PSDS MARK V

DESIGNED FROM EXPERIENCE

USE AND CARE

TUTORIAL

PSDS MARK V

DESIGNED FROM EXPERIENCE

What we will cover in this tutorial:

- **Purpose of the Tutorial**
- **Highlights**
- **Using Your Dispenser**
  - ✓ Components
  - ✓ Testing the dispenser – Initial Check
  - ✓ Bench testing the dispenser
  - ✓ Getting ready to burn
  - ✓ In the event of a machine jam
- **Storing Your Dispenser**
- **User Maintenance**
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  - ✓ Cleaning the MARK V
  - ✓ Pump maintenance
- **Troubleshooting the Dispenser**
  - ✓ Hopper motor fails to run
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  - ✓ Glycol is not pumping
  - ✓ Water is not pumping
  - ✓ Spheres fail to ignite
- **Dispenser Specifications**
- **Machine Settings & Drop Rates**
- **Repairs, Updates & Parts**

PSDS MARK V

Purpose of the Tutorial

This “Use and Care Tutorial” is intended to assist users of the MARK V in understanding how it works and what basic maintenance needs to be done to keep it working properly. It is intended solely as a supplement to the training any operator should be given such as the expected protocols between operators and pilots, pre and post flight responsibilities, etc. Such training is addressed in the ***Interagency Aerial Ignition Guide*.**

Aerostat, Inc. and its affiliate company PSDS, Inc. makes no representation that reviewing this “Use and Care Tutorial” qualifies an individual as a trained operator. Such qualification must be obtained in accordance with the standards established in ***Interagency Aerial Ignition Guide*.**

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HIGHLIGHTS

- ✓ Footprint the same as a MK III but with a stronger hopper and chassis and lighter gross weight
- ✓ Minimal training time for an experienced MK III operator
- ✓ Uses the same diameter sphere as the MK III so there is no need for a separate inventory of spheres
- ✓ Ergonomic design changes for ease of use
- ✓ Easier maintenance including a new “easy adjust” manifold
- ✓ Improved hopper design to feed spheres into the chutes

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HIGHLIGHTS (con't)

- ✓ New long life pumps and use of a glycol recirculation system to maintain a constant pump pressure
- ✓ Improved electrical wiring internally and externally using plug in connections and eliminating the need to replace incandescent light bulbs
- ✓ Lower cost of ownership (The purchase price includes the MARK V, metal transit case, lid, tool kit and bench tester power supply)
- ✓ Unprecedented guarantee of 24 months
- ✓ The MARK V is made in the USA and distributed exclusively by Aerostat, Inc.

PSDS MARK V

USING YOUR DISPENSER

Components

- Remove the MARK V from the transit case and set each component on a firm surface. The components consist of the following:
  - Mainframe / Water tank
  - Hopper
  - Long chute
  - Stabilizer stand
  - Harness
  - Power supply (110vac to 24vdc)
  - Power cord
  - Tool kit

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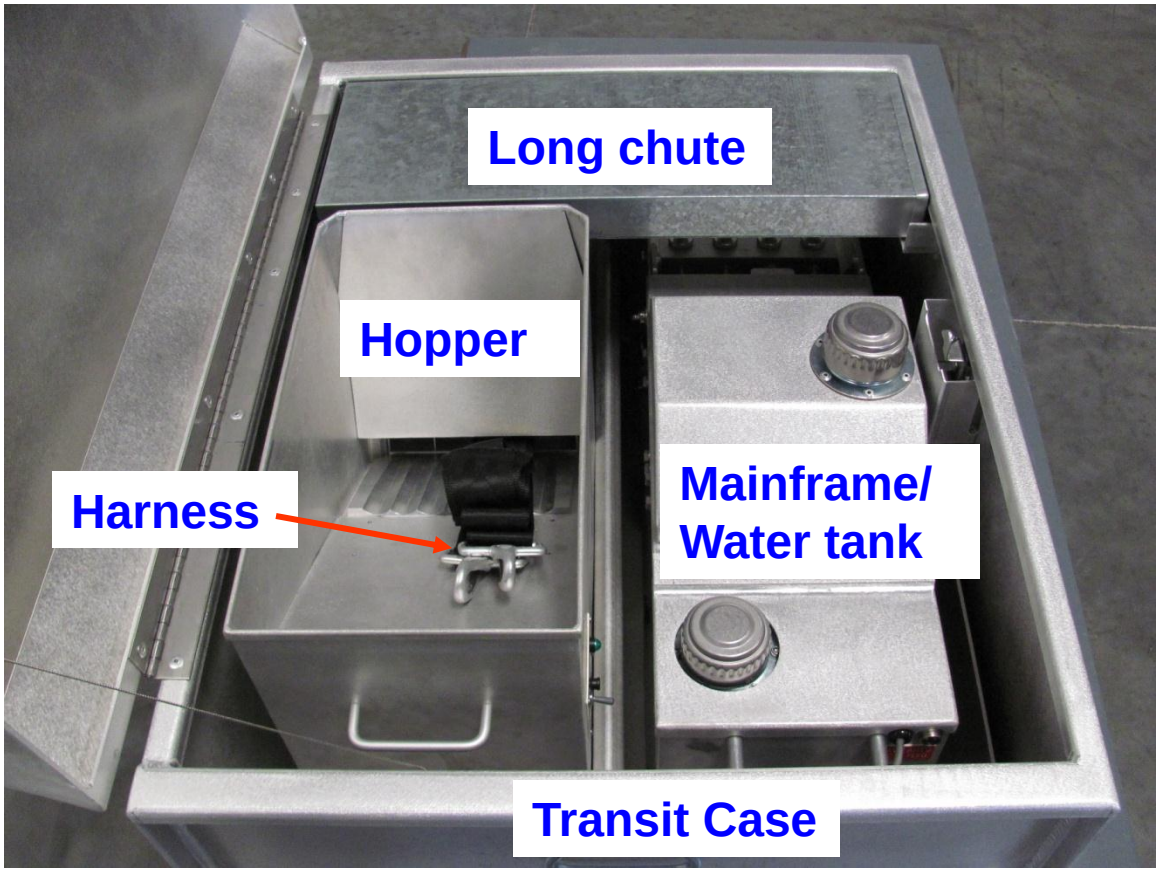
USING YOUR DISPENSER



MARK V Components

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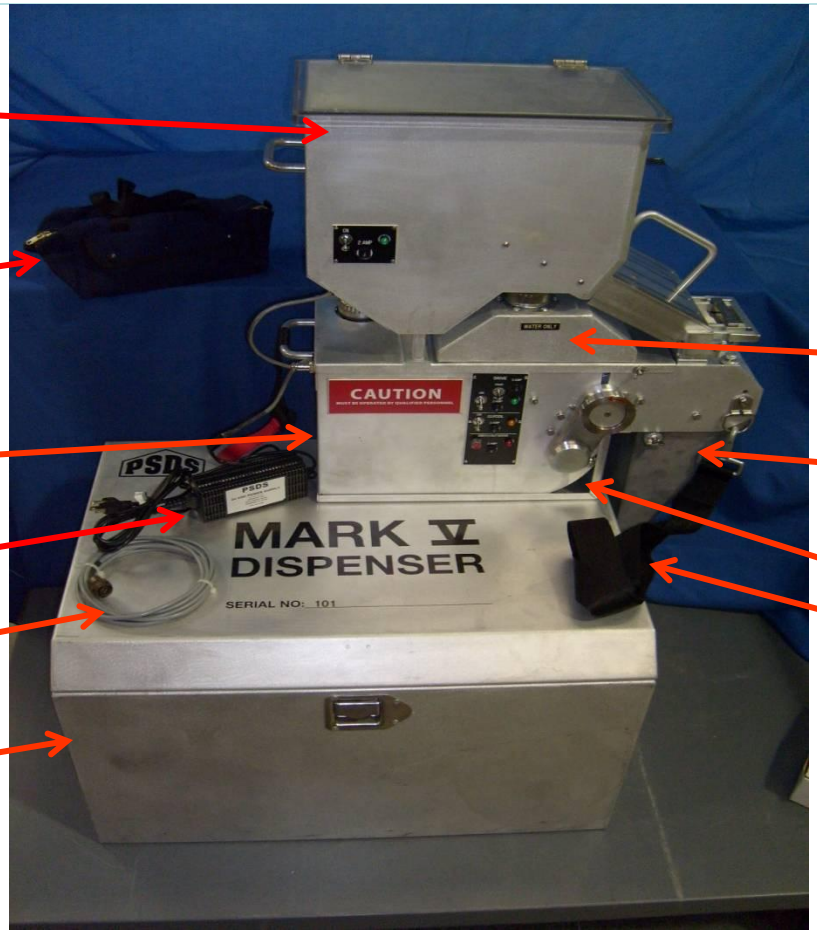
USING YOUR DISPENSER



MARK V Components

PSDS MARK V

USING YOUR DISPENSER

Tool Kit Contents (Note: The kit comes with the MARK V)

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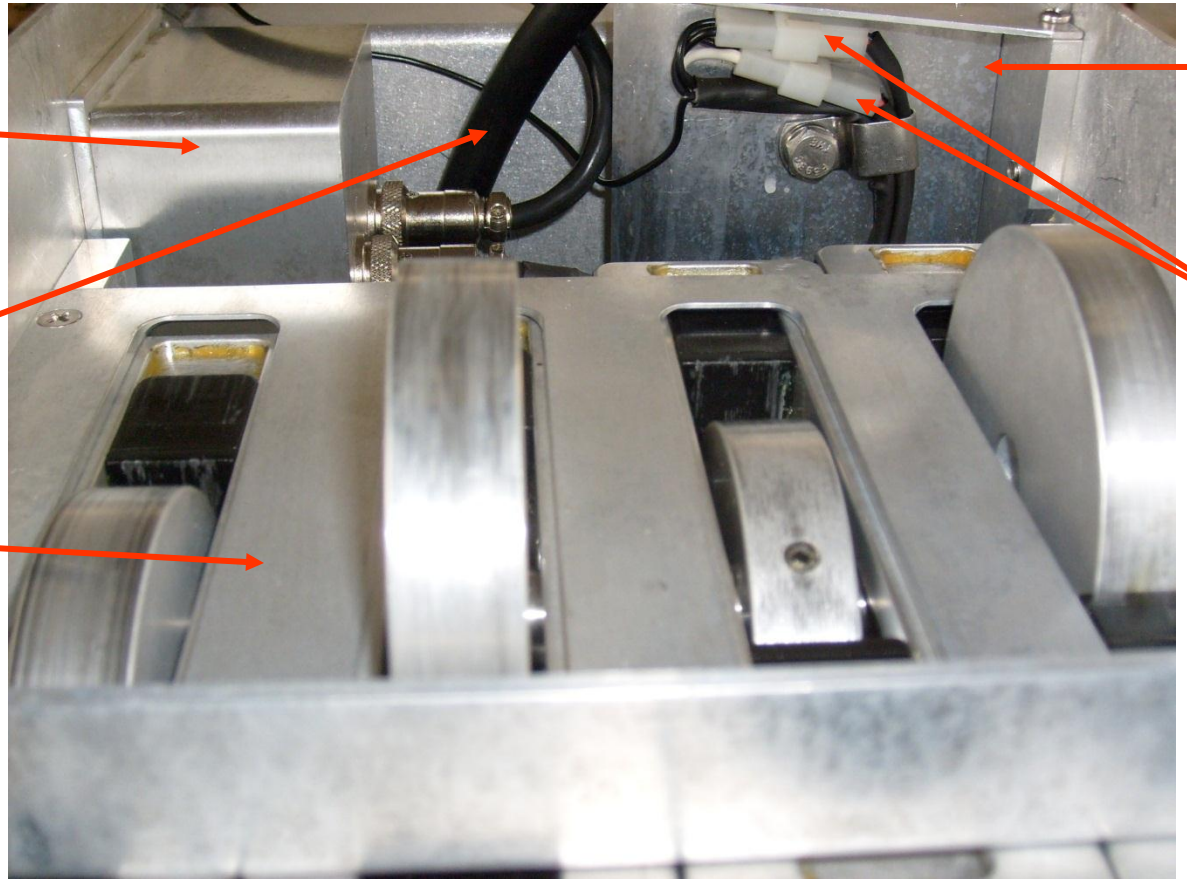
USING YOUR DISPENSER

Mark V Interior View



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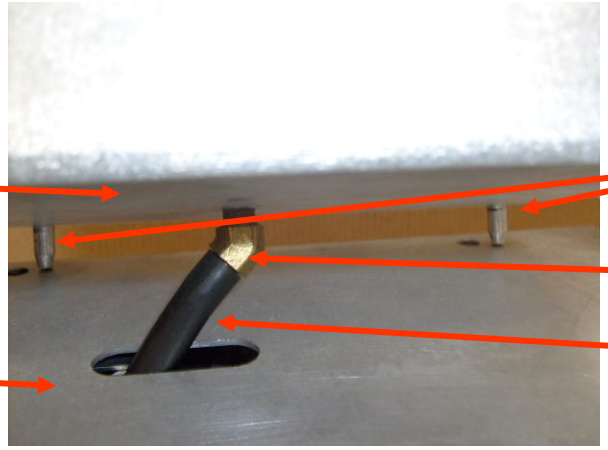
USING YOUR DISPENSER

Water Tank Assembly

Water Tank

Mainframe



Bottom of Water Tank

Lid to Mainframe

Legs (insert in holes in lid)

Brass fitting

Water hose

PSDS MARK V
USING YOUR DISPENSER

Testing the Dispenser – Initial Check

- Remove the hopper from the top of the mainframe to expose the filler caps for both the water and glycol tanks.
- Lift water tank up from the mainframe (about 2 to 3 inches) and remove water line hose from brass fitting on the bottom of the tank. Set tank aside.
- Unscrew the two wing nuts on the sides of the mainframe to remove mainframe cover. Visually check that all hoses are properly connected.
- Insert water line through slot in the middle of the cover and then replace cover and retighten wing nuts. [NOTE: Be sure washers are between the outside edge of the cover and the wing nuts.]
- Open the water tank and check the strainer in the filler neck. Clean out any debris that may be in it.
- Push water line on to the brass fitting on the bottom of the water tank and set the water tank into the four guide holes on the top of the mainframe cover.
- Fill water tank with water and replace cap.

PSDS MARK V
USING YOUR DISPENSER

Testing the Dispenser – Initial Check (cont'd)

- Open the cap on the glycol tank. Clean out any debris that may be in the strainer.
- Fill glycol tank with clean ethylene-glycol (aka: antifreeze). Be careful not to overfill tank. In the event of an overfill wipe up all excess glycol being careful not to push any dirt into the tank.
- Replace the cap on the glycol tank.
- Install hopper on to the top of the mainframe being careful to align the grooves in the hopper feeder chute with the guides inside the mainframe. [NOTE: When properly positioned the top of the hopper should be parallel with the top of the mainframe.]
- Connect the wire lead from the hopper to the "two prong" male plug on the back of the mainframe.
- Connect a 24-28vdc power source to the wire coming out of the back of the mainframe. [NOTE: The PSDS power supply can simply be plugged into the plug on the rear of the mainframe.]

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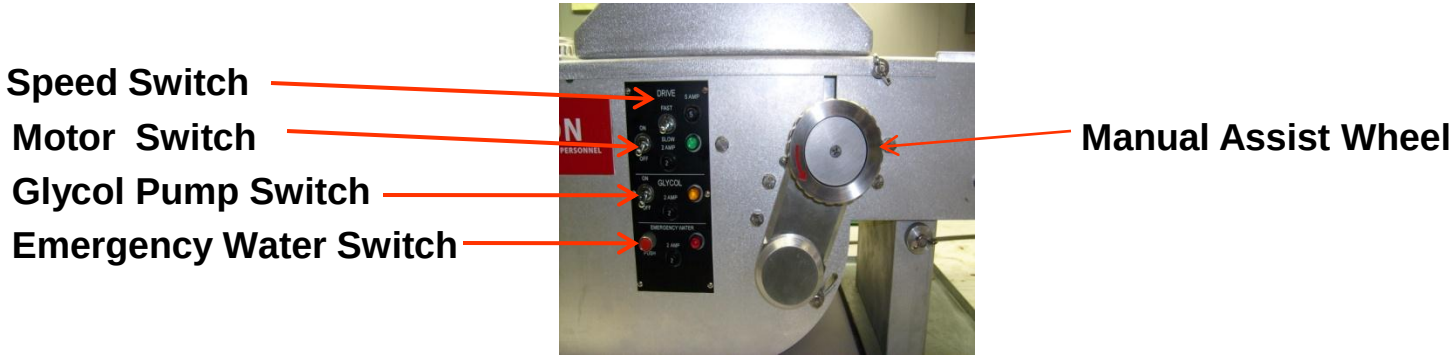
USING YOUR DISPENSER

Testing the Dispenser – Initial Check (cont'd)

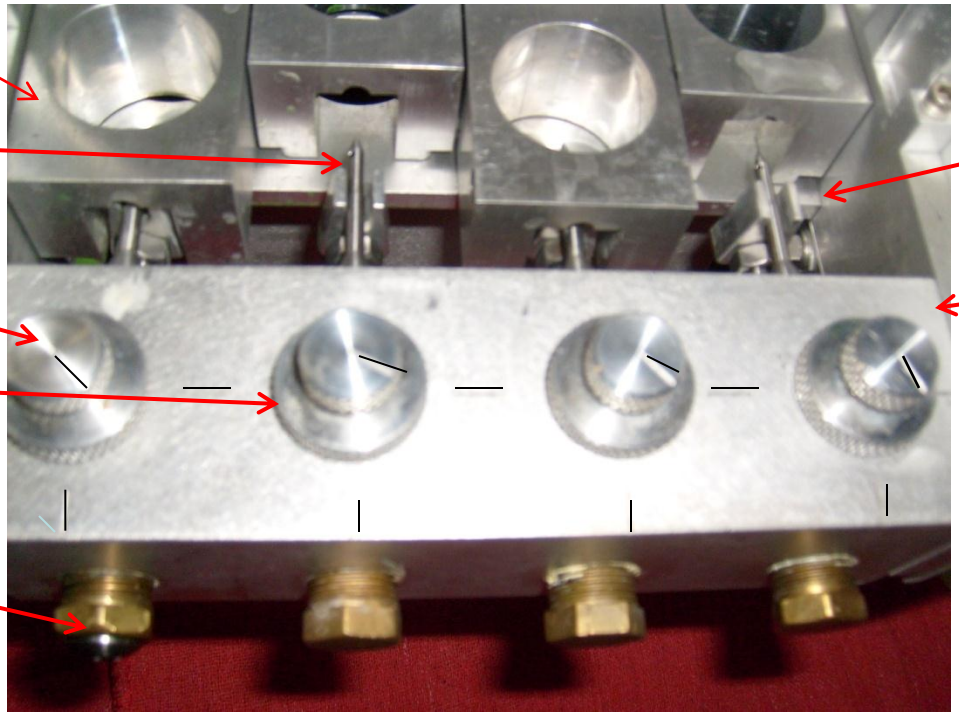


- Turn on the motor switch (green LED should light) on the mainframe and observe the direction of rotation of the manual assist wheel on the side of the mainframe. Rotation should be in the direction of the arrow on the wheel. If it is not the lines from the power source need to be reversed.
- Turn on the hopper control panel switch (the LED indicator should light) and observe that the shuffle plate in the hopper moves back and forth.
- Turn off the hopper control switch.
- Move the speed control switch on the main electrical panel into its opposite position and observe a change in the speed of the slipper blocks.

PSDS MARK V
USING YOUR DISPENSER

Testing the Dispenser – Initial Check (cont'd)

- Prime and Adjust the manifold per the following steps:



- Lubricate all four plungers
- Turn on the motor and the glycol pump switches (NOTE: Motor must be on for glycol pump to operate)

PSDS MARK V
USING YOUR DISPENSER

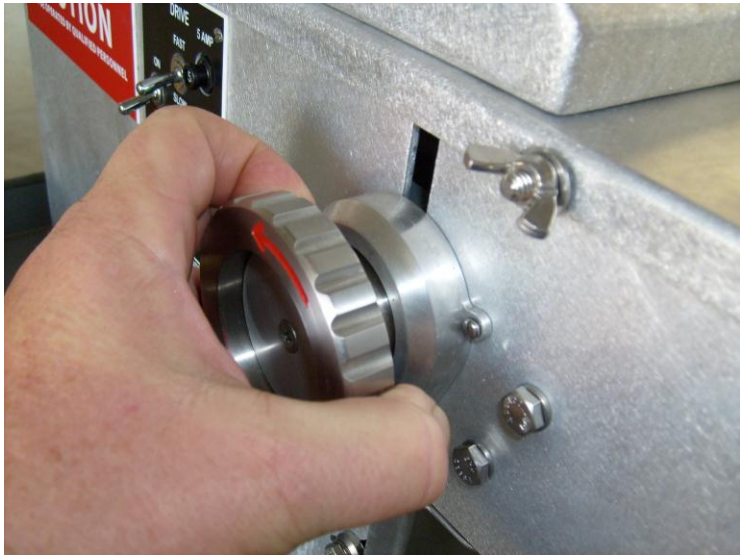
Testing the Dispenser – Initial Check (cont'd)

- Prime and Adjust the manifold per the following steps (con't)
  - Open the bleeder screw to allow air to escape the manifold
  - When there is a steady stream of glycol from the screw retighten it
  - Adjust the flow of glycol for each needle as follows:
    - ✓ Loosen the locking nut all the way.
    - ✓ Turn the needle valve in a clockwise direction until it bottoms out.
    - ✓ Turn the needle valve no more than ONE QUARTER TURN in a counterclockwise direction. There are orientation marks on both the manifold and the needle valve. The needle valve orientation mark should be located between the two marks on the manifold when properly adjusted
    - ✓ Hold the needle valve to be sure it does not move while tightening down the locking nut securely.

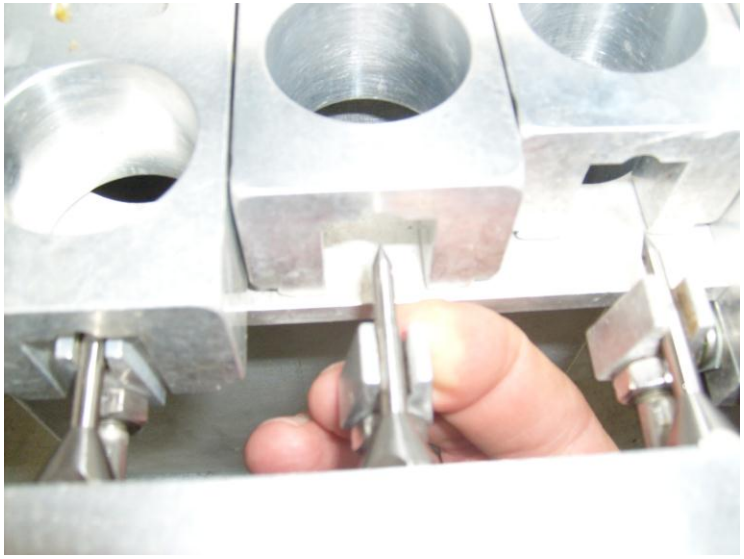
PSDS MARK V
USING YOUR DISPENSER

Testing the Dispenser – Initial Check (cont'd)

- ✓ While holding out the manual assist wheel depress the plunger on the manifold for each needle to observe that the flow from each needle is the same. (Proper priming of a sphere requires about .75 cc of glycol.)



Hold Manual Assist Wheel



Depress Each Plunger

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USING YOUR DISPENSER

Testing the Dispenser – Initial Check (cont'd)

- Turn off the glycol pump switch.
- Depress the emergency water switch button. The red LED should illuminate and you should hear the pump run. Hold the switch button in until you see water coming from the four holes in the manifold. [NOTE: There is no need to prime the water pump.]
- Release the emergency water switch button.
- Disconnect the 24-28vdc power source from the dispenser.

PSDS MARK V
USING YOUR DISPENSER

Bench Testing the Dispenser

[NOTE: This test should not be done until having first performed the *"Initial Check of the Dispenser"* as described above. Before beginning this test make sure the machine is located in an area that is well vented. It is strongly recommended that this operation be performed outside any building.]

- Carefully secure the PSD on a bench with the short chute extending over the edge. [NOTE: The machine must be secured to the bench in order to be certain that it does not tip forward and fall when you start testing. Use of the stabilizer stand is recommended.]
- Place a metal container below the short chute to catch balls. [NOTE: Container should be tall enough so that the balls will not bounce out when dropped into it.]
- Check the glycol and water tanks to make sure there is glycol and water in the respective tanks and that the glycol pump is primed.

PSDS MARK V
USING YOUR DISPENSER

Bench Testing the Dispenser (cont'd)

- Check that the hopper is securely mounted on the mainframe and that the electrical connection is properly secured.
- Verify that the hopper control handles are in the down position to prevent any spheres from leaving the hopper.
- Place some live aerial ignition spheres into the hopper and observe that the four chutes leading from the hopper fill with spheres.
- Connect a 24-28vdc power source to the leads coming out of the back of the mainframe.
- Turn on the motor switch on the mainframe electrical control box and observe the direction of rotation of the manual assist wheel. If the wheel is not rotating in the direction of the arrow shut off the motor and reverse the leads from the 24-28vdc power source from the way they are connected. Re-start the motor and verify that the manual assist wheel is turning in the direction of the arrow.

PSDS MARK V
USING YOUR DISPENSER

Bench Testing the Dispenser (cont'd)

- Depress the emergency water switch to make certain that the water pump is operating and water ejects from the four ports on the manifold.
- Turn on the hopper control switch to activate the agitator in the hopper.
- Turn on the pump switch located on the main electrical control box.
- Raise the inside handle of the hopper control handle to open the two inside chutes and allow two or three spheres from each chute to drop into the container.
- Close the hopper control handle and observe the balls in the container to see if they ignite. [NOTE: An over primed ball will not light but an under primed one will eventually light.]
- Sphere fires inside of the container can be extinguished with a light spray of water. Make sure there is not an excessive amount of water in the bottom of the container before proceeding to the next step.

PSDS MARK V
USING YOUR DISPENSER

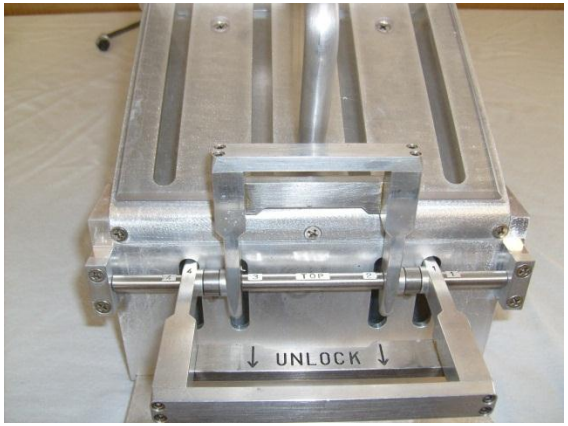
Bench Testing the Dispenser (cont'd)

- Check to be sure there are enough spheres in the hopper to fill the four chutes. Raise both the small and large hopper control chute handles and allow several spheres to drop from each chute.
- Close the hopper control handles and observe the spheres in the container to be sure they ignite.
- Extinguish any burning spheres with a light spray of water.
- Turn off the pump and motor switches. Disconnect the 24-28vdc power source from the dispenser.
- Remove any spheres remaining in the hopper. [NOTE: Be certain that the hopper chutes are all empty when you are done.]
- Your dispenser is now ready for use. If it is not going to be used for a significant amount of time after testing it is recommended that both the water and glycol tanks be drained. To aid in draining the glycol there is a drain valve installed at the bottom of the glycol tank. The water tank can be drained by lifting it from the PSD and removing the water hose or by simply turning the tank over with the cap removed.

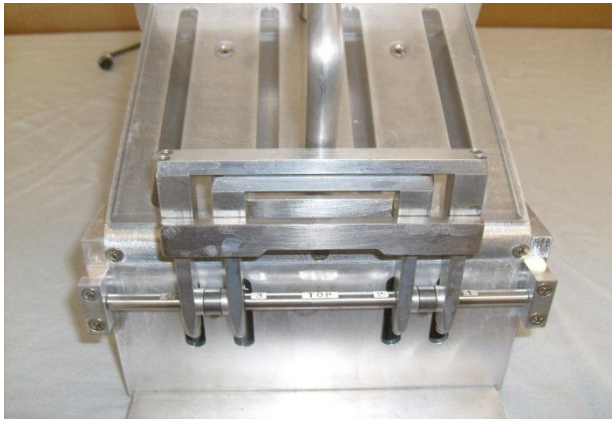
PSDS MARK V

USING YOUR DISPENSER

Drop Chute Handles Locked



Middle 2 Chutes Open



All 4 Chutes Open

PSDS MARK V
USING YOUR DISPENSER

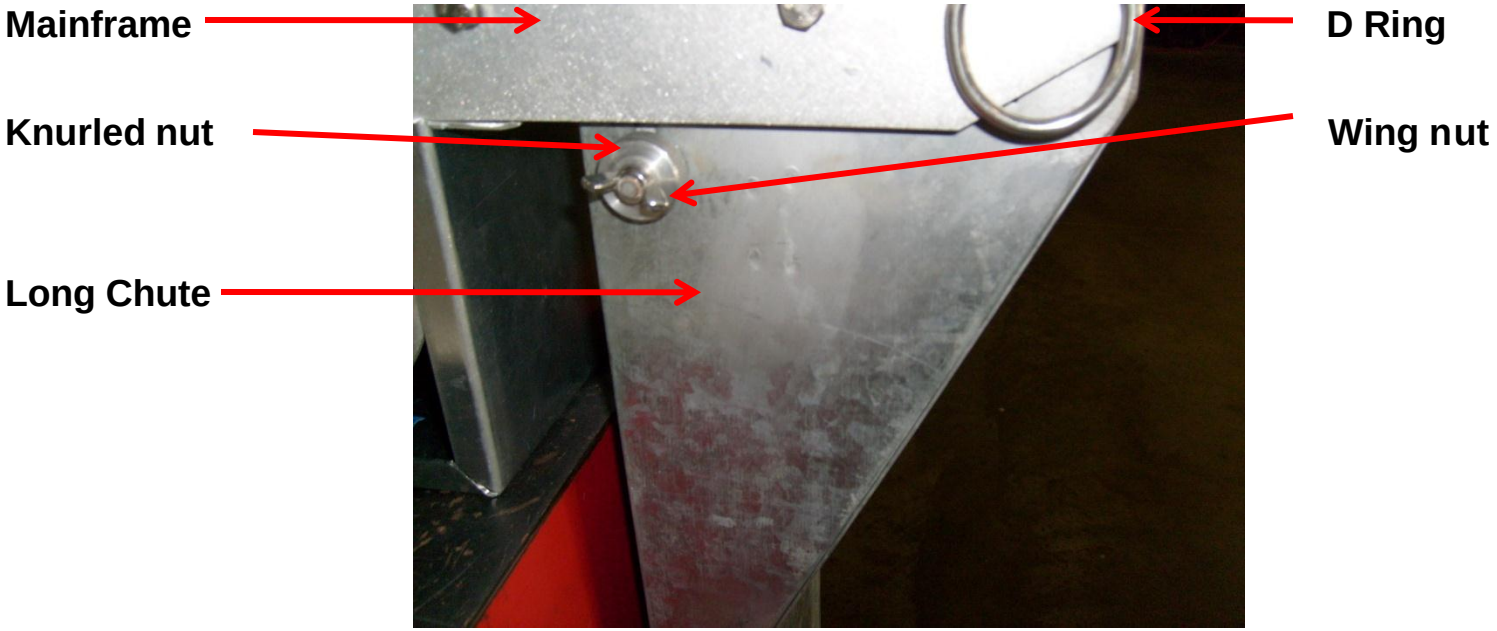
Getting Ready to Burn

- Make sure that the glycol and water tanks are full, the glycol pump is primed and the water pump is operational.
- If not already attached to the dispenser attach the harness to the two “D” rings on the front of the machine.
- Set the assembled dispenser inside the helicopter per instructions specific to the make and model being used. If you choose to use the stabilization tray set it in the helicopter first and then place the MARK V into it.
- Run the harness strap under the helicopter and back in through the opposite side.
- Attach the end of the harness strap to the buckle hanging from the back of the dispenser and loosely tighten it.
- Carefully move the dispenser toward the outside of the helicopter until the short drop chute extends over the outside edge and clears any obstruction. Be sure to keep a firm hold on the handle at the back of the dispenser as the dispenser may tip forward.
- Tighten the harness to hold the dispenser in place.

PSDS MARK V
USING YOUR DISPENSER

Getting Ready to Burn (cont'd)

- Carefully release your grip on the rear handle making sure the dispenser does not begin to shift.
- Install the long chute over the short chute. Be sure to slide the long chute all the way up such that the cutouts pass the bolts which extend from each side of the long chute. Tighten the knurled nut on each side to hold it in place and then the wing nut.



PSDS MARK V
USING YOUR DISPENSER

Getting Ready to Burn (cont'd)

- Connect the power cord to the plug on the back of the PSD and then connect the other end to the power outlet in the helicopter.
- Once power is connected to the dispenser turn on the motor switch on the main control panel and verify the direction of rotation on the manual assist wheel is correct (in the direction of the arrow).
- Be certain that the control handles on the hopper chute are in the down position to prevent balls from falling and then load the hopper with spheres.
- When you are ready to begin dropping spheres, turn on the drive motor switch on the main control panel and select the speed you want the dispenser to run at (high or low) using the speed control switch.
- Turn on the glycol pump switch and the hopper switch then lift the handles on the hopper chute to allow the balls to begin dropping. [NOTE: Lifting only the small inside handle will activate the middle two chutes, lifting both the small and large handle will activate all four chutes.]

PSDS MARK V
USING YOUR DISPENSER

Getting Ready to Burn (cont'd)

- When you wish to stop dropping spheres lower the chute handles to prevent balls from exiting the chute and then observe the drop chute to make certain no other primed spheres are dropping out. (CAUTION: Once the handles are lowered any spheres currently in the slipper block assembly must be allowed to exit from the dispenser as they will have been injected with glycol and therefore will ignite. This could involve about seven spheres depending on how full the hopper was.)
- Once spheres are all cleared from the machine turn off the hopper motor switch, the glycol pump switch and the drive motor switch.

PSDS MARK V
USING YOUR DISPENSER

In the Event of a Machine Jam

- Turn off the motor switch on the main control box.
- Grab the manual assist wheel on the side of the machine and pull it out from the machine to disengage the motor.

- With the manual assist wheel pulled out turn the wheel back and forth to attempt to free the jam. (If the jam frees there will be a decided decrease in resistance to the turning of the manual assist wheel.)

➢ ***<u>Decision Point</u>***

- <u>Did the jam clear?</u>
  - If the jam clears release the manual assist wheel, turn on the motor switch and the MARK V will resume operating as normal.

PSDS MARK V
USING YOUR DISPENSER

In the Event of a Machine Jam (cont'd)

➢ ***Decision Point (cont'd)***

- Did the jam persist?
  - Notify the pilot
  - Close the feed chute handles
  - Turn off all electric switches
  - If a fire starts depress the emergency water supply button (depress for up to 30 seconds). This will result in water spraying on to the balls currently in the slipper blocks and should extinguish any fire that might result from a primed ball.
  - If fire persists use canteen to dump water down the feed chutes through the hopper.
  - **If fire is extinguished** land the helicopter and inspect the MARK V for any debris that would have caused the problem.
  - **If fire persists** notify pilot and jettison the machine by cutting the harness and pushing machine out of the helicopter.

PSDS MARK V
STORING YOUR DISPENSER

- Carefully remove the dispenser from the helicopter and place it on a solid surface.
- Empty any spheres that may be remaining in the hopper and inspect the four chutes to be certain no spheres are left in them.
- Remove the hopper from the mainframe section of the dispenser.
- Drain the water tank by removing the cap and then lifting it from the PSD and turning it over.
- Drain the glycol by positioning the machine so that the drain valve located at the bottom of the glycol tank is accessible. Open the valve and allow the glycol to flow out into a container.

PSDS MARK V
STORING YOUR DISPENSER

(Continued)

- Place the stabilization tray into the transit case so that it will sit under the mainframe.
- Place the mainframe and hopper in their respective places in the transit container. (NOTE: When properly placed in the container the tops of both the mainframe and hopper should be parallel to the upper edge of the case.)
- Place the drop chute extension in the case making certain it is properly placed in the designated spot.
- Close the transit case lid and make sure it latches. [NOTE: If the lid does not drop down easily and latch the machine is not properly positioned in the case.]

PSDS MARK V
USER MAINTENANCE

Machine Lubrication

The most important thing the user can do to assure trouble free operation of the MARK V is to make sure it is kept well lubricated. A non-drying, oily film lubricant such as LPS 2 in aerosol form along with an extension tube that can be inserted into the nozzle is ideal for this. [NOTE: Lubricants such as WD-40 are not recommended!]

- Liberally apply the lubricant to the slipper block assembly then use the manual assist wheel to move the blocks several times to spread the lubricant around evenly.
- Using an extension tube on the lubricant can spray each plunger in the manifold block close to where the plunger enters the block. Then depress each plunger several times to spread the lubricant.
- Insert the extension tube behind the manual assist wheel into the chain drive cover and spray. Turn the manual assist wheel about a half turn and spray again. This will get lubricant on to the drive chain and drive gears.

PSDS MARK V
USER MAINTENANCE

Cleaning the MARK V

- To clean the MARK V it is recommended that the user purchase a bottle of white vinegar and a bottle of 3% hydrogen peroxide.
- Prepare a mixture containing:
  - 1 part water
  - 2 parts white vinegar
  - 1 part 3% hydrogen peroxide
- In a well ventilated area using rubber gloves and goggles apply the solution to the machine (i.e., use a spray bottle, a brush, cloth, etc.).
- Work the solution into heavily soiled spots with a brush and then let it stand for no more than 15 minutes [Note: If left on more than 15 minutes the solution may begin to corrode some metal parts.]
- Spray the machine with a water hose to remove all of the solution. Once it is completely rinsed [Note: Don't forget to rinse the bottom of the machine.] move it to a dry location and allow it to air dry.

SAFETY NOTE: ***Do not*** *store the cleaning solution near aerial ignition spheres as contact between the two may result in ignition.*

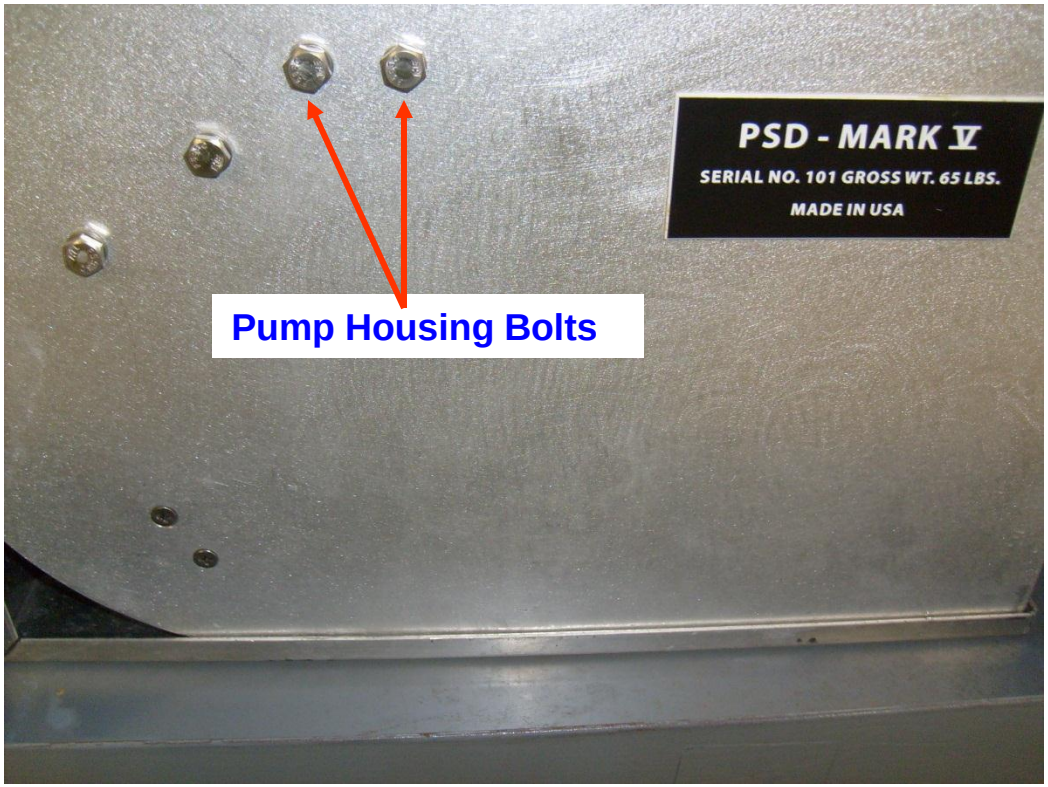
PSDS MARK V
USER MAINTENANCE

Pump Maintenance

- The MARK V contains two identical pumps, one for pumping the glycol and the other for pumping water. If a pump needs to be removed the following information should prove useful to the user:
- Remove the top of the mainframe and locate the pump housing.
- Unplug the two electrical connections on the front of the housing. The entire housing is held in place by two 7/16 inch head bolts located on the outside of the mainframe. Remove those two bolts and lift the pump housing straight up. [Note: Be careful that the flexible hoses do not snag on anything as you lift up the housing.]

PSDS MARK V
USER MAINTENANCE

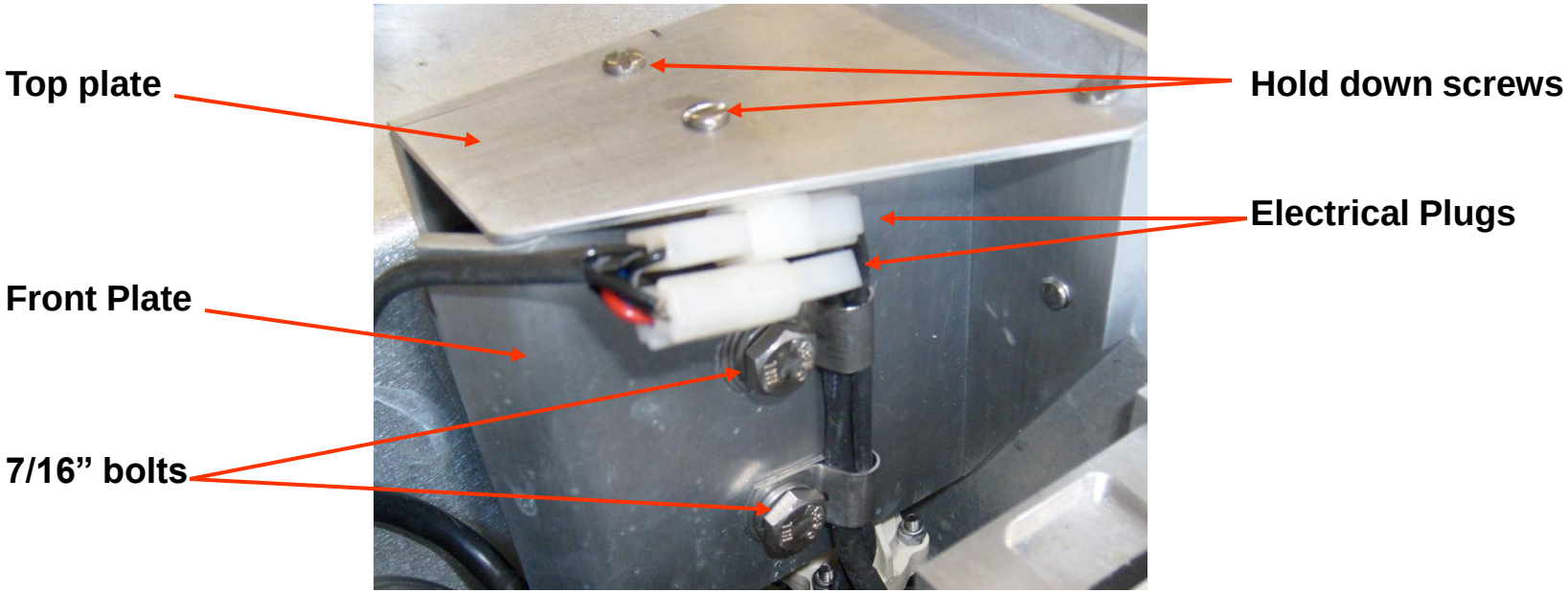
Pump Maintenance (cont'd)



Location of Pump Housing Bolts

PSDS MARK V
USER MAINTENANCE

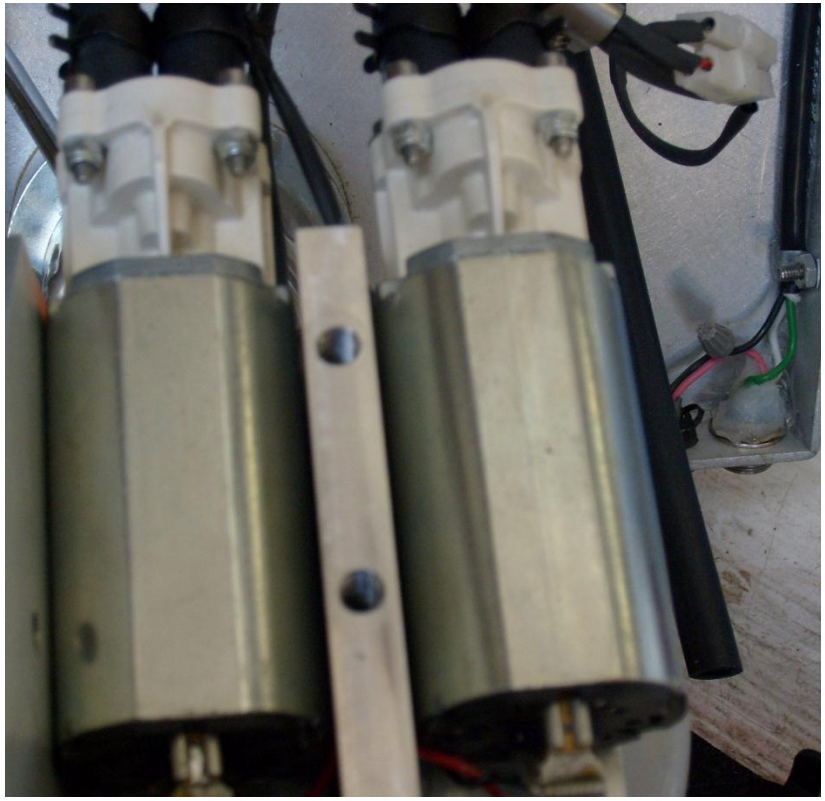
Pump Maintenance (cont'd)



PSDS MARK V
USER MAINTENANCE

Pump Maintenance (cont'd)

- Lay the pump housing on its back and remove the two bolts holding the cover plate and electric brackets (7/16 inch heads).
- The two pumps will now be easily accessible.



Pumps with Cover Removed

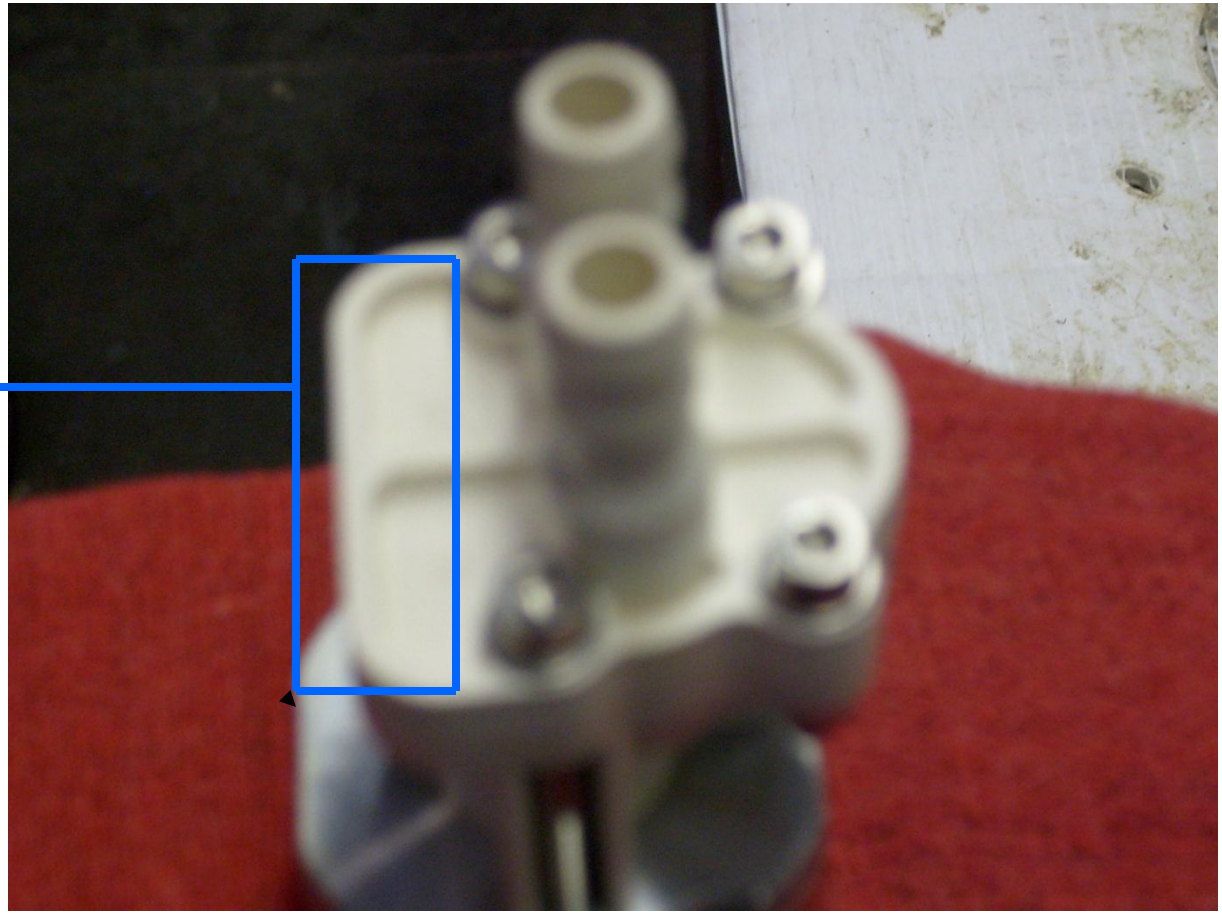
PSDS MARK V
USER MAINTENANCE

Pump Maintenance (cont'd)

- For reference purposes the glycol pump abuts the side of the pump housing.
- Either pump can now be lifted out of the housing. After lifting the pump carefully unplug the electrical connections from the top of the pump. [NOTE: The pumps are marked with a + and – sign by the electric contacts. When reconnecting a pump the red wire goes to the + and the black to the -.
- When the pump is removed from the housing you will see a cavity in the back of the housing which is critical in repositioning the pump securely. When the pump is placed back in the housing the pump head must be positioned such that the flat side of the head sits against the bottom edge of the cavity.

PSDS MARK V
USER MAINTENANCE

Flat side of pump head must rest against cavity in the back of the pump housing.



Proper Positioning of Pump

PSDS MARK V
TROUBLESHOOTING THE DISPENSER

Hopper Motor Fails to Run

- Make sure that the hopper electrical control wire is plugged into and secured in the mainframe.
- Verify that the mainframe is connected to a power source.
- Depress the circuit breaker on the hopper control panel to be sure it is not tripped.

Mainframe Motor Fails to Run

- Make sure the mainframe is connected to a power source.
- Depress the 2 amp circuit breaker for the motor located on the main control panel next to the drive motor switch to be certain it is not tripped.
- Depress the 5 amp circuit breaker on the main control panel to be sure it is not tripped.

PSDS MARK V
TROUBLESHOOTING THE DISPENSER

Glycol is Not Pumping

- If pump can be heard running make sure there is glycol in the tank.
- If pump fails to operate make certain that mainframe is connected to a power source.
- Depress the 2 amp circuit breaker on the main control panel next to the glycol pump switch to be sure it is not tripped.
- Depress the 5 amp circuit breaker on the main control panel to be sure it is not tripped.

Water is Not Pumping

- (NOTE: The water pump is designed to work whenever there is power to the dispenser regardless of what other components are or are not operating. Do not use the dispenser if the water pump is not operational!)
- If pump fails to operate make certain that mainframe is connected to a power source.
- Depress the 2 amp circuit breaker on the main control panel next to the red water pump button to be sure it is not tripped.

PSDS MARK V
TROUBLESHOOTING THE DISPENSER

Spheres Fail to Ignite

(NOTE: For optimum ignition the spheres should be injected with about .75cc of glycol.)

- Check to see that the spheres have been punctured by the needles. If they have then:
- Check the glycol tank to be sure there is sufficient glycol in it.
- Verify that the glycol pump is functioning and that the manifold has been primed.
- Lubricate each of the four plungers on the manifold and depress them to be sure they are working properly.
- Check the needle valve adjustment on the manifold.

If the dispenser will not operate correctly after performing the appropriate steps contact Aerostat, Inc. (352 787-1348) for support.

PSDS MARK V
DISPENSER SPECIFICATIONS

Dispenser weight fully assembled less glycol and water		**65 lbs**
Power source		**24 – 28 VDC**
Dimensions fully assembled	**length**	**27.25 inches**
	width	**10.50 inches**
	height	**26.00 inches**
Hopper capacity (approx.)		**450 spheres**
Glycol tank capacity		**2.4 gal.**
Emergency water tank capacity		**.8 gal.**
Sphere Diameter		**1.25 inches**
Sphere shell material		**High Impact Polystyrene**

PSDS MARK V

MACHINE SETTINGS & DROP RATES

SPEED	# CHUTES OPEN	GROUND SPEED IN MPH				
		10	20	30	40	50
		Approximate distance between ignition points in feet				
SLOW						
	2	**20**	**40**	**60**	**80**	**100**
	4	**10**	**20**	**30**	**40**	**50**
FAST						
	2	**13**	**26**	**39**	**52**	**65**
	4	**7**	**14**	**21**	**28**	**35**

PSDS MARK V
REPAIRS, UPDATES & PARTS

Repairs/Updates to your MARK V can be made by contacting:

Aerostat, Inc.

8830 Airport Blvd.

Leesburg, FL 34788

Telephone: 352 787-1348

Fax: 352 787-4666

Email: customerservice@aerostatinc.com

Depending on how comfortable a user is with making repairs they may wish to consider stocking the following parts:

Spare Pump

Set of Needles

Drive Motor

Parts can also be obtained by contacting Aerostat, Inc.