

OPERATOR'S MANUAL

for the

TDA-5A Aerosol Generator

Revision B



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OPERATING INSTRUCTIONS

TDA-5A Aerosol Generator

CAUTION: Read the usage guidelines at the rear of this manual before operating this aerosol generator

1. Unscrew LIQUID FILL cap located on top of cabinet and fill reservoir until sight gauge registers 3/4 full with the desired liquid aerosol agent.

NOTE: *It is important not to overfill the reservoir. The liquid should never be above the reservoir neck or the unit will not function properly.*

2. Connect standard 1/4" O.D. plastic tubing from the INERT GAS fitting located on top of the cabinet to the pressure regulator for your source of compressed INERT GAS.

NOTE: *To avoid a fire hazard, an inert gas must be used with this unit. The most commonly used are nitrogen, carbon dioxide and argon.*

WARNING: DO NOT USE COMPRESSED AIR

3. Plug power cord into appropriate voltage supply and turn Power Switch ON.
4. Adjust the Pressure Regulator for the supply of INERT GAS to 50 psig and maintain this pressure at all times.

NOTE: *Increasing or decreasing the inert gas supply pressure above or below 50 psig will affect the aerosol output of the generator and its operation.*

5. When the READY lamp illuminates (approximately 20 minutes), the unit is ready to produce aerosol.

NOTE: Once the aerosol flow is started the internal temperature will drop. This is normal.

6. Turn Aerosol Switch ON before adjusting Metering Valve, which is located on the rear of the unit. The Metering Valve is used to adjust the aerosol concentration. Turning the valve counterclockwise will increase concentration and turning the valve clockwise will decrease concentration. When first starting the unit, the valve should be turned fully counterclockwise, after inert gas flow has been started, and then back to the desired output level.

NOTE: Once the heat has reached the level at which the red lamp illuminates (heater block temperature 765° F +/- 10) the unit will continue to produce aerosol for 50 minutes with the Metering Valve fully open. The aerosol will be emitted from the nozzle on the front panel in a steady stream of white smoke. When the Metering Valve is fully open and the entire aerosol output is diluted with 6,500 cfm of air, the aerosol concentration will be approximately 100 micrograms per liter.

7. When testing is complete, close the Metering Valve by turning clockwise until it stops. This will purge the inside of the heater block and keep it clean.
8. To be certain all the aerosol is expelled from the unit, wait approximately 30 seconds after the Metering Valve has been closed.
9. Then turn Aerosol and Power Switches OFF.

CAUTION: BEFORE SHIPPING OR TRANSPORTING UNIT

- a. Be sure Metering Valve is fully closed (full clockwise).
- b. Be sure Aerosol and Power Switches are in OFF positions.
- c. Remove LIQUID FILL cap, then invert unit and drain all liquid from reservoir.
- d. Replace LIQUID FILL cap and be certain it is closed tight.

NOTES:

1. The following liquids may be used in the TDA-5A to generate aerosols:
DOP (Di 2-ethylhexyl-phthalate)
PAO (Poly Alpha Olefin) Emery 3004
2. The unit has been factory calibrated for use with DOP unless otherwise noted. If an alternative liquid is considered, the unit must be adjusted for proper temperature and flow calibration with that liquid. Optimum aerosol output is relative to the internal flow and temperature settings. These settings will vary depending on the unit and liquid. (See Appendix 2 for instructions on changing the temperature operating point). If you have any questions about this adjustment please contact ATI.

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TROUBLESHOOTING PROCEDURES

Symptom	Cause
No power lamp illumination	Not plugged to appropriate voltage source Fuse is blown Power Switch in OFF position
Red Ready Light Not Illuminated	Did not allow enough time to warm up Cartridge Heater(s) is defective Temperature Controller relay is defective Temperature Controller is defective
No Aerosol Output	Liquid reservoir is empty Aerosol Switch in OFF position Improper inert gas pressure Heater Block is clogged
Inconsistent Aerosol Stream	Internal Regulator is defective Improper inert gas pressure Improper internal flow setting Improper temperature setting Heater Block is partially clogged

**TDA-5A AEROSOL GENERATOR
COMPONENT PARTS LIST**

Item	Qty	Description
1	1	Toggle Switch, # T5A0-0061
2	2	Heater, 120 volt, 350 watt, # T5A0-0259
2 alternate (220V electrical)	2	Heater, 220 volt, 350 watt, # T5A0-0259
3	1	Fuse Holder, # T2E0-0322
4*	1	Fuse, 120 volt, 7 amp, #T5A0-0320
5	1	Digital temperature controller, #4600001
6	1	Nitrogen switch, # T5A0-0442
7	1	Air Regulator, # T5A0-0248
8	1	Metering Valve, # T5A0-0420

NOTE: Items shown above are for 120/240 volts unless marked * and listed below. Items listed below are required for 240-volt units.

4	2	Fuse, # 6400101
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APPENDIX 1

The unit has been factory set for either 120 volt or 220-volt service. To confirm setting or change voltage, proceed as follows:

1. Turn off unit and disconnect from power source.
2. Remove four retaining screws on the side of the cabinet and lift off the top cover.
3. On models manufactured prior to July 2000 the 120v/220v switch is located above the heater block and is attached to the rear panel. To switch voltage use a flathead screwdriver to turn the switch to the desired voltage.

**Models manufactured after July 2000 are voltage specific and do not have a voltage selector switch.*

4. After changing voltage, the power entry module fusing must be changed as per the manufacturer's instructions on the next page.
5. Reassemble unit and proceed with testing.

APPENDIX 2

The unit has been factory set for either DOP or PAO. The unit may also be set for any of the other liquids listed in the table below provided a ½ to 1 liter sample is supplied to ATI.

TDA-5 Series COMPARISON DOP SUBSTITUTES

MATERIAL	BLOCK TEMP.	FLOW	RESULTS/COMMENTS
DOP	760° - 770° F 404° - 410° C	10 - 11 lpm	Aerosol stream is very stable, uniform and dry. After varying the concentration from one end of the range to the other, aerosol is still very stable and dry.
DOS	780° - 790° F 415° - 420° C	6 lpm	Aerosol stream is dry and uniform. However, occasional clogging of the block occurs from higher block temperature.
Emery 3004	760° - 770° F 404° - 410° C	7 lpm	Aerosol stream is dry and uniform. Very stable through entire run cycle. An increase in flow resulted in aerosol wetting out. Recommended Replacement For DOP
Ondina Oil	760° - 780° F 404° - 415° C	7 lpm	Aerosol stream is dry and stable. Wetting out did not occur until temperature was reduced to 670° F. Pulsation did not occur until temperature reached 900° F. Good Replacement For DOP
Mineral Oil	750° - 760° F 400° - 404° C	10 lpm	Aerosol stream semi-wet.
	770° - 790° F 410° - 420° C	6 lpm	Increasing the temperature and reducing flow resulted in dryer stream of aerosol but clogged the block very quickly.

To change setup, proceed as follows:

1. Turn off unit and disconnect from power source.
2. After the unit has been allowed to cool down sufficiently, remove four retaining screws on the side of the cabinet side and lift off the top cover.
3. The regulator is located in front of heater block. To adjust flow, first turn Aerosol Switch on and fully close Metering Valve. Turn regulator valve and monitor flow with a flow meter attached to the aerosol outlet module.
4. After changing flow, the temperature controller module operating point must be changed as per the manufacturer's instructions on the next page.
5. Reassemble unit and proceed with testing.

TDA-5B Safety Guidelines

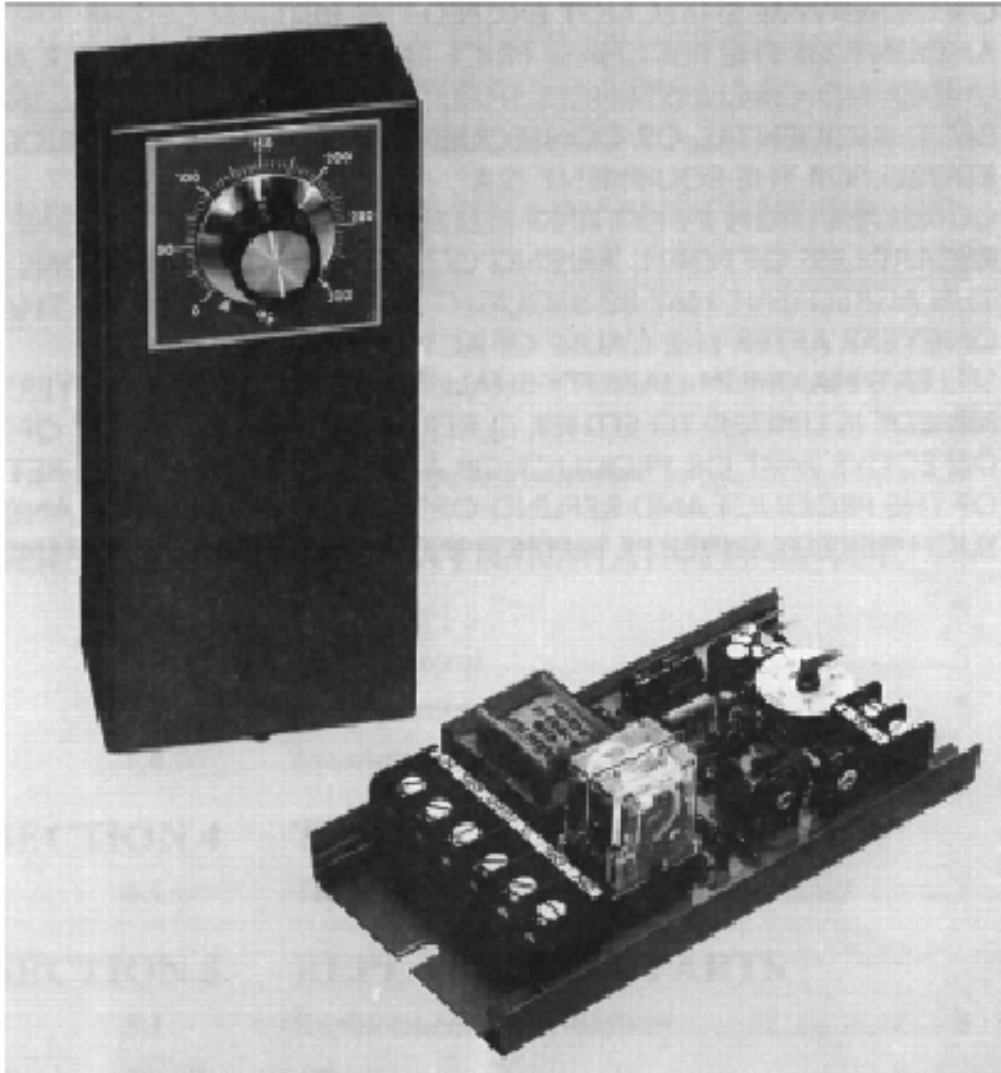
The following usage guidelines were developed in response to a fire incident involving one of ATI's competitor's thermal aerosol generators.

The following procedures and cautions should always be utilized to insure safe operation of ATI's TDA-5B generators.

- 1) Always use an inert gas such as Nitrogen, Argon, Carbon Dioxide or Helium, etc.
- 2) Ensure that the **Aerosol On/Off** switch and metering valve are in the closed position, the unit is full of liquid and the unit is in its final operating position before power is applied to the unit.
- 3) **Always use the proper liquid.** Generator operation is setup dependent. Use of an improper liquid may result in equipment damage or personal injury. The only liquids that are specified and accepted by the factory are DOP & PAO (Emery 3004).
- 4) **Always maintain a gas-input pressure of 50 PSIG +/- 5 psig.** Changes in input pressure can greatly affect the generator performance characteristics.
- 5) Always turn the **Aerosol On/Off** switch on prior to opening the liquid metering valve.
- 6) Always close the metering valve fully clockwise and allow the heater block to purge of liquid for 1 minute before shutting off the **Aerosol On/Off** switch.
- 7) **Caution should be used when refilling a hot unit.** Always use a funnel when filling the unit to prevent liquid spilling around the fill port. Spilling liquid or over filling will cause liquid to enter the cabinet and create a possible fire hazard.
- 8) **Never move a hot generator until it has been purged of liquid.** Movement of the generator while hot may cause liquid to flow into the heater block without an inert gas source. Ambient air combined with aerosol liquid may result in a flash fire situation.
- 9) **Never connect tubing or an unapproved adapter directly to the generator output collar.** For safe & proper operation of the generator, vapor emitted from the heater block must be immediately quenched (cooled) by ambient atmospheric conditions while in the presence of an Inert Gas. The only authorized adapter, available from ATI, allows for a flow of ambient air to contact the vapor immediately upon exiting the generator. **When using this adapter ensure that the quenching holes remain in the open position to allow sufficient airflow to quench the vapor stream.**
- 10) **The Inert Gas supply should always remain connected to a hot generator.** In the event that one or more of the steps outlined above is not followed and a fire results the Inert Gas supply should be used to help extinguish any resulting fire.

SERIES 80 TEMPERATURE CONTROLLERS

Instruction Manual



MADE IN
U.S.A.



ATHENA

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SECTION 1 GENERAL INTRODUCTION

1.1 GENERAL DESCRIPTION AND CAUTIONS.

The Athena Series 80 Controllers are designed for accurate temperature control of ovens, molds, hot stamping machines, packaging machinery, heat tracing, and for replacement of bulb and capillary type temperature controllers. Limit configurations have FM approval.

CAUTION

Possible Fire Hazard. Because these temperature controls or associated equipment may not always fail safe, an approved temperature and/or pressure safety control should be used for safe operation.

1.2 CONFIGURATIONS.

A - Open PCB unit with set point on the PCB

B - Open PCB unit with remote set point

* D - T case with set point on the case

L - High limit controller, D configuration with reset button on case

* - T case 86 series only

1.3 SPECIFICATIONS.

Set Point:	Single turn, 270° rotation Potentiometer (Local or Remote)
Set Point Resolution:	1% with circuit board potentiometer 1/4% with remote potentiometer
Calibration Accuracy:	1% at calibration points with remote potentiometer 2% at calibration points Potentiometer on circuit board
Ambient Temperature Range:	30° to 130° F Series 82 & 86 30° to 150° F Series 88
Cold Junction Compensation:	Internal electrical bridge
Differential/Proportional Band:	Adjustable from differential of 5° F to proportional band of 25° F
Thermocouple Break Protection:	UPSCALE
Output:	B - S.P.S.T. relay 10A/5A H - S.P.S.T. relay 15A S - Pulsed D.C. 0-20Vdc T - S.P.S.T. SS relay 1A
Supply Voltage:	120/240 ± 10% V 50/60 Hz.
Power Consumption:	2 watts
Weight:	1 pound, 8 oz. (0.68 kg) with case and cover

SECTION 2 PRELIMINARY INSTRUCTIONS

2.1 UNPACKING.

Carefully unpack the instrument and inspect for shipping damage. Report any damage to the carrier immediately.

2.2 LOCATING.

Select a location for the controller where it will not be subjected to excessive shock, vibration, dirt, moisture and/or oil. The ambient temperature of the area should be between 30° F and 130° F (Series 82 & 86) 30° F and 150° F (Series 88)

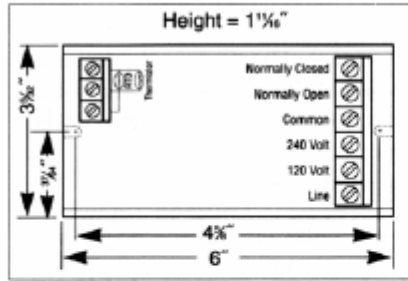
2.3 MOUNTING. (SERIES 82,86,88)

Panel Mounting, External Set Point:

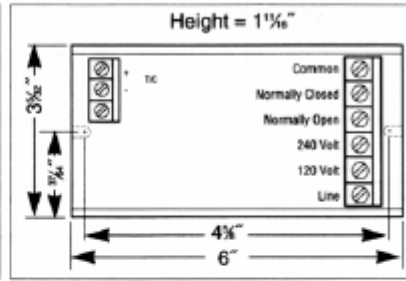
1. Remove knob with small screwdriver and take off the nut holding the scale to the potentiometer.
2. Mount potentiometer through a 3/8" hole in your panel; put scale over shaft and tighten nut.
3. Turn shaft counter clockwise until it stops.
4. Now put knob back on and line up its indicating mark with the arrow on scale.
5. Tighten knob. The unit is now calibrated.

Metal Mounting Case:

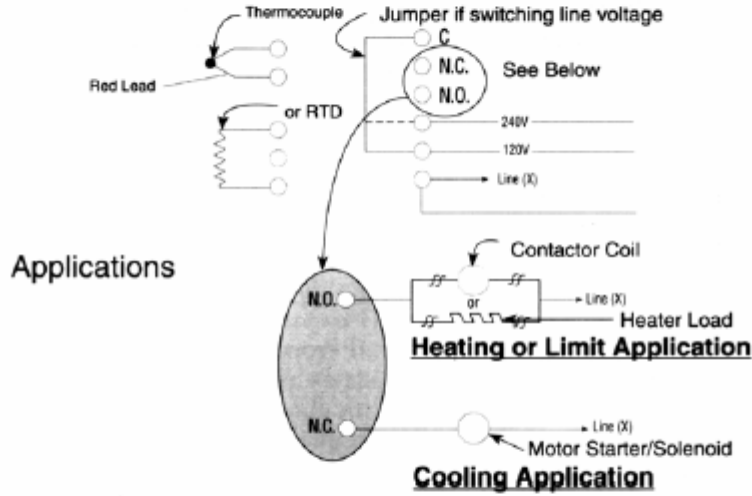
1. Remove the two screws holding the cover. Remove the cover.
2. Carefully spread the plastic holding track and remove the circuit board.
3. Mount the base and plastic track with the appropriate hardware (not supplied) through the the two 11/64" dia. mounting holes.
4. Replace circuit board by aligning one side in track and then gently press in the opposite side. Replace the cover.



Series 82 Wiring & Mounting



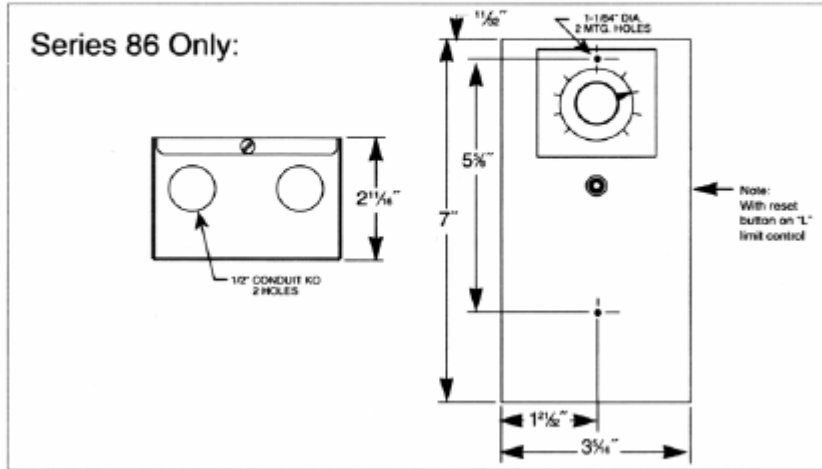
Series 86/88 Wiring & Mounting
(Series 88 has push-on terminals)



Applications

Heating or Limit Application

Cooling Application



2.4 WIRING.

Consult the wiring diagrams on page 4. The unit can be operated with 120/240V 50/60 Hz line voltage. Be certain that the correct voltage is applied to the proper terminals. Cooling loads can be driven from the "N.C." terminal.

2.5 THERMOCOUPLE PLACEMENT.

Proper thermocouple placement can eliminate many problems in the system. The probe should be placed so that it can detect any temperature change with little thermal lag. In a process that requires fairly constant heat output, the probe should be placed close to the heater. In processes where heat demand is variable, the probe should be close to the work area. Some experimenting with probe location will provide optimum results. Extension wires must be of sufficient size so that on long runs the thermocouple circuit resistance does not exceed 100 ohms.

SECTION 3 OPERATION/MAINTENANCE

3.1 OPERATION.

After all connections are completed, adjust the Setpoint knob to the desired temperature and apply line voltage. Adjust the MODE potentiometer as per section 3.3. If Proportional operation has been selected, the output will cycle on and off continuously. If On-Off mode has been selected, the output will change state only as temperature varies around the setpoint.

3.2 LIMIT CONTROL.

Adjust the Setpoint to the desired limit temperature. Apply power and press the Manual Reset button. The Control relay is now latched, the normally open and common contacts closed. When the process temperature being monitored by the limit thermocouple reaches the set value, the limit relay will change state and remain in that state until the monitored temperature falls below the setpoint and the Manual Reset button is depressed. An option is available to provide automatic reset of the limit upon application of control power.

3.3 ADJUSTMENTS.

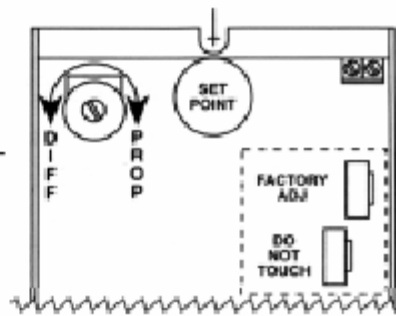
The MODE adjustment allows the control mode to be proportional to On-Off.

For processes requiring very accurate control, adjust the MODE

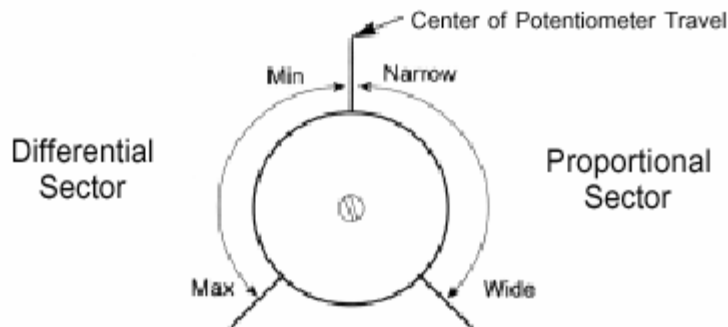
potentiometer clockwise in the Proportional sector until process temperature oscillations just stop.

For processes such as mechanical refrigeration systems, fans, and solenoid valves, and wherever continuous cycling would be detrimental to the load handler, On-Off control should be used. Adjusting the

MODE potentiometer counterclockwise from its center of travel provides On-Off control. The amount of hysteresis (differential) is increased with further ccw adjustments of the MODE potentiometer. Adjustment here provides a compromise between closest temperature control and minimum cycling of the load handler.



Adjustments



3.4 MAINTENANCE.

1. Keep the controller fairly clean and protect it from dirt, water, and corrosive fumes.
2. Periodically recheck electrical connections.
3. Replace the relay if the contacts become electrically worn.

WARNING

Applying incorrect voltage will damage controller. Shorted heaters or wires can damage the relay. For maximum protection, fuse incoming power lines with a fast 10A fuse.

SECTION 4 TROUBLESHOOTING

Prior to checking controller operation, insure system peripherals are functional as follows:

Wiring. Circuit correctly wired

Thermocouple. Correct type, continuity O.K.

Line voltage. Within spec.

Load handler. Functional.

4.1 TROUBLESHOOTING STEPS.

1. Connect simulated sensor input, as follows:
 - Millivolt input: thermocouple units
 - Resistance bridge: R.T.D. units
2. Connect output measurement device to appropriate terminals:
 - “B” output Ohmmeter
 - “T” output AC Voltmeter. Controller output connected to inductive device.
 - “S” output DC Voltmeter
 - “F” output DC Milliammeter
3. Adjust the MODE potentiometer fully counterclockwise.
4. Connect and apply line voltage.
5. Adjust Setpoint to mid-range.
6. Adjust the simulated sensor input to below setpoint and observe output on; calling for heat.
7. Adjust the simulated sensor input to above setpoint and observe output off; not calling for heat.
8. If no output state change in steps 6 & 7
 - a. Defective output device
 - b. Defective controller electronicsOutput relays and ss relays can be field changed. Return the controller to the appropriate repair center for electronics repairs.

