MultiSITE™ MS8000 Series Room Controllers

APPLICATION GUIDE

MS8350
Model No. VUCQMS8350
Commercial HVAC Fan Coil Controller

MS8650
Model No. VUCQMS8650
Rooftop Unit, Heat Pump, and Indoor Air Quality Controller

PROPRIETARY DATA NOTICE

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⃠ Do not throw away, destroy, or lose this manual.

Please read carefully and store in a safe place for future reference.
Content familiarity required for proper installation.

The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. A summary of safety precautions begins on page 4.

For more technical materials such as submittals, engineering databooks, and catalogs, visit www.lghvac.com.

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SAFETY PRECAUTIONS

The instructions below must be followed to prevent product malfunction, property damage, injury or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described below.

TABLE OF SYMBOLS

⚠ DANGER	*This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*
⚠ WARNING	*This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*
⚠ CAUTION	*This symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.*
Note:	*This symbol indicates situations that may result in equipment or property damage accidents only.*
⃠	*This symbol indicates an action that should not be performed.*

Safety of personnel is the primary concern during all procedures. Read and understand this safety summary. Read and understand the installation procedure before beginning installation. Use the appropriate tools and accessories during installation. Plan the work and ⃠ do not work alone, if possible. Know how to obtain emergency medical and fire fighting assistance.

⚠ DANGER

⃠ **Do not use or store flammable gas or combustibles near the unit.**
There is risk of fire, explosion, and physical injury or death.

Disconnect power before installing or servicing the unit.
There is risk of physical injury or death due to electric shock.

Properly size all circuit breakers or fuses.
There is risk of fire, electric shock, explosion, physical injury, or death.

⃠ **Do not share the electrical circuit with other devices.**
There is risk of fire, electric shock, physical injury, or death due to heat generation.

⃠ **Do not use damaged or loose power wiring.** ⃠ **Do not modify or extend the power wiring randomly. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation.**
There is risk of fire, electric shock, and physical injury or death.

⚠ WARNING

The information contained in this manual is intended for use by an industry-qualified, experienced, trained electrician familiar with local, national, and regional codes and who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions will result in personal injury or death.

All electric work must be performed by a licensed electrician and conform to local building codes or, in the absence of local codes, with the National Electrical Code, and the instructions given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Use copper conductors only. Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.
Wires that are too small will generate heat, cause a fire and physical injury or death.

Before making power terminations during earth grounding, de-energize the power source. ⃠ **Do not restore power until completing all other mounting and wiring.**
There is risk of electric shock and physical injury or death.

⚠ WARNING

Discharge yourself correctly before handling and installing the controller.
There is risk of electric shock and physical injury or death.

Install in a controlled environment relatively free of contaminants.
There is risk of electric shock and physical injury or death.

Secure all field wiring connections with appropriate wire strain relief.
Improperly securing wires will create undue stress on equipment power lugs. Inadequate connections will generate heat, cause a fire and physical injury or death.

Ensure the system is connected to a power source that provides adequate power. Ensure that the wiring is the correct size.
If the power source capacity is inadequate, the wiring is not the correct size, or the electric work is not performed properly, it will result in short circuiting, fire, electric shock, physical injury or death.

⃠ **Do not change the settings of the protection devices.**
If the protection device is shorted and forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Properly tighten all power connections.
Loose wiring may overheat at connection points, causing a fire, physical injury or death.

Dispose of any packing materials safely.
- *Packing materials, such as nails and other metal or wooden parts will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags so that children may not play with them and risk suffocation and death.*

⃠ **Do not install the controller if it will be exposed to rain or other precipitation.** ⃠ **Do not install the unit in a location exposed to open flame, extreme heat, or direct sunlight.** ⃠ **Do not touch the unit with wet hands.**
There is risk of fire, electric shock, physical injury, and/or death.

Use a soft, pre-moistened lint-free cloth for cleaning. ⃠ **Avoid getting moisture in openings.**
If moisture accesses the electrical components of the controller, there is risk of fire, electric shock, and physical injury or death.

⃠ **Do not use caustic / corrosive products, ammonia, solvents or any cleaning product containing alcohol or grit.**
There is risk of fire, electric shock, and physical injury or death.

⃠ **Do not drop or crush the controller, or allow it to come into contact with liquids.**
There is risk of fire, electric shock, and physical injury or death.

⃠ **Do not spray anything directly on the controller or use compressed air.**
There is risk of fire, electric shock, and physical injury or death.

⃠ **Never use paint on the controller.**
If moisture accesses the electrical components of the controller, there is risk of fire, electric shock, and physical injury or death.

⃠ **Do not use a damaged device (such as one with a cracked screen).**
There is risk of fire, electric shock, and physical injury or death.

⚠ CAUTION

Wear protective gloves when handling equipment.
Sharp edges cause personal injury.

SAFETY PRECAUTIONS

Note:

The information contained in this manual is intended for use by an industry-qualified, experienced, trained electrician familiar with local, national, and federal codes and who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions will result in equipment malfunction or equipment / property damage.

Ensure the system is connected to a power source that provides adequate power. Ensure that the wiring is the correct size.
If the power source capacity is inadequate, the wiring is not the correct size, or the electric work is not performed properly, it will result in controller malfunction, miscommunication, and / or degraded performance.

Install the controller at least eight (8) inches away from inhabitants, and ⃠ do not locate near or operating in conjunction with any other antenna or transmitter.
There is risk of controller malfunction, miscommunication, and / or degraded performance.

Disconnect power before installing or servicing the unit.
There is risk of equipment damage and degraded performance.

Clean up the site after all procedures are finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the controller or indoor units.

⃠ Do not allow water, dirt, or animals to enter the controller.
There is risk of unit failure or degraded performance.

⃠ Do not spill water or other liquid on the inside of the controller. ⃠ Do not drop the controller into water. If the unit is immersed in water or other liquid, contact your local authorized LG distributor for support.
There is risk of unit failure or degraded performance.

This device is only intended for use as a monitoring and control device. It is not a safety device. ⃠ Do not use it for any other purpose.
Tampering with the devices or unintended application of the devices will result in a void of warranty. There also is risk of data loss or equipment damage.

The controller is not compatible with a Power-Over-Ethernet (POE) network. ⃠ Do not connect the controller on a network segment that carries power.
The unit may fail.

Use a soft, pre-moistened lint-free cloth for cleaning. ⃠ Avoid getting moisture in openings.
There is risk of equipment damage, and will void the manufacturer's warranty.

⃠ Do not spray anything directly on the controller or use compressed air.
There is risk of equipment damage, and it will void the manufacturer's warranty.

⃠ Do not use caustic / corrosive products, ammonia, solvents or any cleaning product containing alcohol or grit.
There is risk of equipment damage, and it will void the manufacturer's warranty.

⃠ Never use tools directly on the touchscreen.
There is risk of damage to the controller screen, and it will void the manufacturer's warranty.

⃠ Never use paint on the controller.
There is risk of equipment damage, and it will void the manufacturer's warranty.

⃠ Do not drop or crush the controller, or allow it to come into contact with liquids.
There is risk of equipment damage, and it will void the manufacturer's warranty.

⃠ Do not use a damaged device (such as one with a cracked screen).
Performance can be affected if the glass on the screen is broken, and it will void the manufacturer's warranty.

Introduction

This application guide covers the Configuration Settings, Sequence of Operation, Fan Operation and Options for the multiple HVAC applications available for the LG MultiSITE MS8350 & MS8650 Room Controllers for Engineers, Integrators and Users..

MS8350 Controllers

For Commercial HVAC Fan Coil Applications.

Features

- Auto / Low / Med / High Fan Speeds
- Low-voltage 24 Vac
- Customizable color digital touch screen interface with Multi-language support
- BACnet® MS/TP, BACnet® IP with optional Wi-Fi Module or Modbus®
- Automatic Demand Response (ADR) used to reduce energy load when electric grid contingencies threaten supply-demand balance
- Custom LUA script can be uploaded to the Room Controller
- Role based configuration (password protected)
- Date and Time Display only when a network time synchronization command is received
- Room temperature display
- On / Off Operation
- Auto / Cool / Heat / Fan Only Modes
- Occupied cooling and heating temperature setpoints
- Unoccupied cooling and heating temperature setpoints
- 7 day scheduling with mode

MS8650 Controllers

For Rooftop Unit, Heat Pump and Indoor Air Quality Applications.

Features

- Auto / On / Smart Fan Speeds
- Low-voltage 24 Vac
- Customizable color digital touch screen interface with Multi-language support
- BACnet® MS/TP, BACnet® IP with optional Wi-Fi Module or Modbus® BACnet MS/TP or Modbus
- Automatic Demand Response (ADR) used to reduce energy load when electric grid contingencies threaten supply-demand balance
- Custom LUA script can be uploaded to the Room Controller
- Role based configuration (password protected)
- Date and Time Display only when a network time synchronization command is received
- Room temperature display
- On / Off Operation
- Auto / Cool / Heat / Fan Only Modes
- Occupied cooling and heating temperature setpoints
- Unoccupied cooling and heating temperature setpoints
- 7 day scheduling with mode

CHOOSING A LOCATION

Choosing a Location for the Controller

⚠ WARNING

A trained technician should always install the controller following local, national, and federal electrical codes; industry best practices; the instructions in this manual; and using the proper tools and test instruments.
Failure to carefully read and follow all instructions will result in personal injury or death.

Discharge yourself correctly before handling and installing the controller.
There is risk of electric shock and physical injury or death.

Ensure the system is connected to a power source that provides adequate power. Ensure that the wiring is the correct size.
If the power source capacity is inadequate, the wiring is not the correct size, or the electric work is not performed properly, it will result in short circuiting, fire, electric shock, physical injury or death.

Note:

A trained technician should always install the controller following local, national, and federal electrical codes; industry best practices; the instructions in this manual; and using the proper tools and test instruments.
Failure to carefully read and follow all instructions will result in equipment malfunction, controller and property damage, and will void the manufacturer's warranty.

This device is only intended for use as a monitoring and control device. It is not a safety device. ⃠ Do not use it for any other purpose.
Tampering with the devices or unintended application of the devices will result in a void of warranty. There also is risk of data loss or equipment damage.

Ensure the system is connected to a power source that provides adequate power. Ensure that the wiring is the correct size.
If the power source capacity is inadequate, the wiring is not the correct size, or the electric work is not performed properly, it will result in controller malfunction, miscommunication, and / or degraded performance.

Install the controller at least eight (8) inches away from inhabitants, and ⃠ do not locate near or operating in conjunction with any other antenna or transmitter.
There is risk of controller malfunction, miscommunication, and / or degraded performance.

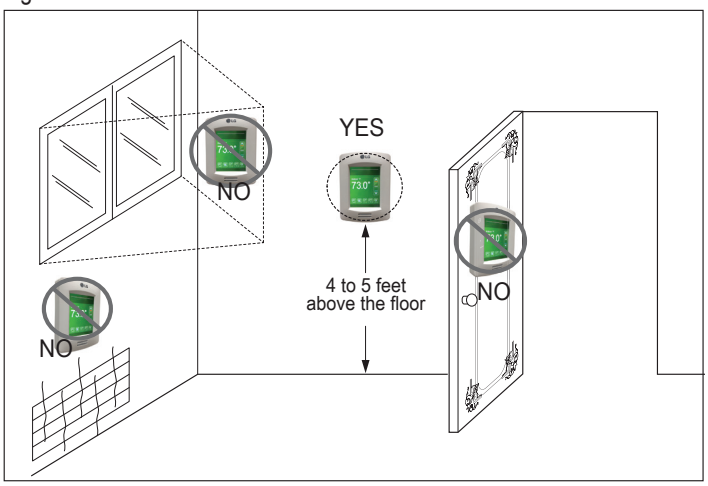
Choosing a Location for the Controller, continued.

A room temperature sensor is inside the controller, so the installation location is critical to proper system operation. Install the controller in a location away from direct sunlight, high humidity, and direct flow or hot or cold air. Install the controller on a flat, clean wall surface approximately four to five (4 to 5) feet above the floor in an area with good circulation and average temperature.

Do's

- If replacing an existing controller, label wires before removing.
- Ensure the wall surface is flat and clean.
- Ensure the controller has sufficient, natural air circulation.
- Ensure the external thermal sensor wiring is away from electrical sources.
- Install the controller four to five (4 to 5) feet (1.2 to 1.5m) above the floor.

Figure 1: Controller Location.



⃠ Do Not's

Do not install the controller:

- *In drafts or dead spots behind doors and corners.*
- *In areas subjected to hot or cold air from ducts / air discharge grills*
- *Near radiant heat from sun or appliances*
- *Near or with a direct heat source.*
- *In areas exposed to direct sunlight.*
- *Near concealed pipes or chimneys.*
- *Uncontrolled areas such as on an outside wall.*

Note:

Failure to comply with these recommendations will result in damage to the unit and void the manufacturer's warranty.

MS8000 ROOM CONTROLLERS LOW-VOLTAGE 24 VAC FCU, RTU, HP AND IAQ APPLICATION OVERVIEW

The MS8350 Room Controller is a cost-effective solution for upgrading low-voltage fan coil unit thermostats only requiring the Room Controller.

The MS8650 Room Controller is a cost-effective solution for upgrading rooftop unit thermostats, heat pump and indoor air quality controllers. The application allows existing wiring between the rooftop unit and the Room Controller to be re-used, reducing overall costs and installation time.

The MS8650 can also add features like CO_2 and fresh air monitoring to the existing functions of a rooftop unit.

The MS8650 Rooftop, Heat Pump, and Indoor Air Quality Controller can be configured to handle a broad variety of applications covering all the standard implementations necessary for rooftop HVAC systems. In addition to controlling heating, cooling and air quality, depending on the model and accessories, the MS8650 can handle wireless networking and switches, Passive Infrared (PIR) occupancy detection using either onboard or remote sensors, and can have custom programs implemented to fulfill specific User requirements. The applications described here cover all these features in combination with the MS8650's advanced scheduling and occupancy controls to provide the functionality for any required rooftop HVAC implementation.

Table 1: Commercial and Hospitality Interface (Local Override and Degrees C/F Selection).

Part Number	Description	Humidity	PIR	ZigBee	Communication
MS8350U5500BP	BACnet Fan Coil Room Controller	Yes	Yes	Yes	BACnet
MS8650U5500BP	BACnet Rooftop, Heat Pump & Indoor Air Quality Room Controller	Yes	Yes	Yes	BACnet

Table 2: Optional Accessories for the MS8350 & MS8650 Room Controllers.

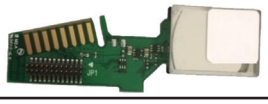
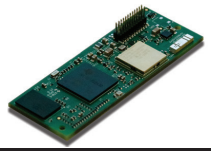
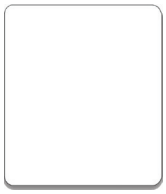
	Part Number	Description
	VCM8001V504	CO_2 Accessory Card
	VCM8002V504	Wi-Fi Accessory Card

Table 3: Wireless Accessories for the MS8350 & MS8650 Room Controllers.

	Part Number	Description
	ZVRCZDWS1	Wireless window and door switch
	ZVRCZCOC1	Wireless ceiling mounted motion sensor
	ZVRCZWOC1	Wireless wall mounted motion sensor
	SEDCO2G5045	ZigBee Sensor CO_2 w/Temp & Humidity; Wall Mounted

TERMINAL IDENTIFICATION AND FUNCTION FOR MS8350

Terminal Identification for a Three-Speed Fan System

Table 4: Terminal Identification and Function for a Three-Speed Fan Type System.

Control Type	On/Off	Floating	Analog
1- BO1	Not used	Not used	Not used
2- BO2	Fan-L	Fan-L	Fan-L
3- BO3	Fan-M	Fan-M	Fan-M
4- BO4	Fan-H	Fan-H	Fan-H
5- RC / 24 Vac ~ Hot	24 Vac ~ Hot	24 Vac ~ Hot	24 Vac ~ Hot
6- C / 24 Vac ~ Com	24 Vac ~ Com	24 Vac ~ Com	24 Vac ~ Com
7- RH	Aux Heat	Aux Heat	Aux Heat
8- BO8	Aux Heat	Aux Heat	Aux Heat
9- UO9	Normally Close Cool Valve	Close Cool Valve	Not used
10- UO10	Normally Close Heat Valve	Close Heat Valve	Not used
11- UO11	Normally Open Cool Valve	Open Cool Valve	Analog Heat Valve
12- UO12	Normally Open Heat Valve	Open Heat Valve	Analog Cool Valve
13- RS485 +	RS485 +		
14- RS485 -	RS485 -		
15- RS485 Ref	RS485 Ref		
16- UI16	UI16 Function		
17- UI17	UI17 Function		
18- Scom	Common		
19- UI19	UI19 Function		
20- UI20	Remote Room Sensor		
21- Scom	Common		
22- UI22	Remote Supply Sensor		
23- UI23	Not used		
24- UI24	Not used		

Terminal Identification for an Electronically Commutated Motor (ECM) Fan System

Table 5: Terminal Identification and Function for an ECM Fan Type System.

Control Type	On/Off	Floating	Analog
1- BO1	Normally Close Heat Valve	Close Heat valve	Not used
2- BO2	Not used	Not used	Not used
3- BO3	Not used	Not used	Not used
4- BO4	ECM Fan Start	ECM Fan Start	ECM Fan Start
5- RC / 24 Vac ~ Hot	24 Vac ~ Hot	24 Vac ~ Hot	24 Vac ~ Hot
6- C / 24 Vac ~ Com	24 Vac ~ Com	24 Vac ~ Com	24 Vac ~ Com
7- RH	Aux Heat	Aux Heat	Aux Heat
8- BO8	Aux Heat	Aux Heat	Aux Heat
9- UO9	Normally Close Cool Valve	Close Cool Valve	Not used
10- UO10	Analog ECM Fan	Analog ECM Fan	Analog ECM Fan
11- UO11	Normally Open Cool Valve	Open Cool Valve	Analog Heat valve
12- UO12	Normally Open Heat Valve	Open Heat Valve	Analog Cool Valve
13- RS485 +	RS485 +		
14- RS485 -	RS485 -		
15- RS485 Ref	RS485 Ref		
16- UI16	UI16 Function		
17- UI17	UI17 Function		
18- Scom	Common		
19- UI19	UI19 Function		
20- UI20	Remote Room Sensor		
21- Scom	Common		
22- UI22	Remote Supply Sensor		
23- UI23	Not used		
24- UI24	Not used		

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Table 6: MS8350 Fan Coil Unit 1, 2 or 3-Speed Fan Applications.

System	Fan	Cooling	Heating	Other
4 pipes	3 Speed	Tri-state valve actuator	Tri-state valve actuator	Door and motion detect + dehumidification
4 pipes	3 Speed	0-10Vdc valve actuator	0-10Vdc valve actuator	Motion detect + dehumidification
4 pipes	3 Speed	2 positions valve actuator	2 positions valve actuator	Motion detect + dehumidification
4 pipes	3 Speed	0-10Vdc valve actuator	2 positions valve actuator	---
2 pipes	3 Speed	0-10Vdc valve actuator	Electric heater	---
2 pipes	3 Speed	0-10Vdc valve actuator	None	---
2 pipes	1 Speed	2 positions valve actuator	None	Fresh air damper

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, Tri-State Floating Valves and Dehumidification Sequence for Low Voltage

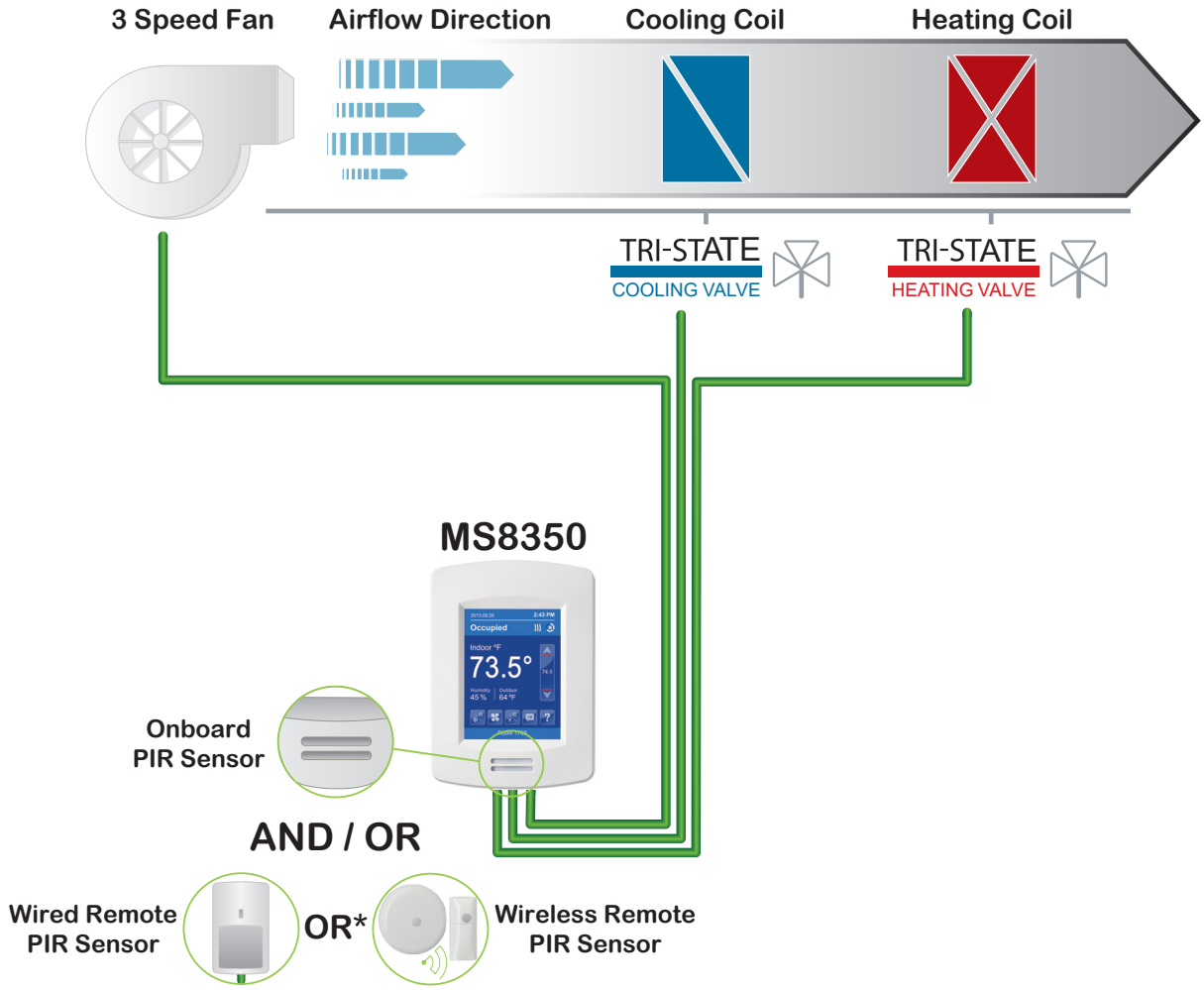


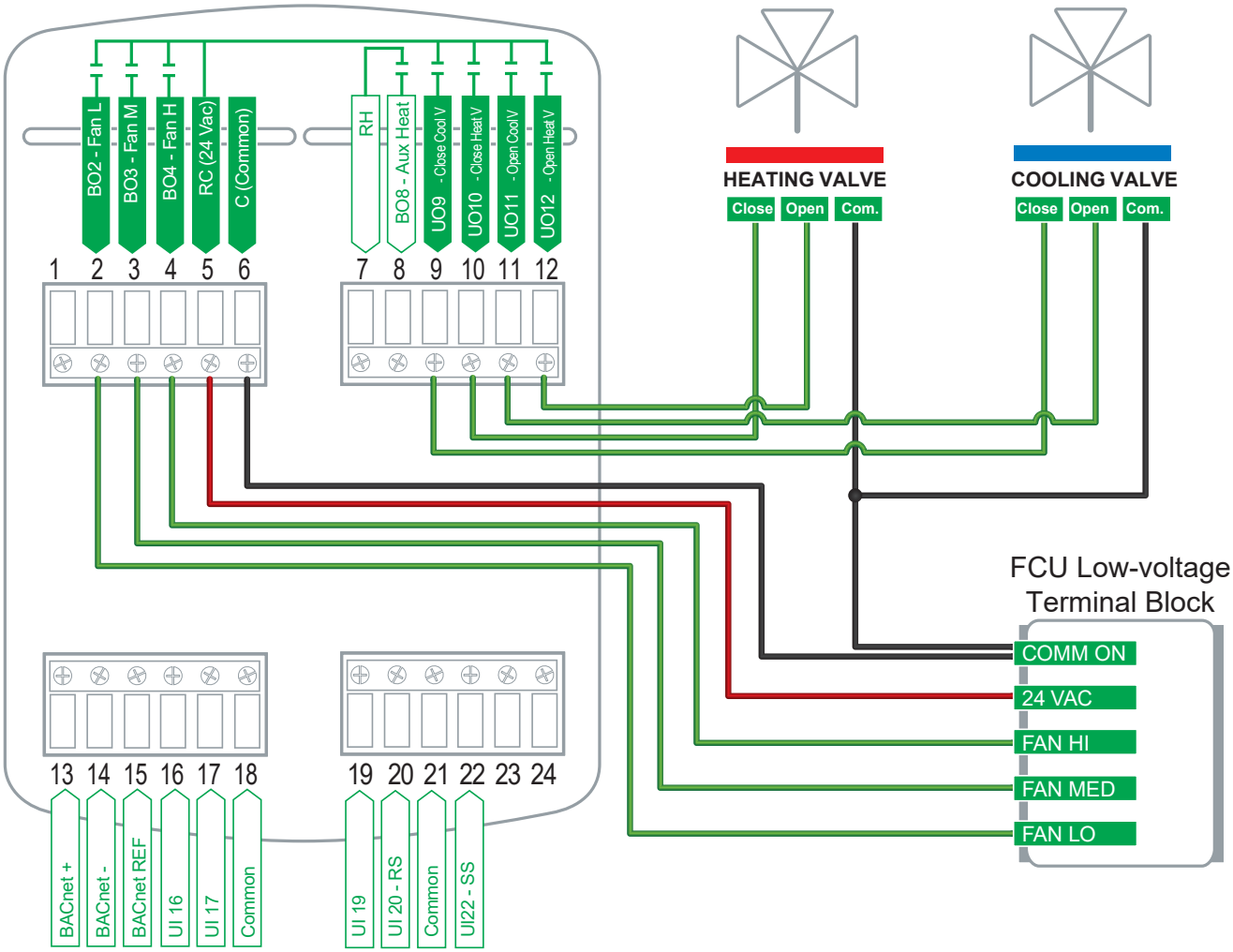
Table 7: Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, Tri-State Floating Valves & Dehumidification Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	3 speed
Fan menu	L-M-H-A
Control Type	Floating
UI16	Motion NO or Motion NC (remote PIR sensor only)
UI17	Door Dry
Pipe no.	4
Seq. operation	Cool / Heat

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, Tri-State Floating Valves and Dehumidification Sequence for Low Voltage

MS8350 Floating Control + 3 Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, Tri-State Floating Valves and Dehumidification Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens to maintain room temperature. Heating valve closes.

On Call for Heat

Heating valve opens to maintain room temperature. Cooling valve closes.

On Demand for Dehumidification

Dehumidification is achieved via cooling coil using heating coil for reheat if necessary. Dehumidification is only allowed in COOL mode, or if cooling is enabled in AUTO mode. Dehumidification is disabled if room temperature falls below low ambient lockout temperature, which is the cooling setpoint minus the configuration defined deadband value. Reheat disabled if cooling demand reaches 100%.

3 Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO2 is energized.
- BO3 is energized
- BO4 is energized.
- Auto: When there is no demand, BO2, BO3 and BO4 are not energized. On demand, system will automatically switch “On” low (BO2), medium (BO3) or high (B04) speed.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems with changeover.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Universal input can be configured for changeover sensor.

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 0-10VDC Analog Valves and Dehumidification Sequence for Low Voltage

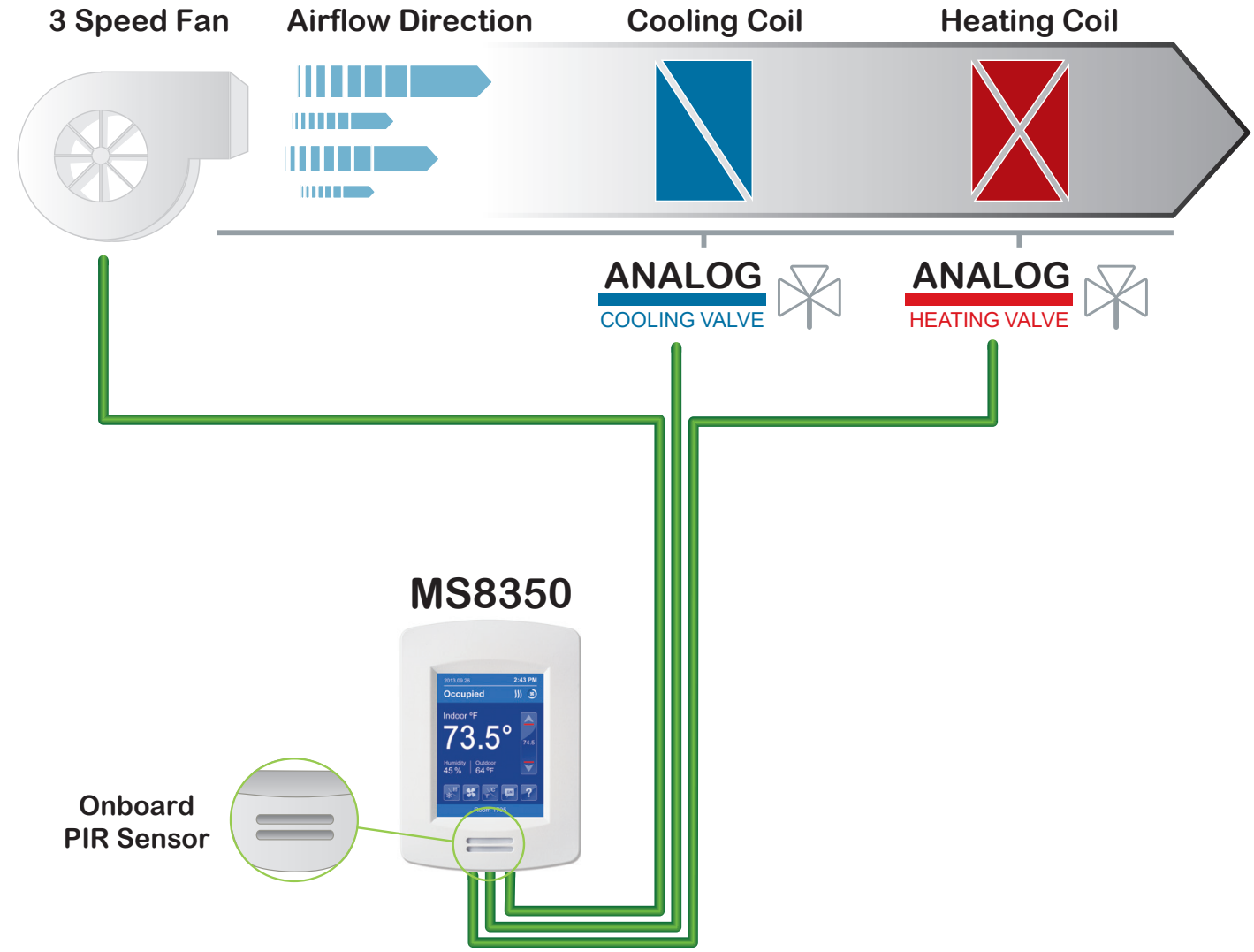


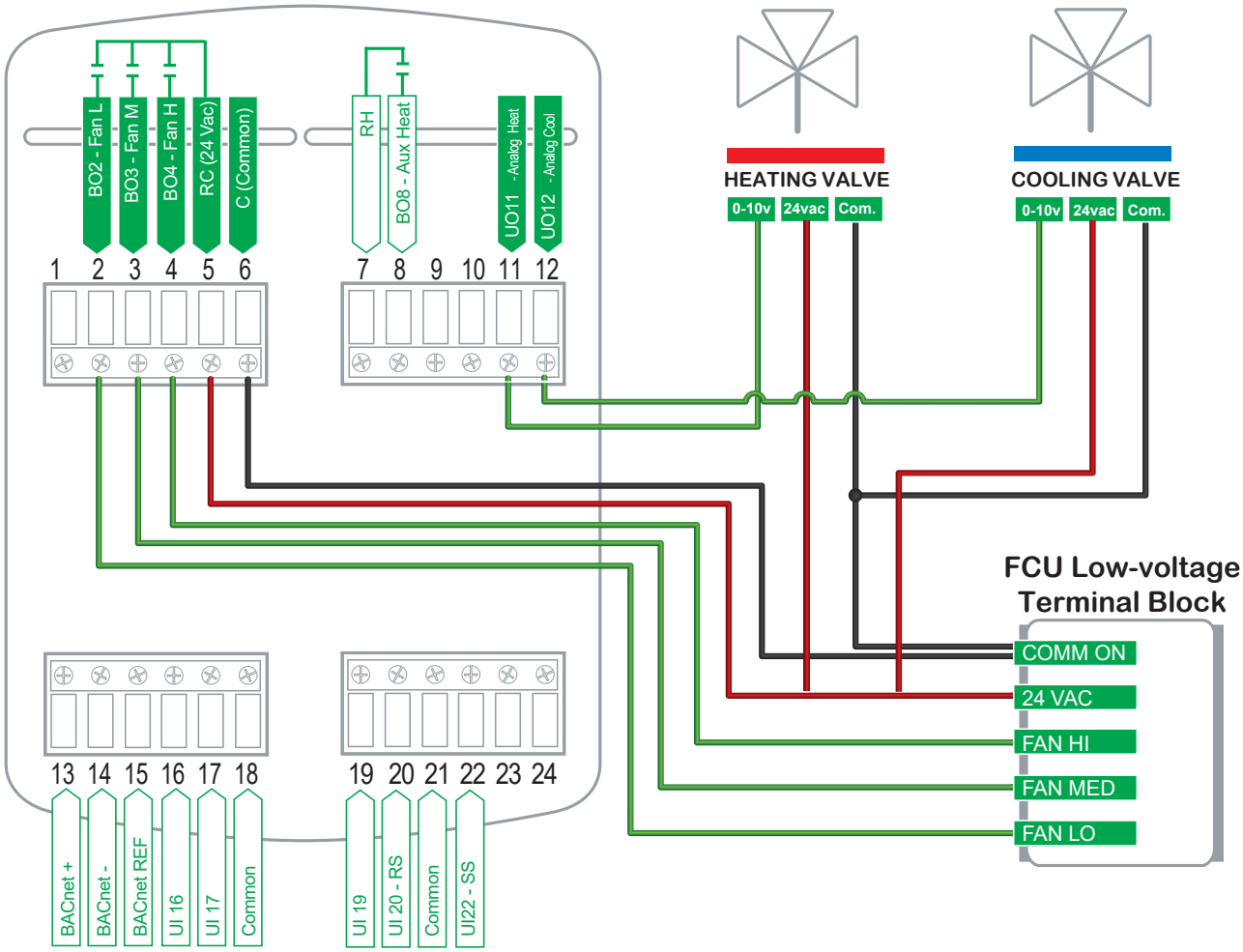
Table 8: Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 0-10VDC Analog Valves and Dehumidification Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	3 speed
Fan menu	L-M-H-A
Control Type	Analog
Pipe no.	4
Seq. operation	Cool / Heat

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 0-10VDC Analog Valves and Dehumidification Sequence for Low Voltage

MS8350 Modulating Control + 3 Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 0-10 VDC Analog Valves and Dehumidification Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens to maintain room temperature. Heating valve closes. Dehumidification enabled.

On Call for Heat

Heating valve opens to maintain room temperature. Cooling valve closes. Dehumidification enabled.

On Demand for Dehumidification

Dehumidification is achieved via cooling coil using heating coil for reheat if necessary. Dehumidification is only allowed in COOL mode, or if cooling is enabled in AUTO mode. Dehumidification is disabled if room temperature falls below low ambient lockout temperature, which is the cooling setpoint minus the configuration defined deadband value. Reheat disabled if cooling demand reaches 100%.

3 Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO2 is energized.
- BO3 is energized
- BO4 is energized.
- Auto: When there is no demand, BO2, BO3 and BO4 are not energized. On demand, system will automatically switch “On” low (BO2), medium (BO3) or high (B04) speed.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems with changeover.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Universal input can be configured for changeover sensor.

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valves and Dehumidification Sequence for Low Voltage

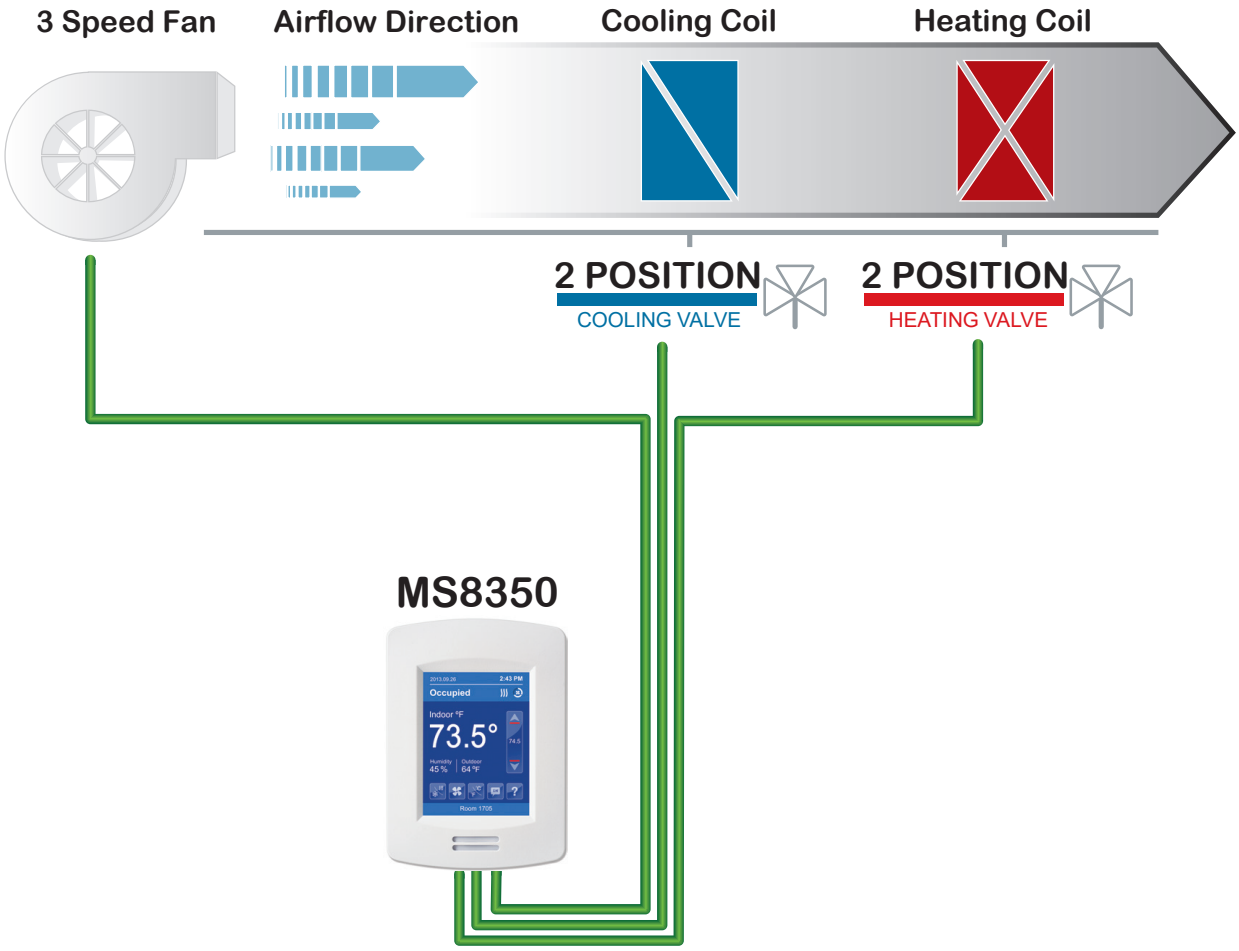


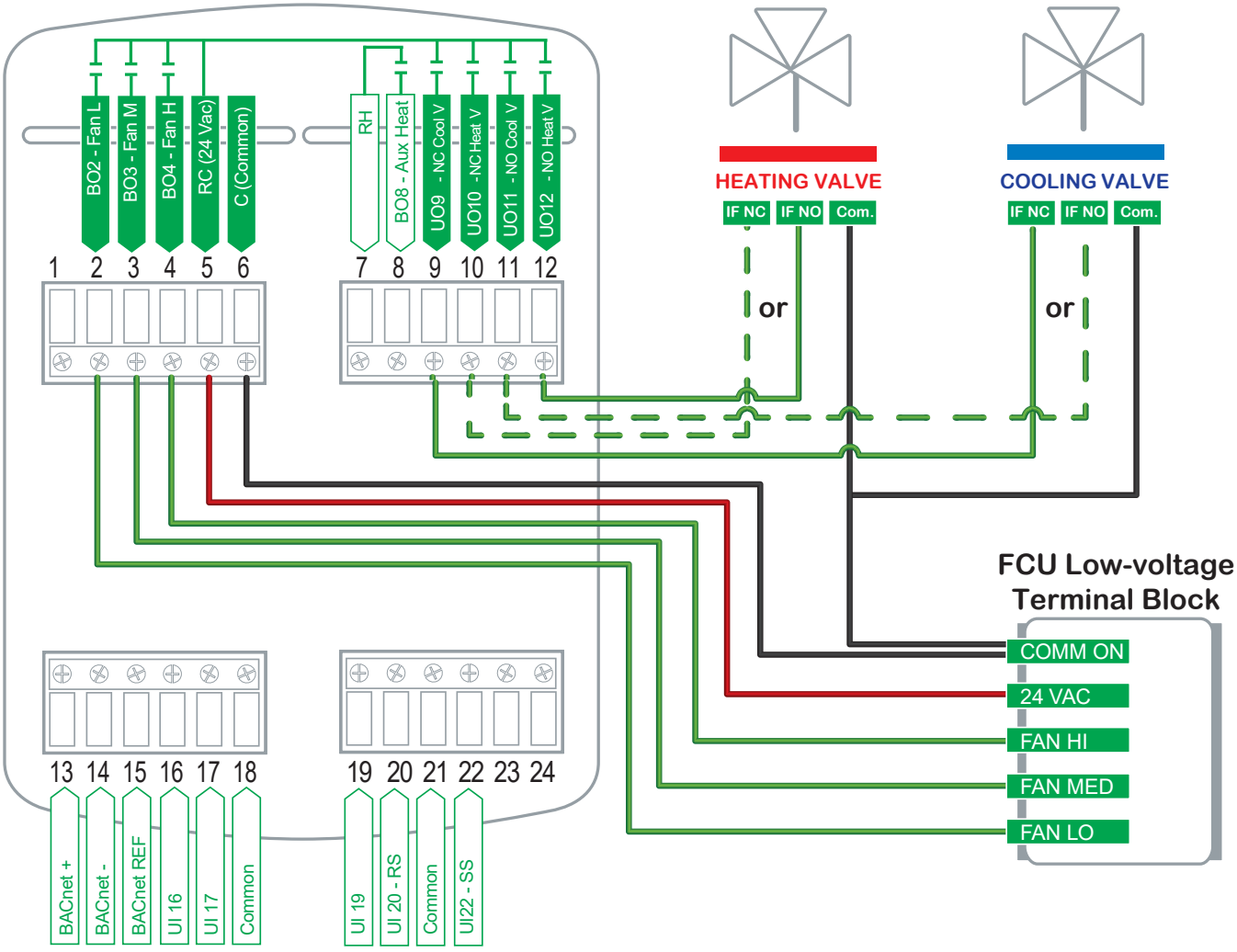
Table 9: Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valves andDehumidification Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	3 speed
Fan menu	L-M-H-A
Control Type	On / Off
Pipe no.	4
Seq. operation	Cool / Heat

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valves and Dehumidification Sequence for Low Voltage

MS8350 On / Off Control + 3 Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valves and Dehumidification Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens to maintain room temperature. Heating valve closes. Dehumidification enabled.

On Call for Heat

Heating valve opens to maintain room temperature. Cooling valve closes. Dehumidification enabled.

On Demand for Dehumidification

Dehumidification is achieved via cooling coil using heating coil for reheat if necessary. Dehumidification is only allowed in COOL mode, or if cooling is enabled in AUTO mode. Dehumidification is disabled if room temperature falls below low ambient lockout temperature, which is the cooling setpoint minus the configuration defined deadband value. Reheat disabled if cooling demand reaches 100%.

3 Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO2 is energized.
- BO3 is energized
- BO4 is energized.
- Auto: When there is no demand, BO2, BO3 and BO4 are not energized. On demand, system will automatically switch “On” low (BO2), medium (BO3) or high (B04) speed.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Universal input can be configured for changeover sensor.

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with Single Speed Fan, 2-Position Cooling Valve and Fresh Air Damper Sequence for Low Voltage

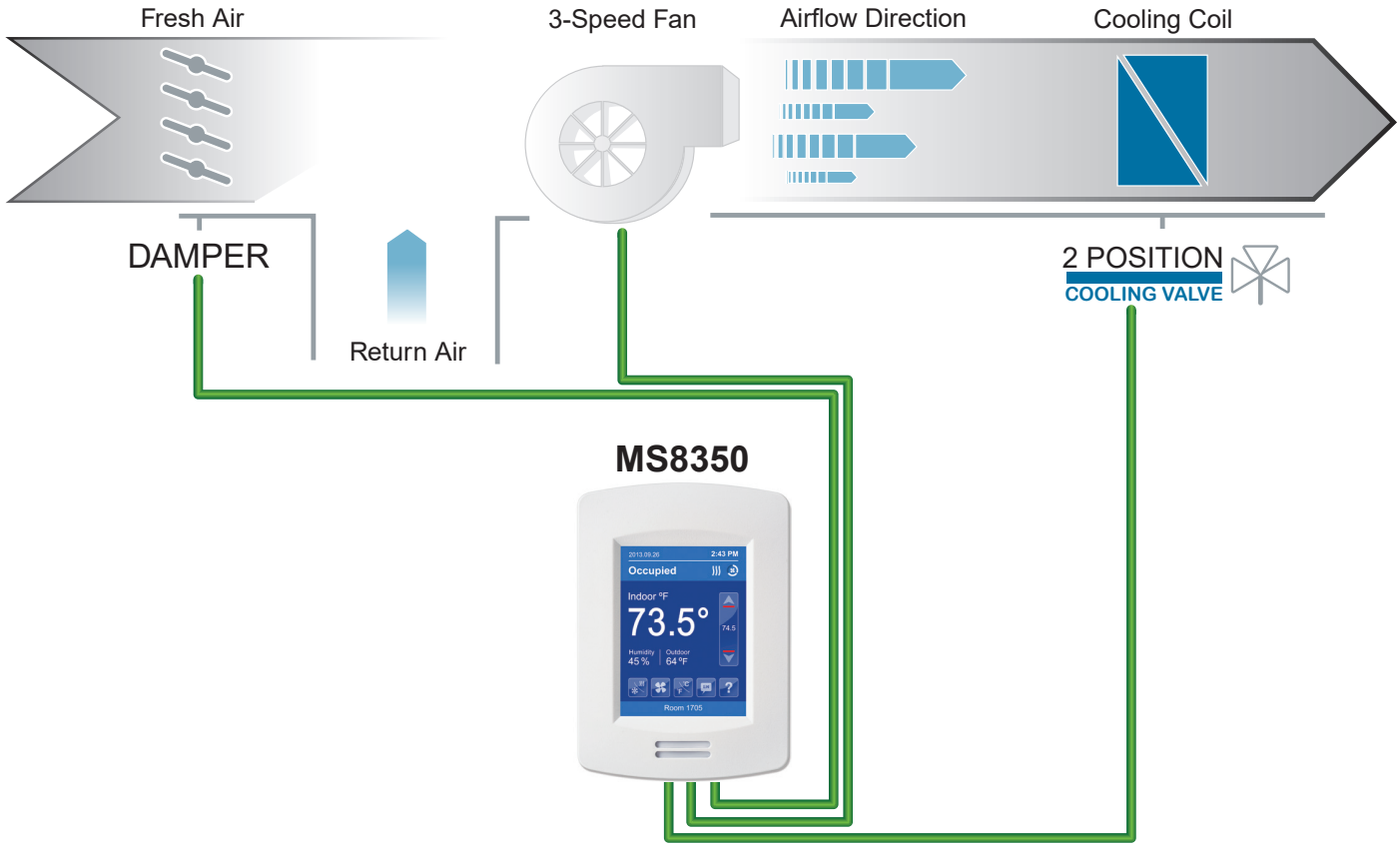


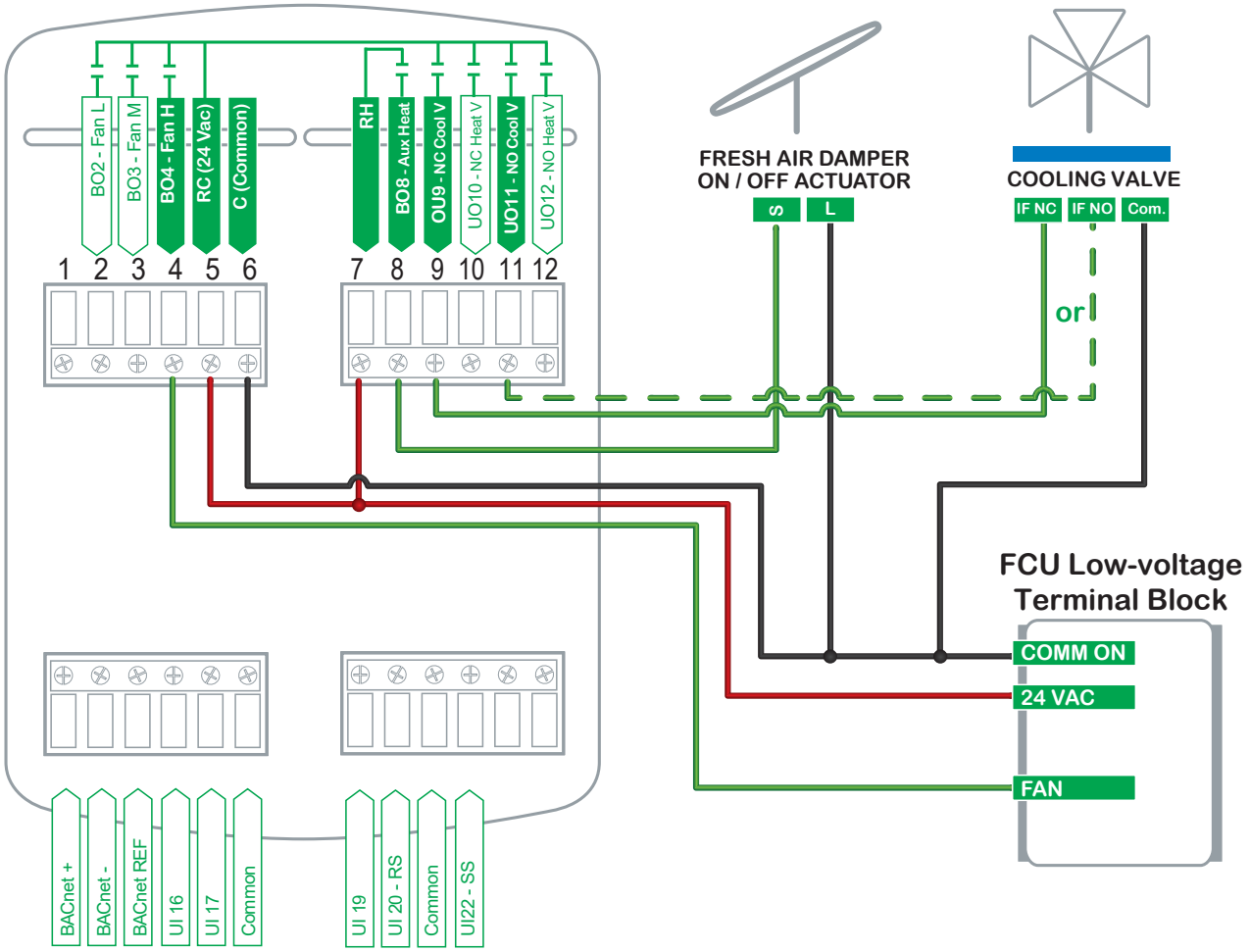
Table 10: Cooling Only 2-Pipe Fan Coil Unit with Single Speed Fan, 2-Position Cooling Valve & Fresh Air Damper Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	1 speed
Fan menu	On-Auto
Control Type	On / Off
BO8 Aux. Out	Aux NO
Pipe no.	2
Seq. operation	Cool Only

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with Single Speed Fan, 2-Position Cooling Valve and Fresh Air Damper Sequence for Low Voltage

MS8350 Modulating Cooling Only + Single Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with Single Speed Fan, 2-Position Cooling Valve and Fresh Air Damper Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating. The auxillary contact closes forcing fresh air damper to open.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling. The auxillary contact closes forcing fresh air damper to open.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter. The auxillary contact closes forcing fresh air damper to open.

On Call for Cool

Cooling valve opens.

On Call for Heat

Cooling valve closes.

1 Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO4 is energized.
- Auto: When there is no demand, BO4 is not energized. On demand, BO4 will be energized.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Can be configured for two speed or three speed fan control.

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling with Reheat 4-Pipe Fan Coil Unit with 3-Speed Fan, Analog Cooling Valve and N.C. On / Off Heating Valve for Low Voltage

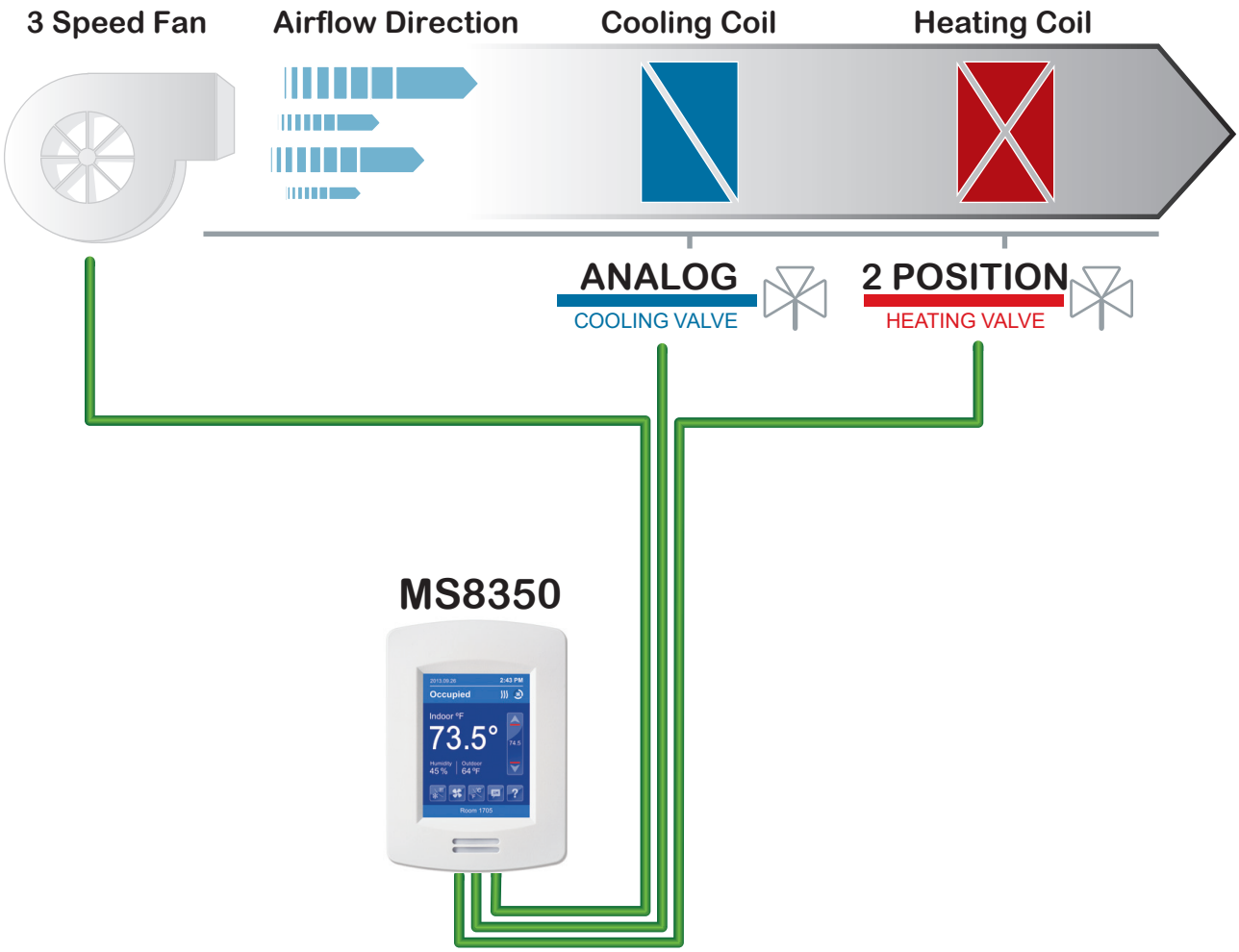


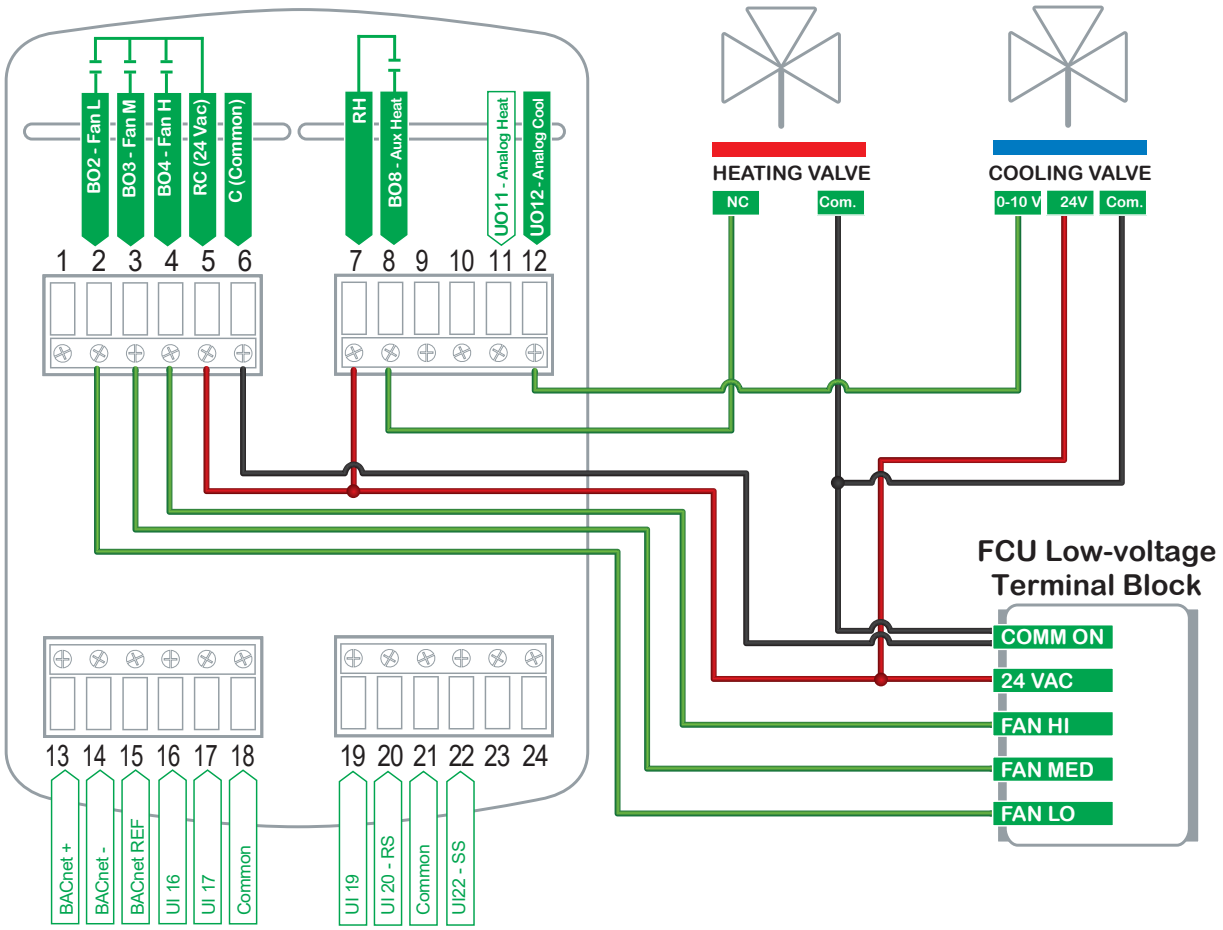
Table 11: Cooling w/Reheat 4-Pipe Fan Coil Unit with 3-Speed Fan, Analog Cooling Valve and N.C. On / Off Heating Valve Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	3 speed
Fan menu	L-M-H-A
Control Type	Analog
BO8 Out Time	0 = 15 Minutes
BO8 AuxOut	Reheat
Pipe no.	4
Seq. operation	Cool / Reheat

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling with Reheat 4-Pipe Fan Coil Unit with 3-Speed Fan, Analog Cooling Valve and N.C. On / Off Heating Valve for Low Voltage

MS8350 Modulating Cooling, On/Off Heating + 3 Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling with Reheat 4-Pipe Fan Coil Unit with 3-Speed Fan, Analog Cooling Valve and N.C. On / Off Heating Valve for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Analog valve starts modulating based on cooling demand.

On Call for Heat

Heating valve opens.

3 Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO2 is energized.
- BO3 is energized
- BO4 is energized.
- Auto: When there is no demand, BO2, BO3 and BO4 are not energized. On demand, system will automatically switch “On” low (BO2), medium (BO3) or high (B04) speed.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with 3-Speed Fan and 0-10VDC Analog Cooling Valve for Low Voltage

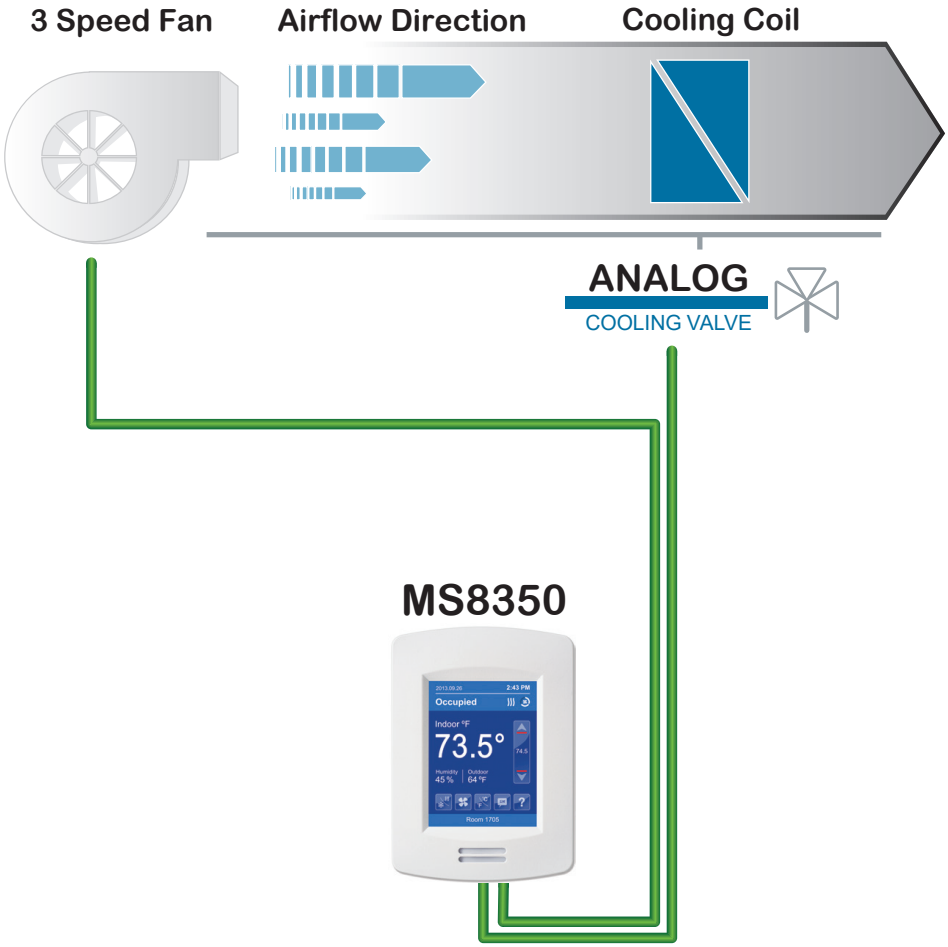


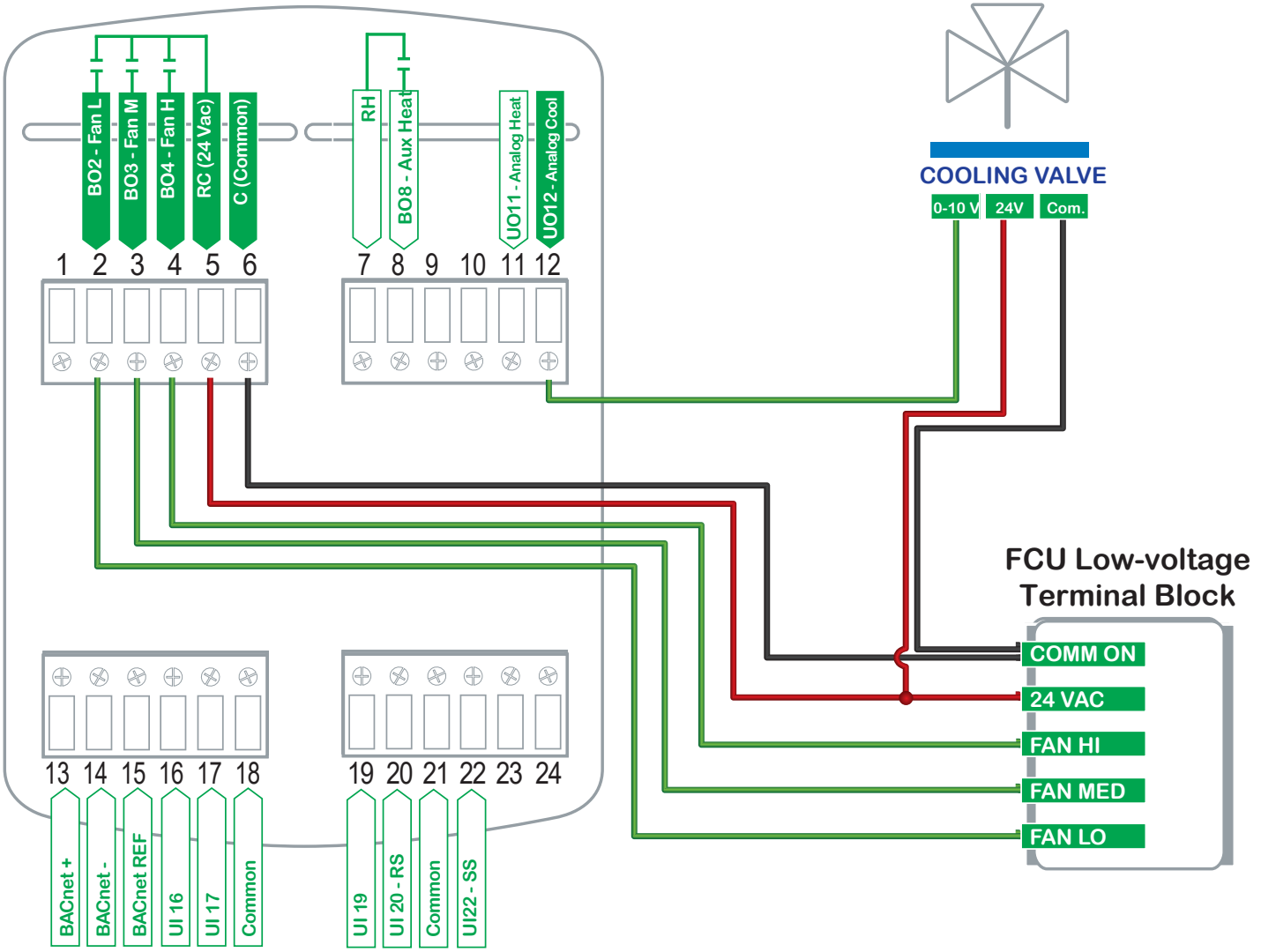
Table 12: Cooling Only 2-Pipe Fan Coil Unit with 3-Speed Fan and 0-10VDC Analog Cooling Valve Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	3 speed
Fan menu	L-M-H-A
Control Type	Analog
Pipe no.	2
Seq. operation	Cool only

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with 3-Speed Fan and 0-10VDC Analog Cooling Valve for Low Voltage

MS8350 Modulating Cooling Control + 3 Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with 3-Speed Fan and 0-10VDC Analog Cooling Valve for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Analog valve modulates allowing cool air to flow to reach setpoint.

On Call for Heat

Valve closes.

3 Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO2 is energized.
- BO3 is energized
- BO4 is energized.
- Auto: When there is no demand, BO2, BO3 and BO4 are not energized. On demand, system will automatically switch “On” low (BO2), medium (BO3) or high (B04) speed.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 4-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Can be configured to one or two speed fans.

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling with Reheat 2-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valve and Electric Reheat for Low Voltage

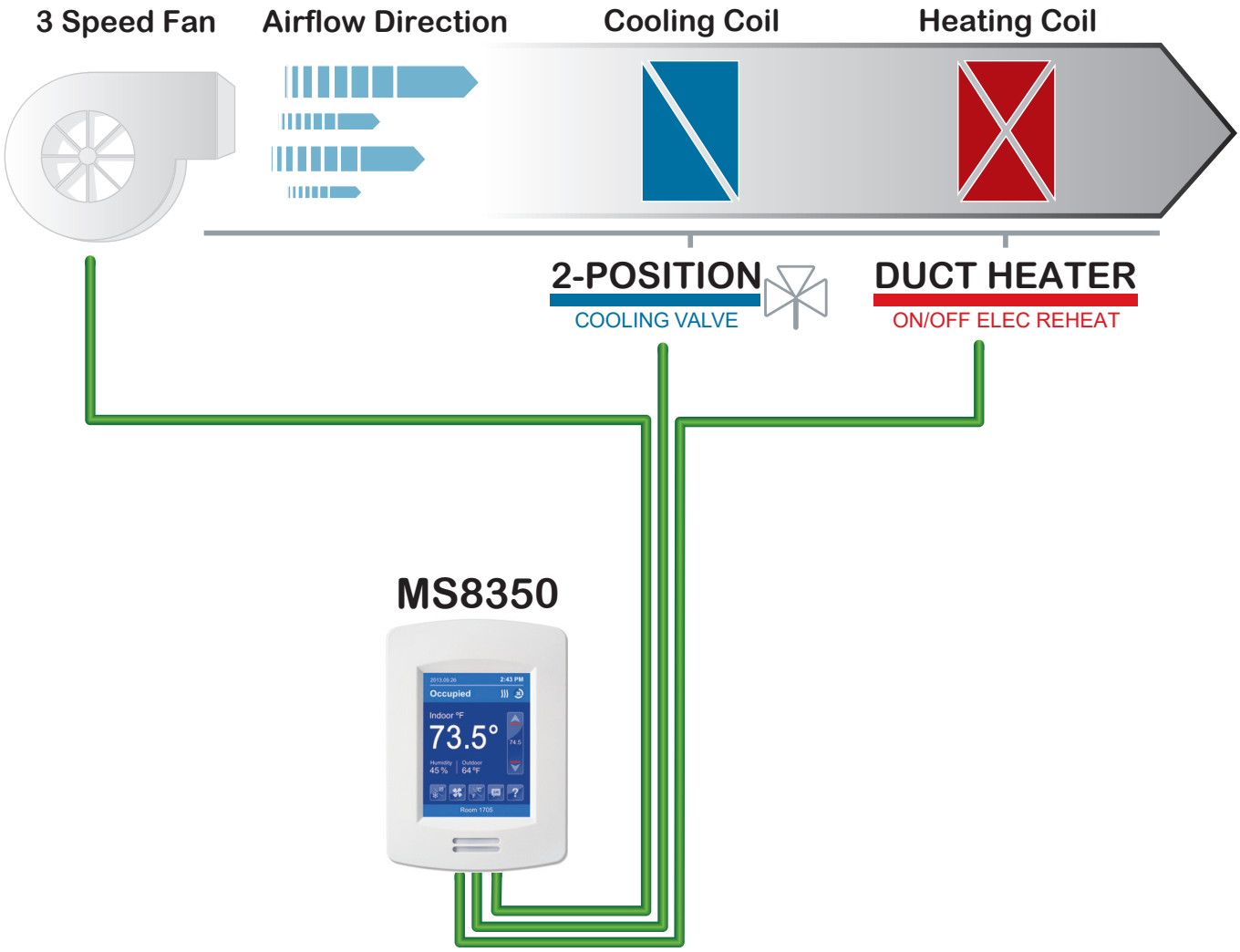


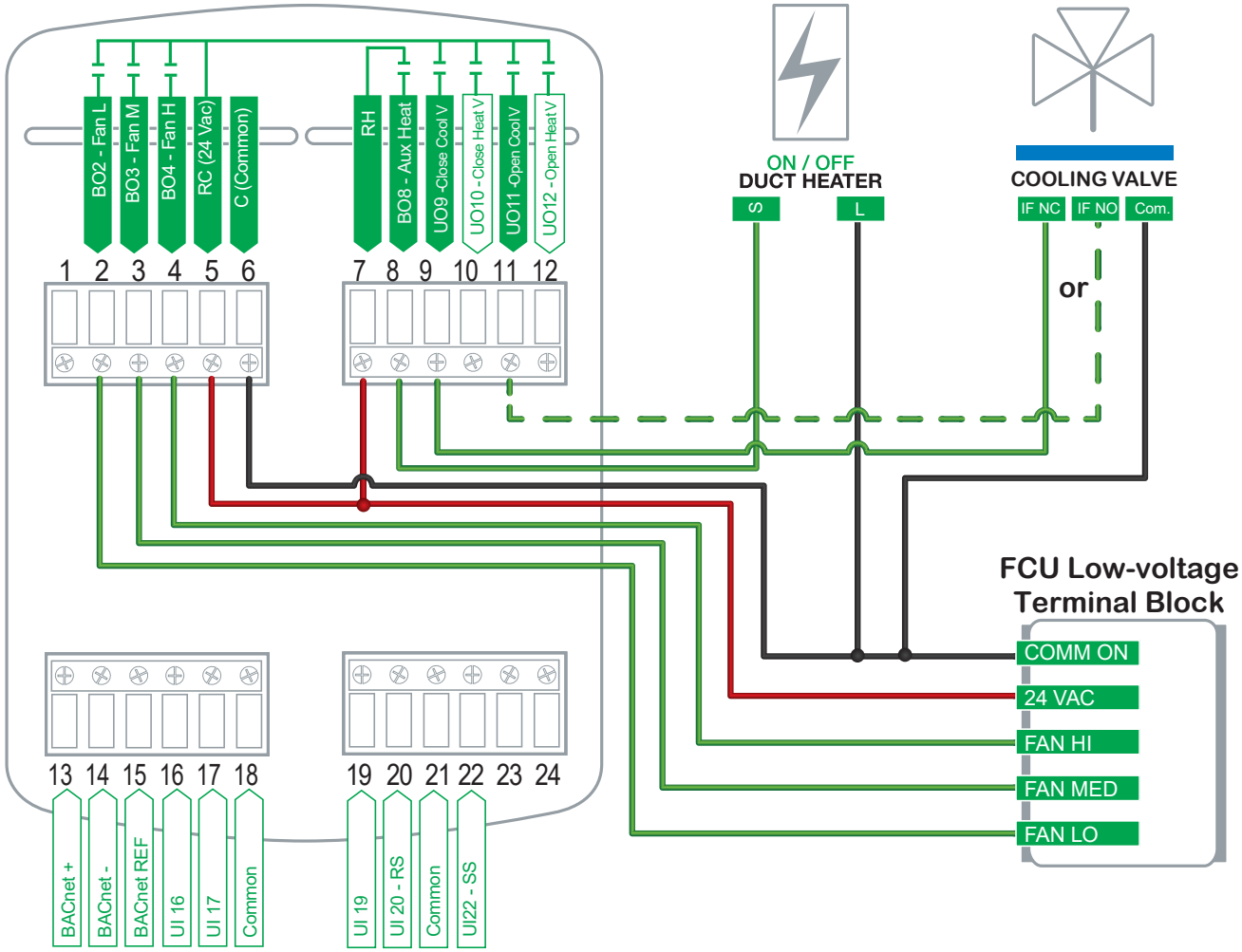
Table 13: Cooling w/Reheat 2-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valve and Electric Reheat Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	3 speed
Fan menu	L-M-H-A
Control Type	On/Off
BO8 Out Time	0 = 15 Minutes
BO8 AuxOut	Reheat
Pipe no.	2
Seq. operation	Cool / Reheat

MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling with Reheat 2-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valve and Electric Reheat for Low Voltage

MS8350 Modulating Cooling, On/Off Electric Heating + 3 Speed Fan



MS8350 FAN COIL UNIT 1, 2 OR 3 SPEED FAN MOTOR APPLICATIONS

Cooling with Reheat 2-Pipe Fan Coil Unit with 3-Speed Fan, 2-Position Valve and Electric Reheat for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating. The changeover sensor sends supply air temperature to controller.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens. Electric heat stays Off.

On Call for Heat

Cooling valve closes. Electric heating energizes.

3-Speed Fan Operation

System Off

BO2, BO3 and BO4 are not energized.

System On

- BO2 is energized.
- BO3 is energized
- BO4 is energized.
- Auto: When there is no demand, BO2, BO3 and BO4 are not energized. On demand, system will automatically switch “On” low (BO2), medium (BO3) or high (B04) speed.

Options

- Wireless adapter modules for BACnet models are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 4-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Can be configured to single or two speed fans.

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Table 14: MS8350 Fan Coil Unit ECM Fan Motor Applications.

System	Fan	Cooling	Heating	Other
4 pipes	ECM	Tri-state valve actuator	Tri-state valve actuator	Door and motion detect + dehumidification
4 pipes	ECM	0-10Vdc valve actuator	0-10Vdc valve actuator	Motion detect + dehumidification
4 pipes	ECM	2 positions valve actuator	2 positions valve actuator	Motion detect + dehumidification
4 pipes	ECM	2 positions valve actuator	2 positions valve actuator	---
2 pipes	ECM	0-10 Vdc valve actuator	Electric heater	---
2 pipes	ECM	0-10 Vdc valve actuator	None	---

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, Tri-State Floating Valves and Dehumidification Sequence for Low Voltage

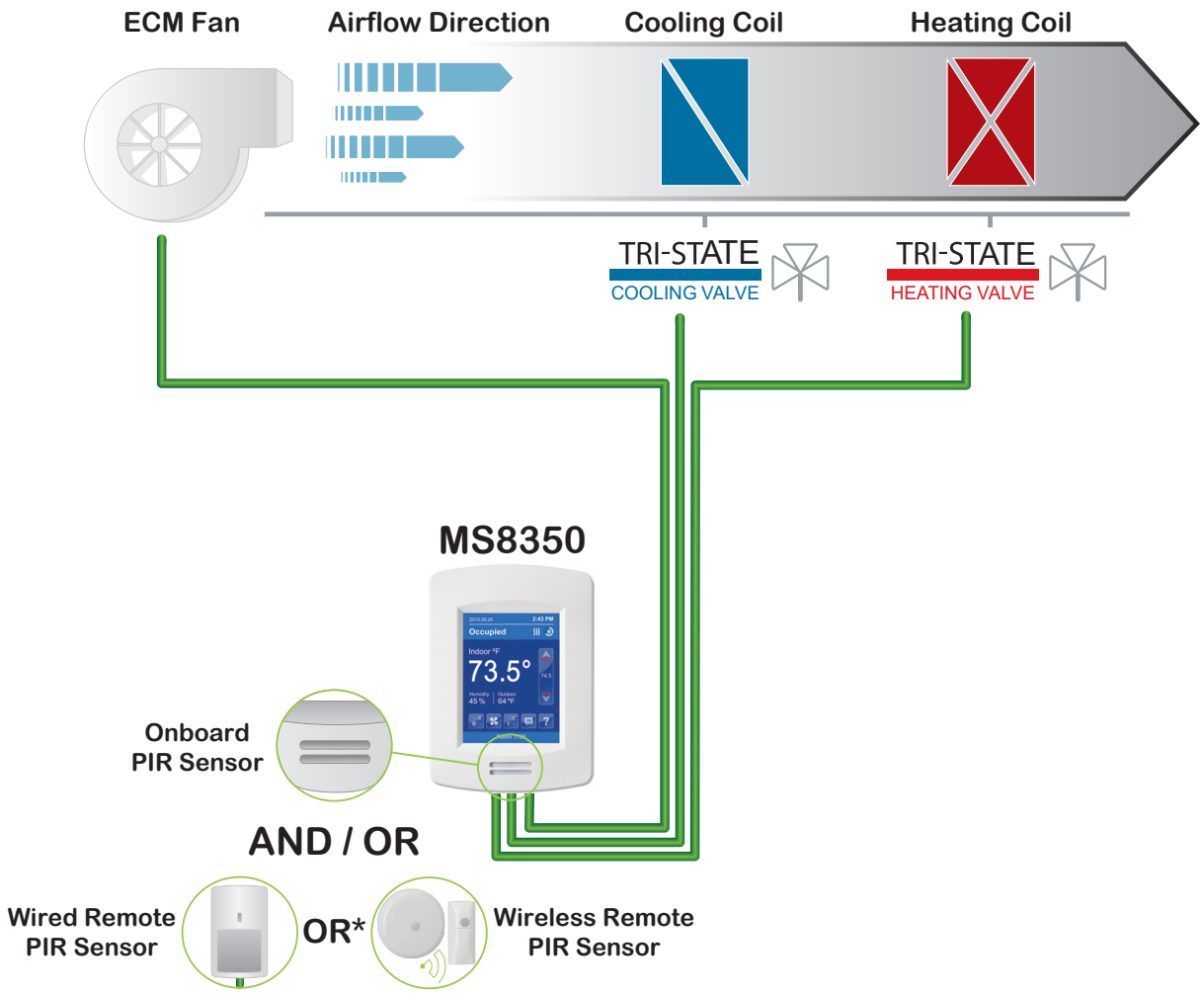


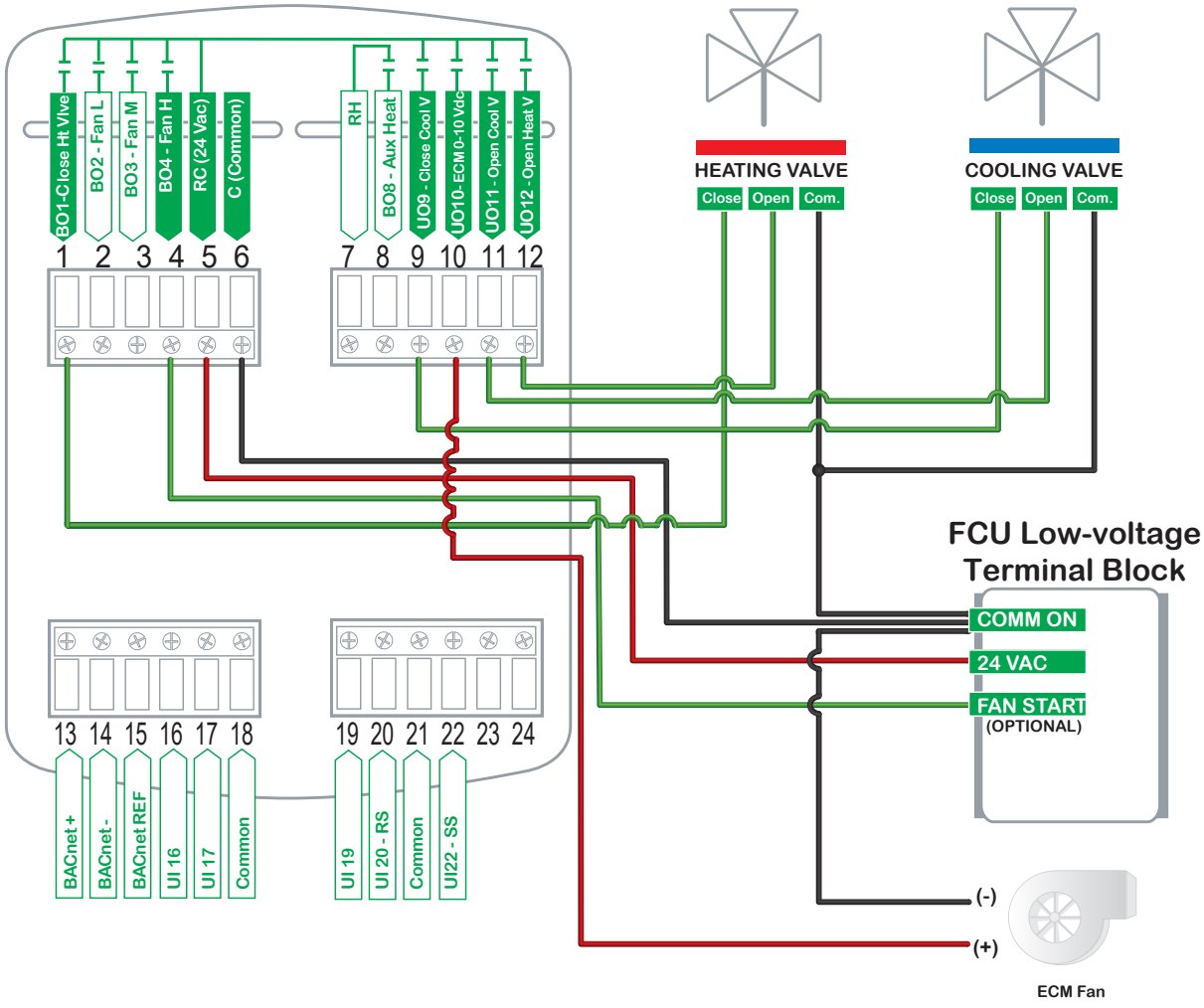
Table 15: Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, Tri-State Floating Valves and Dehumidification Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	ECM
Fan menu	L-M-H-A
Control Type	Floating
UI16	Motion NO or Motion NC (remote PIR sensor only)
UI17	Door Dry
Pipe no.	4
Seq. operation	Cool / Heat

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, Tri-State Floating Valves and Dehumidification Sequence for Low Voltage

MS8350 Floating Control + ECM Fan



MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, Tri-State Floating Valves and Dehumidification Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens to maintain room temperature. Heating valve closes.

On Call for Heat

Heating valve opens to maintain room temperature. Cooling valve closes.

On Demand for Dehumidification

Dehumidification is achieved via cooling coil using heating coil for reheat if necessary. Dehumidification is only allowed in COOL mode, or if cooling is enabled in AUTO mode. Dehumidification is disabled if room temperature falls below low ambient lockout temperature, which is the cooling setpoint minus the configuration defined deadband value. Reheat disabled if cooling demand reaches 100%

ECM Fan Operation

System Off

UO12 = 0Vdc and BO4 (fan start) is not energized.

System On

- Low: UO12 = 2.2 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Med: UO12 = 6.0 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- High: UO12 = 8.6 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Auto: When there is no demand, UO12 = 0 Vdc and BO4 "fan start" are not energized. On demand, system will modulate from "low" to "high" voltages (adjustable from configuration menu) and BO4 "fan start" is energized.

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Universal input can be configured for changover sensor.

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 0-10VDC Analog Valves and Dehumidification Sequence for Low Voltage

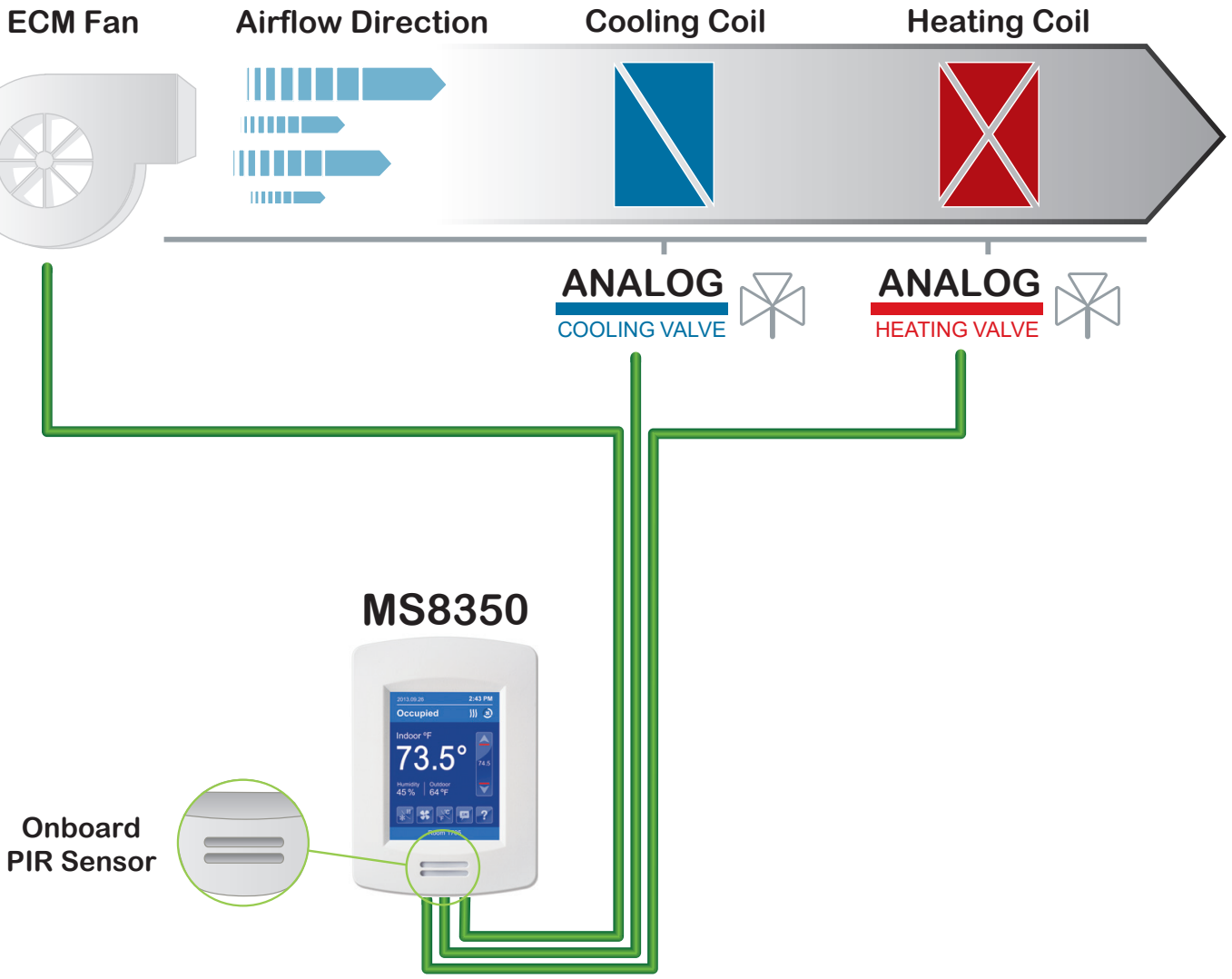
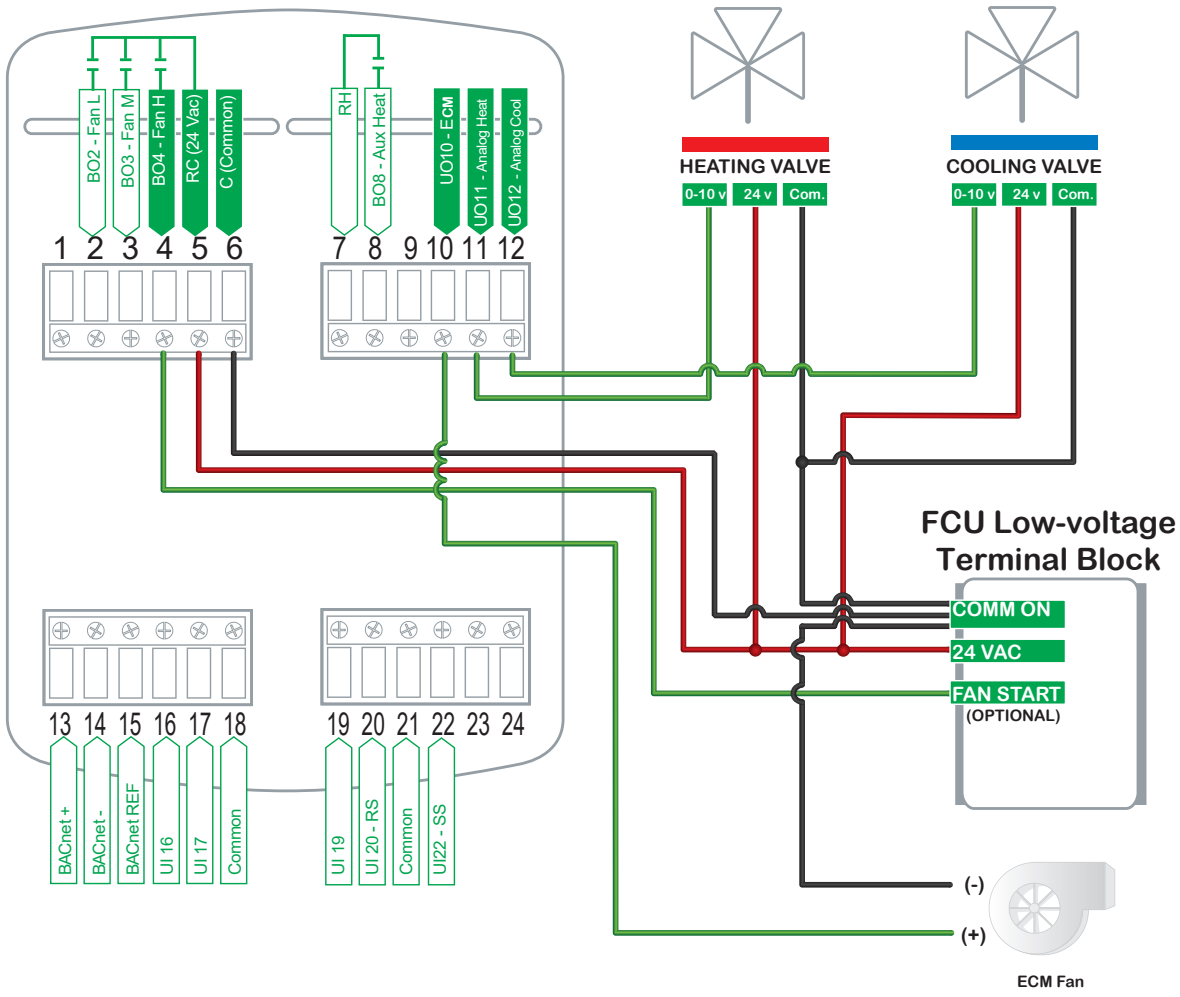


Table 16: Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 0-10VDC Analog Valves and Dehumidification Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	ECM
Fan menu	L-M-H-A
Control Type	Analog
Pipe no.	4
Seq. operation	Cool / Heat

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 0-10VDC Analog Valves and Dehumidification Sequence for Low Voltage

MS8350 Modulating Control + ECM Fan



MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 0-10VDC Analog Valves and Dehumidification Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating. The changeover sensor sends supply air temperature to controller.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens to maintain room temperature. Heating valve closes. Dehumidification enabled.

On Call for Heat

Heating valve opens to maintain room temperature. Cooling valve closes. Dehumidification enabled.

On Demand for Dehumidification

Dehumidification is achieved via cooling coil using heating coil for reheat if necessary. Dehumidification is only allowed in COOL mode, or if cooling is enabled in AUTO mode. Dehumidification is disabled if room temperature falls below low ambient lockout temperature, which is the cooling setpoint minus the configuration defined deadband value. Reheat disabled if cooling demand reaches 100%.

ECM Fan Operation

System Off

UO12 = 0Vdc and BO4 (fan start) is not energized.

System On

- Low: UO12 = 2.2 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Med: UO12 = 6.0 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- High: UO12 = 8.6 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Auto: When there is no demand, UO12 = 0 Vdc and BO4 "fan start" are not energized. On demand, system will modulate from "low" to "high" voltages (adjustable from configuration menu) and BO4 "fan start" is energized.

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Universal input can be configured for changover sensor.

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 2-Position Valves and Dehumidification Sequence for Low Voltage

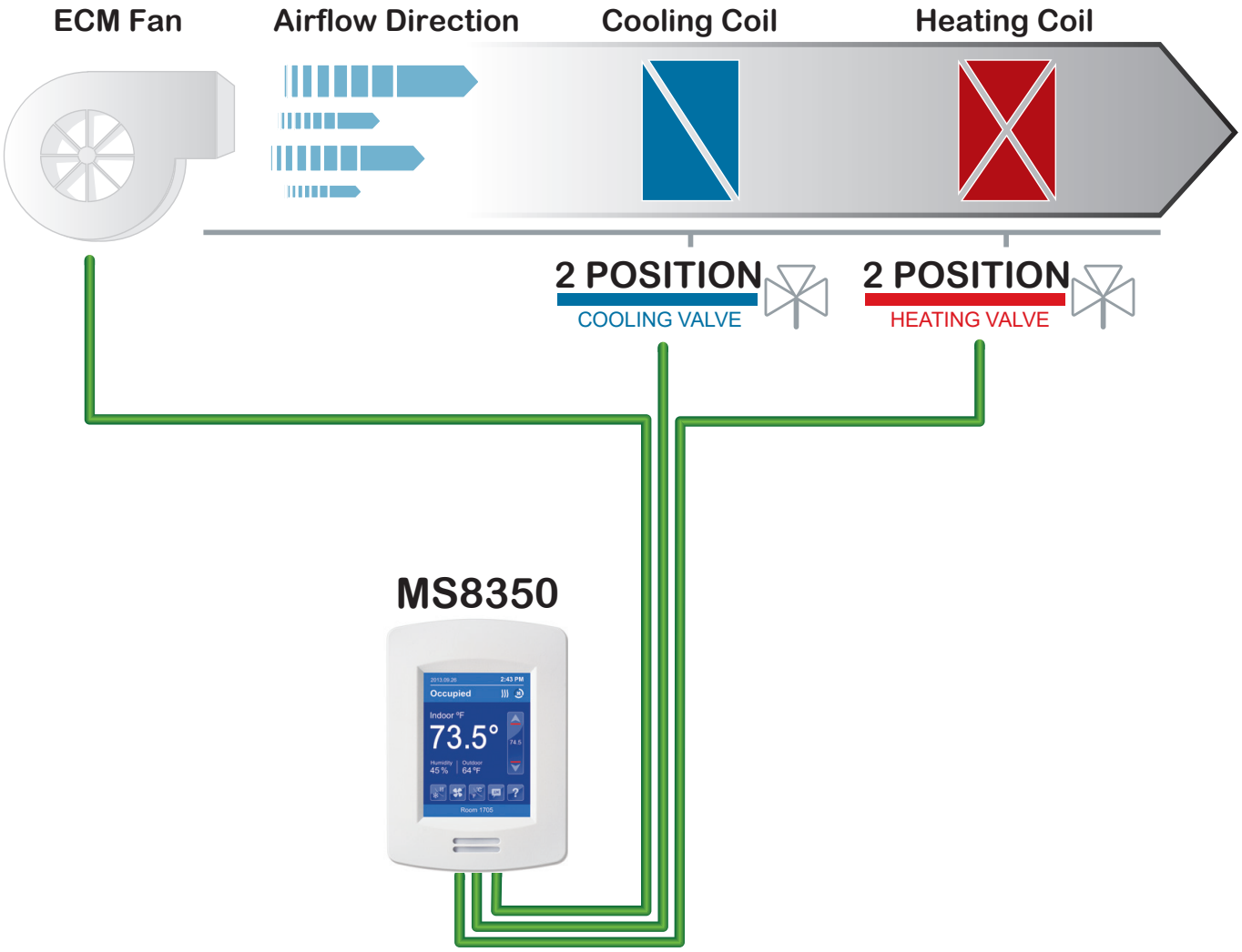


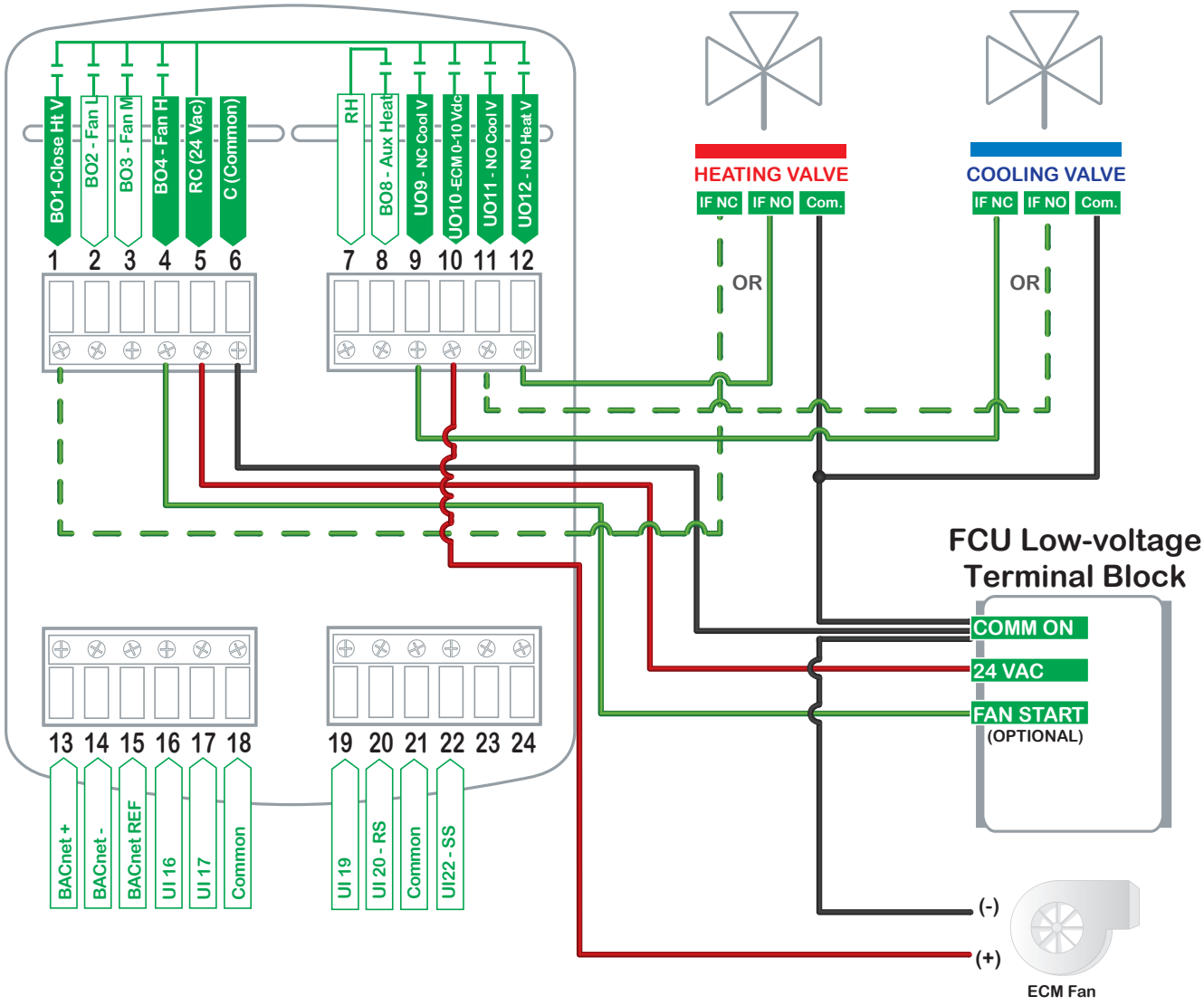
Table 17: Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 2-Position Valves and Dehumidification Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	ECM
Fan menu	L-M-H-A
Control Type	On / Off
Pipe no.	4
Seq. operation	Cool / Heat

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 2-Position Valves and Dehumidification Sequence for Low Voltage

MS8350 On / Off Control + ECM Fan



Heating / Cooling 4-Pipe Fan Coil Unit with ECM Fan, 2-Position Valves and Dehumidification Sequence for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens to maintain room temperature. Heating valve closes. Dehumidification enabled.

On Call for Heat

Heating valve opens to maintain room temperature. Cooling valve closes. Dehumidification enabled.

On Demand for Dehumidification

Dehumidification is achieved via cooling coil using heating coil for reheat if necessary. Dehumidification is only allowed in COOL mode, or if cooling is enabled in AUTO mode. Dehumidification is disabled if room temperature falls below low ambient lockout temperature, which is the cooling setpoint minus the configuration defined deadband value. Reheat disabled if cooling demand reaches 100%.

ECM Fan Operation

System Off

UO12 = 0Vdc and BO4 (fan start) is not energized.

System On

- Low: UO12 = 2.2 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Med: UO12 = 6.0 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- High: UO12 = 8.6 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Auto: When there is no demand, UO12 = 0 Vdc and BO4 "fan start" are not energized. On demand, system will modulate from "low" to "high" voltages (adjustable from configuration menu) and BO4 "fan start" is energized.

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Universal input can be configured for changover sensor.

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Cooling with Reheat 4-Pipe Fan Coil Unit with ECM Fan, Analog Cooling Valve and N.C. On / Off Heating Valve for Low Voltage

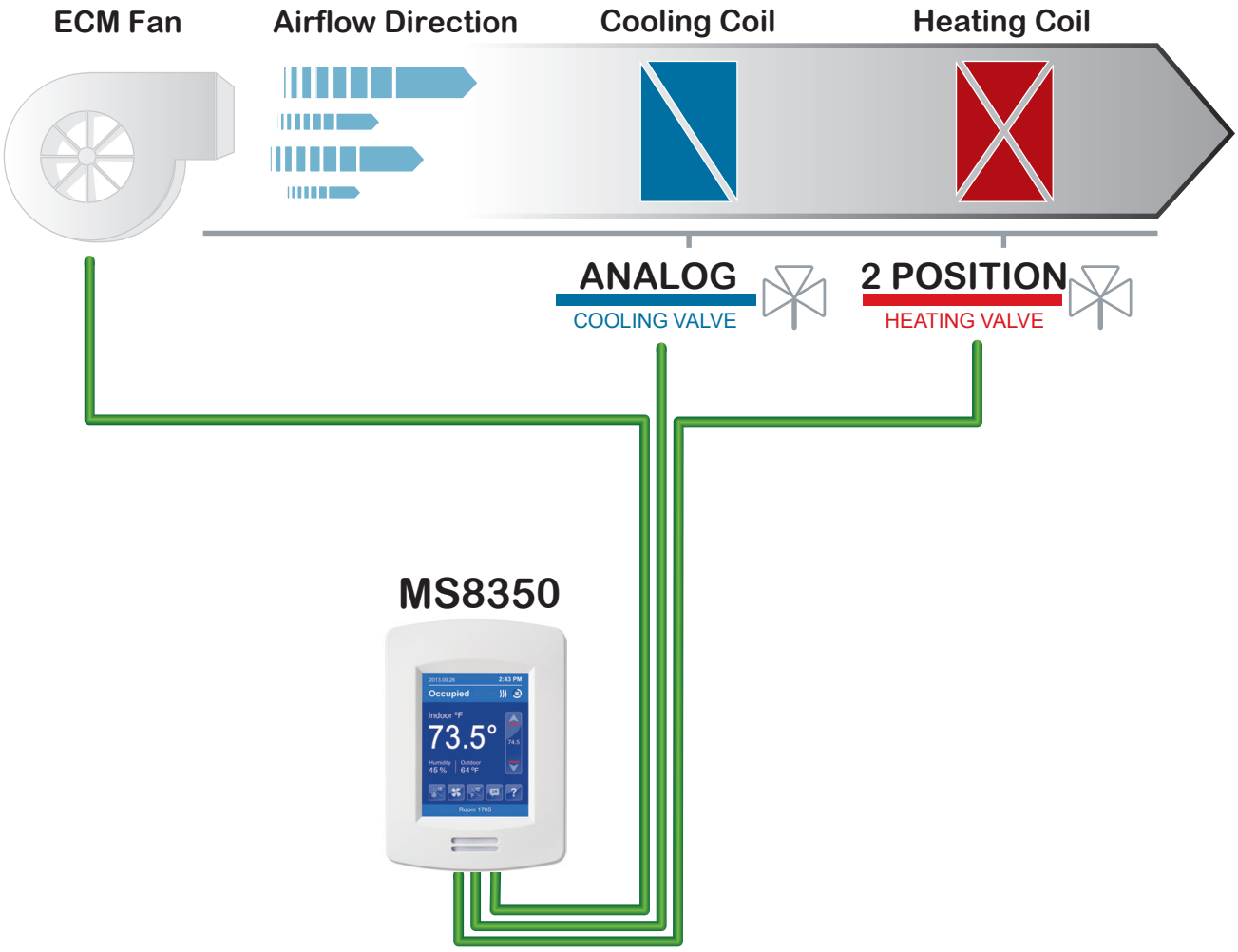
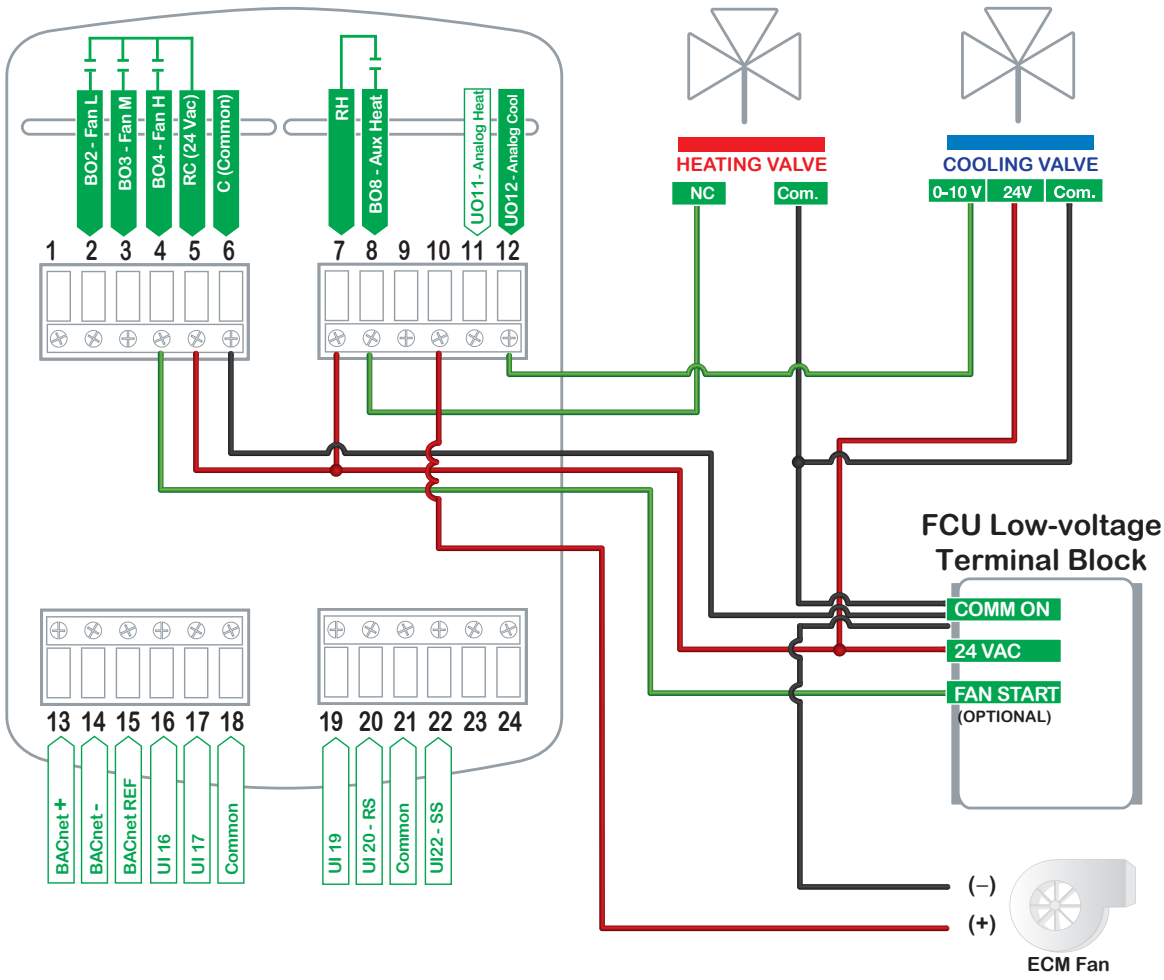


Table 18: Cooling w/Reheat 4-Pipe Fan Coil Unit with ECM Fan, Analog Cooling Valve and N.C. On / Off Heating Valve Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	ECM
Fan menu	L-M-H-A
Control Type	Analog
BO8 Out Time	0 = 15 Minutes
BO8 AuxOut	Reheat
Pipe no.	4
Seq. operation	Cool / Reheat

Cooling with Reheat 4-Pipe Fan Coil Unit with ECM Fan, Analog Cooling Valve and N.C. On / Off Heating Valve for Low Voltage

MS8350 Modulating Cooling, On/Off Heating + ECM Fan



MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Cooling with Reheat 4-Pipe Fan Coil Unit with ECM Fan, Analog Cooling Valve and N.C. On / Off Heating Valve for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Analog valve starts modulating based on cooling demand.

On Call for Heat

Heating valve opens.

ECM Fan Operation

System Off

UO12 = 0Vdc and BO4 (fan start) is not energized.

System On

- Low: UO12 = 2.2 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Med: UO12 = 6.0 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- High: UO12 = 8.6 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Auto: When there is no demand, UO12 = 0 Vdc and BO4 "fan start" are not energized. On demand, system will modulate from "low" to "high" voltages (adjustable from configuration menu) and BO4 "fan start" is energized.

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 2-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.

Cooling Only 2-Pipe Fan Coil Unit with ECM Fan and 0-10VDC Analog Cooling Valve for Low Voltage

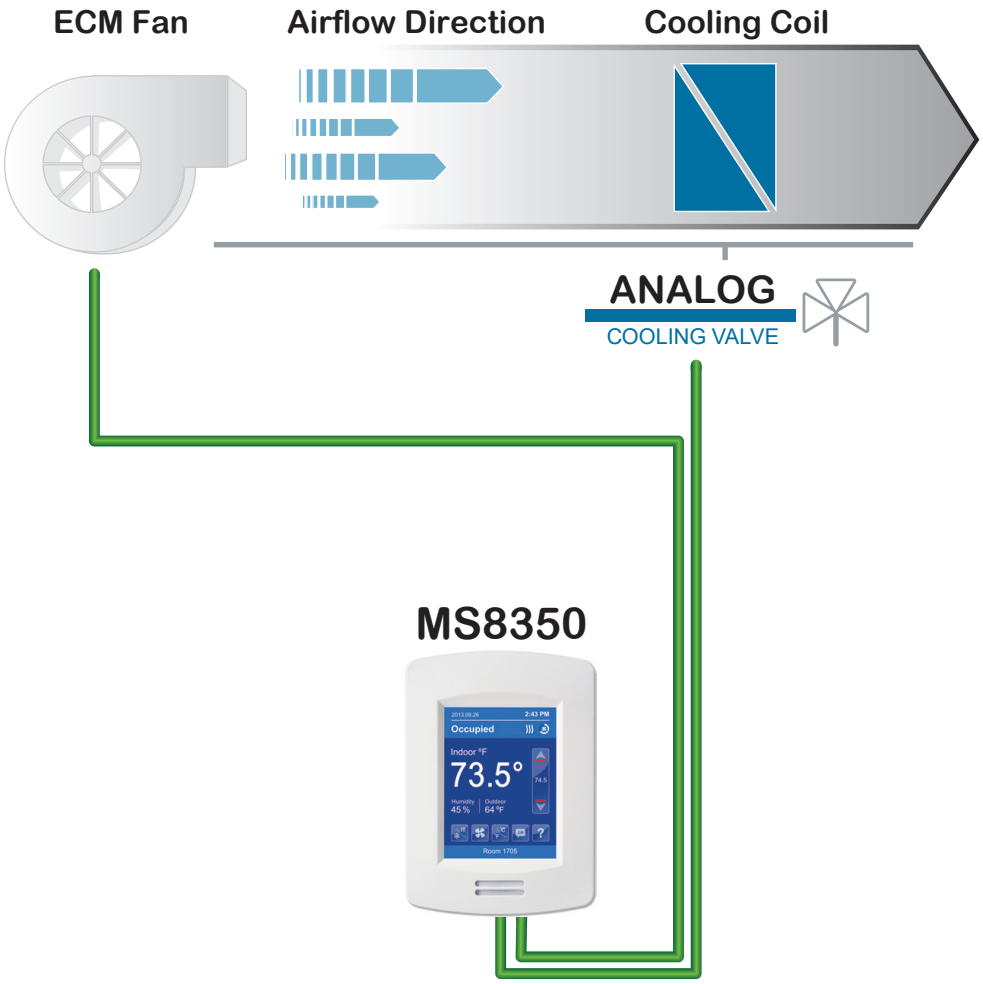


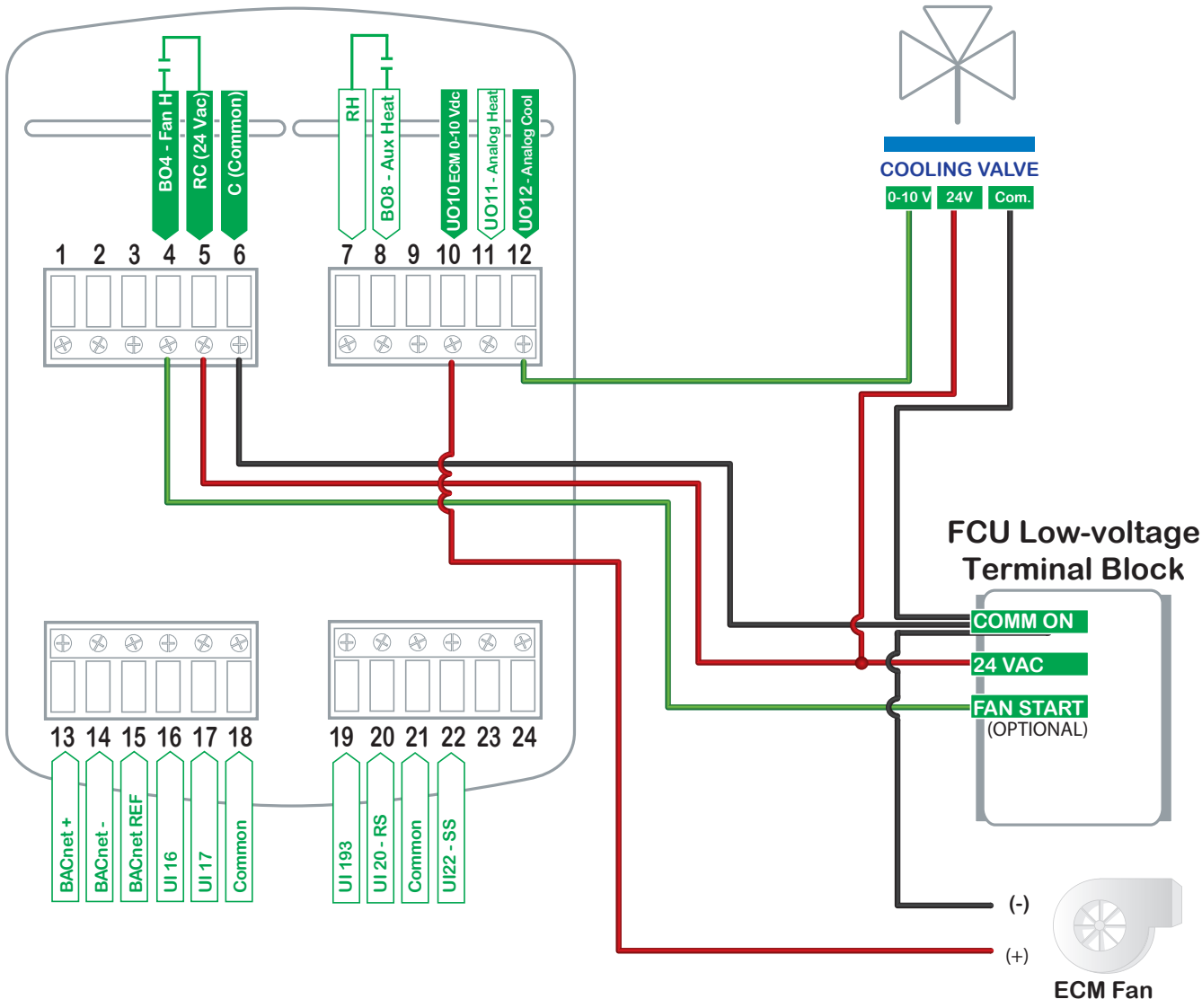
Table 19: Cooling Only 2-Pipe Fan Coil Unit with ECM Fan and 0-10VDC Analog Cooling Valve Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	ECM
Fan menu	L-M-H-A
Control Type	Analog
Pipe no.	2
Seq. operation	Cool only

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with ECM Fan and 0-10VDC Analog Cooling Valve for Low Voltage

MS8350 Modulating Cooling Control + ECM Fan



MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Cooling Only 2-Pipe Fan Coil Unit with ECM Fan and 0-10VDC Analog Cooling Valve for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Analog valve modulates allowing cool air to flow to reach setpoint.

On Call for Heat

Valve closes.

ECM Fan Operation

System Off

UO12 = 0Vdc and BO4 (fan start) is not energized.

System On

- Low: UO12 = 2.2 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Med: UO12 = 6.0 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- High: UO12 = 8.6 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Auto: When there is no demand, UO12 = 0 Vdc and BO4 "fan start" are not energized. On demand, system will modulate from "low" to "high" voltages (adjustable from configuration menu) and BO4 "fan start" is energized.

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 4-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Can be configured to single or two speed fans.

MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Cooling with Reheat 2-Pipe Fan Coil Unit with ECM Fan, 2-Position Valve and Electric Reheat for Low Voltage

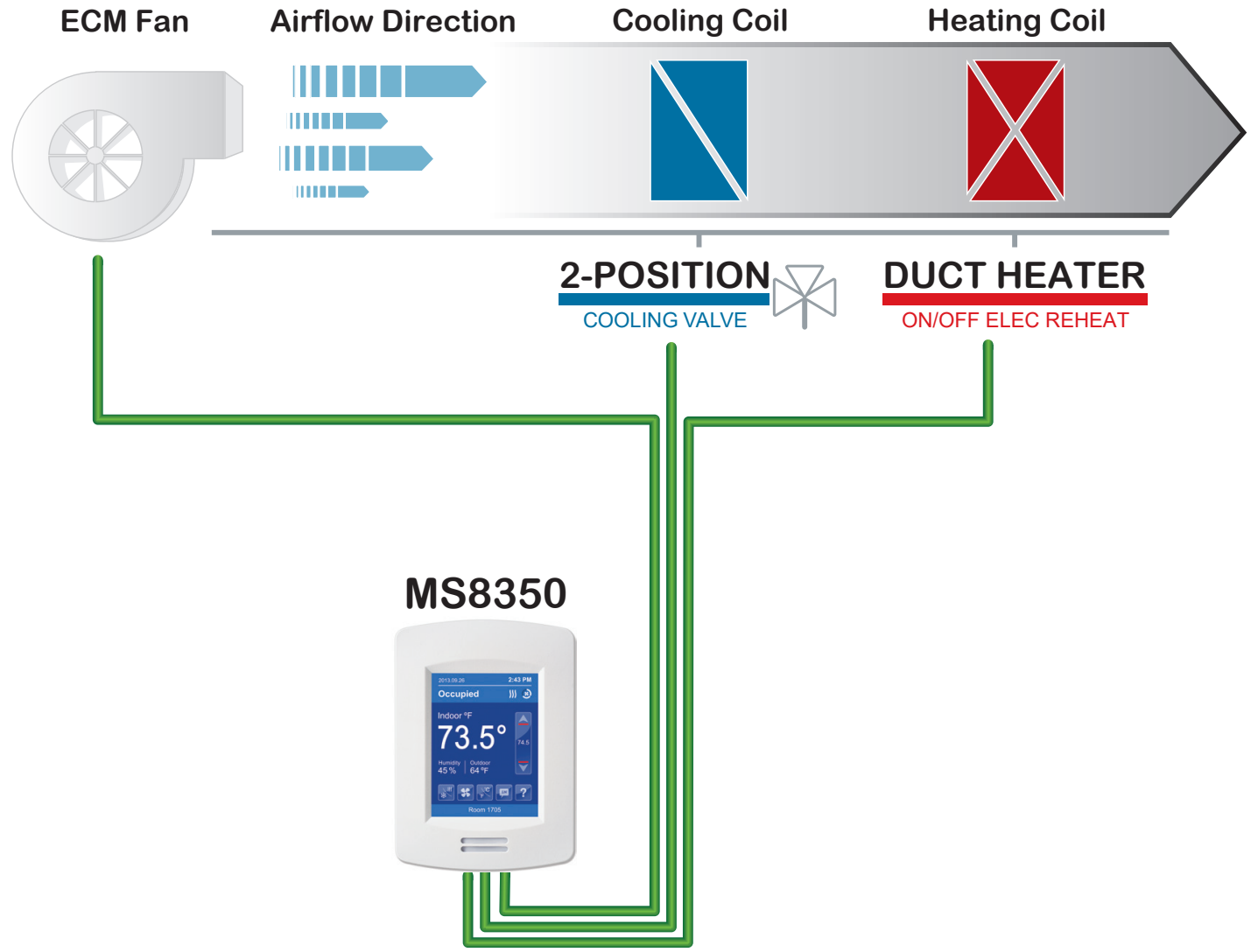
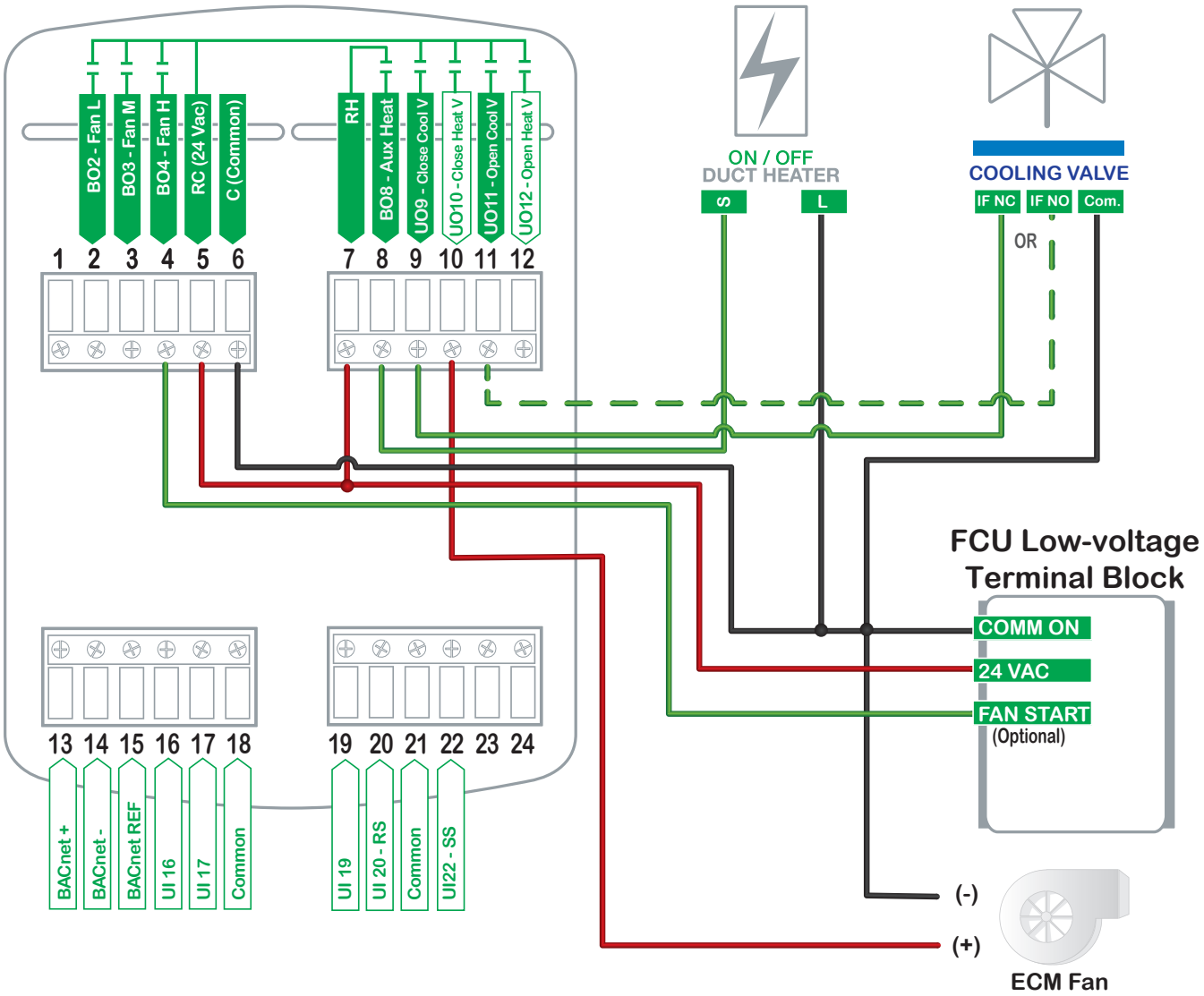


Table 20: Cooling w/Reheat 2-Pipe Fan Coil Unit with ECM Fan, 2-Position Valve and Electric Reheat Configuration.

Configuration Parameter Name	Configuration Settings
Fan control	ECM
Fan menu	L-M-H-A
Control Type	On/Off
BO8 Out Time	0 = 15 Minutes
BO8 AuxOut	Reheat
Pipe no.	2
Seq. operation	Cool / Reheat

Cooling with Reheat 2-Pipe Fan Coil Unit with ECM Fan, 2-Position Valve and Electric Reheat for Low Voltage

MS8350 On / Off Cooling Control, Electric Reheat + ECM Fan



MS8350 FAN COIL UNIT ECM FAN MOTOR APPLICATIONS

Cooling with Reheat 2-Pipe Fan Coil Unit with ECM Fan, 2-Position Valve and Electric Reheat for Low Voltage

Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

On Call for Cool

Cooling valve opens. Electric heat stays Off.

On Call for Heat

Valve closes. Electric heat activates.

ECM Fan Operation

System Off

UO12 = 0Vdc and BO4 (fan start) is not energized.

System On

- Low: UO12 = 2.2 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Med: UO12 = 6.0 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- High: UO12 = 8.6 Vdc (adjustable from configuration menu) and BO4 “fan start” is energized.
- Auto: When there is no demand, UO12 = 0 Vdc and BO4 "fan start" are not energized. On demand, system will modulate from "low" to "high" voltages (adjustable from configuration menu) and BO4 "fan start" is energized.

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- Remote wall mount or duct sensor ready.
- Can be configured for 4-pipe systems.
- 3 universal inputs can be used and configured for advanced functionality as required by the application.
- Can be configured to single or two speed fans.

TERMINAL IDENTIFICATION AND FUNCTION FOR MS8650

MS8650 Terminal Identification For Rooftop Unit, Heat Pump and Indoor Air Quality Applications

Table 21: Terminal Identification and Function.

Description / Application	Used in Applications: Indoor Air Quality, Heat Pump, and Rooftop Unit
Internal Temperature	X
1- BO1	Aux
2- BO2	Y2
3- BO3	Y1
4- BO4	G
5- RC	RC (24 Vac)
6- C	Common
7- RH	RH
8- BO8	W1
9- UO9	W2 / OB
10- UO10	Econo (0-10 Vdc)
11- UO11	Heat (0-10 Vdc)
12- UO12	Dehumidification output (24 Vac On/Off)
13- RS485 +	BACnet (+)
14- RS485 -	BACnet (-)
15- RS485 Ref	BACnet Ref.
16- UI16	UI16 (multifunction input)
17- UI17	UI17 (multifunction input)
18- Scom	Common
19- UI19	CO2 (0-10 Vdc input)
20- UI20	RS (Remote sensor input 10K thermistor)
21- Scom	Common
22- UI22	SS (Supply sensor input 10K thermistor)
23- UI23	OS (Outside sensor input 10K thermistor)
24- UI24	Airflow (0-10 Vdc input)

Table 22: MS8650 Rooftop Unit, Heat Pump and Indoor Air Quality Applications.

Fan	Cooling	Heating	Other
On/Off	2 Stage	2 Stage	Indoor Air Quality, Motion detect & dehumidification
On/Off	2 Stage	Modulating	Indoor Air Quality, Motion detect & dehumidification

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY APPLICATIONS

2 Heating / 2 Cooling For Rooftop Unit and Indoor Air Quality

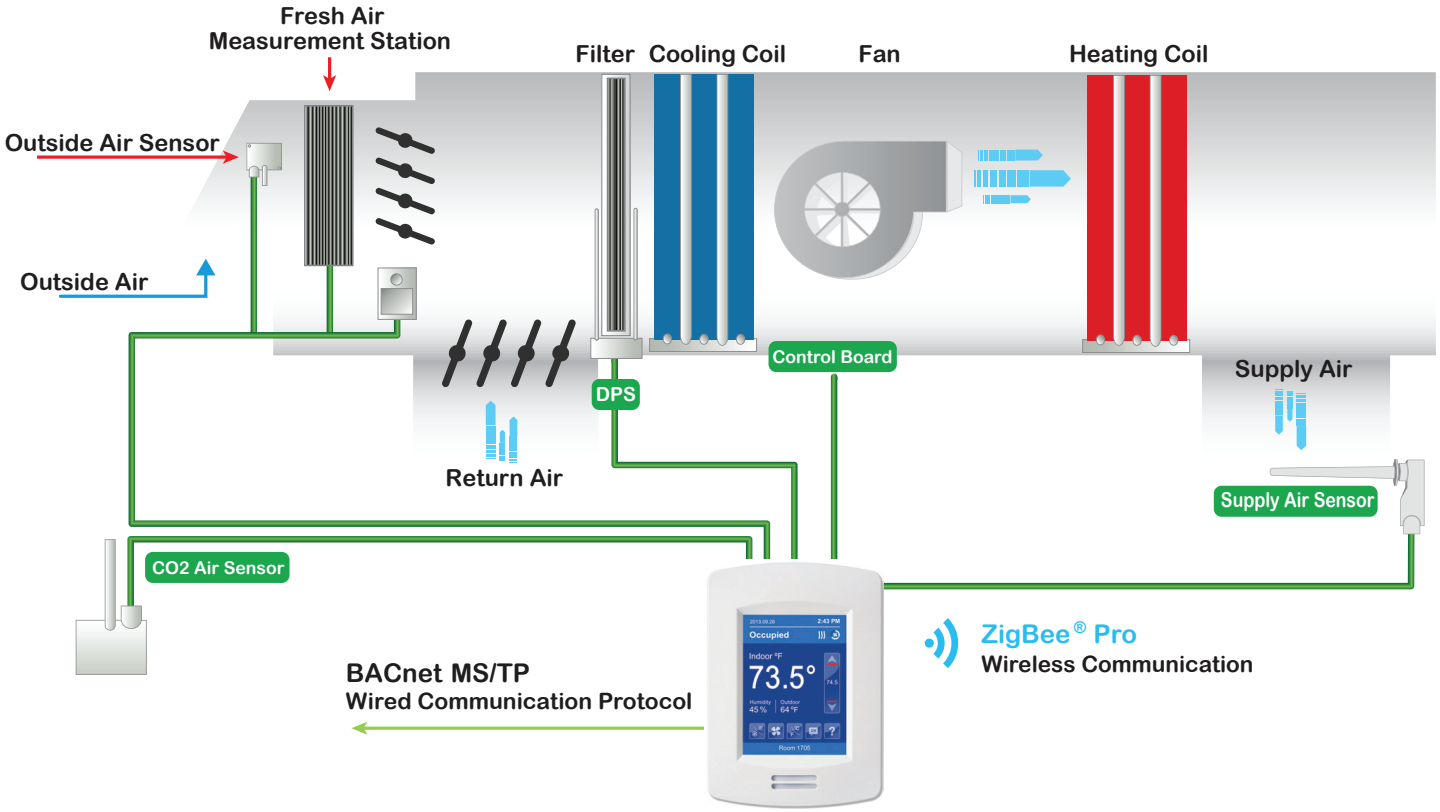


Table 23: 2 Heating / 2 Cooling For Rooftop Unit and Indoor Air Quality.

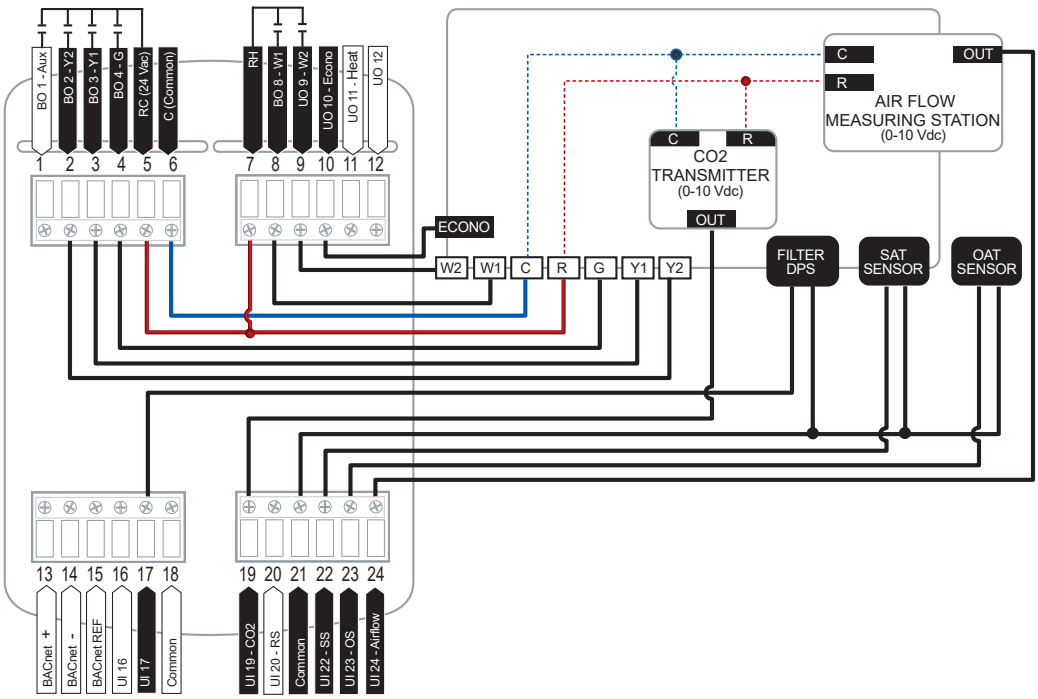
Configuration Parameter Name	Configuration Settings
UI17	Filter
UI19	CO_2
Econo. Config.	On
FA Range	Set Max CFM, cannot be zero
Min Fresh Air	Set Min CFM, cannot be zero
Max Fresh Air	Set Max CFM, cannot be zero
Min CO2	Set Min CO_2, cannot be zero
Max CO2	Set Max CO_2, cannot be zero

Note:

Only required configuration parameters are listed. Other settings are configurable as needed by user.

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY APPLICATIONS

MS8650 RTU: 2 Heating Stages / 2 Cooling Stages



Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

In all Occupancy Modes

If room relative humidity is higher than the user-defined Dehumidification setpoint, both Dehumidification, UO12 and Fan BO4, outputs are energized to reach the setpoint and the Room Controller Cooling and Heating outputs will not trigger. If room relative humidity is higher than the dehumidification set point + hysteresis, the Room Controller will energize dehumidification terminal UO12, BO8 and the cooling terminal BO3. During the dehumidification cycle, the Room Controller modulates heating output UO11 to maintain the room temperature set point.

*A multi-pole relay may be required to activate Cooling and Heating stage(s).

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- 3 universal inputs can be used and configured for advanced functionality as required by the application.

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY APPLICATIONS

Modulating Heat / 2 Cooling For Rooftop Unit and Indoor Air Quality

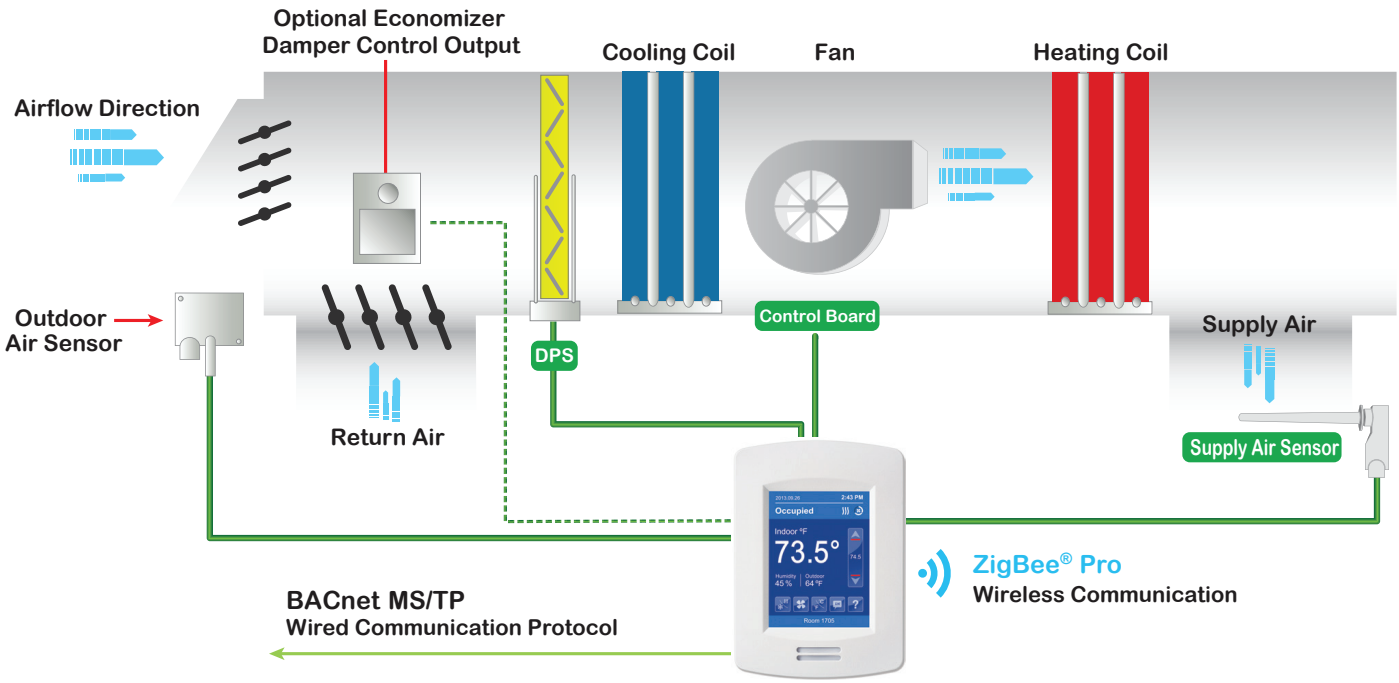


Table 24: Modulating Heat / 2 Cooling For Rooftop Unit and Indoor Air Quality.

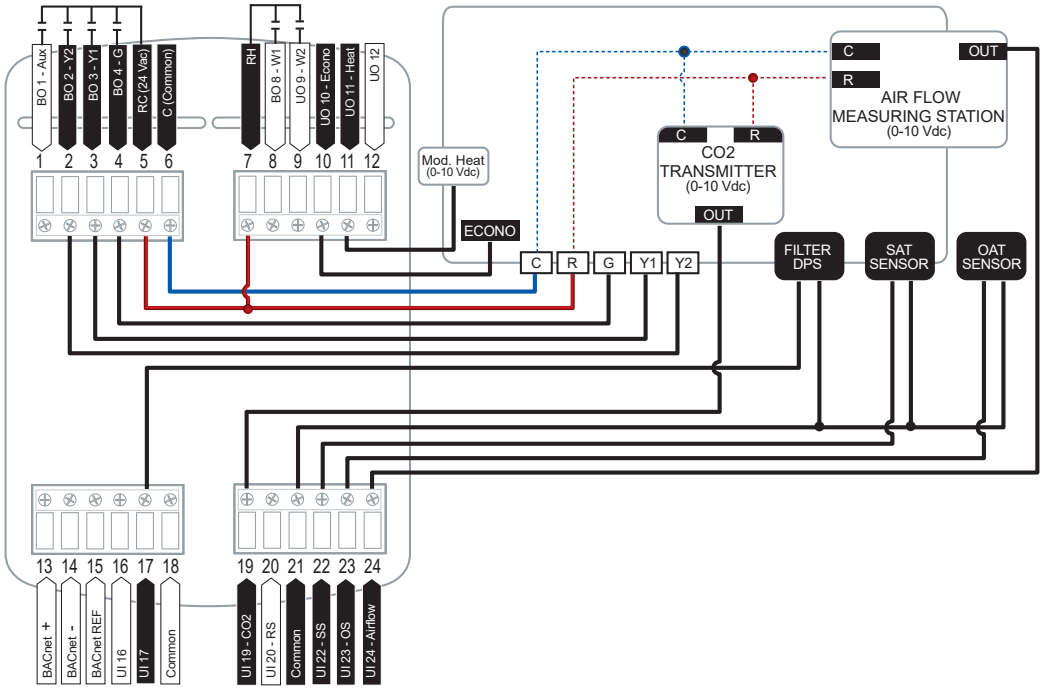
Configuration Parameter Name	Configuration Settings
UI17	Filter
UI19	CO_2
Econo. Config.	On
FA Range	Set Max CFM, cannot be zero
Min Fresh Air	Set Min CFM, cannot be zero
Max Fresh Air	Set Max CFM, cannot be zero
Min CO2	Set Min CO_2, cannot be zero
Max CO2	Set Max CO_2, cannot be zero

Note:

Only required configuration parameters are listed. Other settings are configurable as needed by user.

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY APPLICATIONS

MS8650 RTU: 2 Cooling Stages / Modulating Heat



Sequence of Operation and Wiring

Occupied Mode

Setpoints revert to those defined by occupied cooling and heating.

Stand-by Mode (only available when PIR motion detector sensor is used)

Setpoints revert to those defined by stand-by cooling and heating.

Unoccupied Mode

Setpoints revert to those defined by unoccupied heating and cooling.

Occupied Override Mode

System reverts to occupied mode for duration determined by “ToccTime” parameter.

In all Occupancy Modes

If room relative humidity is higher than the user-defined Dehumidification setpoint, both Dehumidification, UO12 and Fan BO4, outputs are energized to reach the setpoint and the Room Controller Cooling and Heating outputs will not trigger. If room relative humidity is higher than the dehumidification set point + hysteresis, the Room Controller will energize dehumidification terminal UO12, BO8 and the cooling terminal BO3. During the dehumidification cycle, the Room Controller modulates heating output UO11 to maintain the room temperature set point.

*A multi-pole relay may be required to activate Cooling and Heating stage(s).

Options

- Wireless adapter modules are available. (see Appendix B for network wiring).
- 3 universal inputs can be used and configured for advanced functionality as required by the application.

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY FRESH AIR DAMPER CONTROL SEQUENCES

Fresh Air Damper Control Sequences

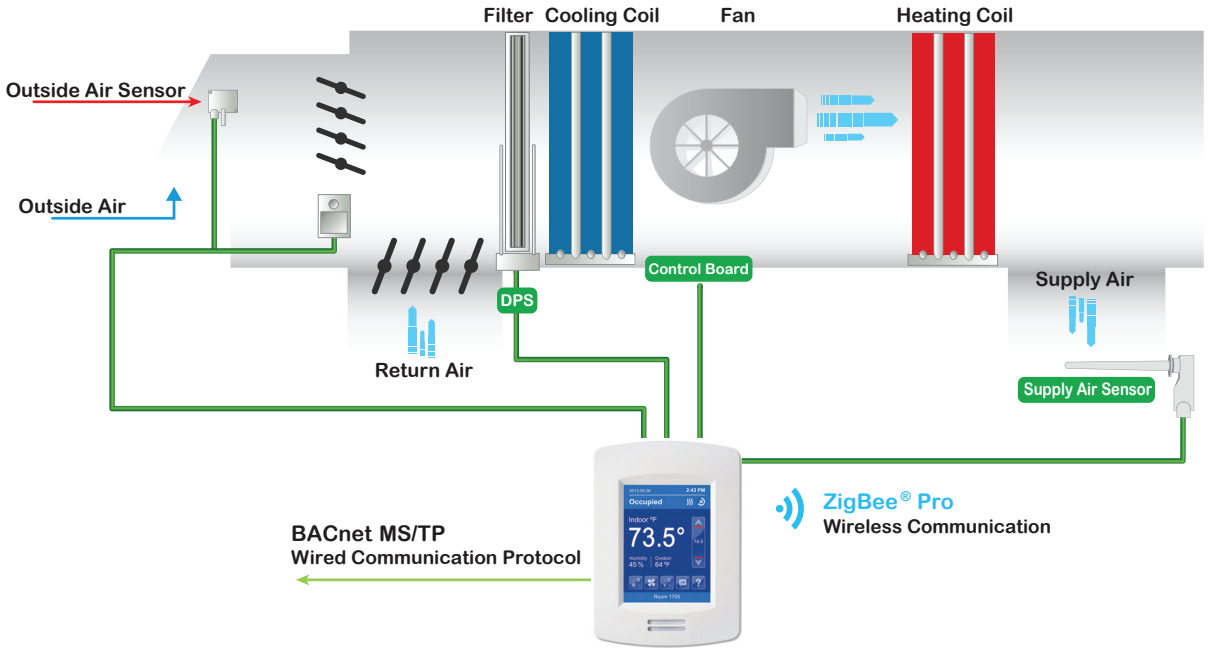
The fresh air damper can be controlled through more than one sequence to achieve different control strategies such as free cooling (economizer mode), minimum fresh air control and CO2 level control. Here are the control sequences available:

Note:

For the sequences mentioned below, the following conditions must be met in order for the sequences to be performed as stated:

- Max Pos parameter value must be greater than Min Pos Parameter value.
- Max CO_2 parameter value must be greater than Min CO2 Parameter value.
- Max FA parameter value must be greater than Min FA Parameter value.

Economizer Control Mode Only



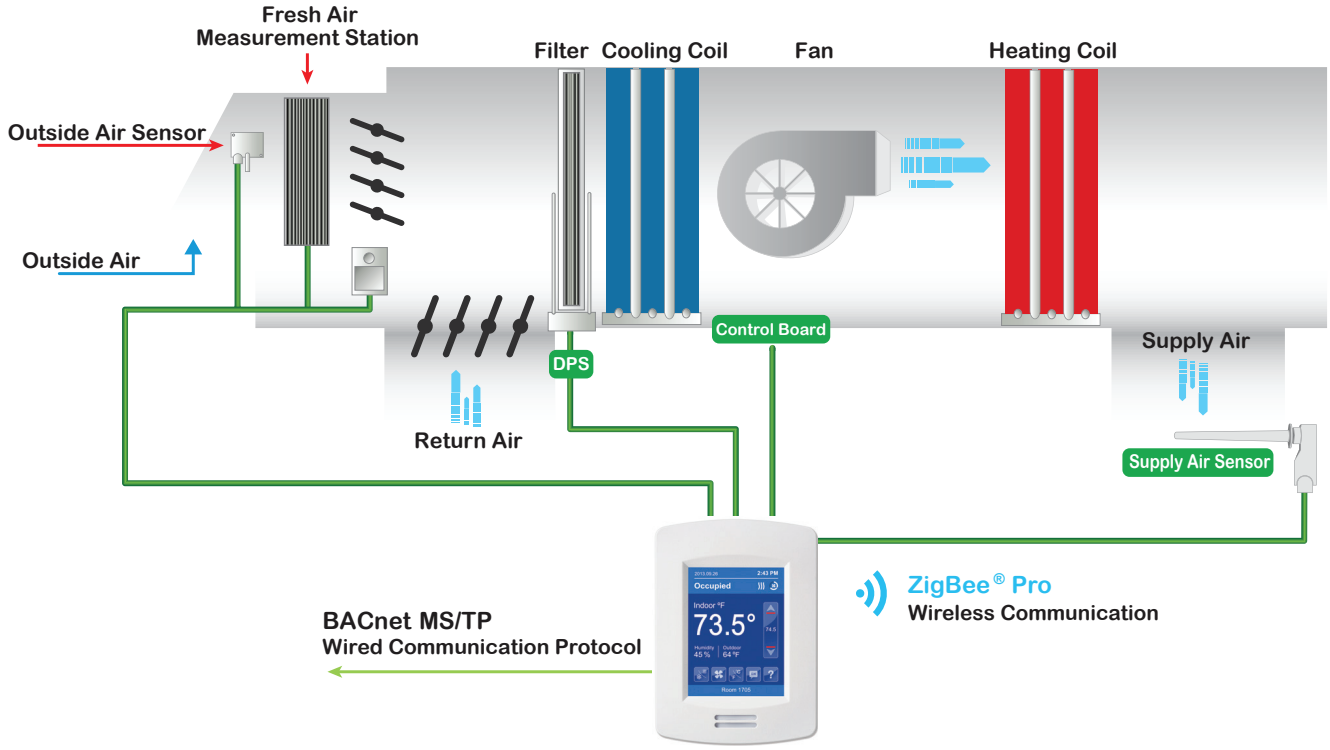
If the fresh air damper is to be used only for free cooling purposes (economizer mode, without fresh air measurement station or CO_2 control), only the Min Pos parameter and the free cooling sequence will be active.

- The FA Range parameter should be set to 0 CFM. (Default Value = 0 CFM).
- Set the Chngstpt parameter to desired value which free cooling is enabled. (Default Value = 55°F).

If the outside air temperature is greater than the changeover setpoint, then normal mechanical cooling will be used. If the outside air temperature is less than or equal to the changeover setpoint, then free cooling will be enabled and mechanical cooling stages will be locked out.

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY FRESH AIR DAMPER CONTROL SEQUENCES

Economizer Control Mode and Fresh Air Measurement Station



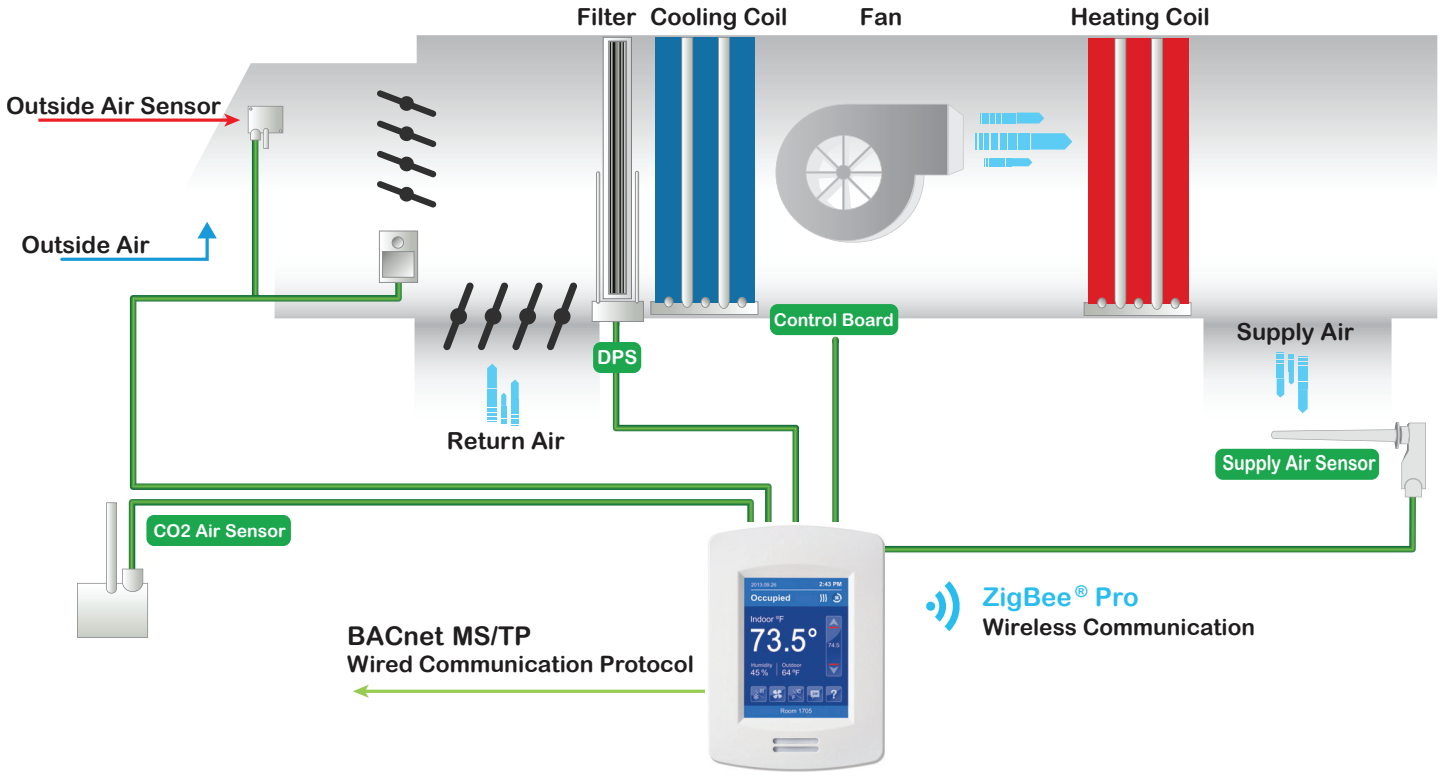
If the fresh air damper is to be used for both free cooling and minimum fresh air volume control (economizer mode and fresh air measurement station, but without CO_2 level control), only the Min FA parameter and the free cooling sequence will be active.

- The FA Range parameter should be set to a value higher than 0 CFM (0 CFM disables the fresh air control).
- Min FA (minimum fresh air) parameter should be set to the desired level.

The FA Range parameter value should be set to the maximum capacity of the fresh air measurement station. Therefore the relationship between air volumes and input signals can be established. For example, if the fresh air station capacity is 10000 CFM, set FA Range to 10000. This will set the relationship of 0 VDC = 0 CFM and 10VDC = 10000 CFM.

MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY FRESH AIR DAMPER CONTROL SEQUENCES

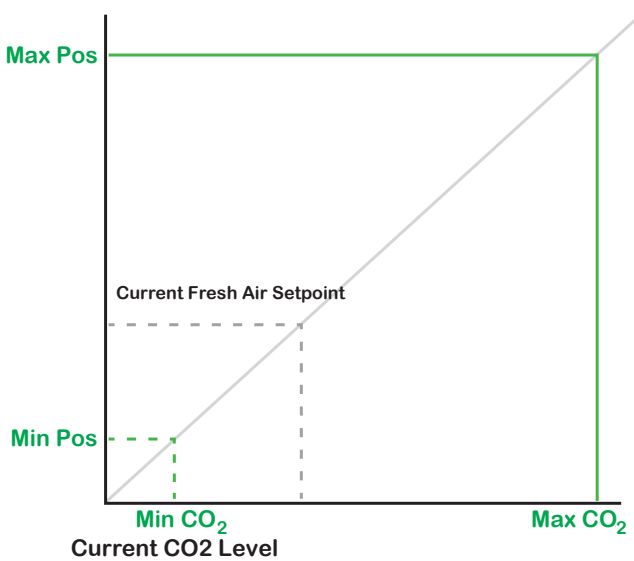
Economizer Control Mode and CO_2 Level Control



If the fresh air damper is to be used for both free cooling and CO_2 level control (economizer mode and CO_2 level control, but without fresh air measurement station), only the Min Pos, Max Pos, Min CO_2 and Max CO_2 parameters as well as the free cooling sequence will be active.

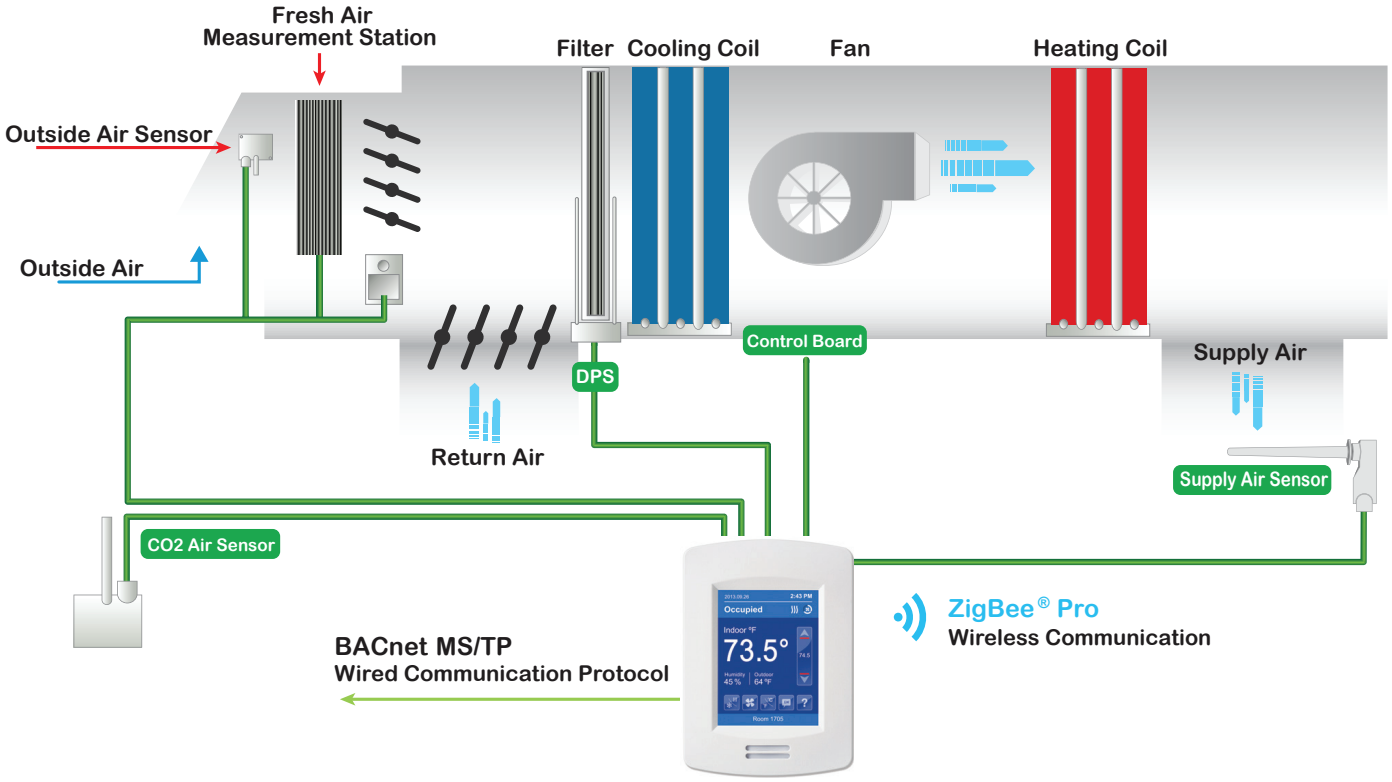
- The FA Range parameter should be set to 0 CFM. (Default Value = 0 CFM).
- Set AI1 parameter to CO_2 (0 VDC = 0ppm ; 10VDC = 2000ppm).
- Min Pos, Max Pos, Min CO_2 and Max CO_2 parameters should be set according to the required setting.

The highest value between free cooling demand output and interpolation output for the fresh air setpoint will be the output to the fresh air damper.



MS8650 ROOFTOP UNIT, HEAT PUMP AND INDOOR AIR QUALITY FRESH AIR DAMPER CONTROL SEQUENCES

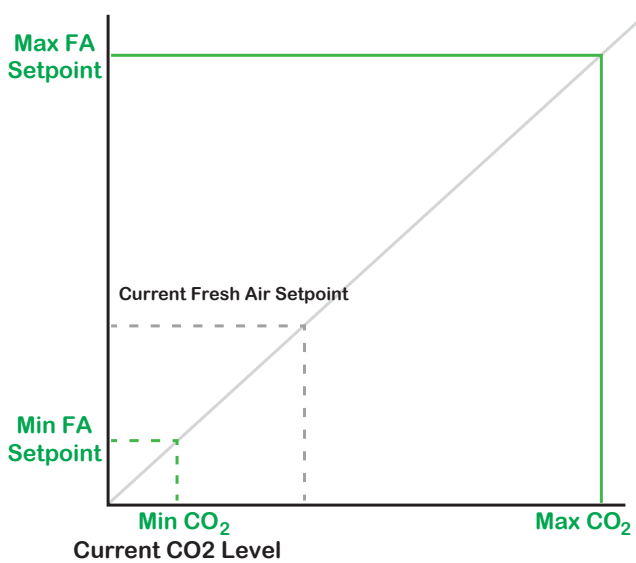
Economizer Control Mode, CO_2 Level Control and Fresh Air Measurement Station



If the fresh air damper is to be used for both free cooling and CO_2 level control with a fresh air measurement station, only the Min FA, Max FA, Min CO_2 and Max CO_2 parameters as well as the free cooling sequence will be active.

- The FA Range parameter should be set to something other than 0 CFM.
- Use an air flow transmitter to read fresh air level with AI2 input (0-5 VDC input).
- Min FA, Max FA, Min CO_2 and Max CO_2 parameters should be set according to the required setting.

The highest value between free cooling demand output and interpolation output for the fresh air setpoint will be the output to the fresh air damper.



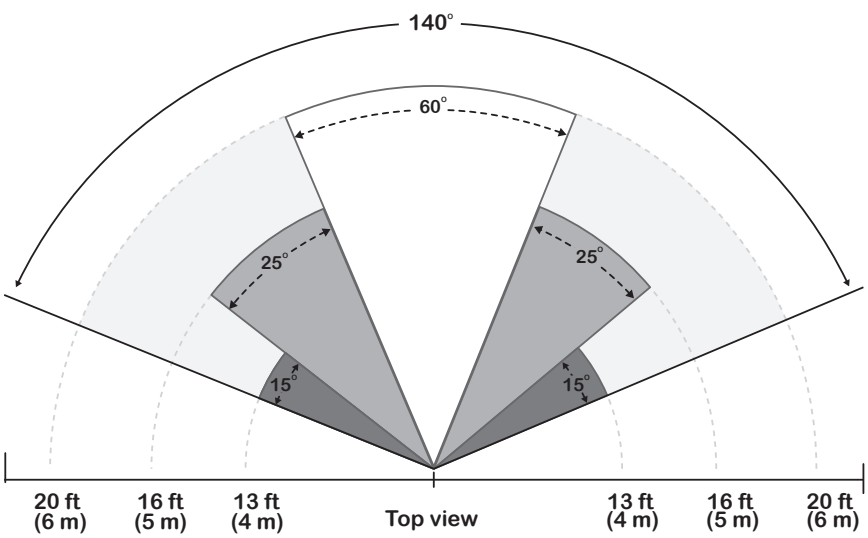
APPENDIX A - PASSIVE INFRA-RED SENSOR DETAILS

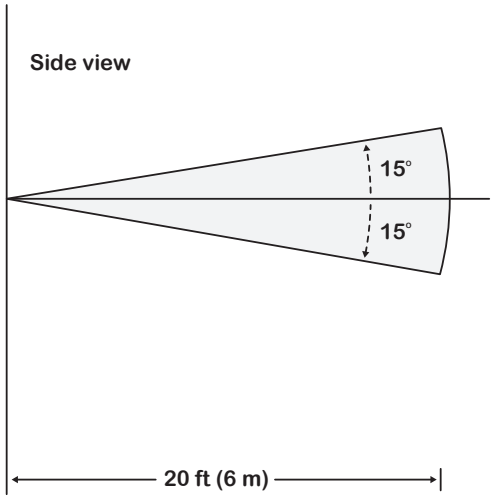
Appendix A - Passive Infra-Red Sensor Sequence of Operation

Initially, the Room Controller is in Stand-by mode and Stand-by setpoints are used. When the Passive Infra-Red (PIR) sensor detects motion, the Occupancy status switches to Occupied and the Stand-By Time timer is reset. The Occupied setpoints are used for this operation. If no motion is detected in the room for the entire Stand-By Time duration (adjustable parameter), the room switches to Stand-by mode and Stand-by setpoints are used. While in Stand-by mode, if no motion is detected for the entire Unoccupied Time period (adjustable parameter), the room switches to Unoccupied mode and uses its Unoccupied setpoints. While in Stand-By or Unoccupied mode, any motion switches the room back to Occupied mode.

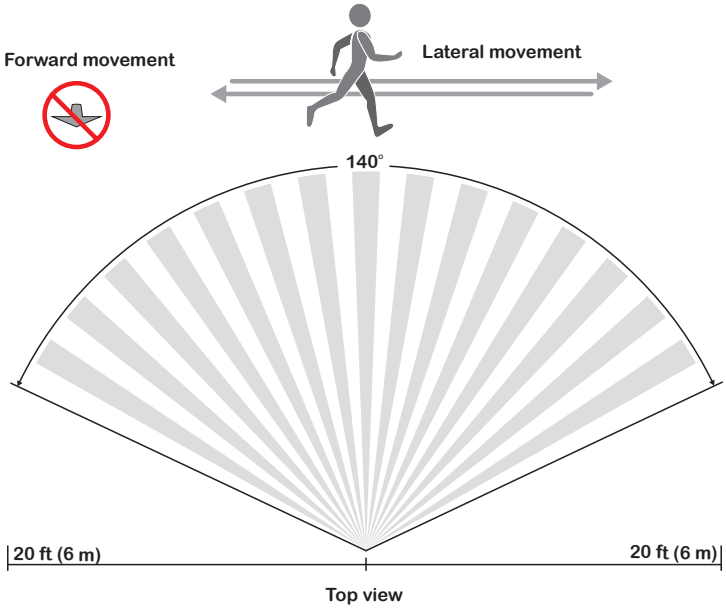
PIR ranges measure 20 feet (6 meters) at 140° and 13 feet (4.5 meters) minimum between 15° to 30° laterally. A typical installation height of approximately 5 feet (1.5 meters) is considered in these measurements.

The figure below illustrates the resolution.





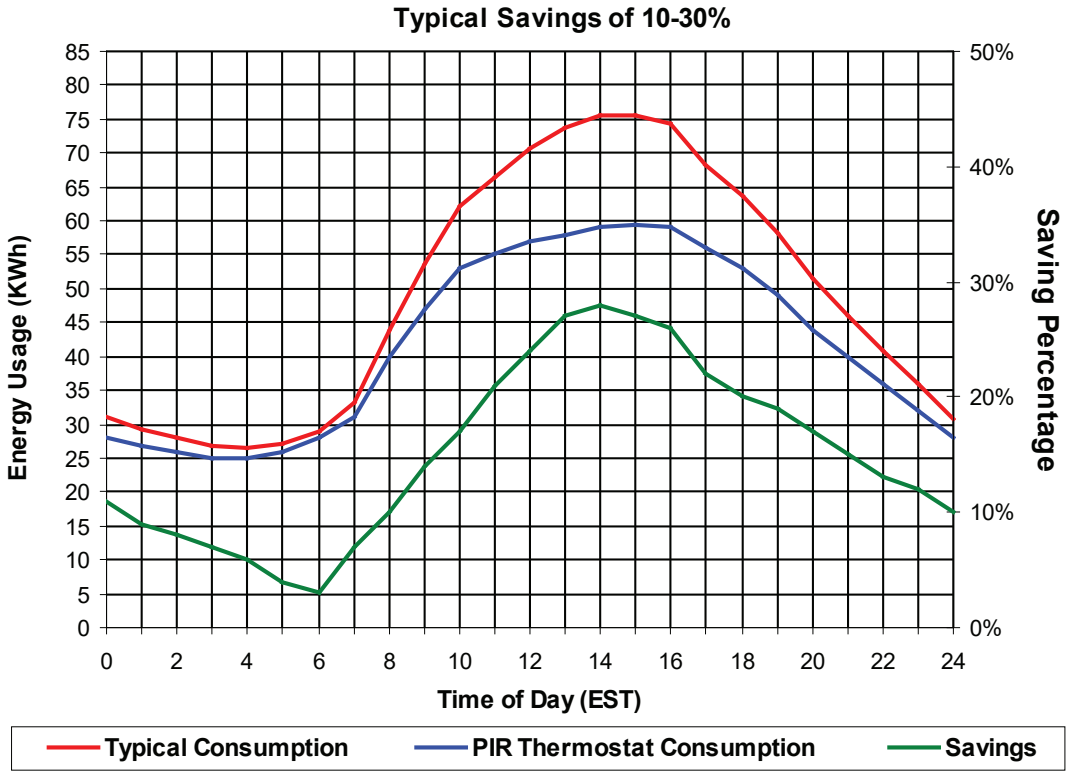
Fresnel Lens Beam and Detection Field



APPENDIX A - PASSIVE INFRA-RED SENSOR DETAILS

Appendix A - PIR Energy Savings

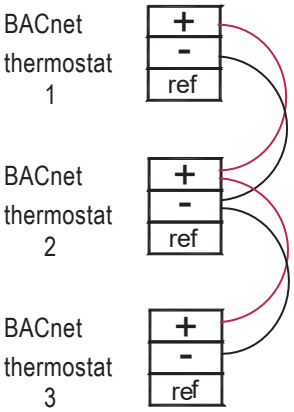
PIR Sensor can maximize your energy savings from 10-30% by adjusting temperature setpoints in unoccupied zones during scheduled periods.



APPENDIX B - OPTIONAL NETWORK SET-UP

Appendix B - Optional Network Set-Up

BACnet communication wiring:



Notes:

- Wiring should be daisy chained
- Respect polarity
- If using 2 conductors shielded wires, connect the shield of each feed together on the back of the controller. ONLY ground the shield at one location. DO NOT connect the shield to the ref terminal.

Appendix C - Wireless ZigBee Pro Motion Sensors

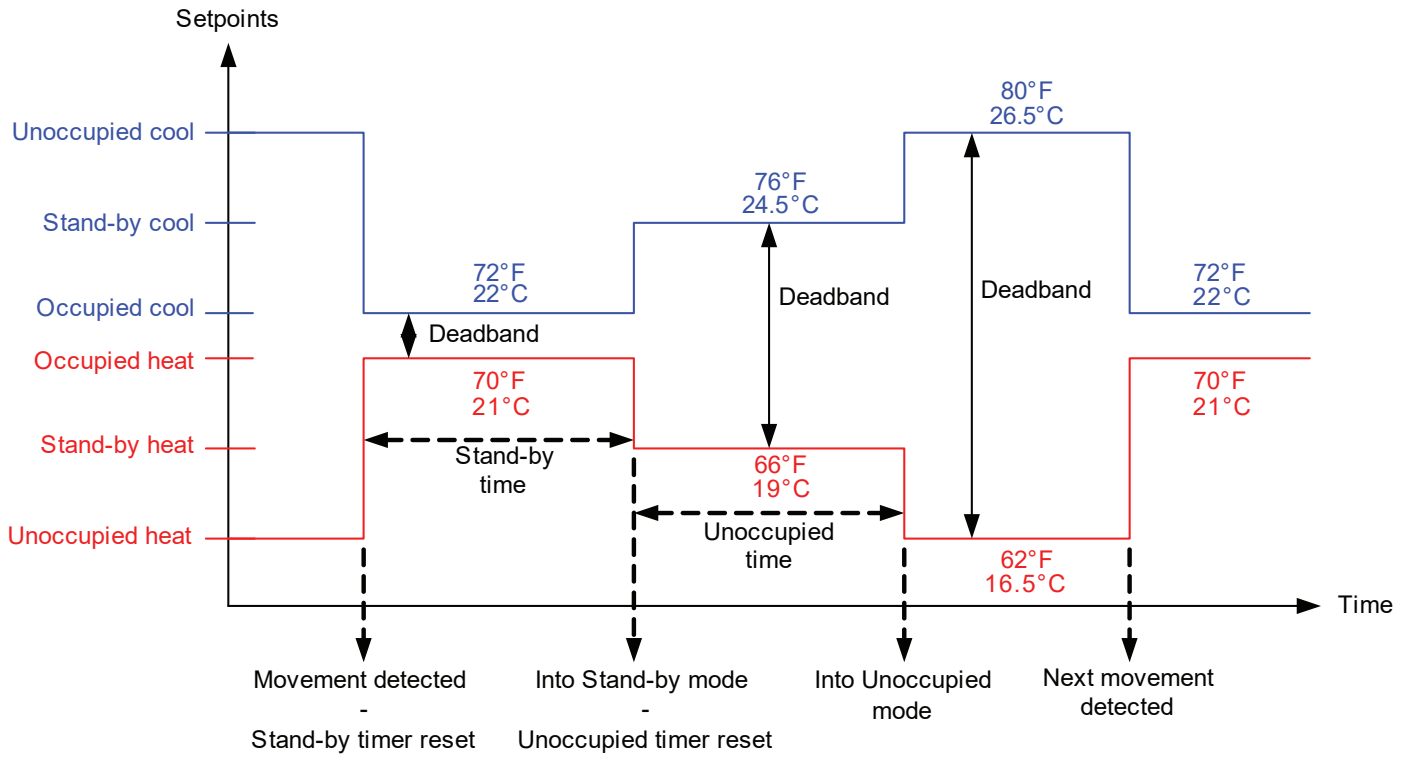
Room Controllers with ZVR Series ZigBee Pro wireless switches can be used in stand-alone mode, or with integration to a central management system, to allow for advanced functions such as central reservation and occupancy functions. Up to ten different ZigBee motion sensors and switches (ZVR-CZW, ZVR-CZC, or ZVR-CZD) can be used with an MS8000 Series Room Controller

Note that if a ZigBee wireless window switch is used, the MS8000 Series Room Controller cannot also use a remote PIR motion sensor, whether wired or wireless. Using one or more wireless remote PIR motion sensors means that a wired PIR motion sensor cannot be used, and vice versa.

The ZVR Series sensors are factory delivered with batteries and are ready to be installed, configured, and used right out of the box. Due to the extremely small current consumption of the sensors, the expected battery life is approximately 10 years, which is equivalent to the battery shelf life.

APPENDIX C - PASSIVE INFRA-RED SENSOR DETAILS

Appendix C - Schematic of Controllers Occupancy Sequence of Operation without Door Sensor



EXAMPLE OF RECOMMENDED DEPLOYMENT FOR MS8350 AND MS8650

Placement of the Room Controller must be given consideration. It is recommended to install the Room Controller as close to a door as possible (but not so as to be blocked by the door), or in an area with high occupant movement.

Ideally the Room Controller should be installed 5 feet (1.5 meters) above the floor surface to ensure maximum detection range is achieved. As well, Room Controller placement should ensure the occupant crosses the lens beam in a perpendicular path within the prescribed detection zone.

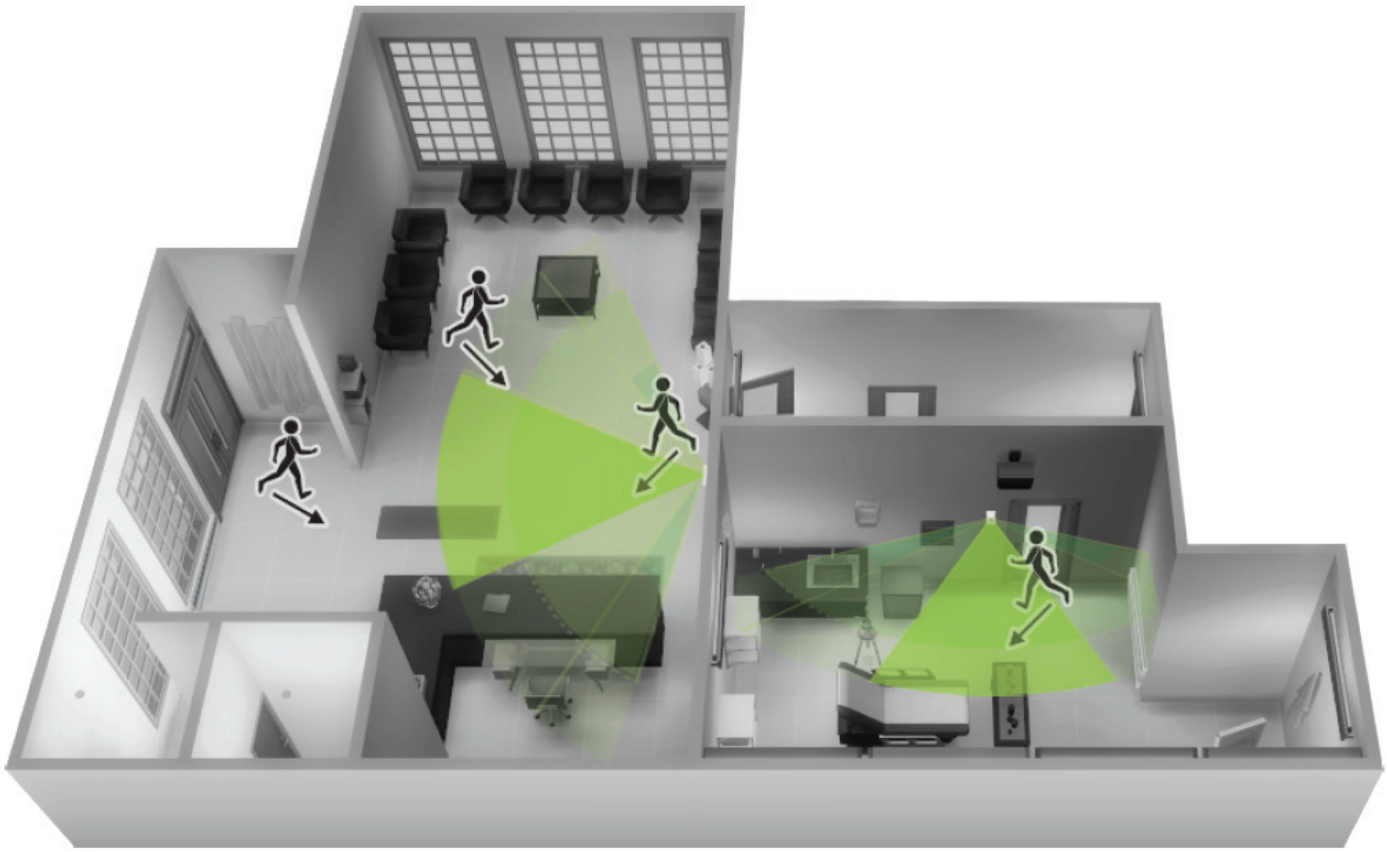
Example of Recommended Deployment

The figure below shows Room Controllers installed in ideal locations for two rooms.

The examination room shows one Room Controller installed adjacent to the door. In this area of the room, occupant traffic is high and ensures the occupant will almost always cross the PIR detection path laterally and within the detection range.

The waiting room shows one Room Controller installed beside a door in the middle of the room. As shown in the diagram below, occupant traffic is high in several areas of the room including the entrance, waiting room, access to the door and activity around the reception desk. Moreover, for each case aforementioned, occupant movement almost always moves lateral to the PIR, which ensures detection by the PIR, as well as respecting the PIR detection range of 20 feet (6 meters) at 140°, and 16 feet (5 meters) between 15° to 30° laterally.

Figure 2: Recommended Deployment.



EXAMPLE OF NON-RECOMMENDED DEPLOYMENT FOR MS8350 AND MS8650

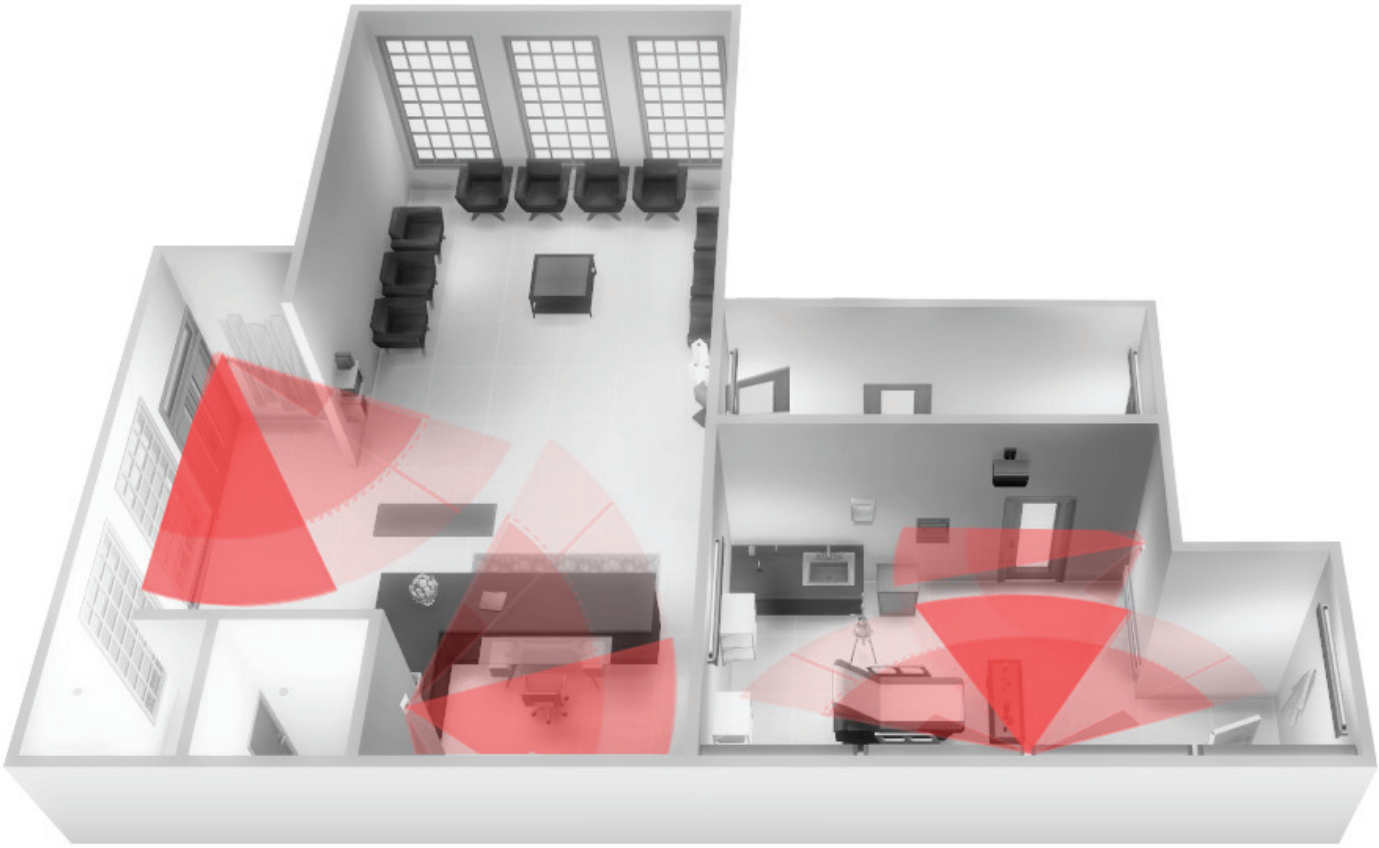
Example of Non-Recommended Deployment

The below shows four Room Controllers (two for each room) installed in non-ideal locations for the two rooms.

The examination room shows one Room Controller installed in a low traffic area near the door, and a second Room Controller installed on the wall directly opposite the door. For the Room Controller installed in the corner wall, the PIR could be blocked by the opened door, while occupant traffic cold also be minimal in this area of the room. For the second Room Controller installed opposite the door, the PIR detection could fall outside the specified detection zone, while at the same time most occupant movement would be not be lateral to the PIR, thereby not respecting optimal crossing patterns for PIR detection.

The waiting room shows one Room Controller installed in the corner of the room, and a second Room Controller installed beside the reception area. For the Room Controller installed in the corner, the opening/closing of the door creates high probability that the PIR would get blocked, and therefore, occupancy going undetected. For the Room Controller installed beside the reception area, occupant traffic could fall outside the detection zone, and the receptionist would often be below the 5 foot recommended installation height for the Room Controller.

Figure 3: Non-Recommended Deployment.



Check with your local government for instruction on disposal of these products.

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