

PATRIOT™

MODEL 2595



**INSTRUCTION MANUAL FOR OPERATION, SERVICE AND
MAINTENANCE FOR PATRIOT™, MODEL 2595**

MANUFACTURED BY:

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

Trade-mark Reg. U.S. Patent Office

INSECTICIDAL FOG GENERATOR

U.S. PATENTS: 2,715,390; 2,738,334; 2,857,332; 2,950,592; 2,970,430;
3,052,094; 4,030,695; 3,151,454; 4,343,719; 4,811,901
4,934,601

Canadian Patent: 762,939

German Patent: 31-48-522

Japanese Patent: 1,587,278

Other U.S. and Foreign Patents Pending.

Manufactured By

CURTIS DYNA-FOG[®], LTD.

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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 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 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.

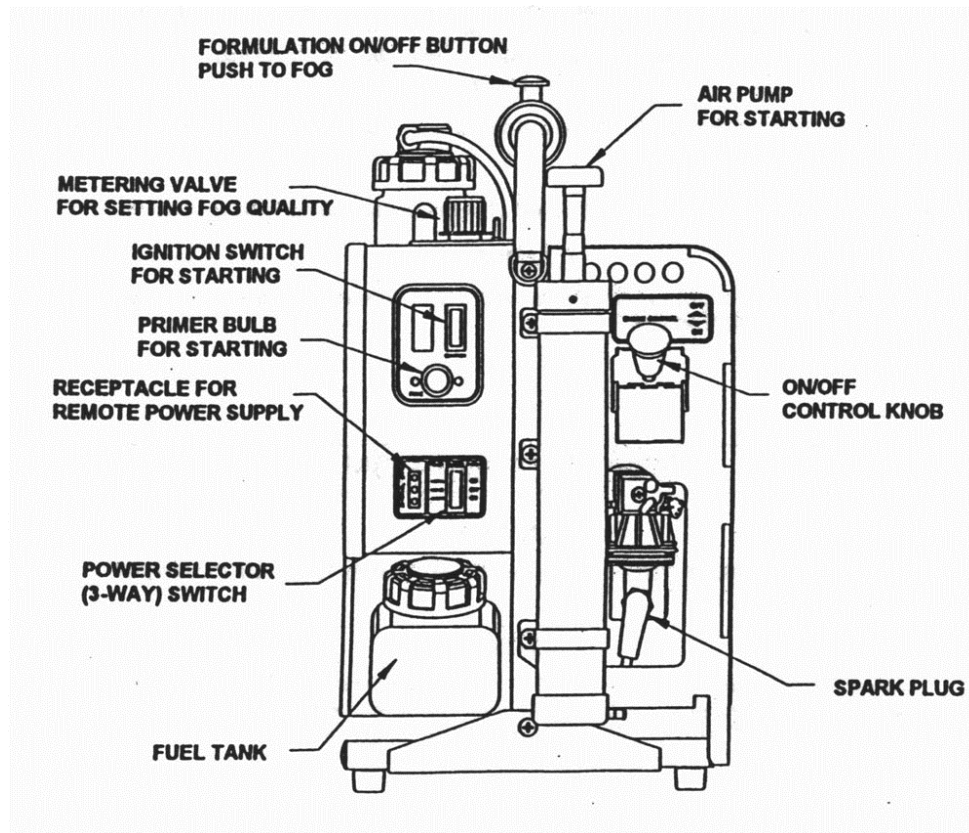


FIGURE 1

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. Position 3-WAY SWITCH for intended battery source.
2. Lift ON/OFF KNOB to ON position.
3. Depress and release PRIMER BULB until fuel reaches bulb. Once fuel reaches bulb, pump bulb (1-2) times only. (A HOT engine requires little or no priming to start. A COLD engine requires (1-2) primes once the fuel reaches the carburetor.)
4. Simultaneously hold down IGNITION SWITCH and fully stroke the AIR PUMP at steady speed until engine begins to run. Once the engine is running, continue to hold down the IGNITION SWITCH until engine is warm and running strong.

IMPORTANT: A “FLOODED” engine may require several steady pumps to start. If the engine has not started within (20) pumps, repeat steps 3 and 4.

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.

Difficult starting is usually a result of weak batteries, carbon formation in the engine neck, and/or stale gasoline.

WARNING

NEVER ACTUATE CASOLINE PRIMER BULB WITH CONTROL KNOB IN OFF POSITION.

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 fully stroke the air pump at steady speed.
4. If the engine has not started within approximately 20 pumps, repeat steps 3 and 4 of starting instructions on page 11.

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 cannot 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.

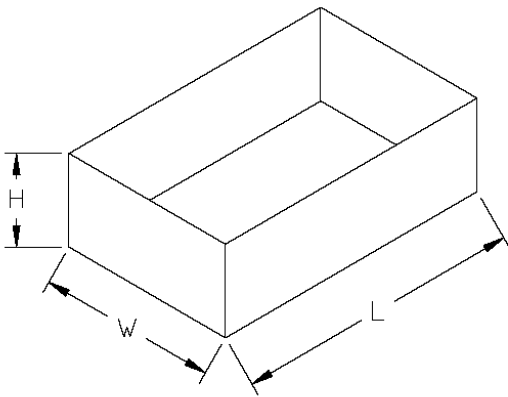
ALWAYS USE THE APPROPRIATE SAFETY EQUIPMENT AND DRESS ACCORDING TO THE CHEMICAL FORMULATION WHICH IS BEING USED.

PREPARING TO DISPENSE FOG

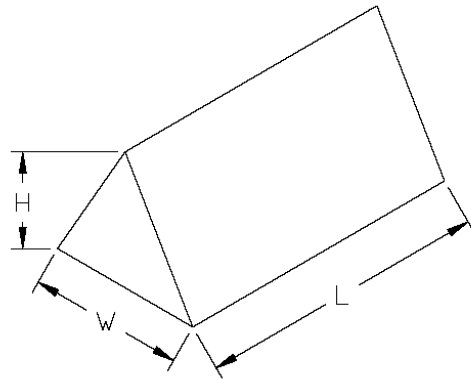
FOGGING WITHIN ENCLOSED SPACES:

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:



$$V = L \times W \times H$$



$$V = \frac{L \times W \times H}{2}$$

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: $\frac{(1.3 \text{ oz.})}{2} = 1.3 \text{ ounces}$

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

$$\frac{(3900 \text{ cu. ft.}) \times (1 \text{ oz.})}{2} \times \frac{(3 \text{ oz.})}{(60 \text{ seconds})}$$

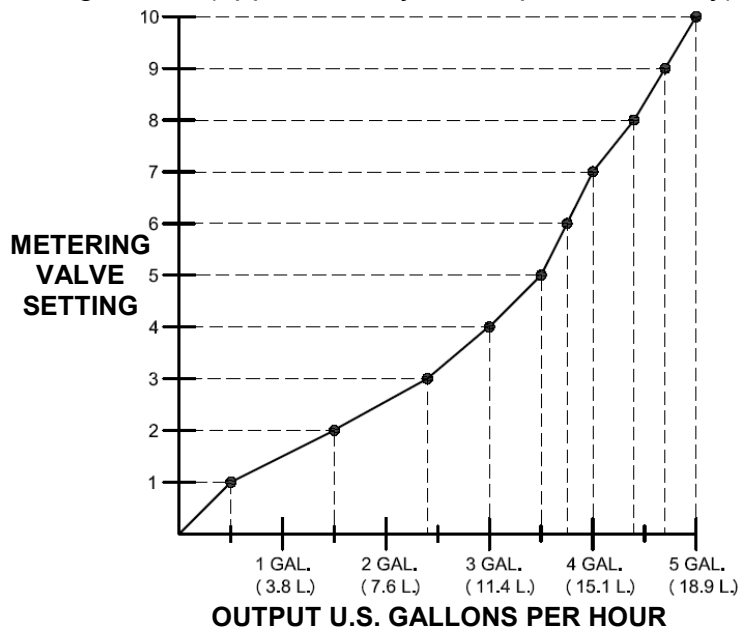
Where t = normal time to fog, and 3 oz. is the average machine flow rate to achieve a "dry fog."

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

FOGGING OUTDOORS: Read and follow all cautions and warnings for "Dispensing Fog" on pages 19 and 20. Read and follow the instructions for thermal fogging on the chemical solution label.

METERING VALVE SETTING VS. FLOW RATE

The graph on the right 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.



Flow rates for Metering Valve Setting, oil-based formulations. Use setting #3 for water-based formulations.

Metering Valve Settings	Gal. per hour
#1	.5
#2	1.5
#3	2.4
#4	3
#5	3.5
#6	3.75
#7	4
#8	4.4
#9	4.7
#10	5

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 Cu. Ft (Cu. meters)	Average Flow Rate* to achieve "DRY" Fog Oz/Min (ML/Min)	Fogging Time (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 Cu. Ft (Cu. meters)	Average Flow Rate* to achieve "DRY" Fog Oz/Min (ML/Min)	Fogging Time (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 19-20, and "Note" on page 20. To test the fog to verify that it is "dry," see "Caution" on page 20.

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 PAGE 16 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 L/HR) OR 3 OZ/MIN, (90 ML/MIN) "DRY-FOG" AS SHOWN.

ADDING FORMULATION

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 L/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

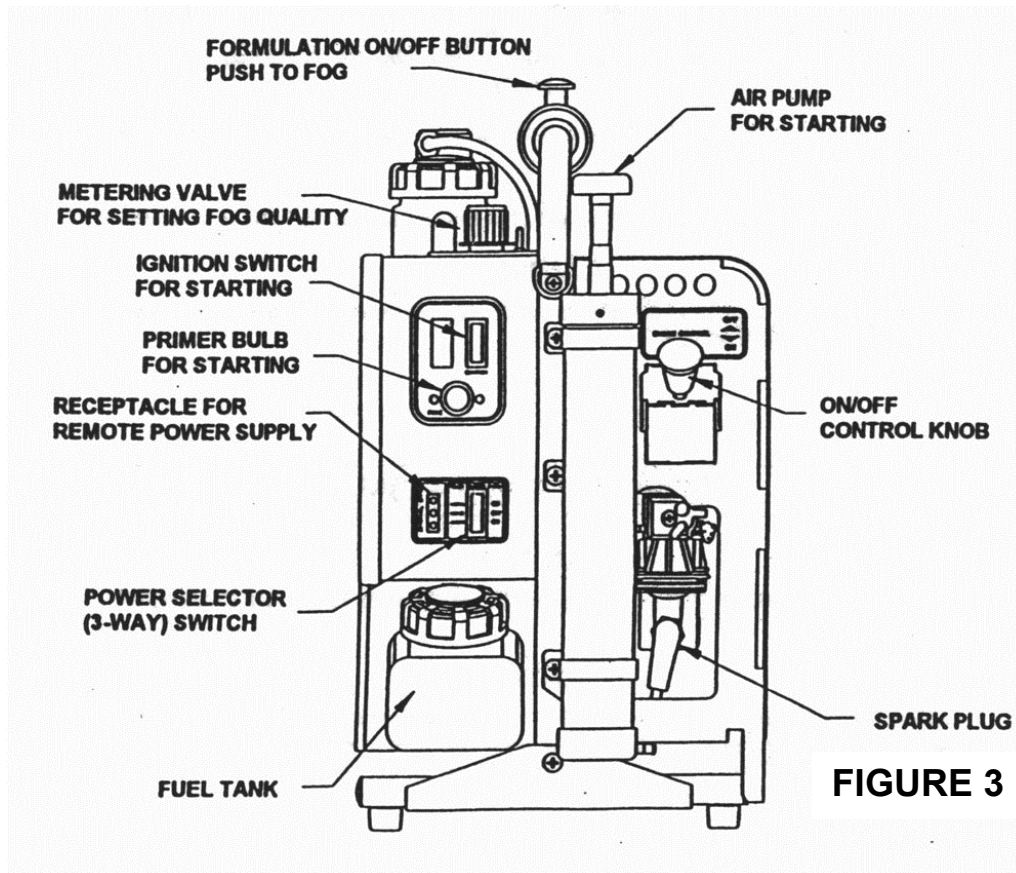
The formulation flow to the INJECTION ORIFICE is controlled both by a FORMULATION METERING VALVE which controls the formulation flow rate and an ON/OFF Valve. The FORMULATION METERING VALVE is marked with the numbers "0" through "10". These numbers are relative indicators of fog quality but are not absolute 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.



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.

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 56) 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 24)

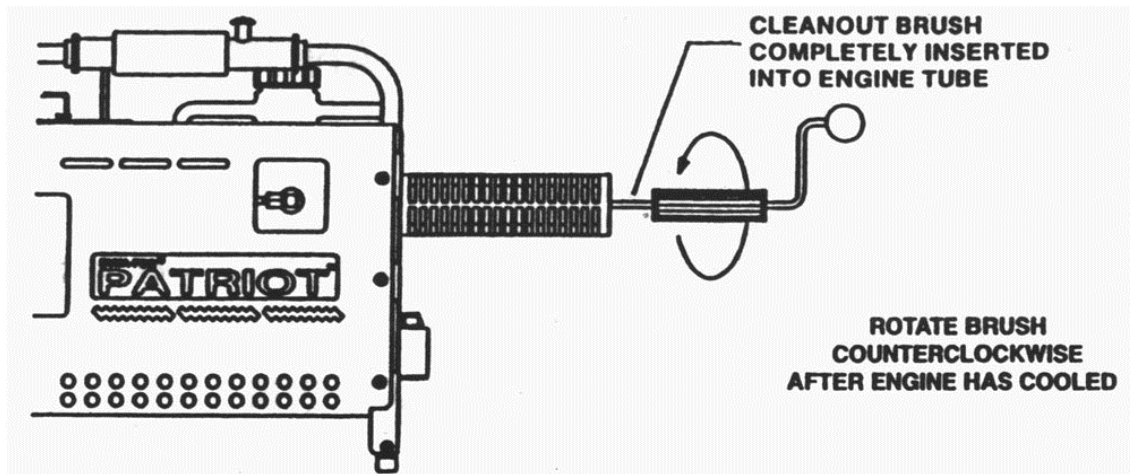


FIGURE 4

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.

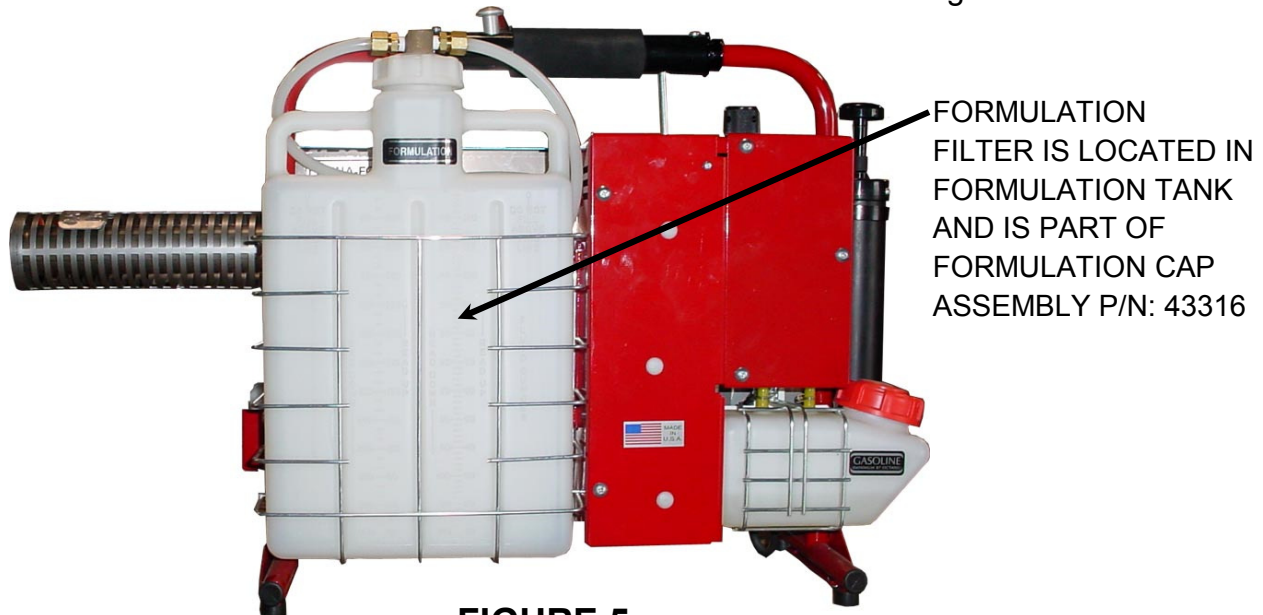


FIGURE 5

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.

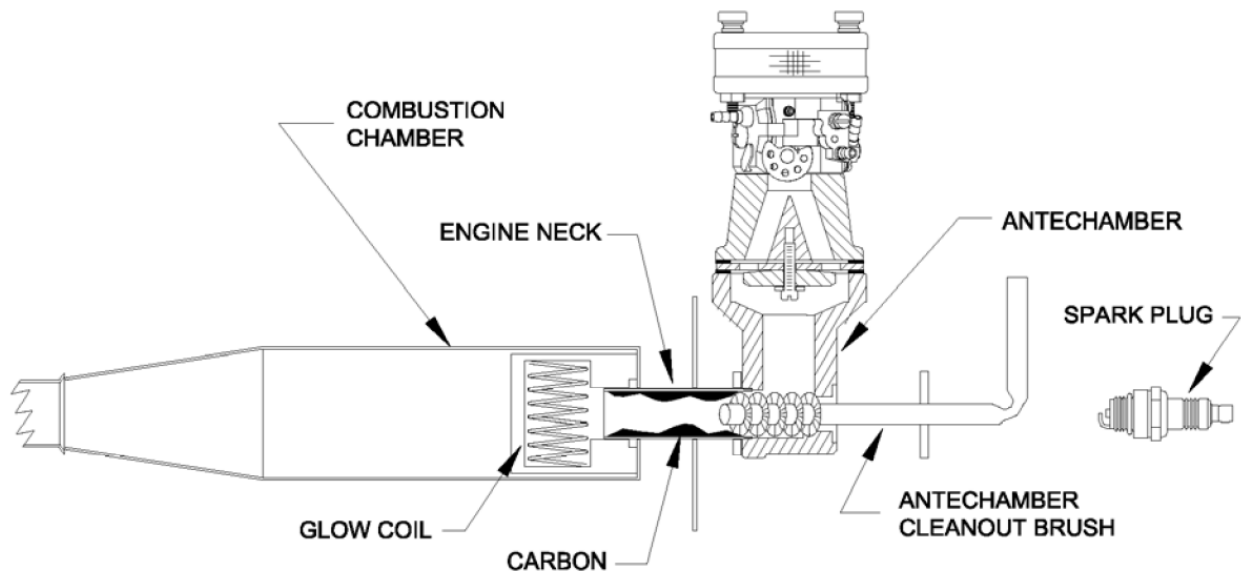


FIGURE 6 ANTECHAMBER CLEANOUT DIAGRAM

AFTER EVERY TWELVE (12) HOURS OPERATION

Clean Formulation Injection Nozzle

1. Disconnect the Formulation Injection Line (Page 42, Fig. 11, Ref. 1) at the injection end and then remove the elbow Ay. (Page 42, Fig 11, 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 (Page 52, Fig. 19, Ref. 5) 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 (Page 42, 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 DC. This voltage will vary slightly with battery age and with the ambient temperature conditions. Under some circumstances, it may vary as much as ± 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 RECHARGED, THEY MAY LEAK AND EXPLODE.

AUXILIARY START BATTERY CABLE

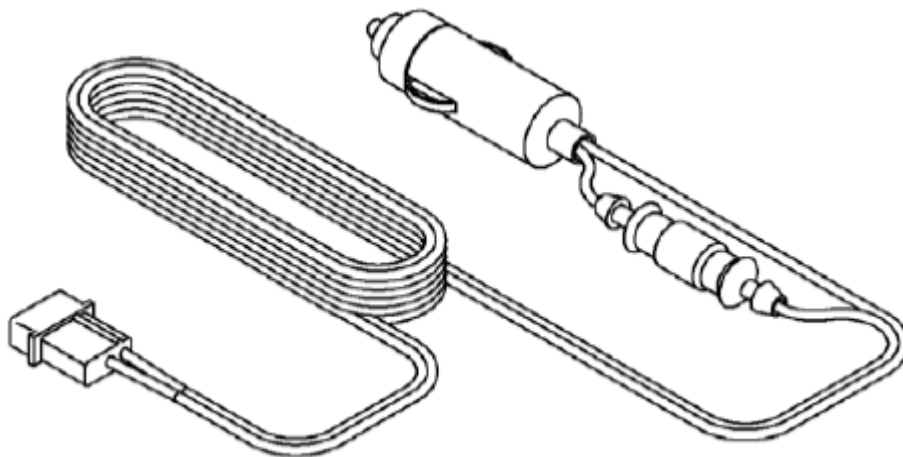


Figure 5
Auxiliary-Start Battery Cable

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, (Page 50, Fig. 17, Ref. 6) 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, 7.5 amp hour, lead acid battery (See below) for starting your machine.

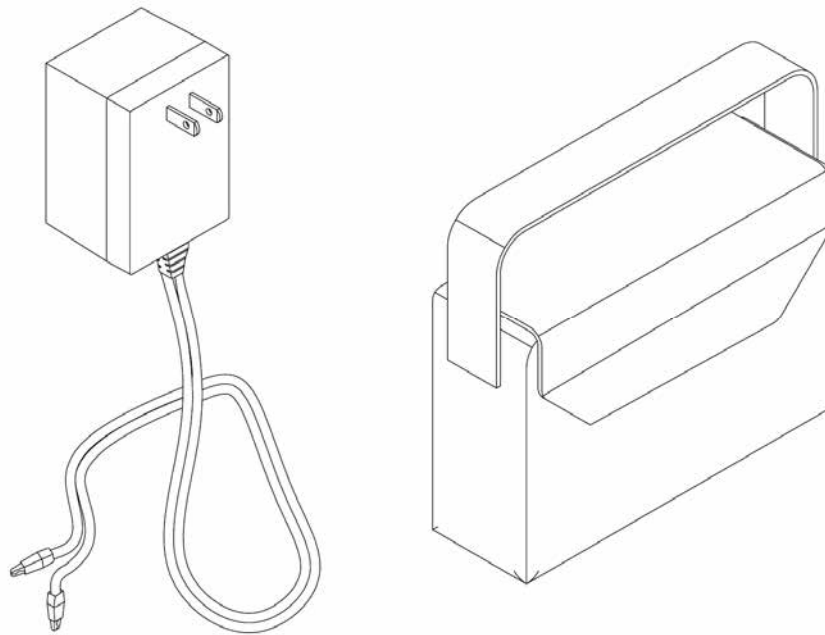


FIGURE 6
Auxiliary-Start Battery Cable

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. Over tightening may damage the carburetor.

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

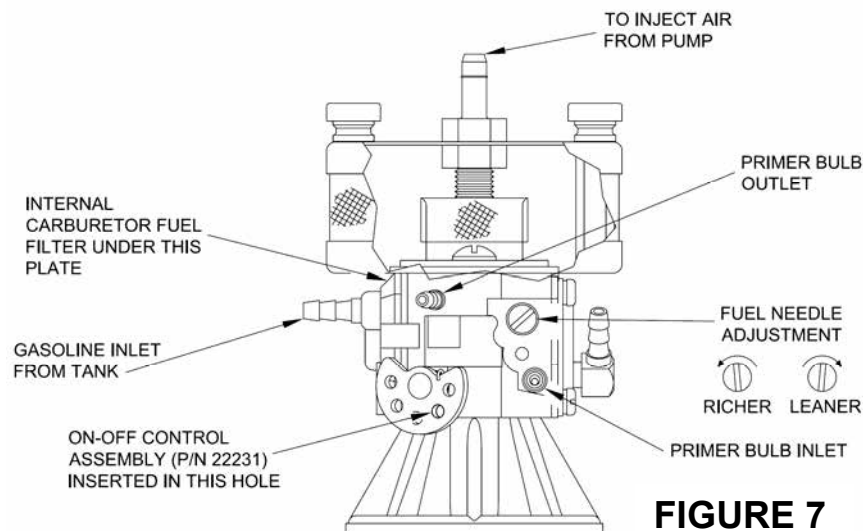


FIGURE 7

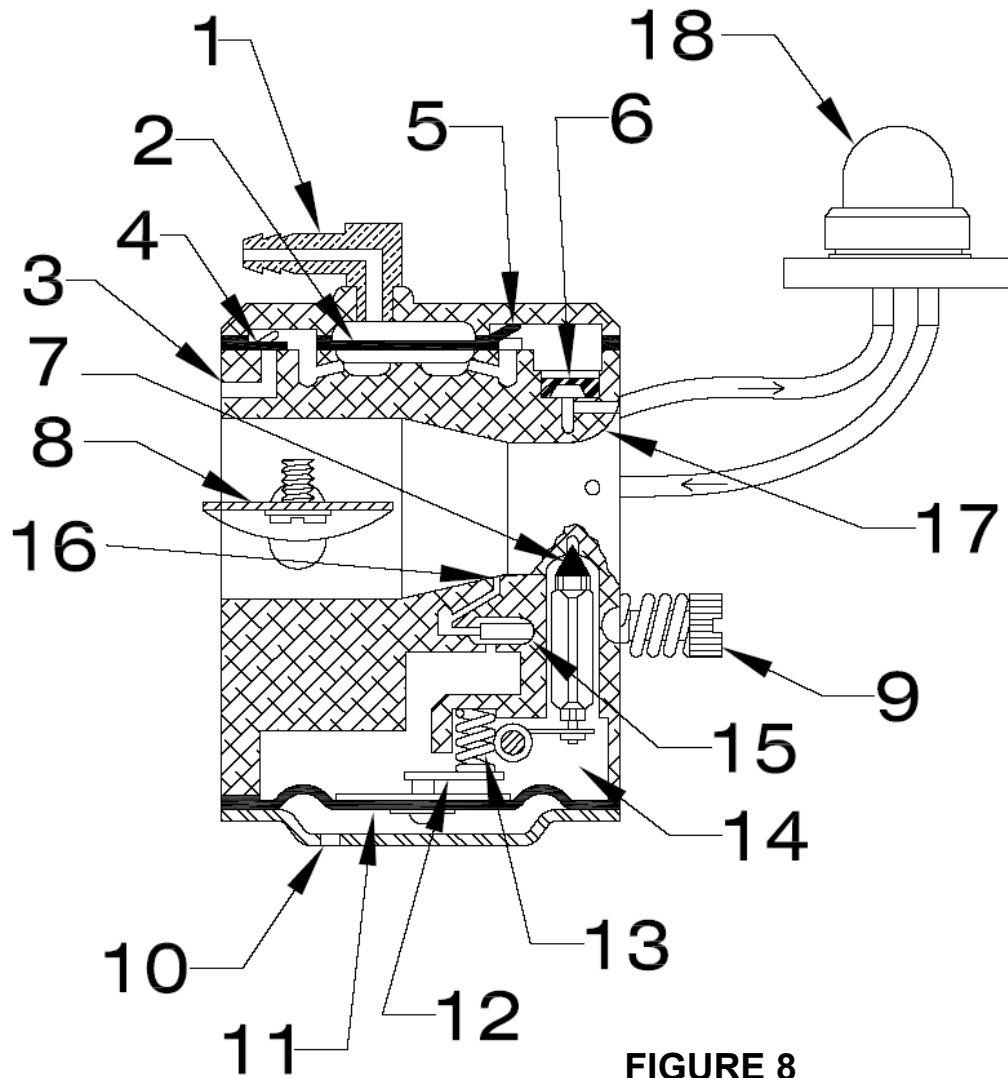


FIGURE 8

Carburetor Systems Diagram Operating Functions

- | | |
|--|---|
| <p>1. Engine Impulse: Actuates Fuel Pump Diaphragm alternating pressure-vacuum pulses.</p> <p>2. Fuel Pump Diaphragm: Fluctuates in response to engine impulse. Transfers fuel through Fuel Pump Valves.</p> <p>3. Fuel Inlet: Fuel drawn from tank.</p> <p>4. Inlet Valve: Responds to Fuel Pump Diaphragm. Opens during vacuum pulse. Closes during pressure pulse.</p> <p>5. Outlet Valve: Closes during vacuum pulse. Opens during pressure pulse.</p> <p>6. Filter Screen: Filter fuel on route to Metering Chamber.</p> <p>7. Inlet Needle Valve: Lifts off seat to allow fuel entry into Metering Chamber.</p> <p>8. Butterfly Valve: Shuts off air flow stopping engine.</p> <p>9. Fuel Needle: Adjusts fuel richness.</p> | <p>10. Atmospheric Vent: Allows air pressure against the Metering Diaphragm.</p> <p>11. Metering Diaphragm: Drawn up by vacuum while engine is running to activate Metering Lever.</p> <p>12. Metering Lever: Lifts Inlet Needle Valve off seat.</p> <p>13. Metering Lever Spring: Transmits force to Metering Lever. Closes Inlet Valve as Metering Chamber fills.</p> <p>14. Metering Chamber: Fuel reservoir.</p> <p>15. Nozzle Well: Fuel is drawn in from Metering Chamber at high speed.</p> <p>16. Nozzle: Increases fuel discharge at high speed.</p> <p>17. Venturi: Increases air velocity at Nozzle, creating a suction to draw fuel into Throttle Bore.</p> <p>18. Priming Pump: Used to supply fuel to antechamber for starting.</p> |
|--|---|

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 32 & 33)

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

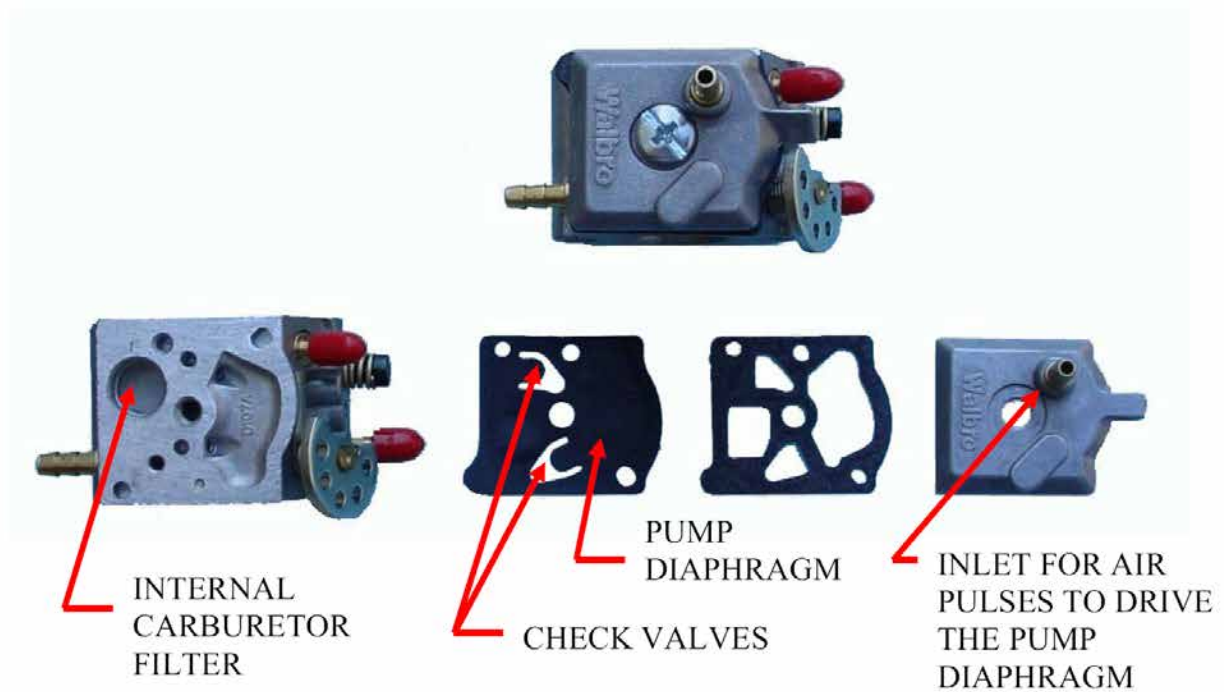
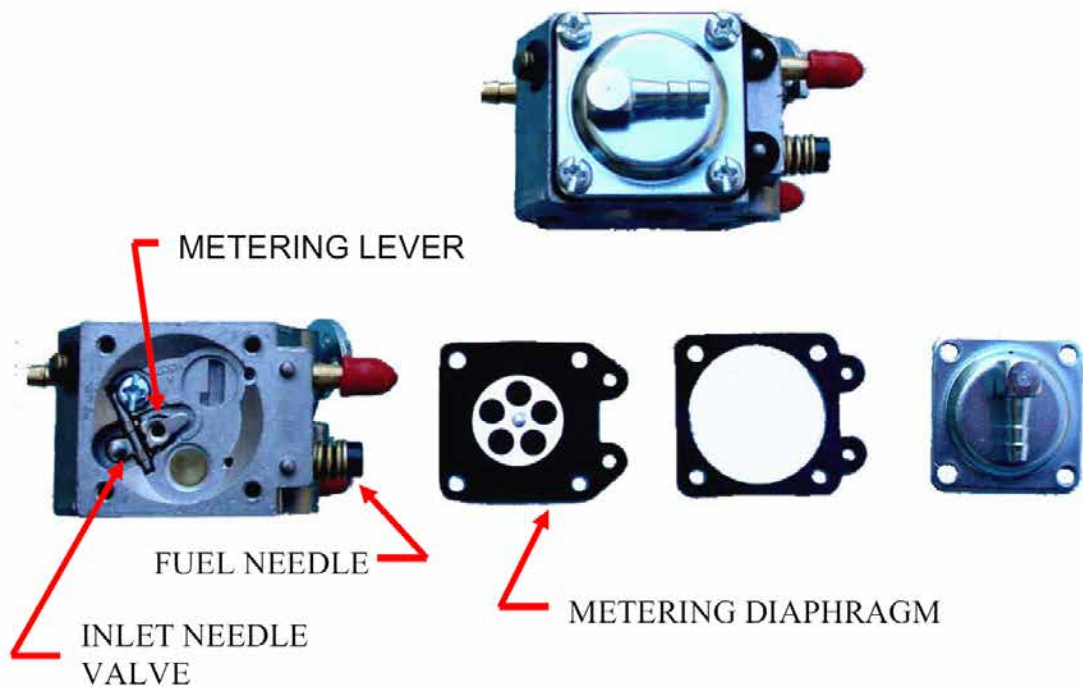
The Venturi is the air passage through the Carburetor. When air moves through a Venturi a partial vacuum is created. The strength of the vacuum varies proportionately to the amount of air flowing through the Venturi. When a constant volume of gasoline is connected to the Venturi, the vacuum created by 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 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 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 3/4 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.

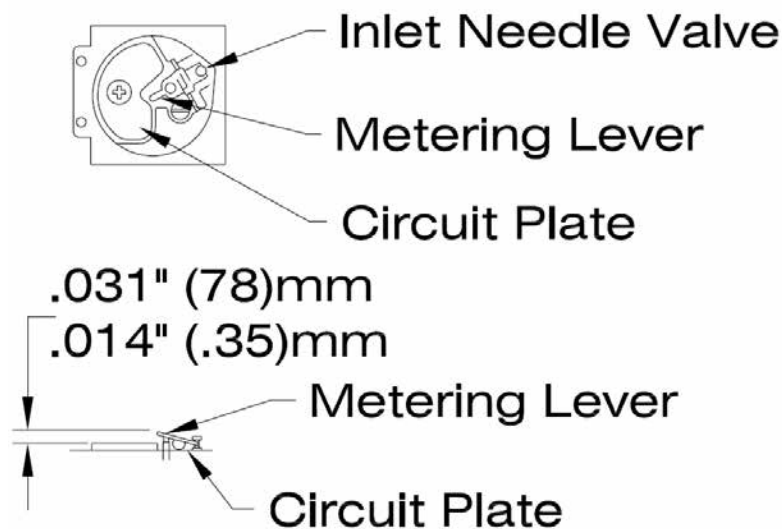
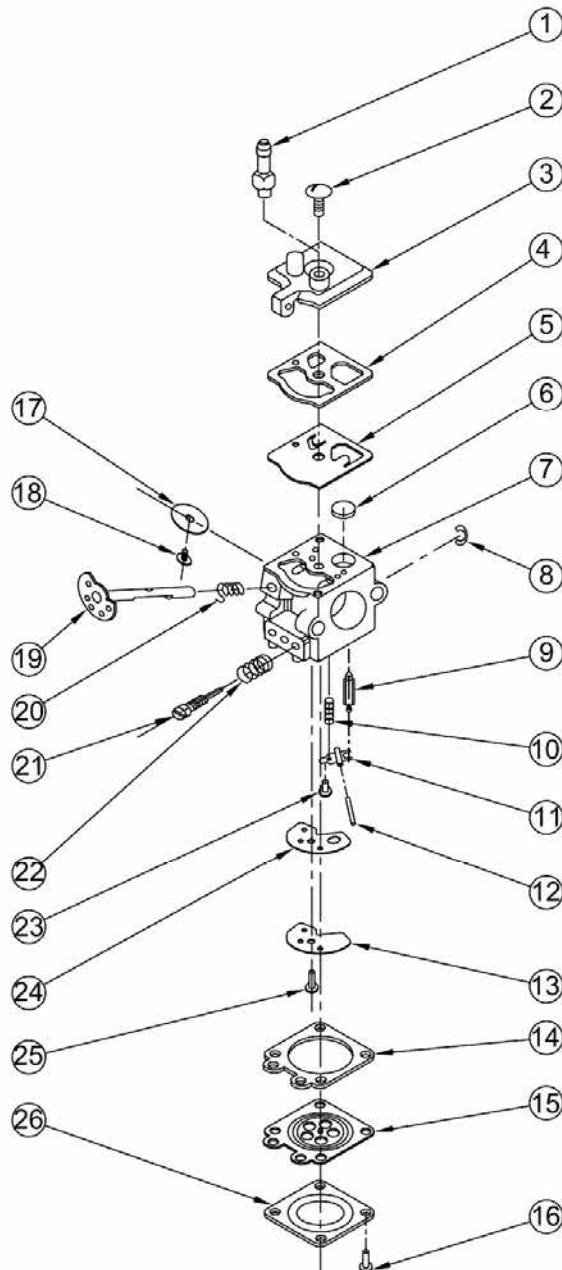


FIGURE 9

To clean the CARBURETOR filter, proceed as follows:

1. Remove the plate, pump diaphragm, and gaskets from the Carburetor. See diagram and illustrations (FIGURE 10).
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.



REF. NO	PART NAME
1	Fitting-Inlet
2	Screw-Pump Cover
3	Cover-Fuel Pump
4*	Gasket-Fuel Pump
5*	Diaphragm-Fuel Pump
6**	Screen-Inlet
7	Body Assembly-Carburetor
8	Ring-Throttle Retainer
9**	Valve-Inlet Needle
10**	Spring-Metering Lever
11**	Lever-Metering
12**	Pin-Metering Lever
13	Plate-Circuit
14*	Gasket-Metering Diaphragm
15*	Diaphragm Assembly-Metering
16	Screw Assembly-Metering Cover & Throttle Clip
17	Valve-Throttle
18**	Screw-Throttle Valve
19	Shaft Assembly-Throttle
20	Spring-Throttle Return
21	Needle-Fuel
22	Spring-High Speed Needle
23	Screw-Metering Lever Pin
24*	Gasket-Circuit Plate
25**	Screw-Circuit Plate
26	Cover-Metering Diaphragm
*	Contents in Gasket/Diaphragm Kit- P/N (58238)
**	Contents in Repair Kit-P/N (58237)

CARBURETOR ASSEMBLY DIAGRAM (FIGURE 10)

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 40) 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.

TROUBLE SHOOTING

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.

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.

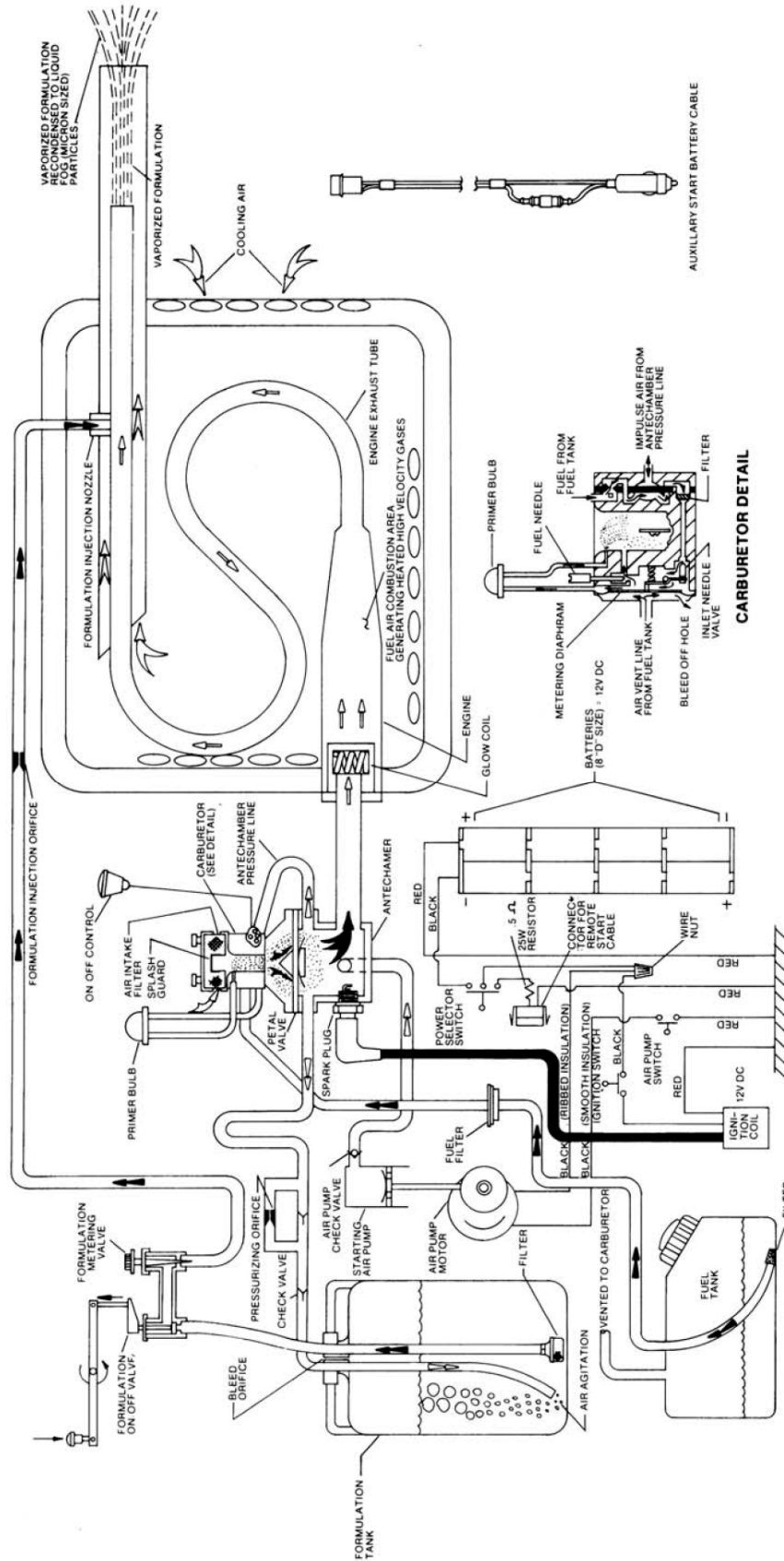
Check:

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?



PATRIOT MODEL 2595 SYSTEMS DIAGRAM

STORAGE AND SHIPMENT

NOTE

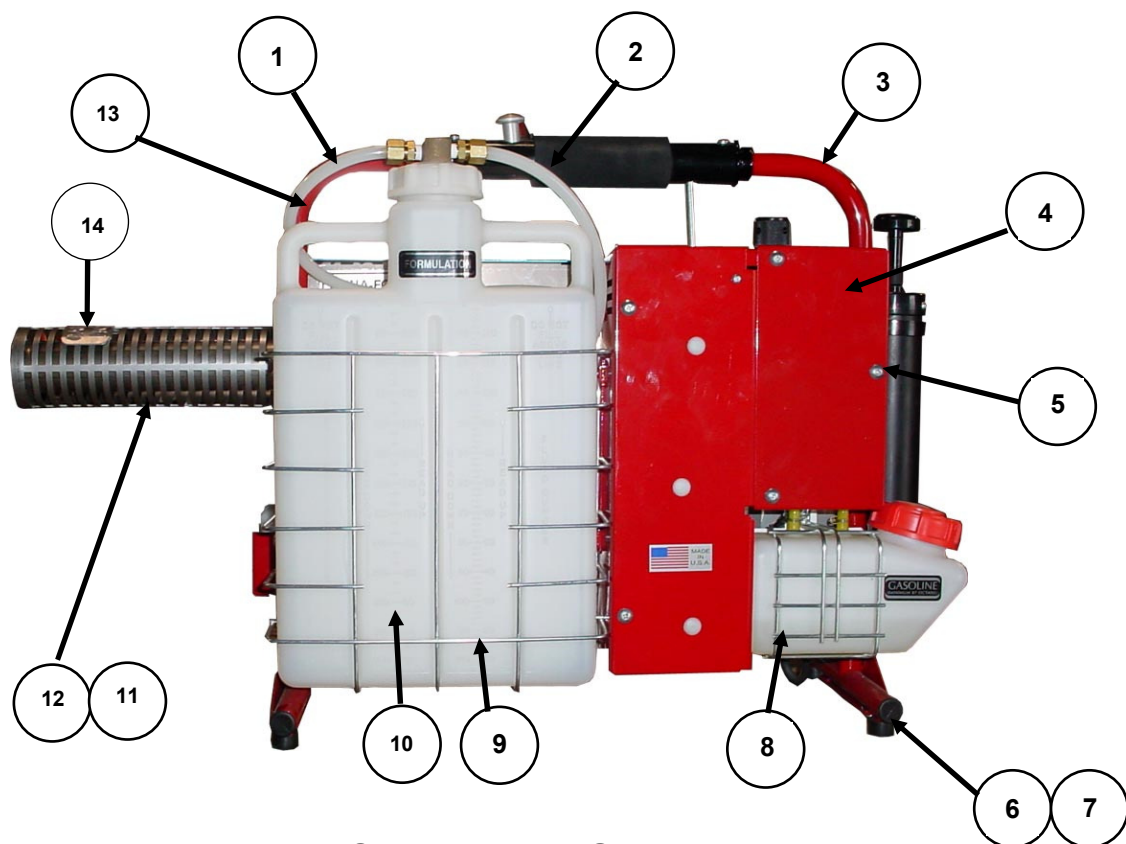
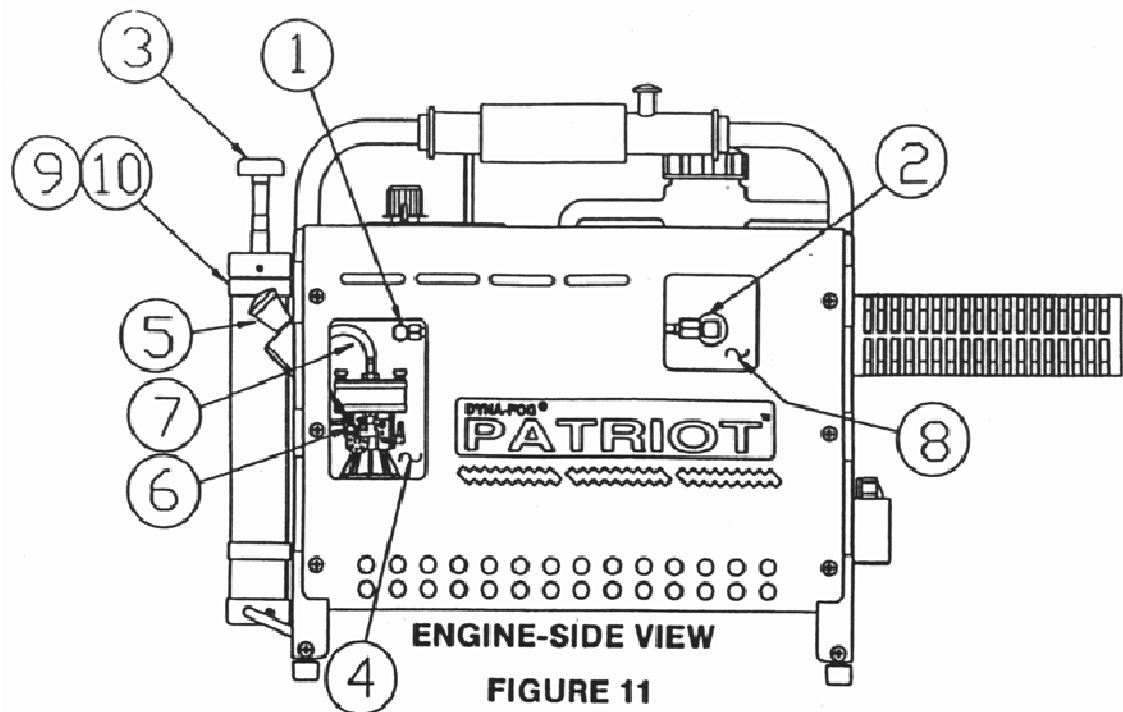
It is a good idea to retain the original machine shipping carton as well as its inner packing and blocking materials for any storage and shipment which may be required.

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.

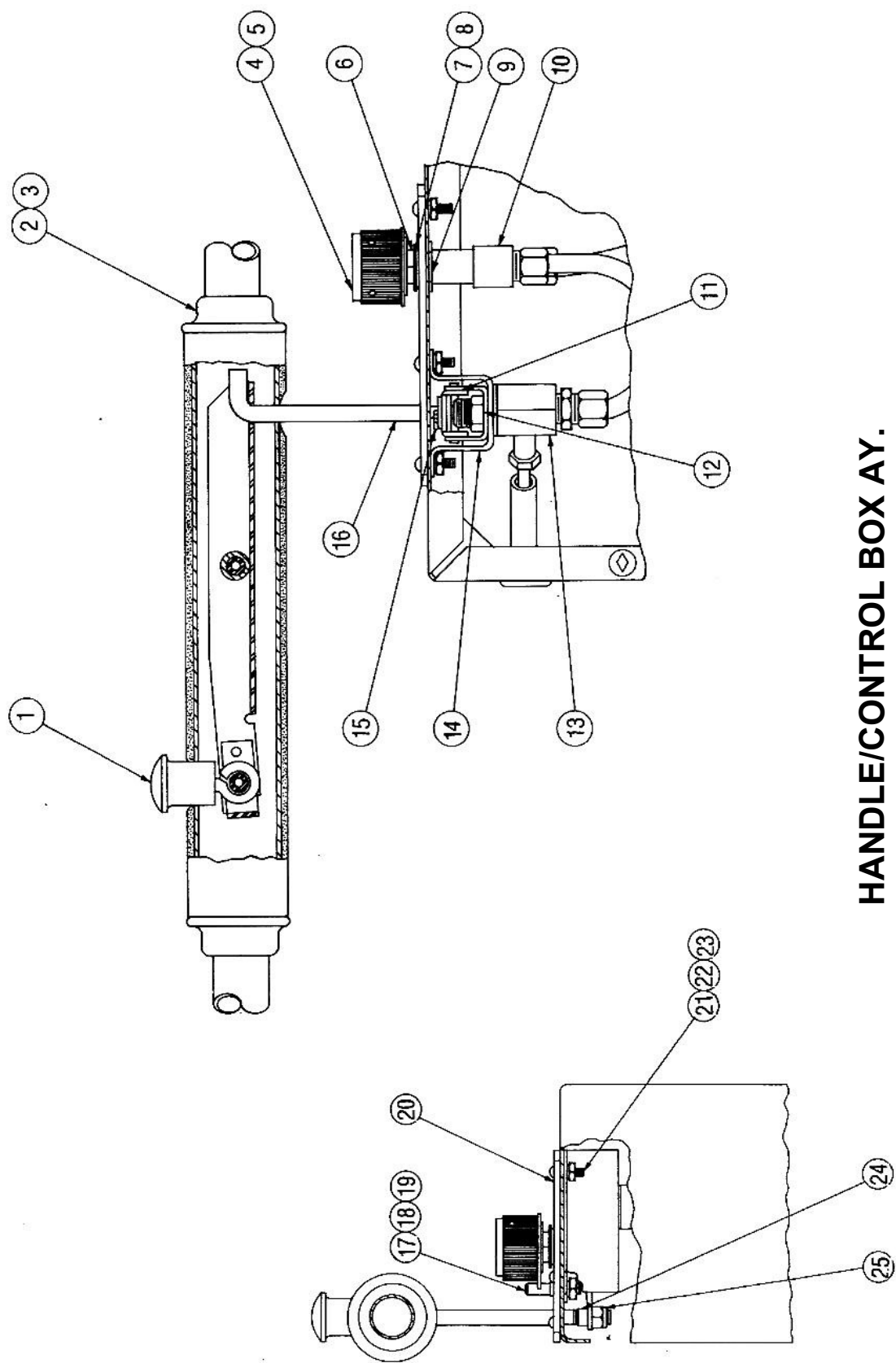


ENGINE-SIDE VIEW (FIGURE 11)

ITEM	PART #	DESCRIPTION
1	43273	FORMULATION INJECTION LINE AY
	43243	INJECTION LINE/SLEEVE
	58212-11	TUBING, NYLON, 8.00 INCHES
	21120	UNION ELBOW
	145463	NUT, 1/4 TUBE
	114628	SLEEVE, 1/4 TUBE
	58239	INSERT, BRASS, 1/4 TUBE
2	43304	ELBOW WITH ORIFICE AY
3	43407	PUMP AY., AIR
4	43278	PLATE AY., MAIN MOUNTING
5	58272-6	CONTROL KNOB AY
	134524	NUT, HEX, #4-40
6	22231	LINKAGE AY., CARBURETOR
7	80447-22	TUBE, VINYL .312
8	43279	ENGINE/HOUSING AY.
9	43406	BRACKET, AIR PUMP
10	59925	PAD, PUMP STRAP

ENGINE-SIDE VIEW (FIGURE 12)

ITEM	PART #	DESCRIPTION
1	43314-4	TUBING, NYLON, 30"
2	43314-3	TUBING, NYLON, 11.25"
3	43229	TUBE AY., REAR SUPPORT
4	43217	COVER, CONTROL HALF
5	85361	SCREW, #10-16 X 1/2 TRCR
6	159929	SCREW, #10-25 X 5/8, PNCR
7	58284	FOOT, RUBBER
8	43043	FUEL TANK MOUNTING WIRE GUARD
9	43246-1	CONTAINER, FORM
10	43275	FORMULATION TANK AY
	80020-1	TANK AY., FORMULATION
	43316	CAP/INSERT AY.
11	43259	DUCT AY., OUTER AIR
12	43245-1	GUARD AY., LONG AIR DUCT
13	43228	TUBE AY, FRONT SUPPORT
14	58706-1	PLATE, CAUTION "HOT"



HANDLE/CONTROL BOX AY.

HANDLE/CONTROL BOX AY.

ITEM	PART #	DESCRIPTION
1	58545	KNOB, ACTUATOR
2	43205	ADAPTOR, HANDLE
3	140868	SCREW, SET, #10-24 X 1/4
4	58560	KNOB, CONTROL
5	140853	SCREW, SET, #8-32 X .187
6	32692	NUT, PACKING
7	20200	WASHER, FLAT
8	10100-112	O-RING
9	43291	PLATE, VALVE LOCATING
10	58557	VALVE AY., METERING
11	32851-1	LEVER & STOP AY., VALVE
12	32670	NUT, 3/8-24, ALUMINUM
13	32536	VALVE AY., SHUTOFF
14	43235	BRACKET, VALVE MOUNTING
15	20414	INTERNAL HAIR PIN
16	58553	ROD, TRIGGER
17	58554	PIN, INDICATOR
18	120361	NUT, 10-24 HEX
19	138479	WASHER, LOCK, #10, EXTO
20	43206-2	PLATE, CONTROL (SCREEN)
21	58615	SCREW, #6-32 X 1/2 CRPH.
22	138526	WASHER, LOCK, #6, INTO
23	114524	NUT, #6-32, HEX
24	10040	EYELET, IGNITION WIRE, ALUMINUM
25	9419454	NUT, LOCK, 1/4-20, HEX

PARTS DIAGRAM

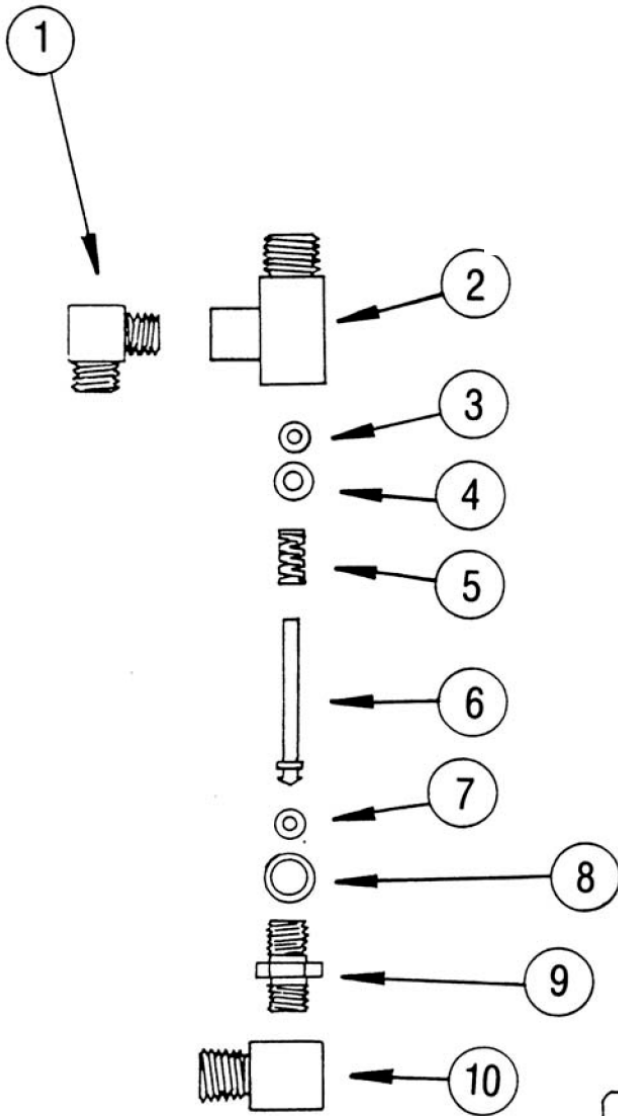


FIGURE 13

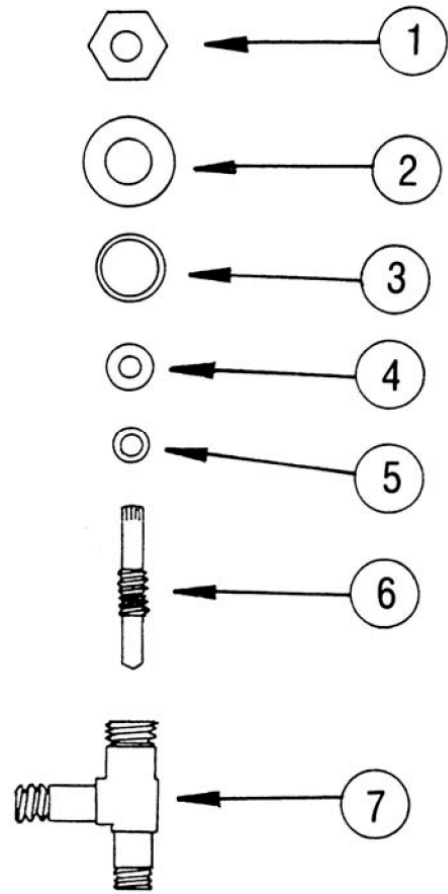


FIGURE 14

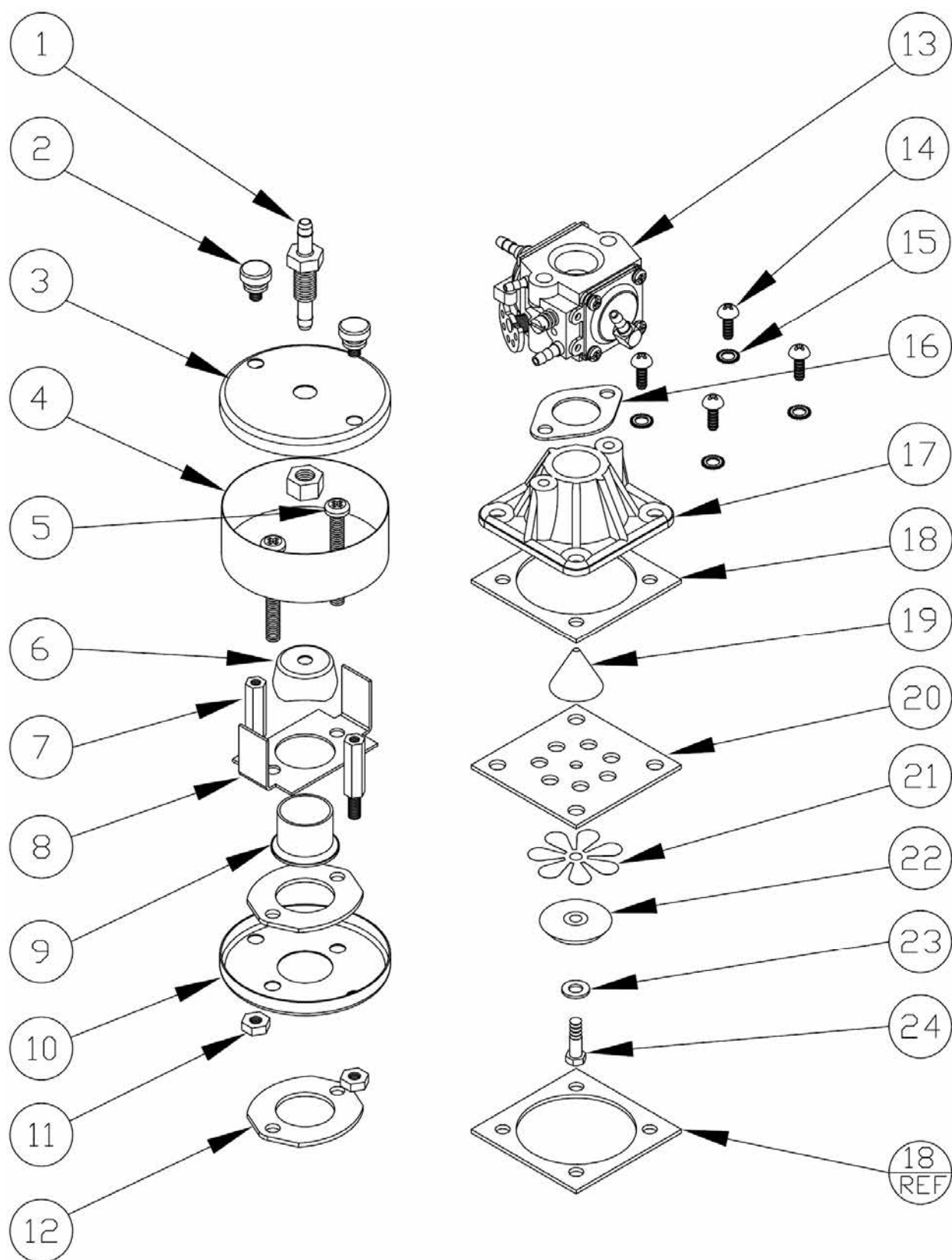


FORMULATION VALVE AY (FIGURE 13)

ITEM	PART #	DESCRIPTION
1	21191-1	90° ELBOW, 1/8 MPT – 3/8 T
2	32537	BODY, SHUT-OFF VALVE
3	10100-8	“O”-RING
4	32044	WASHER, SPECIAL
5	32048	SPRING
6	32538-1	STEM, SHUT-OFF
7	10100-7	“O”-RING
8	10100-12	“O”-RING
9	32543	CONNECTOR

METERING VALVE AY (FIGURE 14)

ITEM	PART #	DESCRIPTION
1	32692	PACKING NUT
2	20200	WASHER, FLAT, 53 ID X .75 OD
3	10100-112	“O”-RING
4	32690	PACKING WASHER
5	32691	BRASS WASHER
6	32689	METERING STEM
7	32693-1	METERING VALVE BODY
8	441789	ELBOW, 1/8 FP-1/4 T



VENTURI/CARBURETOR AY.

VENTURI/CARBURETOR AY.

ITEM	PART #	DESCRIPTION
1	62472	BULKHEAD UNION, 1/4T (WITH NUT)
2	58593	SCREW, 8-32 NYLON, THUMB
3	53035-2	HOUSING, AIR FILTER
4	58531	SCREEN, AIR FILTER
5	132862	SCREW, 10-24 X 1 3/4"
6	58627-1	SCREEN, 30 MESH, SSTL
7	58676	PLATE, SPLASH GUARD
8	58594	STANDOFF, 8-32 M-F, NYLON
9	58674	EYELET, FLAT FLANGE
10	58675	GASKET, CARBURETOR
11	53035-1	HOUSING, START AIR
12	58592	NUT, 8-32, NYLON, HEX
13	58389-1	CARBURETOR ASSEMBLY
14	159929	SCREW, 10-24 X 5/8
15	138479	WASHER, LOCK, #10, EXT.
16	43016	GASKET (BOTTOM), CARBURETOR
17	43011	ADAPTOR, CARBURETOR
18	32109	GASKET, VENTURY
19	32678	CONE
20	32637	PLATE
21	32101	PETAL
22	32634	BACK STOP
23	131015	WASHER, #8, FLAT, REGULAR
24	32105	SCREW, 8-32 X 1/2

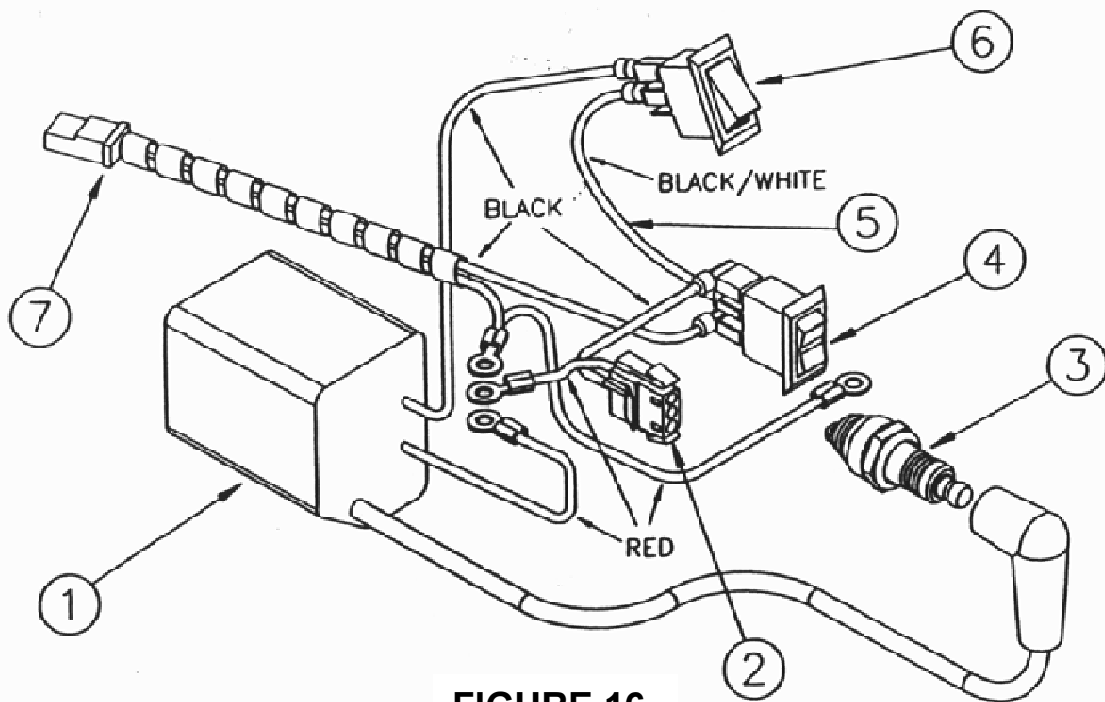


FIGURE 16

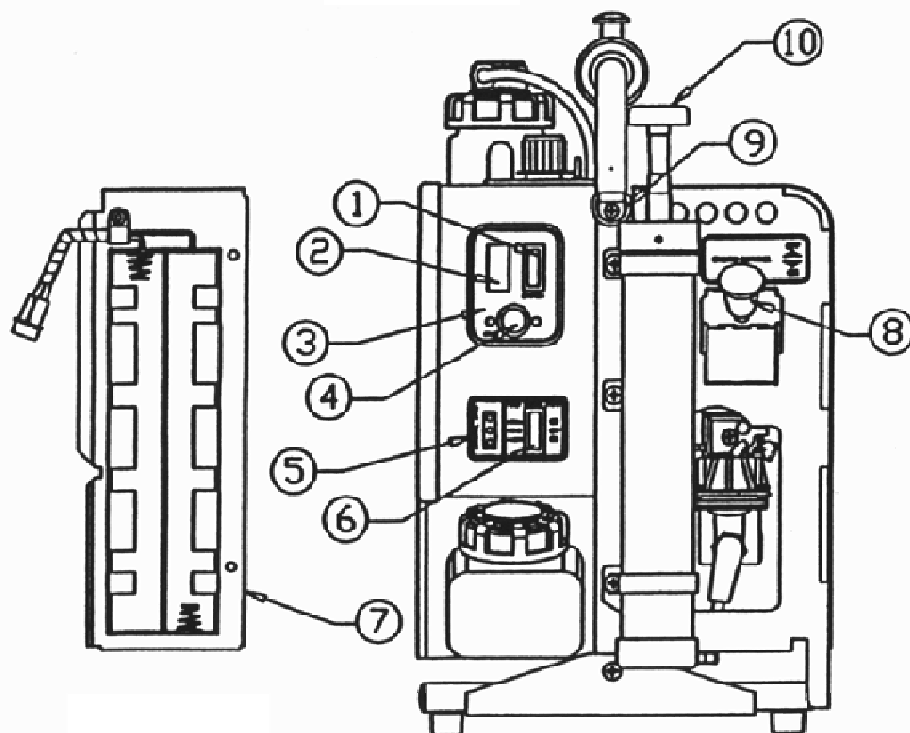


FIGURE 17

ELECTRICAL WIRING (FIGURE 16)

ITEM	PART #	DESCRIPTION
1	58660	COIL AY., IGNITION
2	58830	POWER JACK AY
3	80082	SPARK PLUG AY
	80082-1	SPARK PLUG
	10100-14	"O"-RING
4	58655	SWITCH, 3 POS., ROCKER
5	43402	WIRE AY., BLK/WHT
6	58609	SWITCH, N.O., ROCKER
7	43302	HARNESS, BATTERY

MACHINE REAR-VIEW (FIGURE 17)

ITEM	PART #	DESCRIPTION
1	58609	SWITCH, N.O., ROCKER
2	43403	PLUG, PLASTIC
3	43208	LABEL, CONTROL PANEL
4	43264	PRIMER BULB AY
	63428	PRIMER BULB
	58601-3	TYGON TUBING, 11"
5	86676	LABEL, POWER SELECTOR
6	58655	SWITCH, 3 POS., ROCKER
7	43255-2	HOLDER/COVER AY
	43230-1	COVER, BATTERY
	43254	BATTERY HOLDER AY
8	58272-6	CONROL KNOB AY
9	11719	CLAMP, CARRY STRAP
10	43407	PUMP AY., AIR

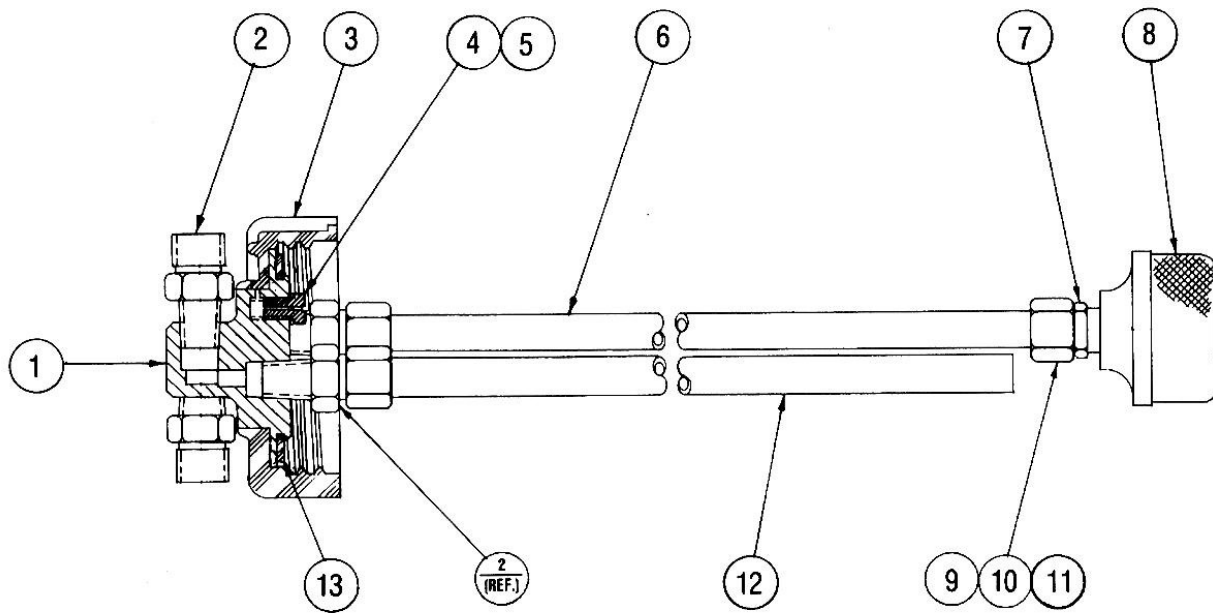


FIGURE 18

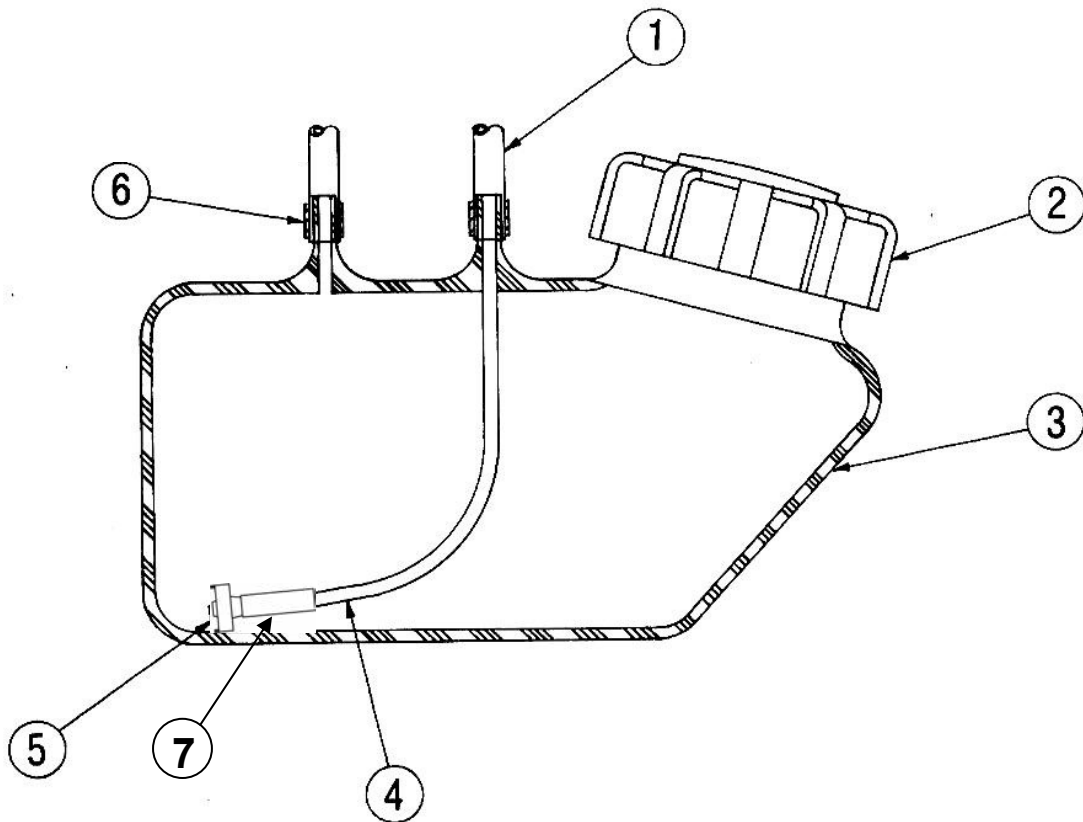


FIGURE 19

FORMULATION CAP AY (FIGURE 18)

ITEM	PART #	DESCRIPTION
1	43290	CAP INSERT
2	21170	CONNECTOR, 1/8P-3/8T
3	21010	CAP, FORMULATION
4	43308-1	SCREW, BLEED (RED)
5	10100-8	"O"-RING
6	43314-1	TUBING, NYLON L=15.00"
7	48095-1	CONNECTOR 1/4P-3/8T
8	86643	FILTER 1/4 N.P.T.
9	45744	NUT, COMPRESSION, 3/8
10	45745	SLEEVE, 3/8 BRASS
11	48116	INSERT, BRASS, 1/4
12	43314-2	TUBING, NYLON, L=12.50"
13	22232	GASKET, VITON

FUEL TANK AY (FIGURE 19)

ITEM	PART #	DESCRIPTION
1	58713-1	TUBE, TYGON, 8"
2	22191-2	CAP AY., RED
	80279	GASKET, CAP
3	43027	FUEL TANK
4	20466-8	TUBE, NYLON
5	62346	FILTER, PLASTICK
6	80296-11	CLAMP, HOSE
7	58713-9	TUBE, TYGON, 1"

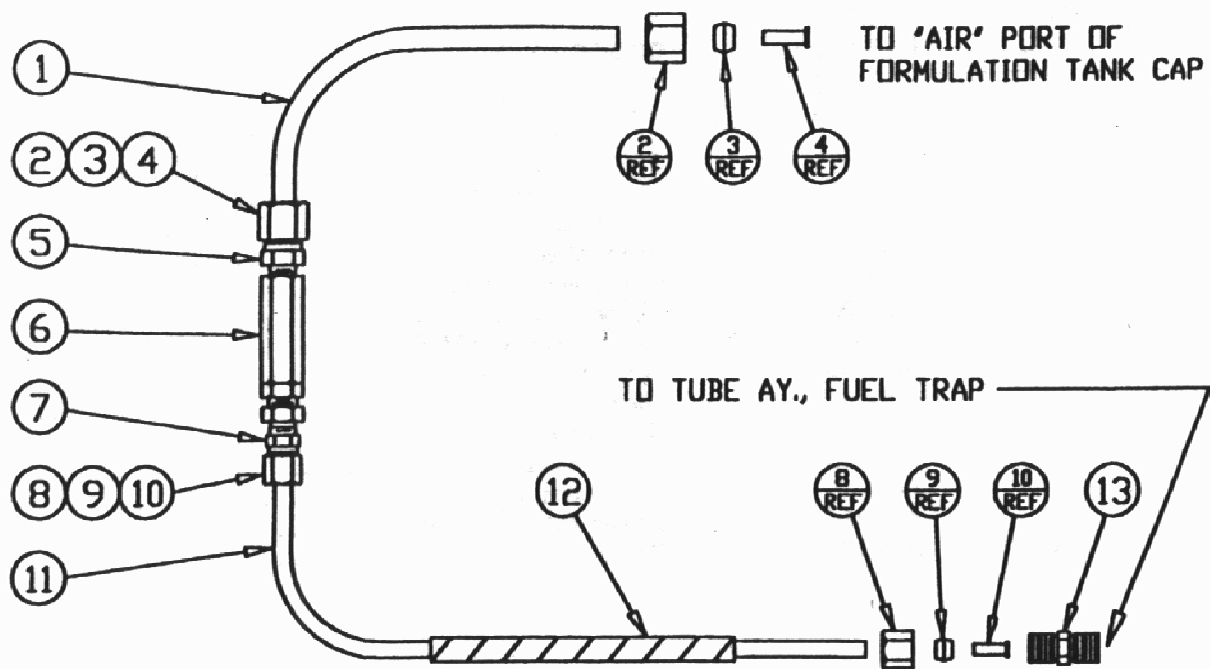


FIGURE 20

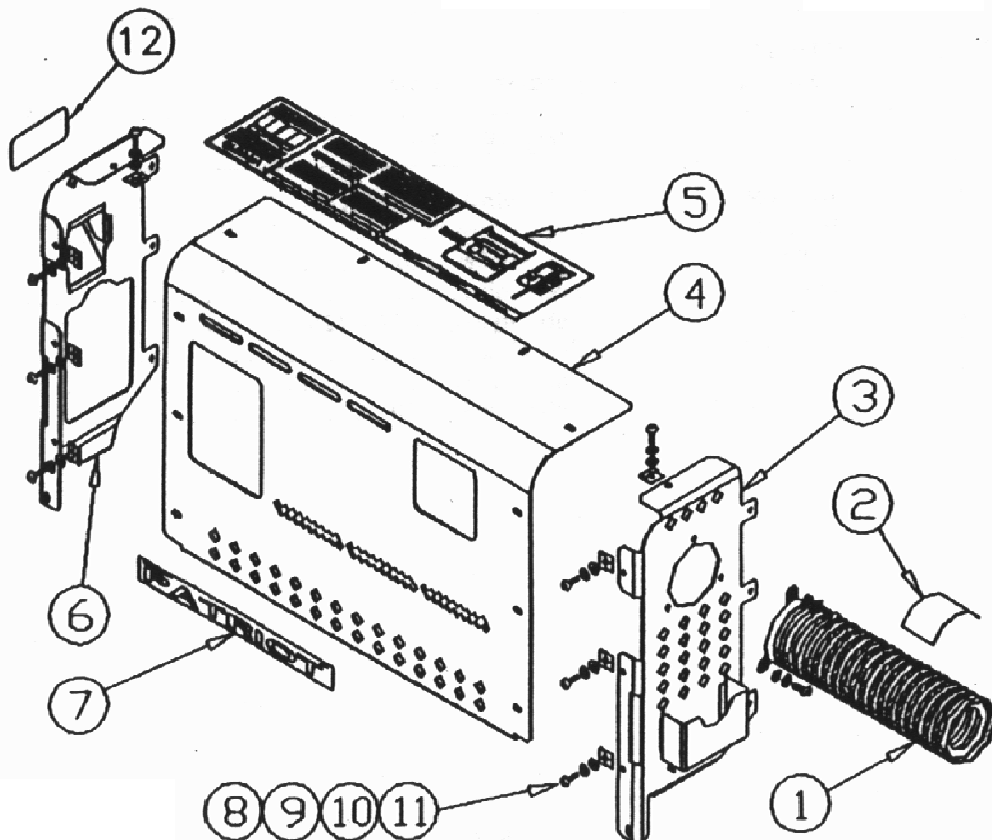


FIGURE 21

LINE AY., PRESSURE (FIGURE 20)

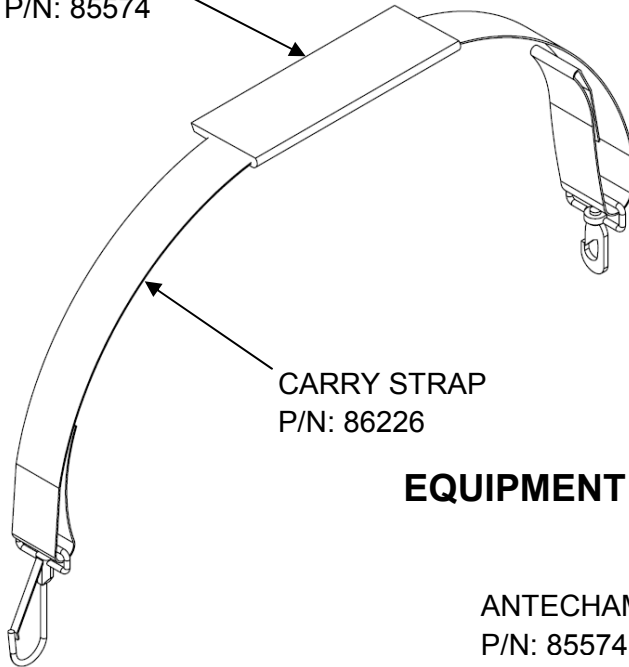
ITEM	PART #	DESCRIPTION
1	43314-3	TUBE, NYLON, .375 O.D.
2	45744	NUT, COMP., 3/8T
3	45745	SLEEVE, 3/8 BRASS
4	48116	INSERT, BRASS, 3/8 T
5	21170	CONNECTOR, 1/8 MP – 3/8T
6	58683	VALVE AY., PRES., VITON
7	441685	CONNECTOR, 1/8 MP – 1/4T
8	145463	NUT, 1/4T
9	114628	SLEEVE, 1/4T
10	58239	INSERT, BRASS, 1/4T
11	58212-10	TUBE, 1/4 O.D., 17"
12	63414-4	HARNESS WRAP
13	441703	CONNECTOR, 1/4T-1/4T

COVER, GUARDS, LABELS (FIGURE 21)

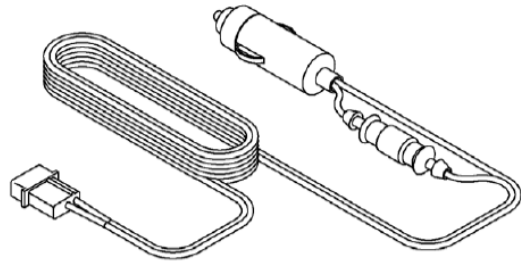
ITEM	PART #	DESCRIPTION
1	43245-1	GUARD AY., LONG AIR DUCT
2	58706-1	PLATE, CAUTION HOT (MOD.)
3	43331-2	GUARD AY., DISCHARGE
4	43327	COVER, ENGINE
5	43404	LABEL, INST/DIAG 2595
6	43332-2	GUARD AY., INLET
7	43401	LABEL, PATRIOT LOGO
8	157678	SCREW, 10-24 X 3/8, TRCT
9	138479	WASHER, LOCK, #10 EXTO
10	120391	WASHER, FLAT, #10 REG.
11	58707	NUT, 10-24 J-TYPE
12	43209	LABEL, ON/OFF CONTROL

ACCESSORIES

STRAP PAD
P/N: 85574



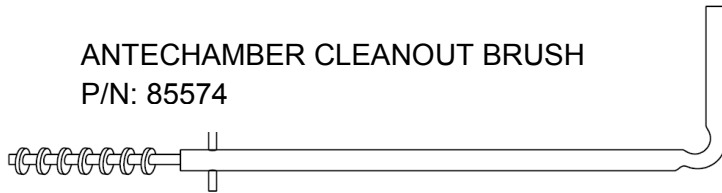
CARRY STRAP
P/N: 86226



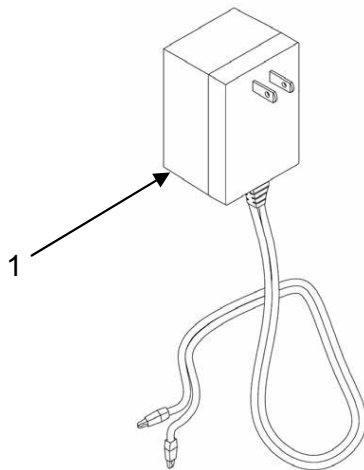
AUXILIARY START BATTERY CABLE
P/N: 58672

EQUIPMENT OPTION

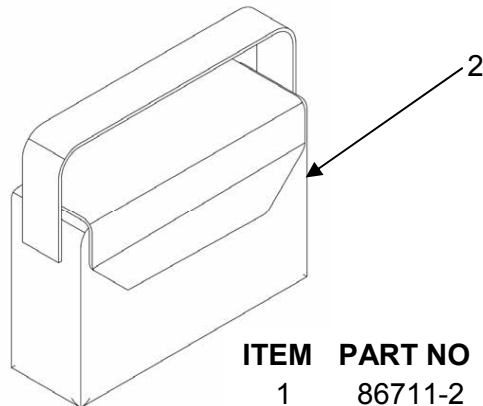
ANTECHAMBER CLEANOUT BRUSH
P/N: 85574



ENGINE CLEANOUT BRUSH
P/N: 85574



1



2

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

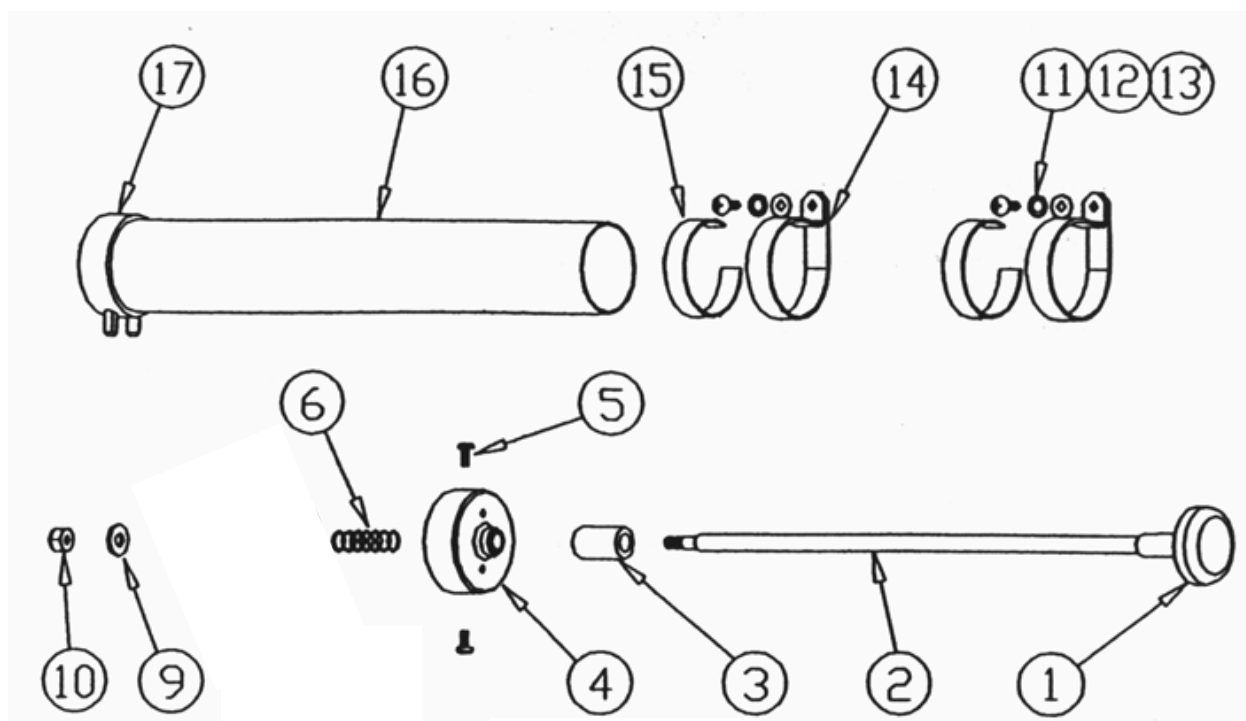


FIGURE 22

AIR PUMP AND BRACKET

ITEM	PART #	DESCRIPTION
1	80133	KNOB
2	80026-7	ROD, AIR PUMP
3	59989	TUBE RUBBER BUMPER
4	58277	CAP, AIR PUMP, PVC
5	190075	SCREW, 6-20 X 5/16., TAP
6	80046	SPRING
7		
8		
9	120392	WASHER, FLAT, 1/4 REG.
10	9419454	NUT, NYLOCK 1/4-20
11	120391	WASHER, FLAT, #10, EXTO
12	138479	WASHER, LOCK, #10, EXTO
13	157684	SCREW, 10-24 X 1/2, TRCR
14	43406	BRACKET, AIR PUMP 2595
15	59925	PAD, PUMP STRAP
16	58293-5	BARREL, AIR PUMP
17	58278-1	AIR PUMP BASE, 1 HOLE

**MODEL 2595
PATRIOT**

Machine Serial No.: _____

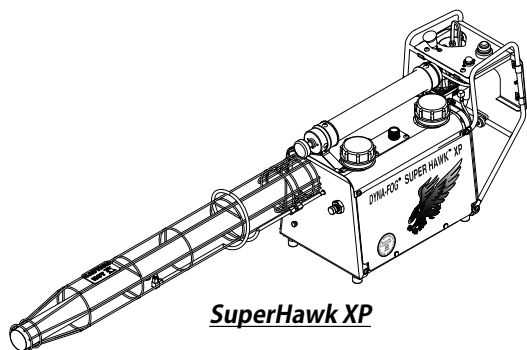
Date Purchased: _____

Purchased From: _____

HELPFUL CONVERSIONS

<u>TO CONVERT</u>	<u>INTO</u>	<u>MULTIPLY BY</u>
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

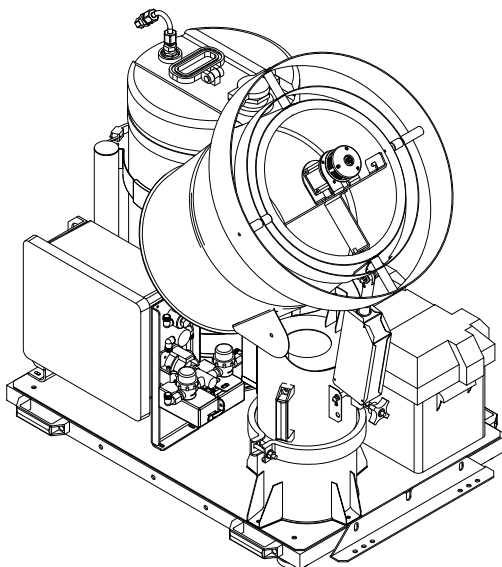
PULSE-JET POWERED THERMAL FOGGERS:

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.

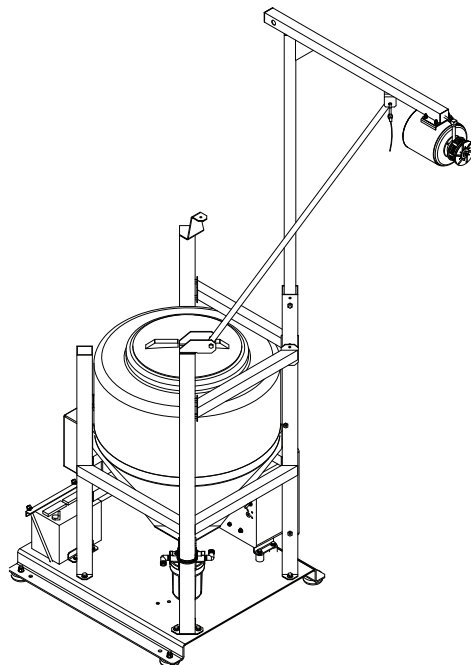
ELECTRIC ROTARY ATOMIZERS:

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.



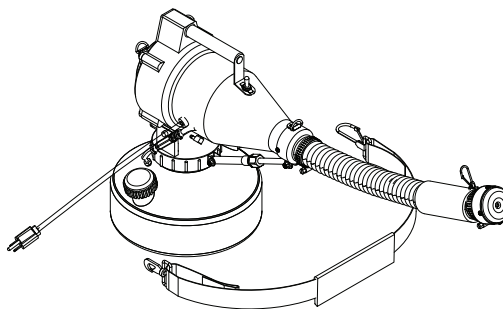
Dyna-Jet L-30



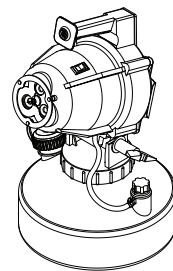
Dyna-Jet L-15

ELECTRIC HAND-HELD ULV/MIST GENERATORS:

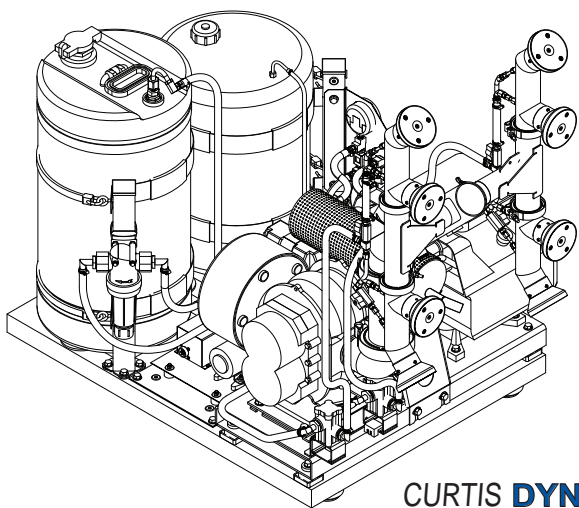
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Cyclone Ultra-Flex



Hurricane ES



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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.

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