BUILDING AUTOMATION OPTIONS FOR THERMA-FUSER™ SYSTEMS

As energy costs continue to rise, the management of energy while balancing tenant comfort and operational costs is a significant challenge for commercial building Owners and Managers. A Building Automation System (BAS) is an option that provides monitoring of entire building systems with single source control and troubleshooting.

Acutherm's Therma-Fuser™ VAV System is designed to work cooperatively with the wide range of BAS options available. Whether you're looking for simple individual temperature control, requiring no energy for operation, or full-scale networking for system scheduling, monitoring, reporting, troubleshooting and more, this guide will help you determine what is best for your building needs and budget. Six basic options are compared using the quick chart on the following page, then each option is described in more detail throughout the guide. A Pressure Independence Module (PIM) is also described.

Option 1: Therma-Fuser™ stand alone diffusers

This simple configuration provides the comfort and energy savings of individual temperature control with easy adaptibility to office changes, no maintenance VAV terminals and low installation cost due to no diffuser wiring. The BAS monitors and controls only the parts of the system that require periodic maintenance.

Option 2: Therma-Fuser™ stand alone diffusers with Room Temperature Sensors

Monitor room air temperatures with the BAS. The BAS can read an analog room temperature signal from a sensor installed in each diffuser.

Option 3: Therma-Fuser™ stand alone diffusers with Wall Adjusters

Adjust room temperature set point with the BAS. The BAS can read and reset the room temperature setpoint of each diffuser using analog signals from an Acutherm Wall Adjuster. The Wall Adjuster may be installed on the diffuser or on the wall and may be either wireless or wired to the diffuser.

Option 4: Therma-Fuser™ stand alone diffusers with Room Temperature Sensors and Wall Adjusters

A combination of Options 2 and 3, this option monitors room air temperatures and adjusts the setpoint with the BAS. The BAS can read an analog room temperature signal from a sensor installed in each diffuser and can read and reset the room temperature setpoint of each diffuser using analog signals from an Acutherm Wall Adjuster.

Option 5: Combination of Therma-Fuser™ stand alone diffusers with Therma-Fuser™ DDC interoperable diffusers

This option offers complete BAS digital input and output on selected diffusers and the simplicity of no wiring to the others. Key spaces are monitored and controlled by the BAS. Other spaces have the benefit of simplicity and low installation cost due to no diffuser wiring.

Option 6: Therma-Fuser™ DDC Interoperable diffusers

This option offers complete BAS digital input and output. Each diffuser has the ability to supply room temperature, airflow and supply air temperature and receive signals for room temperature setpoint, minimum airflow setpoint, maximum airflow setpoint, override open, override closed, CO_2 override and more. Digital signals can be either BACnet or LonWorks.

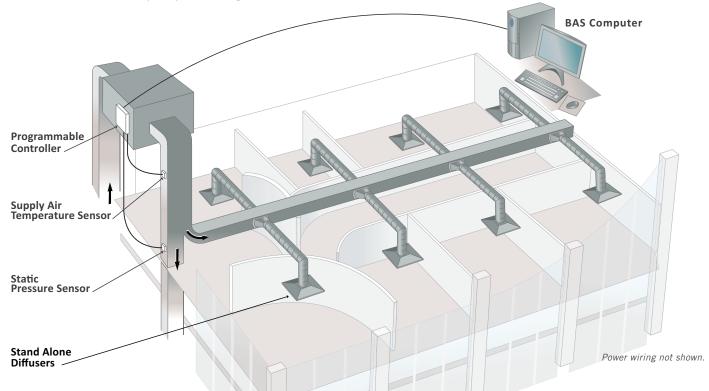# QUICK CHART FOR THERMA-FUSER™ SYSTEM BUILDING AUTOMATION OPTIONS

Features	Option 1 Therma-Fuser stand alone diffusers	Option 2 Therma-Fuser stand alone diffusers + Room Temperature Sensors	Option 3 Therma-Fuser stand alone diffusers + Wall Adjusters	Option 4 Therma-Fuser stand alone diffusers + Room Temperature Sensors and Wall Adjusters	Option 5 Combination of Therma-Fuser stand alone diffusers + Therma-Fuser DDC interoperable diffusers	Option 6 Therma-Fuser DDC interoperable diffusers
+ Comfort - Individual temperature control	✓	✓	✓	✓	✓	✓
+ Comfort - Superior air distribution	✓	✓	✓	✓	✓	✓
+ Energy - Energy saving system	✓	✓	✓	✓	✓	✓
+ Sustainability - Adaptable system	✓	✓	✓	✓	✓	✓
+ Sustainability - No diffuser maintenance	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓
+ Simplicity - No diffuser wiring	✓					
+ Simplicity - BAS only monitors parts of system requiring periodic maintenance	✓					
+ BAS monitors room air temperature		✓		✓	✓[2,4]	✓
+ BAS monitors and adjusts room temperature setpoints			✓	✓	✓[3,4]	✓
+ BAS monitors diffuser supply air temperature					✓[4]	✓
+ BAS monitors diffuser supply air volume					✓[4]	✓
+ Other BAS functions (see description)					✓[4]	✓
+ Installed cost	$	$ $	$ $	$ $ $	$ $ $	$ $ $ $

NOTES:
1. 10-year warranty on Therma-Fuser™ stand alone diffusers. (Not applicable to diffuser options and accessories.)
2. Available on Therma-Fuser stand alone diffusers with options 2 and 4.
3. Available on Therma-Fuser stand alone diffusers with options 3 and 4.
4. Only on Therma-Fuser DDC diffusers.

Option 1: Therma-Fuser™ stand alone diffusers

Achieve all the benefits of Therma-Fuser VAV and only use the BAS to monitor the parts of the system that need periodic maintenance. This simple configuration provides the comfort and energy savings of individual temperature control, easy adaptability to office changes, and no maintenance VAV terminals along with simplicity and low installation cost due to no diffuser wiring. The BAS monitors and controls only the portions of the VAV system requiring maintenance including the fan, VSD, coils and filters plus other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

BAS Computer

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

Stand Alone Diffusers

Power wiring not shown.

Features

+ Comfort - Individual temperature control	✓
+ Comfort - Superior air distribution	✓
+ Energy - Energy saving system	✓
+ Sustainability - Adaptable system	✓
+ Sustainability - No diffuser maintenance	✓ [1]
+ Simplicity - No diffuser wiring	✓
+ Simplicity - BAS only monitors parts of system requiring periodic maintenance	✓

NOTES:
1. 10-year warranty on Therma-Fuser™ stand alone diffusers. (Not applicable to diffuser options and accessories.)
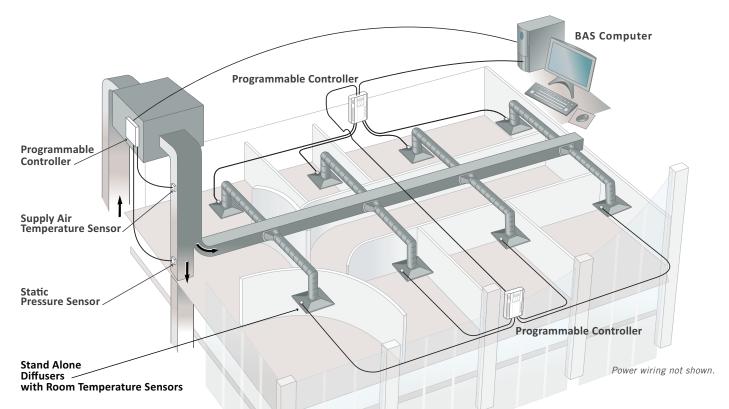
Possible BAS Inputs to VAV System	Possible VAV System Outputs to BAS
Occupancy Schedule	*Discharge Air Temperature*
Emergency Override	*Static Pressure Mode*
Static Pressure Setpoint	*Chilled Water Temperature*
Discharge Air Cooling Setpoint	*Hot Water Temperature*
Discharge Air Heating Setpoint	*Supply Fan Capacity*
Minimum Outdoor Air Setpoint	*Exhaust Fan Capacity*
	Return Air Capacity
	Economizer Enabled
	Outdoor Air Temperature
	Outdoor Air Damper Position
	Outdoor Airflow
	Return Air Temperature
	Mixed Air Temperature
	Space Temperature
	Filter Differential Pressure

Text in italics are VAV system possibilities. BAS inputs and outputs are available from other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

Option 2: Therma-Fuser™ stand alone diffusers ✚Room Temperature Sensors

Achieve benefits of Therma-Fuser VAV and monitor room air temperatures with the BAS. The BAS can read an analog room temperature signal from a sensor installed in each diffuser. The BAS also monitors and controls the portions of the VAV system requiring periodic maintenance. This approach provides the Therma-Fuser VAV advantages of comfort and energy savings from individual temperature control, easy adaptability to office changes, and no maintenance VAV terminals.

BAS Computer

Programmable Controller

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

Programmable Controller

Stand Alone Diffusers with Room Temperature Sensors

Power wiring not shown.

Features

✚ **Comfort** - Individual temperature control	✔	
✚ **Comfort** - Superior air distribution	✔	
✚ **Energy** - Energy saving system	✔	
✚ **Sustainability** - Adaptable system	✔	
✚ **Sustainability** - No diffuser maintenance	✔ [1]	
✚ **BAS** monitors room air temperature	✔	

NOTES:
1. 10-year warranty on Therma-Fuser™ stand alone diffusers. (Not applicable to diffuser options and accessories.)

Possible BAS Inputs to VAV System

Occupancy Schedule
Emergency Override
Static Pressure Setpoint
Discharge Air Cooling Setpoint
Discharge Air Heating Setpoint
Minimum Outdoor Air Setpoint

Possible VAV System Outputs to BAS

Room Temperatures

Discharge Air Temperature
Static Pressure Mode
Chilled Water Temperature
Hot Water Temperature
Supply Fan Capacity
Exhaust Fan Capacity
Return Air Capacity
Economizer Enabled
Outdoor Air Temperature
Outdoor Air Damper Position
Outdoor Airflow
Return Air Temperature
Mixed Air Temperature
Space Temperature
Filter Differential Pressure

Text in italics are VAV system possibilities. BAS inputs and outputs are available from other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

Option 3: Therma-Fuser™ stand alone diffusers + Wall Adjusters

Achieve benefits of Therma-Fuser VAV and make room temperature set point changes with the BAS. The BAS can read and reset the room temperature setpoint of each diffuser using analog signals from an Acutherm Wall Adjuster. The Wall Adjuster may be installed on the diffuser or on the wall and may be either wireless or wired to the diffuser. The BAS also monitors and controls the portions of the VAV system requiring periodic maintenance. This approach provides the Therma-Fuser VAV advantages of comfort and energy savings from individual temperature control, easy adaptability to office changes, and no maintenance VAV terminals.

BAS Computer

Programmable Controller

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

Stand Alone Diffusers and Wired or Wireless Wall Adjusters

ADJ-D

ADJ-W

Wireless Wall Adjuster

Digital Wall Adjusters

Programmable Controller

Power wiring not shown.

Features

+ Comfort - Individual temperature control	✓
+ Comfort - Superior air distribution	✓
+ Energy - Energy saving system	✓
+ Sustainability - Adaptable system	✓
+ Sustainability - No diffuser maintenance	✓ [1]
+ BAS monitors and adjusts room temperature setpoints	✓

NOTES:
1. 10-year warranty on Therma-Fuser™ stand alone diffusers. (Not applicable to diffuser options and accessories.)

Possible BAS Inputs to VAV System

Room Temperature Setpoints

Occupancy Schedule
Emergency Override
Static Pressure Setpoint
Discharge Air Cooling Setpoint
Discharge Air Heating Setpoint
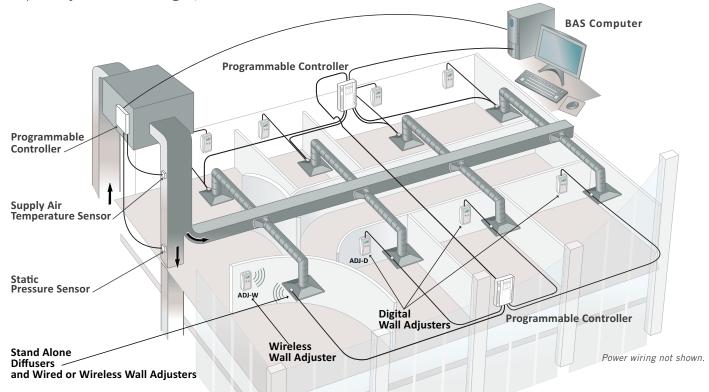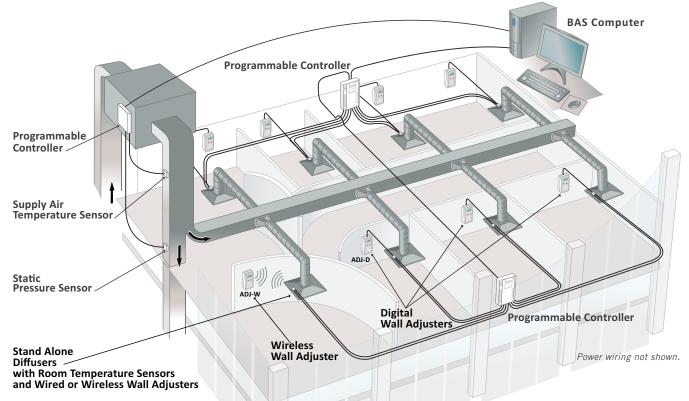*Minimum Outdoor Air Setpoint*

Possible VAV System Outputs to BAS

Room Temperature Setpoints

Discharge Air Temperature
Static Pressure Mode
Chilled Water Temperature
Hot Water Temperature
Supply Fan Capacity
Exhaust Fan Capacity
Return Air Capacity
Economizer Enabled
Outdoor Air Temperature
Outdoor Air Damper Position
Outdoor Airflow
Return Air Temperature
Mixed Air Temperature
Space Temperature
Filter Differential Pressure

Text in italics are VAV system possibilities. BAS inputs and outputs are available from other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

Option 4: Therma-Fuser™ stand alone diffusers ╋Room Temperature Sensors and Wall Adjusters

Achieve benefits of Therma-Fuser VAV and both monitor room air temperatures and make setpoint changes with the BAS. The BAS can read an analog room temperature signal from a sensor installed in each diffuser and can read and reset the room temperature setpoint of each diffuser using analog signals from an Acutherm Wall Adjuster. The BAS also monitors and controls the portions of the VAV system requiring periodic maintenance. This approach provides the Therma-Fuser VAV advantages of comfort and energy savings from individual temperature control, easy adaptability to office changes, and no maintenance VAV terminals.

BAS Computer

Programmable Controller

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

ADJ-D

ADJ-W

Digital Wall Adjusters

Programmable Controller

Wireless Wall Adjuster

Stand Alone Diffusers with Room Temperature Sensors and Wired or Wireless Wall Adjusters

Power wiring not shown.

Features

╋ Comfort - Individual temperature control	✔
╋ Comfort - Superior air distribution	✔
╋ Energy - Energy saving system	✔
╋ Sustainability - Adaptable system	✔
╋ Sustainability - No diffuser maintenance	✔ [1]
╋ BAS monitors room air temperature	✔
╋ BAS monitors and adjusts room temperature setpoints	✔

1. 10-year warranty on Therma-Fuser™ stand alone diffusers.
    (Not applicable to diffuser options and accessories.)

Possible BAS Inputs to VAV System

Room Temperature Setpoints

Occupancy Schedule
Emergency Override
Static Pressure Setpoint
Discharge Air Cooling Setpoint
Discharge Air Heating Setpoint
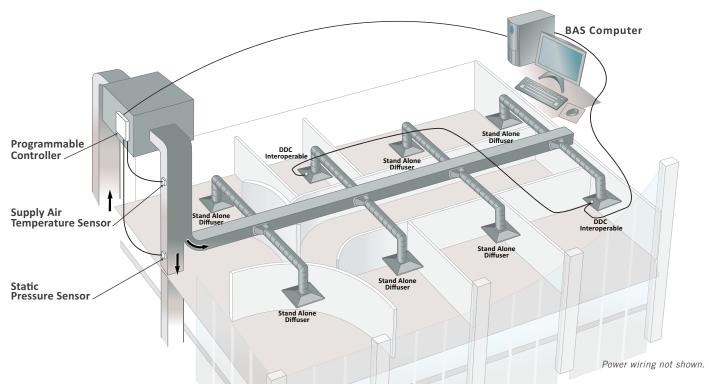*Minimum Outdoor Air Setpoint*

Possible VAV System Outputs to BAS

Room Temperature Setpoints
Room Temperatures

Discharge Air Temperature
Static Pressure Mode
Chilled Water Temperature
Hot Water Temperature
Supply Fan Capacity
Exhaust Fan Capacity
Return Air Capacity
Economizer Enabled
Outdoor Air Temperature
Outdoor Air Damper Position
Outdoor Airflow
Return Air Temperature
Mixed Air Temperature
Space Temperature
Filter Differential Pressure

Text in italics are VAV system possibilities. BAS inputs and outputs are available from other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

Option 5: Combination of Therma-Fuser™ stand alone ✚ Therma-Fuser™ DDC interoperable diffusers

Achieve benefits of Therma-Fuser VAV, complete digital input and output with the BAS on selected diffusers and the simplicity of no wiring to the others. Key spaces are monitored and controlled by the BAS. Other spaces have the benefit of simplicity and low installation cost due to no diffuser wiring. All spaces have the Therma-Fuser VAV advantages of comfort and energy savings from individual temperature control and easy adaptability to office changes. The BAS also monitors and controls the portions of the VAV system requiring periodic maintenance.

BAS Computer

Programmable Controller

DDC Interoperable

Stand Alone Diffuser

Supply Air Temperature Sensor

Stand Alone Diffuser

Static Pressure Sensor

Stand Alone Diffuser

Stand Alone Diffuser

Stand Alone Diffuser

DDC Interoperable

Power wiring not shown.

Features

✚ **Comfort** - Individual temperature control	✓
✚ **Comfort** - Superior air distribution	✓
✚ **Energy** - Energy saving system	✓
✚ **Sustainability** - Adaptable system	✓
✚ **Sustainability** - No diffuser maintenance	✓ [1]
✚ **BAS** monitors room air temperature	✓ [2, 4]
✚ **BAS** monitors and adjusts room temperature setpoints	✓ [3, 4]
✚ **BAS** monitors diffuser supply air temperature	✓ [4]
✚ **BAS** monitors diffuser supply air volume	✓ [4]
✚ **Other BAS functions** (see description)	✓ [4]

NOTES:
1. 10-year warranty on Therma-Fuser™ stand alone diffusers. (Not applicable to diffuser options and accessories.)
2. Available on Therma-Fuser stand alone diffusers with options 2 and 4.
3. Available on Therma-Fuser stand alone diffusers with options 3 and 4.
4. Only on Therma-Fuser DDC diffusers.

Possible BAS Inputs to VAV System

Room Temperature Setpoints*
Room Minimum Airflow Setpoints*
Room Maximum Airflow Setpoints*
Override Open*
Override Closed*
CO₂ Override*

Occupancy Schedule
Emergency Override
Static Pressure Setpoint
Discharge Air Cooling Setpoint
Discharge Air Heating Setpoint
Minimum Outdoor Air Setpoint

*Only for select rooms

Possible VAV System Outputs to BAS

Room Temperature Setpoints*
Room Temperatures*
Room Airflows*
Room Supply Air Temperatures*

Discharge Air Temperature
Static Pressure Mode
Chilled Water Temperature
Hot Water Temperature
Supply Fan Capacity
Exhaust Fan Capacity
Return Air Capacity
Economizer Enabled
Outdoor Air Temperature
Outdoor Air Damper Position
Outdoor Airflow
Return Air Temperature
Mixed Air Temperature
Space Temperature
Filter Differential Pressure

*Only for select rooms

Text in italics are VAV system possibilities. BAS inputs and outputs are available from other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

Option 6: Therma-Fuser™ DDC interoperable diffusers

Achieve benefits of Therma-Fuser VAV and complete digital input and output with the BAS. Each diffuser has the ability to supply room temperature, airflow and supply air temperature and receive signals for room temperature setpoint, minimum airflow setpoint, maximum airflow setpoint, override open, override closed, CO_2 override and more. Digital signals can be either BACnet or LonWorks. The BAS also monitors and controls the portions of the VAV system requiring periodic maintenance. This approach provides the Therma-Fuser VAV advantages of comfort and energy savings from individual temperature control and easy adaptablity to office changes.

BAS Computer

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

DDC Interoperable Diffusers

Power wiring not shown.

Features

+ Comfort - Individual temperature control	✔
+ Comfort - Superior air distribution	✔
+ Energy - Energy saving system	✔
+ Sustainability - Adaptable system	✔
+ Sustainability - No diffuser maintenance	✔
+ BAS monitors room air temperature	✔
+ BAS monitors and adjusts room temperature setpoints	✔
+ BAS monitors diffuser supply air temperature	✔
+ BAS monitors diffuser supply air volume	✔
+ Other BAS functions (see description)	✔

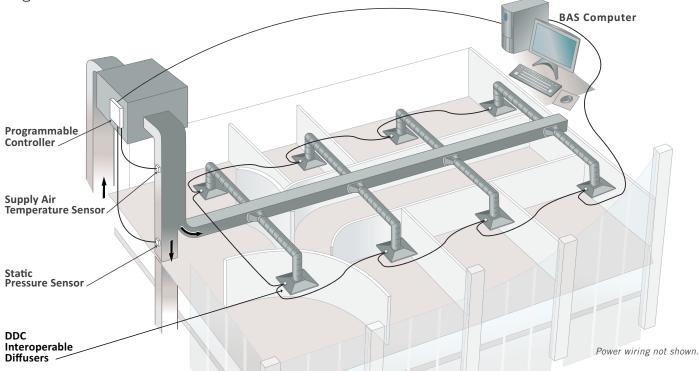| Possible BAS Inputs to VAV System	Possible VAV System Outputs to BAS
Room Temperature Setpoints **Room Minimum Airflow Setpoints** **Room Maximum Airflow Setpoints** **Override Open** **Override Closed** **CO_2 Override** *Occupancy Schedule* *Emergency Override* *Static Pressure Setpoint* *Discharge Air Cooling Setpoint* *Discharge Air Heating Setpoint* *Minimum Outdoor Air Setpoint*	**Room Temperature Setpoints** **Room Temperatures** **Room Airflows** **Room Supply Air Temperatures** *Discharge Air Temperature* *Static Pressure Mode* *Chilled Water Temperature* *Hot Water Temperature* *Supply Fan Capacity* *Exhaust Fan Capacity* *Return Air Capacity* *Economizer Enabled* *Outdoor Air Temperature* *Outdoor Air Damper Position* *Outdoor Airflow* *Return Air Temperature* *Mixed Air Temperature* *Space Temperature* *Filter Differential Pressure*

Text in italics are VAV system possibilities. BAS inputs and outputs are available from other HVAC equipment such as the chiller, boiler, pumps, cooling tower, etc...

Option for Pressure Independence Module (PIM):

Should the air source operate at a higher static pressure level than suitable for quiet Therma-Fuser diffuser performance, static pressure control is required. The Acutherm PIM is ideal for Therma-Fuser diffusers to operate quietly at both full flow and turndown conditions. There are two ways to integrate to the BAS system; analog (PIM) and interoperable (E-PIM). Both offer static pressure control for zone or by-pass applications. The diagrams below show zone applications.

Possible BAS Inputs to VAV System	Possible VAV System Outputs to BAS
Analog & Interoperable: Static Pressure Setpoint Override	**Analog & Interoperable:** Static Pressure Damper Position

ANALOG (PIM)

BAS Computer

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

PIM

Static Pressure Probe

Programmable Controller

Note: Diffusers can be Stand Alone or DDC Interoperable.

Power wiring not shown.

INTEROPERABLE (E-PIM)

BAS Computer

Programmable Controller

Supply Air Temperature Sensor

Static Pressure Sensor

E-PIM

Static Pressure Probe

Note: Diffusers can be Stand Alone or DDC Interoperable.

Power wiring not shown.