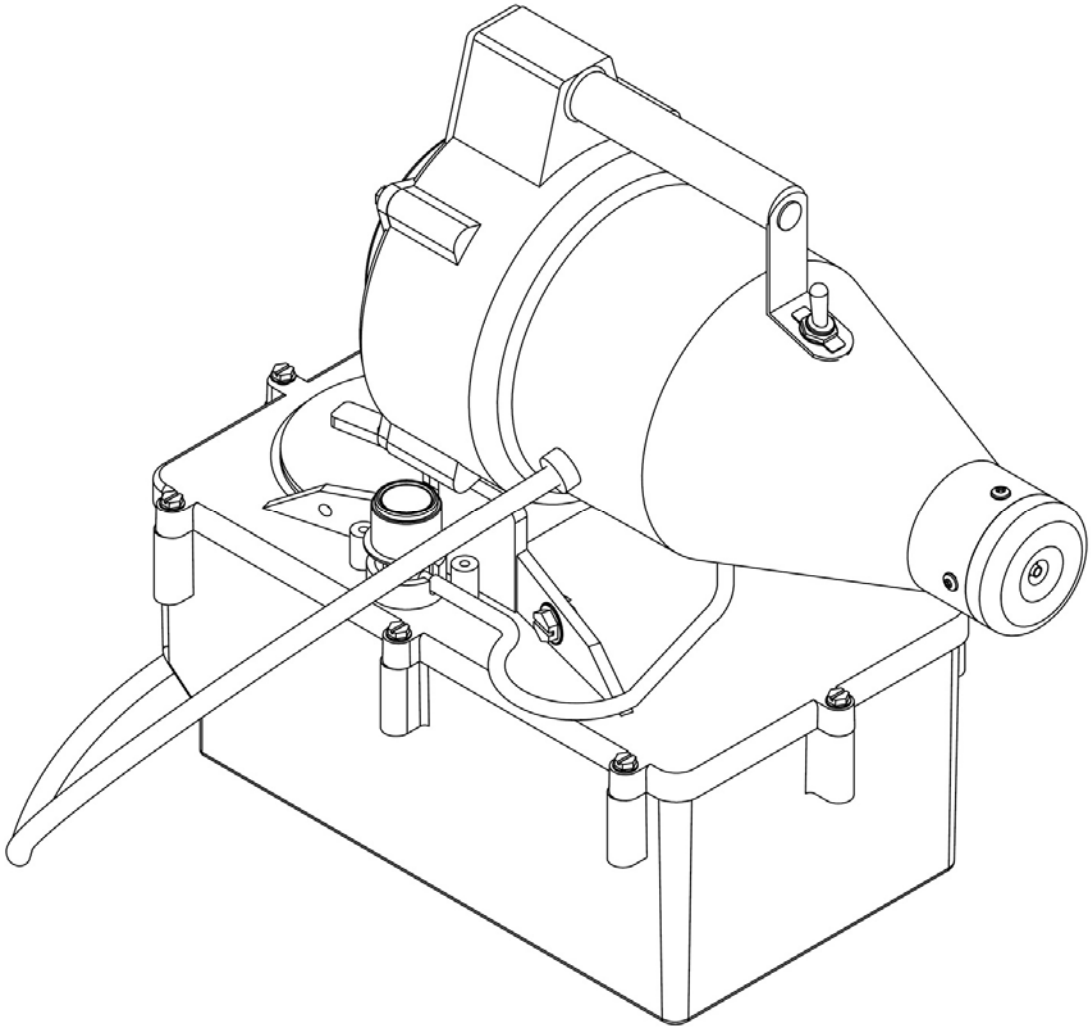
Cyclone™
“Cold Fog” ULV/Mister



MODEL 2730 & 2732
OPERATION AND MAINTENANCE MANUAL

MANUFACTURED BY:

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US and Foreign patents pending

CURTIS DYNA-FOG® Ltd.
"Innovators of Spraying and Fogging Technology Since 1947"

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SPECIFICATIONS

The Cyclone™ machine is an electric “Cold Fog” ULV that utilizes a rugged anodized aluminum nozzle and a high performance blower.

This device is intended for applications of both Oil Based (following necessary precautions) and Water Based chemical treatments.

The body and tank are made of high-density chemical resistant polyethylene. The applicator is useful for dispensing most chemicals which are labeled for aerosol or mist applications such as disinfectants, deodorizers, germicides, insecticides, etc., in locations such as hospitals, schools, nursing homes, greenhouses, stables, warehouses, homes, and farm buildings. The particle sizes generated range from 7 to 30 microns VMD, obtained using water. Machine output and particle size are dependent upon the viscosity of the liquid being dispensed.

Cyclone™ model 2730, 110-130 VAC
Cyclone™ model 2732, 210-250 VAC

MOTORIZED BLOWER:

MODEL 2730	MODEL 2732
Continuous Duty	Continuous Duty
110-130 VOLTS AC	210-250 VOLTS AC
8.5 AMPS	4.2 AMPS
50/60 HZ	50/60 HZ
20,000 RPM	22,000 RPM
107 CFM (6.42 m^3/min) Max	109 CFM (6.54 m^3/min) Max

This machine is one of the world’s finest hand held ULV/Mist generators built to precision standards. With reasonable care and maintenance, this efficient equipment will provide many hours of service. For best results, this ULV generator must be operated and maintained in compliance with these instructions.

SAFETY PRECAUTIONS

WARNING

READ AND UNDERSTAND THESE SAFETY PRECAUTIONS BEFORE OPERATING MACHINE. FAILURE TO PROPERLY FOLLOW THESE PRECAUTIONS MAY LEAD TO A FIRE, EXPLOSION, OR ELECTRICAL SHOCK HAZARD.

1. **Electric Power**. This machine uses electrical power at common commercially available voltages. When directly contacted, such voltages are hazardous to human life. All precautions commonly applicable to the use of the electric power general are applicable to the use of this machine. This machine is designed to operate from three wire power systems where one of the wires is a safety ground. Do not disconnect the safety ground or use extension cords or "cheater" plugs to connect this machine to a two-wire system. This defeats the purpose of the safety ground and may result in a hazardous electrical shock condition.

When making adjustments on the machine, use an area or workbench that is dry and not electrically conductive. Dry, natural wood and plastics are generally non-conductive at the working voltages of this machine. Metals are usually conductive. Do not probe inside the machine.

Extension cords must be properly sized and rated for the voltage, current, and LENGTH of an individual cord. Consult the nameplate current and voltage rating of your machine and the marked rating of the extension cord. A single extension cord only should be used. When two or more extension cords are placed in series, the rated current carrying capacities of the cords may no longer be valid. If an extension cord gets warm to the touch, discontinue its use and obtain a cord with a higher current rating. Improper extension cords are not only hazardous, but may result in poor machine performance due to excessive voltage drop. Finally, since the machine uses oil-based formulations, the extension cord should be rated as oil resistant.

2. **Formulations**. Many formulations are combustible; that is, they all can be caused to burn. This is true of even high flash point or "no" flash point formulations (fine particle dust in a grain mill has "no" flash point). A combustible liquid vapor can more easily be ignited because it more readily forms a uniform mixture with the air, which contains the oxygen needed for combustion. However, fine particles of combustible liquids or solids suspended in the air very closely spaced are capable of propagating flame from one to another once ignition starts. A good analogy is the grain mill explosion. Although the fine particle dust in a grain mill has "no" flash point, the phenomena of the grain mill explosion is an all too common occurrence. While a high flash point or a "no" flash point liquid formulation will ignite far less readily than a low flash point liquid; and for this reason is strongly advocated, the high or "no" flash point formulation can ignite if the proper conditions exist. These conditions are basically two: 1. a sufficient volume of liquid in the form of fine particles suspended in the air; and 2. a sufficiently high energy source of ignition.

3. **Aerosol Concentration**. It has been fully established that an acceptable level of liquid in the atmosphere is one gallon per 50,000 cubic feet (2.7 liters per 1,000 cubic meters). There is a safety margin of at least 5 to 1 in this figure.

4. **Aerosol Ignition**. If a combustible atmosphere is established or a combustible deposit is laid down, a source of ignition may cause a fire. Sources of ignition can be gas or oil pilot lights or sparks from electrical controls. Therefore, it is strongly recommended that all such sources be eliminated by extinguishing all pilot lights and turning off all unnecessary electric power. To avoid

danger of fire or explosion in an enclosed space, the enclosed volume fogging time and required formulation volume should be carefully calculated.

5. **Proper and Improper Use.** The following rules apply to the operation of this machine:

DO

Read the entire manual before operating the machine and pay particular attention to all CAUTIONS AND WARNINGS.

Store formulation in its original labeled container.

Use an extension cord which is properly rated for voltage, current, and length and which is free from nicks, cracks, and other signs of prior abuse. For lengths up to 100 feet, (30.5 meters) cords with No. 12 AWG wire are usually adequate.

Replace damaged or worn electric cord immediately.

Turn the flow valve CLOCKWISE to the OFF position after each spray application while the motor is still operating to allow clearing of the lines. This will also prevent a siphon effect if the unit is ever accidentally knocked over with the valve remaining open.

Always comply with any requirements for protective clothing, goggles, gloves, facial masks, or respirator required by the formulation label.

Ensure that formulation is applied only in strict compliance with the formulation label as well as local, state, and federal regulations.

DO NOT

Do not spray flammable liquids near open flame or other source of ignition.

Do not use a machine that is broken or damaged in any way.

Do not alter the machine by adding or removing parts.

Do not restrict the motor blower inlet area.

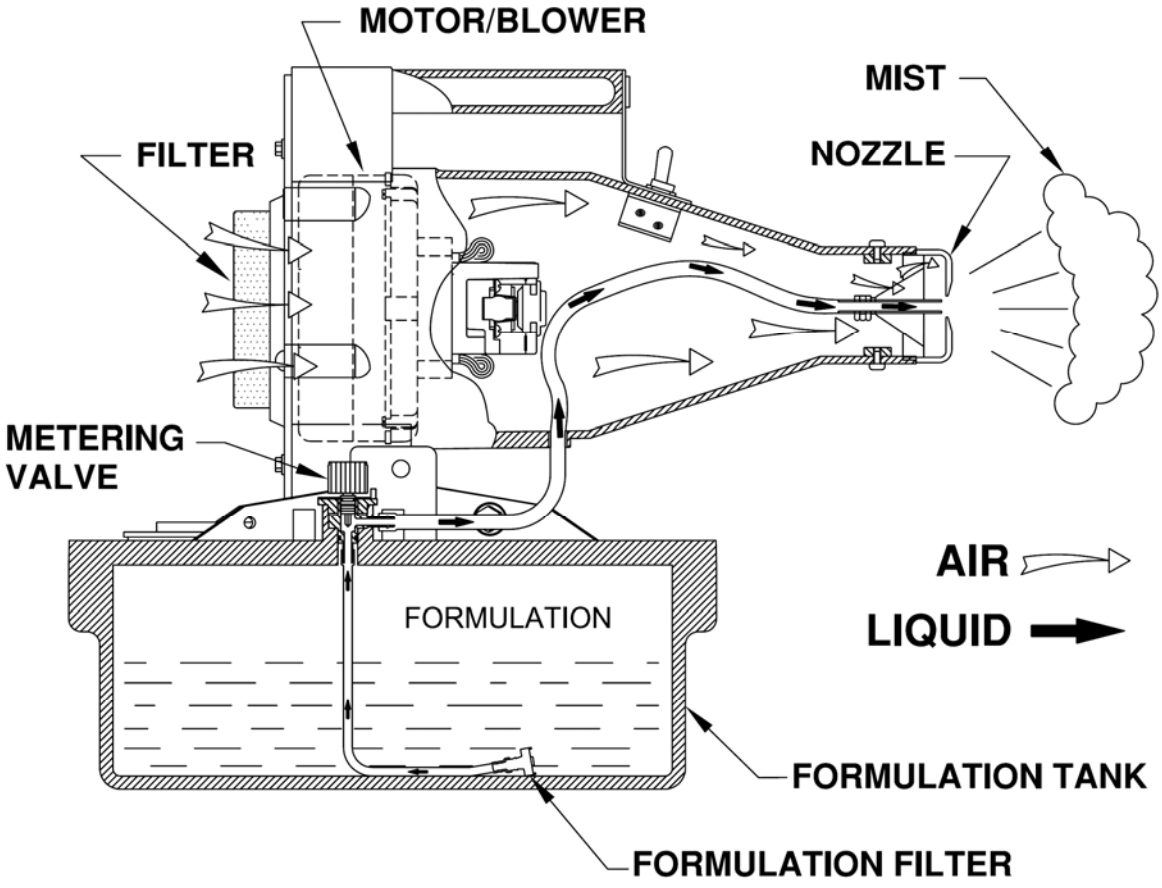
Do not tamper with the output nozzle.

Do not allow the machine to operate unattended.

Do not apply more than one gallon of formulation per 50,000 cubic feet (2.7 liters per 1,000 cubic meters enclosed space). Exceeding this concentration is both hazardous and wasteful.

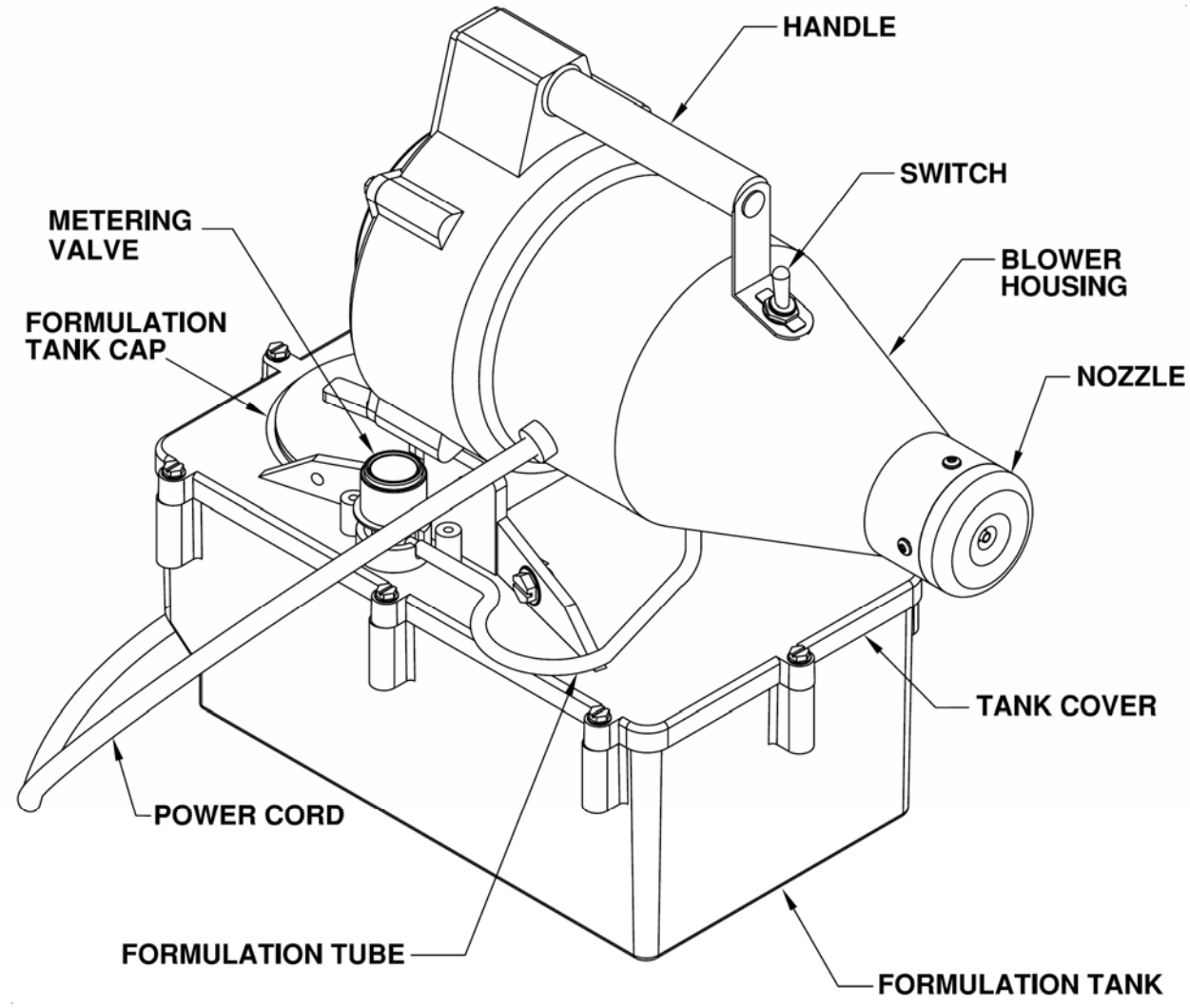
PRINCIPLES OF OPERATION

The machine consists of a motor/blower assembly, blower housing, a nozzle, formulation tank, tank neck filter, metering valve, check valve and shutoff valve (solenoid or manual, depending of the model). The various components are identified in the fluid systems diagram and major components diagram. The blower is a two-stage centrifugal compressor driven by a universal motor operating at a speed of 20,000 rpm. The blower moves a large amount of air through the nozzle system. The flexible hose is located between the nozzle and the blower housing to allow easy orientation of the nozzle to direct the spray into hard to reach areas. The nozzle has six (6) stationary fins, which direct the air to create a swirling effect of the air mass as it leaves the nozzle. In the center of this exiting swirling air, a liquid supply spout tube injects formulation. The formulation is sheared into tiny aerosol droplets and dispersed into the atmosphere. The liquid is delivered to the liquid spout by a combination of positive and negative pressures. A negative pressure is generated in the nozzle by the exiting air mass and a positive pressure is generated inside the blower housing and sampled to pressurize the formulation tank. The positive pressure minimizes the effect of the variation of the flow rate due to the difference in the static head of the liquid when the nozzle is at higher or lower position. The rate of flow is controlled by a metering valve located at the left side of the tank. Generally, the sizes of the output droplets increase with increasing flow rates and with increasing viscosity of the liquid being dispensed. The check valve allows the airflow from the blower housing to the tank, and avoids any return of pressurized air/vapor or liquid to the blower housing. The vented tank cap in combination with the air coming from the blower housing, allows a medium positive pressure inside the formulation tank when the machine is in operation, and equalizes the tank pressure to the atmospheric pressure in a relatively short period of time, when the machine is turned off.



CYCLONE™ FLUID SYSTEM DIAGRAM

CYCLONE™ MAJOR COMPONENTS DIAGRAM



Operation

Proper application of formulation with this machine requires 7 basic steps as follows:

1. Determine the APPLICATION RATE of the formulation from the formulation label.

2. Measure and calculate the ENCLOSED VOLUME to be treated in cubic feet.

3. Multiply the APPLICATION RATE by the ENCLOSED VOLUME to arrive at the AMOUNT REQUIRED.

4. Measure the FLOWABILITY of the liquid under the temperature conditions at which the liquid is to be applied.

5. Use the MACHINE FLOW RATE table to determine an appropriate particle size and MACHINE FLOW RATE and set the MACHINE VALVE SETTING accordingly.

6. Divide the AMOUNT REQUIRED in ounces by the MACHINE FLOW RATE in ounces per minute to find the APPLICATION TIME in minutes.

7. Apply the formulation for the time determined by step 6.

Preparation

1. Read the formulation label and determine the formulation APPLICATION RATE in fluid ounces per 1,000 cubic feet.

EXAMPLE

The label may say to apply formulation at a rate of 2/3 (.66) fluid ounces per 1,000 cubic feet.

2. Measure the dimensions of the ENCLOSED VOLUME and find the total volume of space (cubic feet) by multiplying the length times the width times the floor to ceiling height of the enclosed space.

EXAMPLE

A room that is 20 feet wide by 50 feet long and has a ceiling height of 9 feet would be 20 x 50 x 9 = 9,000 cu. ft. (L x W x H=cu.ft.)

3. Locate the APPLICATION RATE from step 1 at the top of table 2 and the ENCLOSED VOLUME number from step 2 at the left of table 2.

4. Read across from the volume number and down from the application rate number to find the AMOUNT REQUIRED in FLUID OUNCES.

EXAMPLE

To treat an area of 9,000 cu. ft. with a formulation that has an APPLICATION RATE of 2/3 (.66) ounces per 1,000 cu. ft., the AMOUNT REQUIRED would be 6 fluid ounces.

5. Place a sample of the formulation liquid to be dispensed in the relative FLOWABILITY METER provided with the machine such that the liquid level is above the top line.

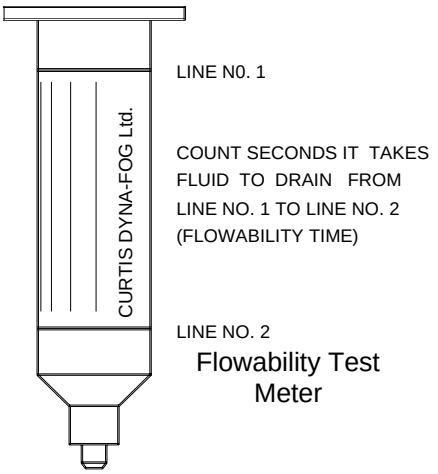
6. Hold the meter vertical and allow the liquid to flow through the brass orifice at the outlet end of the meter into an appropriate container.

7. Using a stopwatch or a watch with a sweep second hand, determine the FLOWABILITY TIME in seconds that it takes for the liquid level to fall from the top line to the bottom line.

NOTE: Periodically calibrate the FLOWABILITY METER using plain water. Water should flow through the orifice such that the time between the top line and the bottom line is 32 ± 2 seconds.

8. Locate the FLOWABILITY TIME in seconds obtained in step 7 at the top of Table 1.

9. In the column under the FLOWABILITY TIME, locate the desired particle size and the corresponding MACHINE FLOW RATE.



Flowability Test Meter

10. Move horizontally to the left from the selected flow rate to obtain the MACHINE VALVE SETTING in the left column.

EXAMPLE 1

The time for the level of the sample of liquid to change from the top line to the bottom line is 39 seconds. This is close enough to the 40 second column to obtain a reasonably accurate output. For a liquid of this flowability, particle size distributions ranging from 8.1 MMD to 14.4 MMD can be selected. If a MMD of 11 is selected, the corresponding flow rate is 1.24 ounces/minute. Moving to the left the applicable MACHINE VALVE SETTING would be "6".

EXAMPLE 2

With the same flowability reading as in example 1, selecting a MMD of 14.4 microns and its companion flow rate of 1.84 ounces/minute requires a valve setting of 10.

11. Locate the AMOUNT REQUIRED as determined in step 4 at the left of Table 3 and locate the MACHINE FLOW RATE determined in step 9 at the top of Table 3.

12. Reading across the AMOUNT REQUIRED row and down the machine flow rate column, determine the APPLICATION TIME in minutes and seconds.

EXAMPLE 1

The machine flow rate for a particular application is determined to be 1.24 ounces per minute. The nearest value in Table 3 is 1.25 ounces per minute. If the AMOUNT REQUIRED is 6 fluid ounces, the APPLICATION TIME is 4:48.

EXAMPLE 2

The machine flow rate for a particular application is determined to be 1.36 ounces per minute and the amount required is 6.5 fluid ounces. The application time can be calculated by dividing the amount required by the machine flow rate. (6.5 ÷ 1.36 = 4.77 minutes).

Application

1. Determine the required Machine Valve Setting and application time according to the instructions under PREPARATION.

2. Set the Machine Valve to the required setting.

3. Place sufficient formulation in the container to ensure that the Pickup Filter remains submerged during application.

4. Plug the machine into an appropriate power source. See Machine Identification label for correct voltage.

5. Turn on the machine power switch to begin application.

6. When application is completed, close Metering Valve while machine is still running.

NOTE

This will prevent possible siphoning of liquid through the nozzle should the machine tip over during transit.

7. Turn Power Switch OFF before unplugging the unit.

Maintenance

1. Periodically clean the formulation tank using a hot water/detergent solution. Open the machine valve to setting #10 and operate the machine for 3 to 5 minutes, flushing the solution through the valve, lines, and nozzle.

2. Examine the electric cord for evidence of damage and replace any damaged cord immediately.

3. After 400-500 hours of operation, carefully remove the blower assembly and examine the brushes and the commutator bars of the blower motor. If brushes are worn out, replace them. If commutator bars are damaged, replace Blower Assembly.

4. If it becomes necessary to disassemble the Machine Flow Valve for cleaning, be careful not to enlarge the metering orifice or damage the taper of the valve steam, as this will affect the calibration of the machine.

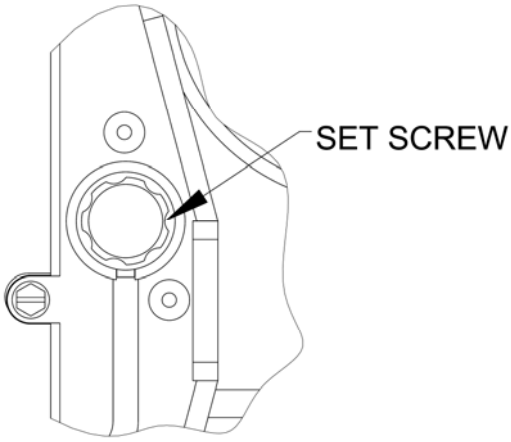
5. Clean the Air Intake Filter after every application. If the filter gets saturated (wet and dripping) while the machine is working, stop the machine and clean the filter.

***Note**: If it becomes necessary to operate the machine in areas where the air becomes saturated with spray droplets and these droplets accumulate at the blower intake filter, the machine can be outfitted with an optional "Fresh Air Intake Hose" P/N 62060.*

To repair the blower/motor components and request spare parts, please see section ""Rotary Fan Replacement".

Valve Adjustment

Satisfactory performance of the metering valve depends upon the proper tightness of the nut which retains the sealing gland. If the nut is too tight, the valve will be difficult to turn. If the nut is too loose, the valve may leak air causing loss of calibration. When necessary to adjust the tightness, the following procedure should be used.



1. Loosen the set screw, located in the groove on the backside of the hand knob, using a 3/32 hex allen key. Rotate counter-clockwise 1 full turn.

2. Lift off hand knob.

3. Using a 9/16 open end wrench, loosen the gland nut 1/2 to 1 turn counterclockwise.

4. Turn the brass stem clockwise by hand until it seals, and then loosen the stem 2 full turns counterclockwise.

5. Tighten the gland nut clockwise by hand.

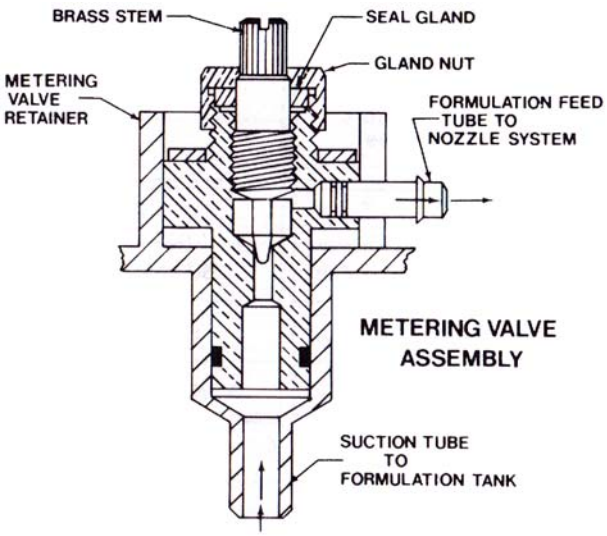
6. Tighten the gland nut an additional 1/8 turn clockwise using the 9/16 open end wrench.

7. The brass stem should now turn by hand with moderate resistance. (NOTE: If difficulty arises in turning the brass stem by hand, the gland nut is too tight. Repeat steps 4, 5, and 6 slightly decreasing the amount tightened.)

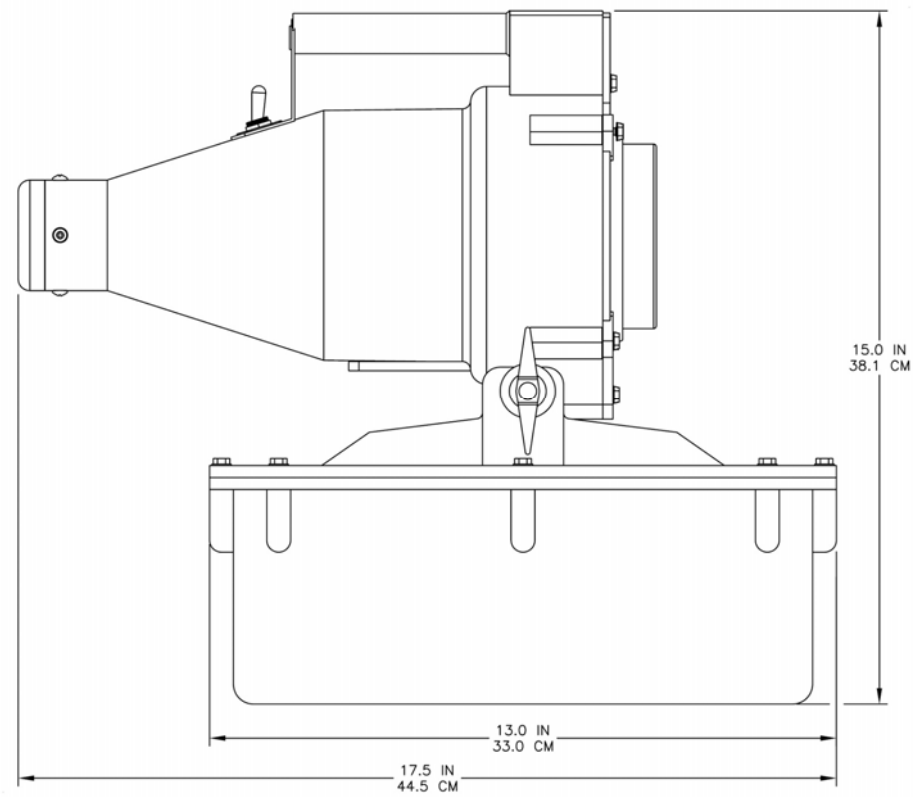
8. After the correct adjustment of the gland nut has been made, turn the brass stem clockwise to the closed position.

9. Install the hand knob over the brass stem, making sure the bent tang (valve stop) is on the right side and against the screw head.

10. Tighten the set screw, located in the groove on the backside of the hand knob, clockwise to secure the knob to the brass stem.



GENERAL DIMENSIONS

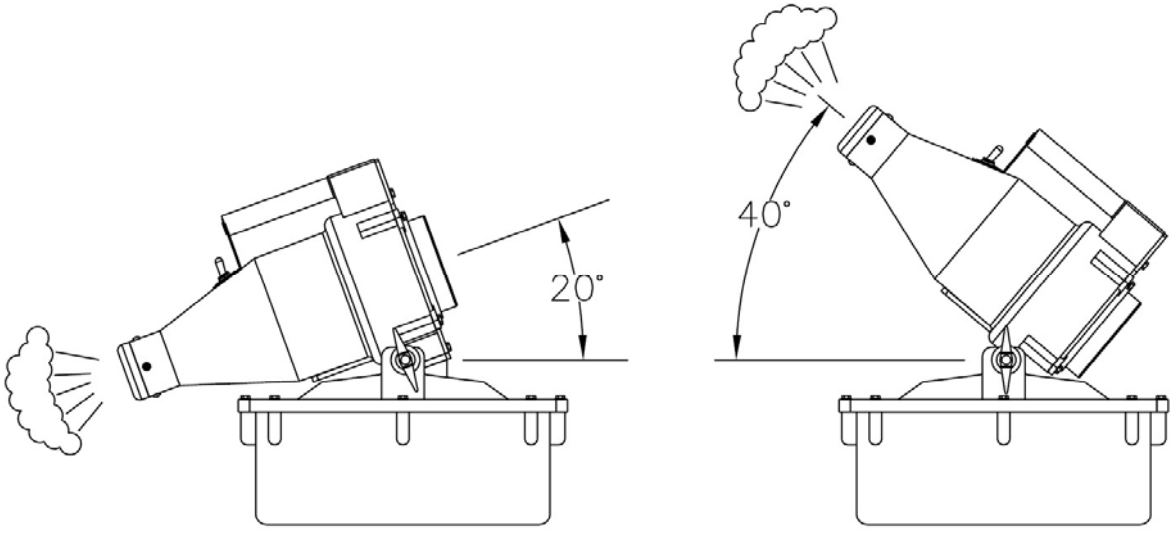


The weight of the unit is 14.2 lbs. (6.4 kg) without liquid.

The Formulation Tank capacity is 1 US Gallon (3.8 L)

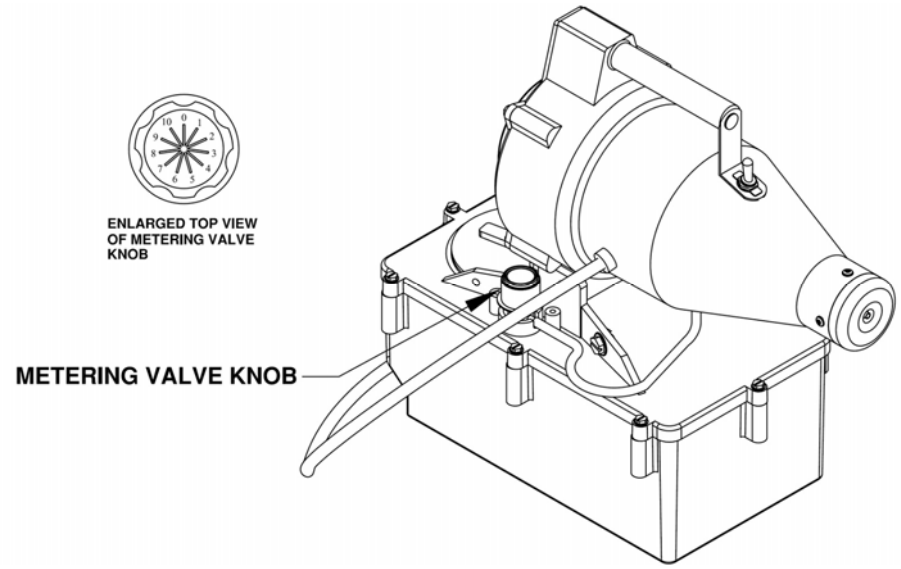
Machine Orientation

The machine allows adjusting the angle from the horizontal position to 40° from the horizontal position to 20° below horizontal. Use the locking handle to adjust the angle.



FLOW RATE

Turning the knob of the Metering Valve regulates the Flow Rate. If the knob is rotated clockwise, the flow rate will be reduced. If the knob is rotated counterclockwise, the flow rate will be increased. As reference, the average flow rate is shown in the bottom table at ten different positions of the Metering Valve knob.



FLOW RATE
TABLE 1

VALVE POSITION (*)	32 SECONDS FORMULATION	DROPLET SIZE MICRONS	40 SECONDS FORMULATION	DROPLET SIZE MICRONS	50 SECONDS FORMULATION	DROPLET SIZE MICRONS
1	2.37 ML/MIN .08 OZ/MIN	5.3 MMD	_____	_____	_____	_____
2	6.21 ML/MIN .21 OZ/MIN	5.4 MMD	1.74 ML/MIN .06 OZ/MIN	8.1 MMD	_____	_____
3	23.66 ML/MIN .80 OZ/MIN	5.7 MMD	8.28 ML/MIN .28 OZ/MIN	9.6 MMD	6.80 ML/MIN .23 OZ/MIN	14.0 MMD
4	36.67 ML/MIN 1.24 OZ/MIN	6.0 MMD	21.29 ML/MIN .72 OZ/MIN	10.0 MMD	12.12 ML/MIN .41 OZ/MIN	14.5 MMD
5	47.31 ML/MIN 1.60 OZ/MIN	6.2 MMD	30.75 ML/MIN 1.04 OZ/MIN	10.6 MMD	17.74 ML/MIN .60 OZ/MIN	15.1 MMD
6	54.41 ML/MIN 1.84 OZ/MIN	6.4 MMD	36.67 ML/MIN 1.24 OZ/MIN	11.0 MMD	22.47 ML/MIN .76 OZ/MIN	15.6 MMD
7	59.14 ML/MIN 2.00 OZ/MIN	6.5 MMD	42.58 ML/MIN 1.44 OZ/MIN	11.4 MMD	28.39 ML/MIN .96 OZ/MIN	16.3 MMD
8	62.69 ML/MIN 2.12 OZ/MIN	6.7 MMD	47.31 ML/MIN 1.60 OZ/MIN	12.6 MMD	34.01 ML/MIN 1.15 OZ/MIN	16.8 MMD
9	66.24 ML/MIN 2.24 OZ/MIN	6.9 MMD	50.27 ML/MIN 1.70 OZ/MIN	13.3 MMD	37.85 ML/MIN 1.28 OZ/MIN	17.1 MMD
10	69.79 ML/MIN 2.36 OZ/MIN	7.2 MMD	54.41 ML/MIN 1.84 OZ/MIN	14.4 MMD	42.58 ML/MIN 1.44 OZ/MIN	17.5 MMD

CAUTION: Read and follow the instructions on the formulation manufacturer's label and in the operation manual.

(*)Note: All flow rate information in the table above is based on spraying water. Thicker viscosity liquids will flow at lower rates than what is shown. Calibrate flow rate before attempting to spray.

IMPORTANT: This device is designed to dispense formulation in a SPRAY (Cold Fog) or MIST. Many of the formulations which may be dispensed with this machine require registration with or approval by various government agencies.

Space Volume (Cubic Feet)	Application Rate (Fluid Ounces Per 1000 Cubic Feet)							
		.25	.33	.50	.66	.75	1:00	1:50
	1,000	.25	.33	.50	.66	.75	1.00	1.50
	2,000	.50	.66	1.00	1.32	1.50	2.00	3.00
	3,000	.75	.99	1.50	1.98	2.25	3.00	4.50
	4,000	1.00	1.32	2.00	2.64	3.00	4.00	6.00
	5,000	1.25	1.65	2.50	3.30	3.75	5.00	7.50
	6,000	1.50	1.98	3.00	3.96	4.50	6.00	9.00
	7,000	1.75	2.31	3.50	4.62	5.25	7.00	10.50
	8,000	2.00	2.64	4.00	5.28	6.00	8.00	12.00
	9,000	2.25	2.97	4.50	6.00	6.75	9.00	13.50
	10,000	2.50	3.30	5.00	6.60	7.50	10.00	15.00
	20,000	5.00	6.60	10.00	13.20	15.00	20.00	30.00
	30,000	7.90	9.90	15.00	20.00	22.50	30.00	45.00
	40,000	10.00	13.20	20.00	26.40	30.00	40.00	60.00
	50,000	12.50	16.50	25.00	33.00	37.50	50.00	75.00
	60,000	15.00	19.80	30.00	40.00	45.00	60.00	90.00
	70,000	17.50	23.10	35.00	46.20	52.50	70.00	105.00
	80,000	20.00	26.40	40.00	52.80	60.00	80.00	120.00
	90,000	22.50	29.70	45.00	59.40	67.50	90.00	135.00
	100,000	25.00	33.00	50.00	66.00	75.00	100.00	150.00
		Formulation Amount Required (Fluid Ounces)						

Formulation Volume Required
vs.
Space Volume and Application Rate

Table 2

Amount Required (Fluid Ounces)	Machine Flow Rate Fluid Ounces Per Minute									
	.25	.50	.75	1.0	1.25	1.50	1.75	2.00	2.25	2.50
1	4:00	2:00	1:20	1:00	0:48	0:40	0:34	0:30	0:27	0:24
2	8:00	4:00	2:40	2:00	1:36	1:20	1:08	1:00	0:53	0:48
3	12:00	6:00	4:00	3:00	2:24	2:00	2:00	1:43	1:30	1:12
4	16:00	8:00	5:20	4:00	3:12	2:40	2:17	2:00	1:47	1:36
5	20:00	10:00	6:40	5:00	4:00	3:20	2:51	2:30	2:13	2:00
6	24:00	12:00	8:00	6:00	4:48	4:00	3:26	3:00	2:40	2:24
7	28:00	14:00	9:20	7:00	5:36	4:40	4:00	3:30	3:07	2:48
8	32:00	16:00	10:40	8:00	6:24	5:20	4:34	4:00	3:33	3:12
9	36:00	18:00	12:00	9:00	7:12	6:00	5:08	4:30	4:00	3:36
10	40:00	20:00	13:20	10:00	8:00	6:40	5:43	5:00	4:27	4:00
20	80:00	40:00	26:40	20:00	16:00	13:20	11:26	10:00	8:53	8:00
30	120:00	60:00	40:00	30:00	24:00	20:00	17:08	15:00	13:20	12:00
40	160:00	80:00	53:20	40:00	32:00	26:40	22:51	20:00	17:47	16:00
50	200:00	100:00	66:40	50:00	40:00	33:20	28:34	25:00	22:13	20:00
60	240:00	120:00	80:00	60:00	48:00	40:00	34:17	30:00	26:40	24:00
70	280:00	140:00	93:20	70:00	56:00	46:40	40:00	35:00	31:07	28:00
80	320:00	160:00	106:40	80:00	64:00	53:20	45:43	40:00	35:33	32:00
90	360:00	180:00	120:00	90:00	72:00	60:00	51:26	45:00	40:00	36:00
100	400:00	200:00	133:20	100:00	80:00	66:40	57:08	50:00	44:27	40:00
	Application Time (Minutes:Seconds)									

Application Time
vs.
Ounces Required and Machine Flow Rate

Table 3

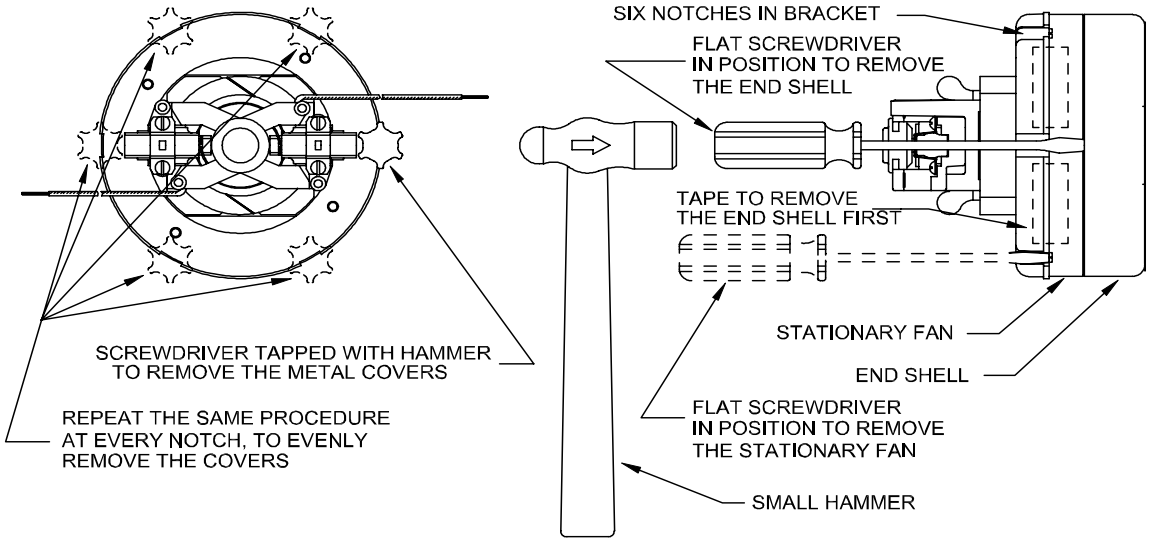
ROTARY FAN REPLACEMENT

CAUTION:

The Blower of your machine rotates at a high speed (approximately 20,000 RPM). The replacement of the Rotary Fan, if required, should be performed by a certified Dyna-Fog representative.

If the machine has been working in a closed room, the intake air filter gets saturated, and liquid (chemical) is introduced to the blower. The first contact point is the center section of the rotary fan, which could be attacked for the chemical. Then the debilitated wall of the fan fails. As result of the broken fan, the motor increases the speed, the airflow and the mist stops. The machine has to be shut off immediately.

The deterioration process of the fan material is accelerated if the machine is operated without air intake filter, or if disinfectant is applied in a closed room. The Fresh Air Intake hose P/N 62060 is recommended for those kinds of applications.



When the machine is disconnected from the power supply, remove the rear cover and pull the motor out the plastic housing. Some cables will keep the motor close to the housing.

TO DISASSEMBLE THE BLOWER:

1) To remove the metal end shell, add some pieces of industrial strength tape and use a screwdriver and hammer to lightly tap as indicated in above diagram. Gently tap the edges gradually working around the entire diameter.
2) After removing the end shell, use a 1/8" Allen Wrench and a ½" open end wrench to loosen and remove the nut. Remove the circular section of the remaining material from the broken fan.
3) Remove tape and proceed to remove the stationary fan by using the screwdriver and hammer. Remove the long spacer and the rotary fan of the second stage.
4) Add the new fans positioning them as shown in the diagram on the next page, place the big washer with the smooth outside edge against the fan material, tighten out the nut to a torque of 20 to 25 Lb-Inch, and reinstall the end shell. A thread lock product like **Loctite ref. 222** (purple) is recommended prior to reinstalling the nut onto the shaft thread.