



INSTRUCTION MANUAL AND PARTS LIST

COUGAR[®]
ULV SPRAYER

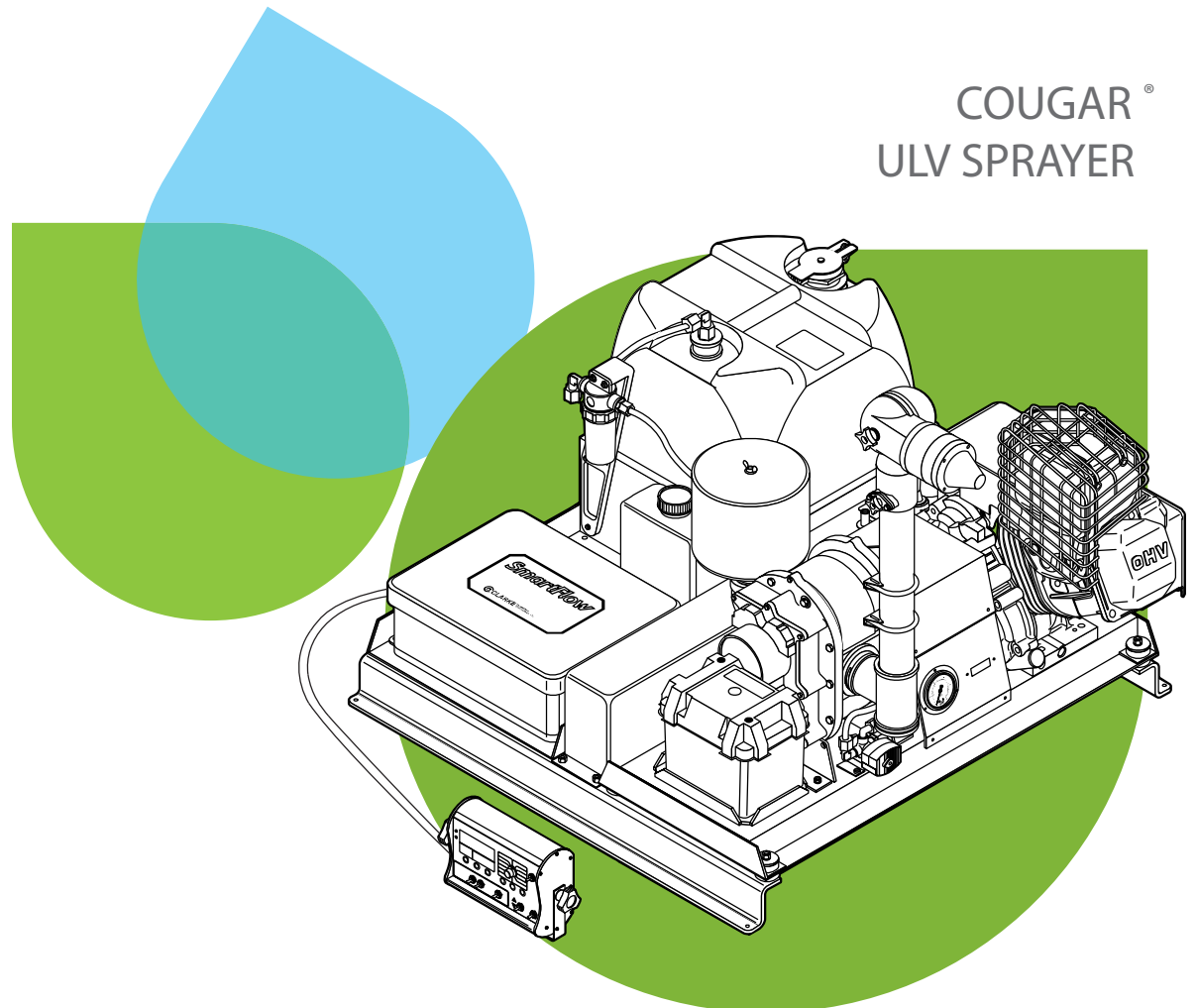


TABLE OF CONTENTS

COUGAR® ULV SPRAYER

Warranty Information	1
Clarke Cougar Specifications	2
Forward	3
Description	5
Theory of Operations	6
Particle Size	6
Assembly Instructions	7
Operation Instructions	9
Pre-Start	9
Start-Up	11
Hour Meter (Total Spray Time)	11
Pressure Gauge	12
Adjusting the Nozzle Air Pressure	12
Low-Pressure Cut-off	12
Smart Flow Control	13
Installation, Operation and Maintenance Manual	13
Description	13
Total Counters	14
Control Box Functions	15
Alarm	16
Warning LED	16
Calibration LED	16
POWER Switch	17
Display	18
Upper Window	19
Left Window	20
Right Window	20

TABLE OF CONTENTS

COUGAR® ULV SPRAYER

Rotary Switch	21
Buttons	23
Gas Controls	24
Electric Controls	24
+/- Switch	25
SPRAY Switch	26
Calibration	27
Calibration Factors	28
Entering Calibration Mode	29
Exiting Calibration Mode	29
Setting Continuous Speed	30
Setting Units	30
Setting Target Application Rate	31
Setting Maximum Speed	31
Setting Minimum Speed	32
Setting Swath Width	32
Setting the Flow Calibration Factor	33
Determining the Flow Calibration Factor	33
Reloading Calibration Defaults	35
Operation	36
Startup	36
Selecting the Application Rate	37
Shutdown	37
Clearing Counters	37
Adjusting Tank Volume	38
Setting the Pressure Offset	38

TABLE OF CONTENTS

COUGAR® ULV SPRAYER

Troubleshooting	39
Warning Signals	39
Error Codes	39
Maintenance	40
General	40
Daily	40
Every 50 Hours	41
Every 100 Hours	42
Engine	44
Blower	44
Recommended greasing intervals:	45
Spare Parts	50
Main Assembly	51
Blower Assembly	55
Nozzle Assembly	57
Chemical Tank Assembly	59
Pump Box Assembly	61
Trouble Shooting	63
Electrical Schematic	68

Warranty Information

Clarke Engineering Technologies, Inc. (CETI) warrants that during the first year following the purchase of CETI manufactured products or equipment, such products or equipment will perform in accordance with the instruction manuals when properly installed, operated and maintained. During the warranty period, CETI's sole obligation and liability shall be at CETI's option to:

A. Replace or repair defective parts (including, at CETI's option, replacement of the entire unit) so that the unit will perform in accordance with the instruction manual.

OR

B. Refund the applicable payment upon return of the product.

Products requiring examination or repair under warranty must be returned postage/freight prepaid to the CETI factory in Rogers, MN. Examination and /or repair at locations other than the factory shall only be done upon authorization of CETI and by persons approved by CETI.

Components and accessories with electronic circuitry will carry the same warranty as the CETI machines provided they are installed at the factory or by an authorized factory representative. Field installations, modifications and /or the addition of other devices to CETI circuitry void this warranty. Aftermarket electronic items and parts such as "chips", "processors", etc. are not eligible for return, credit or warranty once the shipping package has been opened.

This limited warranty does not cover components or parts covered by warranties of other manufactures.

This limited warranty specifically excludes the cost of labor to customers or to other parties connected with the examination and /or repair of warranted products.

EXCEPT AS NOTED ABOVE, NO OTHER WARRANTY IS EXPRESSED, AND NONE SHALL BE IMPLIED, INCLUDING SPECIFICALLY ANY WARRANTY OF MERCHANTABILITY OF WARRANTY OF FITNESS FOR USE OR FOR A PARTICULAR PURPOSE. EXCEPT FOR THE FOREGOING, CETI SHALL HAVE NO LIABILITY TO CUSTOMER OR OTHER PARTY OR ANY GENERAL, SPECIAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE FAILURE OF THE PRODUCT(S) TO PERFORM AS WARRANTED, OF FOR ANY REASON.

THIS IS THE TOTAL EXTENT OF THE WARRANTY.

Clarke Cougar Specifications

Manual Issue: Clarke Cougar 4/05

Engine	9 Gross HP Vanguard (305cc)
Blower	Roots (105 CFM @ 3600 RPM)
Dispersal Head	CLARKE IHPLAT
Fuel	Gasoline Min Octane
Fuel Tank Capacity	2.84 gallons (10.7 liters)
Flush Tank Capacity	2 quarts (1.9 liters)
Insecticide Tank Capacity	15 gallons (56.7 liters)
Droplet Size	90% less than 20 Microns
Flow Rate	Up to 18 oz/min (532.26 ml/min)*
Mounting Area	42" (107 cm) x 38" (97 cm)
Net Weight (Empty)	250 pounds (112 kilos)
Shipping Weight	350 pounds (159 kilos)
Shipping Cube	39.8 feet (12.13 meters)

* With standard 1/4" Piston. Larger pump heads available with flow rates up to 77 oz/min (2277 ml/min).

**THIS MANUAL IS FOR MY CLARKE COLD AEROSOL FOG
GENERATOR - COUGAR**

SERIAL NUMBER _____

**THE ABOVE INFORMATION, WHICH CAN BE FOUND ON THE CHASSIS,
SHOULD BE FILLED IN. YOUR PROMPT ATTENTION TO THIS MATTER WILL
MAKE IT CONVENIENT FOR YOU IN THE FUTURE, AS THIS INFORMATION
MUST BE GIVEN WHEN ORDERING PARTS.**

Forward

Every effort has been made to make this manual as complete as possible so that it will provide maximum assistance in operating and maintaining your CLARKE Cougar Cold Aerosol Fog Generator.

This manual is divided generally into two sections – Operating and Maintenance Section and Illustrated Parts Section.

The Operating and Maintenance Section contains complete instructions for assembling, installing, operating and maintaining your CLARKE Cougar Cold Aerosol Fog Generator. No difficulty should be encountered in following them.

Before attempting to start your unit the first time, study the complete Operation Instructions carefully and identify all parts referred to. You will find that the operation of your CLARKE Cougar Cold Aerosol Fog Generator is a simple matter. However, like all mechanical equipment, your unit requires a certain amount of maintenance.

The Maintenance Instructions will enable your CLARKE Cougar Cold Aerosol Fog Generator to give you continuous and trouble-free service. It is highly recommended that some system be established to assure the performance of this maintenance as its importance cannot be over-emphasized.

Although, with proper maintenance, your unit should operate indefinitely without any trouble, there might come a time when trouble does develop. For such an occasion, a complete Trouble Shooting Section has been prepared and included in this manual.

The Illustrated Parts Section of the manual is made up of exploded views and parts list. Every part of the unit is illustrated and identified with a part number. Always order parts by part number, description and the serial number of your unit.

COUGAR[®] ULV SPRAYER **WARNING**

THIS CLARKE COUGAR COLD AEROSOL FOG GENERATOR IS MANUFACTURED AND SOLD FOR USE ONLY WITH INSECTICIDES WHICH HAVE BEEN DULY REGISTERED AND APPROVED. DO NOT EXCEED THE DOSAGE SET FORTH ON THE REGISTRATION LABEL OF THE INSECTICIDE TO BE USED.

USE OF UNAPPROVED INSECTICIDES AND OR DOSAGE MAY BE HAZARDOUS

IMPORTANT

ONLY QUALIFIED PERSONNEL SHOULD OPERATE THE CLARKE COUGAR FOG GENERATOR

 WARNING

ALL SPRAY SWITCHES MUST BE IN THE "OFF" POSITION BEFORE THE IGNITION SWITCH IS TURNED ON.

SAFETY SUMMARY

1. **WARNING:** Observe all safety precautions set forth on the registration label of the insecticide to be used
2. **WARNING:** Never operate the fog generator in an enclosed area unless the exhaust gases are piped to the outside. Exhaust gases contain carbon monoxide, which is colorless, odorless and poisonous gas.
3. **WARNING:** Do not fill the fuel tank while the engine is in operation. Gasoline spilled on a hot engine may explode and cause serious injury to personnel.
4. **WARNING:** Do not attempt repairs in the insecticide system without protection until the system has been thoroughly flushed with a flushing solution for the insecticide used.

This manual provides the description, theory of operation, assembling instructions, mounting instructions, operation instructions, calibration instructions, maintenance instructions and illustrated parts breakdown for the CLARKE Cougar Cold Aerosol Fog Generator for Ultra Low Volume (ULV) application of insecticide.

Description

The CLARKE Cougar Cold Aerosol Fog Generator consist of an engine, fuel tank, a rotary blower capable of developing 8 P.S.I. maximum pressure, an adjustable discharge nozzle head assembly, a flow control, an insecticide tank, a flush tank, a remote console a filter-silencer with a stainless steel element and insecticide filter.

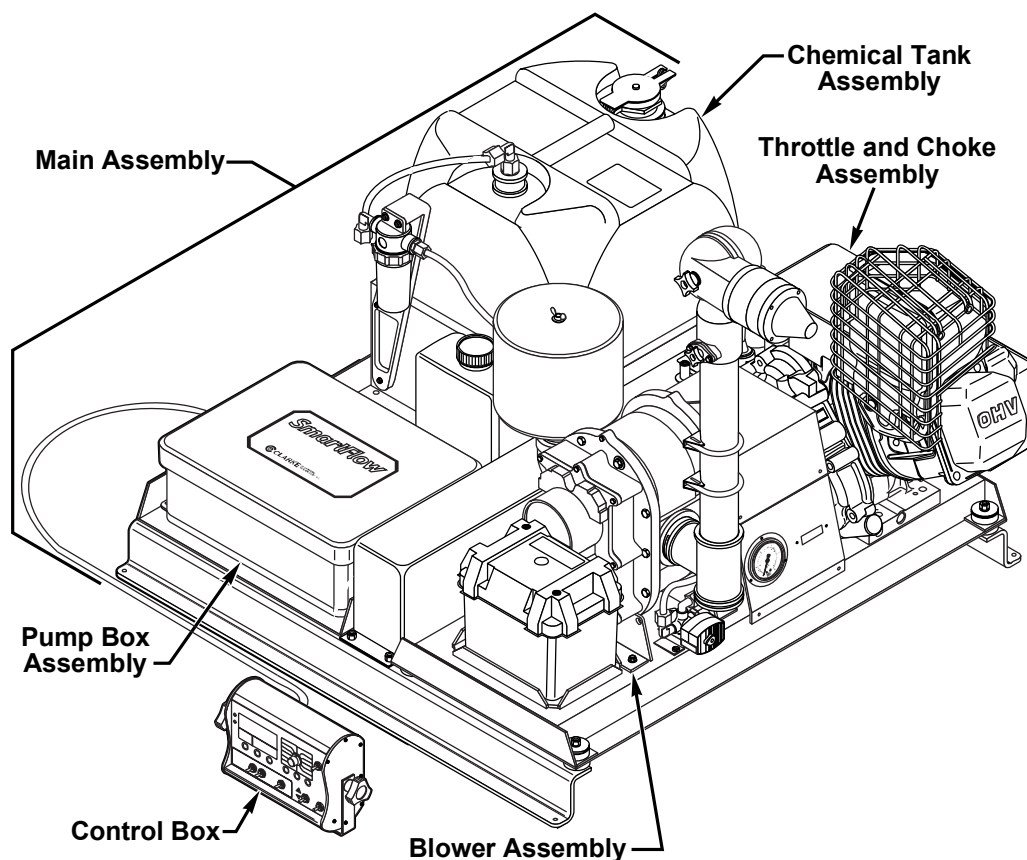


Figure 1- Cougar Cold Aerosol Fog Generator

COUGAR[®] ULV SPRAYER

Theory of Operations

The CLARKE Cougar Cold Aerosol Fog Generator is designed for precision metering of concentrated insecticide through the discharge nozzle head. Any desired flow rate, within limits, can be easily set at a target rate. When fogging, the concentrated insecticide is drawn from the insecticide tank and pumped at the preset rate with constant, even flow to the discharge nozzle head where it is sheared into optimum size droplets by the air blast from the blower and dispersed into the atmosphere. After dispersal, the droplets stay suspended in the air and drift with prevailing winds to insect infested areas. The optimum size of a particular insecticide is defined on the registration label for that insecticide and can be controlled by varying either the nozzle air pressure, the insecticide flow rate or both. Changing the speed of the engine will vary the nozzle air pressure. Slowing down the engine decreases the pressure which increases the droplet size because of less shearing action and conversely, speeding the engine up increases the pressure which decreases the droplet size for a particular flow rate. The correct flow rate will be defined on the registration label for that insecticide. As stated above, the flow rate also affects the droplet size. The droplet size tends to increase as the flow rate increases. Optimum size droplets must be maintained and should be checked periodically by an authorized person.

Particle Size

The air pressure at the nozzle and the volume of the chemical flow changes particle size. Particle size is specified on the label of the insecticide for that insecticide. This is a part of the label and a part of the legal use of that insecticide.

It is the responsibility of the user of the equipment and the insecticide to determine that the particle size developed by the ULV Cold Aerosol Fog Generator they are using is proper for the chemical that is being used. That is the law.

Insecticide labels discuss the determination of particle size and the suppliers of the insecticide should be equipped to measure, or help you measure, the particle size produced by your ULV Cold Aerosol Fog Generator. The ULV Cold Aerosol Fog Generator should not be operated unless the required particle size is known and measured.

Clarke Engineering Technologies, Inc. can not tell you what air pressure to use with a particular insecticide to get the particle size required by the label. There are too many variables involved, such as chemical mixture, flow rate and the temperature of the insecticide.

Your Clarke representative or distributor can work with you to be sure you are producing the correct particle size for the insecticide used.

Assembly Instructions

The CLARKE Cougar Cold Aerosol Fog Generator is shipped completely assembled except that the console needs to be plugged into the two sockets one located on the fog generator, see Figure 2. The plug is polarized and can only be inserted in one position. Be sure to hand tighten the knurled locking cap onto the socket.

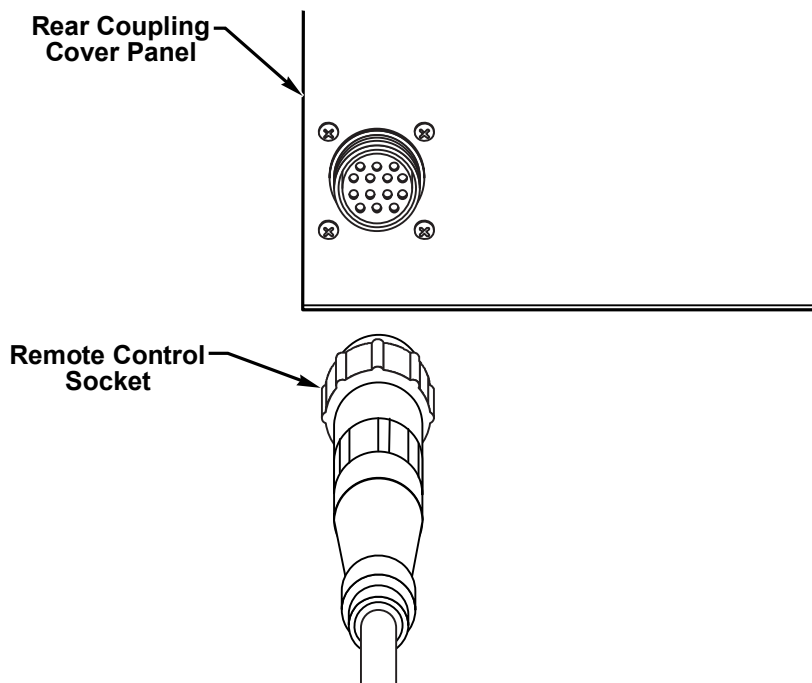


Figure 2- Harness Connection

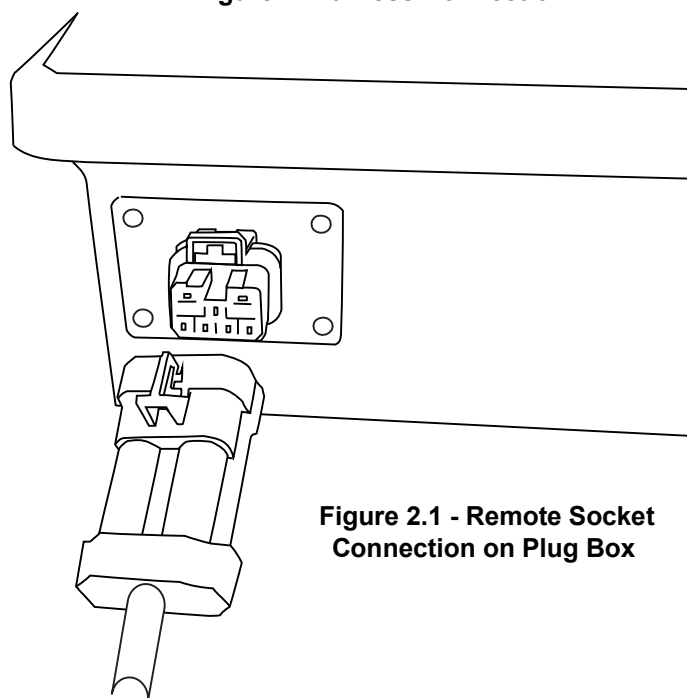


Figure 2.1 - Remote Socket Connection on Plug Box

COUGAR[®] ULV SPRAYER

In order to eliminate vibration and excessive cab noise, the CLARKE Cougar Cold Aerosol Fog Generator should be bolted to the bed of the vehicle. Position the fog generator so that the nozzle is located towards the rear of the vehicle and all switches are easily accessible. Make sure that the fog generator is located where the insecticide tank can be easily filled. With the fog generator in the correct location, drill holes through the holes in the Z-base rails and fasten the unit to the bed with plated bolts. Mount the Console in the cab of the vehicle in a convenient location. Route the cable back to the fog generator in a way that affords protection against cutting and snagging. Align the plug pins with the holes in the socket on the unit and lock the plug in place by hand tightening the knurled locking cap onto the socket.

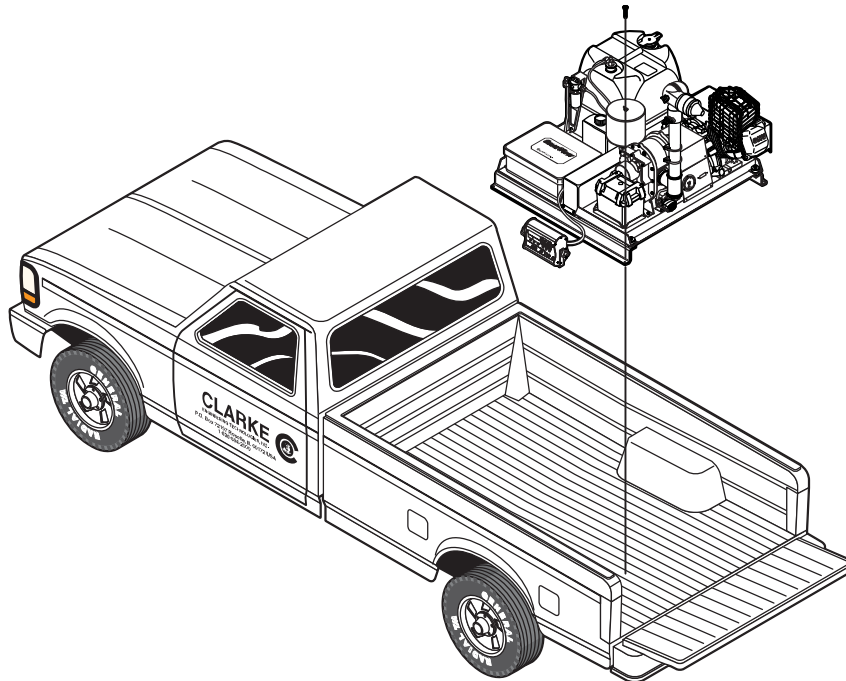


Figure 4- Truck Mounting

Note: Hearing protection must be worn when outside the vehicle in close proximity with the CLARKE Cougar Cold Aerosol Fog Generator Cold Aerosol Fog Generator when it is running.



Read this complete Operation Instructions (page 9) section before starting the CLARKE Cougar Cold Aerosol Fog Generator.

Operation Instructions

When operating the CLARKE Cougar Cold Aerosol Fog Generator for the first time, move to an uncongested and well-ventilated work area in an open area away from flammable materials.

Pre-Start

1. Verify that the battery cable connections are correct and tight. This is a negative ground system.
2. Verify that no foreign objects or tools have been left in or about the fog generator.
3. Check the oil in the engine. If necessary, add oil until the level reaches the mark on the dipstick. The engine manual supplied with the fog generator will advise the correct oil to use. Reference Figure 5.
4. Check the oil and lubrication levels on the blower. See the Blower (page 45) section.
5. Fill the gasoline tank. Reference Figure 5.

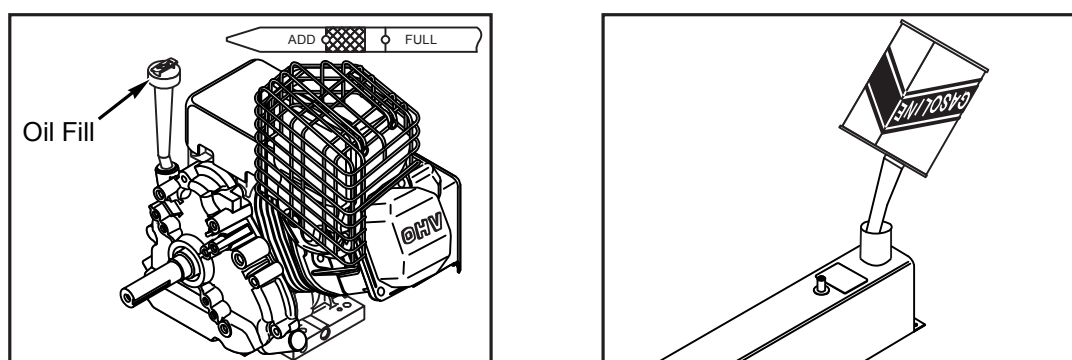


Figure 5- Fill engine Oil and Gasoline Tank

COUGAR® ULV SPRAYER

6. Service the insecticide tank with the appropriate insecticide. Always use a funnel with a strainer screen when adding insecticide to the tank. Reference Figure 6.
7. Place flushing solution in the flush tank. Reference Figure 6.



Figure 6- Filling Insecticide Tank and Flush Tank

8. Verify that the Console is within easy reach of the operator.
9. Verify that the nozzle is in the correct position for spraying. The nozzle is adjustable both horizontally and vertically. To rotate the nozzle, loosen the appropriate knob on the side of the mast or side of the nozzle head and rotate the nozzle. Retighten the knobs after adjustment. Reference Figure 7.

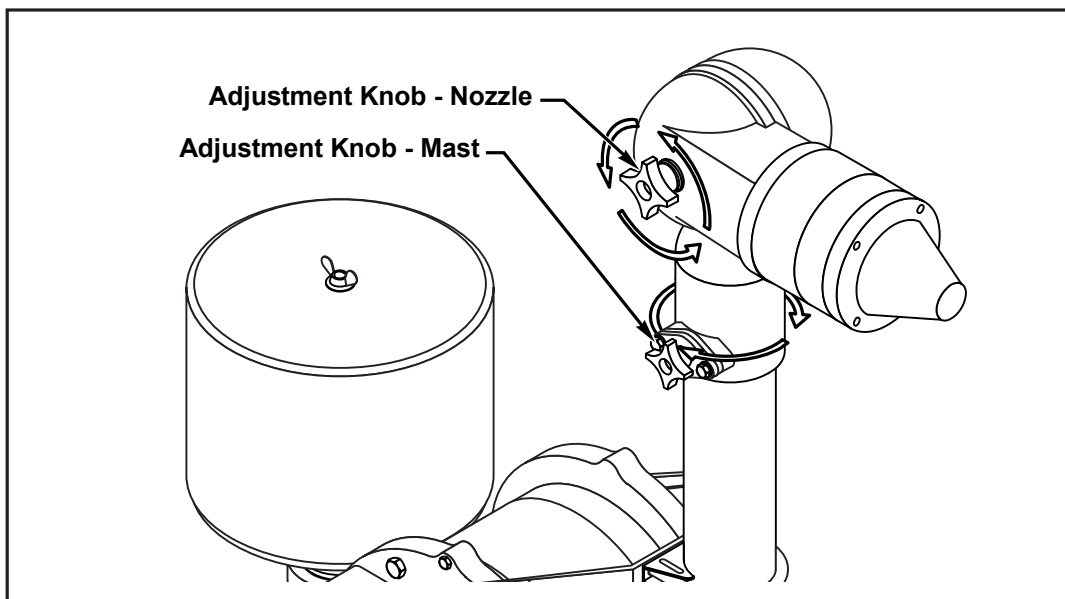


Figure 7- Nozzle Position

Start-Up

1. On the Console, turn the Main Power switch to the ON position. Reference Figure 8.
2. On the Console, set the Spray switch to the OFF position. Reference Figure 8.
3. For a cold engine, on the Console, toggle the choke switch and starter switch at the same time, until the engine fires. Reference Figure 8.
4. For a hot engine, on the Console, toggle the starter switch until the engine fires. Reference Figure 8.
5. When the engine fires release both the choke and starter switch.

Note: Pressing the start button on the engine will also start the engine. The Main Power switch on the Console must be in the ON position for the engine to be started.

Note: Using short cranking cycles of several seconds provides the best starter life. Prolonged cranking can damage the starter motor if cranked more than 15 seconds per minutes.

Hour Meter (Total Spray Time)

The console is equipped with a Total Spray Time meter. To display this meter, press the red time button on the console.

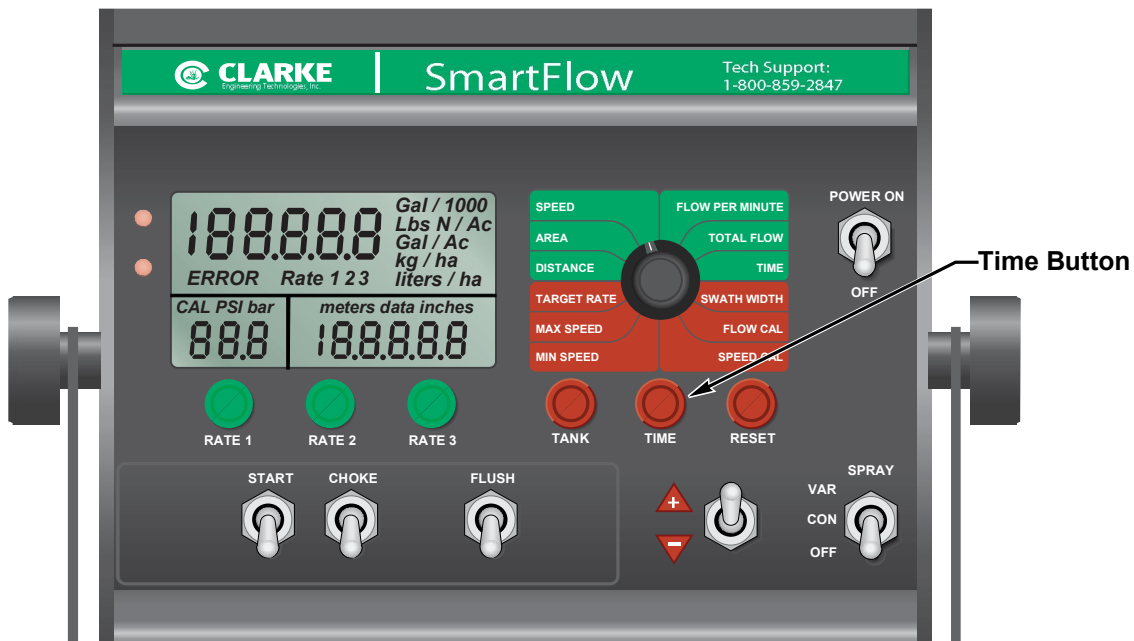


Figure 8- SmartFlow Console

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Pressure Gauge

The unit is equipped with a glycerin filled pressure gauge to read the nozzle air pressure and is mounted on the fog generator coupling guard between the engine and blower.

Adjusting the Nozzle Air Pressure

Nozzle air pressure is one of the main criteria for good particle size. Changing the speed of the engine adjusts this pressure. The nozzle air pressure can be adjusted by checking the pressure gauge as the engine speed is increased or decreased. The engine RPM can be adjusted by using a screwdriver. Reference Figure 9

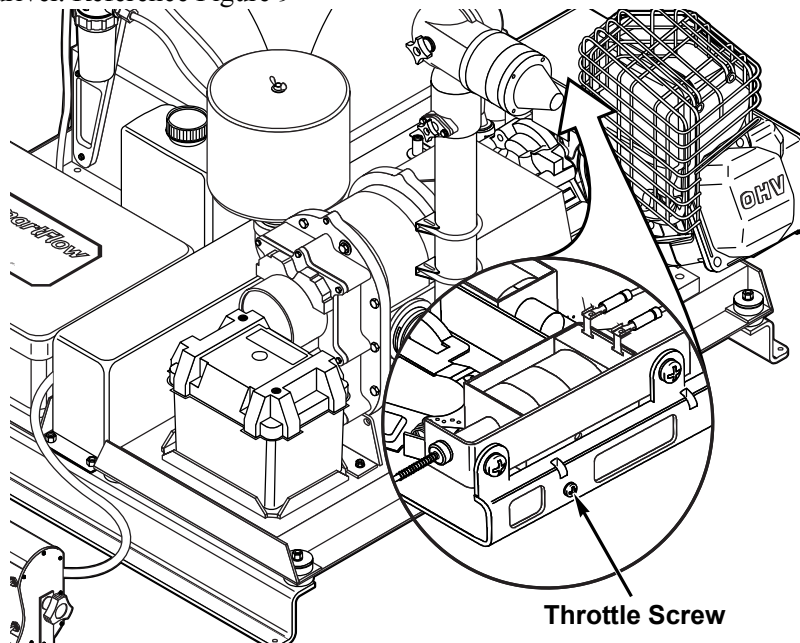


Figure 9- Throttle Screw

Low-Pressure Cut-off

The CLARKE Cougar Cold Aerosol Fog Generator is equipped with an air low-pressure cut-off switch. If, for some reason, the nozzle air pressure drops below 1 P.S.I., the Flow Control will cut off. This prevents the blower from being filled with insecticide because of insufficient air blast. Because of this, the engine on the fog generator must be running when setting the flow rate.

The air low-pressure cut-off switch is located inside the coupling guard and is mounted on the rear of the pressure gauge. If necessary, this switch can be adjusted in the field by removing the rubber plug from the tip of the switch and then using a 7/32" Allen wrench, turn the adjustment screw in about 1/2 turn increments. Turning clockwise increases the air pressure cut-off point. Turning counter-clockwise decreases the air pressure cut-off point.

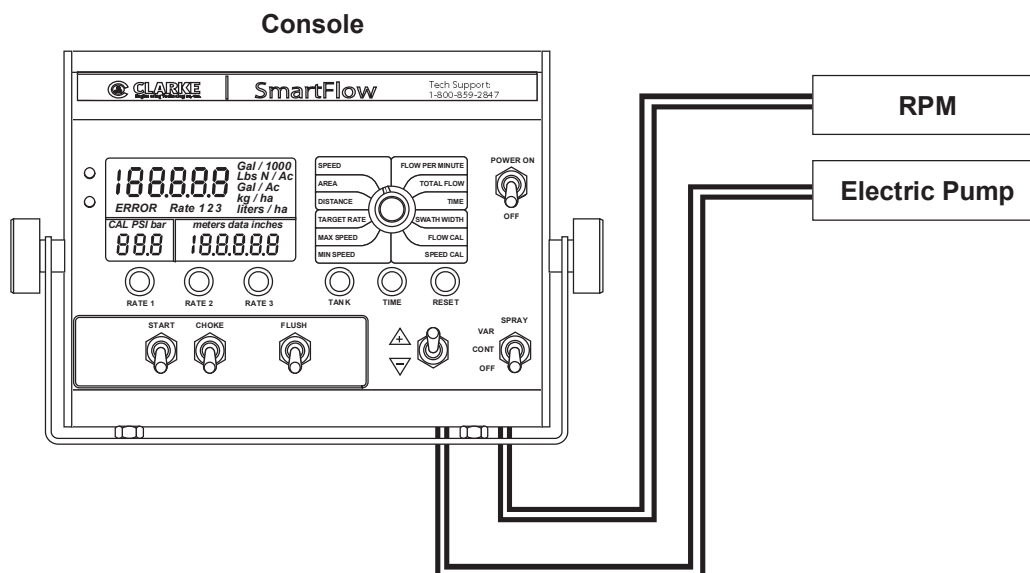
Smart Flow Control

Installation, Operation and Maintenance Manual

Description

The Smart Flow control provides programmable microcomputer control for Clarke spraying systems. The Smart Flow control offers the following features:

- The Smart Flow control uses data from speed and flow sensor to vary the speed of the electric pump on the spraying system. This automatically maintains the target application rate.
- The Smart Flow control can operate alone, or for GPS-controlled Variable Rate Applications (VRA), it can use an RS232 Serial Link to send data to and receive commands from an external computer.
- Three different application rates can be preprogrammed into the Smart Flow control, allowing quick operator selection by the touch of a button.
- The Smart Flow control is available for both gas and electric spraying systems.
- For gas spraying systems, an optional pressure sensor can be installed so the user can monitor the application pressure.



Total Counters

The Smart Flow control accumulates the following totals to document spraying applications:

Counter	Description	Units
Total Flow	The amount of liquid applied since the counter was last reset.	Tenths of a gallon or tenths of a liter
Area*	The total application area since the counter was last reset.	Acres or hectares
Distance*	The distance the vehicle has traveled while spraying since the counter was last reset.	Miles or kilometers
Time	The spray time since the counter was last reset.	Hours
Hours	The cumulative spray time. This counter cannot be reset.	Hours

* Accumulate only in Variable mode.

Control Panel Functions

This section describes the functions of the control panel for the Smart Flow control. The control panel is the same for gas and electric spraying systems, except for the three controls on the lower left.

This section covers these control panel features:

- Alarm (page 16)
- Warning LED (page 16)
- Calibration LED (page 16)
- Display (page 18)
- Rotary Switch (page 21)
- POWER Switch (page 17)
- Buttons (page 23)
- Gas Controls (page 24)
- Electric Controls (page 24)
- +/- Switch (page 25)
- SPRAY Switch (page 26)

CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

Alarm

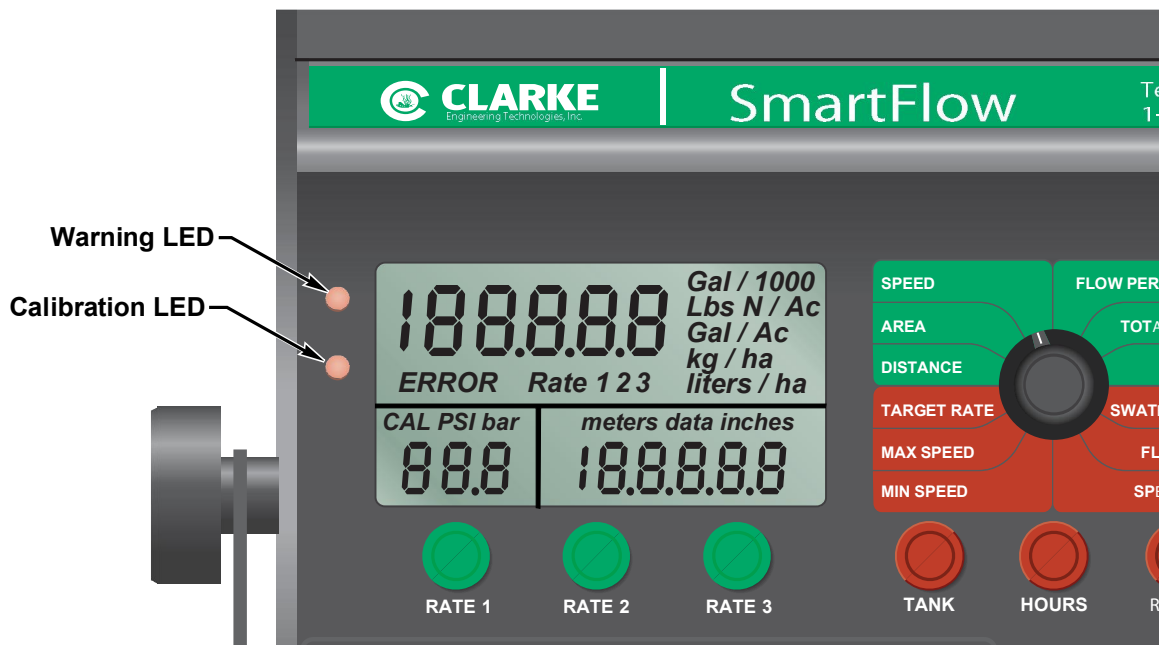
An audible alarm (beeper) sounds when there is an error. The warning LED and ERROR indicator in the upper display window will also be lit.

Warning LED

The warning LED is lit when there is an error. The alarm will sound and the ERROR indicator in the upper display window will also be lit.

Calibration LED

The calibration LED flashes when the control is in Calibration mode and the spray switch is in the OFF position. This indicates that calibration factors can be changed using the +/- (increase/decrease) switch.



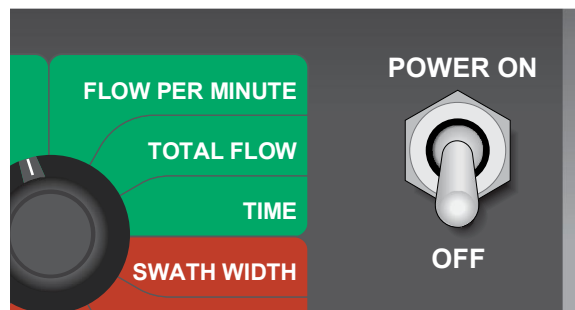
CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

POWER Switch

The POWER switch turns the Smart Flow control on and off. In the OFF position, this switch also grounds the magneto on a gas spraying system or trips the main breaker on an electric spraying system.

 **IMPORTANT:** On an electrical spraying system, the power switch must be turned ON before the main breaker can be turned on.



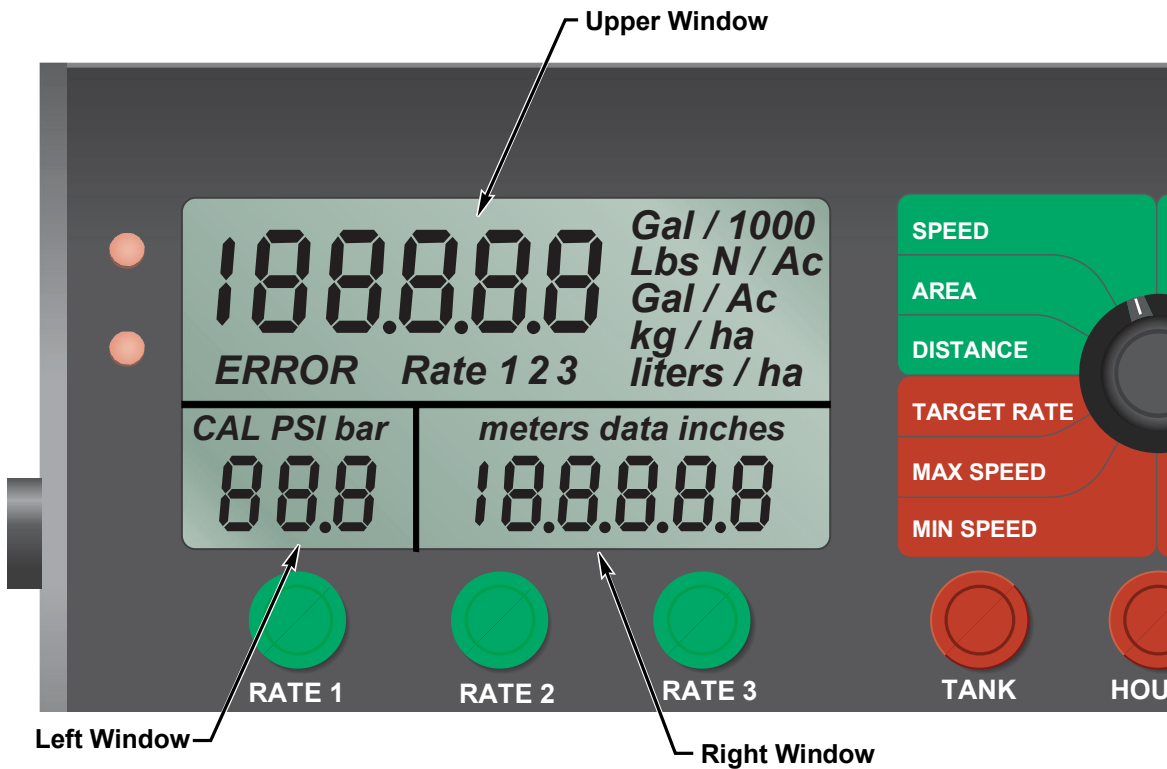
CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

Display

The display is used to view current values and calibration values. The display has three windows:

- Upper window
- Left window
- Right window



CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

Upper Window

The upper window of the display is used to view the application rate, units, and errors.



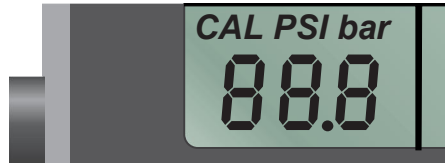
Control	Description
Application rate digits	Variable or Continuous mode: The application rate is displayed in ounces per acre or liters per hectare. Off mode: OFF is displayed when the SPRAY switch is in the OFF position. PCOFF is displayed when an external computer issued an Off command. Calibration mode, rotary switch in Flow Cal position: The calibration flow amount (Cal Total Flow) is displayed. Calibration mode, rotary switch in Speed Cal position: The calibration distance (Cal Distance) is displayed. Calibration mode, rotary switch in other position: A message is displayed.
Unit indicators	English Units Selected When the application rate (ounces per acre) is displayed, the /Ac unit indicator is lit. When the TANK button is pressed, the Gal unit indicator is lit. Metric Units Selected When the application rate (liters per hectare) is displayed, the <i>liters/ha</i> unit indicator is lit. When the TANK button is pressed, no indicator is lit.
ERROR indicator	Indicates that the actual application rate is $\pm 10\%$ from the target application rate. If an error occurs for more than one second, the ERROR indicator is lit, and an error code is displayed in the left window. See “Troubleshooting” on page 39 for a description of the possible error codes.
Rate indicators	Variable or Continuous mode: Displays which of the preset target application rates is active. Calibration mode: Displays which target application rate is being adjusted.

CONTROL PANEL FUNCTIONS

COUGAR® ULV SPRAYER

Left Window

The left window of the display is used to view error codes and pressure codes (when a pressure sensor is installed for a gas spraying system).



Control	Description
Pressure digits	If a pressure sensor is installed, pressure is displayed in all modes. If an error occurs for more than one second, the ERROR indicator in the upper window is lit, and an error code is displayed in the left window. See “Troubleshooting” on page 39 for a description of the possible error codes.
CAL indicator	The control is in Calibration mode.
PSI indicator	English units (psi) are selected.
bar indicator	Metric units (bars) are selected.

Right Window

The right window of the display is used to view the values of rotary switch parameters.



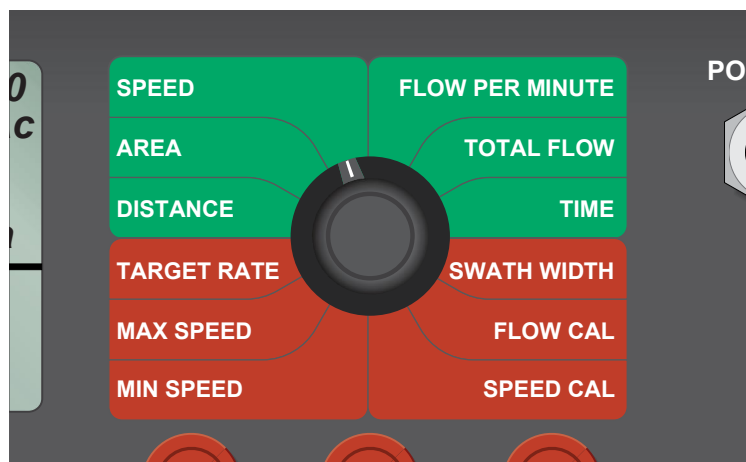
Control	Description
Digits	Displays the value of the parameter selected on the rotary switch.
meters indicator	Metric units are selected and the Swath Width or Speed Cal parameter is selected on the rotary switch.
data indicator	The control is not in Calibration mode, so the value being displayed is not a calibration value.
inches indicator	English units are selected and the Speed Cal parameter is selected on the rotary switch.

CONTROL PANEL FUNCTIONS

COUGAR® ULV SPRAYER

Rotary Switch

The rotary switch is used to select the parameters to display and to set calibration values. The selected value is displayed in the right window of the display, along with the *data* indicator.



Control	Description
Green: Display Positions * Four of these positions are also used for calibration.	
SPEED	Displays the speed in miles per hour or kilometers per hour. In Continuous mode, flashes the Continuous Speed Cal value.
AREA	Displays the area treated since the counter was last reset, in acres or hectares. <i>OFL</i> indicates that the Area counter has exceeded 19999.9.
DISTANCE*	Displays the distance traveled since the counter was last reset, in miles or kilometers. In Continuous or Off mode, displays the last accumulated distance. In Calibration mode, sets the speed that is used in Continuous mode. <i>OFL</i> indicates that the Distance counter has exceeded 19999.9.
FLOW PER MINUTE*	Displays the flow volume in ounces per minute or liters per minute. In Calibration mode, sets the units to English or metric.
TOTAL FLOW*	Displays the total amount of liquid sprayed since the counter was last reset, in tenths of gallons or liters. <i>OFL</i> indicates that the Total Flow counter has exceeded 19999.9.

CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

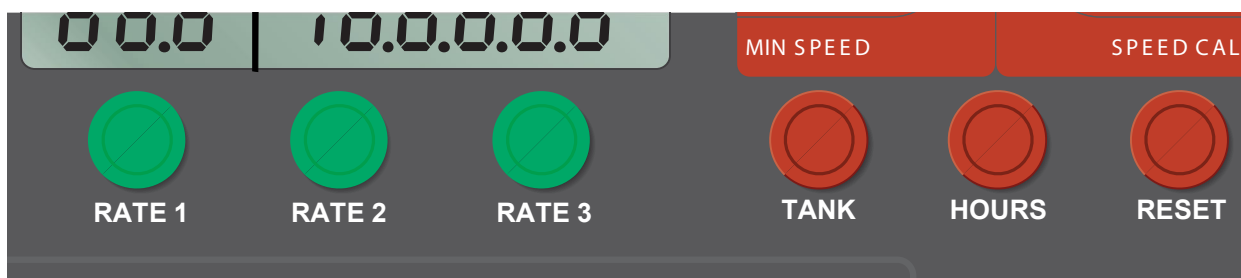
Control	Description
TIME*	Displays the total spray time since the counter was last reset, in tenths of an hour. <i>OFL</i> indicates that the Time counter has exceeded 19999.9.
Red: Calibration Positions	
TARGET RATE	Displays the target application rate in ounces per acre or liters per hectare. In Calibration mode, sets the target application rate.
MAX SPEED	Displays the maximum speed in miles per hour or kilometers per hour. In Calibration mode, sets the maximum speed.
MIN SPEED	Displays the minimum speed in miles per hour or kilometers per hour. In Calibration mode, sets the minimum speed.
SWATH WIDTH	Displays the width of the application area in feet or meters. In Calibration mode, sets the width of the application area.
FLOW CAL	Displays the number of flow sensor pulses generated per gallon or liter of flow. In Calibration mode, sets the number of flow sensor pulses.
SPEED CAL	Displays the distance traveled in feet or meters between speed sensor pulses. In Calibration mode, sets the distance traveled between speed sensor pulses.

CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

Buttons

The buttons are used to select the application rate, display the tank level and spray time, and reset the counters.



Control	Description
RATE 1 button	Selects the first preprogrammed application rate.
RATE 2 button	Selects the second preprogrammed application rate.
RATE 3 button	Selects the third preprogrammed application rate.
TANK button	Displays the amount of liquid remaining in the tank, to the nearest 0.1 gallon or liter. Holding this button and using the +/- switch adjusts the tank volume (typically reset each time the tank is filled). The range is 0.1 to 6553.5 Gal or Liter.
HOURS button	Displays the Hours counter (total cumulative spray time) to the nearest 0.1 hour, up to 19999.9 hours. You cannot reset the Hours counter.
RESET button	When the rotary switch is in the AREA, DISTANCE, TOTAL FLOW, or TIME position and not in Calibration mode, pressing the RESET button for one second resets the associated counters (Area, Distance, Total Flow, and Time).

CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

Gas Controls

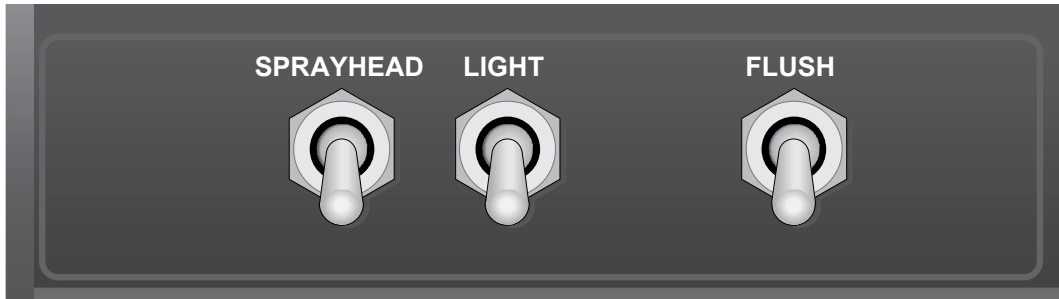
For a gas spraying system, the lower left controls are:



Control	Description
START switch	Starts the gas engine.
CHOKE switch	Chokes the gas engine.
FLUSH switch	Flushes the spraying system.

Electric Controls

For an electrical spraying system, the lower left controls are:



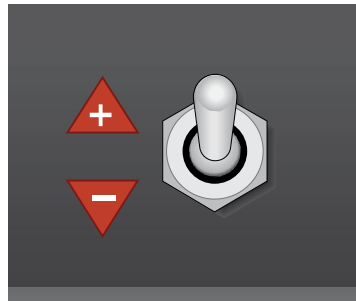
Control	Description
SPRAYHEAD switch	Turns the sprayhead motor on (up) and off (down).
LIGHT switch	Turns the sprayhead light on (up) and off (down).
FLUSH switch	Flushes the spraying system.

CONTROL PANEL FUNCTIONS

COUGAR[®] ULV SPRAYER

+/- Switch

The +/- (increase/decrease) switch is used to enter or adjust values in the display.



Mode	Control	Description
VAR, CON or OFF spray mode	Press TANK button	This switch adjusts the tank volume. See “Adjusting Tank Volume” on page 38.
Calibrate mode	Place rotary switch in a calibration position	This switch adjusts the selected calibration factor. See “Calibration” on page 27.

CONTROL PANEL FUNCTIONS

COUGAR® ULV SPRAYER

SPRAY Switch

The SPRAY switch controls the spray mode.



Control	Description
VAR position	Variable Mode The Smart Flow control varies the pump speed to automatically maintain the selected application rate based on flow and speed. Total Flow, Distance, Time, Hours, and Area counters accumulate in this mode.
CONT position	Continuous Mode The Smart Flow control varies the pump speed to automatically maintain the selected application rate based on flow only This mode can be used to spray while the vehicle is stopped. Total Flow, Time, and Hours counters accumulate in this mode.
OFF position	Off Mode The sprayer is stopped, and the Application Rate, Flow Per Minute, and Active Swath values go to zero. Total Flow and Tank counters accumulate in this mode in case flow does not stop immediately.

Calibration

This section covers these calibration topics:

- Calibration Factors (page 28)
- Entering Calibration Mode (page 29)
- Exiting Calibration Mode (page 29)
- Setting Continuous Speed (page 30)
- Setting Units (page 30)
- Setting Target Application Rate (page 31)
- Setting Maximum Speed (page 31)
- Setting Minimum Speed (page 32)
- Setting Swath Width (page 32)
- Setting the Flow Calibration Factor (page 33)
- Determining the Flow Calibration Factor (page 33)
- Reloading Calibration Defaults (page 35)

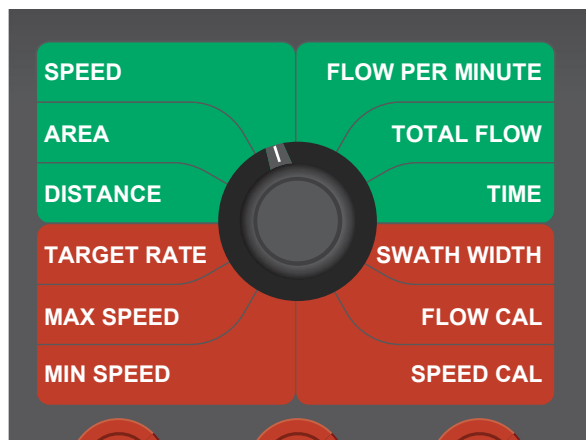
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Calibration Factors

The Smart Flow control has eight calibration factors:

Calibration Factor	Rotary Switch Position	Description
Continuous Speed	DISTANCE	The speed that is used in Continuous mode.
Units	FLOW PER MINUTE	The control can be set to use English or Metric units.
Target Rate	TARGET RATE	Sets the three preset Target Application Rates.
Maximum Speed	MAX SPEED	The maximum speed allowed in Variable mode. If the vehicle exceeds this speed, the control goes into Off mode until the speed goes below this number again.
Minimum Speed	MIN SPEED	The minimum speed allowed in Variable mode. If the vehicle goes below this speed, the control goes into Off mode until the speed exceeds this number again.
Width	SWATH WIDTH	The width of the application area; typically 300 feet for mosquito control applications.
Flow Cal	FLOW CAL	Specifies the number of flow sensor pulses per gallon applied. This enables the Smart Flow control to accurately measure total flow, flow per minute, and application rate.
Speed Cal	SPEED CAL	Specifies the distance the vehicle travels between speed sensor pulses. This enables the Smart Flow control to accurately measure speed, distance, area, and application rate.

Note: To view the first four factors in the previous table, you must place the control in Calibration mode. The last six factors can be viewed at any time by placing the rotary switch in one of the red positions.



Entering Calibration Mode

To place the Smart Flow control in calibration mode:

1. Move the rotary switch to the TARGET RATE position.
2. While holding the +/- (increase/decrease) switch in the + position, push and hold reset button for 2 seconds.
3. When the control has powered up, release the +/- (increase/decrease) switch.

SET is displayed in the upper display window, the CAL indicator is lit in the left display window, and the calibration LED flashes to indicate Calibration mode. Dashes are displayed in the right display window until a calibration factor is selected with the rotary switch.

Exiting Calibration Mode

To exit calibration mode and save changes, rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode. Any changes take effect immediately.

To exit calibration mode without saving changes, move the POWER switch to the OFF position.

COUGAR® ULV SPRAYER

Setting Continuous Speed

To set the speed that is used in Continuous mode:

1. Place the control in Calibration mode.
2. Move the rotary switch to the DISTANCE position.

SPEED is displayed in the upper display window, and the current Continuous Speed is displayed in the right display window.

3. Use the +/- (increase/decrease) switch to increase or decrease the speed. The possible range is 2.0 to 45.0 mph or kph.
4. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

Setting Units

To set the units to English or Metric:

1. Place the control in Calibration mode.
2. Move the rotary switch to the FLOW PER MINUTE position.

UnitS is displayed in the upper display window, and the current Units setting (Eng or MEt) is displayed in the right display window.

3. Use the +/- (increase/decrease) switch to toggle between English and Metric units.
4. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

Setting Target Application Rate

To set one of the three preset Target Application Rates for Variable and Continuous mode:

1. Place the control in Calibration mode.
2. Move the rotary switch to the TARGET RATE position.
3. Press the RATE 1, RATE 2, or RATE 3 button to select the Target Rate to be changed.

The selected rate indicator and current units are lit in the upper display window, and the current Target Application Rate is displayed in the right display window.

4. Use the +/- (increase/decrease) switch to increase or decrease the Target Application Rate. The possible range is 0.01 to 655.35 ounces per acre, or 0.001 to 65.535 liters/hectare. (The range may also be limited by the stroke of the pump.) A typical rate is 1 ounce/acre.
5. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

Setting Maximum Speed

To set the maximum speed allowed in Variable mode:

1. Place the control in Calibration mode.
2. Move the rotary switch to the MAX SPEED position.

Hi is displayed in the upper display window, and the current Maximum Speed is displayed in the right display window.

3. Use the +/- (increase/decrease) switch to increase or decrease the speed. The possible range is 2.0 to 45.0 mph or kph. A typical maximum speed is 20 mph.

Note: The Maximum Speed must be greater than the Minimum Speed, or the sprayer will not start.

Note: Setting the Maximum Speed to zero (0) disables the Maximum Speed limit.

4. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

COUGAR[®] ULV SPRAYER

To set the minimum speed allowed in Variable mode:

1. Place the control in Calibration mode.
2. Move the rotary switch to the MIN SPEED position.

Lo is displayed in the upper display window, and the current Minimum Speed is displayed in the right display window.

3. Use the +/- (increase/decrease) switch to increase or decrease the speed. The possible range is 2.0 to 45.0 mph or kph. A typical minimum speed is 5 mph.

Note: The Minimum Speed must be less than the Maximum Speed, or the sprayer will not start.

Note: Setting the Minimum Speed to zero (0) disables the Minimum Speed limit.

4. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

Setting Swath Width

To set the width of the application area:

1. Place the control in Calibration mode.
2. Move the rotary switch to the SWATH WIDTH position.

Wdth is displayed in the upper display window, and the current Swath Width is displayed in the right display window.

3. Use the +/- (increase/decrease) switch to increase or decrease the Swath Width. The possible range is 0.0 to 6553.5 feet, or 0.00 to 655.35 meters. A typical swath width is 300 feet.
4. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

Setting the Flow Calibration Factor

To set the Flow Cal factor:

1. Place the control in Calibration mode.
2. Move the rotary switch to the FLOW CAL position.

The calibration flow amount (Cal Total Flow) is displayed in the upper display window, and the current Flow Cal factor is displayed in the right display window.

3. Use the +/- (increase/decrease) switch to increase or decrease the Flow Cal factor. The possible range is 0.00 to 6553.5 pulses per gallon.

Note: The Cal Total Flow in the upper display window will change to reflect the new Flow Cal factor.

4. Rotate the rotary switch to TARGET RATE, press and hold the RESET button for three seconds to save the change and exit Calibration mode.

Determining the Flow Calibration Factor

This procedure is used if the target rate needed is not within default target rate span. The default target rate span is approx. .5 ounces to 2 ounces per acre.

If target rate can not be made, flow cal factor must be adjusted. This means that the pump stroke must be adjusted and the smartflow must be recalibrated.

Note: Formula to calculate pump flow rate:

$\text{speed} \times \text{swath} \times \text{target rate (ounces per acre)} / 495 = \text{pump rate (ounces per minute)}$

This is a two step process.

1. calibrate pump (example- 12 ounces per minute.)

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1-800-859-2847*

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2. calibrate smart flow to pump.
 - a. get into cal mode.
 - b. set the continuous speed, swath width, and target rate 1 calibration factors. these will be used to operate the pump at the desired rate. (example – 10 mph, 300 ft. swath width, and 2.5 ounces per acre.)
 - c. turn rotary switch to flow cal.
 - d. reset display to zero by pushing reset button.
 - e. start sprayhead and turn pump on and pump out a
 - f. measured amount. (min. 20 ounces)
 - g. shut off pump and adjust display with +/- switch
 - h. until display reads the actual ounces you pumped
 - i. push reset till display reads off to store results.

** please call our technical services hotline if you have any questions about this procedure.
1-800-859-2847*

Reloading Calibration Defaults

Normally, the calibration settings that were in use when the Smart Flow control was turned off will be active when the control is restarted. However, you can reload the default calibration settings during startup as follows:

Note: This procedure also clears the Total Flow, Area, Distance, Time, and Tank counters and disables the Pressure offset.

English Units: To load English default calibration settings, press and hold the RATE 1 button and hold the +/- (increase/decrease) switch in the + position while moving the POWER switch to the ON position.

Metric Units: To load Metric default calibration settings, press and hold the RATE 2 button and hold the +/- (increase/decrease) switch in the + position while moving the POWER switch to the ON position.

The calibration default settings are as follows:

Calibration Factor	English	Metric
Target Rate 1	1.0 ounces/acre	0.073 liters/hectare
Target Rate 2	1.0 ounces/acre	0.073 liters/hectare
Target Rate 3	1.0 ounces/acre	0.073 liters/hectare
Swath Width	300 feet	91.44 meters
Speed Cal (UPP)	1.03 inches/edge	.026 meters/edge
Flow Cal (PPG)	2660.0 PPG	2660.0 PPG
Minimum Speed	2.0 mph	3.2 kph
Maximum Speed	22.0 mph	35.4 kph
Units	English	Metric
Continuous Speed	10 mph	16.0 kph
Regulator Constant	5	5
Control Threshold	100	100
Pressure Offset	255(Off)	255(Off)

COUGAR® ULV SPRAYER

Operation

This section covers these operating procedures:

- Startup (page 36)
- Selecting the Application Rate (page 37)
- Shutdown (page 37)
- Clearing Counters (page 37)
- Adjusting Tank Volume (page 38)
- Setting the Pressure Offset (page 38)

Startup

To start the Smart Flow control:

1. Move the POWER switch to the ON position.
2. If bAD appears in the upper display window and the CAL indicator in the left display window is lit:
 - a. Press the RESET button.
 - b. Check and correct all calibration factors.
 - c. Check and correct any counters that may have overflowed (Total Flow, Area, Distance, Time, and Hours).
3. Select the desired application rate by pressing the RATE 1, RATE 2, or RATE 3 button.
4. Start the sprayer:
 - Press the START button.

Note: For specific startup procedures, see the Instruction Manual for your spraying system.
5. Place the Spray switch in the desired position (see “SPRAY Switch” on page 26):
 - VAR = Variable mode

Selecting the Application Rate

To select a preset application rate, press the desired rate button (RATE 1, RATE 2, or RATE 3). In the upper display window, the selected rate indicator is lit.

If the SPRAY switch is in the VAR or CON position, the selected rate is displayed for three seconds. If the SPRAY switch is in the OFF position, the upper display window will still display OFF, but the new application rate will be selected.

Shutdown

To shut down the Smart Flow control:

1. Place the SPRAY switch in the OFF position.
 2. Stop the sprayer.
 - For a gas model, the Smart Flow control is not involved in stopping the sprayer.
- Note:** For specific shutdown procedures, see the Instruction Manual for your spraying system.
3. Press the FLUSH switch. Flush the spraying system for at least one minute to completely flush the lines.
 4. Move the POWER switch to the OFF position.

Clearing Counters

To clear the Total Flow, Area, Distance, and Time counters:

1. Make sure that the Smart Flow control is not in Calibration mode.
2. Move the rotary switch to the TOTAL FLOW, AREA, DISTANCE, or TIME position.
3. Press the RESET button for 1 second.

All four counters are reset to zero.

COUGAR[®] ULV SPRAYER**Adjusting Tank Volume**

You should adjust the tank volume to match the actual volume of liquid in your tank each time you fill the tank. To adjust the tank volume:

1. Make sure that the Smart Flow control is not in Calibration mode.
2. Press and hold the TANK button.
3. Move the +/- (increase/decrease) switch to adjust the value displayed in the upper display window. The range is 0.1 to 6553.5 gallons or liters. A typical tank is 15 gallons.

Setting the Pressure Offset

If a pressure sensor is installed on your gas spraying system, use the following procedure to adjust the pressure offset (zero the pressure sensor):

1. Make sure that the Smart Flow control is not in Calibration mode.
2. Move the SPRAY switch to the OFF position.
3. While holding the HOURS button, move the +/- (increase/decrease) switch to the – position.

The pressure in the left display window is reset to zero, and a new pressure offset is stored.

Note: The pressure offset can be reset to zero by reloading the calibration defaults.

Troubleshooting

This section covers these troubleshooting topics:

- Warning Signals (page 39)
- Error Codes (page 39)

Warning Signals

If an error occurs for more than one second, the following occur:

- The warning LED is lit.
- The audible alarm beeps.
- The ERROR indicator in the upper display window is lit.
- An error code is displayed in the left display window.

Error Codes

When an error occurs, one of the following error codes is displayed in the left display window:

Error Code	Description
1	The Pressure OK and RPM OK inputs are both low. (This error occurs only in Variable or Continuous mode.)
2	In Continuous mode, the Pressure OK and RPM OK inputs are high, but there is no flow signal.
3	In Variable mode, the Pressure OK and RPM OK inputs are high and speed is within the minimum and maximum limits, but there is no flow signal.
4	In OFF mode, flow is still being detected.
5	Condition - Flush button pushed, pump not running.

COUGAR[®] ULV SPRAYER

Maintenance

IMPORTANT

It is highly recommended that some system be established to assure the performance of the following maintenance instructions.

General

- Replace worn or damaged parts on the CLARKE Cougar Cold Aerosol Fog Generator.
- Service the engine according to the Engine Maintenance Manual.
- Service the blower according to the Blower Maintenance Manual and the Blower (page 45) section.

Daily

- Visually check the fog generator each day before use and make any necessary adjustments and / or repairs.
- Crank the engine and check the nozzle air pressure as indicated on the pressure gauge on the fog generator. If the pressure varies more than + or - 1/2 P.S.I. from the preset pressure range, readjust the nozzle air pressure. See Adjusting the Nozzle Air Pressure (page 12)
- After use of the fog generator, flush the insecticide system with a suitable flushing solution.

Every 50 Hours

- Check the flow rate calibration. See Setting the Flow Calibration Factor (page 33) and Calibration Factors (page 28).
- Check all bolts and fasteners and tighten if necessary.
- Check all gasoline hoses, insecticide lines and fittings for cracks, leaks or wear. Replace if needed.
- Check all nozzle parts for wear or physical damage. Replace damaged parts.
- Remove and clean the element in the filter-silencer as follows. Reference Figure 9.
 - a. Remove the wing nut and washer.
 - b. Remove the cover and element.
 - c. Clean the inside of the housing and the element as required. If the element is damaged or bent, replace with a new one.
 - d. Replace the element, cover, washer and wing nut.

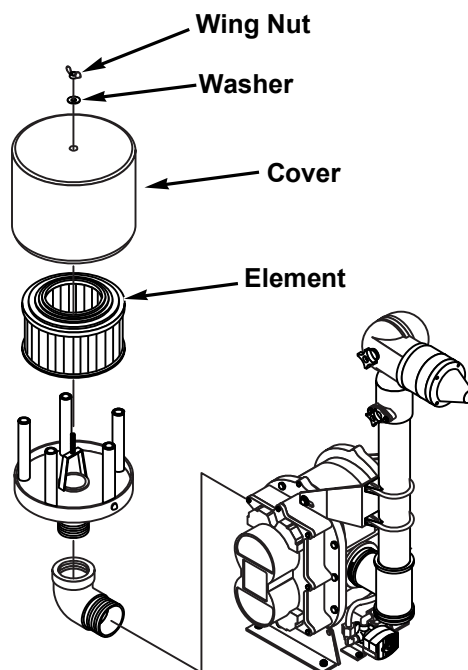


Figure 9- Element Replacement

COUGAR[®] ULV SPRAYER

Every 100 Hours

- Clean the insecticide filter. If this filter becomes stopped up, the insecticide flow will be restricted or stopped. There is a fine mesh screen located in the cylindrical housing. This screen can be removed for inspection and/or cleaned by manually unscrewing the housing bowl. Reference Figure 10

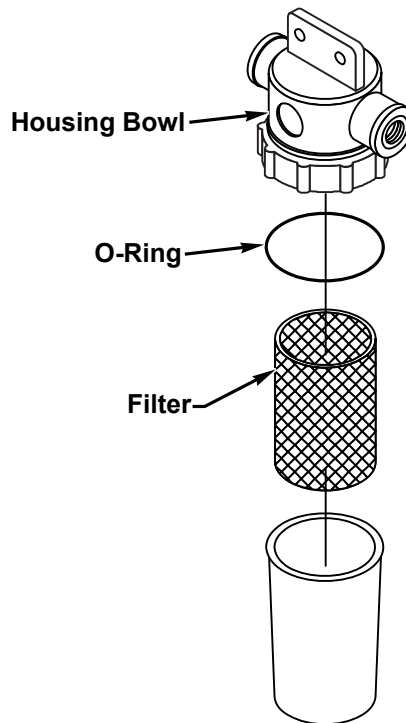


Figure 10- Insecticide Filter

- Check the battery voltage. Test the battery with a volt-ohmmeter. Connect the positive (+) meter lead to the positive (+) battery terminal. Connect the negative (-) meter lead to the negative battery terminal. Set the meter on volts. If the meter reads 11.5 to 12 or more volts, the battery is OK. If the meter reads less than 11.5 volts, check the specific gravity of the electrolyte. See below for instructions on checking specific gravity of the electrolyte.
- Check the battery electrolyte. Remove the battery vent caps and check the electrolyte level. Add clean distilled water if necessary to cover the battery plates. Check the specific gravity of the electrolyte with a hydrometer. If the specific gravity is between 1.250 and 1.280, the battery cell being tested is OK. If the specific gravity is between 1.225 and 1.250, the battery cell being tested is still in fair condition. If the specific gravity is below 1.150 in any one cell, replace the battery. If the specific gravity in one cell is 0.050 more or less than the other cells, and charging does not bring the charge to a 50% charge, replace the battery.

- Replace the in-line gasoline filter. Using pliers, loosen the tension on the two hose clamps and slide them off of the filter barbs. Remove the old filter from the gasoline hose. Install a new filter and replace the hose clamps. New filters can be installed with the direction of flow going either way. Never reverse an old filter. Reference Figure 11.
- Check the pulsation dampers. The metering pump used on the fog generator tends to deliver a slightly pulsating flow of insecticide. For best aerosol particle size, a more even (non-pulsation) flow is desirable. A small air chamber pulsation damper is located in the metering pump outlet line between the pump and the discharge nozzle. It is a nylon assembly with an air dome that can be unscrewed by hand for inspection. There is a gasket that seals the joint between the air dome and the lower housing. The air dome should be checked periodically to make sure that it has not become filled with insecticide. If the dome has no air in it, it will not function as a pulsation damper. When reassembling, be sure that the sealing gasket is properly positioned so as to avoid damage caused by pinching. Applying a light coat of oil or grease will prevent pinching the gasket. Tighten the housing only hand tight when reinstalling. Do not use tools. Reference Figure 11.

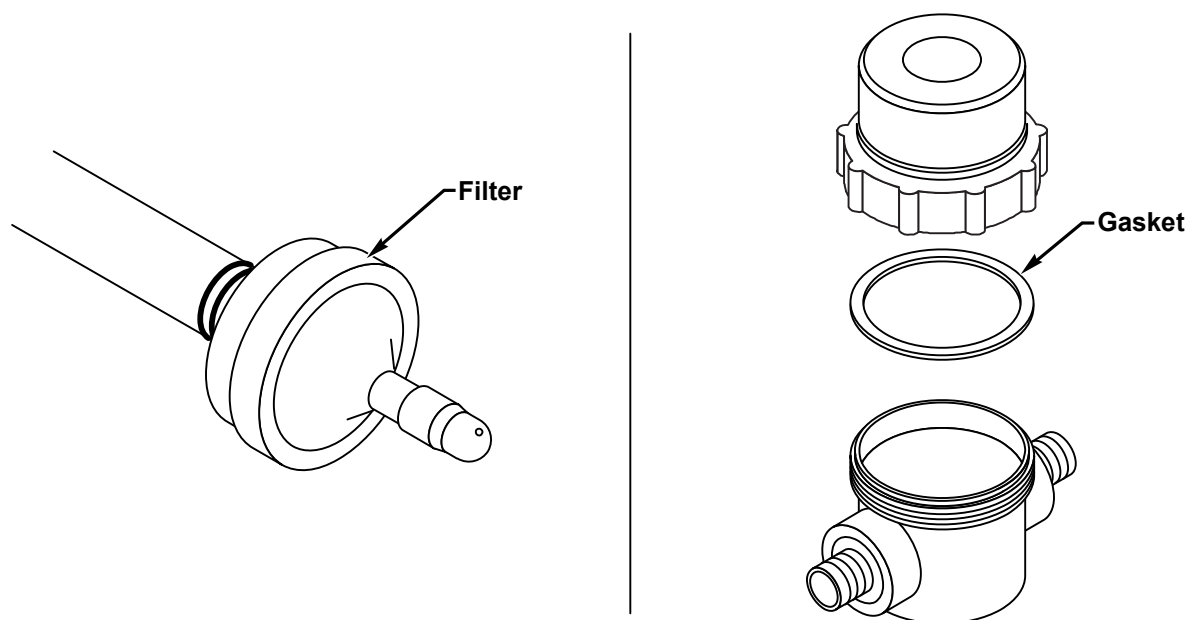


Figure 11- In-Line Gasoline Filter/Pulsation Dampner

COUGAR[®] ULV SPRAYER

Engine

Lubricate and service the engine according to the engine manual. We recommend the use of a high quality, SAE 30W detergent oil classified "for service SF, SG, SH" (such as Briggs & Stratton(r) 100005 or 100028) when operating at temperatures above 40° F. Below 40°, SAE 10W30 or 5W30 oil is acceptable.

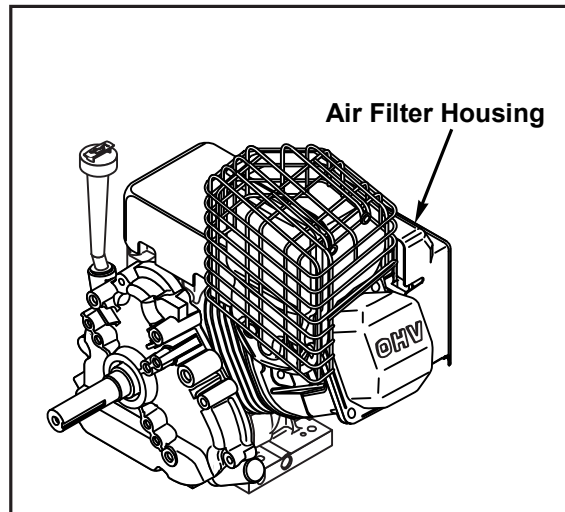


Figure 12- Engine Filters

Blower

A simple but very effective lubrication system is employed on the blower. At the drive shaft end the bearings are grease lubricated using hydraulic pressure relief fittings. These relief fittings vent any excess grease, preventing pressure build-up on the seals. A restriction plug and metering orifice prevent loss of lubricant from initial surges in lubricant pressure but permit venting excess lubricant under steadily rising pressures.

The blind end bearings and timing gears are enclosed by a gearhouse located opposite the drive end of the blower. The lower timing gear functions as an oil slinger, carrying lubricant to the upper timing gear and providing splash lubrication for the bearings. Pressure within the gearbox is vented through the breather plug.

To fill the gearbox, remove the breather plug and the oil overflow plug. Fill the reservoir up to the overflow hole. Place the breather and the overflow plug into their respective holes.

Under normal conditions the oil level on the non-drive end of the blower should be checked every 25 hours of operation. Change the oil every 100 hours or 30 days, whichever comes first. Under extremely hot or dusty operation conditions, the oil level should be checked more often and may

require more frequent changes. Every six months the oil breather plug should be removed cleaned in solvent and blown out with clean compressed air to provide unobstructed venting.

Shaft bearings at the drive end of the blower are grease lubricated and each bearing housing is equipped with pressure type grease fittings and pressure type relief fittings. When servicing drive end bearing, use a premium grade, petroleum base grease with high temperature and moisture resistance and good mechanical stability. Using a pressure gun, force new lubricant into each drive end bearing housing until traces of clean grease comes out of the relief fittings. Grease should be added using hand operated grease gun to the drive end bearings at varying time intervals depending on duty cycle.

Recommended greasing intervals:

1. With the blower operating 8 hours per day, grease should be added every two weeks.
2. With the blower operating 16 hours per day, grease should be added every week.

More frequent intervals may be necessary depending on the grease operating temperature and under unusual circumstances.

The oil used must be of the proper viscosity and certified to meet M-S type specifications of heavy-duty type. Do not use multiple viscosity oils.

Recommended oil viscosity:

- 30 Degrees F and under..... SAE 30
- From 30 Degrees F to 90..... SAE 40
- From 90 Degrees F..... SAE 50

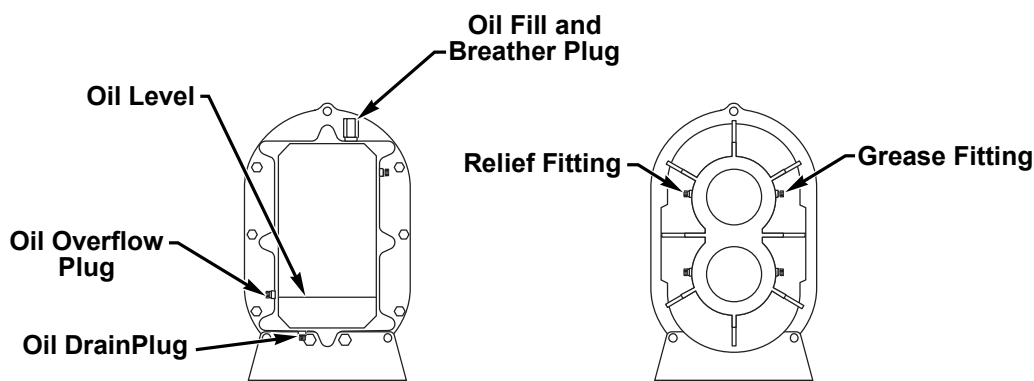


Figure 13- Blower

COUGAR® ULV SPRAYER

To replace the engine or blower coupling or the coupling sleeve:

1. 1. Disconnect the negative battery cable.
2. Remove the coupling guard cover.
3. Remove the blower from the chassis.
4. Remove the setscrews in the engine and blower couplings and slide the couplings off of the shafts. If these couplings are difficult to move, the couplings are either rusted to the shafts or there is a burr on the keys under the setscrews. If this is the case, use penetration oil such as Marvel Mystery Oil(r) to loosen the rust and use a drill slightly smaller than the setscrew holes to deburr the keys. This drill must have a flat point in order not to drill into the keys.
5. Carefully file and remove existing burrs or high spots caused by the setscrews on the engine and blower shafts and the keys.
6. Slide the engine coupling and 1/4" key onto the engine drive shaft. Position the engine coupling 1-5/16" from the engine. Reference Figure 14.
7. Install the engine coupling setscrews and tighten them, which locates the engine coupling in its final position.
8. Slide the blower coupling and 3/16" key onto the blower drive shaft. Position the blower coupling 1-5/16" from the blower. Reference Figure 14.
9. Install the blower coupling setscrews and tighten them, which locates the blower coupling in its final position.

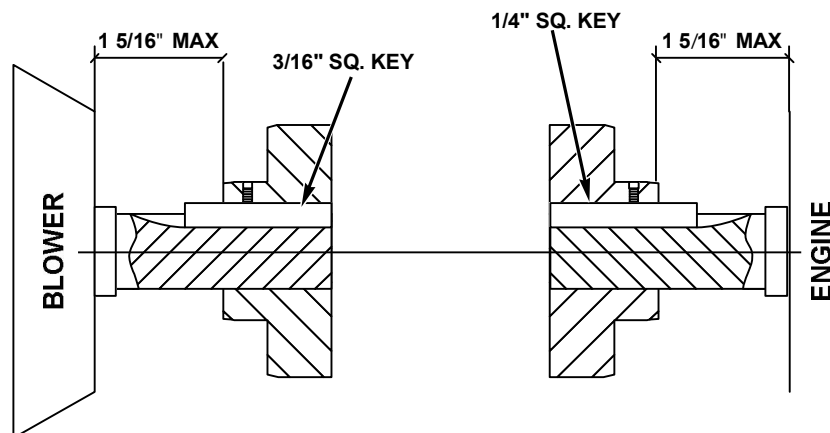


Figure 14- Coupling Assembly

10. Install the rubber coupling sleeve, mount the blower on the chassis, leaving the blower mounting bolts loose and slide the blower towards the engine to engage the sleeve. The blower shaft may have to be rotated to engage the sleeve.
11. Using the shims that were under the blower, shim the blower to align the engine and blower shafts. Tighten the blower mounting bolts.

Steps 12 and 13 **MUST** be preformed to assure correct shaft alignment.

12. Check parallel alignment by placing a straightedge across the two coupling flanges and measuring the maximum offset at various points around the edge of the coupling flanges **WITHOUT ROTATING THE COUPLING FLANGES**. If the maximum offset exceeds .015 inches, realign the shafts. Reference Figure 15.

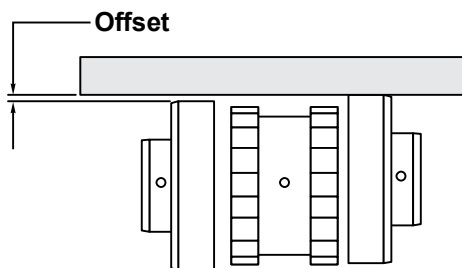


Figure 15- Measuring Offset

13. Check angular alignment with a micrometer, vernier, or caliper. Measure from the outside of one flange to the outside of the other at intervals around the edge of the coupling flanges. Determine the maximum and minimum dimensions **WITHOUT ROTATING THE FLANGE COUPLINGS**. These measurements must be within .070 inches. If correction is necessary, be sure to recheck the parallel alignment. Reference Figure 16.

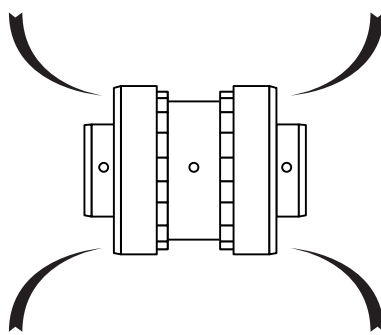


Figure 16- Parallel Alignment

14. Install the coupling guard cover.
15. Connect the negative battery cable.

Note: The coupling, coupling sleeve and connected equipment will normally operate longer and more economically when the couplings are carefully aligned.

CAUTION

Coupling sleeve may be thrown from the coupling assembly with substantial force when the couplings are subjected to a severe shock load or abuse.

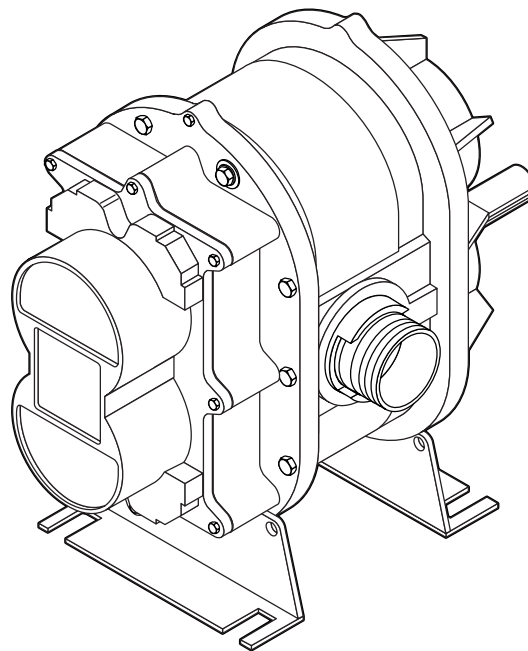
Before storing the CLARKE Cougar Cold Aerosol Fog Generator after use or if it is to be idle for any appreciable length of time, the following preparations should be made:

1. Flush the fog generator for at least 10 minutes.
2. Drain the insecticide tank and thoroughly clean it.
3. Drain the flush tank and thoroughly clean it.
4. Pour 1 quart of light weight oil into the flush tank. Engine oil can be used.
5. Pour enough light weight oil into the insecticide tank to cover the bottom of the drop pipe.
6. Spray and flush the fog generator until the oil in the insecticide and flush tanks is completely through the system and sprays out of the nozzle.
7. Engine:
 - a. All fuel should be removed from the tank. Run the engine until it stops from lack of fuel.
 - b. While the engine is still warm, drain the oil from the crankcase. Refill with fresh oil.
 - c. Remove the spark plugs and add a tablespoon of engine oil into the spark plug holes. Install the spark plugs, but do not connect the plug leads. Crank the engine slowly 2 to 3 revolutions to distribute the oil. Replace the plug leads.
 - d. Clean dirt and chaff from the cylinders, cylinder head fins, engine blower housing, rotating screen and muffler areas.
 - e. Clean all other exterior surfaces of the engine.
 - f. Spread a light film of oil over any exposed metal surfaces of the engine to prevent rust.
8. Remove and clean the filter-silencer element and housing as explained in Maintenance (page 41) section. Reference Figure 9.
9. Blower:
 - a. Remove the oil breather plug, clean in solvent and blow out with clean compressed air.

- b. Drain the oil from the oil reservoir and refill with fresh oil. Grease the bearings on the drive end.
 - c. Remove the filter-silencer. If the filter-silencer is hard to unscrew from the blower inlet port, use penetrating oil such as Marvel Mystery Oil(r) to loosen the rusted threads.
 - d. Pour 1 pint of lubrication oil (SAE 40) in the blower intake.
 - e. With the engine ignition switch off, use the starter to turn the blower slowly so that the entire inner surface of the blower is coated with oil. This will prevent a coat of rust from forming in the blower and in all probability will save the cost of a new blower or an expensive repair bill.
 - f. Reinstall the filter-silencer.
10. Charge the battery and store as recommended by the manufacturer.
 11. Clean all insecticide residue and oil off the CLARKE Cougar Cold Aerosol Fog Generator and repaint if necessary.
 12. Store the CLARKE Cougar Cold Aerosol Fog Generator in a clean dry area under suitable cover protected from the elements.

A major problem can be the blower rusting up over the winter. If moisture gets into air chamber, the rotary lobes will rust together preventing the blower from turning. When this happens, either the engine or blower shaft may be sheared when the engine is started. Following the storage recommendations of this manual can prevent this.

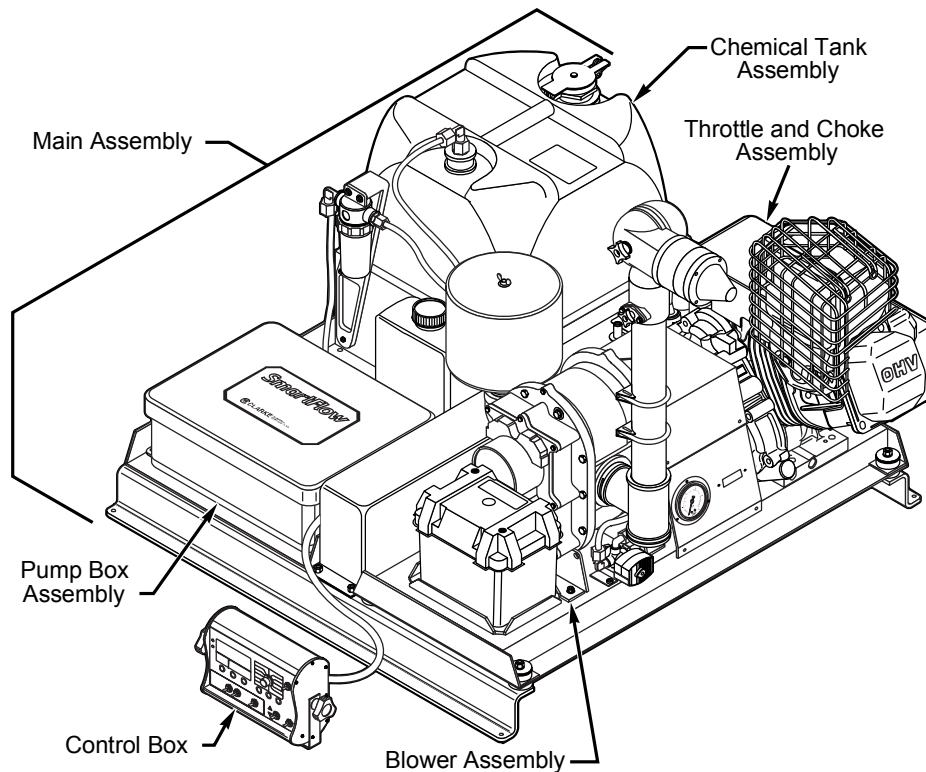
Removing the port elbows and pouring penetration oil such as Marvel Mystery Oil[®] into the lobe chamber will usually loosen a rusted blower. The blower may need to sit for a day or two with the penetration oil in it before the engine is started. When trying to free the blower, don't turn the ignition switch on. Just bump the starter button until the blower turns. In extreme cases, the blower shaft may have to be turned by hand with the pipe wrench to loosen the lobes. Care must be taken not to damage the blower shaft with the pipe wrench. Once the blower turns, the engine can be started and the lobes should hone themselves free of rust.



PARTS BOOK - TABLE OF CONTENTS

COUGAR® ULV SPRAYER

Page	Description	Part No.
51 - 54	MAIN ASSEMBLY	12871
55 - 56	BLOWER ASSEMBLY	12850
57 - 58	NOZZLE ASSEMBLY	12010
59 - 60	CHEMICAL TANK ASSEMBLY	10296
61 - 62	PUMP BOX ASSEMBLY	12979



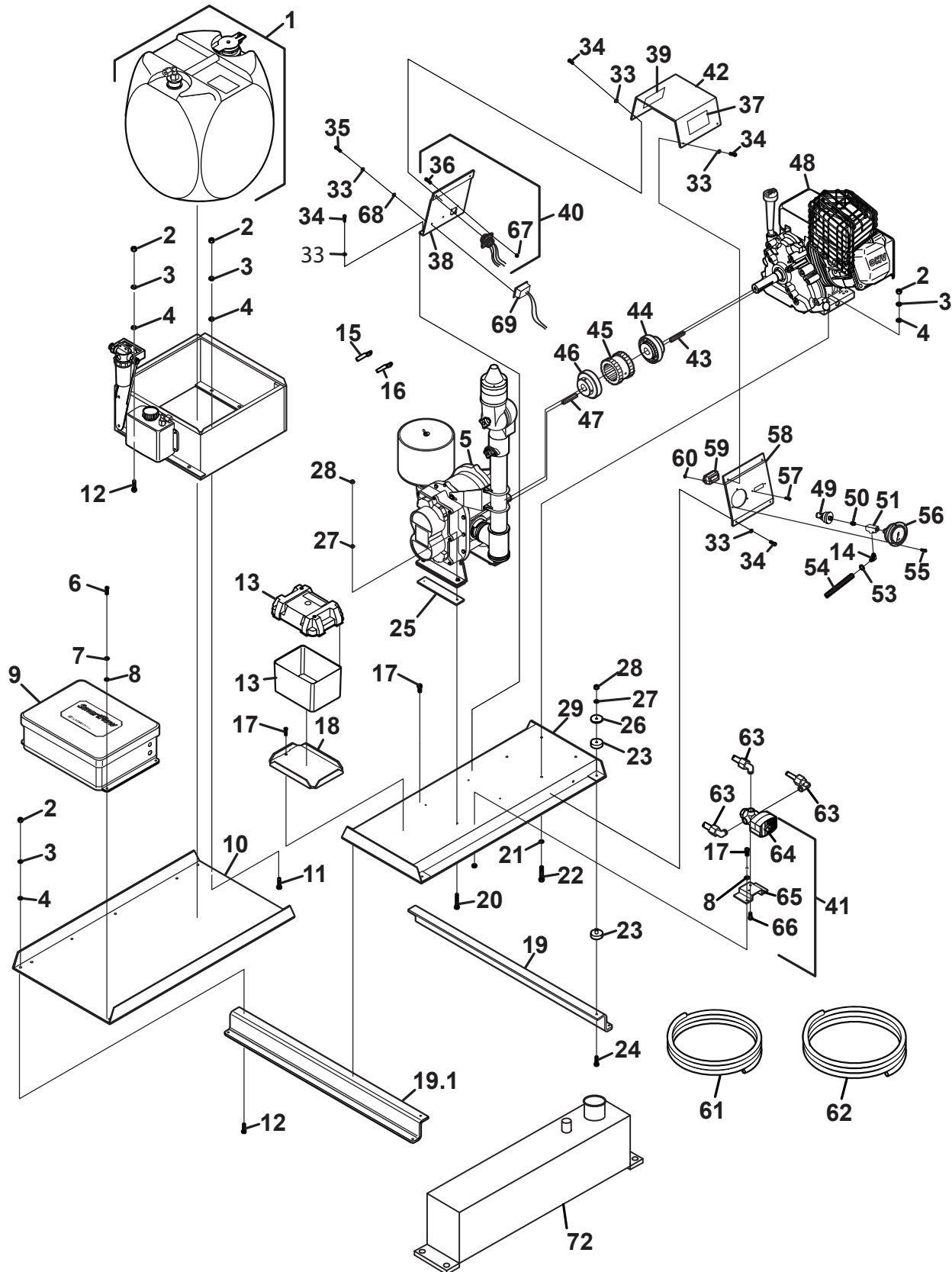
Procedure for determining correct part number and description of individual parts:

1. If the individual part is shown on the illustration, the part number and the description can be obtained from the parts list.
2. If the part is a component of an assembly, the location of the assembly breakdown can be obtained from the parts list. This assembly breakdown will identify the individual part.

NOTE: If there is a reference to serial numbers please take this into consideration.

PARTS BOOK - TABLE OF CONTENTS

COUGAR® ULV SPRAYER



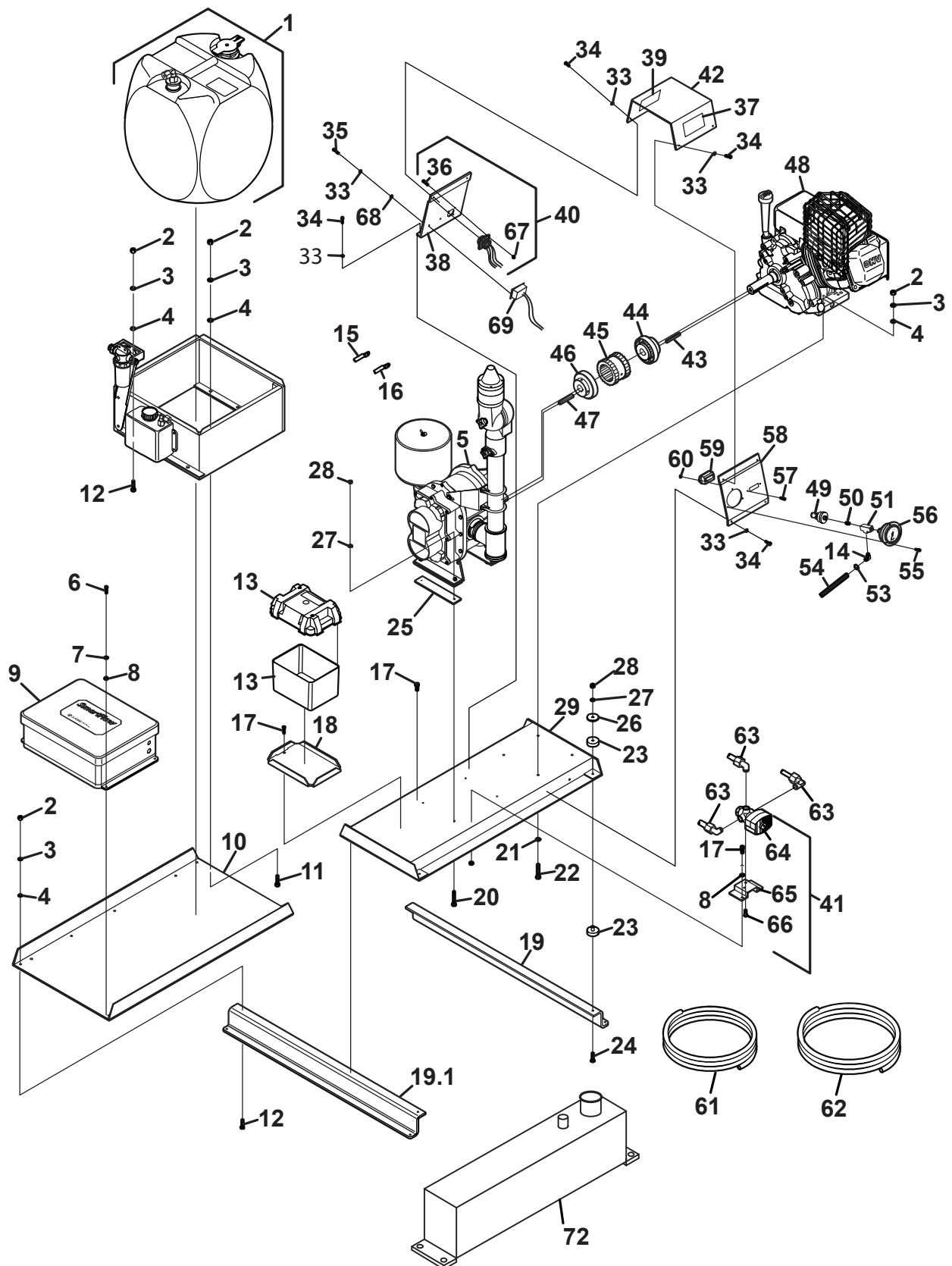
MAIN ASSEMBLY

COUGAR® ULV SPRAYER

Pos	Qty.	Description	Part No.
1	1	FORMULATION TANK ASSEMBLY	10296
2	10	HEX NUT 5/16" - 24	11260
3	10	LOCK WASHER 5/16"	11241
4	10	FLAT WASHER 5/16"	11240
5	1	BLOWER ASSEMBLY W/ MAST	10994
6	4	1/4" - 20 X 5/8 PHILLIPS PAN HEAD SCREW	11187
9	1	FLOW CONTROL ASSEMBLY (SEE PAGE 11)	10976
10	1	TANK TRAY	10916
11	2	BOLT 5/16" - 24 X 1"	11264
12	4	BOLT 5/16" - 24 X 3/4"	11263
13	1	BATTERY BOX	10007
14	1	BRASS ELBOW	10031.1
18	1	TRAY BATTERY	10017
19	1	BASE RAIL, ENGINE	12823
19.1	1	BASE RAIL, ENGINE	12824
20	4	BOLT, 3/8" - 24 X 1 1/4"	11321
21	1	BASERAIL - BLOWER	12824
22	4	BOLT 5/16" - 24 X 2 1/2"	11277
23	4	RUBBER MOUNT	10222
24	4	BOLT 3/8" - 24 X 2"	11323
25	1	.010" SHIM (IF NECESSARY)	10962
26	4	WASHER RUBBER MOUNT	10223
27	8	LOCK WASHER 3/8"	11291
28	8	HEX NUT 3/8" - 24	11320Z
29	1	MAIN FRAME	12624
33	8	#10 INTERNAL LOCK WASHER	11102Z
34	8	PHILLIPS PAN HEAD 10 - 32 X 3/8"	11145Z
35	2	PHILLIPS PAN HEAD 10 - 32 X 1/2"	11147
36	4	6 - 32 X 3/8" PHILLIPS PAN HEAD SCREW	11056
37	1	WARNING LABEL - CONNECTION	10351
38	1	CONNECTION PANEL, COUGAR 8 H.P.	13247
39	1	WARNING LABEL - HEARING	10350
40	1	CONNECTION PANEL ASSEMBLY	13287
41	1	SOLENOID ASSEMBLY, INCLUDES 64,65,66,63	13246
42	1	COUPLING COVER, COUGAR 8 H.P.	12626
43	1	KEY 1/4" X 1/4" X 1 3/4"	10953
44	1	COUPLING HALF, ENG 6S - 1"	10947
45	1	ELEMENT	10949
46	1	COUPLING HALF 6 - S 5/8"	10948
47	1	3/16" x 3/16" x 2" KEY	10954
48	1	ENGINE ASSEMBLY 8 H.P. COUGAR	12846
48	1	ENGINE ASSEMBLY 8 H.P. COUGAR	12846

MAIN ASSEMBLY

COUGAR® ULV SPRAYER



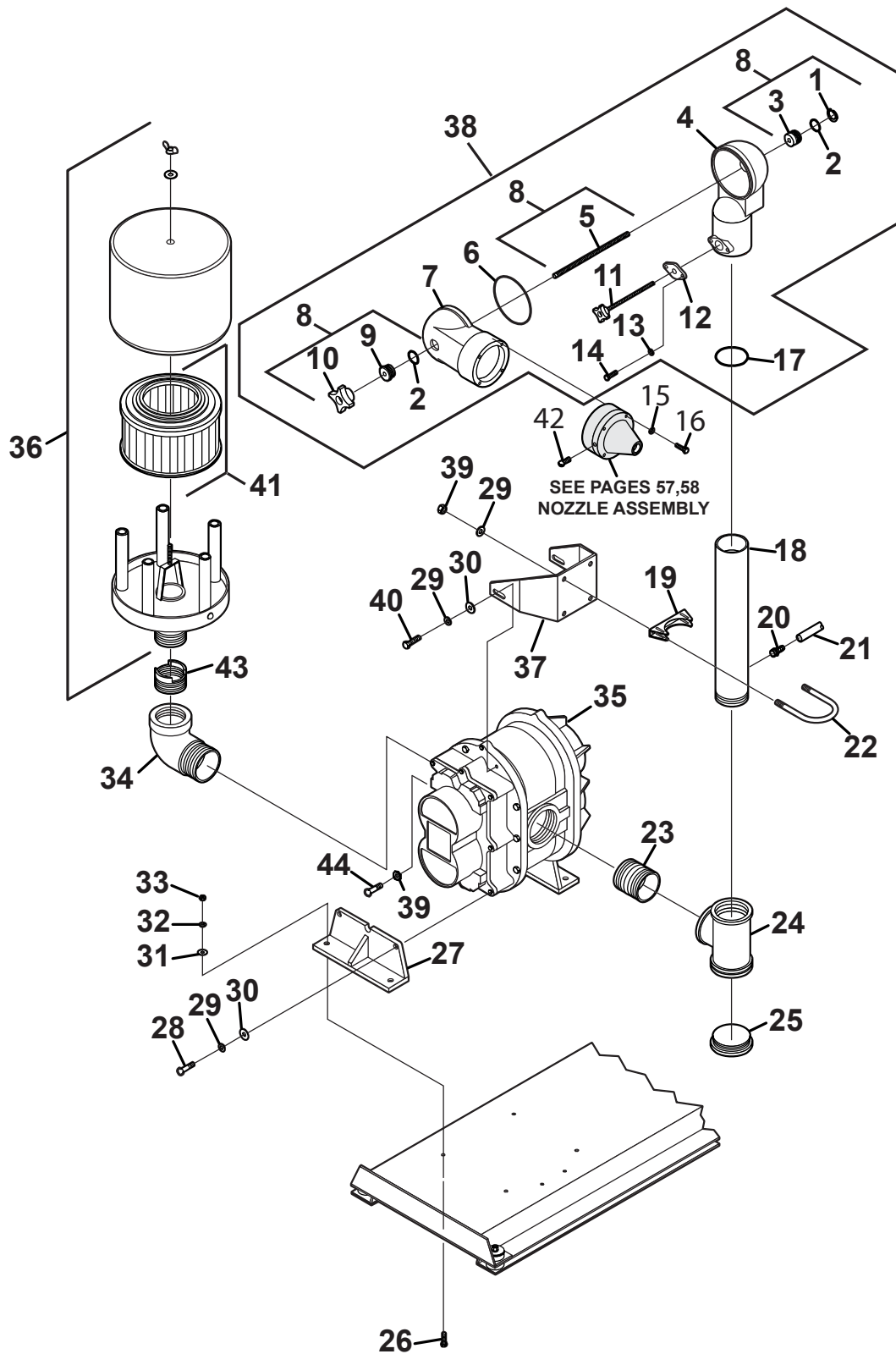
MAIN ASSEMBLY

COUGAR® ULV SPRAYER

Pos	Qty.	Description	Part No.
49	1	PRESSURE SWITCH 1 PSI.....	12328
50	1	1/4" X 1/8" BRASS BUSHING.....	10330
51	1	BRASS "TEE" 1/4"	10329
53	2	HOSE CLAMP	10033
54	13.5"	AIRLINE 1/4"	10042
55	3	PHILLIPS PAN HEAD 6 - 32 X 1/4"	11055
56	1	PRESSURE GAUGE.....	10550
57	2	PHILLIPS PAN HEAD 8 - 32 X 1 1/4"	11088
58	1	GAUGE PANEL, COUGAR 8 H.P.....	12623
59	1	TINY TACH	12248
60	2	PLASTIC LOCK NUT 8 - 32	11077
61	AR	1/4" POLY TUBE - ORDER BY THE INCH.....	10040
62	AR	3/8" POLY TUBE - ORDER BY THE INCH.....	10041
63	3	MALE JACO 3/8" X 1/4" X 90, INCLUDES 3/8" NUT #10539.....	10181
64	1	SOLENOID VALVE 3/WAY	10709
65	1	BRACKET	10580
66	2	PHILLIPS PAN HEAD THREAD FORMING 8 - 32 X 1/4"	11090
67	4	LOCK NUT 6-32.....	11052
68	2	10-32 GREER JAM NYLOCK	11160
69	1	MAGNETO RELAY	13317
	5"	• RED WIRE	30512
	11.5"	BLACK WIRE	30504
	13"	• VIOLET WIRE	13316
			12863
71	1	GAUGE POINT SUB ASSEMBLY, INCLUDES 14,49,50,51,53,54,55,56,57,58,59,60.....	12847
70	1	HARNESS ASSEMBLY.....	13199
72		GAS TANK ASSEMBLY.....	12817

BLOWER ASSEMBLY

COUGAR[®] ULV SPRAYER



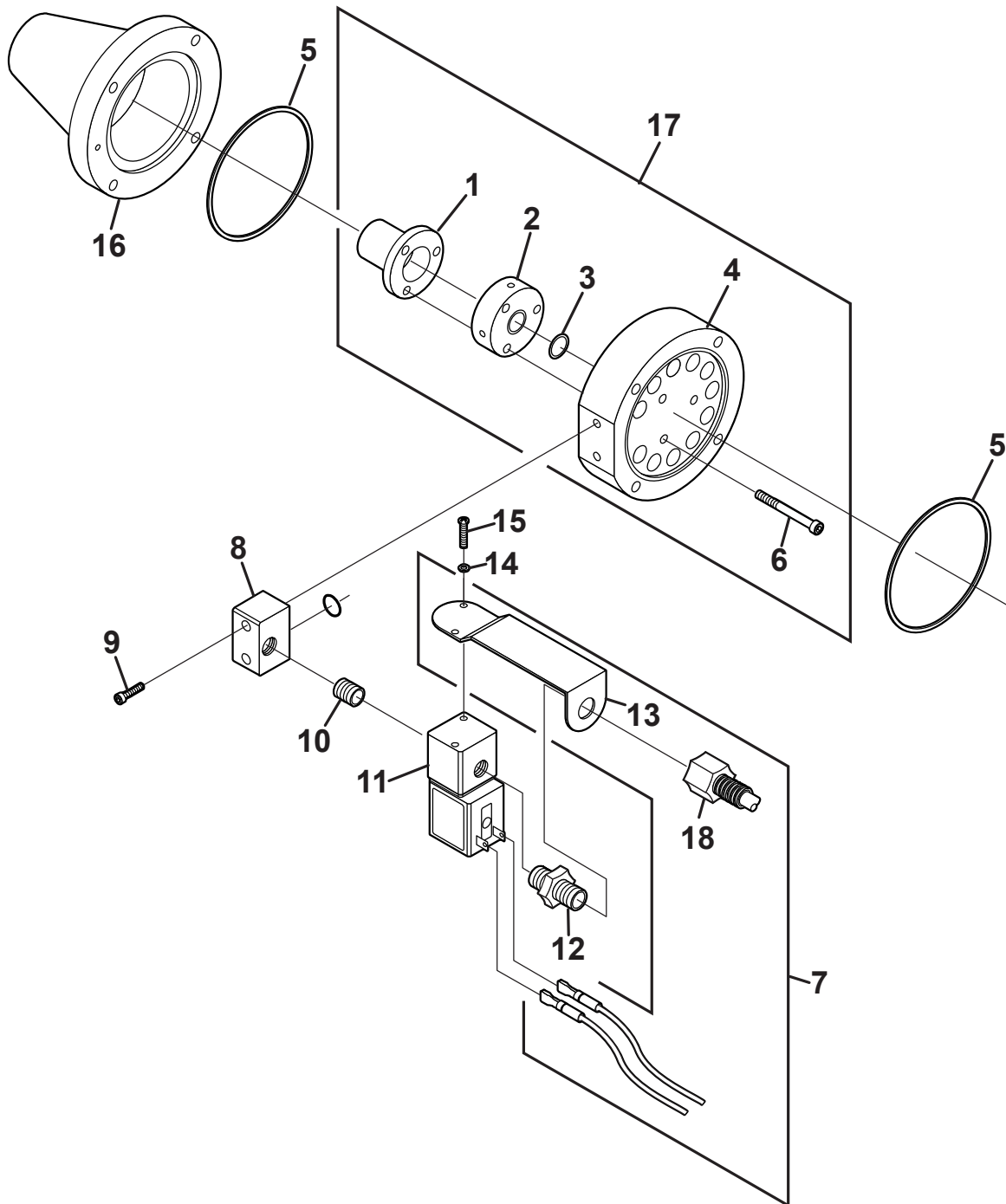
BLOWER ASSEMBLY

COUGAR® ULV SPRAYER

Pos	Qty.	Description	Part No.
1	1	SNAP RING.....	10293
2	2	O-RING	10167
3	1	PLUG (3/8" - 24).....	10183.1
4	1	SWIVEL HALF, INLET	10173
5	1	ROD 3/8" - 24 S.S WITH SPRING PIN 1/8" X 1/2" #11001	10268.1
6	1	O-RING	10184
7	1	SWIVEL HALF, OUTLET	10269
8	1	STUD KNOB ASSEMBLY	10402.1
9	1	PLUG FLANGE	10182
10	1	KNOB	12056
11	1	KNOB, STUD ASSEMBLY	10267
12	1	RETAINER PLATE.....	10292
13	2	INTERNAL LOCK WASHER 1/4".....	11172
14	2	PHILLIPS PAN HEAD SCREW 1/4" - 20 X 3/4".....	11189
15	4	HI COLLAR LOCK WASHER #10.....	11103
16	4	SOCKET CAP SCREW SS 10 - 24 X 1 1/2	11125
17	1	O-RING	10185
18	1	MAST	10194.1
19	2	CLAMP, MAST BRACE.....	10284A
20	1	1/4" X 1/4" MALE HOSE BARB W/ ORIFICE.....	10588
21	13.5"	AIRLINE 1/4"	10042
22	2	U-BOLT	10284
23	1	NIPPLE, 2" X CLOSE.....	10289
24	1	TEE, 2"	10288
25	1	PIPE, PLUG, 2"	12013
26	4	BOLT 3/8" - 24 X 1 1/4"	11321
27	2	FOOT	10961
28	4	BOLT 5/16" - 18 X 1 1/4"	11257
29	10	LOCK WASHER 5/16"	11241
30	6	FLAT WASHER 5/16"	11240
31	4	FLAT WASHER 3/8"	11290
32	4	LOCK WASHER 3/8"	11291
33	4	NUT, 3/8" - 24	11320Z
34	1	ELBOW	10291
35	1	24 BLOWER.....	10960
36	1	AIR FILTER ASSEMBLY, INCLUDES 41	10956
37	1	MAST BRACE	10963
38	1	SWIVEL ASSEMBLY	10312
39	5	HEX NUT 5/16" - 18	11250
40	2	BOLT 5/16" - 18 X 1".....	11249
41	1	FILTER (REPLACEMENT).....	12462
42	1	PHILLIPS PAN HEAD 10-32 X 3/8"	11145Z
43	1	BUSHING	10955
44	1	5/16"-18 X 1-1/2" SQ HD SET SCREW.....	11278

NOZZLE ASSEMBLY

COUGAR® ULV SPRAYER



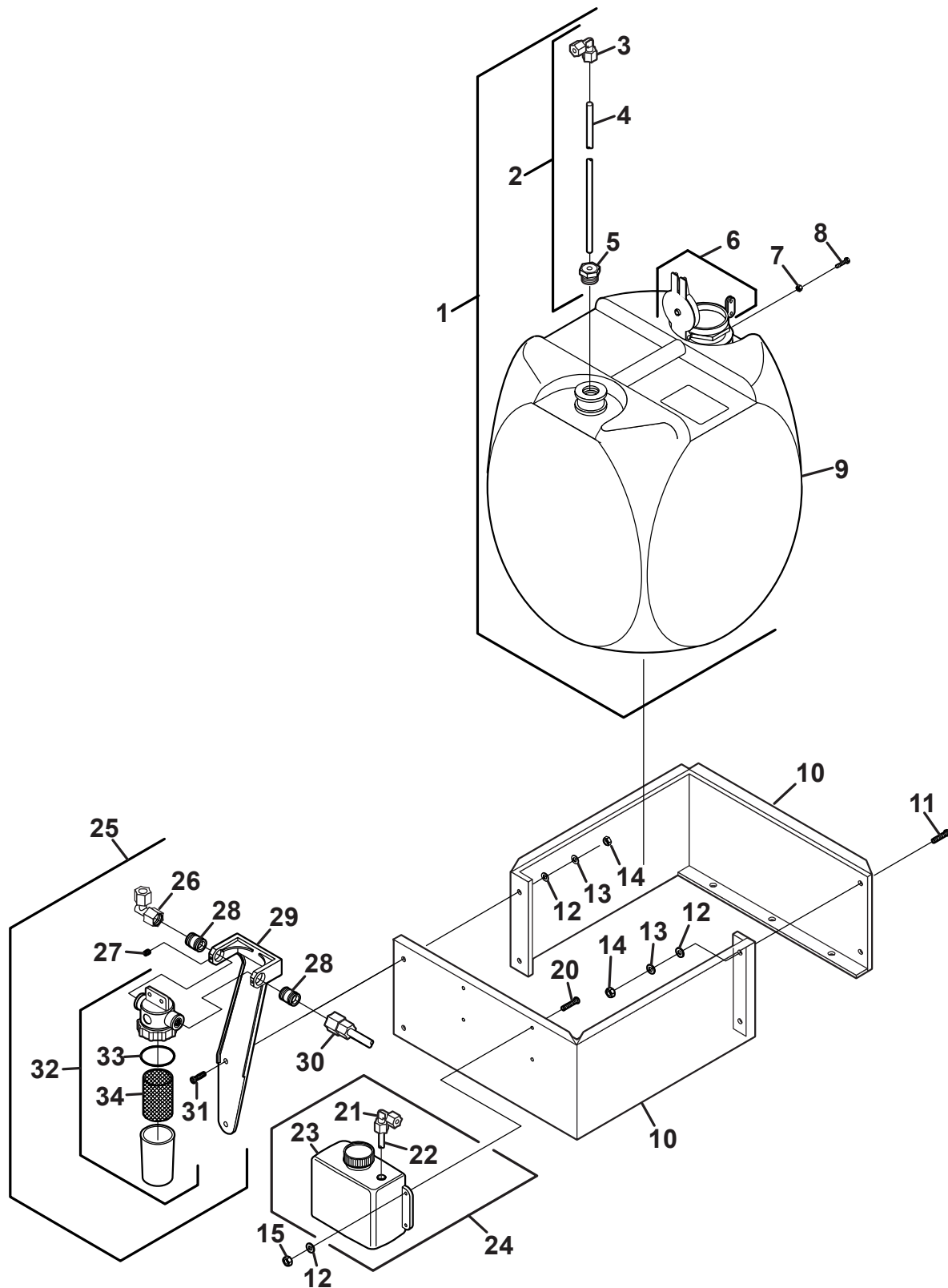
NOZZLE ASSEMBLY

COUGAR® ULV SPRAYER

Pos	Qty.	Description	Part No.
1	1	DIFFUSER CONE, COUGAR 8 H.P.	10972
2	1	MIXING CHAMBER.....	10974
3	1	O-RING	10166
4	1	FLUID ELEMENT	12516
5	2	O-RING	10185
6	3	SOCKET CAP SCREW S.S. 10 - 32 1 1/4"	11155
7	1	HARNESS ASSEMBLY.....	12876
8	1	SOLENOID BLOCK.....	12517
9	2	SOCKET CAP SCREW S.S. 10 - 24 1 1/4"	11124Z
10	1	1/8" CLOSE NIPPLE S.S.	10100
11	1	SOLENOID VALVE	10101
12	1	JACO 1/4" X 1/8" MALE	10037
13	1	SOLENOID BRACKET.....	10021
14	2	LOCK WASHER #4.....	H1210
15	2	3mm - .5 X 7mm PHILLIPS PAN HEAD	13571
16	1	AIR CAP.....	10737
17	1	NOZZLE ASSEMBLY	12010
18	1	LOOM.....	10046
19	1	O-RING	10166

CHEMICAL TANK ASSEMBLY

COUGAR[®] ULV SPRAYER



CHEMICAL TANK ASSEMBLY

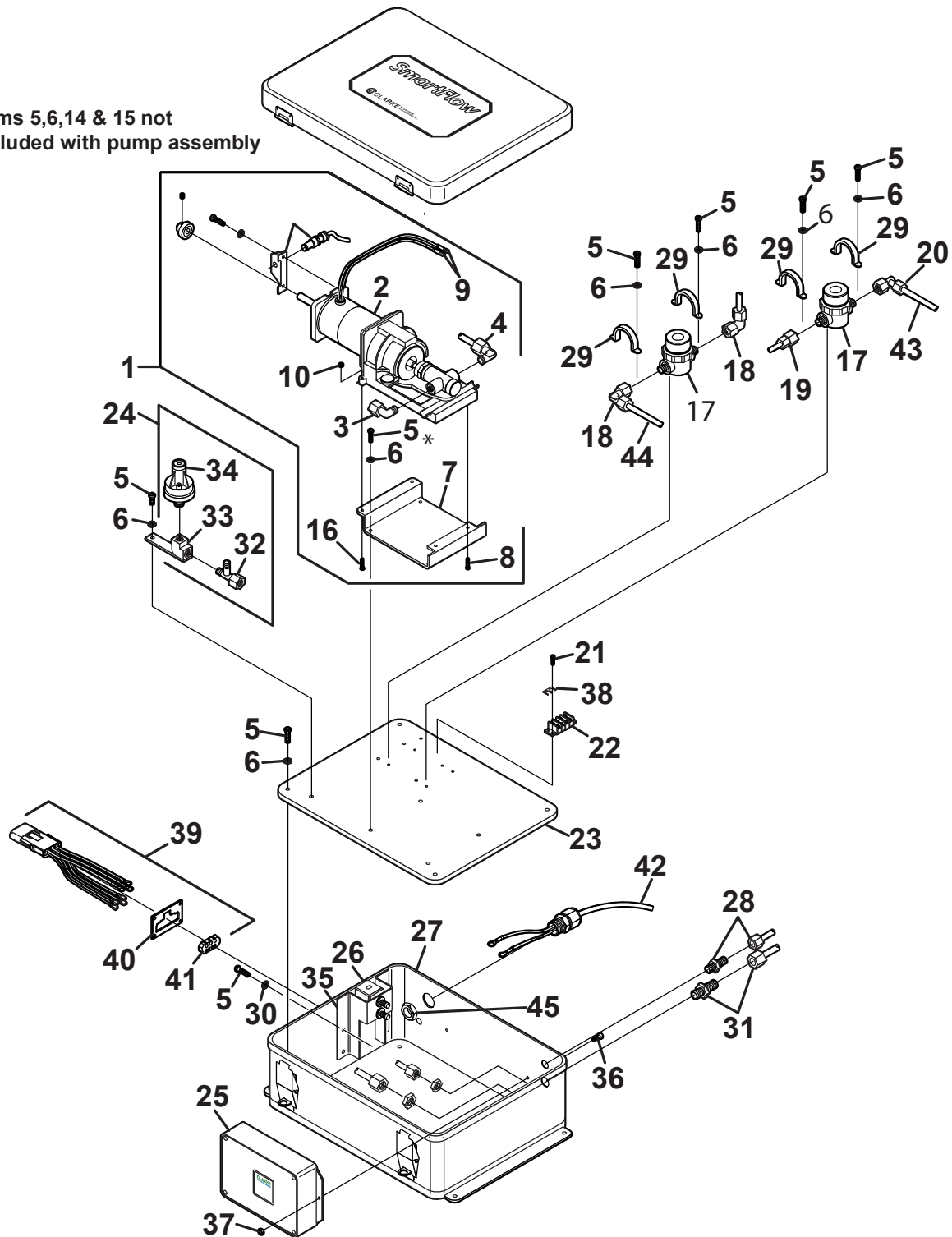
COUGAR® ULV SPRAYER

Pos	Qty.	Description	Part No.
1	1	CHEMICAL TANK ASSEMBLY	10296
2	1	PICK UP TUBE ASSEMBLY	10298
3	1	3/8" X 1/4" 90 DEGREES FEMALE ELBOW INCLUDES 3/8" NUT #10539	10204
4	1	PICK UP TUBE WELDMENT	12050
5	1	3/4" X 1/4" NYLON BUSHING DRILLED	10039.1
6	1	TANK CAP ASSEMBLY	10118
7	1	6 - 32 NYLON INSERT LOCK NUT, S.S.	11063
8	1	6 - 32 X 5/8" PHILLIPS PAN HEAD SCREW, S.S.	11058Z
9	1	CHEMICAL TANK	10011
10	2	TANK WRAP	10020
11	2	1/4" - 20 X 5/8" PHILLIPS PAN HEAD SCREW	11187
12	8	1/4" SAE FLAT WASHER	11170Z
13	4	1/4" SPLIT LOCK WASHER	11171
14	4	1/4"-20 HEX NUT	11180
15	4	1/4" - 20 NYLON LOCK NUT	11183Z
16	1	O-RING	10170
17	1	BLANK CAP	10052
18	1	PLUG	10067
19	1	PHILLIPS PAN SHEET METAL SCREW #8 - 5/8" S.S.	11083
20	4	1/4" - 20 x 3/4" SOCKET FLAT HEAD	11191
21	1	3/8" X 1/4" X 90 JACO FEMALE ELBOW	10204
22	1	PICKUP TUBE	10429
23	1	FLUSH TANK	10416
24	1	FLUSH TANK ASSEMBLY	12891
25	1	FILTER ASSEMBLY INCLUDES ITEMS 26-34	12829
26	1	3/8 X 3/8 X 90 FEMALE JACO ELBOW	10838
27	2	SET SCREW 10-24 X 1/4	11133Z
28	2	NIPPLE, 3/8 X 1 1/2 STAINLESS STEEL	12843
29	1	CASTING, FILTER SUPPORT	12758
30	1	FEMALE JACO 3/8 X 3/8	10836
31	2	1/4" - 20 X 1 1/4" PHILLIPS PAN HEAD SCREW	11197
32	1	STRAINER	10155
33	1	GASKET	10388
34	1	STRAINER	10390

PUMP BOX ASSEMBLY

COUGAR[®] ULV SPRAYER

Items 5,6,14 & 15 not
included with pump assembly



PUMP BOX ASSEMBLY

COUGAR® ULV SPRAYER

Pos	Qty.	Description	Part No.
1	1	PUMP ASSEMBLY.....	10344
2	1	PUMP.....	10177
3	1	1/4" X 1/4" X 90 DEGREES MALE ELBOW INCLUDES 1/4" NUT #10538.....	10038
4	1	3/8" X 1/4" X 90 DEGREES MALE ELBOW INCLUDES 3/8" NUT #10539.....	10181
5	21	10 - 32 X 3/8" PHILLIPS PAN HEAD SCREW.....	11145Z
6	17	#10 SPLIT LOCK WASHER.....	11101Z
7	1	PUMP PEDISTAL.....	10248
8	2	8 X 3/8" PHILLIPS PAN HEAD TAPPING SCREW.....	11075Z
9	2	#6 SPADE TERMINALS.....	30553
10	2	8 - 32 NYLON INSERT LOCK.....	11077
11	1	SET SCREW 8-32 X 1/4".....	11072
12	1	HUB MAGNET RING.....	12946
13	1	MAGNET RING.....	12947
14	1	MAGNET HUB ASSEMBLY INCLUDES ITEMS 11-13.....	12948
15	1	BRACKET AND SENSOR ASSEMBLY.....	12970
16	2	8 - 32 X 7/8" PHILLIPS PAN HEAD SCREW.....	11081Z
17	2	PULSATION DAMPER.....	10148
	2	• GASKET, PULSATION DAMPER INCLUDED WITH ITEM #17.....	10387
18	2	3/8" X 1/4" X 90° FEMALE ELBOW INCLUDES 3/8" NUT #10539.....	10204
19	1	1/4" X 1/4" FEMALE FITTING INCLUDES 1/4" NUT #10538.....	10128
20	1	1/4" X 1/4" FEMALE ELBOW INCLUDES 1/4" NUT #10538.....	10127
21	2	6 - 32 X 3/8" PHILLIPS PAN HEAD SCREW.....	11056
22	1	TERMINAL STRIP.....	10158
23	1	PANEL.....	12957
24	1	PRESSURE SWITCH ASSEMBLY.....	10439
25	1	EPD.....	12988
26	1	CIRCUIT BREAKER.....	12930
27	1	PUMP BOX DRILLED.....	12980
28	1	1/4" BULKHEAD UNION FITTING INCLUDES 1/4" NUT #10538.....	10179
29	4	CLAMP PULSATION DAMPNER MOUNT.....	12965
30	4	WASHER INTERNAL #10.....	11102Z
31	1	3/8" BULKHEAD UNION FITTING INCLUDES 3/8" NUT #10539.....	10180
32	1	JACO "TEE", INCLUDES 1/4" NUT #10538.....	10435
33	1	BRASS ELBOW W/ MOUNTING PLATE.....	10420
34	1	PRESSURE SWITCH - 50 psi.....	10417
35	1	BRACKET FOR CIRCUIT BREAKER.....	12967
36	2	SCREW 10-32 X 1/2" PHILLIPS PAN HEAD.....	11147
37	2	NUT 10-32 GEER JAM NYLOCK.....	11160
38	1	JUMPER.....	37211
39	1	HARNESS ASSEMBLY.....	12991
40	1	PANEL CONNECTION.....	12954
41	1	RETAINER, 7 PIN.....	12904
42	1	CABLE ASSEMBLY (PUMP BOX).....	12978
43	AR	1/4" POLY TUBE - ORDER BY THE INCH.....	10040
44	AR	3/8" POLY TUBE - ORDER BY THE INCH.....	10041
45	1	NUT.....	12505
46	2	SCREW 8-32 X 3/8" PHILLIPS PAN HEAD.....	11084Z
47	2	#8 INTERNAL LOCK WASHER.....	11085

TROUBLE SHOOTING

COUGAR® ULV SPRAYER

TROUBLE	POSSIBLE CAUSE	REMEDY
Air blast at nozzle but no pressure showing on pressure gauge.	Defective pressure gauge. Air leaks in the air line between the nozzle and the pressure gauge.	Replace. Replace air line or reconnect if loose.
Air blast insufficient or no air pressure at nozzle.	Air leakage around joints on nozzle elbow assembly. Defective blower. Engine speed too low. Filter-Silencer element clogged up.	Tighten knob on side of mast or side of the nozzle head. Repair at nearest blower service center. Set to recommended speed. Clean and service.
Air bubbles in chemical lines.	Fittings crossthreaded, loose or defective between insecticide tank and pump. Line strainer gasket pinched. Pulsation Damper gasket pinched.	Retighten or replace. Replace gasket. Replace gasket.
Air pressure at nozzle but pressure gauge needle will not move when the engine speed is varied.	Defective pressure gauge.	Replace.
Blower trouble.	See blower instruction manual.	See blower manual.
Cannot calibrate to correct flow rate.	Air bubbles in chemical lines. Battery charge too low. Leaks in insecticide line between pump and nozzle. Pump gummed up.	Eliminate by checking fittings and chemical lines for leaks. Charge battery. Tighten fittings or replace insecticide line. Flush and if necessary, let pump sit for a few hours with flushing solution in cylinder.

TROUBLE SHOOTING

COUGAR[®] ULV SPRAYER

TROUBLE	POSSIBLE CAUSE	REMEDY
Cannot calibrate to correct particle size.	Air pressure too low, which will produce large particles. Air pressure too high, which will produce small particles. Flow rate too high. Flow rate too low. Nozzle damaged. Temperature too low.	Increase engine speed. Decrease engine speed. Calibrate to correct flow rate. Calibrate to correct flow rate. Replace damaged parts. Calibrate above 70 Degrees F.
Chemical drips from nozzle when not running.	Insecticide tank filled completely to top. Pump system running.	Leave a 2" air space at the top of the tank when filling. Defective low-pressure cut-off switch.
Chemical drips from the nozzle while running.	Engine RPM too low. Excessive flow rate. Insecticide tank filled completely to top. If the spray is ON, defective nozzle. If the spray is OFF, insecticide in blower.	Set throttle for correct air pressure at nozzle. Set for correct flow rate. Leave a 2" air space at the top of the tank. Replace. Run to clear blower and flush blower to remove the insecticide.
Chemical flow out of nozzle is noticeably pulsating.	No air dome in pulsation damper.	Check the air dome to make sure it has not become filled with chemical.
Chemical leaks at fittings.	Fittings crossthreaded or defective.	Retighten or replace.

TROUBLE SHOOTING

COUGAR® ULV SPRAYER

TROUBLE	POSSIBLE CAUSE	REMEDY
Chemical pump not running when Spray switch is turned on.	Defective Spray switch or loose connectors. Defective Low-Pressure Cut-Off switch. Low-Pressure Cut-Off switch out of adjustment.	Replace. Replace. For field repair, this switch can be "jumped" by connecting a wire between the terminals on the switch. Adjust as shown on page 14.
Chemical pump runs but no chemical flow.	Leak in suction line. Out of chemical. Three-way solenoid valve not opening. Three-way solenoid valve clogged up. Nozzle solenoid valve not opening. Nozzle solenoid valve clogged up. Line strainer gasket pinched. Line strainer plugged. Pump is dry. Pump defective.	Check lines, tighten. Check that both chemical tank and flush tank have solution in them. Check voltage at connector which goes to the solenoid valve. The voltage should be 12 volts. If not, check for voltage at the control panel. Disassemble and clean. Check voltage at connector which goes to the solenoid valve. The voltage should be 12 volts. If not, check for voltage at the control panel. Disassemble and clean. Replace gasket. Clean or replace. Prime with motor oil. Visually check pump for rotation and piston movement. Repair or replace.
Coupling sleeve damaged or thrown.	Misalignment between engine and blower shafts.	Carefully align engine and blower shafts.

TROUBLE SHOOTING

COUGAR[®] ULV SPRAYER

TROUBLE	POSSIBLE CAUSE	REMEDY
Engine back fires.	Gasoline mixture too lean. Defective spark plugs. Inlet valves sticking.	Check carburetor. Clean, adjust and/or replace. Free, clean and adjust valve.
Engine compression low.	Valve clearance improper. Defective cylinder head. Defective valves or piston rings. Cylinder head gasket leaks.	Adjust valve. Consult nearest engine service center. Consult nearest engine service center. Tighten head bolts or replace gasket.
Engine cuts off when the Spray switch is turned on.	Cold engine.	Allow the engine to warm up. Momentarily choke the engine when the Spray switch is turned on.
Engine does not deliver full power.	Carburetor choke valve partly closed. Air cleaner dirty. Carburetor defective. Exhaust restricted.	Adjust choke. Service air cleaner. Clean, adjust or replace. Replace muffler.

ELECTRICAL SCHEMATIC

COUGAR[®] ULV SPRAYER

TROUBLE	POSSIBLE CAUSE	REMEDY
Engine hard to start, will not start or fails.	Main Power switch located on remote control box in OFF position or faulty switch and/or wires.	Place switch in ON position or replace faulty switch and/or wires.
	Ignition switch located on engine defective.	Replace.
	Out of fuel or contaminated fuel. Clogged fuel filter.	Add fuel or clean tank and refuel. Clean or replace fuel filter.
	Spark plugs faulty.	Clean or replace spark plugs.
	Fuel pump or carburetor defective.	Consult nearest engine service center.
	Defective fuel pump.	Repair or replace.
	Terminals loose or wiring defective.	Tighten loose terminals, replace defective wiring.
	Spark plug wire disconnected.	Connect spark plug wire.
	Pinched or shorted wiring in the control box.	Re-route wires and tape them.

ELECTRICAL SCHEMATIC

COUGAR® ULV SPRAYER

