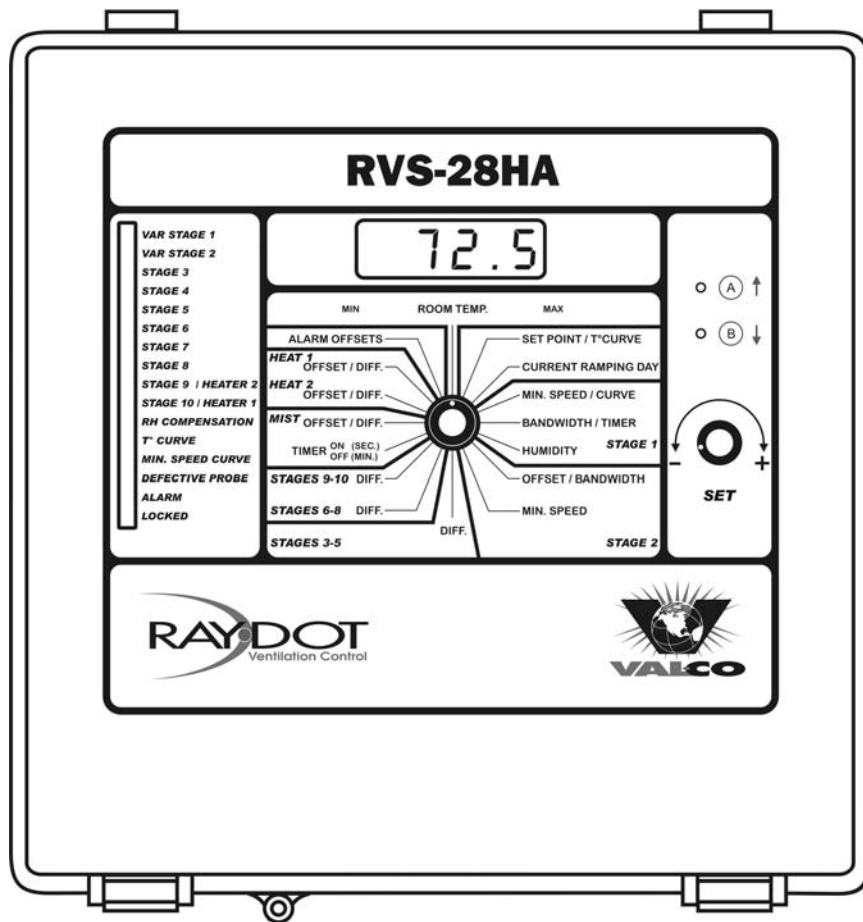

Combined Ventilation Controller

RVS-28HA

10-stage Control for Power Applications
2 variable speed stages, 6 cooling stages (mister cycle available)
and 2 thermo/mister cycle stages



Installation Guide

Read this guide carefully before installing the controller.

PRECAUTIONS

We strongly recommend connecting the controller to an alarm system, and installing a supplementary natural ventilation system as well as a back-up thermostat on at least one cooling stage. Refer to the wiring diagram enclosed with this installation guide to connect the thermostat.

Inputs and outputs circuitry is protected against overload and overvoltage. However, we recommend installing an additional protection device on the supply circuit as well as an external relay on all ON-OFF stages to prolong the life of the controller.

To avoid exposing the controller to harmful gases or excessive humidity, it is preferable to install it in a corridor.

The room temperature where the controller is located **MUST ALWAYS REMAIN BETWEEN 32° AND 104°F (0° AND 40°C)**.

DO NOT SPRAY WATER ON THE CONTROLLER.

FOR CUSTOMER USE

Enter below the serial number located on the side of the controller and retain this information for future reference.

Model number: RVS-28HA

Serial number: _____

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FEATURES

The RVS-28HA is a powerful environmental controller that can manage two variable ventilation stages and eight on/off stages. The first five on/off stages are ventilation stages. The last three may be heating, mist or ventilation stages, depending on user setup. All cooling stages are controlled by the “room temperature”, which is the temperature averaged from # 1 to 4 probe readings. Heaters follow either the room temperature or a zone temperature, depending on user setup. A humidity probe may be used to lower the humidity level by activating stage 1 or by deactivating the mist stage.

It is important to read both the RVS-28HA User’s Guide and the present Installation Guide. The Installation Guide provides information on physical characteristics of the controller, mounting, connections, probes, troubleshooting and technical specifications. The User’s Guide explains the workings of the controller parameters.

RVS-28HA highlights:

- ✦ Displays absolute temperatures for all stages
- ✦ Temperature readings and high/low for both room and individual readings
- ✦ Selectable 2°F offset for all on/off stages
- ✦ Optional humidity probe (reading and high/low) with relative humidity compensation
- ✦ Alarms for high, low and critical temperatures; power failure alarms
- ✦ Test mode
- ✦ Set point and minimum ventilation curve, with 10 easily adjustable points
- ✦ Up to 2 zones of heating
- ✦ De-icing on variable stage 2
- ✦ Standard alarm output
- ✦ PC compatible
- ✦ Built-in adjustable timer on natural ventilation stage
- ✦ Offsets alarm for mist, heat and stage 2
- ✦ CSA approved for both the United States and Canada
- ✦ Temperature selection switch (°F or °C)

Here is a brief description of the RVS-28HA main features.

Digital display

A three-digit display provides a high level of accuracy, allowing the user to specify a temperature to within one tenth of a degree (in Fahrenheit or Celsius units).

Pilot lights

Pilot lights indicating the status of outputs allow you to monitor the operation of the system from a distance.

Minimum ventilation cycle

When ventilation is not required for cooling, the first stage fans can be operated either continuously or intermittently to reduce the level of humidity and supply oxygen to the room.

Temperature and minimum ventilation speed curves

The controller can be set to automatically change the temperature set point and the minimum ventilation speed over a given period of time in accordance with the user's requirements by specifying a temperature curve and a minimum ventilation speed curve with up to six different points each.

Choice of ten motor types

The variation in motor speed resulting from a change in voltage will depend on the make and capacity of the motor. In order to achieve a high degree of compatibility between controller and motor, the user can choose from ten different motor types, thus ensuring that the correct voltages are supplied.

Humidity compensation

The stage 1 minimum speed can be adjusted automatically as a function of relative humidity. As humidity increases, the minimum speed of stage 1 fans increases proportionally to compensate for the change.

Full speed fan start up

In order to overcome the inertia of the ventilation system components and de-ice the fan blades in cold weather conditions, the controller supplies maximum voltage to the variable speed fans during the two seconds that immediately follow start-ups.

Four independent temperature probe inputs

Up to four temperature probes can be connected to the controller in order to obtain a more accurate reading of the average room temperature and a faster reaction time.

Overload and overvoltage protection

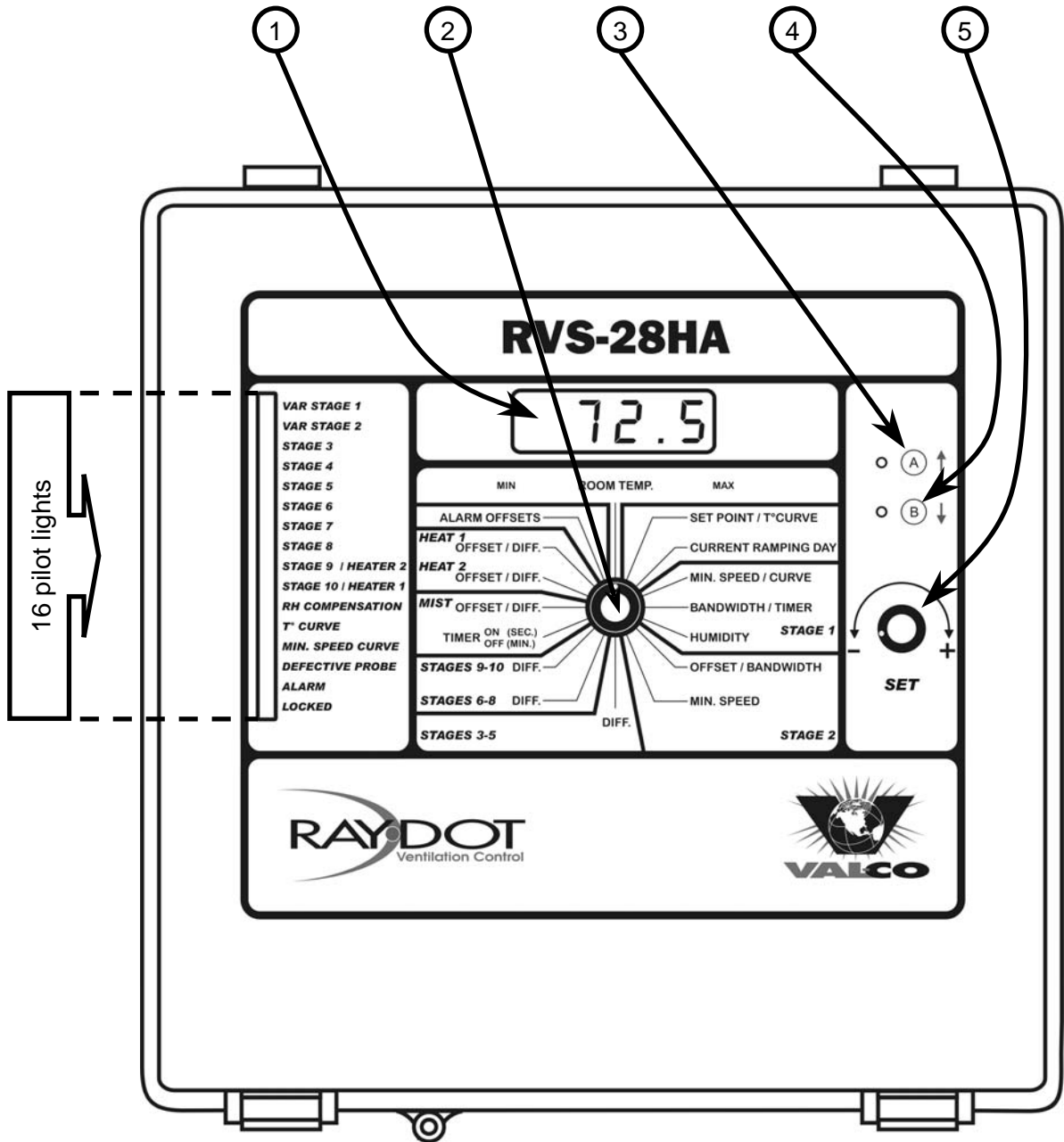
Inputs and outputs circuitry is protected against overload and overvoltage.

Test mode

A test mode allows the user to simulate temperature changes and verify controller performance.

CONTROL INTERFACE

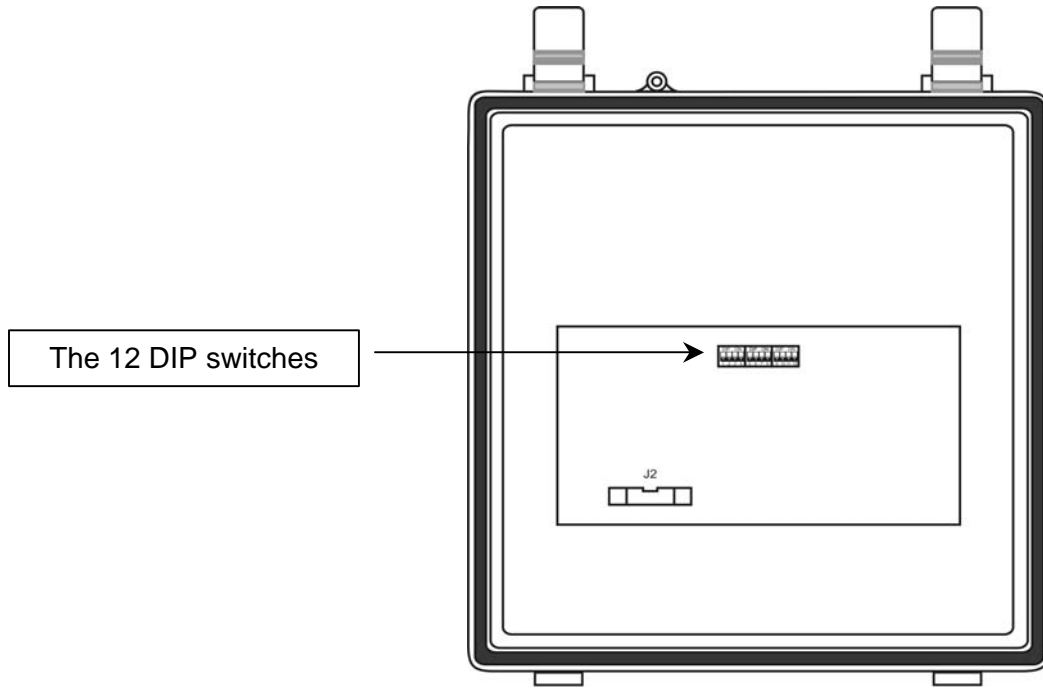
COVER



Item	Name	Function
①	Digital Display	Displays the value of the parameter selected.
②	Parameter selection knob	Used to select a parameter.
③	Push button A	Used to access sub-parameters.
④	Push button B	Used to access sub-parameters.
⑤	Adjustment knob	Used to adjust the value of the selected parameter and to access the TEST MODE (for an explanation on the test mode, see the footnote in the Factory Settings section).
16 pilot lights	Variable stage 1	Lights up when the fan variable stage 1 is activated.
	Variable stage 2	Lights up when the fan variable stage 2 is activated.
	Stage 3	Lights up when stage 3 is activated.
	Stage 4	Lights up when stage 4 is activated.
	Stage 5	Lights up when stage 5 is activated.
	Stage 6	Lights up when stage 6 is activated.
	Stage 7	Lights up when stage 7 is activated.
	Stage 8	Lights up when stage 8 is activated.
	Stage 9/heater 2	Lights up when stage 9 or heater 2 is activated.
	Stage 10/heater 1	Lights up when stage 10 or heater 1 is activated.
	RH compensation	Turns on when relative humidity is being compensated.
	Temperature curve	Is on when the temperature curve is activated.
	Minimum speed curve	Is on when the minimum speed curve (stage 1) is activated.
	Defective probe	Turns on when a probe is defective.
	Alarm	Lights up to signal an alarm.
	Locked	Is on when parameter settings are locked.

DIP SWITCHES

These internal switches, located on the electronic card attached to the back of the cover, are used to set the operating modes described in the table below. When the controller is shipped from the factory, all the switches are set to off.



DESCRIPTION	DIP SWITCH NO.	POSITION	OPERATING MODE
Locking the parameters	1	ON OFF	Locked parameters Unlocked parameters
Temperature units	2	ON OFF	° Celsius ° Fahrenheit
Probe 2	3	ON OFF	Enabled Disabled
Probe 3	4	ON OFF	Enabled Disabled
Probe 4	5	ON OFF	Enabled Disabled
Heating stages	6	ON OFF	Heating No heating
Number of heating stages	7	ON OFF	2 heating stages 1 heating stage
Zoned/cascading heating	8	ON OFF	Zoned heating Cascading heating
Mist	9	ON OFF	Mist on Mist off
Offset on ventilation stages	10	ON OFF	2°F (1.1°C) offset on ventilation stages No offset on ventilation stages
De-icing	11	ON OFF	Enabled Disabled
Reserved	12		Reserved

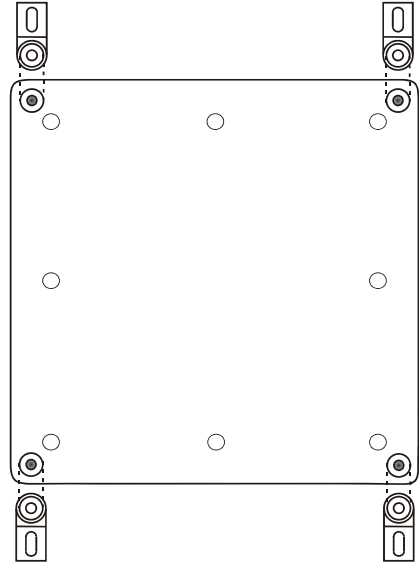
INSTALLATION

MOUNTING INSTRUCTIONS

The enclosure must be mounted in a location that will allow the cover to be completely opened right up against the wall.

Fasten the four brackets to the four mounting holes on the back of the enclosure, using the four screws provided with the brackets. Then mount the enclosure on the wall by inserting screws through the brackets' adjustment slots, into the wall. Make sure to position the enclosure so that the power supply cord extends out of the bottom section of the enclosure.

The bracket slots also serve to adjust the position of the controller. Once you have adjusted the controller position, tighten the four mounting screws.



CONNECTIONS

To connect the controller, refer to the wiring diagram enclosed with this installation manual.

1. Set the voltage switch to the appropriate line voltage.
2. Drill access holes on the bottom of the enclosure only. Do not drill holes on the side or the top of the enclosure.
3. It may be necessary to install a transformer on the heating stage in order to supply the appropriate voltage to the heating unit.

Alarm Connection

There are two types of alarms on the market. One type sets off when current is cut off at its input; the other sets off when current is supplied at its input. For the first type of alarm, use the NO terminal as shown on the wiring diagram. For an alarm of the second type, use the NC terminal.



ALL WIRING MUST BE DONE BY AN AUTHORIZED ELECTRICIAN AND MUST COMPLY WITH APPLICABLE CODES, LAWS AND REGULATIONS. BE SURE POWER IS OFF BEFORE DOING ANY WIRING TO AVOID ELECTRICAL SHOCKS AND EQUIPMENT DAMAGE.

MOTOR TYPES

The relationship between the voltage supplied to a motor and its operating speed is described by a motor type. This type varies with the make and capacity of the motor. The various motors available in the industry have been represented.

Select the appropriate type to ensure that the controller supplies the correct voltage to the stage 1 and 2 variable speed fan motors. The factory default selection is type number 10.

MOTOR TYPES				
TYPE NUMBER	BRAND NAME	MODEL	DIAMETER	VOLTAGE
1 to 8	Other	—	—	—
9	Val-Co	FW08W120MSA	8"	230 V
	Val-Co	FW10W130MSA	10"	
	Val-Co	PM12^140MPA	12"	
	Val-Co	PM16^140MPA	16"	
10	Val-Co	PM21^140MPA	21", 3 blades	230 V
	Val-Co	PM21^190LPA	21", 4 blades	
	Val-Co	PM24^210MPA	24"	
	Val-Co	PM36^280M*A	36"	

Selecting a Motor Type for Stage 1

In the motor types table above, locate the make and capacity of your stage 1 variable speed motors and note the corresponding type number (1 to 10).

1. Set the parameter selection knob to BANDWIDTH/TIMER (STAGE 1). The stage 1 bandwidth appears flashing on the display.
2. Press the push-button \uparrow . The message "tyP" appears on the display, alternating with the currently selected type number, which flashes.
3. Using the adjustment knob, adjust the type number to the desired value.
4. Return to the stage 1 bandwidth display by pressing push-button \downarrow until the message "bd" appears on the display, alternating with the bandwidth value, which flashes.

Selecting a Motor Type for Stage 2

Repeat the steps described for stage 1, this time setting the parameter selection knob to MIN. SPEED (STAGE 2).

TEMPERATURE UNITS

When changing the temperature units ($^{\circ}$ F and $^{\circ}$ C), the display will show "88888" to indicate that the control is rebooting with the new temperature unit. After changing the temperature unit, the user must reset all of the controls parameters.

TEMPERATURE PROBES

Connecting the Probes

The controller is supplied with one room probe connected to terminal # 1.



The probes operate at low voltage and are isolated from the supply. Be sure that probe cables remain isolated from all high voltage sources. In particular, do not route the probe cables through the same electrical conduits as other cables. Do not run probe cables next to other power cables. If crossing over other cables, cross at 90°. Connect the probe shield to the power supply ground terminal.

Switches are used to activate or deactivate the additional probes connected to the controller.

Activate each additional probe by setting the appropriate switch to on.

- Switch # 3 activates the probe connected to input # 2;
- Switch # 4 activates the probe connected to input # 3;
- Switch # 5 activates the probe connected to input # 4.

Extending the Probes

Each probe can be extended up to 500 feet (150 meters). To extend a probe:

1. Use a shielded cable of an outside diameter ranging between 0.245 and 0.260 in. (6.22 and 6.60 mm) to ensure the cable entry is liquid-tight. Cable size should not be under 18 AWG.
2. It is preferable to solder the cable joints (to ensure a proper contact between the two cables) and to solder the shields.

Installing the Room Probes

Locate the room probe connected to terminal # 1 in the center of zone A and the room probe connected to terminal # 2 in the center of zone B.

Installing the Humidity Probe

Install the humidity probe in the middle of the controlled area, where there is good airflow.

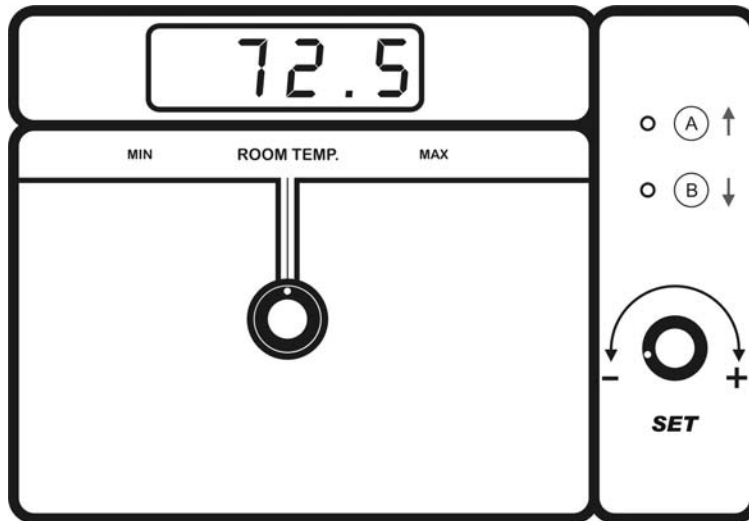
Defective Probes

Room Temperature Probes

If an activated probe is defective or missing, the defective probe pilot light turns on. The display shows the value of the temperature measured by the remaining room probe(s), and the controller operates according to this temperature. If all room probes are defective or missing, the screen will display “P Lo” when the parameter selection knob is set to ROOM TEMP., and the controller will operate according to the minimum ventilation cycle.

To identify the defective probe:

Set the selection knob to **ROOM TEMP.** The room temperature is displayed.



Press push-button A or B until the screen displays “Pr#” (Probe # [number]). If the probe connected to the corresponding terminal is not defective, the screen displays “Pr#” alternating with the temperature measured by the corresponding probe. Otherwise, the letter displays “Pr#” alternating with “Pr#Lo” or “Pr#Hi”.

Humidity Probe

If the humidity probe is defective or if there is no humidity probe, the defective probe pilot light does not turn on, but the display shows the letter “P Lo” or “P Hi” when the parameter selection knob is set to STAGE 1 HUMIDITY (refer to “Stage 1 Humidity Readout” in the User’s Guide).

TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
There is no display.	The circuit breaker on the service panel is off or tripped.	Reset the circuit breaker.
	The wiring is incorrect.	Correct the wiring.
	The input fuse is blown.	Replace the fuse.
	The voltage selector switch is in the wrong position.	Set the switch to the correct position.
	The display board interconnect cable is not properly plugged into the power supply board.	Be sure the cable is firmly plugged in.
The display shows "P Lo" or "P Hi" when the parameter selection knob is set to ROOM TEMP.	All activated probes are improperly connected.	Make the correct room probe connection.
	All activated probes are defective.	Refer to "Defective Probes".
The defective probe pilot light is on.	One or more probes are defective.	Refer to "Defective Probes".
The display shows sudden variations in the room temperature.	A variation in resistance is induced on a probe.	Be sure the probes are dry. Locate them away from drafts and sources of radiant heating.
	There is electrical noise near a probe cable.	Isolate the probe cables from all high voltage sources. Do not route probe cables and other power cables through the same electrical knockout. Do not run probe cables next to other power cables. When crossing other power cables, cross at 90°.
The stage 1 or 2 variable speed fan is not running.	The wiring is incorrect.	Be sure that each variable fan stage is properly connected to the corresponding VARIABLE STG1 & STG2 terminals. Each fan stage requires two wires to be connected.
	The stage's fuse is blown.	Replace the fuse.
	The minimum speed is too low.	Adjust the minimum speed to a higher value.
	The fan motor is defective.	Check if the motor is defective by connecting it to an alternate power supply. If it still is not operating, replace the motor.

PROBLEM	CAUSE	SOLUTION
The stage 1 or 2 variable speed fan runs continuously at full speed.	The wiring is incorrect.	Correct the wiring.
	The ambient temperature is above the set point + bandwidth.	Adjust the set point or bandwidth to the desired value.
The stage 1 or 2 variable speed fan runs erratically.	The selected motor type is inappropriate	Select an appropriate motor type. Refer to "Motor Types".
	The bandwidth is too small.	Adjust the bandwidth to a higher value.
	The stage 1 on time or off time is too short.	Adjust the stage 1 on time or off time to a higher value.
	A variation in resistance induced on a room probe causes this probe to measure sudden variations in the room temperature.	Be sure the room probes are dry. Locate them away from drafts and sources of radiant heating.
	Electrical noise near a room probe cable causes this probe to measure sudden variations in the room temperature.	Isolate the room probe cables from all high voltage sources. Do not route probe cables and other power cables through the same electrical knockout. Do not run probe cables next to other power cables. When crossing other cables, cross at 90°.
The stage 1 variable speed fan runs continuously when the room temperature is below the room set point or when the controller is operating in minimum ventilation cycle.	The stage 1 off time is set to zero.	Set the stage 1 off time to a value other than zero.
	The wiring is incorrect.	Be sure that two wires connect the stage 1 fan to the corresponding VARIABLE STG1 terminal.
	Humidity compensation is activated and relative humidity exceeds the humidity set point.	Adjust the humidity set point or deactivate compensation, as required.
Stage 3, 4, 5, 6 or 7 (fans); stage 8 (fan or mist); or stage 9 or 10 (fan, heater or mist) is not functioning properly.	The wiring is incorrect.	Be sure that two wires connect each stage to the corresponding terminal.
	The fan motor, heater or mist is defective.	Check if the motor, heater or mist is defective by connecting it to an alternate power supply. If it still is not operating, replace the motor or heater.
	The controller is defective.	Listen to check if there is a clicking sound when the stage or heater-mist pilot light turns on. If there is no clicking sound, your controller needs repair.
The mist is not operating as desired.	The mist on time and off time were incorrectly adjusted.	The mist on time is in seconds, and its off time is in <u>minutes</u> . Adjust the mist on time and off time correctly.

PROBLEM	CAUSE	SOLUTION
The alarm doesn't work properly.	The alarm's fuse is blown.	Replace the fuse.
	The wiring is incorrect.	Correct the wiring. Refer to "Alarm Connection".
	The alarm is defective.	Verify if the alarm unit is defective by connecting it to an alternate power supply. Replace the alarm unit if it still is not operating.
	The controller is defective.	Listen to check if there is a clicking sound when the alarm pilot light turns on. If there is not clicking sound, contact your distributor to have the controller repaired.

TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE
Input power	10 W
Power source (line)	115/230 VAC, -20%, +10%, 50/60 Hz
Power fuse	0.125 A @ 250 V, slow blow, 5 X 20 mm
Stages 3 to 10	10 A @ 125/250 VAC 1 HP @ 250 VAC ½ HP @ 125 VAC
Stage 1 and stage 2	10 A @ 115/230 VAC Minimal charge: 25 mA @ 50/60 Hz
Alarm relay	1 A @ 30 VDC
Stage 1 and stage 2 power source (line 1 and line 2)	115/230 VAC, -20%, +10%, 50/60 Hz (same as line power)
Stage 1 and stage 2 fuse	15 A @ 250 VAC, slow blow
Storage temperature	-4°F to 130°F (-20°C to 55°C)
Operating temperature	32°F to 120°F (0°C to 50°C)
Temperature range – inside probes	-6°F to 168°F (-21°C to 76°C)
Weight	7.8 lbs. (3.54 kg)
Dimensions	13" X 13" X 6" (33 X 33 X 15.24 cm)

FACTORY SETTINGS

	Position	Parameter A↑ B↓	Factory Setting	Range of Values	
ROOM TEMP.	ROOM TEMP. MIN./MAX.	Room Temp. Readout	—	-6.0 to 168.6°F (-21.1 to 75.9°C)	
		Lo	—		
		Hi	—		
		Probe 1 Readout	—		
		Probe 1 Lo	—		
		Probe 1 Hi	—		
		Probe 2 Readout	—		
		Probe 2 Lo	—		
		Probe 2 Hi	—		
		Probe 3 Readout	—		
		Probe 3 Lo	—		
		Probe 3 Hi	—		
		Probe 4 Readout	—		
		Probe 4 Lo	—		
		Probe 4 Hi	—		
Test Mode*	OFF				
SET POINT	SET POINT/ T°CURVE	Set Point	75.0°F (24.0°C)	-40.0 to 100.0°F (-40.0 to 40.0°C)	
		Adjust Day	—	1 to 255	
		Adjust Temperature	—	-40.0 to 100.0°F (-40.0 to 40.0°C)	
	CURRENT RAMPING DAY	Current Day	OFF	OFF, 1 to 255	
		Adjust Current Day	OFF		
STAGE 1	MIN. SPEED/ CURVE	Minimum Speed	40	10 to 100%	
		Adjust Day	—	OFF, 1 to 255	
		Adjust Minimum Speed	—	10 to 100%	
	BANDWIDTH/ TIMER	Bandwidth	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 11.0°C)	
		Min. Ventilation On Time	15	0 to 900 seconds	
		Min. Ventilation Off Time	0		
		Motor Type	10	1 to 10	
	HUMIDITY	Readout	—	10 to 90 RH%	
		Lo	—		
		Hi	—		
		R.H. Speed Compensation	50	0 to 100%	
		Humidity Set Point	65	10 to 90 RH%	
Compensation Option	OFF	ON/OFF			

* The **Test Mode** simulates a temperature reading, allowing the user to test the control's reaction at a given temperature.

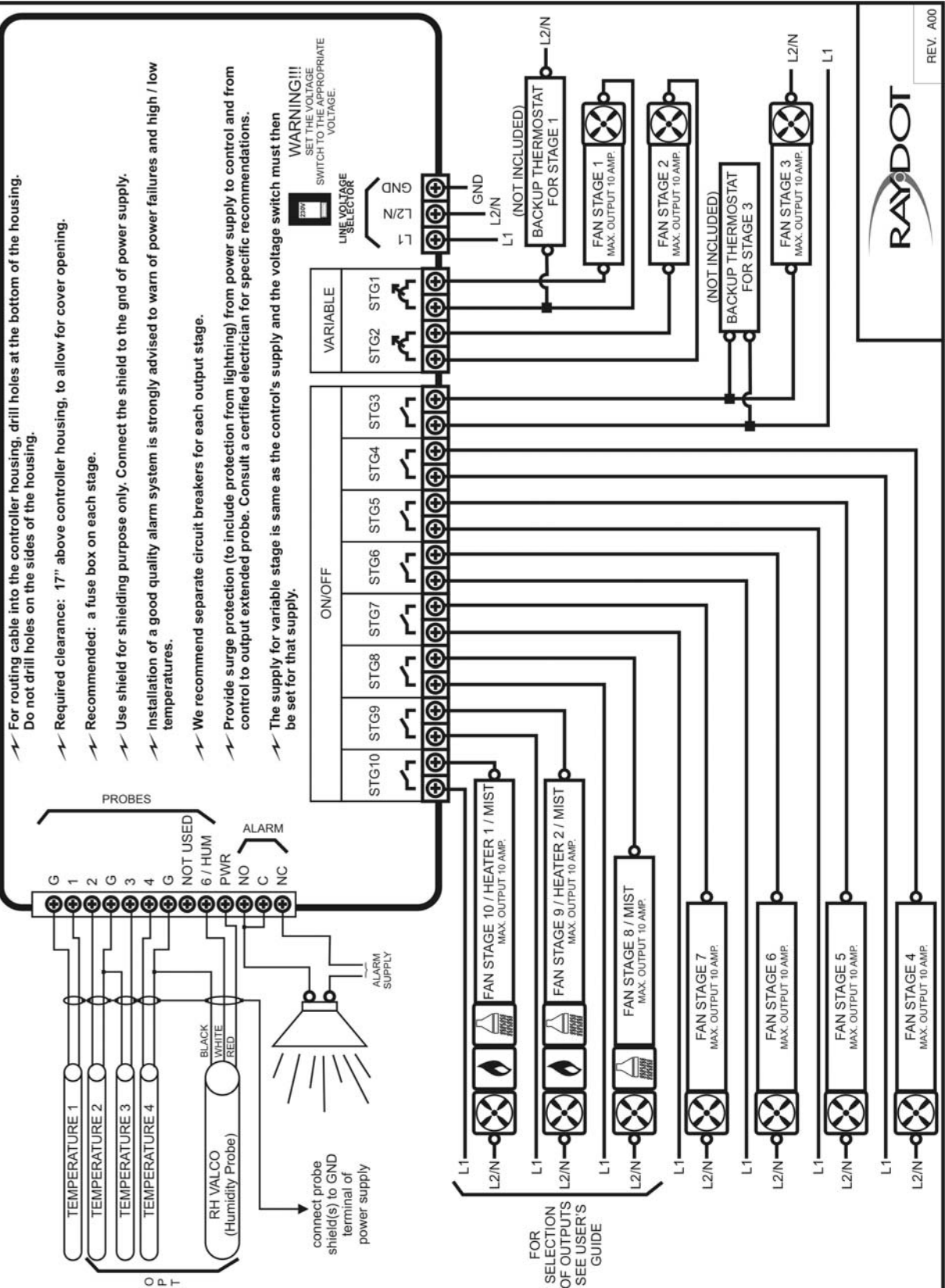
To access the **Test Mode**, the user must position the parameter selection knob to ROOM TEMP. and press push-button A or B until "tEst" appears alternating with "OFF" on the display. To activate the **Test Mode**, the user must turn the SET knob back and forth; "tEst" will briefly appear on the display, followed by the default simulation temperature. Using the SET knob, the user may modify this default simulation value – which is the ROOM TEMP. – by 0.1° increments, and specify any temperature ranging from -6.0°F to 168.6°F (-21.1°C to 75.9°C).

To deactivate the **Test Mode**, the user must move the SET knob back and forth; "tEst" will appear alternating with "OFF" on the display. Or, if the user does not turn a knob or a push a button for five minutes, the control will deactivate the **Test Mode** automatically.

	Position	Parameter A↑ B↓	Factory Setting	Range of Values
STAGE 2	OFFSET/ BANDWIDTH	Offset	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 11.0°C)
		Bandwidth		
	MIN. SPEED	Minimum Speed	40	10 to 100%
		De-icing Cycle Time	1	1 to 720 minutes
		De-icing On Time	0	0 to 900 seconds
	Motor Type	10	1 to 10	
STAGES 3-5	DIFF. 3-5	Stage 3 Differential	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 11.0°C)
		Stage 4 Differential	2.0°F (1.0°C)	
		Stage 5 Differential	2.0°F (1.0°C)	
STAGES 6-8	DIFF. 6-8	Stage 6 Differential	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 11.0°C)
		Stage 7 Differential	2.0°F (1.0°C)	
		Stage 8 Differential	2.0°F (1.0°C)	
STAGES 9-10	DIFF. 9-10	Stage 9 Differential	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 11.0°C)
		Stage 10 Differential	2.0°F (1.0°C)	
MIST	TIMER ON (SEC.)	On Time	60	0 to 900 seconds
	TIMER OFF (MIN.)	Off Time	6	0 to 20 minutes
	OFFSET/DIFF.	Offset	8.0°F (7.0°C)	0.5 to 20.0°F (0.3 to 11.0°C)
		Differential	2.0°F (1.0°C)	
		Humidity Turn Off	75	40 to 90 RH%, OFF
HEAT 2	OFFSET/DIFF.	Offset	3.0°F (3.0°C)	-10.0 to 20.0°F (-5.5 to 11.0°C)
		Differential	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 20.0°C)
		Max. Diff. Prot. Bet. Zones	7.5°F (4.0°C)	5.0 to 40.0°F (0.3 to 20.0°C), OFF
HEAT 1	OFFSET/DIFF.	Offset	3.0°F (3.0°C)	-10.0 to 20.0°F (-5.5 to 11.0°C)
		Differential	2.0°F (1.0°C)	0.5 to 20.0°F (0.3 to 20.0°C)
ALARM	OFFSETS/ CRITICAL	Low Offset	10.0°F (6.0°C)	0.5 to 40.0°F (0.3 to 20.0°C)
		High Offset	12.0°F (7.0°C)	0.5 to 40.0°F (0.3 to 22.0°C)
		Critical High Alarm	95.0°F (30.0°C)	-40.0 to 120.0°F (-40.0 to 50.0°C)
		Alarm Individual/All	ind.	ind./ALL

WIRING DIAGRAM

WIRING DIAGRAM RVS-28HA



- ⚡ For routing cable into the controller housing, drill holes at the bottom of the housing. Do not drill holes on the sides of the housing.
- ⚡ Required clearance: 17" above controller housing, to allow for cover opening.
- ⚡ Recommended: a fuse box on each stage.
- ⚡ Use shield for shielding purpose only. Connect the shield to the gnd of power supply.
- ⚡ Installation of a good quality alarm system is strongly advised to warn of power failures and high / low temperatures.
- ⚡ We recommend separate circuit breakers for each output stage.
- ⚡ Provide surge protection (to include protection from lightning) from power supply to control and from control to output extended probe. Consult a certified electrician for specific recommendations.
- ⚡ The supply for variable stage is same as the control's supply and the voltage switch must then be set for that supply.

