

ELECTRIC START **TRAILBLAZER**™ DYNA-FOG®



**MODEL 2600E  
SERIES 3**

**INSTRUCTION MANUAL  
FOR  
OPERATION, SERVICE AND MAINTENANCE**

# TABLE OF CONTENTS

|                                           |              |
|-------------------------------------------|--------------|
| <b>SPECIFICATIONS</b> .....               | <b>3</b>     |
| <b>TO THE NEW OWNER</b> .....             | <b>3</b>     |
| <b>CORRESPONDENCE</b> .....               | <b>3</b>     |
| <b>DESCRIPTION</b> .....                  | <b>3</b>     |
| <b>WORKING PRINCIPLE</b> .....            | <b>3-4</b>   |
| <b>SAFETY PRECAUTIONS</b> .....           | <b>4-5</b>   |
| <b>OPERATION</b> .....                    | <b>6-17</b>  |
| PREPARING THE ENGINE FOR OPERATION .....  | 6            |
| ENGINE OPERATION .....                    | 6-7          |
| STARTING THE ENGINE .....                 | 8            |
| STARTING A FLOODED ENGINE .....           | 9            |
| STOPPING THE ENGINE.....                  | 9            |
| SELECTING A FORMULATION .....             | 10           |
| FOGGING FOR INSECT CONTROL .....          | 10           |
| PREPARING TO DISPENSE FOG .....           | 11           |
| METERING VALVE SETTING .....              | 12           |
| DISPENSING FOG .....                      | 14-17        |
| <b>MAINTENANCE</b> .....                  | <b>18-21</b> |
| AFTER EACH USE .....                      | 18           |
| FLUSH FORMULATION SYSTEM                  |              |
| INSPECT FOR FORMULATION RESIDUES          |              |
| AFTER EVERY FOUR HOURS OPERATION.....     | 18-19        |
| CLEAN THE ENGINE DISCHARGE (EXHAUST) TUBE |              |
| AFTER EVERY EIGHT HOURS OPERATION.....    | 19           |
| CLEAN THE FORMULATION FILTER              |              |
| CLEAN THE ENGINE NECK                     |              |
| AFTER EVERY TWELVE HOURS OPERATION .....  | 21           |
| CLEAN FORMULATION INJECTION NOZZLE        |              |
| CHECK THE FUEL FILTER BATTERIES .....     | 21-22        |
| <b>CARBURETOR</b> .....                   | <b>23-29</b> |
| IDLE NEEDLE ADJUSTMENT .....              | 23           |
| CARBURETOR SYSTEMS DIAGRAM .....          | 24           |
| CARBURETOR ADJUSTMENT .....               | 28           |
| ADJUSTING THE FUEL NEEDLE .....           | 28           |
| ADJUSTING THE METERING LEVER .....        | 29           |
| CARBURETOR ASSEMBLY DIAGRAM .....         | 29           |
| <b>TROUBLESHOOTING</b> .....              | <b>30-31</b> |
| SYSTEMS DIAGRAM .....                     | 32           |
| <b>STORAGE AND SHIPMENT</b> .....         | <b>33</b>    |
| <b>PARTS IDENTIFICATION</b> .....         | <b>35-49</b> |
| <b>INDEX</b> .....                        | <b>50</b>    |

## SPECIFICATIONS

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| Type.....               | Thermal Aerosol, Resonant Pulse Principle                                        |
| Formulation Output..... | 0-5 U.S. Gal/Hr. ....0-19 liters/hr.                                             |
| Engine Performance..... | 24 HP/Hr. ....18K W/Hr.....15,100 Kcal/hr.                                       |
| Fuel Consumption.....   | 0.3 U.S. Gal/Hr. ....1.1 liters/hr.                                              |
| Weight (Empty).....     | 25 Lbs. ....11.3 Kg.                                                             |
| Weight (Filled).....    | 37 Lbs. ....16.8 Kg.                                                             |
| Fuel Tank.....          | 0.85 Qts. .... .8 Liters                                                         |
| Formulation Tank.....   | 1 U.S. Gal. ....3.8 Liters                                                       |
| Power Supply.....       | (8) 1.5V "D" size Alkaline or a 12V DC<br>Automobile "cigarette lighter" adapter |
| Length.....             | 29 In. ....74 Cm                                                                 |
| Width.....              | 10 In. ....25.4 Cm                                                               |
| Height.....             | 18.25 In. ....46.4 Cm                                                            |
| Fog Particle Size.....  | 0.5-50 Microns (mass median diameter)                                            |
| Shipping Data:          |                                                                                  |
| L x W x H.....          | 31.5 x 13 x 20.25 (In.) ....80 x 33 x 51 (Cm)                                    |
| Weight.....             | 38 Lbs. ....17.2 Kg                                                              |
| Cube.....               | 4.8 Cu. Ft. ....0.14 Cu. M.                                                      |

## TO THE NEW OWNER

This machine is one of the world's finest insecticide fog generators, built to precision standards. With reasonable care and maintenance, this efficient mechanism will provide many hours of service. For best results, this fog generator must be operated and maintained in compliance with these instructions.

## CORRESPONDENCE

In all correspondence concerning the customer's machine and in ordering parts, the customer must refer to the model and serial numbers of his machine. This information is found on the nameplate attached to the machine.

## DESCRIPTION

This fog generator employs the resonant pulse principle to generate hot gases flowing at high velocity. The high velocity gases atomize the formulation instantly so that it is vaporized and condensed rapidly causing negligible formulation breakdown. The fog particle size is readily controllable from approximately 0.5 to 50 microns and greater. The smaller particle sizes correspond to the lower formulation flow rates and the larger particle sizes correspond to the higher formulation flow rates. This machine is intended for outdoor use and for enclosed spaces with volumes of more than 500 cubic feet (14 cubic meters). Use in more confined spaces may create a fire or explosion hazard.

## WORKING PRINCIPLE

The engine is essentially a tube with a combustion chamber, an intake valve, and a supply of a combustible mixture of fuel and air. To begin, a negative pressure is created in the fuel tank by depressing a flexible priming bulb. This draws fuel into the priming bulb, which is then forced into the antechamber and combustion chamber, where it is ignited by the sparkplug. An explosion occurs in the combustion chamber driving the gases out the engine tube. The negative pressure created by the gas flow out the engine tube causes the intake valves to open allowing more air to pass through the venturi of the carburetor. The air passing through the carburetor aspirates fuel from the carburetor in a combustible mixture. This mixture is ignited again and the cycle is repeated. The frequency of repeated explosions is many times per second.

The initial source of ignition is a spark plug powered by an electronic ignition system. After original ignition the repeated cycles are sustained by a glow coil which is an integral and inseparable part of the engine tube assembly. A sample of the pressure pulses from the combustion chamber is routed to the carburetor where it operates a diaphragm fuel pump within the carburetor to pump additional fuel from the fuel tank to the carburetor. When the fuel pump operation has stabilized, further operation of the priming pump is not required.

The exhaust emission of a pulse jet engine is low in pollutant components due to the following basic design features: The combustion chamber and a length of the discharge (exhaust) tube attached to it operate at a bright red temperature approximating 1800°F., (982°C.) In addition, an amount of air (oxygen) in excess of that required for normal burning of fuel vapor is fed to the engine. Thus, combustion is quite complete and pollutants formed in other types of engines are actually burned to their non-pollutant end products in the pulse jet engine.

The formulation remains in the formulation tank under pressure until the formulation valve is opened. Then, the formulation is forced from the tank and delivered to the engine tube where it is injected into the high velocity pulsating flow of hot gases. The formulation is broken into small particles by the pulsating gases, then discharged into the atmosphere.

## **SAFETY PRECAUTIONS**

### **WARNING**

**READ AND UNDERSTAND THESE SAFETY PRECAUTIONS BEFORE OPERATING MACHINE.**

**1. FUEL.** This machine uses **GASOLINE** as the fuel and all precautions commonly applying to this volatile fuel should be observed. Be careful not to spill gasoline over the machine but if this occurs wipe it off and allow evaporation time before starting the machine. **GASOLINE ON THE MACHINE OR SPILLED IN THE IMMEDIATE AREA IS HAZARDOUS. DO NOT ATTEMPT TO PUT FUEL IN A HOT MACHINE.**

**2. FOGGING FORMULATIONS.** All thermal fogging formulations are combustible, that is, they all can be caused to burn. This is true even of high flash point or "no" flash point formulations. A combustible liquid vapor can be ignited because it 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 flashpoint 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. FOG CONCENTRATION.** It has been fully established that an acceptable level of liquid in the atmosphere is one gallon (3.8 liters) for each 50,000 cubic feet (1400 cubic meters). There is a margin of safety of at least 5 to 1 in this figure. But long before this concentration is reached, with the fine white particle fog that this machine generates, visibility within the fog is reduced to less than 15 inches (38 CM.) Thus, an operator fogging within a closed area will not be able to see his way long before a combustible atmosphere can be approached. However, if the operator is outside of the closed area, it is quite possible to over fog, particularly if the area is small, i.e., crawl spaces under buildings or between ceiling and roof.

It is important to always employ a dry fog setting in a closed area to avoid depositing oil particles on combustible surfaces, thus creating a fire hazard. If a combustible atmosphere is established or a combustible deposit is laid down, a source of ignition may cause a fire. Even in open areas, care should be taken to avoid unnecessary accumulations of oil particles on objects within the fogging area. To avoid danger of fire or explosion in a closed space, the enclosed volume, fogging time and required formulation volume must be carefully calculated.

**4. FOG IGNITION.** The greatest hazard of fog ignition is from an external source. This can be gas or oil pilot lights or sparks from electrical controls such as switches, relays, etc. Therefore, it is strongly recommended that all such sources be eliminated by extinguishing all pilot lights and turning off all electrical power before fogging.

The design of the machine is such that it is quite difficult to ignite the fog from an external source since the ignition must be positioned just at the proper distance from the discharge end to cause fog ignition and this distance is on the

order of only 6-8 inches (15-20 cm). If an external source ignites the fog being discharged, it will produce a torching effect. Should this occur, quickly release the FORMULATION ON-OFF BUTTON to stop the fog discharge. Never artificially wedge, or block open the formulation ON-OFF VALVE.

On a dry fog setting, which must always be employed indoors and in confined areas, the ignition source must be continuous since the fog will not continue torching except briefly if the ignition source is removed. On a wet fog setting, it is possible for the fog to continue to torch after removal from the ignition source. Never use a wet fog setting indoors and in confined spaces. Extreme caution must be exercised when using a wet fog setting under any circumstances. A wet fog setting can leave a deposit of liquid on combustible surfaces creating a fire hazard should torching take place.

A second source of fog ignition can be the machine itself. If the machine stops running for any reason including the exhaustion of fuel, the operator must quickly release the FORMULATION ON-OFF BUTTON to stop the fog discharge. If the engine stops, it is possible for some formulation to flow into the still hot engine tube where it will vaporize. Part of this vapor may then be drawn by natural thermal convection back through the annular cooling air space between the cooling duct and the engine tube, to the red hot engine combustion chamber. If the proportion of vapor to air is just right when this occurs, the vapor will ignite and flash back through the discharge end of the engine tube, igniting the small amount of formulation which may continue to flow very briefly. Burning formulation can then drip briefly from the discharge end of the cooling air duct. If this burning formulation comes into contact with an easily combustible material or a surface which has accumulated a substantial deposit of liquid formulation, a fire could result.

**5. SAFETY EQUIPMENT.** Many of the formulations which can be dispensed with this machine are highly toxic and require special safety equipment. The formulation label should specify all safety precautions with respect to the formulation. Read and observe the procedures, **cautions** and **WARNINGS** on the formulation label. Proper ear protection should also be worn when operating this machine.

**6. IMPROPER OPERATION.** There is no substitute for good maintenance practices. An engine with excessive carbon deposits will run weakly and is likely to stop at any time. A weak running engine will also emit an extremely wet fog at lower rates of formulation flow and this can result in surfaces rapidly becoming coated with the formulation and thus help to feed a fire if ignition takes place as described above. Refer to the MAINTENANCE section for cleaning instructions.

**7. IMPROPER USE.** Never place the discharge end of the machine too close to a wall or other obstruction. The engine is maintained at the proper operating temperature by cooling air aspirated (pumped) by hot gases flowing out the discharge (exhaust) end of the engine. If this cooling air flow is prevented, the machine will overheat and it can suffer permanent damage which could result in an explosion or fire. Maintain at least 24 inches (61 CM) clearance between the engine discharge (exhaust) and external objects.

**8. MACHINE DAMAGE.** **Never operate a machine after it has been damaged.** A damaged machine can be a fire hazard.

**9. WIND.** Fogging during windy conditions is not usually practical because the formulation will drift out of the intended area. However, under no circumstances should fogging INTO the wind be attempted. Should the machine stop running for any reason, and a wind gust force vaporized formulation back against the hot combustion chamber, it could ignite and flash back causing momentary flaming from the discharge (exhaust) end of the machine.

**10. CHILDREN.** Many fogging operations are performed in residential areas commonly at dusk. This presents the operator with the problem of children who are attracted to the fog. Children have been observed running into and riding bicycles through the fog. Once in the fog, they cannot see or be seen. In some reported instances, a child has been injured by running into an object obscured by the fog. Also there is a possibility of fire should the machine briefly flame or become ignited from an external source. Still another possible hazard lies in the toxic effect of the formulation, the severity of which depends upon the chemical used, fog density, and the length of time of direct exposure.

**IT IS THE OPERATOR'S RESPONSIBILITY  
TO DISCOURAGE ANYONE FROM PLAYING  
IN THE FOG.**

# OPERATION

## **CAUTION**

**Read this complete OPERATION section and the section on SAFETY PRECAUTIONS before starting the machine for the first time.**

## PREPARING THE ENGINE FOR OPERATION

1. When operating this machine for the first time, place the machine in an uncongested and well-ventilated work area in an open area away from flammable materials. Place the machine on a concrete pad or a stable workbench.
2. Remove Fuel Tank Cap and fill the Fuel Tank with either regular or unleaded gasoline.

## **CAUTION**

**Gasoline with a minimum of 87 octane should be used. Use clean gasoline. Dirty gasoline can promptly overload the fuel filter. Water in the gasoline can cause unexplained stops. Very old or stale gasoline has a detrimental effect on the rubber seals in the fuel system and causes hard starting because it vaporizes poorly.**

3. Place the Fuel Tank Cap on the Fuel Tank and turn the cap firmly in the clockwise (CW) direction until the stop is reached.
4. Wipe any spilled gasoline from the machine and allow time for any unseen spills to evaporate.

## **CAUTION**

**Do not put any formulation in the machine until you have become familiar with starting and stopping the pulse jet engine.**

## ENGINE OPERATION

## **CAUTION**

**Read the complete OPERATION section and the section on SAFETY PRECAUTIONS before operating the engine.**

## **NOTE**

***Abbreviated starting and clearing procedures are shown on the instruction label attached to the machine; however, these should be used as reference only after you are thoroughly familiar with the procedures, CAUTIONS and WARNINGS contained in this manual.***

## NOTE

The method used for starting the engine will vary slightly depending on previous conditions of the machine. Regardless of which of the following conditions exist, the ignition switch must be depressed to restart the engine.

**DRY START:** (Applies when the machine is first placed in service; when the machine has been allowed to run completely out of fuel; or, when the machine has not been in recent use). When starting from the dry condition (all fuel drained, consumed or evaporated from the carburetor), additional actuation of the priming pump will be required to move fuel from the tank to the primer bulb.

**COLD START:** (Applies after the engine has been started initially; has been stopped before running out of fuel; and has been allowed to cool). Under these conditions, very little actuation of the priming pump is required, as some fuel will usually remain in the carburetor. One actuation of the priming pump is usually sufficient under these conditions.

**HOT START:** (Applies after the engine has been started initially; has been stopped before running out of fuel, and has not been allowed to cool before restarting.) Under these conditions, actuating the priming pump is not usually required as some fuel will usually remain in the antechamber.

**FLOODED START:** (Applies after too much fuel has reached the antechamber by excessive operation of the priming pump). See section on STARTING A FLOODED ENGINE.

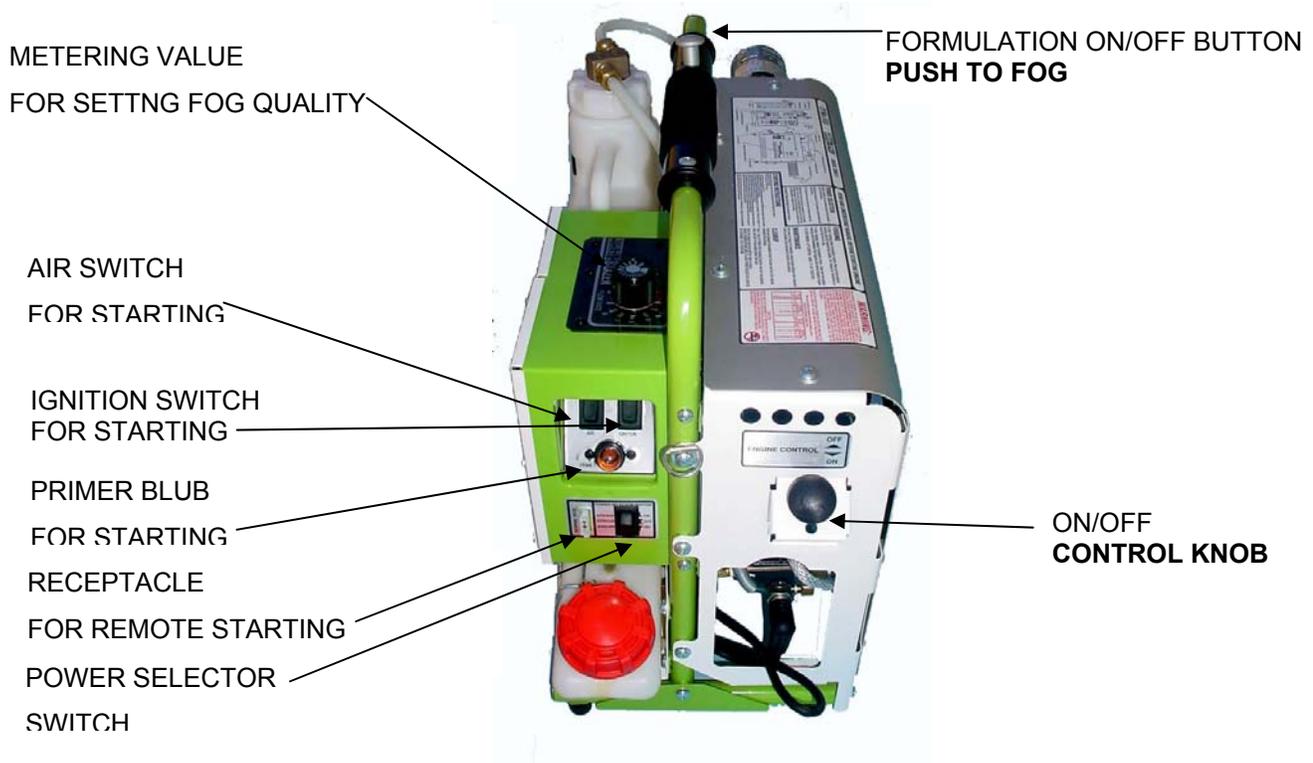


FIGURE 1

# STARTING THE ENGINE

## STARTING INSTRUCTIONS

Read and understand operation manual before starting engine.  
**DO NOT** attempt to start machine with air filter cover removed.

STEPS: For starting a "COLD" engine...

1. Lift ON/OFF engine control knob to ON.
2. To get gasoline to PRIMER BULB, repeatedly depress and release PRIMER BULB until gasoline is visible (You should feel a noticeable resistance once gasoline reaches bulb).
3. Prime engine by depressing and releasing PRIMER BULB 4 times for a "cold engine", 1 time for a "hot engine". DO NOT attempt to prime engine with ON/OFF knob in OFF position!
4. Depress IGNITION switch and *hold*. While depressing IGNITION switch, depress AIR switch *until engine begins to start, then pulse AIR switch intermittently* until engine runs smoothly (15-20 seconds).
5. If the engine has been properly primed or has been overly primed (flooded) it will start within 30-40 seconds. If engine has not started within 30-40 seconds, repeat steps 3 and 4.

Note: A "HOT" engine will require *less priming* and *air* to start. Difficult starting is usually a result of weak batteries, carbon formation in the engine neck, and/or stale gasoline.

### **NOTE**

*"Flooded" means that the fuel-air mixture around the spark plug has become too rich (too much fuel for the amount of air available) to ignite.*

## STARTING A FLOODED ENGINE

1. Verify that the FORMULATION ON/OFF BUTTON is released and that the FORMULATION METERING VALVE has been rotated fully clockwise (CW) until the stop is reached.
2. Lift the **ON-OFF** Control and place it in the **ON** position.
3. Simultaneously depress the "ignition" and "air" switches.
4. If the engine has not started within approximately 40 seconds, repeat steps 4, 5 and 6 of starting instructions on page 8.

## STOPPING THE ENGINE

1. To stop the engine, lift the **ON-OFF** control and place it in the **OFF** position.



**FIGURE 2**

## **SELECTING A FORMULATION**

Thermal fogging is an efficient and economical non-residual method of controlling insects. But the fog machine can not do the job alone. The proper insecticide, properly formulated is absolutely necessary. The machine will accept ineffective, poorly compounded solutions and the fog will appear no different from an efficient and well formulated compound but the killing power will be lacking. It requires insecticide to kill insects.

Improperly compounded formulations can promptly drop out of solution in the formulation system and give poor results. Your distributor is usually qualified to make recommendations and to furnish properly formulated insecticides; but if you have any specific questions or doubts, feel free to contact the factory.

### **CAUTION**

**Use only formulations prepared for thermal fogging and for the specific job to be accomplished. This information should be found on the formulation label.**

### **WARNING**

**THIS DEVICE IS DESIGNED TO DISPENSE CHEMICAL SOLUTIONS IN A FOG. MOST OF THE CHEMICAL SOLUTIONS WHICH MAY BE DISPENSED WITH THIS MACHINE REQUIRE REGISTRATION WITH OR APPROVAL BY VARIOUS GOVERNMENT AGENCIES. USE OF SOME OF THESE SOLUTIONS MAY BE RESTRICTED, REGULATED OR PROHIBITED IN CERTAIN AREAS.**

## **FOGGING FOR INSECT CONTROL**

### **CAUTION**

**Before placing any formulation in the Formulation Tank, the operator should be thoroughly familiar with starting and stopping the pulse jet engine. If you are operating the machine for the first time, start and stop the engine a few times. This is also a good idea for experienced operators who may be operating a new machine or who may be reactivating an old machine after repairs or after a period of inactivity. Refer to the appropriate sections for starting and stopping instructions.**

### **WARNING**

**READ THE SECTION ON SAFETY PRECAUTIONS BEFORE PREPARING TO DISPENSE FOG.**

**READ AND THOROUGHLY UNDERSTAND ALL INFORMATION, CAUTIONS AND WARNINGS ON THE FORMULATION LABEL WHICH MAY AFFECT PERSONAL SAFETY. KNOW ANY DANGERS OF THE SOLUTION USED AND KNOW WHAT TO DO IN CASE OF AN ACCIDENT INVOLVING THE SOLUTION.**

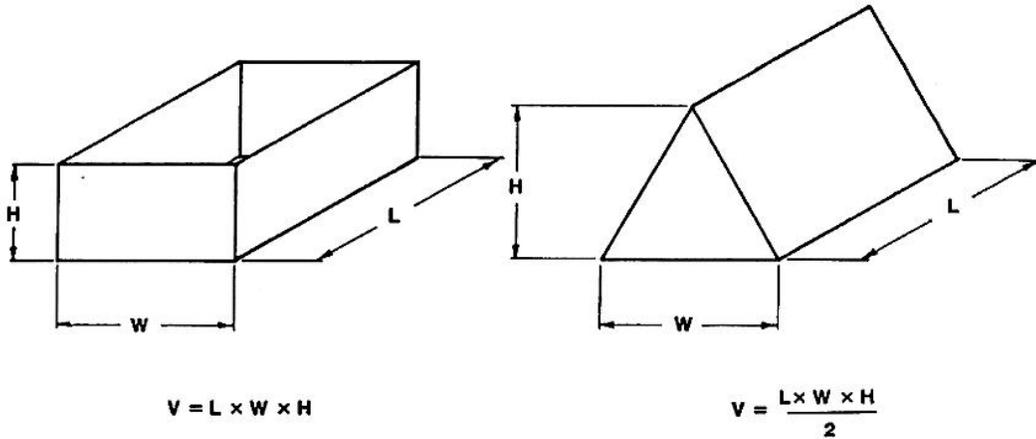
**ALWAYS USE THE APPROPRIATE SAFETY EQUIPMENT AND DRESS ACCORDING TO THE CHEMICAL FORMULATION WHICH IS BEING USED.**

# PREPARING TO DISPENSE FOG

## FOGGING WITHIN ENCLOSED SPACES:

When intending to fog within enclosed spaces such as buildings, crawl spaces, and spaces between ceiling and roof, a "dry" fog must be used. The enclosed space volume, formulation volume, and fogging time must be carefully calculated to avoid overfogging.

Volume formulas for simple shapes usually found in structures are shown below:



## BEFORE FOGGING:

1. Determine the volume of the enclosed space to be fogged in cubic feet or cubic meters as applicable.

Read the formulation label and determine the normal usage rate of the formulation. This usually varies from 1 fluid ounce (oz.) per 1000 cubic feet, (approximately 100 milliliters per 100 cubic meters) to 1 ounce per 3000 cubic feet (approximately 100 milliliters per 300 cubic meters).

2. Determine the Formulation Volume.
3. Determine the fogging time.

## NOTE

*Tables 1 and 2 are provided as a quick reference for determining fogging time.*

*As a "rule of thumb," when fogging indoors, your metering valve setting should never exceed 2.5. Also, the operator must maintain at least eight (8) feet of clearance between the discharge end of the machine and the target being fogged.*

## Example: (Using English System Units)

**STEP 1:** Let's assume the attic space shown on the previous page has a base (W) of 26 feet, and a height (H) of 7 feet and a length (L) of 43 feet. The volume (V) may be determined as:

$$V = \frac{26 \times 7 \times 43}{2} = 3913 = 3900 \text{ cubic feet}$$

Let's also assume that the formulation label specifies a normal usage rate of 1 ounce per 3000 cubic feet. (Table 2) Knowing the usage rate from the formulation label and the volume of space to be fogged, the formulation volume and fogging time can be calculated as shown below.

**STEP 2:** The normal required formulation volume is:

$$\frac{(3900 \text{ cu. ft.}) \times (1 \text{ oz.})}{3000 \text{ cu. ft.}} = \boxed{1.3 \text{ ounces}}$$

**STEP 3:** The normal time to fog 1.3 ounces is:

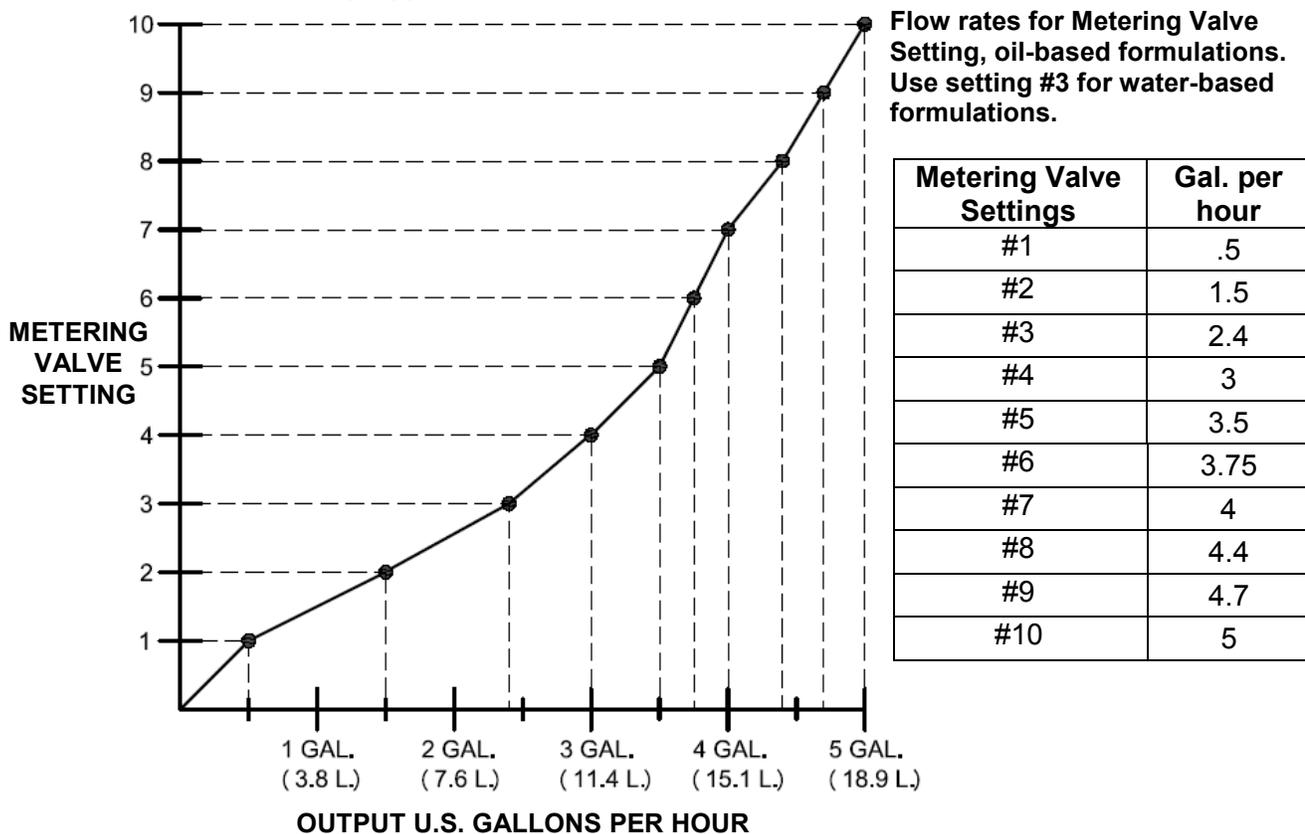
$$\frac{(1.3 \text{ oz.})}{(t \text{ seconds})} \times \frac{(3 \text{ oz.})}{(60 \text{ seconds})} = \boxed{26 \text{ seconds}}$$

where t = normal time to fog,  
and 3 oz. is the average  
machine flow rate to achieve  
a "dry fog."

**FOGGING OUTDOORS:** Read and follow all cautions and warnings for "Dispensing Fog" on pages 14 and 15. Read and follow the instructions for thermal fogging on the chemical solution label.

### METERING VALVE SETTING VS. FLOW RATE

The following graph represents an approximate cross reference between the metering valve setting (0-10) and the formulation flow rate. This graph was derived using fuel oil (approximately 1 centipoise viscosity) as the formulation being fogged.



## ENCLOSED SPACE VOLUME vs FORMULATION VOLUME AND FOGGING TIME

Based on formulation label application rate of:  
 1 fluid ounce (oz) per 1000 cubic feet (cu.ft.)  
 100 milliliters (ml) per 100 cubic meters (cu. m.)

| Volume of Enclosed Space<br>Cu. Ft (Cu. meters) | Average Flow Rate*<br>to achieve "DRY"<br>Fog Oz/Min (ML/Min) | Fogging Time<br>(Seconds) |
|-------------------------------------------------|---------------------------------------------------------------|---------------------------|
| 1000 ( 30)                                      | 3 (90)                                                        | 20                        |
| 2000 ( 60)                                      | 3 (90)                                                        | 40                        |
| 3000 ( 90)                                      | 3 (90)                                                        | 60                        |
| 5000 ( 140)                                     | 3 (90)                                                        | 100                       |
| 10000 ( 280)                                    | 3 (90)                                                        | 200                       |
| 20000 ( 560)                                    | 3 (90)                                                        | 400                       |
| 30000 ( 840)                                    | 3 (90)                                                        | 600                       |
| 40000 (1120)                                    | 3 (90)                                                        | 800                       |
| 50000 (1400)                                    | 3 (90)                                                        | 1000                      |

**TABLE 1**

## ENCLOSED SPACE VOLUME vs FORMULATION VOLUME AND FOGGING TIME

Based on formulation label application rate of:  
 1 fluid ounce (oz) per 3000 cubic feet (cu.ft.)  
 100 milliliters (ml) per 300 cubic meters (cu. m.)

| Volume of Enclosed Space<br>Cu. Ft (Cu. meters) | Average Flow Rate*<br>to achieve "DRY"<br>Fog Oz/Min (ML/Min) | Fogging Time<br>(Seconds) |
|-------------------------------------------------|---------------------------------------------------------------|---------------------------|
| 1000 ( 30)                                      | 3 (90)                                                        | 7                         |
| 2000 ( 60)                                      | 3 (90)                                                        | 13                        |
| 3000 ( 90)                                      | 3 (90)                                                        | 20                        |
| 5000 (140)                                      | 3 (90)                                                        | 30                        |
| 10000 ( 280)                                    | 3 (90)                                                        | 70                        |
| 20000 ( 560)                                    | 3 (90)                                                        | 130                       |
| 30000 ( 840)                                    | 3 (90)                                                        | 200                       |
| 40000 (1120)                                    | 3 (90)                                                        | 270                       |
| 50000 (1400)                                    | 3 (90)                                                        | 330                       |

**TABLE 2**

\*This flow rate is an average. Your actual flow rate required to produce a "dry" fog may vary depending on: the viscosity of the formulation to be fogged, the formulation tank pressure, and the operating characteristics of the engine. A "dry" fog must be used when fogging in an enclosed area. See "Dispensing FOG WARNING" on page 14, and "Note" on page 15. To test the fog to verify that it is "dry," see "Caution" on page 15.

### **WARNING**

**IF YOUR FLOW RATE REQUIRED TO ACHIEVE A "DRY" FOG IS GREATER OR LESS THAN THE AVERAGE FLOW RATE GIVEN IN TABLES 1 AND 2, FOGGING TIME FOR THE ENCLOSED SPACE WILL BE DIFFERENT THAN THE TIME SHOWN. (SEE STEP 3 ON PREVIOUS PAGE TO DETERMINE FOGGING TIME.) IT SHOULD ALSO BE NOTED THAT TABLES 1 AND 2 ARE BASED ON A FLOW RATE OF 1.5 GPH (5.6 LT./HR.) OR 3 OZ./MIN, (90 ML./MIN. "DRY-FOG" AS SHOWN.**

1. If engine is running, stop engine and wait 15 seconds for pressure in Formulation Tank to escape.

### **CAUTION**

#### **Remove tank cap slowly**

2. Rotate the Formulation Tank Cap fully counterclockwise (CCW) and remove it from the Formulation Tank Neck.
3. Place an appropriate amount of formulation in the Formulation Tank.

### **NOTE**

*It is a good idea to put only as much formulation in the tank as is necessary to do a particular job. Thus, the formulation tank will be empty when the fogging job is finished.*

### **WARNING**

**DO NOT USE ANY SUBSTANCES FROM UNMARKED CONTAINERS OR FROM CONTAINERS WITH OBVIOUSLY ALTERED LABELS.**

**READ AND FOLLOW THE INSTRUCTIONS ON THE CHEMICAL SOLUTION LABEL FOR THERMAL FOGGING OF THE SOLUTION.**

4. Place the Formulation Tank Cap on the Formulation Tank and rotate it clockwise (CW) until the stop is reached.

### **NOTE**

**The Formulation Tank must be air tight for the machine to operate properly.**

## **DISPENSING FOG**

### **CAUTION**

**Read the entire OPERATION SECTION and the section on SAFETY PRECAUTIONS before starting the machine for the purpose of dispensing fog.**

### **WARNING**

**DO NOT UNDER ANY CIRCUMSTANCES USE A WET FOG IN A CLOSED AREA.**

**DO NOT FOG ANY ENCLOSED SPACE OF LESS THAN 500 CUBIC FEET (14 CUBIC METERS) WITH THIS MACHINE.**

**DO NOT FOG AN ENCLOSED SPACE FOR MORE THAN 14 SECONDS FOR EACH 1000 CUBIC FEET (28 CUBIC METERS) OF ENCLOSED SPACE. (THIS INFORMATION IS BASED ON THE MAXIMUM MACHINE FLOW RATE OF 5 U.S. GPH (19 LT./HR.) OR 11 OZ./MIN. (325 ML/MIN.) (EQUIVALENT OF 1 U.S. GAL./50,000 CU. FT.).**

**EXTINGUISH ALL OIL AND GAS PILOT LIGHTS AND TURN OFF ALL ELECTRICAL POWER IN A CLOSED AREA BEFORE FOGGING.**

**DO NOT FOG NEAR AN OPEN FLAME OR HOT MATERIALS. THIS INCLUDES LIGHTED MATCHES, CIGARETTES, ETC.**

**DO NOT WEDGE OR BLOCK OPEN THE FORMULATION ON-OFF BUTTON OR LEAVE THE MACHINE UNATTENDED.**

**IF THE ENGINE STOPS FOR ANY REASON, RELEASE THE FORMULATION ON/OFF BUTTON IMMEDIATELY.**

**IF AN EXTERNAL SOURCE IGNITES OR TORCHES THE FOG, RELEASE THE FORMULATION ON/OFF BUTTON IMMEDIATELY.**

**DO NOT AT ANY TIME PLACE THE MACHINE ON ITS SIDE.**

**DO NOT PLACE THE DISCHARGE (EXHAUST) END OF AN OPERATING MACHINE CLOSER THAN 24 INCHES (61 CM) TO A WALL OR OTHER OBSTRUCTION. THIS CAN CAUSE THE ENGINE TO OVERHEAT AND CAUSE THE MACHINE TO SUFFER PERMANENT DAMAGE LEADING TO A FIRE OR EXPLOSION.**

**DO NOT TOUCH THE HOT ENGINE TUBE. ALLOW SUFFICIENT COOLING TIME AFTER OPERATION BEFORE ATTEMPTING ADJUSTMENT, REPAIR OR MAINTENANCE.**

**DO NOT LOOK INTO THE ENGINE DISCHARGE (EXHAUST) TUBE. DO NOT FOG INTO THE WIND.**

**DO NOT LEAVE THE FOG CONTINUOUSLY DIRECTED AT THE SAME AREA OR OBJECT. THIS MAY CAUSE A BUILD-UP OF A FLAMMABLE SUBSTANCE OR LEAVE UNDESIRABLE DEPOSITS ON WALLS, FURNITURE, ETC.**

### **NOTE**

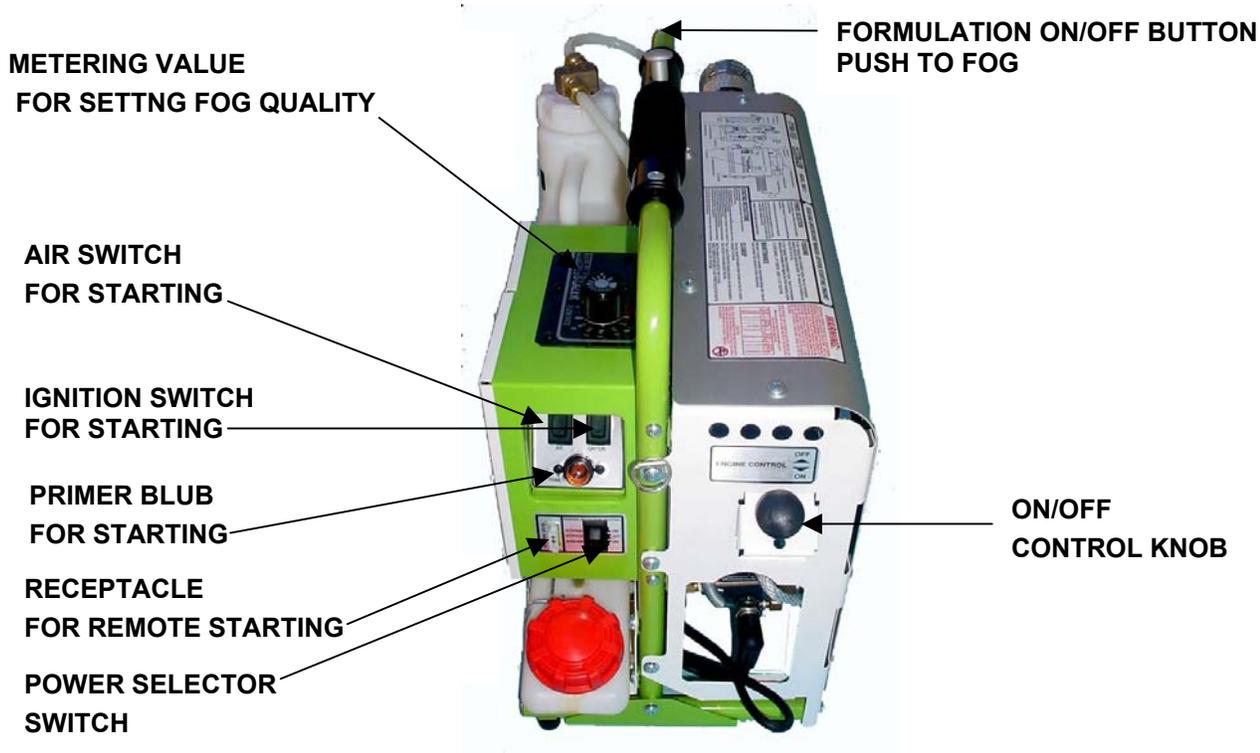
*The formulation flow to the INJECTION ORIFICE is controlled both by a FORMULATION METERING VALVE which controls the formulation flow rate and an ON/OFF Valve. The FORMULATION METERING VALVE is marked with the numbers "0" through "10". These numbers are relative indicators of fog quality but are not absolute calibrations. Starting from an initial setting with the valve turned fully clockwise (CW), rotating the FORMULATION METERING VALVE counterclockwise (CCW) begins to inject formulation at a rate which produces a dry fog. As rotation in the counterclockwise (CCW) direction is continued, the fog quality changes from dry to wet. The point of changeover from dry to wet depends on variables such as the Formulation Tank pressure, the state of cleanliness of the formulation system and the operating characteristics of the engine.*

### **CAUTION**

**When it is intended to fog in a closed area, the operator should first test the fog to verify that it is dry before entering the closed area. To test the fog quality pass a dark piece of paper or a shiny object through the fog at a distance of approximately 24 inches (61 CM) from the discharge (exhaust) end of the machine. If there is any visual accumulation on the paper or object, the fog must be considered wet and the formulation metering valve changed to a dryer setting. Give yourself a margin of safety in setting the formulation metering valve for a dry setting.**

### **START FOGGING**

1. Start the engine as specified in the section STARTING THE ENGINE.
2. Verify that the Formulation Tank Cap is tight.
3. When the engine is running smooth, depress the FORMULATION CONTROL VALVE.
4. Following all applicable NOTES, CAUTIONS and WARNINGS, adjust the FORMULATION METERING VALVE counterclockwise (CCW) to obtain the desired fog quality.



**FIGURE 3**

5. After setting the fog quality, the fog may be started and stopped by pressing and releasing the FORMULATION ON-OFF BUTTON.

### **STOP FOGGING**

1. When fogging is complete, release the FORMULATION ON-OFF BUTTON and rotate the FORMULATION METERING VALVE clockwise (CW) until the stop is reached.
2. Stop the engine by lifting the ON-OFF CONTROL and placing it in the OFF position.

### **CLEAN UP**

1. Drain any unused Formulation from the tank into its original container for proper storage.

### **CAUTION**

**Store all formulations where they are not accessible to children or other persons who may not be aware of potential dangers involved.**

**Do not store formulations in unmarked, or otherwise improper containers.**

**Do not store formulations in empty food or beverage containers or in any container marked for another substance.**

**Do not re-use empty formulation containers for other purposes. Dispose of empty formulation containers in accordance with the formulation label instructions.**

2. After properly storing the formulation, perform the "AFTER EACH USE" maintenance operations under the MAINTENANCE section of this manual.

### **NOTE**

*Many formulations will release residue that can settle in the formulation tank. If this residue is left to collect in the Formulation Tank, it will eventually be carried through the formulation system forming sludge in the system. This sludge can completely block the formulation system making fogging impossible.*

### **CAUTION**

**Because the machine may still have gasoline in its tank, the machine should be stored between uses under conditions applicable to gasoline containers generally, i.e., store in a cool dry and well ventilated place away from sources of ignition.**

3. If preparing the machine for long-term storage or shipment, refer to the section marked STORAGE AND SHIPMENT.

# **MAINTENANCE**

## **NOTE**

*A successful maintenance program begins after the first use of the machine and not after the machine has ceased to function.*

*Numbers in parentheses refer to the identification numbers in the Parts Identification Section.*

## **AFTER EACH USE**

If the machine will be left idle for more than one (1) hour, flush the systems as follows to avoid frozen valves and plugged lines resulting from formulation residues.

### **Flush Formulation System**

1. Drain the Formulation Tank.

#### **CAUTION**

**Store the formulation properly. See the cautions under clean up.**

2. Pour one pint of kerosene, No. 2 Fuel Oil or Diesel Fuel into the Formulation Tank and slosh it around thoroughly inside the tank.
3. Start the engine in accordance with the OPERATION section and fog out all the liquid in the tank.

#### **WARNING**

**ALL CAUTIONS AND WARNINGS APPLICABLE TO OPERATION AND FOGGING ARE APPLICABLE TO THIS FLUSHING PROCEDURE.**

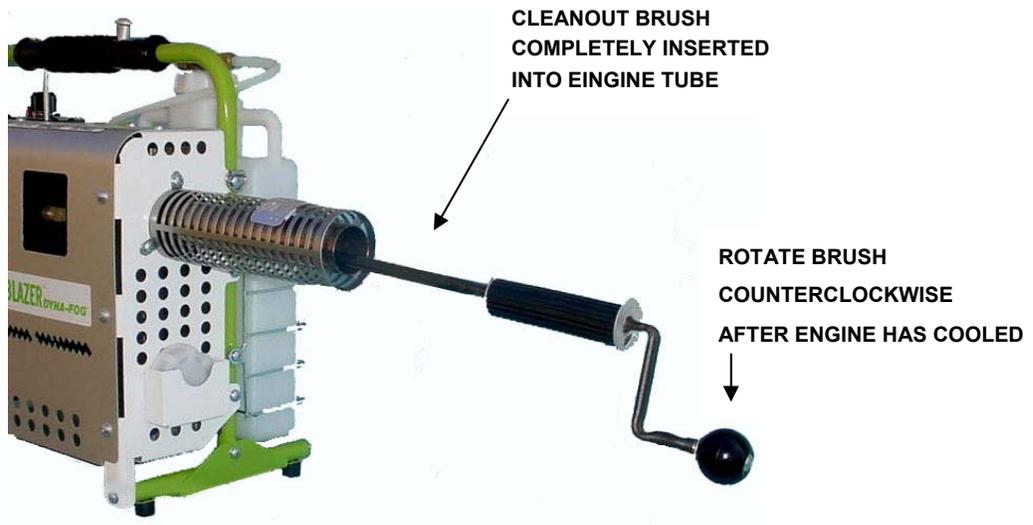
### **INSPECT FOR FORMULATION RESIDUES**

Examine the Formulation Tank and system for residues. If deposits are building up, increase the amount of flushing liquid that is fogged after each use.

## **AFTER EVERY FOUR (4) HOURS OPERATION**

### **Clean the Engine Discharge (Exhaust) Tube**

1. Using the Cleanout Tool provided, (see page 49) insert the brush into the engine discharge (exhaust) tube and rotate it clockwise (CW) as you push the tool into the tube as far as the handle permits. (See page 19)



**FIGURE 4**

2. Continue rotating the tool in the same direction and pull back and remove the brush from the tube.

**NOTE**

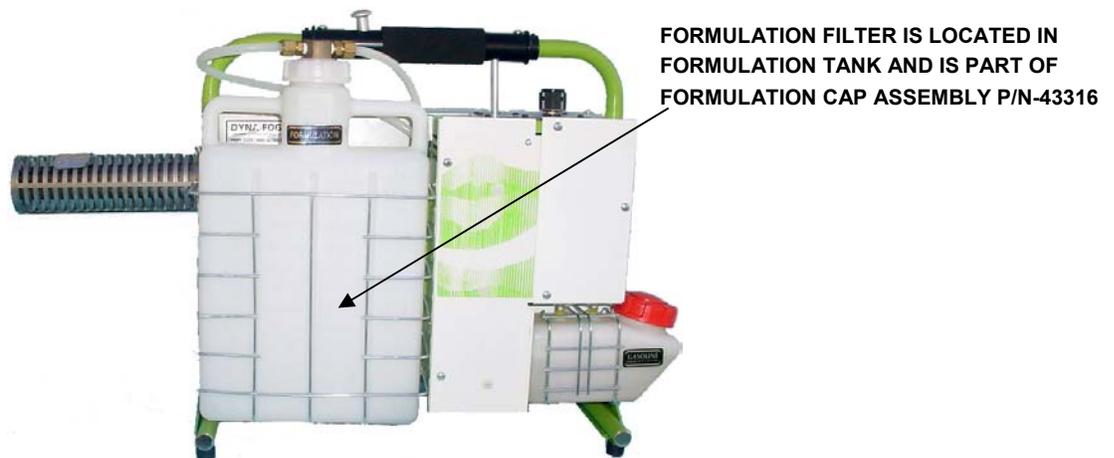
*It is not normally necessary to push and pull hard on the brush handle; however if the engine tube is not cleaned regularly, it becomes increasingly difficult to clean. Push and pull gently and continue rotating.*

*Loose carbon will be removed from the tube when the engine is next started.*

**AFTER EVERY EIGHT (8) HOURS OPERATION**

**Clean the Formulation Filter**

1. Remove the FORMULATION FILTER and clean it with detergent and water.



**FIGURE 5**

2. If the filter has deposits that soap and water will not remove, clean the filter using automotive carburetor cleaner.
3. Thoroughly dry the filter and re-install.

### CAUTION

Do not operate the system without a formulation filter. Extensive damage to the system may occur due to clogging of lines and orifices.

## CLEAN THE ENGINE NECK

### NOTE

A screw driver or similar tool may be used to remove the carbon.

### CAUTION

Extreme care must be taken to prevent damaging the glow coil in the combustion chamber. Any tool used should be short enough to prevent the tip of the tool from reaching and damaging the glow coil.

### WARNING

**A DAMAGED OR OUT OF POSITION GLOW COIL WILL CAUSE POOR ENGINE STARTING AND OPERATION.**

**ACCUMULATION OF CARBON IN THE ENGINE NECK WILL ULTIMATELY RESULT IN HARD STARTING AND POOR PERFORMANCE.**

### Examine the Spark Plug.

In general, the only time the spark plug goes bad is if the white porcelain becomes cracked or broken. Occasionally carbon will form on the electrodes. When this happens, rub the carbon off with a piece of steel wool. The spark plug is gapped at 0.050" or slightly less than the thickness of a United States nickel. Always install the spark plug with your fingers. NEVER USE A WRENCH TO TIGHTEN THE SPARK PLUG.

Adjust the On-Off Control.

1. If the On-Off Control linkage does not rotate the linkage stop from full open to full closed, then the linkage should be adjusted.
2. To adjust the linkage, loosen the Jam Nut and twist the Control Wire into the Control Linkage in the direction needed. When properly functioning, the On-Off Control should rotate the Linkage Plate as far as it will go in either direction.

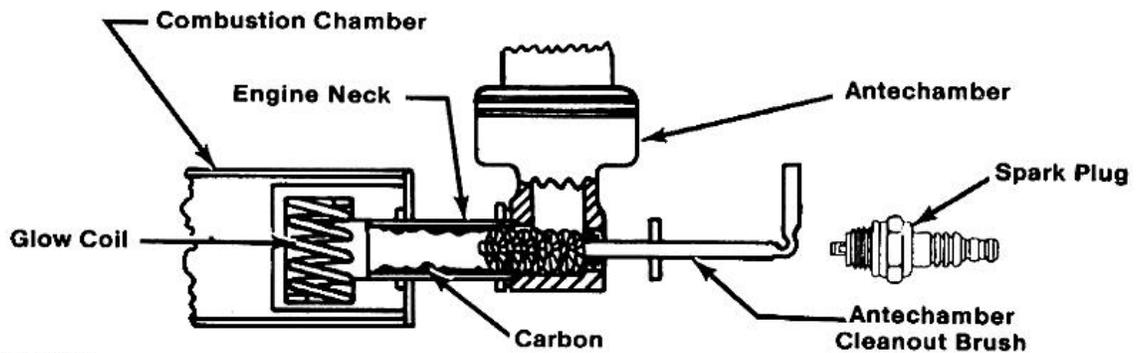


FIGURE 6

Antechamber Cleanout Diagram

## **AFTER EVERY TWELVE (12) HOURS OPERATION**

### **Clean Formulation Injection Nozzle**

1. Disconnect the Formulation Injection Line (Fig. 11 Ref. 1) at the injection end and then remove the elbow Ay. (Fig II Ref. 2)
2. Insert a wire through the Coupling into the engine tube to remove carbon deposits.
3. Then reassemble the Elbow and the Formulation Injection Line.

### **Check The Fuel Filter**

Remove the Fuel Filter (Fig. 20 Ref. 1) from the fuel line. If it is dirty, install a replacement and check the filter within the carburetor (see Carburetion Section).

### **Clean The Formulation Injection Orifice Assembly**

Disconnect the Formulation Injection Line at the FORMULATION INJECTION ORIFICE ASSEMBLY Fig. 11 Ref. 2. Clean the injection orifice to remove accumulated residue. Then re-connect the Formulation Injection Line.

## **Batteries (Use Alkaline Batteries Only)**

No set period of time can be established for the replacement of the "D" size batteries, but the spark intensity should be checked whenever the machine does not function normally. See the section on TROUBLE ISOLATION AND CORRECTION concerning the testing of the electronic ignition.

The nominal voltage of fully charged batteries should be at least 12 Volts D.C. This voltage will vary slightly with battery age and with the ambient temperature conditions. Under some circumstances, it may vary as much as  $\pm 2$  Volts.

### **WARNING**

- **IMPROPER USE OF BATTERIES MAY CAUSE LEAKAGE AND EXPLOSION. THEREFORE, STRICTLY OBSERVE THE FOLLOWING PRECAUTIONS.**

(1) **INSTALL THE BATTERIES WITH THE POSITIVE (+) AND NEGATIVE (-) POLARITIES IN THE PROPER DIRECTION.**

(2) **DO NOT USE NEW AND OLD BATTERIES TOGETHER.**

(3) **DO NOT USE CYLINDRICAL ALKALINE BATTERIES WITH OTHER TYPES OF BATTERIES.**

(4) **NEVER ATTEMPT TO SHORT-CIRCUIT, DISASSEMBLE, OR HEAT BATTERIES. DO NOT THROW BATTERIES IN FIRE.**

- **CYLINDRICAL ALKALINE BATTERIES ARE NOT RECHARGEABLE. IF RE-CHARGED, THEY MAY LEAK AND EXPLODE.**

## AUXILIARY START BATTERY CABLE



**Auxiliary-Start Battery Cable**

Each machine is equipped with an auxiliary-start battery cable (See above) to enable you to select from a choice of battery supplies to start your machine.

To use your auxiliary cable:

1. Place your Power Selector Switch located on the rear panel of the pump enclosure assembly, (Fig. 18, Ref. 7) in the auxiliary position.
2. Connect one end of your cable to the External 12 Volt DC Power Receptacle located next to the Power Selector Switch.
3. Connect the other end of the cable to a 12 Volt DC "cigarette lighter" receptacle.
4. Disconnect the cable once the machine has been started.

As an additional feature, Curtis Dyna Fog Ltd. offers a rechargeable, 12 volt DC, 7 amp hour, lead acid battery (See below) for starting your machine.



**Rechargeable Lead Acid Battery**

# CARBURETOR

The Carburetor on this machine does not need frequent adjustment or servicing. Careful attention to putting only clean gasoline in the machine will significantly reduce trouble with the Carburetor. The Carburetor idle-needle is pre-set at the factory for the correct fuel at an altitude of approximately 1000 feet (305 meters.) Minor adjustment of the needle may be required for high altitude. When the Carburetor is set at the nominal setting as explained below, performance difficulties will usually be found to be caused by sources other than the carburetor. For example, if the engine dies or runs rough, carbon build up in the engine neck will often be found to be the cause. Scheduled cleaning as detailed in MAINTENANCE will eliminate this cause.

## Idle Needle Adjustment

### **Note**

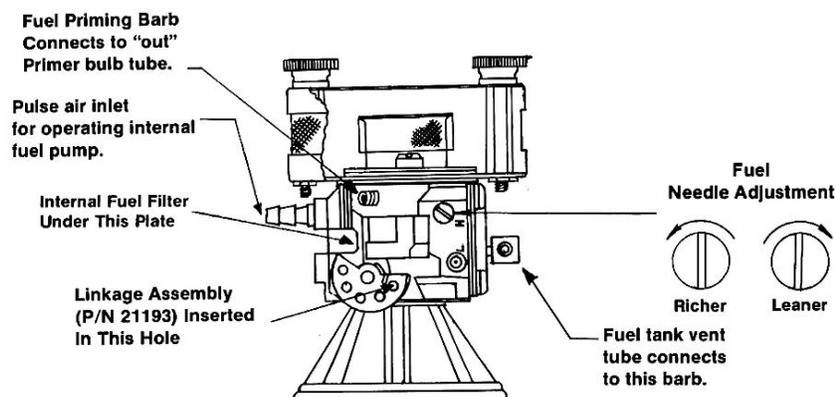
*Read the entire CARBURETOR section before performing the idle needle adjustment.*

1. Drain any formulation remaining in the Formulation Tank.
2. Add approximately 1 quart (1 liter) of flushing solution or fuel oil to the Formulation Tank.
3. Make sure the Fuel Tank has gasoline in it and the FORMULATION METERING VALVE is closed.
4. With the engine stopped, turn the idle-needle screw gently clockwise (CW) until the needle seats.

### **CAUTION**

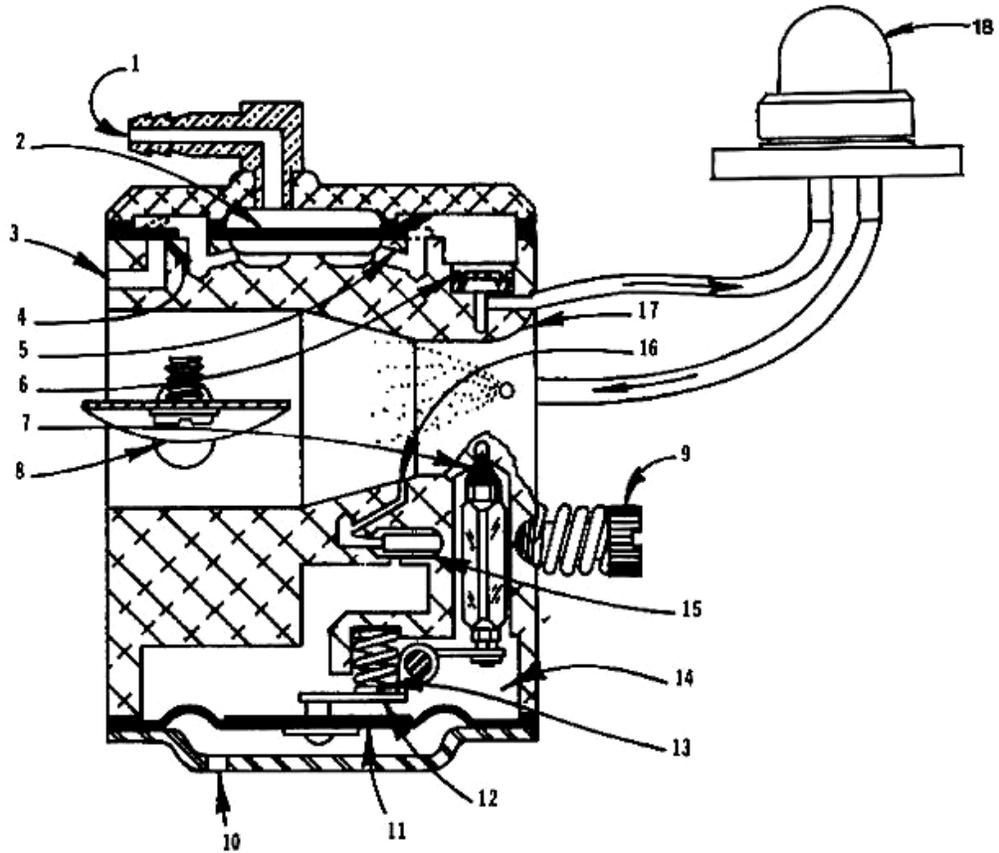
**Do not over tighten the idle-needle. Overtightening may damage the carburetor.**

5. After the needle seats, turn the idle-needle screw counterclockwise (CCW) one-half (1/2) of one revolution.



**FIGURE 7**

# CARBURETOR



**FIGURE 8**

## **Carburetor Systems Diagram Operating Functions**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Engine Impulse: Actuates Fuel Pump Diaphragm alternating pressure-vacuum pulses.</li> <li>2. Fuel Pump Diaphragm: Fluctuates in response to engine impulse. Transfers fuel through Fuel Pump Valves.</li> <li>3. Fuel Inlet: Fuel drawn from tank.</li> <li>4. Inlet Valve: Responds to Fuel Pump Diaphragm. Opens during vacuum pulse. Closes during pressure pulse.</li> <li>5. Outlet Valve: Closes during vacuum pulse. Opens during pressure pulse.</li> <li>6. Filter Screen: Filter fuel on route to Metering Chamber.</li> <li>7. Inlet Needle Valve: Lifts off seat to allow fuel entry into Metering Chamber.</li> <li>8. Butterfly Valve: Shuts off air flow stopping engine.</li> <li>9. Fuel Needle: Adjusts fuel richness.</li> </ol> | <ol style="list-style-type: none"> <li>10. Atmospheric Vent: Allows air pressure against the Metering Diaphragm.</li> <li>11. Metering Diaphragm: Drawn up by vacuum while engine is running to activate Metering Lever.</li> <li>12. Metering Lever: Lifts Inlet Needle Valve off seat.</li> <li>13. Metering Lever Spring: Transmits force to Metering Lever. Closes Inlet Valve as Metering Chamber fills.</li> <li>14. Metering Chamber: Fuel reservoir.</li> <li>15. Nozzle Well: Fuel is drawn in from Metering Chamber at high speed.</li> <li>16. Nozzle: Increases fuel discharge at high speed.</li> <li>17. Venturi: Increases air velocity at Nozzle, creating a suction to draw fuel into Throttle Bore.</li> <li>18. Priming Pump: Used to supply fuel to antechamber for starting.</li> </ol> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## **WARNING**

**IF THE MIXTURE IS TOO LEAN THE ENGINE MAY DIE AT THIS POINT. UPON RESTARTING, FLAME MAY MOMENTARILY SHOOT OUT THE DISCHARGE TUBE.**

## **NOTE**

*This section outlines the operating systems in the Carburetor. Refer to "The Starting System Diagram" and the "Carburetor System Diagram" for a pictorial representation of all systems and names. The end of this section contains procedures for all possible Carburetor adjustments. (See Pages 26 & 27)*

The purpose of the Carburetor is to supply a combustible mixture of fuel and air to the Pulse Jet Engines. The Carburetor uses four systems to create this mixture. These systems are:

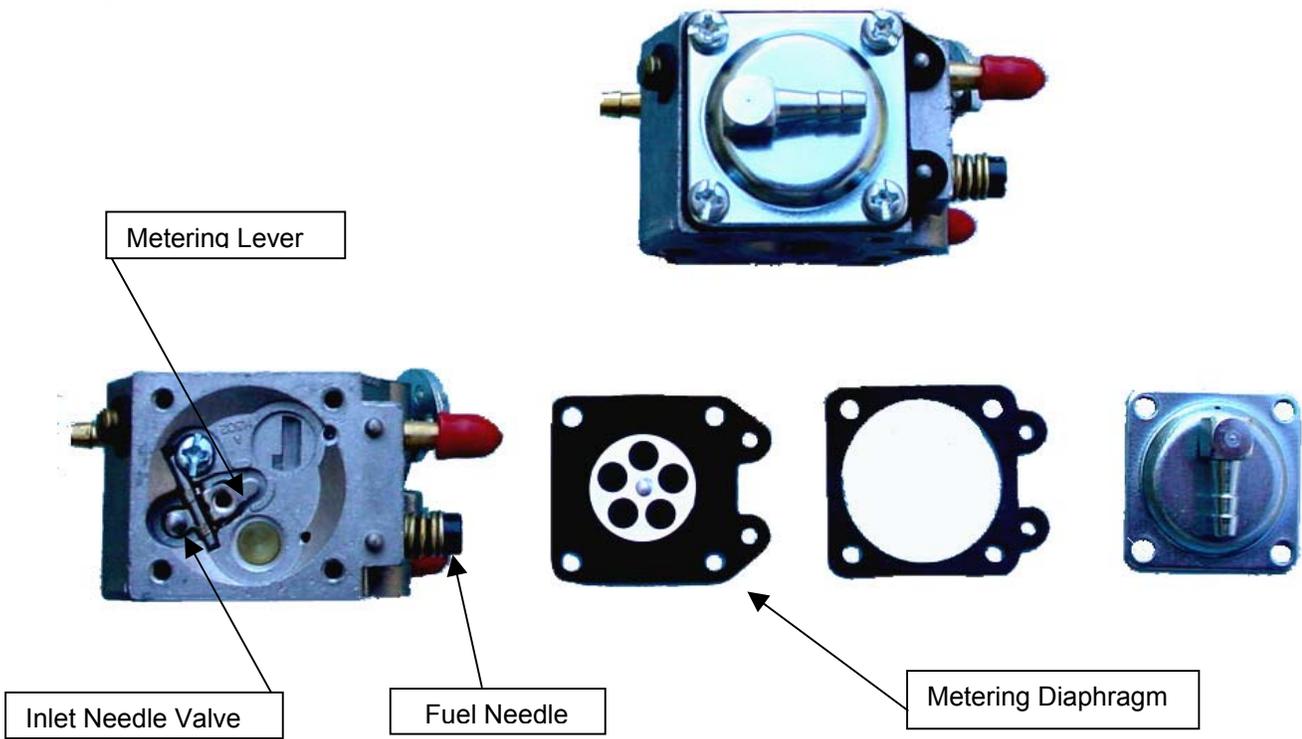
1. A Venturi
2. A Metering Chamber
3. A Fuel Pump
4. A Fuel Needle

The Venturi is the air passage through the Carburetor. When air moves through a Venturi a partial vacuum is created. The strength of the vacuum varies proportionately to the amount of air flowing through the Venturi. When a constant volume of gasoline is connected to the Venturi, the vacuum created by the Venturi will draw an amount of gasoline proportional to the air flow past the Venturi and disperse the gasoline in the airflow. This arrangement allows the Carburetor to always supply the correct ration of fuel and air to the engine.

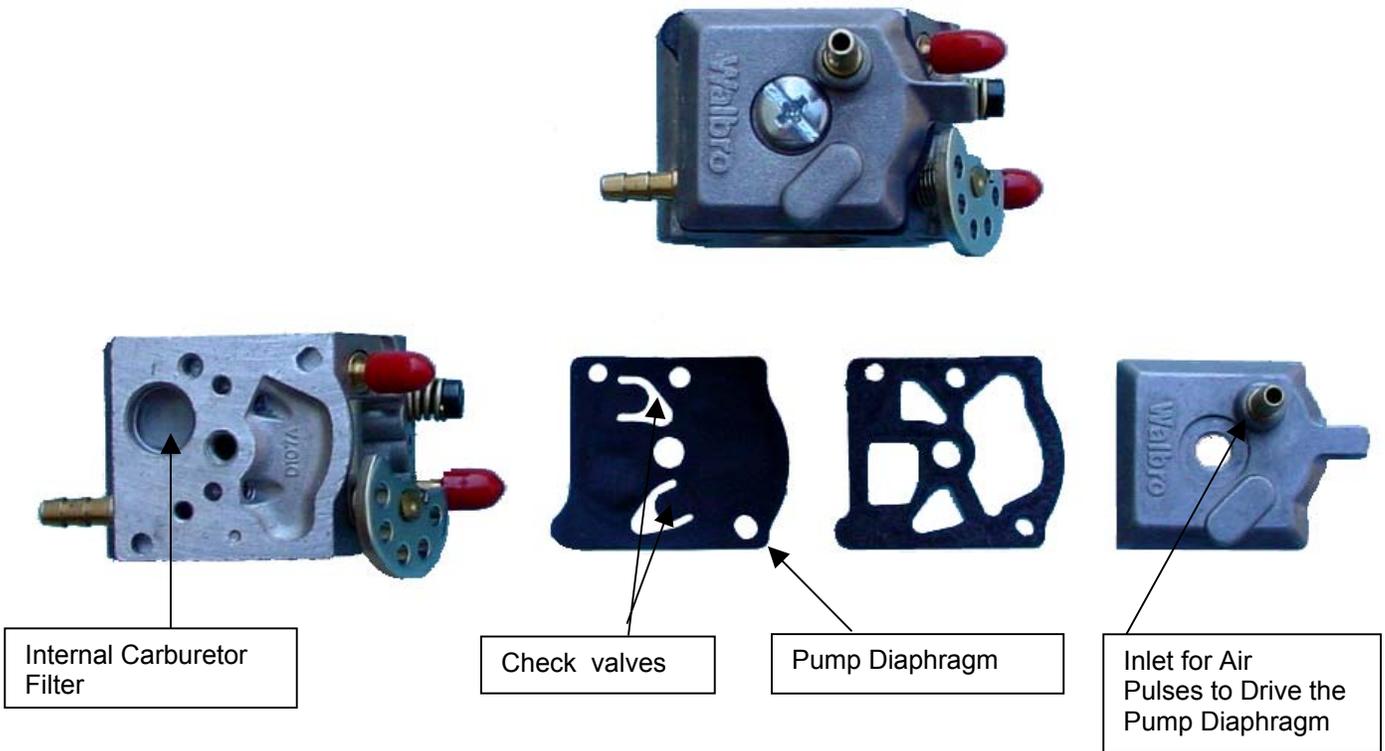
The Metering Chamber maintains a constant volume of gasoline for the Venturi and prevents gasoline from leaking out through the Carburetor should the machine be overturned. As gasoline enters and begins to fill the Metering Chamber, it presses out on the Metering Diaphragm allowing the spring under the Metering Lever to push out on the lever closing the Inlet Needle Valve. When the air flowing through the Venturi draws gasoline from the Metering Chamber, the Metering Diaphragm moves in pressing in the Metering Lever and opening the Inlet Needle Valve, thereby allowing the metering Chamber to fill with gasoline again. When the engine is not running, vacuum is not created in the Venturi to move the Metering Diaphragm so the Metering Diaphragm does not move in and out. In this condition the spring beneath the Metering Lever holds the Inlet Needle Valve closed preventing gasoline from leaking through the Carburetor if the machine is overturned.

The purpose of the Internal Fuel Pump is to deliver the gasoline to the Carburetor and be capable of delivering at least the maximum amount of gasoline the Pulse Jet Engine would ever require. The Fuel Pump Diaphragm is driven by the alternating positive and negative air pressure from the engine's intake-explosion-discharge cycle. Movements of the Pump Diaphragm draw gasoline through a series of check-valves and push the gasoline toward the Metering Chamber.

The Fuel Needle fine tunes the fuel-air mixture allowing for small differences in engines and Venturis.



**Carburetor – Metering Chamber Side**



**Carburetor – Pump Chamber Side**

# CARBURETOR ADJUSTMENT

## NOTE

*If clean fresh gasoline with Dyna-Fog® Fuel Stabilizer additive is used, the Carburetor will almost never require servicing. Usually most operational problems involve carbon build-up, weak spark, or excessive priming causing the engine to flood. All of these possibilities should be checked before working on the Carburetor.*

*An out of adjustment Carburetor will cause the following symptoms. Note that all of these can also be caused by a weak battery and/or carbon build-up.*

### Symptom: #1

Machine is hard to start (too much gasoline).

Cause:

1. Inlet Needle Valve wedged open.
2. Fuel Needle set too far open.
3. Metering Lever set too far out.

### Symptom: #2

Machine is hard to start (not enough gasoline).

Cause:

1. Carburetor is clogged.
2. Fuel needle stuck to its seat.
3. Metering lever set too far in.

### Symptom: #3

Machine runs but dies when beginning to fog.

Cause:

Fuel-air mixture is too lean or too rich.

## ADJUSTING THE FUEL NEEDLE

The engine must be running in order to adjust the Fuel Needle.

If the engine will not run and the Fuel Needle is set between  $\frac{1}{2}$  -1 turn out, the Fuel Needle setting is not likely to be the problem.

If the engine will not run and the Fuel Needle is not set between  $\frac{1}{2}$  - 1 turn out, set the Needle to this setting. The machine should start in this range.

Once the machine is running proceed as follows:

1. With Fuel Oil or Flushing Solution in the Formulation Tank, move the machine where it can be fogged briefly with safety.
2. Set the Formulation Metering Valve to "10" and start the machine.

## CAUTION

**If the machine is running too lean or too rich the next step may cause the engine to stop and a small amount of flame may exit the engine discharge.**

## NOTE

*A Pulse Jet Engine which has lean fuel-air mixture will not carry fog. A Pulse Jet Engine, if running rich will run rough or sputter frequently.*

## WARNING

**WHEN ADJUSTING THE FUEL NEEDLE DO NOT TOUCH THE ENGINE HOUSING. THE HOUSING HEATS UP QUICKLY TO A TEMPERATURE WHICH CAN CAUSE SERIOUS BURNS IF TOUCHED.**

3. Using a small regular tip screwdriver, slowly rotate the Fuel Needle clockwise then counter-clockwise.

Listen to the sound of the engine and adjust the Carburetor Fuel Needle to the setting where the engine is running smoothest and strongest. This setting should be the correct Fuel Needle setting.

4. Depress the Formulation Button.

5. If the engine stops or hesitates, immediately release the Formulation Button and rotate the Fuel Needle counterclockwise 1/16th turn or less. Repeat steps 4 and 5 until the engine no longer hesitates or stops when beginning to fog.

## ADJUSTING THE METERING LEVER

If the Metering Lever is set too far in, the movement of the Metering Diaphragm will not be sufficient to open the Inlet Needle Valve the required amount. This will make the engine hard to start because it will not be getting enough gasoline.

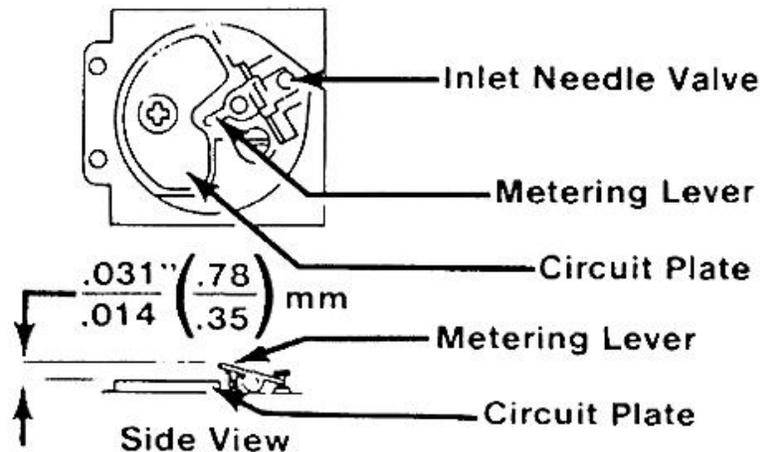
If the Metering Lever is set too far out, the movement of the Metering Diaphragm will open the Inlet Needle Valve too far. This will make the engine hard to start because it will be getting too much gasoline.

A Metering Lever set too low will decrease the volume of gasoline held in the Metering Chamber. This will force the Fuel Needle to be set more than 1 turn from STOP to compensate for less gasoline in the Metering Chamber.

A Metering Lever set too far out will increase the volume of gasoline held in the Metering Chamber. This will force the Fuel Needle to be set at less than ¾ turn from STOP.

If the internal Carburetor parts are replaced or removed it is a good idea to check the Metering Lever adjustment. The Metering Lever is adjusted in relationship to the circuit plate as shown in the Metering Lever Adjustment Diagram (Fig. 9).

Be careful that the Metering Lever tip is not set farther out than 0.031" (0.787mm), since this will cause the gasoline passageway through the Carburetor to remain open all the time. A setting of more than 0.031" will cause the machine to flood and be impossible to clear. After adjusting the Metering Lever be sure to readjust the Fuel Needle.



## Metering Lever Adjustment

FIGURE 9

To clean the CARBURETOR filter, proceed as follows:

1. Remove the plate, pump diaphragm and gaskets from the Carburetor. See diagram and illustrations.
2. Gently remove the filter screen taking care not to deform or spread the wire mesh.
3. Clean the screen in fresh gasoline
4. Re-assemble the parts as illustrated in the Carburetor breakdown.

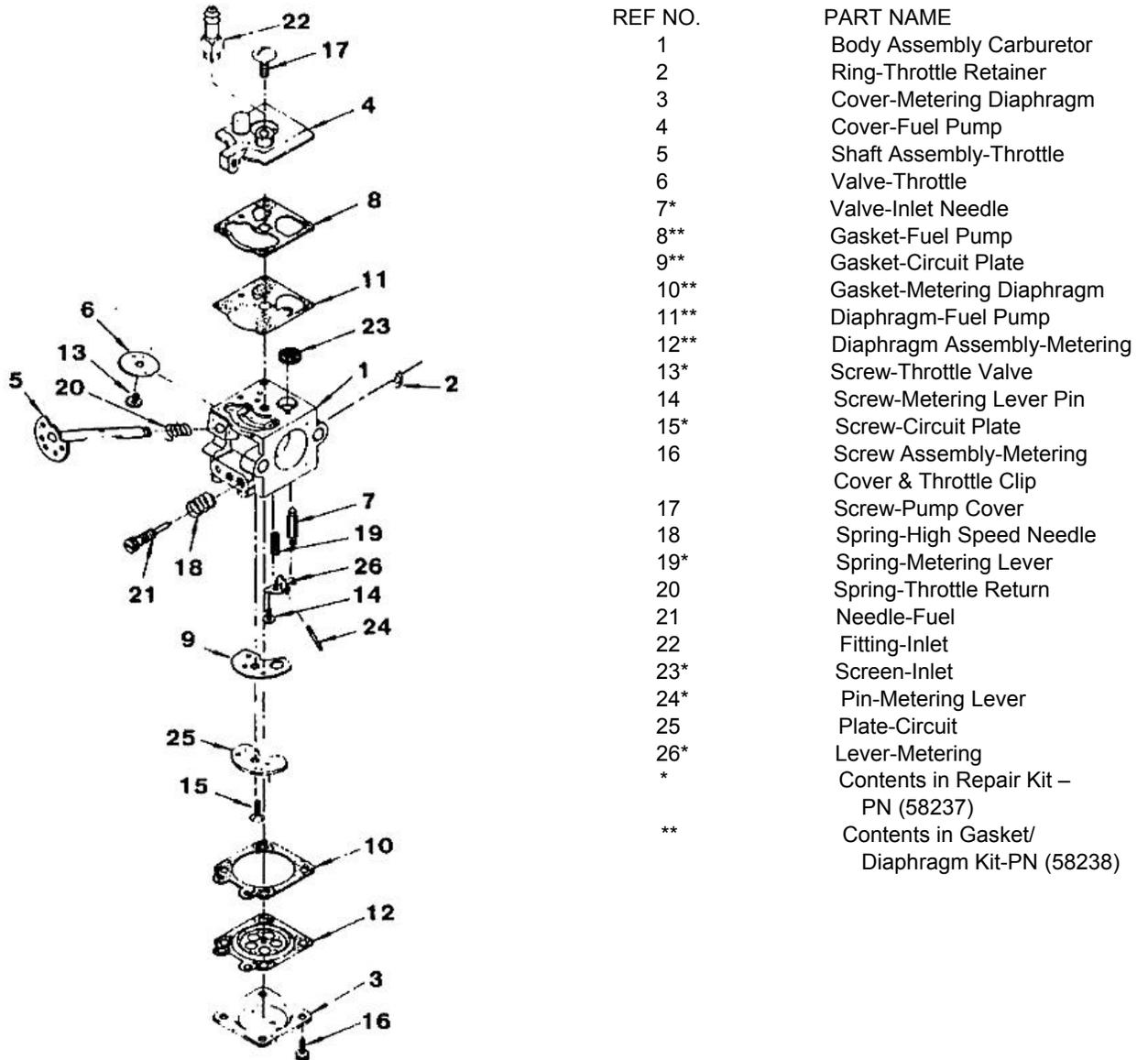


FIGURE 10

## Carburetor Assembly Diagram

## **TROUBLE SHOOTING**

Reduction of trouble begins with the performance of the prescribed maintenance actions. All maintenance actions should be performed before using this procedure. See the Systems Diagram (Page 32) for a schematic presentation of machine operation.

**Symptom:** The engine will not start.

**Check:**

1. The On-Off Control setting could be out of adjustment preventing starting air from reaching the engine. See the section on ADJUSTING THE ON-OFF CONTROL.
2. The machine could be out of gasoline or have very old and stale gasoline in the Fuel Tank. Use only fresh gasoline with Dyna-Fog® Fuel Stabilizer.
3. The Fuel Filter could be clogged.
4. Examine the starting air line to see if it is securely connected to the antechamber. Air should be pumped through the line when the air switch is pressed.
5. The spark plug may be weak or intermittent. If the spark plug is soaked with gas then the machine is flooded. Is the electrode gap correct? Refer to the MAINTENANCE section.
6. Remove the spark plug to see if gasoline reaches the spark plug. If the spark plug is not wet, then gasoline is not reaching the spark plug.

**Symptom:** There is no spark when the Ignition Switch is pressed.

**Check:**

1. The batteries may be too weak. Remember, batteries will go dead over a period of time whether they are used or not used.
2. Examine the wiring for loose connections. Is the spark plug boot firmly attached? Make sure the batteries are connected properly.
3. If the Ignition Switch begins to go bad, it may work in some positions but not in others.
4. After 1, 2 and 3 are tried, then the only possible remaining source of problems is the Ignition Coil. However, recheck the above before replacing the Ignition Coil.

**Symptom:** Gasoline does not reach the Antechamber.

**Check:**

1. The Primer Bulb lines for leaks. By removing the air filter top cover, fuel should be visible when the primer is depressed.
2. The Fuel Filter may be clogged.
3. The Fuel Needle may be closed.
4. The machine may be out of gasoline.
5. The On-Off Control may not be properly located for starting the machine.
6. The Inlet Needle Valve may be stuck in its seat. This frequently occurs when stale gasoline is used, or when the machine is left setting for long periods of time. To solve this problem the Metering Diaphragm Cover and Metering Diaphragm may have to be removed and the Inlet Needle Valve manually broken loose. See the section on the CARBURETOR. Use Dyna-Fog® Fuel Stabilizer, to reduce these types of problems.

# **TROUBLE SHOOTING**

**Symptom:** Machine floods easily.

**Check:**

1. Is the Fuel Needle properly set?
2. The spark plug gap must be properly set. If gap is too close the gasoline will fill the gap and prevent spark from occurring.
3. The Metering Lever could be set too far out.
4. Primer pump being depressed excessively.
5. Batteries may be weak.

**Symptom:** The engine runs weak.

**Check:**

1. Make sure the On-Off Control linkage is properly set. Linkage wheel should rotate fully counterclockwise to STOP. If not, adjust linkage.
2. Is there a carbon build-up? Check by looking with a flashlight. Refer to the MAINTENANCE section.
3. Is there an air leak at the bottom on the Carburetion Assembly?
4. Is the Fuel Needle out of adjustment causing the machine to run weak? See the CARBURETOR section.
5. Is the gasoline bad or dirty?
6. Is there large amounts of air in the gasoline line? Air bubbles make the machine run weak. Check the fuel line connections, including the two lines from the primer bulb to the Carburetor.

**Symptom:** The machine will not fog.

**Check:**

1. Is the Formulation Tank pressurized when the machine is running? If not, the pressurizing valve is bad or installed backwards.
2. Check the formulation delivery lines from the tank to the injection point on the engine to see if they are clogged. These lines will include the Formulation On-Off Valve and the Formulation Metering Valve.
3. Is the pressurizing valve in backwards? See the section on WORKING PRINCIPLES.
4. Check for carbon at the injection point. See MAINTENANCE section.
5. Is the air bleed screw on the bottom side of the formulation cap securely in place?



# **STORAGE AND SHIPMENT**

## **NOTE**

*It is a good idea to retain the original machine shipping carton as well as its inner packing and blocking materials for any storage and shipment which may be required.*

1. If the machine is functional, flush the formulation system in accordance with the instructions under MAINTENANCE. Drain the Formulation Tank and rinse it thoroughly using one of the liquids specified for FLUSHING under MAINTENANCE. When all the liquid has been removed from the Formulation Tank, re-install the Formulation Tank Cap Assembly.

2. Drain the Fuel Tank by removing the Fuel Tank Cap carefully counterclockwise (CCW). Re-install Fuel Tank Cap, then depress the AIR PUMP switch and the IGNITION SWITCH until no further firing occurs and no further fuel is observed in the Antechamber of the engine. This will clear out any fuel left in the lines or in the Carburetor.

3. Remove the Battery from the Battery container and store the Battery in a cool dry place.

4. Store the machine in a cool dry place and if the original carton is not available, cover the machine to avoid any accumulation of dust or dirt.

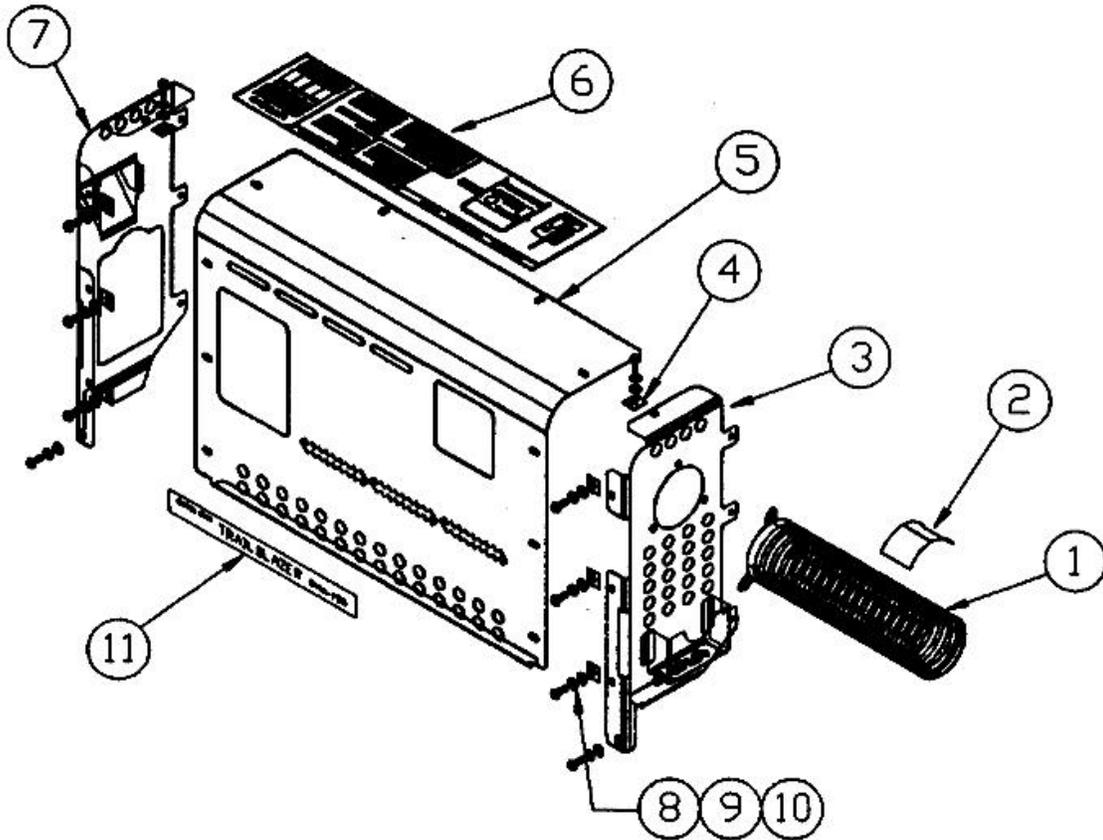
5. When the original carton and its inner packing and blocking materials are not available and the machine is to be shipped long distances or by commercial carrier, considerable care must be taken in packaging to avoid damage in transit.

## **WARNING**

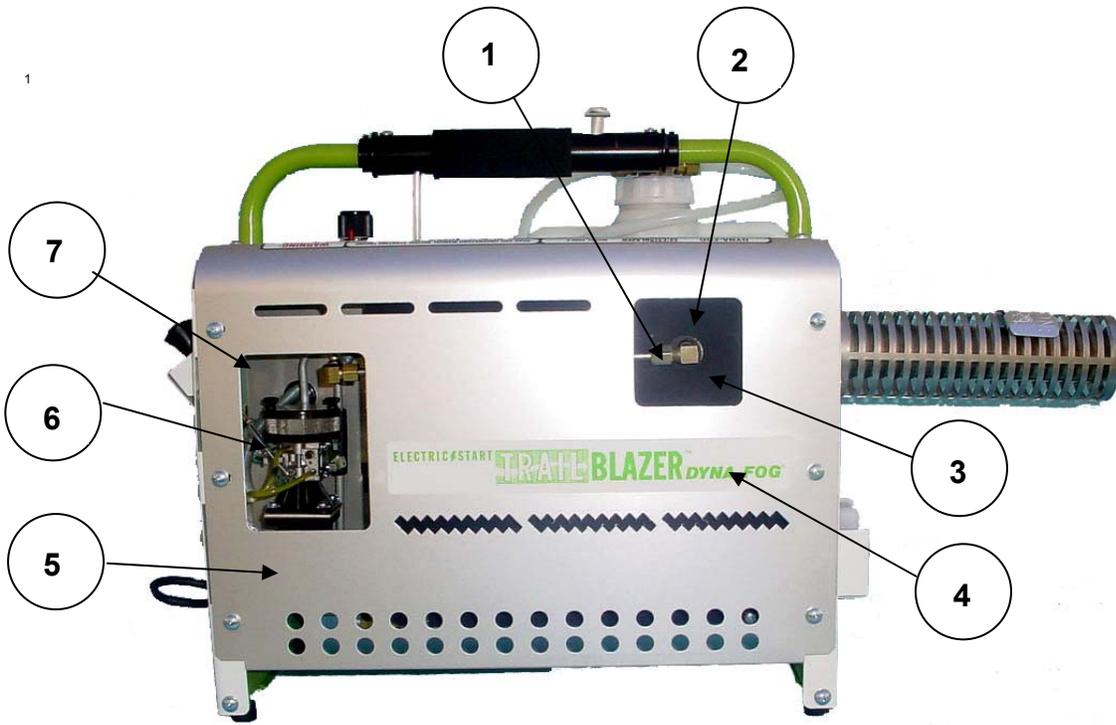
**IT IS AGAINST FEDERAL LAW TO SHIP INSECTICIDES AND FLAMMABLE LIQUIDS IN AN UNMARKED, NON-D.O.T. APPROVED CONTAINER WITHOUT PROPER LABELING AND U.N. NUMBER.**

**IF FOR ANY REASON IT BECOMES NECESSARY TO RETURN YOUR MACHINE TO OUR FACTORY, MAKE CERTAIN THAT THE FORMULATION AND FUEL TANKS HAVE BEEN DRAINED AND FLUSHED AS DESCRIBED ABOVE. IF A MACHINE IS RECEIVED THAT HAS NOT BEEN DRAINED AND FLUSHED, A SERVICE FEE WILL BE CHARGED FOR DOING SO.**

**Parts listing for The Engine Cover Assembly and  
Inlet/Discharge End Assemblies**

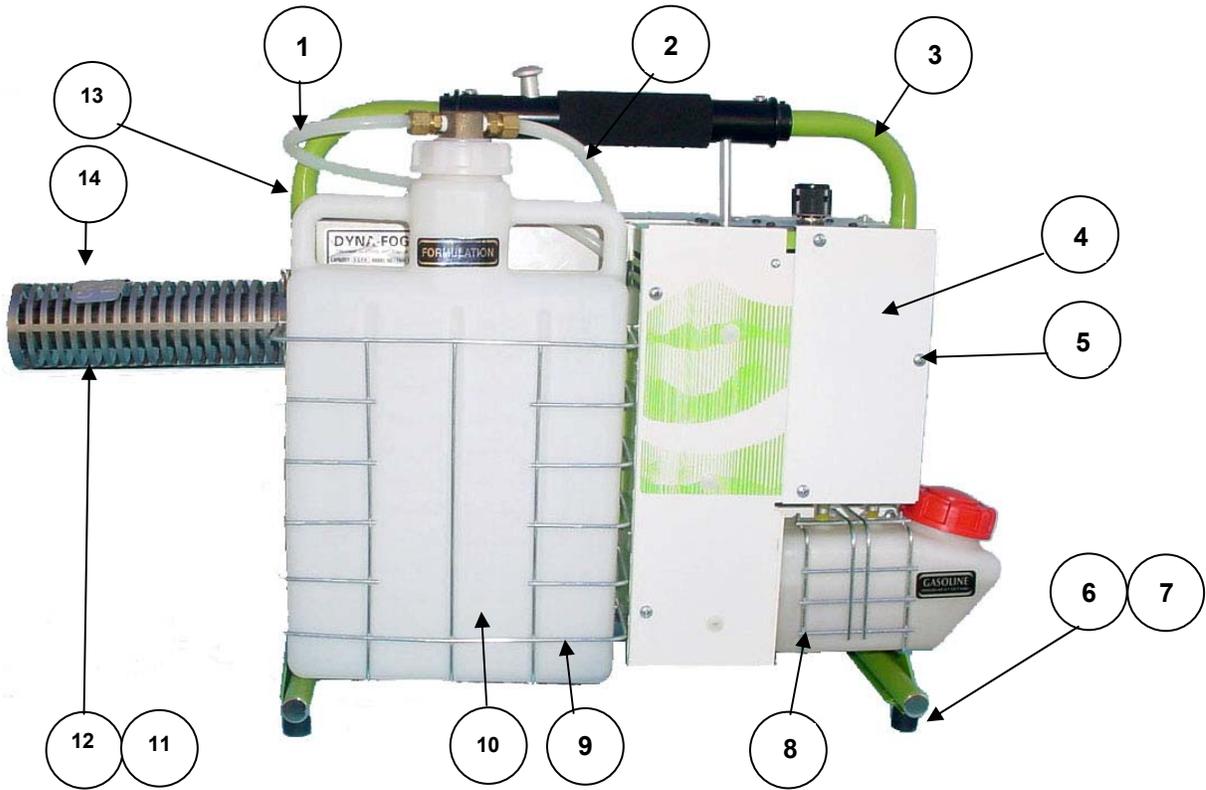


| ITEM | QTY | PART NO.  | DESCRIPTION              |
|------|-----|-----------|--------------------------|
| 1    | 1   | C-43245-1 | GUARD AY., LONG DUCT     |
| 2    | 2   | B-58706-1 | PLATE, CAUTION, HOT      |
| 3    | 1   | C-43331   | GUARD AY., DISCHARGE     |
| 4    | 8   | A-58707   | NUT, 10-24 J-TYPE        |
| 5    | 1   | D-43327-1 | COVER, ENGINE (WHT)      |
| 6    | 1   | B-43297   | LABEL, INSTR./DIAGRAM    |
| 7    | 1   | C-43332   | GUARD AY. INLET          |
| 8    | 10  | G-157678  | SCREW, 10-24 X 3/8, TRCR |
| 9    | 10  | G-138479  | WASHER, LOCK, 10 EXT.    |
| 10   | 10  | G-120391  | WASHER, FLAT, 10 REG.    |
| 11   | 1   | B-43250   | LABEL, TRAIL, LOGO       |



**ENGINE SIDE VIEW**

**FIGURE 11**



**TANK SIDE VIEW**

**FIGURE 12**

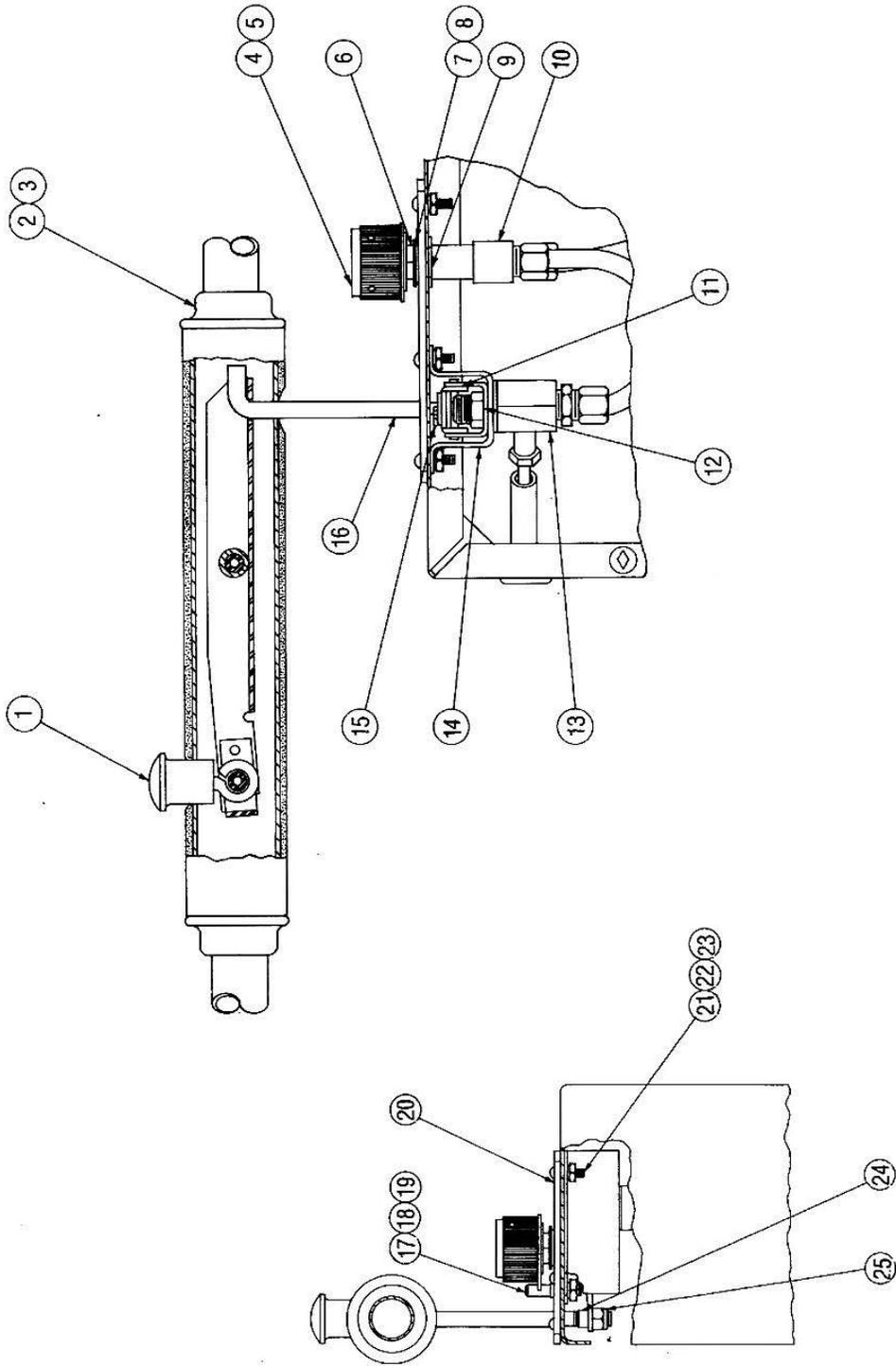
## ENGINE-SIDE VIEW

| <u>REF. NO.</u>         | <u>CURTIS PART NO.</u> | <u>DESCRIPTION</u>                         |
|-------------------------|------------------------|--------------------------------------------|
| <b><u>FIGURE 11</u></b> |                        |                                            |
| 1                       | B-43273                | Formulation injection line ay              |
|                         | A-43242                | Tube, form. Injection                      |
|                         | A-43244-3              | Sleeve, ¼ T flare                          |
|                         | A-43244-2              | Nut, ¼ T flare                             |
|                         | A-21120                | Union elbow                                |
|                         | G-145463               | Nut, ¼ Tube                                |
|                         | G-114628               | Sleeve, ¼ Tube                             |
|                         | A-58239                | Insert, brass, ¼ Tube                      |
| 2                       | A-43304                | Elbow/orifice ay.                          |
| 3                       | D-43279                | Engine/Housing Ay.                         |
| 4                       | A-3250                 | Label, Logo                                |
| 5                       | A-43335                | Cover Ay., Engine                          |
| 6                       | A-22231                | Linkage ay., carburetor                    |
| 7                       | D-43278                | Plate ay., main mounting (stainless steel) |

## TANK-SIDE VIEW

| <u>REF. NO.</u>         | <u>CURTIS PART NO.</u> | <u>DESCRIPTION</u>            |
|-------------------------|------------------------|-------------------------------|
| <b><u>FIGURE 12</u></b> |                        |                               |
| 1                       | A-43314-4              | Tubing, nylon                 |
| 2                       | A-43314-3              | Tubing, nylon                 |
| 3                       | C-43229                | Tube ay., rear support        |
| 4                       | C-43217                | Cover, control half           |
| 5                       | A-85361                | Screw, #10-16 x ½ TRCR        |
| 6                       | G-159929               | Screw, #10-25 x ⅝ PNCR        |
| 7                       | A-58284                | Foot, Rubber                  |
| 8                       | C-43043                | Fuel tank mounting wire guard |
| 9                       | D-43246-1              | Formulation tank wire guard   |
| 10                      | B-43275                | Formulation tank ay.          |
|                         | D-80020-2              | Tank, form. (mod)             |
|                         | B-43316                | Cap/insert ay.                |
| 11                      | B-43259                | Duct ay., outer air           |
| 12                      | B-43245-1              | Guard, exh. Tube              |
| 13                      | C-43228                | Tube ay., front support       |
| 14                      | 58706-1                | Plate, Caution "Hot"          |

# PARTS DIAGRAM



**FIGURE 13**

## HANDLE/CONTROL BOX AY.

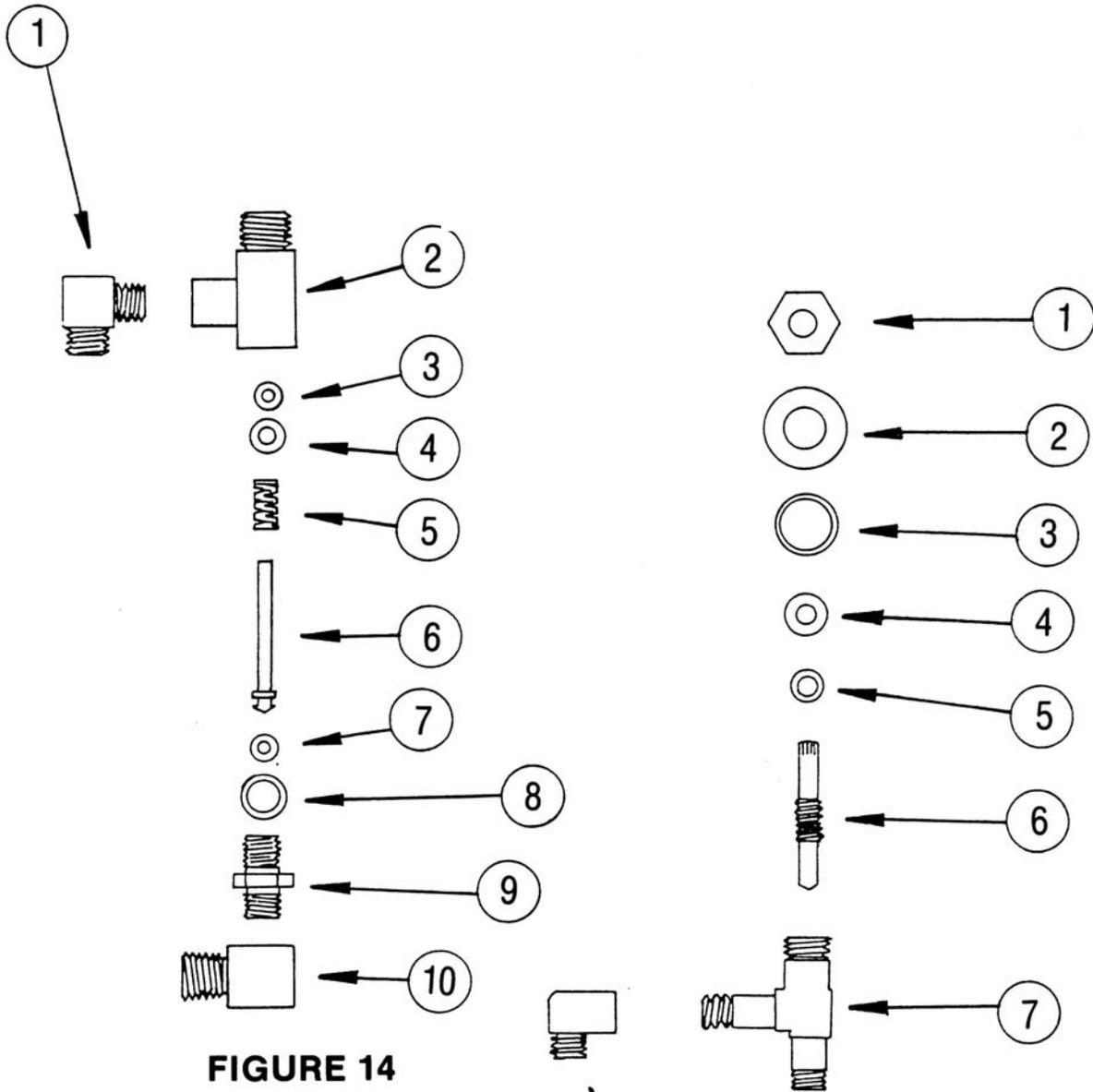
| <u>REF.</u><br><u>NO.</u> | <u>CURTIS</u><br><u>PART NO.</u> | <u>DESCRIPTION</u> |
|---------------------------|----------------------------------|--------------------|
|---------------------------|----------------------------------|--------------------|

---

### FIGURE 13

|    |             |                          |
|----|-------------|--------------------------|
| 1  | A-58545     | Knob, actuator           |
| 2  | A-43205     | Adaptor, handle          |
| 3  | G-140868    | Screw, set #10-24 x ¼    |
| 4  | B-58560     | Knob, control            |
| 5  | G-140853    | Screw, set, #8-32 x .187 |
| 6  | A-32692     | Nut, Packing             |
| 7  | A-20200     | Washer, flat             |
| 8  | B-10100-112 | O-ring                   |
| 9  | A-43291     | Plate, valve locating    |
| 10 | A-58557     | Valve ay., metering      |
| 11 | A-32851-1   | Lever & stop ay., valve  |
| 12 | A-32670     | Nut, ¾-24, brass         |
| 13 | B-32536-1   | Valve ay., shutoff       |
| 14 | B-43235     | Bracket, valve mounting  |
| 15 | A-20414     | Internal hair pin        |
| 16 | A-58553     | Rod, trigger             |
| 17 | A-58554     | Pin, indicator           |
| 18 | G-120614    | Nut, #10-32 hex.         |
| 19 | G-138479    | Washer, lock, #10, exto  |
| 20 | A-43206     | Plate, control (screen)  |
| 21 | N-58615     | Screw, #6-32 x ½ crph    |
| 22 | G-138526    | Washer, lock #6, into    |
| 23 | G-114524    | Nut, #6-32, hex          |
| 24 | A-10040     | Eyelet                   |
| 25 | G-9419454   | Nut, lock, ¼-20, hex     |

# PARTS DIAGRAM



**FIGURE 14**

**FIGURE 15**

## FORMULATION VALVE AY.

| <u>REF. NO.</u> | <u>CURTIS PART NO.</u> | <u>DESCRIPTION</u> |
|-----------------|------------------------|--------------------|
|-----------------|------------------------|--------------------|

---

### FIGURE 14

|    |            |                            |
|----|------------|----------------------------|
| 1  | A-21191-1  | 90° Elbow, 1/8 MPT - 1/4 T |
| 2  | A-32537    | Body                       |
| 3  | B-10100-8  | 'O' Ring                   |
| 4  | A-32044    | Washer                     |
| 5  | A-32048    | Spring                     |
| 6  | A-32538    | Stem                       |
| 7  | B-10100-7  | 'O' Ring                   |
| 8  | B-10100-12 | 'O' Ring                   |
| 9  | A-32543    | Connector                  |
| 10 | G-441789   | Elbow, 1/8 FP - 1/4 T      |

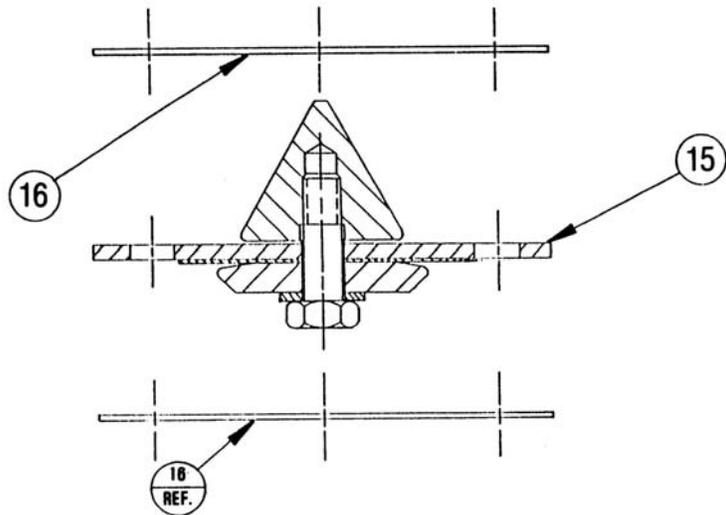
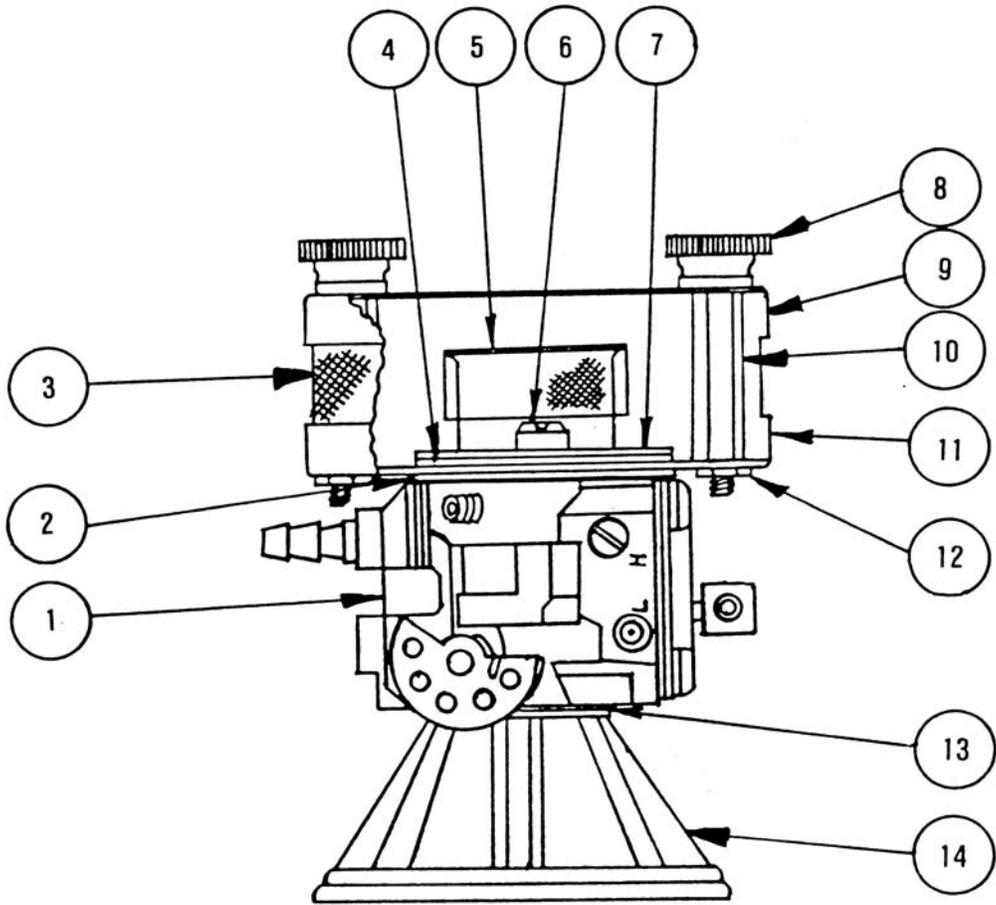
## METERING VALVE AY.

| <u>REF. NO.</u> | <u>CURTIS PART NO.</u> | <u>DESCRIPTION</u> |
|-----------------|------------------------|--------------------|
|-----------------|------------------------|--------------------|

---

### FIGURE 15

|   |             |                        |
|---|-------------|------------------------|
| 1 | A-32692     | Packing nut            |
| 2 | A-20200     | Washer, 53 ID x .75 OD |
| 3 | B-10100-112 | 'O' Ring               |
| 4 | A-32690     | Packing washer         |
| 5 | A-32691     | Brass washer           |
| 6 | A-32689     | Metering Stem          |
| 7 | B-32693     | Metering valve body    |
| 8 | G-441789    | Elbow, 1/8 FP - 1/4 T  |



**FIGURE 16**

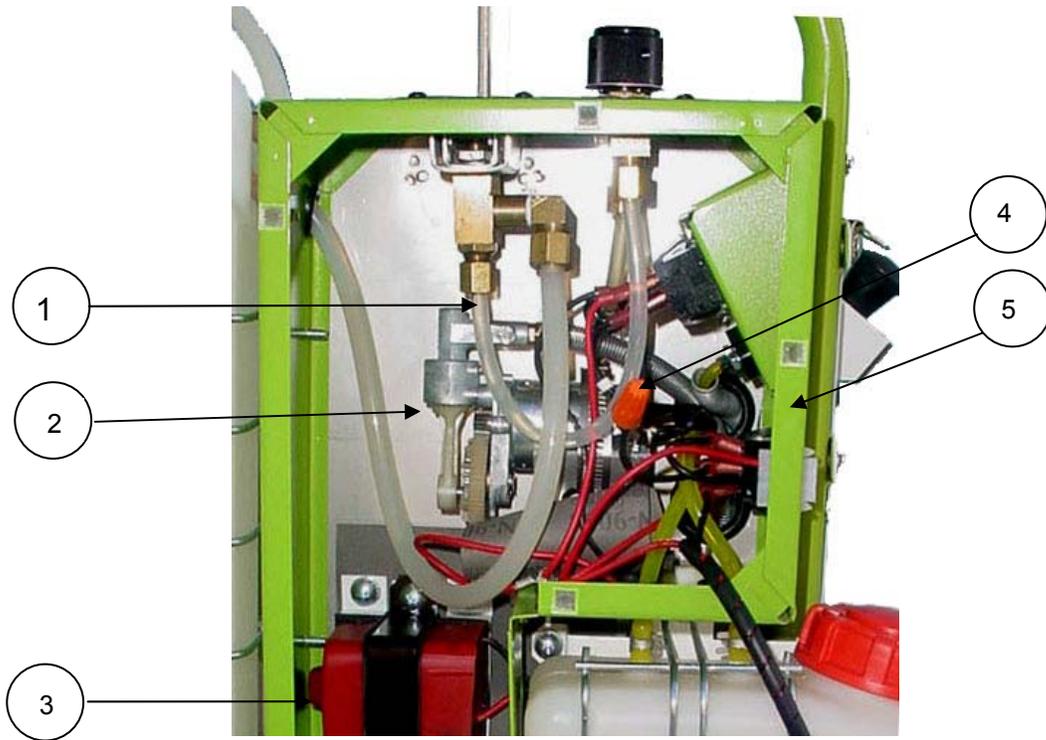
## VENTURI/CARBURETOR AY.

| <b>REF.<br/>NO.</b> | <b>CURTIS<br/>PART NO.</b> | <b>DESCRIPTION</b> |
|---------------------|----------------------------|--------------------|
|---------------------|----------------------------|--------------------|

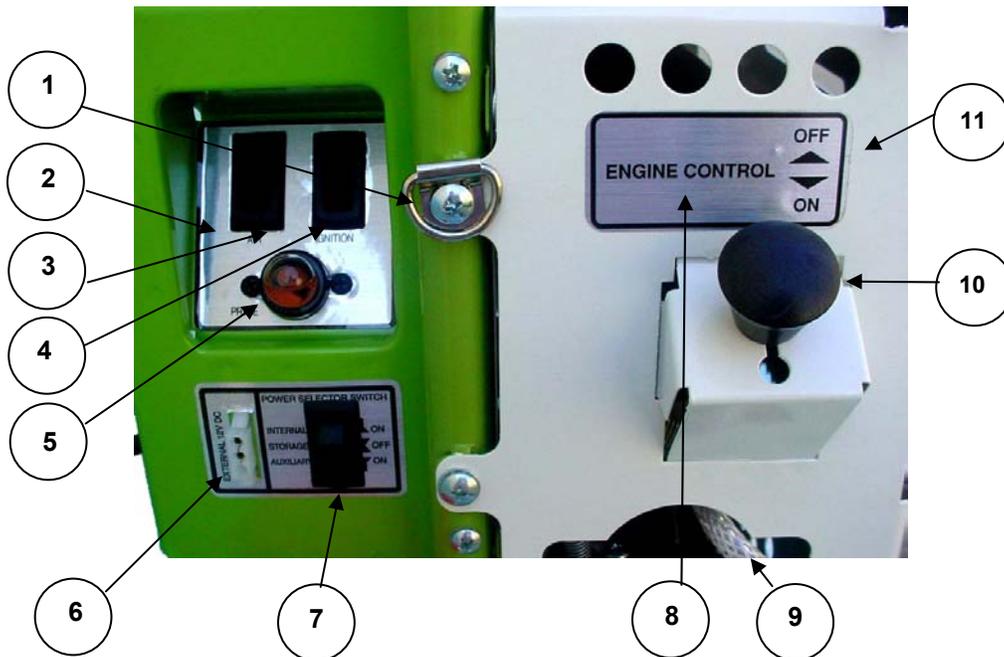
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### FIGURE 16

|    |           |                               |
|----|-----------|-------------------------------|
| 1  | C-58389-1 | Carburetor                    |
| 2  | A-58675   | Carburetor gasket             |
| 3  | B-58531   | Air filter screen             |
| 4  | A-58675   | Carburetor gasket             |
| 5  | A-58627   | Screen, 30 mesh, SSTL         |
| 6  | G-132080  | Screw, 10-24 x 2.0, fillister |
| 7  | A-58626   | Splash guard                  |
| 8  | A-58593   | Screw, 8-32, thumb, nylon     |
| 9  | B-53035-3 | Air filter housing            |
| 10 | A-58594   | Standoff, 8-32, m-f, nylon    |
| 11 | B-53035-1 | Start air housing             |
| 12 | A-58592   | Nut, 8-32, hex, nylon         |
| 13 | A-43016   | Carburetor gasket             |
| 14 | D-43011   | Carburetor adaptor            |
| 15 | A-32636   | Petal valve ay.               |
| 16 | A-32109   | Gasket, venturi               |



**FIGURE 17**



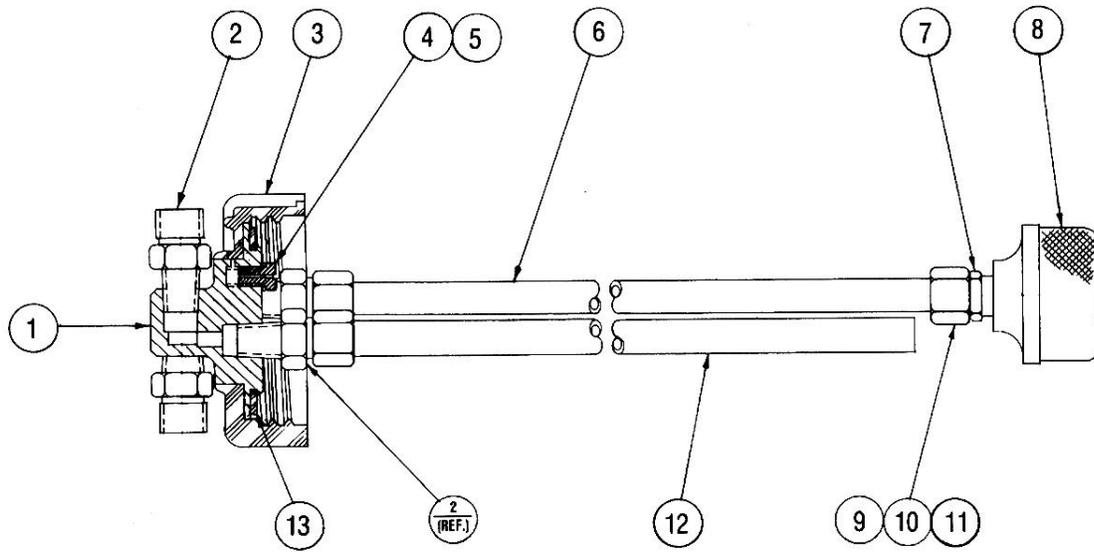
**FIGURE 18**

## VIEW OF CONTROL BOX AY.

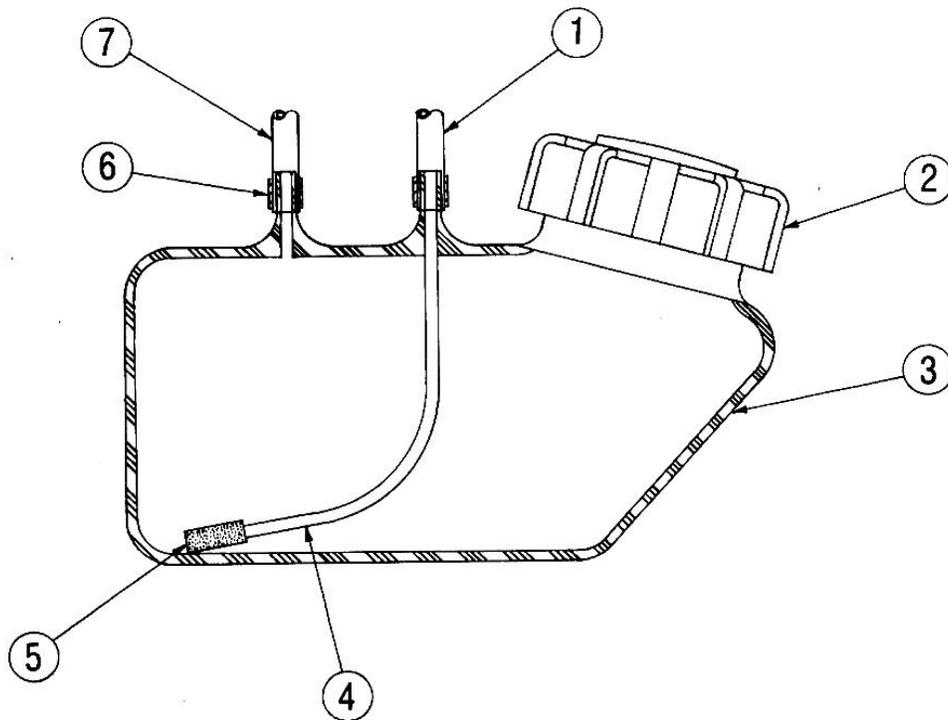
| <u>REF. NO.</u>         | <u>CURTIS PART NO.</u> | <u>DESCRIPTION</u>           |
|-------------------------|------------------------|------------------------------|
| <b><u>FIGURE 17</u></b> |                        |                              |
| 1                       | B-58212-7              | Tubing                       |
| 2                       | C-58517-2              | Pump/Bracket ay.             |
|                         | B-58519-2              | Pump ay., air                |
|                         | B-58518                | Bracket, air pump            |
|                         | A-58606                | Tube ay., pump/antech        |
|                         | B-86695                | Shield, comp.                |
|                         | A-58663                | Air pump bracket mount, wld. |
|                         | A-20054-2              | Clamp, worm drive            |
|                         | A-32809-3              | Insulator, air pump          |
| 3                       | B-43267                | Coil/Bracket ay.             |
|                         | A-58660                | Coil ay., ignition           |
|                         | B-58570                | Bracket, coil mounting       |
|                         | A-58591                | Pad, neoprene                |
|                         | B-43215                | Plate, coil mounting         |
| 4                       | A-45452                | Wire nut                     |
| 5                       | C-43263                | Control box/exp. nut ay.     |
| 6(not shown)            | B-43255                | Holder/Cover ay.             |
|                         | D-43230                | Cover, battery               |
|                         | B-43254                | Battery holder ay.           |

## MACHINE REAR-VIEW

| <u>REF. NO.</u>         | <u>CURTIS PART NO.</u> | <u>DESCRIPTION</u>    |
|-------------------------|------------------------|-----------------------|
| <b><u>FIGURE 18</u></b> |                        |                       |
| 1                       | A-11719                | Clamp, carry strap    |
| 2                       | A-43208                | Label, control panel  |
| 3                       | A-58609                | Switch, N.O., rocker  |
| 4                       | A-58609                | Switch, N.O., rocker  |
| 5                       | A-43264                | Primer bulb ay.       |
|                         | A-63428                | Primer bulb           |
|                         | A-58711-3              | Tubing                |
| 6                       | A-86676                | Label, power selector |
| 7                       | A-58655                | Switch, 3-pos. rocker |
| 8                       | A-43209                | Label, on/off control |
| 9                       | A-43310                | Tube Ay., Pulse       |
| 10                      | A-58272-6              | Control knob ay.      |
| 11                      | A-43332-3              | Guard Ay., Inlet      |



**FIGURE 19**



**FIGURE 20**

**FORMULATION CAP AY. P/N 43316**

| <b>REF.<br/>NO.</b> | <b>CURTIS<br/>PART NO.</b> | <b>DESCRIPTION</b> |
|---------------------|----------------------------|--------------------|
|---------------------|----------------------------|--------------------|

---

**FIGURE 19**

|    |           |                          |
|----|-----------|--------------------------|
| 1  | B-43290   | Cap insert               |
| 2  | A-21170   | Connector, 1/8P - 3/8T   |
| 3  | B-21010   | Cap, container           |
| 4  | A-43308-1 | Screw, bleed (red)       |
|    | A-43308-2 | Screw, bleed (black)     |
| 5  | B-10100-8 | 'O'-Ring                 |
| 6  | A-43314-1 | Tubing, nylon L = 15.00" |
| 7  | A-48095   | Connector 1/4P - 3/8T    |
| 8  | A-86643   | Filter 1/4 N.P.T.        |
| 9  | A-45744   | Nut, compr., 3/8T        |
| 10 | A-45745   | Sleeve, 3/8 brass        |
| 11 | A-48116   | Insert, brass, 3/8T      |
| 12 | A-43314-2 | Tubing, nylon, L-12.50"  |
| 13 | A-22232   | Gasket, viton            |

**FUEL TANK AY., P/N 43276**

| <b>REF.<br/>NO.</b> | <b>CURTIS<br/>PART NO.</b> | <b>DESCRIPTION</b> |
|---------------------|----------------------------|--------------------|
|---------------------|----------------------------|--------------------|

---

**FIGURE 20**

|   |            |                        |
|---|------------|------------------------|
| 1 | A-103044-9 | Tube, vinyl - .250     |
| 2 | B-22191-2  | Cap ay., red           |
|   | A-80279    | Gasket, cap            |
| 3 | D-43027    | Fuel tank              |
| 4 | A-20466-4  | Tube, nylon, NF44-.125 |
| 5 | A-80408    | Fuel filter            |
| 6 | A-80296-11 | Clamp, hose            |
| 7 | A-103044-9 | Tube, vinyl - .250     |

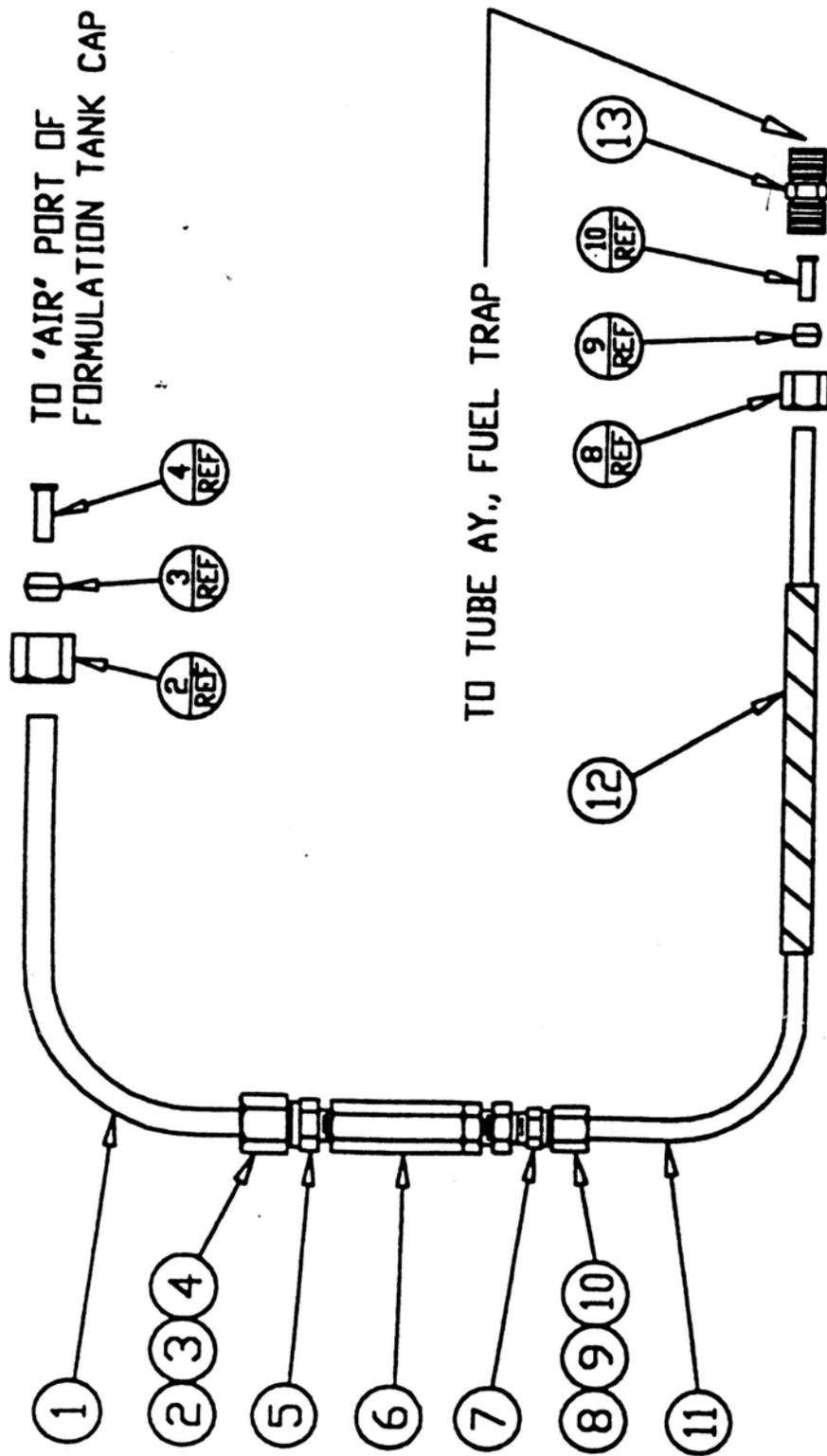


FIGURE 21

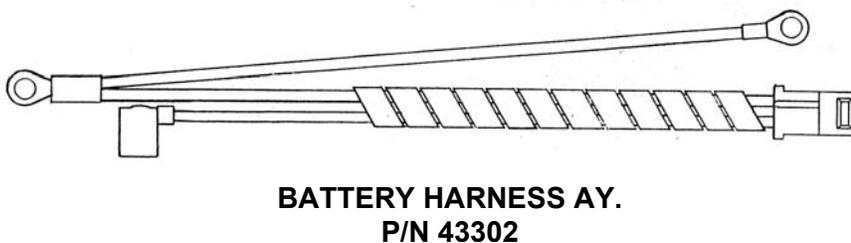
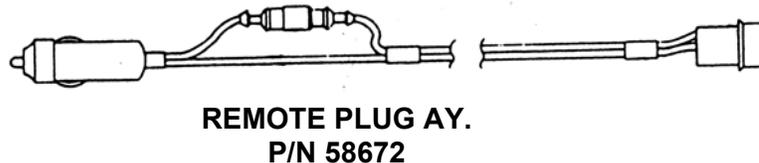
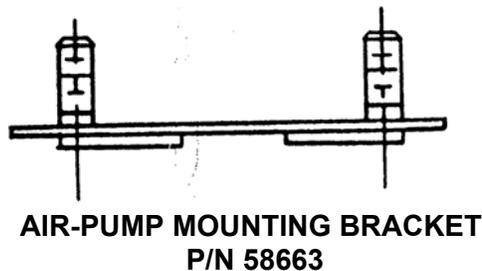
# LINE AY., PRESSURE

| REF.<br>NO. | CURTIS<br>PART NO. | DESCRIPTION |
|-------------|--------------------|-------------|
|-------------|--------------------|-------------|

## FIGURE 21

|    |            |                                               |
|----|------------|-----------------------------------------------|
| 1  | B-43314-3  | Tube, Nylon, .375 O.D.                        |
| 2  | A-45744    | Nut, Comp., $\frac{3}{8}$ T                   |
| 3  | A-45745    | Sleeve, $\frac{1}{4}$ T                       |
| 4  | A-48116    | Insert, Brass, $\frac{3}{8}$ T                |
| 5  | A-21170    | Connector, $\frac{1}{8}$ MP - $\frac{3}{8}$ T |
| 6  | B-58683-1  | Valve Ay., Pres., Aflas                       |
| 7  | G-441685   | Connector, $\frac{1}{8}$ MP - $\frac{1}{4}$ T |
| 8  | G-145463   | Nut, $\frac{1}{4}$ T                          |
| 9  | G-114628   | Sleeve, $\frac{1}{4}$ T                       |
| 10 | A-58239    | Insert, Brass, $\frac{1}{4}$ T                |
| 11 | B-58212-10 | Tube, $\frac{1}{4}$ O.D.                      |
| 12 | B-63414-4  | Harness, Wra                                  |
| 13 | G-441703   | Union $\frac{1}{4}$ T - $\frac{1}{4}$ T       |

Note: Pressure line Assembly (P/N A-43315-1) is including items 1 to 11 (except those indicated as "REF" on figure 21)



## ACCESSORIES



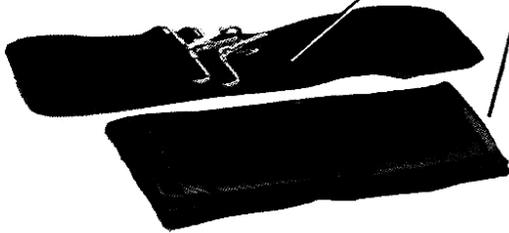
**AUXILIARY START BATTERY CABLE**  
P/N 58672

**ANTECHAMBER CLEANOUT BRUSH**  
P/N 58250



**CARRY STRAP**  
P/N 85574

**STRAP PAD**  
P/N 86226



**ENGINE CLEANOUT BRUSH**  
P/N 80264

## EQUIPMENT OPTION



| ITEM | PART NO. | DESCRIPTION    |
|------|----------|----------------|
| 1    | 86711-2  | 110V CHARGER   |
|      | 86711-3  | 220V CHARGER   |
| 2    | 86711-4  | 12V DC BATTERY |

**RECHARGEABLE 12 VOLT BATTERY  
FOR AUXILIARY STARTING**

# INDEX

|                                     |                   |
|-------------------------------------|-------------------|
| <b>BATTERIES.....</b>               | <b>21, 47</b>     |
| <b>CABLE, AUXILIARY START.....</b>  | <b>22, 47</b>     |
| <b>CARBURETOR.....</b>              | <b>23-29</b>      |
| <b>COIL, IGNITION.....</b>          | <b>38</b>         |
| <b>ENGINE</b>                       |                   |
| OPERATION.....                      | 6                 |
| SPECIFICATIONS.....                 | 3                 |
| WORKING PRINCIPLE.....              | 3-4               |
| <b>FILTER</b>                       |                   |
| AIR.....                            | 42                |
| FORMULATION.....                    | 19, 46            |
| FUEL.....                           | 21, 27, 44        |
| <b>FOGGING.....</b>                 | <b>11-17</b>      |
| <b>GASOLINE.....</b>                | <b>6</b>          |
| <b>MAINTENANCE.....</b>             | <b>18-21</b>      |
| <b>ORIFICE, INJECTION.....</b>      | <b>36</b>         |
| <b>PARTS, REPLACEMENT.....</b>      | <b>35-47</b>      |
| <b>PUMP</b>                         |                   |
| AIR, STARTING.....                  | 43                |
| FUEL, CARBURETOR.....               | 23-29             |
| <b>SAFETY PRECAUTIONS.....</b>      | <b>4-5</b>        |
| <b>SPARK PLUG.....</b>              | <b>20, 42</b>     |
| <b>SPECIFICATIONS, MACHINE.....</b> | <b>3</b>          |
| <b>STORAGE AND SHIPMENT.....</b>    | <b>33</b>         |
| <b>SWITCH</b>                       |                   |
| AIR.....                            | 43                |
| IGNITION.....                       | 43                |
| SELECTOR, POWER.....                | 22,43             |
| <b>TANK CAPACITY</b>                |                   |
| FUEL.....                           | 3                 |
| FORMULATION.....                    | 3                 |
| <b>TROUBLE-SHOOTING GUIDE.....</b>  | <b>30-31</b>      |
| <b>VALVE, METERING.....</b>         | <b>12, 32, 38</b> |

# MODEL 2600 SERIES 3 TRAILBLAZER

Machine Serial No.: \_\_\_\_\_

Date Purchased: \_\_\_\_\_

Purchased From: \_\_\_\_\_

\_\_\_\_\_

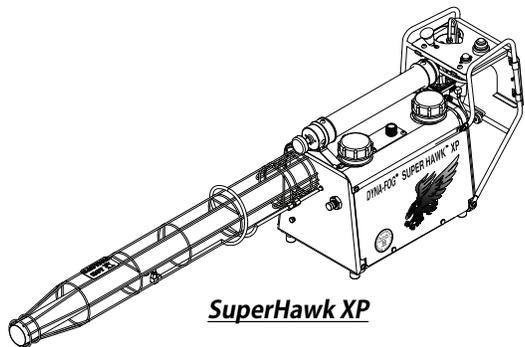
\_\_\_\_\_

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## HELPFUL CONVERSIONS

| <b>TO CONVERT</b> | <b>INTO</b>  | <b>MULTIPLY BY</b> |
|-------------------|--------------|--------------------|
| Ounces            | Milliliters  | 29.57              |
| Milliliters       | Ounces       | .034               |
| U.S. Gallons      | Liters       | 3.79               |
| Liters            | U.S. Gallons | .26                |
| Pounds            | Kilograms    | .45                |
| Kilograms         | Pounds       | 2.2                |
| Cubic Feet        | Cubic Meters | .028               |
| Cubic Meters      | Cubic Feet   | 36.2               |

# Dyna-Fog Offers a Complete Assortment of Sprayers and Foggers



***SuperHawk XP***

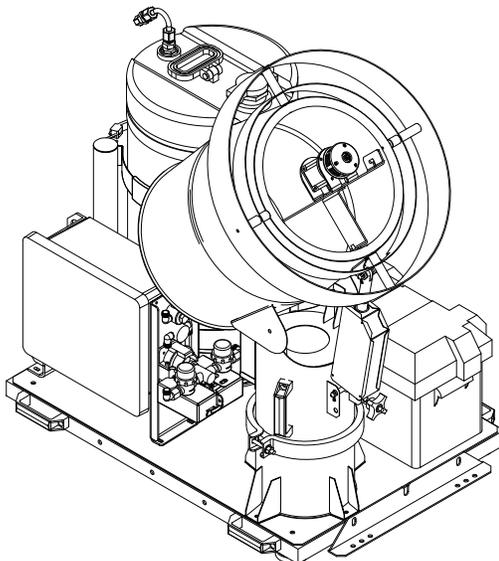
## **PULSE-JET POWERED THERMAL FOGGERS:**

From 0-120 GPH (0-453 LPH) output. Our complete line include different models like the Superhawk, Golden Eagle, Trailblazer, Falcon, Patriot, Blackhawk, Mister III, SilverCloud and Model 1200. Portable or Truck mounted machines. Different models are available for Oil base or Water base formulations.

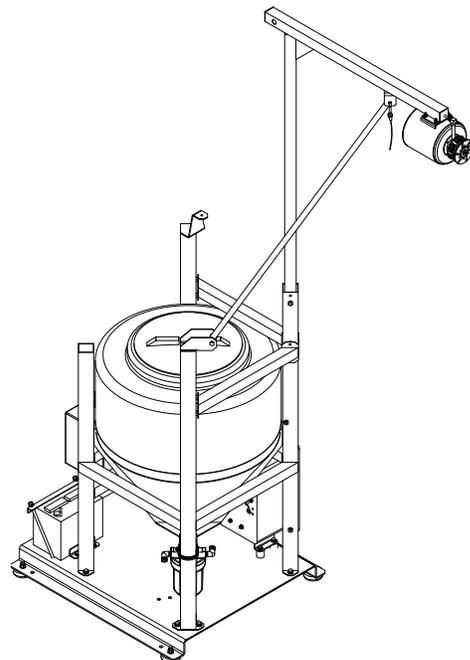
## **ELECTRIC ROTARY ATOMIZERS:**

***DYNA-JET L30:*** State-of-the-Art, Electric Rotary Atomizer ULV Aerosol Generator. 12 VDC, Light Weight, Truck mounted Machine with FMI pump. Optional Syncroflow Available.

***DYNA-JET L15:*** Drift Sprayer for migratory pest control like Locust. Flow Rate from 0 to 2 L/min. Optional Radar Syncroflow.



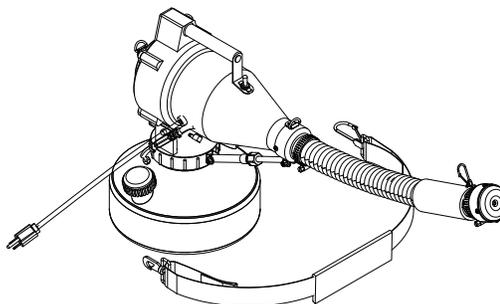
***Dyna-Jet L-30***



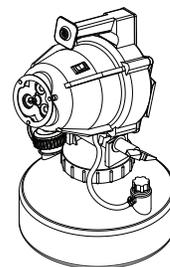
***Dyna-Jet L-15***

## **ELECTRIC HAND-HELD ULV/MIST GENERATORS:**

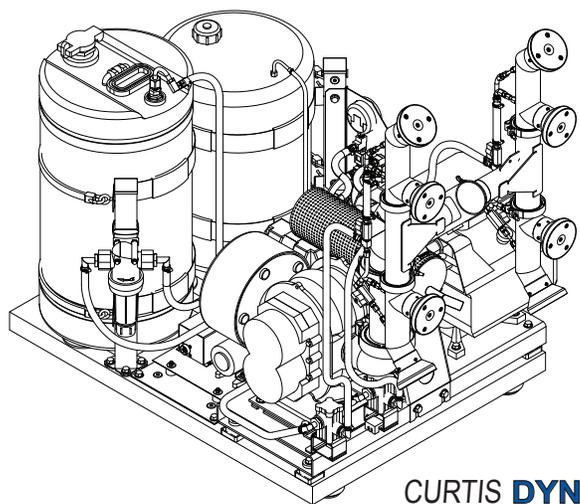
A Full line of electric cold fog applicators with 1-3 gallon tanks, available in 115 and 230 VAC.



***Cyclone Ultra-Flex***



***Hurricane ES***



***LV-8***

## **COMBUSTION ENGINE DRIVEN ULV AEROSOL GENERATORS:**

Truck mounted Units powered by 8, 9, 11, 18 and 20 HP four cycle, OHV Gasoline Engines. Diesel versions also available. One, two, four and eight nozzle configurations. Patented full remote control of boom functions (rotation of turntable and angle of nozzles) available on certain models. Your choice of Gear, Piston or Diaphragm pumping system. Pressurized system versions available for specific international markets. Optional Automatic flow control "Syncroflow" also available with Radar or GPS speed sensing. 25 cc and 40 cc two cycle portable models are also available.