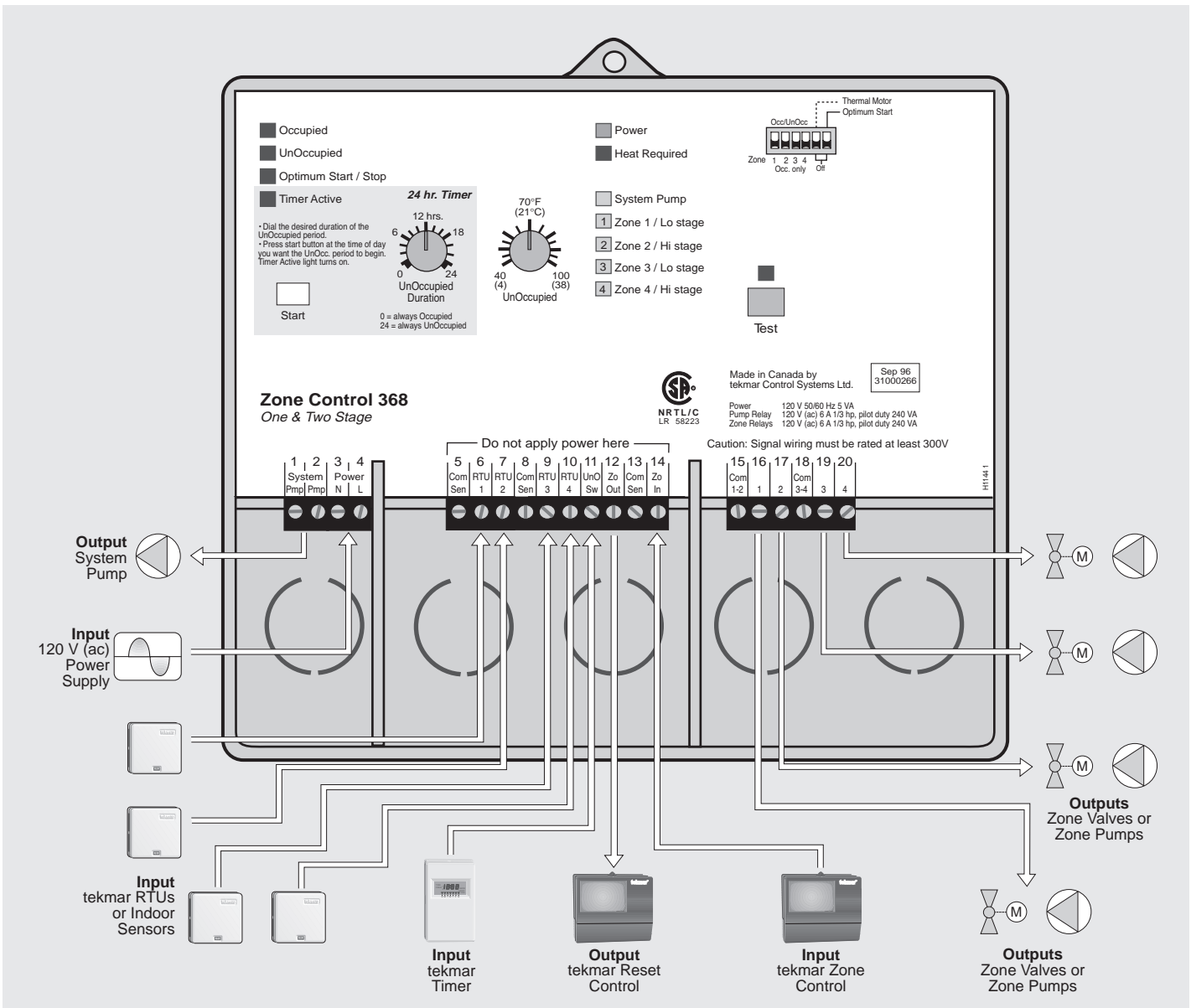




The Zone Control 368 is a microprocessor-based energy management control that uses PID logic to control the temperature in up to 4 heating zones. Multiple zone controls can be connected together for additional zones of heating. Either single stage or two stage zones can be provided by the control. The 368 is primarily designed for use with the tekmar House Controls. When connected to a House Control, the 368 provides indoor temperature feedback that adjusts the supply water temperature in order to satisfy the zone with the highest heat load. The 368 also coordinates the zoning operation in order to minimize boiler short cycling and allow boiler purging between cycles. The 368 has a built in night setback timer and an Optimum Start / Stop feature that allows the control to reheat the zones before the end of the setback period.

Control Strategy	pg. 2	Testing the Control . . .	pg. 9
Sequence of Operation	pg. 3	Error Messages	pg. 11
Installation	pg. 6	Technical Data	pg. 12
Settings	pg. 8	Limited Warranty	pg. 12

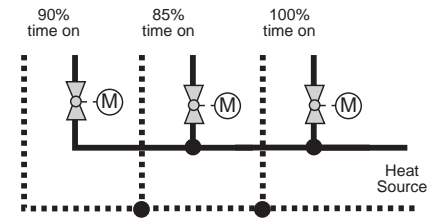


Control Strategy

ZONING OPERATION

In a multiple zone heating system, the zones may have different internal heat gains, heat losses or different temperature settings. Each zone must therefore have individual temperature control. For maximum comfort, the heat should be continuously supplied to the zone at the same rate the zone is losing heat. The most accurate method of accomplishing this is by outdoor reset; however, it is not normally economical to modulate the supply water temperature to every zone.

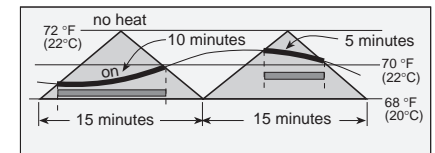
Outdoor reset can be combined with zoning for a more cost effective solution. Through indoor sensors, a zone control can provide indoor temperature feedback to the outdoor reset control. The outdoor reset control will then adjust the supply water temperature to satisfy the zone with the highest water temperature requirement. Heat to the remaining zones will be cycled on and off by the zone control using zone valves or pumps. Since the heat is cycled on and off, accurate PID control logic should be provided to maintain a stable indoor temperature.



PID Zoning Logic

Proportional (P)

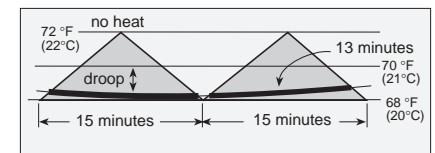
In order to prevent indoor temperature swings, the heat supplied to each zone must be proportional to the heat required by the zone. Proportional control logic can be accomplished by pulse width modulation (PWM). A typical PWM system has a fixed operating cycle. During this operating cycle, the on time of the zone relay is varied based on the difference between the desired zone temperature and the actual zone temperature. As the zone temperature drops, the relay on time increases and as the zone temperature rises, the relay on time decreases.



Integral (I)

Controls that are strictly proportional suffer from a problem of offset. The amount of heat supplied to the zone depends on how far the space temperature is below the desired setpoint. This implies that as the heating load increases, the average room temperature droops. On the coldest day of the year, the most heat is required and therefore the room temperature must be coldest.

In order to overcome this offset, integral control logic is used. Only digital controls can provide integral control logic due to the lengthy response time of buildings. Integral control logic is based on time. The longer the room temperature is below the desired setpoint, the more heat is supplied to the room. With integral control logic, full heat can be supplied to the room on the coldest day of the year without requiring that the room be cold.



Derivative (D)

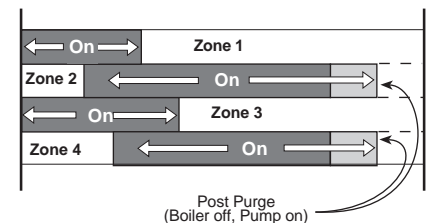
In order to speed up the control's response to quick changes in the heating load, derivative control logic is required. However, sudden room temperature changes, for example from an open door or window, should be ignored by an intelligent control.

P + I + D = PID

If proportional, integral and derivative (PID) control logic are combined, the control is more able to prevent excessive temperature swings and provide a stable room temperature under all conditions. It not only takes into account how much the room temperature has drooped, but also how long there has been a droop and how fast the temperature is changing.

Zone Load Staggering

In a multiple zone system, there can be sudden load changes on the boiler and system due to multiple zones turning on or off. These sudden load changes often lead to boiler short cycling and unnecessary mechanical stresses. The operation of the system can be improved by staggering the starting points of each zone relay within the operating cycle. Staggering of the zones maintains a relatively constant system flow rate which improves boiler operation. Controlled staggering can also minimize boiler running time and improve system efficiency when only a few zones are needed for short periods.



Zone Post Purge

Before the last zone is turned off in a heating cycle, the boiler is turned off but the zone continues to draw heat from the boiler. This post purge of the boiler reduces stand-by losses and reduces overall energy consumption.

UNOCCUPIED (NIGHT SETBACK)

During the night, or at times when people are not within the building, energy can be saved by lowering the building temperature for an UnOccupied (Night Setback) period.

Due to the large thermal mass of buildings, it takes a long time for the indoor space temperature to significantly change whenever the heating system is turned on or off. The building heat up or cool down time is further increased when high mass heating systems are used (e.g. radiant floors). In most cases night setback cannot be used with these systems due to the long recovery time required in the morning. A typical system is demonstrated in the diagram on page 3.

At the start of the night setback period the heat is turned off, but the heat contained within the slab or radiator continues to heat the building and there is a delay before the space temperature begins to drop. At the end of this delay the temperature within the building gradually decreases, and may eventually reach the required UnOccupied temperature after sufficient time has elapsed. Once the setback period is complete, the heat is turned on again but there is a long recovery time required to raise the space temperature to the desired setpoint. The length of the delay and recovery periods changes with outdoor temperature and is different for each zone within the building.

A comfortable setback can be provided if the control “learns” the response time for each zone within the building. Based on the zone’s response time, the control can then calculate an Optimum Stop time and an Optimum Start time. At the Optimum Stop time the control turns off the zone valve or pump in order to overcome the delay period and at the Optimum Start time, the control starts to raise the zone temperature in order to overcome the recovery period. This allows night setback to be used with most heating systems.

Optimum Start / Stop with Water Temperature Boost

When Optimum Start / Stop is combined with Outdoor Reset, the control can boost the water temperature during the recovery period. This provides a faster recovery and allows a longer setback for greater energy savings.

The accuracy of the Optimum Start / Stop routine depends on the feedback available to the control.

Optimum Start / Stop with both Outdoor and Indoor Sensors

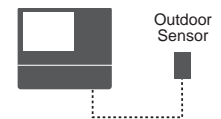
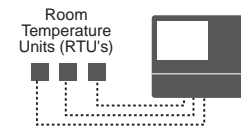
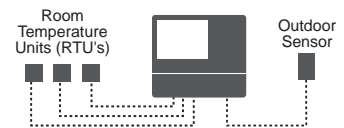
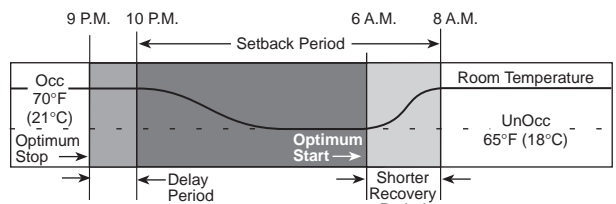
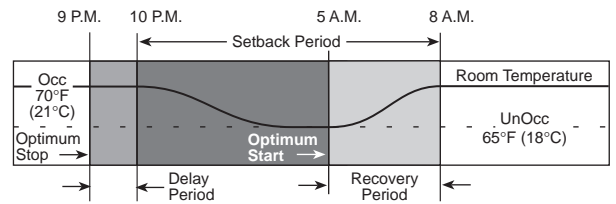
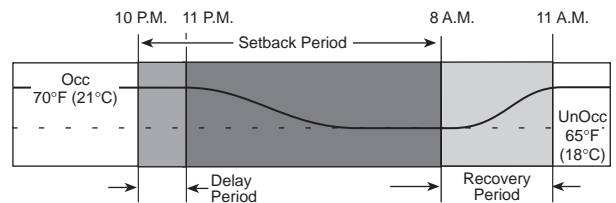
The response time of the building varies with outdoor temperature and is also different for each zone. The most accurate Optimum Start / Stop routine is therefore achieved when both the indoor and outdoor temperatures are monitored during transitions between UnOccupied and Occupied modes.

Optimum Start / Stop with only Indoor Sensors

When only indoor temperature feedback is available, the control must base all Optimum Start / Stop calculations on indoor temperature only. If there are large variations in outdoor temperature, this method cannot provide the same level of accuracy as when both indoor and outdoor sensors are used.

Optimum Start / Stop with only an Outdoor Sensor

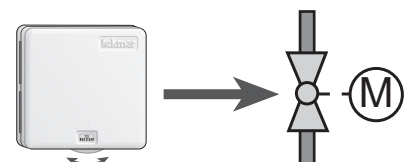
Every building, and often each zone within the building, has a different response time. When only an outdoor sensor is used, the control must assume a particular response time for the entire building. Therefore this is generally the least accurate method of calculating Optimum Start / Stop times.



Sequence of Operation

POWERING UP THE CONTROL

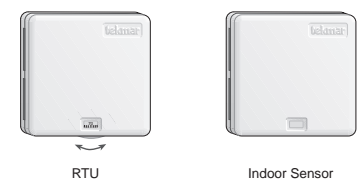
After the Zone Control 368 is powered up, a software version code is displayed for 2 seconds and the red indicator lights are then turned on for 4 seconds. Once the control is powered up, the green *Power* light remains on continuously. For the first fifteen minutes after power up, the *Test* light flashes and the control responds immediately to setting changes. This allows the installer to test the operation of the system. After fifteen minutes, the control enters its normal operating mode in which reactions to setting changes are significantly slower. A slower reaction time allows the control to provide a more stable room temperature.



Only in the first 15 minutes after power up, does the control respond immediately to settings adjustments.

ZONING OPERATION

The 368 can directly control the temperature of up to 4 One Stage heating zones or 2 Two Stage heating zones or a combination of One Stage and Two Stage zones. In order to measure the indoor temperature, each zone requires either an Indoor Sensor or a Room Temperature Unit (RTU). With an RTU the desired zone temperature is set using the RTU dial, but with an Indoor Sensor the desired zone temperature is fixed at 72°F (22°C).



Common Blocks

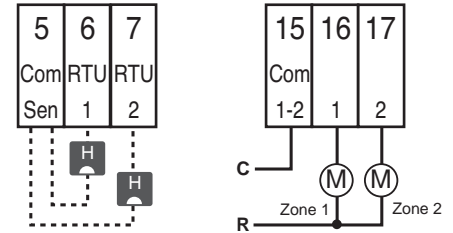
The 368 has 2 common blocks for both the RTU inputs and the relay outputs. Each common block has a terminal starting with *Com* (Eg. *Com Sen* or *Com 1-2*). Each common block can be used for either two One Stage zones or one Two Stage zone.

One Stage Common Blocks

If an RTU is connected to the lowest number in the common block, a One Stage common block is created.

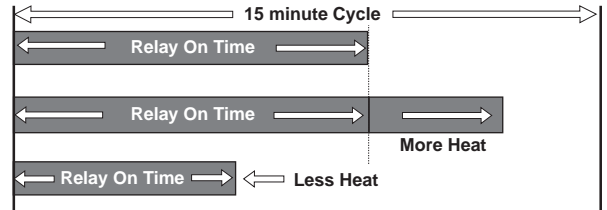
Example An RTU connected between the terminals *Com Sen*— *RTU 1* is used to control the output relay *1*, and an RTU connected between the terminals *Com Sen*— *RTU 2* is used to control the output relay *2*.

Note If only one RTU is used, it must be placed on the lower number in the common block. In the above example this would be *Com Sen* — *RTU 1* controlling output relay *Com 1-2* — *1*.



PID Zoning Logic

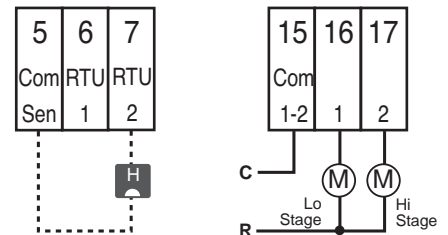
The 368 operation is based on a 15 minute cycle. During each cycle, the control turns on the zone relay for a specific on time. This zone on time is calculated based on the PID response of the zone during the previous 15 minute period. If the zone needs more heat, the on time is increased and if the zone needs less heat, the on time is reduced. In order to prevent short cycling, the 368 ensures that the zone relays remain on or off for at least 3 minutes.



Two Stage Common Blocks

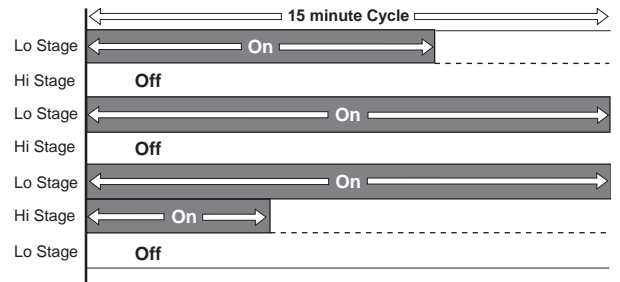
When a single RTU is connected to the highest terminal number in the common block, a Two Stage common block is created. The single RTU therefore controls two output relays: a *Lo stage* relay and a *Hi stage* relay.

Example An RTU connected between the terminals *Com Sen* — *RTU 2* is used to control the output relays *1* and *2*. Relay *1* is the *Lo stage* output relay and relay *2* is the *Hi stage* output relay.



PID Zoning logic

The temperature within each Two Stage zone is controlled by varying the on time of the output relays over a 15 minute period. During light loads, the 368 cycles the *Lo stage* relay on and off. As the load increases, the *Lo stage* relay on time increases until it reaches a maximum of 15 minutes. The *Hi stage* relay is then turned on and its on time is increased as the load increases. When the heating load decreases again, the on time of the *Hi stage* relay is reduced until the *Hi stage* relay is turned off completely. The control then starts to reduce the on time of the *Lo stage* relay.

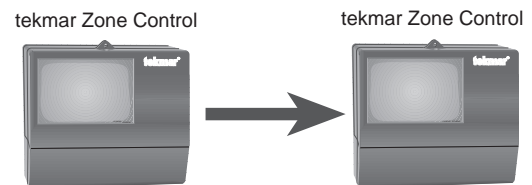


Zone Control Load Staggering and Synchronization

The 368 staggers the operation of the zones in order to achieve a steady load on the boiler while minimizing boiler running time and preventing boiler short cycling. Multiple Zone Controls can be connected together to increase the number of zones. Each of the Zone Controls synchronizes its zone operating cycles based on the *Zo In* input from the other Zone Controls. This results in a more stable system flow rate and improved boiler operation.

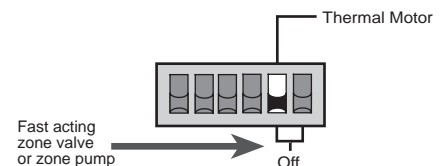
Zone Control Operation with a tekmar House Control

The 368 can communicate with a tekmar House Control in order to provide indoor temperature feedback, turn on the system pump and operate the boiler. When multiple Zone Controls are used, each Zone Control sequentially passes the information to the tekmar House Control. This ensures that the heat requirements of all zones are satisfied. When the 368 is requesting heat from the House Control, the *Heat Required* light is turned on.



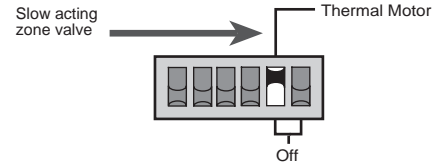
Fast Acting Zone Valves or Zone Pumps

If the *Thermal Motor* DIP switch is set to *Off*, the 368 assumes that fast acting (electric motor) zone valves or zone pumps are connected to the zone relays. The *Heat Required* light is therefore turned on as soon as the first zone relay is turned on. One minute before the last zone relay is turned off, the 368 purges the boiler by signaling to the House Control to turn off the boiler and keep the system pump operating.



Slow Acting Zone Valves with Thermal Motors

When the DIP switch is set to *Thermal Motor*, the 368 assumes that slow acting zone valves with thermal actuating motors are connected to the zone relays. With slow acting zone valves, the 368 allows a 3 minute period for the first zone valve to open before the *Heat Required* light is turned on. The total operating time for the zone relays is also increased by an extra 2 minutes. This helps compensate for the longer opening versus closing time of the slow acting zone valves. Once the last zone relay is turned off, the 368 purges the boiler for one minute by signaling to the House Control to turn off the boiler and keep the system pump operating.



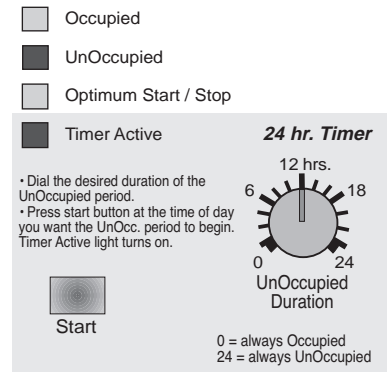
UNOCCUPIED (NIGHT SETBACK)

The 368 can be switched into UnOccupied mode through the built in 24 hr. Timer or by closing an external switch or timer relay wired between the terminals *UnO Sw — Com Sen* (11 & 13) on the control.

24 hr. Timer

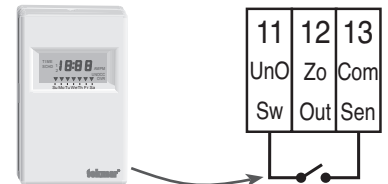
The 368 has a built in 24 hr. Timer which can be used to set a single UnOccupied event during a 24 hour period. The 24 hr. Timer is activated by pushing the *Start* button at the desired starting time for the UnOccupied period. The duration of the UnOccupied period is then set using the *UnOccupied Duration* dial. Once the *Start* button is pushed, the *Timer Active* light is turned on and the 368 enters the UnOccupied mode each day at the same starting time. The 24 hr. Timer can be deactivated by pressing the *Start* button again. A new UnOccupied period starting time can be selected by repeating the above procedure.

Note If an external switch is closed between the terminals *UnO Sw — Com Sen* (11 & 13), the 24 hr. Timer is disabled. An external UnOccupied switch and the 24 hr. Timer should not be used at the same time.



UnOccupied Switch Input

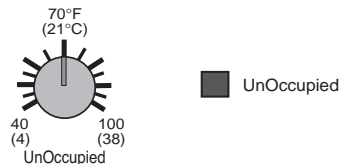
A switch or external timer with a dry relay contact output can be wired between the terminals *UnO Sw — Com Sen* (11 & 13) on the 368. When the switch or relay contact is closed, the 368 registers an UnOccupied signal. A tekmar Timer 031 is available which can be programmed to provide individual UnOccupied schedules for each day of the week with up to two separate UnOccupied events per day. For more information on the Timer 031 see the Data Brochure D 031.



UnOccupied Temperature

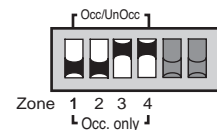
When the 368 is in UnOccupied mode, the *UnOccupied* light is turned on and the *UnOccupied* dial is used to set the desired temperature within the UnOccupied zones.

Note If the RTU dial for an UnOccupied zone is set below the *UnOccupied* dial, the 368 continues to use the RTU dial as the desired temperature within that zone.



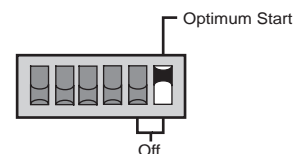
Individual Zone Selection

The DIP switch on the 368 is used to select which zones are switched into UnOccupied mode. If the DIP switch for a specific zone is set to *Occ / UnOcc*, the zone is switched into UnOccupied mode whenever the 368 receives an UnOccupied signal. If the DIP switch for a specific zone is set to *Occ. only*, the zone remains in the Occupied mode at all times.



Optimum Start / Stop

The Optimum Start / Stop feature is enabled when the DIP switch is set to *Optimum Start*. The 368 turns on the *Optimum Start / Stop* light each time the first zone enters its delay or recovery period. Either the tekmar Timer 031 or the built in 24 hr. Timer on the 368 can be used with the Optimum Start / Stop feature. The tekmar Timer 031 has a DIP switch which must be set to *Optimum Start / Stop* in order to synchronize the timer with the 368 Optimum Start / Stop function. For more information on the Timer 031 consult the Data Brochure D 031.



SYSTEM PUMP OPERATION

The *System Pump* light is turned on every time the relay contact between terminals *System Pmp — System Pmp* (1 & 2) is closed. During heating operation, the system pump operates whenever any zone requires heat. If thermal motor zone valves are used, the system pump is held off for the first three minutes of the zone cycle in order to give the zone valve sufficient time to open. The system pump may also operate for an additional purge period once the zone relays are turned off.

Pump / Valve Exercising

The zone valves, zone pumps and system pump are exercised to help prevent corrosion from building up and subsequently jamming the equipment. Every three days the 368 runs through the following exercising procedure.

Exercising Procedure

The 368 first exercises the zone valves or pumps. If a zone valve or zone pump has not been operated in the past 3 days, the 368 turns on the zone relay for 10 seconds.

Note The zone relay exercising time is increased to 3 minutes if the DIP switch is set to *Thermal Motor*.

After the zone valves or pumps have been exercised, the 368 exercises the system pump. If the system pump has not operated in the past 3 days, the 368 turns on the *System Pmp* relay for 10 seconds.

Once the exercising procedure is complete, the 368 returns to its normal operating sequence.

Installation

Caution *Improper installation and operation of this control could result in damage to the 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. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit.*

STEP ONE — GETTING READY

Check the contents of this package. If any of the contents listed are missing or damaged, please contact your wholesaler or tekmar sales representative for assistance.

Type 368 includes:

- One Zone Control 368
- Data Brochures D 368, D 001
- Application Brochures A 368

Other information available:

- Essays

Note *Carefully read the details of the Sequence of Operation sections in all applicable brochures to ensure that you have chosen the proper control for your application.*

STEP TWO — MOUNTING THE BASE

Remove the control from its base by pressing down on the release clip in the wiring chamber and sliding the control upwards. 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. The base has standard 7/8" (22 mm) knockouts which accept common wiring hardware and conduit fittings. Before removing the knockouts, check the wiring diagram and select those sections of the chamber with common voltages. Do not allow the wiring to cross between sections as the wires will interfere with safety dividers which should be installed at a later time.

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

- If a 10K Indoor Sensor is used for any zone, install the Indoor Sensor(s) according to the instructions in the Data Brochure 074 and run the wiring back to the control.
- If a 10K RTU is used, install the RTU(s) according to the installation instructions provided in the Data Brochure D 054 and run the wiring back to the control.
- If multiple Zone Controls are used, run two wires from one Zone Control to the next to create a chain.
- Run wires from the 120 V (ac) power to the control. *Use a clean power source to ensure proper operation.* Multi-strand 16 AWG wire is recommended for all 120 V (ac) wiring due to its superior flexibility and ease of installation into the terminals.
- Run wires from the system pump and from each zone valve / pump to the control.

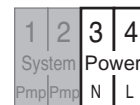
STEP FOUR — ELECTRICAL CONNECTIONS TO THE CONTROL

The installer should test to confirm that no voltage is present at any of the wires. Push the control into the base and slide it down until it snaps in firmly.

Powered Input Connections

120 V (ac) Power

Connect the 120 V (ac) power supply to terminals *Power N — L* (3 and 4).



Sensor and Unpowered Input Connections

Do not apply power to these terminals as this will damage the control.

Zone Control Input and Output

Connect a wire between the *Com Sen* (13) terminals on each 368. Connect the *Zo Out* (12) terminal on the first 368 to the *Zo In* (14) terminal on the second 368. With several Zone Controls, connect the *Zo Out* (12) terminal on the second 368 to the *Zo In* (14) terminal on the third 368 and continue this process for each additional 368. The *Zo Out*



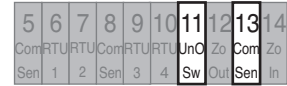
(12) terminal on the last 368 in the chain can be connected to the *Zo In* terminal on a tekmar reset control.

Note The wires from the Zone Control are polarity sensitive. The system will not operate if the wires are reversed.

UnOccupied Switch

If an external timer or switch is used, connect the two wires from the external dry contact switch to the *UnO Sw — Com Sen* (11 and 13) terminals. When these terminals short together, the control registers an UnOccupied signal.

Note If an external switch is closed between the terminals *UnO Sw — Com Sen* (11 and 13), the 24 hr. Timer is disabled and the Optimum Start / Stop information is lost. It is recommended that either the 24 hr. Timer or an external timer / switch is used, not both at the same time.



One Stage RTU and Indoor Sensor Connections

RTUs and Indoor Sensors provide indoor temperature feedback to the control.

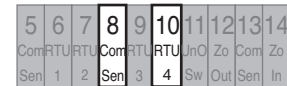
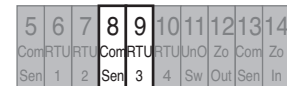
Common block for RTU 1 and RTU 2

- If the common block is used for a single One Stage heating zone, connect the RTU or Indoor Sensor to terminals *Com Sen — RTU 1* (5 and 6).
- If the common block is used for 2 One Stage heating zones, connect one RTU or Indoor Sensor to the *Com Sen — RTU 1* (5 and 6) terminals and connect the other RTU or Indoor Sensor to the *Com Sen — RTU 2* (5 and 7) terminals.



Common block for RTU 3 and RTU 4

- If the common block is used for a single One Stage heating zone, connect the RTU or Indoor Sensor to terminals *Com Sen — RTU 3* (8 and 9).
- If the common block is used for 2 One Stage heating zones, connect one RTU to the *Com Sen — RTU 3* (8 and 9) terminals and connect the other RTU to the *Com Sen — RTU 4* (8 and 10) terminals.



Two Stage RTU and Indoor Sensor Connections

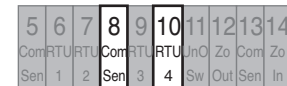
Common Block for RTU 1 and RTU 2

- If the common block is used for a Two Stage heating zone, connect the RTU or Indoor Sensor to terminals *Com Sen — RTU 2* (5 and 7).



Common Block for RTU 3 and RTU 4

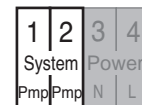
- If the common block is used for a Two Stage heating zone, connect the RTU or Indoor Sensor to terminals *Com Sen — RTU 4* (8 and 10).



Output Connections

System Pump

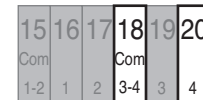
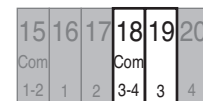
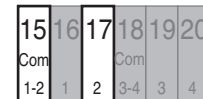
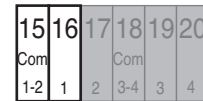
Connect the live (L) side of the 120 V (ac) pump circuit through the *System Pmp — System Pmp* (1 and 2) terminals. The control closes a dry relay contact between these terminals when operation of the system pump is required.



Zone Pumps and Valves

Note Do not connect a zone pump and zone valve circuit to the same *Com* terminal.

- If relay 1 is used, connect the zone pump or zone valve circuit to the *Com 1-2 — 1* (15 and 16) terminals on the control.
- If relay 2 is used, connect the zone pump or zone valve circuit to the *Com 1-2 — 2* (15 and 17) terminals on the control.
- If relay 3 is used, connect the zone pump or zone valve circuit to the *Com 3-4 — 3* (18 and 19) terminals on the control.
- If relay 4 is used, connect the zone pump or zone valve circuit to the *Com 3-4 — 4* (18 and 20) terminals on the control.



STEP FIVE TESTING THE WIRING

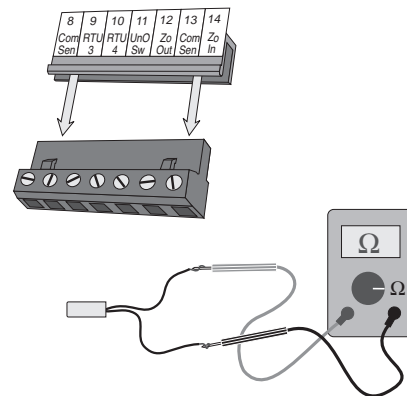
Each terminal block must be unplugged from its header on the control before power is applied for testing. Pull straight down to unplug the terminal block.

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

A good quality electrical test meter, capable of reading from at least 0 — 200 V (ac) and at least 0 — 2,000,000 Ohms, is essential to properly test the wiring and sensors.

Test the Sensors

In order to test the sensors and Room Temperature Units (RTUs), the actual temperature at each sensor and RTU location must be measured. A good quality digital thermometer with a surface temperature probe is recommended for ease of use and accuracy of testing. Where a digital thermometer is not available, a spare sensor can be strapped alongside the one to be tested and the readings compared. Test the sensors and RTU(s) according to the instructions in the Data Brochures D 070, D 074 and D 054.



Test the Power Supply

Make sure exposed wires or bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power N — L* (3 and 4) terminals using an AC voltmeter. The reading should be between 110 and 130 V (ac).

Test the Outputs

System Pump

If a system pump is connected to the *System Pmp — System Pmp* (1 and 2) terminals, make sure power to the terminal block is off and install a jumper between the terminals. When the system pump circuit is powered up, the system pump should start. If the pump does not turn on, check the wiring between the terminal block and the pump and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the jumper.

Zone Pump or Valve

- If a zone pump or valve is connected to the terminals *Com 1-2 — 1* (15 and 16), make sure power to the pump or valve circuit is off and install a jumper between the terminals *Com 1-2 — 1* (15 and 16). When the zone circuit is powered up, the zone pump should turn on or the zone valve should open completely. If this does not occur, check the wiring between the terminal and the pump or valve and refer to any installation or troubleshooting information supplied by the manufacturer.
- If a zone pump or valve is connected to the terminals *Com 1-2 — 2* (15 and 17), follow a similar procedure as described above for the zone 1 relay.
- If a zone pump or valve is connected to the terminals *Com 3-4 — 3* (18 and 19), follow a similar procedure as described above for the zone 1 relay.
- If a zone pump or valve is connected to the terminals *Com 3-4 — 4* (18 and 20), follow a similar procedure as described above for the zone 1 relay.

Connect the Control

- Make sure all power to the devices and terminal blocks is turned off and remove any remaining jumpers from the terminals.
- Reconnect the terminal blocks to the control by carefully aligning them with their respective headers on the control and then pushing the terminal blocks into the headers. The terminal blocks should snap firmly into place.
- Install the supplied safety dividers between the unpowered sensor inputs and the powered 120 V (ac) or 24V (ac) wiring chambers.
- Do not apply power to the control until the adjustment dials and DIP switches are properly set for your application. See the Settings section of this brochure for details on how to set the dials and DIP switches.
- Once the settings are complete, apply power to the control. The operation of the control on power up is described in the Sequence of Operation section of this brochure.

Settings

Before adjusting the dial settings, read through the sequence of operation section of this brochure to ensure that you understand how the control operates.

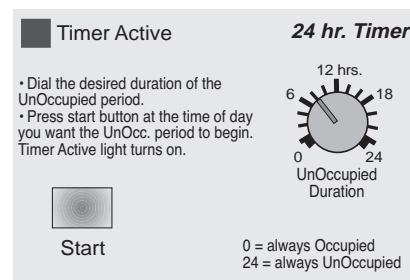
STEP SIX ESSENTIAL CONTROL SETTINGS

UnOccupied

The *UnOccupied* dial is used to set the desired temperature in selected zones during the UnOccupied period.

Using the Internal 24 hr. Timer

First determine the length of time required for the UnOccupied period and turn the *UnOccupied Duration* dial to the desired duration length. If the dial is set to 24 hours, the 368 remains in UnOccupied mode continuously. If the dial is set to 0 hours, the 368 remains in Occupied mode continuously.



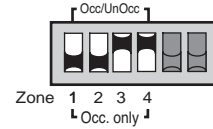
Press the *Start* button at the desired starting time for the UnOccupied period. Once the *Start* button is pressed, the 368 enters the UnOccupied period at the same starting time each day.

Example The user wants an UnOccupied period starting at 10 pm and ending at 6 am. The *Unoccupied Duration* dial is set to 8 hours and the *Start* button is pushed at 10 pm. Once the *Start* button is pushed, the control goes into UnOccupied mode from 10 pm until 6 am the next morning. This cycle is repeated 7 days a week.

DIP Switch Settings

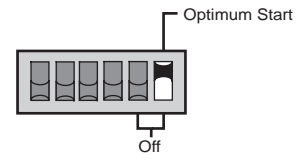
Occ / UnOcc — Occ. Only

Each zone can be selected to operate in either Occupied only mode or both Occupied and UnOccupied modes. If the DIP switch is set to *Zone 1 Occ. only*, the zone connected to relay 1 remains in Occupied mode at all times. If the DIP switch is set to *Zone 1 Occ / UnOcc*, zone 1 is switched into UnOccupied mode each time the 368 receives an UnOccupied signal. Zones 2, 3, and 4 are set in a similar manner to that described above for zone 1. If Two Stage zones are used, the DIP switches for both output relays should be set to the same position.



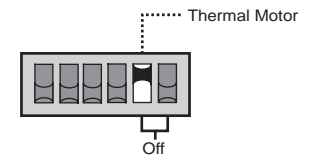
Optimum Start

The Optimum Start / Stop feature is used during transitions between the UnOccupied mode (Night Setback) and the Occupied mode. When the DIP switch is set to *Optimum Start*, the 368 raises the building temperature during the final stages of the UnOccupied period. This helps ensure the building is at the Occupied temperature as soon as the Occupied period begins. If the *Optimum Start* DIP switch is set to *Off*, the 368 does not start raising the building temperature until the UnOccupied period ends. More information on the Optimum Start feature is provided on page 3 of this brochure.



Thermal Motor

Zone valves with thermal actuating motors have long opening and closing times. In order for the 368 to compensate for these longer times, the DIP switch should be set to *Thermal Motor*. If fast acting electric motor zone valves or zone pumps are used, the DIP switch must be set to *Off*.



Testing the Control Functions

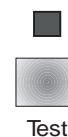
STEP SEVEN — OPERATIONAL TEST OF CONTROL FUNCTIONS

The Zone Control 368 has a test routine which is used to test the main control functions. The 368 continually checks the sensors and displays an error message whenever a fault is found. See page 11 for the list of error messages. When the *Test* button is pushed, the *Test* light is turned on. The *Heat Required*, and *Optimum Start/ Stop* lights are turned off and the individual outputs and relays are tested in the following test sequence.

Test Sequence

Each step in the test sequence lasts 10 seconds. At the end of each step, the device continues to operate until it is turned off in a later step.

During the test routine, the test sequence can be paused by pressing the *Test* button. The test sequence remains paused at that point for up to 5 minutes. If the *Test* button is not pressed again while the test sequence is paused, the control exits the entire test routine. Once the test sequence is paused, the *Test* button can be pressed again to skip to the next step. This can also be used to rapidly skip through the test sequence. To reach the desired step, repeatedly press and release the *Test* button until the appropriate device and indicator light turn on.

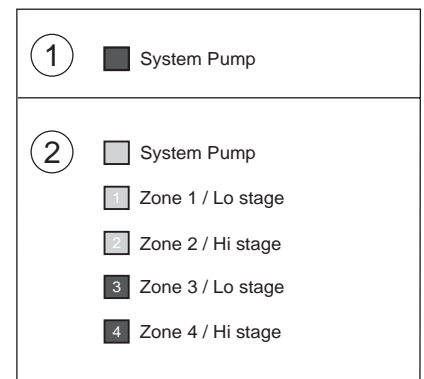


Step 1 - The *System Pump* relay is turned on.

Step 2 - If the *Com 3-4* common block is used for a single One Stage zone, the control turns on relay 3 for 10 seconds.

- If the *Com 3-4* common block is used for two One Stage zones, the control turns on relay 4 for 10 seconds and then turns off relay 4 and turns on relay 3 for 10 seconds.
- If the *Com 3-4* common block is used for a Two Stage zone, the control turns on relay 3 and then, after 10 seconds, turns on relay 4 as well.
- If an RTU is not connected to *RTU 3* or *RTU 4*, the control skips this step.

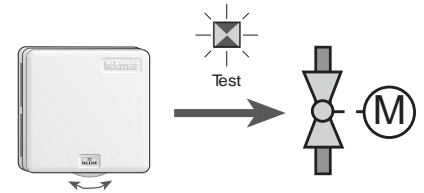
Step 3 - The control tests relays 1 and 2 using the procedure described in Step 2.



Step 4 - After the test sequence is complete, the *Test* light begins flashing and the control enters a fast mode of operation. During this time, the control is more responsive to setting adjustments. If the dial on an RTU is turned up, the on time of the zone relay increases immediately. After fifteen minutes, the control reverts back to normal operating conditions and the on times are based on the average temperature during the previous 15 minute cycle.

Manual Test

While the control is in the fast mode of operation and the *Test* light is flashing, check that each RTU operates the proper zone valve or zone pump. Turn up the *RTU* dial to turn the zone on, turn the dial down to turn the zone off. If an Indoor Sensor is used, a cold spray to the sensor will turn the zone on.



Adjusting RTU settings provides an immediate response for the first 15 minutes only.

Indicator Lights "On"

<i>Power</i>	<ul style="list-style-type: none"> • 120 V (ac) power is applied to the control and the control is energized.
<i>Heat Required</i>	<ul style="list-style-type: none"> • The 368 is sending a heat required signal to a tekmar reset control. At least one of the heating zones requires heat.
<i>System Pump</i>	<ul style="list-style-type: none"> • The relay contact between <i>System Pmp</i>—<i>System Pmp</i> (1 and 2) is closed and the System Pump should be turned on.
<i>Zone 1 / Lo Stage</i>	<ul style="list-style-type: none"> • The relay contact between <i>Com 1-2</i>— 1 (15 and 16) is closed and the device connected to this relay should be turned on.
<i>Zone 2 / Hi Stage</i>	<ul style="list-style-type: none"> • The relay contact between <i>Com 1-2</i>— 2 (15 and 17) is closed and the device connected to this relay should be turned on.
<i>Zone 3 / Lo Stage</i>	<ul style="list-style-type: none"> • The relay contact between <i>Com 3-4</i>— 3 (18 and 19) is closed and the device connected to this relay should be turned on.
<i>Zone 4 / Hi Stage</i>	<ul style="list-style-type: none"> • The relay contact between <i>Com 3-4</i>— 4 (18 and 20) is closed and the device connected to this relay should be turned on.
<i>Test</i>	<ul style="list-style-type: none"> • The control is proceeding through the programmed test sequence.
<i>Occupied</i>	<ul style="list-style-type: none"> • The control is in Occupied mode.
<i>UnOccupied</i>	<ul style="list-style-type: none"> • The control is in UnOccupied (Night Setback) mode.
<i>Optimum Start / Stop</i>	<ul style="list-style-type: none"> • The control is warming the building up during the final stages of the UnOccupied period, or the heating system is turned off during the final stages of the Occupied period.
<i>Timer Active</i>	<ul style="list-style-type: none"> • The timer is set to enter the UnOccupied mode every 24 hours at the time of day the <i>Start</i> button was pressed.

STEP EIGHT TROUBLESHOOTING

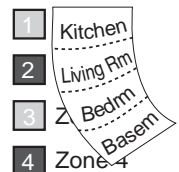
As in any troubleshooting procedure, it is important to isolate a problem as much as possible before proceeding. The Error Messages and *Test* button greatly simplify troubleshooting of the 368. When the control is flashing an error message, identify the fault from the look-up table on page 11 and follow standard testing procedures to confirm the problem. If you suspect a wiring fault, return to steps three, four and five, and carefully check all external wiring and wiring connections.

Sensor and Internal Faults

- If an RTU / Indoor Sensor fault occurs or an external Zone Control input *Zo - in* short circuits, the 368 operates as if that RTU or Zone Control is not connected. An error message is displayed.
- If an internal control fault occurs, the 368 displays an error message. Press the *Test* button to clear the error message. If the error message remains, the control must be returned for repair.

STEP NINE BEFORE YOU LEAVE





























































- Make sure the wiring safety dividers are installed in their proper locations between compartments with different voltages.
- 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 and snap it into place. Install a lock if security is required.
- A sticker has been provided with the control. It is designed to be placed over the Zone 1 ... Zone 4 words so that the zone names can be written onto the control.
- Place this brochure, and all other brochures relating to the installation, in the protective plastic bag supplied with the control.
- Place the bag in a conspicuous location near the control for future reference.
- It is important to explain the operation of the control to the end user and to anyone else who may be operating the system.



Error Messages

Whenever a fault is detected in any of the sensors and / or room temperature units (RTUs), the indicator lights will flash in specific ways, to indicate the location of the problem. For detailed Sensor and RTU testing instructions see Data Brochures D 070, D 074 and D 054.

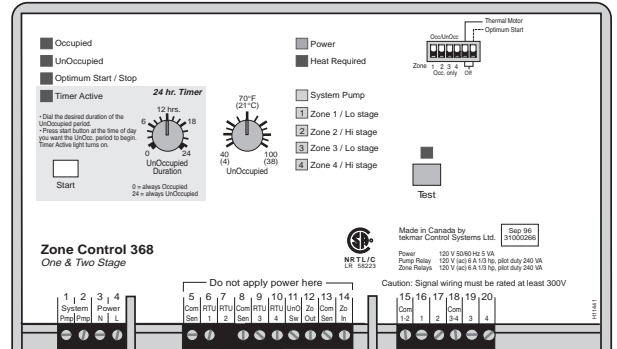
 Light on continually
  Light flashing
  Light off

<p>RTU 1 short circuit</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>RTU 2 short circuit</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>RTU 3 short circuit</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>RTU 4 short circuit</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required
<p>RTU 1 Temperature sensor open</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>RTU 2 Temperature sensor open</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>RTU 3 Temperature sensor open</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>RTU 4 Temperature sensor open</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required
<p>Internal fault</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 	<p>Zo — in short circuit</p> <ul style="list-style-type: none">  Occupied  UnOccupied  Optimum Start / Stop  Timer Active  Power  Heat Required 		

Technical Data

Zone Control 368 One & Two Stage

Literature	— A 000, A 368's, D 368, D 001, D 054, D 070, D 074
Control	— Microprocessor PID control; This is not a safety (limit) control .
Packaged weight	— 2.9 lb. (1300 g), Enclosure A, 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 NRTL / C, meets ICES & FCC regulations for EMI/RFI.
Ambient conditions	— Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
Power supply	— 120 V ±10% 50/60 Hz 5 VA
Pump relay	— 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
Zone relays	— 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
Maximum linkage	— Up to 6 Zone Controls can be linked to a tekmar reset control.
Sensors	— NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
included:	None.
required:	RTU 054, RTU 055 or 10k Indoor Sensor for each active zone. (Order separately)
Timer	— 24 hour, 1 event / day, 3 minute backup
UnOcc. Duration	— 0 to 24 hours
Unoccupied	— 40 to 100°F (4 to 38°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 can be 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. Please read and understand the conditions appearing herein.

tekmar warrants each tekmar product against defects in workmanship and materials, when 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, but in any event the warranty period shall not extend beyond thirty-six (36) months from the production date. During the warranty period, tekmar will, at its discretion, either repair at no charge, exchange or give credit for the defective product, provided the product is returned to tekmar.

The liability of tekmar shall be limited to the cost of parts and labour provided by tekmar to correct defects in materials and / or work-manship 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 product, at tekmar's discretion, and such repair, exchange or credit shall be deemed to be the sole remedy available from tekmar. This warranty does not cover the cost of the parts or labour to remove or to 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 accident, abuse, misuse, negligence, fire, Act of God, 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 the local codes and ordinances, or if due to defective installation of the product.

The warranty applicable to a product is as set out in the statement of warranty policy (the "Warranty") above, receipt of which is hereby acknowledged. The liability of tekmar is limited to those obligations identified in the warranty as obligations of tekmar. The warranty is understood to be in substitution for any loss, costs or damages for which tekmar might otherwise be liable at law or in equity and in particular, in lieu of any liability for fundamental breach of contract.

tekmar disclaims any responsibility for losses, expenses, inconveniences, or any special, indirect, secondary, incidental or consequential damages arising from ownership or use of any items subject to any claim hereunder, regardless of whether such claim is stated in contract, tort or strict product liability.

This warranty is in lieu of all other warranties, express or implied, 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. No implied warranties shall extend beyond twenty-four (24) months from the production date.

Some states or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state or province to province.

Product Return Procedures 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.



tekmar Control Systems Ltd., Canada
tekmar Control Systems, Inc., U.S.A.
Head Office: 4611 - 23rd Street
Vernon, B.C. Canada V1T 4K7
Tel. (604) 545-7749 Fax. (604) 545-0650
October 19, 1996 new area code will be 250.

