

# Sentinel® 5855 Modular Fogging System

## INSTALLATION AND OPERATING PROCEDURES

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#### NOTE

A PDF copy of this manual is available at the following link:

Sentinel 5855 - Operating & Installation Manual (size = 900K)  
[http://www.fogmaster.com/pdfs/op\\_mans/W90015855\\_04.pdf](http://www.fogmaster.com/pdfs/op_mans/W90015855_04.pdf)

# Sentinel® 5855 Modular Fogging System

## INSTALLATION AND OPERATING PROCEDURES

READ AND KEEP THIS MANUAL

### General Description

The main components of the Sentinel 5855 fogging system are:

- An Atomization Control Module (*ACM*) and plug-in control units;
- An Atomization Air Blower (*AAB*, regenerative type) and Blower Relay Module (*BRM*) if required;
- A pump or solenoid valve, depending on the equipment setup, provides liquid to the nozzles, and a Pump Control Module (*PCM*) if required;
- A Liquid Balance Assembly (*LBA*) regulates the flow of liquid to the nozzles and the size of fog droplets produced; and
- One or more Fogmaster® vortex nozzles.

The ACM supervises fogging, activating the blower and pump, according to the directions of the control unit. Several control units are available.

The AAB/BRM provides atomization air to the nozzle(s). The AAB supports blowers up to 1.5 Hp directly. Larger blowers, or those located away from the ACM, need a BRM. The BRM package includes the interface module and control cable.

One-phase blowers larger than 1.5 Hp, and all 3-phase ones, also need a 3rd party motor controller.

The vortex nozzle atomizes fogging liquid and ejects a fast moving plume of small droplets. It works at low pressure – air pressure less than 5 psi [0.3 bar]; liquid pressure 5-15 psi [0.3-1.0 bar].

Because the nozzle orifices are relatively large, it is well-adapted for dusty conditions. Plugging is not generally a problem.



Control module (with "C" controller), 1 Hp blower, and nozzles. Nozzle is available with cam-lock hose fitting, or 2" PVC union for mounting on pipe.

The rate of liquid flow to the nozzle determines the size of the fog droplets produced. Use a low flow rate for fine droplets (dry, or ULV fog); increase flow for larger droplets.

The LBA contains a flow channel for each nozzle, each with flow control valve and variable area flowmeter (rotameter).

The rotameter size (tube diameter and the density of the float) determines the maximum flow capacity. Tube/float assemblies are sized for the liquid supply indicated at the time of order. They may be exchanged in the field if needed.

The supplied rotameter scale is for water under standard conditions. A calibration curve for other liquids can easily be constructed.

Nozzle connections are:

- For air, a cam-lock fitting and hose; for pipe mounted nozzles, a 2-inch PVC slip union.
- For liquid, a compression fitting (1/4 inch [6 mm] OD tubing) and quick connect fitting. Semi-rigid nylon tubing is included with the system. Soft (vinyl) tubing may also be used with a tubing insert.

The discharge direction of the pipe-mounted nozzle is adjustable. The nozzle can swing 360° in direction and 90° in elevation by adjusting the union and screw clamp.

The Sentinel system can also use water from a hose bib, to produce a water fog for humidification or cooling, or to dilute a chemical in line with a proportional injector. The LBA for these systems includes a water connection, pressure regulator and pressure gauge.

## Control Units

Several control units are available for the Sentinel 5855. Product codes and descriptions are:

- M Manual on/off switch.
- T Day/Week timer to turn fogging on and off according to a programmed schedule.
- C Repeating cycle capability in addition to the Day/Week timer. At each program start time, fogging proceeds intermittently, repeating "on" and "off" cycles until the end time. The duration of On and Off cycles is set independently with panel mounted switches.
- H Humidity controller maintains a specified relative humidity.
- E External switch allows direct control of fogging by user equipment (switch box, building automation system, computer, etc).

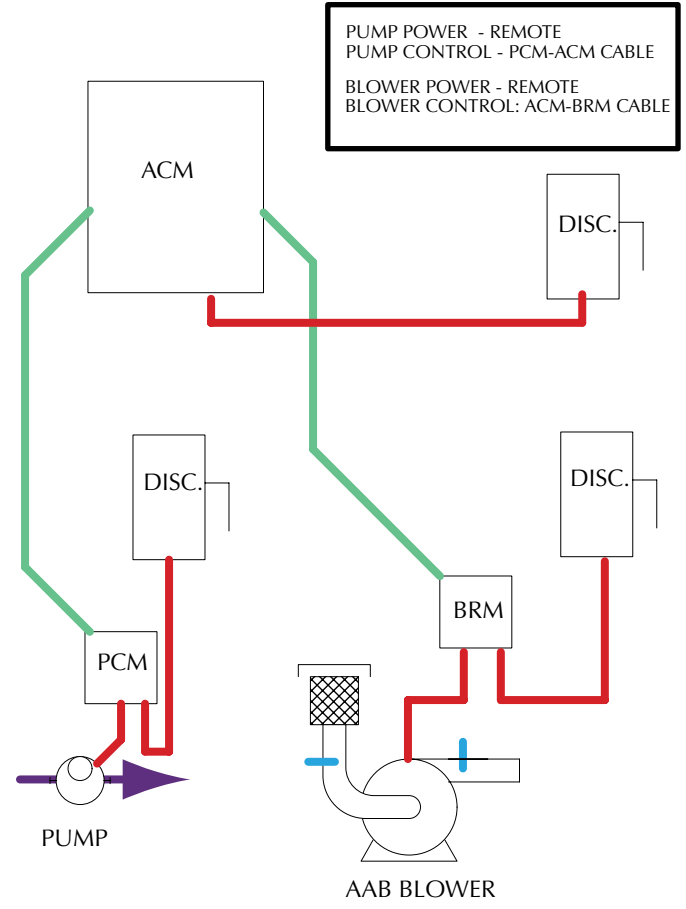
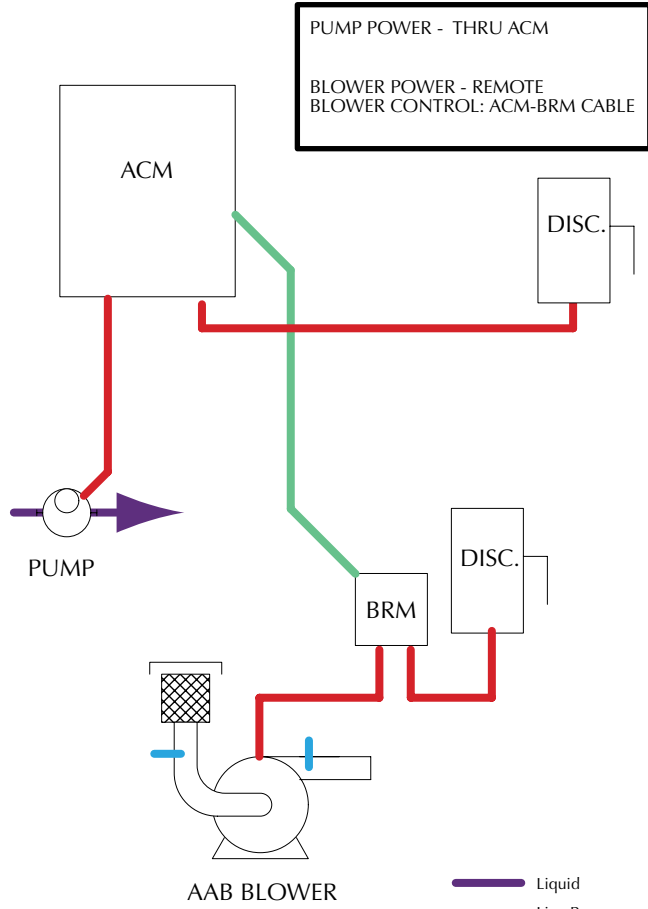
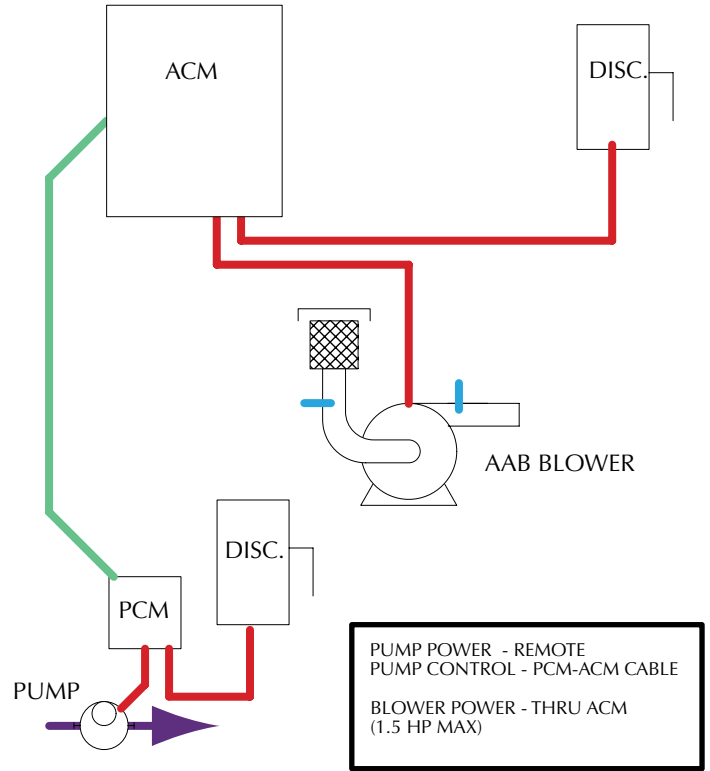
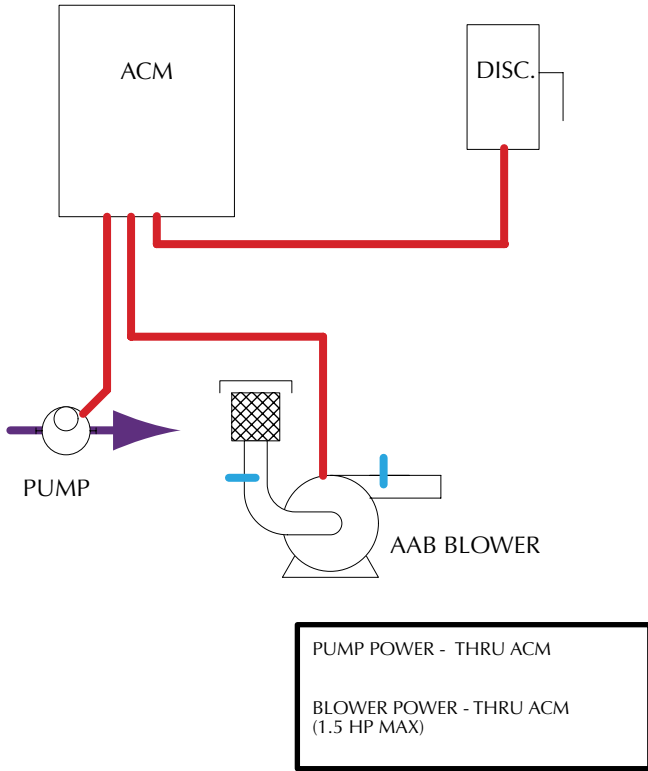
## Equipment Placement

The control module, blower and pump are normally located close to one another, and both pump and blower are powered through the ACM.

If this is not convenient, the pump or blower (or both) can be put where desired. In this case, the remote component is powered through a nearby disconnect, but controlled by the ACM via signal cable and interface module.

These arrangements are depicted graphically in the schematic on the following page.

# MODULE ARRANGEMENTS POWER AND CONTROL CONNECTIONS



- Liquid
- Line Power
- Control Cable from ACM
- Signal Tube to ACM or BRM

# INSTALLATION

## Product Contents

The Sentinel 5855 system usually ships in three cartons, as outlined below. Remove and identify each item.

Ctn	Qty	Contents
1	1	Regenerative blower module (AAB)
	1	Blower documentation
2	1	Liquid balance assembly (LBA)
1 kit		Pipe fittings (Fig 1 typical)
	1	Intake air filter
	1	PTFE tape, roll
	1	Vortex nozzle assembly
	2	Enclosure mounting hardware, pkg
	1	1/4" O.D. nylon tubing, black, 50 ft.
	1	Male adapter, 2" NPT x 2" slip.
	1	Product manual (this document)
3	1	Atomization Control Module (ACM)
	1	Control unit (See "Control Units" section)
	1	Mounting screws, pkg
	1	Mounting template

However, because of the wide range of configurations and options, some systems may be packed differently.

The 71005 usually ships completely assembled.



Fig 1. Typical pipe fittings, nozzle assembly and air intake filter. Details depend upon system options.

## Installation Tools and Supplies

You will also need:

- 2-inch pipe, fittings and supports or hangers to carry air to the nozzle from the AAB. Sch 40 PVC pipe is recommended.
- PVC cleaner and cement
- 5/16" [8 mm] anchors or studs to mount AAB
- Screws to mount LBA
- Wire ties, hook-and-loop (Velcro) tabs or clips to secure liquid lines and control cables

and the following tools:

- Pipe wrench
- Screwdrivers (Phillips and flat blade)
- 5/16" [8 mm] nut driver or wrench
- Adjustable wrench
- Tubing cutter or sharp knife
- Drill and bits.

## Installation Steps

### 1. Make a general installation plan

Select the general location for the major components [ACM, AAB/BRM, pump/LBA and vortex nozzle(s)].

Factors to consider include the size and layout of the area to be fogged, the availability of power (and water if needed), accessibility (to monitor performance and for maintenance), and fogging liquid storage.

If the blower will be powered directly from the 30A relays in the ACM, it should be placed within 5 ft. (the length of the wiring whip and the sense tubes monitoring blower activity).

A pump to be powered directly from the ACM should be close enough for its power cord to be attached.

The NEMA 4 enclosures can be put indoors or outdoors. If the blower is outdoors, some weather protection is recommended.

Determine routing for the module connections:

- Liquid supply line from pump to the LBA
- Liquid tubing from LBA to the nozzle(s)
- Air piping from blower discharge to nozzle(s)
- Module control cables (ACM - BRM, ACM - PCM) as required
- Signal cables or sensor cables (as needed).

## 2. Mount enclosures, Install liquid components.

1. With the machine screws provided, attach the four stainless steel mounting tabs to the rear of the liquid balance assembly.
2. Mount enclosure to wall at a convenient height using bolts or screws appropriate for the mounting surface. Use the mounting tabs attached in step 1. **Do not drill into or through the enclosure.**

The Liquid Balance Assembly must be vertical or rotameters will not read accurately.

3. Mount pump. It should be close enough to the ACM so its power cord can be connected. If this is not possible, you can extend the power cord with a splice or install a pigtail from the ACM.
4. Install liquid components. The input to the LBA is a compression fitting. To attach, loosen fitting nut slightly, insert tubing fully into fitting, and tighten. Fittings designed for flexible tubing are usually tightened finger tight; those designed for rigid tubing typically require a wrench.

Do not bend tubing sharply or it may kink. Coil or cut off excess.

- 4a. For pump systems: Install liquid reservoir, suction tubing and intake screen and connect to pump intake. Connect pump discharge port to the LBA inlet.

The kit includes  $\frac{1}{4}$ " [6 mm] OD semi-rigid nylon tubing.

- 4b. For city water systems: Attach liquid screen filter to hose bib, and run tubing to the inlet of the LBA or proportional injector if used. A separate instruction manual is included with city water systems.
5. (For BRM only) Attach the 4-wire blower control cable to the ACM. Align keyway and contacts, push in connector to seat contacts, and secure with the collar ring ( $\frac{1}{4}$  turn clockwise). Route the blower control cable to the BRM location, securing to wall as desired. **Do not attach the control cable at this time.** Coil excess cable safely out of the way.
6. Connect power wires to ACM terminal blocks in wiring entry. A 120V, 20A branch circuit is recommended for blowers to 1.1 Hp. A 220-240V circuit is required for the 1.5 Hp blower option.
7. Cut the plug off the end of the pump power cord, route through strain relief, strip wires and connect to terminals provided.
8. Confirm that the voltage selector switch is set to the proper voltage (Fig 2).

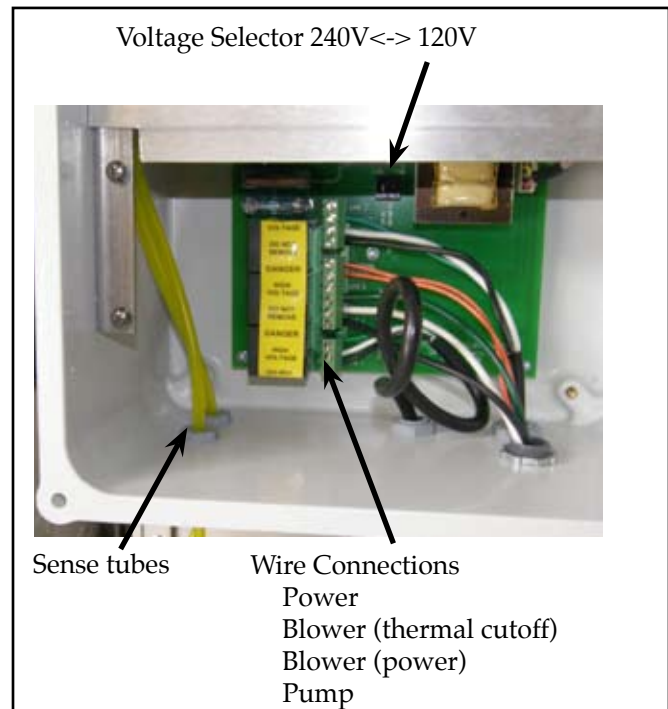


Fig 2. Atomization Control Module wiring entry.

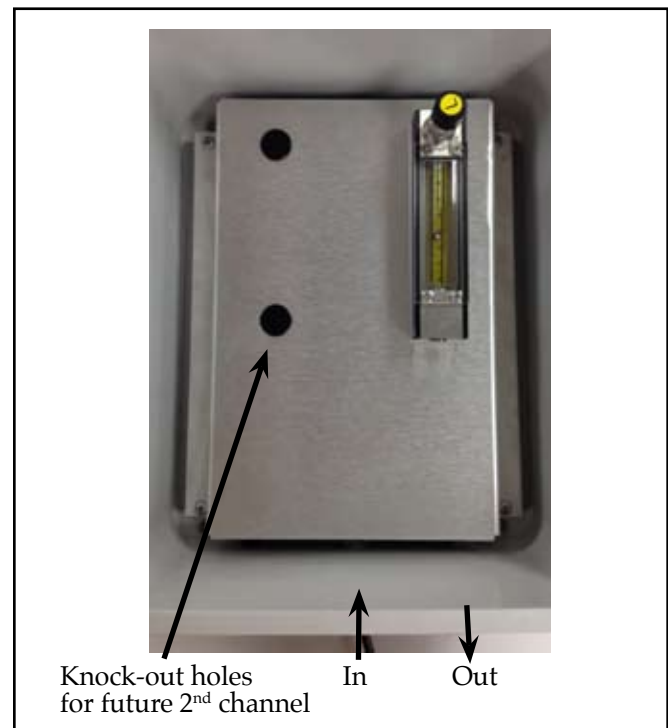


Fig 3. Liquid Balance Assembly (1 channel)



### 3. Install regenerative blower module (AAB)

1. Select a vibration-free surface for the blower. If wall mounting, ensure that blower is horizontal. When floor mounting, select a location that is horizontal. If blower must be placed on a sloping floor, orient it with the ring (large) end **lower** than the motor.

If the discharge line is to go up (overhead), install blower with the ring to the left (discharge port *above* intake port). This will simplify piping in most cases. (Fig 4 shows mounting details. The dimensions are for the 1.0 Hp blower *only*. Use the included mounting template for mounting locations of other blowers.)

Conversely, if the discharge is down, install blower with ring to the right.

The location of the AAB should provide space for the Blower Relay Module and third-party motor starter, if used.

The blower must be within 4 ft of the ACM (or BRM) so the signal tubes can be attached (*step 9*).

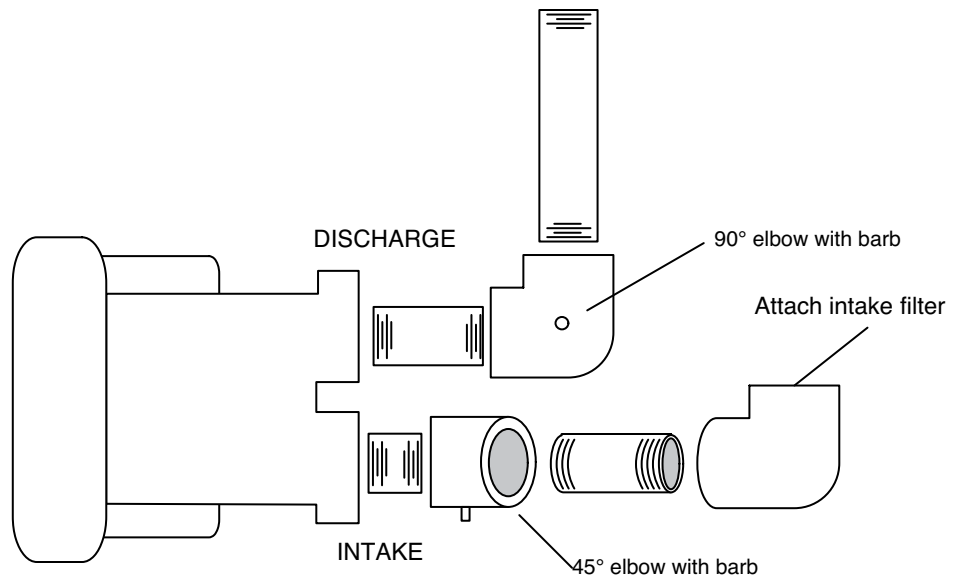
2. Install anchors or mounting studs to secure the AAB. See Fig. 4 for bolt pattern and, for floor mounted units, the *minimum* wall standoff distance. **Do not mount the blower yet.**
  3. Assemble *discharge* pipe fittings to AAB as shown, starting at the blower. **Some fittings have tube barb fittings for the signal tubes. These must be installed so barbs are within reach of the signal tubes of the ACM (or BRM).** Use PTFE tape or pipe sealant when assembling. Tighten snugly.
  4. Assemble *intake* fittings as shown, again using PTFE tape or pipe sealant. Orient the fittings so the tubing barb is within reach of the signal tubes. Install intake air filter.
  5. Place the blower in position and bolt securely.
  6. Install BRM if using (see next section).
  7. Connect power to the blower in accordance with local electrical codes and instructions included with blower and motor controller.
- 7a. **Blowers up to 1.5 hp, 120/240V, 1Ø** are powered directly from the ACM (or BRM). Open wiring box, attach wiring whip, and connect power and thermal cutoff leads (orange wires) as indicated on the circuit board of the ACM or BRM (Fig 2).

The thermal cutoff switch of the blower **must** be wired to the PCB terminals marked "Thermal Cutoff". Please see the addendum on blower wiring (page 19) for additional information.

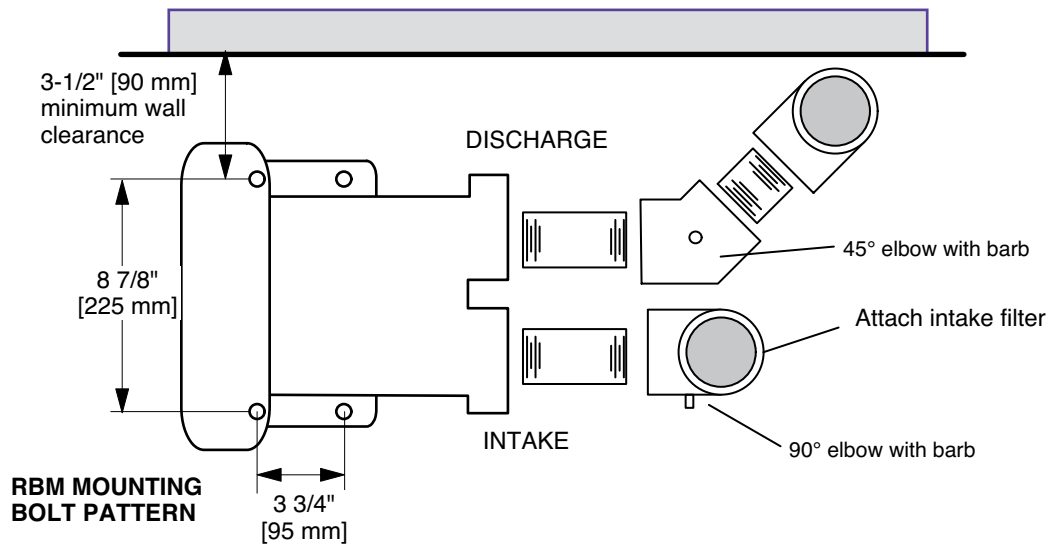
- 7b. **Larger blowers** (greater than 1.5 Hp, with 3Ø motors, or using voltages greater than 250V) require the BRM and a suitable third party motor starter. See the manufacturers' documentation for details of wiring blower and starter.
8. Connect signal tubes to the hose barbs on the air line piping as indicated – "SUCTION" tube to the barb under the intake filter, and "DISCHARGE" tube to the barb on the output line.  
**The signal tubes are essential to the operation of the blower. If they are not connected or if they are reversed, the system will not operate.**  
Signal tubes should hang loosely and be secured to prevent damage.
9. Replace cover on ACM or BRM and secure with screws.

### 4. Install blower relay module (BRM)

1. The BRM (if used) must be located within 4 ft of the blower so the sense tubes can be connected. Drill mounting holes according to the template provided. Remove cover of BRM, insert screws into the mounting wells (see Fig 5) of the enclosure and mount BRM to wall.
2. Connect wires from disconnect to Power In terminals. Install wiring whip to blower and attach to BRM terminals. Attach blower's thermal cutoff leads to appropriate terminals on BRM.
3. Attach the 4-wire blower control cable from the ACM to the connector on the BRM. Twist connector to align keyway and contacts, press to insert, and lock the collar ring. Route other end of control cable and attach it to the ACM.



**A. WALL MOUNTING (front view)**



**B. FLOOR / PLATFORM MOUNTING (top view)**

Fig 4. Blower (1 hp model) mounting arrangements. When mounting to a wall, put ring to left (shown) for upward discharge piping. When discharge piping is to go downward, mount with ring to right.



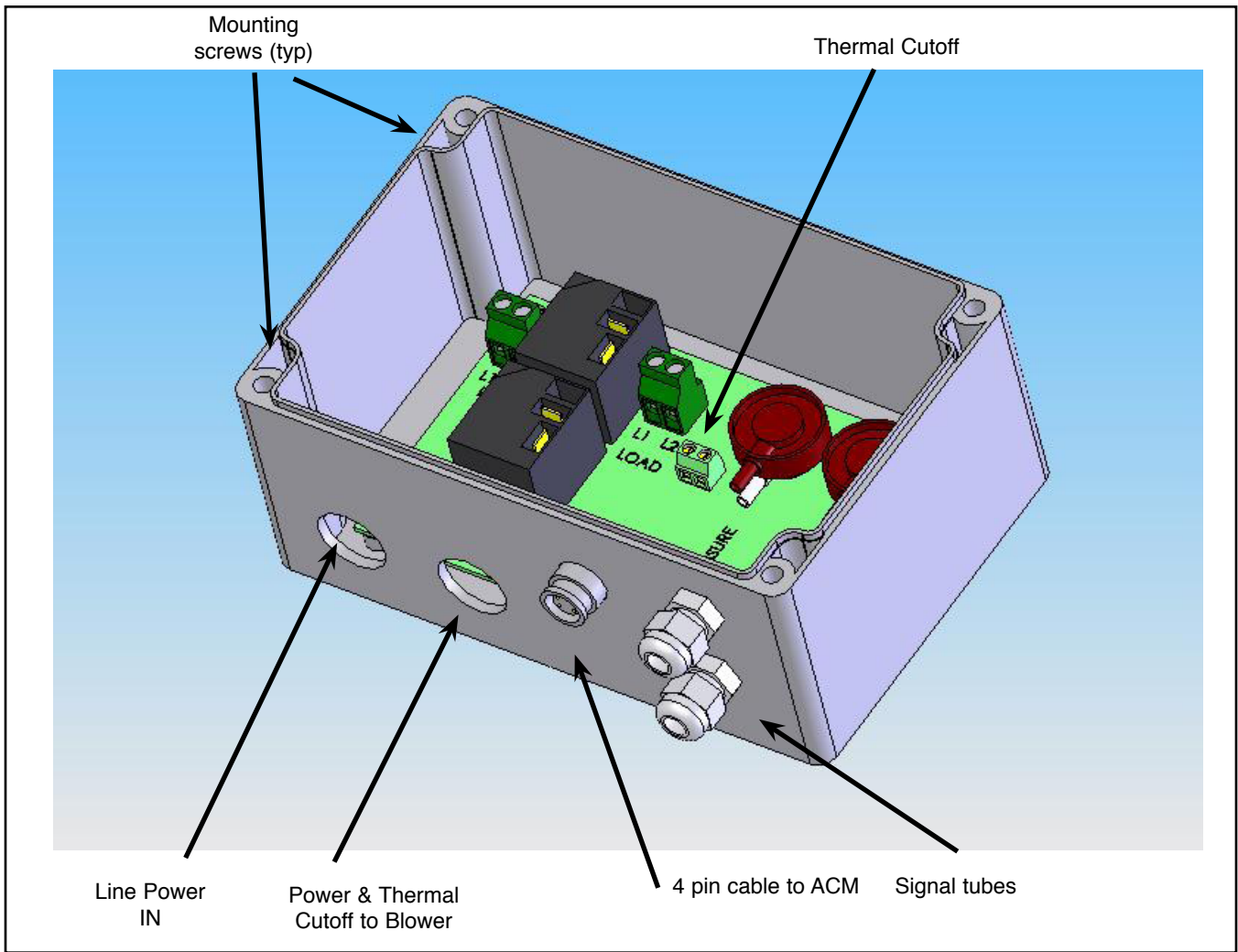


Fig 5. The Blower Relay Module supplies power for a blower located too far from the ACM for a direct connection. A local disconnect powers the ARM relays, which are controlled by a low voltage signal from the ACM. The “thermal cutoff” terminals are in series with the relay coil and must be connected to the blower’s overload switch. [If the blower lacks a pilot duty thermal cutoff, install a shunt across the thermal cutoff terminals.]

The BRM’s inlet and discharge signal tubes must be connected to the corresponding tube barbs on the blower piping.

The BRM can support blowers to 1.5 Hp, 120/208/220-240V, 1Ø. The BRM is also used in the control circuit of 3rd party motor controllers to operate blowers larger than 1.5 Hp.

### 5a. Install air lines – hose/nozzle assembly

1. At blower discharge manifold, install female cam-lock fittings and plugs.  
The hose/nozzle assembly can be located further from the blower, if desired. Attach a PVC male adapter, extend the air line with 2" PVC pipe, and terminate with a 2" female adapter. Attach the female cam-lock fitting. In this case, the liquid line must also be extended to the end of the air piping.
2. Before connecting the cam-lock hose fitting, operate blower a few minutes to flush any debris from the air lines. To start blower, turn on the ACM power switch and select the Blower Override setting (see "System Control").
3. Attach male cam-lock of hose/nozzle assembly. Attach liquid line to quick connect fitting.

### 5b. Install air lines – pipe union nozzle

1. Loosen the rear stainless steel clamp on the nozzle and rotate assembly to familiarize yourself with the nozzle's angular range. You can also change nozzle direction by rotating it at the union.
2. Decide how you want the air supply pipe to approach the nozzle for best discharge angle. In most applications, fog should have a long "throw" distance so droplets don't impinge on a nearby surface.
3. Plan the path of the AAB-to-nozzle piping for minimum friction loss and pressure drop. Use 2 inch pipe *or larger* in long straight runs with as few fittings as possible. For bends, use sweep elbows (or two 45° fittings separated by a short pipe) rather than a tight 90° elbow. **Do not use fittings that are "necked down" internally.**
4. Install air pipe. Start at the AAB and work towards the nozzle. Sch. 40 PVC pipe and slip (glued) fittings are adequate. If pipe will be exposed to sunlight, use UV-resistant grade.  
Provide pipe hangers or clamps to support the weight of the pipe and eliminate stress on the blower housing.
5. Before mounting nozzle, clean air lines to remove any debris or shavings. If nozzle has already been glued in place, unscrew union and remove nozzle.  
Operate the blower for a few minutes to flush the lines. To start blower, turn on the ACM power switch and select the Blower Override setting (see "System Control"). Turn blower off.
6. Attach nozzle at union, adjust direction and tighten union and nozzle clamps.
7. Attach liquid supply tubing to nozzle. The nozzle assembly has a compression fitting and a quick connect fitting (press tab and pull fitting apart).
9. Run liquid tubing back to the LBA, securing with tie wraps as required. Cut off or coil excess tubing, and connect tubes to the appropriate ports on the LBA enclosure.

# SYSTEM CONTROL

The ACM controls operation of the components of the atomizing system (air blower, liquid pump or solenoid valve) according to its switch settings and the control unit installed. Several types of control units are available: programmable timers, sensors and user-provided input signal.

The ACM includes switches to facilitate testing and start-up. However, normal operations should be controlled through the control unit, which generally

includes an override setting for manual control, labelled "Auto / Manual" or "Manual On / Off"

Fig. 6 shows the switches and status lights of the ACM. (The "C" control unit is depicted; the following pages have operating instructions for this and other control units.)

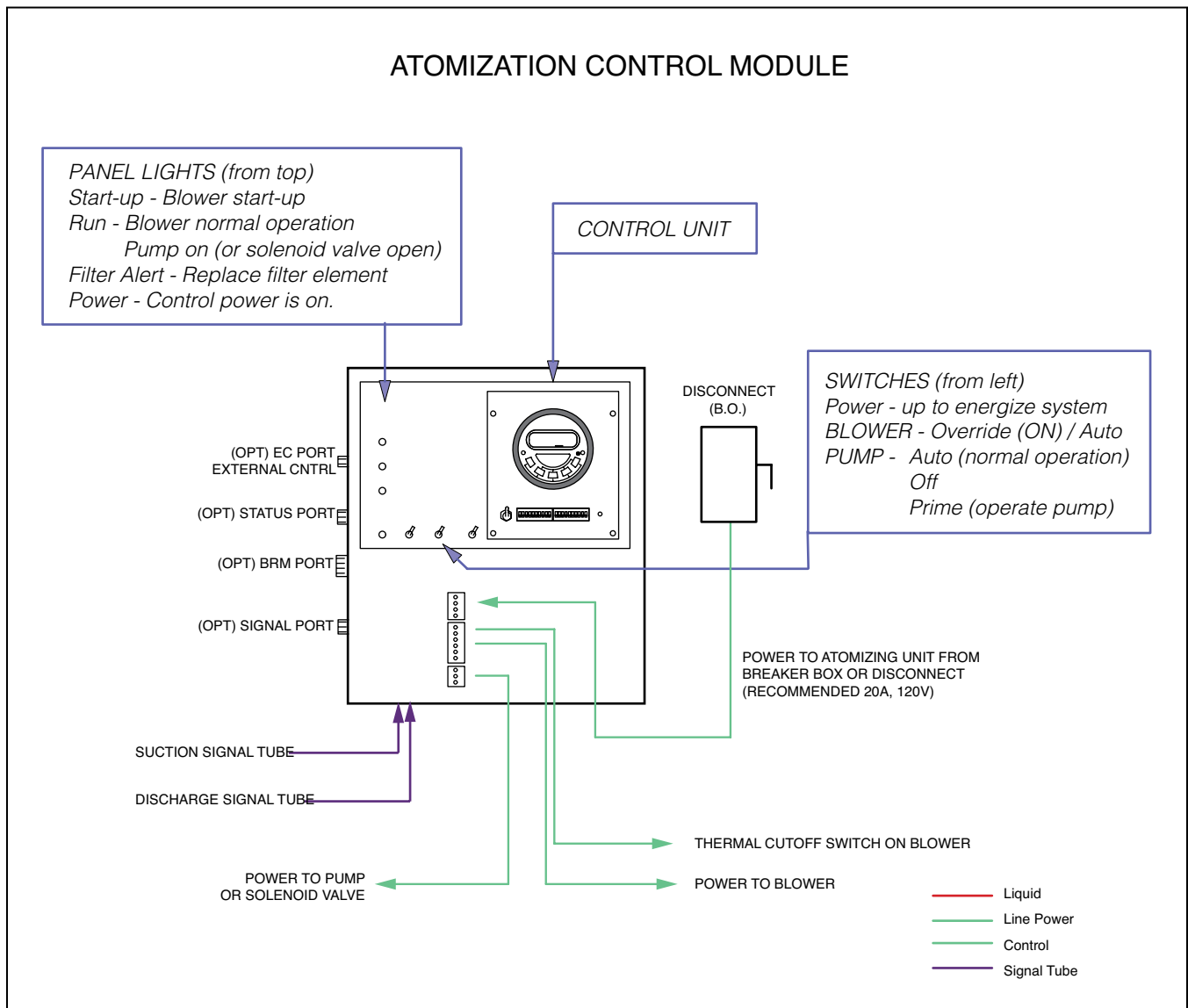


Fig 6. Atomization Control Module — control section and wiring connections (cover removed)

## “T” – Day/Week Timer Control Unit

The Day/Week timer has a seven day range and holds start and stop times for up to eight fogging “events” (a set of Day/On/Off times). The frequency of each event can be set to: a specific day of the week; every day (Sun - Sat); weekdays only (Mon - Fri); or weekends only (Sat - Sun).

The “manual” button of the clock cycles between its three operating modes: ON, OFF, and AUTO:

In OFF mode, timer output is disabled. There is no fogging.

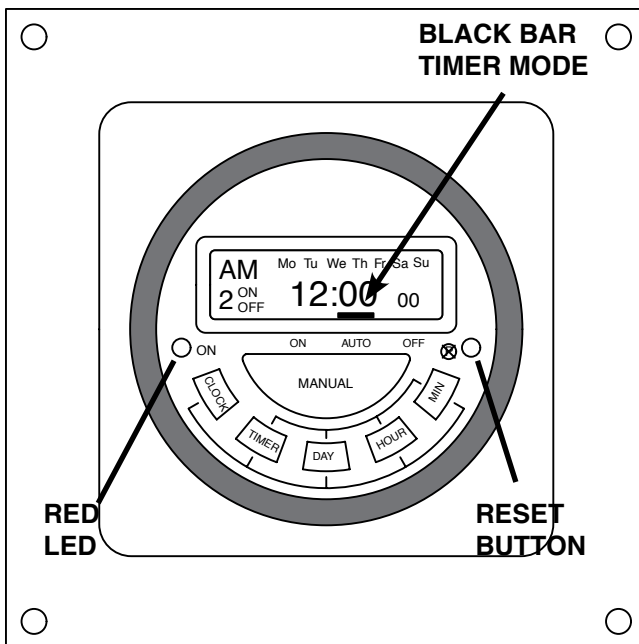
In AUTO mode, timer output and fogging follow the program schedule in timer memory (see below for programming instructions).

In ON mode, timer output and fogging are on continuously.

The face of the clock module contains a red LED. This is illuminated whenever timer output is on.

The clock includes a rechargeable battery. It can retain the event schedule for about 30 days if the ACM’s power switch is Off.

The “T” module controls fog operation directly. [The “C” model (see below) controls fog operation either directly or through a repeating cycle timer.]



### General Operation

The LCD display normally (operating phase) shows the current time and day. In programming phase, it shows event frequency and start/stop times.

The RESET button clears all memory data, including current day and time.

The MANUAL button cycles the timer mode (ON - AUTO - OFF - AUTO). **The black horizontal bar above the text shows the timer mode.**

The TIMER button puts the unit into programming phase to enter events.

The CLOCK button puts it into operating phase.

### To set the current day and time

Press CLOCK and DAY buttons until current day shows. Release both buttons to set today.

Press CLOCK and HOUR until current hour shows. Release both buttons to set current hour.

Press CLOCK and MIN buttons until current minute shows. Release both buttons to set current minute.

### To enter events into memory

Press TIMER button to put timer into programming phase. The left side of the display shows “1ON” and the scheduled time for event 1 to begin.

Press HOUR button to change the hour of the event start, and MIN to change the minute.

Press the DAY button to select the frequency of the event. There are more than 10 options including Mo thru Su (all 7 days); Mo thru Fr (weekdays only); Sa thru Su (weekends only); any given day; etc.

Press TIMER again to save “1ON” information and show “1OFF” settings. Change Event 1 ending time data with the HOUR, MIN and DAY buttons.

Repeat process for additional events.

Press CLOCK to exit programming mode.

### Manual operation

Press MANUAL until the LCD bar shows ON. The blower spools up and fogging begins.

### Automatic operation

Press CLOCK, and then MANUAL button to set the desired timer mode (ON AUTO OFF AUTO).

Selecting OFF -> AUTO: fogging remains off until the next On program time.

Selecting ON->AUTO: fogging remains on until the next Off program time. To clear timer memory

Press RESET button. (RESET also clears time and day settings.)

### To override program settings

To stop fogging during a program event, press the MANUAL button to the OFF position.

To begin fogging outside a program event, press the MANUAL button to the ON position.

### **Countdown Operation**

You can also run the "T" control unit to simulate a countdown timer. Press RESET to clear all events from timer memory. (You will have to reset the current day and time.)

Enter a single event into memory. If you want a delay time before fogging starts, enter it. Enter the end time, adding length of start delay if any.

Press CLOCK. Set mode to OFF, then AUTO.

After the countdown cycle has finished, **put timer into OFF mode, or delete the programmed event.** Otherwise, the event will repeat a week later.

### **"C" – Repeating Cycle Control Unit**

The repeating cycle control unit adds a cycle timer to the Day/Week timer. Fogging will cycle on and off repeatedly during any programmed event, or when the clock is operating under Manual mode.

The cycling timer is subordinate to the main clock timer; it is activated whenever the red LED is lit showing clock output.

The cycle timer is enabled by the CYCLE/CONT switch. CONT bypasses the cycle timer.

The first cycle is "on", which will continue for the time programmed into the left bank of dip switches. The cycle timer then shifts to the "off" phase and stays there for the time entered into the right bank of dip switches.

To operate as a "T" module, with clock control but *no* cycling, put the CYCLE/CONT switch to the CONT position.

The length of On and Off cycles is 1-165 minutes each, in 1 minute increments. Dip switch values are 1, 2, 3, 4, 5, 10, 20, 30, 40 and 50 minutes. Push switches **up** to set it until they total your desired time.

As an example, to enter a cycle of 3 minutes on, 17 minutes off, put all ON switches down except "3", and put all OFF switches down except "10", "5" and "2" [or 8+9, or 4+6+7].

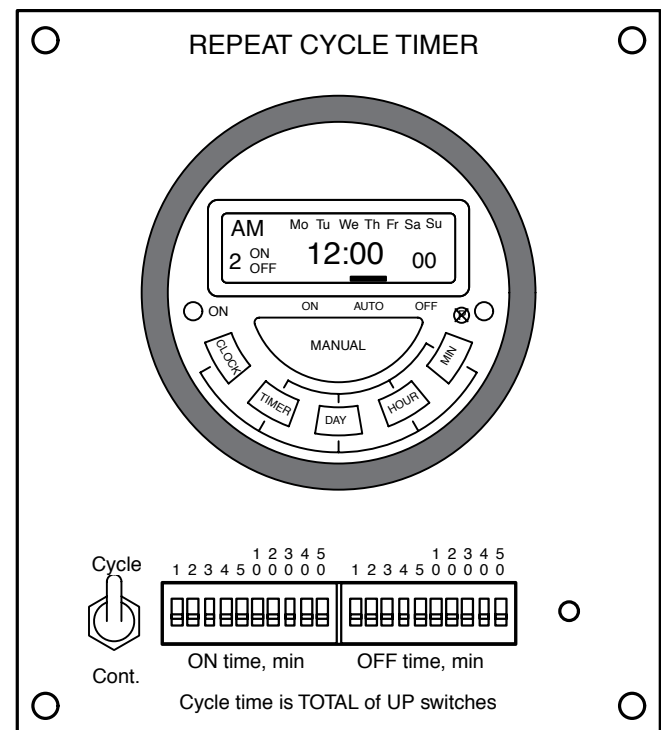
### Description of operation

The Day/Week timer provides overall system control (see description for "T" control unit). The CYCLE/CONT switch sends output from the Day/Week timer to the dip switch module (CYCLE) for intermittent fogging, or bypasses it (CONT) for continuous output.

### Manual operation

For *steady output*, set the CYCLE/CONT switch to CONT position (for continuous output) and cycle the MANUAL button to ON.

For *cyclic output*, choose on and off cycle lengths and enter into dip switches. Set CYCLE/CONT switch to CYCLE (for repeating cycle). Press the MANUAL button to ON.



### Scheduled operation with cyclic output

Enter event times and days into the Day/Week timer memory (see "T" unit). Choose on and off cycle lengths and enter settings in dip switches.

Set CYCLE/CONT switch to CYCLE (repeating cycle operation). Press MANUAL button to AUTO to begin programmed operation.

### Scheduled operation with steady output

Enter event times and days into the Day/Week timer memory (see "T" unit).

Set CYCLE/CONT switch to CONT (continuous output). Press MANUAL button to AUTO to begin programmed operation. Fogging occurs during each program event.

## "H" – Humidity Control Unit

The 5850 can fog water for humidification. As fog droplets evaporate, they increase the humidity.

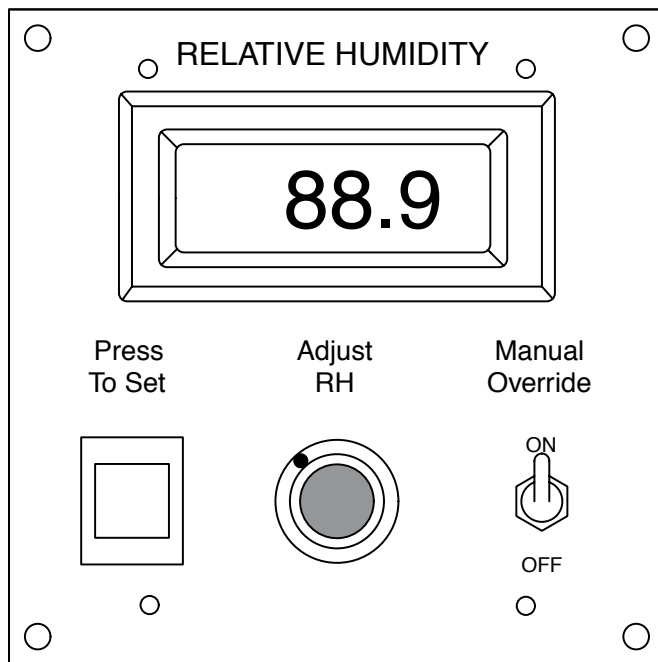
The MANUAL/AUTO switch determines if the fogger operates continuously (MANUAL) or only when commanded by the controller (AUTO). MANUAL is useful for testing and troubleshooting.

In AUTO, the fogger powers up when the relative humidity *at the sensor* falls below the target level (setpoint); it powers down when the RH rises above the setpoint.

The controller gathers humidity data continuously and displays it on the LED. The display will **flash** when the controller is asking for more moisture, or when the machine is under manual control.

To adjust the setpoint, press the left switch to SETPOINT and turn the ADJUST knob.

A "dead band" between the on and off trigger points helps smooth on/off cycles. The dead band is adjustable (1.0-3.0 RH point range); press the switch to DEADBAND and turn the ADJUST knob.



### Package contents

The "H" unit includes the following items, plus those listed on page 3:

- 1 Humidistat sensor
- 1 Sensor cable (3 pin). A 50 ft. cable is standard. Other lengths are available
- 1 Hose bib adapter with 50-mesh strainer.

### Installing the sensor

Connect the sensor cable to the ACM 3-pin socket. Align keyway and contacts, press to insert fully, and secure by turning the lock collar clockwise.

Select the sensor location (see "Application Tips" for more information), extend the cable, attach sensor and secure lock ring. Mount the sensor with double sided tape.

### Sensor calibration

The sensor is factory calibrated to an accuracy of better than 2 percent points RH. It can be recalibrated in the field with a reference standard ("Maintenance").

## "E" – External Switch Control Unit

The "E" control unit responds to a user-supplied device (switch box, relay, computer, building automation system, etc). It lets you incorporate fogging into your process.

For example, you could install a sensor to monitor odor and fog an odor neutralizer whenever it exceeds a threshold value.

The control unit supplies a low voltage control signal to the external device and monitors the return line. Fogging begins when the external device closes a switch (the contacts on the external device should be rated 1A or greater).

### Package contents

The "E" unit includes the items listed on page 3, plus the following:

- 1 Control cable (3 pin). A 50 ft. cable is standard. Other lengths are available. The cable has a standard 2-pin connector on one end, and bare wires on the other.

### Installation

Attach control cable to ACM and to external switch. Wire colors and pin assignments are:

Red	to user switch
Black	to user switch

The control signal voltage is 24VAC.

### Manual operation

To run the fogger locally, *ignoring the external switch*, set MANUAL/OVERRIDE switch to MANUAL

### Automatic operation (external control)

To control fog operation by the remote device, set MANUAL/OVERRIDE switch to EXTERNAL. When the external switch closes (opens) the connection between the red and black wires, the "E" control unit starts (stops) fogger operation.



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## START-UP PROCEDURE

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1. Connect all nozzles – the air lines to the AAB discharge manifold, and the liquid lines to the Liquid Balance Assembly. Open rotameter flow control valves completely.

2. Turn on the ACM power switch. Green power light will come on.

Test blower operation briefly (blower switch to Override) to confirm the red start-up light (power to blower relays), then switching to the green “run” light as the blower reaches normal speed. Return the Blower switch to Auto.

3. Set up the liquid reservoir and connect suction tubing to pump. Try to avoid bends or high spots that may trap air.

Depress the “pump prime” switch to power up

### NOTE ON POSITIVE DISPLACEMENT PUMPS

The standard Sentinel system is designed for low pressure operation, and does not include a pressure relief valve to deal with a dead headed pump.

The LBA valves are used only to **balance** flow to the various nozzles, so each nozzle gets its fair share. They should not be used to throttle total flow to the nozzles, or closed so that excess pressure builds up at the pump discharge.

**To balance flow:** Open each valve fully, then slowly close the one showing the highest flow. Continue until all rotameters display the desired flow rate.

**To change total flow:** Open all valves fully, adjust pump speed and rebalance as above.

the pump (make certain the pump’s power switch is in the “on” position). Continue priming until you see liquid flowing through the rotameters of the Liquid Balance Assembly.

To speed up priming, increase pump speed.

When the pump has been primed, set the ACM (or PCM) pump switch to Auto, and reset pump speed to its normal rate.

4. Set control unit for manual operation (see “System Control”). The AAB will start up. When it comes to speed (1-2 seconds), the status light switches from “Start” to “Run” and the pump powers up (on some models a solenoid valve

opens) letting liquid flow through the rotameters to the liquid output ports and on to the nozzles.

5. When first priming the system, it is common to find air bubbles entrained in the liquid lines. These generally dissipate over several hours’ running. Increasing flow or tapping gently on the rotameters or supply tubing may help. Air in the rotameter will lead to an inaccurate reading.
6. Confirm the nozzle is producing fog. Small droplets are hard to see; hold your hand or a tissue in the nozzle discharge, or increase flow to make larger droplets.  
Confirm that rotameter responds to changes in needle valve and regulator settings.
7. Adjust pump speed (if able) to set the liquid flow rate and droplet size desired.
8. Program the control unit as required for your application. “Application Tips” has more information on this.
9. Set ACM control unit for automatic operation.

Flow (and, for water supply systems, pressure) may wander initially until all air has been purged from the liquid lines. Adjust settings periodically until they are stable.

A humidification user may have to experiment to find the best combination of RH setpoint, flow rate and sensor location for his facility.

Start with a fairly low RH setting, and increase it in 3-5 point steps, observing results at each step. Move sensor to different locations. Vary flow rate and droplet size.

“Application Tips” has more information on this subject.

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## APPLICATION TIPS

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### What size droplet is optimum?

The “right” size fog droplet depends on the circumstances. Finding the best operating point requires some experimentation. These general comments may be helpful:

- An odor control application would favor small droplets because they diffuse quickly and are easily carried with the air stream. Also they have a large surface area relative to volume, making them more effective for gas contacting.
- A humidification application would also prefer small droplets; they have a large surface area for evaporation, and are less likely to fall out. On the other hand, a low flow rate means the fogger must operate longer to deliver the same amount of water.
- A user applying sanitizers, disinfectants or anti-mold chemicals would prefer bigger droplets. His goal is to cover all surfaces with a thin layer of chemical to kill target organisms. If droplets are too heavy, however, they may settle out before they can spread through the treatment area.
- Droplets tend to evaporate as they travel further from the nozzle. You may have to consider evaporation losses when computing liquid requirements or fogging times.

### Impact of water quality on nozzle performance

The atomizing performance of the nozzle will be degraded if foreign materials accumulate on its vortex generating surfaces.

If bacteria or algae in raw well water colonize on the nozzle, a 5 micron cartridge filter may help.

Dissolved minerals in “hard” water can be left behind when residual droplets evaporate. A water softener does not solve this problem – it merely replaces Ca and Mg ions with Na – but a reverse osmosis system will.

### Fogging Suspended Solids

Although most fogging involves solutions of homogeneous liquids some people ask about fogging a suspension of solids. This can be done, with some precautions.

First, the suspension should be stable, or agitated to prevent settling out. Solids should be small enough to pass a 50-mesh screen.

Although the vortex nozzle has no small orifices to plug, solids may accumulate on the nozzle and reduce atomization performance.

Solids could also accumulate in the rotameter and need to be flushed out periodically with water or an appropriate solvent.

### To Calibrate Liquid Flow Rate

Rotameter scales are calibrated for water. If your liquid is a different density or viscosity, you may want to calibrate it for your situation.

To calibrate the rotameter, disconnect the liquid supply tubing at the nozzle (or remove the tubing from the discharge fitting of the LBA), turn on the system and collect the liquid in a graduated cylinder or measuring cup at different flow settings. The mating fitting on the LBA discharge port must remain connected to open the exit port check valve.

## About Humidity

**Relative humidity** is the ratio between the actual concentration of water vapor in the air (in lbs/ ft<sup>3</sup> or gm/ m<sup>3</sup>) to the maximum possible at that temperature (the **saturation limit**). The relative humidity is 100 per cent at saturation.

Cooler air can hold less water vapor than warm air; it has a lower saturation limit. Therefore, relative humidity will *increase* as air is cooled. If air is cooled until the relative humidity reaches 100% (the **dewpoint** temperature), some of the vapor starts to condense into the liquid phase.

Water vapor, like all gases, tends to diffuse until its concentration is uniform throughout a room. Two areas with the same vapor concentration but at different temperatures will have different relative humidities. The cooler area, closer to the dewpoint, has the higher RH.

### Wine Barrel Room Humidification

Raising the humidity of a barrel room can reduce topping losses significantly, particularly in drier climates.

However, if the humidity target is set too high, one may encounter wetting, from two sources – condensation, if the temperature of the room or any equipment (for example, chiller coils, refrigeration units) should drop below the dewpoint; and fallout, if fog droplets settle before they can evaporate.

Some experimentation is often needed to find the optimum humidity, because the room itself plays a large role. A “tight” room, with well-designed refrigeration, minimal ventilation and few door openings, won’t lose much water vapor. It needs only a little fog to make up for water losses. Such a room might be able to maintain 85-90% RH without wetting.

On the other hand, a room with large vapor losses (of whatever cause) will need more make-up water. In this room, the fogging system must operate longer and more frequently, and still might not achieve your humidity goals. The only remedy is to search out and eliminate pathways of water loss.

There are many ways water can escape from a room – through ventilation ducts, open or poorly sealed doors, night air cooling. It can also be lost to absorption (by case goods) or by condensation on fermentation tank chiller coils, refrigeration coils, cold door or window frames or ventilation grills.

## Nozzle Location

Aim the nozzle where you want your fogging liquid to be applied.

Do not fog directly at a wall (including the wall of a ventilation duct) unless you want to wet it.

For humidification, it’s best to aim the nozzle down an aisle, preferably in the room’s long direction, to maximize droplet hang time for evaporation. Tilt the nozzle up slightly so the discharge plume can arch towards the ceiling (but not impinge on ceiling trusses or joists).

### Location of Humidity Sensor

The humidity sensor should be put in the general path of the fog discharge, but no closer than 15-20 ft. to the nozzle. When fogging starts up, this area is first to experience the increased humidity, and is therefore is the most sensitive control point.

This location seems to offer a good compromise between on-off cycling and humidity overshoot.

As the water droplets evaporate, the moist air spreads throughout the room, mixed by the forceful discharge of the nozzle and by diffusion. If you find that some areas are poorly mixed, consider adding a low speed fan to promote circulation.

### Humidity target and wetting

It is fairly easy to maintain a moderate RH, say 50% without wetting; the air is far from saturation and droplets evaporate quickly.

It is harder to maintain a high humidity, say 85-95%. The air is close to saturation; droplets take longer to evaporate, and are more likely to hit something first. In this case, use a low liquid flow rate and make small droplets to minimize the likelihood of wetting.

### Humidification using city water

Many wineries are vigilant about chlorine as a potential contributor to TCA. Since city water often contains residual chlorine, we recommend you install an activated charcoal cartridge filter on the water line before the LBA.

## ADDENDUM: PUMP CONTROL DETAILS

The liquid delivery equipment of the Sentinel 5855 (pump or solenoid valve) is controlled by the ACM. This note provides more detail about its electrical wiring, the 5855 start-up sequence and condition checks, the interpretation of status lights, and troubleshooting.

### Pump Wiring Requirements

The ACM delays liquid delivery to the nozzles until there is sufficient air flow and pressure to atomize and eject it from the fogging nozzle(s). If powered independently, the pump could operate prematurely, letting liquid dribble into the air line with potential damage to the air hose, piping or blower. The warranty does not cover damage arising from incorrect pump wiring. Therefore, the pump must be wired to the pump terminal block of the ACM (or PCM, if used).

To wire the pump to the ACM (or PCM), remove the electric plug from the pump power cord, strip the leads and attach them to the pump terminal block. You may also wire a female pigtail to the terminal block and plug the pump into it.

### ACM/PCM Pump Switch

OFF position:	Power is OFF at the pump relay terminals, regardless of other settings.
AUTO position:	Power is ON at the pump relay terminals, subject to the conditions listed below.
PRIME position:	(Momentary contact). Power is ON at the pump relay terminals, regardless of other settings.

### Normal Operation (Pump switch in Auto position)

Start-Up Phase / red light: When fog is required, the ACM energizes the blower relay and the RED “Start-Up” light. Depending on the size and inertia of the blower rotor, start-up may take 10-20 seconds. A pressure switch monitors the status of the blower. During the Start-up phase, no power is available at the pump relay.

Run Phase / green light: When each of the following conditions is satisfied, the ACM energizes the pump relay (or solenoid valve) and the GREEN “Run” light, causing liquid to flow to the nozzle(s):

1. The suction sense tube of the ACM (or BRM) is attached to the air intake tubing barb.
2. The pressure sense tube of the ACM (or BRM) is attached to the air discharge tubing barb.
3. Line power is available (hot) at the ACM Power In terminal block.
4. The ACM Power switch is ON and the green Power light is illuminated.
5. The pump’s on/off switch (if any) is switched on.
6. The ACM Pump switch is set to the Auto position.
7. A nozzle assembly (or cam-lock plug) is attached to each air discharge port.
8. The blower is operating normally and developing adequate pressure in the air manifold. (The ACM control mode may be override, manual or programmed.)

### To Test Pump Operation (independent of blower condition)

1. Confirm the pump power cord is connected to the ACM (or PCM) pump terminal block.
2. Confirm the pump power switch (if any) is in the ON position.
3. Confirm the pump suction and discharge lines are properly connected.
4. Confirm that a nozzle liquid feed tube is connected to at least one discharge port of the LBA, and that the corresponding flow control valve is open.
5. Turn on the ACM Power switch and confirm GREEN Power light on ACM panel.
6. Push the ACM’s Pump switch down (Prime position). The pump will operate, prime and deliver liquid to the discharge manifold. Do not operate the pump longer than necessary to prime or confirm pump operation. In particular, do not continue to prime pump until liquid flows from the nozzle unless blower is running.
7. Return the ACM’s Pump switch to Auto to enable normal operation.

### Trouble Shooting

- Start-up (red) light does not illuminate: Check that the pump switch is in the Auto position.
- Run (green) light does not illuminate: Check conditions under “Normal Operation (Pump switch in Auto position.” In particular check that the pressure sense tube is connected properly, and that the air system has no open ports, open pipes, or unattached nozzles.

## ADDENDUM: BLOWER OPERATION & WIRING

### Normal Operation

When fogging is required, the ACM first starts up the blower so atomizing air can reach full strength before liquid enters the nozzle. The blower spool-up time delay depends on the size and weight of the rotor, the operating voltage and the characteristics of the motor starter. For small blowers, less than 1.5 Hp, start-up takes 10-20 seconds.

### Blower Power

There are several ways to supply power to the blower:

- From the ACM (for 1/120/240 V blower motors, maximum 1.5 Hp). In this case, the branch circuit feeding the ACM must have adequate capacity to support the blower.
- From a Blower Relay Module (for 1/120/240 V blower motors, maximum 1.5 Hp). The BRM is used if the ACM and blower are not close enough for direct wiring, or if you want to put the blower load on a separate branch circuit. The BRM option includes the ACM blower control port and control cable.
- Through a third-party motor starter or controller. An appropriate starter is required for a blower larger than 1.5 Hp; for any 3-phase unit; or for a blower running on a supply voltage other than 1/120/230). The coil circuit of the motor starter is wired to the blower relay terminals of the ACM (or BRM) if used. Setup is easiest if the coil voltage is the same as the ACM, but other voltages may be used. Consult factory for other setups.

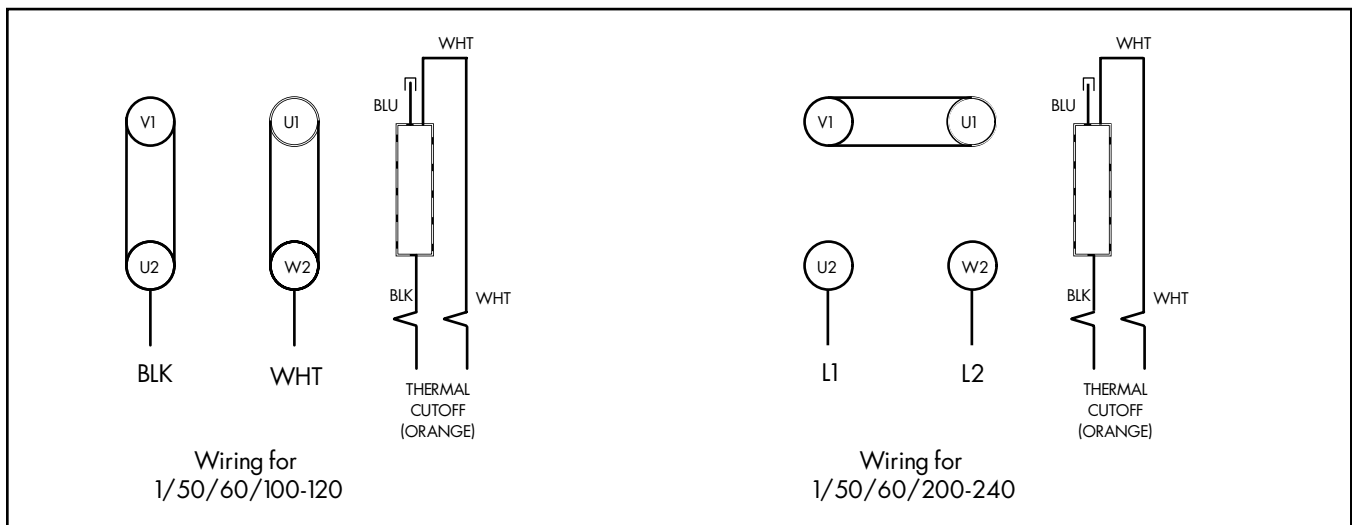
### Blower wiring

Connect power to the blower in accordance with local electrical codes and instructions of the blower and motor controller manufacturers.

Blower motors include a thermal safety switch to shut down the motor if its temperature exceeds a threshold value. The type and wiring of the safety switch determines whether the motor can resume normal operation once it cools down. Sentinel 58xx systems expect a “pilot duty” safety switch, wired in series in the low voltage blower relay control loop. In this setup, fogging operation will resume normally when the motor cools down.

Some motors do not offer connections for an external pilot duty safety cutoff, but rather put the switch in the power wiring. Check the blower documentation for the type of safety cutoff and proper wiring. If your blower lacks external cutoff, you must install a shunt wire across the Thermal Cutoff terminals of the ACM (or BRM).

The diagram below clarifies the manufacturer’s wiring diagram included with the All-Star 1.1 Hp blower.



Wiring diagram for A58502110 (All-Star model RB3-101-1, 1.1 Hp) blower

## To Test Blower Operation

You can bypass the ACM's normal control logic to test blower wiring and operation:

- 1 Confirm all wiring and control tube connections. If the BRM is used, confirm the control cable is connected properly between the ACM and the BRM.
- 2 Turn on main power switch on the ACM control panel. The green power LED illuminates, indicating control power.
- 3 On the control panel, put the blower switch to the "override" position. This activates the red "run" light on the control panel and closes the blower relay, sending power to the blower; or the BRM relay; or the coil of the motor starter. The blower will begin to spool up.
- 4 As the blower approaches full speed, the "start" light on control panel will turn off and the green "run" light turn on.

If the blower does not spool up, check blower wiring and confirm that power is available at the blower main disconnect, and at each wiring point.

If the green light does not turn on, confirm the control tubes are properly connected.



## Warranty

This product is warranted for one year from the purchase date against defects in materials and workmanship. If you have a warranty claim, return the unit freight prepaid to The Fogmaster Corporation. We will repair or replace (at our option) any defective parts and return the unit to you.

This warranty does not apply to any unit which has been: subject to misuse, neglect or accident; used for a purpose for which it is not designed; altered in any manner; serviced by unauthorized parties; or subjected to any but the specified voltage. This warranty does not apply to motor brushes, tank gaskets, the consequences of improper installation or operation, or chemical attack or corrosion.

This warranty is limited to the original purchaser only, and does not include claims for incidental or consequential damages resulting from the non-function or malfunction of this product or for breach of any express or implied warranties.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

This Limited Warranty notice replaces any other warranty or guarantee information accompanying this product or appearing in any literature referring to this product. Any implied warranties, including merchantability or fitness for a particular purpose, shall not extend beyond the warranty period.

## NOTES

## NOTES

**Always read and follow the instructions for use  
of the chemical you are applying.**



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