

Modular Room Control (MRC) Series Digital Thermostat

Application

The MRC Digital Thermostat is an expandable multi-purpose, high-quality Direct Digital Control (DDC) illuminated thermostat designed to control virtually any Fan Coil Unit (FCU) or Packaged Terminal Air Conditioning (PTAC) found in hotel guestrooms. The MRC comes standard with five relays and can be equipped with an on-board Infrared (IR) transceiver and Passive Infrared (PIR) motion detector. Coupled with a magnetic door switch (wired or wireless), the MRC becomes the brain of a highly effective Energy Management System (EMS) for guestrooms.

When connected to the Central Interface Network (CINET) with a pair of low voltage wires, a centrally controlled EMS package is created. The MRC is readily expandable to include functionality such as humidity control, outside temperature display, mini-bar access reporting, occupancy reporting to housekeeping, automatic control of lights, and much more. Use of infrared or low-voltage wiring enables remote control of lights, occupancy reporting, and other functions.

Installation

Locate the MRC thermostat as follows:

- on a partitioning interior wall, and approximately 1.5 m (5 ft) above the floor in a location of average temperature
- away from direct sunlight or radiant heat, outside walls or behind doors, air discharge grills, stairwells, or outside doors
- away from steam or water pipes, warm air stacks, unheated/uncooled areas, or sources of electrical interference

**CAUTION: Risk of Shock.**

Disconnect the power supply before mounting the thermostat to prevent electrical shock or possible damage to the equipment.

Mounting

The MRC is designed to be mounted on a standard double-gang (4 x 4) junction box. If it is necessary to mount the MRC on a single-gang box, the left side (display side) of the MRC overlaps the wall area to the left of the junction box.

To mount the MRC mounting plate:

1. Remove the two small screws at the base of the MRC.
2. Pull the bottom of the back-mounting plate slightly away from the front housing and then pull the back-mounting plate down.

IMPORTANT: If the back-mounting plate is rotated more than 2 or 3°, the plastic tabs at the top of the plate may fracture or break off.

3. Attach the mounting plate to the junction box, using the mounting screws provided with the MRC. Ensure that the plate is mounted with the raised arrow pointing UP (↑).

Wiring

**CAUTION: Risk of Equipment Damage.**

Before applying power, make all wiring connections and check the connections. Short-circuited or improperly connected wires may result in permanent damage to the unit.

IMPORTANT: Make all wiring connections in accordance with the National Electrical Code (NEC) and all local regulations.

To simplify installing and removing the MRC, a standard Molex® 10-position or 8-position connector is used. The female receptacle is on the back of the MRC vertically centered over the high-voltage section (see Figure 1).

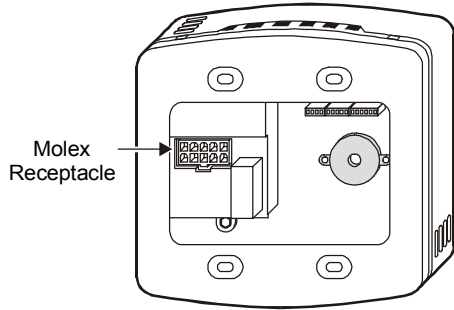


Figure 1: Molex Receptacle Location

The MRC is supplied with a Molex connector prewired with eight or ten 8 in. (203 mm) color-coded leads. These leads are connected in the wall junction box to the wiring from the FCU or other Heating, Ventilating, and Air Conditioning (HVAC) device with wire nuts (see Figure 2).

Note: For installations in which all 10 leads are not required, the extraneous leads should be cut off at the Molex connector.

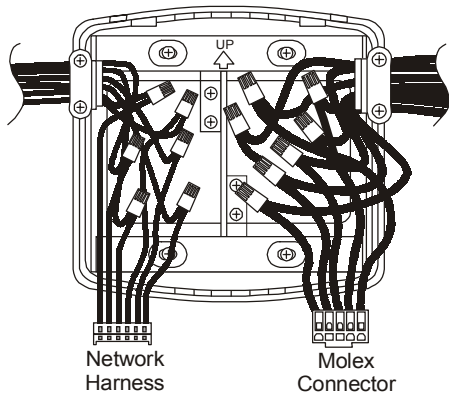


Figure 2: Backplate Wiring

Figure 3 shows the 10-position Molex connector with 8 in. (203 mm) wire leads, supplied with all relay output models of the thermostat. The end view of the male connector from the wire insertion side with the pin numbers is indicated. This is the same as looking at the female connector point on the backside of the MRC.

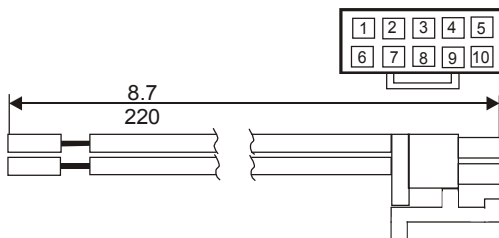


Figure 3: 10-Pin Molex Connector Wire Lead, in. (mm)

Figure 4 shows the 8-position Molex connector. It is used with the 24 V TRIAC model MRC and comes with 8-in. wire leads. The end view of the male connector from the wire insertion side with the pin numbers is indicated. This is the same as looking at the female connector point on the backside of the MRC.

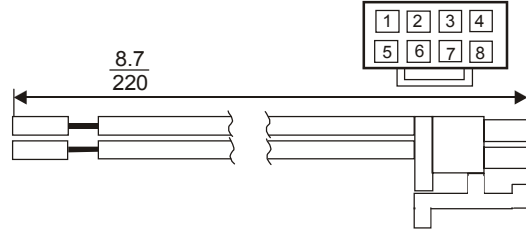


Figure 4: 8-Pin Molex Connector Wire Lead, in. (mm)

IMPORTANT: It is essential that the leads from the FCU or other HVAC device be properly connected to the male 8-pin or 10-pin connector (see Figure 6 through Figure 10). Following each wiring diagram is a table containing the color legend for the 8-pin or 10-pin female receptacle (H1) at the back of the MRC. Common industry practice for color coding has been used, but there is no guarantee that the same standard has been used for the wires coming from the FCU.

To wire the MRC thermostat:

1. Use wire nuts to connect the wiring harness to the FCU wires within the electrical box (see Figure 2).
2. Plug the prewired 8 or 10-pin connector into the female receptacle at the back of the MRC.
3. Hook the tabs at the top rear of the MRC housing into the matching depressions at the top of the mounting plate and rotate the bottom of the housing toward the wall until it snaps into place on the mounting plate (see Figure 5).
4. Secure the housing to the mounting plate with the two small screws removed in Step 1 of the *Mounting* section.

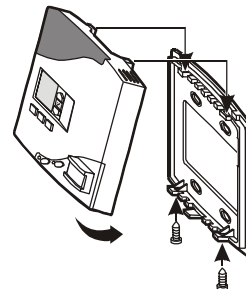


Figure 5: Returning the MRC to the Mounting Plate

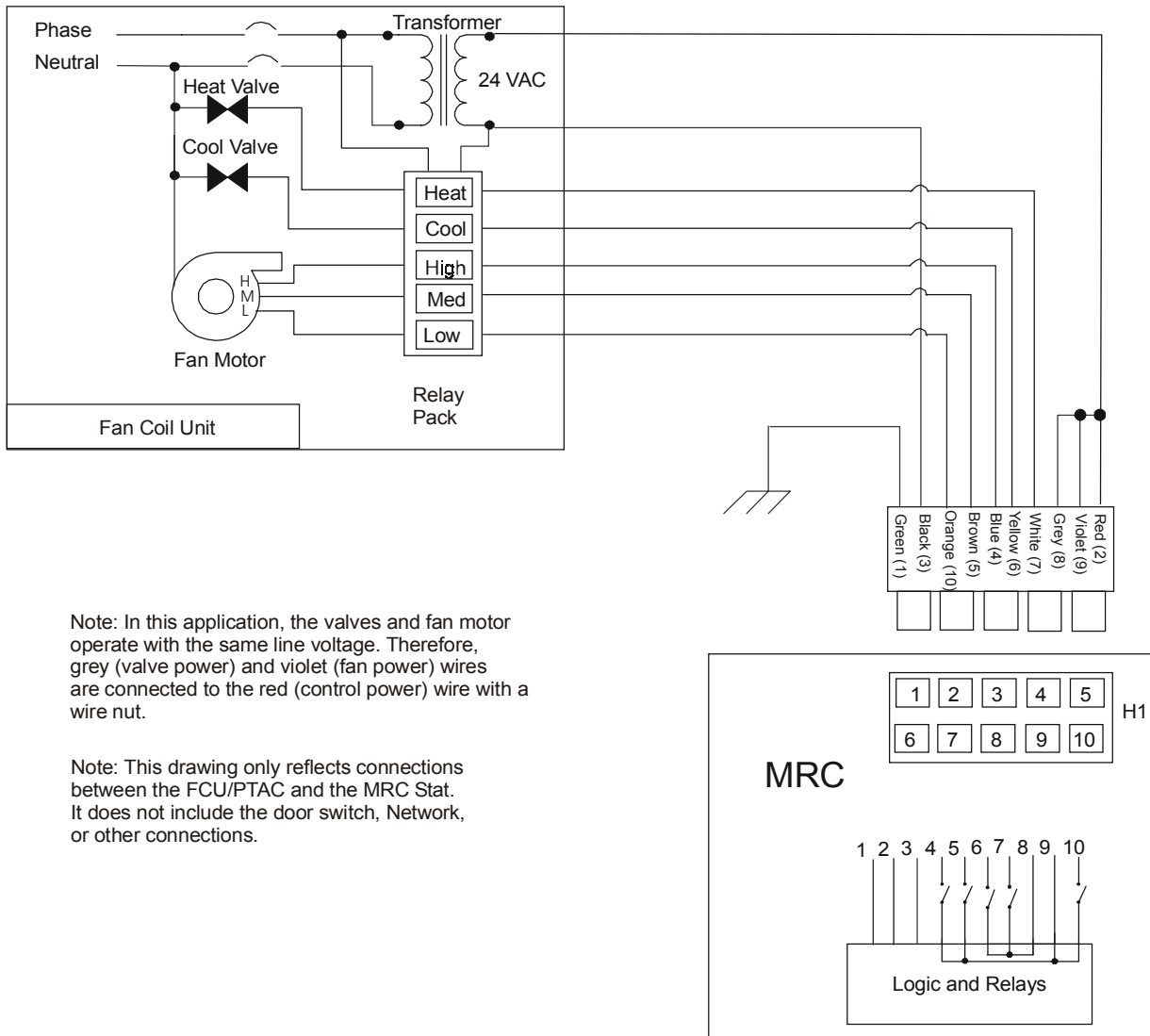


Figure 6: 4-Pipe, 3-Speed Fan FCU with 7 Wires 24 VAC Wiring

Table 1: Pin Number Wire Color and Function

Pin Number	Wire Color	Function
1	Green	Ground
2	Red	Control Power
3	Black	Neutral
4	Blue	High Fan
5	Brown	Medium Fan
6	Yellow	Cold Water Valve
7	White	Hot Water Valve
8	Grey	Valve Power
9	Violet	Fan Power
10	Orange	Low Fan

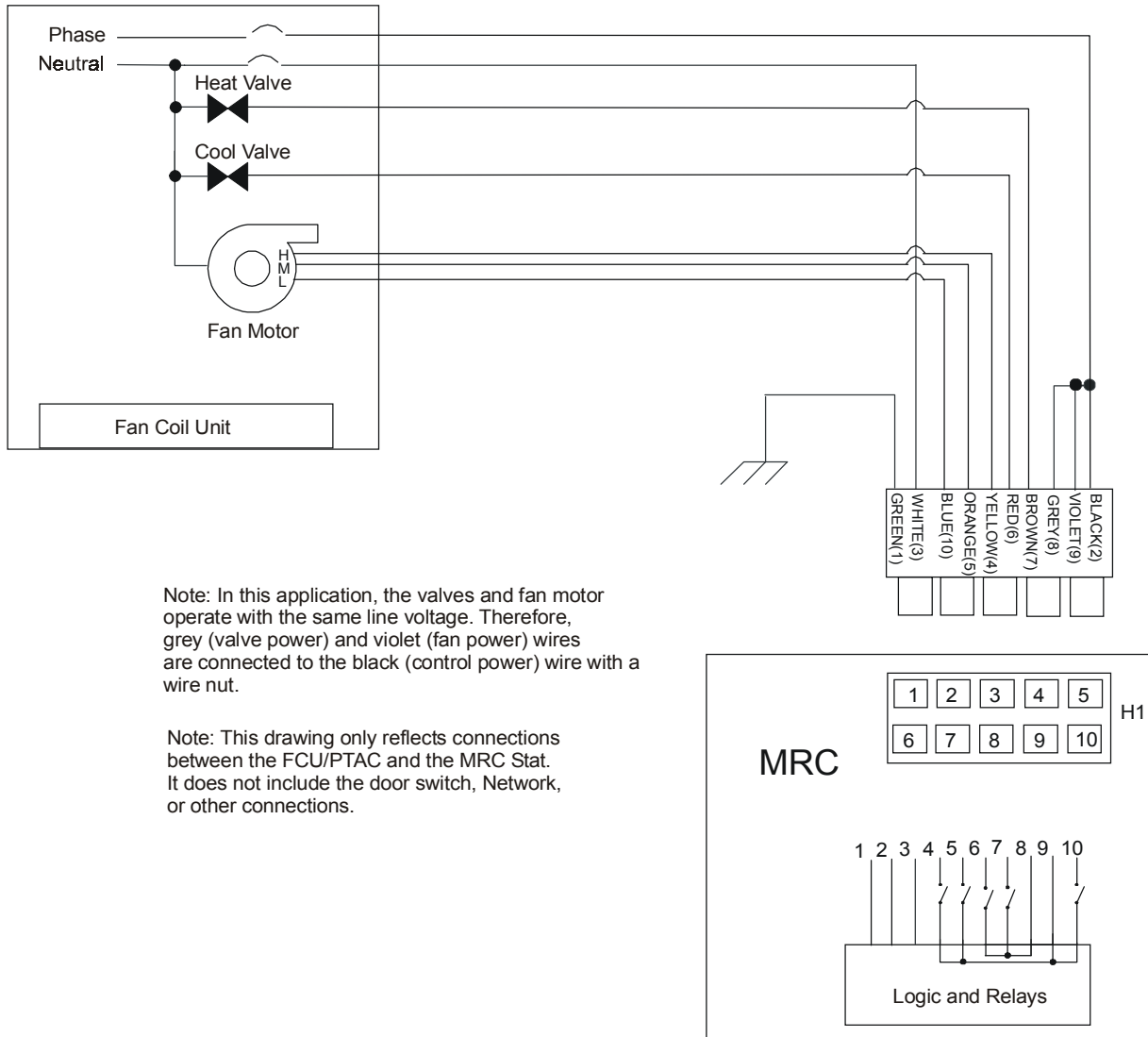
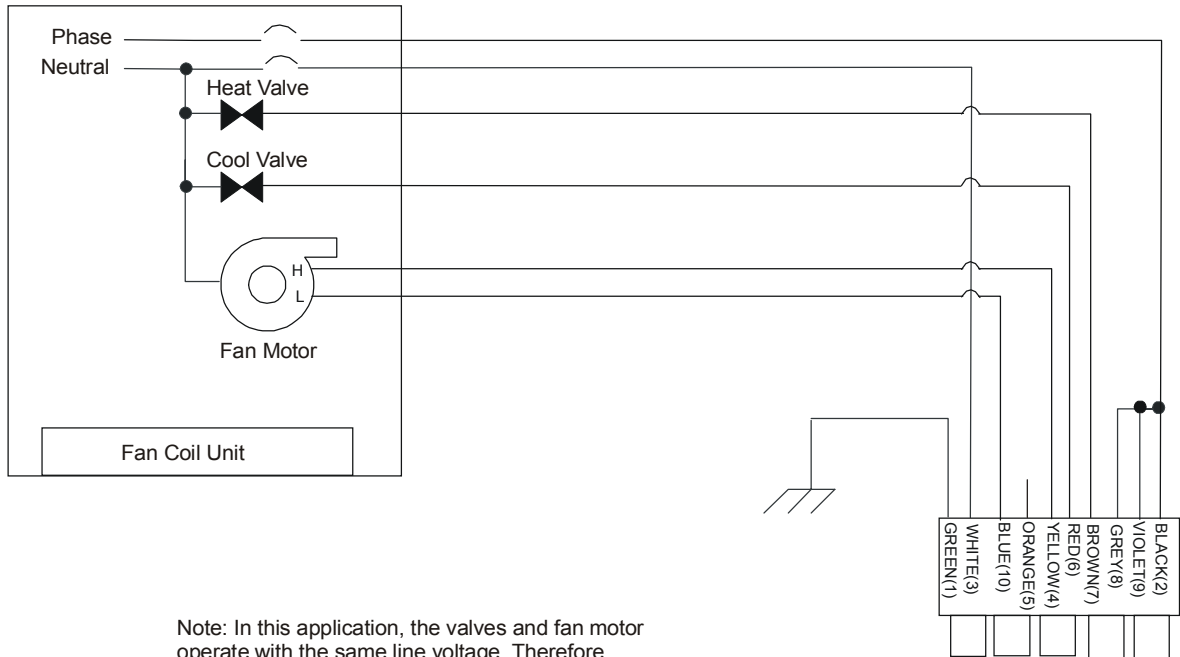


Figure 7: 4-Pipe, 3-Speed Fan FCU with 7 Wires 100 VAC - 277 VAC Wiring

Table 2: Pin Number Wire Color and Function

Pin Number	Wire Color	Function
1	Green	Ground
2	Black	Control Power
3	White	Neutral
4	Yellow	High Fan
5	Orange	Medium Fan
6	Red	Cold Water Valve
7	Brown	Hot Water Valve
8	Grey	Valve Power
9	Violet	Fan Power
10	Blue	Low Fan



Note: In this application, the valves and fan motor operate with the same line voltage. Therefore, grey (valve power) and violet (fan power) wires are connected to the black (control power) wire with a wire nut.

Note: This drawing only reflects connections between the FCU/PTAC and the MRC Stat. It does not include the door switch, Network, or other connections.

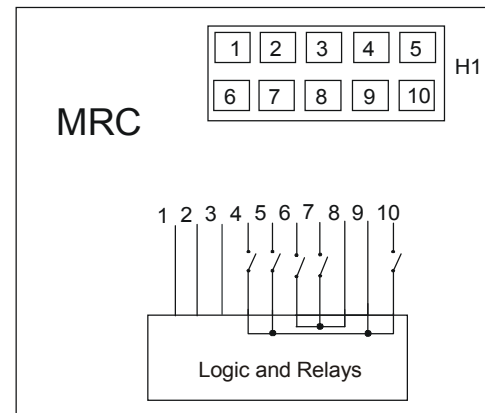
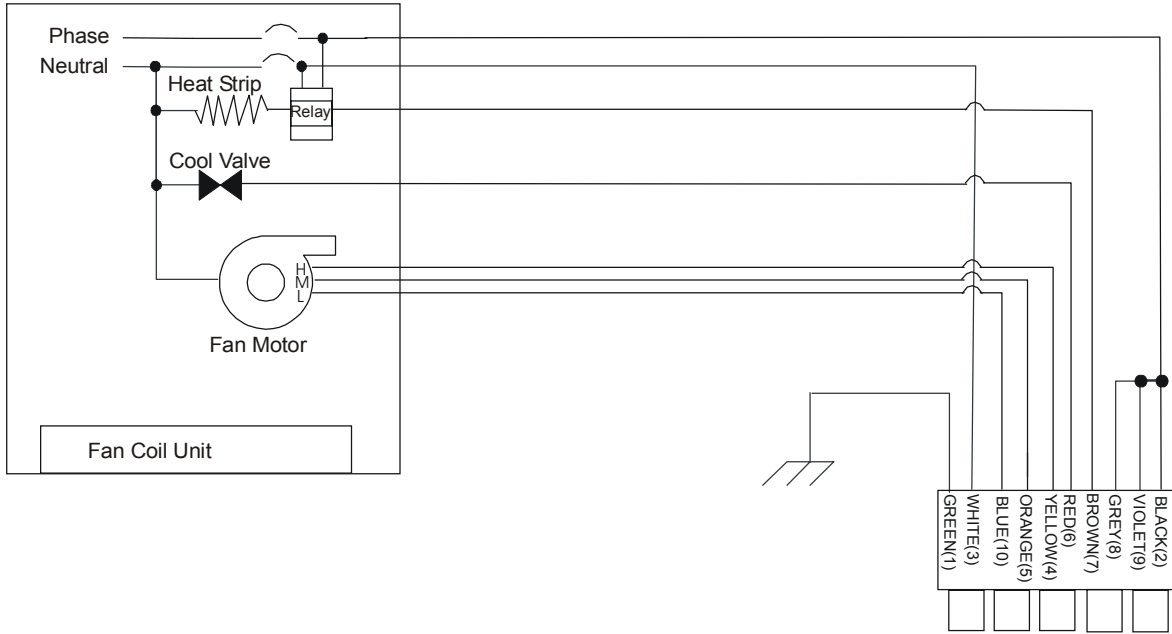


Figure 8: 4-Pipe, 2-Speed Fan FCU with 6 Wires 100 VAC - 277 VAC Wiring

Table 3: Pin Number Wire Color and Function

Pin Number	Wire Color	Function
1	Green	Ground
2	Black	Control Power
3	White	Neutral
4	Yellow	High Fan
5	Orange	Medium Fan
6	Red	Cold Water Valve
7	Brown	Hot Water Valve
8	Grey	Valve Power
9	Violet	Fan Power
10	Blue	Low Fan



Note: In this application, the valves, heat strip, and fan motor operate with the same line voltage. Therefore, grey (valve and heat strip power) and violet (fan power) wires are connected to the black (control power) wire with a wire nut.

Note: This drawing only reflects connections between the FCU/PTAC and the MRC Stat. It does not include the door switch, Network, or other connections.

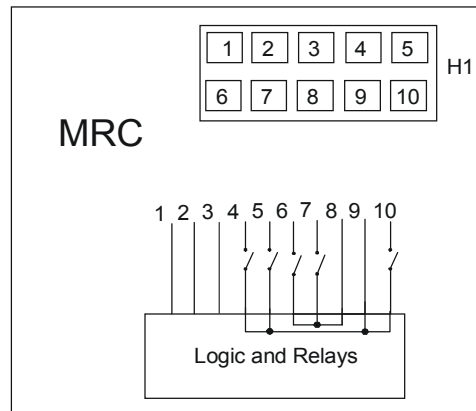


Figure 9: 2-Pipe, 3-Speed Fan FCU with Heat Strip and 7 Wires 100 VAC - 277 VAC Wiring

Table 4: Pin Number Wire Color and Function

Pin Number	Wire Color	Function
1	Green	Ground
2	Black	Control Power
3	White	Neutral
4	Yellow	High Fan
5	Orange	Medium Fan
6	Red	Cold Water Valve
7	Brown	Hot Water Valve
8	Grey	Valve Power
9	Violet	Fan Power
10	Blue	Low Fan

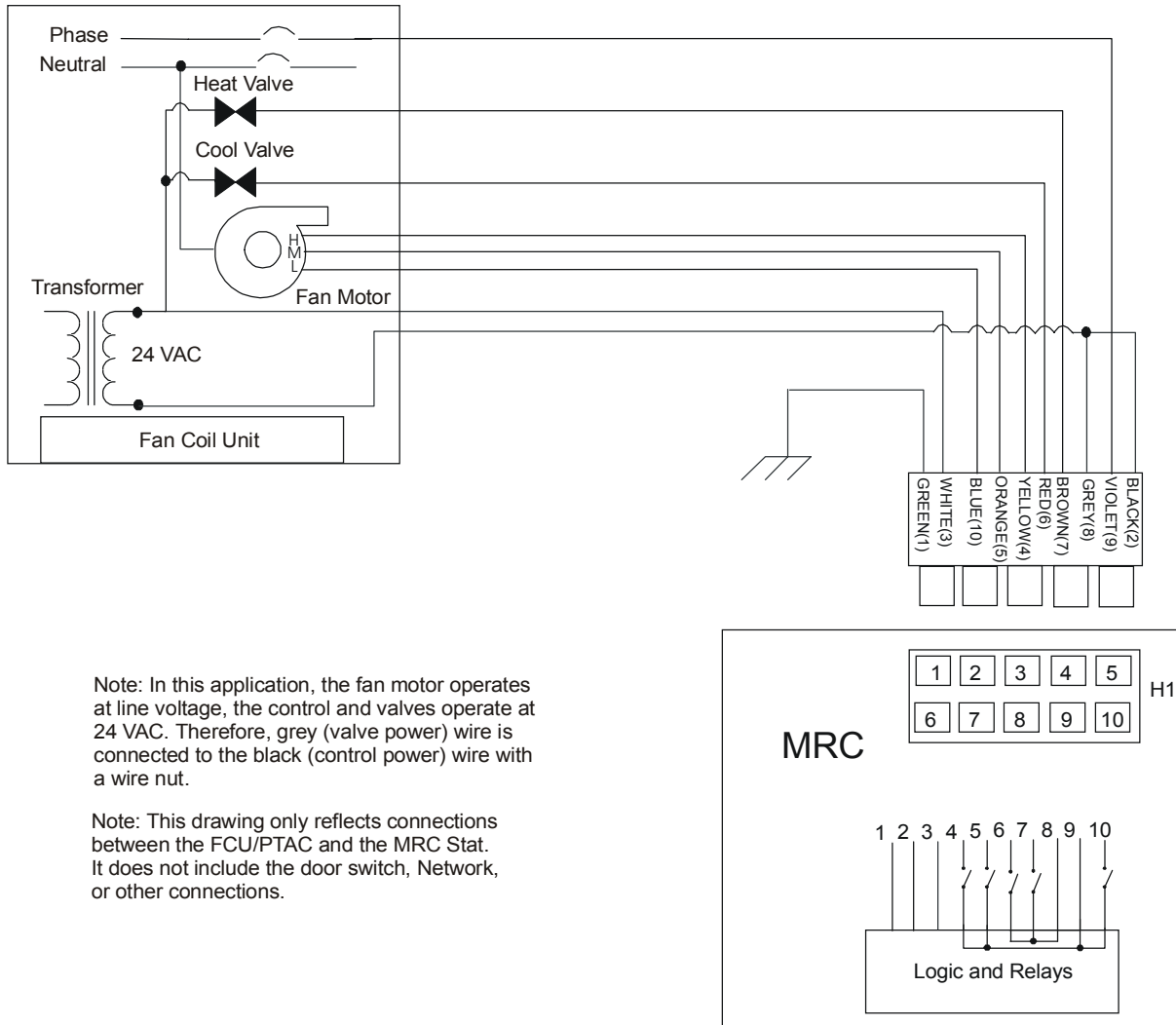


Figure 10: 4-Pipe, 3-Speed Fan FCU with 7 Wires 100 VAC - 277 VAC Fan Wiring, and 24 VAC Control and Valve Wiring

Table 5: Pin Number Wire Color and Function

Pin Number	Wire Color	Function
1	Green	Ground
2	Black	Control Power
3	White	Neutral
4	Yellow	High Fan
5	Orange	Medium Fan
6	Red	Cold Water Valve
7	Brown	Hot Water Valve
8	Grey	Valve Power
9	Violet	Fan Power
10	Blue	Low Fan

Setup and Adjustments

The MRC coupled with a magnetic door switch (wired or wireless) and a Passive Infrared (PIR) sensor (on-board or separate [wall mount or ceiling mount]) becomes the brain of a highly effective energy management system for guestrooms.

Door Switch - Wired (MRC19-MDS0)

In each room, run a two-conductor, 24-gage [minimum] cable from the thermostat to the doorframe location (see Figure 11) extending through the door header framing leaving a minimum of 5 in. (127 mm) of extra cable. The cable should extend through the center of the framing approximately 5 in. (127 mm) in from the top (or side) corner of the door.

Run the other end of the cable [along with any other low-voltage cables] to the back of the MRC thermostat. A minimum of 12 in. (305 mm) of extra cable should be left at the thermostat location for termination.

IMPORTANT: New Construction.

At the time of doorframe installation, the cable must be pulled through a pre-drilled hole in the hollow metal door header. This allows for installation of the door switch at a later date. (The door must also be pre-drilled to accept the magnet side of the door switch.)

Note: If an MRC19-PKG0 DND/MUR external plate is being used, the cable from the MRC19-MDS can be terminated at the location of the MRC19-PKG0. A minimum of 12 in. (305 mm) of extra cable should be left at the MRC19-PKG0 location for connection to the MRC19-PKG0. This method of installation eliminates the need to run the cable directly to the MRC Thermostat. Refer to the *Do-Not-Disturb/Make-Up-Room/Door Chime Kit Installation Instructions (Part No. 24-9778-22)* for more detailed installation and wiring instructions.

The MRC19-MDS0 is a normally open reed magnet switch. Electrically, the contacts are closed when the reed switch is in close proximity to a suitable magnet. Figure 11 defines the recommended mounting method for the switch in a hotel guestroom environment. The location of the contact was selected so that the switch detects a door that is resting against the frame but is not latched. Placing the switch closer to the hinge of the door provides a **door closed** indication with increasingly open angle.

Note: The MRC19-MDS0 has a **lip** that protrudes below the frame of the door. The spacing between the door and the frame must be able to accommodate this lip (which is about 0.060 in. [1.5 mm] thick).

The switch and the mating magnet may also be installed horizontally near the top, as shown in the drawing as an alternate location. For installation in a wooden door/frame, the depth of the hole in the frame should be 2 in. (51 mm) and the depth of the hole in the door should be 1 in. (25.4 mm).

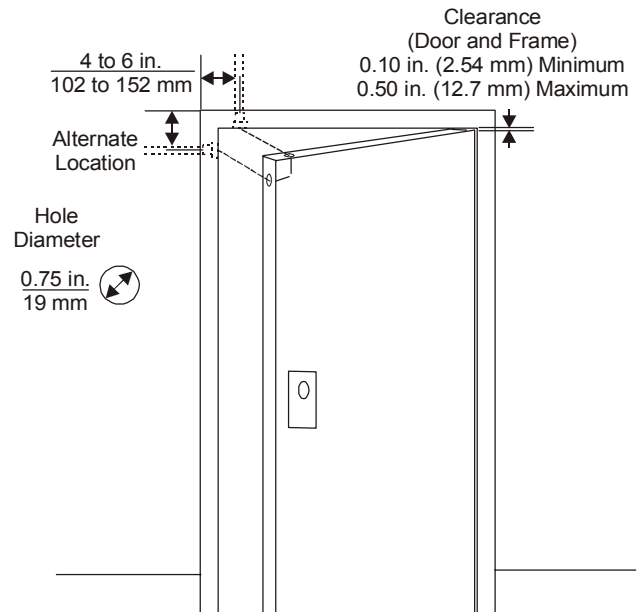


Figure 11: MRC19-MDS0 Installation

Door Switch - Wireless (MRC19-MDS2)

In each room, run the supplied two-conductor, 24-gage cable from the doorframe location (see Figure 12) extending through the door header framing leaving a minimum of 12 in. (305 mm) of extra cable. The cable is to extend through the center of the framing approximately 5 in. (127 mm) in from the top (or side) corner of the door or where otherwise specified.

The cable should be run from the door header location to the specified location of the MRC19-MDS2 or MDS3 infrared transmitter. The transmitter is typically mounted above or to the side of the doorframe casing. A minimum of 12 in. (305 mm) of extra cable should protrude from the wall for connection to the infrared transmitter.

IMPORTANT: New Construction.

At the time of doorframe installation, the cable must be pulled through a pre-drilled hole in the hollow metal door header. This allows for installation of the door switch at a later date. (The door must also be pre-drilled to accept the magnet side of the door switch.)

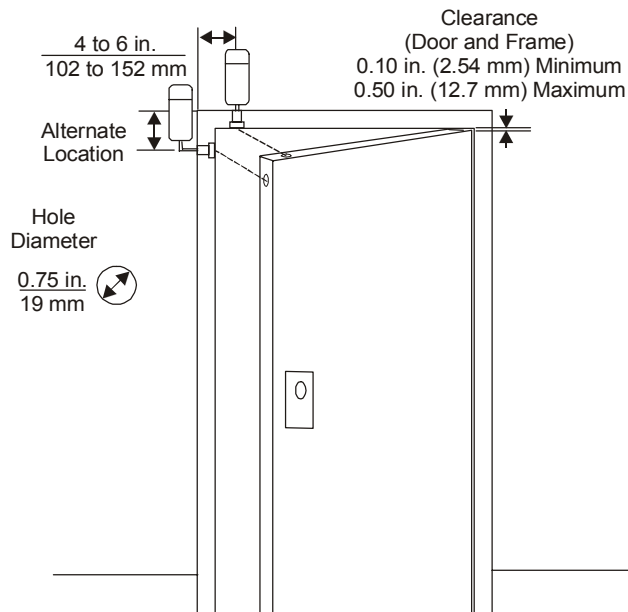


Figure 12: MRC19-MDS2 Installation

Motion Detector (PIR) Non-integrated in Thermostat

Note: Refer to the *Modular Room Control MRC19-PIR Series Motion Detector Sensors Installation Instructions (Part No. 24-9778-49)* for more detailed installation and wiring instructions.

Wall Mount

In each room **where a non-integrated motion detector is required**, run a four-conductor, 24-gage cable from the location of the motion detector (typically the corner of the room), along with any other low-voltage cables directly to the MRC thermostat (see Figure 13). Leave a minimum of 12 in. (305 mm) of extra cable at the thermostat for connections.

One end of the cable should extend directly out of the corner, 1-1/2 in. (38 mm) below the bottom of the crown molding (refer to architectural plans for crown molding dimensions). A minimum of 12 in. (305 mm) of extra cable should extend beyond the finished wall surface.

Note: The sensor is corner mounted and does not cover the cable if it is more than 3/4 in. (19 mm) out of the corner. Determine the specific location of the motion detector by establishing where the optimal coverage of the room occurs. The owner, project architect, and/or interior designer must review and approve the location.

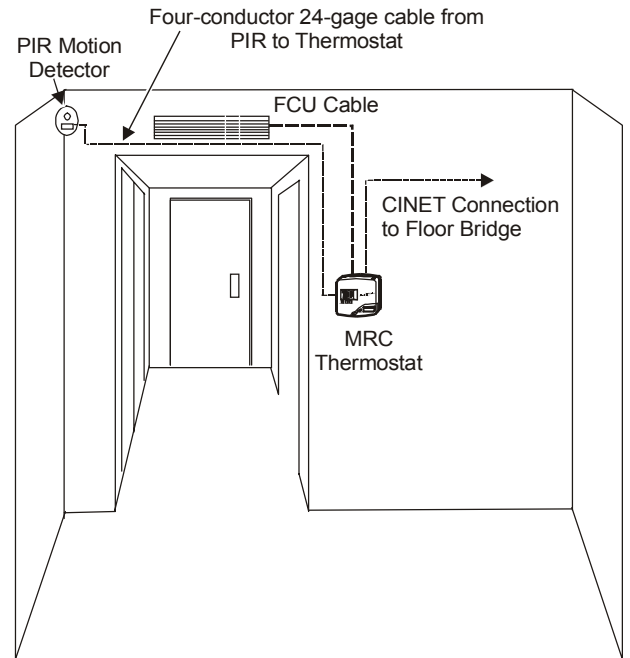


Figure 13: MRC19-PIRW Motion Sensor Installation

Ceiling Mount

Mount the detector on a firm section of ceiling at a height of between 8 and 15 feet (2.44 and 4.57 m) and well away from neon or fluorescent lights.

Run a four-conductor, 24-gage cable from the location of the motion detector (along with any other low-voltage cables) to the MRC thermostat. Leave a minimum of 12 in. (305 mm) of extra cable at the thermostat for connections.

Operation

The following descriptions are the display and control button functionality for the **standard** MRC product:

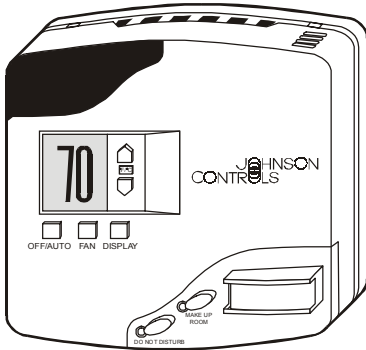


Figure 14: Liquid Crystal Display (LCD) and Control Buttons

- The OFF/AUTO button cycles the MRC between OFF and AUTO modes. In AUTO mode, the MRC automatically determines the optimum valve and fan speed settings needed to maintain target (**SET** temperature). In the OFF mode, only the word **OFF** is displayed and the MRC is no longer in control of the fan speed or valve settings except for maintaining room temperature between programmed maximum and minimum limits.

- The FAN button is only functional when the MRC is in AUTO mode. If pressed, the display first shows the current fan speed. If pressed again, fan speed cycles to the next higher speed, and that speed is displayed. After HI fan speed is reached, if the button is pressed again, fan speed cycles back to LO, and the sequence begins again. The MRC automatically adjusts valve settings in an attempt to maintain target temperature. After 10 minutes, operation reverts to full AUTO in which the MRC sets the fan to the speed best suited to maintain target temperature.
- The DISPLAY button cycles between SET (target) temperature and ROOM (actual) temperature. When the MRC is activated and in AUTO mode, the SET temperature is automatically displayed. The ROOM temperature is only displayed if the DISPLAY button is pressed and then is displayed for only 5 seconds. Following that 5-second period, the display reverts to SET temperature.

Table 6 through Table 9 are four typical scenarios showing the automatic operation of the MRC under various temperature conditions.

Table 6: 2-Pipe, 3 Speed Fan FCU with Cold Water in Pipe

System State (OFF/AUTO)	Room Temperature	Set Temperature	Fan	Valve
OFF	75°	72°	OFF	CLOSED
AUTO	72°	72°	OFF	CLOSED
AUTO	73°	72°	LO	OPEN
AUTO	75°	72°	MED	OPEN
AUTO	77°	72°	HI	OPEN
AUTO	70°	72°	OFF	CLOSED

Table 7: 2-Pipe, 3 Speed Fan FCU with Cold Water in Pipe and Continuous Fan Specified

System State (OFF/AUTO)	Room Temperature	Set Temperature	Fan	Valve
OFF	75°	72°	LO	CLOSED
AUTO	72°	72°	LO	CLOSED
AUTO	73°	72°	LO	OPEN
AUTO	75°	72°	MED	OPEN
AUTO	77°	72°	HI	OPEN
AUTO	70°	72°	LO	CLOSED

Table 8: 4-Pipe, 3 Speed Fan FCU with Hot and Cold Water Available

System State (OFF/AUTO)	Room Temperature	Set Temperature	Fan	Cold Water Valve	Hot Water Valve
OFF	75°	72°	OFF	CLOSED	CLOSED
AUTO	72°	72°	OFF	CLOSED	CLOSED
AUTO	73°	72°	LO	OPEN	CLOSED
AUTO	75°	72°	MED	OPEN	CLOSED
AUTO	77°	72°	HI	OPEN	CLOSED
AUTO	70°	72°	LO	CLOSED	OPEN
AUTO	67°	72°	HI	CLOSED	OPEN

Table 9: 2-Pipe, 2 Speed Fan FCU with Cold Water in Pipe, Heat Strip and Continuous Fan Specified

System State (OFF/AUTO)	Room Temperature	Set Temperature	Fan	Valve	Heat Strip Valve
OFF	75°	72°	LO	CLOSED	OFF
AUTO	72°	72°	LO	CLOSED	OFF
AUTO	73°	72°	LO	OPEN	OFF
AUTO	75°	72°	HI	OPEN	OFF
AUTO	77°	72°	HI	OPEN	OFF
AUTO	70°	72°	LO	CLOSED	ON
AUTO	67°	72°	HI	CLOSED	ON

Table 10: Accessories

Description	Part Number	Corresponding Literature
Expansion Boards		
5 Triac Expansion Board	MRC19-EXP1	–
6 Relay Expansion Board	MRC19-EXP2	–
5 Triac/2 AO Expansion Board	MRC19-EXP3	–
6 Relay/2 AO Expansion Board	MRC19-EXP4	–
Lamp and Lighting Control Devices		
IR Lamp Module - Non-Dimming	MRC19-LMP0	<i>MRC Series Digital Thermostat Product Bulletin (LIT-1201430)</i>
IR Wall Switch - Non-Dimming	MRC19-LMP1	<i>MRC Series Digital Thermostat Product Bulletin (LIT-1201430)</i>
Continued on next page . . .		

Motion Detectors (Cont.)		
Passive IR Detector, Wall Mounted	MRC19-PIRW	<i>MRC Series Motion Detector Sensors Installation Instructions (Part No. 24-9778-49)</i>
Passive IR Detector, Ceiling Mounted	MRC19-PIRC	<i>MRC Series Motion Detector Sensors Installation Instructions (Part No. 24-9778-49)</i>
IR Eyes		
Smart IR Eye to Communicate with Locks, Wall Mounted	MRC19-SIRW	–
Smart IR Eye to Communicate with Locks, Ceiling Mounted	MRC19-SIRC	–
Do-Not-Disturb/Make-Up-Room/Door Chime		
Packaged Set of DND/MUR/Chime Including Wiring Harnesses	MRC19-PKG0	<i>DND/MUR/Door Chime Kit Installation Instructions (Part No. 24-9778-22)</i>
Peripherals		
Oversized Adapter Plate 6.25" x 6.25"	MRC19-PLT0	–
Magnetic Door Switch, Wired, Core Mount	MRC19-MDS0	<i>MRC Series Digital Thermostat Product Bulletin (LIT-1201430)</i>
Magnetic Door Switch, Wired, Surface Mount	MRC19-MDS1	<i>MRC Series Digital Thermostat Product Bulletin (LIT-1201430)</i>
IR Transmitter w/ MRC-6MDS-0 (white)	MRC19-MDS2	<i>MRC Series Digital Thermostat Product Bulletin (LIT-1201430)</i>
IR Transmitter w/ MRC-6MDS-0 (black)	MRC19-MDS3	<i>MRC Series Digital Thermostat Product Bulletin (LIT-1201430)</i>
Remote IR Transceiver for Extender Cards	MRC19-EYE0	–

Technical Specifications

Product	MRC Series Digital Thermostat
Power Requirements	24 VAC at 50/60 Hz, 24 VDC nominal, 2.4 VA (MRC19-3xxxx and MRC19-4xxxx) 100 to 240 VAC at 50/60 Hz, 2.4 VA (MRC19-5xxxx) 265 to 277 VAC at 50/60 Hz, 2.4 VA (MRC19-6xxxx)
Relay Contact Rating	240 VAC, 2 ampere maximum
Triac Relay Contact Rating	50 mA minimum, 250 mA maximum
Recommended Wire Size	18 gauge
Thermostat Measurement Range	33 to 99°F (1 to 37°C)
Outdoor Air Temperature Indication Range	0 to 99°F (-18 to 37°C)
Display Resolution	Setpoint: one decimal point; Actual Temperature: zero decimal point for °F and one decimal point for °C
Minimum Deadband	2°F (1°C) between heating and cooling
°C/°F Conversion	Button located on front display
Ambient Operating Conditions	41 to 149°F (5 to 65°C), 0-95% RH noncondensing
Ambient Storage Conditions	33 to 149°F (1 to 65°C)
Dimensions (H x W x D)	4.7 x 4.7 x 1.2 in. (120 x 120 x 30 mm)
Shipping Weight	0.6 lb (0.27 kg)
FCC Compliance	This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



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Published in U.S.A.
www.johnsoncontrols.com