

AU9000 COLD FOGGING MACHINE

**Operator's Manual and
Parts Catalogue**



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1. INTRODUCTION

The Micronair AU9000 is a vehicle-mounted cold fogging machine developed specifically for the control of adult mosquitoes, flies and similar pests using both conventional and water-based ULV insecticides.

The AU9000 provides excellent control of spray droplet size and flow rate of insecticide, whilst being easy to operate and maintain. It is intended for use by municipalities, pest control contractors, military authorities and similar organisations requiring reliable, cost-effective pest control.

The sprayer uses a reliable 10 HP Briggs & Stratton four-stroke engine with electric start, driving a powerful 180 m³/hour blower. Two sprayheads can be independently oriented both horizontally and vertically to achieve a wide swath width and to provide optimum coverage of the target.

All controls are operated from inside the vehicle cab for maximum operator safety. The sprayer incorporates many unique safety features, including an air pressure sensor to stop the insecticide pump in the event of the engine stopping or a failure of the blower. The flow rate of insecticide is controlled by a ten position switch on the control box in the cab to ensure precise and repeatable calibration.

All pipework and components in contact with insecticide are manufactured from chemical resistant materials. The insecticide tank has a wide aperture for ease of filling and a drain valve for easy and safe emptying after use. A 10 litre flushing tank is provided to enable insecticide to be purged from the pump, hoses and sprayheads after use.

The engine and blower are mounted on a rigid base frame to ensure smooth running and reliable operation, even in extreme conditions. The frame is provided with mounting holes and provision for lifting with a fork truck for secure installation and ease of handling.

The AU9000 has been tested for compliance with WHO specifications.

2. SPECIFICATION

Dimensions:	Length 880 mm, width 850 mm, height 700 mm excluding sprayheads (1150 mm including sprayheads)
Spray release height:	1100 mm above vehicle bed
Weight:	140 kg (tanks empty)
Engine:	10 HP Briggs & Stratton Vanguard single cylinder 4-stroke with electric start from control box in the vehicle cab or switch on the engine
Fuel:	Standard 95 octane unleaded petrol (gasoline)
Fuel tank:	3.3 litre capacity steel tank with splashproof filler cap

Running time:	2¼ hours approx at full throttle
Blower:	180 m ³ /hour capacity side channel blower running at 3100 RPM
Sprayhead:	Stainless steel body with vortical nozzle
Spray droplet size:	15 – 20 µm VMD for oil-based ULV insecticides 20 – 25 µm VMD for water-based ULV insecticides (Actual VMD will depend on formulation properties)
Output rate:	Adjustable 0 – 1.4 l/min (total from both sprayheads)
Output adjustment:	By cab-mounted electronic control
Insecticide tank:	50 litre capacity HDPE construction with 180 mm diameter filling aperture and cap with splashproof vent
Flushing tank:	10 litre capacity HDPE construction with 100 mm diameter filling aperture
Electrical power:	12 VDC @ 5 A max (spraying), 60 A (engine start)
Power source:	12 V vehicle battery
Control box:	Mounted in cab of vehicle Switches: Engine start/stop Engine throttle Insecticide pump Indicators: Air pressure Insecticide pressure
Mounting on vehicle:	By M10 bolts through universal mounting base

3. INSTALLATION

3.1. Installation on Vehicle

The AU9000 is designed for installation on the bed of a pick-up truck, small lorry or similar vehicle. It may also be mounted on a trailer towed behind a vehicle.

The procedure to mount the sprayer is as follows:

1. Position the sprayhead mast on the vertical member of the frame at the rear of the sprayer with the sprayheads facing backwards and secure in position with the two M6 bolts, nuts and washers provided.
2. Connect the liquid feed hose to the fitting on the pump outlet and two air tubes to the air manifold at the base of the sprayer. Secure the air tubes with the hose clips provided.
3. Position the sprayer on the bed of the vehicle so that it is as far back as possible without the frame of the machine touching the tail-board. The sprayheads should protrude slightly behind the vehicle if possible. The sprayer can be positioned either in the centre of the bed of the vehicle or can be moved to one side to allow easy access and space to carry additional items.

IMPORTANT: If installing the sprayer on a light-weight vehicle or trailer, it must be positioned such that the weight of the machine does not affect the stability or roadworthiness of the vehicle.

4. Adjust the position of the sprayer so that the mounting holes in the frame align with suitable positions to drill holes in the vehicle bed. If the bed is made from corrugated metal, the base members of the frame should be in contact with the tops of the corrugations adjacent to the mounting holes. If corrugations or other obstructions on the vehicle bed prevent sufficient contact with the sprayer frame, a sheet of waterproof plywood at least 12 mm (1/2") thick or steel at least 3 mm (1/8") thick can be fitted under the machine.
5. Mark and drill at least four 11 mm (7/16") diameter holes in the vehicle bed to align with holes in the frame. There must be at least one hole at each end of the frame on each side of the sprayer.

IMPORTANT: Before drilling any holes, ensure that the area under the vehicle bed is clear of fuel lines, tanks, electrical items or structure that could be damaged or weakened by drilling.

6. Bolt the sprayer to the bed of the vehicle with the M10 bolts, nuts and washers supplied (or use longer bolts if necessary). The square steel packers (5992) provided with the kit should be used under the nuts to spread the load on the underside of the bed. Alternative packers may be made and used if necessary.

3.2. Electrical Installation



Fig. 1 – Control Box in Cab of Vehicle

1. Route the cable from the sprayer in the rear of the vehicle to the cab. Whenever possible, pass the cable and its protective conduit through existing holes provided for electrical wiring. If necessary, new holes should be drilled for the cable. All holes should be protected with plastic or rubber bushings to prevent chafing of the cable.
2. Unplug the fuse assembly EX6329/100 on the end of the grey battery cable protruding from the protective conduit. The black plastic locking tab on one side of the connector must be pressed down before pulling it apart.
3. Route the battery cable from the cab to the vehicle battery. Ensure that this cable is protected by plastic or rubber bushes if it passes through holes or adjacent to sharp edges.
4. Connect the ring tag on the red wire of the fuse assembly to the positive (+) battery terminal.
5. Connect the ring tag on the black wire of the fuse assembly to the negative (-) battery terminal or the vehicle ground adjacent to the battery.
6. Plug the connector on the sprayer battery cable into the socket on the fuse assembly.
7. Secure the cables and fuse assembly so that they cannot move against sharp edges or hot surfaces. Note that the fuse holder can be held in position by pushing its securing pegs into 5 mm (3/16") holes.
8. Position the control box in the cab of the vehicle (see Fig. 1). This should be adjacent to the driver or the spray operator's seat. The box can be secured in position with the self-adhesive Velcro strips provided.
9. Route the black cable from the protective conduit to the connector on the control box. Insert the connector and secure by twisting the locking ring a quarter turn clockwise.

IMPORTANT: The box and cable must be positioned so as not to obstruct the movement of occupants of the cab, not to obstruct the vision of the driver and not to cause a hazard in the event of an accident.

3.3. Engine Oil

The sprayer is shipped with no oil in the engine. The engine must be filled with 10W-30 multigrade oil as described in the Briggs & Stratton Owner's Manual. The oil capacity is approximately 0.8 litre.

IMPORTANT: The engine incorporates a low oil sensor that disables the ignition if the oil falls below the minimum level. The oil level should be allowed to stabilise for about 15 minutes after filling before checking and topping up if necessary. Over-filling with oil can cause the engine to run very hot and can cause it to run intermittently and stop. See Fault Finding table in section 7.10.

See section 7.2 for further details.

4. OPERATION

This section describes the normal operation of the sprayer. It is important that the machine is calibrated prior to use (see section 6).

IMPORTANT: Hearing protection must be worn when working within 2 m (6 feet) of the sprayer whilst the engine is running – see Health & Safety section.

Labels and functions of valves, controls, switches and indicator lights are shown in ***bold italics***. All references to left, right, rear and front are with respect to the vehicle (ie as viewed from the rear of the vehicle with the sprayer installed, looking forward).

4.1. Before Operation

1. Prior to the commencement of spraying, a treatment plan must be drawn up. This must define the route of the spray vehicle. Whenever possible, the vehicle should travel at 90 degrees to the prevailing wind and each spray pass must be upwind of the previous pass so as to avoid driving through the spray cloud. The distance between spray passes will normally be determined by the layout of streets or buildings, but should ideally be about 50 m (see calibration instructions in section 6). The treatment plan must also define the speed of the vehicle whilst spraying and must clearly identify any areas that are not to be sprayed.
2. Adjust the horizontal direction and the vertical elevation of both sprayheads to suit the target. Normally, one head would be angled 30° – 45° above the horizontal to give maximum vertical coverage. The other head can either be angled below the horizontal to reach insects near ground level or can be angled upwards to maximise the effective swath width of the sprayer.

4.2. Filling

1. Ensure that the ***Drain*** valve is CLOSED, the ***Main Tank*** valve is OPEN and the ***Flushing Tank*** valve is closed – see Fig. 2. Note that all valves are closed when the handle is at right angles to the valve body and open when the handle is parallel with the body.
2. Fill the insecticide tank with the required amount of product. If necessary, this should already have been mixed in accordance with the manufacturer's approved instructions. The filler (basket) filter in the tank should be in position during filling. The quantity of product put into the tank should be limited to the amount required for the spray job or 50 litres, whichever is less.
3. Replace the insecticide tank filler cap firmly after filling.

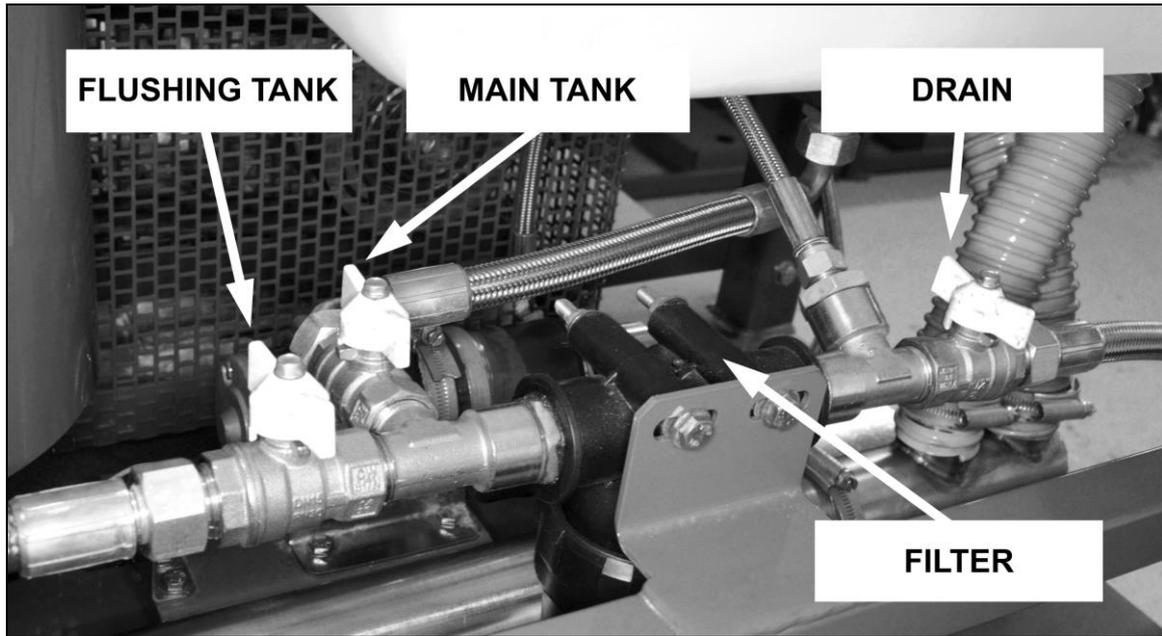


Fig. 2 – Valves & Filter Under Tank

Fill the fuel tank with the required amount of petrol (gasoline). The maximum capacity of the tank is 3.3 litres. Use only standard 95 octane unleaded petrol (gasoline).

IMPORTANT: Do not over-fill the fuel tank.

4. Replace the fuel tank cap firmly after filling.

4.3. Starting Engine

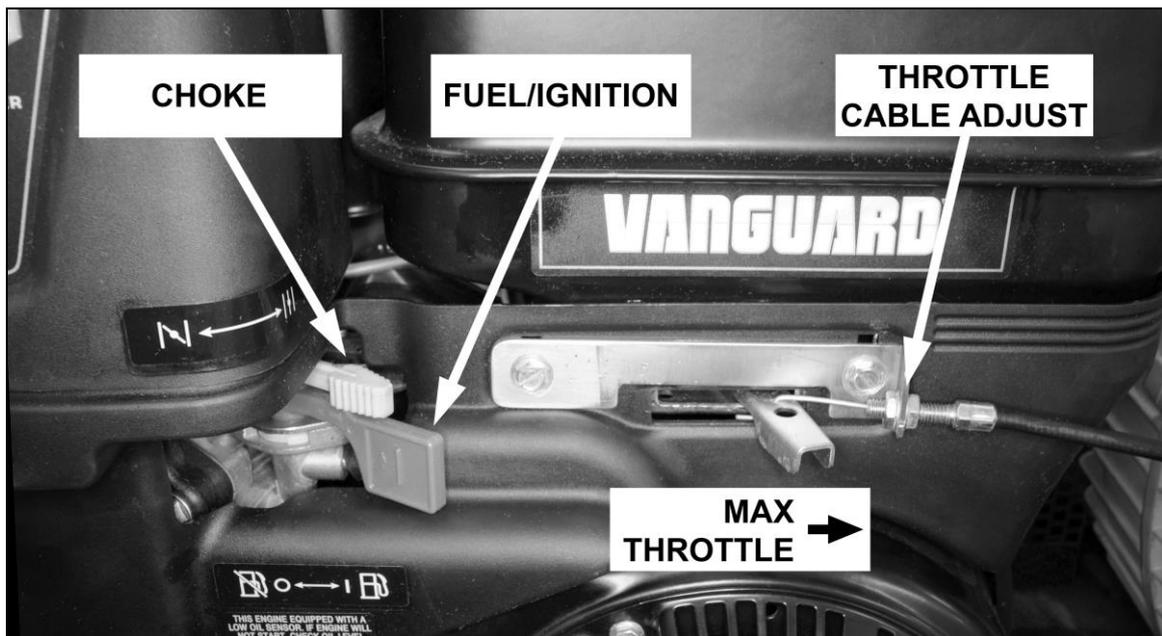


Fig. 3 – Engine Controls

1. Ensure that the switches on the sprayer control box in the cab are set as follows:
 - **Pump:** OFF
 - **Throttle:** MAX
2. Move the red combined **Fuel Valve** and **Ignition** lever on the engine to the full OPEN position (I ) – see Fig. 3.
3. Set the grey **Choke** lever on the engine to the OPEN position (| † |).
4. Move the **Engine** switch on the control box to the START position until the engine starts and then allow the switch to return to the centre RUN position. Alternatively, the engine can be started by the key operated START () switch on the engine or by means of the manual starter cord. If using the manual starter, set the **Choke** lever to the CLOSED position (| † |) and pull on the engine starter cord to start the engine. Note that the cord should not be pulled completely out. The cord or starter mechanism could be damaged if the cord is pulled against its end stop. When starting the engine, pull the starter cord slowly until resistance is felt, allow the cord to retract and then pull rapidly to avoid kickback. After about 10 seconds, slowly move the **Choke** lever to the OPEN position (| † |).

IMPORTANT: If starting the engine with the key operated starter switch or the manual starter the **Engine** switch on the control box must be set to RUN and not to STOP.

5. Set the **Throttle** switch on the control box to IDLE.

4.4. Spraying Procedure

IMPORTANT: Insecticide must only be sprayed whilst the vehicle is moving within the treatment area.

1. Set the valves on the sprayer as follows:
 - **Main Tank** valve OPEN
 - **Flushing Tank** valve CLOSED
 - **Drain** valve CLOSED
2. Ensure that the sprayer is correctly calibrated according to the requirements of the treatment plan (see section 6).
3. When the vehicle reaches the beginning of the first pass in the treatment area:
 - Set the **Throttle** switch to MAX – the **Air** indicator should illuminate.
 - Set the **Pump** switch to ON – the **Pump** pressure indicator should illuminate.
4. Visually check that both sprayheads are operating (note that there may be a delay of a few seconds when the pump is turned on the first time and air is purged from the pipework).

5. When the vehicle reaches the end of a spray pass (or is upwind of an area not to be sprayed or if it is necessary to stop the vehicle for a short time):
 - Set the **Pump** switch to OFF.
 - Leave the **Throttle** switch in the MAX position.
6. At the end of a spray block:
 - Set the **Pump** switch to OFF.
 - Set the **Throttle** switch to IDLE.
7. The indicator lights on the control panel should be checked whilst spraying. Both green lights should be illuminated when the sprayer is operating normally. Abnormal indications are as follows:
 - **Air** indicator not illuminated when **Throttle** switch is set to MAX – engine stopped or out of fuel.
 - **Pump** pressure indicator not illuminated when **Pump** switch is ON – **Throttle** switch not set to MAX or blower not operating (see above). This is a safety feature to prevent spraying when there is insufficient air output for correct atomisation of the spray.
 - **Pump** pressure indicator not illuminated when Pump switch is ON – insecticide tank empty.

See also Fault Finding table in section 7.10 for other causes of abnormal operation or indications.

8. Stop the engine at the end of the job by setting the **Engine** switch on the control box to the STOP position and then moving the red **Fuel Valve and Ignition** lever to the fully closed position (). In an emergency the engine can be stopped by moving the red **Fuel Valve and Ignition** lever to the fully closed position (). This overrides the **Engine** switch on the control box.

4.5. Flushing of Sprayer

The sprayer should be flushed out at the end of a spray operation so as to remove insecticide from the pipework, pump and atomisers. The machine is fitted with a 10 l capacity flushing tank to hold a suitable solvent. Kerosene (diesel) should be used to flush oil or solvent based ULV insecticide formulations. Water should only be used to flush water miscible formulations. The sprayer must always be flushed whilst in the spray area so as to avoid contamination elsewhere. The procedure to flush the sprayer is as follows:

1. Set the valves on the sprayer as follows:
 - **Main Tank** valve CLOSED
 - **Flushing Tank** valve OPEN
 - **Drain** valve CLOSED
2. Drive the vehicle within the spray area and spray about 2 l of liquid from the flushing tank, following the procedure in section 4.4 above. It is important that the vehicle should be moving at the normal spraying speed whilst flushing so as to avoid applying a high concentration of contaminated flushing liquid in one place.

4.6. Emptying of Insecticide Tank

Whenever possible, only the amount of insecticide required for a job should be put into the tank and all insecticide should be used within the spray area. However, if insecticide remains at the end of a job, it should not be left in the tank. The procedure to empty the tank is as follows:

1. Position a container of adequate capacity below the level of the bottom of the insecticide tank and put the free end of the drain hose into the container.
2. OPEN the **Drain** valve until all insecticide has been drained from the sprayer.
3. CLOSE the **Drain** valve and stow the drain hose.
4. Store or dispose of the insecticide drained from the sprayer according to the instructions on the label and statutory requirements.

5. HEALTH & SAFETY

Legislation regarding the application of insecticides that are potentially harmful to individuals or the environment varies considerably between countries. Operators using insecticides and equipment must ensure they are working within the regulations applicable to their area.

Irrespective of legislation, Micron Sprayers Limited advise the users of their equipment that all possible care must be taken to ensure the health and safety of the user and personnel in the vicinity of the spraying operation.

The following recommendations are for guidance only and do not exclude any statutory requirement:

1. The application of each insecticide should follow the recommendations of the manufacturer. Extreme care should be taken to prevent insecticide reaching the operator or any target where contamination could have an adverse effect.
2. Ensure that the equipment is correctly calibrated for the product being used.
3. Suitable protective clothing, gloves, eye protection and masks must be worn when mixing or working with or near toxic products and operators must adhere to all relevant handling precautions and regulations.
4. Hearing protection must be worn whilst standing within 2m (6 feet) of the sprayer when the engine is running. Hearing protection should not be worn by personnel in the vehicle cab.
5. The doors and windows of the vehicle cab should be kept closed whilst the sprayer is operating.
6. The sprayer should never be operated whilst the vehicle is travelling downwind (ie wind blowing from behind).
7. The entire spray system and all ancillary equipment must be thoroughly washed out after use or before maintenance.
8. All insecticide residues must be safely stored or disposed of.

9. All used insecticide containers must be safely disposed of in accordance with local regulations and requirements.
10. First aid and washing facilities must always be available and personnel must be trained in their use.

6. CALIBRATION

6.1. Calculation of Output from Sprayer

The total output (flow rate) from the sprayer (both sprayheads) must be calculated according to the average distance between spray passes (track spacing) and the speed of the vehicle. These must be determined in advance and recorded in the treatment plan (see section 4.1 above).

IMPORTANT: The track spacing must always be used when calculating the output from the sprayer. The track spacing must not be confused with the effective swath (distance that spray droplets are carried downwind). The track spacing should always be less than the effective swath to ensure overlap of the spray and to allow for the effects of buildings and other obstructions.

The area treated by the sprayer per minute is calculated from the formula:

$$\text{Coverage (ha/min)} = \frac{\text{Track spacing (m)} \times \text{Vehicle speed (Km/hr)}}{600}$$

The coverage for typical operating conditions is shown in Table 1.

The required total output from the sprayer (from both sprayheads) is calculated by multiplying the coverage of the sprayer (ha/min) by the volume application rate for the product being sprayed (l/ha):

$$\text{Flow from sprayer (l/min)} = \text{Coverage (ha/min)} \times \text{Application rate (l/ha)}$$

If the insecticide is diluted before use, the volume application rate refers to the total volume of the diluted mixture, not to the undiluted product.

Example:

Track spacing: 50 m
 Vehicle speed: 15 Km/hr
 Application rate: 0.5 l/ha

$$\begin{aligned} \text{Coverage (ha/min)} &= \frac{\text{Track spacing (m)} \times \text{Vehicle speed (Km/hr)}}{600} \\ &= \frac{50 \times 15}{600} = 1.25 \text{ ha/min} \end{aligned}$$

$$\begin{aligned} \text{Flow from sprayer (l/min)} &= \text{Coverage (ha/min)} \times \text{Application rate (l/ha)} \\ &= 1.25 \times 0.5 = 0.625 \text{ l/min} \end{aligned}$$

The output from each of the two sprayheads is half the total output from the machine ($0.625 \div 2 = 0.312$ l/min in the example above).

Speed (Km/hr)	Track Spacing (m)								
	20	30	40	50	60	70	80	90	100
10	0.33	0.50	0.67	0.83	1.00	1.17	1.33	1.50	1.67
12	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00
14	0.47	0.70	0.93	1.17	1.40	1.63	1.87	2.10	2.33
16	0.53	0.80	1.07	1.33	1.60	1.87	2.13	2.40	2.67
18	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00
20	0.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33
22	0.73	1.10	1.47	1.83	2.20	2.57	2.93	3.30	3.67
24	0.80	1.20	1.60	2.00	2.40	2.80	3.20	3.60	4.00
26	0.87	1.30	1.73	2.17	2.60	3.03	3.47	3.90	4.33
28	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67
30	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00

Table 1 – Coverage of Sprayer in Hectares/minute

6.2. Adjustment of Output from Sprayer

Insecticide is delivered to the sprayheads by a positive displacement gear pump. The speed of the pump (and hence the flow rate) is set by an electronic regulator in the control box in the cab. The flow rate is adjusted by a 10 position rotary switch. The total flow from the sprayer (ie from both sprayheads) for each of the switch positions is shown in Table 2 below:

Switch Position	Total Flow (l/min)	Total Flow (ml/min)
1	0.10	100
2	0.15	150
3	0.20	200
4	0.30	300
5	0.40	400
6	0.50	500
7	0.70	700
8	0.90	900
9	1.10	1100
10	1.40	1400

Table 2 – Flow Rate from Sprayer

To ensure accurate calibration the flow from each sprayhead should be measured before use. The procedure to measure the output is as follows:

1. Set the **Flow** switch on the control box to the setting that gives the flow rate closest to the required total output from the sprayer.
2. Put at least 10 l of the product to be sprayed into the insecticide tank.
3. Adjust both sprayheads to their lowest vertical position (ie both sprayheads pointing downwards below the horizontal).
4. Start the engine of the vehicle and leave it running during the calibration check. This is to ensure that the vehicle battery is being charged and its voltage is the same as when driving.

IMPORTANT: The engine of the sprayer must **NOT** be run during calibration.

5. Set the **Pump** switch on the control box to ON.
6. Place or hold a bucket or other large container under each sprayhead.
7. Press and hold the **Calibrate** switch on the box at the right hand side of the sprayer (see Fig. 4) until a steady stream of insecticide comes from each sprayhead.

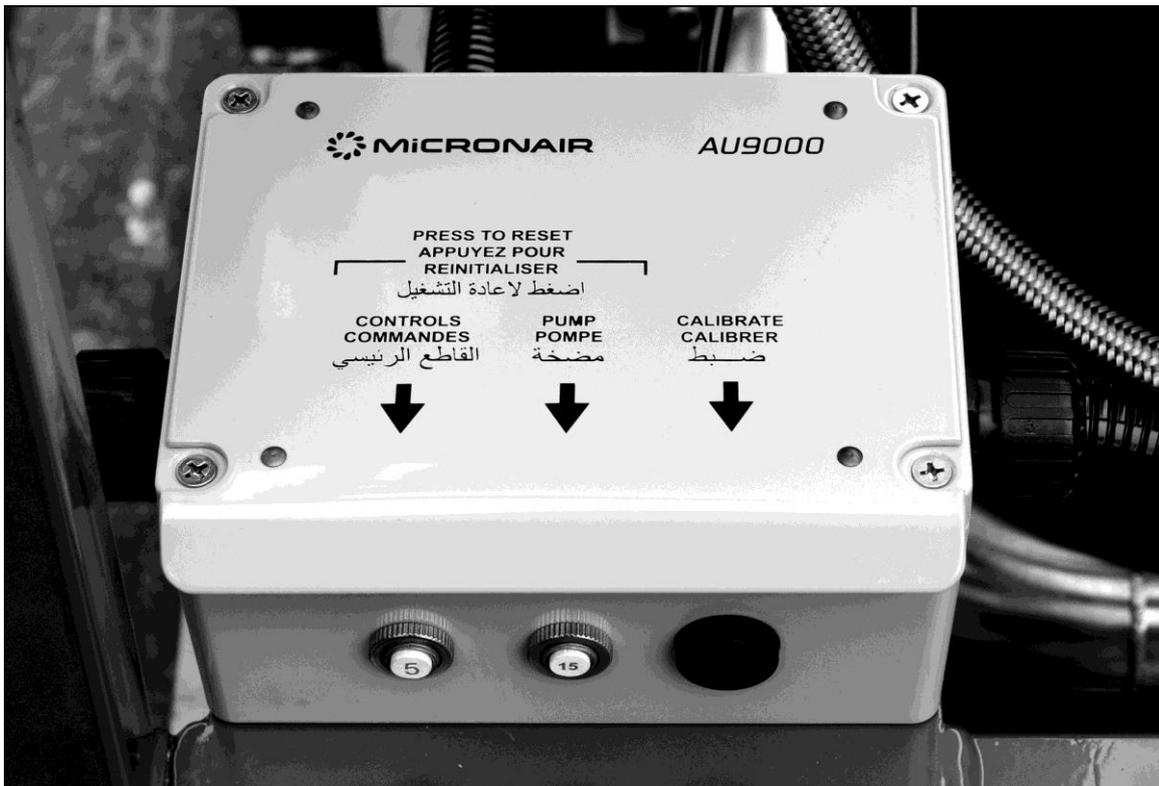


Fig. 4 – Calibration Switch on Junction Box

8. Place a graduated jug or measuring cylinder under each sprayhead and collect insecticide for a measured time (typically 1 or 2 minutes, depending upon the flow rate and the size of the measuring container). See Fig. 5.
9. Release the Calibrate switch.
10. Check the volumes of insecticide collected. The amounts in each container should not differ by more than about 10%. Put the insecticide from both heads into one graduated jug or measuring cylinder and measure the total volume collected. Divide this by the time for the measurement to obtain the total flow rate from the sprayer.
11. Compare the measured flow rate with the rate required for application of the insecticide (see section 6.1 above). If there is a significant difference adjust the FLOW switch to a higher or lower setting and repeat steps (6) – (10) above.

IMPORTANT: Wear gloves, protective clothing and eye protection when calibrating the sprayer. Return insecticide collected from the sprayheads to the main tank and wash all measuring containers etc after use.



Fig. 5 – Flow Calibration Check

Example:

Required total flow rate:		0.3 l/min
Nearest Flow switch setting (ref Table 2):		Number 4
Volume from right-hand sprayhead:		0.305 l
Volume from left-hand sprayhead:		0.290 l
Time to collect measured volumes:		2 minutes
Total volume (l)	=	0.305 + 0.290 l = 0.595 l
Flow rate (l/min)	=	$\frac{\text{Total volume (l)}}{\text{Time (min)}}$
	=	$\frac{0.595}{2} = 0.298 \text{ l/min}$

7. MAINTENANCE

7.1. General

The AU9000 sprayer is constructed from durable, chemical resistant materials and will give long service if it is correctly used and maintained. In addition to the specific maintenance instructions in the sections below, the following procedures must be followed:

1. The insecticide tank must be emptied after use if the sprayer is not to be used again within a period of 12 hours. See section 4.6.
2. The sprayer must be flushed after each spray operation and before it is put into storage between spray seasons. See section 4.5.
3. All external surfaces of the sprayer should be cleaned after use to remove any chemical residues, dust etc. The machine should normally be cleaned with a cloth soaked with water and detergent. In the event of severe contamination with oil-based chemicals, a cloth soaked in kerosene or diesel can be used first. Do not use a high-pressure hose or steam cleaner as this could force water into electrical and other vulnerable components.

IMPORTANT: Wear gloves and eye protection when cleaning the sprayer and dispose of contaminated cleaning cloths and washing liquid safely.

4. The sprayer should be protected from rain and prolonged direct sunlight when not in use, either by parking the vehicle under cover or by covering the machine with a protective sheet.
5. The fuel tank should be emptied if the sprayer is not to be used for more than one month. This can be done by closing the fuel valve, removing the fuel hose from the valve and then opening the valve to drain the fuel into a suitable container.

6. After emptying the fuel tank the engine should be run to use up all fuel in the pipework and carburettor. The procedure is as follows:
 - i. Start the engine normally (see section 4.3).
 - ii. Slowly move the red combined **Fuel Valve** and **Ignition** lever on the engine towards the CLOSED ( O) position until the Ignition switch just operates. Before the engine stops, move the lever back slightly so that the engine continues to run.
 - iii. Wait for all fuel in the carburettor and hoses to be exhausted and for the engine to stop.
 - iv. Move the red combined **Fuel Valve** and **Ignition** lever to the fully CLOSED ( O) position.

7.2. Engine

Full maintenance instructions for the Briggs and Stratton Vanguard engine are given in the engine Owner's Manual supplied with each sprayer. Additional information will be found on the Briggs & Stratton web site at <http://www.vanguardengines.com/engines/Single%20Cylinder/vanguard-100-gross-hp/>

The following maintenance schedule is applicable to engines operating in a typical urban environment. Service intervals should be reduced when operating in dusty conditions.

Item	Action	Normal service interval – carry out action at each calendar interval or number of operating hours, whichever comes first				
		Each use	First 5 hours	Every 25 hours or 1 yr	Every 50 hours or 1 yr	Every year
Engine oil	Check level	✓				
	Change		✓ [1]		✓ [1]	
Air cleaner	Check	✓				
	Clean			✓ [2]		
	Replace					✓ [3]
Spark plug	Check/clean				✓ [4]	
	Replace					✓
Running/idle speed	Check/adjust					✓ [5]
Valve clearance	Check/adjust					✓ [6]
Fuel filter	Check				✓	
	Replace					✓
Fuel line	Check & replace if necessary	Every 2 years [7]				

Table 3 – Engine Maintenance Schedule

Notes:

- [1] Recommended oil for engine: SAE 10W-30 multigrade (suitable for -15 °C – +40 °C ambient temperature). Oil capacity 0.8 l (approx).
- [2] Reduce service interval to 1 month or 25 hours (or less if necessary) in dusty conditions.
- [3] Replace paper element only (not foam pre-cleaner).
- [4] Set gap to 0.030" (0.75 mm). Plug type Champion RC12YC/130-526, NGK BCPR5ES/130-914 or Denso Q16PR-U/130-954.
- [5] Running speed 3200 RPM \pm 150 RPM, idle speed 2000 RPM \pm 150 RPM.
- [6] Clearances: inlet 0.004" – 0.006" (0.10 – 0.15 mm), exhaust 0.009" – 0.011" (0.23 – 0.28 mm).
- [7] Replace only with approved petrol (gasoline) fuel hose.

The engine oil level should be checked with the dipstick on the yellow filler cap – see Fig. 6.

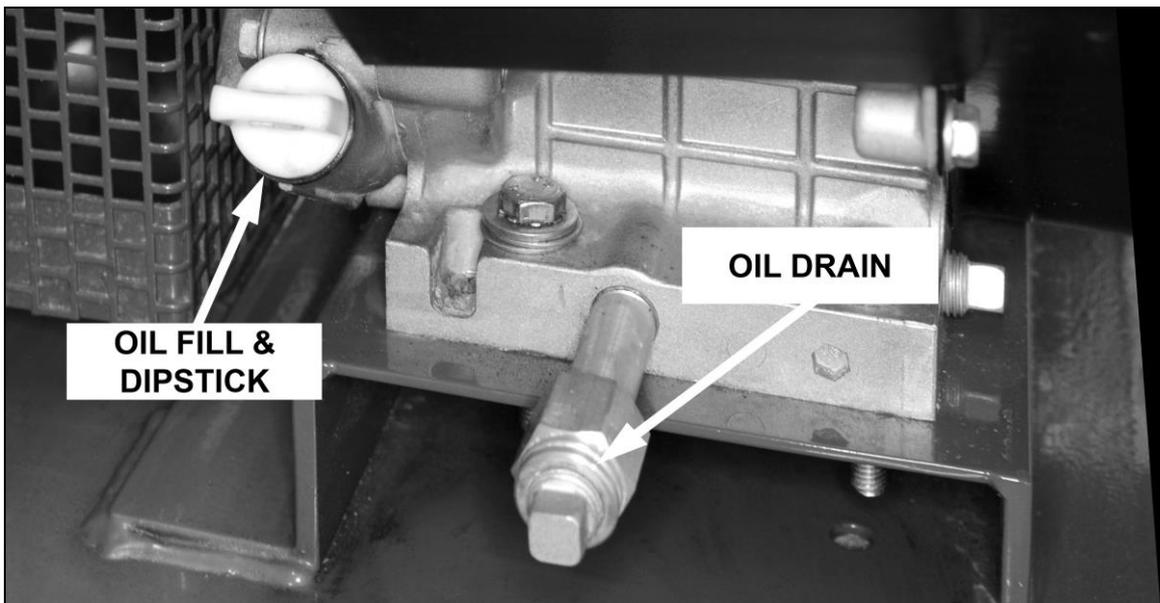


Fig. 6 – Engine Oil Filler and Drain

The procedure to drain the engine oil is as follows:

1. Run the engine for 2 – 3 minutes to warm the oil. Stop the engine.
2. Place a shallow container with a capacity of at least 1 litre under the oil drain fitting.
3. Remove the drain plug and allow all the oil to drain from the engine.
4. Replace the drain plug before re-filling the engine with oil.

7.3. Engine Throttle Linkage

The engine throttle is operated by an electric actuator via a flexible push/pull cable – see Fig. 3. The throttle lever on the engine should move fully to its maximum position when the **Throttle** switch on the control box is set to MAX. The operation of the throttle linkage should be checked after each 50 hours of operation and the cable adjusted if necessary. The procedure is as follows:

1. Connect the sprayer to a battery or 12 V power supply. Do not run the engine of the sprayer.
2. Move the **Throttle** switch on the control box from IDLE to MAX. Check that the throttle lever moves to the right.
3. Check for any free movement of the throttle lever on the engine. The lever should be held just against its end stop by the actuator cable. If there is any free movement slacken the two locking nuts on the sleeve of the cable and adjust the nuts so that the lever is resting against its end stop without any excessive load in the cable. Tighten the locking nuts, start the engine and check for correct operation of the throttle.

7.4. Blower Drive Belts

The blower of the sprayer is driven from the engine via a centrifugal clutch and two V-belts. The condition and tension of the belts should be checked after the first 20 hours of operation with new belts and every 50 hours thereafter. The procedure to check and tension the belts is as follows:

1. Remove the both belt guards by unscrewing the four M6 securing screws and wing nuts.

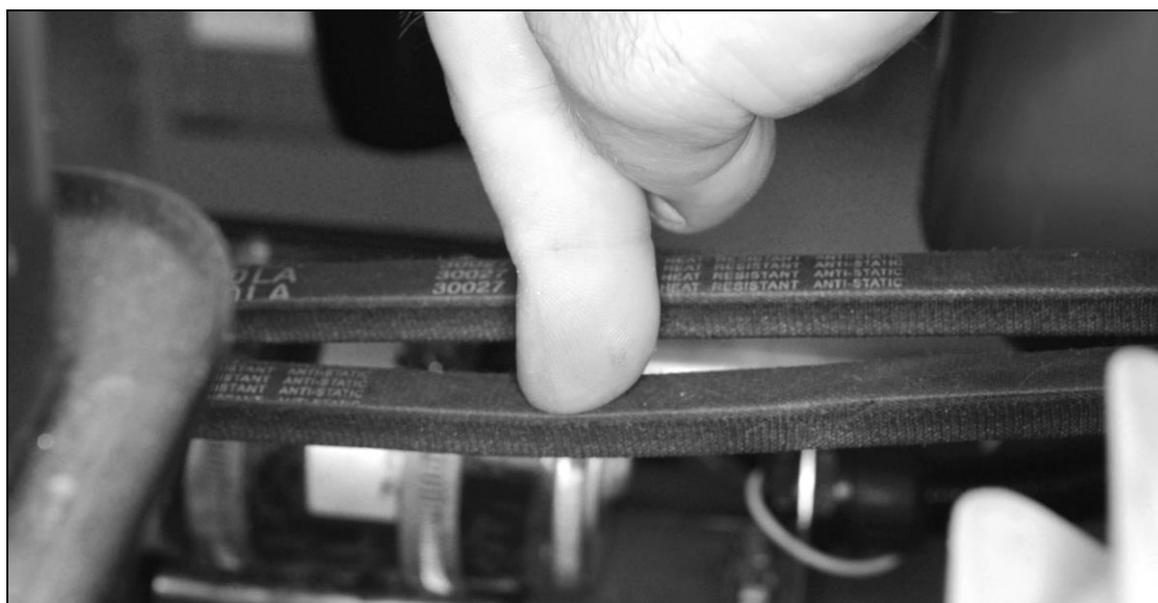


Fig. 7 – Belt Tension Check

2. Visually check the condition of the belts. Belts should be replaced if they show any signs of fraying or delamination or if they are running at the bottom of the grooves in the pulleys. See replacement procedure below.
3. Apply firm finger pressure (approx 1 kg) to the centre of the top part of each belt. Each should deflect by about 15 mm and the deflections both belts should be equal. See Fig. 7.
4. If the deflection of the belts is excessive they must be tensioned as follows:
5. Slacken the four M8 bolts securing the base of the engine to the mounting plate on the frame by one turn. Note that these bolts fit into tapped holes so there are no loose nuts under the plate. See Fig. 8.
6. Slacken the lock nuts on the two M12 jack screws against the bottom flange of the engine.
7. Turn the jack screws alternately and by equal amounts to move the engine and tension the belts. Continue turning the screws until the belts are correctly tensioned – see (3) above.
8. Tighten the lock nuts on the two jack screws, tighten the four engine securing bolts and replace the belt guards.

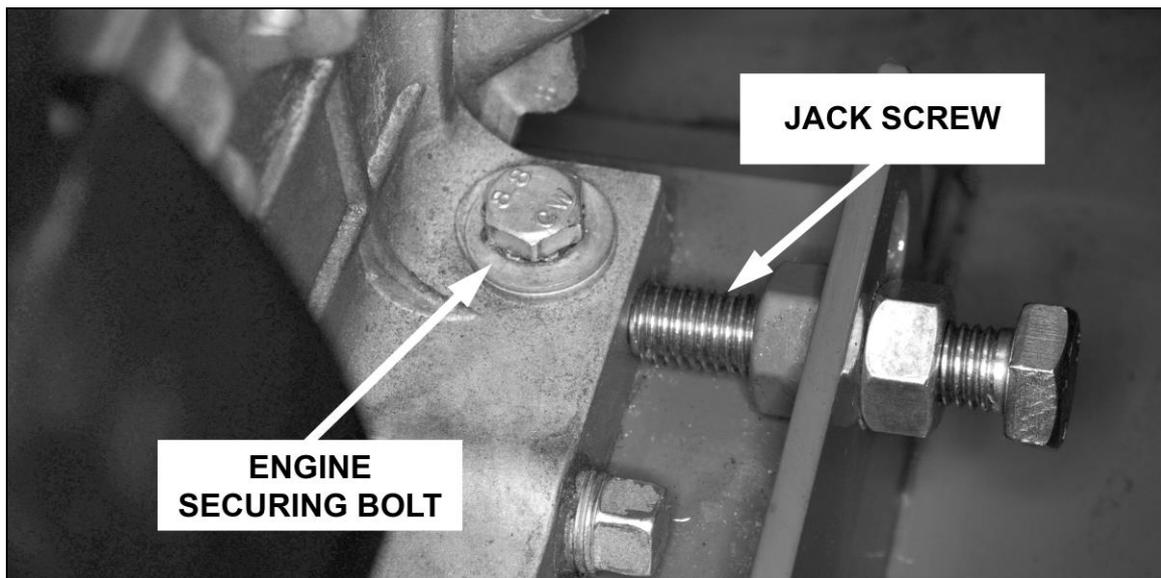


Fig. 8 – Engine Securing Bolt and Jack Screw

Worn or damaged belts must always be replaced as a pair. The procedure is as follows:

1. Remove both belt guards by unscrewing the four M6 securing screws and wing nuts.
2. Slacken the four M8 bolts securing the base of the engine to the mounting plate on the frame by one turn. Note that these bolts fit into tapped holes so there are no nuts under the plate. See Fig. 8.
3. Slacken the lock nuts on the M12 two jack screws against the bottom flange of the engine.

4. Unscrew the jack screws alternately and by equal amounts and move the engine on the base plate to release the tension on the belts.
5. Remove both belts from the pulleys and replace with two new belts.
9. Turn the jack screws alternately and by equal amounts to move the engine and tension the belts. Continue turning the screws until the belts are correctly tensioned – see above.
10. Tighten the lock nuts on the two jack screws, tighten the four engine securing bolts and replace the belt guards.
11. Check the tension of the belts after the first 20 hours of running and adjust if necessary.

7.5. Air Filter

The air filter on the inlet to the blower should be checked at the beginning of each spray season and every 25 hours thereafter (or more frequently if operating in dusty conditions). The procedure is as follows:

1. Remove the knurled knob from the top of the filter housing.
2. Lift the cover upwards and away from the internal filter– see Fig. 9.
3. Lift the filter upwards and remove from the central stud.
4. Clean the filter by blowing compressed air from the outside until all dust and contamination is removed from the folds of the paper element.

IMPORTANT: Only clean the filter with compressed air. Do not wash the paper element with water or solvent.

If the paper element is damaged or badly contaminated it must be replaced. The Micronair part number for a replacement element is CBP3518.

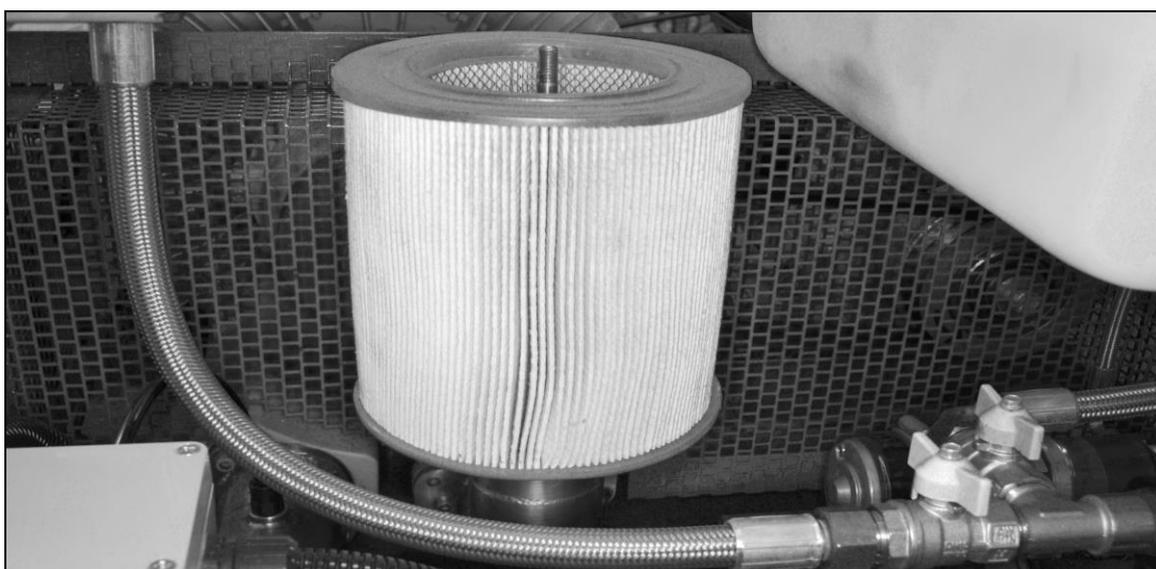


Fig. 9 – Air Filter (Cover Removed)

7.6. Sprayheads

The sprayheads contain no internal moving parts. The following should be checked before use:

5. Condition of air hoses. Hoses should be replaced if they are worn or damaged.
6. Security of locking knobs at vertical and horizontal adjustments. The red fibre friction washers must be in place between the moving parts.
7. The drain holes at either end of the underside of each head should be clear. These holes can be checked and cleaned with a piece of small diameter wire.
8. The flow of insecticide should be approximately equal ($\pm 10\%$) from both sprayheads. Low flow from one head indicates blockage of the feed tube inside the vortex generator in one or both heads. To clean the tube, proceed as follows:
 9. Remove one nut from each of the two studs securing the end plates of the head. Remove the front plate (with the liquid feed hose) from the main body. There is no need to disconnect the liquid or air tubes. Remove the rear (outlet) plate and vortex generator.
 10. Clean the white feed tube that passes through the centre of the vortex generator with a piece of fine wire and blow the hole clear with compressed air.
 11. Reverse step (9) to replace the end plates and tighten the securing nuts. When fitting the front plate ensure that the O-ring is in position at the rear of the feed adaptor and that this locates over the conical end of the feed tube of the vortex generator.
 12. Put a small amount of kerosene in the tank, place containers under the heads, set the **Pump** switch to ON and press the **Calibrate** button until kerosene flows from the heads. Check that the flow from each head is unobstructed and that the flow rates are approximately equal.

7.7. Air Pressure Switch

The sprayer is fitted with an air pressure switch to detect proper operation of the blower. The switch operates the **Air** indicator on the control box and also enables the pump. The pump will not run unless the air pressure switch is closed and the **Air** indicator is illuminated. If the indicator and pump do not operate correctly the switch must be adjusted as follows:

1. Open the junction box on the sprayer frame by removing the four lid screws – see Fig. 4.
2. Start the engine of the sprayer but do not operate the pump.
3. Set the **Throttle** switch on the control box to IDLE.

4. Locate the pressure switch in the junction box – see Fig. 10. Using a 2 mm hexagon (Allen) key rotate the adjusting screw until the **Air** indicator on the control box is just extinguished. Turning the screw anti-clockwise will cause the indicator to illuminate and turning it clockwise will cause it to extinguish.
5. Set the **Throttle** control to MAX. The **Air** indicator should illuminate.
6. Rotate the adjusting screw clockwise until the **Air** indicator is just extinguished. Note the amount of rotation of the screw required for this adjustment.
7. Rotate the adjusting screw anti-clockwise by half the amount noted in step (6).
8. Move the **Throttle** switch between the IDLE and MAX settings and check the **Air** indicator illuminates at the MAX setting and is extinguished at IDLE.

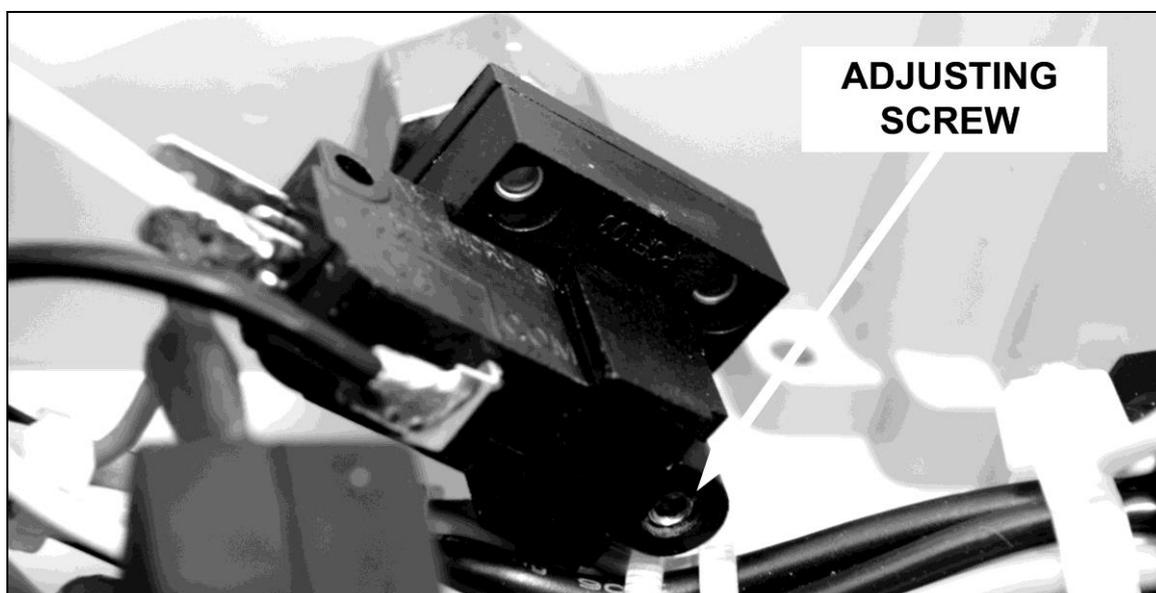


Fig. 10 – Air Pressure Switch in Junction Box

7.8. Pump, Pipework and Filter

The insecticide pump used on the AU9000 sprayer is a gear pump magnetically coupled to an electric motor. As the pump has a magnetic coupling there is no shaft seal to wear or leak. The pump head contains no user serviceable parts and should be replaced as a complete assembly.

All hoses have a PTFE lining with a braided stainless steel outer covering and crimped end fittings. Hoses cannot be repaired if they are damaged and must be replaced with the appropriate Micronair spare parts.

There is a 50 mesh filter in the insecticide pipe between the tank and the pump (see Fig. 2). This should be checked and cleaned after the first month (or 20 hours) use of the sprayer and then every three months or after each 50 hours of operation, whichever occurs first. The procedure to clean the filter is as follows:

1. CLOSE both tank isolating valves (see Fig. 2).
2. Place a shallow container with at least 0.5 l capacity under the bowl of the filter.
3. Unscrew the filter bowl and remove the filter screen.
4. Clean the filter screen and the inside of the filter bowl.
5. Check the condition of the O-rings around the filter screen and on the outside of the filter body (adjacent to the thread for the bowl). Replace any damaged or swollen O-rings.
6. Fit the screen inside the bowl and screw the bowl onto the filter body. Do not over-tighten the thread.
7. OPEN the isolating valve of the tank to be used.

IMPORTANT: Wear gloves and eye protection when working on the pump, filter or pipework. Re-use any clean insecticide drained from the system and dispose of any contaminated residues, cleaning cloths etc safely.

7.9. Pump Pressure Switch

The sprayer is fitted with a pressure switch to detect proper operation of the pump. The switch operates the **Pump** indicator on the control box when the pump is producing sufficient pressure to deliver insecticide to the sprayheads. If the **Pump** indicator does not operate correctly the switch must be adjusted as follows:

1. Locate the pressure switch mounted on the T-piece at the outlet of the pump – see Fig. 11. Slide the black cover away from the switch body, taking care not to disconnect the two wires.
2. Put some kerosene or water in the flushing tank. Close the **Main Tank** valve and Open the **Flushing** tank valve.
3. Put a bucket or container under each sprayhead.
4. Set the **Pump** switch on the control box to ON and the **Flow** switch to POSITION 1.
5. Using a flat screwdriver rotate the adjusting screw on the end of the switch until the **Pump** indicator on the control box is just extinguished. Turning the screw anti-clockwise will cause the indicator to illuminate and turning it clockwise will cause it to extinguish.
6. Set the **Pump** control to ON and ensure that liquid is flowing from both sprayheads. The **Pump** indicator should illuminate.

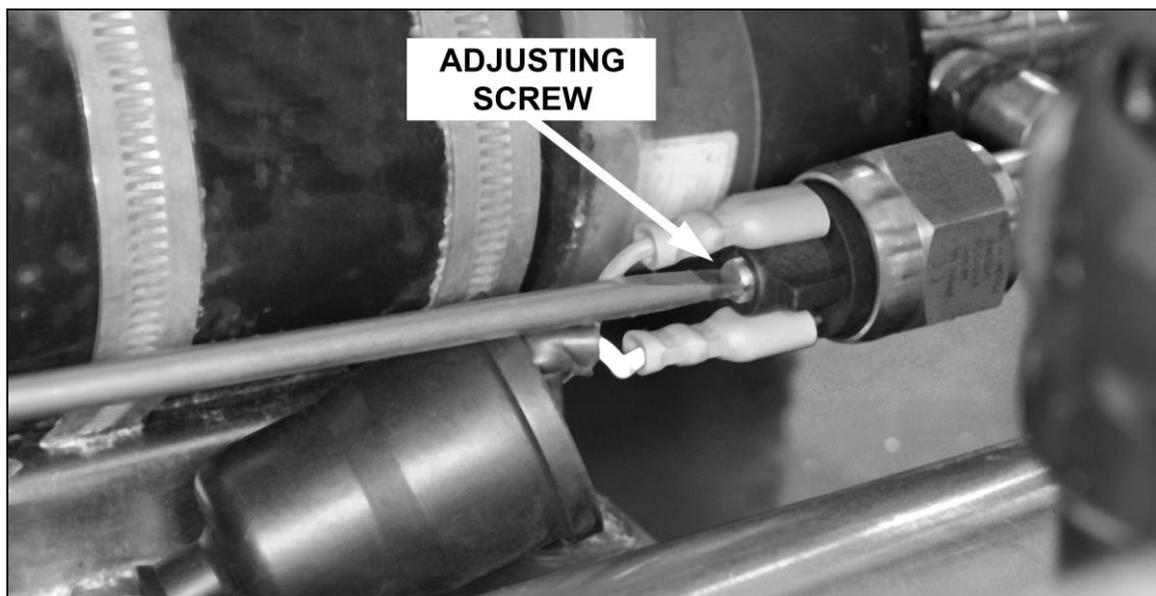


Fig. 11 – Pump Pressure Switch with Screwdriver

7. Rotate the adjusting screw clockwise until the **Pump** indicator is just extinguished. Note the amount of rotation of the screw required for this adjustment.
8. Rotate the adjusting screw anti-clockwise by half the amount noted in step (7).
9. Move the **Pump** switch between the OFF and ON settings and check the **Pump** indicator illuminates at the ON setting and is extinguished at OFF.

7.10. Fault Finding

Problem	Possible Cause	Action
Engine does not start	Choke OPEN (when using manual starter)	Set choke lever to CLOSED position until after engine starts
	Throttle set to IDLE	Set throttle switch to MAX
	Spark plug oiled, damaged or gap incorrectly set	Check and adjust, clean or replace spark plug
	Oil level low	Check oil level and add oil if necessary
	Carburettor flooded	CLOSE fuel valve, OPEN choke, set throttle to IDLE and pull starter cord 10 times. Leave for 5 minutes and then OPEN fuel valve and start engine normally

Engine starts but runs intermittently or stops	Choke left CLOSED	Set choke lever to OPEN
	Oil level too high	Drain oil to MAX level on dip-stick
	Oil level low (level switch operates intermittently, especially when driving over rough ground)	Check oil level and add oil to MAX level on dip-stick
	Blocked fuel filter	Replace fuel filter
	Fuel level low	Add fuel (note that at least 0.5 l of fuel is required for reliable operation when driving over rough ground)
	Fuel valve closed	Open fuel valve
	Blocked engine air filter	Clean engine air filter
	Spark plug oiled, damaged or gap incorrectly set	Check and adjust, clean or replace spark plug
No output from either sprayhead with pump ON (pump pressure indicator OFF)	Tank isolation valve CLOSED	OPEN valve
	Main spray liquid filter blocked	Clean main spray liquid filter
	Check valve or check valve filter blocked	Remove check valve and filter, clean and replace
	Pump motor not operating	Check voltage at pump leads. If voltage is present repair or replace pump, if not investigate electrical system and controller
	Pump motor operating, but no flow from pump (magnetic pump coupling slipping)	Dismantle pump and check for internal blockage etc
	Air pressure switch not operating (pump only operates when there is air pressure from blower)	Ensure that throttle switch is set to MAX Check operation of air pressure switch and adjust or replace if necessary
No output from either sprayhead with pump ON (pump pressure indicator ON)	Blockage in sprayheads or pipework on outlet side of pump	Clear blockage
No or reduced output from one sprayhead	Sprayhead feed tube blocked	Open head and clean feed tube (check both sprayheads)
Long delay between switching pump ON and output from sprayheads	Check valve stuck open	Remove check valve and clean

8. PARTS LISTS

This section lists parts for the frame, tanks, blower, sprayhead, pump, pipework and control system. A full parts list and maintenance manual for the Briggs & Stratton 10 HP Vanguard engine can be downloaded from the B&S web site at:

<http://bsintek.basco.com/BriggsDocumentDisplay/default.aspx?filename=29jnxDX.WFzXFix2>

8.1. Frame, Mast & Tanks

Item	Description	Part No	Qty	Notes
1	Frame	EX7264	1	
2	Sprayhead mast	EX7300	1	
3	Sprayhead bracket	EX7304	2	
4	Knob, bracket locking	CBP3515	2	
5	Washer, M6	CBP2226	2	
6	Washer, fibre 38 mm O/D	EX7319	2	
7	Knob, sprayhead locking	CBP3515	4	
8	Washer, fibre 19 mm O/D	EX7318	4	
9	Bolt, M8	CBP3527	2	
10	Washer, M8	6900	4	
11	Nut, M8 nyloc	CBP2267	4	
12	Main tank, 50 l capacity	EX7237	1	
13	Filter basket, main tank	CBP2732	1	
14	Lid, main tank	CBP2943	1	
15	Air vent, main tank	CBP2891	1	Items 15 & 16 supplied together
16	Air vent retaining nut	CBP2891	1	
17	Flushing tank, 10 l capacity	5955	1	
18	Filter basket, flushing tank	5449	1	
19	Lid, flushing tank	5208A	1	

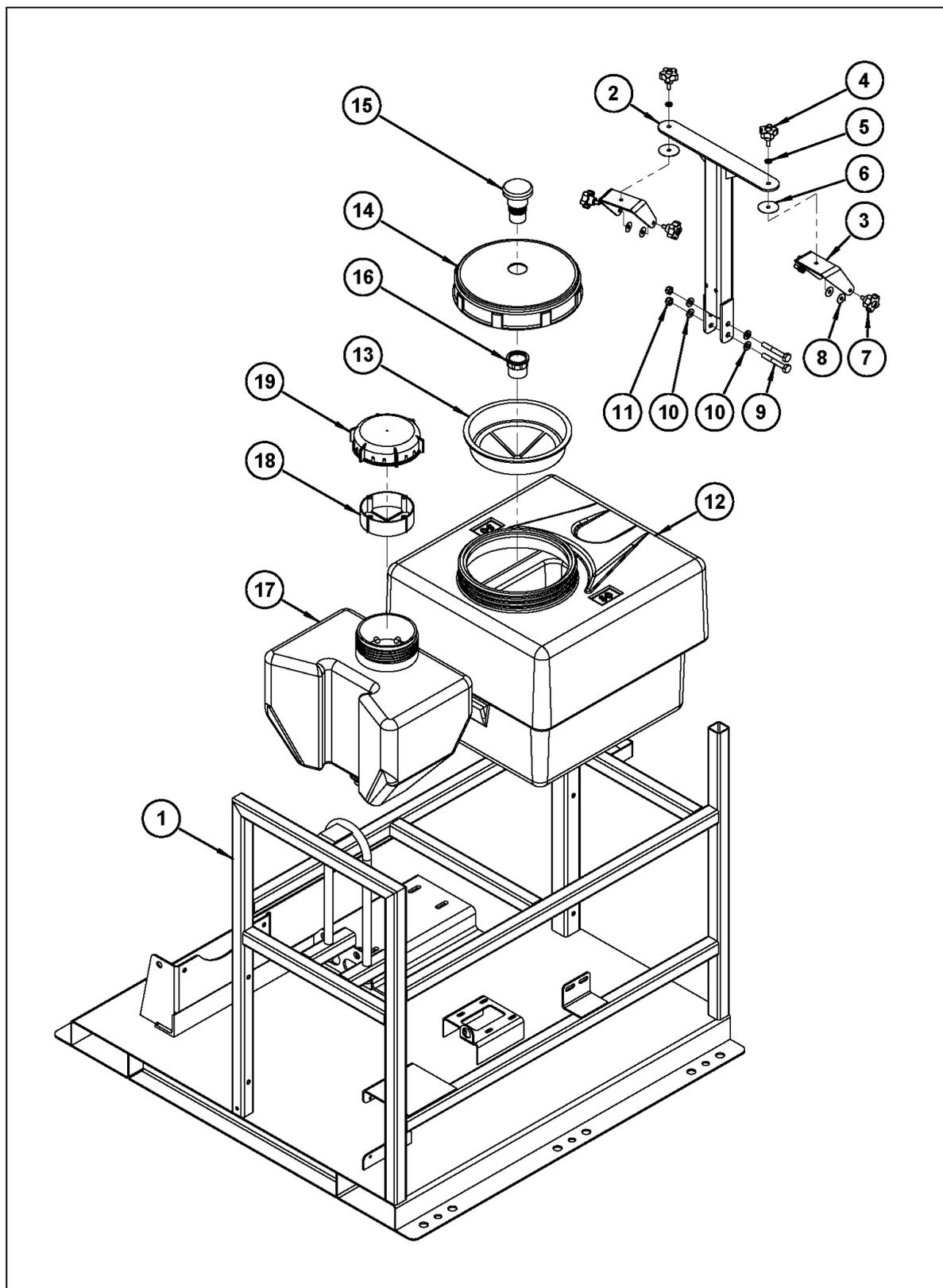


Fig. 12 – Frame, Mast & Tanks

8.2. Engine, Blower, Drive Belts & Air Tubes

Item	Description	Part No	Qty	Notes
1	Engine, 10 HP Vanguard	CBP3570	1	
2	Centrifugal clutch with pulley	CBP3507	1	With M8 grub screw
3	Key, engine shaft	EX7366	1	
4	Bolt, 7/16" UNF high tensile	CBP2807	1	
5	Spacer bush, engine shaft	EX7331	1	
6	V-belt	CBP3525	2	
7	Pulley, twin groove	EX7327	1	
8	Screw, M8 cap head	CBP1444	1	
9	Washer, M8 spring	CBP1452	1	
10	Spacer bush, blower shaft	EX7303	1	
11	Key, blower shaft	CBP7367	1	
12	Blower	CBP3504	1	
13	Bolt, M8	CBP3528	2	
14	Washer, M8	6900	2	
15	Spacer tube, blower mounting	EX7332	1	
16	Bolt, M8	CBP7368	1	
17	Filter base assembly	EX7310	1	
18	Screw, cap head M6	CBP3530	4	Used on inlet & outlet
19	Washer, M6	CBP2226	4	Used on inlet & outlet
20	Filter element	CBP3518	1	
21	Filter cover	EX7320	1	
22	Knob, filter cover	CBP3519	1	
23	Air outlet tube assembly	EX7321	1	
24	Adaptor, 6 mm tube	6533	1	
25	Tube, 6 mm O/D	CBP2802	0.3 m	
26	Air duct, 38 mm I/D	CBP3517	2	1 m long each
27	Hose clip	CBP15	4	

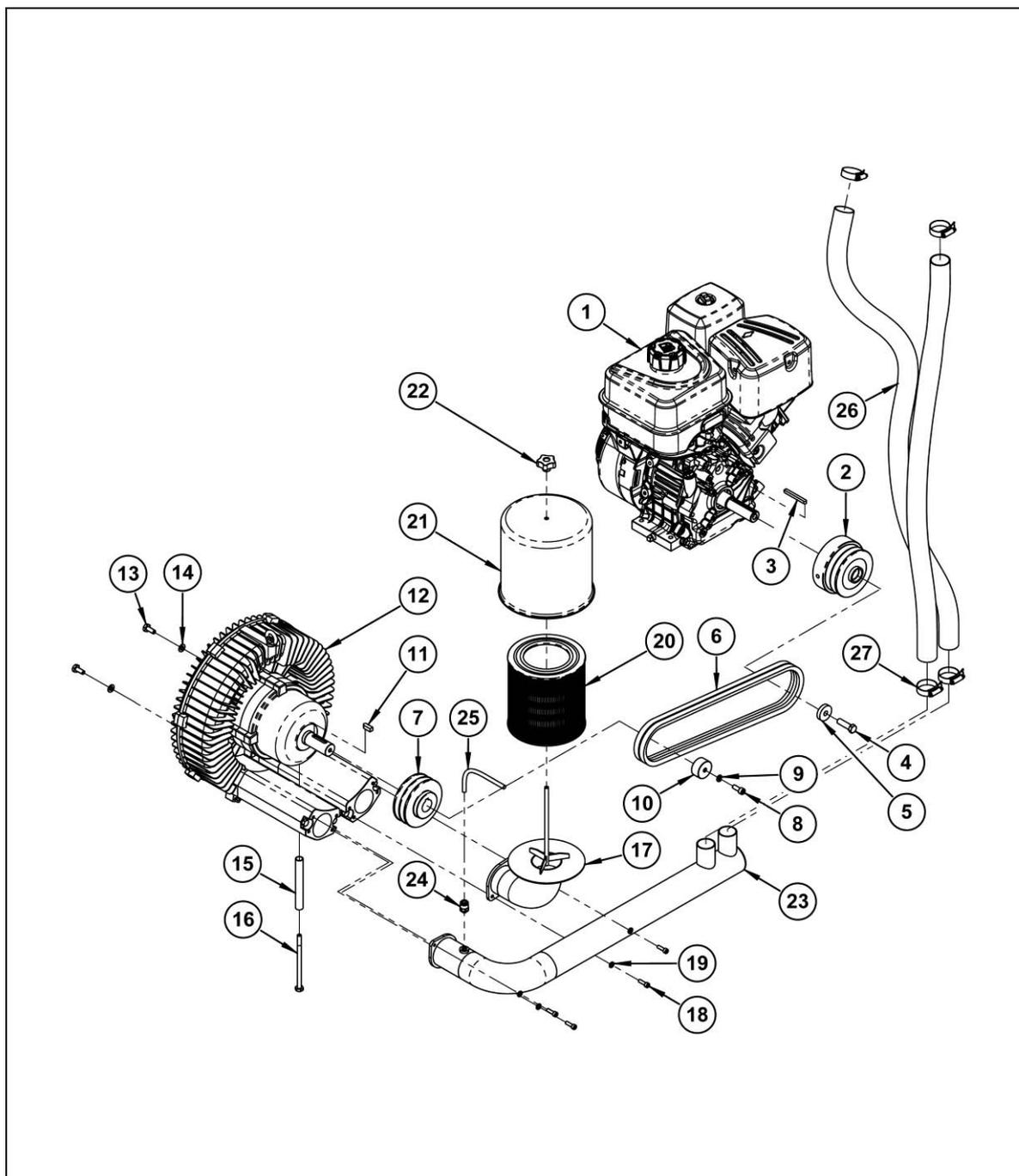


Fig. 13 – Engine, Blower, Drive Belts & Air Tubes

8.3. Liquid Pipework

Item	Description	Part No	Qty	Notes
1	Sprayhead	EX7265	2	See Fig. 15 for detail
2	Hose, manifold to sprayhead	EX7311	2	
3	Adaptor, 1/4" M/M	6777	2	
4	Manifold block	EX7316	1	
5	LFM Body, 1/4"	AJ6379	1	
6	Non-return valve	EX7317	1	
7	Hose, pump to manifold	EX7312		
8	T-piece, 1/4" M/F/M	CBP2766	1	
9	Pressure switch	CBP2742	1	
10	Adaptor, 1/4" BSPP/NPT M/M	CBP3169	2	
11	Pump with 12 V motor	EX7329	1	See Fig. 16 for detail
12	Hose, filter to pump	EX7317	1	
13	Adaptor, 1/2" - 1/4" M/M	CBP2875	1	
14	T-piece, 1/2" M/F/F	CBP2874	1	
15	Ball valve, 1/2" M/F	5900	3	
16	Hose, drain	EX6900	1	
17	Adaptor, 1/2" M/M	CBP2893	2	
18	Filter	5881A	1	See Fig. 17 for detail
19	T-piece, 1/2" M/M/F	CBP2507	1	
20	Hose, main tank to filter	EX7314	1	
21	Adaptor, 1/2" M/M	CBP2873	1	
22	Outlet fitting, main tank	-	1	Part of tank EX7237
23	Adaptor, tank outlet	EX6897	1	
24	Hose, flushing tank to filter	EX7315	1	
25	Bulkhead connector, 1/2"	CBP2892	1	
26	Nut, 1/2"	6797	1	
27	O-ring	6721	1	
28	Washer, M20	6027	1	
29	Bolt, M6 x 80 mm	5968	4	
30	Washer, M6	CBP2226	8	
31	Nut, M6 nyloc	5984	4	

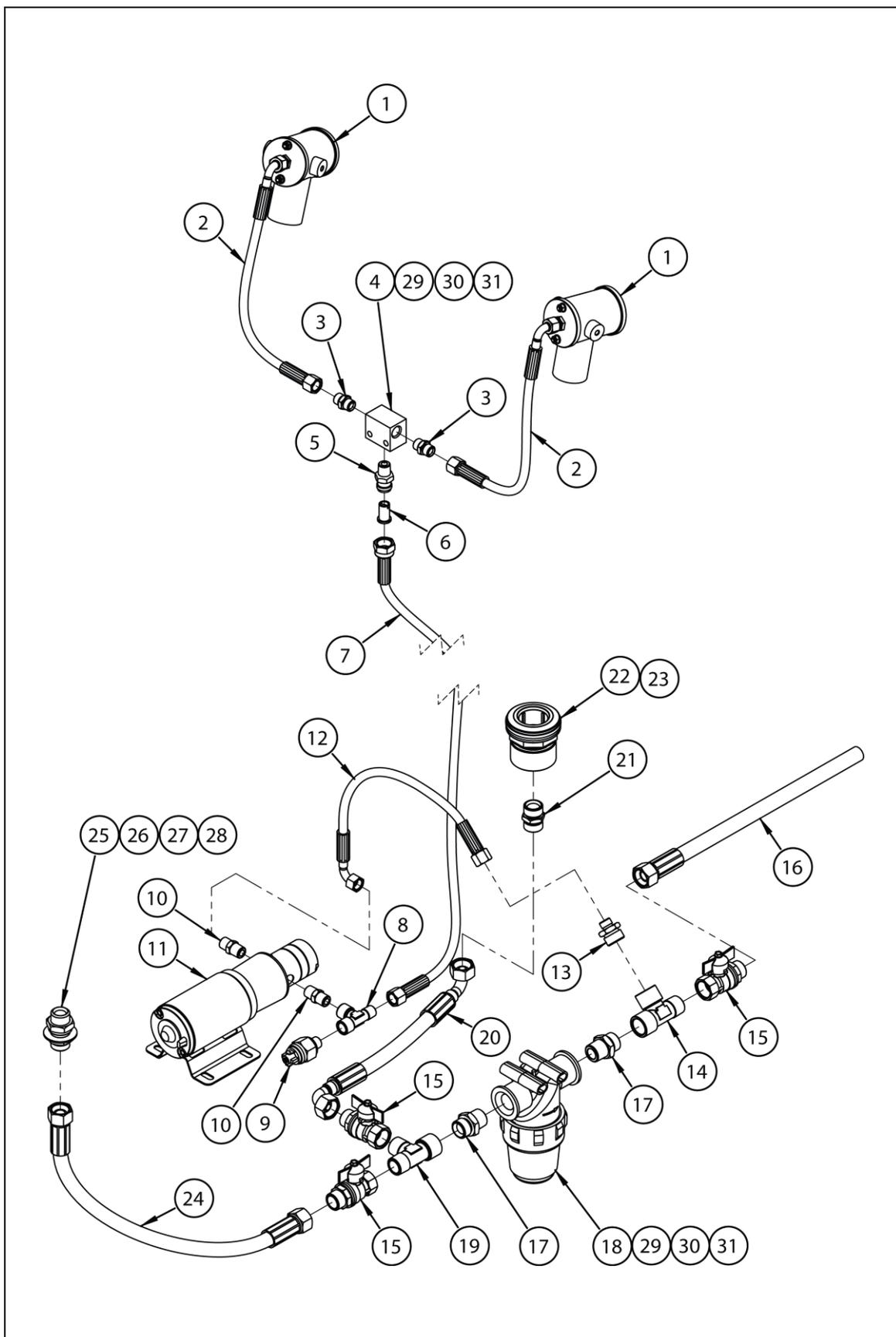


Fig. 14 – Liquid Pipework

8.4. Sprayhead

Item	Description	Part No	Qty	Notes
1	Body with air inlet tube	EX7266	1	
2	End plate, inlet	EX7268	1	
3	End plate, outlet	EX7267		
4	Bolt, M5	EX7355	2	
5	Washer, M5	CBP2211	4	
6	Nut, M5, nyloc	CBP2210	2	
7	Adaptor, liquid inlet	EX7309	1	
8	O-ring	CBP3514	1	
9	Nut, 1/4" BSP	EX7330	1	
10	Nozzle core	CBP3509	1	
11	Screw, M5	CBP1770	1	
12	Vortex generator	CBP3510	1	
13	Screw, M3	CBP3511	2	
14	Spacer tube	EX7328	2	
15	Washer, M3	CBP3291	2	
16	Nut, M3 nyloc	5976	2	
17	Sprayhead assembly complete	EX7265	1	All items above

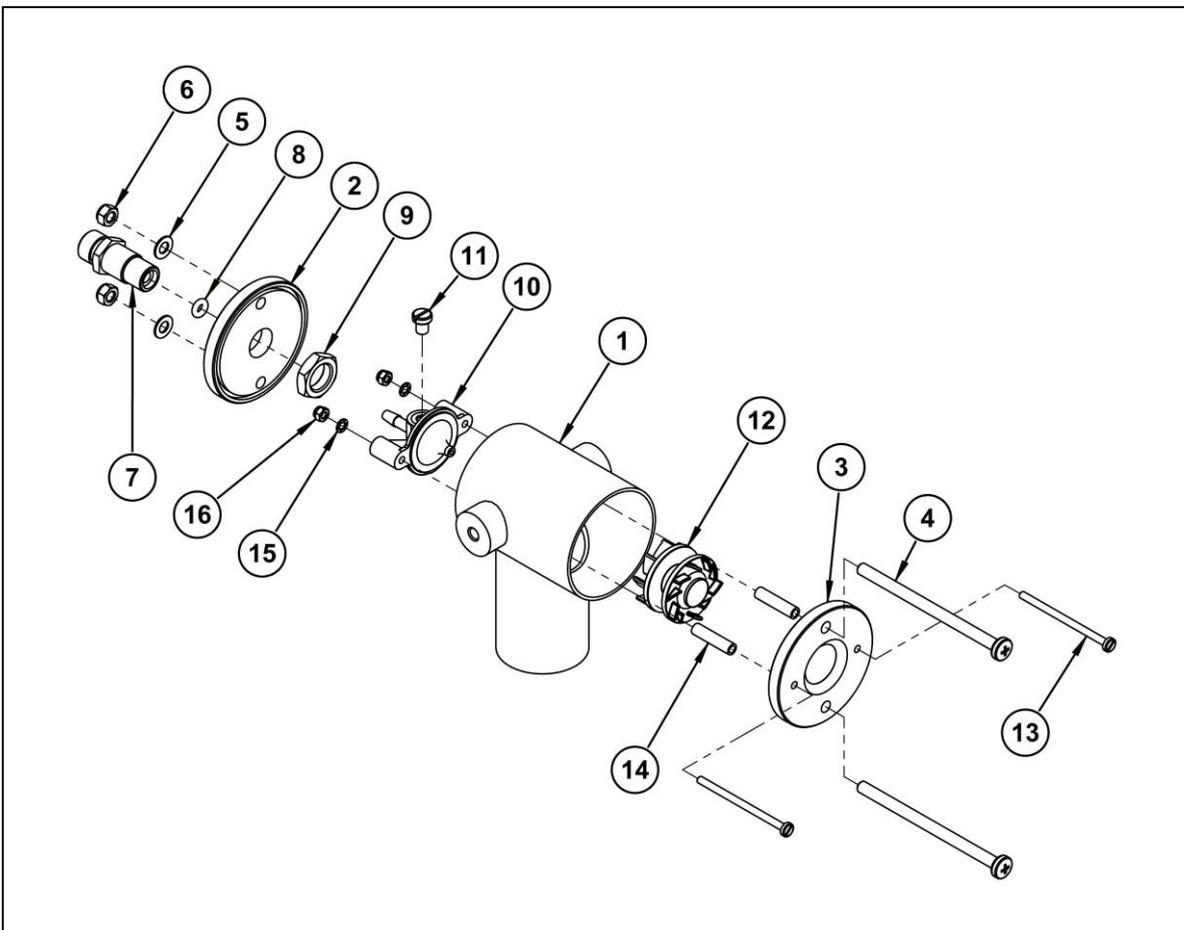


Fig. 15 – Sprayhead

8.5. Pump

Item	Description	Part No	Qty	Notes
1	Motor	5866	1	With bracket & clips
2	Adaptor ring	5986	1	
3	Drive magnet	5987	1	With grub screw
4	Pump head, stainless steel	7256	1	
5	Screw, 4-40 UNC	5990	3	
6	Pump assembly complete	EX7329	1	All items above

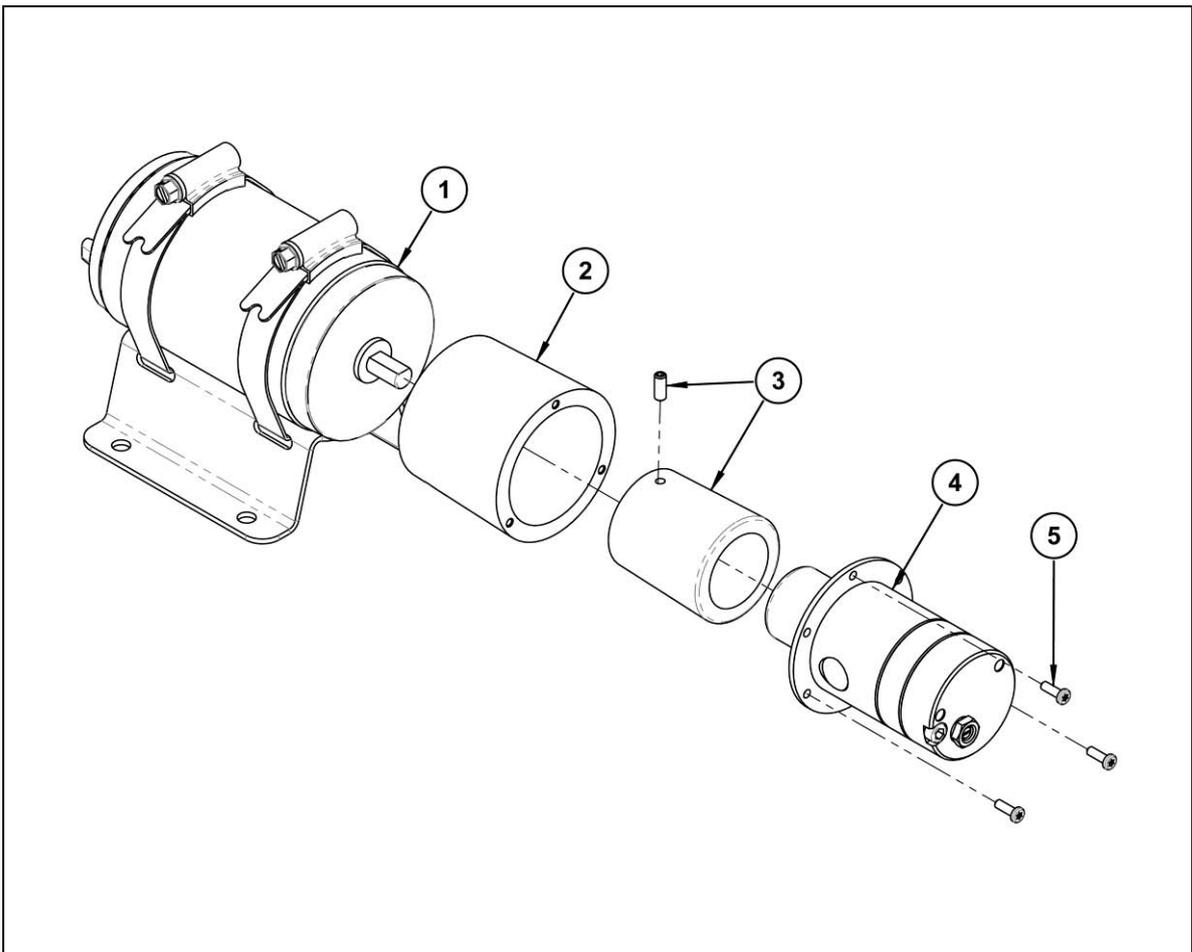


Fig. 16 – Pump

8.7. Electrical Parts & Control System

Item	Description	Part No	Qty	Notes
1	Junction box & wiring loom assembly	EX7356	1	Includes cables
2	Air pressure switch	EX7325	1	Inside box (not shown)
3	Throttle actuator assembly	EX7306	1	Includes throttle cable
4	Throttle cable	CBP3526	1	
5	Pump with 12 V motor	EX7329	1	See Fig. 16 for detail
6	Pressure switch	CBP2742	1	
7	Pressure switch cover	CBP2857	1	
8	Flexible conduit	AJ6187	A/R	
9	Conduit gland	CBP2865	2	
10	Control box	EX7357	1	In cab (not shown)
11	Battery fuse, 100 A	CBP2991	1	Near battery (not shown)

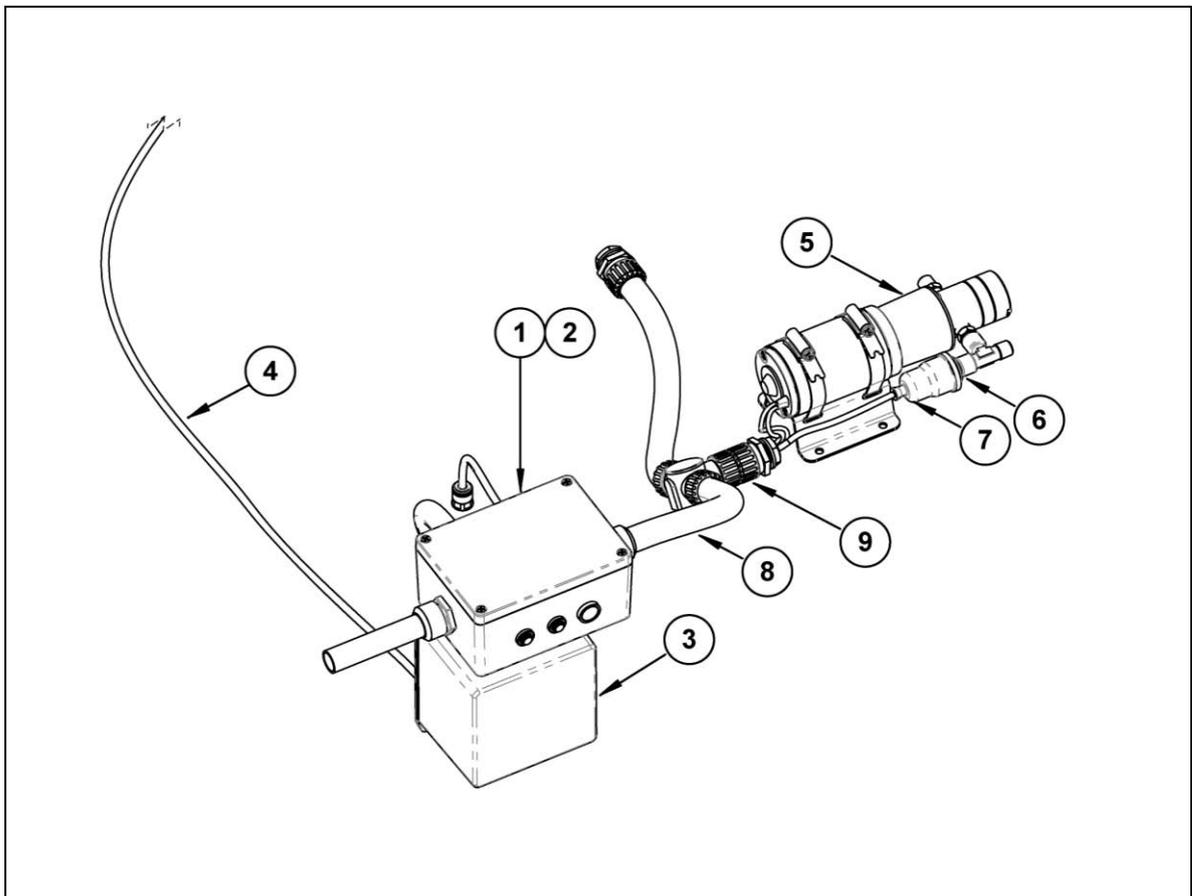


Fig. 18 – Electrical Parts & Control System

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9. ELECTRICAL SCHEMATIC

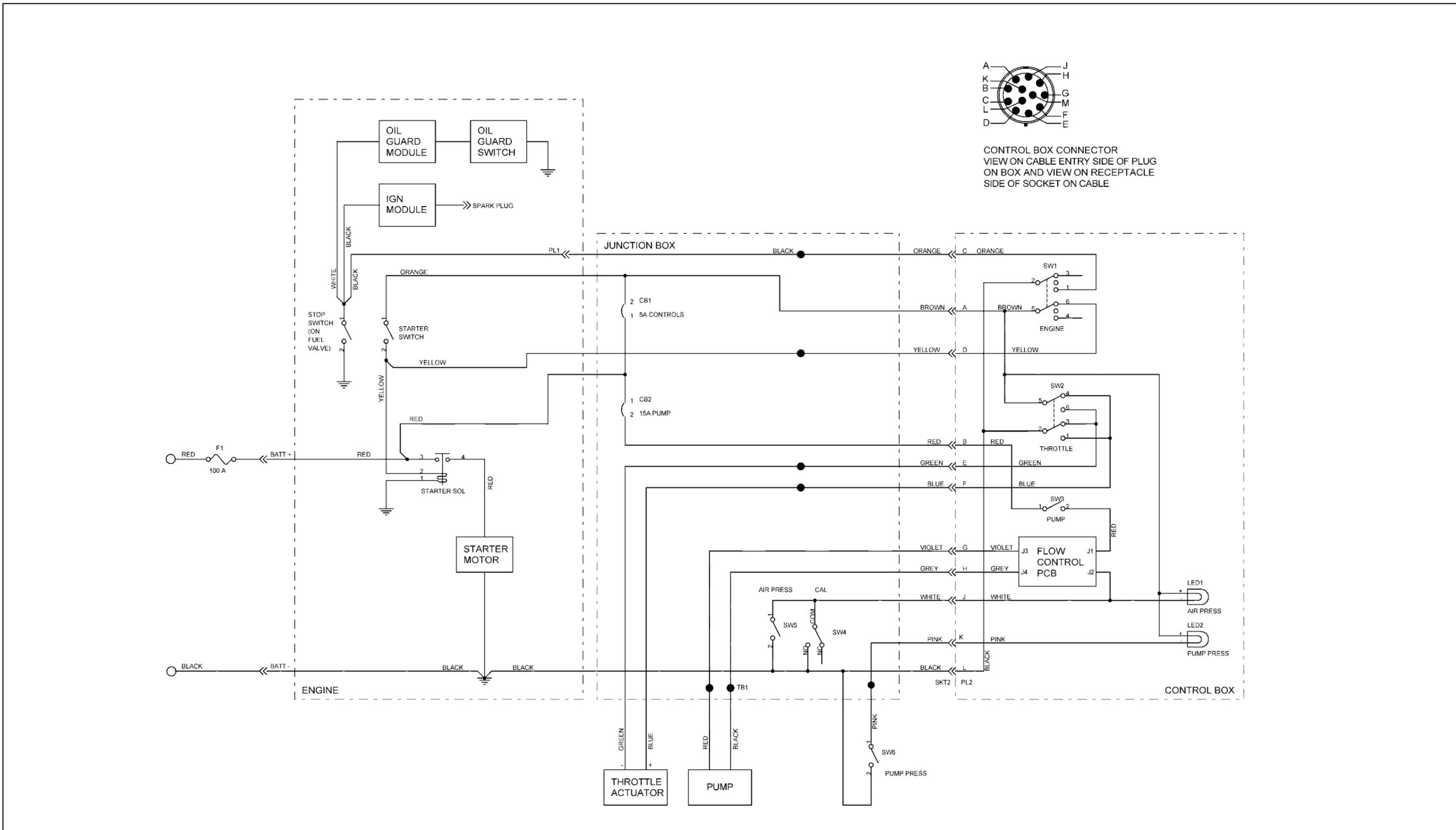


Fig. 19 – Electrical Schematic

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10. WARRANTY

Micron Sprayers Limited give a one year warranty covering all parts of the sprayer except the engine. The warranty period commences upon the delivery of the sprayer to the customer. The warranty is subject to the following conditions:

1. The sprayer must have been correctly installed on the vehicle and operated in accordance with the instructions in this handbook.
2. The sprayer must have been maintained in accordance with the maintenance schedules in this handbook.
3. Only genuine Micron spare parts should have been fitted and no components should have been subject to unauthorised repair.
4. The sprayer must have been emptied and cleaned after use and must have been kept under cover and not exposed to extreme weather conditions when not in use.

Micron Sprayers undertake to replace or repair (at its sole discretion) any components that fail as a consequence of faulty materials or workmanship. This warranty is limited to the repair or replacement of components only. Micron Sprayers Limited are not responsible for any labour costs associated with the replacement of faulty components.

The engine (but not the blower or centrifugal coupling) is covered directly by Briggs & Stratton's worldwide warranty. The local Briggs and Stratton service centre should be contacted in the event of a warranty claim relating to the engine.

11. CONVERSION FACTORS

1 yard	= 3 feet	= 0.91 metre
1 metre	= 39.37 inches	= 1.09 yards
1 statute mile	= 0.87 nautical mile	= 1.61 kilometres
1 nautical mile	= 1.15 statute mile	= 1.85 kilometres
1 kilometre	= 0.62 statute mile	= 0.54 nautical mile
1 statute mile	= 1760 yards	= 5280 feet
1 nautical mile	= 2027 yards	= 6081 feet
1 kilometre	= 1094 yards	= 3282 feet
1 metre/sec	= 2.237 miles per hr	= 196.9 ft/min
1 acre	= 43560 sq feet	= 4840 sq yards
1 acre	= 4047 sq metres	= 0.40 hectare
1 hectare	= 107600 sq feet	= 11955 sq yards
1 hectare	= 10000 sq metres	= 2.47 acres
1 sq mile	= 640 acres	= 259 hectares
1 sq kilometre	= 247 acres	= 100 hectares
1 US gal	= 0.83 Imp gal	= 3.78 litres
1 Imp gal	= 1.20 US gals	= 4.54 litres
1 litre	= 0.26 US gal	= 0.22 Imp gal
1 US pint	= 16 US fl ounces	= 0.47 litres
1 Imp pint	= 20 Imp fl ounces	= 0.57 litre
1 US fl ounce/acre	= 1.04 Imp fl ounce/acre	= 73.04 ml/hectare
1 ml/hectare	= 0.0137 US fl oz/acre	= 0.0142 Imp fl oz/acre
1 US gal/acre	= 8 US pint/acre	= 9.45 litres/hectare
1 Imp gal/acre	= 8 Imp pints/acre	= 11.35 litres/hectare
1 litre/hectare	= 0.11 US gal/acre	= 0.081 Imp gal/acre
1 pound	= 16 ounces	= 0.45 kilogram
1 kilogram	= 2.20 pounds	= 35.3 ounces
1 ounce	= 28.35 grams	
1 pound/sq inch	= 0.068 atmosphere	= 0.067 bar
1 atmosphere	= 14.70 pounds/sq in	= 1.01 bar
1 bar	= 14.50 pounds/sq in	= 0.98 atmosphere
1 kilopascal	= 0.01 bar	= 0.145 pounds/sq in

Every care has been taken in the design of this equipment and the preparation of this Handbook. However, Micron Sprayers Limited cannot accept responsibility for errors or the consequences thereof. The user must satisfy himself that the equipment is suited to his needs, is performing according to his requirements and that all statutory requirements and regulations are being complied with.