

# RCC10U

## Room Temperature Controller for Two-pipe Fan Coil Units



<b>Description</b>	Room temperature controller for two-pipe fan coil units.
<b>Features</b>	<ul style="list-style-type: none"> <li>• Output for on/off valve actuator.</li> <li>• Output for three-speed fan.</li> <li>• Dual setpoint temperature scale.</li> <li>• Control depending on the room or return air temperature.</li> <li>• Automatic Heating/Cooling changeover.</li> <li>• Operating modes: Normal, Energy Saving, Freeze Protection and Off.</li> <li>• Operating mode changeover input for remote control.</li> <li>• Selectable control parameters.</li> <li>• Operating voltage 120 Vac.</li> </ul>
<b>Application</b>	<p>Typical use:</p> <ul style="list-style-type: none"> <li>• Controlling room temperature in individual rooms that are heated or cooled with two-pipe fan coil units.</li> <li>• Opening or closing a valve</li> <li>• Switching a three-speed fan.</li> </ul> <p>Suitable for use in systems with:</p> <ul style="list-style-type: none"> <li>• Automatic Heating/Cooling changeover.</li> <li>• Heating only/Cooling only or Heating and Cooling applications.</li> </ul>
<b>Product Number</b>	RCC10U      With input for return air temperature sensor

## Accessories

ARG70	Adapter plate, for 2-inch x 4-inch or 4-inch x 4-inch electrical wall boxes
QAH11.1	Changeover/remote sensor
141-570	Lockable Thermostat Guard



## Ordering

The QAH11.1 temperature sensor (which can be used as a return air temperature or changeover sensor), and valves must be ordered separately. An ARG70 Wall Box Adapter (used to mask the drywall when mounting the controller to a 2-inch x 4-inch or 4-inch x 4-inch electrical wall box) must also be ordered separately.

**Table 1. Equipment Combinations.**

Product Number	Description	Technical Instructions
QAH11.1	Temperature Sensor	155-329P25
599 Series	Two-way and Three-way Zone Valves	155-320P25
SF Series	Zone Valve Actuator	155-321P25

## Warning/Caution Notations

<b>WARNING:</b>		Personal injury, or loss of life may occur if you do not follow a procedure as specified.
<b>CAUTION:</b>		Equipment damage, or loss of data may occur if you do not follow a procedure as specified.

## Functions

The controller measures the room temperature with its integrated sensor or external return air temperature sensor (QAH11.1)—if used—and maintains the setpoint by delivering control commands to the two-position (on/off) valve.

The switching differential is adjustable; it can be 2°F (1°C) or 7°F (4°C) in Heating mode, or 1°F (0.5°C) or 3.5°F (2°C) in Cooling mode.

## Fan Operation

The fan is switched to the selected speed via control output 11, 10 or 9 (Low, Medium or High).

When the Temperature-dependent fan control function is activated (can be selected with DIP Switch No. 1), the fan and valve are switched ON or OFF depending on the temperature.

It is switched OFF by:

- Leaving the Heating or Cooling sequence, if the function Temperature-dependent fan control is activated.
- Manually changing to Standby  $\cup$ , if room conditions do not call for Freeze Protection mode.
- Activating an external operating mode changeover switch, if installation conditions do not call for Energy Saving or Freeze Protection mode.
- Turning the controller's power supply OFF.

### Heating/Cooling Mode

Output terminals 7 and 5 (neutral) command the control valve.

Output terminals 7 and 5 are open (0 Vac) when:

1. The measured room temperature is at half the switching differential below the setpoint (Heating mode), and
2. The valve has been fully closed for more than one minute.

Output terminals 7 and 5 are closed (120 Vac) when:

1. The measured room temperature is at half the switching differential above the setpoint (Heating mode), and
2. The valve has been fully open for more than one minute.

**NOTE:** Output terminals 7 and 5 deliver a control command only for fail-safe open (Normally Open) valve/actuator assemblies. **Fail-safe closed (Normally Closed) valve/actuator assemblies cannot be used with the RCC10U Controller.**

### Return Air Temperature

The RCC10U provides control based on either the measured room temperature or the fan coil unit's return air temperature.

Changeover is automatic if a QAH11.1 cable temperature sensor is connected to the device. Place the sensor in the return air duct and terminate to the controller.

Order the QAH11.1 separately for return air sensing.

### Automatic Heating/Cooling Changeover

CW = Chilled Water Cooling mode  
HW = Hot Water Heating mode  
M = Operating mode  
SDC = Switching differential, cooling  
SDH = Switching differential, heating  
T = Room temperature  
Tw = Water temperature  
W = Room temperature setpoint  
Y = Signal voltage

The controller uses the water temperature measured by the changeover sensor (QAH11.1) to switch from Heating to Cooling mode, or vice versa. When the water temperature is above 82°F (28°C), the controller switches to Heating mode; below 61°F (16°C) it switches to Cooling mode. If the water temperature is between the two changeover points immediately after switching on, the controller will start in the Heating mode. The water temperature is measured at one-minute intervals and the operational status is updated.

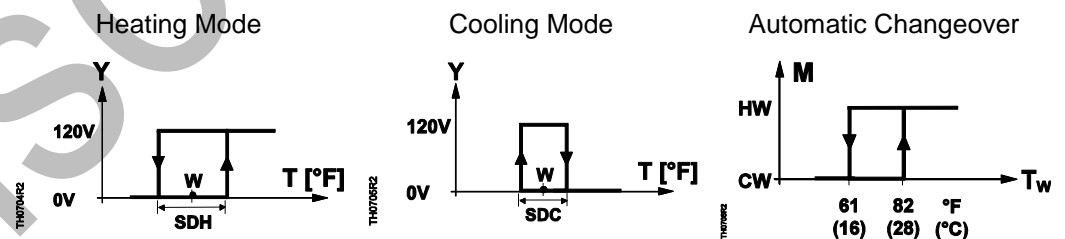


Figure 1. Switch Action for Output Terminals 7 and 5.

### Remote Changeover

**Heating/Cooling** An electric switch placed between input terminals 2 and 3 can facilitate remote changeover. Terminals 2 and 4 must be bridged. When the switch is closed, the Cooling mode is selected. When the switch is open, the Heating mode is selected. Up to ten thermostats can be connected in parallel.

**Heating only** For heating only applications, input terminals 2 and 3 are open.

**Cooling only** For cooling only applications, input terminals 2 and 3 must be bridged with wire.

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### Purging Function

The changeover sensor initiates the change from Heating to Cooling mode even if the two-way valves are shut down for a long period of time. To ensure this function, the valves are opened for one minute at two-hour intervals.

After power is reset to the controller, the heating and cooling valve will open for one minute to flush pipes, for accurate remote changeover sensing. When this function is completed, the changeover sensor will select the correct mode.

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### Setpoint Limit Stops

The room temperature setpoint can be limited in increments of 2°F (1°C) by using the minimum and maximum setpoint limit stops. This prevents unauthorized setpoint adjustment.

To set limit stops, remove the setpoint knob by pulling straight off the shaft. Reposition gray tabs for high and low stops in the holes around the perimeter of knob as required. See Figure 2.

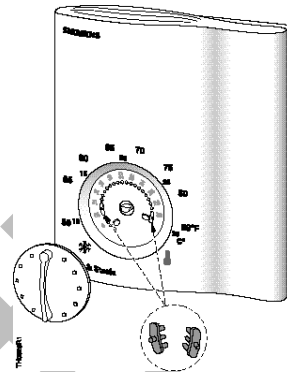





Figure 2. Setpoint Limit Stops.

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### Operating Modes


The following operating modes are available:

#### Normal Operating Mode

Heating or Cooling mode with automatic changeover and with manually selected fan speed:  (Low),  (Medium),  (High). In Normal operation, the controller maintains the adjusted setpoint.

#### Freeze Protection Mode

The Freeze Protection function is activated only when DIP Switch No. 4 is set to OFF. Freeze Protection mode can be activated by:

- Manually switching to Standby .
- Activating the external operating mode changeover switch, if DIP Switch No. 2 is set to OFF.

If the room temperature falls below 46°F (8°C), the controller will automatically switch to Freeze Protection mode. In that case, the heating valve opens and the fan operates at the selected speed. If the Standby mode is selected, the fan will operate at low speed. The room temperature is maintained at a setpoint of 46°F (8°C) and the setpoint adjusted by the user will be ignored.

If Freeze Protection operation is locked (DIP Switch No. 4 in position ON), Standby is also locked, which means that the controller will switch to OFF instead of Standby.

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### Energy Saving Mode

In Energy Saving mode, the heating setpoint is 61°F (16°C) and the cooling setpoint is 82°F (28°C), independent of the position of the setpoint knob. This operating mode will be activated when input D1 for operating mode changeover is active and DIP Switch No. 2 is set to ON.

When the DIP switch is in Energy Saving mode and the fan speed control is set to Standby, the Energy Saving mode takes precedence over Standby mode. When the room temperature drops below the Energy Saving setpoint, the fan operates at low speed until the energy load is satisfied; then the fan turns off. Low fan speed will be selected even though the fan switch is on Standby.

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### Operating Mode Changeover Switch

A changeover switch can be connected to status input D1–GND. When the switch closes its contact (such as, caused by an open window), the operating mode will change from Normal operation to Energy Saving mode (if DIP Switch No. 2 is set to ON), or from Normal operation to Standby (if DIP Switch No. 2 is set to OFF). If the room temperature falls below 46°F (8°C) and if DIP Switch No. 4 is set to OFF, Freeze Protection mode will become active.

The operating action of the switch (NC or NO) can be selected by DIP Switch 3.

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### Mechanical Design

The unit consists of two parts:

- A plastic housing which accommodates the electronics, the operating elements and the built-in room temperature sensor.
- A controller base.

The housing snaps into the top of the mounting base and is secured with a screw at the bottom.

The wire terminal block is mounted on the base; the DIP switches are located at the rear of the housing.

To access the DIP switches, remove controller from controller base. See Figure 3.

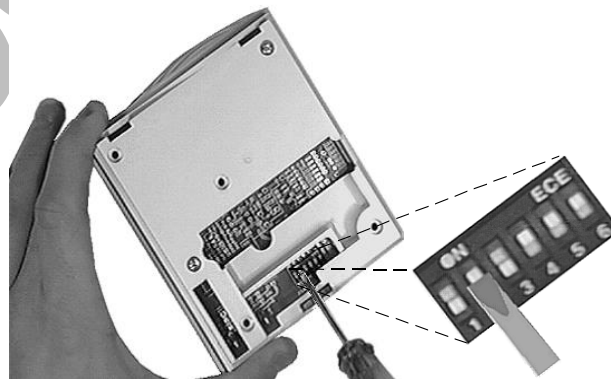


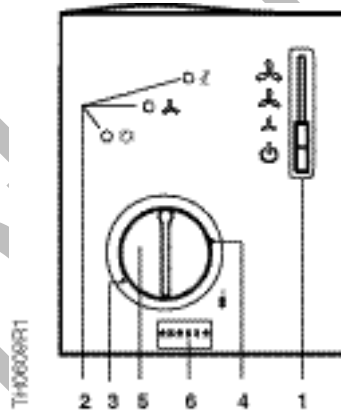
Figure 3. DIP Switch Setting.

**Table 2. DIP Switches.**

DIP Switch No.	Description	Position ON	Position OFF
1	Fan control	Fan control is temperature-dependent in all operating modes	Fan control in Normal operation is temperature-independent <sup>1</sup>
2	Operating mode changeover via an external switch	Changeover between Normal operation and Energy Saving mode	Changeover between Normal operation and Standby <sup>1</sup>
3	Operating action of switch for external operating mode changeover	Changeover activated when contact of switch is closed (NO) <sup>1</sup>	Changeover activated when contact of switch is open (NC)
4	Standby	Freeze Protection function disabled	Freeze Protection function enabled
5	Switching differential	2°F (1°C) in Heating mode <sup>1</sup> 1°F (0.5°C) in Cooling mode <sup>1</sup>	7°F (4°C) in Heating mode 3.5°F (2°C) in Cooling mode

1. Factory setting

## Construction



- 1 Standby mode selector  $\cup$ /fan speed switch:  $\cup$  (Low),  $\cup$  (Medium),  $\cup$  (High).
- 2 LEDs for indicating Heating mode, Cooling mode and fan operation.
- 3 Setting for minimum setpoint limit stop (in increments of 2°F [1°C]).
- 4 Setting for maximum setpoint limit stop (in increments of 2°F [1°C]).
- 5 Room temperature setpoint knob.
- 6 Set of DIP switches (mounted on circuit board).

**Figure 4. Construction.**

## Mounting, Installation and Commissioning

- The unit can be located on a wall or inside a fan coil unit. Do not mount in direct sunlight or near other heat or refrigeration sources.
- Mounting height is approximately 60 inches (150 cm) above the floor, when using the wall mounting option. See Figure 5.
- The unit can be fitted to most commercially available recessed electrical wall boxes or directly on the wall. A Wall Box Adapter Kit (ARG70), ordered separately, is recommended but not required to mount an RCC10U controller to a 2-inch x 4-inch electrical wall box. An ARG70 is required for 4-inch x 4-inch electrical wall box mounting. The wall plate will cover the drywall cutout.
- Check the settings of the DIP switches and change them, if required.
- After applying power, the controller makes a reset during which the fan LED flashes indicating that the reset has been accomplished. This takes about three seconds. When the LED stops flashing, the controller is ready to operate.

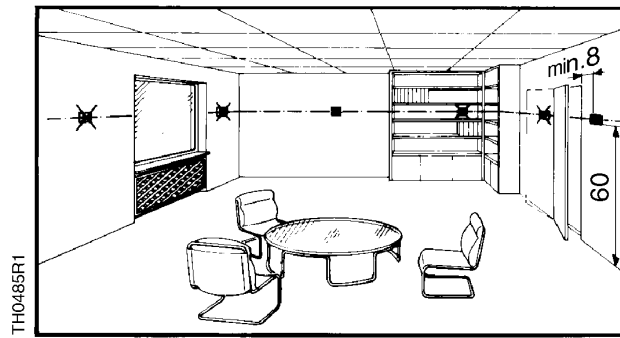


Figure 5. Acceptable Mounting Height in Inches.

- Prior to fitting the changeover sensor, apply thermal conductive paste on the pipe where the sensor is to be placed. Secure with plastic cable ties.
- The sensor is not position sensitive.
- The cables used must meet the insulation requirements for live voltage.
- The control valve is fully open for one minute upon start-up to determine if it is in Heating or Cooling mode (purging function).
- User input via setpoint knob or operating mode/fan speed selector results in instantaneous response. There is a one-minute delay before changes made to temperature sensing and changeover are implemented.



### WARNING:

Sensor inputs 1, 2 and 3 carry live voltage potential. If the sensor's cables must be extended, the cables used must be suited for live voltage.

- Installation Instructions are included with the controller.

## Installation Instructions

An ARG70 wall plate adapter is required to mount an RCC10U controller to a 4-inch x 4-inch electrical wall box.

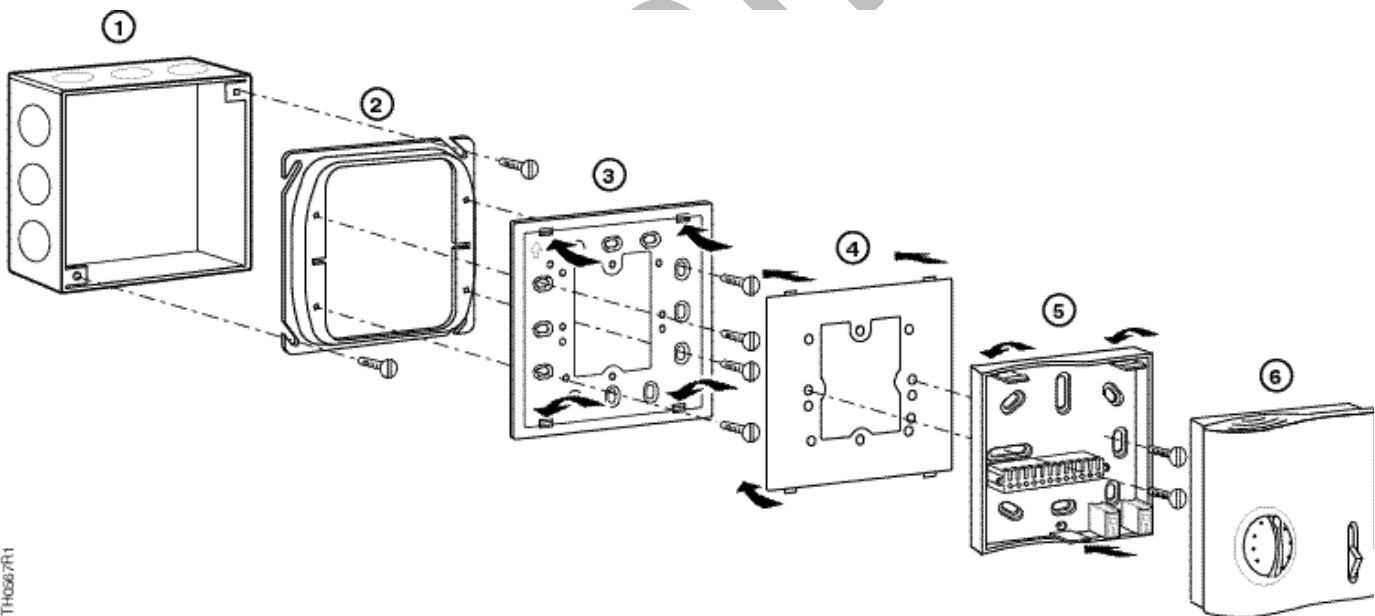
### 4-inch x 4-inch Electrical Wall Box Mounting

1. Loosen the screw at the bottom of the controller with a small screwdriver.
2. Lift the bottom of the controller from the controller base and push up to remove.



**Figure 6. Controller Separation.**

3. Fasten the wall box adapter (3) to plaster ring (2), supplied by others, using the four screws provided with the ARG70.
4. Flex adapter mask (4) and snap in place inside wall box adapter (3).
5. Pull wires through plaster ring (2).
6. Fasten controller base (5), to wall box adapter assembly (3) and (4) with the two screws provided.



**Figure 7. 4-inch x 4-inch Electrical Wall Box Installation.**

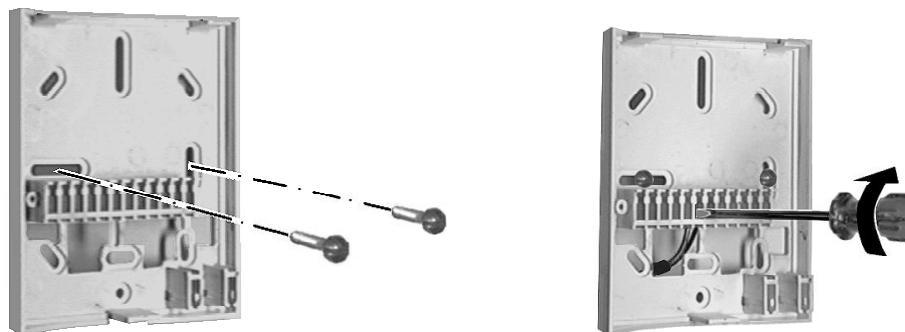
- |   |                     |   |                 |
|---|---------------------|---|-----------------|
| 1 | Electrical wall box | 4 | Adapter mask*   |
| 2 | Plaster ring        | 5 | Controller base |
| 3 | Wall box adapter*   | 6 | Controller      |

\* Included with ARG70



**4-inch x 4-inch Electrical  
Wall Box Mounting,  
Continued**

7. Terminate wires per wiring instructions located above the terminal block.



**Figure 8. Wiring Termination.**

8. Reattach the controller to the controller base.
9. Secure by tightening the screw at the bottom of the controller.



**Figure 9. Controller Reattachment.**

The installation is now complete.

### 2-inch x 4-inch Electrical Wall Box Mounting

An ARG70 wall plate adapter is recommended, but not required to mount an RCC10U controller to a 2-inch x 4-inch electrical wall box.

1. Loosen the screw at the bottom of the controller with a small screwdriver.
2. Lift the bottom of the controller from the controller base and push up to remove. See Figure 6.
3. Fasten the wall box adapter (3) to plaster ring (2), supplied by others, using the two screws provided.
4. Flex adapter mask (4) and snap in place inside wall box adapter (3).
5. Pull wires through plaster ring (2).
6. Fasten controller base (5), to wall box adapter assembly (3) and (4) with the two screws provided.
7. Follow Steps 7 through 9 of the *4-inch x 4-inch Electrical Wall Box Mounting* section.

The installation is now complete.

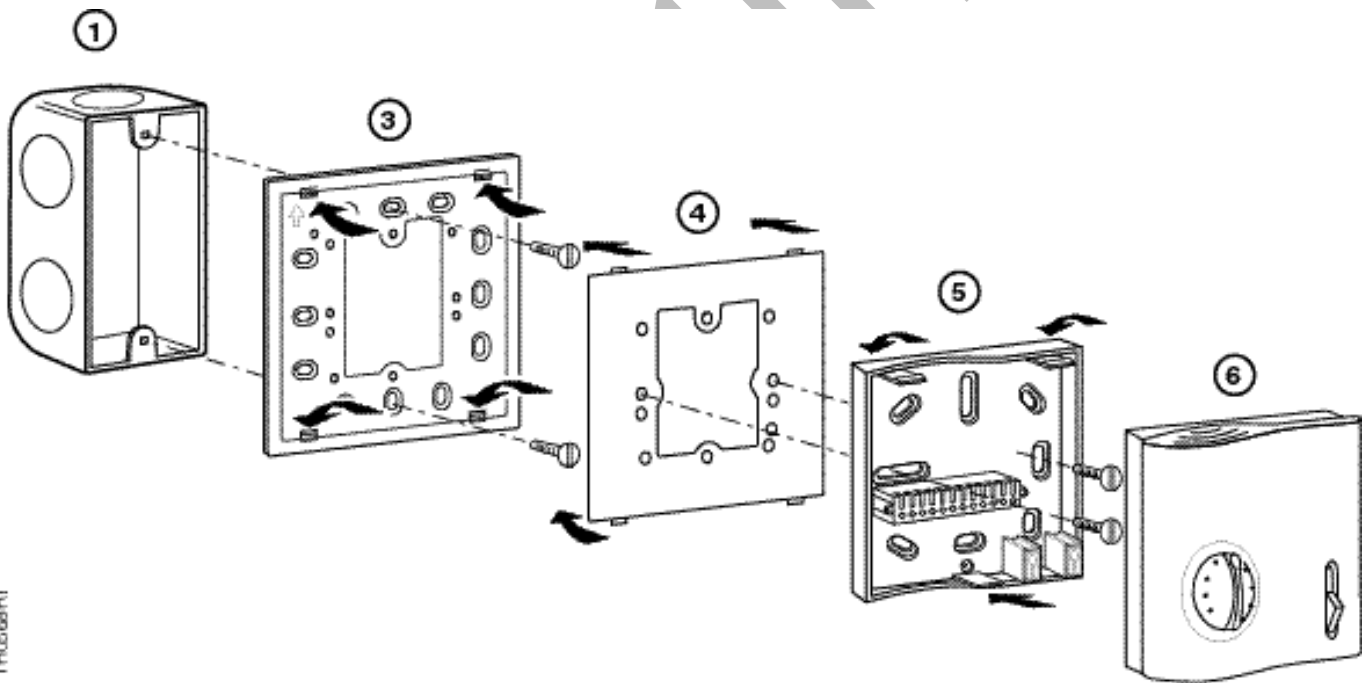


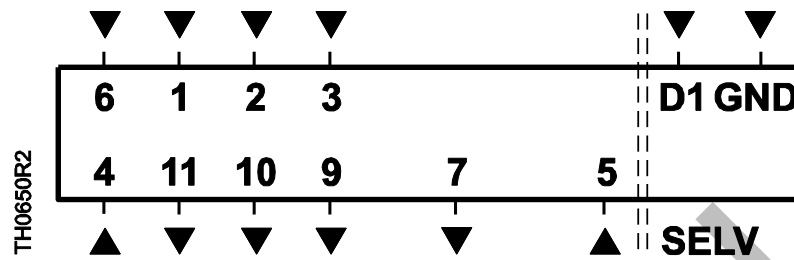
Figure 10. 2-inch x 4-inch Electrical Wall Box Installation.

- |                       |                   |
|-----------------------|-------------------|
| 1 Electrical wall box | 5 Controller base |
| 3 Wall box adapter*   | 6 Controller      |
| 4 Adapter mask*       |                   |

\* Included with ARG70

<b>Specifications</b>  <b>Power Supply</b>	Operating voltage	120 Vac +10/-15%	
	Frequency	50/60 Hz	
	Power consumption	Maximum 10A	
	Control Outputs (Fan) 11, 10, 9 (Valve) 7	120 Vac max./5 res./3.5 FLA/7.0 LRA 120 Vac max./5 res./3.5 FLA/7.0 LRA	
	Signal Input 1 for return air sensor	QAH11.1, Class 2 NTC resistor 3K $\Omega$ @ 77°F (25°C)	
	Signal Input 3 for changeover sensor	QAH11.1, Class 2 NTC resistor 3K $\Omega$ @ 77°F (25°C)	
	Permissible number of thermostats in parallel, Signal Input 3	Ten	
	Status Input D1 and GND Contact sensing	6 to 15 Vdc/3 to 6 mA	
	Operating action	Single-pole, Single-throw (SPST)	
	Permissible cable length with copper cable 16 AWG for connection to Terminals 1, 3, D1, and GND	262 feet (80 m)	
	<b>Operational Data</b>	Setpoint setting range	50°F to 85°F (10°C to 30°C)
		Switching differential in Heating mode SDH (selectable)	2°F or 7°F (1°C or 4°C)
		Switching differential in Cooling mode SDC (selectable)	1°F or 3.5°F (0.5°C or 2°C)
Setpoint (Energy Saving mode $\odot$ ), heating		61°F (16°C)	
Setpoint (Energy Saving mode $\odot$ ), Cooling		82°F (28°C)	
Setpoint (Freeze Protection $\uparrow$ )		46°F (8°C)	
<b>General Ambient Conditions</b>	Operation Temperature Humidity	32°F to 122°F (0°C to 50°C) <95% rh	
	Shipping and storage Temperature Humidity	-13°F to 158°F (-25°C to 70°C) <95% rh	
	<b>Agency Approvals</b>	UL Listing	UL 873
		cUL certification	C22.2 No. 24-93
Conforms to CE requirements			
<b>General</b>	Degree of housing protection	NEMA 1	
	Connection terminals	Solid wires or prepared standard wires 2 x 16 AWG or 1 x 14 AWG Minimum 20 AWG	
	Weight	0.55 lb (0.25 kg)	
	Housing color Cover Base	White and gray Gray	
	Degree of housing protection	NEMA 1	

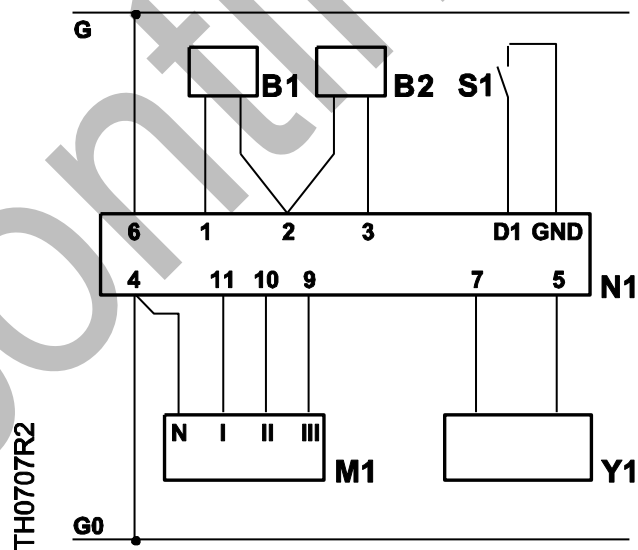
## Wiring Terminals



- 1 Status input, Return air temperature sensor
- 2 Measuring neutral, Return air temperature sensor and changeover sensor
- 3 Status input, Changeover sensor
- 4, 5 Neutral
- 6 Operating voltage 120 Vac
- 7 Control output, Valve, 120 Vac
- 9 Control output, Fan speed III, 120 Vac (High)
- 10 Control output, Fan speed II, 120 Vac (Medium)
- 11 Control output, Fan speed I, 120 Vac (Low)
- D1, GND Status input for potential-free operating mode changeover switch (operating action can be selected)

Figure 11. Wiring Terminals.

## Wiring Diagram



- B1 Return air temperature sensor (QAH11.1)
- B2 Changeover sensor (QAH11.1)
- G Operating voltage 120 Vac
- M1 Three-speed fan
- G0 Neutral
- N1 RCC10U Room Temperature Controller
- S1 External operating mode changeover switch
- Y1 599 Series Zone Valve

Figure 12. Wiring Diagram.

## Dimensions

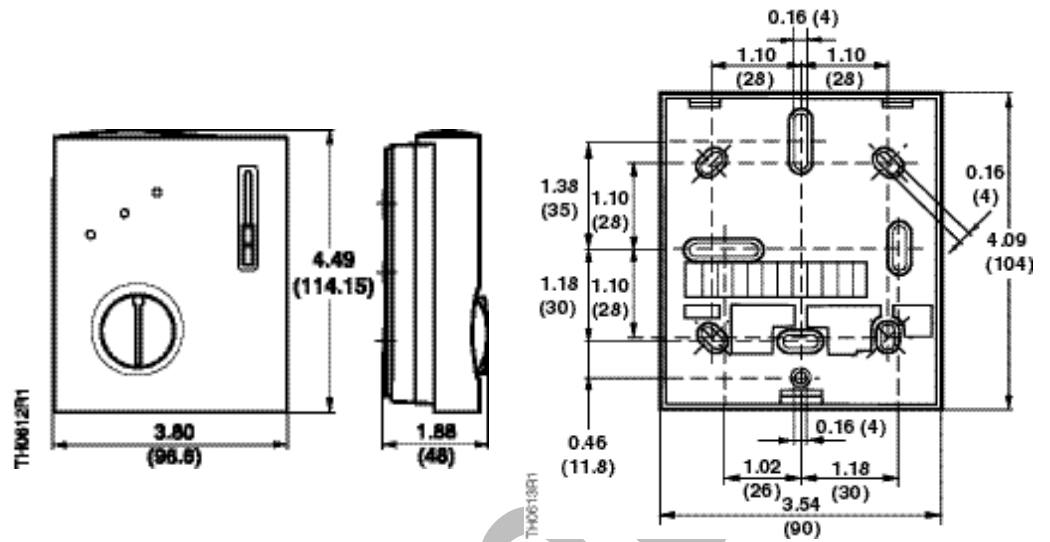


Figure 13. RCC10U and Base Plate in Inches (Millimeters).

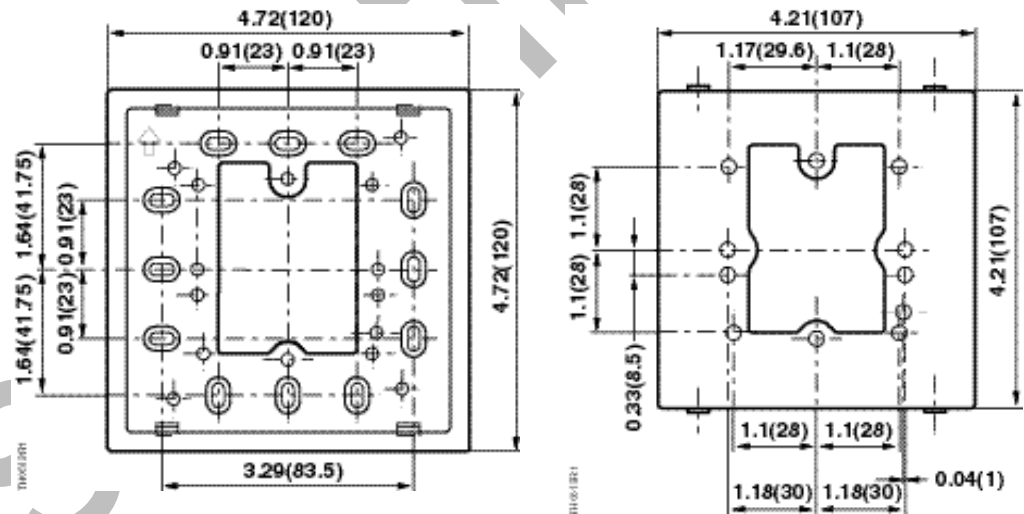


Figure 14. ARG70 Dimensions in Inches (Millimeters).

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