



User's Manual

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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.

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 external backup with proper setting for the specific age of the bird and alarm systems that will function at all times and will be tested periodically, either daily or weekly. These are to operate critical systems even in case of a Rotem system failure. Neglecting to provide such proper backup and an alarm will be regarded as the user's willingness to accept the total risk of loss, injury and financial damage.

ROTEM Computerized Controllers Ltd.

1 Haofan st. kiryat Arie

Petach-Tikva 49511, Israel

Tel: 972-3-920-6200

Fax: 972-3-924-9834

Software version: 7.02r01

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Features

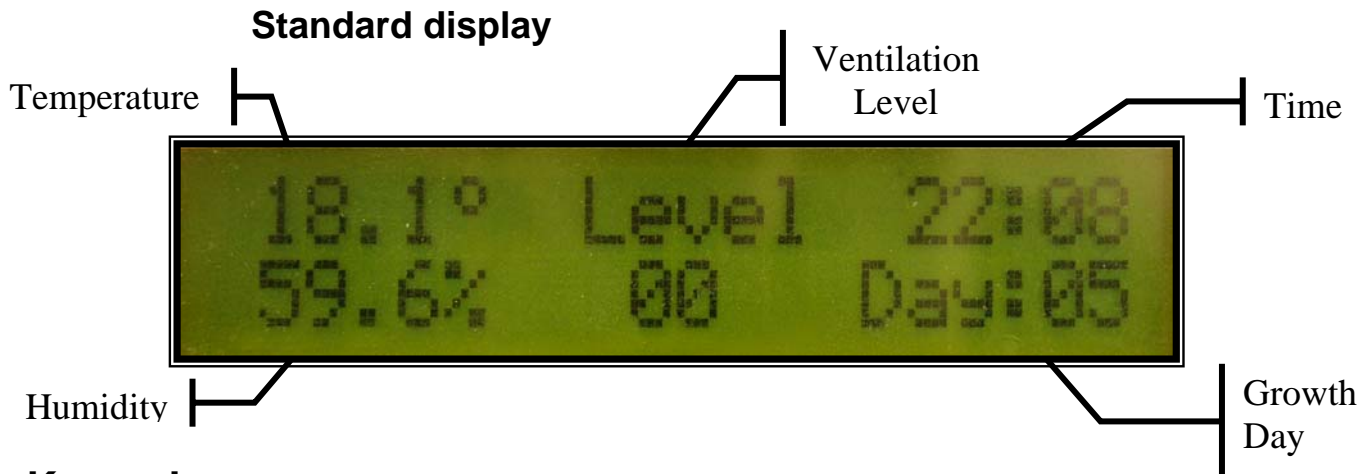
- 2X20 Lighted liquid crystal display (LCD).
- 19 keys keyboard.
- 12/20/32 relays with relay extension option for the AC-200 Plus.
- Two built in bird scale connections.
- 4 temperature sensors.
- Humidity sensor input.
- Pressure sensor input.
- PC communication.

Operating Instructions

Display

Here is the **AC-2000** standard display. If there is an **alarm** the screen will alternately show the alarm message and this display.

If the sensors are disconnected instead of temperature, "fail" will be written.



Keypad

MENU: The **Menu** key displays the main menu from the standard screen, and exits the menus whenever you are already in a menu. It is like a push-push lamp switch that you push to turn on, and push again to turn off.

SHIFT: When in long tables press shift with 3 or 9 and the lines will jump by 10 each time. (More shift options on the controller's box display)

ENTER: The **Enter** key completes your entry or menu selection. The Platinum Plus recognizes numeric values when setting temperatures, times, etc. only after you push the enter key.

DEL: The **Delete** key erases typing mistakes. It also enables the 'Cold Start' function if held at power on.

ARROW: The **Arrow** keys move you around the menus, and help you make selections. In some cases you can also use them to change values.

NUMBERS: The **Numeric** keys enter numbers and make choices in numbered menus.

Hot Keys

The **AC-2000** has 7 hot keys for quick information.
The hot keys function only from the main screen.

Hot key 1: Displays the current target temperature.

Hot key 2: Current relays status.

Hot key 3: Outside temperature and humidity.

Hot key 4: Displays the temperature according to zones.

Hot key 5: Current pressure and the pressure target.

Note: This hot screen will not display unless a pressure sensor was defined in Sensor Layout.

Hot key 6: Displays the minimum and maximum levels of ventilation.

Hot key 9: Controller's version.

Principles, Options, Operation

Cooling and Ventilation

Cooling and ventilation are closely related. Most ventilation is based on temperature since satisfying temperature needs also satisfies most other ventilation requirements. Timers for minimum ventilation settings and humidity sensors cover ventilation needs that temperature sensors do not handle correctly. When air movement cannot provide enough cooling, foggers, misters and cooling pads provide it.

Since mechanical ventilation means are expensive to operate, many try to take advantage of free natural ventilation. With so many ways to have ventilation systems, we can only provide guidelines. You will need to adapt the **AC-2000** to your particular needs.

Power Ventilation

Powered fans are the usual means of choice to provide reliable ventilation and cooling. Powered inlets are also popular; static pressure sensors ensure that fresh air enters with sufficient velocity to travel well within the poultry house and mix with inside air to prevent drafts. Whether fresh air enters through ridge vents, directly through static pressure controlled wall inlets, or through a plenum, the **AC-2000** provides control throughout the flock growth cycle. Power ventilation usually means minimum or near minimum air flow (to reduce heat losses).

Transitional Ventilation

Transitional ventilation is a term covering those areas not otherwise described. Most often it describes airflow at greater than minimum requirements, but less than full tunnel ventilation.

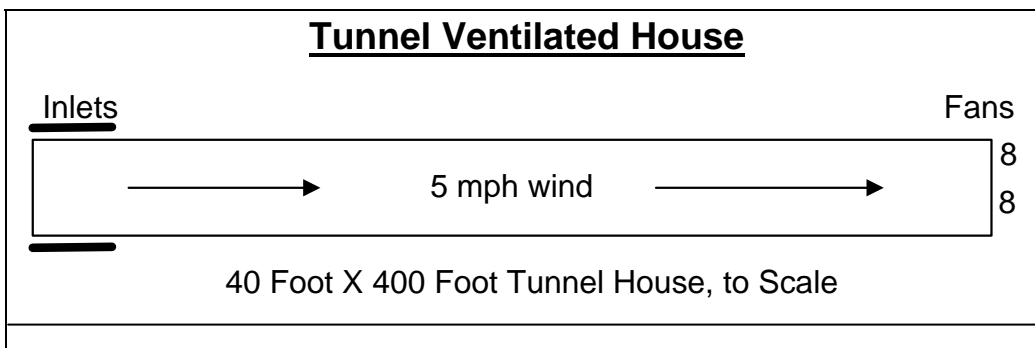
Natural Ventilation

When nature cooperates, there may be no better way to provide an optimum poultry environment. Curtain sidewalls 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-2000** accept settings that facilitate the use of these and other systems for natural ventilation.

Tunnel Ventilation

Tunnel ventilation takes advantage of the wind chill factor of moving air. Large birds at 85°F in still air will suffer; move the air at 5 mph and the birds are comfortable. Some producers find that creating a 5 mph wind through a long poultry house by using large fans at one end is the most economical and reliable means to ventilate poultry. Also, cooling pads

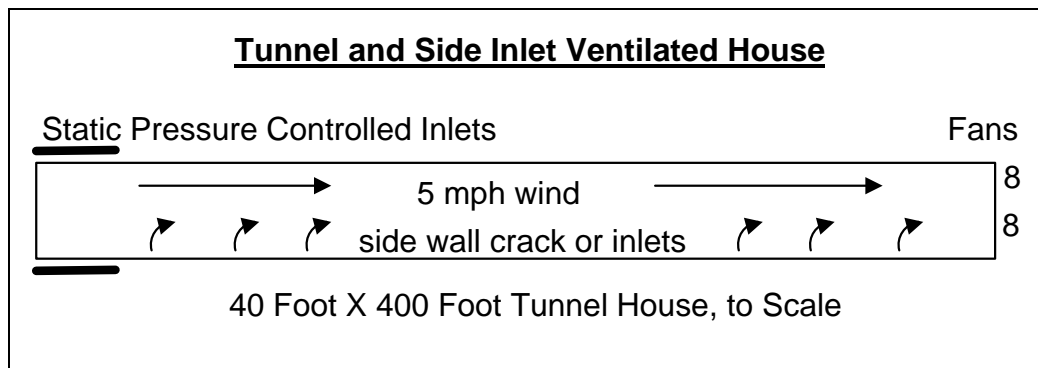
work well with tunnel ventilation because the tunnel fans automatically draw fresh air through them, and there is little danger of spraying excessive water inside the house.



With a full house, there will be a temperature rise toward the fan end. Cool air enters at the inlets, often through chiller or cooling pads. As it passes through the house, it warms up and may be several degrees warmer than at the cool end. In the event of inlet curtain failure, airflow stops and static pressure rises. The **AC-2000** will open the ridge/side wall inlets and generate an alarm in this emergency.

Some producers mix tunnel ventilation with side inlets, while others use the **AC-2000** static pressure emergency feature to open the side inlets only if static pressure gets too high. The **AC-2000** provides a fan to curtain movement interlock so that the tunnel inlets or tunnel.

Inlet curtains can control static pressure; when the inlet



curtain moves the **AC-2000** can temporarily stop the fans so the curtains will not hang up.

Many houses do not use natural ventilation at all. Instead, the ventilation gradually increases, as the birds grow, through the crack or side wall/ceiling inlets. During brood and young bird stage, one or two of the tunnel fans draw air into the house through the inlets, the tunnel inlet curtains being closed. When this is insufficient to cool the birds, the end or tunnel curtain opens. Cooling pads at the inlet curtain, or foggers

through the house, provide additional cooling. This may eliminate the expense of sidewall fans.

As more air moves through the house, the air movement itself has a cooling effect. You may add a temperature differential for each ventilation level, which the **AC-2000** will add to the target temperature before using that level, to account for this cooling effect. Normally the minimum ventilation levels do not require any temperature differential since the air velocity is very low.

<u>Tunnel Ventilation Parameters</u>	
Parameter	Comments
Menu 1 Cool Temperature	Controls evaluation of the Menu 4 cool table, it also sets the <i>inside</i> house temperature forcing tunnel ventilation.
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.

In menu 91, item 4, the **AC-2000** asks for the ventilation level at which to start tunnel ventilation if side curtains provide natural ventilation, the **AC-2000** must restrict entering and leaving tunnel mode to prevent wearing out the curtains. The **AC-2000** waits till the cooling temperature set point before entering tunnel. Additionally, if there is an outside sensor, the outside temperature must be greater than the target temperature. If there is no natural ventilation and your house is extremely well balanced, you may choose no tunnel level at all.

System variable 21 specifies the minimum stay in and out of tunnel ventilation, and system variable 5 the temperature above target temperature to exit tunnel mode. Otherwise, the temperature changes when tunnel operation starts could cause a yo-yo in and out of tunnel mode, wearing out the curtains.

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-2000** to turn on small amounts of fan power for minimum ventilation requirements.

3. It allows the **AC-2000** to turn on additional fan power in reasonable steps, as ventilation requirements increase.
4. Combinations of groups 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 arbitrary number of fans.

Generally, a variable speed fan, or one fan on timer provide for minimum ventilation. The variable speed fan does not count as a group, and has its own entries in the ventilation table. A second fan in another group can provide backup for the first fan, whether the first fan is a timed fan, or a variable speed fan. Except for this minimum ventilation group, each group of fans typically has two or more fans on one electrical circuit. Six groups suffice for the usual numbers of fans. The **AC-2000** uses up to eight groups of fans.

Variable Speed Fan

Variable speed fans rarely supply precisely the airflow programmed in the ventilation table. Therefore, when setting variable fan speeds, check the actual airflow at the settings you use. Some fans may deliver 50% airflow at a 90% setting and other fans stop turning completely at settings below 50%. Certain fan blades may be unable to blow air against the wind or static pressure at slow speeds. With some experimentation, however, you should be able to find suitable settings for your fan and ventilation levels.

Be sure to check for vibration and overheating at your slowest speeds. If you notice this, increase the minimum settings. System variable 20 sets the 0% voltage and variable 22 sets the 100% voltage for the variable speed fan. The **AC-2000** calculates the correct output from the variable speed percent values you enter in the ventilation tables. That is, 50% in the ventilation table is half way between system variables 20 and 22.

Summary, Ventilation

1. Assign ventilation fans to groups. The groups may use multiple output relays, so that several outputs make up a group. Different groups may not share the same relay. There is no information to enter into the control at this point. Simply write the group numbers down with the assigned fans in the installation record, Menu 92. The **AC-2000** uses up to eight different groups.
2. Fill out the Ventilation Level Table, Menu 92. This is part of the system installation menu, which does not appear on the front panel of the control. The **AC-2000** may use up to 20 levels. **Warning:** Be careful to set the maximum ventilation level number correctly in configuration, menu 91, item 2. If the higher unused ventilation levels are at zero, the control will turn off all fans when it reaches those

levels on a hot day. It is good practice to duplicate the last line for the rest of the table.

3. Fill out the Curtain Level Table, Menu 95 to correspond with the Ventilation Level Table, Menu 92. Note that the levels in both tables correspond with each other. Fill out the Temperature Table. Pick convenient growth days, and set appropriate target, heating and cooling temperatures. The **AC-2000** can automatically ramp these temperatures at intermediate growth dates; simply enable 'auto temp reduction,' item 6 in installation, menu 91. The control will regulate the ventilation and heating equipment to maintain these temperatures.
4. Fill out the Minimum-Maximum Level Table by bird growth dates. This table limits the ventilation levels the **AC-2000** may use. The Minimum settings are your winter handle on air quality in the house.
5. Set the Target Humidity and Cooling Tables if using these systems.
6. If using static pressure controlled inlets, enter the static pressure settings.

Examples: Fan Groups, Curtains, and Levels

Sometimes the easiest approach is to see an example. In this section we consider two different broiler houses. One is curtain sided with cross ventilation and exhaust fans. The other is also curtain sided, but has only tunnel fans. All of the fans in the first example are in the sidewalls. In the second, they are all at one end of the building.

The **AC-2000** organizes the main ventilation fans in up to eight groups of various sizes. It turns on combinations of up to eight of these groups at a time to provide the correct amount of ventilation. The example here, Typical Fan Grouping, Example A, demonstrates a common organization pattern. The **AC-2000** can also use a variable speed fan, and timers to cycle fans on and off. **Note** that Group 5 in this example uses three different outputs.

Typical Fan Grouping, Example A

Group 1	Minimum Ventilation Fan 1 on Timer
Group 2	Minimum Ventilation Fan 2 on Timer
Group 3	One Ventilation Fan, Fan 3
Group 4	One Ventilation Fan, Fan 4
Group 5	Two Ventilation Fans, Fans 5 and 6
Group 5	Two Ventilation Fans, Fans 7 and 8
Group 5	Two Ventilation Fans, Fans 9 and 10

Example A

Example A uses no tunnel ventilation, but does have two independent side curtains. The fans are all in the side walls; some are exhaust fans. Others, for cross ventilation, sweep air diagonally across the house when the curtains are open on hot days. A fixed one inch crack allows minimum fresh air into the building when the exhaust fans operate. A possible ventilation table is on the next page.

Example A uses exhaust fans for minimum ventilation when the weather is too cold to let the curtains down. Ventilation level 1 is for day old chicks, and moves a minimum amount of air into the house. Level 9 has all exhaust fans going to provide air for large birds on very cold days. Levels 10 through 15 are various degrees of natural ventilation, and level 16 and above turn on the cross ventilation fans for additional cooling during extremely hot conditions.

Typical Ventilation Level Table, Example A

Ventilation Level	Ventilation Groups	On Min	Off Min	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	1.0	4.0	0	0
3	1 0 0 0 0 0 0 0	2.0	3.0	0	0
4	1 0 0 0 0 0 0 0	3.0	2.0	0	0
5	1 0 0 0 0 0 0 0	1.0	0.0	0	0
6*	1 2 0 0 0 0 0 0	5.0	5.0	0	0
7	1 2 0 0 0 0 0 0	1.0	0.0	0	0
8	1 3 0 0 0 0 0 0	1.0	0.0	0	0
9	1 2 3 0 0 0 0 0	1.0	0.0	0	0
10...15	0 0 0 0 0 0 0 0	0.0	0.0	0	0
16...20	3 4 5 0 0 0 0 0	1.0	0.0	5.0	0

* **Note:** ventilation level 6 has fan groups 1 and 2 active. The cycle timer is set at 5.0 minutes on and 5.0 minutes off. The cycle timer always applies to the highest numbered group in the ventilation level, so in this case group 1 is on steady, group 2 cycles 50% on a ten minute cycle period.

** **Note:** The **AC-2000** displays either the On/Off minutes at each level, or the variable speed setting. It does not display both at once, although all data remains correctly in computer memory. Menu 91, item 3, controls which data shows on screen.

Warning: Example A, repeats ventilation level 16 all the way to level 20.

One should set the maximum ventilation level to 16 in Configuration, menu 91, and item 3 for this example. However, if the maximum ventilation level were at 20, with levels 17 through 20 blank, the **AC-2000** would turn off all fans at ventilation levels 17 through 20, if programmed to blank. You may duplicate these levels to prevent this, or program the maximum number of ventilation levels.

The curtain level table works with the ventilation level table.

Curtain Level Table, Example A

Ventilation Level	Curtain 1 % Open	Curtain 2 % Open
1...9	0.0	0.0
10	15	10
11	25	20
12	40	30
13	60	50
14	100	70
15...20	100	100

Example A has two side curtains for ventilation past ventilation level 9. For this example, curtain 1 is normally to the lee side of prevailing winds. Example A has it open slightly ahead of curtain 2. If the **AC-2000** has a wind direction indicator, it automatically switches Curtain 1 and Curtain 2 levels according to the wind direction.

Referring to the ventilation table, at level 16 seven cross ventilation fans (Groups 4, 5 and 6) blow air across the flock for more cooling. With system variable 4 set to 15, "Maximum level when inside temperature is below cooling," the **AC-2000** will not use level 16 or above unless the temperature is above the cooling system set point. Alternatively, set the differential to account for the cooling effect and cost of these fans, as shown.

Example B**Typical Fan Grouping, Example B**

Group 1	Ventilation Fan 1 on Timer
Group 2	Ventilation Fan 2 on Timer
Group 3	Ventilation Fan 3 on Timer
Group 4	Two Ventilation Fans, 4 and 5
Group 5	Two Ventilation Fans, 6 and 7
Group 6	Two Ventilation Fans, 8 and 9
Group 7	Two Ventilation Fans, 10 and 11

In example B a single curtain machine runs two side curtains, and a second machine the tunnel curtain. All the fans are 48" tunnel fans. The **RPS-1** static pressure sensor controls sidewall/ceiling inlets independently from the ventilation table.

For ventilation under cold conditions, one, two or three of the tunnel fans provide minimum ventilation. These draw fresh air through the side inlets, providing uniform fresh air throughout the house. With good outside conditions, example B uses natural ventilation with no fans (levels 10...15). Many growers would insist on using stir fans for safety. Tunnel ventilation with cooling pads (levels 16...19) provides ventilation for large birds during hot weather.

Typical Ventilation Level Table, Example B

Ventilation Level	Ventilation Groups	On Minutes	Off Minutes	Diff	Var
1	1 0 0 0 0 0 0 0	0.5	9.5	0	0
2	1 0 0 0 0 0 0 0	1.0	9.0	0	0
3	1 0 0 0 0 0 0 0	2.0	8.0	0	0
4	1 0 0 0 0 0 0 0	5.0	5.0	0	0
5	1 0 0 0 0 0 0 0	1.0	0.0	0	0
6	1 2 0 0 0 0 0 0	5.0	5.0	0	0
7	1 2 0 0 0 0 0 0	1.0	0.0	0	0
8	1 2 3 0 0 0 0 0	1.0	0.0	0	0
9	1 2 3 4 0 0 0 0	1.0	0.0	0	0
10...15	0 0 0 0 0 0 0 0	0.0	0.0	0	0
16	1 2 3 4 0 0 0 0	1.0	0.0	4.0	0
17	1 2 3 4 5 0 0 0	1.0	0.0	6.0	0
18	1 2 3 4 5 6 0 0	1.0	0.0	10.0	0
19	1 2 3 4 5 6 7 0	1.0	0.0	10.0	0

The first part of Example B's ventilation table reflects power and transitional ventilation with air coming through static pressure controlled inlets. At ventilation level, 10 natural ventilation starts with the side curtains fully open at level 15. At level 16 the **AC-2000** switches into tunnel ventilation, with maximum fan power at level 18. Note the adjustment example B makes with target temperature in tunnel mode by adding differential temperatures from level 15 and above.

Many modern growers will not use natural ventilation. They would simply move the tunnel levels right up to level 10, leaving out the natural ventilation portion.

Curtain Level Table, Example B

Ventilation Level	Side Curtains % Open	Tunnel Curtain % Open
1 through 8	0	0
9	15	15
10	25	25
11	40	40
12	55	55
13	75	75
14	100	100
15...20	0	100

The Curtain Level Table, Example B, coordinates with the ventilation table. Note how the tunnel curtain stays open, and the side curtains close at level 15.

The **AC-2000** enters tunnel ventilation at the cooling set point, not target temperature. System variable 21 enforces a minimum time in tunnel and out of tunnel to prevent yo-yoing. System variable 6 sets the degrees above target temperature to leave tunnel mode.

Example B uses natural ventilation for levels 9 through 14. Tunnel ventilation starts at level 15, which one enters in menu 91, Configuration, item 5. The tunnel curtain works with the side curtains until level 14. At level 15 the side curtains close while the tunnel curtain remains open for tunnel ventilation. The tunnel curtain may operate at a different speed than the side curtains. Enter the time for curtains opening and closing in menu 91, Configuration, item 10, so the **AC-2000** can account for the curtain movement rates.

Heaters

The **AC-2000** supports several kinds of heaters. Standard low and high-level heaters and radiant heaters work in up to three zones.

Standard Heaters

Each of the zones may have low and high-level standard heaters. The low level heaters turn on first, and if they cannot maintain the set temperature, the high level heaters turn on. For historical data collection, the **AC-2000** records the run time for the low level heaters only. It does not record the times for the high level or radiant heaters.

If you use a single zone, the **AC-2000** uses the average of the zone temperature sensors to control the heating. If using multiple zones, the **AC-2000** uses the specific zone sensor designated for each zone. See menu 91, item 5 and menu 94.

Note: should the **AC-2000** turn on any of the standard heaters, it immediately returns to minimum ventilation. Be sure to calibrate your temperature sensors to prevent one zone reading low calling for heat, and other zones read high forcing higher levels of ventilation, which exhausts the heat unnecessarily.

Radiant Heaters

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

Some radiant heaters require one relay to turn on the ignition, and another relay for the high level burner. System variable 10 sets the ignition relay on time. System variable 38 allows setting a higher set temperature for radiant heaters than the standard heaters.

Other Systems

The **AC-2000** will also run lighting, feeding and extra systems. The feeding and lighting systems may coordinate for dark-out and periodic operation. Extra systems can run according to time, temperature sensor, or cycle timer.

Water Meter and Alarm

A standard pulse output water meter may attach to the **AC-2000**. It will then keep historical water consumption information, and generates 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 overtime alarm limit, variable 33 the shortage limit, and variable 34 the delay time for reporting water alarms. Use menu 46 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. Moreover, this is disabled when water calibration is zero.

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

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-2000** 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 43 and 44 provide for calibration by known weight, or by the factory provided calibration factor.

Feed Overtime Alarm and Shutoff

If system variable 24 is one, the **AC-2000** assigns the terminal 5 digital input 1 to the feed overtime sensor. System variable 25 sets a delay between activation of a feed overtime alarm input, and activation of the alarm relay. System Variable 43 elects whether to shut off the feed system on an alarm.

Wind Direction Sensor

If system variable 24 is zero, 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-2000** 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 Communication

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

Control Menu

Experiment with the control using the temperature settings. Press the **MENU** key to bring up the control menu. If you press **MENU** again, the standard display will reappear.

* CONTROL MENU * 01 TEMPERATURE

Note the two digits, '01,' beside the '**TEMPERATURE**'. This number is from the Quick Menu printed on the front of the **AC-2000**, to the left of the display and keypad. Enter any quick menu number, and then press the **Enter** key to quickly reach that information. You can also browse Quick Menu items with the arrow keys. The blinking line under the '1' is the cursor. It marks the point at which your typing will appear.

With menu '**01 TEMPERATURE**' in the display, press the **ENTER** key.

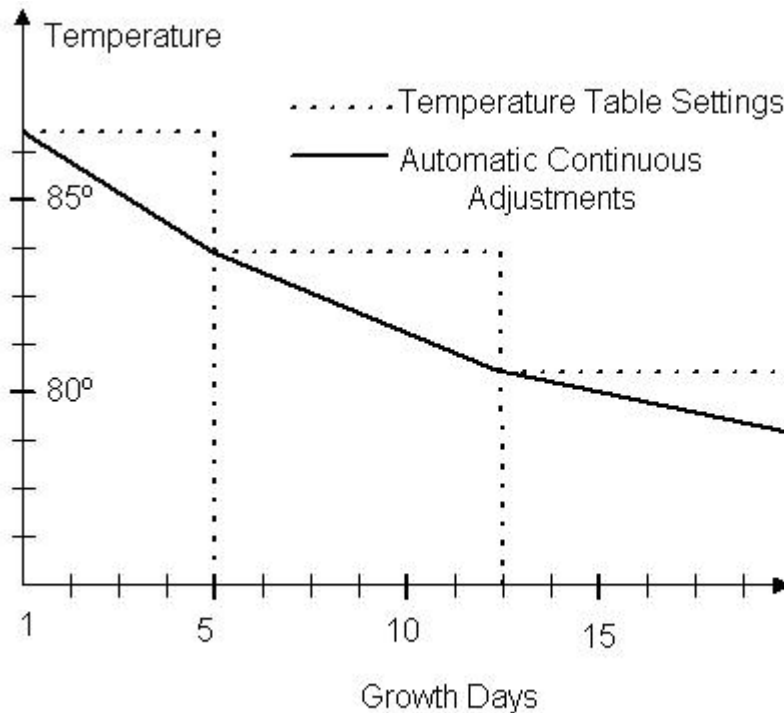
Temperature Table, Menu 1

Line Number	Growth Day	Target	Heating	Cooling/Tunnel
1	1	30	28	33
2	10	28	26	30
3	21	26	24	28
4	30	25	22	27
5	42	24	20	26
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0

Target temperatures according to bird age go in Menu 1, Temperature Table. The **AC-2000** provides space for up to ten growth dates with corresponding target temperatures, heat set points and cool or tunnel set points. The target temperature represents the ideal bird temperature; the heat temperature controls heater operation. The cooling set point determines the point at which the **AC-2000** switches into tunnel ventilation or uses evaporative cooling equipment.

Configuration, menu 91, item 6, “automatic continues daily temperature adjustment,” controls whether the **AC-2000** interpolates between lines of the temperature table, or uses the exact set points from the table. The interpolation results in temperature ramping with smooth continuous change, rather than the sudden jumps.

Continuous Temperature Adjustment



Minimum-Maximum Level Table, Menu 2

Line Number	Growth Day	Minimum	Maximum
1	1	1	5
2	7	2	10
3	14	4	14
4	21	5	14
5	35	5	14
6	42	6	20
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0

The Min-Max Level Table limits the **AC-2000** ventilation and curtain levels by bird age. In the example here, the **AC-2000** will not exceed ventilation level 5 until growth day 7. From growth day 7 through growth day 13, the **AC-2000** will use at least ventilation level 2 (even if the heaters are on), but will not exceed level 10.

The 'Minimum' column of this table is the usual place to adjust air quality in your poultry house. If the house requires more air, simply increase the minimum level, if less airflow then decreases the minimum ventilation level.

Humidity Table, Menu 3

The **AC-2000** can run the ventilation system to meet target humidity if it has a humidity sensor. To disable humidity treatment, set the target humidity to 99%. A suitable ammonia sensor may become available; your **AC-2000** is ready to use it when it arrives.

To enable fresh air treatment (without a humidity sensor), set target humidity to 0%. The fresh air, humidity treatment program increases ventilation by one level if temperature is stable or slowly climbing and humidity is above target humidity.

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

Cooling Table, Menu 4

Line No.	From Time	To Time	From Temp	To %RH	On (Min)	Off (Min)
1	09:00	21:30	27.7	85.0	1	10
2	09:00	21:30	28.8	85.0	1	5
3	09:00	21:30	30	82.5	1	2
4	12:30	16:00	32.2	75.0	1	0
5	00:00	00:00	00.0	00.0	0	0

The Cooling Table regulates the cooling pads or fogging system. Before considering the cooling table, the temperature must exceed the present cooling temperature (from menu 1).

Consider line 2, in the cooling table above. Between 9:00 AM and 9:30 PM, if the temperature is above both the cool set point and 28.8°C, and the humidity below 85.0%, the cooling relay could cycle one minute on and five minutes off. When multiple lines apply, the **AC-2000** uses the highest numbered line possible.

Note: the **AC-2000** automatically sorts the table in order of 'From Temperature' after you enter the data.

Lighting, Menu 5

Line #	Day	From Time	To Time	Intensity
1	1	01:00	03:00	100%
2	1	05:00	07:00	100%
3	1	05:30	03:00	20%
4	1	22:00	23:00	100%
5	7	09:00	14:00	20%
6	20	00:00	23:59	100%
*	*	*	*	*
50	*	*	*	*

The lighting table stores up to fifty entries during which to turn on the lights. The **AC-2000** sorts the table by 'day,' then by 'from time.' There can be several light periods each growth day. It turns lights on and off using relays, or accepts 0 to 10 Volt controlled light dimmers. In this example, the day 1 settings apply until day 7, at which time the day 7 setting supersedes it.

Feeding System, Menu 6

Line #	From	To	Qt/bird
1	06:00	14:00	1.000
2	13:00	07:00	1.000
*	*	*	*
10	*	*	*

Menu 6 sets the feeding system. It may run up to ten feeding periods per day. For full feeding, set times to cover the entire day. The **AC-2000** 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-2000** takes into account the mortality, initial bird population, and the feed delivery rate.

If desired, the **AC-2000** will alarm and shut off the feed system for feed overruns.

Feed Cycle, Menu 7 (Breeders Version Only!)

CYCLE	1	2	3	4	5	6	7
STATUS	1	1	0	1	1	0	1

The feed cycle has up to 7 days. The number of days is set in menu 97- system variables, variable 52. For example if variable 52 is set on 4 the number of days in the cycle will be 4.

In Flock Management menu, table 15 Time & growth Day, use the arrow keys and move to the day of cycle number. This number will indicate the first day cycle.

In the status line set either 0 for no feed or 1 for feed.

Extra Systems (Breeders-Menu 7, Broilers-Menu 8)

The **AC-2000** 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 123.9÷F for the high temperature.

Extra Systems

System	From Time	To Time	From Temp	To Temp	On	Off	Sensor
1	00:00	23:59	0	123.9	5	5	0
2	06:35	07:00	0	123.9	0	0	0
3	04:00	20:00	80.5	123.9	1	4	5

Static Pressure (Breeder-Menu 9, Broiler-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-2000* will adjust the air inlets for proper ventilation.

Menu 8 has the main static pressure settings. There are eleven adjustable parameters with the following purposes:

1. Low Outside Temperature 20÷F. 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-2000** will interpolate between the low and high settings.
2. Low Temperature Pressure Set Point, 0.08 inches of water column.
3. High Outside Temperature, 70÷F. 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, 0.05 inches of water column.
5. Low Pressure Alarm, 0.00 inches of water column.
6. High Pressure Alarm, 0.20 inches of water column.
7. Open Run Time, 5 Seconds. This sets the maximum length of open run time to reduce the pressure
8. Close Run Time, 5 Seconds. You can set different open and close run times.
9. Run Delay, 10 Seconds. This is the delay after an open or close run to allow the house time to stabilize after a change in pressure setting. This delay allows for stabilization. System variable 31 is a start up delay. It sets the time for validating a pressure change to prevent reacting to wind gusts.
10. Hysteresis, 0.02 inches of water column. This sets the total dead band about the set point, in which the does not adjust the inlets.

➤ **The defaults are all “0”**

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

1. System variable 28, units: selects millibars, inches of water column or Pascal 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 that cannot move under static pressure.
3. System variable 30, minimum ventilation level for low-pressure alarm: disables the low-pressure alarm for low ventilation levels.
4. System variable 31, start delay, forces a minimum delay before responding to changes in static pressure readings. The **AC-2000** bypasses this delay during ventilation level changes and when it turns 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.

Foggers Table, Menu 9 (Broilers only!!)

Line No.	From Time	To Time	From Temp	To %RH	On (Min)	Off (Min)
1	09:00	21:30	27.7	85.0	1	10
2	09:00	21:30	28.8	85.0	1	5
3	09:00	21:30	30	82.5	1	2
4	12:30	16:00	32.2	75.0	1	0
5	00:00	00:00	00.0	00.0	0	0

The Foggers Table regulates the fogging system. Before considering the Foggers table, the temperature must exceed the present cooling temperature (from menu 1).

Consider line 2, in the Foggers table above. Between 9:00 AM and 9:30 PM, if the temperature is above both the cool set point and 28.8°C, and the humidity below 85.0%, the Fogger relay could cycle one minute on and five minutes off. When multiple lines apply, the **AC-2000** uses the highest numbered line possible.

Note: the **AC-2000** automatically sorts the table in order of 'From Temperature' after you enter the data.

MANAGEMENT

Mortality, Menu 11

Add Mortality	0
Daily Sum	12

Enter mortality counts to keep the flock count current. Enter at any time of the day to mortality, and the **AC-2000** will total them for daily counts in the daily line. If you only enter the quantity once per day, you can put it directly in the daily line.

Mortality, Menu 11 (Breeder Version only!)

Female mortality	0
Daily female	6
Male mortality	0
Daly male	6

Enter female/male mortality counts to keep the flock count current. Enter at any time of the day a male/ female mortality, and the **AC-2000** will total them for daily counts in the daily line. If you only enter the quantity once per day, you can put it directly in the daily line.

Poultry Count, Menu 12

Initial chicks	10,000
Updated count	9988

Enter the bird population when you receive a new flock. As you enter daily mortality counts, the **AC-2000** 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.

Feed Inventory, Menu 13

Feed supply	1000
Feed inventory	5000

The **AC-2000** 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.

Eggs Inventory, Menu 14 (Breeder Version only!)

Add eggs	200
Daily eggs	200
Add hatching	0
Daly hatching	0

Enter Egg counts to the add eggs line at any time of the day, and the **AC-2000** will total them in the daily egg counts line. Do the same for hatchings. If you only enter the quantity once per day, you can put it directly in the daily line.

Time & Growth Day, Menu 15

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. Edit the growth day for the present flock if needed. Normally the new flock function, menu 16, sets it. The growth day works with the ventilation tables to change the settings as your birds grow.

Day Of Cycle is the feed cycle day. The number set here is the first feed cycle day and if changed the cycle will begin again from this day.

Flock Number, Menu 16

Menu 15 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-2000** start a new growth cycle, and erase the old management data. The **AC-2000** will start over using the ventilation settings for growth day 1, and collect new management data for the new flock.

Alarm Reset, 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 17.

Alarm Test, Menu 19

You can set an arbitrary time and period for the alarm to activate.

HISTORICAL DATA

Temperature, Menu 21

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

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.

Humidity, Menu 22

The **AC-2000** 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

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

Menu 23 shows the bird weight history if you have one or two optional bird scales. For each growth day, the **AC-2000** 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 key to observe the female data and another time to watch the male data. The up/down arrow keys move forward and backward through the growth days. Using the communication software, it is possible to view uniformity.

Water Consumption, 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 Consumption, 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

Code	Alarm
1	Low Temperature
2	High Temperature
3	Sensor Failure, Zone A
4	Sensor Failure, Zone B
5	Sensor Failure, Zone C
6	Feeder overtime
7	Low Static Pressure
8	High Static Pressure
9	Water Overtime
10	Water shortage
14	Ammonia Level
15	Incompatible card
16	Static Pressure Sensor Fail

The **AC-2000** stores the last 99 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.

Mortality, Menu 27

Menu 27 allows you to review the mortality history. The **AC-2000** 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. Note that the **AC-2000** maintains heater on times only for heaters with relay codes 9, 11 and 13. If you run your heaters with other relay codes, their time will not be recorded.

Eggs, Menu 29 (Breeder Version only!)

Day	Egg	Accumulate	Hatch	Accumulate
1	98	98	0	0
2	150	248	0	0
3	102	350	3	3

This table shows the historical egg count and egg hatch.

TEST**Temperature, Menu 31**

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

A disconnected sensor shows **DIS**.

A Shorted sensor shows **SHR**.

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 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-2000** 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 overtime 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-2000**. The **AC-2000** calculates actual values using calibration factors and other formulas for humidity or static pressure.

- The (p) column displays the A/D values of the internal pressure sensor and not on the analog inputs.

Analog Output, Menu 36

The analog output controls a variable speed fan and a light dimmer and it will activate them both in the same time. Enter the approximate output voltage using this menu to check the variable speed fan and the light dimmer.

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-2000** 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. Note that the calibration base value is fixed upon entering menu 41; therefore, do not enter menu 41 until after the sensors are at a stable known temperature. The **AC-2000** will calculate the calibration factor. The sensors are frequently accurate to within about 2°F as they come from the factory.

Instead of measuring air temperature for calibration, it may be 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. Ensure the water temperature is near ambient air temperature to prevent warm up or cool down while calibrating. Also, stir the water while measuring it to eliminate hotter and cooler regions. Note that the calibration is precise only at the calibration temperature. Errors tend to increase as the temperature deviates from the calibration temperature.

Humidity, Menu 42

To calibrate the humidity sensors simply measure the current humidity using an external independent sensor and change the humidity level in the controller to match the independent sensor.

A disconnected sensor will show **DIS.** and a shorted one will show **SHR.** The factor value is automatic and cannot be changed.

Scales, Menu 43

Calibrate the bird scales with menu 43. While keeping the scale empty (no birds on it), enter menu 43, and select the scale to calibrate. Allow at least five seconds to give the **AC-2000** time to zero the scale then place a known weight of at least 100gr 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 43, 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 at the grocery store using their calibrated, legal for trade, scales. Then use this weight to check and calibrate the scales. (Minimum weight for calibration is a 100 gr. But it's recommended to use more than a kg.)

Scales Factor, Menu 44

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 44.

In menu 44 there are 2 poles: FACTOR-The calibration number which refers to the first and second plate.

The second pole is REFERENCE: This pole refers to the reference weight at the moment, first row for females and second row for males. (Impossible to change manually)

Feed Pulse Ratio, Menu 45

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 45.

Water Pulse Ratio, Menu 46

Enter the quantity that the water meter measures per pulse with menu 46. Refer to your water meter instructions for this value.

Defining '0' will disable all water alarms, Both shortage and overflow.

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 level.
 - 1.3. Fans not working when they should be.
 - 1.4. Ventilation Level 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 levels 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 four corner keys (7, MENU, ALT and ENTER).
3. While holding the four corner keys, turn power on to the control.
4. Hold the four corner keys briefly until 'cold start' appears in the display.
5. Reenter all values and tables into the control.

Installation and Configuration

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

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 MENU, and then enter the menu number from the Installation Menu.

Installation

Install the **AC-2000** 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-2000** 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-2000** controls.

Avoid mixing high voltage wiring with sensor and low voltage wiring. Keep the **AC-2000** 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. Communications baud rate (1200, 2400, 4800 or 9600) for hookup to a personal computer or modem.
2. Maximum number of ventilation levels to use. The **AC-2000** supports up to 20 ventilation levels. However, limiting this to a smaller number simplifies the ventilation table.
3. 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-2000** show on/off timer settings.
4. First tunnel level. When using tunnel ventilation, enter the ventilation level (in accordance with the ventilation level and curtain level tables) at which the system starts tunnel ventilation.
5. Number of heating zones. The **AC-2000** can control up to three separate heating zones. For just one zone, the average temperature controls the heaters. If you have two or more zones, the assigned sensors control the heaters in each zone (menu 94).
6. Automatic continuous temperature adjustment. The **AC-2000** uses precisely the values entered in the temperature tables for each growth period if this is '0'. For automatic interpolation between these entries, enter a '1'.
7. Barn Number. This identifies the particular barn for the home personal computer. Use a unique number for each **AC-2000** to permit the communication program to identify each one.
8. 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. The **AC-2000** uses this value to calculate the run time for each curtain when it moves them.
9. Tunnel curtain opening and closing times.

Ventilation Table, Menu 92

The **AC-2000** turns on increasing fan power as ventilation needs increase. The increases should be proportional from level to level. This means that the ventilation increases about 50% to 100% at each level. If at level one a single fan on timer at 0.5 minutes on, 4.5 minutes off, changes at level 2 to 1.0 minutes on, 4.0 minutes off, there is a 100% increase. At a much higher level, say at ventilation level 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.

The ventilation table, menu 92, defines the fan powered ventilation levels for the poultry house. This includes variable speed, timer and on/off fans for up

to 20 levels of ventilation. At each ventilation level, a cycle timer can run the highest numbered fan group used at that level. With no values in the timer on and off fields, or only an off time or only an on time, the **AC-2000** defaults to constant on operation.

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

Since air movement provides a cooling effect, the **AC-2000** provides a temperature differential at each level. This is particularly important in tunnel ventilation, where the cooling effect can be -12°C . The **AC-2000** will wait until the target temperature plus the differential before using that ventilation level.

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

<u>Code</u>	<u>Description</u>
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
39	Fogger
40	Alarm
42, 43	Tunnel open/close
45, 46	Curtain 3: Open, Close
47, 48	Curtain 4: Open, Close

Select menu 93 for relay layout. There are twelve relays inside the **AC-2000**, and there may be additional relay extensions. All the relays are numbered sequentially. 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.

Each relay may work normally or reversed using the NO/NC field. Most relays should be set to normal. The alarm output, code 40, should usually be normally closed so that the alarm activates on a power failure. In normally closed mode, the **AC-2000** turns the relay on to turn the function off, and releases the relay to turn the function on. Usually, relay 12 is the alarm relay since it provides both normally open and normally closed contacts.

With the extension box, relay 20 can serve as an alarm relay instead of relay 12.

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	40	1
13	37	0
Etc	-	-
-	-	-
20	0	0

Manual Relay Operation

Any relay with a code of '0' is not part of the automatic system. However, it will follow the NO/NC (Normally Open, Normally Closed) specification. To turn it on manually (for an extended time, as for installing and for trouble shooting) simply specify code 0, and set NO/NC to 1. To turn it off manually, set NO/NC to 0.

This method has the advantage that the **AC-2000** will not reset and return it to automatic operation, as it does with test menu 33. It permits the installer as much time as needed to check wiring and electrical connections with the relay in a known position. **Note:** return the relay code to the correct function, so that the **AC-2000** can operate it properly.

Relay Record

A permanent record of relay assignments on a small card at the **AC-2000** provides important information for servicing. By referring to the card, the service person can quickly test the correct output and identify problems. Of course, written records of circuit breaker assignments, manual override switches, and other connection information should also be available.

Sensor Layout, Menu 94

The **AC-2000** supports up to three 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, humidity, and static pressure. It also assigns outside sensors.

Note: For half or third house brood, set up the zones to prevent averaging in the grow end sensor. 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 incorrect and historical data may show incorrect temperatures since the grown end sensor may have a much different temperature. 'Extra' systems (relay codes 31, 32 and 33), or positive pressure optimizer, if set to average temperature, might work incorrectly.

Radiant heaters used as brooders can have their own dedicated sensors. These do not affect the average temperature reading. If a static pressure sensor is used, it must be connected to one of the analog inputs in place of a humidity sensor.

1. Temperature Zone Sensors A, B and C. Install on any of temperature inputs, 1 through 6. 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. Install on any analog inputs, 1 through 3.
4. Outside Humidity Sensor. Install on one of the analog inputs, 1 through 3.
5. Static Pressure Sensor. Install on one of the analog input 1 to 3. 4 is for internal pressure sensor

Curtain Table, Menu 95

Enter minimum opening percentage for each curtain.

The curtain table defines curtain levels for up to five curtains (4 natural & 1 tunnel curtains) at natural ventilation levels.

When in natural mode the tunnel curtain will operate as a natural curtain.

When entering tunnel ventilation mode, only the tunnel curtain operates according to static pressure.

Exhaust fans may cause curtains to cling to the wiring mesh. For this reason, system variable 23 can allow the **AC-2000** 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-2000** can then turn off the fans while adjusting the curtain to achieve the desired static pressure.

System Variables, Menu 97

1. Hysteresis, Target Temperature. This sets the dead band above target temperature. The ventilation level increases at the target temperature plus the hysteresis, and decreases at the target temperature. Factory default is 1.0°F.
2. Ventilation levels increase time delay. This sets the minimum delay when increasing temperatures cause higher ventilation. Factory default is 3.0 minutes.

- Since the **AC-2000** 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 levels decrease time delay. This sets the minimum delay when decreasing temperatures cause lower ventilation. Factory default is 1.0 minute.
 4. Maximum ventilation level with average temperature less than cooling set point. This sets the maximum ventilation level 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-2000** may leave tunnel ventilation, once it has entered tunnel mode. Factory default is 0.0÷F.
 6. Not Used.
 7. Relative temperature difference for high temperature alarm. This sets the degrees above target temperature to generate an alarm. Factory default is 6.0÷F. 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 0.5÷F. 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 heat temperature to generate an alarm. Factory default is 5.0÷F.
 12. Cooling hysteresis. This sets the difference between cooling system turn on and cooling system turn off temperatures. Factory default is 1.0÷F.
 13. Humidity and fresh air treatment main delay duration. Factory default is 5 minutes.
 14. Temperature difference for re-circulation fan activation. This sets the temperature difference between Zone A and Zone B, at which the re-circulation fans turn on. Factory default is 8.0÷F.
 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. When resetting an alarm, the message on the main screen st
 17. Minimum Variable Speed
 18. Maximum Variable Speed
 19. Wind direction check period. The **AC-2000** 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% light dimmer setting. This variable sets the minimum voltage for light intensity in the light table. Factory default is 0 volts.
 21. Tunnel mode, exit lockout. This variable sets the minimum time the **AC-2000** will stay locked in tunnel after entering tunnel mode. Factory default is 60.0 minutes.

22. 100% light intensity. This setting is the 100% level for light intensity. Factory default is 10.0 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-2000** 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 overtime alarm input selection. Setting this to 1 makes the second digital input function as feed overtime alarm input. If it is 0, the second digital input causes the **AC-2000** to use it as a prevailing wind direction indication.
25. Feed overtime alarm delay. Requires activation of the feed overtime 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 overtime 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 level to allow low static pressure alarm. The factory default of '1' allows low static pressure alarms at all ventilation levels.
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-2000** bypasses this delay for ventilation level changes and cycle timer fans, since it knows that the pressure change is not due to a wind gust.
32. Water over flow 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-2000** must see to prevent generating a water shortage alarm. Note that the lights must be on during times this alarm can occur. The **AC-2000** recognizes that birds don't drink in the dark, and disables the alarm during lights out. Factory default is 0.
34. Water over flow alarm delay. This sets the minimum amount of time that water overflow must be active before the **AC-2000** generates an alarm. Factory default is 10.0 minutes.
35. Water over flow only during dark times.
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 degree.

37. Heater humidity treatment threshold. This sets the relative amount above requested humidity at which heater use to reduce humidity begins. Factory 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. Static pressure setting during Tunnel – Value 0 – Control static pressure during Tunnel mode. Value 0.1 to 10 minutes – No pressure control, and disable low static pressure when changing between Minimum Ventilation or Natural Ventilation and Tunnel modes. Air Inlet close relay activates 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 Air Inlet close relay activates 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 50°C.
41. Sunrise/Sunset effect duration. This sets the length of time to change light levels from one setting to another.
42. This parameter allows an extra delay during light up. At lights up there will be this delay time to ignore water overflow.
43. Selection to turn off feed relays for feed overtime 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-2000** 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 level differential option) the high temperature alarm occurs at target temperature plus system variable 7. **Warning:** if there is no airflow 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. Upper range: High weight, above which, do not allow scale to enter.
47. Lower range: Low weight, below which, do not allow scale to enter.
These 2 parameters are entered in order to avoid illegal weightings.
For example: a few birds at a time.
48. Tare Sensitivity, 0-A/D to 99-A/D: This parameter set the number of + and - A/D reading required for taking the Tare before taking a new weighing. Increasing this value will allow taking Tare and a weight for unstable hanging platform but accuracy will decrease because of that. (A/D reading)

- 49. Weighing Sensitivity, 0% to 100%: Maximum weight sampling difference allowed (In%) during weighing Process, to be considered as legal weight for memory registration. Higher value will accelerate weighing speed but may reduce accuracy.
- 50. Weight Start Time (0-24).
- 51. Weight End Time (0-24).
- 52. Feeding Day Cycle.
- 53. Temperature change that will be considered as a fast drop in temperature, in order to reduce a level when the temperature inside is below target temperature and it's cold outside. (Outside temp. is colder than heat temp. or there is no outside temperature sensor)
- 54. Temperature change that will be considered as a fast drop in temperature, in order to reduce a level when the temperature inside is above target temperature and it's cold outside. (Outside temp. is colder than heat temp. or there is no outside temperature sensor)

Password, Menu 98

To protect the integrity of the **AC-2000** settings, use a password. For the communications programs to access all the **AC-2000** controls on one line, they will need to have the same password. You can enter a high password to provide complete access, and/or a low password that allows reading the control but not making changes.

Lightning Protection

Because of the potential for lightning damage to electronic devices, Rotem recommends the use of lightning protection on both the power supply, and the communication terminals, if used.

Power Line Protection

The Rotem **RPLP-1** provides lightning protection to the **AC-2000**. Refer to the **RPLP-1** documentation for proper connection. While no lightning protection is perfect, the **RPLP-1** significantly enhances the reliability of the built in lightning protection. In addition, Rotem recommends the use of an isolation transformer in front of the **RPLP-1** to help block lightning and other transients. **Note:** common surge protectors provide little additional protection, and may trip unnecessarily.

An isolation transformer preceding the **RPLP-1** can also help significantly against lightning.

Communication Line Protection

The Rotem **RCLP-1** provides lightning protection to the communication lines of the **AC-2000**. Refer to the **RCLP-1** documentation for proper connection. While no lightning protection is perfect, the **RCLP-1** significantly enhances the reliability of the built in lightning protection. Common surge protectors provide little additional protection, and should not be used

with the **AC-2000** because of the potential to interfere with communications.

Installation Records

Temperature Table, Menu 1

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

Minimum-Maximum Table, Menu 2

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

Cooling Table, Menu 4

Line	From Time	To Time	Above Temp	Below %RH	ON Min-utes	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				

Line	Day	From Time	To Time	Intensity - %
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	14.0÷F	
Low Temperature Pressure Setting	0	
High Temperature	14.0÷F	
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 Levels	20	
Variable Speed Fan	No (0)	
First Tunnel Level	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 & Curtain Level: Menu 92, Menu 95

Level	Fans, Groups of Fans	Cycle Time		Temp Diff.	Var %	Curtain % Open			
		On	Off			1	2	3	4
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Note: The **AC-2000** uses ventilation resources available to keep the set temperatures. There is no level-to-level differential drift, as there is with some leveled controllers. For example, some ten-level controllers will drift 2.0°F per level, or 20.0°F from level 1 to 10. The **AC-2000** maintains the target temperatures, and shifts to higher energy saving set temperatures at precise points (System variable 4).

However, you may also set temperature differentials for each level as desired. Use this to account for the cooling effects of air speed in tunnel ventilation and ventilation system costs. For example, full tunnel ventilation provides about 10°F of cooling, calling for a 10°F temperature differential. Otherwise, the birds may be over cooled or over ventilated.

Relay Layout, Menu 93

Re-lay	Code	NO/NC	Description
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Note: The alarm relay (typically relay 12 or 20) can provide a power failure alarm if it is set to normally closed (NC).

Sensor Layout, Menu 94

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

Extra Curtains, Menu 95

Curtain	Sensor	Run Time (Seconds)
1		
2		
3		
4		
5		
6		

Note: If Sensor is '0', the curtain uses the average temperature.

Note: System variable 2 controls minimum delay between opening runs.
System variable 3 controls minimum delay between closing runs.

Note: Extra curtains close in tunnel mode.

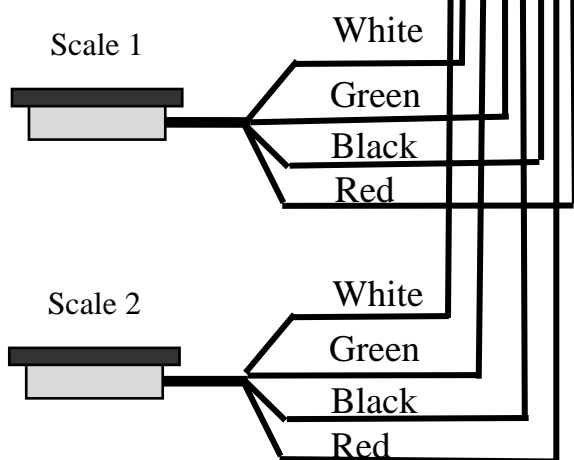
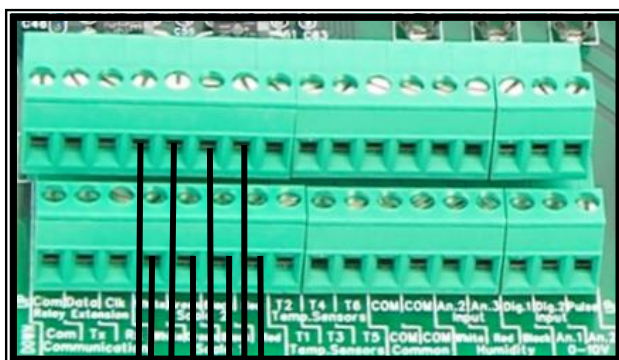
System Variables, Menu 97

Var.	Description	Default	Range
1	Target Temperature Hysteresis (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
2	Ventilation Level Increase, Time Delay (Minutes).	3.0	0.2 - 10.0 Min.
3	Ventilation Level Decrease, Time Delay (Minutes).	1.0	0.2 - 10.0 Min.
4	Max Ventilation Level Below Cooling Temp.	20	0 - 20 Levels
5	Tunnel Mode Exit, Amount Above Target (Degrees).	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
6	Out Temperature As Diff. Above Target Temp. To Allow Tunnel Mode Exit (Degrees).	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
7	High Temp Alarm, Amount Above Target (Degrees).	4.0 C° 7.2 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
8	Low Level Heater Hysteresis, Amount Below Heat Set Temperature (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
9	High Level Heater Hysteresis, Amount Below Heat Set Temperature (Degrees).	2.0 C° 3.6 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
10	Radiant Heater Ignition Time (Sec).	60	0 - 99 Sec.
11	Low Temp Alarm, Amount Below Heat (Degrees).	3.0 C° 5.4 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
12	Cooling Hysteresis (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
13	Humidity Treatment Main Delay (Minutes).	5.0	0.0 - 99.9 Min.
14	Zone A, B Temp Diff for Re-circulation Fan (Degrees).	5.0 C° 9.0 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
15	Midnight Curtain Calibration Enable: 0 = No. 1 = Yes.	1	0-1
16	Delay time for coming back from alarm reset	30	0-99Min
17	Output Voltage At 0 % Variable Speed Power.	3.0	0.0 - 10.0 V out
18	Output Voltage At 100 % Variable Speed Power.	10.0	0.0 - 10.0 V out
19	Wind Direction Averaging Period (Minutes).	30.0	0.0 - 99.9 Min.
20	Output Voltage At 0% Light intensity.	0.0	0.0 - 10.0 V out
21	Tunnel Mode Exit Lockout Time (Minutes).	60.0	0.0 - 99.9 Min.
22	Output Voltage At 100 % Light intensity.	10.0	0.0 - 10.0 V out
23	Minimum Curtains 1+2 Opening for Group Fans Run (%).	0.0	0.0 - 99.9 %.
24	Wind Direction Or Feed Overtime Alarm Selection: 0 = Wind Direction. 1 = Feed Overtime Alarm.	0	0-1
25	Feed Overtime Alarm Delay (Minutes).	0.0	0.0 - 99.9 Min.
26	Alarm Relay Output Delay (Minutes).	0.5	0.0 - 99.9 Min.
27	Humidity Treatment Duration (Minutes).	1.0	0.0 - 99.9 Min.

28	Pressure Units: 0 = Millibar. 1 = Inch Water. 2 = Pascal. 3 = Cm. Water. 4 = Mm. Water.	1 (Inch Water)	0 - 4
29	Static Pressure Interlock (Group Fans Off During Pressure Adjustment): No = 0. Yes = 1.	0	0-1
30	Minimum Level for Low Static Pressure Alarm	1	0 - 20 Levels
31	Static Pressure Wind Gust Delay (Seconds).	10	0 - 99 Sec.
32	Water Overflow Alarm Quantity per Minute (Units).	99	0 - 99 Units.
33	Water Shortage Alarm Quantity per Hour (Units).	0	0 - 99 Units.
34	Water Overflow Alarm Delay (Minutes).	10.0	0.0 - 99.9 Min.
35	Water overflow during dark (Quantity per Hour)	0	0-99 Units
36	Humidity Treatment, Heater Use Limit (Degrees).	1.0 C° 1.8 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
37	Humidity Treatment, Heater Use Humidity Start Point.	99.9	0.0 - 99.9 %.
38	Radiation Heater, Set Point Above Heat. (Degrees)	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
39	Natural/Tunnel mode change, low-pressure alarm disables (Minutes).	3.0	0.0 - 99.9 Min.
40	Absolute High Temperature Alarm (Degrees).	50.0 C° 122.0 F°	0.0 - 50 C° 32.0 - 122.0 F°
41	Sunrise/Sunset Duration (Minutes).	1.0	0.0 - 99.9 Min.
42	Delay time to ignore water overflow At sunrise	10	0.0-99.9Min.
43	Enable Feed Shutoff if Feed Overtime Alarm: No = 0, Yes = 1.	0	0-1
44	Air Inlet Open Advance (Seconds).	6	0 - 99 Sec.
45	Level Differential High Temp Alarm Option (Degrees).	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
46	Percentage Above Reference Weight (%).	30.0	0.0 - 99.9 %.
47	Percentage Below Reference Weight (%).	30.0	0.0 - 99.9 %.
48	Tare Sensitivity (A/D).	12	0 - 99 A/D
49	Weighing Sensitivity (%)	3.0	0.0 - 99.9 %.
50	Birds Weighing Start Time. (Daytime).	0.0	0.0 - 24.0 (Hours)
51	Birds Weighing End Time. (Daytime).	24.0	0.0 - 24.0 (Hours)
52	Feed Cycle Length Limitation. (Days).	7	1 - 7 Days
53	Temp Change To Be Considered As Quick Drop In Degrees, To Reduce A Level To Reach Below Target Temp (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
54	Temp Change To Be Considered As Quick Drop In Degrees, To Reduce A Level To Reach Above Target Temp (Degrees).	1.0 C° 1.8 F°	0.3 - 20.0 C° 0.5 - 36.0 F°

55	Delay for ignition time – This is the delay between ignition relay on to heater on	10 Sec.	0-99Sec
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Bird Scale Option

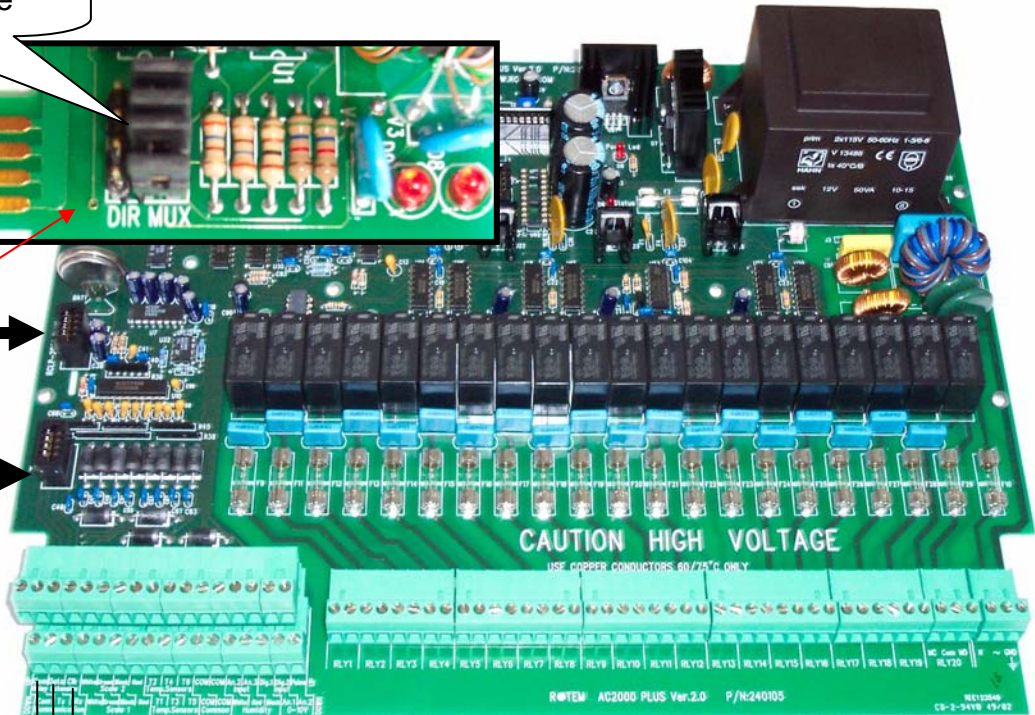


RCLP-2000 PLUS for P.C. Communication

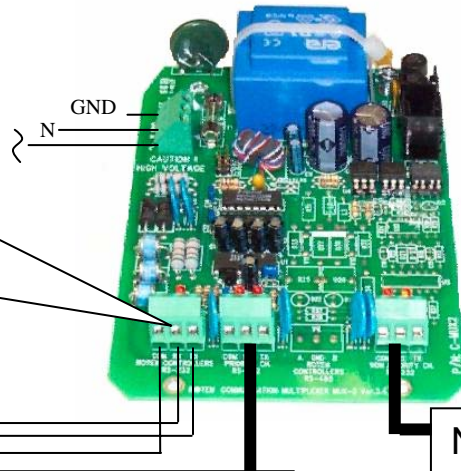
Make sure the jumpers are connected in MUX mode

AC-2000 PLUS

RCLP-2000



Cross the wires:
Tx - Rx
Rx - Tx
COM - COM
NOTE: if you don't cross the wires, communication will not operate.



Mux-2

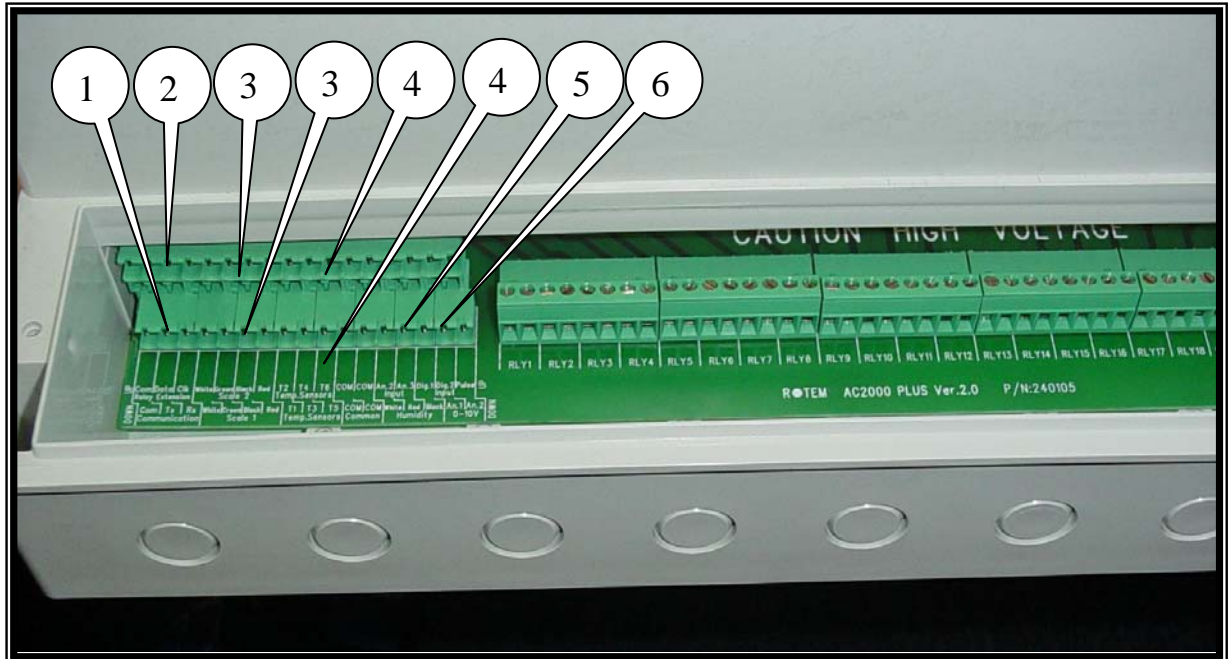
Priority channel: connect the DB25 Male connector to the modem.

Non Priority channel: connect the DB9 Female connector to the PC's COMM port.

Note: when operating the communication software, the MUX-2 and RCLP LED should flash. If receive LED (RX) is not flashing on the RCLP, check wiring and try to swap RX and TX wires connected to the MUX.

Moreover, when upgrading software, U1 component must be replaced. If U1 is not replaced the following message appears: "INCOMPATIBLE HARDWARE CARD" and the software will not recognize it either.

Terminals

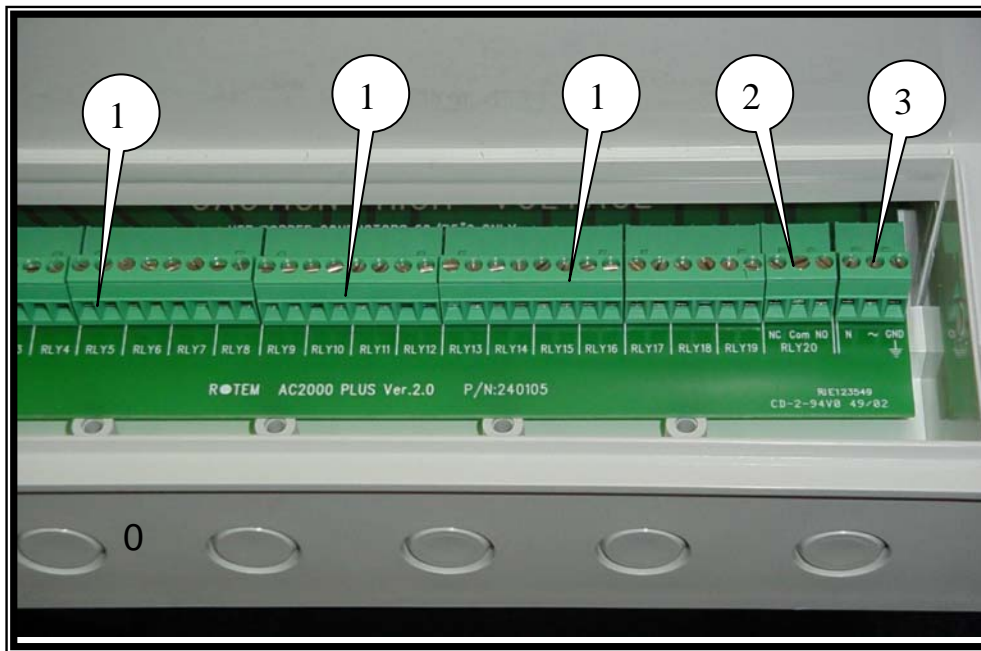


1. **Communications:** Three terminal block for P.C communication using the optional multiplexor, **MUX-2**.
RX: Receive into **AC-2000**. With multiple controls, connect all the RX pins together. Connect to TX at Multiplexor only.
TX: Transmit from **AC-2000**. With multiple controls, connect all the TX pins together. Connect to RX only at Multiplexor only.
COM: Ground reference for communications. Do not connect shields to this pin. Connect to COM at multiplexor also.
2. **Relay Extension:** **Com** - The relay extension box such as the **REB-8** may be located up to 10 feet from the **AC-2000**. Do not connect the shield to this terminal. Connect the shield to earth ground only at one end of the cable to avoid ground loops.
Data - This line carries data to the relay extension.
Clk - This line carries a clocking signal for use by the relay extension.
3. **Up To 2 Optional Bird Scales,** Connect White, Green, Black and Red of scale 1 to lower terminal, and White, Green, Black and Red of scale 2 to upper terminal.

4. **Temperature Sensors:** The temperature sensor is a 2 wires black shielded cable thermistor (RTS-2).
Connect one wire to the temperature sensor terminal and the other to common (Polarity don't care).
5. **Analog Inputs:** **An.1-** Humidity sensor with wire connections according to wire colors.

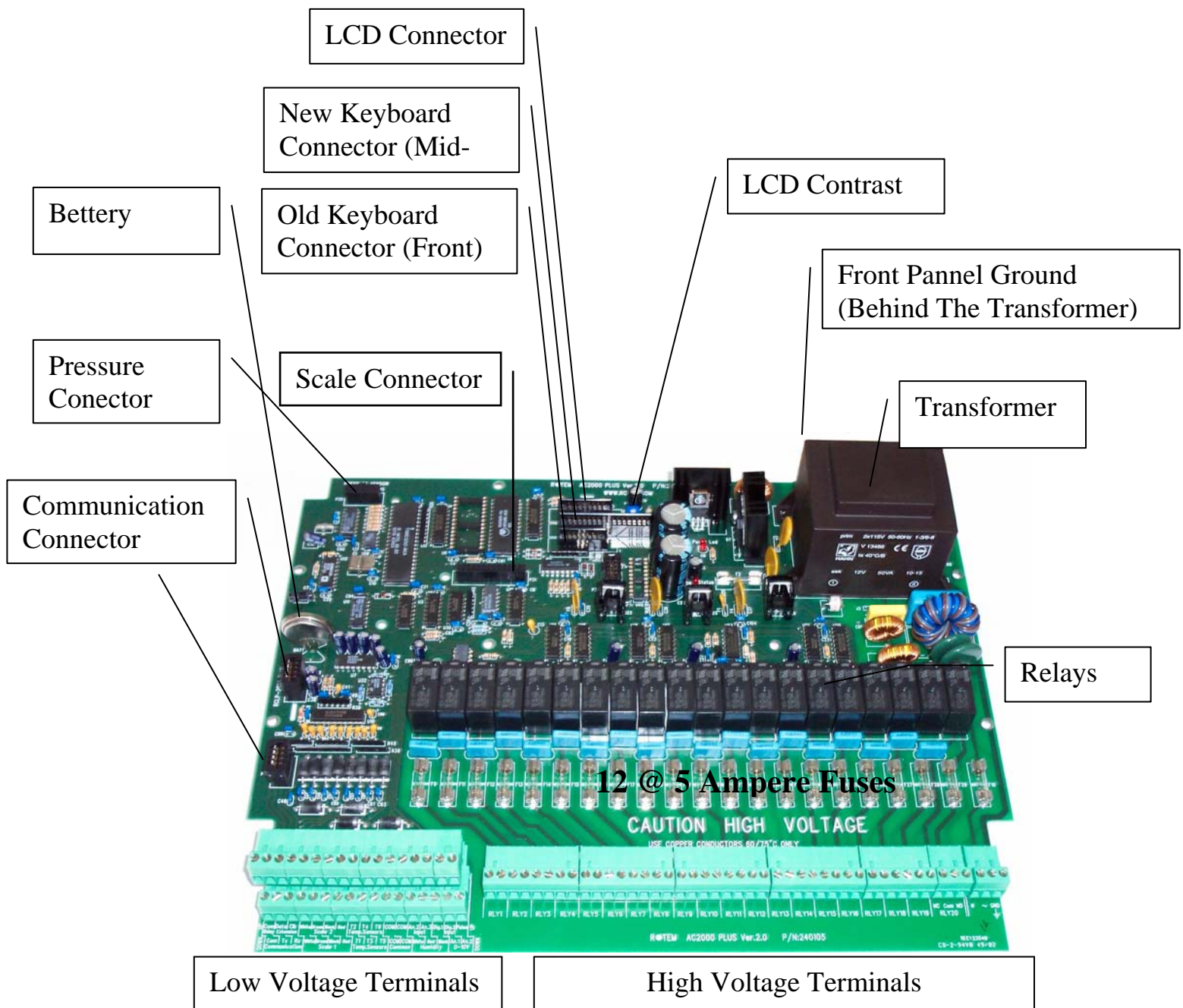
An.2– Pressure sensor (Connect + red wire to An.2 and Black – wire to Common).
An.3 – Humidity Zone B or C or Outside Humidity input. Connect the White wire of the Humidity sensor to An.3 and the Red and Black together with the Humidity input Red and Black.
6. **Digital Inputs:**
Dig 1-Feed overtime alarm input or wind direction selection.
Dig 2-Feed counter.
Pulse- Water counter.
7. **Analog Outputs:**

An.1: 0 to 10V- Light Intensity control signal.
An.2: 0 to 10V- Variable speed control signal.

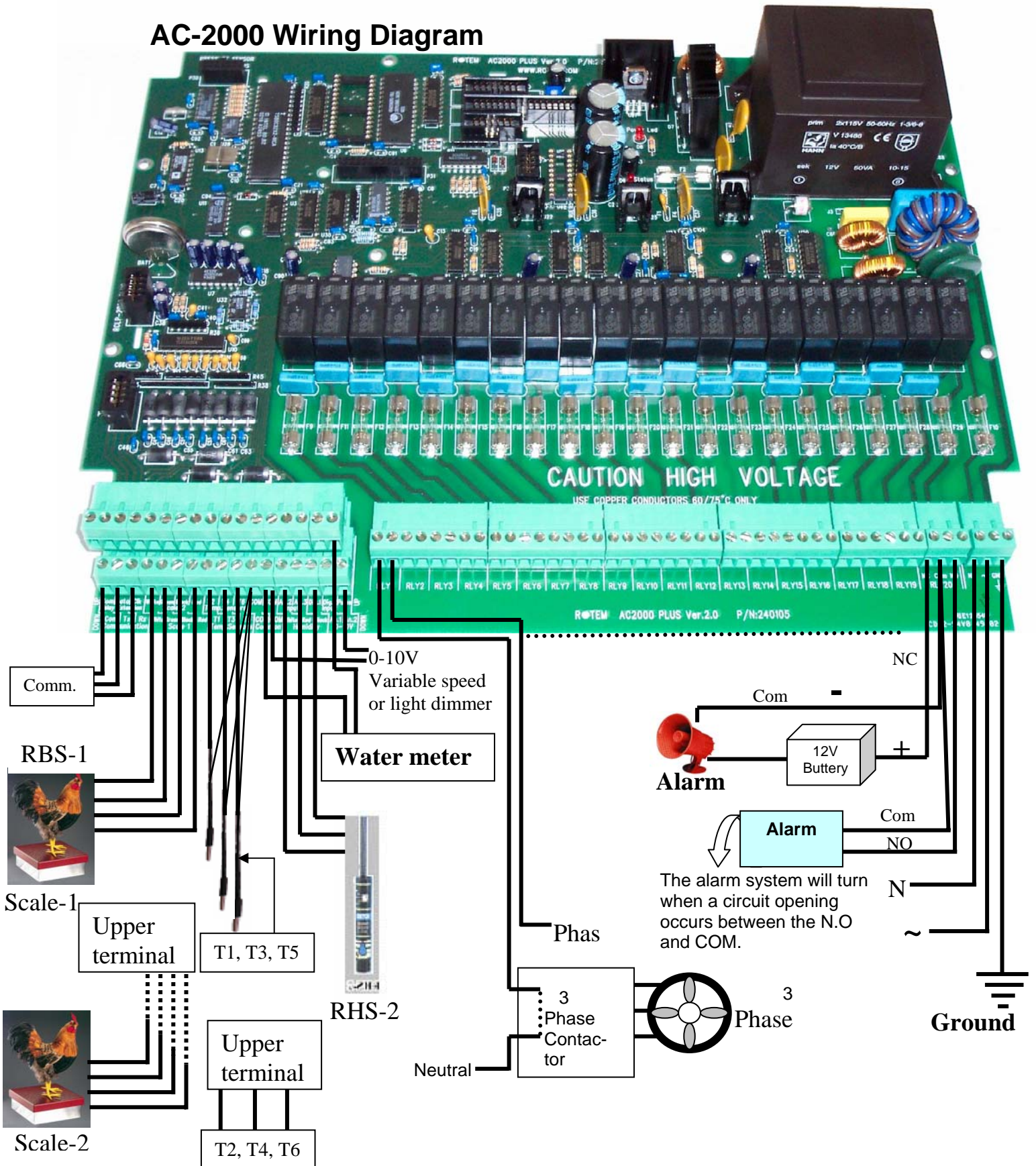


1. **Relays 1 to 19:** Each pair of terminals goes to one relay. These relays are fused with a 5-ampere, 250-volt slow blow fuses. The relays are normally open when not powered.
2. **Relay 20,** three terminal block: This relay normally serves as an alarm relay. It is also fused with a 5 ampere, 250 volt slow blow fuse, and can serve as an ordinary relay: **NC** - Normally closed contact.
Com - Common contact.
NO - Normally open contact.
3. **Power:** Three terminal block:
Neutral (N): connect to the Neutral Power line.
Phase (~): connect to the Phase Power line.
Ground (GND): connect to a solid earth safety ground, normally with the bare safety ground wire, or a green wire.

Board Layout



AC-2000 Wiring Diagram



Electrical Grounding for Controllers

Electrical equipment can be destroyed or slowly damaged by voltage spikes, lightning hits, etc'. Proper electrical grounding in combination with the AC 2000+ internal protections is essential to protect the system, reduce the risk of damage and prolong its lifetime. Correct selection and installation of equipment will protect your system and reduce the risk of human injury. Proper grounding provides an easy path for electrical current to return to its source. A grounding system should tie all non-current carrying conductors to earth ground (0 volts). The grounding system should present a minimum resistance to current flow. Make sure all items used are in proper condition, for example, a corroded wire clamp attaching a ground wire to a ground rod might add 100 ohms or more resistance to a system. Less than 5 ohm will be considered as a good ground.

Ground Rods

Ground rods are used to efficiently connect the system to earth where current may be dissipated in the soil.

- Material: Ground rods should be copper clad or galvanized steel.
- Diameter: Minimum 5/8", preferably 3/4". Generally the larger the rod diameter, the lower it's resistance to current flow.
- Length: Minimum 2.5 meters (8 feet), preferably 3-meter (10-foot). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.
- Single grounding: It is important that there is only one grounding location where a rod or series of rods are connected to each other using a ground wire.
- Independent ground rods will increase the risk of current, from a lightning strike for example, being dissipated through one rod and reentering the system through an adjacent rod.
- Location: Close to the main circuit breaker panel and in moist soil. For example in an area that is usually wet from a drip or a low spot where water drains. Make sure the area is well protected from damage by lawnmowers, tractors, etc'.
- Rod installation: Drive the rod into the earth until about 10 cm (4 inches) is left above grade. If it is impossible to drive the rod to the proper depth, it is acceptable to lay the rod horizontally, 80 cm (2.5 feet) below grade.
- In case the rod is exposed to damage, for example by lawnmowers or tractors it can be installed in a hole, about 20 cm (8 inches) deep so that the rod is about 10 cm under grade and 10 cm above hole level.



The National Electric Code (NEC) mandates two ground rods unless you can show less than 10 ohms resistance with one rod.

Ground Wire

The ground wire is a large copper wire that connects the main circuit breaker panel to the ground rod.

- Material: Ground rods should be copper clad or galvanized steel.
- Diameter: Typically, 16 mm (6-gauge) copper wire is sufficient. If the wire run is greater than 20 feet, 20 mm (4-gauge) wire should be used.
- Length: Minimum 2.5 meters (8 feet), preferably 3-meter (10-foot). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.

The ground wire should be protected from damage by lawnmowers, tractors, etc'. It should be buried minimum 15 cm (6 inches) under grade for protection and enter the house as soon as possible. It is important that the wire not be cut; it should remain continuous.

Ground Clamps

Ground wires should not be merely wrapped around a ground rod. Ground clamps are used to attach a ground wire to a ground rod. The most common clamp is known as an acorn clamp. Make sure the ground clamps you select are rated for outdoor use. Do not use pipe clamps rated for inside water lines or hose clamps to attach the ground wire.



Ground connection

What Should Be Grounded?

Any equipment that is or could become energized, even accidentally, should be grounded. Current from lightning, strikes objects in a random fashion. Accounts of lightning strikes reveal scenarios most of us could not predict.

Electric circuits should be wired with a 3-wire conductor consisting of hot, neutral and grounding wires. The grounding wire should be attached cleanly and securely to devices or systems to be grounded. The other end of the grounding wire should be attached to the ground bus on the main panel.

TECHNICAL SPECIFICATIONS

Input Power Voltage

One Phase 110 VAC (USA and Canada)
240 VAC (Outside USA and Canada)

0.5 Amp, 50-60Hz.

Relay Loads

5.0 Amps, 250 Volts, Fused

Analog Inputs

0 - 11 Volts, 10 Milliamps Max.

Analog Output

0 - 10 Volts:
Current Limited With 100-Ohm Resistor.

Digital Inputs

5 ma @ 5 Volts, Dry Contact

Operating Temperature Range: -10÷C to 50÷C (14÷F to 125÷F)

Enclosure: Water and Dust Tight.

Fuses: Main fuse: 0.315 Amps, 250 Volts
Others: 5 Amps, 250 Volts

Installation Menu

95. Male/Female Curve

Male Female Curve, Menu 96

According to the flocks type enter the estimate male/female weight for each given growth day for the controller to know the type of bird being weight.

Breeder Version System Variables, Menu 97

Var	Description	Default	Range
1	Target Temperature Hysteresis (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
2	Ventilation Level Increase, Time Delay (Minutes).	3.0	0.2 - 10.0 Min.
3	Ventilation Level Decrease, Time Delay (Minutes).	1.0	0.2 - 10.0 Min.
4	Max Ventilation Level Below Cooling Temp.	20	1 - 20 Levels
5	Tunnel Mode Exit, Amount Above Target (Degrees).	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
6	Out Temperature As Diff. Above Target Temp. To Allow Tunnel Mode Exit.	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
7	High Temp Alarm, Amount Above Target (Degrees).	4.0 C° 7.2 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
8	Low Level Heater Hysteresis, Amount Below Heat Set Temperature (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
9	High Level Heater Hysteresis, Amount Below Heat Set Temperature (Degrees).	2.0 C° 3.6 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
10	Radiant Heater Ignition Time (Sec).	60	0 - 99 Sec.
11	Low Temp Alarm, Amount Below Heat (Degrees).	3.0 C° 5.4 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
12	Cooling Hysteresis (Degrees).	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
13	Humidity Treatment Main Delay (Minutes).	5.0	0.0 - 99.9 Min.
14	Zone A, B Temp Diff for Re-circulation Fan (Degrees).	5.0 C° 9.0 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
15	Midnight Curtain Calibration Enable (Enable On = 1.0, any other value disables).	1	0-1
16	Not Used.	---	---
17	Output Voltage At 0 % Variable Speed Power.	3.0	0.0 - 10.0 V out
18	Output Voltage At 100 % Variable Speed Power.	10.0	0.0 - 10.0 V out
19	Wind Direction Averaging Period (Minutes).	30.0	0.0 - 99.9 Min.
20	Output Voltage At 0% Light intensity.	0.0	0.0 - 10.0 V out
21	Tunnel Mode Exit Lockout Time (Minutes).	60.0	0.0 - 99.9 Min.
22	Output Voltage At 100 % Light intensity.	10.0	0.0 - 10.0 V out
23	Minimum Curtains 1+2 Opening for Group Fans Run (%).	0.0	0.0 - 99.9 %.
24	Wind Direction Or Feed Overtime Alarm Selection: 0 = Wind Direction. 1 = Feed Overtime Alarm .	0	0-1
25	Feed Overtime Alarm Delay (Minutes).	0.0	0.0 - 99.9 Min.
26	Alarm Relay Output Delay (Minutes).	0.5	0.0 - 99.9 Min.
27	Humidity Treatment Duration (Minutes).	1.0	0.0 - 99.9 Min.
28	Pressure Units: 0 = Millibar.	1	1 - 4

	1 = Inch Water. 2 = Pascal. 3 = Cm. Water. 4 = Mm. Water.		
29	Static Pressure Interlock (Group Fans Off During Pressure Adjustment): No = 0 Yes = 1	0	0-1
30	Minimum Level for Low Static Pressure Alarm.	1	0 - 20 Levels
31	Static Pressure Wind Gust Delay (Sec).	10	0 - 99 Sec.
32	Water Overtime Alarm Quantity per Minute (Units).	99	0 - 99 Units.
33	Water Shortage Alarm Quantity per Hour (Units).	0	0 - 99 Units.
34	Water Overtime Alarm Delay (Minutes).	10.0	0.0 - 99.9 Min.
35	Not Used.	---	---
36	Humidity Treatment, Heater Use Limit (Degrees).	1.0 C° 1.8 F°	0.0 - 20.0 C° 0.0 - 36.0 F°
37	Humidity Treatment, Heater Use Start Point.	99.9	0.0 - 99.9 %.
38	Radiation Heater, Set Point Above Heat.	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
39	Natural/Tunnel mode change, low-pressure alarm disable (Minutes).	3.0	0.0 - 99.9 Min.
40	Absolute High Temperature Alarm.	50.0 C° 122.0 F°	0.0 - 50 C° 32.0 - 122.0 F°
41	Sunrise/Sunset Duration (Minutes).	1.0	0.0 - 99.9 Min.
42	Not Used.	---	---
43	Enable Feed Shutoff if Feed Overtime Alarm.	0	0-1
44	Air Inlet Open Advance, Seconds.	6	0 - 99 Sec.
45	Level Differential High Temp Alarm Option.	0.0	0.0 - 20.0 C° 0.0 - 36.0 F°
46	Percentage Above Female Reference Weight (%).	15.0	0.0 - 99.9 %.
47	Percentage Below Female Reference Weight (%).	15.0	0.0 - 99.9 %.
48	Percentage Above male Reference Weight (%).	15.0	0.0 - 99.9 %.
49	Percentage Below male Reference Weight (%).	15.0	0.0 - 99.9 %.
50	Birds Weighing Start Time. (Daytime).	0.0	0.0 - 24.0 (Hours)
51	Birds Weighing End Time. (Daytime).	24.0	0.0 - 24.0 (Hours)
52	Feed Cycle Length Limitation. (Days).	7	1 - 7 Days
53	Temperature change to be considered as quick drop in degrees, to reduce a level to reach below target temp. (Degrees)	0.5 C° 0.9 F°	0.3 - 20.0 C° 0.5 - 36.0 F°
54	Temperature change to be considered as quick drop in degrees, to reduce a level to reach above target temp (Degrees)	1.0 C° 1.8 F°	0.3 - 20.0 C° 0.5 - 36.0 F°