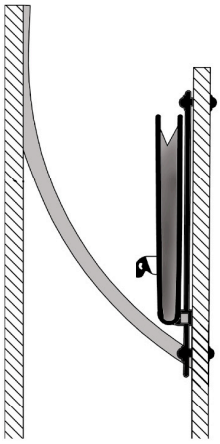
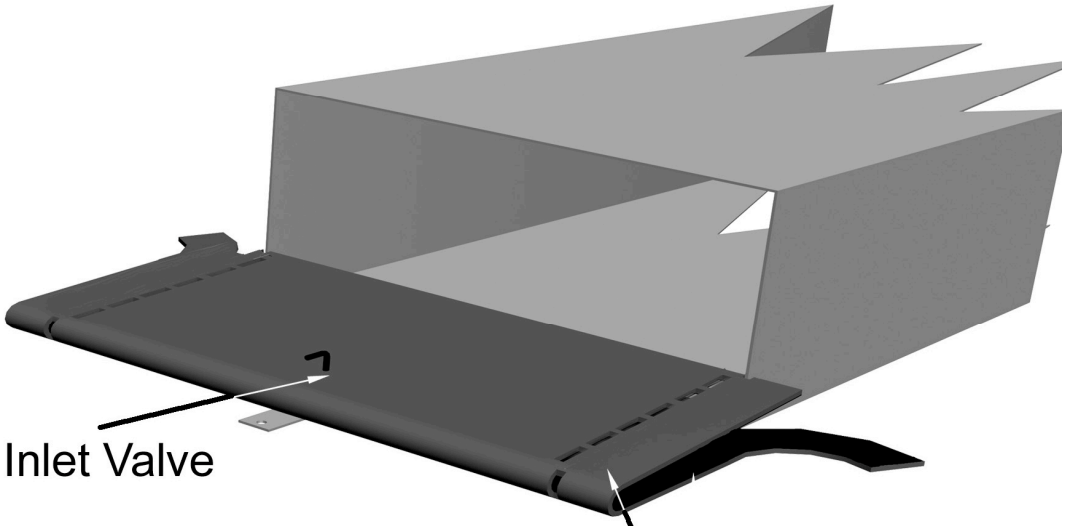
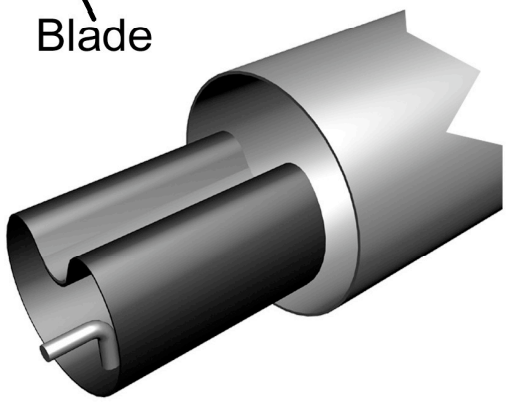
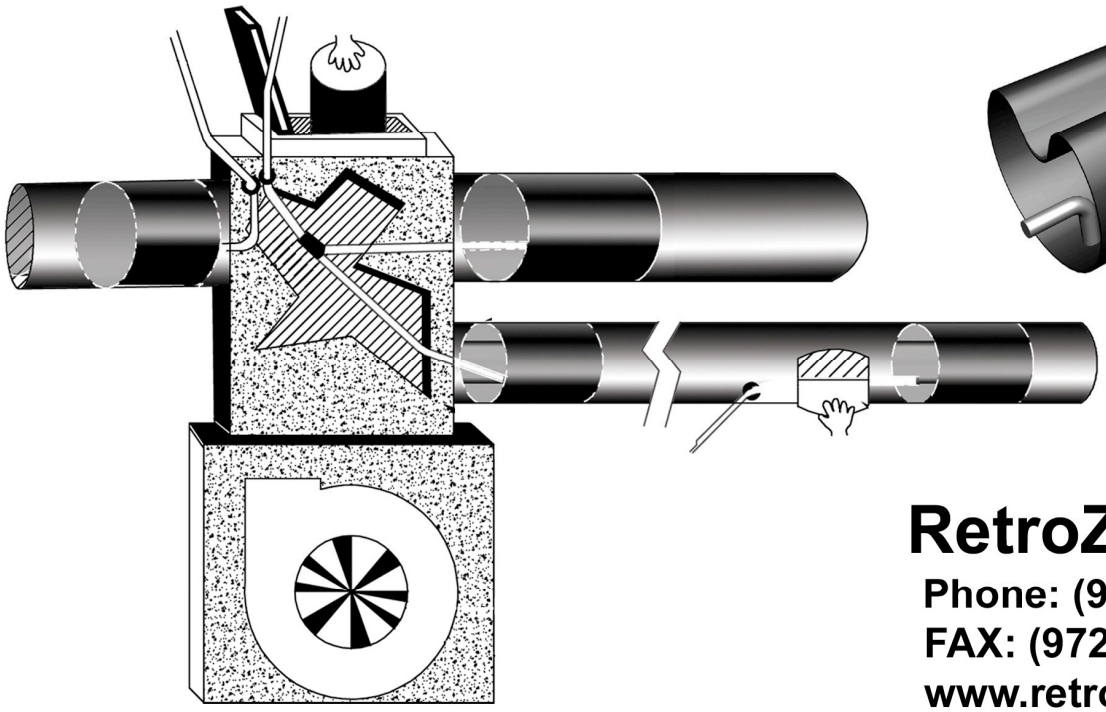
RETROZONE

Airzone Installation Guide









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AIRZONE INSTALLATION MANUAL

TABLE OF CONTENTS REV. 290.1

Carefully read the entire Airzone Installation Manual before beginning, especially sections 3, 4, 6 and 7.

Other information that is system-specific may be included with each product. For instance, precise set-up instructions are included with each static pressure relief system.

The Airzone Installation Manual is designed to be used with the Troubleshooting Guide and Specific Product Information. Make sure you have all information before starting installation. Thank you for selecting Airzone.

Fig 1-1 Lay FlexDamper on a clean, flat surface identify the non-inflated adjustment flap on one end of the FlexDamper.

Fig 1-2 Cut a Length of FlexDamper Connect Tape twice as wide as the FlexDamper and lay it on a flat surface adhesive side up. Place the adjustment flap onto the tape, centered from end to end and side to side

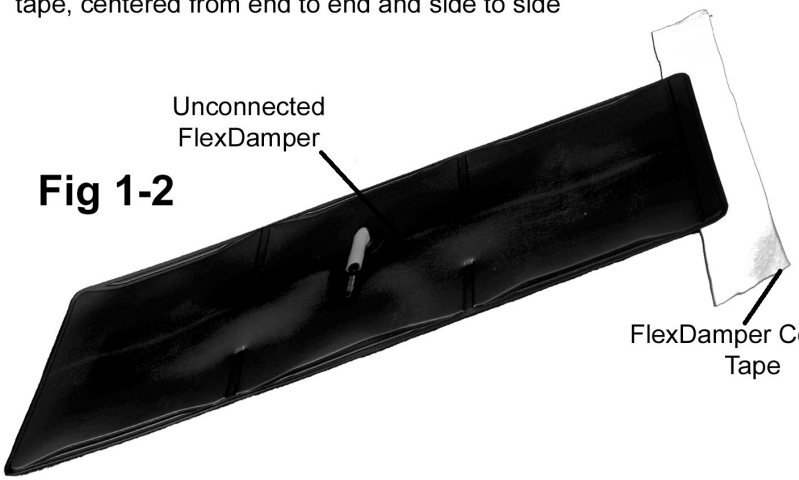


Fig 1-2

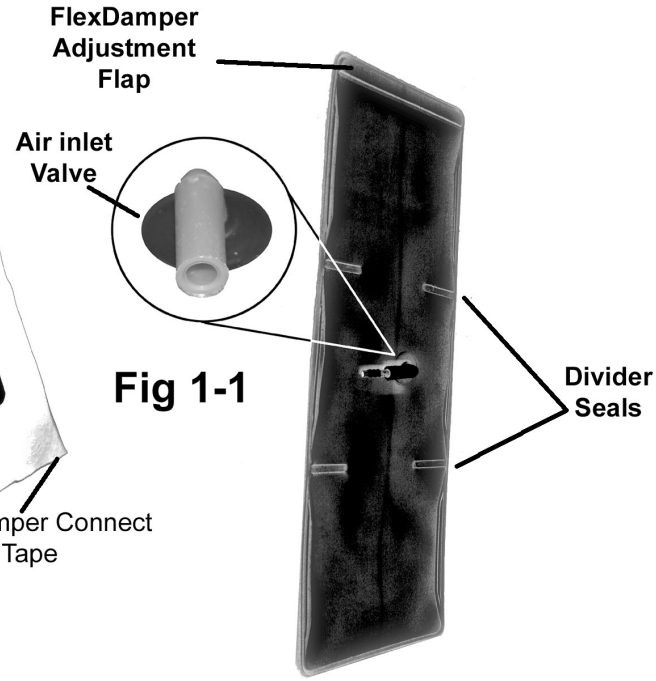


Fig 1-1

Fig 1-3 Bring other end of FlexDamper to position over adjustment flap and tape

Fig 1-4 Fold outer lengths of connect tape over the inside of FlexDamper **NOTE:** Before firmly affixing tape to FlexDamper, review next steps to determine correct sizing of the FlexDamper

Fig 1-5 Completed FlexDamper

Fig 1-3

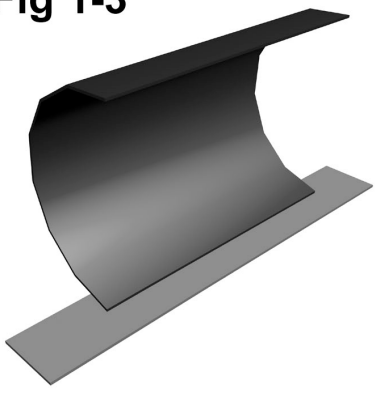


Fig 1-4

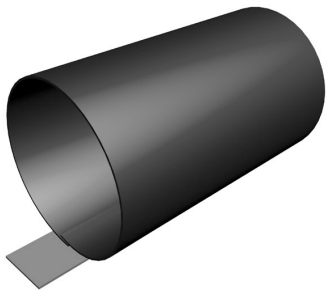


Fig 1-5

Fig 1-6

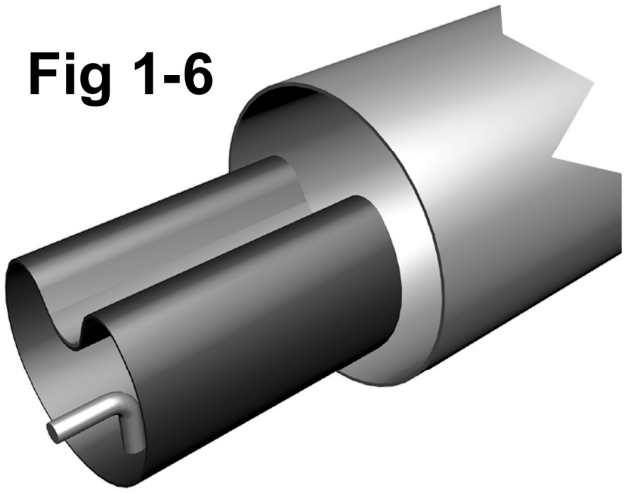


Fig 1-6 Fold FlexDamper at tape joint, insert into duct, then release and fit in to place to determine if FlexDamper is sized correctly

Fig 1-7 Vary the diameter of the FlexDamper by varying the overlap of the opposite end of the FlexDamper, to achieve a correct fit (See 1-7,1-8,1-9)

(When correct size is achieved, go to next step)

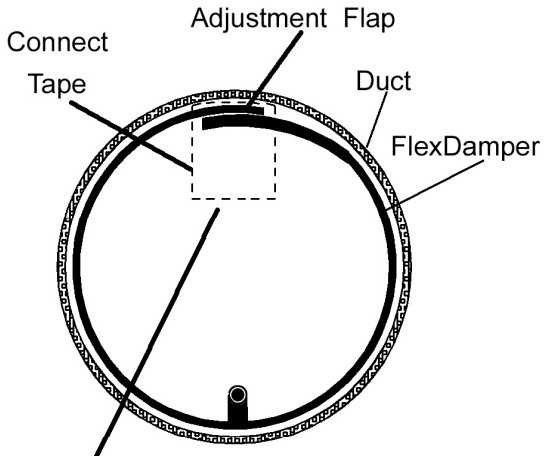
Fig 1-8 A correctly sized FlexDamper will be in contact with the duct around the entire circumference

Fig 1-9 A significantly undersized FlexDamper will leak an excessive amount of air. A slightly undersized FlexDamper will gradually attain a perfect fit as the tape slips

Fig 1-10 An oversized FlexDamper will not operate correctly

DO NOT OVERSIZE

Fig 1-7



Note: When a correct fit is achieved, press the tape down securely to the FlexDamper, move on to installation instructions

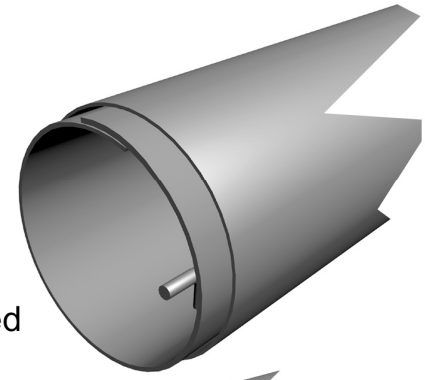


Fig 1-8
Correctly Sized

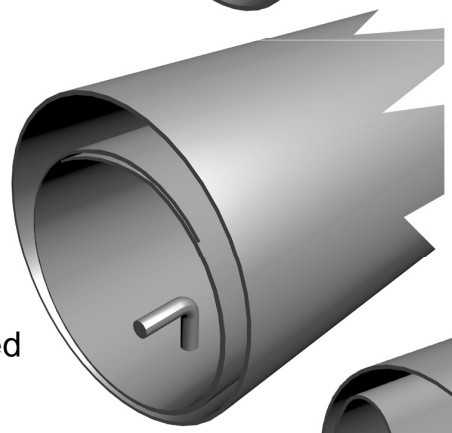


Fig 1-9
Significantly Undersized

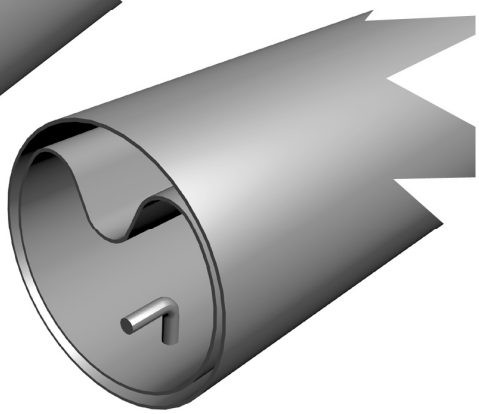


Fig 1-10
Oversized

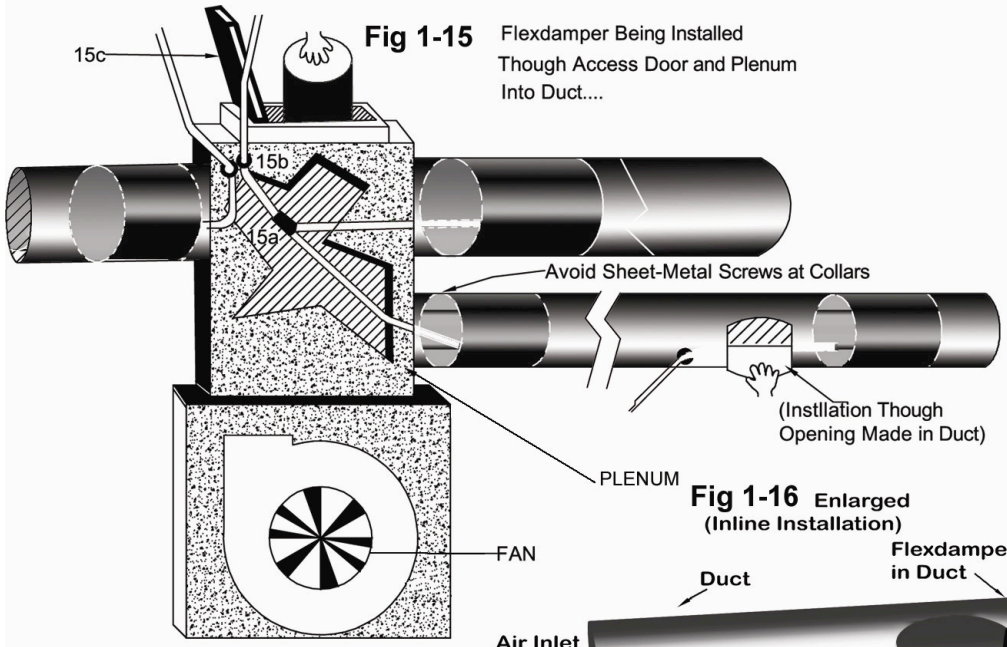


Fig 1-15 Flexdamper Being Installed Though Access Door and Plenum Into Duct....

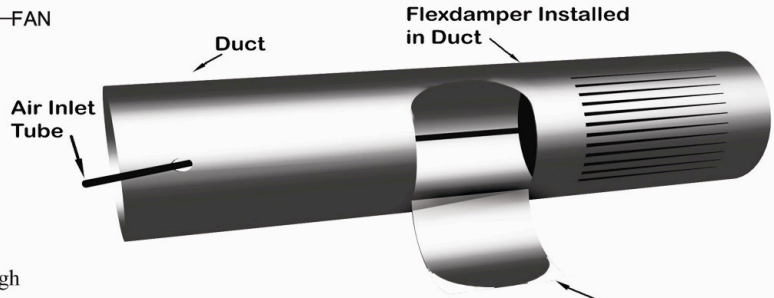


Fig 1-16 Enlarged (Inline Installation)

Opening Made in Duct For an Inline Installation of a Flexdamper

Fig 1-17 FlexDamper Installed Through Splittter

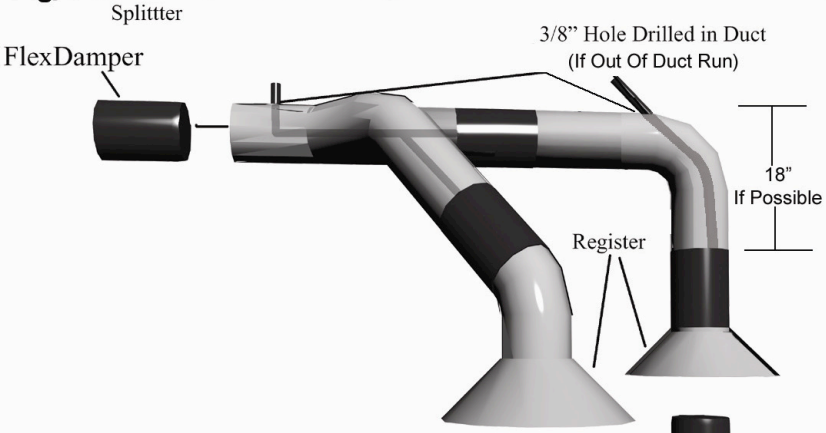


Fig 1-18 - FlexDamper Installed Through Register

SECTION 1 Round Flexdamper

ROUND FLEXDAMPER ASSEMBLY INFORMATION 1290

Study all instructions carefully before beginning. Refer to Round Flexdamper assembly diagrams before beginning (Fig. 1-1 to 1-10).

Other information

Tape Connection - On some larger Flexdampers, it may be necessary to use two or more lengths of tape to secure the ends together. Once installed, the duct contains the Flexdamper and prevents the tape from pulling apart.
Try to keep the connect tape and Flexdamper warm during assembly to aid in good adhesion. This special tape "sets" over time and provides a strong bond.
The Nylon "T" connector taped to each Flexdamper should be removed and saved for splicing the Flexdamper tube into other Flexdamper tubes serving the same zone.

ROUND FLEXDAMPERS - INSTALLATION METHODS

SECURING THE FLEXDAMPER IN HIGH VELOCITY, VERTICAL, OR OTHER DUCTS - OPTIONAL ADHESIVE MOUNTING.

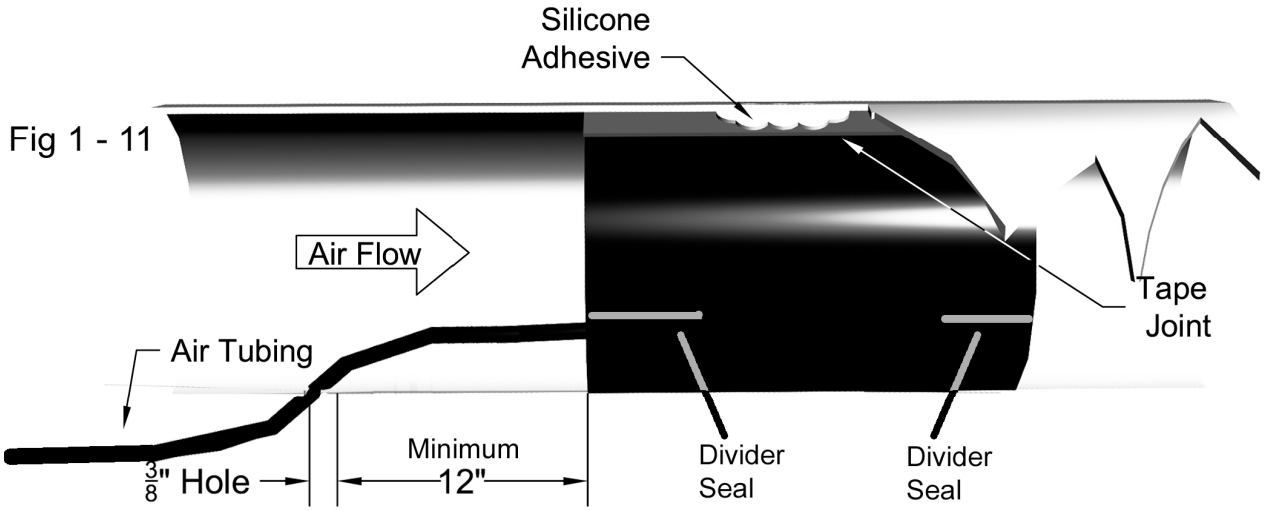
CAUTION! Use only pure silicone adhesive. Other adhesives may not meet UL or other safety requirements.
PLEASE READ! Most Flexdampers when used in most horizontal ducts require no adhesive. The semi-rigid internal belt in the Flexdamper allows it to stand upright in the duct, while the tubing should be cut to a length that keeps the Flexdamper from sliding down the duct.
However, certain applications exist where a more secure bond to the duct is required, such as a vertical duct where the tubing, because of mounting needs, runs downward and does not support the Flexdamper.
Retrozone highly recommends the use of silicone adhesive on larger Flexdampers and Flexdampers mounted in vertical ducts. In fact, since it is so easy to do, Retrozone recommends the "First Stage" adhesive mounting for all Flexdampers, to insure trouble-free operation.
Fig. 1-11. Stage 1 adhesive mounting - Optional but recommended for all Flexdampers. Install air tubing on Flexdamper. Then place a liberal amount of silicone adhesive on the top, center taped joint of the Flexdamper. Install in duct.
Fig. 1-12 Stage 2 adhesive mounting - recommended for vertical, high velocity and other special applications. Add two, 2 inch strips of connect tape to outside area of Flexdampers, centered between divider seals. Apply adhesive to tape strips. Apply silicone adhesive to top tape joint (same as **Fig.1-11**).
Install Flexdamper in duct. Inflate Flexdamper orally or with the Airzone Panel (**Fig. 1-13**) to allow the silicone to cure. Flexdamper should now be supported by adhesive in two places evenly spaced around Flexdamper.

SECTION 1 Round Flexdampers

Fig.1-16 In-line installation. Useful in many applications using steel or rigid duct, including Northern homes where ducts are run under floor joists.
Carefully peel back insulation, uncovering a suitable amount of duct. Drill a 3/8" hole to enable the use of tin snips. (You may want to drill a second 3/8" hole about 18 inches upstream, if the air tube is to exit the duct).
Then, using tin snips, cut out a three-sided "half moon" piece of sheet metal large enough to easily fit one's hand and a rolled Flexdamper through. The larger the duct, the larger the Flexdamper, so the larger the hole should be.
Bend back the sheet metal on the uncut axis. Now, work through this opening to install the Flexdamper. The Flexdamper may be tightly rolled to a small diameter, but try not to crease the internal belt.
Caution! Wear gloves and long sleeves, and avoid snagging either yourself or the Flexdamper on the sharp sheet metal edges.
Hint: You may find it easier to attach the connect tubing to the Flexdamper before you insert it through the hole. If using optional silicone adhesive, try putting the adhesive on after the Flexdamper is in the duct.
After installation is complete, bend sheet metal back in place, and tape or caulk to insure an airtight seal. Tape insulation back in place.
Fig. 1-17 Splitter installation - In many installations, one large (trunk) duct will split into two or more smaller (branch) ducts. If the smaller ducts branching from the larger duct serve the same zone, then only one Flexdamper in the larger duct is needed.
However, if the branch ducts serve different zones, then a Flexdamper will need to be installed in each of these branch ducts.
Many different types of duct "splitters" exist- sheet metal, fiberboard, etc.
Similar to a plenum installation, often one duct can be removed to allow installation in the other ducts branching from the splitter. Transitioning the air tubing from the Flexdampers through holes drilled in the splitter is often convenient.
Fig. 1-18 Register Installation - The register installation is often a good choice, since the Flexdamper can be installed by simply removing the register. Read Section 6 on avoiding noise problems for register installations.
Working up through the register, first size the Flexdamper to the correct diameter (see **Fig. 1-8**). Since many register installations are in vertical duct, review adhesive mounting methods **(Figs. 1-11 to 1-13)**
Next, drill a 3/8" hole in the duct at least a foot or more upstream of where the Flexdamper will be located (not necessary if tube is to run inside of duct back to plenum). With flexible type duct, reinforce both inner and outer membranes with connect tape before punching hole. Working from above the ceiling, run a length of tubing into duct and out through register.
Make sure area where Flexdamper will be mounted is free of sheet metal screws. Attach end of air tube to the Flexdamper, apply silicone adhesive if applicable, then insert and install in duct.

Stage I - Adhesive Mounting
- Optional - But Recomended....

Fig 1 - 11



Stage II - Mounting for Vertical Ducts
and Other Special Application where
Flex Dampers Need More Secure Mounting

Fig 1 - 12

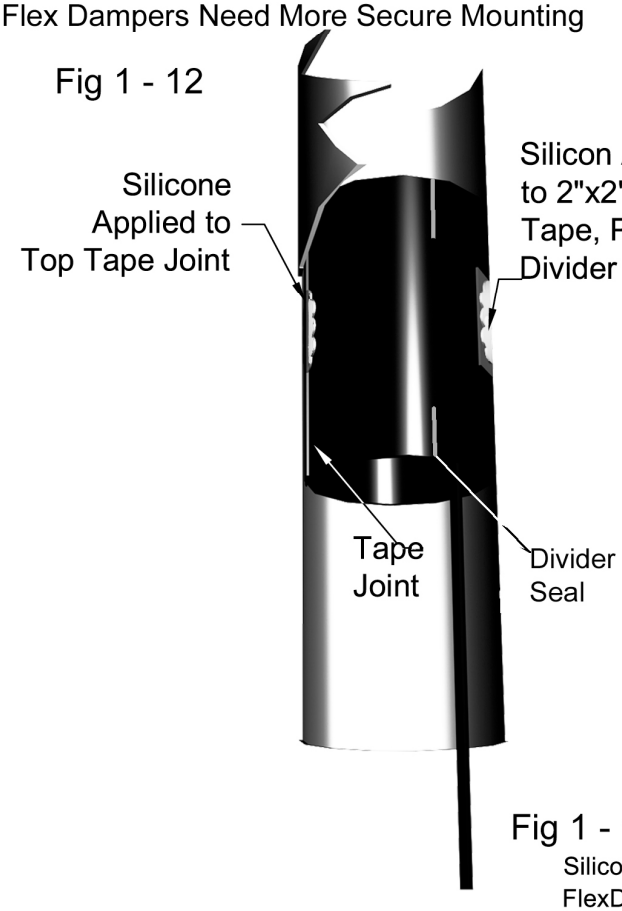


Fig 1 - 13

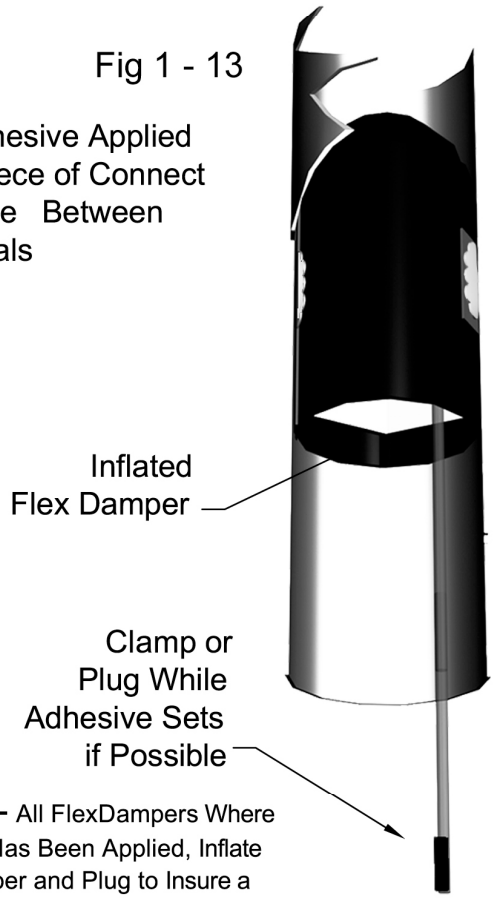


Fig 1 - 13 - All FlexDampers Where Silicone Has Been Applied, Inflate FlexDamper and Plug to Insure a good Bond.
Note: DO NOT Allow Adhesive on Edges of FlexDamper.

SECTION 1 Round Flexdamper

Fig. 1-13 For all Flexdampers using silicone adhesive, especially vertical mounts:
If possible, immediately after installation inflate Flexdamper orally or with Airzone Control System and leave inflated (plug tube) for as long as possible to insure a good bond.
Caution: Do not use compressed air or any source over 3 PSI.

HELPFUL HINT- Install Flexdampers needing adhesive mounting first to allow more curing time on the adhesive.
Fig.1-11 The tubing should be cut to a length that limits the Flexdamper from sliding down the duct. When doing a register or in line duct Installation, leave enough tubing upstream to move through an up and down arc as the Flexdamper inflates and deflates.

INSTALLING THE FLEXDAMPER

Study the **"FLEXDAMPER INSTALLATION DIAGRAM"** (**Fig 1-15**) carefully before attempting installation. Different methods of installation exist to install the Flexdamper, depending on the application.

General Notes, all Round Flexdampers:

The air tubing used with the energy saving Airzone System is very durable, but somewhat stiff. When installing a Flexdamper, straighten the air tube or locate the Flexdamper in such a way that the air tube is not "fighting" the Flexdamper. Round Flexdampers work great in steel or flexible duct. Whenever transitioning a tube through flexible duct, reinforce the inside membrane with a patch of connect tape before punching hole.
Fig. 1-15 Plenum Installation - Note: This type of installation is recommended for new construction applications. Design the plenum so that all Flexdampers can be installed and serviced through an access door installed in the plenum. Retrofit Plenum Installation: Particularly useful in southern applications where ducts are often "homerun" to the plenum, installing the Flexdampers from inside the plenum can be fast and easy. Should not enough room exist for an access door (or the distance from the access door to a duct(s) is too far), you may be able to remove just one (preferably larger) duct, and gain access to the inside of the plenum in this manner.

CAUTION! Be sure not to mount Flexdampers over sheet metal screws that are sometimes present in plenum starting collars. While incredibly tough, the Flexdamper over time may develop a leak, which can diminish system performance.

Fig. 1-15a. Flexdampers installed from the plenum and serving the same zone can be connected together inside the plenum, so that only one tube for each zone needs to be run through the plenum and to the energy saving Airzone System. Make sure Flexdampers don't have enough tubing to slide down the duct.
Fig. 1-15b Drill a 3/8” hole in the plenum for each zone tube that needs to transition through the plenum.
Fig. 1-15c Plenum access door installed on plenum.

CAUTION! Especially when new, round Flexdampers can make a "popping" noise when inflating. Locating the Flexdamper at the register, especially in steel duct, may cause a slight but objectionable noise in a bedroom area. However, this typically is only a problem if the Flexdampers are moving during the night: In homes where the sleeping area is one zone, and where the other zones will be set back at night, the Flexdampers will seldom actuate. Avoid placing the Flexdamper at the register in a bedroom if you anticipate the Flexdamper repeatedly changing positions during the night.

SECTION 2 Rectangular Flexdampers

RECTANGULAR FLEXDAMPER INSTALLATION INSTRUCTIONS

Pub 1290 Retrozone, Inc. (formerly Enerzone Systems Corp.)

The rectangular Flexdamper is designed to be retrofit into almost any existing rectangular duct, including fiberboard or steel. The unique "trim-to-fit" design insures a great fit, even in odd size ducts.
Each rectangular Flexdamper can be adjusted to fit many different ducts within its range. Consult rectangular damper sizing chart for more information (**Page 11**).
Rectangular Flexdampers use pressure to actuate and close a duct, as well as vacuum to pull the rectangular Flexdamper blade into a fully open position.
Fig 2-1. The rectangular Flexdamper consists of a top blade that moves upward to stop the flow of air, a bottom base that does not move, a securing bracket and an air inlet valve.
An air actuated membrane in between the base and blade forces the blade upward or downward when pressure or vacuum is applied.
The metal securing bracket is a structural part of the Flexdamper, and does not necessarily require attachment to the duct in horizontal installations.
Fig 2-2. Height Adjustment Strap - Located on the back of the Flexdamper, the height adjustment strap limits the upward travel of the rectangular Flexdamper's blade.
To adjust, loosen the nut on the rectangular Flexdamper blade, and select a hole on the strap that limits the upward travel of the blade to an acceptable point.
Caution! The use of the height adjustment strap is particularly important in fiberboard duct to limit the stress placed on the duct.
Fig 2-1. The rectangular Flexdamper is designed to lay in the bottom of the duct, but can also be mounted in a vertical plane on the side of a duct.
Caution! Read this next section on trimming the rectangular Flexdamper, since you have only one chance to get it right!
Take great care to not cut or puncture the air-actuated membrane. Household scissors may be used.
Trimming the rectangular Flexdamper: The base of the rectangular Flexdamper should be cut to make a tight, interference fit in the bottom of the duct (**Fig. 2-3**). Trim equal amounts off each side, so that the air inlet valve remains in the middle of the Flexdamper. Example: If a 14 inch wide Flexdamper is being sized to fit a 12" wide duct, trim one inch off each side.
When working with duct with internal insulation, be careful to not tear or rupture this insulation, as insulation erosion can begin.

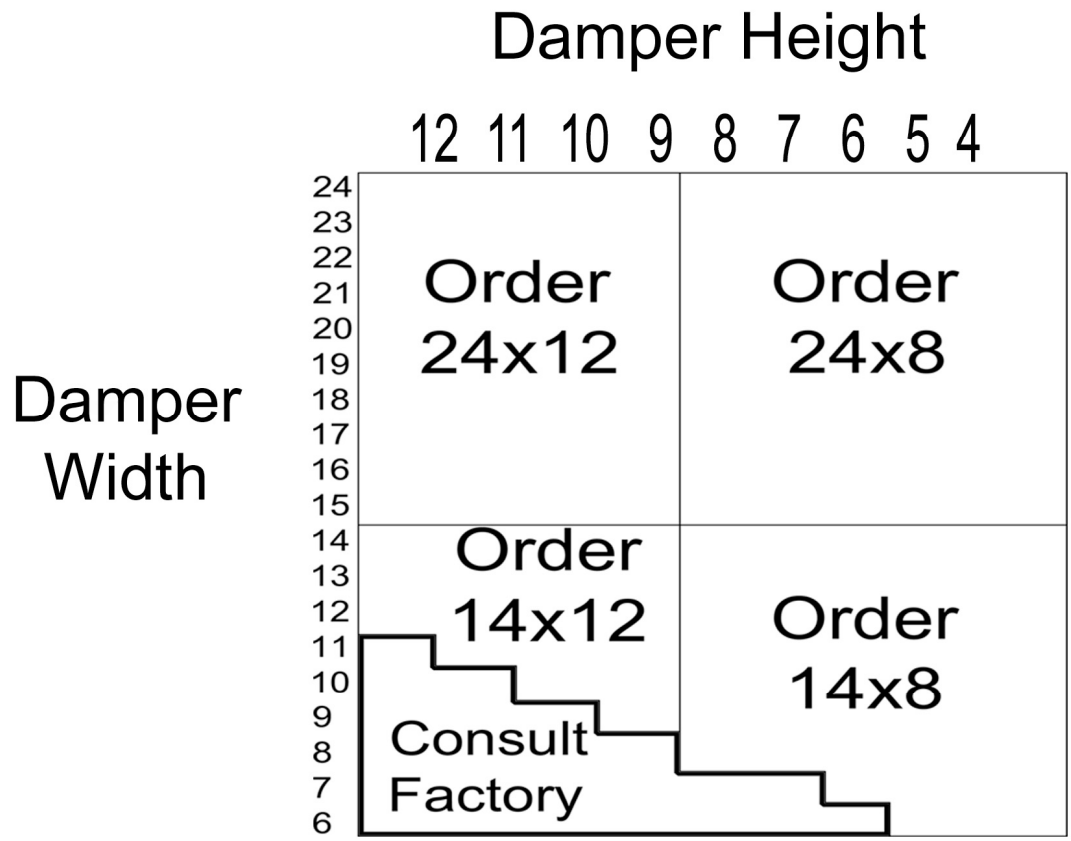
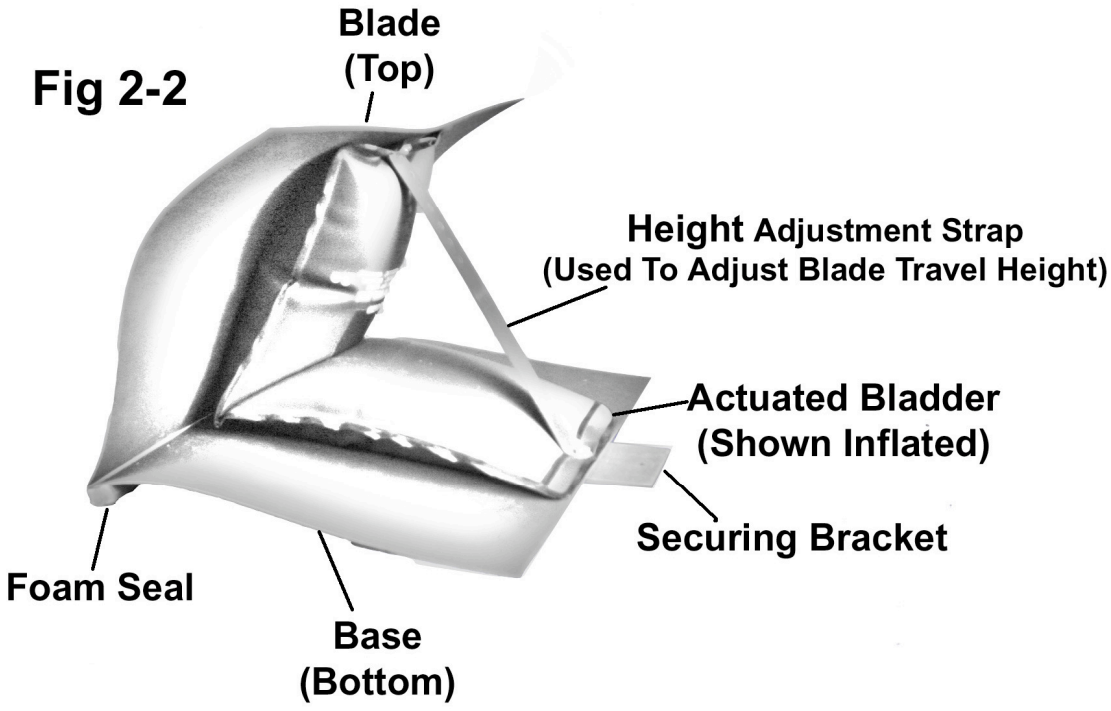

Damper Height
12 11 10 9 8 7 6 5 4
Damper Width
24 23 22 21 20 19 18 17 16 15
14 13 12 11 10 9 8 7 6
Order 24x12
Order 24x8
Order 14x12
Order 14x8
Consult Factory

Fig 2-2


Blade (Top)
Height Adjustment Strap
(Used To Adjust Blade Travel Height)
Actuated Bladder
(Shown Inflated)
Securing Bracket
Foam Seal
Base
(Bottom)

SECTION 2 Rectangular Flexdampers

The tight interference fit keeps the rectangular Flexdamper from moving about in the duct, and keeps the blade in proper position. The air tubing should be cut to a length to prevent the rectangular Flexdamper from moving down the duct. The air tubing and tightly fitting base therefore keep the rectangular Flexdamper in position, so that securing the rectangular Flexdamper to the duct with the securing bracket is not necessary in most applications. Trimming the top Blade: Trim the top blade of the rectangular Flexdamper an additional 1/4 inch more than the base to allow the blade to clear the sides of the duct. Depending on the condition of the duct, you may have to vary this amount of clearance. However, excessive clearance will cause excessive leakage. Remember you can always trim more off, but you can't put it back on!

Fig. 2-4 Very low leakage installation: Applications desiring ultra low leakage should first install and actuate the rectangular Flexdamper. The rectangular Flexdamper should be attached to the duct using the securing bracket so there is no chance of movement. With the Flexdamper actuated by the Airzone Control System, carefully trace the position of the blade in relation to the side of the duct from the bottom to the top of the duct (**Fig. 2-5**). Then let air out of the rectangular Flexdamper. Using silicone adhesive, install the foam sealing gaskets from the Airzone rectangular Flexdamper Low Leakage kit. Slightly overlap the tracing of the blade in such a manner that the blade slightly but firmly contacts the foam gasket when the Flexdamper is actuated. Actuate the rectangular Flexdamper before the silicone adhesive sets, and adjust the foam gaskets to a perfect fit. Use the Airzone Control system to actuate the Flexdamper to determine the Flexdamper's exact shape when in operation. Then allow adequate time for the silicone to set.

Fig. 2-5 Mounting the rectangular Flexdamper in a vertical plane. Sometimes a rectangular duct may be run on it's side, requiring the Flexdamper to be mounted on a vertical side. Mounting the Flexdamper in this manner is practical, although the Flexdamper should be mounted by the securing bracket. Also, trim an additional amount of material off the bottom edge of the blade to compensate for potential sag.

Fig. 2-6 Mounting the rectangular Flexdamper in a vertical duct: Rectangular Flexdampers can be mounted in vertical ducts, although mounting by the securing bracket is necessary. On those Flexdampers where the air inlet valve points downward (when Installed horizontally), the vacuum supplied by the Retrozone pump will pull the blade in place in the damper open mode. Do not mount the Rectangular Flexdamper to the top of the duct where gravity works directly against the damper blade.

Fig. 2-7 On larger rectangular Flexdampers you can fold the blade/base to allow it to fit in smaller duct hole.

Fig 2 - 1

Trim Blade 1/4" to Clearance From Duct or Insulation
Note: Blade is Trimmed 1/4" Smaller Than Base On Both Sides

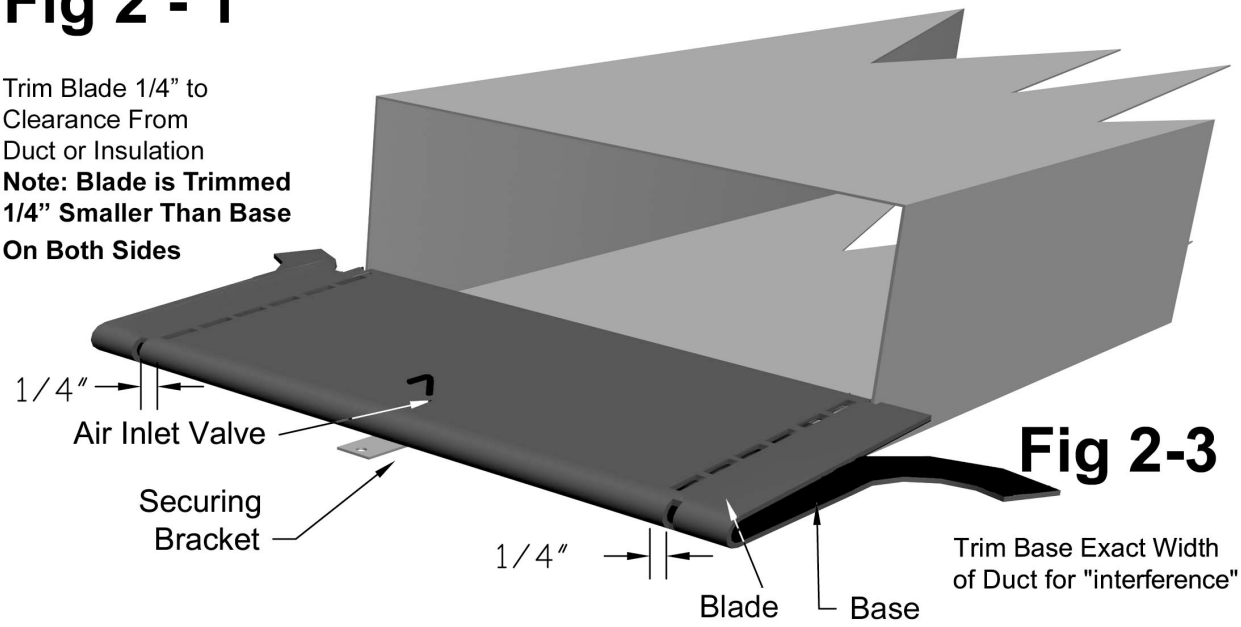


Fig 2-3

Trim Base Exact Width of Duct for "interference" Fit

Fig 2 - 5

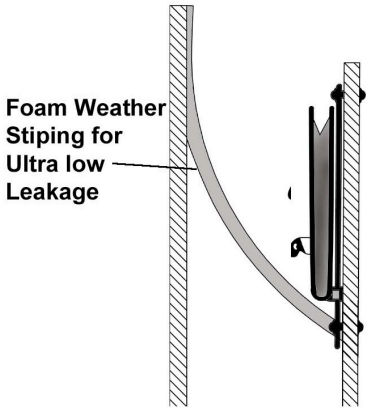


Fig 2 - 6

Note: Mount Securing Bracket to Side of Duct on Vertical Run **(Fig 2-5)**

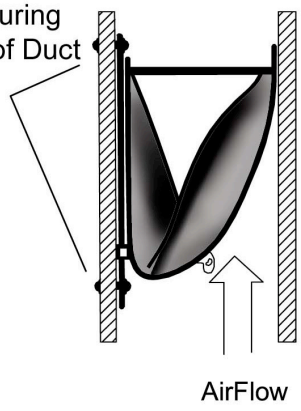


Fig 2 - 4

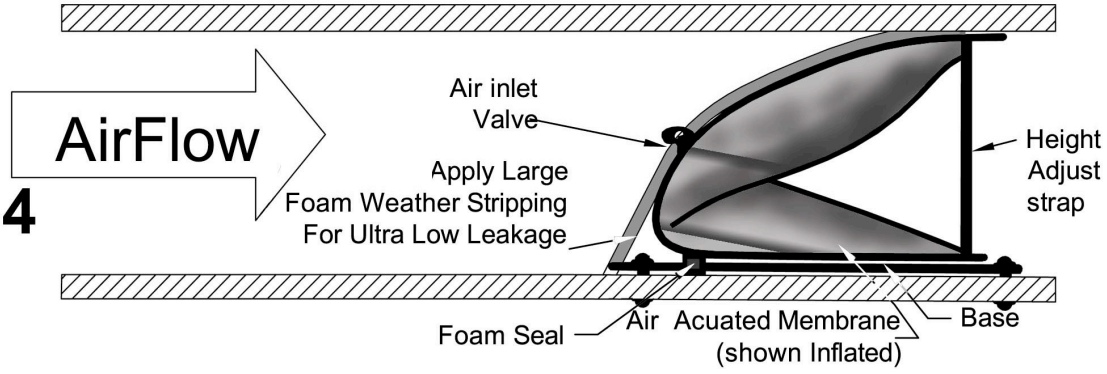
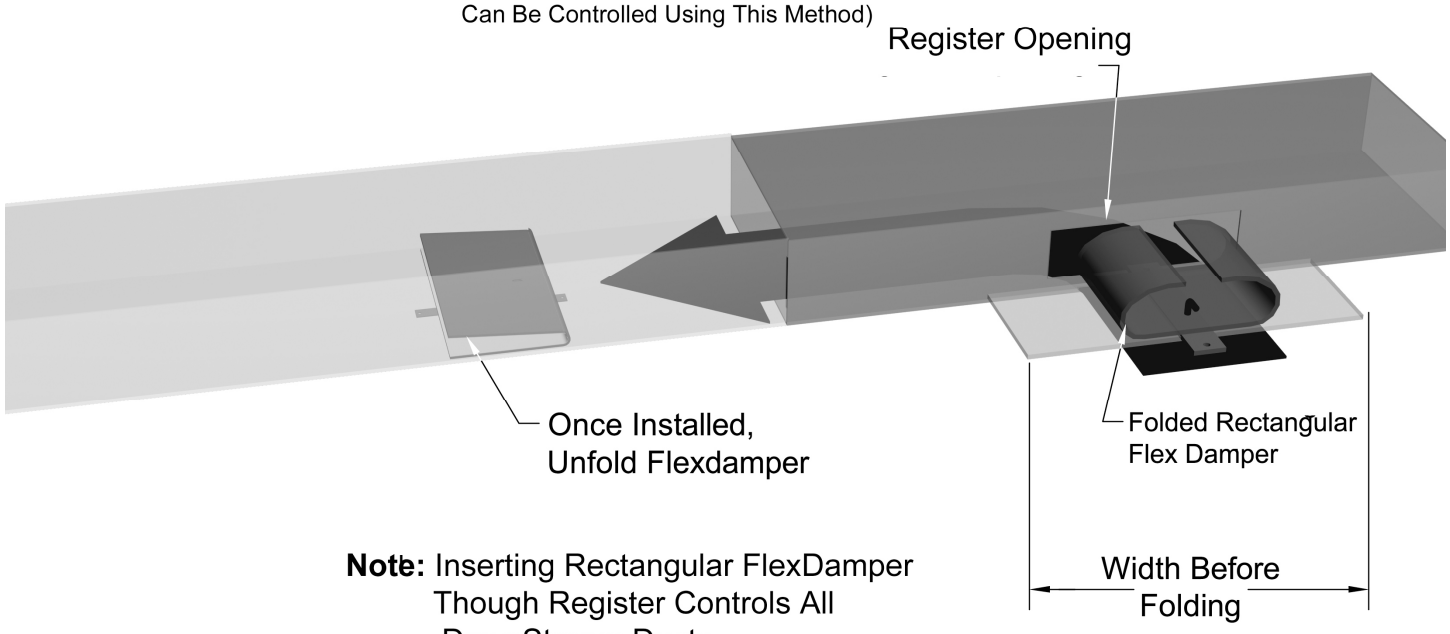


Fig 2 - 7 Rectangular FlexDamper Can Be Folded as shown for Insertion Though a Register. (enclosed Ducts Behind Furrdowns Can Be Controlled Using This Method)



Note: Inserting Rectangular FlexDamper Though Register Controls All DownStream Ducts

SECTION 3 Static Pressure Control

SECTION 3 STATIC PRESSURE RELIEF SYSTEMS FOR ALL RETROZONE ENERGY SAVING SYSTEMS

Forward: To maintain reliable and efficient operation of the HVAC System, airflow through the internal heat exchanger and air conditioning coil of the HVAC system must not be substantially reduced!

As zones are closed, static pressure will rise, forcing more air out fewer ducts and registers. At the point the pressure rises above the rating of the fan, airflow can become substantially reduced, or noise at the register can increase to an unacceptable level and reduces energy savings. While problems are rare, restricting too much airflow must be avoided. Retrozone provides a series of industry accepted, reliable devices and techniques to avoid any problems.

STEPS TO TAKE TO INSURE TROUBLE-FREE OPERATION.

The best way to proceed is to measure total system airflow with various airflow instruments with all zones open, and then go back and measure individual zones to compare airflows. If this is not practical, proceed with the steps below:

1. Follow "Typical Static Pressure Guidelines" below.
2. Install an ECL switch on all systems except heat pumps. Install duct sensors (for hi/lo protection) with zone panels that accept their connections.
3. Monitor the HVAC system closely to insure none of the problems described in "Systems and Effects" section.
4. Modify the zoning system as described in "Solutions" section if problems are encountered.

1. TYPICAL STATIC PRESSURE GUIDELINES

Two and 3 zone retrofit: When the ducts are evenly divided, 2 zone retrofit and often 3 zone retrofit jobs can be accomplished with no static pressure relief system. The use of an ECL switch is always recommended. Three zone retrofits may benefit from dump zones (see dump zone).
Two or 3 zone new construction: Upsize ducts according to design guide specs, and no pressure relief system should be needed.

Four zones or more, residential: Use an ECL and a barometric relief damper, or consult factory.
Four Zones or more, commercial: Use an ECL, barometric relief damper or static pressure system if over 5 tons, or consult factory.

Heat Pumps, All: Extra care must be taken since the ECL switch will not work on a heat pump. Use Hi/lo sensor switches with selected control panels.

SECTION 3 Static Pressure Control

NOTE 1: On borderline installations, it is typically very easy to add a static pressure relief system or dump zone AFTER the Retrozone system is installed, and if a problem with too much airflow reduction is encountered.

2. Install Evaporator Coil Limit Switch - See **Fig 3-2** and ECL switch installation sheet for more information. The ECL switch is designed to break the common wire from the transformer or control panel to the solenoid air switches. The effect is to defeat all zoning and restore total airflow to the system. The ECL is not designed to control the compressor. The ECL switch is a safety only. If activated by low suction line temperature, action should be taken to determine the cause (dirty filters, clogged coils, too little zone duct capacity, etc.)
NOTE: The ECL can be falsely triggered by cold ambient temperatures, although this is rare. Insulate the ECL switch if ambient conditions are likely to fall below 38ºF.

3. Symptoms and Effects of too much airflow reduction.

SYMPTOMS:
Described below are some of the immediate symptoms if too much airflow is reduced:

1. Fan "whining" or changing pitch.
2. Duct fittings coming loose.
3. Air Conditioning Evaporator Coil freezing over with ice.
4. Furnace high limit shutting furnace down.
5. Compressor shutting down on safeties.

EFFECTS:
Described below are the effects of airflow reduction on the HVAC equipment. These type of problems are extremely rare, but can be caused by restricting too much airflow through the HVAC equipment:

The HVAC Blower fan: If too much airflow is restricted, a typical squirrel-cage type blower will usually begin to freewheel, and actually use less electricity. Zoning poses little or no threat to the fan, although the fan can overheat if airflow is totally blocked.

The HVAC Air Conditioning Coil and Compressor - While rarely a problem, if too much airflow is restricted for too long, moisture can begin to collect and freeze on the inside evaporator coil, eventually shutting down airflow. This can cause refrigerant to return to the compressor as a liquid instead of a gas, which can cause damage. (The ECL switch is great, low cost protection. See ECL switch). Even when too much airflow is reduced, the one zone calling for air will usually satisfy quickly, long before any problem develops.

The HVAC Heat Exchanger - Less sensitive than the compressor is the Heat Exchanger. However, caution should be exercised so that the high limit safety switch on the furnace is not activated by restricting too much airflow.

4. SOLUTIONS IF TOO MUCH AIR FLOW REDUCTION IS SUSPECTED.

ALSO USEFUL FOR REDUCING AIR NOISE

A. Create Dump Zone
B. Evaporator Coil Limit Switch
C. Zone Redesign
D. Barometric Relief Damper
E. Static Pressure Control System

A. CREATING A DUMP ZONE: Remove a Flexdamper from a duct that serves a non-critical area that can be over conditioned without causing comfort problems. For instance, a Flexdamper serving a hallway would be a good candidate. If possible. locate the dump zone close to a return air register. BE SURE to plug the air tube of the removed Flexdamper for proper operation.

B. EVAPORATER COIL LIMIT SWITCH (ECL Switch): Recommended for all systems except heat pumps. The ECL switch deflates all Flexdampers by breaking the 24vac "common" to the solenoids. NOTE: Any energy saving Airzone solenoid can have the vacuum and pressure tube reversed to create a normally closed switch. Using the ECL switch with a "normally open" air solenoid can cause the Flexdamper to inflate when the 24vac common is broken – avoid ECL Switch use in these applications. See Section 4 - Solenoids for more information.

The ECL switch (see fig. 3-2) mounts on the suction line close to the HVAC evaporator coil. The ECL contacts open at approximately 38ºF and do not reset until around 52ºF.

The ECL switch is effective against coil icing caused by reduced airflow from too aggressive zoning. Many other HVAC system problems can cause coil icing, such as dirty filters, coils, or improper refrigerant charge. HVAC equipment must be kept in good working order.

A sometimes-activating ECL switch can be hard to diagnose; and is usually indicated by areas that are getting airflow even when the thermostat is not calling.

An ECL switch is a safety device only, and should never activate in a properly designed system. If the ECL switch is activating, immediately take corrective actions.

C. ZONE REDESIGN - Sometimes, depending on the application, it may be possible to increase the duct capacity of a smaller problem zone by adding to it a duct from a

larger zone. With Flexdampers, this can be done simply by disconnecting and re-connecting Flexdampers to different zones, where it can be done. Remember, the capacity of a duct has to do with both its size AND length. Longer ducts have more friction, and can carry less air. Also, the number of turns a duct makes will reduce capacity and energy savings.
Another way to increase airflow is to increase the duct size, or add a second duct to an area, although this is often not practical.

D. BAROMETRIC RELIEF DAMPER - This industry accepted method of controlling static air pressure uses a weighted metal damper to divert air back to the supply air side of the HVAC unit as static air pressure increases. As a result, a single zone receiving air gets less air overall, but that air will be cooler or warmer, which will satisfy the zone faster, therefore, saving energy.

Generally speaking, do not bypass any more air than is necessary to:
- Protect the HVAC equipment.
- Reduce noise to acceptable levels.

Where to use: 5 ton (62,000 btu) units or smaller.
Adjusting the Barometric Relief Damper:
After the Zoning system is installed, adjust all thermostats to call so that all zone Flexdampers are open. Then adjust the weights on the Barometric Relief Damper so that the blade just closes. As zones are then closed, the blade should open and bypass air.

E. STATIC PRESSURE CONTROL SYSTEM (Fig 3-3) Similar to the Barometric Relief Damper, the Static Pressure Control System bypasses the exact amount of needed air from the supply plenum to the return plenum.
Where to use: HVAC systems over 5 tons.
This system uses pressure sensing switches to modulate the bypass damper to the exact position needed to assure precision airflow and static pressure throughout the HVAC system. Has a pressure set point range of .17 to 2" W.C. Unit is pre-wired at factory and includes damper, probe and sensing tube. See below for needed sizes. Complete hook-up instructions are included with each system.

TONNAGE OF HVAC UNIT	RECOMMENDED DAMPER SIZES	
	Rectangular	Round
3 – 3.5	12" x 8"	10"
4 – 5	12" x 12"	12"
7.5 – 10	14" x 12"	14"
12.5	18" x 12"	16"
15 – 17.5	24" x 12"	18"

Larger sizes available along with intermediate sizes. Call Factory for details.
Round dampers can handle up to 3" W.C.

Barametric Relief Damper Uses Steel or Flex Duct to Connect Between Supply and Return Air Plenum. Weighted arm Relieves Excess Air Pressure

Fig 3-1

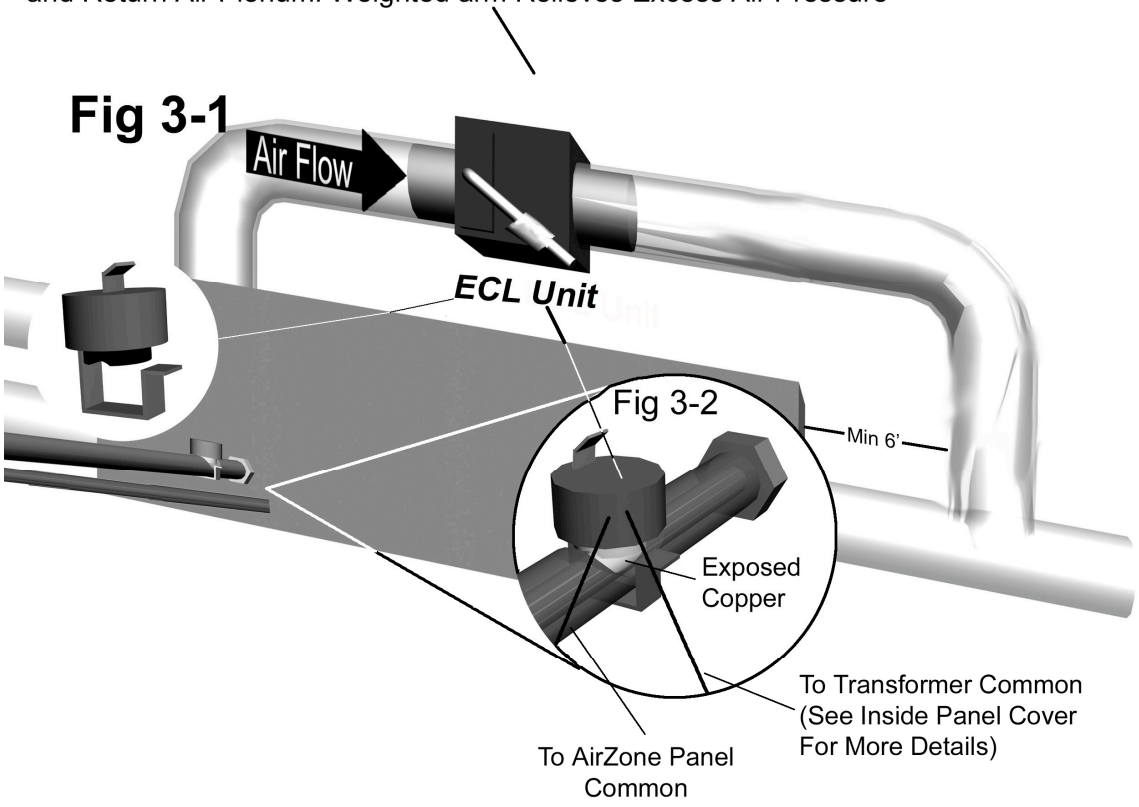
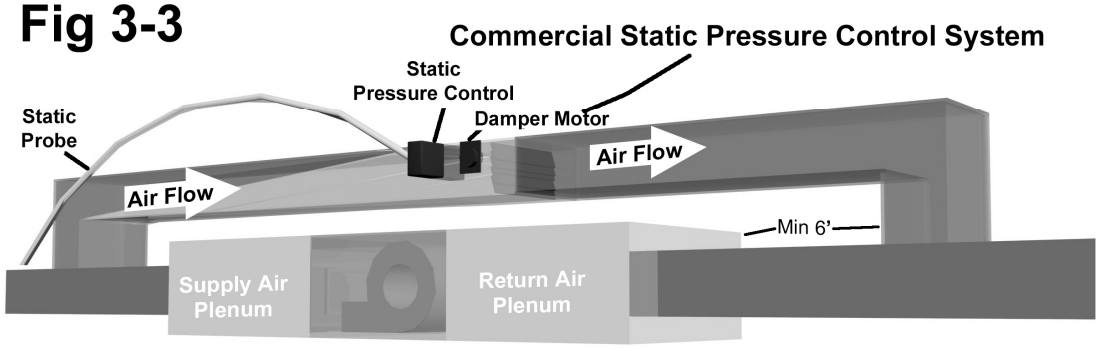


Fig 3-3



SECTION 4 Airzone Controllers - General Information

SECTION 4: RETROZONE CONTROLLERS - GENERAL INFORMATION

Specific information on individual Airzone Control Systems are included with each panel, including wiring and other information. The following information is generic to all Airzone Systems.

The Airzone Trouble Shooting Manual contains more information on how individual components work.

A. Where to locate the Airzone control panel.
B. Flexdamper actuating times.
C. Pump hook-up and other information.
D. Solenoid-Slave Zone information.
E. Thermostats.

A. Where to Locate the Airzone control panel(s)

Note: Consult Section 6 "Avoiding Noise Problems" as this section may impact locating the Airzone Central Control Equipment.

If possible, the Airzone Control Units should be mounted in a conditioned space, away from temperature extremes. Doing so will prolong the life of all components. However, it is acceptable to mount Airzone Control Units in attics and other areas that do not exceed 130ºF. Most Control Panels are rated for 130ºF duty, but Retrozone strongly recommends the mounting of these panels in conditioned space. This may be useful also because of the status LED lights, which can provide user feedback. It is acceptable to mount the control panels remotely from the Airzone Solenoid panel. While all Airzone equipment should be easily accessible for service, all user inputs are from the control panel only.

B. Flexdamper Actuating Times - How fast is fast enough?

The speed at which Flexdampers actuate is dependant on several factors, including:

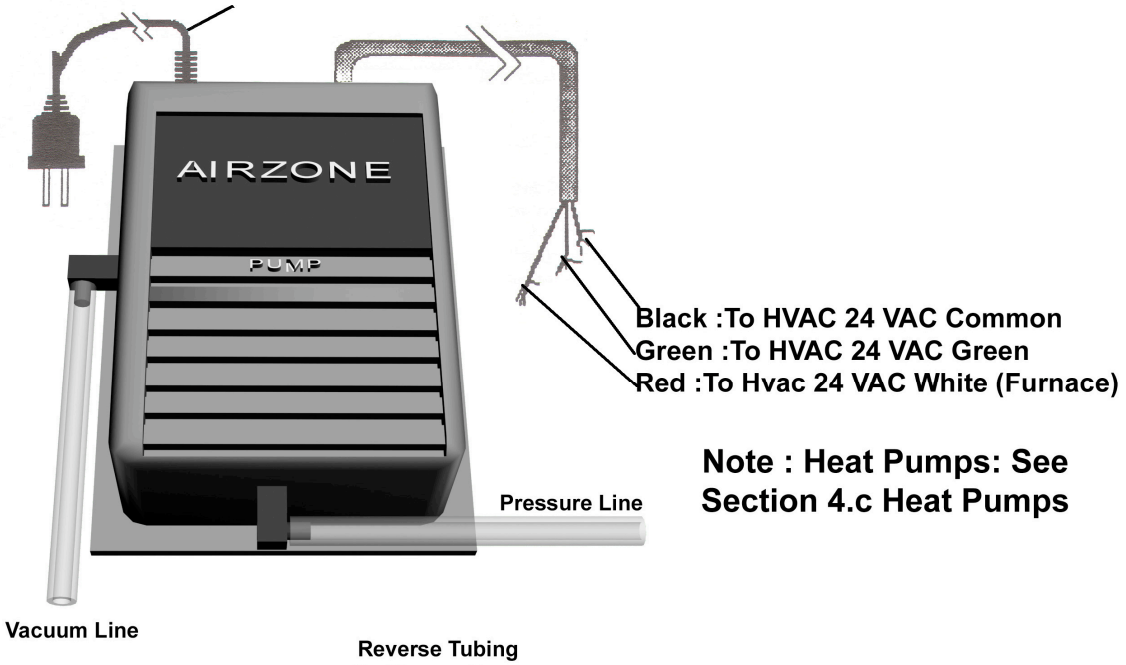
1. The size of the Flexdampers on each zone.
2. The length of the tubing.
3. The timing of the call to actuate - are other zones also calling?

95% of all new Airzone installations operate satisfactorily on just one pump. Should the reaction time of the Flexdampers be too slow, a second expansion pump can easily be added later. In most cases, Airzone central control equipment is located near the inside furnace/blower section of the HVAC. Keep tubing lengths as short as possible, although runs of 50 and 100 feet are common. Excessively long tubing runs will slow Flexdamper actuating times, perhaps making a second pump necessary. Any application with more than one 12 or 14 inch Flexdamper on a zone may be a candidate for a second Airzone pump. Excessive air tubing lengths or amounts may also slow reaction times.

C. Pump hook-up and other information. See fig. 4-1
The Airzone pump is a long life, continuous duty type pump. Pumps are designed to be powered by 24VAC AND 110VAC. All pumps have an internal 24vac relay with three connecting wires. Wire pump as described in the inside cover panel instructions of your Airzone System. The troubleshooting manual contains detailed information on the pump and relay, however please note:
* The black wire connects to the common wire of the HVAC's 24vac Transformer, NOT the Airzone transformer.
* The pump is designed to hang loosely from a nail or screw, over-tightening can split the rubber mounting tab.
* Heat Pumps often do not require connection of both green and red pump relay wires. It is acceptable to connect just one pump relay wire to any (24vac low voltage only!) heat pump control wire that is energized in all modes (usually the fan wire)
* In certain applications it may be necessary to run the pump continuously, simply wire the pump directly to the Airzone transformer with the common and red or green pump relay wire.

D. Solenoid - Slave Zone information. See Fig. 4-2 "Solenoid Air Switches"
CAUTION: Do not remove or tamper with the pressure and vacuum relief valves installed inside the Airzone System. These important valves must remain in the proper lines, and pointed in the proper direction. Any Airzone solenoid can be changed from normally open operation to normally closed operation. Simply disconnect and reverse the two tubing connections to each solenoid as shown. DO NOT reverse the vacuum and pressure relief valves as severe damage to the system can result.
“Normally open" means that when de-energized, the solenoid air switch connects the vacuum line of the pump to the Flexdamper, causing it to open or remain open.
"Normally Closed" means that when de-energized, the solenoid air switch connects the pressure line of the pump to the Flexdamper, causing it to close and restrict air flow.
SLAVE ZONES- Slave zones are zones where a thermostat or a switch directly controls the solenoid/Flexdamper to simply close off airflow to an area, without controlling the HVAC system.
Slave Zone Thermostats - Use the normally closed solenoid configuration, since a thermostat will energize the solenoid when airflow to an area is needed.
Toggle switch or other slave zone control - Depending on the application, use whatever mode - normally open or normally closed (see **Fig. 4-2**) - that will result in the solenoid being energized the least amount of time. Retrozone recommends doing so to reduce energy use and prolong component life.

FIG 4-1



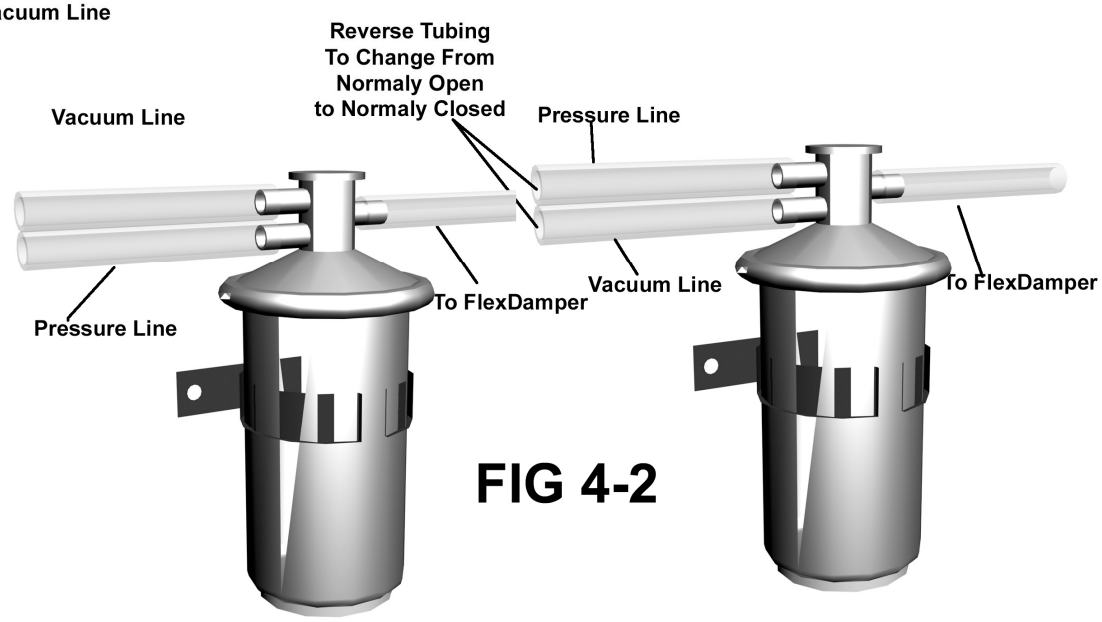


FIG 4-2

Normally Closed Configuration

Normally Open Configuration

SECTION 4 Retrozone Controllers-General Information

E. Thermostat Mounting Location and other information.
Correct thermostat mounting - Careful location of the Retrozone thermostats will have great importance on the comfort and energy efficiency of the HVAC unit, and can greatly reduce wiring time and costs.
Fig. 4 - 3 Shows a typical floor plan of a home, divided into five zones. The thermostat for each zone should be centrally located within each zone.
The thermostat for each zone:
- should not be located on an outside wall, above a lamp, in direct sunlight, in the direct air-stream from a register, or anywhere else where a false reading may occur.
- should be located about 5 feet from the floor, in an area that receives good air circulation for that zone only.

FIGURE 4 - 3 EXPLAINED: The "T" in a circle represents a thermostat.
Wiring tip Fig 4 - 3A: Whenever possible, locate the zone thermostat on a wall shared with a closet, utility room, or other room where the thermostat wire can be run through the wall and then up the closet (or other) wall, and through the ceiling or floor. This wiring method is far easier than "fishing" wire between walls.

Zone 1 thermostat includes both the living room and dining room, and is located where the radiant heat from the fireplace will not give the thermostat false readings.

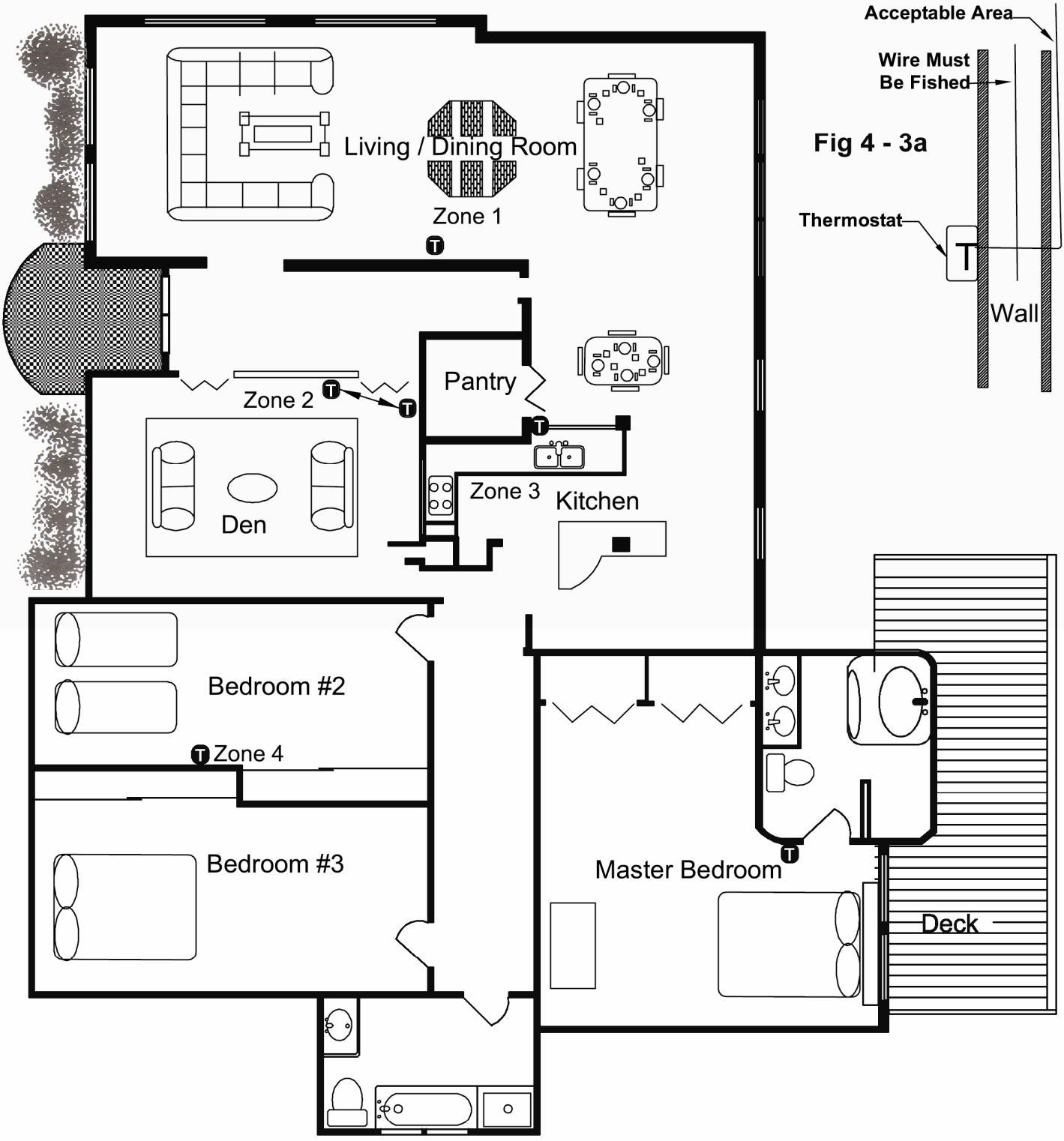
Zone 2 thermostat includes the den and entrance, and is located to sample the temperature between both. A less desirable, but easier to wire location is also shown, since the wire can be run inside the pantry. Thermostats should always be mounted in the middle of a zone, if possible.

Zone 3 thermostat is mounted between the kitchen and the breakfast nook, where the thermostat can "sample" the temperature from both areas. Also, the thermostat is located on a pantry wall, simplifying wiring (see Fig 4 - 3a) by eliminating the need to "fish" wire between the walls.

Zone 4 thermostat should be located in whichever bedroom is most used, or most sensitive - such as the case of a newborn. Mounting on outside of closet simplifies wiring **(see fig 4 - 3a).**

Zone 5 thermostat - Even if this was a two zone job (living - sleeping zone), the sleeping zone thermostat almost always should be mounted in the master bedroom. In this example, the thermostat is mounted in an excellent spot - interior wall, close to the bed, AND in an area where it can "sample" both bedroom and master bath temperatures. The same thermostat location strategies apply to commercial jobs in the same manner.

Fig 4 - 3



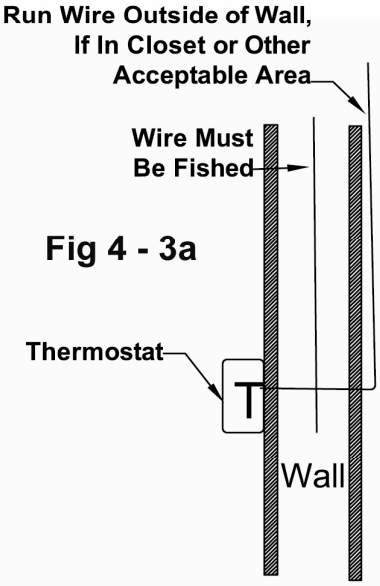


Fig 4 - 3a

SECTION 4 Retrozone Controllers-General Information

SECTION 4 OUTSIDE AIR INTAKE See **Fig. 4 - 4**

Forward: Often outside air can be used to provide a "free" source of cooling and ventilation into a home or office. In many parts of the country, the air conditioning is forced to run to remove sun load latent heat. Sometimes special situations dictate the need for occasional ventilation, such as Radon concentrations. The Airzone outside air option can provide an effective solution. Basic outside air control: To selectively use outside air, the normal return air must be equipped for control by Flexdampers. In addition, a duct needs to be run between the return air plenum and an outside air location. The outside air pick-up duct's (**Fig. 4 - 5**) length should be as short as possible. Size the outside air pick-up duct as large as possible. This will insure maximum effectiveness of outside air use.

Control Sequence: See **Fig. 4 - 5**

The outside air system is provided with a manual toggle switch to, when activated, provide the following:

A. Flexdamper(s) actuate to block the normal return air path while another Flexdamper opens in the outside air duct. If equipped, a vent duct would open for discharge air.

B. The 24vac control signal to the compressor and heat exchanger is blocked, preventing either from running.

C. The Airzone System remains operational, so outside air can be directed into any zone. The ability to direct all the outside air into one zone enhances the ventilation capabilities of the outside air system.

D. Advanced controls are under development; consult factory for information.

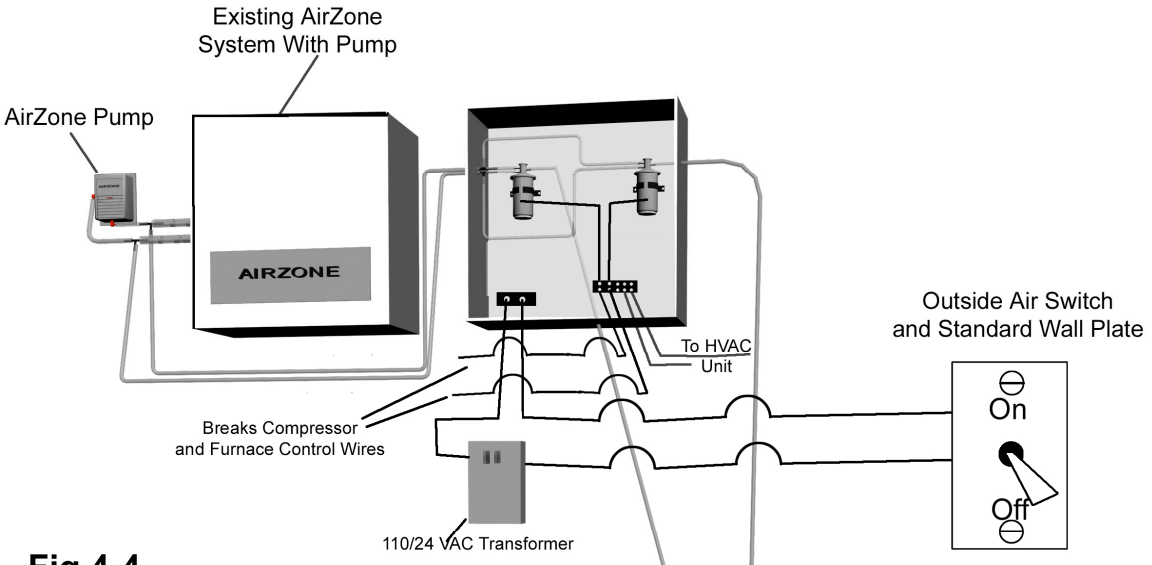

Existing AirZone
System With Pump
AirZone Pump
AIRZONE
To HVAC
Unit
Outside Air Switch
and Standard Wall Plate
On
Off
Breaks Compressor
and Furnace Control Wires
110/24 VAC Transformer

Fig 4-4

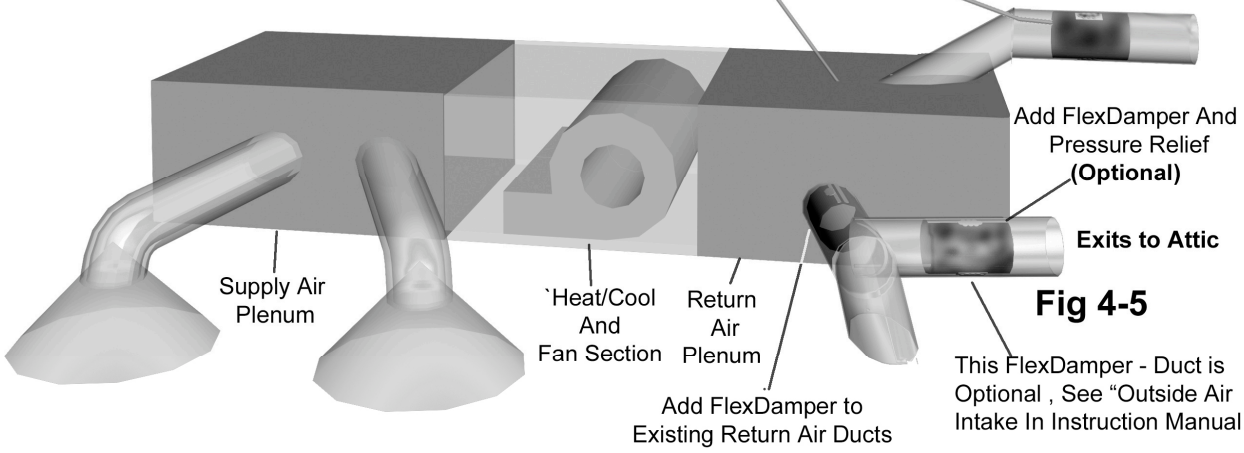

Add FlexDamper And
Pressure Relief
(Optional)
Exits to Attic
Supply Air
Plenum
`Heat/Cool
And
Fan Section
Return
Air
Plenum
Add FlexDamper to
Existing Return Air Ducts
This FlexDamper - Duct is
Optional , See “Outside Air
Intake In Instruction Manual

Fig 4-5

SECTION 5 Expanding any Airzone System

Forward: Any Airzone System can be expanded to run other Airzone Equipment (except where noted).
The primary advantage of this is that the pump on the base Airzone System can provide the air for the other panels, thus eliminating the cost of additional pumps.
Some Airzone products are designed to tie into other Airzone Systems, such as the Static Pressure Control System.
Other Airzone Products, such as SPP panels (without the control panel), can be used stand alone or slaved to another Airzone panel. All Airzone products can be special ordered without pumps, consult factory.
When adding additional Airzone Panels, remember that extra 24vac transformers will probably be necessary.

SECTION 6 Avoiding Noise Problems

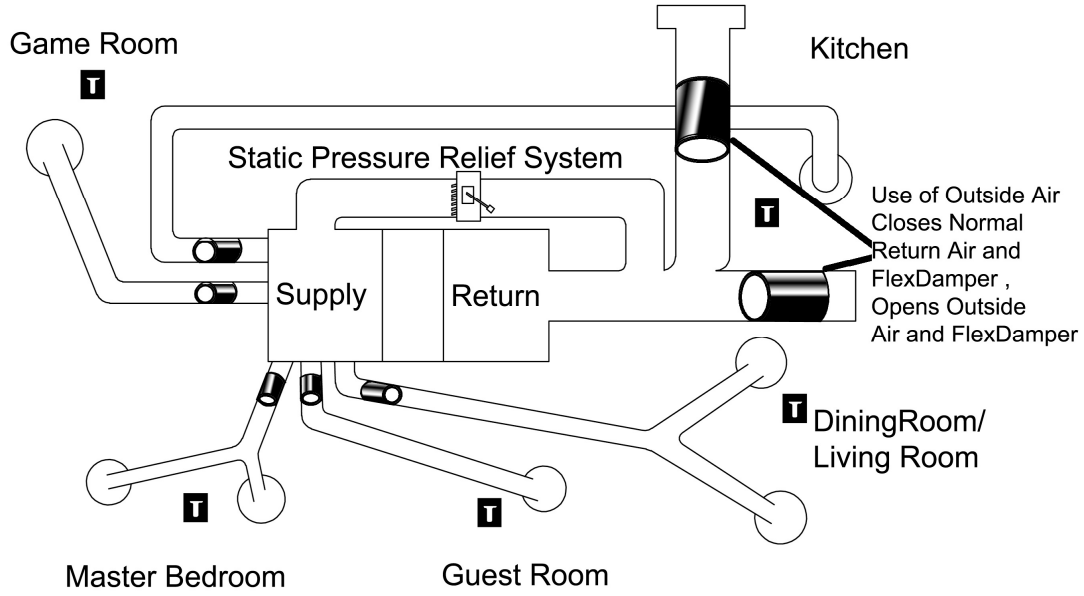
AVOIDING SOUND OR NOISE PROBLEMS
Flexdampers have eliminated many of the noise problems such as rattles found in older style damper systems.
Even without this section, chances are your Airzone installation would have no problems with noise. But Retrozone's experience has shown that in special circumstances, such as residential bedrooms (during sleeping hours), even the slightest noise can cause concerns. A thorough review of this section will help you avoid or fix most noise problems.

Different types of sound:
Airzone Component Sounds, including: Pump sounds
Solenoid sounds
Flexdamper Actuating Sounds
Air Sounds, including:
High velocity air rush at register
Register rattles
Airzone Component Sounds
Pump and solenoid sounds - Avoid any problem by NOT locating the Airzone control system around a bedroom or other noise sensitive area. The pump only runs when the HVAC runs, so the slight pump hum is usually masked by the HVAC system.
Flexdamper Actuating Sounds - Flexdampers can make a very slight "popping sound" (especially when new) when actuating. While rarely a problem, these sounds are more pronounced in steel duct, especially when the Flexdamper is mounted at the register. If you must register mount a Flexdamper in steel duct in a bedroom area, consult Retrozone for advice.
Register mounting the Flexdamper in a bedroom area may be acceptable if the home only has one occupied sleeping zone, and if the other zones are setback at night. This is because the Flexdampers serving the bedroom areas would normally remain open and seldom actuate, thus having no potential to make unwanted sounds.
Air Sounds - High velocity air rush at register - As zones are closed down, more air will be forced out the remaining open ducts, sometimes causing increased register sound. This concern is far more common with rigid steel duct than flexible duct.

Fortunately, this type of constant background sound is "white" noise, similar to a waterfall, and is usually not a problem. However, should this sound be a problem, refer to Section 3 for methods of relieving static pressure.

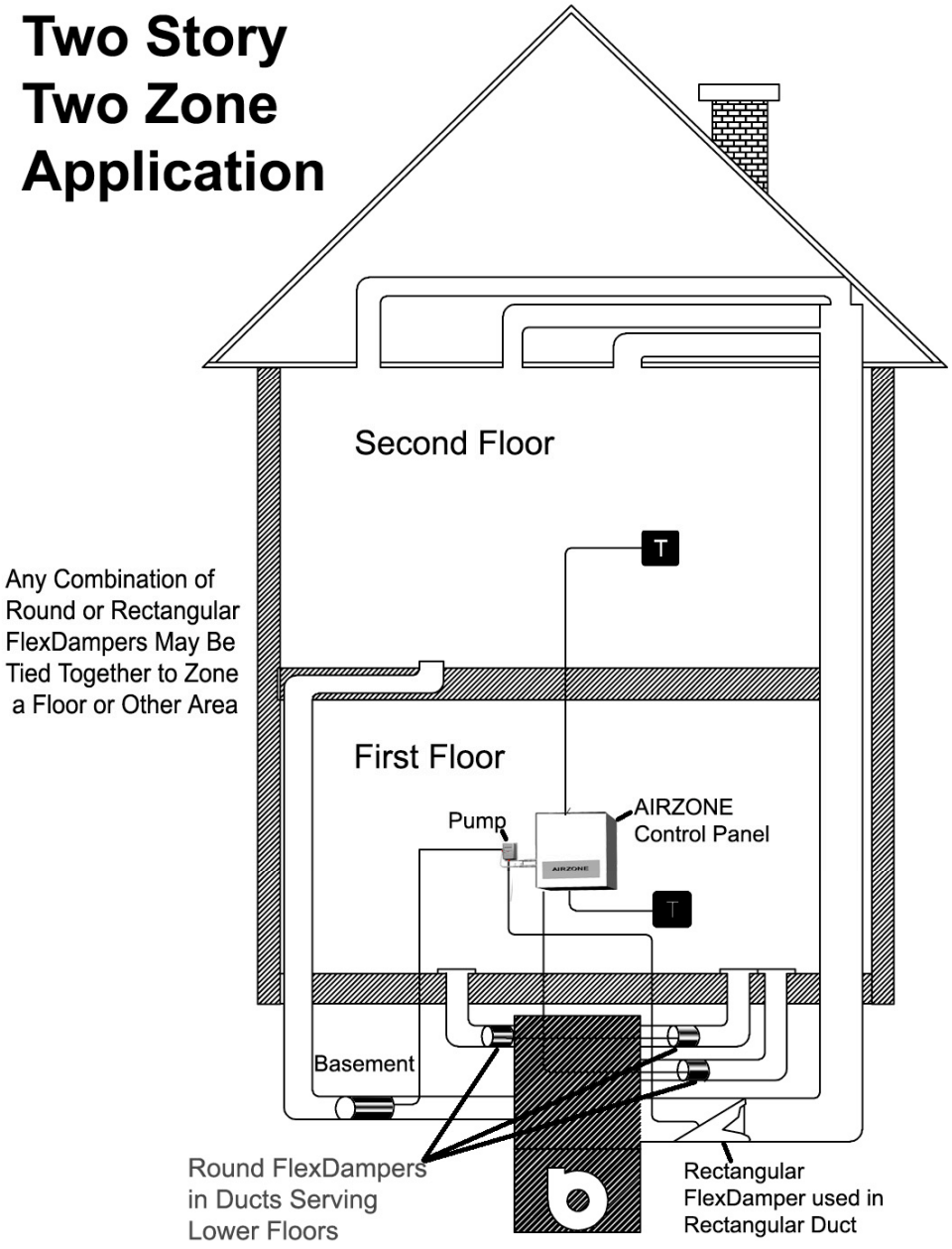
Register Rattles - More offensive is register rattles. In a retrofit job, occasionally a register may rattle as air speed increases. Remove and replace, or secure register vanes in such a way that rattles will not occur. You might also try small high-density weather stripping between the register and the wall.

5 Zone With Outside Air and Static Pressure Relief System



Static Pressure Relief System or Barometric Relief Damper Modulates to Insure Proper Airflow And Reduce Noise

Two Story Two Zone Application



SECTION 7 Planning and Pre-wiring Information

ZONE CONTROL FOR HOME AND OFFICES - GREATER COMFORT GREATER ENERGY SAVINGS.

With an Airzone system directing the flow of air exactly where and when you need it, energy is not wasted over-heating or cooling an area that is already satisfied or unoccupied. Fuel savings of 10 to 30 percent or more are possible, depending on how the Airzone System is used or "managed."

DIFFERENT TYPES OF ZONE CONTROL
Three different types of zone control with Airzone give you three different levels of capabilities.
Primary Zones- (Airzone Systems with control panels) A primary zone is a zone with a thermostat that not only controls Flexdampers but also controls the operation of the HVAC System, and is totally automatic. When a primary zone thermostat calls for air, the Flexdampers serving this zone will open, Flexdampers serving other zones will close, and the HVAC system will operate.
Slave Zones- (SPP panels with no Control Panels) Slave zones are used to simply open and close certain ducts, such as those serving an unused guest bedroom. While slave zones can be controlled by a toggle switch or thermostat, only the Flexdamper(s) are controlled: The HVAC unit is not brought on or off. Airzone's SPP Panel, on its own, is an example of a slave zone.
Combination Primary/Slave Zones: Suppose you wanted to zone a home into three primary zones with a SPP panel and control panel, and also wanted to control a seldom used utility and guest bedroom. Use a SPP-3/control panel combo tied with an SPP-2 for this control. Order the SPP-2 without a pump. Why not use an expanded SPP-3/control panel combo for five primary zones of control? Besides greater cost, if the utility room were set up as a primary zone, it could be the only zone calling for air - forcing you to use some type of static pressure relief system. On the other hand, if this area were a small office where temperature was critical, a primary zone would be the way to go.

DESIGNING ZONE CONTROL INTO A HOME OR OFFICE - NEW CONSTRUCTION OR RETROFIT.

ALL SYSTEMS - Designing a zoning system into a home or office is easy, if a few basics are understood. The zoning system should always allow a certain amount of airflow over the coil or heat exchanger of the HVAC system, so the Airzone system should never be installed in such a way as to restrict a significant amount of the total airflow going through the HVAC furnace/evaporator coil.
As an Airzone System begins to close dampers, the air velocity and static pressure will increase, and more air will be moved through the remaining open ducts. This occurs up to the point that the HVAC fan capacity is exceeded and the amount of airflow is reduced. At that point, simply use one of several static

pressure control systems or methods offered by Retrozone, Inc.

Where to mount the Airzone Panel: The Airzone Panel(s) can be mounted by the HVAC unit, or remotely if desired, as long as the panel(s) are easily accessible. Avoid bedroom closets or locations where the minor noise of the Airzone Panel could be a problem.

Where to mount thermostats: Thermostat placement is critical to maximize the benefits of zoning. Thermostats should be placed at a central location in each zone, on an interior wall. Avoid placement where lamps, sunlight, or other artificial heat loads can affect the thermostat.

NEW CONSTRUCTION

The Airzone System can often eliminate the need for two or more separate HVAC systems, while at the same time offering more zones of control. Because the Airzone System manages airflow so efficiently, you can use a smaller HVAC system with no loss of comfort and big gains in energy savings. In fact, the Airzone System works best with a properly sized or slightly undersized unit.
On installations where the duct system is being designed to use zoning, the size of the ducts can be slightly increased to enhance the zoning performance. When designing the duct system for zoning, caution should be used to avoid two extremes: First, over sizing the ducts to a point that, when all Flexdampers are open, air velocity (how fast the air is moving through the duct) falls to a point that air is not properly circulated in the duct. Second, under sizing the ducts to a point where too much airflow is restricted when only one zone is calling for air. For an Airzone System of three zones or less, each zone's duct(s) should be sized to handle 60 to 70 percent of the total airflow. This will enable an installer to avoid using any kind of static pressure relief system, since both extremes mentioned above will be avoided. Instead, static pressure and air velocity will vary as zone dampers open and close. Call a Retrozone expert for more information.

New Construction - Designing the duct system layout.
Designing a duct system to include an Airzone System can be easier than designing a single zone duct system. Why? A conventional single zone system must have the duct sizes carefully calculated to the load on each room or zone. Even so, this method of duct sizing cannot compensate for sun load and other changing variables.
An Airzone System automatically controls the airflow to each zone, making the size of the duct serving the area less critical. The ducts should be sized larger than ducts in a single zone system so that each zone can receive enough air to quickly satisfy.

SECTION 7 Planning and Pre-wiring Information

Two and three (and sometimes four) zone systems using the Airzone System can be designed with no static pressure control systems. Airzone Systems using more zones will typically need one of the static pressure control systems.

Planning the layout of the duct system in new construction requires not only attention to the floor plan of the home, but also how the homeowner will be using the home. Making each room a zone can be impractical because of the expense; instead the home should be divided into areas or zones that are used typically at the same time. An easy example is a home that has all the living areas on one end, and the sleeping areas on the other. The designer might make this a two zone application - living and sleeping. The duct system should be designed so that the ducts serving each zone are accessible for easy Flexdamper installation.

Checklist for installing an Airzone System in new construction:
A. Design duct system so that each duct is accessible for Flexdamper installation and service. All ducts from each zone should connect together and then home run back to the plenum, so that each zone has only one or two ducts, thus needing only one or two Flexdampers. Where the capacity of a 12 inch or larger duct is needed for a given zone, consider using two smaller Flexdampers/ducts per zone, since response time will be faster.
B. Up-size the ducts according to the guidelines in this section and the Manual J guidelines. It is very important to have plenty of duct capacity into each zone so that zone may satisfy quickly, should it be the only zone calling. Don't worry about a zone getting to much air; the Airzone system will automatically control that.
C. Run all thermostat wire during the construction phase. Run 8 conductor, 22 gauge thermostat wire, or call for specific details for your system. Be sure to locate thermostats central to each zone.
D. Depending on the duct layout and the mounting location of the Airzone System Panel, run tubing during construction.
E. Do not oversize the HVAC system - bigger is not better with zoning. Consult Manual J for details.

RETROFIT-DESIGNING RETROZONE INTO AN EXISTING HOME OR OFFICE.
The Airzone System was especially designed for existing applications where the ducts are already in place, since Flexdampers can be installed easily in existing ducts. The Airzone System can correct many existing system problems. See "Correcting Problems in Existing Systems" for details. Try to divide the home into two or more general zones of use. Also inspect the duct layout to determine how the home can be divided. Several ducts can be tied together to create one zone.
Attempt to limit the number of primary zones to six or less.

SECTION 7 Planning and Pre-wiring Information

Each zone will need a thermostat centrally located within that zone.
Experience has shown that most duct systems can be divided into two equal zones (and sometimes three) and need no static pressure relief system.

REGULATING THE STATIC PRESSURE ON YOUR SYSTEM
As mentioned earlier, some care must be taken to insure that an adequate amount of airflow continues to pass through the HVAC system to insure proper operation. While restricting too much airflow can cause several HVAC problems, these problems are easy to deal with or solve using various Retrozone products and design techniques. Problems with restricting too much airflow are rare for the following reasons: When only one zone is calling (the most restrictive mode) that thermostat is satisfied very quickly, before problems such as coil icing can occur.
With Airzone Systems, many options and safeties exist to control these potential concerns. Install the Airzone System according to the instructions. Should you have a problem, use one of the solutions below for correction.

A. ECL Switch - Two and three zone new construction / retrofit applications typically need nothing more than Airzone's inexpensive ECL switch installed on the suction line of the evaporator coil to monitor against coil freeze up.
If refrigerant temperature drops too low, all Flexdampers will open. The ECL switch is recommended for all systems except heat pumps. Heat Pumps should use a control panel that accepts duct sensors for hi/lo protection.

B. Dump Zones - If too much airflow restriction is suspected, simply remove a Flexdamper from a duct serving a common area like a hallway where temperature control is not critical. This "wild duct" is open all the time, and relieves system pressure.

C. Barometric relief damper - This Retrozone product is installed in a duct between your supply air plenum and return air plenum, and opens automatically to relieve pressure as zones close off.

D. Static Pressure Control System - Similar to the barometric damper, the Static Pressure Control System provides static pressure control for commercial installations over 5 tons, and is available in all duct sizes.

SIZING THE HVAC UNIT CORRECTLY

Fact 1: The most efficient HVAC unit is one that is sized correctly to the load on a home or office.
Fact 2: Many HVAC units are oversized for the home or office.

Over-sizing your HVAC system may sound like a great idea - plenty of capacity to keep you warm or cool. But the truth is that an oversized unit actually decreases your comfort AND wastes energy at the same time. An Airzone System, by eliminating over cooled and over heated areas, stretches the capacity of the unit. Further, when unused zones are shut down, even a severely undersized HVAC unit (not recommended) has the ability to provide total comfort in the zones that are being used.

Almost everyone has some type of a problem with comfort in their home, as well as a desire to save energy. Airzone Systems can be used to correct many types of comfort and/or energy problems:

A. Undersized HVAC System - Review the '"Sizing the HVAC Unit Correctly" Section above to understand why Airzone Systems can turn the undersized unit into a highly efficient and comfortable unit. Without zoning, most HVAC systems have to be sized for "design conditions," meaning the hottest and coldest days of the year. However, these peak temperature extremes account for only about 5% of the year. The rest of the time, energy and comfort are wasted through cycling losses and poor humidity control. With Airzone, a smaller HVAC unit can be used for better comfort and energy savings. What about the 5% of hottest and coldest days? Remember, with an Airzone System, no energy is wasted overheating and overcooling the areas you are using, so you get more mileage from the capacity you do have. Second, you can always setback areas not in use, and achieve total comfort in the occupied zones. The other 95% of the year is rewarded with significant gains in energy savings and comfort.

B. Hot and Cold Spots - Using multiple thermostats and multiple zones of control, Airzone puts air exactly where it’s needed, by "borrowing" the air from unoccupied or satisfied areas.

C. Poorly Designed Duct Systems: Airzone can correct many duct design flaws since Airzone forces the air to go exactly where it’s needed. The key to solving HVAC problems with Airzone is common sense and a thorough understanding of how Airzone operates. For more Information on how Airzone can be used to correct a problem duct system, call the Retrozone Factory.

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