

INSTRUCTION MANUAL AND PARTS LIST

PRO-MIST DURA
WITH SMARTFLOW II



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PRO-MIST DURA® ULV

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SMARTFLOW II MANUAL

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Warranty Information

Your Pro-Mist Dura is warranted to the original purchaser by Clarke against defects in workmanship or materials for a period of one (1) year from the date of purchase from Clarke. If any warranted component fails within that period, return the component to Clarke, shipping prepaid, for repair or replacement at its option. This warranty does not include incidental damages arising from machine failure, from incorrect use, or from improper or neglect of maintenance.

This warranty covers only the repair or replacement of warranted defective parts. It does not cover components which normally wear out or are used up during operation or through time. In the latter category are items such as tubing, fittings and rubber mountings.

Parts which prove to be defective will be repaired or replaced free of charge FOB factory, provided:

1. The component was properly installed, as per enclosed manual, given reasonable care, protected from wet weather conditions and freezing temperatures and used for its intended purpose.
2. No repairs have been attempted by other than factory personnel. No alterations or adjustments have been made to the electrical controls.
3. The component (s) have been returned properly packaged, insured, and with transportation charges prepaid.
4. Upon examination, Clarke personnel are satisfied that the defects were not caused by abuse, or subjection to conditions that violate the system specifications or neglect.
5. When the component is plugged into a vehicle electrical system, a volt check confirms that the vehicle's alternator is meeting automotive standards 13.8 v to 14.8 v (15 v max) at the alternator. This is required for both the component and vehicle reliability.

All returns must have an authorization number issued by Clarke (1-800-323-5727). Please call ahead to save time and cost of having items returned. Thank you!

Important Notes to Help You Get the Most out of Your Sprayer and Maintain the Warranty

1. Read and understand this instruction booklet before operating your sprayer. If you have questions about operating the sprayer, proper applications, or insecticides, call Clarke and ask for technical support.
2. Use only insecticides that are specifically registered by the appropriate state and federal agencies for ultra-low-volume (ULV) adult mosquito and/or fly control.
3. **Read and follow the insecticide label.** It is a federal offense to use any pesticide in a manner not in accordance with its labeling. This includes directives on the use of protective clothing and safety equipment.
3. To obtain the best results with a ULV sprayer, the operator must be knowledgeable of space spraying concepts. Many insecticide labels list specific training and/or certification requirements for users. Consult Clarke or your nearest cooperative extension agent for information.
4. Operate the sprayer only when:
 - The vehicle is moving in a forward direction.
 - Winds are less than 8 m.p.h.
 - Insects are exposed to spray (evening or early morning is the best time for most species).
5. Operate the sprayer only when the safety guard is in place. If the sleeve assembly becomes damaged and flies apart while the safety guard is not in place, serious physical injury could result. Always wear safety glasses as well as ear protection when working near a running sprayer.
6. Using the Special Spanner puller tool, remove Hub and Sleeve Assembly from Spray Head Assembly before storing sprayer for extended periods of time. Failure to follow this instruction may result in sprayer damage. Clean Hub and Sleeve Assembly and store in a sealed bag or container.
7. The spray head motor is a precision high speed device. **Pay special attention to avoid any forceful impacts or stress on the spray head motor shaft.** Use a small amount of common automotive type of anti-seize grease on the threads of the motor shaft, hub and retaining ring. Always use the Spanner Puller Tool as described in the sleeve removal and replacement section.
8. Maintaining the Disposable Sleeve is a key part of insuring proper machine performance as well as extending spray head motor life. Sleeve life can vary dramatically depending on type of formulation and dispensing rate. Always monitor the condition of the sleeve. The Maintenance Alert is a programmable countdown timer that can assist in managing this required maintenance interval. See the Maintenance Alert Count Down timer section for details on this feature.

To Our Pro-Mist Dura Customers:

The Pro-Mist Dura ULV Sprayer is an extremely durable, yet lightweight, all-electric Ultra-Low Volume aerosol space sprayer that can provide wide-area outdoor adult mosquito and fly control when properly mounted on a moving vehicle and used with the correct insecticide. It produces a nearly invisible mist that is formed from billions of individual droplets. The mist moves with natural air currents to provide excellent ULV space spraying success. Frequently, excellent flying insect control can be accomplished with an application rate of just 1/2" ounce of liquid per acre. The Pro-Mist Dura creates precise droplets by introducing liquid into a porous sleeve that is rotated at high speed by an electric brushless motor. The resulting aerosol is dispersed using an efficient axial fan.

Electric power can be advantageous over gasoline engine power for aerial production and dispersal, especially when the rising cost of fuel is considered. Installation and removal of the Pro-Mist Dura from the vehicle on which it is carried requires minimum of effort because it has no heavy engine or compressor. In addition to its light weight, the Pro-Mist Dura ULV Sprayer features low energy requirements and low noise during operation. It has the ability to operate continuously for 5- 6 hours on one charged high-quality 12 volt deep-cycle marine battery. When it's connected to a vehicle with a sufficient charging system the Promist Dura can operate continuously. A vehicle installation kit is available for proper installation.

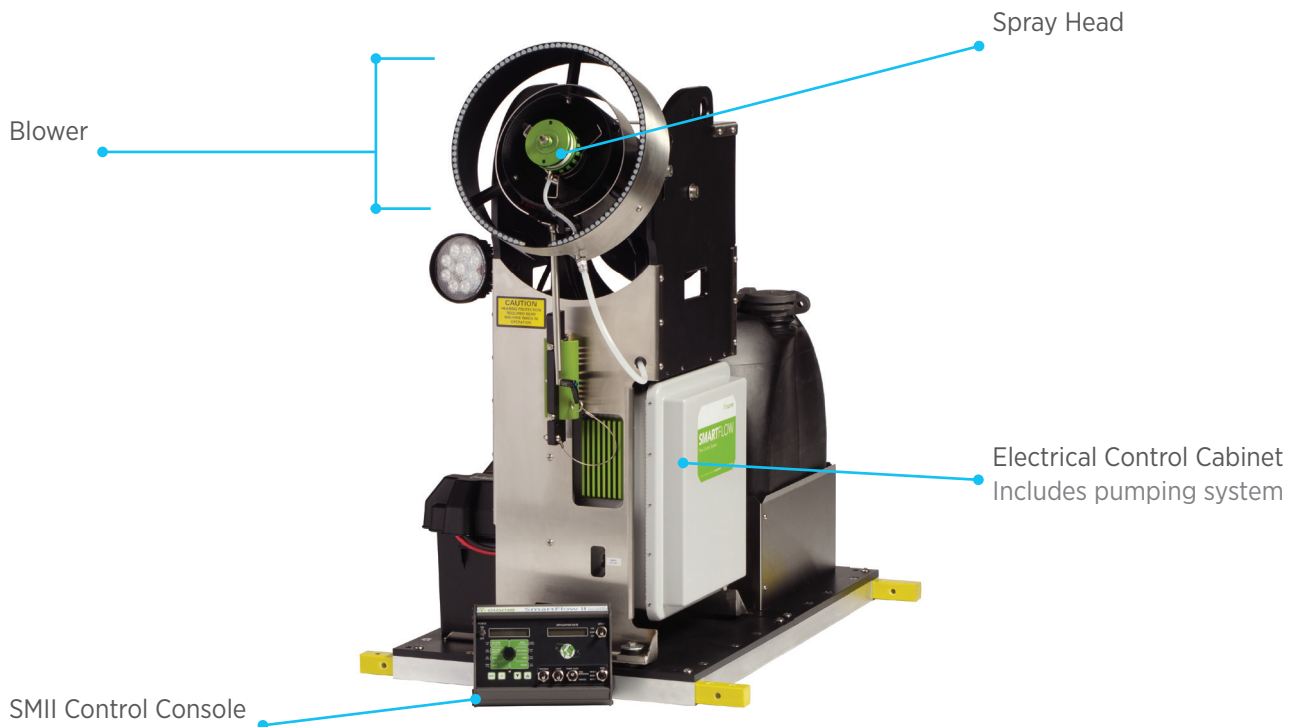
The SmartFlow II console mounted near the operator provides control for nearly all sprayer functions.

INSTALLATION

PRO-MIST DURA® ULV

Description

The Pro-Mist Dura ULV Sprayer consists of four systems: the Spray Head (atomizing unit), the Blower, the Pumping system, and the SmartFlow II Control System, (SMII). The spray head produces a controlled droplet spectrum from liquid introduced inside the rapidly rotating porous sleeve. Centrifugal force drives the liquid through the pores to the outside surface of the sleeve where droplets are formed. Though ULV space spraying for mosquito and fly control is performed from a moving vehicle and depends on proper utilization of natural air currents, a blower is provided to assist the movement of spray mist away from the vehicle on which the sprayer is mounted. The proportional flow pump delivers the insecticide to the spray head. The SMII Control system allows the operator to control systems and insures that they work together properly. The SMII Console is mounted close to the vehicle operator.



PRO-MIST DURA

INSTALLATION

PRO-MIST DURA® ULV

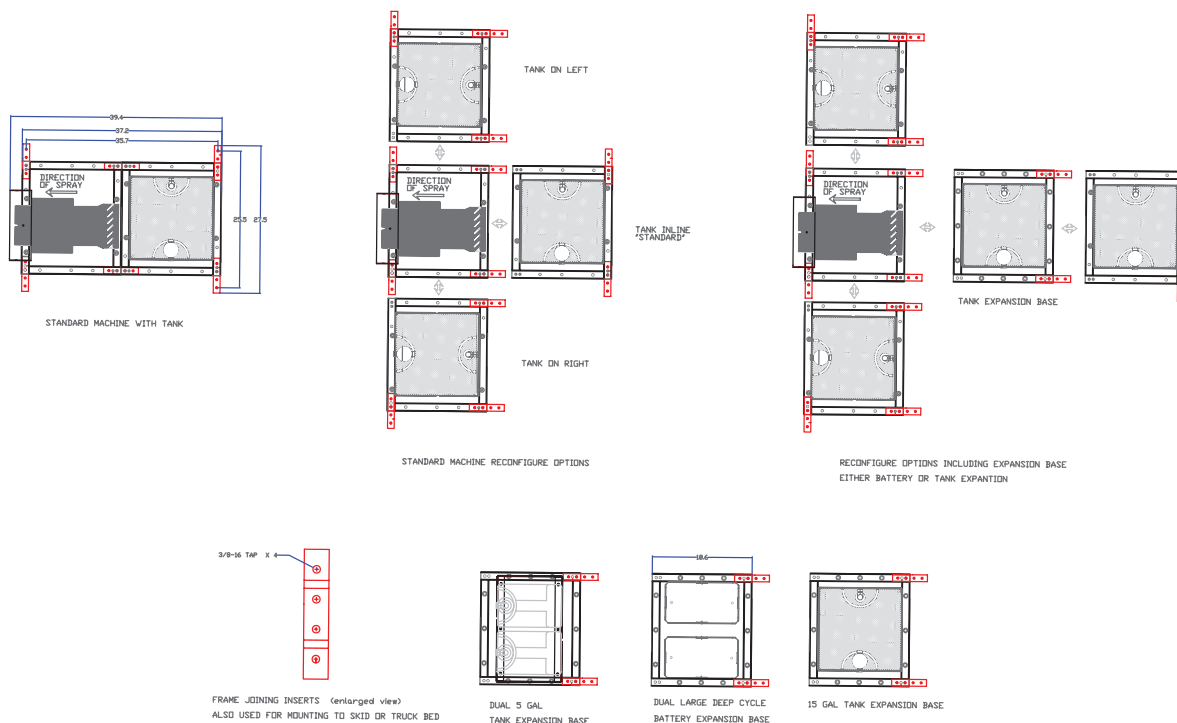
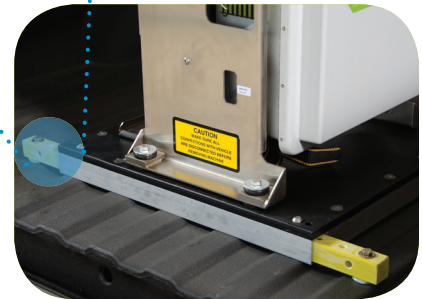
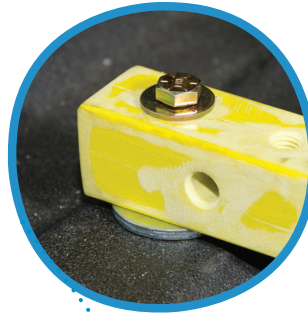
Pro-Mist Dura Configuration Options

The Pro-Mist Dura has been designed as a modular system and can be easily configured to meet your preference. Flexibility is made simple by connector shafts that let you mix and match separate pads housing the spray head, formulation tank/s and battery.

Connector shafts let you easily join together or take apart pads in 4 inch increments. Configure in a single row running the length of the truck, horizontal across the back or in and L-shape.

Blower stand base can be separated from the tank base and can be reconfigured to change overall footprint.

Bases can be configured to include an expansion battery base, dual 5 gallon tank or an additional 15 gallon tank base.



INSTALLATION

PRO-MIST DURA® ULV

Uncrate and Remove from Skid

CAUTION: NO IMPACT TO SPRAY HEAD



INSTALLATION

PRO-MIST DURA® ULV

Mount to Vehicle

The Pro-Mist Dura ULV Sprayer can be conveniently mounted on a variety of trucks and utility vehicles. To easily move and lift the machine we recommend either placing a 2x4 through the handles on the black blower housing column or a strap or small pipe through the holes on top of this same column.

IN GENERAL, IT SHOULD BE MOUNTED AS FAR AS POSSIBLE TO THE REAR OF THE VEHICLE.

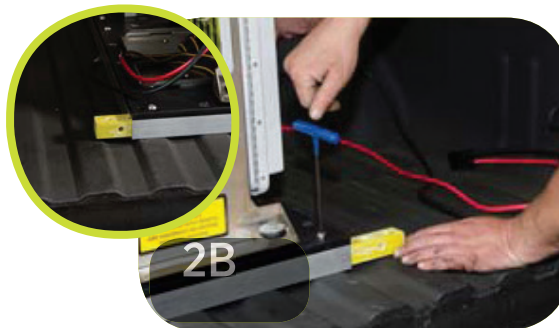
For instance, on a pick-up truck, the sprayer should be mounted within a few inches of the tailgate. By doing this, the outlet of the blower will be positioned above and slightly behind the tailgate.

This is important because many moving vehicles create a vacuum behind them. The downdraft may pull the mist toward the ground if the discharge is too low or too far forward. The elevated position of the spray head on the Pro-Mist Dura prevents this from happening on most trucks even when the sprayer is mounted down in the truck bed. Smooth dispersal of spray may be further enhanced by removing the tailgate on vehicles so equipped.



Normally, the sprayer is positioned with the blower outlet aimed 45 ° up and to the rear of the vehicle. Certain ULV insecticide labels require this orientation. For flying insect control, regardless of the insecticide, little or no advantage will be gained by aiming the blower to one side or the other.

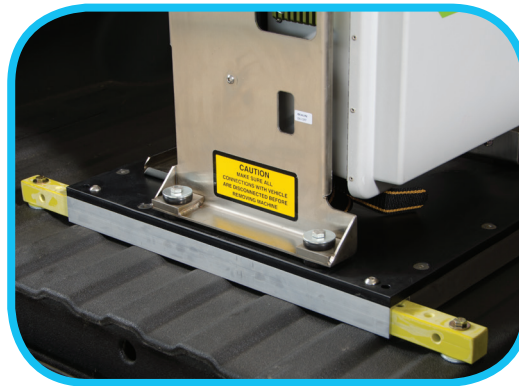
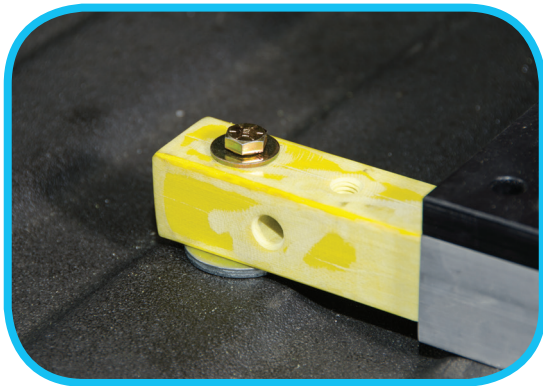
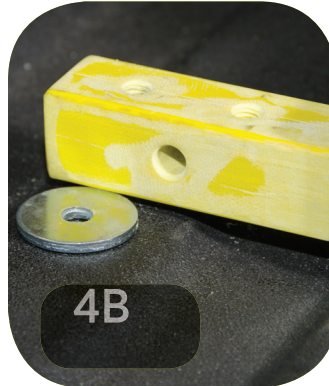
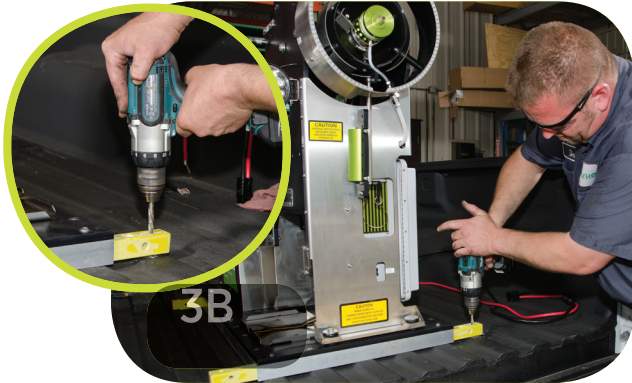
The Pro-Mist Dura sprayer may be subjected to great stress on vehicles that are driven on rough road surfaces. Secure the sprayer with nuts, bolts and lock washers at all four corners. **Lag screws are not adequate fasteners. We recomend using 5/16 bolts with a flat washer. An option is to use pretreated wood beams (4 x 4) and bolt to bed of vehicle.** The Pro-Mist Dura warranty is voided if the unit is damaged due to improper mounting.



INSTALLATION

PRO-MIST DURA® ULV

Mount to Vehicle (Cont.)

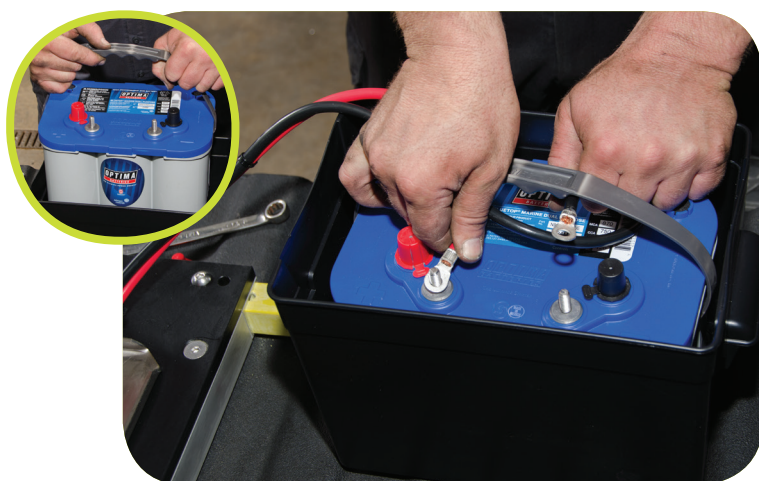


INSTALLATION

PRO-MIST DURA® ULV

Supplying Power

The Pro-Mist Dura ULV Sprayer can be powered for a few hours running solely on its own fully charged 12 Volt Deep Cycle Battery, (deep cycle marine battery) mounted on the Blower Stand Base. However it is strongly recommended that if possible the unit be connected to your vehicle's high-quality 12 Volt Charging System. Either way, a deep cycle marine battery must be mounted on the Pro-Mist Dura Blower stand base.



A Clarke Install Kit is available for easy installation to your vehicle's battery. This kit includes cables, vehicle circuit breaker, terminals, and screw lugs.

Install Kit must be ordered separately.
Order Part No. 333815.



INSTALLATION

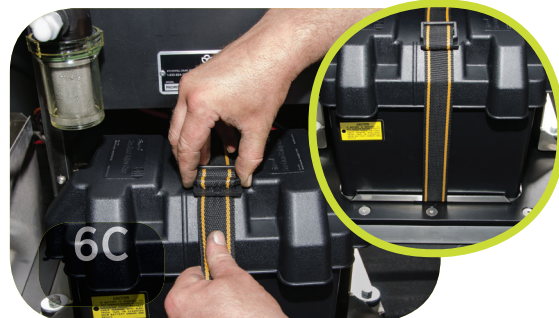
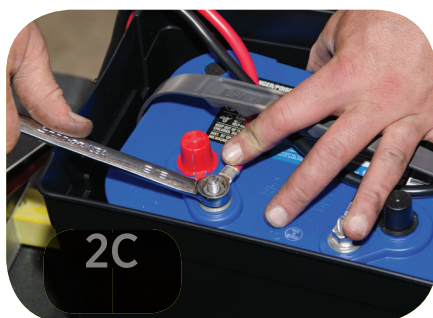
PRO-MIST DURA® ULV

Mounting a Battery on the Pro-Mist Dura for Self-Contained Operation

You can expect a couple hours of operation from one fully charged medium sized (size 24M)12 volt Deep Cycle battery. An expansion battery base option is available to expand and increase the machines on board battery capacity. Using the sprayer with its own battery allows the sprayer to be quickly mounted on any vehicle, even vehicles without an electrical system. We strongly recommend the use of a deep-cycle, hi-capacity, high quality RV/Marine battery. This type of battery will best handle the stress of repeated charging and discharging. As the available current diminishes, the speed of the spray head will need to be adjusted back up to your desired rpm. Eventually the battery will no longer have the required power to maintain high speed rotation. The machine will then shut down the spray head.

The Battery Box located on the Blower Stand Base is designed to hold up to a size “24M” marine battery. A short power cord with plug is provided to connect this onboard battery to the blower stand power plug. Be careful to observe proper polarity. The Red lead is connected to the positive (+) battery terminal, and the black lead is connected to the negative (-) battery terminal, Observe the Polarity markings on the plugs housing.

CAUTION: DO NOT CONNECT UNTIL FINAL STEP OF ELECTRICAL INSTALLATION.



INSTALLATION

PRO-MIST DURA® ULV

Connecting the Pro-Mist Dura to Your Vehicle's Electrical System

STEP-BY-STEP IMAGES ON PAGES 12 - 16.

For continuous operation, we recommend that the Pro-Mist Dura be connected directly to the vehicle's battery/charging system. An electrical Installation kit is available from Clarke for this configuration. This kit contains vehicle circuit breaker, terminals, and screw lug.

The sprayer requires a rate of charge of 30 amps at 13 vdc (measured at the sprayer's battery) in order to keep that battery well charged during continuous spraying. A high output automotive alternator (60 amps or more) usually provides enough current to allow continuous operation of the sprayer without additional charging of the battery after spraying has been completed.

Regardless of how you power your Pro-Mist Dura, the SMII Console can be mounted in any convenient location within easy reach of the operator. Take care not to obstruct the driver's view forward or view of vehicles instruments. The control cable plugs into the back of the SMII Console at one end and into the Pump box at the other end. Now you may turn on the Vehicle Breaker.

NOTE: Vehicle Installation Cables and Breakers MUST meet Clarke Engineering Systems Vehicle Installation Specifications or Pro-Mist Warranty will be voided.

The following instructions apply to vehicle installation:

IMPORTANT: If the vehicle breaker, is not used, or it not installed as instructed, then all warranties will be voided.

Parts Required to complete Vehicle Installation

- Vehicle Installation Kit P/N 333815 (or comparable)
- Deep Cycle Marine 12 Volt Battery

Tools Required to Complete Vehicle Installation

- Screw Driver
- Wrench Set up to 5/8"
- Crimping Tool for Insulated Ring Lugs wire size AWG8.
- Electric Hand Drill and power source.
- A 3/16 inch Drill Bit (for mounting breaker bracket).
- A 2" Hole Saw that fits your Hand Drill.
- A Sharp Knife.

Where to Install The Power Cable on the Vehicle

You may choose to run the power Cable out through a hole in the front panel of the truck bed, in thru the rear panel of the cab, under the seat, out thru the fire wall into the engine compartment, and over to the vehicle battery.

Or you may choose to run the Power Cable out through a hole in the front panel of the truck bed, down under the cab, up into the engine compartment, and then over to the vehicle battery. With the first choice you could also bring the Pro-Mist Operator Control Unit cable into the cab thru the same holes as the power cable providing the hole is large enough to accept both cables, which would be a 2-inch hole.

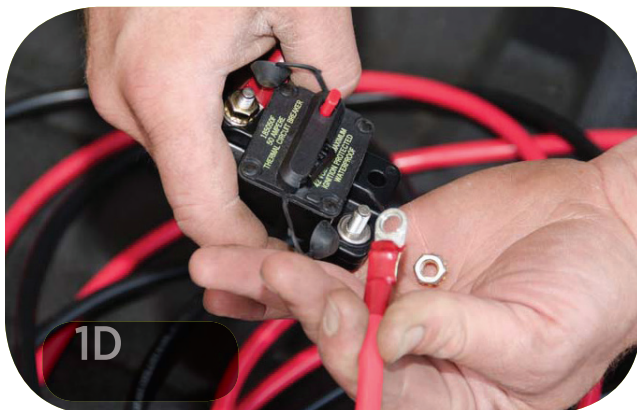
INSTALLATION

PRO-MIST DURA® ULV

Connecting the Pro-Mist Dura to Your Vehicle's Electrical System (Cont.)

Steps below depict connecting the ProMist Dura to Vehicle's electrical system, using the Clarke Electrical Installation Kit.

Basically, this consists of hooking the vehicle's charging system to a power cable that will plug into the spray machine, as well as an on-board battery that will also plug into the machine and act as a buffer.



1D
Disconnect the long red lead from the 50 Amp breaker.



2D
Mount the 50 amp breaker very close to the positive battery terminal. (Connection to the breaker is shown in Step 1D.)



3D



4D

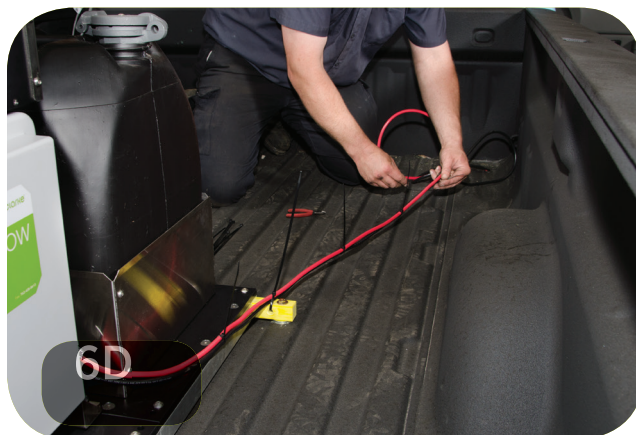
INSTALLATION

PRO-MIST DURA® ULV

Connecting the Pro-Mist Dura to Your Vehicle's Electrical System (Cont.)



5D Taking the long cable sections (now free from the breaker) connect the plug end to the vehicle 12 volt input on the back of the machine.



6D Run both the black and red lead towards the front of the truck in the direction of the vehicle's battery and the mounted 50 amp breaker.



7D Drill a hole in the bed of the truck or find alternate path to run the cables the vehicle battery. Use a heavy-duty rubber grommet around hole to protect cable.

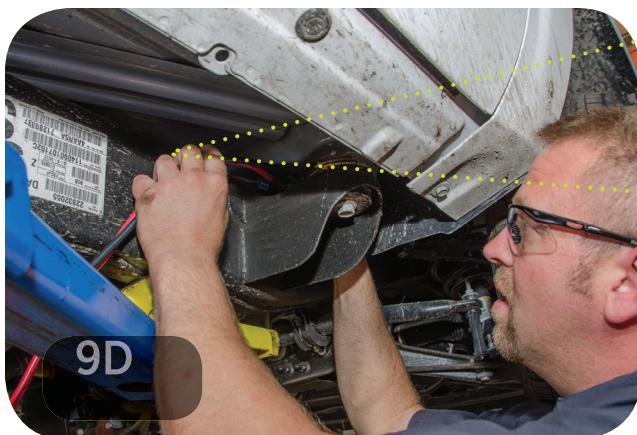


8D Feed the cables through the hole.

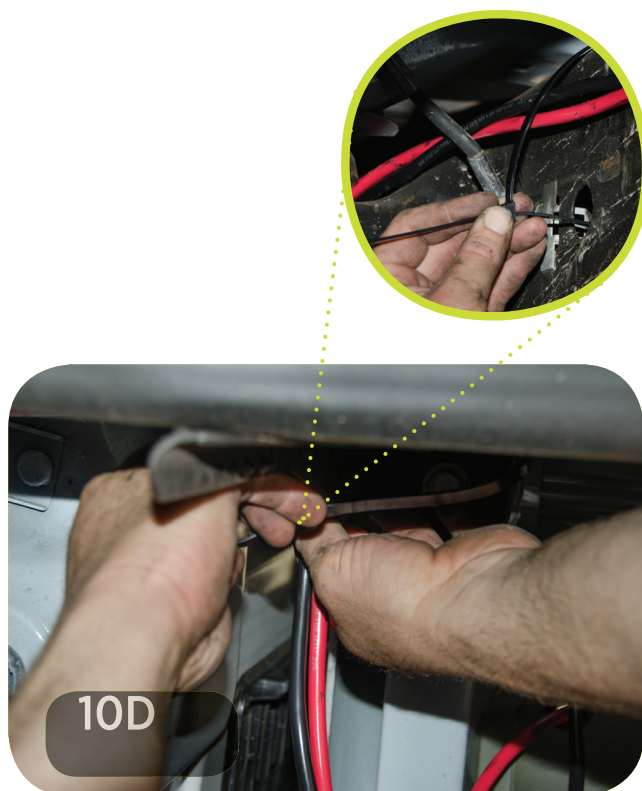
INSTALLATION

PRO-MIST DURA® ULV

Connecting the Pro-Mist Dura to Your Vehicle's Electrical System (Cont.)



From the underside of the truck pull the cables through continuing towards the vehicles battery and 50 amp breaker.

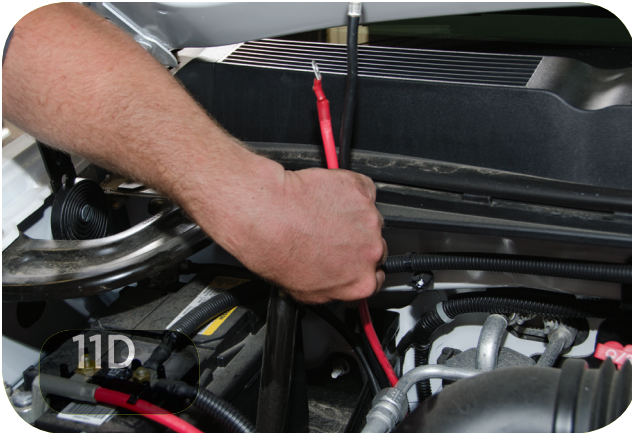


Secure cables using cable ties and protect from sharp edges and hot surfaces.

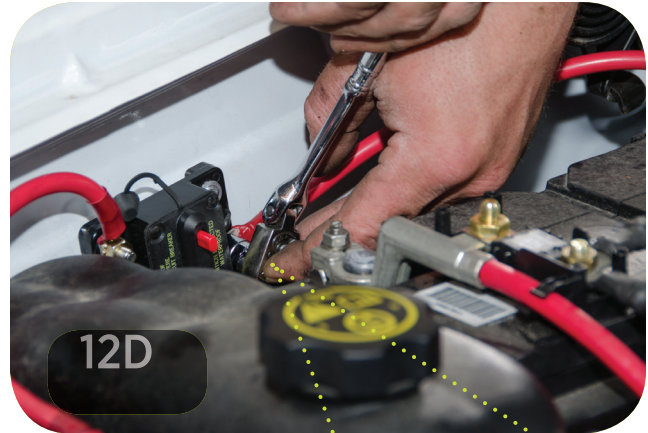
INSTALLATION

PRO-MIST DURA® ULV

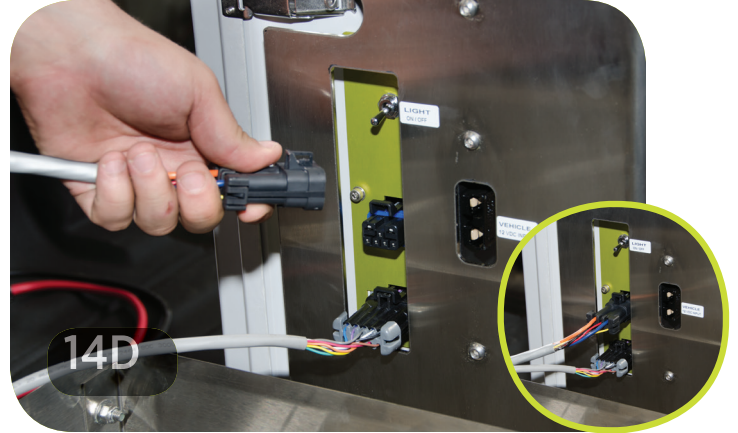
Connecting the Pro-Mist Dura to Your Vehicle's Electrical System (Cont.)



Pulling the cables into the engine compartment to the mounted breaker secure the ring terminal of the red cable to the breaker. The black cable will connect to the negative battery terminal in a future step of this instruction.



Connect the 10 pin control cable to the back of the machine.



Connect the 7 pin control cable to the back of the machine. These will be routed into the cab of the truck to hook up to the SmartFlow II control console. (These cables can be routed similar as the power cables by drilling into the cab and protecting the cables from sharp surfaces. Other methods include routing through the door or back window.)

INSTALLATION

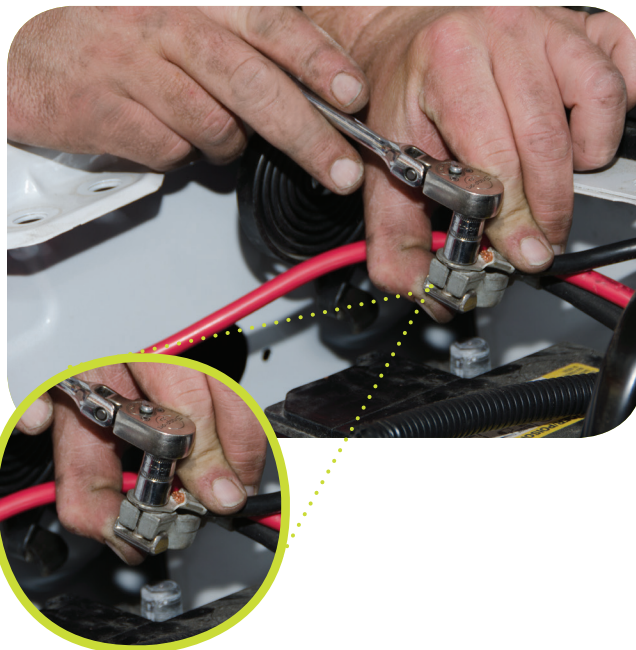
PRO-MIST DURA® ULV

Connecting the Pro-Mist Dura to Your Vehicle's Electrical System (Cont.)

With these cables connected to the rear of the SMII control console determine the best mounting location within the cab. The included SMII mounting bracket can be used to secure the console within the cab. It is recommended to secure the console for safety purposes.



Connect the power leads to the vehicle battery terminals.



Connect machine's onboard battery to the Promist's power plug.

Verify all electrical connections are clean and secure. Reset breaker to allow vehicle charging system to deliver power to the machine's onboard battery.

OPERATION

PRO-MIST DURA® ULV

Before operating the sprayer:

1. Check that: all electrical cables and connections are secure and clean. Be sure the battery is in good condition and the vehicle's alternator charges at a dc voltage, less than 15V (if you are going to connect the sprayer to the vehicle's electrical system). This specification is standard for most vehicles.
2. Check the insecticide delivery system to insure that all tubing is securely connected, the filter is tight and the quick-connect fittings are latched.
3. Add insecticide to the tank. Avoid running the pump for extended periods without fluid in the lines.
4. After all connections are complete, reset the breaker to supply power to the sprayer.

Operation

No spraying should be performed until the pump has been calibrated to deliver the proper rate of insecticide to the spray head. Directions for calibration are given in the following section. Read this section on Operation then proceed to the SmartFlow II Control: Installation, Operation and Maintenance section.

The SMII Console is used to control the operation of the sprayer from a location such as the vehicle cab or the handlebar of an ATV. To power up the machine, first verify "Spray head" and "Spray" switches on the console are switched off. Then you must turn on the main On/Off Circuit Breaker switch located on the lower half of the Blower stand, under the aluminum heat sink. When powering off the machine from the console off switch, this Breaker switch on the machine will also switch to the off position automatically.

The pump will operate only if the spray head is operating at a speed (rpm) that is above 23,000 rpm and below 30,000 rpm or the machine is in Calibration Mode. (See Calibration section for details on Calibrating the dispensing rate.)



Stopping the pump is a built-in safety feature to prevent spillage of insecticide. If at any time during operation the spray head does not rotate fast enough to properly spray, the controller will automatically prevent the pump from operating. In an over speed situation the spray head motor will shut down automatically at speeds above 30,000 rpm. This is done to protect the motor. The main power must be cycled (turned off, then on) to reset this fault. Lower the rpm set point by turning down the rpm adjust dial. Do this before restarting the machine in order to avoid another immediate over speed fault. Then adjust speed to desired level after the motor warms up for several minutes (typically between 25-28k rpm).

As with any ULV space spraying device that is mounted on a vehicle, spraying should be done only when the vehicle is moving forward. Begin spraying only when vehicle has reached the forward speed for which you have calibrated the pump, and stop spraying before stopping the vehicle.

CAUTION: Do not spray when the vehicle is not moving, or when backing up because this may result in insecticide falling on the vehicle or its operator, as well as overdosing the immediate area with insecticide.

NOTE: Some insecticides are corrosive to metals or attack plastics; others become gummy or form preipitates if left in the insecticide lines, pump and sleeve. The porous sleeve on the Pro-Mist Dura ULV Sprayer will become clogged, if gummy or solid residues are present.

Therefore, it is important that you thoroughly flush the insecticide delivery system when you will not be using your sprayer on a daily basis. This will minimize problems caused by residues of insecticides or oils. Vegetable oils are especially troublesome because they form a varnish-like gum in a few days. So be especially careful to remove all traces of these when flushing.

Flushing Procedures

1. Disconnect the inlet line from the tank pick-up tube fitting and twist off the pick-up tube.
2. Take the tank pick-up tube and place it in any container suitable for your flushing solution.
3. Snap the quick connect inlet line back to the pick-up tube and flush by:
 - a. Running the machine in **Cal Mode**, (this runs the pump without the spray head running, flushing back into a container). (See SmartFlow II section for more details.) This procedure in **Cal Mode** is convenient because there is no need to ramp up the spray head and you don't need to be outdoors. **Seperate care may be needed to change or flush the sleeve. It is recommended to spin dry the sleeve if flushed.**

- b. Or, flush through the sleeve by running the machine outdoors at normal speed. Keep in mind that for some initial period during flushing, the pure insecticide remaining in the line (between the pump and the spray head) will be dispensed from the sprayer. Therefore, during flushing the spray vehicle should be moving forward just as it would during a spraying operation.

4. **Always make sure that the Hub with sleeve is secured before running the spray head to avoid over-heating.**
5. If you are not using the machine for long periods of time, flushing is recommended to keep lines and the sleeves clean. **Quick way to purge and spin the sleeve dry:**
 - a. Hook up the tank line to park/purge fitting and spray until lines are pumped dry and the sleeve is spun dry. (This purging process helps in providing consistent droplets and a balanced sleeve.)

NOTE: Use **ONLY** Clarke Pro-Flush.

Step-by-step fluid plumbing path on page 34.

SPRAYER MAINTENANCE

PRO-MIST DURA® ULV

Sleeve Removal and Replacement

The efficiency of the sprayer is largely a function of the cleanliness of the Hub and Sleeve assembly. It is ALWAYS a better choice to replace a sleeve that is suspected of being clogged rather than cleaning it.

Though it may be possible to get some additional life out of a sleeve by gently and carefully cleaning it, it is not recommended. If any imbalance, defects or damage is identified the sleeve must be discarded and must not be used.

Using a sleeve that is in poor condition increases the risk of the sleeve coming apart at high speed causing unnecessary risks and damage.

Removal and Reinstallation of the Hub and Sleeve Assembly

Removal from Spray Head

It is critical that the Hub and Sleeve assembly is removed from the spray head motor prior to attempting a sleeve change.

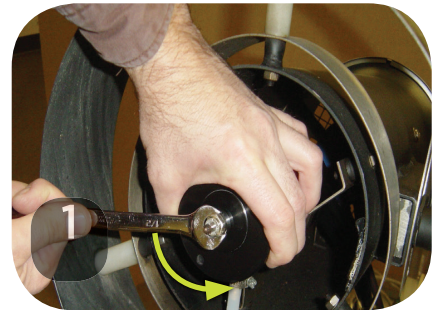
The specially designed Spanner Puller tool is necessary to accomplish a Sleeve change without damaging the precision components within the high speed motor.

NOTE: To avoid damaging the motor, DO NOT attempt to remove the sleeve while the hub is on the motor. Always remove the Hub to replace the sleeve.

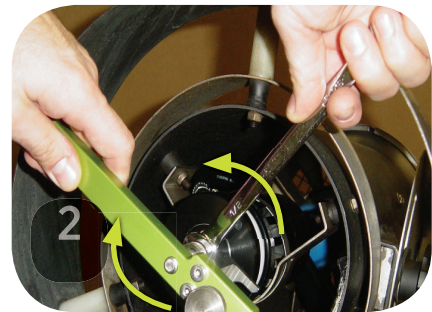
Follow the specific steps described to remove, change and replace this critical part of the machine.

The following tools are needed:

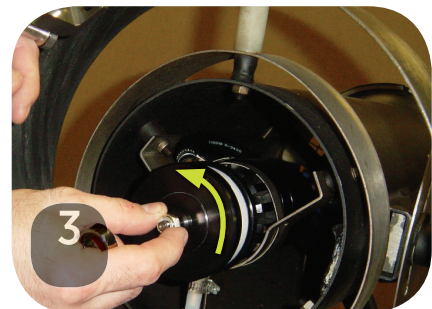
- Green “Spanner/Puller” Tool (included with Pro-Mist Dura)
- ½” Wrench



Using 1/2” Wrench loosen nut carefully and remove from Shaft.



If needed the hex socket feature on the Spanner Puller tool can hold the shaft steady while using the wrench to loosen the nut. Be careful not to damage the threads of the Shaft.



Loosen and remove the nut with fingers.

SPRAYER MAINTENANCE

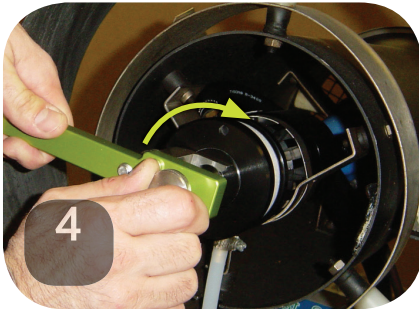
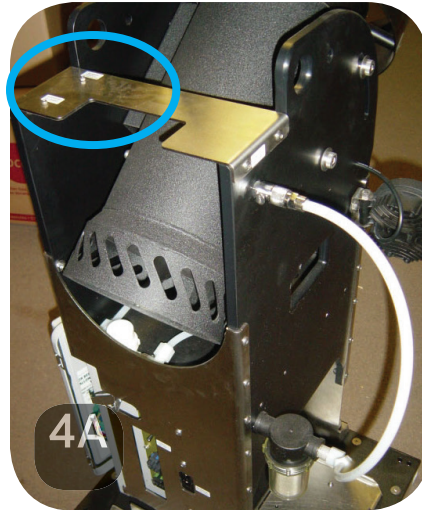
PRO-MIST DURA® ULV

Sleeve Removal and Replacement (Cont.)

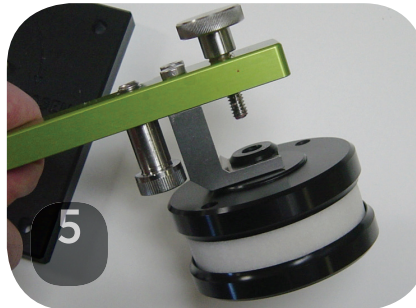
NOTE: The base plate (as shown in picture 6)
can be purchased seperately: Part #332742

OR

Hub can be secured to the blower Stand.
Affix two small screw heads where indicated
in picture 4A.



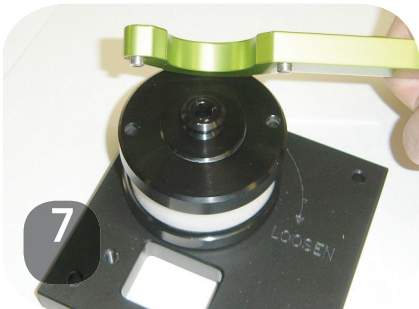
Position the Spanner Puller tool
over the flange of the Hub and
turn the thumb screw on the tool
to pop the Hub free from the
Shaft. If very stuck grab thumb
screw with pliers.



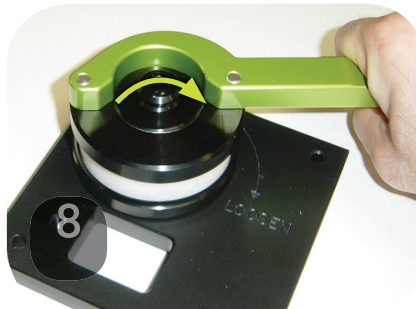
Carefully remove the Hub from the
Shaft. Be careful not to drop
or damage the Hub. It is critical
it remains balanced and round.
NEVER run a damaged or out
of balanced Hub.



Secure the Spanner Base plate
to the work bench, truck bed,
or machine base. Locate the
sockets on the bottom brim of the
Hub onto the posts of the base
plate. This will hold the Hub from
spinning when loosening the
retaining ring.



Locate the posts of the Spanner
Puller tool into the sockets
of the Retaining ring.



The retaining Ring is secured
to the Hub with a Left Handed
Thread. It is important to
remember to crank **CLOCKWISE**
to loosen.

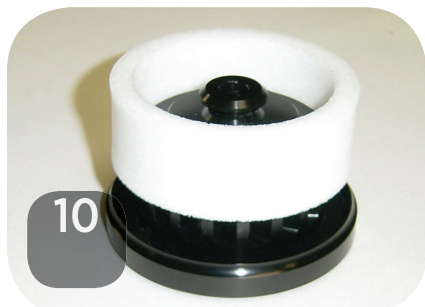


Remove the Used Sleeve, it should
slide off easily.

SPRAYER MAINTENANCE

PRO-MIST DURA® ULV

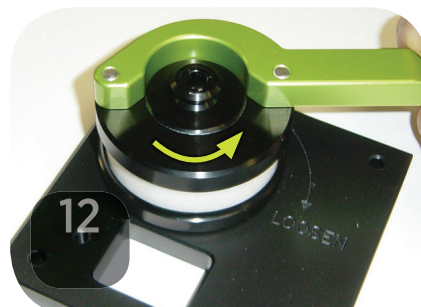
Sleeve Removal and Replacement (Cont.)



The new Sleeve fits tightly onto the Hub; be sure to position the sleeve so it can be pressed straight onto the Hub.



Using Both hands, press firmly straight onto the Hub; be sure it is pressed below the top surface of the Hub.



Carefully secure the Retaining Ring to the Hub, start the threads by hand and finish tightening by using the Spanner Puller Tool. Remember to tighten with Counter Clockwise rotation.

Cleaning

Clean the external parts of a spraying machine after every spraying session. Certain insecticides used in fly control are corrosive to metals, may attack plastics, or both. For example, Malathion quickly softens many plastics. Vegetable oils, which are used to dilute some insecticides, will become gummy and cause plastics to soften or swell. Therefore, many problems can be prevented by proper cleaning and care of the spray unit. This includes proper flushing of the system, including the sleeve assembly.

By the end of a spray season, there will have been a certain amount of UV (sunlight) degradation of insecticide lines and a residual chemical build-up inside the fittings. An especially thorough cleaning should be performed prior to extended storage such as may occur over the winter. Empty and clean the insecticide tank. Then pump 12-15 oz./min. (360-450 ml./min.) of Pro-Flush solvent from that tank and through the system for a minute or two.

Pro-Flush will flush insecticides, oils and moisture. After flushing, operate the sleeve assembly at spraying speed for several minutes. Finish by allowing the sleeve to spin after moving the inlet line to the “Park and Purge” fitting located on the upper half of the battery side of the machine; this will allow the lines to empty and the sleeve to spin dry.

Pro-Flush will protect the system for extended periods and will leave a bit of lubricant in the pump and valve so that they won't seize during storage.

For protection during very long or severe conditions remove the insecticide line from the spray head, then pump one cup of light petroleum oil, such as Bio-Blend 8, through the system until the insecticide pump is filled.

In short, **fill the insecticide system, but not the sprayhead, with oil.** The oil will prevent valve and pump parts from drying out and seizing. Displace any water that may be present and keep the tubing soft.

The Sprayhead

The Pro-Mist Dura's spray head uses a porous sleeve assembly, driven at 23-30,000 RPM, to produce droplets from insecticide that has been introduced to the inside of the assembly. The high speed of rotation and the porosity of the sleeve are important for proper mist production. Actual droplet sizes produced also depend upon the characteristics of the insecticide, the flow rate, temperature, viscosity and weather conditions. The spray head will produce spray droplets which meet label specifications for all currently available product formulations commonly used for mosquito and fly control dispensed at typical flow rates.

The spray head uses a 24 volt brushless electric motor. The spray head Hub and Sleeve assembly is mounted directly on the one piece motor shaft which rides on high-speed, precision ball bearings.

A properly used spray head with a porous sleeve assembly is capable of handling liquid flow of up to approximately 18 oz./min. (532.26 ml./min.), depending upon the flow and atomization characteristics of the liquid being sprayed.

The Clarke porous sleeve acts much like a filter. Therefore it should be used only with liquids that contain no suspended solids, regardless of how small the particles are. Solid particles which are suspended in the spray material will be filtered out by the sleeve and will eventually clog it. Don't use chemicals which have been in storage for long periods, particularly in partially filled containers, because they may contain solid impurities such as precipitates or breakdown products. If you must spray these materials, filter them first through a "cone shaped" paint filter, doubled up (one inside the other), available through local automotive suppliers. Even with filtering, the spraying of such materials will greatly shorten the working life of the disposable porous sleeve.

A high quality in-line insecticide filter is provided on the Pro-Mist Dura and is required to insure maximum sleeve life. Do not substitute paper filters for the Clarke filter. The substitute may disintegrate and clog the system.



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Tool List for Sprayer Maintenance

Screwdrivers

- Phillips head
- Regular/Flat blade

Ratchet

- 3/8" Drive Ratchet with 1/2" Deep Socket
- 1/4" Drive Ratchet with 5/16" Regular Socket
- 1/4" Drive Ratchet with 3/8" Deep Socket

Wrench

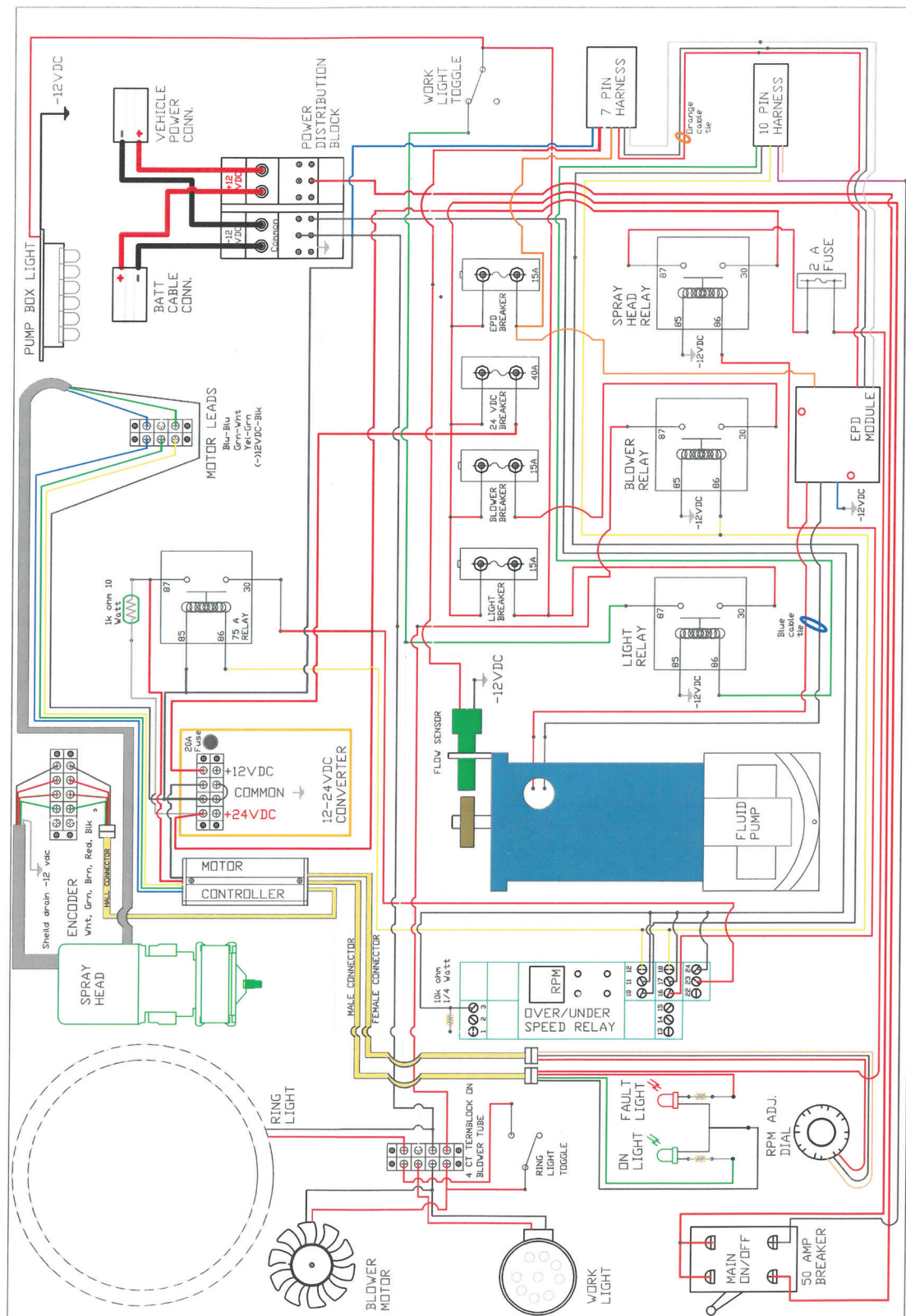
- 6" Adjustable
- 5/16" Socket Adjustable
- Standard Hex Key or Allen wrench

Miscellaneous

- Spanner Puller Tool (included)
- Scissors or Knife

NOTE: Removal of major components from the ProMist Dura ULV sprayer is simple and intuitive. Electrical schematic and wiring components are shown on pages 53 & 54. Refer to the troubleshooting section to isolate a malfunctioning component. All assemblies can be replaced as well as a selection of spare parts. Call Clarke technical service, 800-859-2847 for guidance.

Electrical Schematic



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Wiring Connections

MOTOR CONTROLLER CONNECTIONS

FEMALE CONNECTOR

Wire #4	RED — from rpm adj. dial
Wire #20	BLACK — from rpm adj. dial
Wire #3	TAN — from rpm adf. dial

MALE CONNECTOR

Wire #6	BLACK — from LEDs
Wire #7	RED — from 2A fuse
Wire #11	GREEN — from Green LED
Wire #12	RED — from Red LED

HALL CONNECTOR

Wire #5	RED — from Encoder
Wire #16	WHITE — from Encoder
Wire #17	BROWN — from Encoder
Wire #18	GREEN — from Encoder
Wire #19	BLACK — from Encoder
-12 VDC Common	SHIELD — from Encoder

MOTOR CONNECTION

Wire BLUE	BLUE — from motor
Wire GREEN	WHITE — from motor
Wire YELLOW	GREEN — from motor

CONNECTION PANEL CONNECTIONS

SmartFlow II — 7 PIN HARNESS

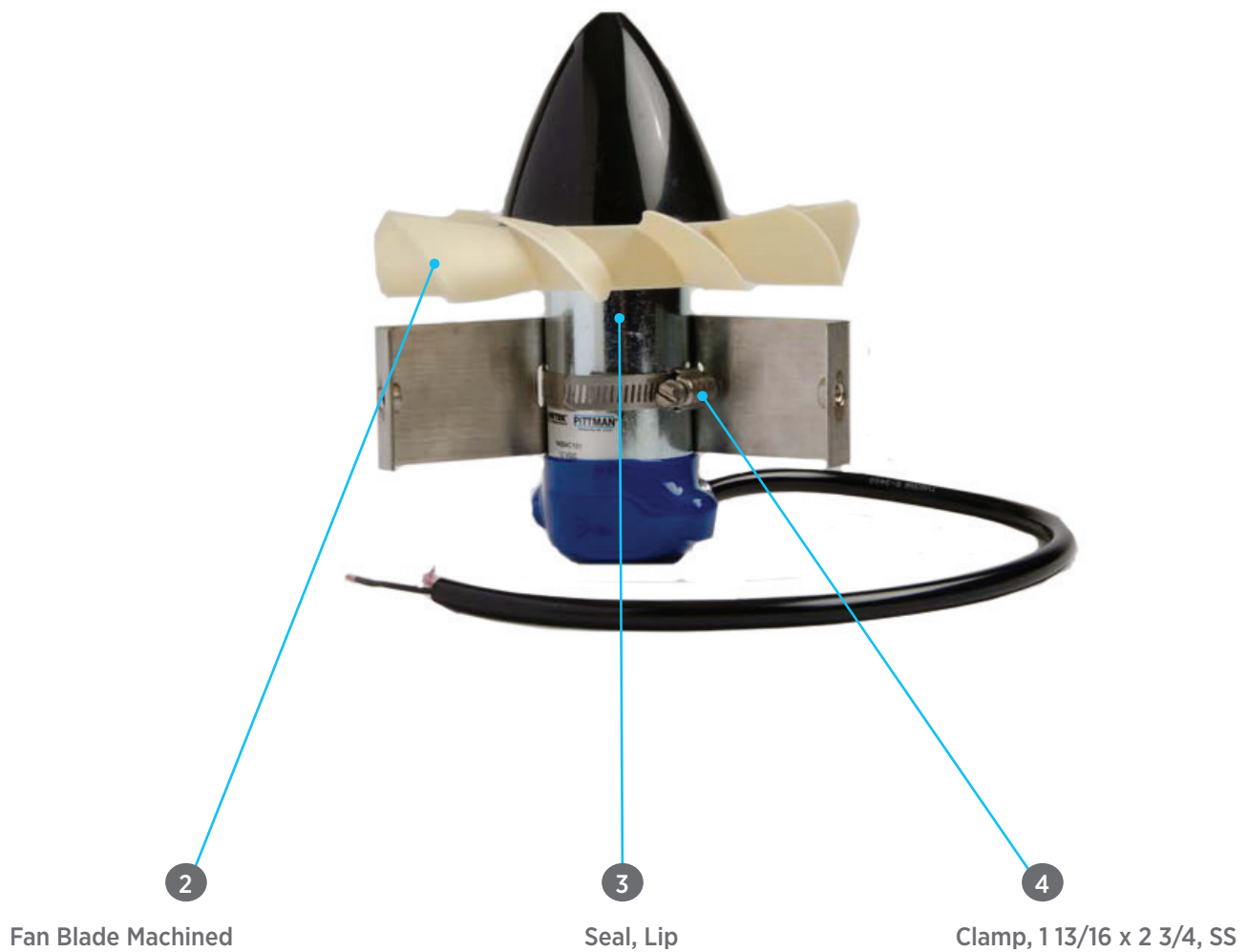
BLUE wire	-12VDC common
ORANGE wire	EPD Breaker (downstream)
RED wire w/(orange cable tie)	Red wire from EPD w/(orange cable tie)
BLACK wire w/(orange cable tie)	Black wire from EPD w/(orange cable tie)
GRAY wire	GRAY wire from EPD
WHITE wire	WHITE wire from Speed Sensor

SMARTFLOW II — 10 PIN HARNESS

BLACK wire	RP ok signal, PIN 10 on over under relay)
PURPLE wire	50 amp breaker trip line (Black wire)
BROWN wire	Not used
YELLOW Wire	Blower Relay coil

Blower Motor Assembly

1 Motor Blower Assembly Complete with Mount



Blower Motor Assembly — Part Numbers

POS	QTY	DESCRIPTION	PART NO.
1	1	Blower Motor Assembly (complete with mount)	328444
2	1	Fan Blade, Machined	328428
3	1	Seal, Lip	328460
4	1	Clamp, 1 13/16 x 2 3/4, SS	329377

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

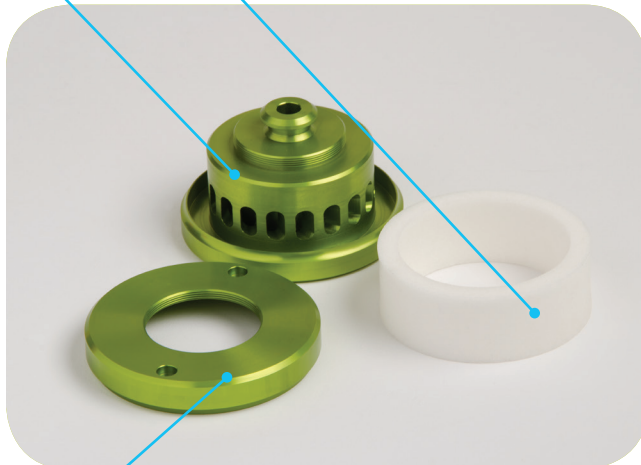
Spray Head Assembly

1 Spray Head Assembly Complete



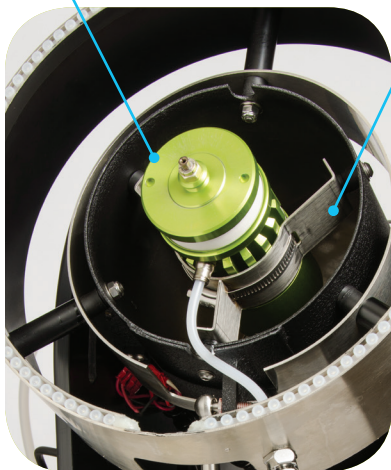
2 Hub

3 Disposable Porous Sleeve, Single



5 Nut, Flex top, 5/16-24, Thread Chased

4 Retaining Ring



6 Clamp,
2.31 x 3.25 SS
(Spray Head
Mount)

7 Disposable Porous Sleeve, 2 Pack (single shown)



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Spray Head Assembly — Part Numbers

POS	QTY	DESCRIPTION	PART NO.
1	1	Spray Head Assembly (complete)	328832
2	1	Hub	329765
3	1	Disposable Porous Sleeve, Single	331736
4	1	Retaining Ring	329773
5	1	Nut, Flex top, 5/16-24, Thread Chased	332320
6	1	Clamp, 2.31 x 3.25 SS (Spray Head Mount Clamp)	328543
7	1	Disposable Porous Sleeve, 2 Pack	331736

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Formulation Tank Assembly

1 15 Gal. Formulation Tank Assy



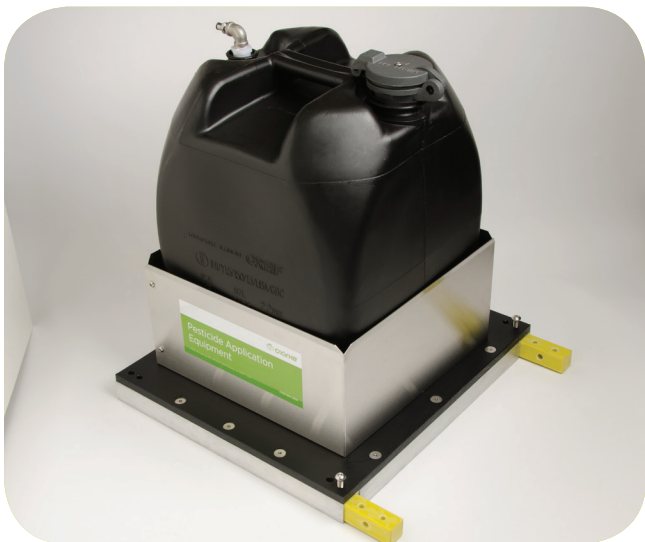
2 Assy Pickup Tube, 15 Gal.



3 Tank Cap Assy



4 15 Gal. Expansion Base Assy Includes Tank



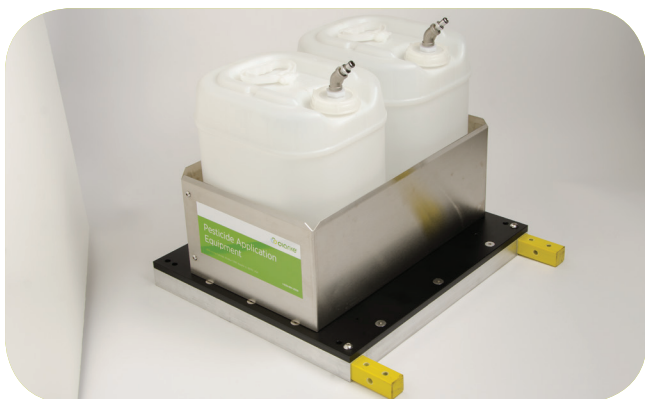
5 Dual 5 Gal. Formulation Tank Assy
(single shown)



6 Assy, Pickup Tube, 5 Gal.



7 Assy, Base Expansion Dual 5 Gal.



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Formulation Tank Assembly — Part Numbers

POS	QTY	DESCRIPTION	PART NO.
1	1	15 Gallon Formulation Tank Assembly (Complete with Pickup Tube and Cap)	328303
2	1	Assembly Pickup Tube, 15 Gallon	328288
3	1	Tank Cap Assembly	319419
4	1	Assembly, Base, Exp 15 Gallon	331538
5	2	Dual 5 Gallon Formulation Tank Assembly (Single Tube Assembly, includes Pickup Tube)	328296
6	2	Assembly, Pickup Tube, 5 Gallon	328270
7	1	Assy, Base, Exp Dual 5 Gallon (Expansion base includes expansion tank, not a standard tank.)	329674

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Plumbing Path/Fluid Flow

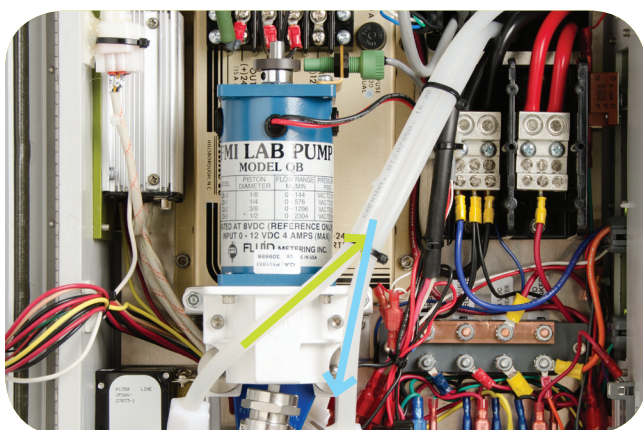
1 Insecticide leaving formulation tank



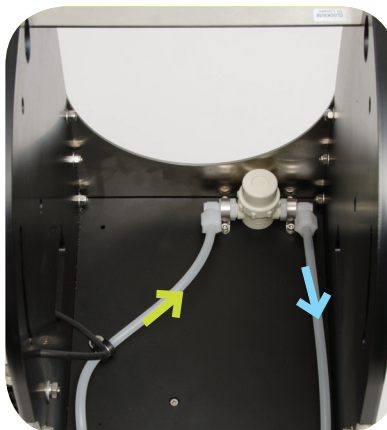
2 Enters filter/strainer



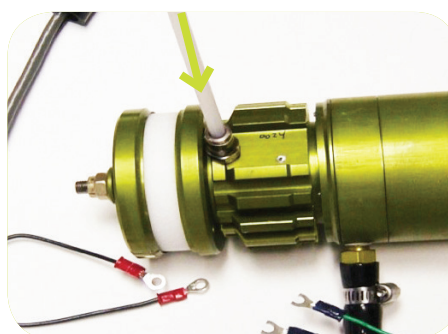
3 Travels to the pump



4 Through the damper



5 Following the tube on the quick connect on the spray head



6 To and through the spray head

NOTE: This is the bottom side of the spray head. When mounted, the quick-connect fitting at a 6:00 position where blower tube is connected.

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Plumbing (Fluid Path Components)

1 15 Gal. Formulation Tank Assy



2 Dual 5 Gal. Formulation Tank Assy (single shown)



OR



3 Coupler, tube, 3/8 Socket

4 Strainer, Bowl T, PP, Clear (with fill screen)

5 Filter Element for Strainer

6 Seal, Strainer (chemical resistant for strainer)

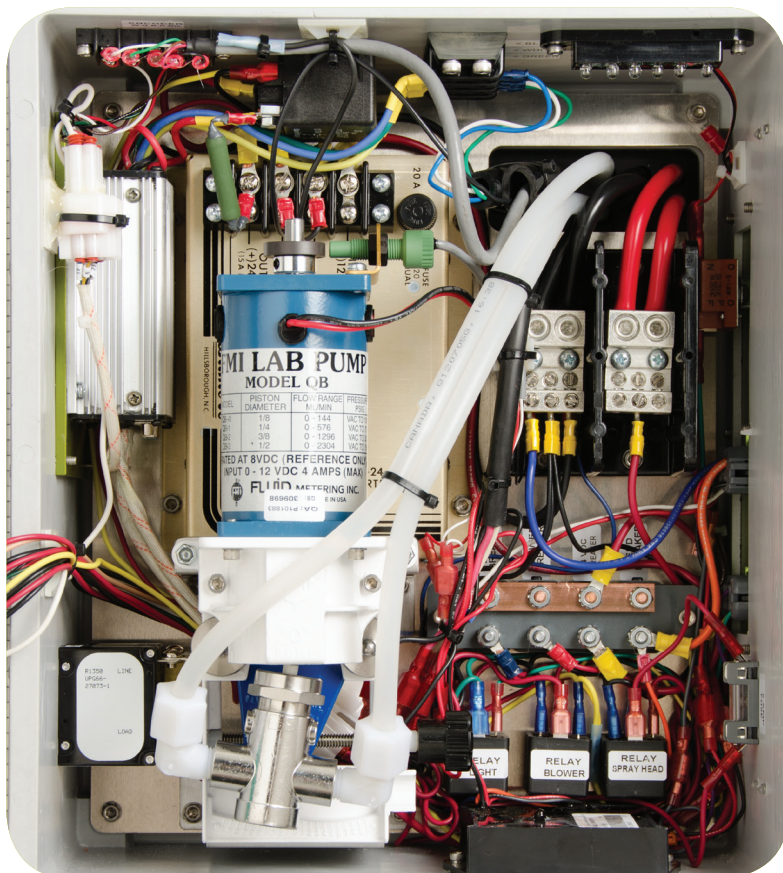
7 Fitting, 90, 3/8" Tube



PARTS BOOK AND COMPONENTS

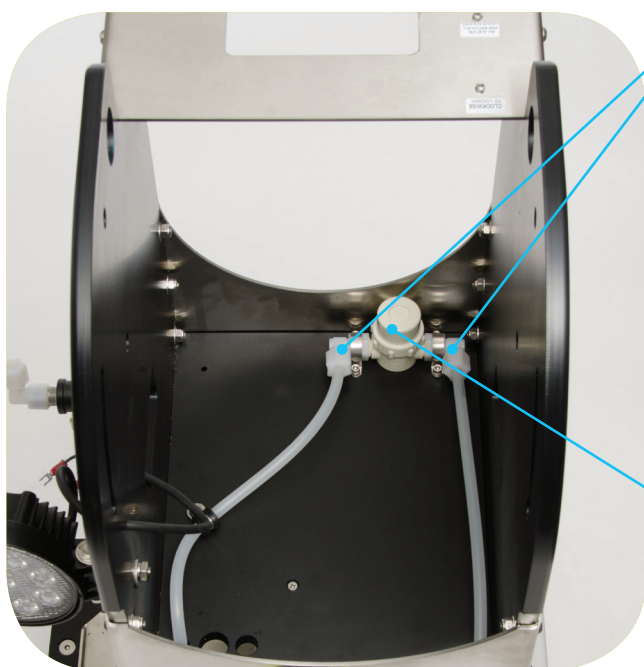
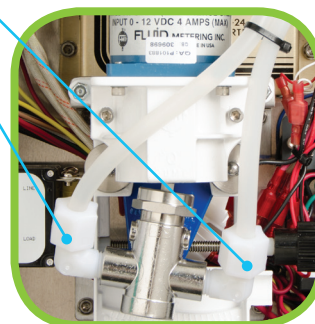
PRO-MIST DURA® ULV

Plumbing (Fluid Path Components, Cont.)



9 Assembly, Pump (complete with sensor and fittings)

8 Fitting, 90°, 3/8" tube, 1/4" NPT Male



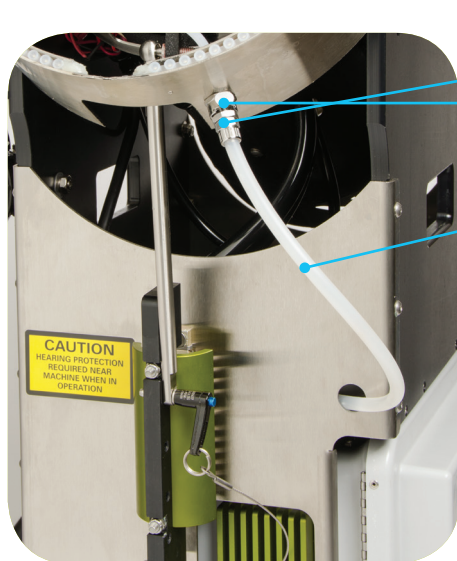
10 Fitting, Elbow, 3/8" x 1/4", 90°

11 Damper, Pulsation

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Plumbing (Fluid Path Components, Cont.)



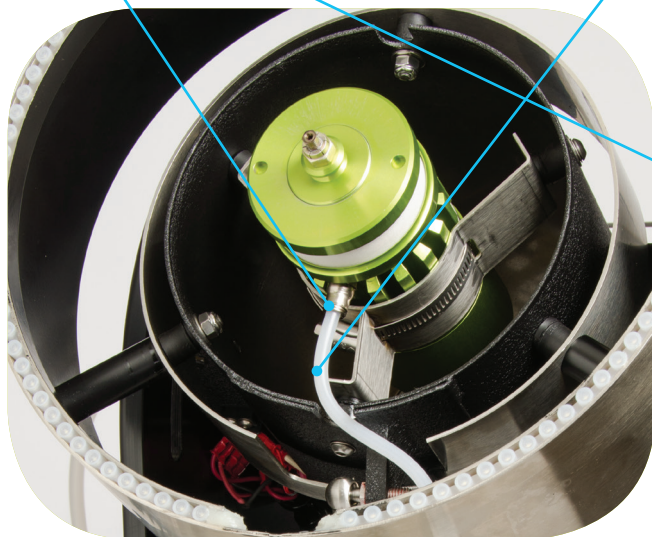
12 Coupler, Tube, 3/8" (Plug)

13 Coupling, QC Tube, Socket, mounted on Guard

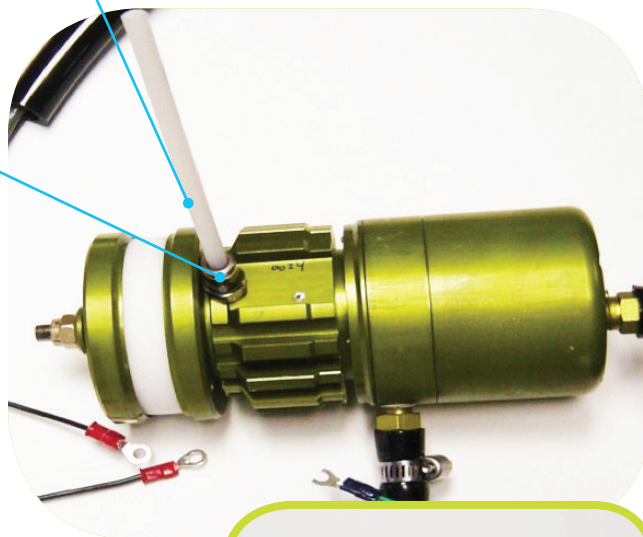
17 Tube, 3/8", PE (order by the foot)

14 Coupling, QC, 1/4" Tube x 1/8 NPT
(Quick-connect on spray head assembly.)

16 Tube, 1/4", PE (order by the foot)
(This tubing, #10040, is exactly 5" here)



SprayHead Assy with Blower Tube



15 SprayHead
Assy
Complete



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

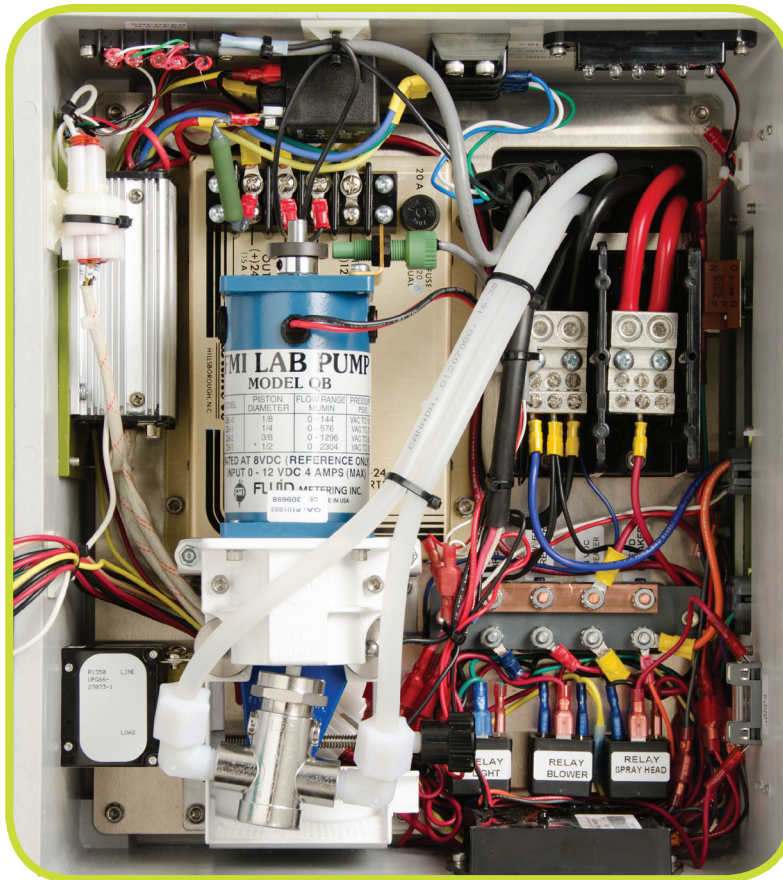
Plumbing Path/Fluid Flow — Part Numbers

POS	QTY	DESCRIPTION	PART NO.
1	1	15 Gallon Formulation Tank Assembly (Complete with Pickup Tube and Cap)	328303
		OR	
2	2	Dual 5 Gallon Formulation Tank Assembly (Single Tank assy, includes Pickup Tube)	328296
3	1	Coupler, Tube, 3/8", Socket (on inlet line)	329062
4	1	Strainer, Bowl, T, PP, Clear (Complete with Filter Screen)	328254
5	1	Filter Element for Strainer	10390
6	1	Seal, Strainer (Chemical Resistant Seal for Strainer, not standard)	328262
7	2	Fitting, 90°, 3/8" Tube, 3/8" Tube	10838
8	2	Fitting, 90°, 3/8", Tube, 1/4" NPT Male)	10181
9	1	Assy, Pump (complete with sensor and fittings)	328642
10	2	Fitting, elbow, 3/8" x 1/4", 90°	10204
11	1	Damper, Pulsation	10148
12	1	Coupler, Tube, 3/8" (Plug)	330431
13	1	Coupling, QC Tube, Socket (Mounted on guard ring)	329369
14	1	Coupling, QC 1/4" Tube x 1/8" NPT (Quick-connect on SprayHead assy)	329476
15	1	Spray Head Assembly Complete	328832
16	1	Tube, 1/4", PE (order by the foot)	10040
17	1	Tube, 3/8", PE (order by the foot)	10041

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Pump/Electrical Cabinet

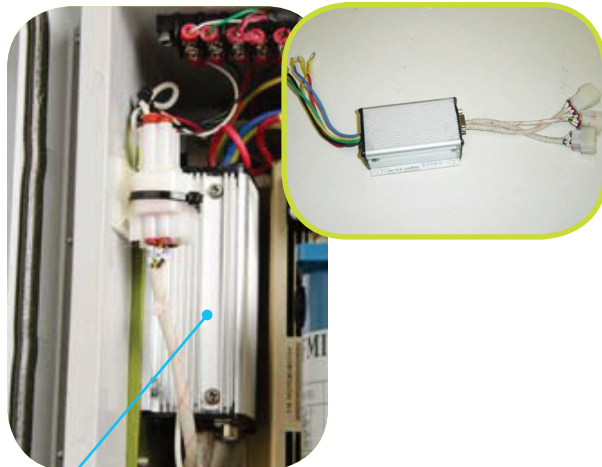
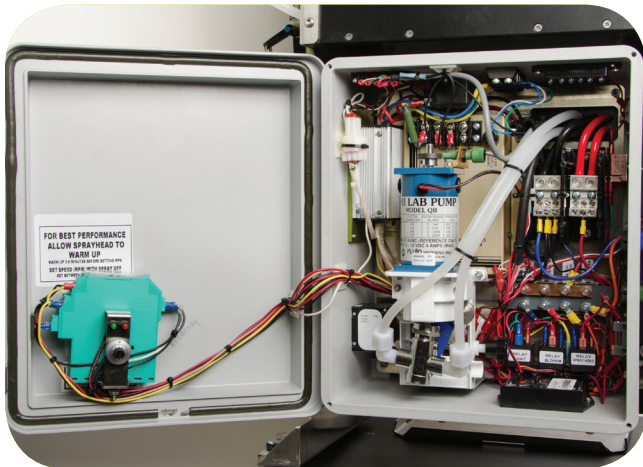


PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Pump/Electrical Cabinet (Cont.)

1 Pump Box Assy

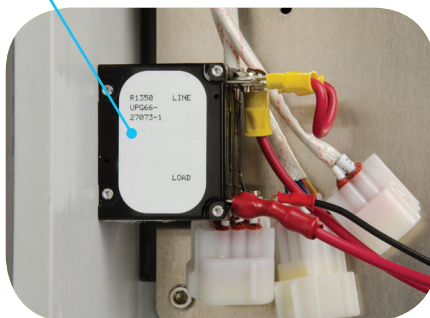
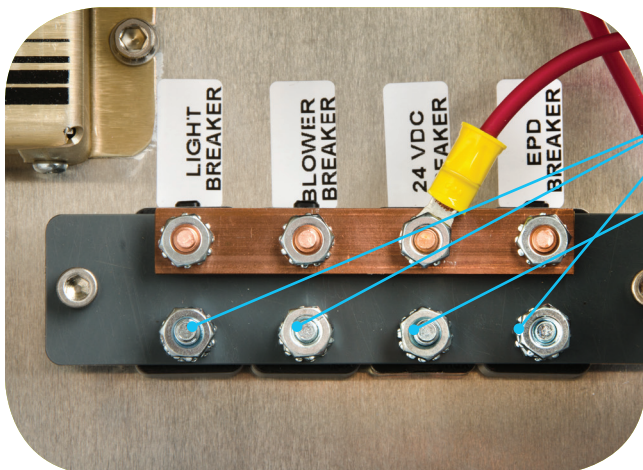


2 Controller Motor Programmed

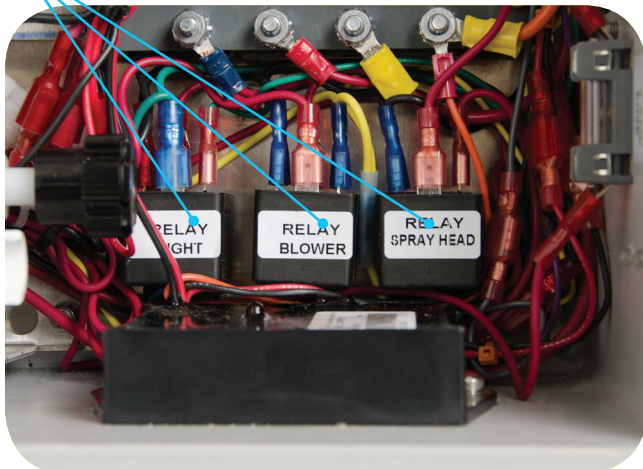
3 Circuit Breaker, 15 Amp

4 Circuit Breaker, 40 Amp

5 Main ON/OFF Amp with Trip



6 Relay 852 W-1A-F-C1-12V dc



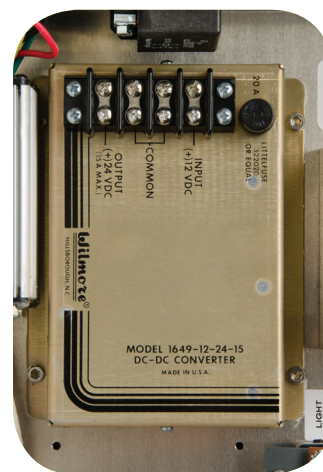
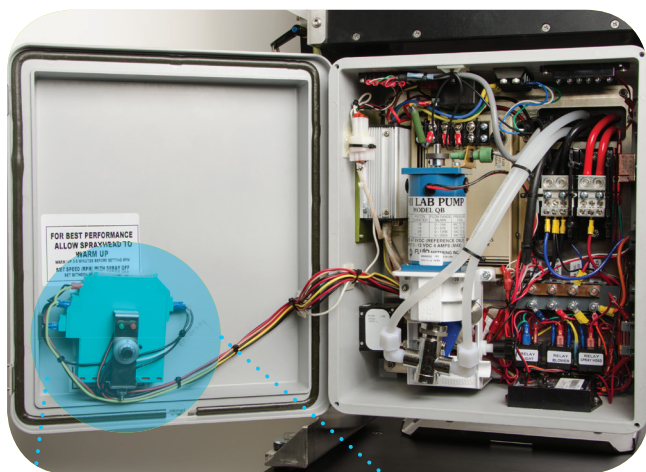
7 Relay, 12 VDC, 75A



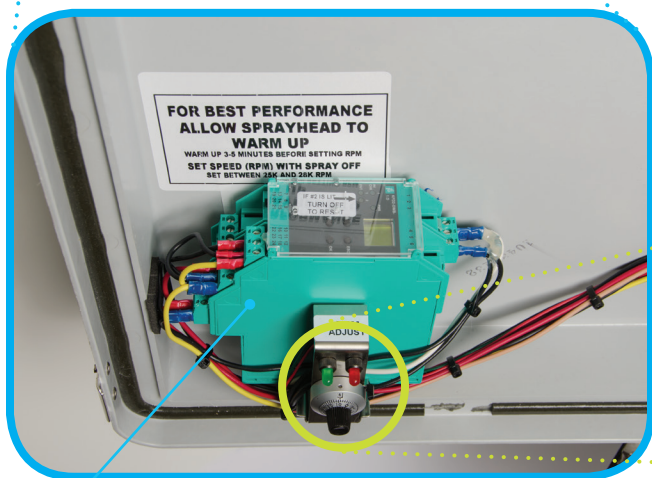
PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Pump/Electrical Cabinet (Cont.)



Converter DC to DC 10



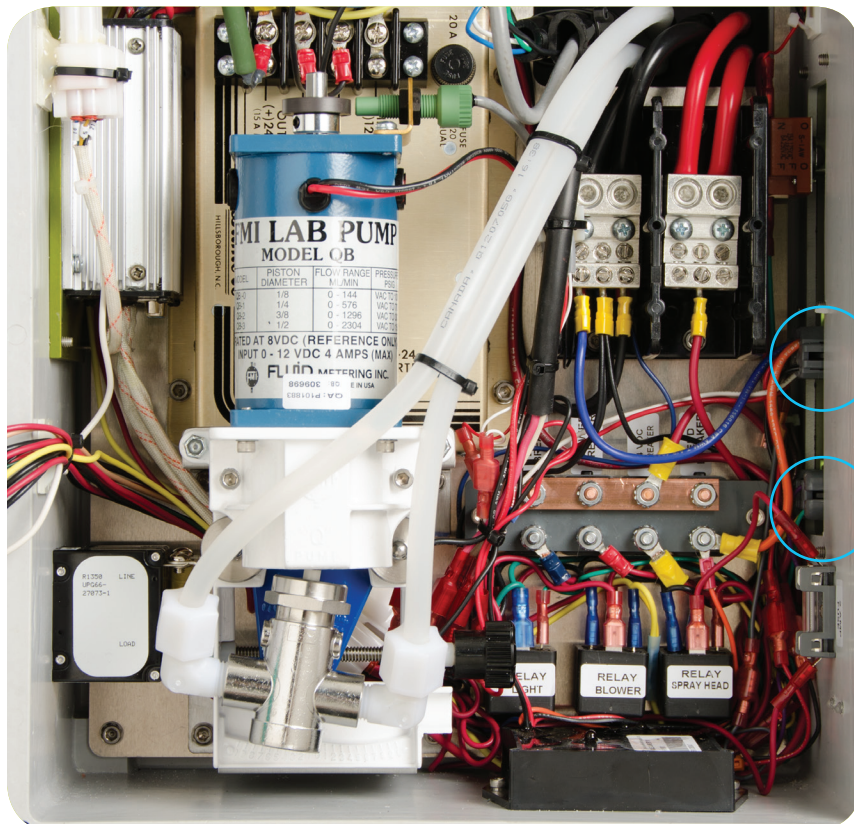
8 Relay, Speed Over/Under (Programmed)



Assy, LED Pot 9

Pump/Electrical Cabinet (Cont.)

11 Assy Pump

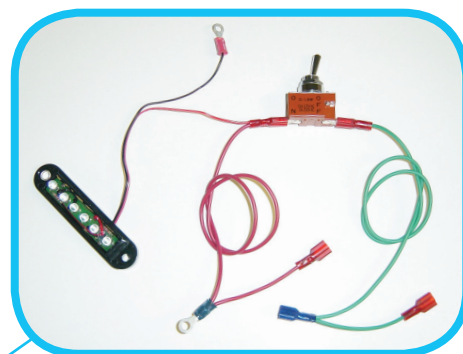


- 14 Harness 7 Pin Power/Flow (interior connection view)
- 15 & Retainer, 7 Clip (small clip to secure harness to panel)
- 12 Harness 10 Pin (interior connection view)
- 13 & Retainer, 10 Clip (small clip to secure harness to panel)

Pump/Electrical Cabinet (Cont.)



Rear, Exterior



Interior Wiring

16 Assy, Light/Relay Hookup
(Work light Toggle with cabinet light and switch)

14 Harness 7 Pin (Exterior Connection View)

12 Harness 10 Pin (Exterior Connection View)



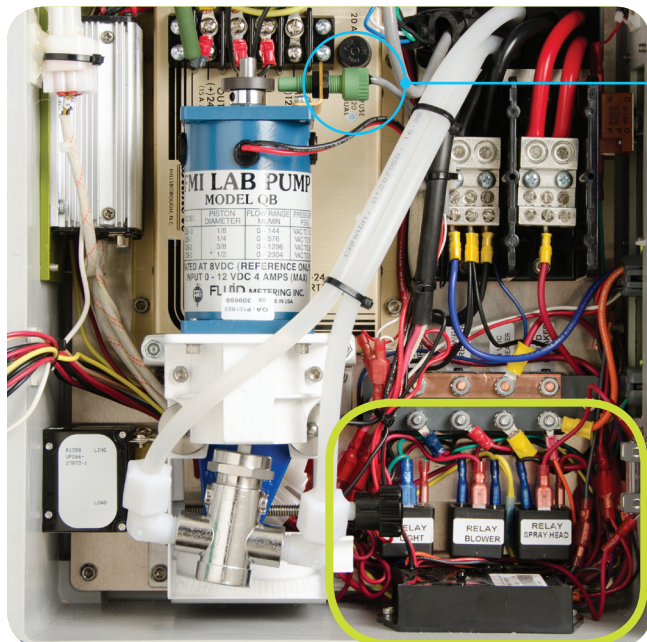
Front, Exterior

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

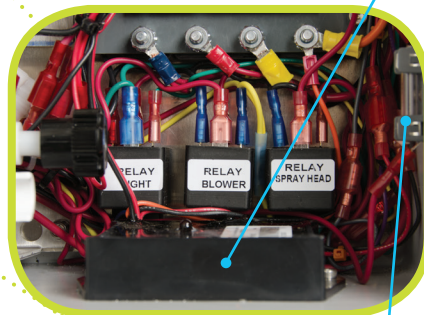
Pump/Electrical Cabinet (Cont.)

Assy Pump



18 Bracket and Sensor Assy

EPD Module 19
(Electronic Product Driver)



Fuse, 2A 3 AG 20

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Pump/Electrical Cabinet — Part Numbers

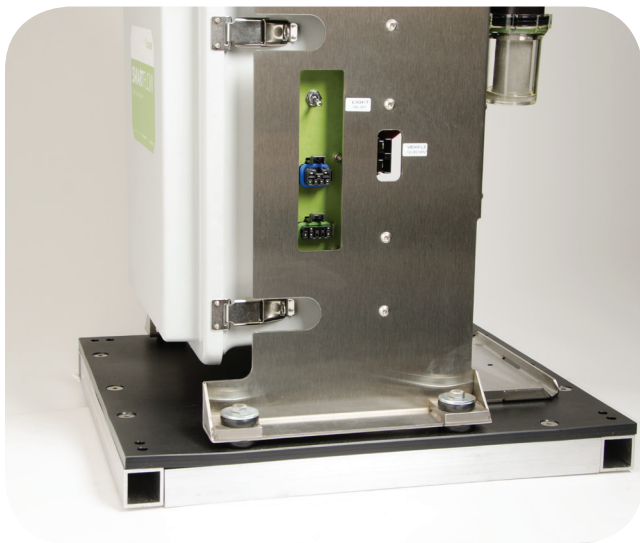
POS	QTY	DESCRIPTION	PART NO.
1	1	Pump Box Assembly (Pump/Electrical Cabinet)	328684
2	1	Controller, Motor (Programmed)	332304
3	2	Circuit Breaker, 15 Amp	12931
4	1	Circuit Breaker, 40 Amp, Auto Reset	328775
5	1	Main ON/OFF 50 Amp Breaker with Trip	328759
6	3	Relay 852W-1A-F-C1-12Vdc	322347
7	1	Relay, 12 VDC, 75A	329905
8	1	Relay, Speed Over/Under (Programmed)	332312
9	1	Assy, LED/Pot	331059
10	1	Converter, DC to DC	328783
11	1	Pump Assembly (Complete with Sensor & Fittings)	328642
12	1	Harness, 10 Pin	329921
13	1	Retainer, 10 Clip	329939
14	1	Harness, 7 Pin	329913
15	1	Retainer, 7 Clip	12904
16	1	Assy, Light/Relay Hookup (Worklight Toggle with Cabinet light & Switch)	330499
18	1	Bracket and Sensor Assy	12970
19	1	Electronic Pump Driver Module (EPD)	12988
20	1	Fuse, 2A 3 AG	331249

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Main Assembly

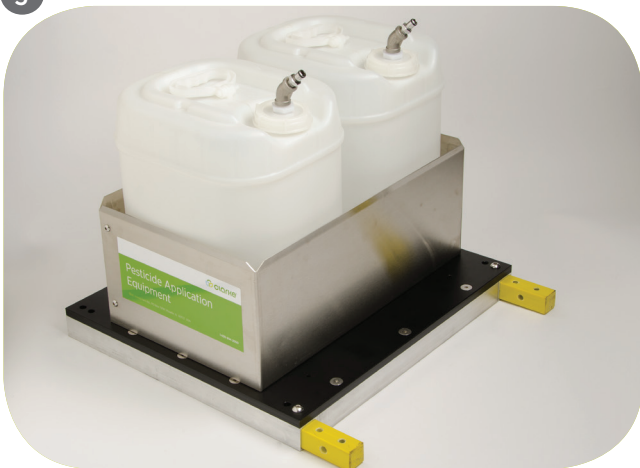
1 Assy, Blower Stand



2 Assy, Base, 15 Gal. Tank



3 Assy, Base, Dual, 5 Gal. (Includes Two Tanks)



4 15 Gal. Formulation Tank Assy
(Complete, includes Pickup Tube and Cap)



5 Dual 5 Gal. Formulation
Tank Assy (Complete,
includes Pickup Tube.)



6 Assy, Blower Tube
(without SprayHead Assy)



7 Spray Head Assy (Complete)

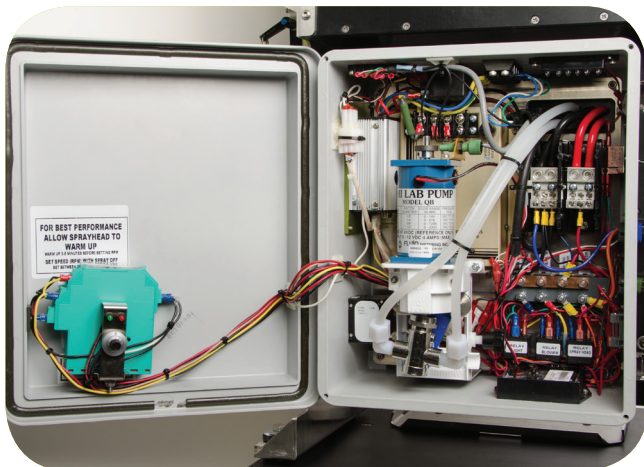


PARTS BOOK AND COMPONENTS

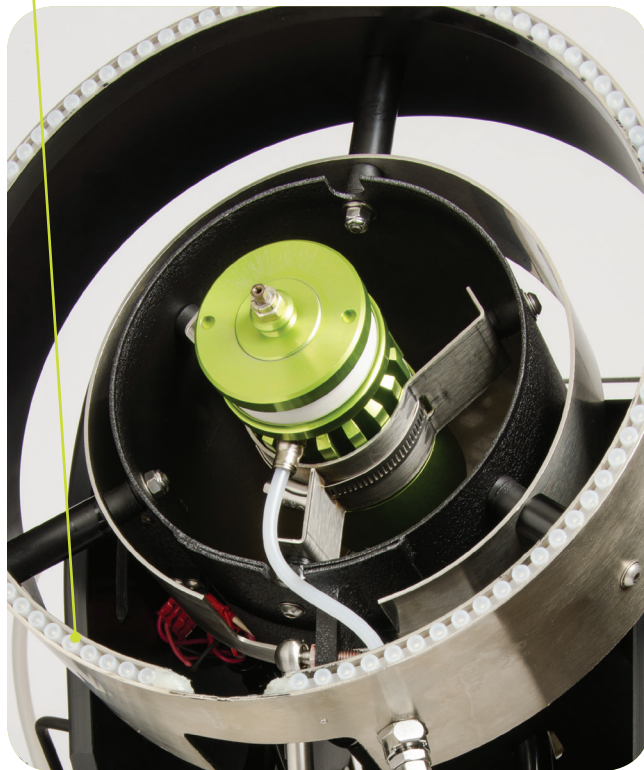
PRO-MIST DURA® ULV

Main Assembly (Cont.)

8 Assy, Pump Box



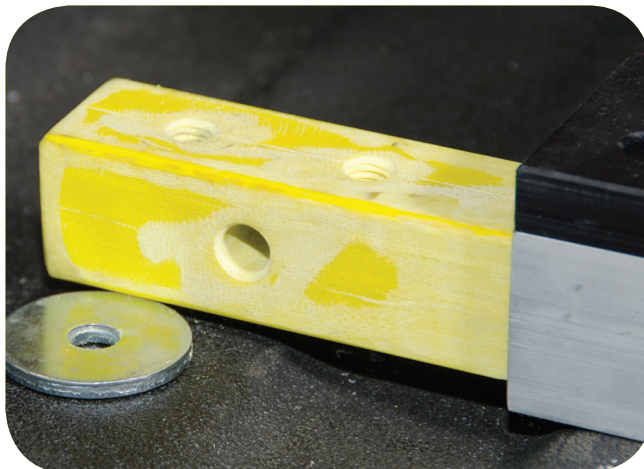
9 Flood Light, LED, 27W



10 SmartFlowII includes Cables and Mounting Bracket



11 Insert, Frame Joint



12 Handle L, Adjust Pin



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Main Assembly – Part Numbers

POS	QTY	DESCRIPTION	PART NO.
1	1	Assy, Blower Stand	328121
2	1	Assy, Base, 15 Gallon Tank	329682
3	1	Assy, Base, Dual 5 Gallon Tanks	332114
4	1	15 Gallon Formulation Tank Assembly (Complete, includes Pickup Tube & Cap)	328303
5	2	Dual 5 Gal Formulation Tank Assembly (Complete, includes Pickup Tube)	328296
6	1	Assyembly, Blower Tube (without SprayHead Assembly)	329707
7	1	SprayHead Assembly (Complete)	328832
8	1	Assembly, Pump Box	328684
9	1	Flood Light, LED, 27w	330423
10	1	SmartFlow II and Cables	331447
11	8	Insert, Frame Joint	329541
12	1	Handle L, Adjust Pin	328246

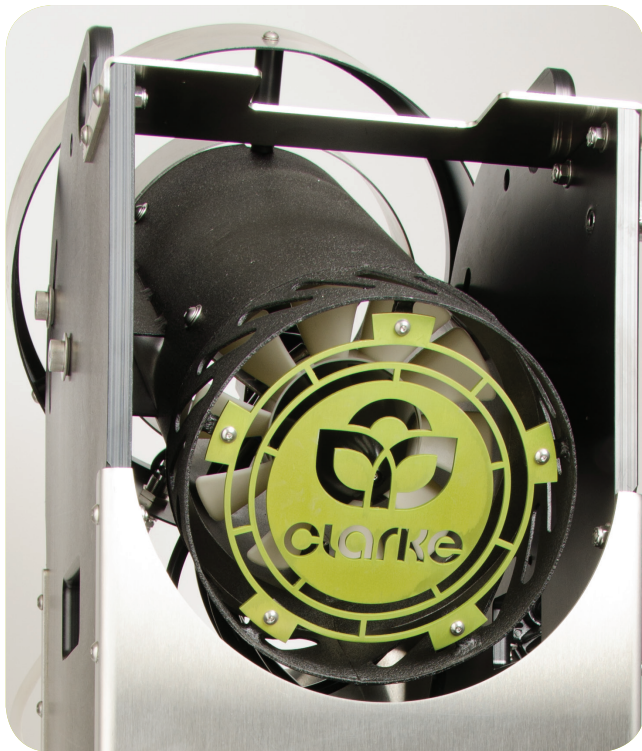
PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Blower Tube Assembly

1 Assy, Blower Tube (without SprayHead Assy)

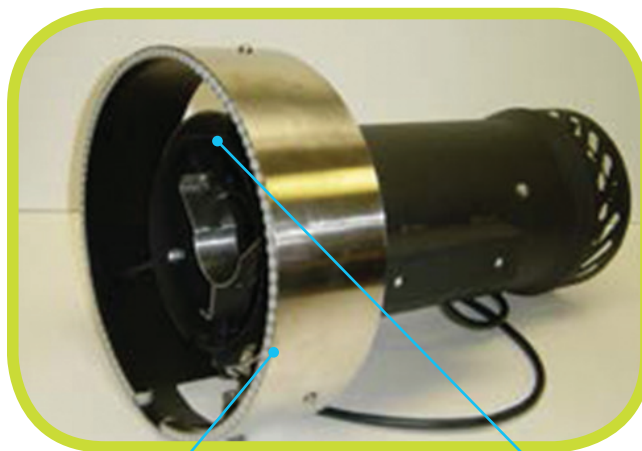
Rear, Exterior



Front, Exterior



Side View



3 Assy, Motor, Blower (Complete Assy. with Bracket)



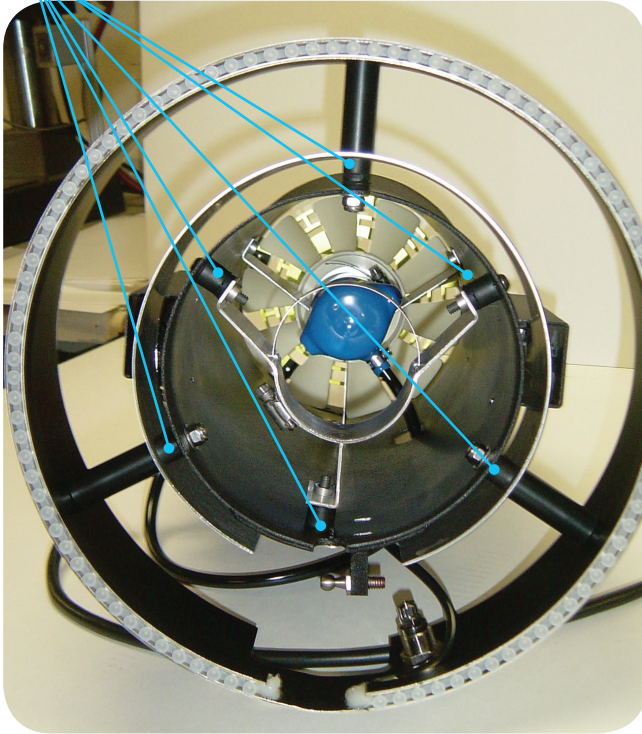
5 Hose Clamp, 1 13/16 x 2 1/4, SS (Blower Motor Mount Clamp)

6 Ring, Extension, 8.5"

7 Guard Ring, Extension, 13"

Blower Tube Assembly (Cont.)

8 Mount, Shock, Blower Tube (6)



Assy, Motor, Toggle Switch

10

Terminal Strip, 4-Pos

11



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Blower Tube Assembly (Cont.)

LED Light Bar (Flexible
Ring Light)

12

Mount Spray Head

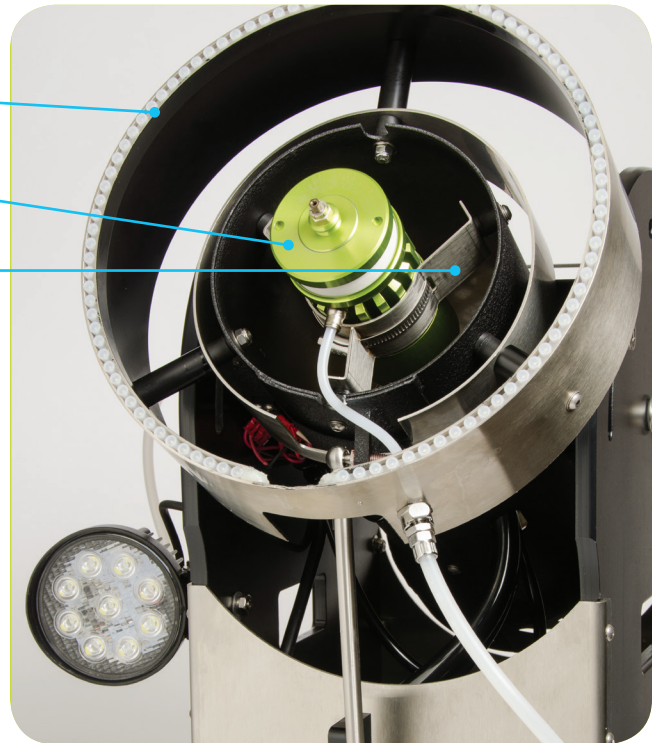
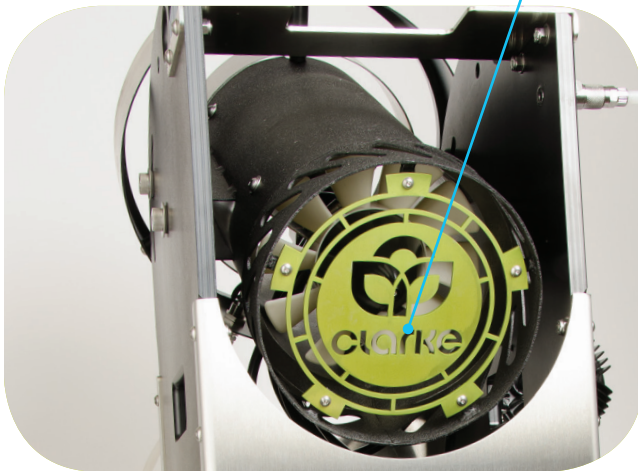
13

Clamp, 2.31 x 3.25 SS
(Spray Head Mount Clamp)

14

Plate, Cover,
Blower Tube, Rear

15



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

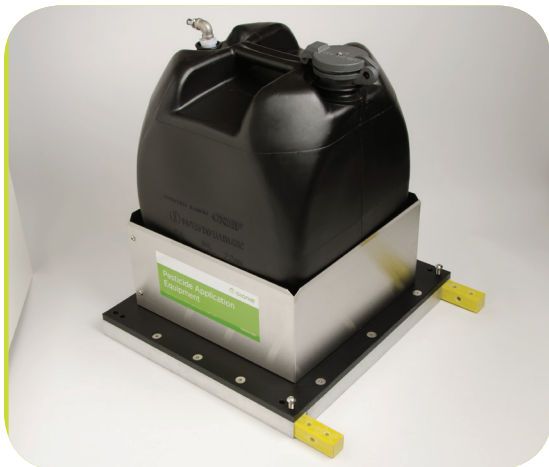
Blower Tube Assembly – Part Numbers

POS	QTY	DESCRIPTION	PART NO.
1	1	Assembly, Blower Tube (without Spray Head Assembly)	329707
3	1	Assembly, Motor Blower (Complete with Bracket)	328444
5	1	Hose Clamp, 1 ¹³ / ₁₆ x 2 ³ / ₄ SS (Blower Motor Mount Clamp)	329377
6	1	Ring, Extension, 8.5"	328551
7	1	Guard, Ring, 13"	328569
8	6	Mount, Shock, Blower Tube	328535
10	1	Assembly, Toggle Switch	331570
11	1	Terminal Strip, 4-Pos	10158
12	1	LED Light Bar (Flexible Ring Light)	328626
13	1	Mount, Spray Head	328585
14	1	Clamp, 2.31 x 3.25 SS (SprayHead Mount Clamp)	328543
15	1	Plate, Cover, Blower Tube, Rear	330241

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

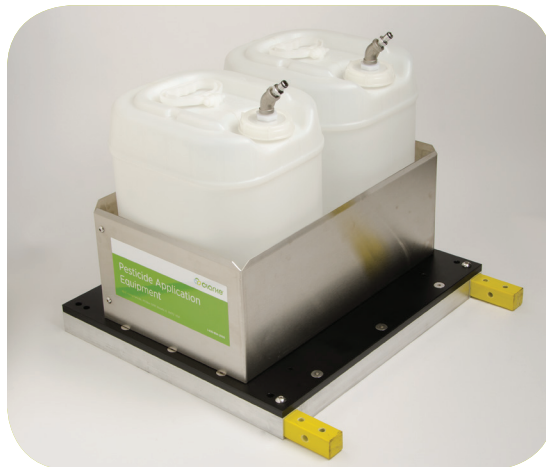
Available Accessories

**DESCRIPTION**

Assy, Expansion Base, 15 Gallon Tank
(Not standard tank base.)

PART NO.

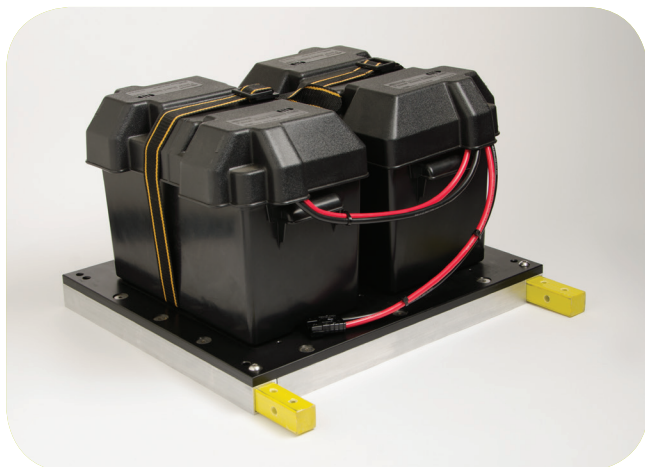
331538

**DESCRIPTION**

Assy, Expansion Base, 5 Gallon Tank
(Not standard tank base.)

PART NO.

329674

**DESCRIPTION**

Assy, Base, Expansion, Battery,
(Houses Two Deep Cycle Batteries),
Includes Cables

PART NO.

328387

**DESCRIPTION**

Disposable Pourous Sleeve, 2-Pack

PART NO.

331736

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Available Accessories (Cont.)

**DESCRIPTION**

Assy, Spanner/Puller Tool
(necessary for removing hub
and changing sleeve)

PART NO.

328973

**DESCRIPTION**

Spanner Base Plate (work bench
mount to hold hub while using
spanner wrench)

PART NO.

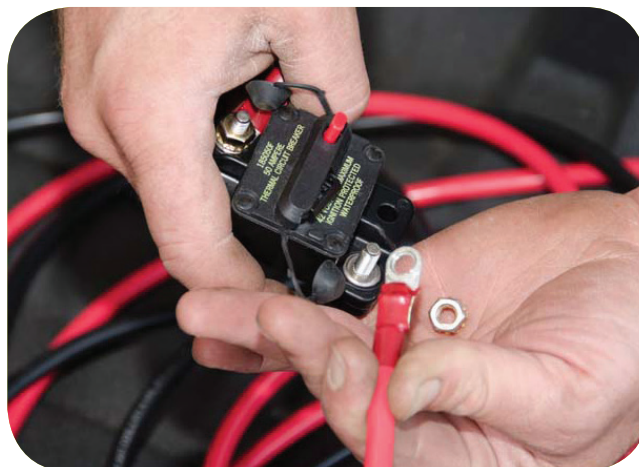
332742

**DESCRIPTION**

Assy, Install Kit

PART NO.

333815

**DESCRIPTION**

Circuit Breaker, 50 Amp, Waterproof

PART NO.

333683

PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Available Accessories (cont.)

DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
GPS	13589	Fuse Holder, In-Line, AGU	333675
		Fuse, AGU, 60 Amp, Fast	333691
		Expansion Battery Base Cable Set	332338



PARTS BOOK AND COMPONENTS

PRO-MIST DURA® ULV

Spare Parts Kit (Expanded)

QTY	DESCRIPTION	PART NO.
10	10 Ft of part #319302 Tube 3/8"	319302
5	5 Ft of part #319295 Tube, 1/4"	319295
1	Coupling, QC Tube, Socket	329369
1	Coupler, Tube, 3/8, Socket	329062
4	Replacement O-Ring for 1/4" QC Coupler Male End	334235
1	LightBar LED	328627
1	Strainer, Bowl, T, PP, Clear	328254
1	Seal, Strainer	328262
1	Hub	329765
1	Retaining Ring	329773
6	Assembly, Sleeve, 2 piece	331736
2	Nut, Flex Top, 5/16-24, Thread Chased	332320
1	Coupling, QC, 1/4 Tube x 1/8 NPT	329476
1	Magnet Ring Assembly	12948
1	Sensor Speed	12937

Spare Parts Kit (Mini)

QTY	DESCRIPTION	PART NO.
1	Spare Parts Kit Mini Complete	334227
10	10 ft of part #319302 Tube, 3/8"	319302
5	5 ft of part #319295 Tube, 1/4"	319295
2	Assy, Sleeve, 2 piece	331736
1	Nut, Flex top, 5/16-24, Thread Chased	332320
4	Replacement O-Ring for 1/4" QC Coupler, Male End	334235
1	Filter Element for Strainer	326654

INSTRUCTION MANUAL

SMARTFLOW II



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SMARTFLOW II

SMARTFLOW II MANUAL

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DESCRIPTION

SMARTFLOW II

SmartFlow II Installation, Operation and Maintenance Manual

SMARTFLOW II CONSOLE



DESCRIPTION

SMARTFLOW II

Installation, Operation and Maintenance Manual

The SmartFlow II control provides programmable microcomputer control for Clarke spraying systems.

The SmartFlow II control offers the following features:

- The SmartFlow II 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 SmartFlow II 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.
- The SmartFlow II control is available for both gas and electric spraying systems.
- The SmartFlow II accumulates several totals (Volume, Area, Distance, Time and Hours) to help verify spraying applications.

SMARTFLOW II CONSOLE



Total Counters

The SmartFlow II has five total counters:

Total Counters	Page 62
Volume	Page 63
Area	Page 63
Distance	Page 64
Time	Page 64
Hours	Page 64

Total Counters

The SmartFlow II accumulates the following totals to document spraying applications:

COUNTER	DESCRIPTION	UNITS
Volume	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

TOTAL COUNTERS

SMARTFLOW II

Volume Counters

Three Volume counters are provided. When in the **VOLUME** position the selected counter is indicated by the Number icon (1, 2, 3) in the Data display and a different counter can be selected by using **INC** key. (Note the **DEC** key is not used since that is used to clear the counter in some models). Cycling power or brown outs will not change the selection. The user cannot change the Counter selection while in **CALIBRATE** or **SPECIAL CALIBRATE** but it can be changed while in Test Speed mode.

If a flow signal is present then Volume continues to accumulate while in the **VARIABLE, CONTINUOUS** or **OFF** mode. All three Volume counters are always active and will accumulate volume (not just the selected or displayed counter).

Area and Volume counters are coupled together (as pairs) so selecting Volume counter 1 also selects Area Counter 1. This was done so user can easily see how much Volume was applied to a particular area (Volume 1 is always applied to Area 1, and Volume 2 to Area 2 etc.).

Area Counters

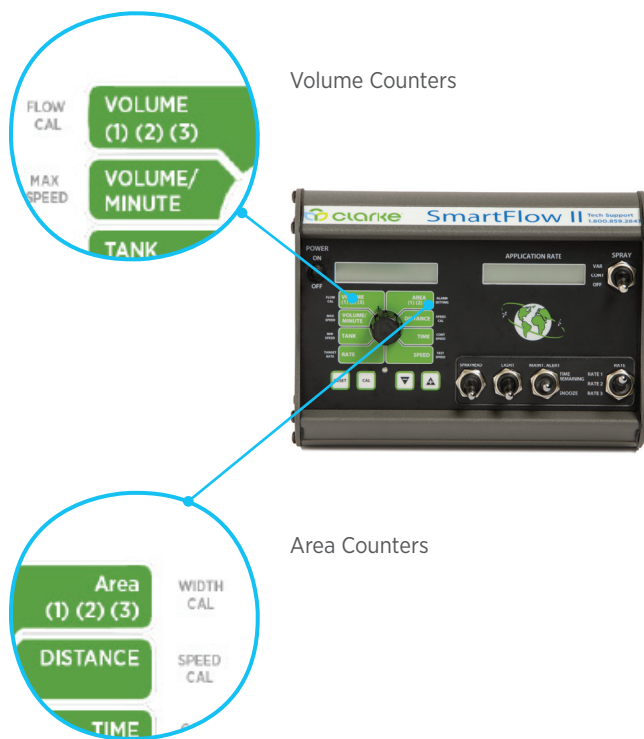
Three Area counters are provided. When in the **AREA** position the selected counter is indicated by the Number icon (1, 2, 3) shown in the Data display and a different counter can be selected by using the **INC** key. Cycling power or brown outs will not change the selection. The user can not change the Counter selection while in **CALIBRATE** or **SPECIAL CALIBRATE** but it can be changed while in Test Speed mode.

NOTE: The DEC key is not used since that is used to clear the counter in some models: 'Lite' and 'D'.

Area is only accumulated while in the **VARIABLE** mode (and not “Lo Speed” or “Hi Speed”) and all three counters are active and will accumulate area (not just the selected or displayed counter). When in the **CONTINUOUS** or **OFF** mode all three Area counters stop accumulating area.

Area and Volume counters are coupled together (as pairs) so selecting Area counter 1 also selects Volume Counter 1. This was done so the user can easily see how much Volume was applied to a particular area (Volume 1 is always applied to Area 1, and Volume 2 to Area 2 etc.).

The Speed Cal factor can be changed at any time (before or after a field is completed) and the correct area will be re-computed.



TOTAL COUNTERS

SMARTFLOW II

Distance

The **DISTANCE** position shows the distance traveled in 0.1 increments from 0 to 9,999.9 miles or km Distance is accumulated in Feet (or Meters).

The Distance counter will only accumulate when in the **VARIABLE** mode (and not “Lo Speed or Hi Speed”). If in the **CONTINUOUS** or **OFF** mode it will display the last accumulated distance.

Distance is saved to EEPROM during brown outs or when power is turned off.

Time

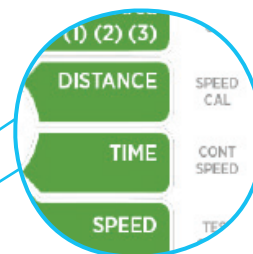
The **TIME** position displays the “spray time” since the counter was last reset. It displays from 0.1 to 9999.9 hours.

The “Time” counter accumulates spray time when in **VARIABLE** (and not “Lo Speed” or “Hi Speed”) or **CONTINUOUS** mode.

Hours

When the SmartFlow II is turned on, it will display the number of hours it has operated in 0.1 hour increments up to a maximum of 9999.9 hours (then it displays OFL).

Data Display Window
Displays hours



CONTROL PANEL FUNCTIONS

SMARTFLOW II

Control Panel Functions

This section describes the functions of the control panel for the SmartFlow II control.

This section covers these control panel features:

LCD Displays Page 66

Alarms Page 67

Warning LED Page 67

Rotary Dial Functions Page 68 - 77

Toggle Switches Page 78 - 84

Push Buttons Page 85

SMARTFLOW II CONSOLE



CONTROL PANEL FUNCTIONS

SMARTFLOW II

LCD Displays

The Clarke control box has two LCD displays, (Data display window and Application Rate display window) each of which is capable of displaying any combination of digits, decimal points, and icons as shown in the illustration below.



SMARTFLOW II CONSOLE

CONTROL PANEL FUNCTIONS

SMARTFLOW II

Alarm On/Off Toggle Switch

An audible alarm (beeper) sounds when there is an error. A rear mounted toggle switch (on the back of the SmartFlow II console) is used to turn off (disable) the audible alarm.

The Warning LED and “ERROR” indicator in the Data display window will also be lit.

Warning LED

While in **VARIABLE** or **CONTINUOUS** mode, the Warning LED, and the Audible Alarm will turn on (steady) when- ever there is more than 10% error in the application rate. However the audible alarm (only) can be delayed if the “Alarm Setting” is used.

SMARTFLOW II CONSOLE



Warning LED Light

Alarm On/Off Toggle Switch



SMARTFLOW II
(Rear View)

CONTROL PANEL FUNCTIONS

SMARTFLOW II

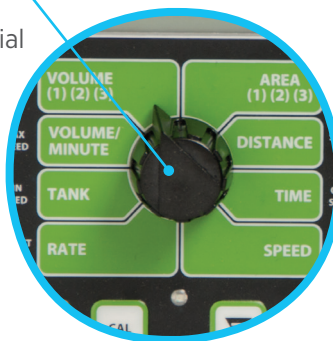
Rotary Dial Functions

The rotary switch is used to select the parameters to display and to set calibration values. The SmartFlow II has eight display functions and are selected by the rotary knob positions as described in this section.

SMARTFLOW II CONSOLE



Rotary Dial



Rotary Dial Functions (Cont.)

1. Rotary Dial Position: **DISTANCE**

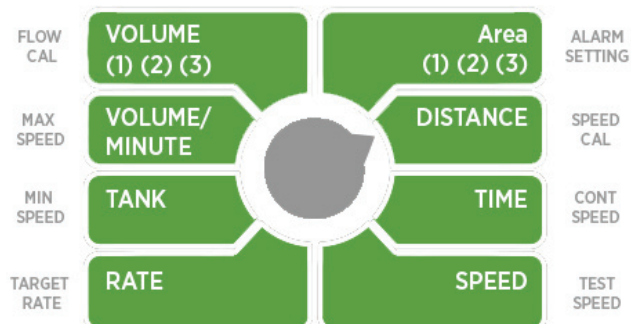
Function: Distance Traveled

The **DISTANCE** positions shows the distance traveled in 0.1 increments from 0 – 9,999.9 miles or kilometers and then increments from 10,000 – 99,999 miles or kilometers.* This is shown in the Data Display window.

The Distance counter will only accumulate when in **VARIABLE** mode (and not “Lo Speed” or “Hi Speed”). If in the **CONTINUOUS** or **OFF** mode it will display the last accumulated distance.

Use the **RESET** button for clearing Distance.

Distance is saved to **EEPROM** during brown-outs or when power is turned off.



***NOTE:** Once 99,999 is reached, Data Display will show OFL (Overflow) and stop counting. The user must clear Distance to resume counting.

Rotary Dial Functions (Cont.)

2. Rotary Dial Position: **SPEED**

Function: Ground Speed

The **SPEED** position shows ground speed in 0.1 increments from 0.0 – 655.4 mph or kph if in **VARIABLE** or **OFF** mode and is shown in the Data Display window. If in **CONTINUOUS** mode then the Continuous Speed Cal value is flashed instead of the actual speed.

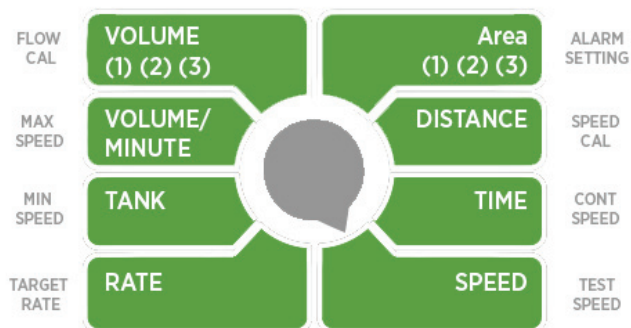
If using **GPS** then the **GPS** Speed input is used and the Speed input is ignored. SmartFlow II can accept GPS speed from an external device (typically a PC with GPS) via the “G: Command. To use GPS Speed the user must program the Speed Cal to zero, (with the **DECREASE** button) which will disable the normal Speed input.

It is assumed the GPS speed received is “Speed over ground” and is always in mph 10.

When using GPS the distance is no longer measured directly, instead it is calculated by the GPS receiver. Thus the SmartFlow II Distance and Area accuracy will be determined by the GPS receiver. Control accuracy will also depend on the GPS receiver.

EXAMPLE: If GPS receiver only sends data once every second, then at 10 mph the vehicle will travel 14.7 ft. in 1 second. Therefore in the **VARIABLE** mode automatic control can only be made once every second, making it respond much more slowly to speed changes.

NOTE: The SmartFlow II will convert mph to kph depending on the Units selected and use it for all control and measurement functions (Speed, Area, Distance).



Rotary Dial Functions (Cont.)

3. Rotary Dial Position: AREA 1, 2, 3

Function: Acres Sprayed

Three Area counters are provided. When in the **AREA** position the selected counter is indicated by the Number icon (1, 2, 3) shown in the Data display and a different counter can be selected by using the **INC** key. (Note the **DEC** key is not used since that is used to clear the counter in some models). Cycling power or brown outs will not change the selection. The user cannot change the Counter selection while in **CALIBRATE** or **SPECIAL CALIBRATE** but it can be changed while in Test Speed mode.

Area is only accumulated while in the **VARIABLE** mode (and not “Lo Speed” or “Hi Speed”) and all three counters are active and will accumulate area (not just the selected or displayed counter). When in the **CONTINUOUS** or **OFF** mode all three Area counters stop accumulating area.

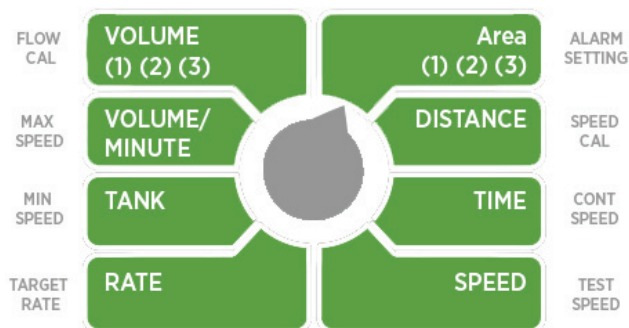
In English units it counts from 0.1 – 9,999.9 acres then drops the decimal point to count up to 99,999 acres. Metric counts from 0.01 – 999.99 hectares then shifts the decimal to count up to 9,999.9 hectares, then drops the decimal point to count up to 99,999 hectares.

NOTE: Once the display reaches 99,999 it will display **OFL (Overflow)** in the Data display window and stop counting. The user must clear the Area to resume counting. Use the **RESET** button for clearing Area.

Area and Volume counters are coupled together (as pairs) so selecting Area counter 1 also selects Volume Counter 1. This was done so the user can easily see how much Volume was applied to a particular area. (Volume 1 is always applied to Area 1, and Volume 2 to Area 2 etc.).

The Speed Cal factor can be changed at any time (before or after a field is completed) and the correct area will be re-computed.

All three Area counters are saved to **EEPROM** during brown-outs or when power is turned off.



Rotary Dial Functions (Cont.)

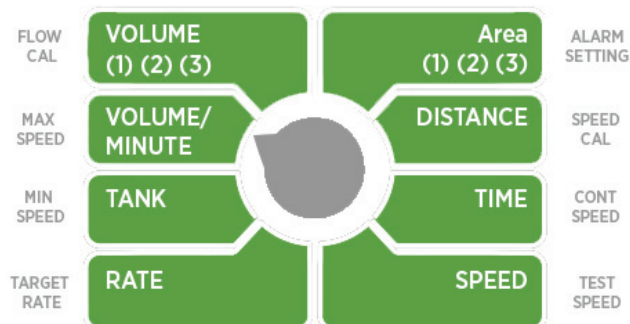
4. Rotary Dial Position: **VOLUME/MINUTE**

Function: Ounces or Milliliters per Minute

The **VOLUME/MINUTE** position shows a range from 0.001 – 16,777 oz/min or from 0.1 – 99,999 ml/min. A typical application is 1 oz/acre at a width of 300 ft. at 10 mph which generates a typical volume/minute of 6.060 oz/min or 179.2 ml/min.

English volume/minute is displayed with one or more decimal places that range from 0.001 – 99,999 gallons/minute. Metric volume/minute is displayed with zero or one decimal place that ranges from 0.1 – 99,999 ml/min. For English and Metric automatic decimal shift and hysteresis is the same as described in the Rate section (page 76).

Volume/Minute operates while in **VARIABLE**, **CONTINUOUS** or **OFF** mode, as long as a flow signal is present. control can only be made once every second, making it respond much more slowly to speed changes.



Rotary Dial Functions (Cont.)

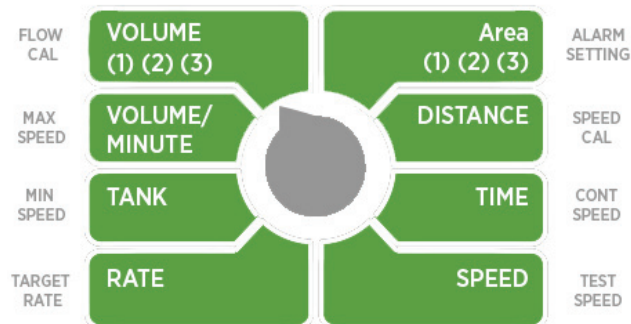
5. Rotary Dial Position: **VOLUME (1)(2)(3)**

Function: Volume Pumped in Gallons or Liters

Three Volume counters are provided. When in the **VOLUME** position the selected counter is indicated by the Number icon (1, 2, 3) in the Data display window and a different counter can be selected by using **INC** key. (Note the **DEC** key is not used since that is used to clear the counter in some models). Cycling power or brown outs will not change the selection. The user cannot change the Counter selection while in **CALIBRATE** or **SPECIAL CALIBRATE** but it can be changed while in Test Speed mode.

If a flow signal is present then Volume continues to accumulate while in the **VARIABLE, CONTINUOUS** or **OFF** mode. All three Volume counters are always active and will accumulate volume (not just the selected or displayed counter).

The Volume mode displays the volume pumped from .01 – 999.99 gallons or liters and then from 1,000.0 – 9,999.9 gallons or liters and then from 10,000 – 99,999 gallons or liters. Once it reaches 99,999 it will display “OFL” (Overflow) and stop counting. The user must clear Volume to resume counting. Use the **RESET** button for clearing Volume.



Area and Volume counters are coupled together (as pairs) so selecting Volume counter 1 also selects Area Counter 1. This was done so user can easily see how much Volume was applied to a particular area (Volume 1 is always applied to Area 1, and Volume 2 to Area 2 etc.).

The Flowmeter Calibrate factor can be changed at any time (before or after an application is completed) and the correct Volume will be re-computed.

Rotary Dial Functions (Cont.)

6. Rotary Dial Position: **TANK**

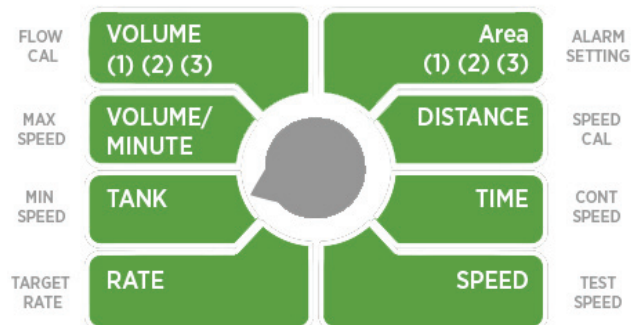
Function: Amount of Liquid in the Tank

The **TANK** position shows the amount of liquid remaining in the tank, to the nearest tenth of a gallon or liter. An alarm (see below) will be given when the Tank level equals or drops below the Set Point cal factor (default 2.0 gallons or 7.5 liters) while in **VARIABLE, CONTINUOUS** or **OFF** mode. This alerts the user that the Tank is low whether he is spraying or stopped. The user can stop the audible and visual Tank alarm momentarily pressing the **RESET** button (while in any position).

If a flow signal is present then Tank continues to decrement while in the **VARIABLE, CONTINUOUS** or **OFF** mode.

The Tank volume can be adjusted by setting the Spray switch to **OFF** and then using the **INC** or **DEC** buttons to adjust it from 0.0 – 6553.5 gallons or liters. For safety this can only be done while the spray switch is in **OFF**.

Adjusting the Tank volume to any value greater than zero will always activate the Tank Alarm function. Adjusting it to 0.0 will disable and clear the Tank Alarm. Once activated, the alarm will beep On and Off slowly, the Warn **LED** will turn on and the Application Rate display will alternate between **FILL** and normal until the user adjusts the Tank value above the **TANK ALARM SET POINT** (alarm will stop) or back to 0.0 to disable it.



The Tank value cannot be changed while in Cal mode or Special Cal mode, but it can be changed while in Test Speed mode.

The **FILL** message will not flash while in Cal mode or Special Cal mode.

NOTE: Setting the Spray switch to OFF will stop the 10% Rate Error alarm (steady tone) but will not stop the Tank Alarm. If the user clears the Tank alarm by pressing the **RESET** button it will stay cleared even if the SmartFlow II power is turned on and off.

Rotary Dial Functions (Cont.)

7. Rotary Dial Position: **TIME**

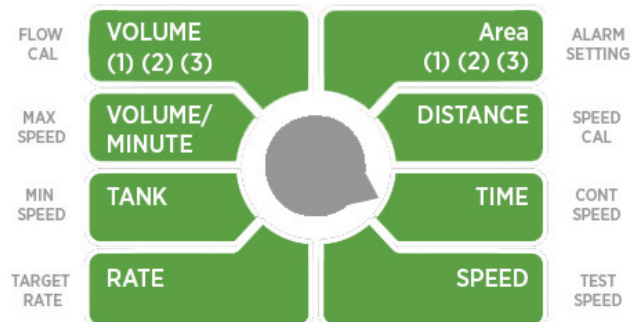
Function: Time Spraying Since Counter

Was Last Reset

The **TIME** position displays the spray time since the counter was last reset. It displays from 0.1 – 9999.9 hours and then from 10,000 – 99,999 hours. Once it reaches 99,999 it will display OFL (overflow).

The Time counter accumulates spray time when in Variable (and not “Lo Speed” or “Hi Speed”) or Continuous mode and the “**PRESSURE OK**” or “**RPM OK**” input is active.

Use the **RESET** button for clearing Time.



Rotary Dial Functions (Cont.)

8. Rotary Dial Position: RATE

Function: Displays Actual Rate in OZ/Acre or Milliliters/Hectare

The **RATE** position displays in the “Data” display window and also will show the same value show in the “Application Rate” display window.

The **RATE** position displays .001 – 99,999 oz/acre or 0.1 – 99,999 mLiters/Hectare.

Rate operates while in **VARIABLE** and **CONTINUOUS** mode but will go to zero in the OFF mode even if a flow signal is present. It also goes to zero if in **VARIABLE** mode and “Lo speed” or “Hi Speed” in Application Rate display.

Rate is displayed with one or more decimal places depending on the rate as shown below. In general the decimal point is automatically shifted to eliminate redundant digits that add “jitter” while maintaining a 1% resolution for high accuracy.

English Units:

When slowly increasing from 0 to maximum, the decimal point will automatically shift at the following values:

3 decimal places	0.000 – 1.999
2 decimal places	2.00 – 9.99
1 decimal place	10.0 – 99.9
No decimal place	100 – 16,777 (displays OFL)

When slowly decreasing from maximum to 0, the decimal point will automatically shift at the following values:

No decimal place	16,777 – 90
1 decimal place	89.9 – 9.0
2 decimal places	8.99 – 1.00
3 decimal places	0.999 – 0.000

Between each of the above 4 decimal ranges, a hysteresis window as shown below will prevent rapid

switching back and forth between decimal points.

2 or 3 decimal places	1.000 – 1.990
1 or 2 decimal places	9.00 – 9.90
0 or 1 decimal places	90.0 – 99.9

Metric Units:

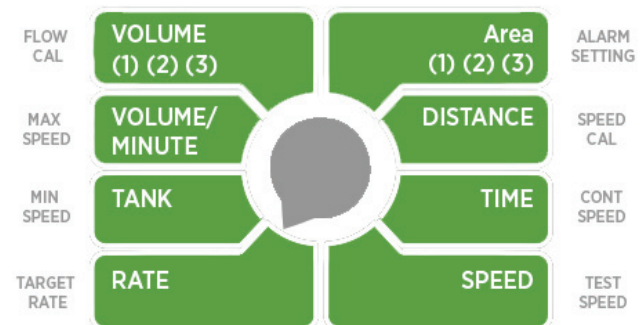
When slowly increasing from 0 – maximum the decimal will shift at the following values:

1 decimal place	0.1 – 99.9
No decimal place	100 – 99,999 (then goes to OFL)

When slowly decreasing from maximum to 0 the decimal will shift at the following values:

No decimal place	99,999 – 90
1 decimal place	89.9 – 0.1

If an error between the Actual Rate and the Target Rate is $\geq 5\%$ then the display simply show the Target Rate. If the error ever exceeds 10% then the Warn LED and the audible alarm will turn on (steady). However, the audible alarm (only) can be delayed by adjusting the “Alarm Setting” calibration value.



Rotary Dial Functions (Cont.)

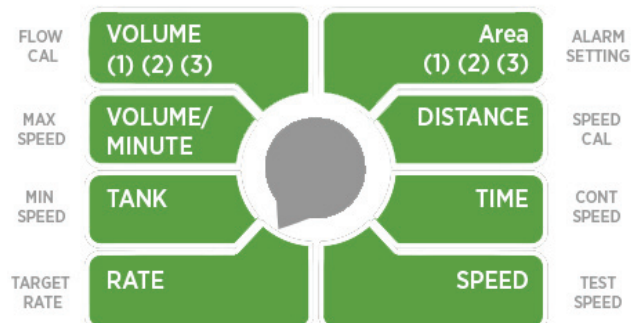
NOTE: The Application Rate display window will always match the Rate displayed in the Data display window except for the following:

- Displays Target Rate for 3 seconds when the Rate Toggle switch is changed and the “FILL” message does not alternate with it.
- Alternate between “Lo” and “SPEED” when in VARIABLE mode (and not PCOFF) if the speed is below “min Speed”, and it will alternate between “hi” and “SPEED” if the speed is above “Max Speed: cal factor. This will take precedence over the 3 second display of Target Rate.
- Displays “OFF” when in OFF mode or display “PCOFF” is PC issued and Off command by sending target+0. “OFF” takes precedence over “PCOFF” and both take precedence over the “Lo/Hi Speed” and “OFL” messages.

If some error occurs “Err 1” – “Err 4” will display and take precedence over the the above messages (OFF, PCOFF, OFL, FLUSH and Hi/Lo SPEED). (See Error Codes section for details).

- It will alternate “FILL” when the Tank level is low and these messages: OFF, PCOFF, OFL, ErrX. (FILL is not displayed when it’s alternating between “Lo/Hi and SPEED”.)
- The MAN icon is on when in CONTINUOUS mode and the AUTO icon is on when n VARIABLE mode.
- A number icon 1,2,3 will turn on, based on the rate selected with the Rate Toggle switch. When in PCCC mode, these numbers will be off. This will remind the user the SmartFlow II is under PC control and it’s using a Target received from the PC rather than Target Rate 1, 2 or 3.

The Application Rate display is blanked during power up when the SmartFlow II Hours and REV level are displayed.



Toggle Switches

The SmartFlow II has six toggle switches:

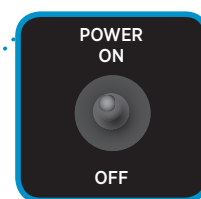
1. Power On/Off Switch

The Power switch is a momentary, single-pull, single-throw (**SPST**) switch.

NOTE: The Power switch is a momentary Single Pole, Single Throw (SPST) switch. In the up or ON position the SPST switch contacts are open. In the momentary OFF position (down) the switch contacts are closed to provide a ground to an external Circuit Breaker. Power is turned “on” by activating an external main power switch on the ProMist Dura which supplies power directly to the SmartFlow II. This power bypasses the momentary Power toggle switch. The function of the switch solely to power down the SmartFlow II console and the ProMist Dura.

To turn the system “off” the user must hold the power switch in the **OFF** (down) position which supplies a ground to an external Circuit Breaker. This ground trips the Circuit Breaker cutting power to the SmartFlow II (and everything else).

To Power back on, the machine’s main power switch must be turned on.



CONTROL PANEL FUNCTIONS

SMARTFLOW II

Toggle Switches (Cont.)

2. Spray Head

On/Off toggle switch turns the spray head on and off.



3. Light

On/Off toggle switch turns the work light on and off.



Toggle Switches (Cont.)

4. Maintenance Alert

The Maintenance Alert provides a countdown timer displayed in tenths of seconds which is used to monitor the condition of the “Disposable Sleeve” and works only when running in **VARIABLE** or **CONTINUOUS** mode with “RPM OK” input active. The timer does not countdown when in **OFF**. When the time expires, the sprayer is shot down (spray head and chemical pump are stopped). A warning is given 1 minute prior to shutdown and after this point the Snooze feature may be activated.

The Maintenance Alert toggle has two positions: **TIME REMAINING** and **SNOOZE**.

TIME REMAINING allows the operator to check or reset the remaining time. (Time remaining values are stored on power down.) Holding the **TIME REMAINING** toggle will show the time remaining on the Application Rate display window. (If Snooze has been activated, a “-” sign is displayed before the time remaining to indicate that the spray head is running on borrowed time.)

With the **SPRAY** toggle switch in **OFF***, holding the **TIME REMAINING** toggle and then also pressing the **RESET** key for 1 second will reset the Maintenance Alert timer to its preset value. (See Special Calibration: Maintenance **ALERT** time).

NOTE: As a safety mechanism, the Spray switch is required to be in the OFF position (not VAR or CONT), because resetting the Maintenance Alert timer automatically re-starts the sprayer.

TIME REMAINING displays “**OFF**” if the feature is disabled. (Special Calibration: Maint.**ALERT** Time = “OFF”).

Alarm Indicators: notify the operator on the Sleeve condition.

No-Alarm (normal operation) Maintenance Alert Timer > 1 minute:

- None



Alarm-Notify (1 min. warning) Maintenance Alert Timer < 1 minute:

- Audible Alarm beeps 3 times, then stops.
- Red **LED** flashes.
- “**ALERT**” message shown on Application Rate display window, alternates with normal display values/messages.

Alarm-Active (Sprayer Shut Down) Maintenance Alert Timer = 0 (Expired):

- Audible Alarm sounds for 3 seconds, then turns off.
- Red **LED** flashes.
- Alternation messages “**CHECK**” and **SLEEV**” are shown on Application Rate display window until Maintenance Alert Timer is reset.

SNOOZE toggle position is used to display the current “Snooze Count” value or to activate the Snooze feature which temporarily allows continued operation. “Snooze Count” values are stored on power down so the SmartFlow II will remember how many Snoozes have already been used.

Selecting the **SNOOZE** toggle shows the current Snooze-Count on the Application Rate display window as long as the toggle switch is held. If the current Snooze value has reached the MaxSnooze Count (see Special Calibration: Max Snooze Count), then Snooze can no longer be activated and the Snooze Count does not increment. Resetting the Maintenance Alert Timer clears the Snooze Count to 0.

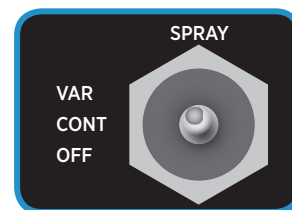
Toggle Switches (Cont.)

5. Spray Toggle Switch

The Spray toggle switch has three positions

VAR (Variable), **CONT** (Continuous), **OFF** (off mode, not Power Off).

Spray Toggle Switch Positions



CALIBRATION FACTOR	DESCRIPTION
VAR Position	Variable Mode The SmartFlow 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 SmartFlow 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, FlowPer Minute, and Active Swath values go to zero. Total Flow and Tank counters accumulate in this mode in case flow does not stop immediately.

VAR:

In the **VARIABLE** position the **AUTO** icon turns on in the Application Rate display window. As the Speed of the vehicle can “vary”, the SmartFlow II will “vary” the drive to the electric pump to automatically maintain the selected Target Rate (1, 2, or 3). Both Speed and Flow are measured to compute and control the application rate (Oz/Acre).

When switched from **OFF** to the **VARIABLE** mode the user must also turn on the Spray Head switch, which will start the spray head motor.

NOTE: The motor/head activates an internal “RPM OK” switch when it reaches 27,500 RPM. If the pressure is sufficient, (“Pressure OK” or “RPM OK”) then the SmartFlow II will turn on the spray pump by turning on the “EPD Enable” output. The “EPD Enable” is turned back off if the “Pressure OK” or “RPM OK” inputs ever indicate low pressure or low RPM.

The Target Rate cannot be adjusted by using the INC and DEC buttons.

Toggle Switches (Cont.)

CONT:

The **CONTINUOUS** mode can be used to spray while stationary or parked. In the position the **MAN** icon turn on in the Application Rate display window. The Speed is assumed to be “continuous” or a constant speed. The SmartFlow II will measure the flow (but not the speed) and automatically adjust the sprayer to maintain the selected Target Rate* (1, 2, or 3) on a “continuous” speed even though the actual **CONTINUOUS** ground speed may vary or is stopped. Only the Flow is measured to compute and control the application rate (Oz/Acre) independent of actual ground speed.

NOTE: The Target Rate cannot be adjusted by using the INC and DEC buttons.

When switched from **OFF** to the **CONTINUOUS** mode, the SmartFlow II will turn on and off as described in **VARIABLE** mode.

The “Continuous” speed Calibration value can be set from 2.0 – 45.0 mph (or kph) and the same speed is used for all 3 Rates. If the “speed” position is selected on the rotary switch, it will flash the “Continuous Speed” Calibration factor rather than show the actual speed.

OFF:

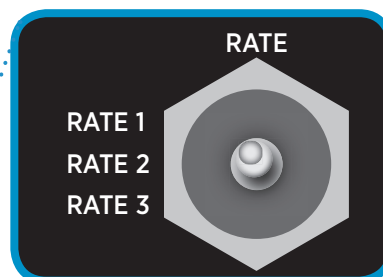
In the **OFF** mode the Application Rate display will show “**OFF**” and the **AUTO** and **MAN** icons will turn off. The SmartFlow II will stop the sprayer.

Toggle Switches (Cont.)

6. Rate Toggle Switch

This toggle switch is used to select from 1 to 3 pre-programmed application rates for **VARIABLE** or **CONTINUOUS** spray rate control. A number icon 1, 2, 3 will turn on in the Application Rate display window to reflect which rate is selected.

When the Rate switch is changed, the Application Rate display window will show the selected Target Rate for 3 seconds if in **VARIABLE** or **CONTINUOUS** mode. It is not displayed while in the **OFF** mode because “**OFF**” is being displayed, but the new rate is still selected.



Push Buttons

The SmartFlow II has four push buttons. Their functions are described below:

1. Reset Button

When Area and Volume 1 (only) are selected then the **RESET** button will clear 4 counters (Area 1, volume 1, Distance and Time) at the same time. When in the **OFF** mode, and in the Distance, Area, Volume or Time rotary position then pressing the **RESET** button for 1 second will clear Time, Distance, Area 1 and Volume 1 (4 counters). While in the Distance or Time position it will not display “**CLEAR**” or clear any counters unless the counter pair 1 is selected in Area or Volume.

The Area-Volume pairs 2 or 3 are cleared independently. While in Area of Volume mode, select the desired pair to clear (2 or 3) and with the Spray toggle in **OFF** mode press the **RESET** button for 1 second. Since the Area and Volume counters are paired, clearing a selected Area counter will also clear the corresponding Volume counter (and vice versa).

When the **RESET** button is pressed it will immediately display “**CLEAR**” in the Data display window as a warning that it is about to clear counters. If the **RESET** button is released while displaying “**CLEAR**” then the counters remain unchanged. If the **RESET** button is pressed for 1 second or more then the “**CLEAR**” message disappears and is replaced with “0” to indicate the counters were cleared.

When fine tuning Flow Cal, the **RESET** button is pressed to immediately clear a separate (independent) Volume counter only used for fine tuning Flow Cal (“**CLEAR**” is not displayed).

Pressing **RESET** while in the PcOff will have no effect and will not clear any counters. Instead the SmartFlow II must be in **OFF** mode using the console’s Spray toggle switch. (See Maintenance Alert section for additional use of **RESET** button.)



CONTROL PANEL FUNCTIONS

SMARTFLOW II

Push Buttons

2. INC (+) and

3. DEC (-)

The **INC/DEC** buttons are used to enter or adjust values in the display.

If in Volume or Area mode the **INC/DEC** buttons will select 1 of 3 counters.

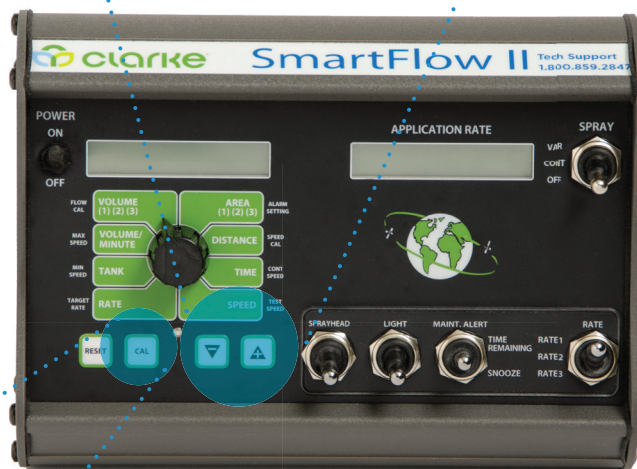
If in the **Tank** mode then the **INC** or **DEC** buttons are used to change the Tank level. This also works while in the **PCCC** (PC Command/Control) mode.

If in **Speed** position and **Test Speed** mode, then the **INC** and **DEC** buttons will adjust the Test Speed.

In the **Calibrate** or special **Calibrate Mode**, the **INC** or **DEC** buttons are pressed to increase or decrease each Calibrate value and the longer the key is pressed the faster the value will change. (See Maintenance Alert section for additional use of the **DEC** button).

4. CAL Button

Used to start and stop the Calibrate modes (see Calibrate Modes and Special Calibrate Modes).



Calibration

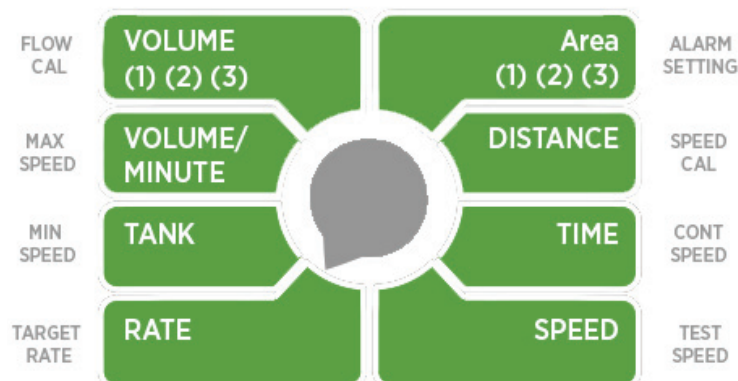
This section covers these calibration factors and procedures:

Calibration Factors	Page 87
How to Enter the Calibrate Mode	Page 88 - 89
Alarm Setting	Page 90
Speed Cal	Page 91
Cont. Speed	Page 91
Test Speed	Page 92
Target Rate	Page 93 - 94
Min Speed	Page 95
Max Speed	Page 96
Flow Cal	Page 97
How to Calibrate	Page 98
Reloading Calibration Defaults	Page 99 - 100

Calibration Factors

The SmartFlow II control has 8 calibration factors:

CALIBRATION FACTOR	ROTARY SWITCH POSITION	DESCRIPTION
Alarm Setting	AREA (1) (2) (3)	Sets the delay time for triggering the audible alarm.
Speed Cal	DISTANCE	Specifies the distance the vehicle travels between speed sensor pulses. This enables the SmartFlow II control to accurately measure speed, distance, area and application rate.
Cont. Speed	TIME	The speed that is used in Continuous mode.
Test Speed	SPEED	Not a true calibrate factor, but a method of testing the sprayer.
Target Rate	RATE	Sets the three preset Target Application Rates.
Min 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.
Max Speed	VOLUME/MINUTE	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.
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.



How to Enter Calibration Mode

Two methods can be used to enter the Calibrate mode.

1. Only allows user to view the Cal factors. To enter “View” Calibration Mode:

- Toggle the Spray Switch to **OFF**.
- Press and hold the **CAL** button for 1 second. The word “**CAL**” will be displayed in the Application Rate display window and the Data display window will show the Cal factors. The red Warn **LED** will remain off as a reminder the user cannot change the Cal factors.

To exit “View” Calibration Mode:

- Press **CAL** button for 1 second.

NOTE: The audible alarm remains off while in either Cal mode except when fine tuning Flow Cal (where auto control operates).



How to Enter Calibration Mode (Cont.)

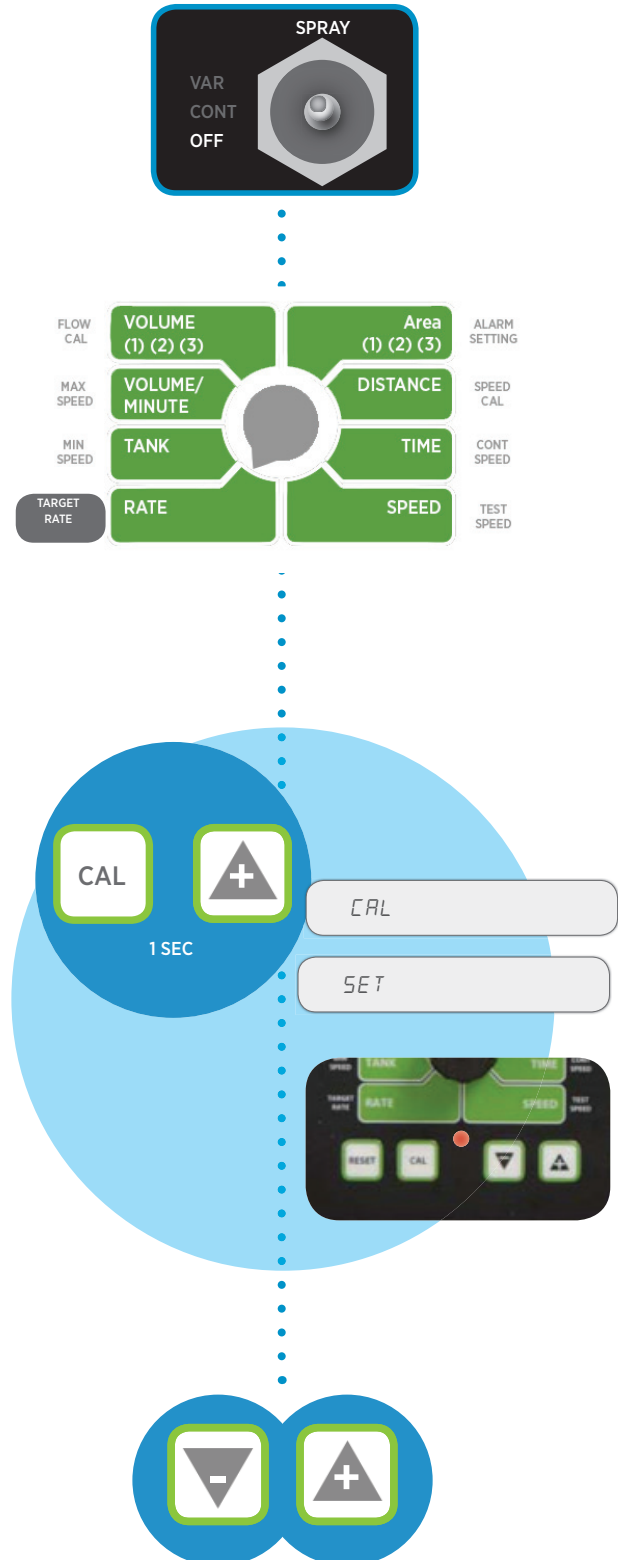
2. Allows user to view and change the cal factors.

To enter “View and Change” Calibration Mode:

- Toggle the Spray Switch to **OFF**.
- Turn Rotary switch to Target Rate” position. Press and hold both the **CAL** and **INC** button for 1 second. The work “**SET**” will be displayed in the Data display window and the word “**CAL**” will be displayed in the Application Rate display window. The red Warn **LED** will flash on/off as a warning that the cal factors can be set (changed). A calibration factor is selected with the rotary switch. The word “**SET**” remains in the Data display window until the user releases both the **CAL** and **INC** buttons to prevent accidental increments to a Cal factor. The **INC** or **DEC** buttons are used to adjust the Calibrate factor and the longer the key is pressed the faster the value will change.

To exit “View and Change” Calibration Mode:

- Press the **CAL** button for 1 second with the rotary switch in any position. The Spray switch can be in **VARIABLE**, **CONTINUOUS** or **OFF**. If a Cal change was made the SmartFlow II will store the Cal factors in **EEPROM**.
- To exit Calibration Mode without saving any changes, simply turn the Power off.



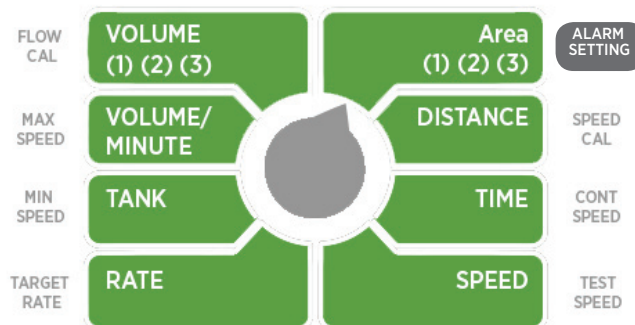
Calibration Factors

1. Alarm Setting

The **ALARM SETTING** calibration factor is used to set the delay time for triggering the audible alarm*. This delay can be changed from 0 – 6 seconds.

1. To set the **ALARM SETTING** Cal factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads SET and the red Warning **LED** light is flashing.
2. Move the rotary dial to **ALARM SETTING** position. In the Data Display window, the DELAY SECONDS are displayed. In the Application Rate Window, CAL is displayed.
3. Use the **INC/DEC** buttons to increase or decrease the time.
4. Rotate the rotary dial to **TARGET RATE**, press and hold the **CAL** button for 3 seconds to save the change and exit Calibration mode.

***NOTE:** This delay setting only affects the audible alarm, it does not affect any visual alarm (warning LED). It also does not affect the Tank alarm (slow beeping) of the Min/Man speed alarm (fast beeping). Example: Whenever there is more than 10% error in the application rate, the Warning LED will turn on (not affected by this setting), but the audible alarm will not turn on for another (delay value) seconds. Therefore, if the SmartFlow II has settled on target withing (delay value) seconds, the audible alarm will not turn on. This temporary delay in sounding the Audible Alarm helps to prevent it from becoming a nuisance alarm (where user may be tempted to shut it off).



Calibration Factors (Cont.)

2. Speed Cal

SPEED CAL displays the Distance Sensor Cal factor in distance traveled between speed sensor pulses. It can be changed from 0.001 – 655.36 cm per Edge (rise and fall from pulse to pulse).

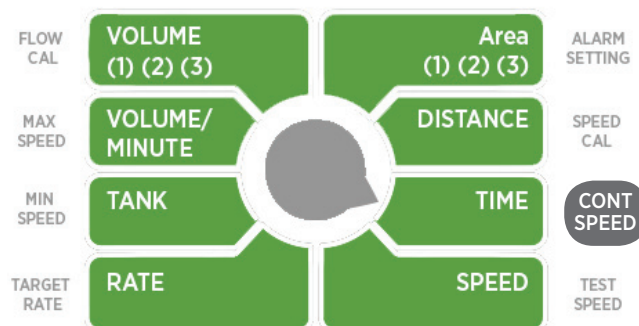
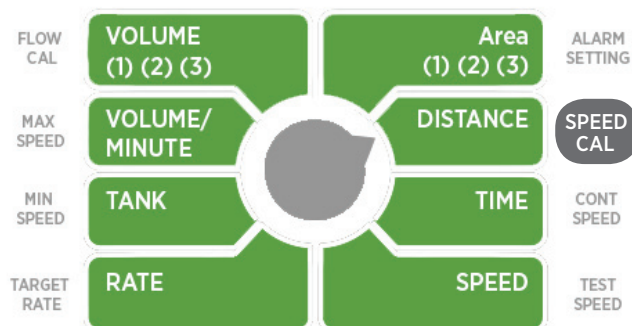
To use GPS speed Sensor the user must set Speed Cal to zero (no calibration is required).

1. To set the **SPEED CAL** factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads **SET** and the red Warning **LED** light is flashing.
2. Move the rotary dial to **SPEED CAL** position. The Data Display window will show speed sensor pulses. In the Application Rate Window, CAL is displayed.
3. Use the **INC/DEC** buttons to set to zero.
4. Rotate the rotary dial to **TARGET RATE**, press and hold the **CAL** button for 3 seconds to save the change and exit Calibration mode.

3. CONT Speed

CONT SPEED displays the Continuous Speed value which can be adjusted from 2.0 – 45.0 mph or kph. This Speed is used for all Application Rates when in the **CONTINUOUS** mode.

1. To set the **CONT SPEED** factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads **SET** and the red Warning **LED** light is flashing.
2. Move the rotary dial to **CONT SPEED** position. 'SPEED' is displayed in the in the Data display window and the current Continuous Speed is displayed in the Application Rate display window.
3. Use the **INC/DEC** buttons to increase or decrease the speed.
4. Rotate the rotary dial to **TARGET RATE**, press and hold the **CAL** button for 3 seconds to save the change and exit Calibration mode.



Calibration Factors

4. Test Speed

TEST SPEED is not a true “calibrate factor” but rather a method of testing the sprayer. Typically it is used to confirm that **Auto Control** can be maintained across a range of expected ground speeds. The **VARIABLE** mode (on **SPRAY** toggle switch) must be selected because the **CONTINUOUS** mode will always use the “Continuous Speed” cal factor (instead of Test Speed). It will display “GoVAr” (Go to **VARIABLE**) if the user tries to adjust the Test Speed while in the **CONTINUOUS** mode.

Each time the Calibrate Mode is selected (either “View” or “View and Change” cal mode) the Test Speed will be reset to 0 mph (turned off) so it does not interfere with any other calibration procedures.

To use Test Speed:

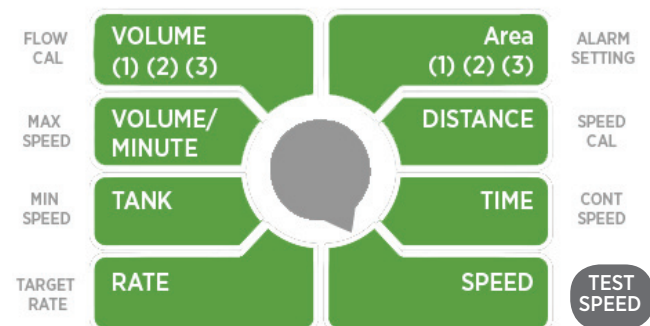
- Turn the rotary dial to the **Speed** position and use the **INC** button to adjust it above 0 mph. (Any non-zero Test Speed will make the **CAL** icon flash and the Warn LED light will turn on to remind the user that a “Test Speed” is running and the Calibrate Mode is no longer fully operating and therefore he cannot change any Calibrate factors).
- Normal operating modes will now use the Test Speed instead of the actual speed input.
- **Speed** will operate using the **Test Speed** and **Volume, Tank, Rate** and **Volume/Minute** will also operate.
- The **Area** and **Distance** will not change while in the Test Speed Mode. The Application Rate window will show normal data instead of “CAL”.
- The audible alarm will operate as normal.
- In the **VARIABLE** mode the SmartFlow II will automatically adjust the flow to reach the Target Rate (GPA) based on the Test Speed.
- In the **CONTINUOUS** mode, SmartFlow II will adjust the flow to reach the Target Rate (GPA) based on the Continuous speed cal factor (instead of Test Speed).

To exit Test Speed:

Hold the **CAL** button for 1 second (or turn the SmartFlow II off) and the **CAL** icon will stop flashing, the red Warning LED will turn off and Test Speed will be exited. (The Test Speed cannot be turned off by reducing it to 0 because the minimum Test Speed is 0.1 mph.

NOTE: If the user changes some Cal Factors and then instead of exiting **CAL** mode he starts the Test Speed mode, then all Cal Factors will be stored in EE when he stops Test Speed mode by exiting the CAL Mode. But if the user cycles power to stop the test speed mode then the Cal Factors will **NOT** be stored.

While in the Speed position holding the **CAL** and **INC** buttons will not start the Test Speed Mode. This could happen by accident when the user is trying to start the “View and Change” Cal mode but is accidentally in the **Speed** position instead of the **Rate** position.



Calibration Factors

5. Target Rate

TARGET RATE displays the Target Application rate for **VARIABLE** and **CONTINUOUS** mode (automatic control). Up to three different Target Rates can be programmed in oz/acre or from mLiter/Hectare. Since a typical rate is 1.00 oz/acre (73.1 mL/Hectare) this provides excellent resolution and range.

The **Rate** toggle switch (Rate 1, 2 or 3) will determine which target Rate is selected and the number icon (1, 2 or 3) will be displayed in the Application Rate display window.

Target Rate is displayed with one or more decimal places depending on the flow rate as shown below. It can range from 0.01 – 99,999.

1. To set the **TARGET RATE** factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads SET and the red Warning LED light is flashing.
2. Move the rotary dial to **TARGET RATE** position.
3. Move the rate 1, rate 2 OR rate 3 toggle switch to select the Target Rate to be changed.
4. The selected rate and current units are displayed in the in the Data display window and the current target application rate is displayed in the Application Rate display window.
5. Use the **INC/DEC** buttons to increase or decrease the speed.
6. Rotate the rotary dial to **TARGET RATE**, press and hold the **CAL** button for 3 seconds to save the change and exit Calibration mode.

English Units:

When slowly increasing from 0 to maximum, the deimal point will automatically shift at the following values:

VALUE	DECIMAL PLACES	RANGE
5	3	0.000 - 1.999
6	2	2.000 - 9.90
7	1	10.0 - 99.0
8	None	100 - 16,777 (and then stops)

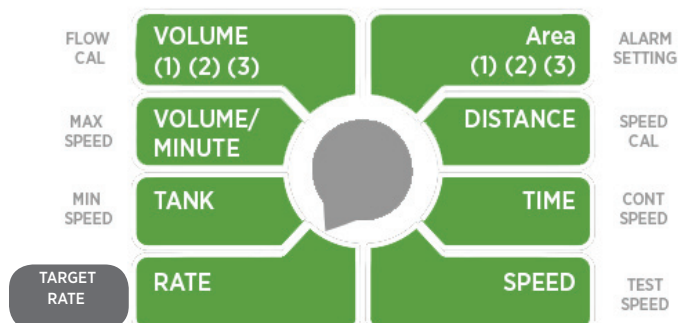
When slowly decreasing from maximum to 0, the decimal point will automatically shift at the following values:

VALUE	DECIMAL PLACES	RANGE
5	None	16,777 - 90
3	1	89.9 - 10.0
2	2	9.90 - 1.00
1	3	0.999 - 0.000

Between each of the above 4 decimal ranges, a hysteresis window as shown below will prevent rapid switching back and forth between decimal points.

2 or 3 decimal places 1.000 - 1.990

0 or 1 decimal places 90.0 - 99.0



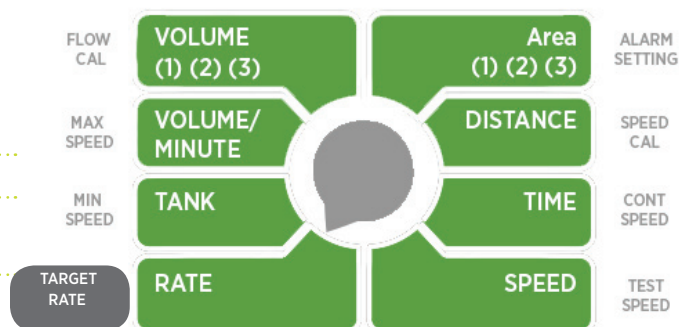
Calibration Factors

5. Target Rate (Cont.)

Metric Units:

When slowly increasing from 0 – maximum the decimal will shift at the following values:

DECIMAL PLACES	RANGE
1	0.1 – 99.9
None	100 – 99,999 (then goes to OFL)



When slowly decreasing from maximum to 0 the decimal will shift at the following values:

DECIMAL PLACES	RANGE
None	99,999 – 99
1	98.9 – 0.1

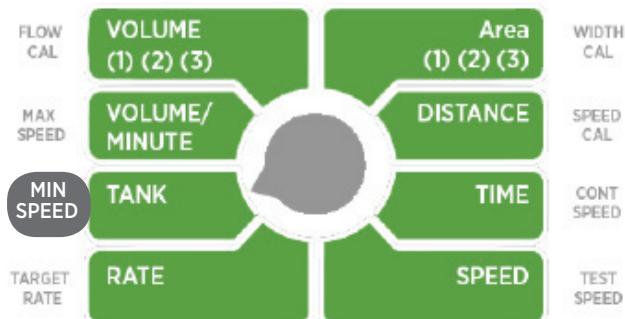
Calibration Factors (Cont.)

6. Min Speed

MIN SPEED displays the “Minimum Speed” which can be adjusted from “off” to 0.1 to 45.0 mph or kph. If used, the user must ensure that Min Speed is less than Max Speed (if used) or else the sprayer will never turn on.

Min Speed is used to stop the sprayer (and Distance, Area and Time counting) when the ground speed drops below this limit (in the **VARIABLE** mode only).

1. To set the **MIN SPEED** factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads SET and the red Warning LED light is flashing.
2. Move the rotary dial to **MIN SPEED** position. ‘Lo’ is displayed in the in the Data display window and the current Minimum Speed is displayed in the Application Rate display window.
3. Use the **INC/DEC** buttons to increase or decrease the speed.
4. Rotate the rotary dial to **TARGET RATE**, press and hold the **CAL** button for 3 seconds to save the change and exit Calibration mode.



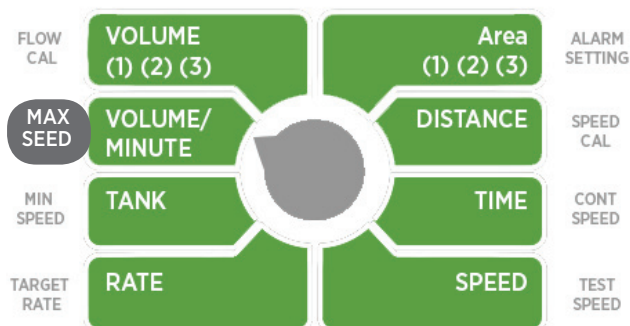
Calibration Factors (Cont.)

7. Max Speed

MAX SPEED displays the “Maximum Speed” which can be adjusted from “Off” to 0.1 to 45.0 mph or kph. If used, the user must ensure that **MAX SPEED** is greater than Min Speed (if used) or else the sprayer will never turn on.

MAX SPEED is used to stop the sprayer (and Distance, Area and Time counting) when the ground speed exceeds this limit (in the **VARIABLE** mode only).

1. To set the **MAX SPEED** factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads SET and the red Warning LED light is flashing.
2. Move the rotary dial to **MAX SPEED** position. ‘Hi’ is displayed in the in the Data display window and the current Minimum Speed is displayed in the Application Rate display window.
3. Use the **INC/DEC** buttons to increase or decrease the speed.
4. Rotate the rotary dial to **TARGET RATE**, press and hold the **CAL** button for 3 seconds to save the change and exit Calibration mode.



Calibration Factors

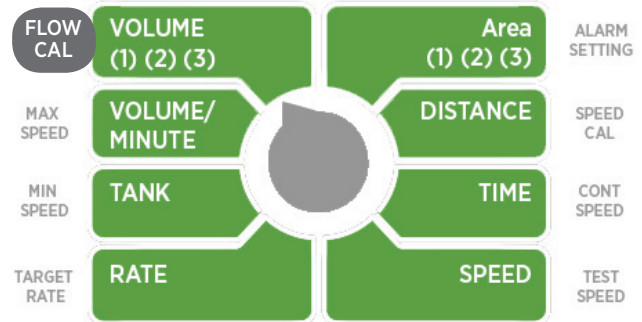
8. Flow Cal

In the Flow Cal position the current Flowmeter Calibrate factor value will be displayed. This specifies the number of flow sensor pulses per gallon applied. This enables the SmartFlow II control to accurately measure total flow, flow per minute and application rate. The Flowmeter calibrate factor is in (English or Metric).

1. To set the Flow Cal factor: Place the SmartFlow II in Calibration mode by placing the rotary dial to **TARGET RATE** and hold the **CAL** and **INC** buttons together until the console reads SET and the red Warning LED light is flashing.
2. Place the **RATE** toggle switch to **RATE 1**.
3. Move the rotary dial to **FLOW CAL** position
4. Set the correct rate* for your product's fluid oz./min. per the product label by using the **INC/DEC** buttons. This rate will be displayed in the Application Rate display window.

***HINT:** Choose your fluid oz./min. per product label, then divide by 6 to give you your correct target rate to program the console.

5. The selected rate and current units are displayed in the in the Data display window and the current target application rate is displayed in the Application Rate display window.



To Calibrate:

1. **Fill** your formulation tank.
2. **Power** move the SmartFlow II POWER toggle switch to "ON".
3. **Check** to make sure the SPRAY toggle switch is on "OFF".
4. **Turn** rotary switch to RATE/TARGET RATE position.
5. **Press** CAL and INC buttons simultaneously. "Cal" will appear in the application rate window.
6. **Disconnect** the product/formulation line from nozzle (or spray head) and have someone hold it in a container with ounce markings (should hold at least 64 oz. or 1/2 gallon)
7. **Turn** rotary switch to VOLUME (1) (2) (3)/FLOW CAL position.
8. **Move** the SPRAY toggle switch to "CONT".
9. **Turn** the container to 64 oz..
10. **Move** the SPRAY toggle switch to "OFF".
11. **Check:** Press the CAL button momentarily and the Data display window will change to show the amount in ounces..
12. **Adjust** If the number in the Data display window does not equal the number of ounces pumped into your container, press the INC or DEC buttons until the rate shown in the Data display window equals the amount in the container. You'll need to hold for 10 seconds before adjustment begins.
13. **Save** Rotate the rotary dial to TARGET RATE, press and hold the CAL button for 3 seconds to save the change and exit Calibration mode.
14. **Reattach** the product line.
15. **Ready** *The SmartFlow II can be programmed to save 3 calibration rates by repeating the above process and selecting the RATE toggle switch and moving to Rate 1, Rate 2, and Rate 3 respectively. If there is a huge differentiation in fluid oz/min you might need to make a pump adjustment by turning up or down the pump dial located on the pump in the pump box.

To fine tune the Flow Cal Value:

Verify the **VOLUME** counter is currently displayed. Use the **INC** and **DEC** buttons (press and hold) to adjust the **VOLUME** counter until it matches the actual total volume in the calibrated container. This will automatically fine-tune the Flow Cal value. Press the **CAL** button again to toggle the display to show the Flow Cal value and write it down for future reference. Repeat the test to confirm the accuracy.

NOTE: The Flow Cal value is always displayed when the rotary switch is turned to the Flow Cal position. So if a user displays the Flow Cal value and then presses the CAL button to toggle to the Volume 1 value, leaves it displaying the Volume 1 and then rotates the switch to some other Cal factor, when he returns to the Flow Cal position it will automatically switch back to displaying the Flow Cal value rather than staying "stuck" in the volume 1 display (with the CAL icon flashing).

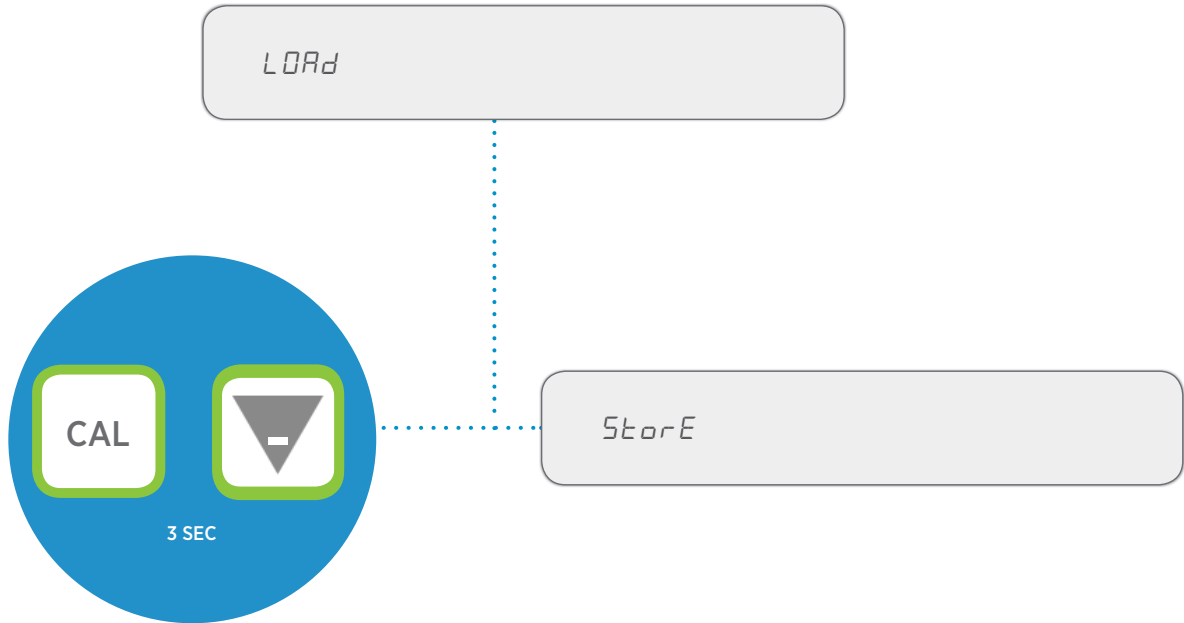
Reloading Calibration Defaults

Default Calibrate factors are loaded, and all Counters are cleared, if the **CAL** and **DEC** buttons are held while turning the SmartFlow II on. If the rotary switch is in the position, it will select the Metric Units and load Metric defaults. Any other rotary position will select English units and load English defaults.

CAL FACTOR	ENGLISH	METRIC
Distance	0	0
Area 1	0	0
Area 2	0	0
Area 3	0	0
Gallons 1	0	0
Gallons 2	0	0
Gallons 3	0	0
Tank	15.0	56.8
Time	0	0
Audible Alarm Delay "Alarm Setting"	3 sec	3 sec
Speed Cal	189 (inch/edge)	0.48 (cm/edge)
Flow Cal (Edges/Oz)	2660.0	2660.0
Target Rate 1	1.00 Oz/A	73.0 mL PH
Target Rate 2	1.00 Oz/A	73.0 mL PH
Target Rate 3	1.00 Oz/A	73. mL PH
Continuous Speed	10.0 mph	16.0 kph
Min Speed	2.0 mph	3.2 kph
Max Speed	22.0 mph	35.4 kph
Units	0 (Eng)	1 (Metric)
Vehicle ID	1	1
Width	300.0 feet	91.44 m
Control Speed	-1	-1
Tank Set Point	2.0 Gal.	7.5 Liter
Tank Size	15.0	56.8
Maintenance Alert Timer	15.0 hours	15.0
Max Snooze Count	8	8

Reloading Calibration Defaults (Cont.)

To confirm that defaults were actually loaded, the SmartFlow II will display LOAd for at least 1.5 seconds or as long as the **CAL** or **DEC** buttons are held, up to 3 seconds. If the **CAL** and **DEC** buttons are held for 3 seconds, the display will change to StorE and the defaults will be saved to EEPROM. If the **CAL** and **DEC** keys are ehld less than 3 seconds then StorE is never displayed and defaults are loaded but not stored in EEPROM.



NOTE: When loading defaults the Tank value is loaded with the default 'Tank Size' to prevent a Tank Alarm after loading defaults.

Special Calibration Modes

This section covers these special calibration modes and procedures:

Special Calibration Modes	Page 102
1. Units	Page 103
2. Vehicle ID	Page 103
3. Width	Page 103
4. Control Speed	Page 103
5. Tank Alarm Set Point	Page 103
6. Fill Tank Point	Page 103
7. Maintenance Alert	Page 104
8. Max Snooze Count	Page 104

SPECIAL CALIBRATION MODES

SMARTFLOW II

Special Calibration Modes

When in Special Calibrate mode various words will be displayed in the Application Rate display window to help identify which Special Cal Factor you have selected.

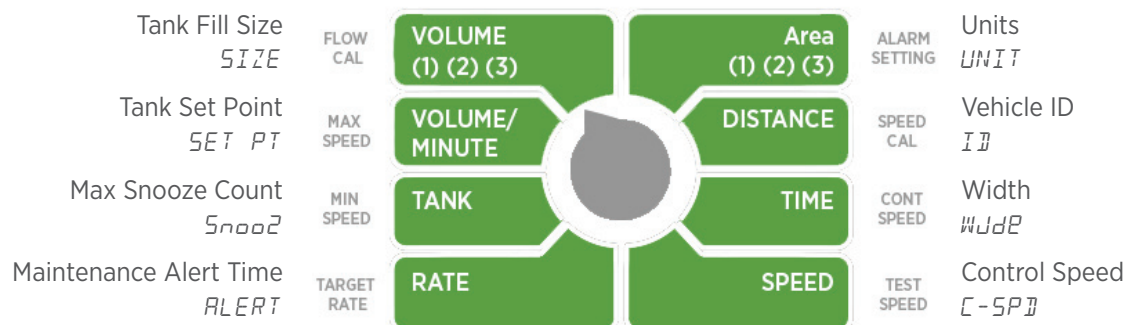
To enter **SPECIAL CALIBRATE** mode the user must turn the machine's Power Switch to **ON** then hold the **CAL** and the **RESET** button at the same time. The Data display will show "SPEC" for 1.5 seconds and then the value of the selected **SPECIAL CALIBRATE** factor.

The **CAL** icon will also be visible in the Data display window and the red Warn LED will flash to indicate that these factors can be adjusted.

Various words will be displayed in the Application Rate display to help identify which Special Cal Factor is selected. The **INC** or **DEC** buttons are used to adjust each **SPECIAL CALIBRATE** factor and the longer the button is pressed the faster the value will change.

All **SPECIAL CALIBRATE** factors will be stored in Electrically Erasable Programmable Read-Only Memory (**EEPROM**) when exiting **SPECIAL CALIBRATE** mode (press **CAL** button for 1 sec). They will not be saved when power is turned off, so if a user accidentally makes a change he can turn the power off to abort any **SPECIAL CALIBRATE** changes.

The following positions have a Special Cal factor. The Data display will show dashes and the Application Rate display will go blank when in an unused Special Cal position.



Special Calibration Modes (Cont.)

1. Units

Selecting Area position displays Unit in the Application Rate display and allows the user to change the Units. Pressing the **INC** or **DEC** button will toggle between English and Metric and the Data display will show Eng or mEt.

It is recommended that Units be changed by loading English or Metric defaults because changing the Units cal factor does not automatically convert other Cal factors. Therefore if the Units are changed the user must review and change all other cal factors (like Width) to the correct value for those units. display will go blank when in an unused Special Cal position.

2. Vehicle ID

Selecting Distance position displays I d in the Application Rate display and allows the user to change the Vehicle ID from 0 to 255.

3. Width

Selecting Time position displays UU idE in the Application Rate display and allows user to change the Width from 0.1 to 6,553.5 feet or 0.01 to 655.35 meters if Metric.

4. Control Speed

Selecting Speed position displays C-SPd in the Application Rate display and allows the user to change the Control Speed for the control algorithm. Pressing the **INC** or **DEC** key will adjust the Control Speed from -4 to 3. It is normally set in the middle (-1) but if needed, it allows the user to decrease or increase the Control Speed for his particular system.

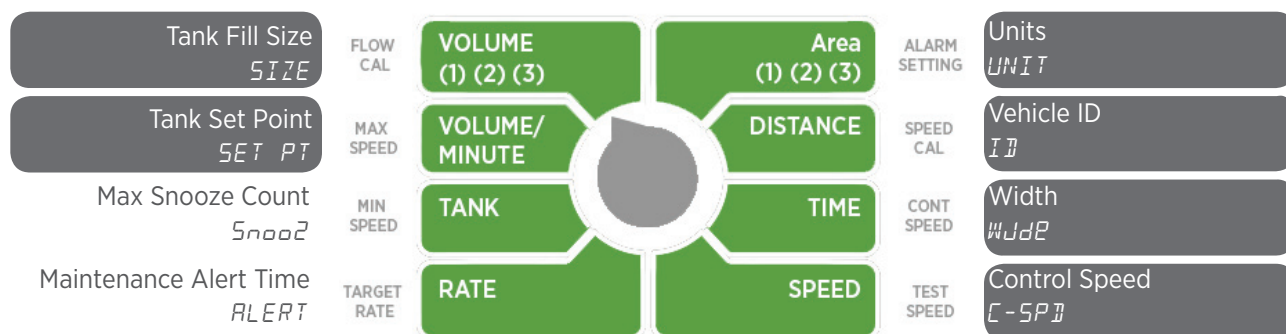
5. Tank Alarm Set Point

Selecting the Volume/Minute position displays SEEPE in the application Rate display and allows the user to change the **TANK ALARM SETPOINT** which can be toggled to **OFF** or set from 0.1 to 6,553.5 Gallons or Liters.

When **OFF** no alarm will be given as the Tank is emptied otherwise a visual and audible alarm is given. See Tank function for details.

6. Fill Tank Size

Selecting Volume position displays "SIZE" in the Application Rate display allows the user to enter a FILL TANK SIZE which can be toggled to **OFF** for 0.1 to 6,553.5 Gallons or Liters.



Special Calibration Modes (Cont.)

7. Maintenance Alert (Countdown Timer)

Selecting “Rate” in Special Calibrate mode displays **ALERT** in the Application Rate display window and allows the user to enter a “Maintenance Alert Timer” value which can be adjusted from **OFF** to 100.0 hours (Default = 0 or Off). When “Off” the feature is disabled.

The SmartFlow II controller for the Pro-Mist Dura comes with a new feature that helps keep track of the condition and maintenance of the disposable porous sleeve. By utilizing this programmable countdown timer and adjusting the set time to the average sleeve life you experience, it can be a vital tool in increasing the life and performance of your machine.

Sleeve life can vary depending on the purity and type of formulation used. (Clarke recommends changing the sleeve after approximately 30 hours of spray time.)

NOTE: NEVER CHANGE SLEEVE WITH HUB SECURED TO SPRAY HEAD. Damage to spray head motor is possible. See Sleeve Removal and Replacement instructions (pages 19 - 21).

The Maintenance Alert timer can be customized to fit your demonstrated sleeve life and can be set from 0 or OFF to 100 hours. Attention to inspection and maintenance is critical for the sleeve as well as the Strainer filter screen.

The **TIME REMAINING/SNOOZE** toggle allows operator to check (or reset) the time remaining until the preset maintenance Alert shutdown. A Snooze option is included and allows for a 1 hour time extension.

8. Max Snooze Count

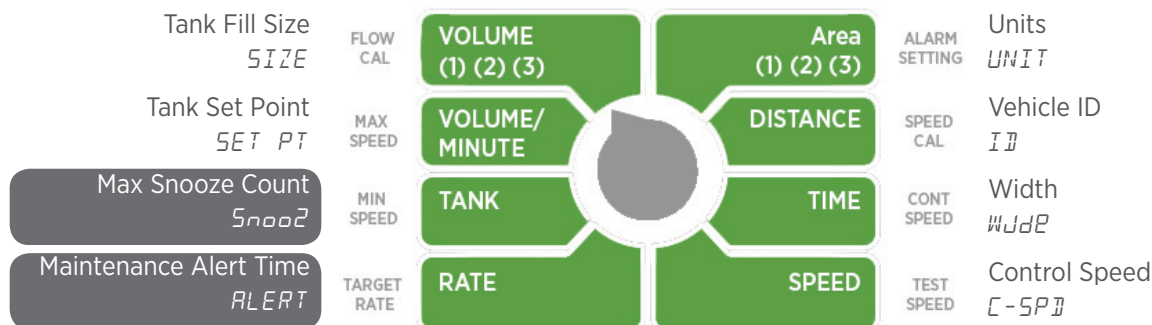
Selecting Tank in special calibrate mode displays “Snoo2” (Snooze) in the Application Rate display window and allows the user to enter a “Max Snooze Count” value which can be adjusted from 1 to 20 (Default = 8).

One minute prior to a Maintenance Alert shut down, an Alert (3 beeps and flashing red light) will notify that the end of the preset time is near. Snooze must be triggered during this 1 minute to extend time or sprayer will shut down. Actuating the Snooze toggle will add one hour to the timer for each snooze event and will increment the snooze counter.

The SNOOZE feature allows the operator to check the current Snooze Count value, as well as to activate Snooze. If on a spray mission it is advisable to hit the snooze to add one hour rather than resetting the timer fully without actually inspecting or changing the sleeve.

The Snooze feature allows for a customized number of snooze events, this can be set from 1 to 20. Both “Time Remaining” and “Snooze Count: values are stored on power down, so the console will remember the values if the sprayer is shut down.

Snooze must be triggered during this 1 minute to extend time or sprayer will shut down. After a shutdown it is possible to activate a snooze event if the **SPRAY** toggle is switched to the **OFF** position and then the Snooze toggle is actuated. Restart of the machine is then possible without resetting the timer. If Snooze has been activated a “—” sign is displayed before the time remaining to indicate that the Sleeve is running on “borrowed time”.



Operation

This section covers these operating procedures:

Startup/Shutdown..... **Page 106**

Power Up Messages..... **Page 107 - 108**

Selecting the Application Rate..... **Page 109**

Clearing Counters..... **Page 110**

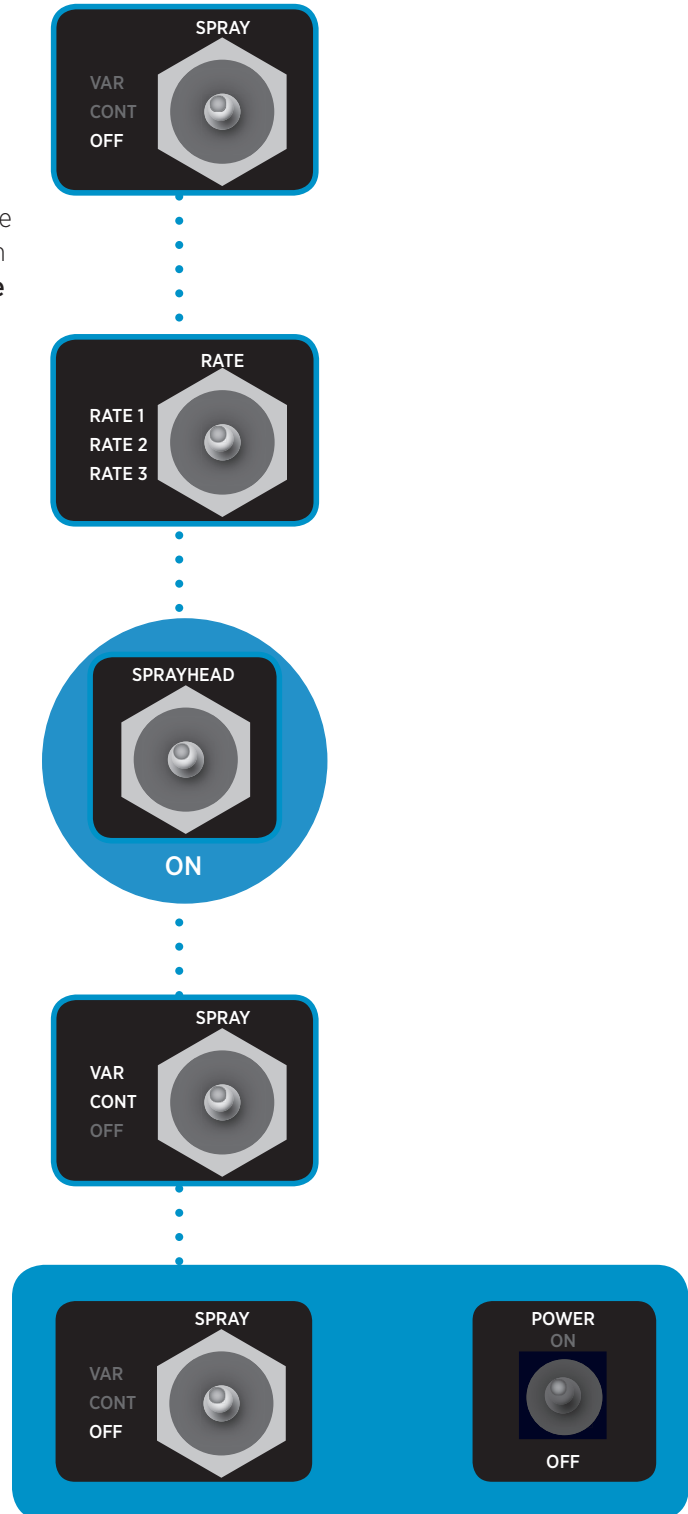
Adjusting Tank Volume..... **Page 111**

Resetting After a Maintenance
Alert Shut Down..... **Page 112**

Startup/Shutdown

Step by Step SmartFlow II Operation

1. Make sure **SPRAY** button is in **OFF** position on the SmartFlow II console.
2. Place **RATE** switch in position "RATE 1, RATE 2 or RATE 3".
3. (No need to turn on the power switch on the console as the power switch automatically defaults to the on position.) **You must turn on auxiliary power on the rear of the machine .**
4. Turn the **Spray Head** switch to the **ON** position.
5. When ready to start spraying move **SPRAY** switch to **VAR** or **CON** located on the console.
6. When done spraying flip **SPRAY** switch to **OFF**.
7. Flip **POWER** switch to **OFF** position. (This switch will again default to the **ON** position in a few seconds, but by this time, there will be no power to the machine.)



OPERATION

SMARTFLOW II

Power Up Messages

When the SmartFlow II is turned on it will give a very short beep and flash the Warning LED to ensure they are working.

It will then display the number of hours it has operated in 0.1 hour increments up to a maximum of 9999.9 hours (then it will display OFL).



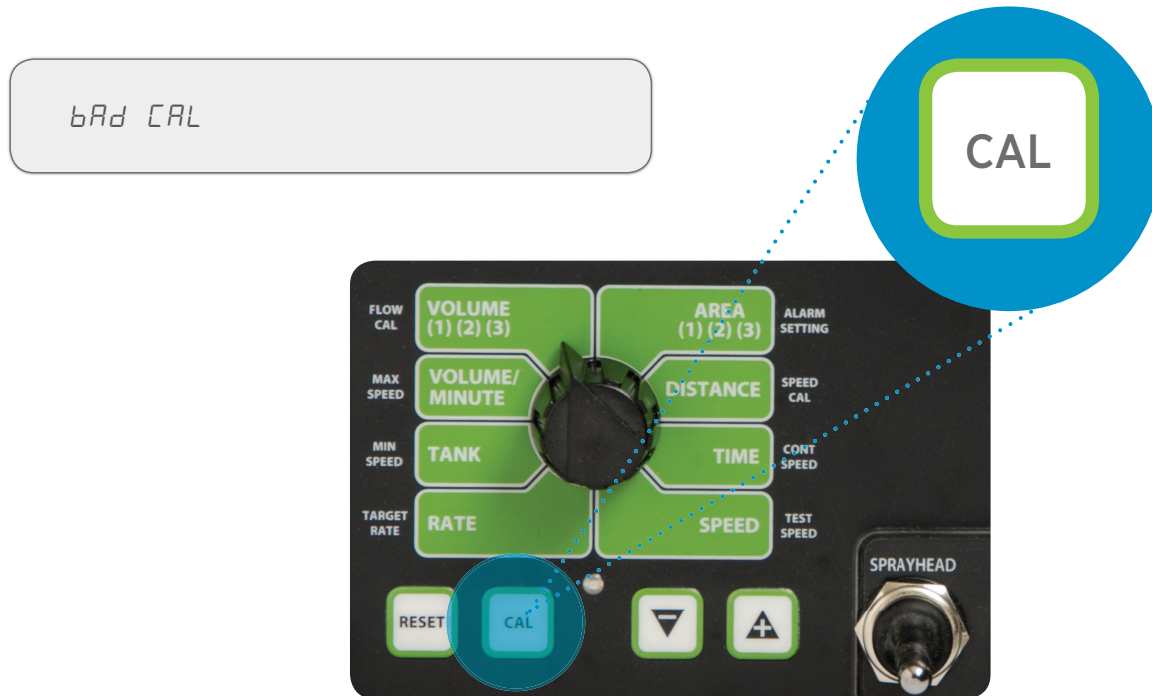
After one second it will display the Software Part Number and for 1.5 seconds and then will display the Software Revision for 1.5 seconds.



Power Up Messages (Cont.)

Bad Cal

At power the SmartFlow II performs a verification of its stored memory (EEPROM). If it detects a problem it will display “**bAd CAL**” and wait for the user to press the **CAL** button.



It will then enter “view only” **CALIBRATE** and the user should check all the calibration values and the SPECIAL CALIBRATE factors. The console will remember Bad Cal until the user selects the ‘View’ Calibrate Mode.

Cycling power, etc. will not clear it.

OPERATION

SMARTFLOW II

Selecting the Application Rate

To select a preset application rate, flip the toggle switch to the desired rate (RATE 1, RATE 2, or RATE 3) and this will be displayed in the APPLICATION RATE window.



If the **SPRAY** switch is in the **VAR** or **CONT** position, the selected rate is displayed.

If the **SPRAY** switch is in the **OFF** position, the upper window will still display OFF, but the new application rate will be selected.



Clearing Counters

When **Area** and **Volume 1** (only) are selected then **RESET** key will clear four counters (Area 1, Volume 1, Distance and Time) at the same time.

When in the **OFF** mode, and in the Distance, Area, Volume or Time rotary position then pressing the **RESET** key for 1 second will clear Time, Distance, Area 1 and Volume 1 (four counters).

While in the Distance or time mode it will not display or clear any counters unless the counter pair 1 is selected in Area or Volume. The Area-Volume pairs 2 or 3 are cleared independently.

While in Area or Volume mode, select the desired pair to clear (2 or 3) and with the Spray toggle in **OFF** mode press the **RESET** key for 1 second. Since the Area and Volume counters are paired, clearing a selected Area counter will also clear the corresponding Volume counter (and vice versa).

When the **RESET** key is pressed it will immediately display in the Data display as a warning that it is about to clear counters. If the **RESET** key is released while displaying then the counters remain unchanged. If the **RESET** key is pressed for 1 second or more then the message disappears and is replaced with "0" to indicate the counters were cleared.

Adjusting Tank Volume

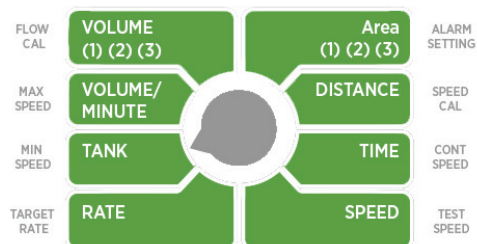
You should adjust the tank volume to match the actual volume of pesticide liquid in your tank each time you fill the tank. The **TANK** position (using rotary switch) shows the amount of liquid remaining in the tank, to the nearest tenth of a gallon or liter.

An alarm will be given when the Tank level equals or drops below the default Set Point cal factor of 2 gallons or 7.5 liters while in **VARIABLE, CONTINUOUS** or **OFF** mode. This alerts the user that the Tank is low whether he is spraying or stopped. (The user can stop the audible and visual Tank alarm by momentarily pressing the **RESET** button while in any position.)

If a flow signal is present then Tank continues to count down while in the **VARIABLE, CONTINUOUS** or **OFF** mode.

To adjust the tank volume:

1. Make sure that the SmartFlow control is not in Calibration mode.
2. The tank volume can be adjusted by setting the Spray switch **OFF** and then using the **INC** or **DEC** keys to adjust it from 0.0 to Gal or Liter. For safety this can only be done while the spray switch is in **OFF**.

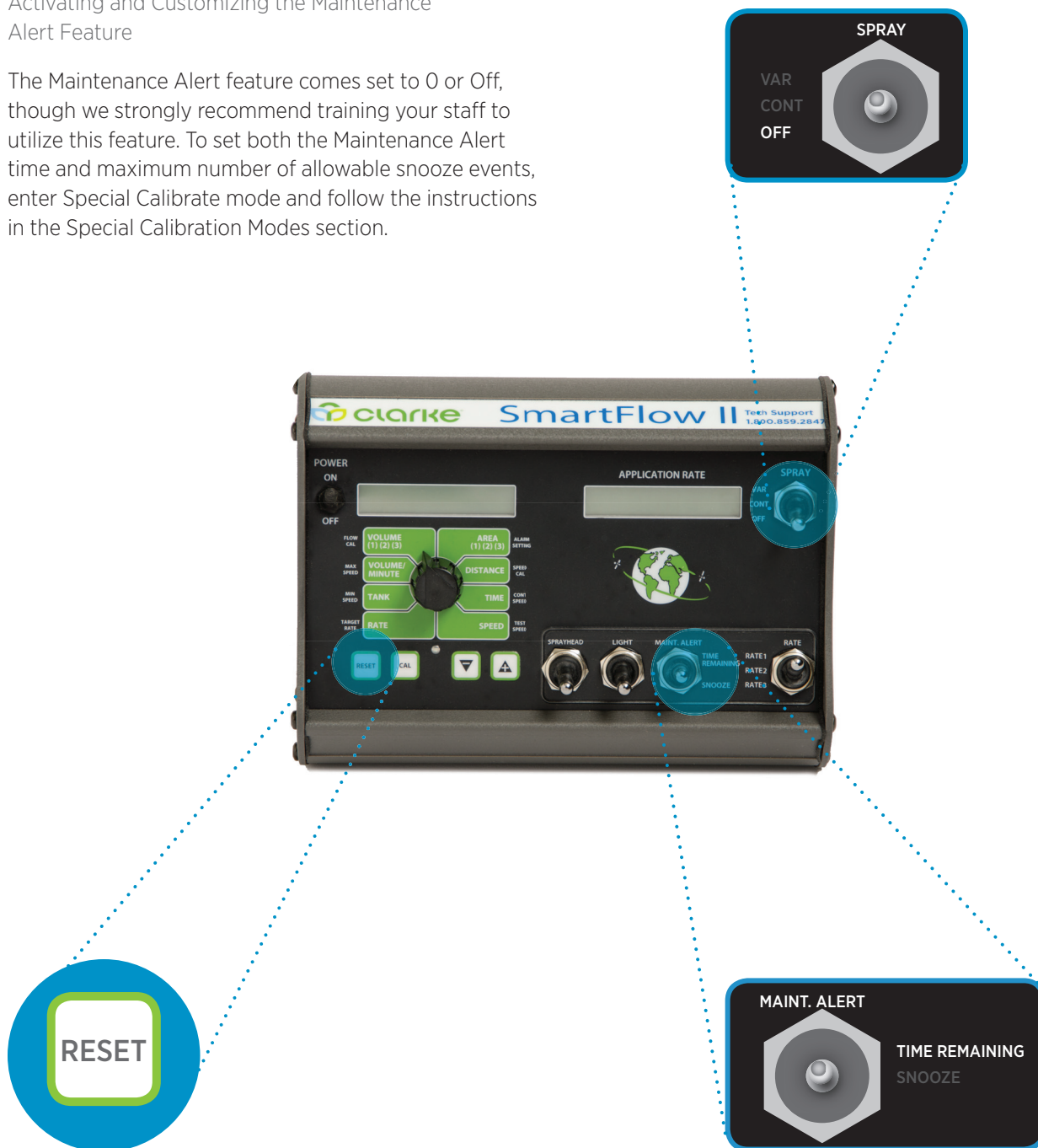


Resetting After a Maintenance Alert Shut Down

With the SPRAY toggle switch in OFF, holding the **TIME REMAINING** toggle and then also pressing the **RESET** button for 1 second will reset the Maintenance Alert timer to its preset value.

Activating and Customizing the Maintenance Alert Feature

The Maintenance Alert feature comes set to 0 or Off, though we strongly recommend training your staff to utilize this feature. To set both the Maintenance Alert time and maximum number of allowable snooze events, enter Special Calibrate mode and follow the instructions in the Special Calibration Modes section.



Troubleshooting

This section covers these warning indicators:

Alarm Indicators	Page 114
Error Codes	Page 115 - 119
Err 1	Page 115 - 118
Err 2	Page 115
Err 3	Page 119
Err 4	Page 119
Message/Warnings	Page 120 - 121
No Light Operation	Page 122
No Console Power	Page 122
Warning LED & Audible Alarm	Page 123
Low Voltage Detection	Page 123

Alarm Indicators

The following indicators are used to notify the operator regarding the Sleeve condition, RPM and Power Status:

Sleeve Condition

No-Alarm (Normal Operation) Maintenance

Alert Timer > 1 minute:

- None

Alarm-Notify (1 min. Warning) Maintenance Alert

Timer < 1 minute:

- Audible Alarm beeps 3 times, then stops.
- Red LED flashes.
- “ALERT” message shown on Application Rate display window, alternates with normal display values/messages.

ALERT

Alarm-Active (Sprayer Shut Down) Maintenance Alert

Timer = 0 (expired):

- Audible Alarm sounds for 3 seconds, then turns off.
- Red LED flashes.
- Alternation messages “CHECK” and SLEEV” are shown on Application Rate display window until Maintenance Alert Timer is reset.

CHECK

SLEEV

Error Codes — Err 1

Error Code 1 (Spray Head speed [RPM] not within limits)

Condition:

The warning LED is lit. Audible alarm beeps, if switched on. The RED indicator is lit. Error code is displayed in Application Rate display window. Pump does not run with the Spray switch in the “CONT” or “VAR” position.

Check 1

Spray Head must be switched on and running above the minimum speed for the pump to run. Visually inspect spray head for rotation; check the rpm displayed on the over/under relay located in the door of the pump box assembly. If the Spray Head is running but not above the 23,000 RPM minimum speed limit, increase using the RPM adjust dial and turn clockwise to increase above 23,500. The pump should restart if the Spray switch is set to “On”. (Increase slowly to prevent ramping above the Maximum speed limit of 30,000 RPM. Typical setting should be between 25k and 28k Rpm.)

OVER AND UNDERSPEED RELAY TRIP FAULT INDICATION

23K RPM



Yellow #1 when lit indicates an underspeed condition:

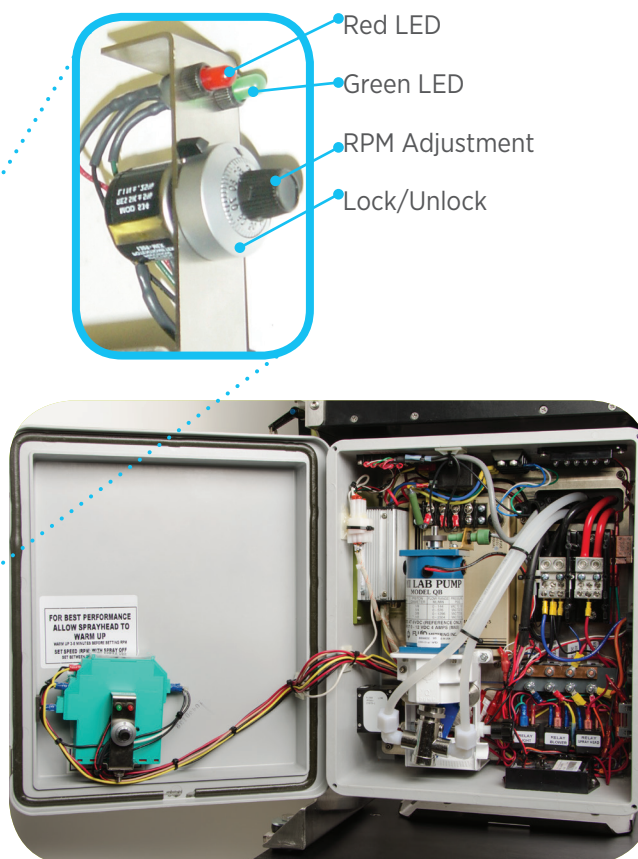
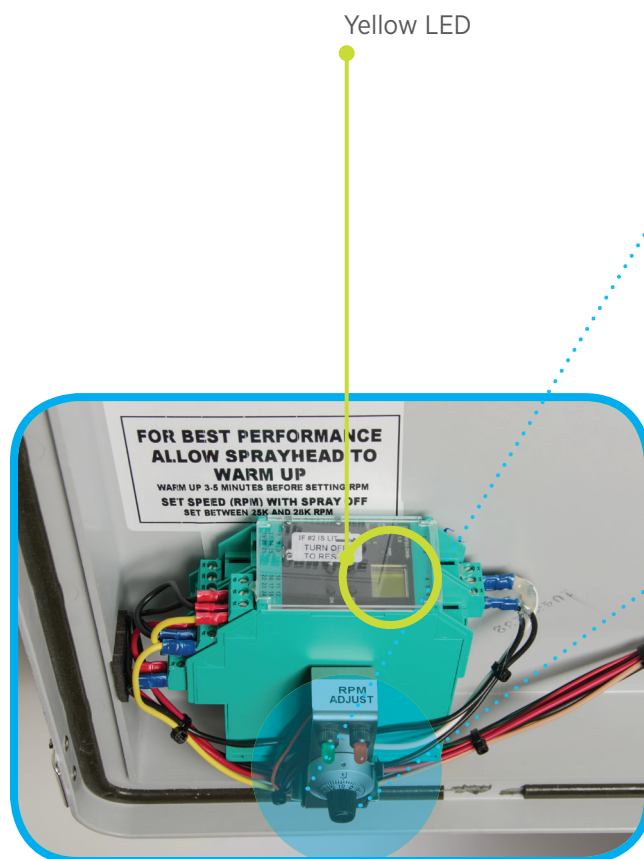
Low Limit set at 23K RPM. Low Limit will stop chemical pump until speed above 23.5 K RPM is reached. Re-adjust to 28.0 K RPM with chemical off.

30K RPM



Yellow #2 when lit indicates an overspeed condition:

High Limit set at 30 K RPM. This is a hard fault and will require full shutdown to reset. Turn speed dial down at least 1 full turn before restarting.



Error Codes — Err 1 (Cont.)

NOTE: If the Spray Head is not running and increasing the rpm setting with the rpm adjust dial has no effect see below information on fault codes and over/under relay fault indications to help identify the issue. If no Green LED or blinking red LED codes are displayed and nothing is displayed on the over/under relay, go to “Check 2” to investigate a possible issue with the 24 volt supply.

GREEN LED CODES

Green LED off	No 24 VDC to motor controller
---------------	-------------------------------

RED LED CODES

BLINKING SEQUENCE

FAULTS

Over voltage error	• • •	Excessive battery voltage
Under voltage error	• • • •	Low battery voltage
Over Temp warning	• • • • •	Motor controller temp is above 90° C
Fail to start, no RPM	• • •	Possible excessive load
Over Temp error	• • • •	Allow to cool, possible over current or bad motor
Frequency reset	• • • •	May be caused by over voltage, bad motor
Internal reset	• • • • •	Can be caused by momentary over current of high/low battery voltage; can happen during normal operation.

Error Codes — Err 1 (Cont.)

Check 1a

For an over voltage error, verify charging system is not producing spikes of voltage higher than 15.2 volts. This may also cause fluctuations in motor speed, making it difficult to hold the rpm set point to within the machine's set limits.

For an under voltage error, verify battery condition and vehicle charging system is sufficient for the power requirements of the machine.

For an over temp warning, allow unit to cool. Upon cooling, if machine functions, document conditions resulting in fault, e.g. Speed, Ambient Temperature, Dispensing Rate, DC Amps and contact Clarke technical service for assistance.

For a fail to start no rpm error, rotate the spray head carefully by hand; if it feels smooth and free of excessive drag, make note of condition and move on to next check.

For an over temp error, allow unit to cool. Upon cooling, if machine functions, document conditions resulting in fault, e.g. Speed, Ambient Temperature, Dispensing Rate, DC Amp, and contact Clarke technical service for assistance.

For a frequency reset error, restart system and make note of behavior, contact Clarke technical service for assistance.

For an internal reset fault, restart system and monitor performance and supply voltage; this can occur during normal operation.

If the small #1 yellow LED is lit on the over/under speed relay this indicates an under speed fault. This fault occurs when the speed of the spray head slows below 23k rpm. The system will respond by stopping the pump and preventing the pump from running until the speed rises above 23.5k rpm. It is recommended that the rpm set point is set between 25k and 28k rpm. Set with spray off and having allowed the motor to warm up for several minutes. Possible causes would be the rpm set point was set too close to the low limit, or insufficient supply of power causing a drop in speed. The introduction of fluid to the sleeve will result in an rpm drop. The amount of the drop depends on the condition of the sleeve and the dispensing rate. (If low limit faults are common, move rpm set point up slightly).

If the small #2 yellow LED is lit on the over/under speed relay this indicates an over speed fault. This fault occurs when the speed of the spray head rises above 30k rpm. The system will respond by shutting down the spray head for the purpose of protecting the unit from damage. It is recommended that the rpm set point is set between 25k and 28k rpm. Set with spray off and having allowed the motor to warm up for several minutes. Possible causes would be the rpm set point was set too close to the upper limit, and/or the rpm was set with spray on. Switching spray off removes the load and results in a rise in rpm. The amount of the rise depends on the condition of the sleeve and the dispensing rate. (If upper limit faults are common, move rpm set point down slightly.)

Error Codes — Err 1 (Cont.)

Check 2

If spray head is still not functioning, check that the over/under speed relay located in the door of the pump box is powered up. If it is, it is likely your 24 VDC supply voltage is ok. If no Green LED or blinking Red LED codes are displayed and nothing is displayed on the over/under speed relay it is a sign that there may be an issue with the 24 volt supply.

Check that the 24VDC circuit breaker is not tripped.

If tripped, the connection is not closed and there will be no 12 volt power supplied to the 24 volt converter, resulting in no 24 DC volts. Check that connections are clean and secure, reset breaker if necessary and retest. (To reset the 24 VDC breaker the main power must be removed by switching off the 50Amp main on/off breaker momentarily.) Other breakers are reset by pushing in the black button located on the top of the circuit breaker.

If the 24 VDC breaker is not tripped and it has been verified that 12 VDC is being supplied to the 12-24 VDC converter, yet there is no 24 VDC present, check the on board 20 amp fuse found in the upper right hand corner of the converter.

If the on board 20 amp fuse is not blown and previous checks have been verified, it may be that the converter is defective or damaged. Replace the 24 VDC converter.

Error Codes — Err 2

No flow signal - Spray switch in CONT mode

Condition

The warning LED is lit. Audible alarm beeps. (If switched on) Red indicator is lit.

Error code is displayed in Application Rate display window.

Pump does not run with the Spray switch in the "CONT" position.

Check 1

The spray head must be turned on and spinning within the rpm limits (23k -30k rpm) for the pump to be activated. This ensures proper droplets are formed when fluid is delivered to the sleeve. The pump can be activated with spray head off when in Cal Mode, see section on Calibration for detailed instruction.

Check 1a

Visually inspect pump.

Turn pump coupler manually with your fingers. Does pump turn?

If yes, go to Check 1b.

If no, go to Check 2.

Check 1b

Check white wire voltage from speed sensor.

If 5 volts present, check voltage at red wire and rotate motor and inspect voltage. If it fluctuates, sensor is likely good. If not, replace sensor.

Check 2

Disassemble pump from motor and replace frozen component. Contact Clarke technical service for assistance.

Error Codes — Err 3

No flow signal—Spray switch in VAR mode

Condition

The warning LED is lit. Audible alarm beeps, (if switched on.)

Red indicator is lit.

Error code is displayed in Application Rate display window.

Pump does not run with the Spray switch in the “VAR” position.

Check 1

The spray head must be turned on and spinning within the rpm limits (23k -30k rpm) for the pump to be activated. This ensures proper droplets are formed when fluid is delivered to the sleeve. The pump can be activated with spray head off when in Cal Mode, see section on Calibration for detailed instruction.

Check 1a

Visually inspect pump.

Turn pump coupler manually with your fingers. Does pump turn?

If yes, go to Check 1b

If no, go to Check 2b

Check 1b

Check white wire voltage from speed sensor.

If 5 volts present, check voltage at red wire and rotate motor and inspect voltage. If it fluctuates, sensor is likely good. If not, replace sensor.

Check 2

Disassemble pump from motor and replace frozen component. Contact Clarke technical service for assistance.

Error Codes — Err 4

Flow signal—Spray switch in OFF mode

Condition

The warning led is lit. Audible alarm beeps, (if switched on) Red indicator is lit.

Error code is displayed in Application Rate display window.

Check 1

Does error happen when spray head is shut off?

Yes: Normal operation

No: Replace console and reset

Messages and Warnings

The Consoles will display the following messages (in alphabetical order) for the conditions indicated:

DISPLAY	CONDITION
<i>bAd CAL</i>	if EEPROMCheck Sum equals zero or fails at power up.
<i>CAL</i>	Shown in App Rate display to help indicate Cal mode is selected.
<i>CLEAR</i>	Warning that user is about to Clear a counter.
<i>C-SPd</i>	In App Rate display to indicate the control algorithms 'Control Speed' in Special CalMode is selected.
<i>Err 0</i>	Error code in App Rate display where n = 1 to 5.
<i>FAIL</i>	Failed to reprogram the Flash.
<i>FILL</i>	Flashed in App Rate display to indicate the Tank level is equal or less than Tank Set Point.
<i>FLASH</i>	Console is ready to have the Flash reprogrammed.
<i>FLUSH</i>	In App Rate display when performing Flush operation.
<i>bOUAr</i>	User is trying to adjust Test Speed while in CONTINUOUS mode and needs to "Go to VARIABLE" mode.
<i>HI SPEED</i>	In the App Rate display indicates the ground speed exceeds the Max Speed cal factor while in VARIABLE mode.
<i>Id</i>	In App Rate display to indicate Special Cal 'Vehicle ID' is selected.
<i>LOAd</i>	User has loaded Default Cal Factors. (Metric if in Area mode).
<i>Lo P</i>	Low Power. Pump is stopped.
<i>Lo SPEED</i>	In the App Rate display indicates the ground speed has dropped below theMin Speed cal factor while in VARIABLE mode.
<i>OFF</i>	In App Rate display when Spray toggle switch is in OFF mode.
<i>OFL</i>	Overflow in any display (greater than 99999).
<i>PASS</i>	Correctly finished reprogramming the software.
<i>PCOFF</i>	In App Rate display when VRA Controller selects "PC Off" mode by sending Target = 0.
<i>SEE</i>	User has started 'View and Change' Cal mode.

Messages and Warnings (Cont.)

DISPLAY	CONDITION
SEEP E	In App Rate display to indicate Special Cal Tank 'Set Point' is selected.
SPEC	In App Rate display to indicate Special Cal mode is selected.
SIZE	In App Rate display to indicate Special Cal Tank 'Size' is selected.
Store	Has stored Default Cal Factors to non-volatile memory.
Units	In App Rate display to indicate Special Cal 'Units' is selected.
WIDTH	In App Rate display to indicate Special Cal 'Width' is selected.
Alert	In AppRate display to warn that there is less than 1 minute of Maintenance Alert Time remains before sprayer is shutdown.
CHANGESLEEVE	In AppRate display to indicate that sprayer has been shut down and operator should check or replace sleeve.

Messages/Warnings: No Light Operation

Condition

Light switch engaged on console, Work Light not activated.

Check 1

Verify that the light breaker circuit breaker is not tripped. If tripped, the connection is not closed and there will be no 12 volt power supplied to the light.

Check for loose connections on light breaker or defective light relay.

Verify supply power is sufficient to operate the system.

Remove the light components electrical connections and attempt to power up light with verified 12 volt source.

If light is still not activating with power applied, the light is damaged and defective.

Check 3

Disconnect 7 wire cable from pump box; measure for voltage between the two large terminals of the 7 pin connector (thick Blue and Orange wires).

Repair

If voltage is present and it was not present for check 2 , replace defective cable.

If voltage is not present, see Check 4.

Check 4

Check the EPD circuit breaker in pump box. Is the circuit breaker tripped? (i.e. black button extended)

Repair

Push in circuit breaker button. **If circuit breaker stays closed,** reconnect cable and console, and retest.

If circuit breaker does not stay reset, go to Check 5.

Messages/Warnings: No Console Power

Condition

No display or luminance.

Check 1

Make sure that the main breaker and power on switch are engaged. Make sure battery is connected and fully charged.

Check 2

Disconnect 7 pin cable from console; measure for voltage between the two larger terminals in the connector (thick Blue and Orange wires).

Repair

If voltage is present, reconnect to console.

If voltage not present, see Check 3.

Check 5

Check red wire from main circuit breaker to circuit breaker's bus bar.

Repair

Tighten and/or replace wire, if damaged.

Retest system.

If circuit breaker still will not reset, replace circuit breaker.

Messages/Warnings: Warning LED & Audible Alarm

While in VARIABLE or CONTINUOUS mode, the Warning LED, and the Audible Alarm will turn on (steady) whenever there is more than 10% error in the application rate. However the audible alarm (only) can be delayed if the “Alarm Setting” is used.

While in VARIABLE, CONTINUOUS, or OFF mode, the Audible Alarm will beep (on and off) the Warn LED will turn on, and the Application display will alternate with the “FILL” message, whenever the **TANK** value is less than the **TANK ALARM SET POINT**.

When in the “View Calibration” mode the Warning LED does not turn on but when in the “View and Change” Calibration mode then the Warning LED will flash (warning) that the **INC** and **DEC** keys will change the calibrate factors.

The Warning LED will flash (warning) when in the Special Calibrate mode and the **INC** and **DEC** keys will change the special calibrate factors.

The Warning LED will turn on (steady) when in Test Speed mode.

There are three types of Audible alarms.

1. A Steady tone indicates a 10% Rate Alarm
2. A fast beeping (On/Off) indicates the Maximum or Minimum Speed has been exceeded.
3. A slow beeping (On/Off) indicates a Tank Alarm.

When all three alarms occur at the same time, the priority is shown above and the Rate Error alarm will take precedence and the alarm will stay on steady, and the Min/Max Speed alarm will take precedence over the Tank alarm.

The audible alarm (only) can be turned off (disabled) using the “Alarm On/Off” toggle switch on the back of the console.

Messages/Warnings: Low Voltage Detection

When the supply voltage drops below minimum the required operating range, the Data display will display “Lo P” (Low Power) and:

- Stop Sprayer (clear Enable EPD output to ‘0’).
- Stop Blower (clear Enable Throttle/Nozzle output to ‘0’)
- Store all counters in EEPROM

If supply voltage returns (brown out recovery) to normal operation then it will turn the blower back on (enable Throttle/Nozzle output) and then wait for either “Pressure OK” or “RPM OK” and then turn the sprayer back on (enable EPD output) to return to normal operation.



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