ROTEM
COMPUTERIZED CONTROLLERS

REC-8R
Environmental Control

Operation and Installation Manual

Warning: Rotem products are designed and manufactured to provide reliable operation. Strict tests and quality control procedures are applied to every product.

However, there is the possibility that something may fail beyond our control. Since these products are designed to operate climate control and other systems in confined livestock environments, where failure may cause severe damage, the user should provide adequate back up and alarm systems. These are to operate critical systems even in case of a Rotem system failure. Neglecting to provide such back up will be regarded as the user's willingness to accept the risk of loss, injury and financial damage.

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Features

- Multiple Stainless Steel Temperature Sensors
- Optional Humidity Sensor
- Four Digit Display
- Easy to Use Operator Control Panel with Four Digit Display
- Water and Dust Tight Enclosure
- Special Programs such as Fresh Air Treatment

Basic Operating Principles

The Environment Control **REC-8R** measures inside and outside temperatures with one or two inside-the-barn temperature sensors. It also uses an optional inside humidity sensor and outside temperature sensor. By activating fans, heaters and cooling systems, it brings the conditions inside the barn to pre-set parameters. These are target temperature and requested humidity.

Target temperature is the most important parameter. It is a set point determined by you, the user. Heaters, fans, cooling system and alarm are set as independent differentials above or below target temperature. When you change the target temperature, the **REC-8R** automatically adjusts the other levels. Since the differentials are independent, you can use the outputs in various ways, as explained later.

Requested humidity and the optional humidity sensor are important for three main reasons:

1. If the humidity is exceptionally high, the **REC-8R** will keep the cooling system off. Foggers, misters and cooling pads are not effective in extremely high humidity.
2. If the humidity is high, the **REC-8R** will periodically increase the ventilation level to bring in fresh air. The fresh outside air will be drier than the inside air due to transpiration by the birds. Cooler outside air dries out when it warms to inside temperatures, reducing humidity.
3. Ammonia levels correlate with humidity levels. When the **REC-8R** adjusts ventilation for humidity, it is also improving the ammonia condition.

Operation Summary

1 ***Display, Edit Front Panel Item***

- Press Select repeatedly until the LED indicator beside the desired item illuminates.
- Note that you cannot edit sensor values, such as temperature or humidity readings, except with the calibration procedure.
- The LED indicator for items you can edit, such as target temperature, will flash.
- The standard display of Inside Temperature returns after a short while. To extend the viewing period, press one of the arrow keys.
- To edit, press the Program key. Then, use UP or DOWN arrow keys.
- Press Select to continue.

3 ***View or Set Clock***

- Select standard display (Inside Temperature).
- Press and hold UP arrow key.
- While holding UP arrow key, press Program key.
- To set clock, press Program key again, or Select to continue with other items..
- Use UP and DOWN arrow keys to change hours.
- Press Select, then UP and DOWN arrow keys to change minutes.

4 ***View or Set Growth Day***

- Select standard display (Inside Temperature).
- Press and hold DOWN arrow key.
- While holding DOWN arrow key, press Program key.
- To change growth day, press Program key again.

Use UP and DOWN arrow keys to change the growth day.

5 ***Calibrate Sensors And Clear Failed Sensor Alarm***

- Select standard display (Inside Temperature).
- Press and hold UP arrow key. While holding UP arrow key, press and hold Select key.
- Sensor 1 appears in display. To edit or clear a sensor 1 alarm, press the Program key.
- Use the UP and DOWN arrow keys to set the sensor to the correct reading.

Press Select to continue.

6 ***View or Edit System Variables***

- Select standard display (Inside Temperature).
- Press and hold Both arrow keys for about 2 or 3 seconds.
- System Variable A appears in display.
- **Warning**: Refer to your manual and review the meaning and use of each system variable, before changing it.
- Press Program to change it, then use the UP and DOWN arrow keys.
- Press Select to continue with the next system variable.

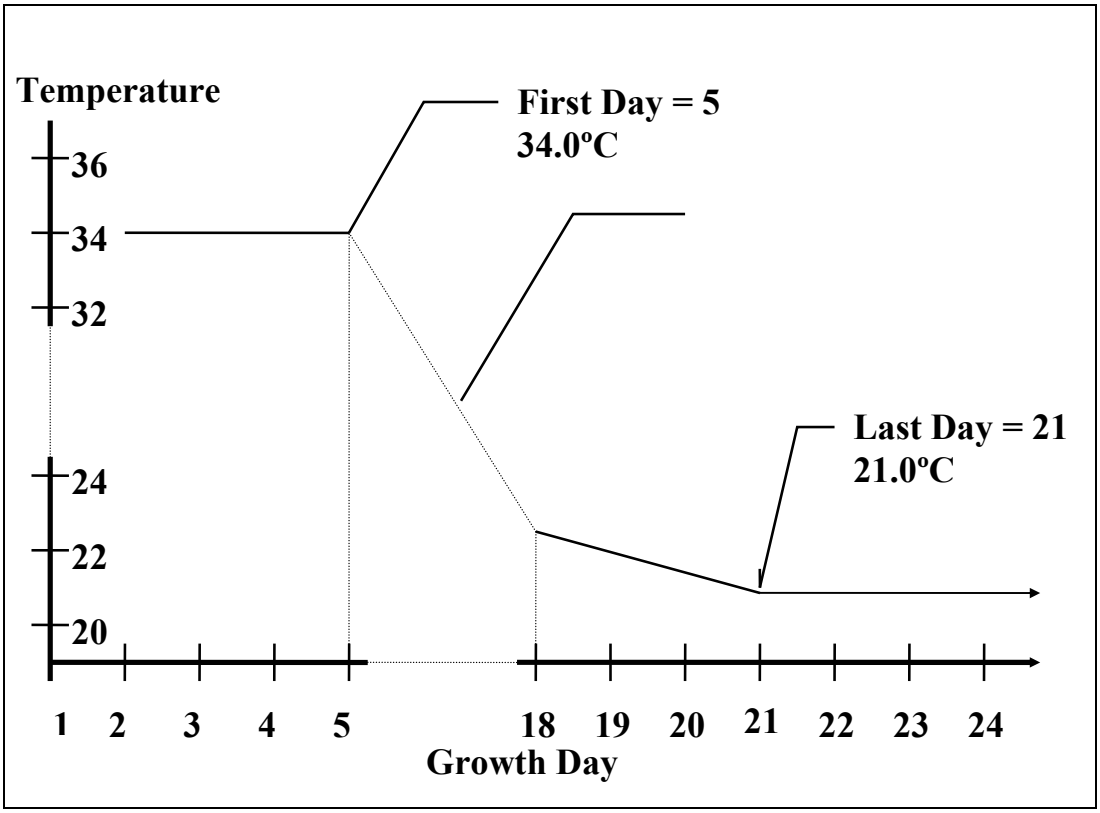
7 ***Clear Alarm Relay***

- If a serious alarm occurs, the REC-8R activates the alarm relay, which generally turns on an alarm siren or bell.
- The alarm siren or bell may be distracting if you are working on the problem.
- Simply press the Select key to turn off the alarm relay. The alarm will still flash in the display.
- If a new alarm occurs, the relay will activate again.

Target Temperature Setting

The REC-8R has an automatic temperature adjustment feature. This permits you to set the target temperatures for the entire flock growth period, and let the **REC-8R** adjust the temperatures for you each day.

Figure 1



Automatic Temperature Adjustment

As shown in Figure 1, Target Temperature is constant up to the first day of automatic temperature adjustment. The **REC-8R** then automatically adjusts the temperature each day up to the last day of automatic adjustment. In Figure 1, the first day is 5 (F.dAY = 5), and target temperature is 34.0ºC. As long as the growth day is less than or equal to five, the **REC-8R** keeps a target temperature of 34.0ºC. Last day is set to 21 (L.dAY = 21) with target temperature at 21.0ºC. From growth day 21 and on the target temperature will be 21.0ºC. (These numbers are an example only; your settings may be different.)

Detailed Description of Outputs

Each of the eight outputs has a corresponding indicator in the row at the top of the control. The **REC-8R** turns these on whenever the output is active. In order to set parameters for each output, first follow the Procedure to Adjust Output Parameters. Refer to the individual sections on each particular output for further details.

Procedure to Adjust Output Parameters

1. Press and hold the Select key until the heater indicator (top left in the form of a flame) blinks.
2. Repeatedly press the Select key until the indicator for the output you wish to adjust blinks. If you pass it, you will need to start again.
3. Press the Program key. The first parameter will flash alternately with its name. Use the Up Arrow and Down Arrow keys to edit the value.
4. If there are more parameters, you must press the Program key to access them. Once you have pressed the Program key, the Select key will advance through all the parameters for this output, before going on to the next output.
5. Press the Select key to go to the next parameter or output. After the last output, or last parameter of the Alarm output, pressing on the Select key returns you to the standard display.
6. If you forget to finish editing with the Select key, the **REC-8R** automatically returns to the standard display after a short delay.

Heater 1 and 2 Outputs:

The heater outputs operate at a differential below target temperature. This automatically adjusts the heater set point. Besides the differential, you may adjust the hysteresis level for the heater output. Finally, you may choose to have the variable speed fan stop, or allow it to run at the minimum setting, when the heaters are on. The following diagram illustrates the relationship between target temperature, differential, and hysteresis for the heater output. The other outputs have similar parameters.

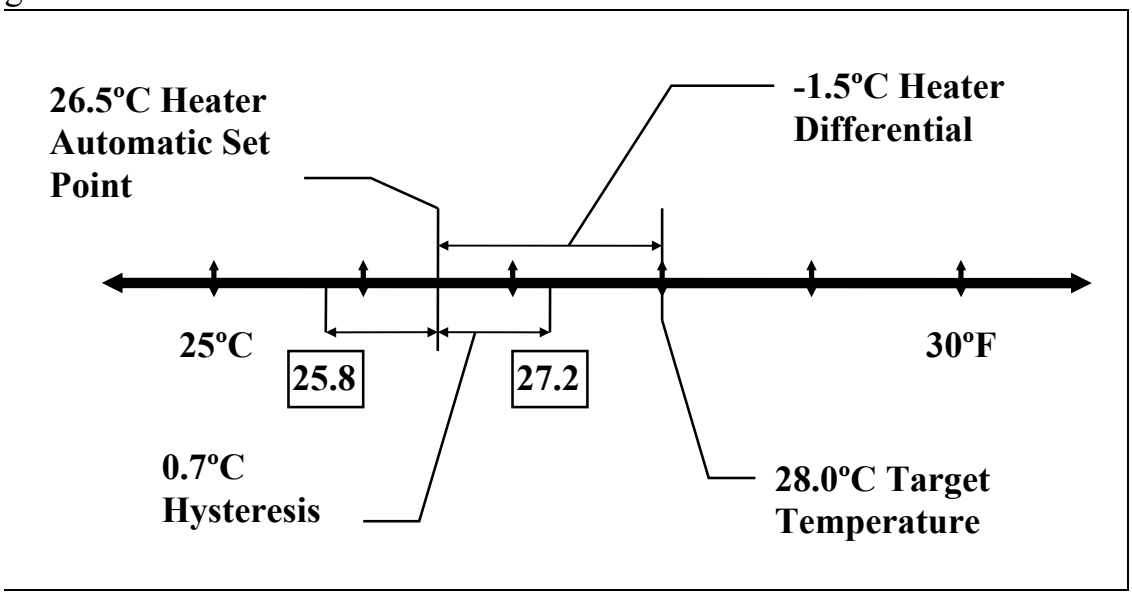
The “Sens” option is to determine which sensors will activate heater 1 and which will activate heater 2.

The “Sens” appears after “Diff” in “Heaters” (Press “Prog”. to enter the “Heaters” and “Select” to switch to “sens.”

The options are 1,2,3 for a certain sensor or 12,13,23,123 for an average between the chosen sensors (12 is the average between sensor 1 and 2 etc.)

Default: 1 for heater 1 and 2 for heater 2.

Figure 2



Target Temperature, Heater Differential and Hysteresis

For this example the target temperature is at 28.0ºC. The heater differential is -1.5ºC, which places the heater set point automatically at 26.5ºC. The grower set the heater hysteresis (system variable C) at 0.7ºC.

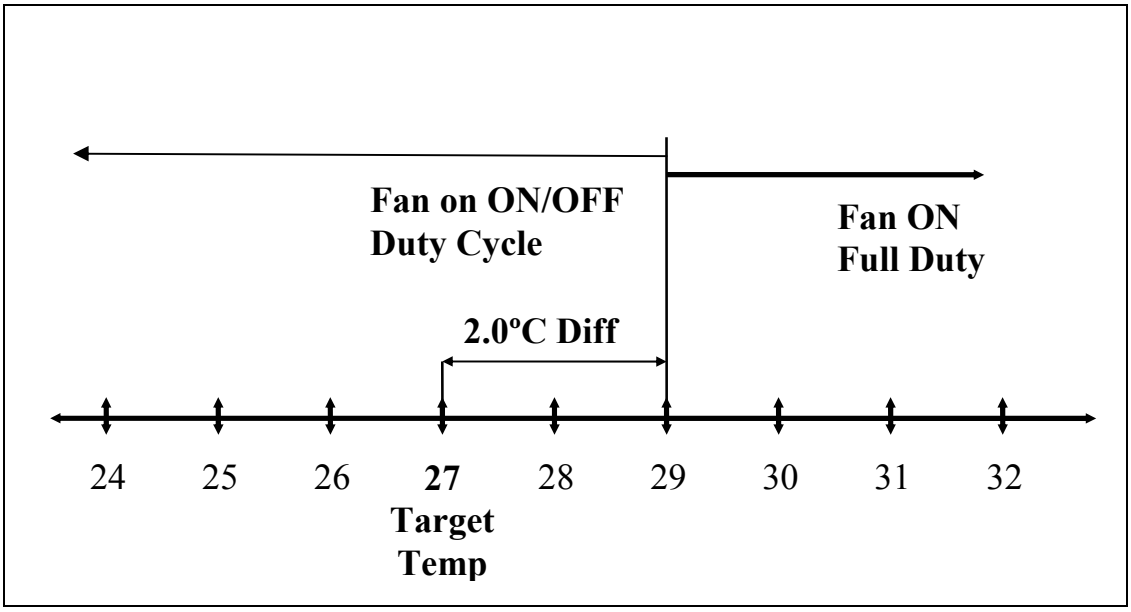
The hysteresis level is a second type of differential about the heater set point. The heater first turns on at the lower hysteresis point or 25.8ºC, then stays on until the temperature climbs to the upper hysteresis point or 27.2ºC. Between these points the heater can be on or off, depending on the **REC-8R**. Below the lower hysteresis point the heater must be on, above the upper point the heater must be off.

Fan 1, 2, 3, 4, 5, 6, 7

The fan 1 and 2 output is for ON/OFF cycle. The various settings, including the ON/OFF duty cycle settings for fan 1 and 2 are under the Fan icons on the front panel of the **REC-8R**. In case that ON=0 and OFF=0 the fans will operate as regular fan without the ON/OFF cycles (like fans 3,4 and 5). Fans 3, 4,5,6,7 do not have duty cycle parameters. However, Fan 5 is under the alarm icon ***if*** you have selected the fan option in lieu of the alarm option as explained in **system parameters** below.
Fan 6 is under the Heater 1 icon ***if*** you have selected the fan option in lieu of the Heater 1 option as explained in **system parameters** below.
Fan 7 is under the Heater 2 icon ***if*** you have selected the fan option in lieu of the Heater 1 option as explained in **system parameters** below.

If ***system parameter J*** = 1 than the controller will operate only one fan at a time. This mode is suitable for autotransformer used.
The "Sens" option is to determine which sensors will activate Fan 1 and the rest of the fans and the Cooling will operate accordingly.
The "Sens" appears after "Diff" in "Fans" (Press "Prog." to enter "Fans" and select to switch to "Sens"
The options are 1,2,3 for a certain sensor or 12,13, 23,123 for an average between the chosen sensors.
Default: 12

Figure 3, Fan 1 and 2 Operation



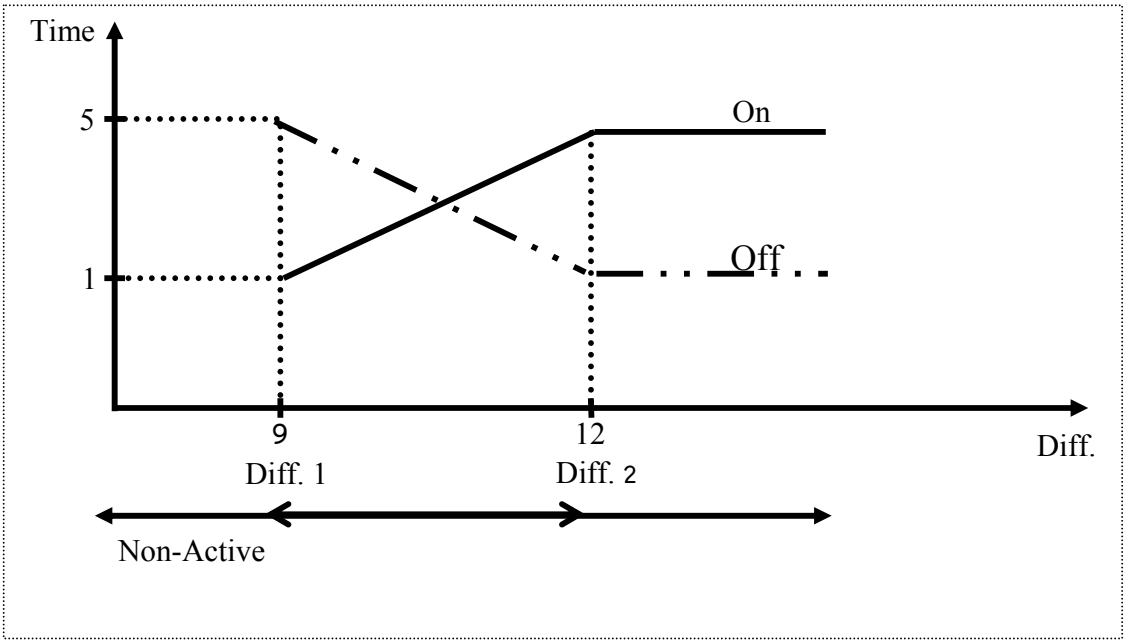
Fresh Air/Humidity Treatment

The Fresh Air/Humidity Treatment feature turns on one additional fan, unless all the fans are running for a programmable amount of time. It performs this function whenever the humidity is higher than the target humidity for more than a preset time. Program these items in the system variable section.
The humidity treatment is operating down to Heater 1 temperature even if Fan 6 is using instead of Heater 1.

Note: If there is no humidity sensor in use than it's possible to have fresh air treatment by changing the requested humidity to 0. This will turns on one additional fan for a programmable amount of time (programmed by hidden parameters E and F. (The default is every 5 minute to 1 minute)

Cooling

The cool output has an independent differential with respect to target temperature, a cycle timer and a relative humidity setting. If the humidity level is above the relative humidity setting, the cooling system will not operate.



Cooling is now dynamic and has 2 diffs and 2 on/off times.

- Below dif 1 the cooling does not operate.
- From dif 1 to dif 2 the cooling will operate according to a curve.
- Above dif 2 will operate according to dif 2.

Minimum on and off time is 0.1minute (6 sec.) if operation is in cycle. Dif 1 will always be smaller then dif 2.

Default: Diff 1- 9.0 On 1- 1.0 Off 1- 5.0
Diff 2 - 12.0 On 2 - 5.0 Off 2- 1.0
Rh - 85

Example: Target is 70 and the temperature is 90.
The On time will be 2:20min. and the Off time 3:20min. according to the curve.

Alarm

The alarm output has two differentials, one for low temperatures and one for high temperatures. If the measured temperature goes below the low differential, or above the high differential from set point, the alarm output activates. The alarm output also activates if power fails, or if both temperature sensor 1 and sensor 2 fail. The display, however, flashes under any failure condition. Refer to the following alarm table.

Alarm Table

Condition	Alarm Relay	Display
Power Failure	Active	Off
High or Low Temperature Alarm	Active	Flashing
Both Sensor 1 and 2 Failed	Active	Flashing
One or more Sensors bad, but at least one of Sensor 1 or 2 Good	Inactive	Flashing
All normal	Inactive	Steady

Clearing Alarms

1. To clear only the alarm relay for an active alarm, press the Select key. The alarm relay will inactivate, but the display will continue to flash. If a new major alarm occurs, the alarm relay will activate again. This feature enables you to work on the problem without distraction by loud alarm sirens or bells.
2. To turn off the flashing display for a failed or removed sensor, use the calibration procedure. When you press the Program key at step 4 of the calibration procedure, the **REC-8R** will remove the sensor from the alarm list. You do not need to use the arrow keys to adjust the value in this case; simply leave the value at zero.

Calibration Procedure

1. Start with the display on Inside Temperature. Press the Select key repeatedly if needed until inside temperature is in the display.
2. Press and hold the up arrow key, then also press and hold the Select key until the Sensor 1 temperature reading blinks alternately with '-1-' in the display. This requires holding both keys for about 2 seconds. (Note, that if your finger slips off the up arrow key, the heater icon in the top row will begin to blink. If this happens, simply press Select several times until no icons are blinking in the top row and start again.)
3. Repeatedly press Select until the sensor you wish to calibrate appears in the display. The temperature sensors are numbered 1, 2 and 3. The humidity sensor is labeled 'rh'.
4. Press the Program key. 'Prog' appears momentarily in the display. Use the arrow keys to adjust the value to the correct value. Ensure you have used an accurate sensor for your calibration standard, and that it is at the same temperature or relative humidity as the sensor to be calibrated.

Manual Operation

1. To operate any output manually, set system variable I to a value other than 0. Any value from 1 to 98 automatically sets a safety timer of ten minutes, after which the **REC-8R** returns to automatic operation. If you set variable I to 99, then the **REC-8R** remains in manual operation until you change variable I.
2. Press and hold Select until the heater 1 icon blinks. Press Select repeatedly until you reach the output you wish to control manually.
3. Press PROG, and then the UP and DOWN arrow keys to turn the output on and off.

System Variables

System Variable Table

Variable	Default Value	Description
C.F	Fahrenheit	0 => Celsius, 1 => Fahrenheit
F.HyS	1ºF, 0.5ºC	Fan Hysteresis
H.Hys	1ºF, 0.5ºC	Heater Hysteresis
rh.hy	2%	Humidity Hysteresis
rh.on	1.0 Minutes	Humidity Treatment Duration
rh.dl	5.0 Minutes	Humidity Treatment Delay
AL.F5	ALr (alarm)	Relay 8 Setting: ALr - Alarm FAn5 – Fan 5
t.dLy	2 Sec	Stage Autotransformer Delay while parameter F.OP=1
r.OP	0 (Auto)	Auto/Manual Relay Operation 0 – Auto, 1 – Manual for 10 minute
F.OP	0 (Normal)	Fans Operation Mode 0-Normal 1- Suitable for Autotransformer.
H1.F6	HEA1 (Heater 1)	Relay 1 Setting: HEA1 - Heater 1 Fan6 - Fan 6
H2.F7	HEA2 (Heater 2)	Relay 2 Setting: HEA2 - Heater 2 Fan7 - Fan 7
HOUS	0	House number
bAUd	9600	Communication Baud rate
PASS	0	Password
HIS	1 (Hour)	Data logging interval time. (1,2,3,4,6,8,12,24 Hours)

Checking current version of Software

In order to check what is the current version of software installed, press Program and Select simultaneously, while the unit displays the inside temperature.
The display will show the version with 3 or 4 digit, for example 297 is version February 1997.
To return to the main display, press Select again.

Communication

In order to communicate via a remote P.C., using Windows environment RotemNet communication software (3.11, windows 95,98,2000), do the following:

1. Install the Rotem-Net Communication Program under windows.

2. Connect the REC-8R Communication port to the PC with supplied cables according to one of the two following options:

a. If the REC-8R controller is situated at less then 8 meters from the PC, than you can connect the REC-8R directly to the P.C. (to the RS232 serial port free COM) and set the jumpers on the controller power board, to DIR.

b. If the REC-8R controller is situated at more then 8 meters from the PC, you need to use Rotem Mux-2 box for communication.
The MUX-2 should be installed near the P.C. and the REC-8R jumpers should be set to MUX.

3. After having set all the hardware connections, please enter the house communication number (HOUS), and the baud rate (bAUd) and start the communication software and set the same baud rate in the local setting.

Factory Default Settings

To restore factory default settings perform a 'cold start':

1. Remove power from the **REC-8R.**
2. Press and hold the Select key and both Arrow keys.
3. While holding the three keys, restore power.
4. The **REC-8R** will restore the following settings.

Factory Settings

Item	Value
Target Temperature	80ºF, 26.6ºC
Requested Humidity	55%
Growth Day	1
Time	no change
Heater 1 Differential	-1.0ºF, -0.5ºC
Heater 2 Differential	-4.0ºF, -2.0ºC
Fan 1 Differential	0.0ºF, 0.0ºC
Fan 1 ON Time	1.0 Minutes
Fan 1 OFF Timer	1.0 Minutes
Fan 2 Differential	3.0ºF, 1.6ºC
Fan 2 ON Time	0 Minutes
Fan 2 OFF Timer	0 Minutes
Fan 3 differential	4.0ºF, 2.2ºC
Fan 4 Differential	5.0ºF, 2.7ºC
Fan 5 Differential	6.0ºF, 3.3ºC
Fan 6 Differential	7.0ºF, 3.9ºC
Fan 7 Differential	8.0ºF, 4.4ºC
Cooling Differential	9.0ºF, 5.0ºC
Cooling ON Time	1.0 Minutes
Cooling OFF Time	5.0 Minutes
Humidity Limit for Cooling	85%
Alarm High Differential	7.0ºF, 3.0ºC
Alarm Low Differential	-5.0ºF, -2.0ºC
System Variable A	1
System Variable B	1.0ºF, 0.5ºC
System Variable C	1.0ºF, 0.5ºC
System Variable D	2.0%
System Variable E	1.0 Minutes
System Variable F	5.0 Minutes
System Variables G through n	0

Installation

An authorized electrician must install the REC-8R. Power must be disconnected to avoid electrical shock and damage.

To avoid exposing the **REC-8R** to harmful gases or high humidity, it is recommended to install it in the service room**.**

Installation Category (Over voltage Category) III

5 Amps should protect the power supply to the controller
Circuit breaker

1. Open the enclosure lid by unfastening the two screws to the left-hand side in the front.
2. Mount the **REC-8R** on the wall, using the 4 supplied screws through the mounting holes. (FIG 2)
3. Place the required cables through the cable holders at the bottom of the unit. Connect the wires according to the wiring diagrams:

3.1. Fig. 3 for Single-phase 110 volt fans, USA and Canada Only.
3.2. Fig. 4 for Two-phase 230 volt fans, USA and Canada Only.
3.3. Fig. 5 for Single-phase 240 volt fans, outside the USA and Canada.

4. To connect temperature and humidity sensors use shielded two or four conductor #18-#24 gauges cable. Connect the shields to the Ground terminal. Do not connect the shields at more than one point, or you may induce ground loop currents. Connect the red power supply wire of the humidity sensor to the VC terminal on the COMMUNICATION terminal block.
5. Close the **REC-8R** enclosure lid carefully and tightly. Use RTV silicon or equivalent sealant to seal the cable holders.
6. After installation is completed, operate the **REC-8R** for a few hours and re- check for proper operation.

Specifications

Input Voltage Supply:
Single-phase 110 VAC (USA & CANADA).
Two phase 230 VAC (USA & CANADA).
Single phase 240 VAC (Outside the US & CANADA).
0.315 Amp, 50 - 60 Hz
Heaters, Fans, and Cooling:
5 Amp. Normally Open Relays.
Alarm Output:
NO and NC Pilot Duty
Operating Temperature Range:
-10 to 50 C° (14 to 125 F°)
Enclosure:
Water and dust tight. (IP55)
Fuses:
Main Fuse: 0.315 Amp Slow
Secondary Fuse: 1.25 Amp Slow.
Relays Fuse: 5 Amp. Slow

Wiring Diagram