NITRO SPRAYER
MAINTENANCE AND REPAIR MANUAL

4000 SERIES MODELS

DO NOT OPERATE THIS EQUIPMENT UNTIL THIS MANUAL HAS BEEN READ AND UNDERSTOOD

Part Number 21.47116
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Introduction

This Maintenance and Repair Manual is provided to instruct the maintenance technician on repair procedures of the Miller Nitro Sprayer. Complete Remove and Install procedures are provided. When needed, additional procedures for Disassembly, Inspect, Clean, Measure, and Assembly are provided.

Make sure the maintenance technician reads and understands this manual before working on the Miller Nitro Sprayer. Failure to follow the recommended procedures may result in injury and equipment damage, and could void the warranty.

The machine serial number is located on the inside front right side frame rail below the lift arm pivot. For your convenience, refer to this number and your product model number when requiring service or parts information. Record the machine serial number, model number, date of purchase, and dealership name in the space provided below.

Date Purchased _____

Model No. _____ Serial No. _____

Dealership _____

Right- and left-hand sides are determined from a position sitting in the operator's seat looking forward.

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CHAPTER 1 - GENERAL AND SAFETY INFORMATION

Safety Precautions

Notes, Notices, Cautions, Warnings, and Dangers Definitions

Throughout this guide **NOTE, NOTICE, CAUTION, WARNING**, and **DANGER** will be used. Please observe these **NOTES, NOTICES, CAUTIONS, WARNINGS,** and **DANGERS;** be aware that servicing a vehicle requires mechanical skill and a regard for conditions that may be hazardous. Improper service or repair may damage the vehicle or render it unsafe.

NOTE

Addresses practices not related to personal injury.

NOTICE

Indicates a situation which, if precautions are not complied with, may result in equipment or property damage.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, may result in minor or moderate personal injury.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

BEFORE you attempt to operate this machine, read and study the following safety information. In addition, MAKE SURE that every individual who operates or works with this equipment, whether family member or employee, is familiar with these safety precautions. Miller-St. Nazianz provides guards for exposed moving parts for the operator's protection; however, some areas cannot be guarded or shielded in order to make sure of proper operation. The OPERATOR'S MANUAL AND SAFETY SIGNS on the machine itself warn you of dangers and SHOULD BE READ AND OBSERVED CLOSELY.

Failure to follow these precautions could result in death or serious injury.

General Safety Precautions

Read and understand all of the safety precautions and warnings before performing any repair. This list contains the general safety precautions that must be followed to provide personal safety. Special safety precautions are included in the procedures when they apply.

- Make sure the work area surrounding the product is dry, well-lit, well-ventilated, and free from clutter, loose tools, parts, ignition sources, and hazardous substances. Be aware of hazardous conditions that can exist.
- Always wear protective glasses, protective shoes, and hard hats when working.
- Rotating parts can cause cuts, mutilation, and strangulation.
- Do not wear loose fitting or torn clothing. Remove all jewelry when working.
- Do not attempt to operate machine without covers or shields in place.
- Never leave this machine unattended while it is running.
- Inspect machine for damage after use.
- Never allow unqualified or non-certified individuals to operate this machine.
- Wear safety goggles and all proper clothing when operating, servicing, or refilling this machine. Always read and follow all manufacturers' recommendations when handling chemicals.
- Do not work on anything that is supported ONLY by lifting jacks or a hoist. Always use blocks or proper stands to support the product before performing any service work.
- To avoid personal injury, use a hoist or get assistance when lifting components that weigh 50 lbs (23 kg) or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. Always use a spreader bar when necessary. The lifting hooks must not be side-loaded.
- Do not perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.
- **Do not drive this vehicle on public roads at high speeds with product in the product tank. Always empty the product tank before leaving the area of operation.**
- Always be sure the area is clear of all personnel before starting the engine or operating this vehicle.

Sprayer Safety Precautions

⚠ WARNING

Do not pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in explosive atmospheres. The pump should be used only with liquids compatible with the pump component materials. Failure to follow this warning could result in personal injury and/or property damage and will void the product warranty.

SPRAYER OPERATIONS

For your safety:

- Do not pump at pressures higher than the maximum recommended pressure.
- Secure the discharge lines before starting the pump. An unsecured line may whip causing personal injury and/or property damage.
- Check hoses for wear or worn condition before each use. Make certain that all connections are tightly secured.
- Periodically inspect the product pump and the system components. Perform routine maintenance as required.
- Do not use these pumps for pumping water or other liquids meant only for human or animal consumption.

SPRAYER SERVICE AND MAINTENANCE

For your safety:

- Disconnect power before servicing.
- Release all pressure within the sprayer system before servicing any sprayer component.
- Drain all fluids from the sprayer system before servicing any sprayer component. Flush with water three times.
- Use only pipe, hose, and fittings rated for the maximum psi rating of the pump.

Chemicals and Hazardous Substances Safety Precautions

HAZARDOUS SUBSTANCE ALERT

A pesticide is a chemical used to directly control pest populations or to prevent or reduce pest damage (e.g., insecticides, herbicides, fungicides).

- Always drain and flush pump or other wet system components before servicing or disassembling for any reason.
- Always drain and flush pump or other wet system components prior to returning unit for repair.
- Never store pump or other wet system components containing hazardous chemicals.
- Flush the component with neutralizing liquid. Attach tag or include written notice certifying that this has been done.
- It is illegal to ship or transport any hazardous chemicals without United States Environmental Protection Agency licensing.
- Never operate this product in or near explosive atmospheres or where aerosol (spray) products are being used.
- Do not pump combustible liquids or vapors with this product or use in or near an area where flammable or explosive liquids or vapors may exist.
- Do not use this product near flames.

- Agricultural pesticide and herbicide mist or liquid can cause permanent eye, skin, or lung damage or death. Always wear proper protective clothing, goggles, respirator, gloves, or other protective garments as recommended by the labels of the chemicals used.

Prolonged exposure to pesticides can cause injury or death.

To minimize risk:

- Allow only trained, certified applicators to apply pesticides.
- Keep pesticides out of the cab.
- Follow all instructions in:
  - U.S. EPA workers protection standard for agricultural pesticides.
  - State or regional guidelines for worker safety and health.
  - Manufacturer's label for each pesticide applied.

AGRICULTURAL PESTICIDES AND HERBICIDES ARE TOXIC. Pesticides and herbicides not safely used, handled, stored, and disposed of can cause serious injury or death to individuals and harm to the environment.

- Wear protective clothing and equipment.
- Choose the best pesticides and herbicides for your application. It is your responsibility to be informed on appropriate pesticides and herbicides to use for your application(s).
- Read, understand, and follow the pesticides and herbicides manufacturer's label.
- Contact pesticides and herbicides supplier, extension agent, or other qualified personnel if you have usage questions.

Engine Safety Precautions

ENGINE OPERATION

For Your Safety:

- Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation, or other bodily injury or death.
- Disconnect the battery (negative [-] cable first, then the positive [+] cable) and discharge any capacitors before beginning any repair work. Put a "Do Not Operate" tag in the operator's compartment or on the controls.
- Use ONLY the proper engine barring techniques for manually rotating the engine.
- If an engine has been operating and the coolant is hot, allow the engine to cool before you slowly loosen the filler cap and relieve the pressure from the cooling system.
- Relieve all pressure in the air, oil, and cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do not check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- To prevent suffocation and frostbite, wear protective clothing and ONLY disconnect liquid refrigerant (freon) lines in a well-ventilated area. To protect the environment, liquid refrigerant systems must be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capture and recycling refrigerant.
- Corrosion inhibitor contains alkali. Do not get the substance in your eyes. Avoid prolonged or repeated contact with skin. Do not swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.

- Naphtha and Methyl Ethyl Ketone (MEK) are flammable materials and must be used with caution. Follow the manufacturer instructions to provide complete safety when using these materials. KEEP OUT OF REACH OF CHILDREN.
- To avoid burns, be alert for hot parts on products that have just been turned OFF and hot fluids in lines, tubes, and components.
- Always use tools that are in good condition. Make sure you understand how to use them before performing any service work. Use ONLY genuine OEM replacement parts.
- Always use the same fastener part number (or equivalent) when replacing fasteners. Do not use a fastener of lesser quality if replacements are necessary.
- Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.

Wheels and Tires Safety Precautions

For Your Safety:

- If a rim is leaking air, **DO NOT** weld on the rim! **NO WELDING SHOULD BE DONE without prior authorization from Miller-St. Nazianz. DO NOT** put a tube in the tire! **DO NOT** use tire sealant in the tire! These types of repairs can allow the defect to propagate to the point that the rim could fail resulting in personal injury or severe damage to the sprayer. **REPLACE** any leaking or damaged wheels with **NEW** wheels.
- Never rework, weld, heat, or braze rims. **NO WELDING SHOULD BE DONE without prior authorization from Miller-St. Nazianz.** If you have a wheel on your sprayer with a rim leaking air, contact your Miller dealer immediately.
- **DO NOT** drive or load tires beyond their rated speed and load capacities. Check with the tire manufacturer for load and speed ratings for your particular tire.
- **Driving this vehicle with product in the product tank at high speeds on public roads will lead to tire failure resulting in loss of vehicle control. Always empty the product tank before leaving the area of operation.**

Electrical Safety Precautions

OPERATION OF ELECTRICAL COMPONENTS

For Your Safety:

- This machine and its systems are designed to operate using a 12-volt DC power supply only.
- Never operate this machine with a damaged electrical cord. Disconnect from electrical supply if machine is not working properly or cord is damaged.
- Do not attempt to operate this machine without the appropriate fuses and breakers in place.
- Do not attempt to bypass a fuse. If a fuse is no longer serviceable, a shock or short hazard may exist.
- Never replace original fuses/breakers with a higher amperage fuses/breakers.
- Inspect all components for damage after any electrical problem.
- All electrical components generate heat. To avoid serious burns, never touch internal components immediately after use.
- Disassembly or attempted repairs, if accomplished incorrectly, can create electrical shock and/or short hazards. Only qualified personnel should perform repair service.

- Never attempt to replace electrical wires and cables with smaller gauge wire and cable.
- Some electrical components can store energy after the unit is shut down. Be sure to completely de-energize all electrical components, discharging all stored energy before beginning any service work.

Towing Safety Precautions

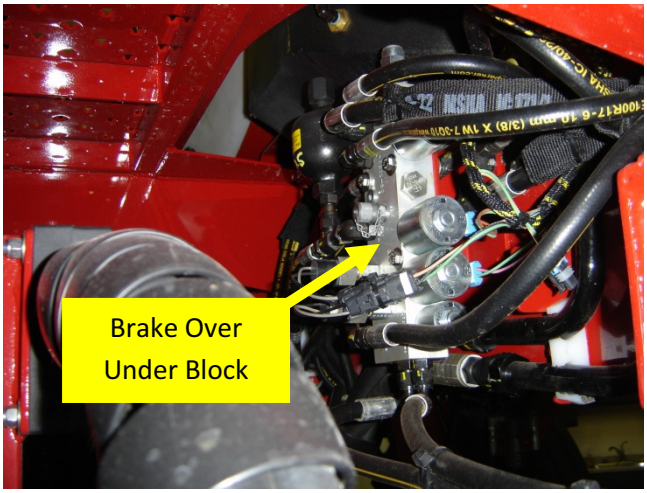
NOTICE

***IMPORTANT**: Contact your MIller dealer for more information on proper towing procedure. Failure to do so may cause severe damage to the drive system.*

If the vehicle must be towed and the vehicle has lost engine and/or hydraulic system power, the parking brakes will automatically apply. The parking brake is spring-applied when hydraulic pressure is lost. Contact your dealer for proper procedure to disable the parking brake. Tow the vehicle at very slow speeds and only for a very short distance. Following are the steps to towing a downed vehicle.

Moving a Downed Vehicle

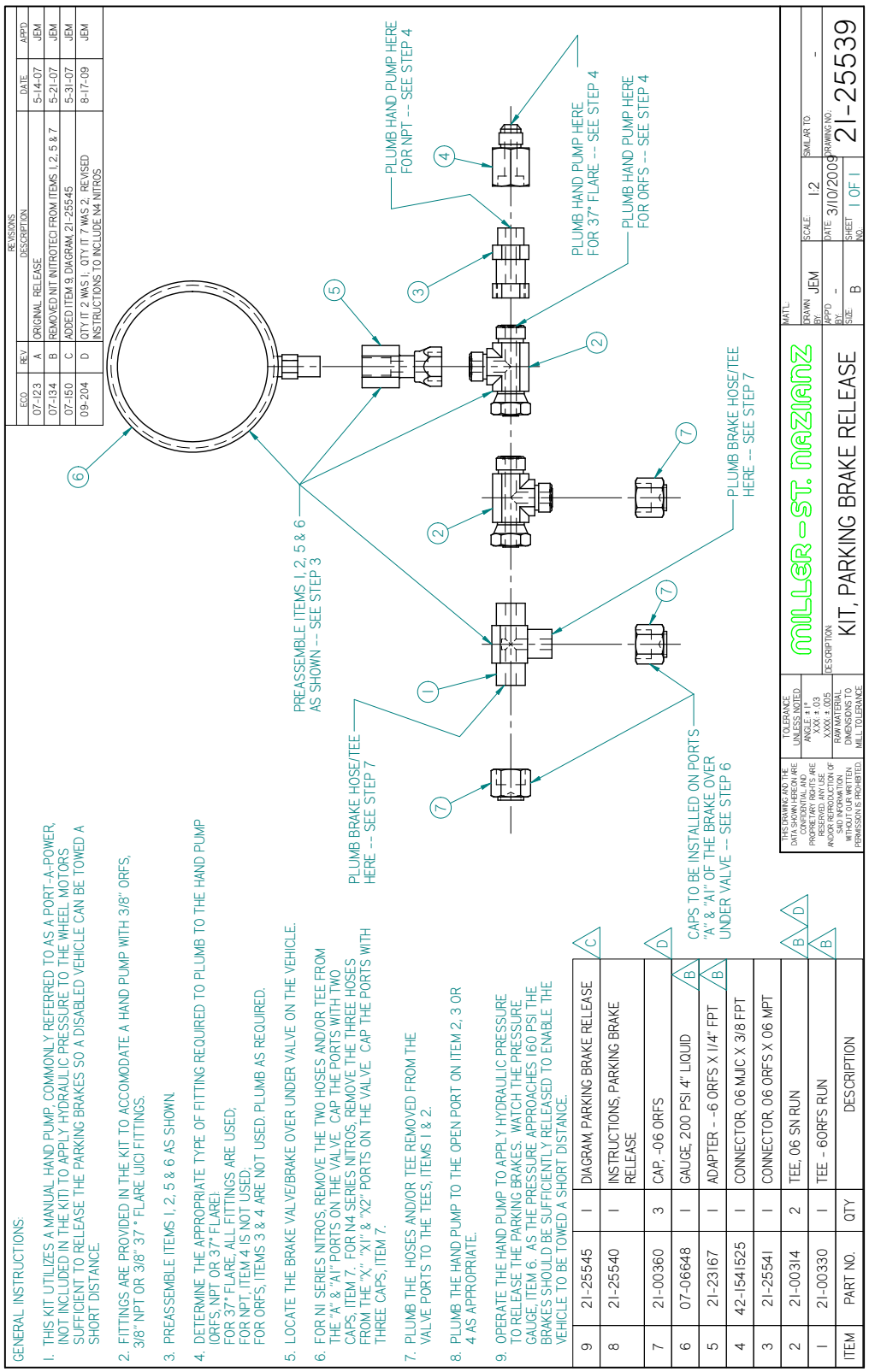
1. Obtain the Miller kit Part Number 21.25539, or have available the two O-ring face seal Run Tees and Port-A-Power adapter included in the kit. Fill the Port-A-Power with clean, 68 weight hydraulic oil only to prevent contamination of the hydraulic system. Add additional oil as needed to maintain pressure.



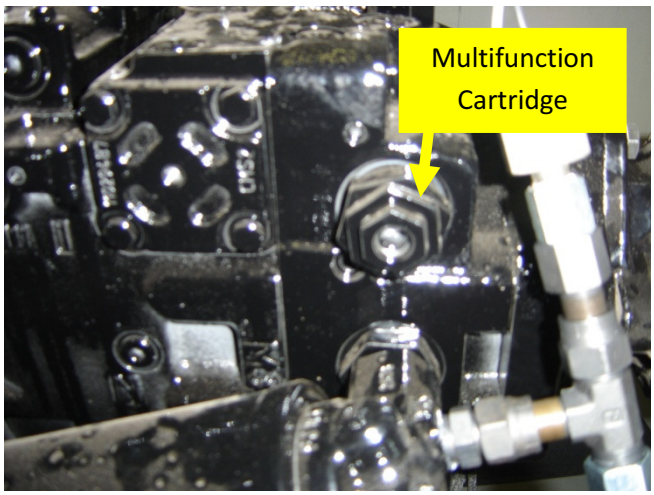
Brake Over Under (BOU) Block

2. Locate the Brake Over Under (BOU) block, located in front of the ladder.

3. Prepare for hose disconnects and valve plugging; set out the Port-A-Power, along with the fittings from the kit P/N 21.25539 (see Drawing below for details).



4. Locate ports labeled X, X1, and X2 on the BOU block.
5. Remove the hose connected at the X port and connect it to one of the Tee fittings; insert a plug into the valve connection point from which the hose was removed.
6. Remove the hose connected at the X1 port and connect it to one of the Tee fittings; insert a plug into the valve connection point from which the hose was removed.
7. Remove the hose connected at the X2 port and connect it to one of the Tee fittings; insert a plug into the valve connection point from which the hose was removed.

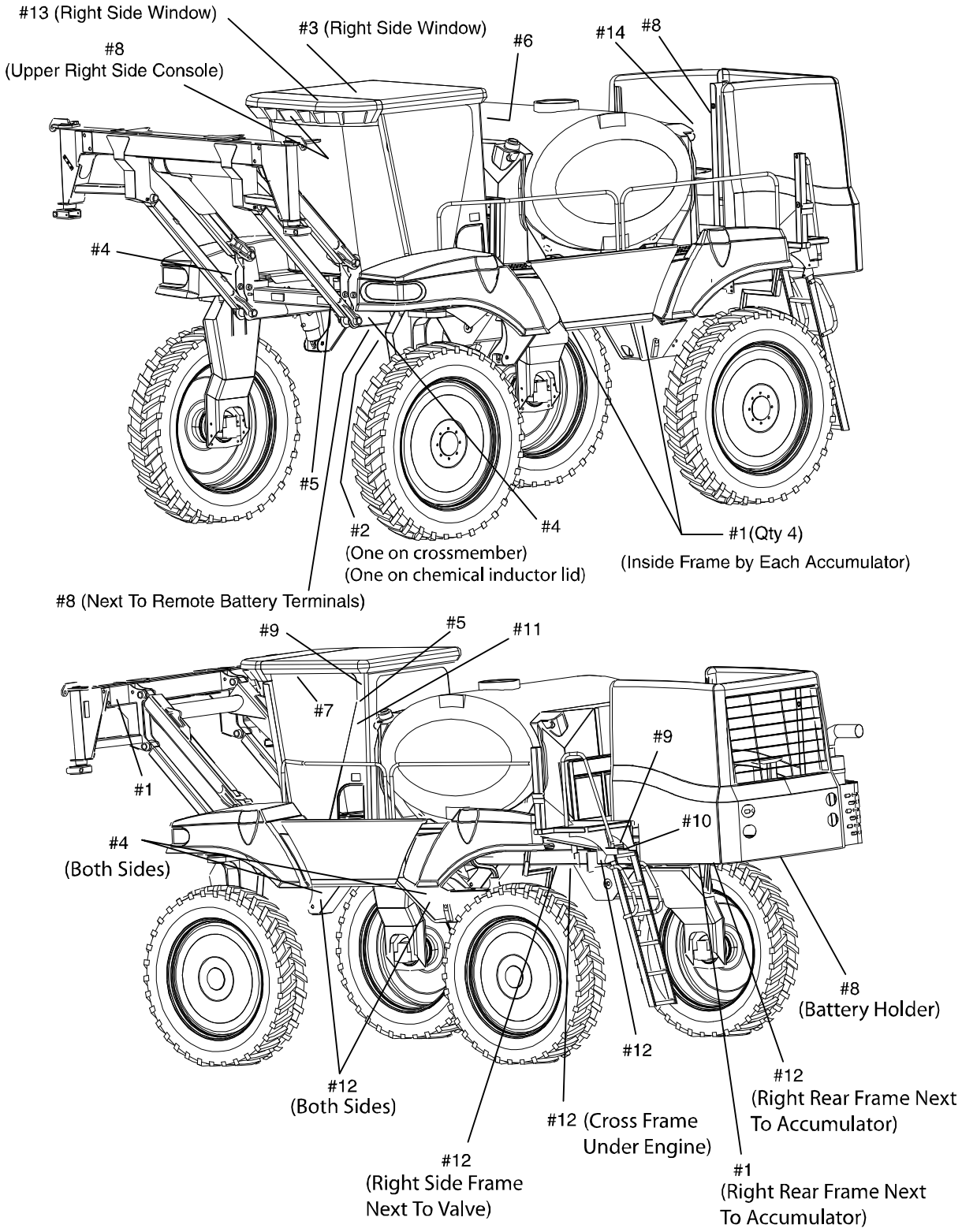


Multifunction Cartridge

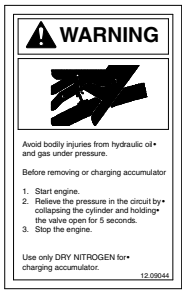
8. Locate the four multifunction cartridges located on the back side of the hydrostat; the second hex coupling hex nut should be turned counterclockwise three full turns. Do not turn more than that as this action will permit external leakage.
9. Have someone in the cab move the hydro lever to the forward position; pump the Port-A-Power to 165 psi minimum and the brakes will release. You **must** keep pressure to at least 165 psi to keep the brakes released, so closely monitor the pressure gauge when vehicle is moving. Tow at slow speed (0–3 mph) and **only** far enough to remove vehicle from roadway or to load onto a trailer. Severe damage to vehicle will result from towing vehicle an extended distance.

Safety Sign and Decal Locations

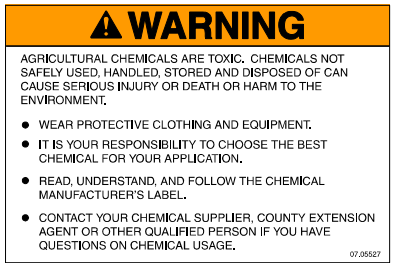
SAFETY SIGNS



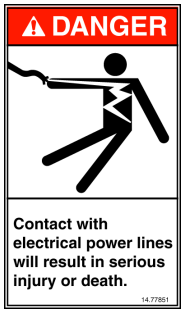
Safety Signs - continued



#1
21.09044 (Qty 7)
Accumulator Warning



#2
07.05527 (Qty 2)
Chemical Warning

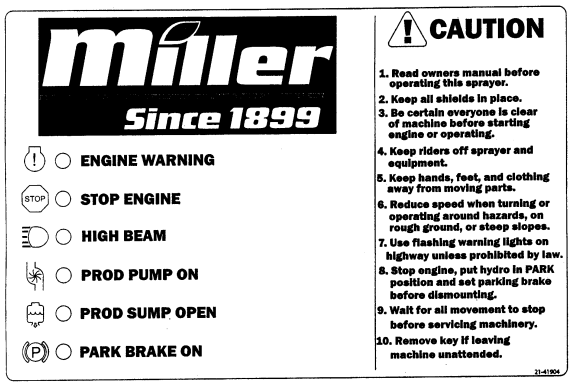


#3
14.77851 (Qty 1)
Electrocution Danger

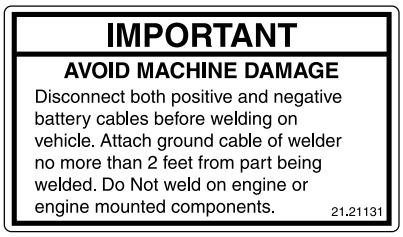
#4
21.09025 (Qty 6)
Pinch Point Danger

#5
21.20121 (Qty 2)
Cylinder Stop Warning

#6
07.09573 (Qty 1)
Fresh Water Tank Warning



#7
21.41904 (Qty 1)
Overhead Warning

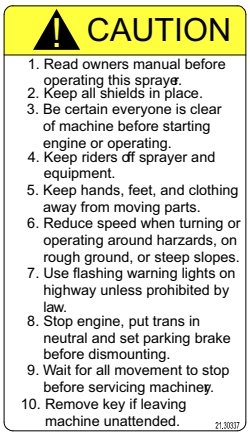


#8
21.21131 (Qty 4)
Before Welding Caution

Safety Signs - continued

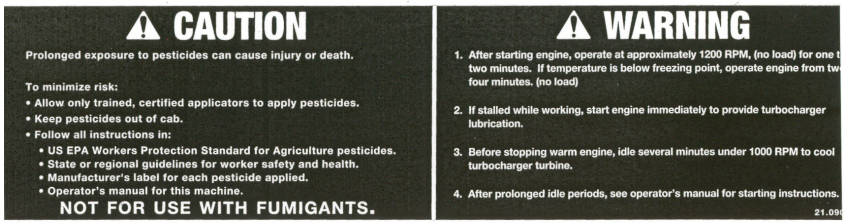
#9
21.09026 (Qty 2)
Walkway Danger

#10
21.30945 (Qty 1)
Ladder Caution



#11
21.30337 (Qty 1)
Instructions Caution

#12
21.09024 (Qty 8)
High Pressure Warning

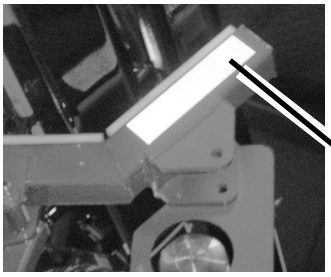


#13
21.09020 (Qty 1)
Operating Warning

#14
21.25450 (Qty 1)
Start From Seat Danger

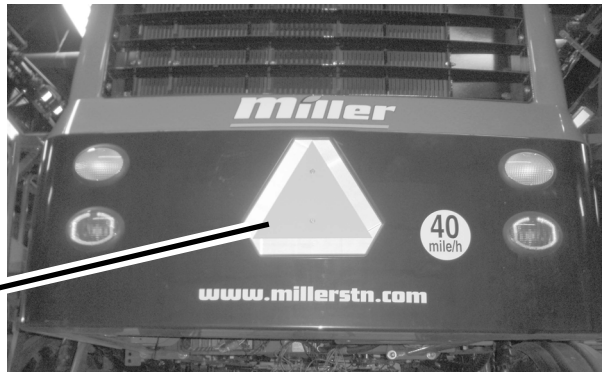
907219 (Qty 2)
Decal - Red Retroflective
Left Side Shown

907221 (Qty 2)
Decal - Orange Florescent
Left Side Shown



907220 (Qty 2)
Decal - Yellow Retroflective
Left Side Shown (Front side of boom saddle)

SMV Emblem



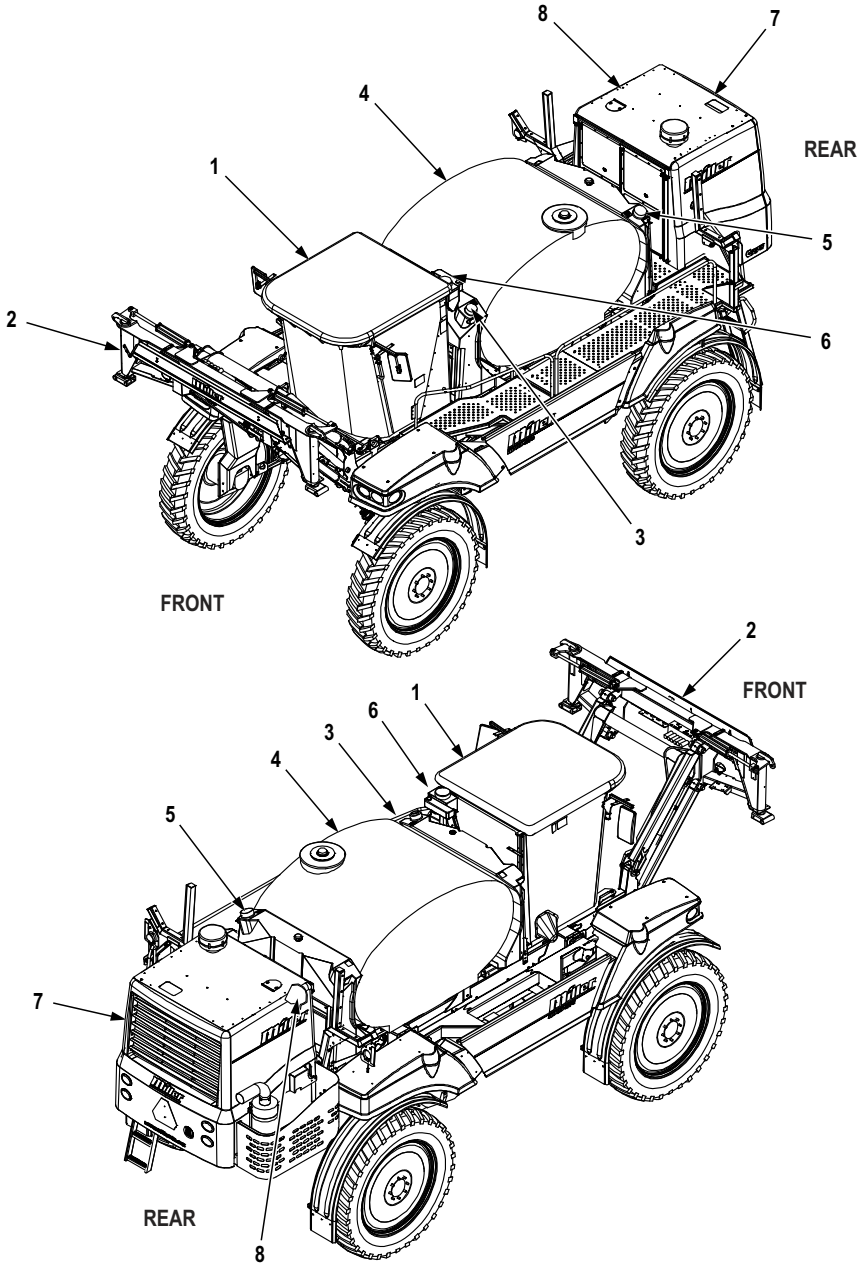
907225 SMV Emblem

SIS (Speed Indicator Symbol)

21.42045 SIS Decal
(40 mph)

21.42048 SIS Decal
(65 km/h)

Major Components Locations



1	Cab	5	Rinse Tank
2	Sprayer Boom, Center Section	6	Hand Rinse Tank
3	Fuel Tank	7	Engine
4	Product Tank	8	Hydraulic Oil Tank (behind engine panel)

Hoses/Fittings - General

Application Basics

Hydraulic hoses, fittings, and hose assemblies connect hydraulic motors to the pump and transmit high-pressure hydraulic fluids. These high-pressure fluids transfer energy and do useful work.

Hydraulic hose is flexible and is used primarily to allow motion between components at either end of the hose assembly, and to simplify routing/installation.

Bending, Motion, Routing

Hose assemblies should be long enough and routed in such a way that prevents exceeding manufacturers minimum bend radius recommendations.

To prevent excessive strain at hose-to-coupling interfaces, make hoses long enough to allow for contraction and expansion. Depending on size and application, hydraulic hoses can elongate up to 2 percent when pressurized, but more importantly, can contract as much as 4 percent which can especially stress hose-to-coupling interfaces.

Twisting a high-pressure hose only 5 degrees can reduce service life by 70 percent and a 7-percent twist can reduce service life up to 90 percent. When this kind of motion cannot be avoided, hose clamps between bends, with ample hose length on both sides of clamp, can relax torsion and help compensate for hose contraction.

Hose clamps can also provide protection from abrasion against adjacent surfaces. Additionally, metal or fabric sleeves can be installed to help keep abrasive particles away from hoses, and assist in the bundling of multiple hoses.

Hoses that do not properly accommodate equipment dynamics, such as hoses connected to cylinders that undergo pivoting motions, can create an undesirable situation. A swivel joint can provide a solution to this situation by permitting pivoting motions that reduce the bending transmitted to the hose assembly and by reducing the length of hose required.

Hose and Fitting Care

The hose manufacturers' guidance should be followed on the selection of hose fittings, hose types, and installation, as well as compatibility with the pressure rating of the system within which they will be used.

Many variables can affect compatibility of system fluids with hose materials, including type of fluid, fluid pressure, temperature, concentration, and duration of exposure.

Inspection

A careful examination of the hoses and fittings should be performed prior to assembly, checking for correct type, size, and length. Also inspect for cleanliness, obstructions, burrs, blisters, kinks, cracks, cuts, or any other visible defects. If any of these conditions are found, immediately shut down the vehicle and replace the hose assembly.

The fitting and sealing surfaces need to be inspected for burns, nicks, corrosion, or other imperfections. No substandard or defective components should be used in an assembly.

Repairs/Replacements

If any of the previously mentioned undesirable or defective hoses or fittings are found, including leaking fittings, worn clamps, guards, or shields, then these items must be tightened, repaired, corrected, or replaced as required.

Before performing any repairs/replacements, be sure to follow these precautions:

- Always shut the engine off and release all hydraulic pressure.
- Beware of any hydraulic pressure that may be stored in pressure vessels or accumulators.
- Always use supports, jacks, stands, or blocks to prevent movement of hydraulic implements or components.