ModuFlex
Adaptive, Comfortable, Sustainable Environments

ModuFlex by Price is an Underfloor Air System Solution that is easy to apply. This system combines the benefits of Raised Access Floor (RAF) and Price’s years of occupant comfort experience to provide a tailored solution that achieves a comfortable building environment and maximum flexibility.
Price ModuFlex is easy to apply and a flexible zone based solution for Underfloor Air Systems. These systems are most commonly applied to commercial office spaces to improve air quality and thermal comfort, while saving energy and reducing utility costs.

Projects with raised access floors and underfloor air systems typically require flexibility, energy efficiency and improved indoor environmental quality (IEQ). ModuFlex's zone solutions have been strategically designed to provide a modular solution that optimizes energy usage and IEQ. ModuFlex leverages Price's rigorously tested Underfloor Air Distribution (UFAD) products to ensure occupant comfort, and native BACnet microprocessor controllers to ensure proper control.

Together, these components provide a modular system that is easy to remodel and reconfigure and can communicate with the existing building management system.

**KEY SYSTEM FEATURES:**
- Easy-to-apply zone-based solutions.
- Combines Price's years of occupant comfort experience with cutting edge system controls.
- Thoroughly tested controls for a reliable network integration.
- Modular solution that optimizes energy efficiency and IEQ.
- Ability to customize the solution to fit your unique needs.

**SYSTEM APPLICATIONS**

- **Special Zone: Sub-plenum Cooling Only - Variable Volume** Pg. 7
- **Interior Zone: Cooling Only** Pg. 4
- **Special Zone: Perimeter Heating and Interior Cooling** Pg. 8
- **Mechanical Room** Pg. 9
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- **Interior Zone: Cooling Only - Variable Volume** Pg. 3
- **Interior Zone: Cooling Only - Constant Volume** Pg. 3
INTERIOR ZONE APPLICATIONS

For most large open spaces with cubicles and open meeting areas, large interior zones may be thought of as having nearly uniform conditions. The whole zone has a relatively stable load during occupied hours and may be treated as such. Loads in the interior zone are predominantly composed of occupant, lighting, and equipment loads. These zones will be supplied air via a common main plenum. These zones typically only require cooling to maintain thermal comfort.

INTERIOR ZONE
Cooling Only: Constant Volume (IZ1)
This control zone is formed using manually adjustable constant volume diffusers with air being supplied from the pressurized floor plenum. Pressure nodes placed strategically throughout the plenum monitor the plenum pressure. The Underfloor Pressure Controller (PCU) maintains desired plenum pressure and airflow through signalling the main fan to modulate or adjust the plenum dampers.

Modular Floor Displacement Diffuser
- Manually adjustable baskets with aluminum (8in. or 10in.) or polymer (8in.) face construction
- Optimal low velocity displacement design, VE of 1.2
- Placement independent of occupant location

Price Thermostats
- Dial, LCD, Motion sensing and wireless options
- Password protected adjustment menu
- LinkerSoft port for easy room side program access

INTERIOR ZONE
Cooling Only: Variable Volume (IZ2)
This control zone is formed using variable volume modular floor diffusers controlled from the room thermostat. A thermostat monitors the room temperature, while the PCM adjusts the dampers to meet the cooling requirement of the space.

Modular Floor Twist Diffuser
- Automated DBV basket with aluminum (8in. or 10in.) or polymer (8in.) face construction
- Throw no more than 4.5 ft. at 50 fpm, VE of 1.2
- Relatively higher flow capacity

Power and Control Module
- UMC3 control board, native BACnet
- Power and control signal transmitter over one cable
- Quick connect cables used to daisy chain units together
PERIMETER ZONE APPLICATIONS

These zones are typically more complex than interior zones. Perimeter zones generally have larger and more varying loads and often require auxiliary heat. Using the proper system helps control heating and cooling requirements for the space. The following are the most common applications for conditioning perimeter zones.

PERIMETER ZONE
Trough Heating And Cooling (PZ1)
An efficient mode of conditioning perimeter zones is by placing drop-in plenum heaters within the perimeter grilles to heat and cool. Cooling is handled through variable air dampers in the trough, and heating is used when the thermostat notes a drop in temperature below the set point. This removes the need for ductwork and fan terminals along the perimeter, reducing noise and energy consumption. A thermostat monitors the room temperature, while the PCM adjusts the dampers to meet the space requirements.

Natural Convection Heat
Occurs when the plenum damper is closed and room air is heated through natural convection in a heater trough and reintroduced into the space. A thermostat monitors the room temperature, while the PCM adjusts the dampers to meet the cooling requirement of the space.

Forced Heat
Occurs when plenum air is forced across the heater with the plenum damper open. This is typically only required when high heating capacities are demanded.

PERIMETER ZONE
Ducted Fan Heating and Cooling (PZ2)
Traditionally, fan terminals have been used to provide variable heating and cooling to the perimeter. The fan terminal is equipped with either a hot water coil or an electric heater. Air is forced through the fan and then introduced into the space through floor grilles. A thermostat monitors the room temperature, while the PCM on the fan terminal modulates the fan and heating device to meet the space requirements.

PERIMETER ZONE
Ducted Fan Heating and Cooling (PZ3)
In areas where plenum cooling can be implemented the LPT-HC has a damper which modulates between cooling and heating positions. In this application, a fan terminal is only required when high heating capacities are demanded.

For more information visit www.priceindustries.com

Underfloor Fan Powered Box
- Onboard Power and Control Module comes with UMCB and transformer
- Electric, hot water and chilled water coils
- Deluxe speed controller available for true RPM feedback

Linear Floor Plenum
- LFG grille with LFP plenum for underfloor applications
- Drop-in installation

Linear Plenum Terminal with Damper
- Damper for switchover between plenum or fan supply
- Drop-in installation
- Duct connection for fan forced heating side

Linear Natural Convection Terminal
- Natural convection heat using hydronic or electric coils
- Drop-in installation
- Plenum VAV cooling

High Capacity Linear Terminal
- Cooling and heating water coils
- 2-pipe and 4-pipe coil types
- Plenum VAV cooling

Linear Fan Terminal
- Compact, high efficiency EC fans
- Drop-in installation
- Electric heat, hot water and chilled water coil options

Lower Cost
More Control

5-ModuFlex

For more information visit www.priceindustries.com

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SPECIAL ZONE APPLICATIONS

Conference rooms, meeting rooms and interior private offices can experience wide load swings due to intermittent occupancy or equipment operation. Interior zones with large swings in occupancy or equipment loads, or those that require smaller individual control zones, can also be thought of as special zones. There are several common options available to address these zones in order to maintain comfort levels in all areas.

**SPECIAL ZONE**

**Perimeter Heating and Interior Cooling (SZ2)**

The cooling for this zone is handled by using variable volume modular floor diffusers. The pressurized plenum for the space is divided from the rest of the floor plate. This sub-plenum is pressurized by a fan terminal. A thermostat monitors the room temperature and occupancy, while the PCM adjusts the fan to meet the cooling requirements of the space. This strategy is useful for rooms with large temperature swings and higher occupancy, versus smaller break-out style conference spaces.

**Modular Floor Displacement Diffuser**

- Manually adjustable baskets with aluminum (8in. or 10in.) or polymer (8in.) face construction
- Optimal low velocity displacement design, VE of 1.2
- Placement independent of occupant location

**Power and Control Module**

- UMC3 control board, native BACnet
- Power and control signal transmitted over one cable
- Quick connect cables used to daisy chain units together

**Price Thermostats**

- Dial, LCD, Motion sensing and wireless options
- Password protected adjustment menu
- LinkerSoft port for easy room side program access

**Linear Natural Convection Terminal**

- Natural convection heat using hydronic or electric coils
- Drop in installation
- Plenum VAV cooling

**Power and Control Module**

- UMC3 control board, native BACnet
- Power and control signal transmitted over one cable
- Quick connect cables used to daisy chain units together

**Modular Floor Displacement Diffuser**

- Automated DBV basket with aluminum (8in. or 10in.) or polymer (8in.) face construction
- Optimal low velocity displacement design, VE of 1.2
- Placement independent of occupant location

**Price Thermostats**

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**Underfloor Fan Powered Box**

- Onboard Power and Control Module comes with UMCB controller and transformer
- Electric, hot water and chilled water coils
- Deluxe speed controller available for true RPM feedback

**SPECIAL ZONE**

**Sub-plenum Cooling Only: Variable Volume (SZ1)**

This control zone is formed using fixed damper position modular floor diffusers. The pressurized plenum for the space is divided from the rest of the floor plate. This sub-plenum is pressurized by a fan terminal. A thermostat monitors the room temperature and occupancy, while the PCM adjusts the fan to meet the cooling requirement of the space. This strategy is useful for rooms with large temperature swings and higher occupancy, versus smaller break-out style conference spaces.

**Modular Floor Displacement Diffuser**

- Manually adjustable baskets with aluminum (8in. or 10in.) or polymer (8in.) face construction
- Optimal low velocity displacement design, VE of 1.2
- Placement independent of occupant location

**Underfloor Fan Powered Box**

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**Price Thermostats**

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PRESSURE CONTROL

Office spaces are one of the more diversely loaded spaces which in underfloor applications can share a common pressurized plenum. Diffusers and grilles for UFAD are selected based on certain floor static pressures. This demands maintaining floor pressurization for proper comfort and system operation.

PLENUM PRESSURIZATION (PP1)
Price’s unique solution provides pressure monitoring and control while maintaining the aesthetics of the space. Pressure nodes that are concealed with the floor diffusers are used to monitor the pressure in the space. Underfloor pressure controllers must be capable of handling very low pressure resolution, on the order of 0.001 in.w.g. or less. Typically common plenum pressure set-points range from as low as 0.05 in.w.g. to 0.08 in.w.g.

MECHANICAL ROOM (MR1)
The Price Fan Column is a bottom discharge vertical unit specifically designed for underfloor air systems. It is intended to minimize the mechanical room and air shaft footprint to maximize the usable floor space. Return air will enter the mechanical room at top level and mix, either through a cooling coil or bypass section, with fresh air delivered through outdoor air only risers. Discharge air temperature can be used to module the return air cooling. The fan can be modulated to maintain plenum pressure at all load conditions. CO₂ sensors can be used to module the fresh air VAV box to provide demand control ventilation.

Price Fan Column
- Localized air handling
- Cooling coils and return air bypass
- Discharge air temperature control

Relative Pressure Node
- Sensor is factory mounted on bottom of blank off
- Ultra low pressure operating range
- Concealable under any Price Modular Floor Diffuser

Power and Control Module
- PCU control board with constant or variable pressure sequences
- Sends signal to either Variable Frequency Drive (VFD) on fan column, or remote plenum supply dampers
- Ability to receive signals from multiple pressure nodes

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PRICE DESIGN & LAYOUT ASSISTANCE

Price ModuFlex solution comes with design assistance. Our experienced team is trained to help with designing and laying out complete underfloor air systems.

- Application support
- Layout assistance
- Product related performance

As shown in the example below, an underfloor office layout can be divided into typical control zones.

All blue zones shown will have a typical layout as illustrated under Interior Cooling Only: Constant Volume (Z1). All purple zones illustrated will have a typical layout as shown under Perimeter Trough Heating and Cooling Zones (Z2). All yellow zones illustrated will have a typical layout as shown under Interior Cooling Only: Variable Volume (Z2). *

These zones can now be sized and tabulated to provide a detailed zone schedule similar to the illustration below.

Example Zone Schedule*

<table>
<thead>
<tr>
<th>ZONE</th>
<th>MARK 1</th>
<th>MARK 2</th>
<th>LENGTH (FT.)</th>
<th>FLOW (L/min.)</th>
<th>RECOVERY (HR%)</th>
<th>LAT. (F)</th>
<th>TOTAL FAN RATING (HRS)</th>
<th>HVAC</th>
<th>ZONE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZONE 1</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 2</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 3</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 4</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 5</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 6</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 7</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 8</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
<tr>
<td>ZONE 9</td>
<td>MFD-A</td>
<td>MFD-B</td>
<td>300</td>
<td>100</td>
<td>85</td>
<td>73.4</td>
<td>55500</td>
<td>170</td>
<td>High Capacity, 3-Stage Heating</td>
</tr>
</tbody>
</table>

* All VAV zones are designed for a minimum static pressure set point of 0.03 in. w.c.

** This is intended to show an example of one type of UFAZ control strategy. Various project factors can affect the approach of the system solution to achieve the ultimate design goals.

Documents for effective scope communication and informed bidding process.

Details Sheets (optional on request) and the Zone Schedule can then be added to the construction documents for effective scope communication and informed bidding process.

For more information visit www.priceindustries.com
RESOURCES AND SUPPORT

**COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING**

CFD provides a means to validate design before construction and the confidence that the system will perform as intended in the field. Price's CFD team is amongst the most experienced and proficient in the industry, and we encourage designers to work with us to validate their UFAD designs.

**PRCN: PRICE RESEARCH CENTER NORTH**

Price’s state-of-the-art research laboratory, Price Research Center North, features the most advanced UFAD flow visualization chambers, testing facilities, and mock-up rooms in North America.

Flow visualizations and mock-ups allow designers to simulate field conditions and evaluate system performance – providing them with the confidence that their space will perform as expected in the field.

Ask about our mock-up services on your next job, or better yet, visit PRCN yourself and tour our facilities.

**APPLICATIONS SUPPORT**

Price is a service oriented company and has a dedicated UFAD applications team devoted to answering your questions quickly, completely, and correctly. We are here to help – our applications team regularly provides support on:

- Model Selection
- Layout Assistance
- Calculation Assistance
- On-site Training
- On-site Performance Validation

**PRICE TRAINING PROGRAMS AND WEBINARS**

The Price Training Programs (PTP) provides Consulting and Design Engineers with the training needed to specify and select air distribution equipment to best meet their design criteria. The UFAD course covers everything you need to know about underfloor products, including:

- Introduction to UFAD
- Theory Behind UFAD
- UFAD Products Available
- Design Considerations
- Control Zones

Our webinars are another excellent way to learn about specific topics while gaining professional development hours. Visit [www.priceindustries.com](http://www.priceindustries.com) to register today!

For more information visit [www.priceindustries.com](http://www.priceindustries.com)
PRICE ENGINEER’S HVAC HANDBOOK

The Most Comprehensive Guide to HVAC Fundamentals

The Price Engineer’s HVAC Handbook is a compilation of the engineering knowledge related to the application of air distribution and noise control products and approaches gained at Price over the past 60 years.

Within the handbook, chapters on UFAD and its applications feature liberal use of examples and graphics to help illustrate and explain concepts and systems.

Chapter 17: Underfloor Air Distribution

Contact your local Price sales representative to reserve your copy.

PRICE UNDERFLOOR MICROSITE

The Price Underfloor Microsite is the ultimate online resource for those looking to learn more about Price Underfloor solutions.

The site features:

- Product Information
- Interactive ModuFlex application guide
- Case Studies
- Training Modules
- Smoke Test Videos
- Product Videos

Visit www.priceindustries.com/underfloor today!

PRICE CONTROLS START-UP SERVICE

Price offers an industry-leading controls start-up service, through which our trained Applications team will travel to the installation site and perform some or all the following valuable services:

- Pre-construction meetings
- Construction site walk-throughs
- Installation examples
- Controls integration assistance
- Help with the commissioning of typical Price UFAD equipment, including functional testing
- On-site product review and troubleshooting
- Training and education for owner, occupants, and maintenance personnel

Using Price’s complete UFAD systems in conjunction with our on-site support service is a great way to ensure absolute confidence in your Price UFAD system.
Product Improvement is a continuing endeavour at Price. Therefore, specifications are subject to change without notice. Consult your Price Sales Representative for current specifications or more detailed information. Not all products may be available in all geographic areas. All goods described in this document are warranted as described in the Limited Warranty shown at priceindustries.com. The complete Price product catalog can be viewed online at priceindustries.com.

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