AC-2000HP

Complete Poultry House Control

User's 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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Major Components and Features

LCD-Screen, Keyboard

A liquid crystal display (LCD), 2 lines by 20 characters, enables the computer to communicate information to you. It displays real time data such as temperature, humidity, messages, and alarms. The back light built into the display enables you to read it in the dark.

Enter data into the **AC-2000HP** with the keyboard and select display information. Although you can enter all data at the keyboard, you will probably find it is much easier to enter settings through the personal computer communications program.

Relays

Up to 32 built in relays and additional expansion relays, operate equipment such as fans, heaters, curtains, cooling systems, feeders, lighting, etc. The relays have 30 amp or 2 Horse Power UL and CSA ratings. However, for frequent use items such as minimum ventilation fans on timer operation, ROTEM recommends a maximum of 1 Horse Power per relay. The **AC-2000HP** also provides a separate dedicated alarm relay, giving a total of up to 33 relays.

Bird Scale Extension

The **AC-2000HP** supports up to two precision **RBS-1** bird weighing platforms. These provide accurate bird weights throughout the growth period.

Heating Zones

The **AC-2000HP** divides the house into as many as six heating zones. Each zone may use its own temperature sensor. Radiant heaters or brooders in each zone may choose their individual temperature sensor also.

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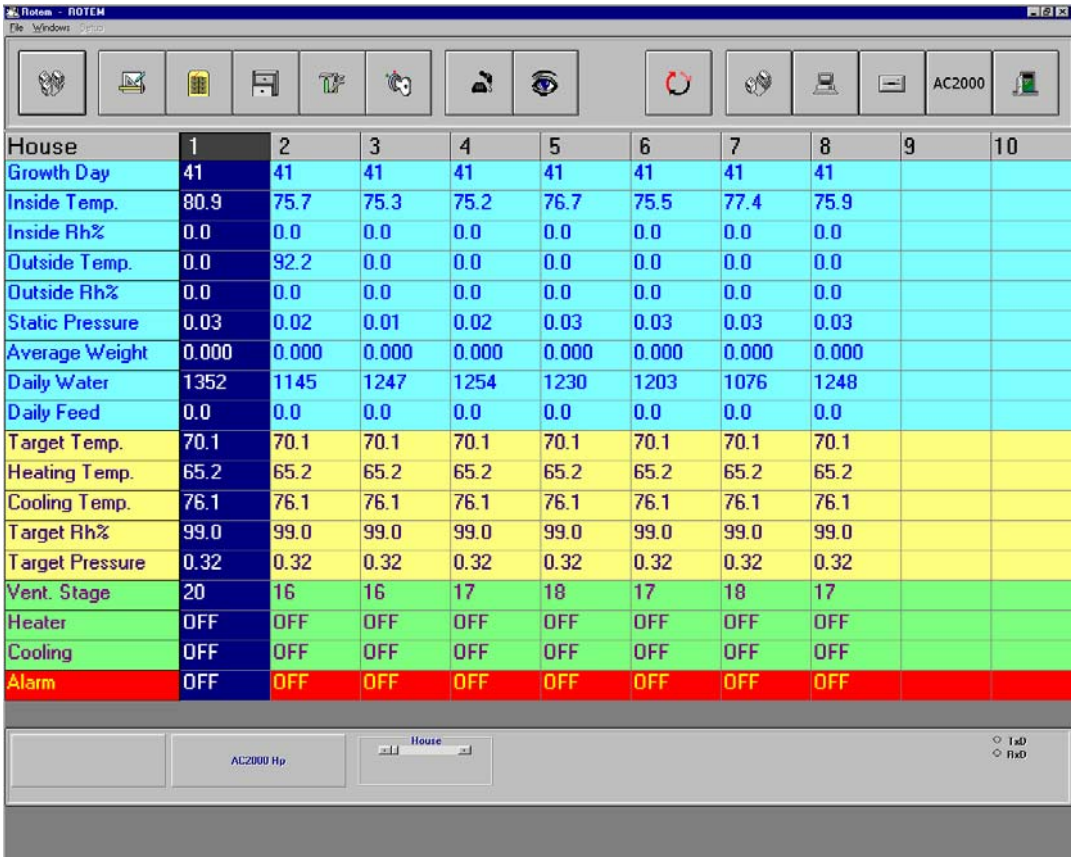
Communications Option

The communications option enables the **AC-2000HP** to communicate with you through a personal computer. The personal computer provides many features such as a larger display, the ability to save and restore alternate programs, and remote access. The following picture is from a typical eight-house installation.

Typical Communications Screen

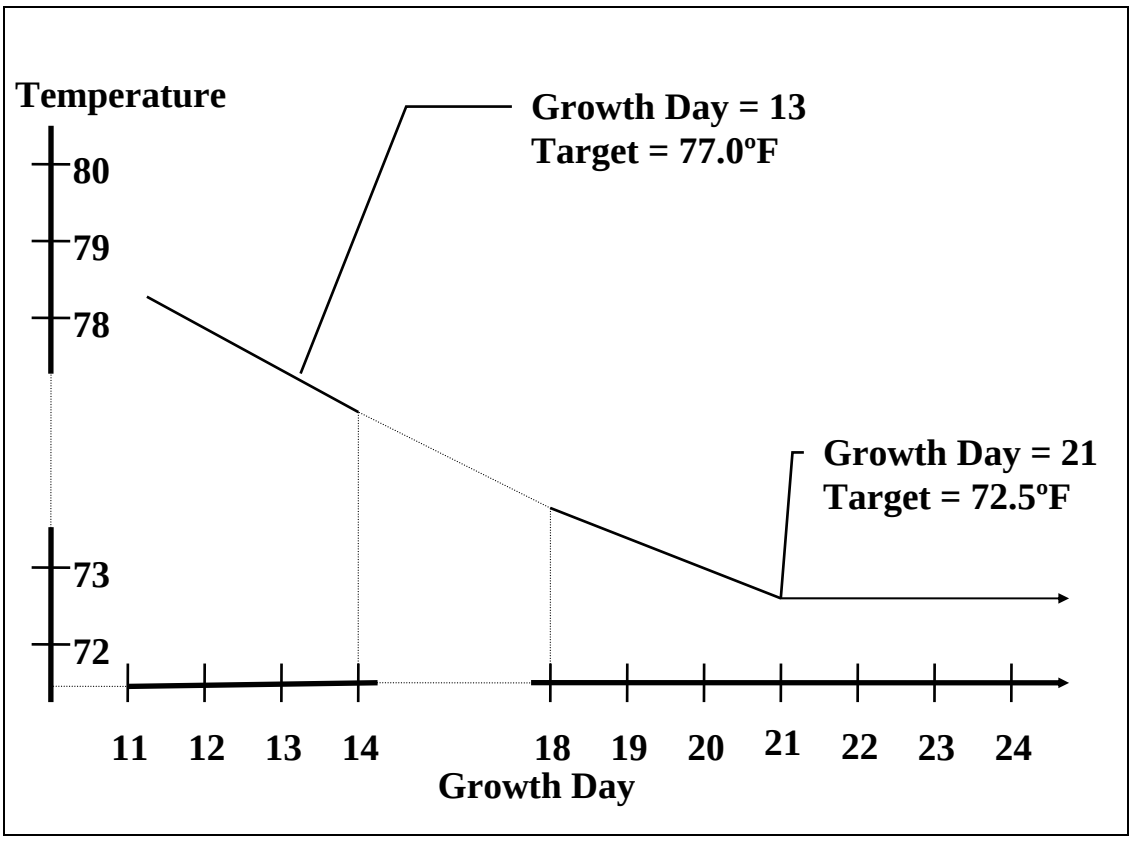


House	1	2	3	4	5	6	7	8	9	10
Growth Day	41	41	41	41	41	41	41	41		
Inside Temp.	80.9	75.7	75.3	75.2	76.7	75.5	77.4	75.9		
Inside Rh%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Outside Temp.	0.0	92.2	0.0	0.0	0.0	0.0	0.0	0.0		
Outside Rh%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Static Pressure	0.03	0.02	0.01	0.02	0.03	0.03	0.03	0.03		
Average Weight	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Daily Water	1352	1145	1247	1254	1230	1203	1076	1248		
Daily Feed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Target Temp.	70.1	70.1	70.1	70.1	70.1	70.1	70.1	70.1		
Heating Temp.	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2		
Cooling Temp.	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1		
Target Rh%	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0		
Target Pressure	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32		
Vent. Stage	20	16	16	17	18	17	18	17		
Heater	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		
Cooling	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		
Alarm	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF		

Automatic Temperature Adjustment, Sensors

A maximum of 6 temperature sensors measure inside and outside temperature to 0.1%, providing temperatures to 0.1ºF resolution.

The **AC-2000HP** provides for automatic continuous temperature adjustment or ramping. Set target temperatures for up to ten chosen bird growth days, and the **AC-2000HP** automatically adjusts temperatures at all times in between.



Humidity and Static Pressure Sensors

Two humidity sensors measure inside and outside humidity. Humidity limits for such items as foggers, stop them from adding water to the air during rainy weather. With the humidity sensors, the **AC-2000HP** can introduce air conditioning cycles to control ammonia levels that correlate with humidity.

You can connect the ROTEM **RPS-1** static pressure sensor to control air inlets. Adequate static pressure helps ensure proper mixing of fresh outside air with indoor air for more uniform ventilation conditions.

Water and Feed Monitoring

Arad water meters provide suitable signals to the **AC-2000HP** to monitor water consumption and allow it to trigger alarms for excessive or insufficient water consumption rates.

The **AC-2000HP** can also monitor your feed consumption, and maintain feed inventory based on feed system running time or calibrated pulsed input. The feed overflow alarm input to the **AC-2000HP** can provide additional warning of broken feed delivery systems, and will optionally shut off the feed system in the event of an over run.

Light Dimmer &Variable Speed Output

Connect a Light Dimmer, or a Variable Speed Control, such as the **RVS-1**, to the variable output. This provides smoother control of ventilation than simple on/off timers. When used as a light dimmer control, the **AC-2000HP** also provides sunrise/sunset effects to keep your birds calm.

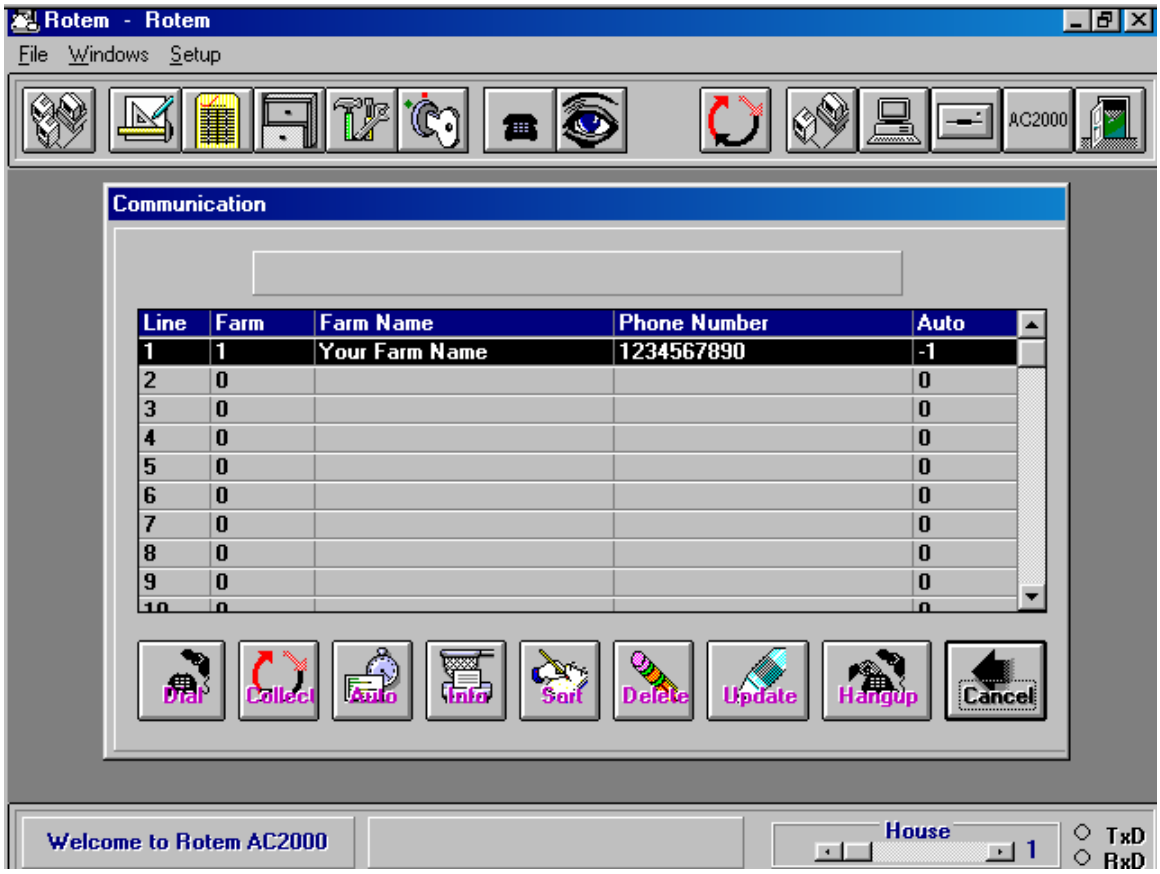
Power Outage Considerations

The **AC-2000HP** stores all settings and historical information in battery backed and non-volatile memory. After a brief power outage, it returns to its previous operating condition methodically. Any fan groups that were operating turn on sequentially, with a five second delay between each group to prevent overloading your standby generator, or tripping your peak reading utility power meter into a higher cost bracket.

PC Remote Communication

Your personal computer may connect to the **AC-2000HP,** either locally or via modem. With a personal computer, you can monitor and control the poultry houses from home or office. Password protection prevents unauthorized persons from changing your settings. Picture 1 shows a typical startup screen for those using remote communications. Besides your own houses, you might cooperate with neighbors to help keep an eye on each other's houses on special occasions.

Communications Start Up Screen



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Pictorial View

The ROTEM Communications Software gives you a pictorial view of simulated houses. You can immedately see what is running and present status in any of your poultry houses. It is available for download from the ROTEM Website, http://www.rotem.com, and works with the ROTEM family of controls.

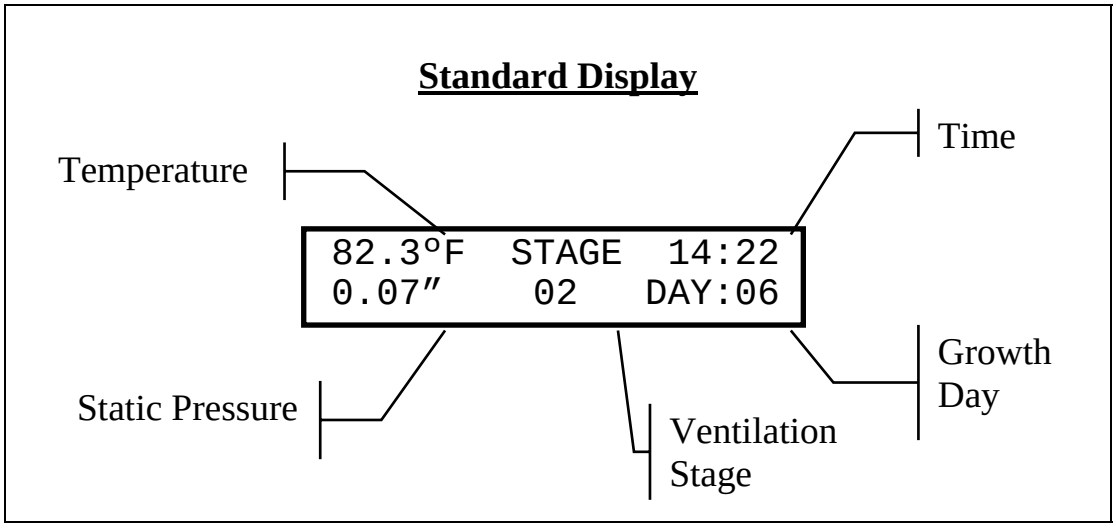
Battery Backup, Non-Volatile Memory

The onboard lithium battery keeps the clock running during power outages. It also keeps historical information alive in the computer memory. The system parameters and control settings are stored in non-volatile memory (EEPROM), which requires no power to preserve memory. These settings remain correct even if the lithium battery should run down.

Basic Operating Instructions

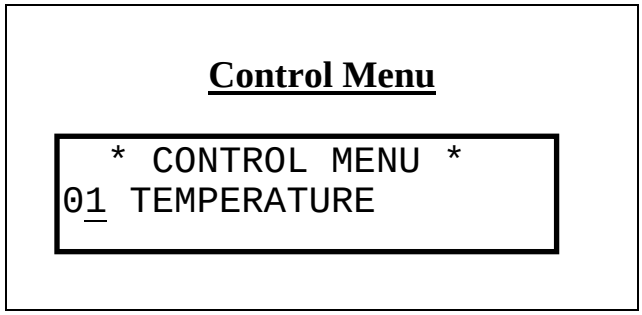
Display

The **AC-2000HP** normally shows the following in the lighted display. If there is an **alarm** the screen will alternately show the alarm message and the standard display.



Press the **ESC** key to bring up the control menu. If you press **ESC** again, the standard display will reappear.

Note the two digits, 01, which are the Quick Menu identifier number beside the word **TEMPERATURE**. The Quick Menu is printed on the front of the **AC-2000HP**, to the left of the display and keypad. Enter any quick menu identifier number and then press the **Enter** key to quickly reach specific information.



You can also scroll to Quick Menu items with the arrow keys. The left and right arrow keys move between menus, the up and down keys move within the selected menu.

The blinking line under the '1' is called a cursor. It marks the point at which typing will appear.

With menu 01 TEMPERATURE, in the display, press the **ENTER** key. The screen now shows the first line of the set temperature table. In this example, the target temperature is 84.0ºF. The heat comes on at 81.4º and cooling (pads or misting) at 88.5º. Here, these settings are effective on day one of the growth cycle. (Note the '1' under the 'Day' heading.) Day 1, in this case, would be the first 'bend' point of the temperature curve. The **AC-2000HP** can interpolate between growth day settings.

Set Temperature Table, Line 1

```
# Day Trgt Heat Tunl
1   1 84.0 81.4 88.5
```

Use the up/down arrow keys to move to other lines of the set temperature table. Use the left/right arrow keys to place the cursor under any value you wish to change. In this example, the cursor is in the Heat setting. Line 6 is effective on day 30 of the growth cycle.

Set Temperature Table, Line 6

```
# Day Trgt Heat Tunl
6  30 75.0 65.0 85.0
```

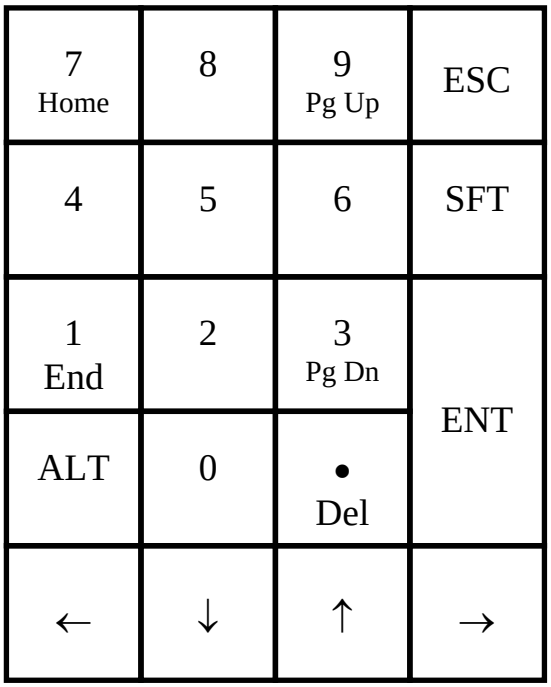
Once in a programming table, such as the set temperature table, the arrow keys will move the display only within the table, not about the Quick Menu. Press ESC to go back to the previous screen.

Keypad

You already know how to use the ESC key and the arrow keys. The computer accepts new values only when you press the ENTER key. If you simply move further with the arrow keys, or back with the ESC key, the control forgets the new value and remembers the old one.

The ALT key provides several quick functions. Press and hold ALT, then press and also hold another key to put quick information in the display or perform other functions. The functions are:

Keypad

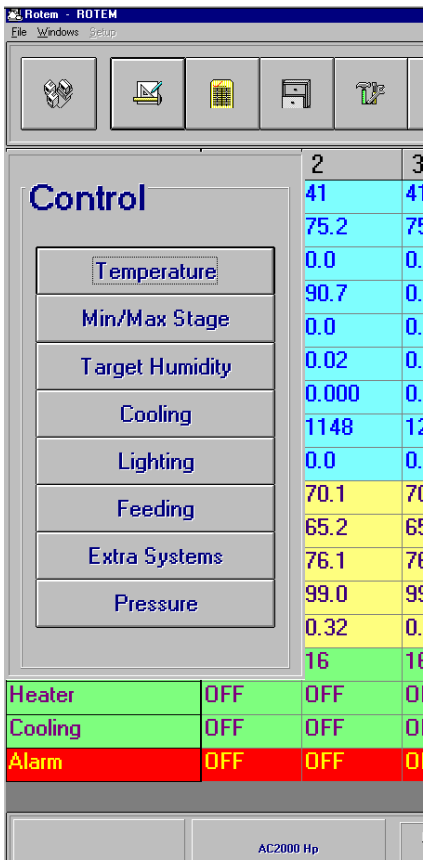


ALT-1	Active target temperatures
ALT-2	Output Relay Status
ALT-3	Outside Temperature and Outside Relative Humidity
ALT-4	Zone A, B and C Temperatures
ALT-5	Static Pressure
ALT-6	Permitted Ventilation Stages
ALT-7	Ammonia (NH_3) Level
ALT-9	Firmware Revision
ENT-7	Modem Initialization
SFT-Del	Delete Entry
SFT-Pg Up	Page Up
SFT-Pg Dn	Page Down
SFT-Home	Move to start of list
SFT-End	Move to end of list

Summary

Press ESC to leave the standard display, and enter the control menu, or to back out from any menu. Refer to the Quick Guide on the front panel of the **AC-2000HP**. Find the item you wish to see, and enter the one or two digit code for that item. If the item is too large to fit in the display, use the arrow keys to view hidden parts of it.

The Control Menu



This picture shows the control menu as it appears on a typical personal computer. It is identical to the control menu on the **AC-2000HP** itself. From your PC you can adjust all the control settings on any of your houses.

In the control menu you set primary parameters such as the target temperatures and the ventilation stages permitted for various bird ages.

The temperature settings are the first and most important parameter.

Temperature Table, Menu 1

Menu 1, Temperature Table, contains target temperatures according to the age of your birds. Young chicks require higher temperatures than older birds. The **AC-2000HP** provides space for up to ten growth dates with corresponding target temperature set points, heat set points and cool set points.

Note the separate entries for heat and cooling. The control will apply heat or cooling at these temperatures. For example, in the settings below on line 1 (shaded), the **AC-2000HP** has a target temperature of 88.5ºF, but will not turn on the heat until 87.0ºF. The ability to provide separate heat and target temperatures improves cooperation between the ventilation system and the heating system. On line 7, note that it is possible to move the heat settings further from the ideal target temperature settings. The bigger birds might require supplemental heat at a relatively lower temperature when they are older and have feathers.

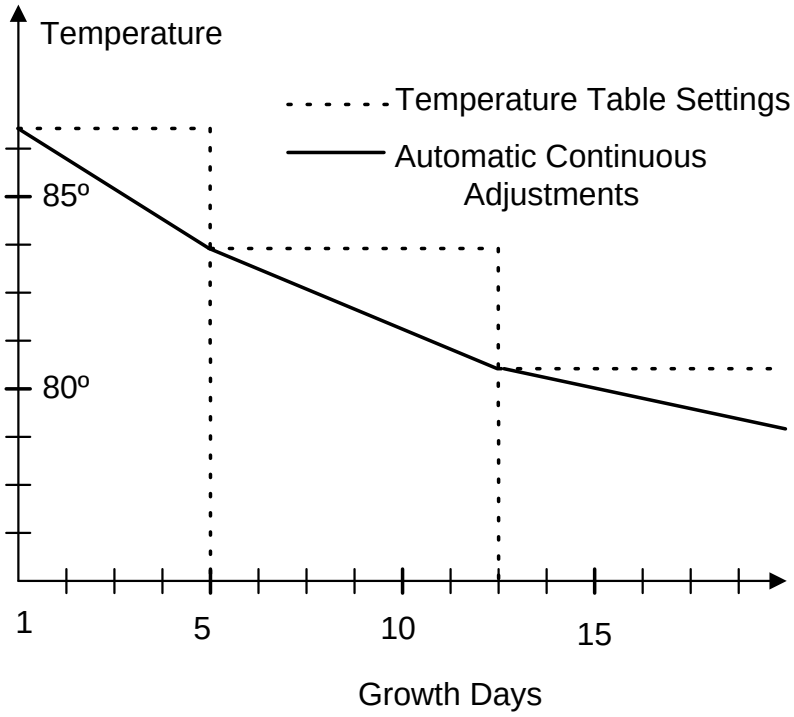
Temperature Table

Line Number	Growth Day	Target Temperature	Heating Temperature	Tunnel Temperature
1	1	88.5	87.0	99.9
2	3	88.0	86.5	99.9
3	7	85.0	83.0	99.9
4	14	80.0	75.0	85.5
5	21	76.0	70.0	80.0
6	28	74.0	65.0	80.0
7	35	72.0	60.0	80.0
8	42	70.0	60.0	80.0
9	0	0	0	0
0	0	0	0	0

The cooling temperature set point determines the point at which the **AC-2000HP** considers operating foggers or cooling pads according to the cooling table, Menu 4. Note that the cooling system does not ***necessarily*** operate at the cooling temperature, depending on additional factors in Menu 4.

System Variable 4 (Menu 97) also permits you to specify an arbitrary maximum ventilation level which the **AC-2000HP** will not exceed if the temperature is below the cooling level. See also the paragraph on Tunnel Ventilation, since the 'cooling' temperature also affects tunnel operation.

Continuous Temperature Adjustment



Configuration, menu 91, item 8, "automatic daily temperature adjustment," controls whether the **AC-2000HP** interpolates between lines of the temperature table and calculates in between set temperatures, or uses only the exact temperatures from the table. Interpolation results in temperature ramping with smooth continuous change. Otherwise, it would jump abruptly at midnight on the growth days programmed in the temperature table.

Minimum-Maximum Stage Table, Menu 2

The Minimum-Maximum Table is the primary ***air quality*** control. It sets the minimum ventilation stages based on bird age. If the air quality is poor, simply increase the minimum setting. In the example here, the **AC-2000HP** will use at least ventilation stage 4 after growth day 14. This could be normal for brooding. From growth day 5 through growth day 13, the **AC-2000HP** will use at least ventilation stage 2 even if the heaters are on, but will not exceed stage 10.

The 'Minimum' settings of Menu 2 are the proper place to control ***air quality*** in your poultry house. This method is much simpler than adjusting the ventilation table (Menu 92 and Menu 95). Ventilation levels above 'Minimum' provide cooling capability if the temperature rises too high.

Minimum-Maximum Stage Table

Line Number	Growth Day	Minimum	Maximum
1	1	1	10
2	5	2	10
3	14	4	20
4...10	-	-	-

Tunnel Ventilation

Tunnel ventilation provides cooling by the wind chill effect of moving air. In many poultry houses there is a change in ventilation between tunnel ventilation and standard inlet or ridge vent ventilation. Because of the extra 'cooling' effect, the AC-2000HP enters tunnel mode at the cooling temperature of Menu 1. The following table summarizes the special parameters that affect tunnel ventilation.

Tunnel Ventilation Parameters

Parameter	Comments
Menu 1 Cool Temperature	Controls evaluation of the Menu 4 cool table, it also sets the minimum ***inside*** house temperature before entering tunnel.
Menu 97 System Variable 5	Once in tunnel, inside temperature must drop below this amount above target temperature before exiting tunnel mode.
Menu 97 System Variable 21	Sets minimum stay time either in tunnel, to prevent yo-yoing. Emergency temperature levels can override this.

Fresh Air, Ammonia and Humidity Treatment, Menu 3

The **AC-2000HP** can run the ventilation system to meet target humidity if it has a humidity sensor. With an optional ammonia sensor, you can also set maximum ammonia levels. The **AC-2000HP** will increase ventilation levels to meet these levels. To disable humidity treatment, set the target humidity to 99%. Similarly, to disable ammonia treatment, set target ammonia to 99%.

To enable fresh air treatment (without a humidity sensor), set target humidity to 0%. The fresh air, humidity treatment program increases ventilation by one stage if temperature is stable or slowly climbing and humidity is above or equal to target humidity. It considers internal and external temperature and humidity sensors before increasing the ventilation stages.

System variables 13, 27, 36, 37 and 42 affect the fresh air, ammonia and humidity treatment program. Variable 13, treatment delay, specifies the minimum delay between increases in ventilation stage to reduce humidity or provide more fresh air. Variable 27 sets the minimum length of time to remain at the new ventilation stage at each increase. Variable 36 specifies the maximum amount above target temperature, and variable 37 sets the excess humidity differential, at which the **AC-2000HP** may use the heaters to treat humidity.

Cooling Table, Menu 4

The Cooling Table sets the operating times, cycle timers,

Cooling Table

Line No.	From Time	To Time	Diff Temp	To Humidity	On Minutes	Off Minutes
1	09:00	21:30	2.0	85.0	1	10
2	09:00	21:30	4.0	85.0	1.5	5
3	09:00	21:30	6.0	82.5	1	2.5
4	12:30	16:00	8.0	55.0	1	0
5	00:00	00:00	00.0	00.0	0	0

temperatures and humidity levels that apply to your cooling pads or fogging system. The tunnel temperature, in menu 1, controls when the **AC-2000HP** considers the cooling table. If the temperature is below Menu 1 tunnel temperatures plus the differential temperature in Menu 4, the **AC-2000HP** will not run the cooling systems. If the temperature exceeds the Menu 1 tunnel temperature, the **AC-2000HP** uses the highest numbered line possible from the Menu 4 cooling table.

Consider line 2, in the cooling table above. Between 9:00 AM and 9:30 PM, if the temperature is above the tunnel set point plus the 8ºF differential in line 4 above, then if the humidity below 85.0%, the cooling system could cycle 1.5 minutes on and 5 minutes off. Line 4 says that if it is very hot (at least 8ºF above tunnel) in the afternoon and also fairly dry (below 55% relative humidity), then the cooling system runs full time.

Note: the **AC-2000HP** automatically sorts the table in order of 'Diff Temperature' after you enter the settings.

Lighting, Menu 5

The lighting table stores up to fifty entries during which to turn on or dim the lights. The time periods may range from as short as one minute to 24 hours by programming the from times and to times. The water shortage alarm automatically disables during lights out, since the birds will not drink while sleeping. You may use a relay to turn the lights on and off, or also combine the variable output to control a light dimmer. For multiple light periods per day, program the various periods for the same growth day. The **AC-2000HP** keeps the lines sorted in growth day order.

Lighting

Line #	Day	From Time	To Time	Level
1	10	05:30	15:25	50%
2	10	23:00	01:00	100%
*	*	*	*	*
10	*	*	*	*

Feeding System, Menu 6

Menu 6 controls the feeding system, which may run up to ten feeding periods per day. For full feeding, set times to cover the entire day. The **AC-2000HP** stops delivering feed when it has supplied the amount of feed specified in Qt/bird. If this quantity is zero, the feed system will stay off. The **AC-2000HP** takes into account the mortality, initial bird population, and the feed delivery rate.

Feeding System

Line #	From	To	Qt/bird
1	06:00	14:00	0.045
*	*	*	*
10	*	*	*

Feed monitoring can be time based, or calibrated pulse input. Calibration menu 44 selects whether to use run time or pulse feed measurements, and also calibrates both types of inputs. If there is an empty bin or the fill system is dumping feed on the floor, the **AC-2000HP** can generate an alarm and shut off the feed system. System Variables 24, 25 and 43 control this feature.

For periodic feeding with sleep periods for the birds, set corresponding times for both the light system, and the feed system. The **AC-2000HP** supports this method of intense bird management to achieve higher levels of performance. An optional current moni-

tor ensures the feed lines are fully charged at the start of each feeding.

Extra Systems, Menu 7

The **AC-2000HP** provides three extra systems to use for various purposes. Each system has a clock time during which it runs, high and low temperature set points with selectable sensor, and a cycle timer. If the sensor is '0', the extra systems use the average temperature the ventilation system uses. To ignore temperature, enter 0 for the low, and a large temperature, say 120.0ºF for the high temperature. Note that you must enter an 'On' time in the timer field, even if you do not wish to use the timer function (see System 2 in the example here).

Extra Systems

System	From Time	To Time	From Temp	To Temp	On	Off	Sensor
1	00:00	23:59	0	120.0	5	5	0
2	06:35	07:00	0	120.0	1	0	0
3	04:00	20:00	80.5	120.0	1	4	5

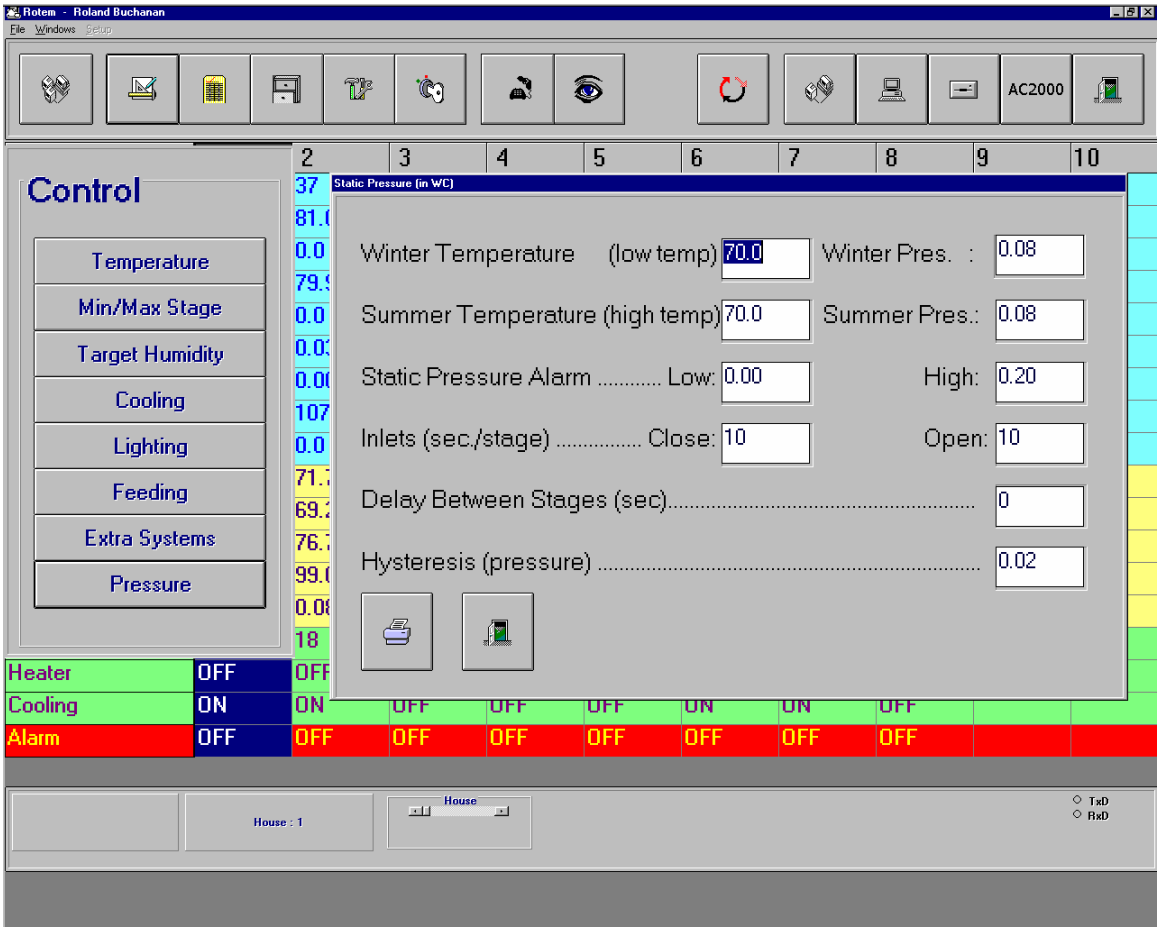
Static Pressure Controlled Air Inlet, Menu 8

Static pressure controlled air inlets ensure proper distribution and mixing of fresh outside air with stale inside air. With an optional static pressure sensor, such as the ROTEM **RPS-1**, the **AC-2000HP** will adjust the air inlets for proper ventilation.

Menu 8 has the main static pressure settings. To view the present static pressure, and present target pressure, use the Alt-5 keypad shortcut. There are ten adjustable parameters with the following purposes and default values:

1. Low Outside Temperature. During cold conditions, higher pressure results in better mixing of outside air with inside air. This temperature setting specifies the temperature at which the low temperature pressure set point is in effect. The **AC-2000HP** will interpolate between the low and high settings.

2. Low Temperature Pressure Set Point. This is the target pressure if the outside temperature is at or below the winter



temperature.

3. High Outside Temperature. Higher air flow through larger openings (lower pressure) during hot conditions improves conditions. This temperature setting specifies the temperature at which the high temperature pressure set point is in effect.
4. High Temperature Pressure Set Point. This is the target pressure if the outside temperature is at or above the summer temperature. Between the high and low temperature settings, the **AC-2000HP** calculates the in between setting.
5. Low Pressure Alarm. Using Menu 97, Variable 30, you can set a minimum ventilation stage below which there will be no low pressure alarm.
6. High Pressure Alarm.
7. Open Run Time. Maximum duration of an open run to reduce static pressure.
8. Close Run Time. Maximum duration of a close run to increase static pressure.

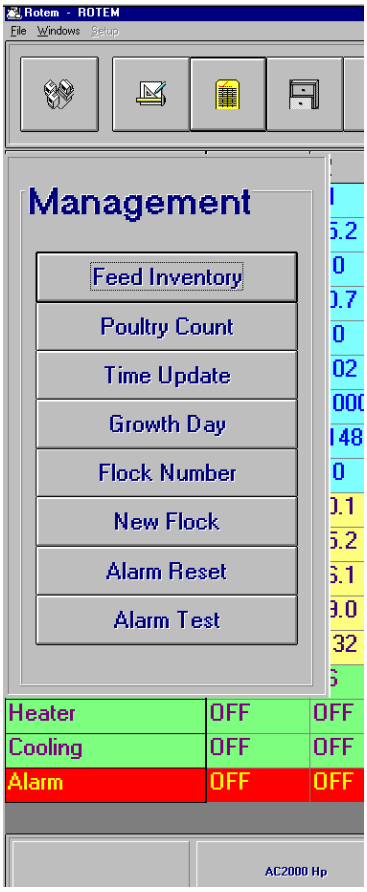
9. Run Delay. Delay between consecutive open or close runs. System variable 31 is a start up delay, which sets the time for validating a pressure change to prevent reacting to wind gusts.
10. Hysteresis. This sets the total dead band about the set point, in which the **AC-2000HP** does not adjust the inlets. For example, 0.02 inches water column hysteresis, allows a +/- 0.01 variation from target pressure.

The following system variables (menu 97) affect the static pressure system:

1. System variable 28, units: selects millibars, inches of water column or Pascals as the pressure unit.
2. System variable 29, interlock: stops the fans during operation of the inlets. This is useful in the case of a curtain inlet which cannot move under static pressure.
3. System variable 30, minimum ventilation stage for low pressure alarm: disables the low pressure alarm for low ventilation stages.
4. System variable 31, start delay, forces a minimum delay before responding to changes in static pressure readings. The **AC-2000HP** bypasses this delay when it cycles the group fans on or off.
5. System variable 26, alarm message delay: prevents momentary pressure loss from opening doors, and high pressure pulses due to wind gusts, from setting off nuisance alarms.

Note: enter both summer and winter (high and low temperature) pressure settings, even if you do not use the outside temperature sensor to ramp the static pressure settings. In this case, simply duplicate the target pressure settings in both places.

Management



The management menu provides important tools for the poultry producer. These tools record water and feed consumption, how long the heaters have been running, and other important information.

Mortality, Menu 11

Enter daily mortality counts to keep the flock count current. Enter all the counts in the top line, add mortality, and the **AC-2000HP** will total them for daily counts in the bottom line. If you only enter the quantity once per day, you can put it directly in the bottom line, daily sum.

Mortality

```
ADD MORTALITY..:     0
DAILY SUM......:     0
```

Poultry Count, Menu 12

Enter the bird population when you receive a new flock. As you enter daily mortality counts, the **AC-2000HP** will maintain your estimated bird population under updated count. The feeding system (menu 6) uses these numbers for restricted feeding schedules. **Note:** if the poultry count becomes zero, the feeding system will automatically stop operation.

Poultry Count

```
Initial chicks:     0
Updated count.:     0
```

Feed Inventory, Menu 13

The **AC-2000HP** provides a convenient feed inventory. Each time feed arrives, enter the quantity in the top line, feed supply. The bottom line, feed inventory, shows the feed remaining. Edit this quantity to reconcile the inventory when necessary.

Time Update, Menu 14

Select menu 14 to view or set the clock. The internal clock uses a precision crystal, and should rarely need adjusting. Various functions, such as the cooling table and the curtain position calibration function use the internal clock. The time is in 24 hour format.

Growth Day, Menu 15

Edit the growth day for the present flock if needed. The growth day works with the ventilation and other tables to automatically correct the settings as your birds grow.

Do not set the growth day back to start a new flock. If you do, the **AC-2000HP** will mix the new water and feed consumption, temperatures, and other historical data with old data, giving erroneous results. Use the New Flock, Menu 17 procedure for that.

Flock Number, Menu 16

Menu 16 shows the flock number. This number keeps the management information for each group separate in your personal computer.

New Flock, Menu 17

Answer 1 for yes, or 0 for no, to have the **AC-2000HP** start a new growth cycle, and erase the old flock data. The **AC-2000HP** will start over using the settings for growth day 1, and collect new management data for the new flock.

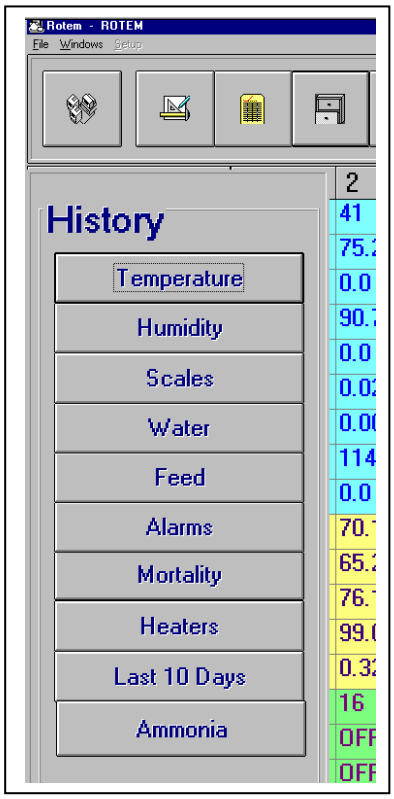
Clear Alarm, Menu 18

This item clears the alarm relay for an active alarm. It may be difficult to concentrate on working the problem when the alarm siren sounds continually; turn it off with menu 18. In the event of the feed overrun alarm, it will re enable the feed system.

Alarm Test, Menu 19

Enter 0 to disable the alarm clock. You can enter the time for the alarm and the duration of the alarm in minutes.

Historical Data



Temperature, Menu 21

Review the minimum, average and maximum temperature history from growth day 1 to the current growth day with menu 21. The control calculates a true continuous average over the whole 24-hour period for each day, not simply one half of minimum plus maximum. These temperatures are from the average of the zone sensors.

Temperature History

Day	Min.	Avg.	Max.
*	*	*	*
20	70.3	74.1	79.5
21	70.2	73.2	75.0
*	*	*	*
today	70.0	72.0	74.0

Humidity, Menu 22

The **AC-2000HP** records the minimum, average and maximum humidity history from growth day 1 to the current growth day. As with temperature, the control calculates a true continuous average over the whole 24-hour period using the average of the zone humidity sensors.

Scales, Menu 23

Menu 23 shows the bird weight history if you have one or two optional bird scales. For each growth day, the **AC-2000HP** shows the average weight, the number of birds weighed, and the standard deviation. If you have two scales, the display first shows the combined statistics. Use the right/left arrow keys to see the indi-

Scales

Day	Avg.	Count	S.D.
*	*	*	*
20	1.234	58	0.023
*	*	*	*
today	*	*	*

vidual scale data. The up/down arrow keys move forward and backward through the growth days.

Water, Menu 24

Menu 24 shows the daily water consumption, with percent change from the previous day for each growth day. Use the up/down arrow keys to move forward or backward to see other growth days.

Feed, Menu 25

Menu 25 shows the daily feed consumption, with percent change from the previous day for each growth day. Use the up/down arrow keys to move forward or backward to see other growth days.

Alarms, Menu 26

The **AC-2000HP** stores the last 20 alarm events with the growth date, time and alarm code. Use menu 26 to view them. The Alarm Codes table shows the meaning of each alarm code.

Menu 18 allows you to clear the alarm relay, relay code 40. You can clear the alarm relay to silence the alarm siren or bell, while you work on the problem. Additionally, if there is a feed overrun alarm, this resets the feed system allowing feed to the birds.

Alarm Codes

Code	Alarm
1	Low Temperature
2	High Temperature
3	Sensor Failure, Zone A
4	Sensor Failure, Zone B
5	Sensor Failure, Zone C
6	Feed Overrun Alarm
7	Low Static Pressure
8	High Static Pressure
9	Water Overflow
10	Inadequate Water Flow
11	Sensor Failure, Zone D
12	Sensor Failure, Zone E
13	Sensor Failure, Zone F
14	High Ammonia
15	Not Used
16	Static Pressure Sensor Fail

Mortality, Menu 27

Menu 27 allows you to review the mortality history. The **AC-2000HP** shows the present growth day data first. To view other growth days, use the up and down arrow keys.

Heaters, Menu 28

Menu 28 shows the on time for the low level heaters in each zone. The values are in minutes for each growth day. These fuel consumption records tell you where most of your fuel expenses are, helping you control costs. Note that the **AC-2000HP** maintains heater on times only for the low level heaters. High level and radiant heaters are not recorded.

Heater Run Time

Day	-A-	-B-	-C-	-D-	-E-	-F-
*	*	*	*	*	*	*
20	144	155	123	*	*	*
21	132	150	120	*	*	*
*	*	*	*	*	*	*
Today	*	*	*	*	*	*

Principles, Options, Operation

Cooling and Ventilation

There are at least three different ventilation regimes in most poultry houses: minimum, transitional and cooling. Minimum ventilation corresponds ventilation to provide adequate air quality for the birds breathing needs and removal of noxious substances. This ventilation is required even if the heaters are on. Normally timer fans provide this ventilation. The transitional region provides excess fresh air to cool the birds, but without any wind chill. Finally, in the third regime we move air directly across the birds to provide wind chill cooling, such as in tunnel ventilation.

Minimum Ventilation

Timer fans are the usual means to provide reliable minimum ventilation. Often, powered air inlets control the incoming air. Static pressure sensors ensure that fresh air enters with sufficient velocity to travel well within the poultry house in the plenum or near the ceiling above the birds, to mix with warm inside air. This gives the birds fresh air without drafts, reuses the bird heat near the ceiling, and minimizes heating costs.

Transitional Ventilation

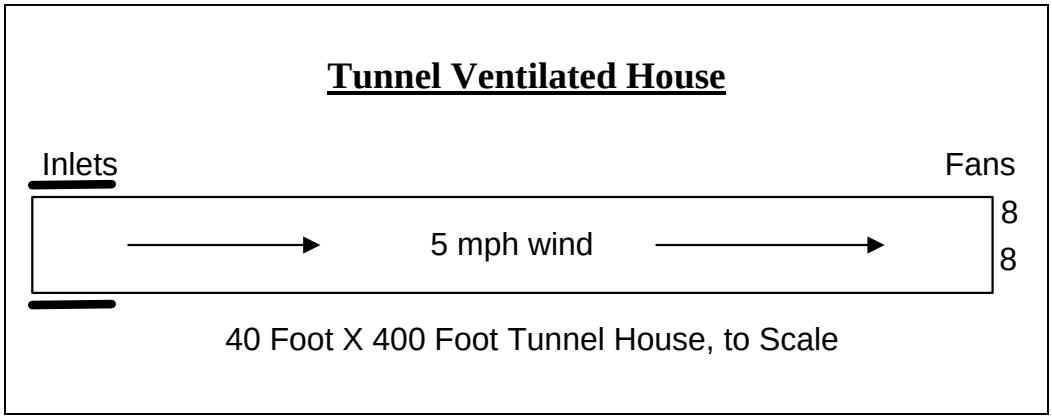
During cold weather with larger birds, the temperature may rise above ideal temperatures because of bird heat. Simply increasing the air flow through powered inlets provides enough additional cooling to maintain the target temperature. In this regime, the **AC-2000HP** maintains target temperature by increasing ventilation levels.

Tunnel Ventilation

During hot weather with larger birds, it is not possible to maintain adequate cooling for the birds through ceiling inlets. In most modern broiler houses, the **AC-2000HP** switches to tunnel ventilation, causing direct air movement on the birds. Full tunnel provides about 10ºF to 15ºF of wind chill effect on the birds.

Cooling System

When ventilation becomes inadequate, most producers use cooling pads or foggers in their broiler houses. The **AC-2000HP** provides an independent system to control cooling. Although the system is independent, the grower adjusts it to work effectively with the ventilation system. If the system consists of fogger nozzles in the house, you can use it prior to tunnel ventilation to cool the air. If the system is strictly a cooling pad, then it is used after full tunnel ventilation is established.



With tunnel ventilation, there will be a temperature rise toward the fan end. Cool air enters at the inlets, often through cooling pads. As it passes through the house, it warms up and may be several degrees warmer than at the cool end. To limit the temperature increase, tunnel ventilation requires a minimum number of fans to ensure the air moves all the way through the house quickly, before the temperature rises too much. At full tunnel, the air requires about one minute to move all the way through the house in most installations. This provides for a minimum heat rise, and gives all the birds cooling by the wind chill effect.

Natural Ventilation

When nature cooperates, there may be no better way to provide an optimum poultry environment. Curtain side walls that open fully can provide large amounts of fresh air at little cost. Ridge vents, ventilation doors and other structures provide other ways to use natural ventilation advantageously. The ventilation table and other parameters in the **AC-2000HP** accept settings that facilitate the use of natural ventilation.

Other Considerations

When using cooling pads, it is important not to allow air through inlets or cracks, which bring hot outside air into the house. However, some inlet systems permit special ventilation tricks such as opening ceiling inlets all the way to blow air directly onto the feed lines. Such tricks do not apply to all installations, and can often be used only during good circumstances. Another example is opening the tunnel inlet curtain under static pressure. While this reduces fan efficiency and air flow throughout the house, it helps to ventilate the triangular dead space between the inlets at the end of the house.

The **AC-2000HP** provides a fan to curtain movement interlock. When adjusting tunnel inlet curtains, the **AC-2000HP** can briefly turn off the fans so that the tunnel inlets or tunnel inlet curtains can move without static pressure, and not hang up while the fans maintain static pressure.

Grouping Ventilation Fans

Grouping fans achieves several objectives:

1. It reduces the possibility that everything quits all at once. If one relay or fan fails, the others can keep going.
2. It allows the **AC-2000HP** to turn on small amounts of fan power for minimum ventilation requirements.
3. It allows the **AC-2000HP** to turn on additional fan power in reasonable steps, as ventilation requirements increase.
4. By using various sizes and combinations of groups, it can reduce wiring costs. For example, seven fans on seven circuits allow complete flexibility. However, seven fans in groups of 1, 2 and 4 fans requires only three circuits for about half the cost, and still allows turning on any number of fans.
5. Note that grouping does not require assigning all fans to one circuit. You can program groups by assigning the same group number to several relays. This way several independent circuits can work together by software grouping, and still have hardware flexibility.

Generally sidewall fans or one tunnel fan on timer provide for minimum ventilation. Except for these minimum ventilation groups, each relay typically has one or two fans on one electrical circuit. The **AC-2000HP** uses up to eight groups of fans at each ventilation stage.

Variable Speed Fan

Variable speed fans rarely supply precisely the air flow programmed in the ventilation table. Therefore, when setting variable fan speeds, check the actual air flow at the settings you use. Some fans may deliver 50% air flow at a 90% setting and other fans stop turning completely at settings below 50%. With a little experimentation, however, you should be able to find suitable settings for your fan and ventilation stages. Menu 97, System Variables 20 and 22 set the 0% and 100% outputs for the variable speed fan.

Ventilation Summary

1. Assign ventilation fans to groups. The groups may use multiple output relays, so that several outputs make up a group. There is a table in the back of this manual where you can document relay assignments. Note, that you can assign as many relays as needed for each group. For example, fan group 4 may have 3 fans, but you can put a maximum of 2 fans on a single relay. Simply assign two relays to fan group 4. The **AC-2000HP** will run them simultaneously. For long life, Rotem recommends limiting each relay to 1 HP; for infrequent use, the relays safely accommodate 2 Horse Power loads.
2. Fill out the Ventilation Stage Table, Menu 92. The **AC-2000HP** uses up to 20 stages. **Warning:** Be careful to set the maximum ventilation stage number correctly in configuration, menu 91, item 3. If the higher unused ventilation stages are at zero, the control will turn off all fans when it reaches those stages on a hot day.
3. Fill out the Curtain Level Table to correspond with the Ventilation Stage Table. Note that the stages and levels in both tables correspond with each other. Many modern houses use only the tunnel inlet curtain.
4. Fill out the Temperature Table. Pick convenient growth days, and set appropriate target, heating and cooling temperatures. The **AC-2000HP** can automatically ramp these temperatures at intermediate growth dates; simply enable 'auto temp reduction,' item 5 in installation, menu 91. The **AC-2000HP** will regulate the ventilation and heating equipment to maintain these temperatures.
5. Fill out the Minimum-Maximum Stage Table by bird growth dates. The 'minimum' entries are your handle on air quality, and should be adjusted as litter conditions and other air quality needs change.

6. Set the Target Humidity and Cooling Tables if using these systems. Note that target humidity set to 0% turns on 'fresh air treatment.'
7. If using static pressure controlled inlets, enter the static pressure settings.

Example: Fan Groups, Stages, Curtains, Levels

Sometimes the best approach is to see an example. In this example, the house is curtain sided, with 10 tunnel fans and 4 sidewall fans. One curtain machine runs the tunnel inlet curtain. The side curtains have curtain drops and manual hand winches. A ROTEM **RPS-1** pressure sensor assists the **AC-2000HP** to control ceiling mounted sidewall inlets. There are fogger nozzles within the house, and cooling pads at the tunnel inlet, but we set these in their own independent Menus.

Ventilation Relay Assignments, Example

For this example, we use the following relay assignments:

Ventilation Relays, Example

Relay Number	Relay Code	NO/NC	Description
1	1	0	Sidewall Fans 1 and 2
2	1	0	Sidewall Fans 3 and 4
3	2	0	Tunnel Fan 1
4	3	0	Tunnel Fan 2
5	4	0	Tunnel Fans 3 and 4
6	5	0	Tunnel Fans 5 and 6
7	6	0	Tunnel Fans 7 and 8
8	7	0	Tunnel Fans 9 and 10

Both relays 1 and 2 have relay code 1. This allows conveniently using one half the sidewall fans for very young birds on good litter. You can manually turn off one set of fans with the on/off/auto switches. The **AC-2000HP** treats both relays as a single unit. Although this example uses 8 relays to control the fans, there are seven groups of fans.

The following ventilation table illustrates the main principles of ventilation organization with the **AC-2000HP**. Essentially, start at stage 1 with the minimum air for young birds on good litter. Provide more or less proportional increases in ventilation at each

stage, until you reach full tunnel ventilation. Example Ventilation Table

Typical Ventilation Stage Table, Example

Ventilation Stage	Ventilation Groups	On Min-utes	Off Minutes	Diff	Var
1	1 0 0 0 0 0 0 0	0.5	4.5	0	0
2	1 0 0 0 0 0 0 0	0.8	4.2	0	0
3	1 0 0 0 0 0 0 0	1.2	3.8	0	0
4	1 0 0 0 0 0 0 0	1.7	3.3	0	0
5	1 0 0 0 0 0 0 0	2.5	2.5	0	0
6	1 0 0 0 0 0 0 0	3.5	1.5	0	0
7	1 0 0 0 0 0 0 0	1.0	0.0	0	0
8	1 2 0 0 0 0 0 0	2.5	2.5	0	0
9	1 2 0 0 0 0 0 0	1.0	0.0	0	0
10	1 2 3 0 0 0 0 0	1.0	0.0	0	0
11	2 3 4 0 0 0 0 0	1.0	0.0	0	0
12	2 3 4 0 0 0 0 0	1.0	0.0	5.0	0
13	2 3 4 5 0 0 0 0	1.0	0.0	7.5	0
14	2 3 4 5 6 0 0 0	1.0	0.0	10.0	0
15	2 3 4 5 6 7 0 0	1.0	0.0	12.0	0
16...20	0 0 0 0 0 0 0 0	0.0	0.0	10.0	0

Note the shaded region. This is the tunnel ventilation region, comprised of four ventilation levels. In this area the tunnel inlet curtain is at 100% open. At all other ventilation levels, the tunnel inlet curtain is fully closed. *(Some growers may prefer to open the tunnel curtain only 50% at ventilation stage 12 to bring air into the inlet end at higher speed. Although this restricts air and provides less air through the remainder of the house, it might increase survivability in marginal conditions in the triangular 'dead' area at that end of the house.)*

In this example, stage 12 duplicates the fans in stage 11. The temperature differential forces a rise of 5ºF before using this stage. When the tunnel curtain opens 100%, static pressure drops resulting in increased in air flow, even with the same fans.

Note that the **AC-2000HP** continues to monitor static pressure in tunnel ventilation. If the static pressure rises to the alarm

point, the ceiling or sidewall inlets open, allowing in emergency air.

Example Minimum-Maximum Table, Menu 2

Given the above ventilation table, we now select the stages applicable at selected bird ages. You should change the minimum entries in this table to adjust for varying litter conditions, and ensure adequate ventilation at the minimum end. The 'minimum' portion of the min-max table is your handle on ***air quality*** for the birds.

Once the birds are almost full grown, say 42 days of age, this example enforces a minimum of all sidewall fans on full time, even in the coldest weather.

Min-Max Table, Example

Line #	Growth Day	Min	Max
1	1	2	11
2	5	3	11
3	10	4	11
4	15	5	11
5	21	6	15
6	28	7	15
7	35	8	15
8	42	9	15
9	0	0	0
10	0	0	0

When the birds are in the brood chamber, the grower turns off the extra sidewall ventilation group. Depending on house design, the two fans during brood may be both inside the brood chamber, one inside and one outside, or both outside. Some producers eliminate the sidewall fans entirely, and do minimum ventilation using timers on the tunnel fans. Others have a single fan near the end of the house in the brood chamber. The **AC-2000HP** cooperates with you in each case.

Example, Target Temperature, Menu 1

This temperature table is representative; your settings will vary depending on the type of heaters used and other factors. Note that the **AC-2000HP** will calculate temperatures for growth days between those given in the table (automatic ramping feature). To quickly view the present target temperatures, press and hold the Alt-1 shortcut.

Temperature Table, Example

Line #	Growth Day	Target Temp	Heat Temp	Tunnel Temp
1	2	90.0	89.0	99.9
2	5	89.0	88.0	99.9
3	9	87.0	86.0	99.9
4	14	83.0	82.0	99.9
5	21	82.0	81.0	90.0
6	28	80.0	77.0	90.0
7	35	75.0	70.0	85.0
8	42	70.0	63.0	80.0
9	49	68.0	60.0	80.0
10	-	-	-	-

Heaters

The **AC-2000HP** supports several kinds of heaters. Each of the six zones may have low and high level heaters, and radiant heaters with low/high levels and separate ignition. For positive pressure houses, the **AC-2000HP** provides separate burner and air plus optimizer functions.

Standard Heaters

Each of the zones may have a low and high level standard heaters. The low level heaters turn on first, and if they cannot maintain the heat set temperature, the high level heaters turn on.

In its historical data collection, the **AC-2000HP** records the run time for the low level heaters. This can be very important in determining which houses consume the most fuel. If one of your houses runs significantly more brooders than others, it may be that some of the heaters are not working, or that there is excessive heat loss in that building.

If you use a single zone, the **AC-2000HP** uses the average of the zone temperature sensors to control the heating. If using multiple zones, the **AC-2000HP** uses the specific zone sensor designated for each zone. See menu 91, item 7 and menu 94.

Note: should the **AC-2000HP** turn on any of the standard heaters, it immediately returns to the minimum ventilation level.

Radiant Heaters

Many brooders are of the radiant heater type. The **AC-2000HP** allows the radiant heaters to have individual temperature sensors to control the brooder heat for the young chicks.

Some radiant heaters require a separate relay to turn on the ignition, and another one for the high level burner. System variable 10 sets the ignition relay on time. Radiant heaters can have their own separate sensors, which do not affect the ventilation system. This is to account for the radiant heating effect, so that the ambient air temperature may be lower than the effective temperature on the birds. System variable 38 allows setting a higher set temperature for radiant heaters than the standard heaters.

Lighting, Feeding and Other Systems

The **AC-2000HP** will also run lighting, feeding and extra systems. The feeding and lighting systems may coordinate for dark-out and periodic feeding operations. Extra systems can run according to time, temperature sensor, or cycle timer. Note that the lighting system may use a relay to simply turn lights on and off, or an optional dimmer for intensity control with sunrise and sunset effects.

Water Meter and Alarm

A standard pulse output water meter may attach to the **AC-2000HP**. It will then keep historical water consumption information, and generate alarms in the event of too little or too much water flow. A drop in water consumption may be the first indicator of a problem with the flock, allowing corrective action before a serious situation develops.

System variable 32 sets the overflow alarm limit, variable 33 the shortage limit, and variable 34 the delay time for reporting water alarms. Use menu 45 to calibrate the amount of water per pulse of the water meter. Test menu 37 reports live counts to test the water meter; while menu 24 gives historical water consumption data. **Note:** the shortage alarm applies only during ‘light’ conditions if the light table (menu 5) turns the lights on and off.

The **Arad**, 0.1 gallon per pulse meter works well with the **AC-2000HP**.

Bird Scales

The ROTEM **RBS-1** bird scale platforms can provide regular growth information on the flock. With historical information on a flock by flock basis, one can quickly judge actual performance of the flock. The **AC-2000HP** supports one or two weighing platforms.

Menu 23 provides historical bird weights, both as an average of two platforms, and individually by platform. It also includes standard deviation statistics, and number of birds weighed each day. Menu 38 allows testing the scales by weighing objects. Menus 42 and 43 provide for calibration by known weight, or by the factory provided calibration factor.

Feed Overflow Alarm

If system variable 24 is '1', the **AC-2000HP** assigns the terminal 5 digital input 1 to the feed overflow sensor. System variable 25 sets a delay between activation of a feed overflow alarm input, and activation of the alarm relay. During feed overflow alarm, the **AC-2000HP** will turn off the feed system to prevent running the system empty or bridged, or from emptying the feed tanks onto the floor. Use Menu 18 to reset a feed overflow alarm.

Wind Direction Sensor

If system variable 24 is '0', the wind direction input, digital input 1, can switch the curtain level tables for curtains 1 and 2 based on wind direction. System variable 19 sets the time period for the wind direction check. After each time period, the **AC-2000HP** averages the wind direction to a 0 or a 1. If the average came to a 1 (contact closed) curtain 1 and 2 ventilation table settings are switched for the next period; otherwise each curtain keeps its own settings.

Remote Communications

One of the most important capabilities of the **AC-2000HP** is remote communications. A personal computer may connect locally, or by modem, to an **AC-2000HP** almost anywhere in the world. Password protection prevents unauthorized access.

With a personal computer, one can conveniently check the poultry houses from home. With the large display screen on a computer, the overview of information presented by each **AC-2000HP** is greatly improved. As an example, the ventilation and curtain tables show as one complete unit on the personal computer, instead of the partial tables on the **AC-2000HP** display screen.

Maintenance

These menus provide quick checks of the equipment. To check for abnormal operation or equipment failure, follow the trouble shooting guide, and make quick checks using these functions.

Test

Temperature, Menu 31

Menu 31shows the individual readings of the temperature sensors. The **AC-2000HP** averages the zone sensors (see Sensor Layout, menu 94) to determine the house temperature for ventilation.

Humidity, Menu 32

Menu 32 shows the individual humidity readings of each humidity sensor. If using a static pressure sensor, then the voltage from it will show on the display as an equivalent humidity. See Analog Inputs, menu 35.

Relays, Menu 33

Turn any individual relay on or off by moving the cursor to the relay number and pressing the enter key. The **AC-2000HP** will automatically reset and return to normal operation mode after a delay if no keys are being pressed. **Note:** see Manual Relay Operation in the installation section for a method of extending manual relay operation to arbitrarily long times.

Digital Inputs, Menu 34

Input 1 is for either wind direction, or a feed overflow alarm. Input 2 is for the feed pulse system. The displayed values will show the open or shorted state on the input.

Analog Inputs, Menu 35

Menu 35 shows the humidity/static pressure analog inputs. The values shown represent the internal digital numbers used by the **AC-2000HP**. The **AC-2000HP** calculates actual values using calibration factors and other formulas for humidity or static pressure.

Analog Output, Menu 36

The analog output controls a variable speed fan. Enter the approximate output voltage using this menu to check the variable speed fan. **Note:** the value will disappear from the display upon entering it.

Water Pulse, Menu 37

This input is dedicated to water meter use. Menu 37 shows the current pulse count, and should change if water is flowing.

Scales, Menu 38

This menu allows testing the scales. Place a known weight on the scale; the value will show in the display.

Note: the internal algorithms that check for stable bird weights may cause the tare to reset while weighing multiple birds. This will not cause the readings to be off since the **AC-2000HP** keeps track of the number of birds on the scale. The display will change after a brief delay, when a bird gets off, or a new one gets on. If the bird remains stable on the scale, the display will change to zero. Then, if it comes off the scale, the display will show the negative value of its weight.

Calibration

Temperature, Menu 41

Check and calibrate each temperature sensor with menu 41. To calibrate, stabilize the sensors at a known temperature, then enter that temperature.. The **AC-2000HP** will calculate the calibration factor. If you know the calibration factor, you can enter it directly.

Instead of measuring air temperature for calibration, it is simpler to measure the temperature of a pail of water. Air temperature changes rapidly in small regions by several degrees as air currents move, making calibration difficult. Starting with the water temperature near 'brood' temperature provides the most accurate temperatures at the most sensitive time in the birds life. Make sure to stir the water well while measuring to eliminate hotter and cooler regions (stratification).

Scales, Menu 42

Calibrate the bird scales with menu 42. While keeping the scale empty (no birds on it), enter menu 42, and select the scale to calibrate. Allow at least five seconds to give the **AC-2000HP** time

to zero the scale Then place a known weight of at least 2.5 pounds on the scale and enter that weight. The display will now show the entered weight. Remove the weight, and ignore the values in the display. The scale will be calibrated.

Exit menu 42, and the scale will weigh birds; the display shows internal working values rather than actual weights while weighing birds. The program for the scale keeps track of the number of birds on the scale, and may show positive or negative changes in weight in the display. It will not log a reading while the birds are moving, to prevent erroneous measurements.

An inexpensive method of obtaining an accurate calibration weight is to weigh a grocery item (2 lb can of beans, 2 liter soda bottle) at the grocery store using their calibrated scales. Then use this weight to check and calibrate the scales.

Scale Calibration Factor, Menu 43

To eliminate the need for a precise known calibration weight, ROTEM calibrates the scale platforms prior to shipment. Simply enter the calibration number from the platform using menu 43.

Feed, Menu 44

To calibrate the feed delivery measurement system, first select a pulse based system, or time based system. Then enter the pounds of feed delivered per pulse or per minute, depending on the type of system, with menu 44.

Water, Menu 45

Enter the quantity that the water meter measures per pulse with menu 45. Refer to your water meter instructions for this value. The usual **Arad** water meter delivers 0.1 gallons per pulse.

Save to Data Plug, Menu 46

This menu allows saving program settings to a portable data plug. You can then take the data plug to other controllers to set them identically.

Copy from Data Plug, Menu 47

This menu copies control settings from a portable data plug and programs the **AC-2000HP** for you. It is much more reliable than entering data by hand, and does not require a modem or pc connection.

Trouble Shooting Guide

This guide touches the most common problems. It is not a complete guide.

1. Check for unusual symptoms:
   - 1.1. Temperature too high or too low.
   - 1.2. Heater working with curtain open or a high ventilation stage.
   - 1.3. Fans not working when they should be.
   - 1.4. Ventilation Stage too high (for young birds).
   - 1.5. Curtains moving in the wrong direction.
   - 1.6. Fogging or Cooling Pad operation on a humid day.
   - 1.7. Heaters working unevenly, one or more working significantly more time.
2. Make quick checks of your sensors. Are they reading correctly? Have the birds destroyed a sensor?
3. Verify the minimum/maximum tables. The control will not use lower or higher ventilation stages if they are not allowed in these tables
4. Use the relay test function (menu 33) to temporarily see if the individual fan groups, curtains, etc. go on and off. It is very convenient to have these written down on a card by the control. If they don't work, have a service person check the fuses, circuit breakers and equipment for failure.
5. Check the relay code tables, to make sure they are correct.
6. Check the sensor layout menu, and verify that the sensors are in the correct location.
7. If you still have problems after these checks:
   - 7.1. Call your serviceman, farm manager or distributor.
   - 7.2. Call your local Rotem Dealer for Technical Help.
   - 7.3. If they can't help you, call your Rotem sales representative.

Factory Reset

To return all the data tables and settings in the control to factory fresh settings, follow this procedure.

1. Turn off power to the control.

2. Press and hold the 7, ESC, ALT and ENTER Keys.
3. While holding these four keys, turn power on to the control.
4. Hold the four keys until the 'wait' goes away and 'cold start' appears in the display. If the 'cold start' does not appear before the control shows normal screens, you probably missed one of the four required keys.
5. Reenter all values and tables into the control.

Installation and Configuration

The installation menus are not shown on the front panel of the control. They are not used in the day to day operation of the control, but only during initial installation. To get to these menus from the default display, press ESC, and then enter the menu number from the Installation Menu.

Installation Menu

91 Configuration
92 Ventilation Levels 1
93 Relay Layout
94 Sensor Layout
95 Curtain Setup
96 Extra Curtains
97 System Variables
98 Password

Installation

Install the **AC-2000HP** in a dry well lighted area, preferably in an annex to the main poultry house. Mount it using the three holes provided…one in each of the left and right lower corners, accessible from the front under the terminal strip cover, and one top center in the back. The top center hole is a keyhole variety. Install the screw for this hole first to about 0.1 inches of the wall surface. Then hang the control on this screw. Install the other two screws to fasten the **AC-2000HP** securely.

Always connect the temperature and sensor shields to the earth ground. However, do not connect communication wire shields, which go from one house to another at both ends. Connect them at one end only. Connection at both ends can cause ground loop currents to flow, which reduce reliability. **Note:** the COM connection for communications is not the shield wire. The COM, RX and TX wires must connect to each other at all **AC-2000HP** controls.

Avoid mixing high voltage wiring with sensor and low voltage wiring. Keep the **AC-2000HP** as far as possible from heavy contactor boxes and other sources of electrical interference.

Configuration, Menu 91

The first item on the installation menu is Configuration, menu 91. This menu governs the following items:

1. Celsius or Fahrenheit temperature display.
2. Communications baud rate (1200, 2400, 4800 or 9600) for hookup to a personal computer or modem.
3. Maximum number of ventilation stages to use. The **AC-2000HP** supports up to 20 ventilation stages. However, limiting this to a smaller number simplifies the ventilation table.
4. Variable speed fan. To display variable speed fan settings in the ventilation table, menu 92, enter a '1' here. Enter a '0' to have the **AC-2000HP** show on/off timer settings.
5. First tunnel stage. When using tunnel ventilation, enter the ventilation stage (in accordance with the ventilation stage and curtain level tables) at which the system starts tunnel ventilation.
6. Number of heating zones. The **AC-2000HP** can control up to six separate heating zones. For just one zone, the average temperature controls the heaters. If you have two or more zones, the assigned sensor controls the heaters in each zone (menu 94).
7. Automatic continuous temperature adjustment. The **AC-2000HP** uses only the values entered in the temperature tables for each growth period if this is '0'. For automatic interpolation between these entries, (continuous ramping of temperature) enter a '1'.
8. Barn Number. This identifies the particular barn for the home personal computer. Use a unique number for each **AC-2000HP** to permit the communication program to identify each one.
9. Curtain opening and closing times. Enter the number of seconds it takes the curtains to go from fully closed to fully open, and from fully open to fully closed for each curtain.

Ventilation Table, Menu 92

The **AC-2000HP** turns on increasing fan power as ventilation needs increase. The increases should be proportional from stage to stage. This means that the ventilation increases about 25% to 100% at each stage. If at stage one a single fan on timer at 0.5

minutes on, 4.5 minutes off, changes at stage 2 to 1.0 minutes on, 4.0 minutes off, there is a 100% increase. Similarly, say at ventilation stage 15, an increase from 4 fans to 6 fans represents a 50% increase in fan power. Please review the example ventilation tables for this principle.

At each ventilation stage, a cycle timer can run the highest numbered fan group used at that stage. With no values in the timer on and off fields, or only an off time or only an on time, the **AC-2000HP** defaults to constant on operation. Some growers run foggers as if they were fan groups in higher ventilation regions. This is practical, since both tunnel ventilation and fogging provides cooling for the birds.

Since air movement provides a cooling effect, the **AC-2000HP** provides a temperature differential at each stage. This is particularly important in tunnel ventilation, where the cooling effect can be 10ºF. The **AC-2000HP** will wait until the target temperature plus the differential before using that ventilation stage.

Because of limited display size, the **AC-2000HP** shows only the on-off timer, or the variable speed setting at each stage. Menu 91, item 4 selects which the **AC-2000HP** shows. However, both settings remain correctly in memory.

Note: the ventilation table coordinates with the curtain table. For natural ventilation, one should regard the curtain table as part of the ventilation table: the two tables together are one larger table.

Relay Layout, Menu 93

Relay Code Table

Code	Description
1 through 8	Ventilation Group 1 through 8
9, 10	Zone A Heat: Low, High
11, 12	Zone B Heat: Low, High
13, 14	Zone C Heat: Low, High
15, 16, 17	Zone A Radiant Heat: Low, High, Ignition
18, 19, 20	Zone B Radiant Heat: Low, High, Ignition
21, 22, 23	Zone C Radiant Heat: Low, High, Ignition
24	Cooling System
25	Lighting System
26	Feeding System
27, 28	Curtain 1: Open, Close
29, 30	Curtain 2: Open, Close
31, 32, 33	Extra Systems 1 through 3
34	Circulation Fans
35, 36	Positive Pressure Optimizer: Burner, Fan
37, 38	Static Pressure Air Inlet: Open, Close
40	Alarm
42, 43	Static Pressure Tunnle Curtain: Open, Close
45, 46	Curtain 3: Open, Close
47, 48	Curtain 4: Open, Close
50, 51	Extra Curtain 1: Open, Close
52, 53	Extra Curtain 2: Open, Close
54, 55	Extra Curtain 3: Open, Close
56, 57	Extra Curtain 4: Open, Close
58, 59	Extra Curtain 5: Open, Close
60, 61	Extra Curtain 6: Open, Close
65, 66	Zone D Heat: Low, High
67, 68	Zone E Heat: Low, High
69, 70	Zone F Heat: Low, High

Select menu 93 for relay layout. There are various numbers of relays inside the **AC-2000HP**, depending on the number of relay cards. All the relays are identified numerically on the main pc board, and are usually in sequence. Assigning the relay code to each relay causes it to assume the particular function. Simply changing the relay code changes the function of the relay.

Menu 93

Relay	Code	NO/NC
1	1	0
2	2	0
3	3	0
4	4	0
5	25	0
6	26	0
7	etc	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	37	0
etc	-	-
-	-	-
32	0	0
33A	**Alarm, Not Programmable**	

Each relay may work normally or reversed using the NO/NC field. Most relays should be set to normal. The **AC-2000HP** provides a separate dedicated alarm relay. If you wish, you may program another alarm relay using code 40 for special purposes, such as signaling a dialer on a separate circuit from a siren.

Sensor Layout, Menu 94

The **AC-2000HP** supports up to six heating zones, each with individual heaters. The average of the zones determines the overall house temperature for the ventilation system. Menu 94 assigns particular sensors to the heating zones for temperature and radiant heaters. It also assigns humidity, static pressure and outside sensors.

Note: for half or third house brood, set up the zones to prevent averaging in grow end sensors. If the cold grow end sensor averages with your heated zones, it causes the house temperature to read too cold. This does not affect the heating, since the heaters use the individual zone sensors. However, the ventilation may be in-

correct and historical data may show incorrect temperatures. Radiant heaters used as brooders can have their own dedicated sensors. These do not affect the average temperature reading.

The **AC-2000HP** can use an outside temperature or humidity sensor in addition to the zone sensors. With these the **AC-2000HP** takes outside conditions into account for the ventilation and fresh air/humidity treatment programs.

1. Heat Zones A, B, C, D, E and F. Install any of the temperature sensors, 1 through 6 to control each zone. When partial house brooding, reduce the number of zones to exclude sensors not in the brood area. Otherwise, sensors in the grow end will cause erroneous readings.
2. Outside Temperature Sensor. Install one of the temperature inputs, 1 through 6. Ensure that the outside sensor has protection from direct sun, and hot air currents from the poultry house. Proper placement and shielding is important to successful outside temperature measurement.
3. Humidity Zone Sensors A, B and C.
4. Outside Humidity Sensor.
5. Static Pressure Sensor.

Curtain Table, Menu 95

The curtain table defines curtain levels for up to four curtains at all ventilation stages. This includes closing the curtains for minimum powered fan ventilation, opening them for natural ventilation and setting them for tunnel ventilation. At each ventilation stage, the curtains move to the opening level specified in the curtain level table.

Since curtains operate at various speeds, the **AC-2000HP** needs to know the amount of time it takes them to go from fully open to fully closed, and vice versa. Enter these values configuration, menu 91.

Exhaust fans may cause curtains to cling to the wiring mesh. For this reason, system variable 23 allows the **AC-2000HP** turn off the fans (all eight groups) if the curtains need to move at small openings. System variable 29 enables a static pressure/curtain movement interlock in case a curtain (relay codes 37 and 38) controls static pressure. The **AC-2000HP** can then turn off the fans while adjusting the curtain.

Extra Curtains, Menu 96

The **AC-2000HP** no longer provides the extra curtain function, as of revision date 0700.

System Variables, Menu 97

1. Hysteresis, Target Temperature. This sets the dead band above target temperature. The ventilation stage increases at the target temperature plus the hysteresis, and decreases at the target temperature. Factory default is 1.0ºF.
2. Ventilation stage increase time delay. This sets the minimum delay when increasing temperatures cause higher ventilation. Factory default is 3.0 minutes. Since the AC-2000HP may detect a drop in temperature, when above the set point, the actual ventilation increase is usually a little more than the minimum setting.
3. Ventilation stage decrease time delay. This sets the minimum delay when decreasing temperatures cause lower ventilation. Factory default is 1.0 minutes.
4. Maximum ventilation stage with average temperature less than cooling set point. This sets the maximum ventilation stage the control will use at any time the temperature is below the cooling set point. It is a convenient way of limiting the use of extra ventilation fans to a second set point, namely the cooling temperature. Factory default is 20.
5. Temperature Offset (differential) above target temperature for tunnel mode exit. This sets the degrees above target temperature that the **AC-2000HP** may leave tunnel ventilation, once it has entered tunnel mode. Factory default is 0.0ºF. See also variable 6 below. If there is no outside temperature sensor, then variable 6 has no effect.
6. Tunnel exit occurs if inside temperature is less than the target temperature plus variable 5 above, **and also** the outside temperature is less than the target temperature minus variable 6 here. If there is no outside temperature sensor, then variable 6 has no effect. Set Var. 6 to 99 in order to ignore outside temperature for Tunnel exit.
7. Relative temperature difference for high temperature alarm. This sets the degrees above target temperature to generate an alarm. Factory default is 6.0ºF. Note also system variables 40 and 45.
8. Heater hysteresis. This sets the difference between heater turn on and heater turn off. Factory default is 0.5ºF. This hysteresis is to the low side of the set point.
9. High Level Heater Hysteresis. This is the relative temperature difference for high level heaters, or amount below the heat set temperature to turn on high level heaters.

10. Radiant heater ignition time. This sets the length of time the radiant heater ignition is held on. Factory default is 60 seconds.
11. Relative temperature difference for low temperature alarm. This sets the degrees below target temperature to generate an alarm. Factory default is 5.0ºF.
12. Cooling hysteresis. This sets the difference between cooling system turn on and cooling system turn off temperatures. Factory default is 1.0ºF.
13. Humidity and fresh air treatment main delay duration. Factory default is 5 minutes.
14. Temperature difference for recirculation fan activation. This sets the temperature difference between Zone A and Zone B, at which the recirculation fans turn on. Factory default is 8.0ºF.
15. Midnight curtain position calibration. A '1' enables midnight curtain calibration, a '0' disables it. The calibration program runs the curtain to the nearest of fully open or fully closed positions at midnight. The duration of the calibration is the same as the time taken to go fully open or fully closed, as entered in configuration, menu 91.
16. Not Used.
17. Not Used.
18. Not Used.
19. Wind direction check period. The **AC-2000HP** can switch curtain tables between curtains 1 and 2 based on wind direction. This parameter sets the period for checking average wind direction, before deciding which way the wind is blowing. Factory default is 30.0 minutes.
20. Zero% fan speed and light dimmer setting. This variable sets the minimum voltage for both variable speed in the ventilation table, and light intensity in the light table. Factory default is 3.0 volts.
21. Tunnel mode, exit lockout. This sets the minimum time the **AC-2000HP** will stay locked in tunnel after entering tunnel mode. Factory default is 60.0 minutes.
22. One hundred% variable fan speed or light intensity. This setting is the 100% level for variable speed fans and light intensity. Factory default is 11.0 volts.
23. Fans stop for curtain moving at less than this opening. Exhaust fans may create static pressure pulling the curtains against the house when they are almost closed. Set the point to which you want the fans to stop when the curtains move. The **AC-2000HP** uses the sum of curtain 1 and curtain 2 openings to determine whether to turn the fans off briefly while moving the curtains. Factory default is 0%.
24. Wind direction/feed overflow alarm input selection. Setting this to 1 makes the second digital input function as feed overflow alarm input. If it is 0, the second digital input causes the **AC-2000HP** to use it as a prevailing wind direction indication.

25. Feed overflow alarm delay. Requires activation of the feed overflow alarm (see system variable 24) by this amount of time, to prevent tripping on short alarms. Factory default, 0.0 minutes.
26. Alarm output delay. This delay applies to all alarms, except the feed overflow alarm (See system variables 24 and 25.) Factory default is 0.5 minutes. . The alarm relay activates after this delay.
27. High Humidity treatment duration. Factory default 1 minute.
28. Pressure units for static pressure option. 0 => millibar, 1 => inches of water column, 2 => Pascals. Factory default is 1.
29. Static Pressure Interlock. Factory default is no interlock or code '0'. A code of '1' turns on the static pressure interlock, which turns off all ventilation groups during static pressure adjustment.
30. Minimum ventilation stage to allow low static pressure alarm. The factory default of '1' allows low static pressure alarms at all ventilation stages.
31. Static Pressure wind gust delay. The factory default of 10 seconds prevents the static pressure relays from responding due to short wind gusts. See menu 8 for other parameters related to static pressure operation. **Note**: the **AC-2000HP** bypasses this delay for ventilation stage changes and cycle timer fans, since it knows that the pressure change is not due to a wind gust.
32. Water overflow alarm level. This sets the water quantity per minute from the water meter that will trigger an overflow alarm. Factory default is 99. Calibration Menu 45 scales the quantity, so enter the scaled quantity, instead of the number of pulses from the water meter.
33. Water shortage alarm level. This sets the minimum water quantity per hour that the **AC-2000HP** must see to prevent generating a water shortage alarm. Note that the lights must be on during times this alarm can occur. The **AC-2000HP** recognizes that birds don't drink in the dark, and disables the alarm during lights out. Factory default is 0.
34. Water overflow alarm delay. This sets the minimum amount of time that a water overflow must be active before the **AC-2000HP** generates an alarm. Factory default is 10.0 minutes.
35. Rotem Use Only. Not used.
36. Heater Humidity treatment stop temperature. This sets the number of degrees above target temperature at which humidity treatment with the heaters stops. Factory default is 1.0 degrees.
37. Heater humidity treatment threshold. This sets the relative amount above requested humidity at which heater use to reduce humidity begins. Factor default is 99%, which disables it.
38. Radiation Heater threshold. This is the relative number of degrees above heater set point, at which the radiant heaters turn on. They stay on for all temperatures below this. Factory default is 0.

39. Disable low static pressure when changing between Minimum Ventilation or Natural Ventilation and Tunnel modes. Relays with Code 38 activate for this time (up to 10 minutes maximum). Values 11 to 98 minutes default to 10. Value of 99 eliminates low-pressure alarm during Tunnel mode and relays with code 38 activate for 10 minutes. If air pressure rises to alarm settings, the inlets (relay code 37) open to allow in emergency air. Factory Default is 0 minutes.
40. This sets an absolute high temperature alarm point, which remains at the place you set it. Factory Default is 99ºF.
41. Sunrise/Sunset effect duration. This sets the length of time to change light levels from one setting to another.
42. Alarm Level for Ammonia, ppm.
43. Selection to turn off feed relays for feed overflow alarm. A '1' means yes, a '0' means no.
44. Static Pressure inlet advance. This is the number of seconds prior to turning on fans that the inlets will begin to open when fans cycle according to the ventilation table settings. It is significant for minimum ventilation settings, where a total run time of 0.5 minutes might not allow the inlets to get open and set before the fans turn off again.
45. This option instructions the AC-2000HP to consider the ventilation level temperature differential in the relative high temperature alarm setting. The alarm will occur at the target temperature plus the current ventilation level differential temperature plus system variable 7. If you leave this at zero (no stage differential option) the high temperature alarm occurs at target temperature plus system variable 7. **Warning**: if there is no air flow in the house, the temperature differential from Menu 92 will cause the alarm temperature to be higher than normal. This can result in bird loss; use this option only with adequate back up and other means to ensure adequate air flow at all times.
46. Not Used.
47. Not Used.
48. Not Used.
49. Not Used.
50. Not Used.

Password, Menu 98

To protect the integrity of the **AC-2000HP** settings, use a password. The passwords also control access for the communications programs. It is important to keep the password confidential.

The 'high' password provides read and write access. A person having this password can change any value in the **AC-2000HP**.

The ‘low’ password provides read only access. A person with the low password can read all values, but not change them.

If you leave the password at ‘0’ the **AC-2000HP** does not check for it, and allows straightforward access.

Installation Records

Temperature Table, Menu 1

Line	Growth Day	Target	Heat	Tunnel
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Minimum-Maximum Table, Menu 2

Line	Growth Day	Minimum Stage	Maximum Stage
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Target Humidity, and _____

Target Ammonia, Menu 3

_____
_____
_____

Cooling Table, Menu 4

Line	From Time	To Time	Diff Temp	Below %RH	ON Minutes	OFF Minutes
1						
2						
3						
4						
5						

Lighting Table, Menu 5

Line	Day	From Time	To Time	Intensity - %
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				

20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				

Feeding Table, Menu 6

Line	From Time	To Time	Quantity/Bird
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Extra Systems, Menu 7

Line	From Time	To Time	Above Temp	Below Temp	ON Time	OFF Time	Sensor
1							
2							
3							

Static Pressure, Menu 8

Item	Default	Value
Low Temperature	14.0ºF	
Low Temperature Pressure Setting	0	
High Temperature	14.0ºF	
High Temperature Pressure Setting	0	
Low Pressure Alarm	0	
High Pressure Alarm	0	
Open Run Time (Seconds)	0	
Close Run Time (Seconds)	0	
Delay Between Runs (Seconds)	0	
Hysteresis	0	

Configuration, Menu 91

Item	Default	Value
Celsius or Fahrenheit	F (1)	
Communications Baud Rate	2400	
Ventilation Stages	20	
Variable Speed Fan	No (0)	
First Tunnel Stage	None (0)	
Heating Zones	1	
Automatic Temperature Ramping	No (0)	
Barn Number	0	
Curtain 1 Open Time	0	
Curtain 1 Close Time	0	
Curtain 2 Open Time	0	
Curtain 2 Close Time	0	
Curtain 3 Open Time	0	
Curtain 3 Close Time	0	
Curtain 4 Open Time	0	
Curtain 4 Close Time	0	

Ventilation Stage & Curtain Level: Menu 92, Menu 95

Stage, Level	Fans, Groups of Fans	ON Time	OFF Time	Temp Diff.	Var %	Curt 1, %	Curt 2, %	Curt 3, %	Curt 4, %
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Note: The **AC-2000HP** uses ventilation resources available to keep the set temperatures. There is no stage-to-stage differential drift, as there is with some staged controllers. The time delay and hysteresis settings (Menu 97, System Variables 1, 2 and 3) ensure stable operation, while the **AC-2000HP** maintains the desired set temperature at any ventilation level.

You may also set temperature differentials (offsets or relative set points) for each stage as desired. Use this to account for the cooling effects (wind chill) of air speed in tunnel ventilation and ventilation system costs. For example, full tunnel ventilation can provide over 10ºF of cooling, calling for that temperature differential. Otherwise, the birds may be over cooled.

Sensor Layout, Menu 94

Description	Sensor
Temperature Zone A	
Temperature Zone B	
Temperature Zone C	
Temperature Zone D	
Temperature Zone E	
Temperature Zone F	
Radiation Heater Zone A	
Radiation Heater Zone B	
Radiation Heater Zone C	
Radiation Heater Zone D	
Radation Heater Zone E	
Radiation Heater Zone F	
Outside Temperature	
Humidity Zone A	
Humidity Zone B	
Humidity Zone C	
Outside Humidity	
Static Pressure	
Ammonia	

Relay Codes for Menu 93

Relay Code Table

Code	Description
1 through 8	Ventilation Group 1 through 8
9, 10	Zone A Heat: Low, High
11, 12	Zone B Heat: Low, High
13, 14	Zone C Heat: Low, High
15, 16, 17	Zone A Radiant Heat: Low, High, Ignition
18, 19, 20	Zone B Radiant Heat: Low, High, Ignition
21, 22, 23	Zone C Radiant Heat: Low, High, Ignition
24	Cooling System
25	Lighting System
26	Feeding System
27, 28	Curtain 1: Open, Close
29, 30	Curtain 2: Open, Close
31, 32, 33	Extra Systems 1 through 3
34	Circulation Fans
35, 36	Positive Pressure Optimizer: Burner, Fan
37, 38	Static Pressure Air Inlet: Open, Close
40	Alarm
45, 46	Curtain 3: Open, Close
47, 48	Curtain 4: Open, Close
50, 51	Extra Curtain 1: Open, Close
52, 53	Extra Curtain 2: Open, Close
54, 55	Extra Curtain 3: Open, Close
56, 57	Extra Curtain 4: Open, Close
58, 59	Extra Curtain 5: Open, Close
60, 61	Extra Curtain 6: Open, Close
65, 66	Zone D Heat: Low, High
67, 68	Zone E Heat: Low, High
69, 70	Zone F Heat: Low, High

Relay Layout, Menu 93

Relay	Code	NO/NC	Description
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

Extra Curtains, Menu 96

Not available

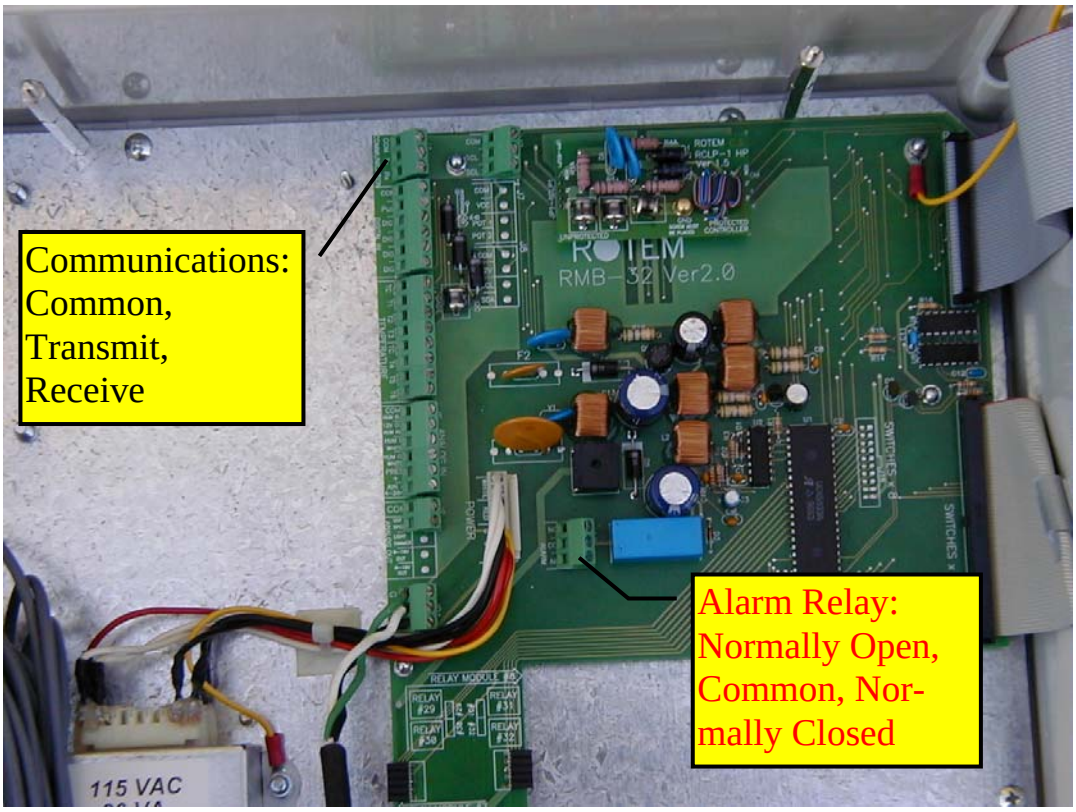
System Variables, Menu 97

Var	Description	Default	Value
1	Hysteresis, Target Temperature	1.0ºF	
2	Ventilation Stage Increase, Time Delay	3.0 Min	
3	Ventilation Stage Decrease, Time Delay	1.0 Min	
4	Max Ventilation Stage Below Cooling Temp	20	
5	Tunel Mode Exit, Amount Above Target	0	
6	Outside Temp tunnel mode exit adjustment	0	
7	HighTemp Alarm, Amount Above Target	6.0ºF	
8	Low Level Heater Hysteresis, Amount Below Heat Set Temperature	0.5ºF	
9	High Level Heater Hysteresis, Amount Below Heat Set Temperature	1.0ºF	
10	Radiant Heater Ignition Time	60 Sec	
11	Low Temp Alarm, Amount Below Target	5.0ºF	
12	Cooling Hysteresis	1.0ºF	
13	Humidity Treatment Main Delay	5.0 Min	
14	Zone A, B Temp Diff for Recirculation Fan	8.0ºF	
15	Midnight Curtain Calibration Enable (Enable On = 1.0, any other value disables)	On	
16	Not Used		
17	Delay time after cycle end for center fans on		
18	Center fans run time following variable 17		
19	Wind Direction Averaging Period	30 Min	
20	0% Variable Fan Speed or Light Dimmer Output Voltage	3.0 V	
21	Tunnel Mode Exit Lockout Time	60 Min	
22	100% Variable Fan Speed or Light Dimmer Output Voltage	11.0 V	
23	Minimum Curtains 1+2 Opening for Group Fans Run	0%	
24	Wind Direction (0)/Feed Overflow Alarm (1)	Wind	
25	Feed Overflow Alarm Delay	0.0 Min	
26	Alarm Relay Output Delay	0.5 Min	

27	Humidity Treatment Duration	1.0 Min	
28	Pressure Units -0 = millibar, 1 = inch water column, 2 = Pascals	1	
29	Static Pressure Interlock (Group Fans Off During Pressure Adjustment), No = 0	No	
30	Minimum Stage for Low Static Pressure Alarm	1	
31	Static Pressure Wind Gust Delay	10 Sec	
32	Water Overflow Alarm Quantity per Minute	99 units	
33	Water Shortage Alarm Quantity per Hour	0 units	
34	Water Overflow Alarm Delay	10 Min	
35	Not Used		
36	Humidity Treatment, Heater Use Limit	1.0ºF	
37	Humidity Treatment, Heater Use Start Point	99%	
38	Radiation Heater, Set Point Above Heat	0.0ºF	
39	Natural/Tunnel mode change, low pressure alarm disable	0	
40	Absolute High Temperature Alarm	99	
41	Sunrise/Sunset Duration	0	
42	Ammonia Alarm Level, ppm	30.0	
43	Enable Feed Shutoff if Feed Overflow Alarm	0	
44	Air Inlet Open Advance, Seconds	8	
45	Stage Differential High Temp Alarm Option	0	
46	Not Used.		
47	Not Used.		
48	Not Used.		
49	Not Used.		
50	Not Used.		

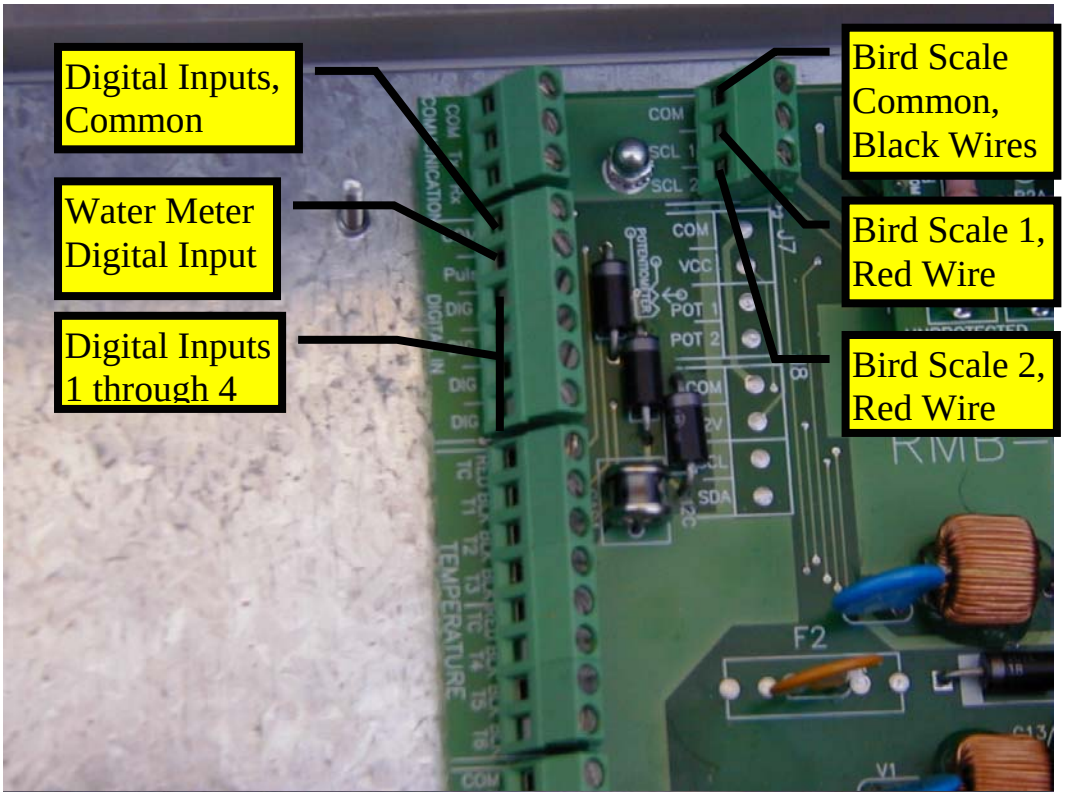
Technical Data

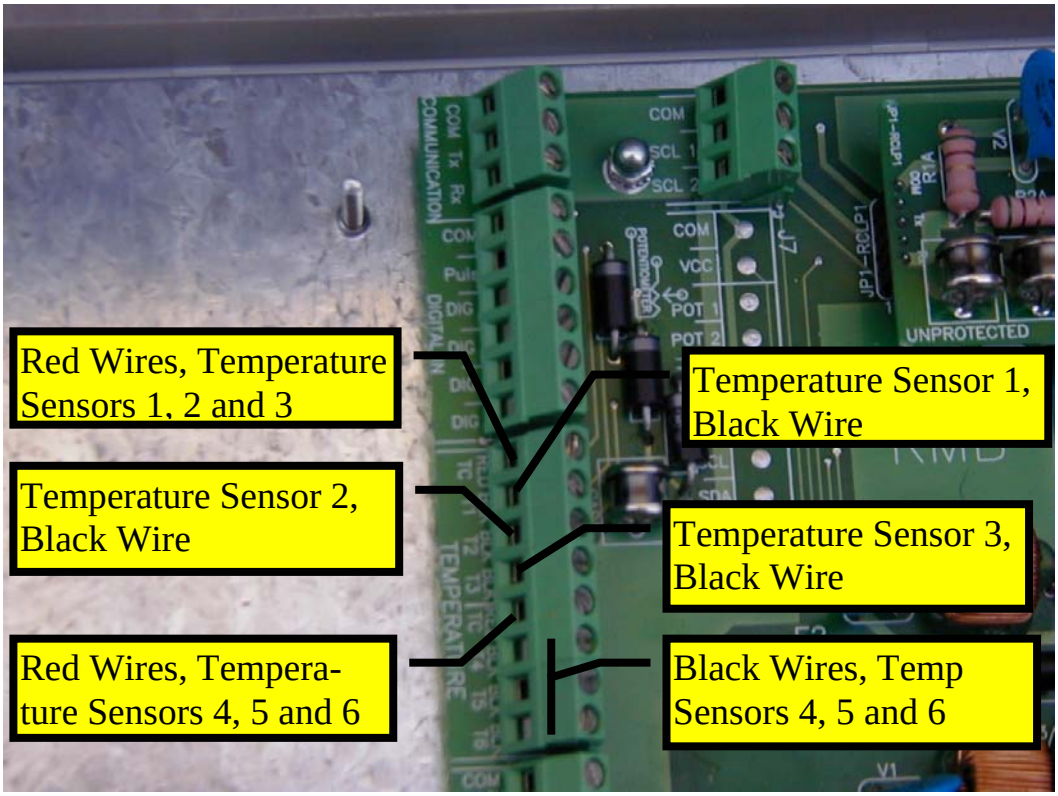
This photo shows the main connection terminals for the **AC-2000HP**. To avoid conflict with high voltage and heavy currents at the relays in the lower part, bring all the signal wiring in from the top left side, if possible. This includes communications, scales, temperature and other sensors.



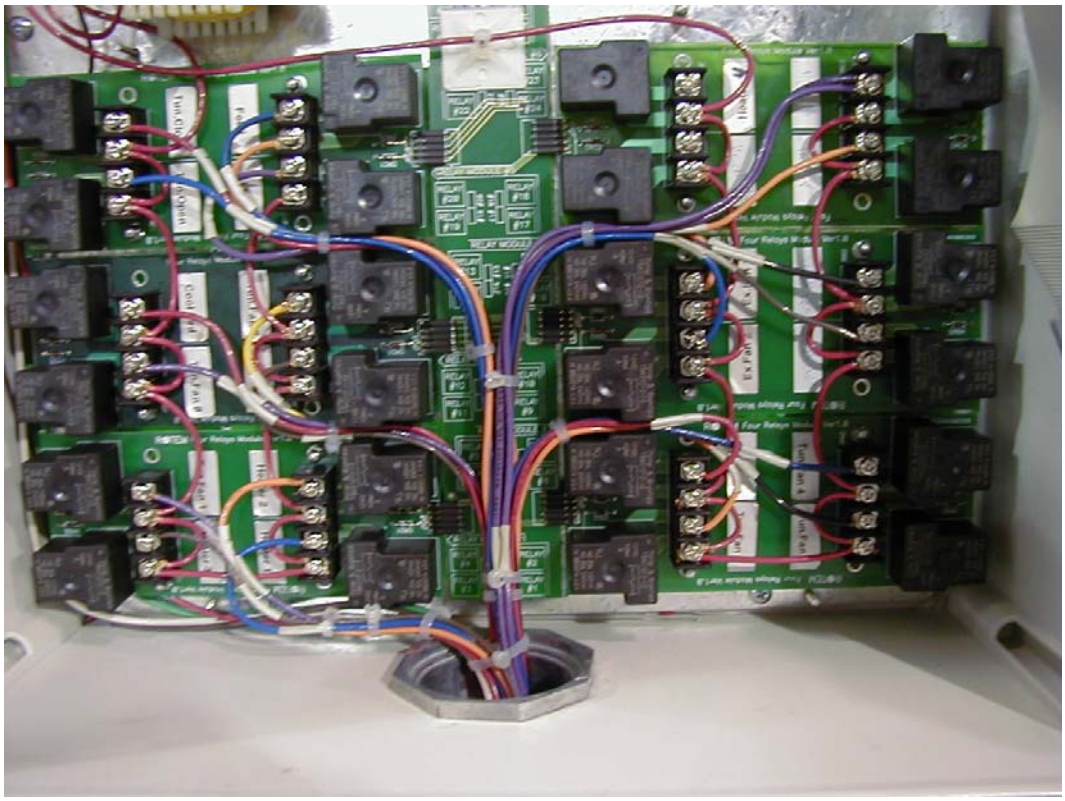
AC-2000HP

Terminals





Typical Relay Installation Wiring



Note that this style wiring makes it easy to replace any relay module when necessary. The main wiring bundle is in the center of the box and does not cover any relay modules.

Specifications

Input Voltage:	110 VAC (USA and Canada)
	240 VAC (Outside USA and Canada)
	0.5 Amp, 50-60 Hz
Relay Loads:	5.0 Amps, 250 Volts, Fused
Analog Inputs:	0 - 5 Volts
Analog Ouput:	0 - 11 Volts, 10 milliamps max.
12 Volt Output:	Current limited with 100 Ohm Resistor.
Digital Inputs:	5 ma @ 5 Volts, dry contact

Operating Temperature Range: -10ºC to 50ºC (14ºF to 125ºF)
Enclosure: Water and Dust tight
Fuses:Main fuse: 0.315 Amps, 250 Volts
Others: 5 Amp, 250 Volts

Environmental Protection

Recycle raw materials instead of disposing as waste. The controller, accessories and packaging should be sorted for environmental-friendly recycling. The plastic components are labeled for categorized recycling.

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