IntelliZone™
Comfort Zoning System
Four Zone Capability

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System Application & Design
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The IntelliZone Comfort Zoning System is a residential and/or commercial zone control system which works with Envision™, Synergy3D, Envision™ Air Handler, PREMIER™ and E Series units (up to 6 tons) or other compatible systems to space condition up to four zones. Each zone is controlled by its own space thermostat and damper motor(s) using a maximum 1-inch W.G. inlet static pressure at zone dampers. The IntelliZone monitors the thermostats, puts the system in the proper mode of operation, and energizes the correct number of stages of heating or cooling and airflow.

The IntelliZone was designed to solve problems that are inherent with the concept of HVAC zoning by: 1) eliminating the bypass damper; 2) applying the ECM2 blower motor to zoning; 3) using "Multiple Level" zone calls (Heating 0-3, Cooling 0-2), allowing the controller to better estimate the demand of each zone and thus condition space most efficiently; and 4) designing a high value control which is both easy to install and service. The IntelliZone System is a perfect match to Envision™, Synergy3D, Envision™ Air Handler, Premier and E Series geothermal systems, extending comfort and energy savings farther than ever before.

WaterFurnace International’s corporate headquarters and manufacturing facility is located in Fort Wayne, IN. A scenic three-acre pond located in front of the building serves as our geothermal heating and cooling source to comfort-condition our 110,000 square feet of manufacturing and office space. As a pioneer, and now a leader in the industry, the team of WaterFurnace engineers, customer support staff and skilled assembly technicians is dedicated to providing the finest comfort systems available.

By choosing or specifying WaterFurnace IntelliZone™ Series products, you can be assured that your customer is investing in an exceptional comfort system and peace of mind for many years to come.
Introduction

Zoning is a method of ensuring that all areas of a home or building receive the right amount of heating or cooling. Zoning allows the occupant to independently control the temperature in each area of the building. If desired, all areas can be adjusted for occupancy patterns and uses.

Zoning is particularly useful where normal heat distribution patterns result in uneven temperature control. For example, a building that is partly below grade can use zoning to eliminate uneven temperature control between the basement and the rest of the building. Large buildings that might have long, unequal length duct runs can use zoning to equalize the delivery of conditioned air. Buildings with many large windows can use zoning to compensate for solar heat gain and radiation losses at night.

Along with providing comfort, zoning can provide energy savings by keeping various zones at desired set points without over-cooling or overheating. In effect, zoning mandates that the heating/cooling system condition only the portions (or zones) of the building which need to be conditioned. This translates into shorter compressor run times and ultimately lower space conditioning bills.

Flexibility in Zone Comfort Control

The IntelliZone allows the selection of either comfort or economy mode in each individual zone to provide maximum savings in areas that allow it (such as workshops and basements), while maintaining perfect comfort in the zones where accurate temperature is most desired (such as bedrooms and baths).

Comfort Mode

A single zone call (Y1) for conditioning will engage the compressor and allow a minimal set point variation, thus providing ultimate comfort.

Economy Mode

A single zone call (Y1) for conditioning will be ignored by the IntelliZone until either a Y2 call is initiated from the same zone or another zone calls for conditioning (Y1). This allows a slightly greater set point variation than in comfort mode. This setting prevents less important zones from energizing the compressor unless it is really needed, thus saving money. As a bonus in this mode, upon a Y1 call, the IntelliZone may try to precondition the zone with return air from other zones already satisfied and, in some cases, can preclude the need for energizing the compressor.

Flexibility in System Staging

The IntelliZone System allows four different staging options. Once the compressor call has been initiated by a zone, the compressor will be upstaged using one of four staging options:

Normal

This “as shipped” mode will upstage the blower and compressor normally.

Quicker

This mode will upstage the blower, compressor and auxiliary electric heat more expeditiously than “normal” mode for increased comfort.

Faster

When heating, this mode will upstage the blower and auxiliary electric heat slightly faster than “quicker” mode. Cooling operation same as “quicker” mode.

Faster with Timer

This mode allows for a timed element in compressor and electric heat upstaging in 45% and 70% zones for situations in which normal staging is inadequate when heating. This staging position should be reserved for the most demanding and aggressive situations. If the heat pump is already operating in the first stage, activate second stage after a 15-minute continuous Y3 zone call from a 45% or 70% zone until the zone call is reduced to a Y2. Airflow will be increased to speed tap 3 or 4 during this period. If the heat pump is already operating in second stage, activate third stage after a 15-minute continuous Y3 zone call from a 45% or 70% zone until the zone call is reduced to a Y2. Airflow will be increased to speed tap 5 during this period. Cooling operation remains the same as “quicker” mode.

Eliminating Bypass Damper

By utilizing the full functionality of the ECM2 blower motor, the bypass damper can be eliminated from the zone system. In effect, the ECM2 replaces the bypass damper.

In conventional systems, the air handling device can deliver airflow only at one or two levels, which means a significant amount of excess air must be “bypassed” to the return. By looking at which zones are calling, the IntelliZone determines the most efficient compressor and fan speeds. Since the IntelliZone, with its five speeds on-line at all times, has the ability to deliver the correct amount of airflow that the structure is calling for, there is no need for bypass.

When utilized properly, the ECM2 motor will provide precise airflow control for a given space. In the Premier IntelliZone System, the ECM2 motor is controlled directly from the IntelliZone microprocessor control board.

The ECM2 will operate on up to five pre-configured airflow levels depending on the load requirements of the house. If the IntelliZone is controlling a dual-capacity unit, there will be two airflow levels for low-speed compressor operation and two airflow levels for high-speed compres-
Introduction (cont.)

If the IntelliZone is controlling a Premier or E Series single-speed unit, there will be one airflow level for Y1 operation and two airflow levels for Y2 operation. By varying the airflow level per the needed output capacity of the heat pump, bypass is eliminated and the correct amount of air is delivered to the house.

A fifth pre-configured airflow level will determine the airflow during ventilation (continuous fan) periods. In dehumidification mode, all airflow levels are reduced by one-speed in cooling.

Efficient Space Conditioning

Traditional zone control systems control single-speed compressors and single-speed blowers and typically use single heating and cooling calls to determine space conditioning needs. By operating at only one capacity level, these traditional systems are seriously handicapped in their ability to handle the varying load of the structure.

The IntelliZone control system controls the dual-capacity compressor as well as the ECM2 variable-speed fan, coupling this variable capacity equipment with multiple level zone calls allows the IntelliZone to exactly match the demands of the space.

One of the goals of the IntelliZone system is to minimize compressor and fan operation by operating at the lowest, most efficient speed possible. The IntelliZone makes logic decisions which minimize compressor run-times and help decrease energy cost. For example: If one or more zones have Y1 demand calls, the thermostat has determined that the particular zones need conditioning, but the demand is at a low level. The IntelliZone control algorithm will take these low level calls and determine that low-speed compressor with the proper airflow will satisfy the zone calls. Thus, the system operates in low speed most of the time and intelligently provides cost-efficient space conditioning control.

Many times, as in any structure, the space conditioning peak load for each zone can happen at a different time throughout the day. This may be due to sun, wind, or even the zone use. This diversity can sometimes allow slightly smaller capacity equipment to condition one zone during its morning peak and then condition another during its afternoon peak, whereas an unzoned structure would have to be sized with larger capacity equipment to condition both areas at once.

The above illustration is representational and is not intended as a guide for IntelliZone system installation.
**Design Features**

**Diagnostic LEDs**

With traditional zone control systems, the installer typically has a difficult time determining the status of the inputs and outputs of the zone control board. The IntelliZone System employs an LED for each input and output. With just a glance, the installer is able to quickly determine what inputs the IntelliZone is receiving and what outputs the IntelliZone is sending to the unit.

**Application Flexibility**

- Multiple level zone calls communicate exact zone load requirements for intelligent equipment control.
- Controls up to four zones with dual-capacity compressor (two zones with single-speed compressor).
- Direct control of ECM2 fan motor to match needs of the space. Five fan speeds are available at all times.
- Zone size as small as 25% of whole house (dual-capacity compressor).
- Individual zone-selectable economy or comfort modes.
- Four upstaging options (normal, quicker, faster and faster with timer) to allow a wide range of comfort and energy consumption solutions.
- Dehumidification mode lowers airflow in cooling for better dehumidification.
- Simple, reliable thermostat operation; simple programming for the homeowner.
- Individual zone-selectable continuous or intermittent fan.
- Smart algorithm serves simultaneous heating and cooling demands.
- Reduces fan power consumption.

**Installation and Service Advantages**

- Bypass damper not needed (minimal oversizing of ductwork may be desired).
- All low voltage wiring (24VAC).
- Central mode control for temporary conditioning of the whole house using one thermostat.
- Low cost electronic or programmable zone thermostats.
- Three-wire or two-wire damper actuators for maximum performance and reliability.
- Transformer with integrally mounted circuit breaker.
- LED indicators (input, damper operation, fan speed and unit output) at each zone for easy diagnostics.
Description of Operation

IntelliZone Operation

Upon a call (or calls) from the zones, the IntelliZone "weighs" each zone based upon two components: 1) the level of call (Y1, Y2, Y3) coming from the zone; and 2) the size of the zone (zone % DIP switch selected). This gives a very accurate picture of not only overall heating or cooling requirements (as in other control methods), but also how much heating or cooling is really required for each separate zone.

This, in turn, defines how much compressor (1st or 2nd stage), fan (speeds 2 thru 5), and auxiliary heat should be engaged for each particular situation. The result is a system that utilizes lower compressor and fan speeds more often for improved comfort and energy savings, while relying upon auxiliary heat less often for more energy savings than non-zoned systems.

Heating, Unit 1st stage

Operation as stated above with separate zone call levels of Y1, Y2, and W being translated into unit call 1st stage (Y1). Fan speeds allowed are 2 and 3.

Heating, Unit 2nd stage

Operation as stated above with separate zone call levels of Y1, Y2, and W being translated into unit call 2nd stage (Y1, Y2). Fan speeds allowed are 4 and 5.

Heating, Unit 3rd stage

Operation as stated above with separate zone call levels of Y1, Y2, and W being translated into unit call 3rd stage (Y1, Y2, W). Only fan speed 5 is allowed.

Cooling, Unit 1st stage

Operation as stated above with separate zone call levels of Y1, Y2, and O being translated into unit call 1st stage (Y1, O). Fan speeds allowed are 2 and 3. In dehumidification mode, the allowed fan speeds are 1 and 2.

Cooling, Unit 2nd stage

Operation as stated above with separate zone call levels of Y1, Y2, and O being translated into unit call 2nd stage (Y1, Y2, O). Fan speeds allowed are 4 and 5. In dehumidification mode the allowed fan speeds are 3 and 4.

Emergency Heat

Emergency heat mode may be engaged by depressing the Emerg/Reset switch on the IntelliZone control board (SW7) until the fault LED (located immediately below the switch), as well as all zone thermostat fault LEDs, stop flashing, indicating emergency heat mode has been deactivated and normal IntelliZone operation may resume.

Continuous Fan

The unit's fan will be operated on fan speed 1 (G-LED) while heating or cooling is suspended for any zone(s) selected for continuous fan operation at the zone thermostat. Upon any heating or cooling call to the unit, all continuous fan operation ceases.

Lockout Mode

The heat pump microprocessor control must be configured for continuous 'L' signal (SW2-8 ON) for faults to be displayed at the thermostats.

During the lockout mode, the appropriate unit LEDs will be illuminated along with the fault LED on each zone thermostat and the fault LED located on the IntelliZone control board. Unless the lockout is caused by an ECM2 low RPM fault, the fan will continue to operate on fan speed 1. If the collective zones translate into a > 24% heating call, emergency heat operation will occur and all zone dampers will open. Fan speed will be 5.

All unit lockout conditions will be observed by the IntelliZone control with the exception of:

Fan RPM

The IntelliZone monitors fan RPM to sense if the fan is not operating. This lockout mode occurs if the fan RPM falls below the low RPM limit (100 RPM) for 30 continuous seconds. The unit must be in the No RPM mode (SW3-3) since the IntelliZone is now controlling and monitoring the ECM2 fan motor instead of the unit. This lockout is indicated by a fast flash of the fault LEDs on the zone thermostats and the IntelliZone control board.

Fan Speed

<table>
<thead>
<tr>
<th>Output Signal</th>
<th>SW6-4 Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal Mode</td>
</tr>
<tr>
<td>Heating</td>
<td></td>
</tr>
<tr>
<td>Y1, G</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Y1, Y2, G</td>
<td>4 or 5</td>
</tr>
<tr>
<td>Y1, Y2, W, G</td>
<td>5</td>
</tr>
<tr>
<td>W, G</td>
<td>5</td>
</tr>
<tr>
<td>Cooling</td>
<td></td>
</tr>
<tr>
<td>Y1, O, G</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Y1, Y2, O, G</td>
<td>4 or 5</td>
</tr>
<tr>
<td>Continuous Fan</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: When only the 'G' LEDs illuminate, fan speed 1 is active.
# Blower Data

## Premier and E Series Single-Speed Blower

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MAX ESP</th>
<th>AIRFLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>E035, P034</td>
<td>0.50</td>
<td>600 700 800 900 1000 1100 1200 1300</td>
</tr>
<tr>
<td>E040, P040</td>
<td>0.50</td>
<td>650 750 850 950 1050 1150 1250 1350</td>
</tr>
<tr>
<td>E047, P046</td>
<td>0.50</td>
<td>650 750 850 950 1050 1150 1250 1350</td>
</tr>
<tr>
<td>E040, P046 w/1hp*</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
<tr>
<td>E047, P046 w/1hp*</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
<tr>
<td>E058, P056</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
<tr>
<td>E066, P066</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
</tbody>
</table>

**Notes:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. Factory 1 setting is minimum allowed for cooling. Settings 2-5 must be located within boldface CFM range. CFM is controlled within ±5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter. Highest 5 DIP switch settings are assumed to be 1, 2, 3, 4, and 5.* With optional one horsepower fan motor.

## E Series Dual Capacity Blower

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MAX ESP</th>
<th>AIRFLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>E036</td>
<td>0.50</td>
<td>600 700 800 900 1000 1100 1200 1300</td>
</tr>
<tr>
<td>E048</td>
<td>0.50</td>
<td>600 700 800 900 1000 1100 1200 1300</td>
</tr>
<tr>
<td>E048 w/1hp*</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
<tr>
<td>E060</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
<tr>
<td>E072</td>
<td>0.75</td>
<td>750 900 1000 1200 1400</td>
</tr>
</tbody>
</table>

**Notes:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. CFM is controlled within ±5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter. * With optional one horsepower fan motor.
# Blower Data (cont.)

## Envision Single Speed ECM

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MAX ESP</th>
<th>AIR FLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
</tr>
<tr>
<td>036</td>
<td>0.50</td>
<td>650 750 850 1000 1100 1200 1300 1400 1500</td>
</tr>
<tr>
<td>036 w/1hp*</td>
<td>0.75</td>
<td>800 1000 1100 1300 1500 1600 1800</td>
</tr>
<tr>
<td>042</td>
<td>0.50</td>
<td>650 800 900 1050 1150 1250 1350 1450 1550</td>
</tr>
<tr>
<td>042 w/1hp*</td>
<td>0.75</td>
<td>800 900 1000 1200 1400 1600 1700 1850 2000 2200 2300 2400</td>
</tr>
<tr>
<td>048</td>
<td>0.50</td>
<td>650 800 900 1050 1150 1250 1350 1450 1550</td>
</tr>
<tr>
<td>048 w/1hp*</td>
<td>0.75</td>
<td>800 900 1000 1200 1400 1600 1700 1850 2000 2200 2300 2400</td>
</tr>
<tr>
<td>060</td>
<td>0.75</td>
<td>800 950 1100 1300 1500 1750 1950 2100 2300</td>
</tr>
<tr>
<td>070</td>
<td>0.75</td>
<td>800 950 1100 1300 1500 1750 1950 2100 2300</td>
</tr>
</tbody>
</table>

**Notes:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. Factory 1 setting is minimum allowed for cooling. Settings 2-5 MUST be located within boldface CFM range. CFM is controlled within ±5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter. Highest five DIP switch settings are assumed to be 1, 2, 3, 4 and 5. Factory L-M-H settings shown for comparison purposes only.

*With optional 1 horse power fan motor.

## Envision Dual Capacity ECM

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MAX ESP</th>
<th>AIR FLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
</tr>
<tr>
<td>038</td>
<td>0.50</td>
<td>650 750 850 1000 1100 1200 1300 1400 1500</td>
</tr>
<tr>
<td>038 w/1hp*</td>
<td>0.75</td>
<td>800 1000 1100 1300 1500 1600 1800</td>
</tr>
<tr>
<td>049</td>
<td>0.50</td>
<td>650 800 900 1050 1150 1250 1350 1450 1550</td>
</tr>
<tr>
<td>049 w/1hp*</td>
<td>0.75</td>
<td>800 900 1000 1200 1400 1600 1700 1850 2000 2200 2300 2400</td>
</tr>
<tr>
<td>064</td>
<td>0.75</td>
<td>800 950 1100 1300 1500 1750 1950 2100 2300</td>
</tr>
<tr>
<td>072</td>
<td>0.75</td>
<td>800 950 1100 1300 1500 1750 1950 2100 2300</td>
</tr>
</tbody>
</table>

**Notes:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. Factory 1 setting is minimum allowed for cooling. CFM is controlled within ±5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter.

**Note:** Dual Capacity Envision has a 70% low capacity output, therefore minimum CFM required per zone is 40% of nominal CFM, significantly higher than the E Series with a 50% low capacity output.
## Envision Air Handler ECM with Envision Split Single Speed

<table>
<thead>
<tr>
<th>AIR HANDLER</th>
<th>MAX ESP</th>
<th>SPLIT MODEL</th>
<th>AIR FLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAH036</td>
<td>0.50</td>
<td>036</td>
<td>300 400 600 800 900 1000 1100 1200 1400</td>
</tr>
<tr>
<td>NAH042</td>
<td>0.75</td>
<td>042</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
</tr>
<tr>
<td>NAH048</td>
<td>0.75</td>
<td>048</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
</tr>
<tr>
<td>NAH060</td>
<td>0.75</td>
<td>060</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
</tr>
<tr>
<td>NAH060</td>
<td>0.75</td>
<td>070</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
</tr>
</tbody>
</table>

**NOTES:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. Factory 1 setting is minimum allowed for cooling. Settings 2-5 MUST be located within boldface CFM range. CFM is controlled within +5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter. Highest five DIP switch settings are assumed to be 1, 2, 3, 4, and 5.

## Envision Air Handler ECM with Envision Split Dual Capacity

<table>
<thead>
<tr>
<th>AIR HANDLER</th>
<th>MAX ESP</th>
<th>SPLIT MODEL</th>
<th>AIR FLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAH036</td>
<td>0.50</td>
<td>038</td>
<td>300 400 600 800 900 1000 1100 1200 1400</td>
</tr>
<tr>
<td>NAH048</td>
<td>0.75</td>
<td>049</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
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<tr>
<td>NAH060</td>
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<td>064</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
</tr>
<tr>
<td>NAH060</td>
<td>0.75</td>
<td>072</td>
<td>650 850 1100 1300 1500 1700 1850 1950 2100</td>
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</tbody>
</table>

**NOTES:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. Factory 1 setting is minimum allowed for cooling. Settings 2-5 MUST be located within boldface CFM range. CFM is controlled within +5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter. Highest five DIP switch settings are assumed to be 1, 2, 3, 4, and 5.

## Synergy3D Dual Capacity

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MAX ESP</th>
<th>AIR FLOW DIP SWITCH SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>038</td>
<td>0.50</td>
<td>650 750 850 1000 1100 1200 1300 1400 1500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 2 3 4 M 5 H</td>
</tr>
<tr>
<td>038 w/1hp*</td>
<td>0.75</td>
<td>800 1000 1100 1300 1500 1600 1800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L 2 3 M 4 H 5</td>
</tr>
<tr>
<td>049</td>
<td>0.50</td>
<td>650 800 900 1050 1150 1250 1350 1450 1550</td>
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<tr>
<td></td>
<td></td>
<td>1 2 3 4 M 5 H</td>
</tr>
<tr>
<td>049 w/1hp*</td>
<td>0.75</td>
<td>800 900 1000 1200 1400 1600 1700 1850 2000 2200 2300 2400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 L 2 3 4 M 5 H</td>
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<tr>
<td>064</td>
<td>0.75</td>
<td>800 950 1100 1300 1500 1750 1950 2100 2300</td>
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<tr>
<td></td>
<td></td>
<td>1 2 3 M 4 H 5</td>
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<tr>
<td>072</td>
<td>0.75</td>
<td>800 950 1100 1300 1500 1750 1950 2100 2300</td>
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<tr>
<td></td>
<td></td>
<td>1 2 3 M 4 H 5</td>
</tr>
</tbody>
</table>

**NOTES:** Factory settings are at recommended 1-2-3-4-5 DIP switch locations. Factory 1 setting is minimum allowed for cooling. Settings 2-5 MUST be located within boldface CFM range. CFM is controlled within +5% up to the maximum ESP. Max ESP includes allowance for wet coil and standard filter. Highest five DIP switch settings are assumed to be 1, 2, 3, 4, and 5.

Dual Capacity Envision has a 70% low capacity output, therefore minimum CFM required per zone is 40% of nominal CFM, significantly higher than the E Series with a 50% low capacity output.
Wiring Schematic
IntelliZone System
97P38B01

INTELLIZONE SPECIFICATION CATALOG

Wiring Schematic
IntelliZone System
97P38B01

10
Damper Specifications

General

Model ZDRT3 and ZDCT3 are “3-wire” motorized rectangular and circular dampers utilizing a 24VAC actuator to power open and power close the damper in a period of 90 seconds. The ZDRT2 and ZDCT2 are “2-wire” motorized rectangular and circular that use a damper’s 2-wire actuator to power close and spring open the damper. All dampers are constructed of heavy gauge G90 galvanized steel.

Damper/Actuator Features

The IntelliZone system utilizes a “3-wire” power open/power close damper actuator featuring:

- Brushless DC Motor (3-wire only)
- Adjustable open position (3-wire only)
- Manual damper release lever (3-wire only)
- No-stall brushless motor for long life
- Up to 2 in. W.G. differential pressure capability
- Magnetic Clutch (3-wire only)
- Quick replacement
- Low power draw
- Capable of 45 in. lbs. of torque minimum (45 in. lbs. running or breakaway)
- 90 second opening (3-wire only)
- 90 second closing

ZDR - Rectangular Damper Features

- 18-gauge G90 galvanized sheet steel using the “toggle lock” fastening system to increase corrosion resistance
- Damper position indicator
- Integral cable strain relief
- Available in sizes 8” H x 8” W through 14-inch H x 30-inch W
- Air leakage less than 6% @ 2 in. W.G. (AMCA 500-75)
- Nylon bearing to prevent binding

ZDC - Circular Damper Features

- 18-gauge G90 galvanized sheet steel using the “toggle tab lock” fastening system to increase corrosion resistance.
- Double beading to maintain roundness and rigidity.
- One straight and one crimp end.
- Nylon end bearing to prevent binding.
- Damper blades which close against a 1” foam seal for air tightness.
- Damper position indicator.
- Integral cable strain relief.
- Available in 5-inch through 18-inch diameters.
- Air leakage less than 6% @ 2 in. W.G. (AMCA 500-75)

Notes:

- Actuators mounted on “H” dimension.
- *T2 indicates 2 wire (power close, spring open) dampers.
- T3 indicates 3 wire (power close, power open) dampers.

Model ZDR Rectangular Dampers

<table>
<thead>
<tr>
<th>WIDTH IN INCHES</th>
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<th>10&quot; HIGH</th>
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Notes: *T2 indicates 2 wire (power close, spring open) dampers. T3 indicates 3 wire (power close, power open) dampers.

Model ZDC Circular Damper

Model ZDC Circular Dampers Selection*

<table>
<thead>
<tr>
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<td>18&quot;</td>
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</tbody>
</table>

Notes: *T2 indicates 2 wire (power close, spring open) dampers. T3 indicates 3 wire (power close, power open) dampers.
Zone Selection

Selecting zoning areas of a home or office is the first step required for successful IntelliZone setup. IntelliZone allows four independent zones of operation on dual capacity equipment and two independent zones of operation on single-speed equipment. Clearly, most homes and offices have more than four rooms. What must be decided is, “Given a maximum of four or two different zones of operation, which rooms in the house or office will be best suited under the control of the same sensor?” There are two basic ways to accomplish this:

1. Zoning by Use and Occupancy, or
2. Zoning by Outside Exposure

Zoning by Use and Occupancy

For a typical residence, different rooms in the house are used or occupied at different times during the day. A typical single story home has three bedrooms, a kitchen, a living room, a dining area, bathroom(s), and a family room as shown below in Figure 1.

Never place more than one zone in a single room.

Note that the type of use in each room or group of similarly used rooms determines the assigned zone. Figure 1 illustrates a four zone example of zoning by use.

The kitchen, dining, living, family, and utility rooms are excellent choices for a separate zone because they are commonly occupied during the same time of day and share common exposures. IntelliZone will provide more conditioned air to these areas when they are in use and less to other areas of the house when unoccupied.

It is doubtful that the living room, family room, kitchen, and bedrooms will all be occupied at the same time. For most of the year, the family room will be occupied at different times of the day than the living room and bedrooms.

The master suite and bedrooms should almost always be on separate zones than the main living areas because each area tends to be occupied at different times. Obviously, bedrooms are usually occupied during the night, not during the day when the living area of the house is occupied. With IntelliZone, the bedrooms can be “set-back” during the day and the main living areas “setback” at night. This allows the HVAC equipment to concentrate on the kitchen and living areas when occupied and on the bedrooms at night when the rest of the house may be unoccupied.

A feature in a residence which can dictate zoning is multiple stories or floors. In a two story structure, the upper and lower floors will have different heating or cooling demands. These differences can be attributed to heat migration (the tendency of heat to rise), types of use, occupancy, and the roof heat load.

Another example is a small doctor’s office. The zones to consider would be the waiting room, patient rooms, lab, and office areas. The waiting room is an excellent zone because the number of people will vary during the day; usually, an exterior door is opened frequently, and these rooms require large amounts of air for ventilation.

Patient rooms are another good choice for a zone; usually occupied by one to three people with tight requirements on temperature needed to ensure comfort. A lab or similar area could be a separate zone because of the different type of use as compared to the rest of the building.

Other good commercial candidates might include small to medium size dentist offices, retail stores with employee lounges and offices, general commercial offices with computer rooms or conference rooms, car dealerships with show rooms, general offices, and parts rooms.

Figure 1: Sample Floor Plan with Four Zone Example
Zone Selection (cont.)

Zoning by Outside Exposure

Zoning by the exterior exposure considers the time of day when the peak cooling and heating loads occur. Zoning by exterior exposure should be considered when the following two conditions exist:

1. There are distinctly different rooms or areas along the south and west exposures, and the building has a large area of glass on those exposures. An example is a room where over half of the cooling load is due to transmission through the glass alone.

2. There are a relatively small number of people in the building and a small number of people occupying offices or spaces along the south or west sides of the building. In short, the heat gain due to people and the ventilation required for the occupants is small when compared to the overall cooling requirements for the building.

Zoning by exposure is not the normal method of zoning for most residences. The exceptions to this rule are rooms along the south or west which have large amounts of glass. Generally bedrooms on the southwest exposure require similar levels of heating or cooling because the time of use precludes heat gain from the sun as a major factor in occupant comfort. Exceptions include large windows or other features.

Using the zoning by exposure method in an office can be more difficult than in a home. If the predominant load in the building is people, the IntelliZone should follow the major occupancies in the building as determined by the occupants. If there are few people in the building, then zoning by exposure becomes prevalent since the heat load applied to the individual offices or rooms is dominated by the exposure and time of day. In all cases, judgement is required due to variations in climate, floor plan, type and time of use, glass areas, and glass orientation.

If still unsure which areas or offices to place in a particular zone, the best method is to use load calculations such as ASHRAE or another reliable method. Once this is done, compare the hours to peak load (both heating and cooling) and group offices together that have approximately the same time of day for the peak loads.

General Zone Selection Rules

- Minumum of three branch runs per zone.
- Zone together areas of like uses, but separate areas based on differing uses.
- Avoid grouping rooms of different levels or floors into the same zone.
- Avoid grouping rooms with opposite sun or weather exposures in the same zone.

Note: Insure zone duct is designed to handle CFM required.

Sample Screens of IntelliZone Design Software

Figure 4: IntelliZone Calculator - Two Zone Load Summary

Figure 5: IntelliZone Calculator - Four Zone Load Summary
Special Zoning Applications

Residential

Unfinished Basement

- Return air ducts are required to all zones.
- Careful design of ductwork, including return air, for future finishing is crucial.
- Insulated basements, in general, require very little space conditioning. However, the floor space can be substantial. To provide adequate air movement, more air flow will be required than the space conditioning load would indicate.
- In the North, an unfinished basement can be difficult to raise above 65° F in the winter due to its large mass of exposed concrete and typically minimal supply and return ductwork. Therefore, it is not recommended to use a zone setpoint over 65° F in the winter. In the summer, damper leakage occurring from cooling calls in other zones, along with cool basement temperatures, can actually produce a heating call in the basement. Therefore, use a lower heating setpoint of 60° F or a “cooling only” mode on the basement zone thermostat.
- Continuous fan selection on the zone thermostat can help circulate some of the cooler air to other zones in the summer and help dehumidify the basement area.

Open Entry/Stairwell in a Multi-Story Home

- Large open areas between two floors allow a tremendous volume of air to rise to the upper floor causing overheating in the winter and undercooling in the summer. Although running a continuous fan can help recirculate the air between floors, a zone system will provide the conditioning exactly to the zone that needs it. Be careful that the system doesn’t cool the upper level while heating the lower level in the winter.

Garage, Unused or Unconditioned Zone

- Conditioned garages should be insulated and sealed as tightly as possible to avoid excessive energy use. Although a dedicated space conditioning unit installed specifically for the garage is the best choice, this is not always possible. If the garage zone is being conditioned by the main system, typically only the supply air is ducted. The thermostat setpoints, and thus the amount of supply air, should be limited to avoid increasing air infiltration to the home due to the negative pressure. Main unit return air ducts are not allowed by most building codes due to the chance of recirculating fumes from the garage throughout the home.
- Unused zones can include guest bedrooms. Unconditioned zones may include unfinished areas. Both of these represent areas in which reduced setpoints are desired to limit energy use. In these zones, a continuous fan speed should not be selected. Due to the common return system with other zones, the setpoint should be no more than 10° F off from other zone setpoints. If a >10° F setback is desired, a return duct damper system should be installed in the zone to more fully isolate the zone from the rest of the home.

Small Zone

- If a group of rooms is zoned but constitutes less than 25% of the total system load, the duct system needs to be designed to handle the minimum 25% of the system air flow (50% in single-speed equipment). For example, an E048 system (1500 cfm max and 600 cfm minimum) would have a minimum design zone of 375 cfm (25% x 1500 cfm = 375 cfm). When this zone calls, the unit will push 700 cfm through the ductwork designed for 375 cfm. Although higher velocity will be encountered here, the noise level and throw should not be objectionable or even noticeable. This also eliminates the need for a bypass damper. A minimum of three branch runs should be employed in any zone to limit the effects of one branch duct being blocked by shoes, furniture, etc.

Sun Room

- A sunroom can present a tremendous cooling load and will likely require a higher cooling setpoint. Such rooms represent areas in which reduced setpoints would be desired to limit energy use. In these zones, continuous fan should not be selected and, due to the common return system with other zones, the setpoint should be no more than 10° F off other zone setpoints. If a >10° F setback is desired, a return duct damper system should be installed in the zone to more fully isolate it from the rest of the home.

Commercial

Conference Room/Office

- Frequently, conference room(s) and office(s) are grouped together on the same zone due to the direction of exposure. However, when a closed-door conference is held with 12 people, it frequently becomes uncomfortable for either the conference room occupants or one of the office occupants (due to the tremendous difference in loads present within the zone). Here, zoning can solve the problem easily by providing the exact cooling where and when needed.
Peak Heating and Cooling Demands

Cooling-Dominated Structures

In cooling-dominated structures such as commercial buildings and southern residential homes (where electric heat is rarely needed as an auxiliary heat source), up to five load calculations need to be performed. Commercial hourly peak load calculations on all of the four zones under control of the IntelliZone System are required. This information sizes the supply air ductwork and the zone damper properly. The fifth load is the entire building (all four zones). Why perform this step? Because the different zones have different times of day when they need peak cooling or heating. The actual peak cooling or heating load is usually less than the sum of the peak loads for the four zones.

The load calculation for the entire structure is used to size the HVAC equipment only. Ductwork branches and zone dampers are sized using the peak zone conditions for each particular zone. The difference between the sum of the peak loads for the individual zones and the peak load for the entire building is called “diversity.” Diversity is a measurement of the effective cooling or heating capacity added to the system due to zoning. The physical heating or cooling capacity is not increased, but because it is more effective, HVAC equipment can be sized smaller using zoning diversity. This represents the first cost savings of the IntelliZone Comfort Zoning System. Secondary savings are attributed to the lower operating costs.

Many popular software packages or HVAC residential loads now calculate peak zone loads; check your software package for its capability.

Heating-Dominated Structures

In heating-dominated structures, such as northern residential homes (where units are generally sized with a small amount of electric heat installed as an auxiliary heat source), diversity may be present in cooling; however, the unit size is dictated by the heating load and diversity is rarely present. In this application, a simple room-by-room or zone-by-zone analysis can be performed with the resultant sum of the rooms or zones taken as the whole house load. The table below lists the four zone loads of this example home.

### Example Four Zone Load Summary

| Zone 1 Main Living | Htg BTUH | Htg CFM | Total Clg | Sens Clg | Clg CFM | Max CFM | Adjusted 100% CFM | Min CFM Req’d. | Design CFM | # of Branch | Actual CFM % | Actual Load % | Zone DIP % |
|--------------------|----------|---------|-----------|----------|---------|---------|------------------|---------------|-------------|-------------|-------------|--------------|-------------|-----------|
| Kitchen            | 2259     | 73      | 3128      | 2400     | 145     | 145     | 118              | 1             | 1           | 29%         | 34%         | 45%         |
| Family             | 4264     | 138     | 6660      | 5128     | 311     | 311     | 252              | 2             | 2           | 14%         | 23%         | 45%         |
| Utility            | 3002     | 97      | 1614      | 1243     | 75      | 75      | 78               | 1             | 1           | 29%         | 34%         | 45%         |
| Living/Dining      | 6351     | 205     | 7158      | 5511     | 334     | 334     | 271              | 3             | 3           | 15%         | 19%         | 45%         |
| Total              | 15876    | 512     | 18560     | 14282    | 866     | 887     | 718              | 600           | 718         | 29%         | 34%         | 45%         |
| Zone 2 Bedrooms    |          |         |           |          |         |         |                  |               |             |             |             |             |             |
| Bdrm 1             | 3224     | 104     | 1939      | 1752     | 106     | 106     | 240              | 2             | 1           | 24%         | 15%         | 45%         |
| Main Bath          | 892      | 29      | 284       | 407      | 25      | 25      | 147              | 1             | 1           | 24%         | 15%         | 45%         |
| Bdrm 2             | 2708     | 87      | 1692      | 1550     | 94      | 94      | 213              | 1             | 1           | 24%         | 15%         | 45%         |
| Total              | 6824     | 220     | 3915      | 3708     | 225     | 225     | 215              | 600           | 600         | 24%         | 15%         | 45%         |
| Zone 3 Master Suite|          |         |           |          |         |         |                  |               |             |             |             |             |             |
| Mstr Bdrm          | 2806     | 91      | 2294      | 1766     | 107     | 107     | 351              | 2             | 2           | 24%         | 11%         | 45%         |
| Mstr Bath          | 2350     | 76      | 1504      | 1158     | 70      | 70      | 249              | 1             | 1           | 24%         | 11%         | 45%         |
| Total              | 5156     | 166     | 3798      | 2924     | 177     | 177     | 148              | 600           | 600         | 24%         | 11%         | 45%         |
| Zone 4 Basement    |          |         |           |          |         |         |                  |               |             |             |             |             |             |
| Total Zones        | 19123    | 617     | 5007      | 3967     | 240     | 240     | 419              | 600           | 600         | 24%         | 41%         | 45%         |
| Total House        | 46979    | 1515    | 31280     | 24882    | 1508    | 1508    | 1852             | 1500          | 2518        |             |             |             |
| Unit Data Model    | Nom Hi CFM | Min Lo CFM | 40% Nom CFM |
| ND*049            | 1500     | 1350    | 600       |

Note: Dual Capacity Envision has a 70% low capacity output, therefore minimum CFM required per zone is 40% of nominal CFM, significantly higher than the E Series with a 50% low capacity output.
System Sizing

HVAC Equipment

The HVAC equipment size should always be determined by performing a load calculation on the entire building or the area of the building that will be serviced by the equipment. Most of the time, this peak load will be less than the sum of the peak loads from the four zones. Remember that each of the peak loads for the individual zones will usually occur during different times of the day. The building peak load or “block” load takes this into account and is the most accurate means of sizing the HVAC equipment. Performing load calculations helps eliminate much of the guesswork involved with equipment sizing.

Transformers

Providing adequate transformer power (VA) to supply the system is an important requirement. Each IntelliZone 3-wire damper requires 3.0VA at nominal voltage (7.0VA for 2-wire). The standard available transformer is a 75VA with circuit breaker (Part # ZTK240). Table 4 shows a sample sizing procedure that should be carried out for each installation. If the total VA is greater than 75VA, then a second transformer should be wired in parallel to provide a total power capability of 150VA. Maximum recommended dampers are 12.

Transformer 'VA' Calculation (3-wire actuator)

| Zone 1 dampers | Power to 2 IntelliZone Damper | 6.0 VA |
| Zone 2 dampers | Power to 1 IntelliZone Damper | 3.0 VA |
| Zone 3 dampers | Power to 2 IntelliZone Damper | 6.0 VA |
| Zone 4 dampers | Power to 3 IntelliZone Damper | 9.0 VA |
| **Total VA Draw** | **24 VA** |

Ductwork

If the installed ductwork is not large enough to handle the peak zone loads, the HVAC system will fail to maintain comfort in these zones. This will defeat the purpose of the IntelliZone System. An analogy to this is the water supply piping to a residence. In many cases, the pipe supplying the entire home is a one-inch diameter pipe. This pipe supplies all of the lavatories, showers, tubs, kitchen, spigots, and clothes washer. There may be three outdoor spigots and two showers in the house, but virtually never are the pipes to these devices found to be less than 1/2-inch diameter. Once again, the reason is diversity. The HVAC ductwork must be sized properly so when any one of the IntelliZone System’s zones demands capacity, the ductwork has the ability to supply it. Using the IntelliZone software can help limit the ductwork oversizing.

Supply Ductwork

When sizing the supply air system and the return air system (if applicable), the diversity used to size the HVAC equipment plays a role here as well. The supply air ductwork should be of sufficient size to handle the HVAC air handler cfm before any branching occurs. After branching the ductwork to one or more of the zones, the supply or return air ductwork cannot be reduced in size to the extent that normally would be expected in a HVAC system. The reason is the diversity and peak zone.

Note: Dual Capacity Envision has a 70% low capacity output, therefore minimum CFM required per zone is 40% of nominal CFM, significantly higher than the E Series with a 50% low capacity output.

Return Ductwork

Return air ductwork should be adequate in each zone to return the same amount of air delivered to the zone. In certain rooms, returns are not allowed by code or not desirable (kitchens and baths, respectively). Returns in other rooms in that zone should be sized larger to compensate.

General Rules:

- Minimize the number of dampers and plan to install the dampers as close to the main trunk as possible
- CAUTION: When installing the IntelliZone in a structure with fossil fuel (oil, gas, propane) appliances, it is important that both supply and return dampers are used in each zone to avoid potential backdrafting of fossil-fueled appliances.

- The IntelliZone software should be used to aid in the selection and calculation of design cfm.
System Sizing (cont.)

Figure 2: Four Zone Ductwork Example (Delivery CFM)

General Installation Guidelines

Refer to the IntelliZone Installation guide (P/N IM1958) for complete installation and program information.

General rules to follow when installing a zone system:

- Up to four zones with dual capacity units (two with single-speed units)
- All dampers should be located as close to the main trunk as possible to limit the amount of pressurized trunkline and thus limit air leakage.
- No less than three branch runs in a zone to prevent a single branch obstruction (curtains or clothes etc.) from affecting unit airfow.

CAUTION: When installing the IntelliZone in a structure with fossil fuel (oil, gas, propane) appliances, it is important that both supply and return dampers are used in each zone to avoid potential backdrafting of fossil-fueled appliances.

- Insulate and seal around rectangular dampers to prevent leakage.
- All dampers must be wired with 18-gauge wire. (Note: Crimp connections should never be used on solid conductor wire.)
- Insure that the transformer can handle the power requirements of the system.
- No more than three dampers per zone.
- Ductboard-mounted dampers should be supported within six inches of the damper due to the weight and stress on the ductboard.
- Unit DIP switch #3-3 should be in the NO RPM mode.
- Unit DIP switch #3-2 should be in the OFF position when used with a zone control system.
- Unit DIP switch #2-8 should be ON (continuous 'L' signal) when used with a zone control system.
Zone Percentages

Selection

Selecting the zone percentage can also be accomplished by using the Zone Calculator software. This percentage represents an approximation of the maximum heating or cooling load percentage of the zone. The Premier IntelliZone allows 0, 25, 45, and 70% selections. Some general rules to follow in this selection procedure are as follows:

- Pick the larger percentage for major living areas such as family rooms, etc.
- Pick the smaller percentage for minor living areas such as dens or bedrooms.
- Pick a larger percentage if more branches are required than the load indicates due to large area per load (i.e., unfinished insulated basement).
- The IntelliZone software should be used to aid in the selection and calculation of design cfm.

The IntelliZone determines modes as a proportion of the total demand. A simple example of this to begin with is a two-zone system in the cooling mode. If each zone is set at 70% we have the following scenario:

Zone 1 = 50%
Zone 2 = 50%

We now must determine what percentage of the total load each zone represents. To perform this operation, add the two zones together 70 + 70 = 140. One zone would then be 70/140 or 50%.

We know from the previous example that the IntelliZone will initiate a “Y2” output to the compressor when it is set to normal upstaging and 51% of total demand is needed. It will issue a “W” call to the unit when there is a 90% total demand.

It is a common assumption that if you have a house with two zones equally divided each zone should be set at an equal amount, usually 70%. As can be seen in the above chart, it will take a “Y3” call from one zone as well as a “Y2” call from the second zone to obtain auxiliary heat.

This is a simple example, but three- and four-zone systems are calculated in the same manner. Fan speeds are also assigned upon the percentage of system demand and a complete understanding of this process is not necessary for day-to-day decisions. As a serviceman, the temptation arises, in some instances, to influence the logic of the board by jumping “Y1” and “Y2”. While this will create a quicker response, the ductwork of that zone must be capable of handling the cfm delivered by the unit (i.e., if a “Y2” signal is given to the unit, can the ductwork handle the total cfm of the unit).

When setting up a new system remember that if you have unused zones they must be set to zero. If they are not, the setting that they have will be included in the total demand preventing the other zones from operating correctly, as there will be no inputs on those zones.
Locating Thermostats

The thermostat should be located in the room or zone it controls. Locate a thermostat approximately five feet (60") above the floor. Do not locate a thermostat where it may be exposed to direct sunlight, drafts, or direct supply air. Do not place a thermostat on an outside wall. Follow the same general guidelines that apply with standard thermostat installation. If two or more bedrooms are on a single zone, locate a sensor in a hallway or area where it can sense the return air from both rooms.

Figure 3: Four Zone Thermostat Location

- Zone 1 Main Living
- Zone 2 Bedrooms
- Zone 3 Master Suite
- Zone 4 Basement
- IntelliZone Thermostat
Notes: