

Safety Precautions- General



FAILURE TO UNDERSTAND AND PRACTICE GOOD SAFETY PROCEDURES
COULD RESULT IN BODILY INJURY OR DEATH



Agricultural chemicals can be dangerous. Improper selection or use can seriously injure persons, animals, plants, soil or other property. BE SAFE: Select the right chemical for the job. Handle it with care. Follow the instructions on the container label and of the equipment manufacturers.

Never operate the spraying equipment with safety shields removed. Be aware that even with all safety shields in place the equipment can be dangerous if operated incorrectly. All farm machinery is inherently dangerous to children and to persons unfamiliar with its general operation. Since air sprayers contain numerous moving parts that can be extremely hazardous, steps should be taken to assure the safety of the operator. Never conduct maintenance on the equipment when parts are moving. Be aware of moving parts. Make sure all persons are clear of the equipment when in operation. Failure to follow any of the above warnings may cause serious bodily injury or death. Prior to operating this equipment, be sure to read and understand the operator's manual. If there is any portion you do not understand, or any phase of the machine's operation you do not understand, be sure to contact your dealer or Northern Ag Mist Sprayer.

1. Carefully study and understand your manual.
2. Do not wear loose fitting clothing that may catch in moving parts.
3. Make sure all shields and guards are in place and functioning.
4. Be sure there are no tools or other foreign objects laying on or in the machine.
5. Do not start the machine until you are sure everyone is clear.
6. Be sure the machine is hitched or mounted properly to the tractor or pickup.
7. Under no circumstance should a machine equipped for 540 RPM drive be operated with a tractor that has 1000 RPM PTO.
8. Accumulation of dirt or foreign material in blower wheel may cause imbalance or excessive vibration. Inspect daily, thoroughly clean when necessary.
 - A. Keep hands, feet and clothing away from moving parts, especially the air intake area of the fan.
 - B. Do not clean, adjust or lubricate your equipment while it is running.
 - C. Do not step over the PTO shaft while it is turning.
 - D. Never sit or stand on this machine while it is in operation.
 - E. Never leave a running machine unattended.
 - F. Stay clear of fan discharge area.
 - G. Please follow all suggested chemical safety precautions – please read below list of safety precautions.

Filling your Mist Sprayer

Determine the chemical concentration required according to chemical label directions. Generally, these directions give a range of low to high concentrations for a specific use. Air sprayers perform well using the light to medium concentrations.

Wettable powders should be premixed with water to eliminate lumps. This premixed solution should be strained through no larger than a 40-mesh screen when adding to the tank.

When filling the spray tank be sure to have the tank half full of water then add the required chemical and finish filling the tank to the desired capacity. Use only clean water and fresh chemicals for best results.

Most chemicals deteriorate rapidly after mixing so mix only the amount you intend to use immediately. Never leave unused chemicals in the tank or lines of the sprayer. Drain and flush after each use.

Starting your Mist Sprayer

Never run the mist sprayer without liquid in the tank. Running the sprayer dry can cause excessive wear and heading of the pump. This will greatly reduce the effectiveness and life of the pump.

When the correct chemical concentration has been selected and the tank has been filled to the desired level the mist sprayer can now be used.

Loosen the lock nut on the pressure regulator "T" handle and turn the "T" handle until the desired pressure is reached (40-60 PSI should be sufficient). After the desired pressure has been reached be sure to retighten the lock nut.

Starting your Mist Sprayer – Centrifugal Pump

- a. Most centrifugal pumps are equipped with mechanical seals. Do not run the pump dry!
- b. Grease idler arm on belt drive pumps regularly so the pump may rotate freely.
- c. Priming:
 - a. **DO NOT OPERATE PUMP BEFORE PRIMING!**
 - b. If liquid level is above pump, permit liquid to fill pump suction line and volute. Bleed off air through top pipe plug in the volute before starting pump.
 - c. Be sure there is no backpressure on the discharge side of the pump before priming.
 - d. After priming pump and bleeding air, start the tractor engine and engage PTO shaft. If pump does not build up pressure as engine speed increases, it is not properly primed and should be shut down and primed again.
 - e. After a short period of operation, check all pressure bolting for tightness.
 - f. See manufacturer's operation manual for proper operating speeds.

Starting your Mist Sprayer – Operating Centrifugal Pump

1. Secure sprayer to tractor.
2. As per manufacturer's operation manual suggestion, pre-check your pump before connecting to tractor.
3. Grease any working parts requiring grease on a regular basis.
4. With tractor shut off, connect sprayer to tractor

5. Check all hoses for cracks, kinks, or soft spots and replace accordingly.
6. Check all connections, belts and nuts for tightness.
7. Be sure operator remote shut-off valve is shut off.
8. Adjust pressure regulator to allow full flow into the tank for re-circulation (turn pressure regulator valve counter clock-wise as far as it will go).
9. Open gate valve located between the pump and the tank.
10. Prime pump according to manufacturer's recommendations.
11. Partially fill tank (with water). Make sure you have enough water to check nozzle calibration and priming. CAUTION: NEVER ALLOW YOUR CENTRIFUGAL PUMP TO RUN DRY!
12. Slowly engage the tractor PTO.
13. Open operator remote valve to full open.
14. Using the pressure regulator valve adjust to desired spraying pressure.
15. If desired pressure cannot be obtained you may have to use the operator valve to adjust the pressure – use this as a last resort.
16. With operator valve open (spray mode), check nozzles for deformed spray angle and proper calibration. (See "calibration" section of this manual).
17. Check all nozzle caps; be sure they are tight.
18. Replace any worn tips.
19. Check nozzle alignment and proper spray pattern.
20. Disengage tractor PTO. You are now ready to fill tank for field operation.
21. Always check with your chemical dealer for instructions on handling, mixing and filling your sprayer with chemicals.

Starting Your Mist Sprayer – Trouble Shoot Centrifugal Pump

- A. Broken or worn belt
 - a. This is normally due to operation of pump while pulleys are misaligned, or the PTO shaft is engaged too rapidly.
 - b. With the sprayer disconnected from the tractor - loosen mounting bolts on centrifugal pump. Allow pump to slide forward such that the faulty belt can be removed and a replacement belt may be installed. There is no need to disassemble pump.
- B. Inability to reduce pressure
 - a. Reduce PTO or engine shaft speed.
 - b. Check for leaks in suction line
 - c. Check impeller to make sure vanes are not plugged.
 - d. Increase suction hose size if undersized and check for collapsed or kinked suction hose.
 - e. Check for air leaks (tighten all hose clamps).
 - f. The operator valve may need to be partially closed if correct pressure cannot be achieved.

Starting Your Mist Sprayer – Roller Pump

- A. One of the most common causes for faulty pump performance is gumming or corrosion inside the pump. This prevents the rollers from moving freely in their roller slots. Flush the pump with a solution that will neutralize the liquid previously pumped through it. Mix according to manufacturer's directions.
- B. To prevent corrosion, after cleaning the pump as described above, flush a permanent type of automobile antifreeze containing a rust inhibitor such as FLUID FILM into pump ports. Turn the shaft several times to draw protective liquid through pump and coat entire inner surface. Drain pump and plug ports to keep air out during storage.
- C. DON'T operate pump dry.
- D. DON'T pump acids or other liquids corrosive to cast iron.
- E. DON'T pound pump apart with a hammer or pry it apart with a screwdriver.
- F. DON'T pump sandy or gritty liquids (such as white wash).
- G. DON'T pump out septic tanks or basements with your sprayer pump.

Starting Your Mist Sprayer – Operating Roller Pump

- 1. With the sprayer disconnected from the tractor - check pump to be sure shaft turns freely by hand. If it does not, see "Trouble Shooting Roller Pumps."
- 2. With tractor turned off connect sprayer to the tractor.
- 3. Check all hoses on sprayer for kinks, cracks, or soft spots (replace hoses if they show any of these conditions).
- 4. Check all bolts, nuts, belts and hose connections to be sure they are tight.
- 5. Fill tank with only a few gallons of water – enough to check nozzle calibration and to see operation pressure.
- 6. Open gate valve on suction line and allow water to fill pump.
- 7. Be sure operator valve is shut off.
- 8. Slowly engage tractor PTO.
- 9. Open operator remote valve to full open.
- 10. Using the pressure regulator valve adjust to desired spraying pressure.
- 11. With operator valve open (spray mode), check nozzles for deformed spray angle and proper calibration. (See "calibration" section of this manual).
- 12. Check all nozzle caps; be sure they are tight.
- 13. Replace any worn tips.
- 14. Check nozzle alignment and proper spray pattern.
- 15. Disengage tractor PTO. You are now ready to fill tank for field operation.
- 16. Always check with your chemical dealer for instructions on handling, mixing and filling your sprayer with chemicals.

Starting Your Mist Sprayer – Trouble Shooting Roller Pumps

1. IF PUMP ROTOR APPEARS TO BE STUCK
 - a. Rust (corrosion) scale or sticky residue
 - i. Loosen each end-plate bolt one full turn
 - ii. Try again to rotate pump by hand
 - iii. If pump can be turned by hand, rotate it several times on PTO shaft to free pump rotor. Squirt a few tablespoons of oil onto the parts to help free the rotor.
 - iv. Tighten end plate bolts securely. Attach torque arm and hoses, then pump water or spray material for a few minutes to fully flush pump residue.
 - b. Solid objects lodged in pump, such as metal chips, nuts, washers, etc... This will make it necessary to take the pump apart. See manufacturers suggestions on disassembly of roller pumps.
2. IF PUMP DOES NOT PRIME:
 - c. Check for:
 - i. Leaks in suction line
 - ii. Obstructions in suction line
 - iii. Shut-off valve on discharge line
 - iv. Pump speed too slow
 - v. Excessive pump wear
 - vi. Pump rollers stuck in slots
 - vii. Pump seals leaking air
 - viii. Pump turning incorrect direction
3. PUMP HAS LOSS OF PRESSURE
 - d. This may be caused by:
 - i. Pump too high above liquid source
 - ii. Clogged suction strainer
 - iii. Kinked or collapsed suction hose may pull loose and clog passage. This is not always noticeable on the outside of the hose.
 - iv. Leaks in suction line fittings. These are hard to located because air leaks inward.
 - v. Pump turning incorrect direction
 - vi. Pump running too slow
 - vii. Faulty pressure gauge
 - viii. Pump rollers sticking in slots
 - ix. Pump seals leaking air
 - x. Nozzle orifice worn increasing flow and reducing pressure

Calibration – Calculations / Examples

GPA – Gallons per acre

PTO – Power-take Off

RPM – Revolutions per minute

MPH – Miles per hour

GPM – Gallons per minute

PSI – Pounds per square inch (pressure gauge reading)

To effectively determine the application rate use the following procedure:

1. Select the GPA (gallons per acre) of spray mixture required. Refer to chemical mfg. Label directions and recommendations.

Example: Gallons per Acre = 1.5 GPA

2. Select the suitable sprayer speed. For tractors, decide which gear will be used; then determine the exact speed for that gear when traveling at an engine speed that turns the PTO 540 RPM. It may be necessary to drive the tractor in a straight line for one minute at 540 PTO speed and measure the feet traveled. The number of feet traveled in one minute divided by 88 equals MPH (miles per hour). Let us assume the tractor traveled 440 feet in one minute. See below for the calculation.

EXAMPLE :	MPH =	$\frac{\text{\# OF FEET TRAVELED IN ONE MINUTE}}{88}$
		$\frac{440 \text{ FT}}{88} = 5 \text{ MPH}$

3. Select the swath width to be used. Let's assume the swath width for your machine is set for 60 ft.

EXAMPLE: SWATH WIDTH = 60 FEET



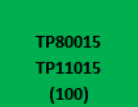
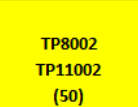
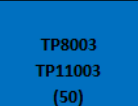
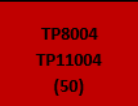
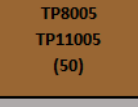
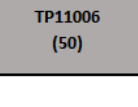
4. Calculate the total flow rate in GPM (gallons per minute) required.



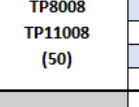
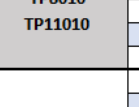
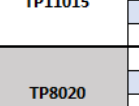
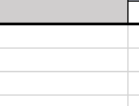
Example:	Total GPM =	$\frac{\text{GPA X MPH X SWATH WIDTH}}{495}$
		$\frac{1.5 \text{ GPA X } 5 \text{ MPH X } 60 \text{ FT}}{495} = .91 \text{ GPM}$

5. Calculate flow rate of each nozzle. Let us assume you are using a 5- nozzle volute. See the calculations below.

Example:	Flow Rate Per Nozzle =	$\frac{\text{TOTAL GPM}}{\text{NUMBER OF NOZZLES}}$
		$\frac{.91 \text{ GPM}}{5} = .182 \text{ GPM per Nozzle}$

6. Select nozzle tip and filter from the nozzle selection chart below.

	 PSI	DROP SIZE		CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN
		80 degree	110 degree		
 TP80015 TP11015 (100)	30	F	F	0.13	17
	35	F	F	0.14	18
	40	F	F	0.15	19
	45	F	F	0.16	21
	50	F	F	0.17	22
	60	F	F	0.18	23
 TP8002 TP11002 (50)	30	M	F	0.17	22
	35	F	F	0.19	24
	40	F	F	0.20	26
	45	F	F	0.21	27
	50	F	F	0.22	28
	60	F	F	0.24	31
 TP8003 TP11003 (50)	30	M	M	0.26	33
	35	M	F	0.28	36
	40	M	F	0.30	38
	45	F	F	0.32	41
	50	F	F	0.34	44
	60	F	F	0.37	47
 TP8004 TP11004 (50)	30	M	M	0.35	45
	35	M	M	0.37	47
	40	M	F	0.40	51
	50	M	F	0.45	58
	60	F	F	0.49	63
 TP8005 TP11005 (50)	30	M	M	0.43	55
	35	M	M	0.47	60
	40	M	M	0.50	64
	50	M	M	0.56	72
	60	M	M	0.61	78
 TP8006 TP11006 (50)	30	C	M	0.52	67
	35	C	M	0.56	72
	40	M	M	0.60	77
	50	M	M	0.67	86
	60	M	M	0.73	93

	 PSI	DROP SIZE		CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN
		80 degree	110 degree		
 TP8008 TP11008 (50)	35	C	M	0.75	96
	40	C	M	0.80	102
	50	M	M	0.89	114
	60	M	M	0.98	125
 TP8010 TP11010	30	C	M	0.87	111
	35	C	M	0.94	120
	40	C	M	1.00	128
	50	M	M	1.12	143
 TP8015 TP11015	60	M	M	1.22	156
	30	VC	C	1.30	166
	35	C	C	1.40	179
	40	C	C	1.50	192
 TP8020 TP11020	50	C	M	1.68	215
	60	C	M	1.84	236
	30	VC	VC	1.73	221
	35	C	VC	1.87	239
	40	C	C	2.00	256
	50	C	C	2.24	287
	60	C	C	2.45	314

7. Check the application rate by collecting the output of one nozzle at a select pressure for one minute. Measure the output in gallons and multiply by the number of nozzles. This will give you the actual application rate in GPM. Delivery rate can be increased or decreased by varying the pressure as required. Never use pressure in excess of 80 PSI.