent to 120Vac, 24Vac, other powered wiring or telephone wiring. In locations subject to strong sources of electromagnetic interference, grounded,shielded cable or grounded metal conduit should be used.**
- Install the wiring from the zone valves or pumps to the base, *being careful to label each pair at the base* so as to not mix them up before making the terminations.
- Install the wiring from the system pump and/or boiler (if used), to the base.
- Install the wiring from the cooling system circuit (if used), to the base.
- Install the wiring from the tekmar reset control (if used), to the base.
- Install the wiring from an additional tekmar zone control (if used), to the base.
- Install the wiring from an external setback timer (if used), to the base.
- Install the wiring from the 120Vac power supply to the base.

Important notes on recommended wire sizes:

- 120Vac wiring – maximum 14AWG, minimum 16AWG multi-strand (TEW).
  Because of its superior flexibility, multi-strand wire is highly recommended for the 120Vac wiring. Do not oversize this wire, as difficulty in the wiring and removal of plugs will be encountered and damage to the control could result.
- 24Vac or RTU wiring – 18AWG solid or stranded LVT

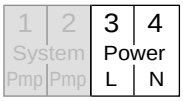
Step Four — Electrical connection to the control

Power and output connections

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

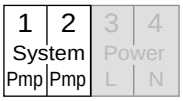
- Install the control into the base, sliding it down until it snaps into place.
- All electrical connections are made directly to the plug terminals.
- Connect the 120Vac power supply to terminals *Power L — N* (3 and 4).

Maximum 120 Volts



- Connect the System Pump circuit to terminals *System Pmp — Pmp* (1 and 2). These terminals lead to a dry relay contact which closes when the control requires System Pump operation.

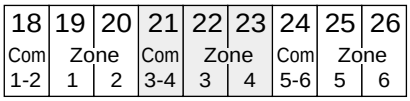
Note: For pumps larger than 1/3 hp., a properly sized isolation relay must be used.



- Connect the wiring from the Zone #1 valve or pump to terminals *Com 1-2 — Zone 1* (18 and 19). Tighten the terminal screw at terminal 19, but leave terminal 18 loose until the wiring from zone #2 is connected. ***If a cooling option is used, it is important to refer to the instructions on the next page for wiring the cooling circuit in with the zone #2 circuit.***
- Connect the wiring from the Zone #2 valve or pump to terminals *Com 1-2 — Zone 2* (18 and 20). Tighten both terminal screws making sure there is a good connection at terminal 18 since it will have wires from both the Zone #1 and #2 valves or pumps.

- Connect the wiring from the Zone #3 valve or pump to terminals *Com 3-4 — Zone 3* (21 and 22). Tighten the terminal screw at terminal 22, but leave terminal 21 loose until the wiring from Zone #4 is connected.
- Connect the wiring from the Zone #4 valve or pump to terminals *Com 3-4 — Zone 4* (21 and 23). Tighten both terminal screws making sure there is a good connection for both wires at terminal 21.

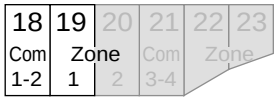
Maximum 120 Volts!



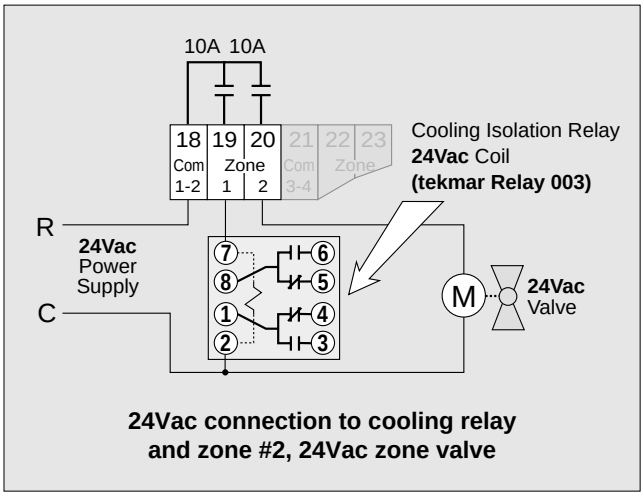
- Connect the wiring from the Zone #5 valve or pump to terminals *Com 5-6 — Zone 5* (24 and 25). Tighten the terminal screw at terminal 25, but leave terminal 24 loose until the wiring from Zone #6 is connected.
- Connect the wiring from the Zone #6 valve or pump to terminals *Com 5-6 — Zone 6* (24 and 26). Tighten both terminal screws making sure there is a good connection for both wires at terminal 24.

Cooling system connections

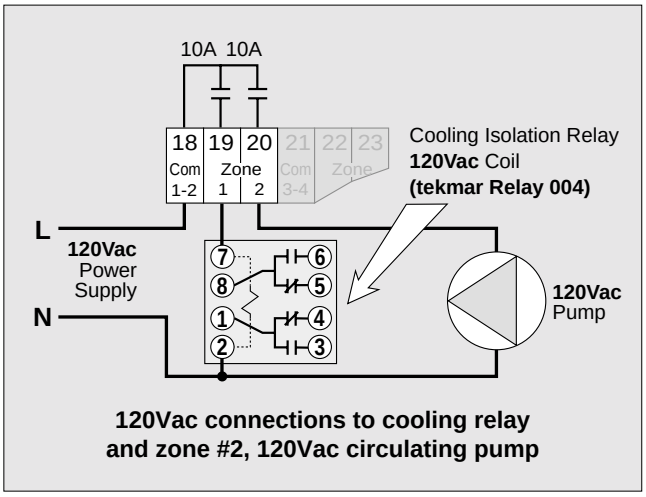
- Connect the wiring from the cooling system isolation relay to terminals *Com 1-2 — Zone 1* (18 and 19).



- **When using this control to operate a cooling system, an isolation relay must be installed and the relay must be powered from the same power supply as the Zone #2 valve or pump, unless zone #2 and its terminal are unused.**

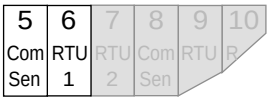


24Vac connection to cooling relay and zone #2, 24Vac zone valve



120Vac connections to cooling relay and zone #2, 120Vac circulating pump

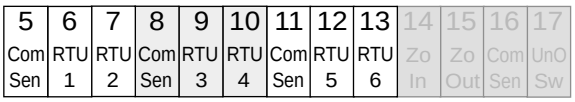
- Connect the wiring from the Zone #1 RTU 052 or Indoor Sensor 074 to terminals *Com Sen — RTU 1* (5 and 6). Tighten the terminal screw at terminal 6, but leave terminal 5 loose until the wiring from the Zone #2 RTU is connected.
  If this control is only used to enable a cooling system to operate when heating is not required – *as in cooling option (a), page 3* – do not install an RTU or Indoor sensor at these terminals.



Sensor and <u>unpowered</u> input connections

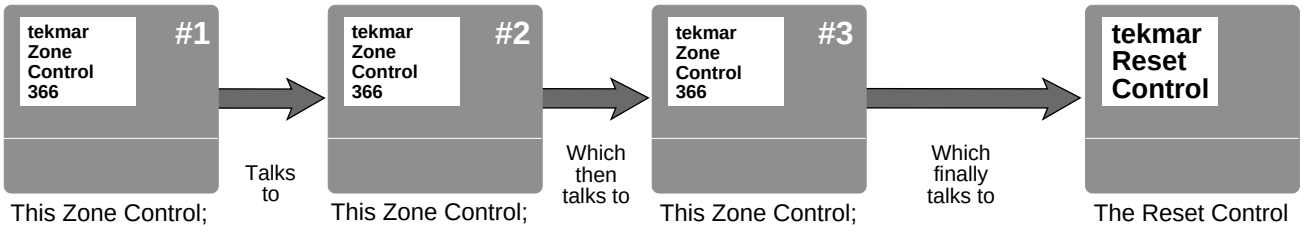
Power should never be applied to these terminals. Damage to the control will result.

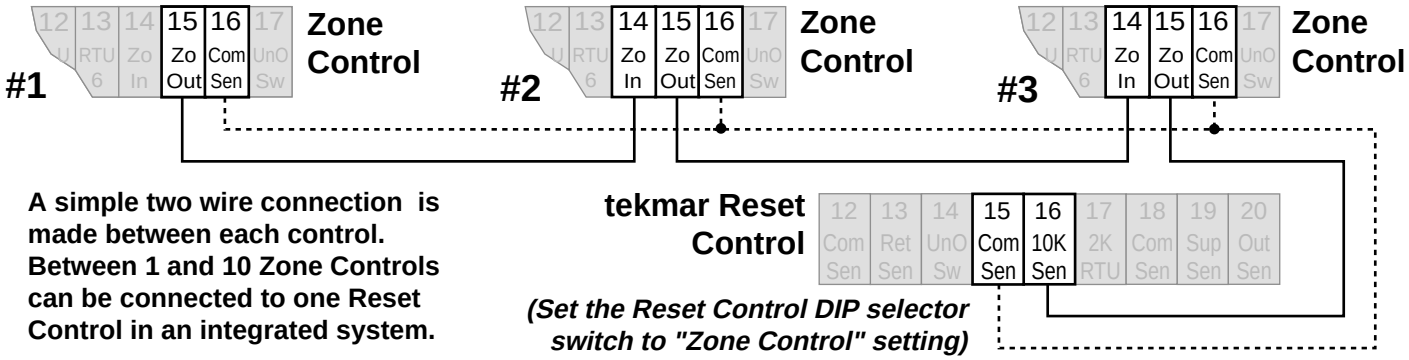
Do not apply power here!



- Connect the wiring from the Zone #1 RTU to terminals *Com Sen — RTU 1* (5 and 6). Tighten the terminal screw at terminal 6, but leave terminal 5 loose until the wiring from the Zone #2 RTU is connected. If zone #1 is used for cooling, **refer to the cooling circuit wiring instructions above.**
- Connect the wiring from the Zone #2 RTU to terminals *Com Sen — RTU 2* (5 and 7). Tighten both terminal screws making sure there is a good connection for both wires at terminal 5.
- Connect the wiring from the Zone #3 RTU to terminals *Com Sen — RTU 3* (8 and 9). Tighten the terminal screw at terminal 9, but leave terminal 8 loose until the wiring from the Zone #4 RTU is connected.
- Connect the wiring from the Zone #4 RTU to terminals *Com Sen — RTU 4* (8 and 10). Tighten both terminal screws making sure there is a good connection for both wires at terminal 8.
- Connect the wiring from the Zone #5 RTU to terminals *Com Sen — RTU 5* (11 and 12). Tighten the terminal screw at terminal 12, but leave terminal 11 loose until the wiring from the Zone #6 RTU is connected.
- Connect the wiring from the Zone #6 RTU to terminals *Com Sen — RTU 6* (11 and 13). Tighten both terminal screws making sure there is a good connection for both wires at terminal 11.

If this installation is making use of multiple type 366 Zone controls in combination with a tekmar Reset control, they must be connected together in order to communicate as illustrated below. Please refer to application brochure A 366 for wiring details.

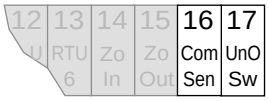




A simple two wire connection is made between each control. Between 1 and 10 Zone Controls can be connected to one Reset Control in an integrated system.

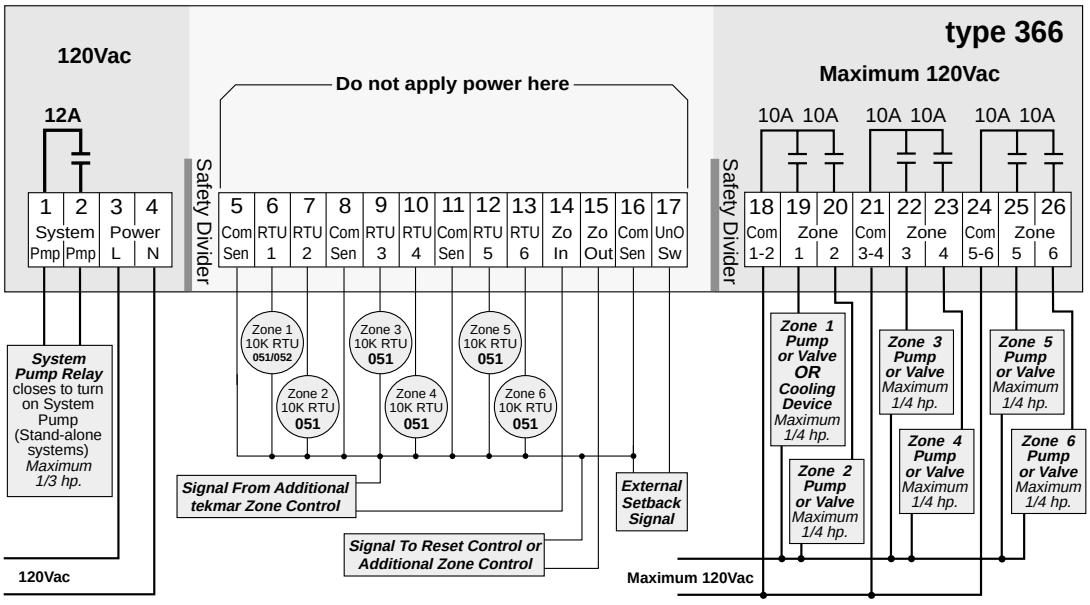
(Set the Reset Control DIP selector switch to "Zone Control" setting)

- If you are connecting an external timer to this control, connect the dry contact terminals of the timer to terminals UnO Sw — *Com Sen* (16 and 17) of this control.



Caution: Dry contacts only. Do not connect a powered input to these terminals.

Electrical connections to the terminal plugs of the type 366 control. Control relays are shown in "power down" condition.



Note: This illustration shows the various devices that can connect to the 366, and is <u>not</u> a wiring diagram. For a detailed wiring schematic of your specific application, refer to the Application Brochure A 366.

Step Five — Testing the wiring

Caution

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

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. If the output plug is connected to zone pumps, the heavier guage wire may make it difficult to remove without damage to the control. In these cases it may be necessary to test the pumps while the plug is still connected to its header.

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.

Test the RTU/Indoor Sensors

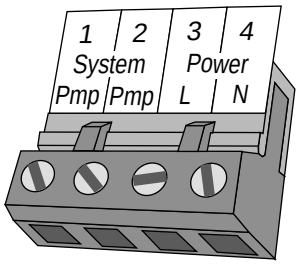
These tests must be made *before* turning on the power supply, and with the terminals unplugged. The RTUs are to be tested according to the instructions on page 11 of this brochure, and the 074 Indoor Sensors according to the instructions in brochure D 001.

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 *Power L — N* (3 and 4). 110 to 130 Volts AC should be measured at these terminals.

Test the outputs

If a System Pump circuit is connected to the *Sys Pmp — Sys Pmp* (1 and 2) terminals; *make sure power to the circuit is off* and install a jumper in the terminal plug between terminals 1 and 2. When the circuit is powered-up, the pump 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 (pump, switching relay, etc.) for faults. If the pump operates properly when the circuit is powered up, *disconnect the power, remove the jumper* and proceed to the next step.



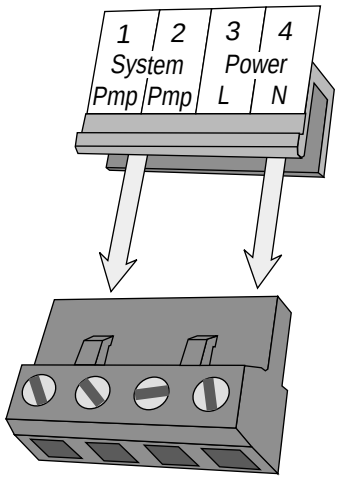
Terminal plug pushed into its header on the control

Caution:

***Solid, single strand wire larger than 16 AWG is not recommended when this control is being used to switch zone pumps.* If such heavy wire has been used to make the terminations, it may be necessary to disconnect each pump circuit individually rather than trying to remove the terminal plug from its header since the force necessary to remove the plug may damage the control.**

To check the Zone #1 valve/pump circuit (heating), *make sure power to the circuit is off* and install a jumper in the terminal plug between terminals *Com 1-2 — Zone 1* (18 and 19). When the circuit is powered-up, the valve/pump 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 for faults. If the valve/pump operates properly when the circuit is powered up *disconnect the power, remove the jumper* and continue to check the other zones in the same way.

If a Cooling system isolation relay is connected to terminals *Com 1-2 — Zone 1* (18 and 19), *make sure power to the circuit is off* and install a jumper in the terminal plug between terminals 18 and 19. When the circuit is powered-up, the isolation relay should pull in and the cooling system 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 for faults. (If this control is being used to enable an independently controlled cooling system, its own controls may prevent the cooling system from operating). If the Cooling system operates properly when the circuit is powered up *disconnect the power, remove the jumper* and proceed to the next step.



Terminal plug disconnected from its header on the control

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.
- Install the wiring safety dividers in their appropriate slots within the wiring chamber.

Test the Zo inputs/outputs

If you are using additional type 366 controls or connecting to a tekmar Reset Control, you will have to check the *Zo In — Com Sen* (14 and 16) and *Zo Out — Com Sen* (15 and 16) terminals for correct voltages. Make sure all of the controls have been completely tested according to their own instructions and then power them up.

Using a test meter set to read *AC volts*, check each control between terminals *Zo In — Com Sen* (14 and 16) and *Zo Out — Com Sen* (15 and 16) and also check the Reset control between its *10K Sen — Com Sen* terminals. **Any AC voltage reading should be less than 0.1 Vac or damage to the control may result.**

Using a test meter set to read *DC volts*, check each control between terminals *Zo In — Com Sen* (14 and 16) and *Zo Out — Com Sen* (15 and 16) and also check the Reset control between its *10K Sen — Com Sen* terminals. The dc readings should be between 0.75Vdc and 3.4Vdc.

- The control is now ready for set-up and operation.

Caution

The tekmar Six Zone Control 366 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.

Settings

Step Six — Essential control settings

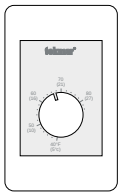
To obtain the best operation from a zone control, it is important to measure the various room air temperatures as accurately as possible. RTUs should be installed in a location in each room that is representative of average air temperatures and not subject to isolated sources of heat or cold.

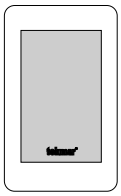
For specific application details refer to Brochure A 366. More detailed technical descriptions of the effects of control settings on overall system operation is described in the tekmar Essays, E 001, E 002. If this control is to be connected to a tekmar reset control, the installer should read the Data and Application brochures for that control to understand the operation of the total system.

051 RTU dial settings

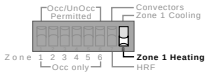
Heating

During the time the control is in the Occupied mode, each RTU 051 dial can be set to maintain the room air temperature in its zone from 40°F (5°C) to 85°F (30°C).
Every zone can be controlled at a different temperature during the Occupied period. Those zones that are set up as "Occ. only" zones will maintain the RTU dial setting temperature even when the control is switched to the UnOccupied mode.
Zones with Indoor Sensor 074s connected will be maintained at 70°F, and those zones that are set up as "Occ. only" zones will maintain that temperature even when the control is switched to the UnOccupied mode.


Heating RTU 051


Indoor Sensor 074

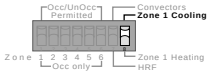
If the cooling options of this control are not used and zone #1 is to be used as a heating zone, the "Zone 1 heating/cooling" DIP switch must be switched to the "Zone 1 heating" (down) position, allowing the zone #1 relay to operate a heating zone valve or pump.



Cooling

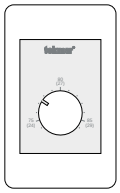
The "Zone 1 heating/cooling" DIP switch must be switched to the "Zone 1 cooling" (up) position to allow the zone #1 relay to operate the cooling system.
The Cooling RTU 052 dial can be set from 74°F (23°C) to 86°F (30°F) when connected to operate zone #1 for cooling.

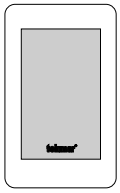
Heating RTUs must be set at least 5°F below the desired cooling setpoint.



When an Indoor Sensor 074 is used, cooling will be maintained at 77°F (25°C).
With no RTU or sensor connected to zone #1, the control will operate only as a heating/cooling interlock, allowing the cooling system to operate whenever there has been no call for heat for at least one hour. This mode is to be selected only when the cooling system has its own, independent control system.

Note: This control can use tekmar 051, 052 RTUs or 074 Indoor Sensors only. Older style tekmar 2K RTUs are not compatible and will not operate properly.


Cooling RTU 052


Indoor Sensor 074

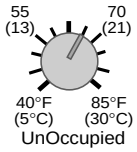
Occ/UnOccupied permitted — Occ only Switch, UnOccupied dial

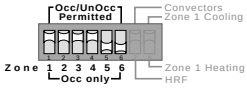
When a zone DIP switch is in the "Occ. only" position, that zone will always be controlled at the temperature of the RTU dial setting regardless of whether the control is in the Occupied or UnOccupied mode.

When a zone DIP switch is in the "Occ/UnOcc permitted" position, that zone will be controlled at the temperature of the UnOccupied dial setting whenever the control is in the UnOccupied mode.

The UnOccupied dial can be set to maintain the room air temperature in the UnOccupied zones from 40°F (5°C) to 85°F (30°C). When the control is put into the UnOccupied mode, the room temperature in all of the "UnOcc permitted" zones will drop down to the temperature of this dial setting for the duration of the UnOccupied period. If the RTU dial temperature is lower than the UnOccupied dial setting, that zone will always be controlled at its RTU dial setting.

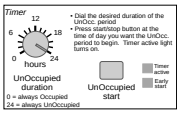
With the switches set as illustrated at right, zones 1, 2, 3, and 4 will go down to the UnOccupied temperature and zones 5 and 6 will remain at their RTU dial setting temperatures.





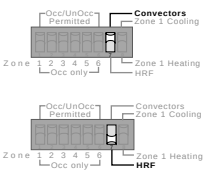
Built-in tekmar timer

This control has a built-in timer that will operate the control on an automatic setback schedule chosen by the user.
See page 3 for timer operating instructions.



Convectors/HRF Switch

The position of this switch determines a number of control functions related to system response times. If the switch is in the "HRF" position, the control will go into "Early start" to the UnOccupied mode 60 minutes before the system is supposed to be in UnOccupied, as opposed to 15 minutes in the "Convector" position. It will also calculate a longer "Early start" to Occupied mode than it would if the switch were in the "Convector" position, and during operation the control will compensate for the slower response times of a system with high thermal mass.



Some HRF panels with low mass and quick response times (higher temperature wooden floor systems) may be best operated with the switch in the "Convector" position, and some older, heavy, cast-iron convectors may be best operated with the switch in the HRF position. Experimentation may be necessary in some of these systems in order to get the best performance.

Testing the Control Functions

Indicator lights

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

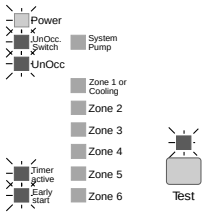
Power light on	• the 120Vac power supply has been connected and the control is energized.
Unocc. Switch light on	• an external signal has shorted together terminals *Com Sen — UnO Sw* (16 and 17).
Unocc light on	• the built-in timer or an external signal has put the control into the UnOccupied mode.
Timer Active light on	• the UnOccupied start button has been pushed, activating the built-in setback timer.
Early Start light on	• the control is operating the zones in "Early Start" mode to either bring them up to the Occupied temperature or down to the UnOccupied temperature.
System Pump light on	• the System Pump relay is on, closing the contacts between the *System Pmp — Pmp* (1 and 2) terminals.
Zone 1 to 6 light(s) on	• the zone(s) relay is on, closing the contacts between the *Com — Zone* terminals of the zone(s).
Test light on	• the control is going through the programmed test routine.

Step Seven — Operational test of control functions - Test button

The Six Zone Control 366 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. If an RTU or Indoor Sensor fault occurs at any time, the lights will flash an error message and the test routine will be exited until the fault is located and corrected. The error messages are listed on page 11.

Power light on — Test light on — Red lights on

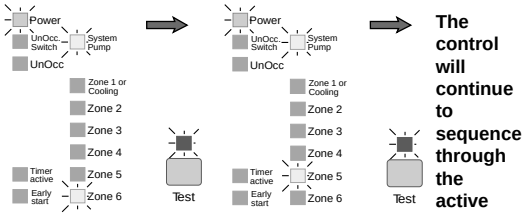
On power-up, and at the start of the test routine, all of the red status lights are switched on for approximately 5 seconds. The control searches for short circuits in the RTU wiring and, if none are found, proceeds to the next step. If an RTU fault occurs, the control suspends the test routine and indicates the fault by flashing some of the lights in an error message.



Note: Whenever the control exits the test routine, there is an automatic 3 second delay before the control will allow re-entry. Pushing the test button during this 3 seconds will have no effect.

Power light on — Test light on — System Pump light on — Zone 6 through 1 lights on

The control turns on the System Pump relay and tests the zone relays from zone #6 through to zone #1. It turns on the first active zone relay for 10 seconds and then advances through the active zones, turning each one on for 10 seconds. *An active zone is one which has an RTU/074 connected.*

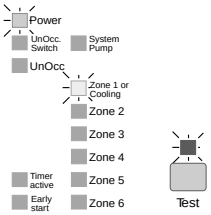


If the Test Button is pushed once during the time a zone is open, the "Test" light will flash and the control will be held in a pause mode for 5 minutes, after which time it will automatically exit the test routine and return to normal operating mode. Pushing the Test button during the 5 minute pause will allow the control to resume the test routine at the next step.

Power light on — Test light on — Zone #1 light on

Once all of the heating zones have been tested, the System Pump relay and light are turned off, and if zone #1 has been selected for cooling, the "Zone 1 cooling" relay is turned on for 10 seconds after which the control exits the test routine.

If the Test Button is pushed once during the time the cooling system is on, the "Test" light will flash and the control will be held in a pause mode for 5 minutes, after which time it will automatically exit the test routine and return to normal operating 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 and 3. *One or more of the indicator lights may be on.* Refer to page 2, 3 and 4 for a description of the possible indicator light combinations under normal operating conditions.

Notes on the cycling of zone valves or pumps

tekmar Zone Controls maintain more precise room temperatures than other types of zone controls for three main reasons:

(1) The control operates each zone on a 15 minute timed cycle and will calculate a % of "on time" for each cycle. By matching the heat loss of the space with the amount of cycle "on time" the control can balance the heat input to maintain a constant room temperature.

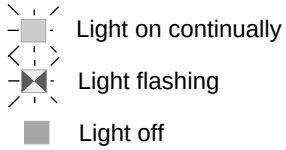
(2) The RTU/Indoor Sensors are not simple on/off devices like standard thermostats and can therefore detect very small changes in room temperature. The control can read the actual room temperature as well as the exact setting and act on these readings to more accurately calculate the % "on time" based on the room temperature deviation from the RTU setting.

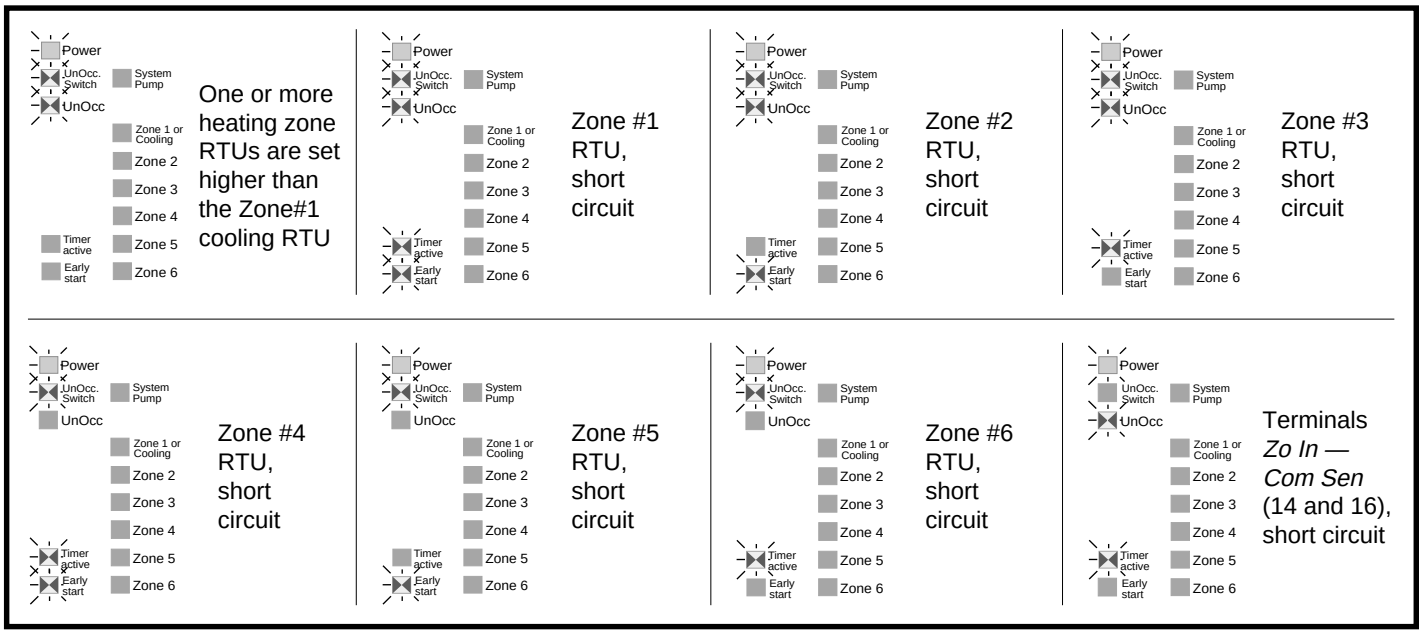
(3) 366 Zone Controls monitor the heat requirements of all of the zones in the building, and can fine tune the operation of a tekmar Reset Control to deliver only as much heat as is required by the zone with the highest heat demand. This allows the zones to operate at longer % on times. Monitoring the requirements of every zone, allows the control to cycle them in an intelligent way rather than in a random way so as to spread the system load out evenly and maintain constant flow.

Error Messages

Whenever a short circuit is detected in an RTU/074 circuit or in the *Zo in* circuit, the indicator lights will flash in specific ways to indicate the problem. This look-up table describes each error condition and shows the flashing light sequence that results. A short or open circuit results in the zone affected becoming inactive.

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.





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 control 366. When the control is flashing an Error Message, identify the fault from the look-up table on this 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.

To Test the 051 and 052 RTUs and the Indoor Sensor 074

RTUs and sensors should be tested at the control terminal plugs with the plugs removed from their headers. The chart below gives the resistance readings expected at different sensor temperatures.

For Indoor Sensor 074

Place the Ohm-meter leads onto the 074 sensor terminals. Readings should be within ± 1% of the chart readings. If the readings are incorrect, check the wiring between the control and the sensor to ensure there is no problem in the wiring.

For RTUs 051 and 052

Place the Ohm-meter leads onto the RTU terminals and note the reading. Reverse the leads and note the reading again. The higher of the two readings should be within ± 1% of the chart readings below. Ignore the lower reading. If the readings are incorrect, check the wiring between the control and the RTU to ensure there is no problem in the wiring.

°F	°C	Ω	°F	°C	Ω	°F	°C	Ω
40	4.4	26,099	66	18.9	13,138	74	23.3	10,762
48	8.9	20,993	68	20.0	12,493	78	25.6	9,760
56	13.3	16,986	70	21.1	11,883	82	27.8	8,862
62	16.7	14,544	72	22.2	11,307	86	30.0	8,057

Step Nine — Before you leave

- Make sure the safety dividers are installed in the correct locations, 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 DIP switches 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 maintainance of this control and of the system to the end user and anyone else who may be operating the system.

Technical Data

Technical Specifications

Dimension (h x w x d)	— 6-5/8" x 7-9/16" x 2-13/16" (170 x 193 x 72mm)
Weight	— 2.9 lbs (1.3 Kg)
Ambient	— 30 to 120°F (0 to 50°C), < 95% RH non-condensing
Power supply	— 120Vac ± 10%, 50/60Hz
System Pump Relay capacity	— SPST, 120Vac, 12A, 1/3 hp, pilot duty 480VA 4A
Other Relay capacities	— SPST, 120Vac, 10A, 1/4 hp, pilot duty 240VA 2A
RTUs	— RTU 051, Indoor Sensor 074, RTU 052 for zone 1 cooling use only
Control accuracy	— ± 0.2°F (± 0.1°C)

This electronic control does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. Le présent numérique n'émete pas de bruits radioeléctriques dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le réglement sur le brouillace radioeléctrique édicté par le Ministére des Communications du Canada.

Features

13 Indicator lights	— Power, UnOcc, UnOcc Switch, Timer Active, Early Start, System Pump, Test Zone 1 or Cooling, Zone 2, Zone 3, Zone 4, Zone 5, Zone 6
Zone 1 to 6 heating outputs	— SPST relay contacts close to power valves or pumps
System pump output	— SPST relay contacts close when heating is required
Built-in timer	— 24 hour programmable setback timer
External setback	— External signal or timer can initiate and end setback periods
Early Start	— Control enters/exits setback based on heating system and load requirements
PWM, P+I control	— Proportional + Integral processing with Pulse Width Modulation of valves/pumps
Test button	— Initiates and controls pre-programmed test run
Error message display	— RTU faults are indicated by flashing light codes

Settings

051 RTU dial	— 40°F (5°C) to 85°F (29°C)
052 RTU dial	— 74°F (23°C) to 86°F (30°C)
074 Indoor Sensor	— fixed settings of 70°F (21°C) heating, 77°F (25°C) cooling
Unoccupied	— 40°F (5°F) to 85°F (29°C)
Unoccupied duration	— 0 to 24 hours
Occupied/Unoccupied switches	— Each zone can be individually selected to go into setback or not
Convectors/HRF switch	— To fine tune control operation for different types of heating systems
Zone 1 heating/cooling switch	— To select zone #1 to operate a cooling system or operate as a heating zone

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 unauthorised 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 Authorisation (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.

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tekmar Control Systems, Inc., USA
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Vernon, B.C. Canada V1T 4K7
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