



Fertilizer Spreader

Pro-Force® Dry Spreader

Operator's Manual

Models 1150, 1250, 1350, 1450, 1650,
1850, 2050, 2250 & 2650

Serial Number B46630100 & Higher

Part No. 417735

Refer to Part No. 417736 for Parts Catalog

Foreword



This symbol identifies important safety messages. When you see it, read the message that follows and be alert to the possibility of personal injury.

Remember, safety instructions stated in this manual are for your protection. Read them carefully and follow them closely when working around or using this machine.

Read and study this manual completely before attempting to operate this implement. Take this manual to the field for handy reference when operating, adjusting, or servicing your machine. It can be stored in the supplied tube located on the implement.

When referenced, “Right-Hand” (RH) and “Left-Hand” (LH) side of the machine are determined by standing behind the machine and facing in the direction of travel.



Product Information

When ordering parts or when requesting further information or assistance, always give the following information:

- Machine name
- Model
- Serial number

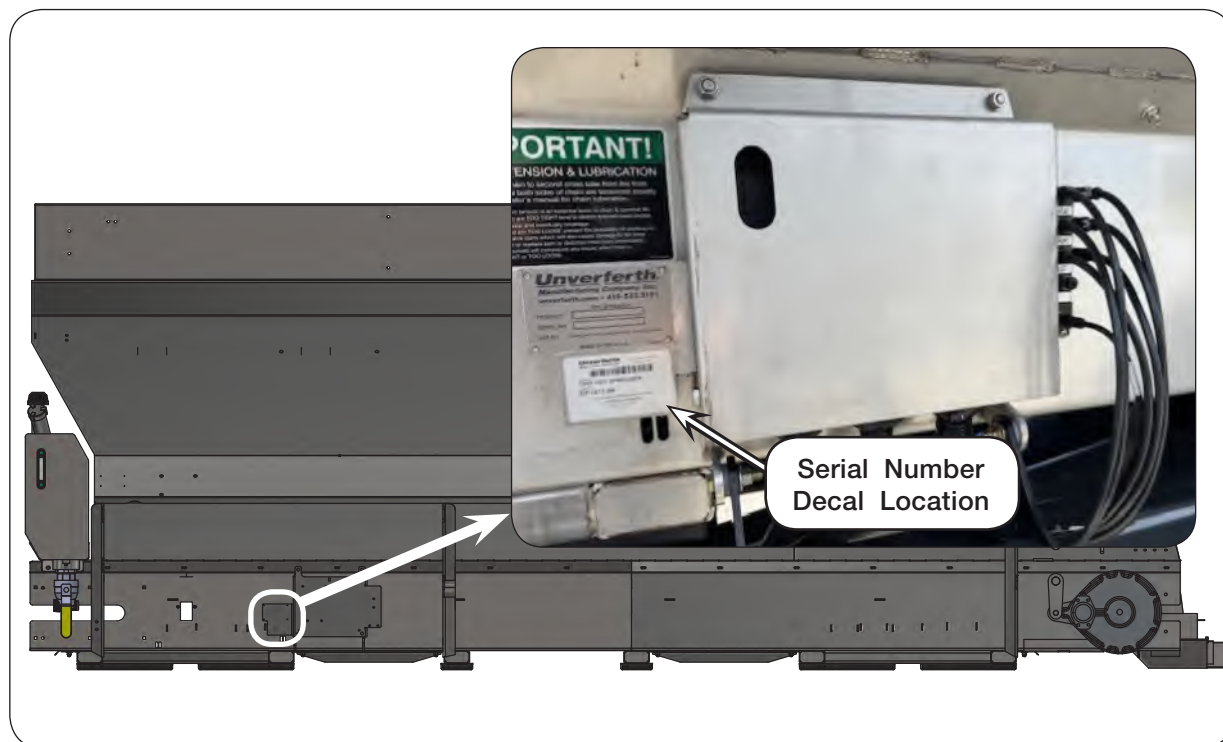
All products manufactured by Unverferth Mfg. Co., Inc. are warranted to be free from material and workmanship defects for one full year from time of consumer delivery. Your local dealer will gladly assist you with any warranty questions.

Please fill out and retain this portion for your records.

Purchase Date _____ Model _____ Serial Number _____

Dealer _____ City _____

Dealer Contact _____ Phone _____



IMPORTANT

- The information, specifications, and illustrations in the manual are based on information available at the time it was written. Due to continuing improvements in the design and manufacture of Unverferth products, all specifications and information contained herein are subject to change without notice.

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FOR SCALE, AUTO GREASER, AND / OR ELECTRIC TARP
INFORMATION, PLEASE REFER TO THE INDIVIDUAL MANUALS.

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General Hazard Information

No accident-prevention program can be successful without the wholehearted cooperation of the person who is directly responsible for the operation of the equipment.

A large number of accidents can be prevented only by the operator anticipating the result before the accident is caused and doing something about it. No power-driven equipment, whether it be transportation or processing, whether it be on the highway, in the field, or in the industrial plant, can be safer than the person who is at the controls. If accidents are to be prevented--and they can be prevented--it will be done by the operators who accept the full measure of their responsibility.

It is true that the designer, the manufacturer, and the safety engineer can help; and they will help, but their combined efforts can be wiped out by a single careless act of the operator.

It is said that, "the best kind of a safety device is a careful operator." We, at Unverferth Mfg. Co., Inc. ask that you be that kind of operator.



REMEMBER:
THINK SAFETY
A CAREFUL OPERATOR IS THE
BEST INSURANCE AGAINST AN
ACCIDENT!

SIGNAL WORDS



INDICATES AN EXTREMELY HAZARDOUS SITUATION OR ACTION THAT WILL RESULT IN SERIOUS INJURY OR DEATH.



INDICATES A HAZARDOUS SITUATION OR ACTION THAT COULD RESULT IN SERIOUS INJURY OR DEATH.



INDICATES AN UNSAFE SITUATION OR ACTION THAT MAY RESULT IN PERSONAL INJURY.

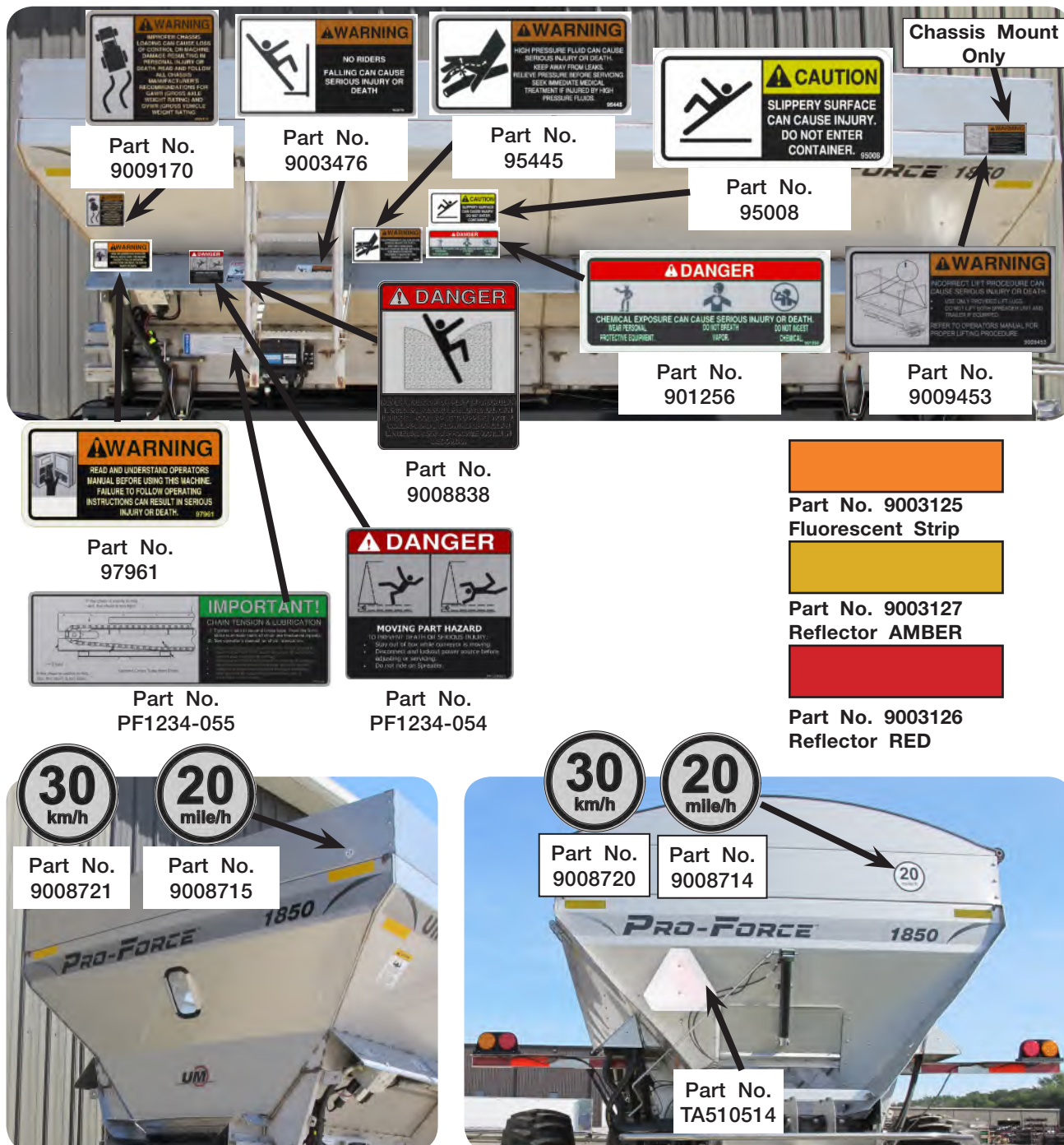


Is used for instruction on operating, adjusting, or servicing a machine.

Safety Decals

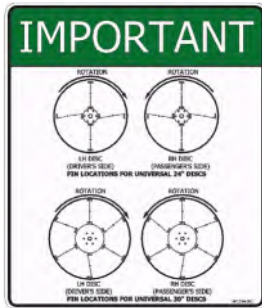
WARNING

- REPLACE LOST, DAMAGED, PAINTED, OR UNREADABLE DECALS IMMEDIATELY. IF PARTS THAT HAVE DECALS ARE REPLACED, ALSO MAKE SURE TO INSTALL NEW DECALS. THESE DECALS INFORM AND REMIND THE OPERATOR WITH OPERATIONAL INFORMATION AND SAFETY MESSAGES.

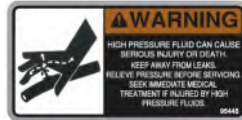


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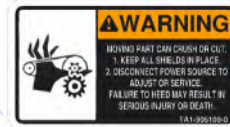
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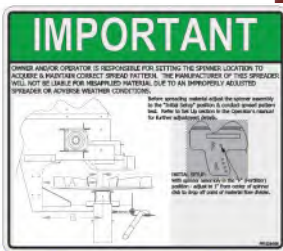
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Part No.
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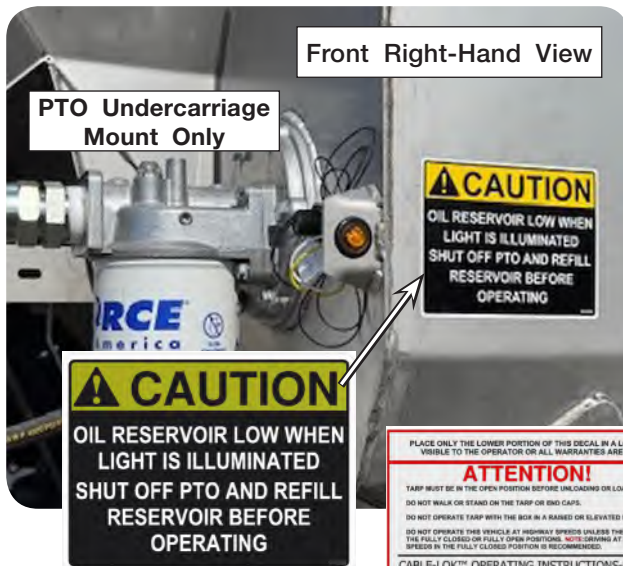
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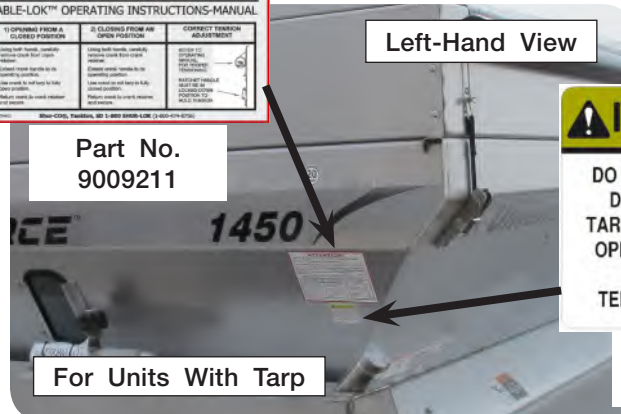


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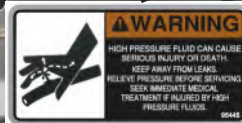
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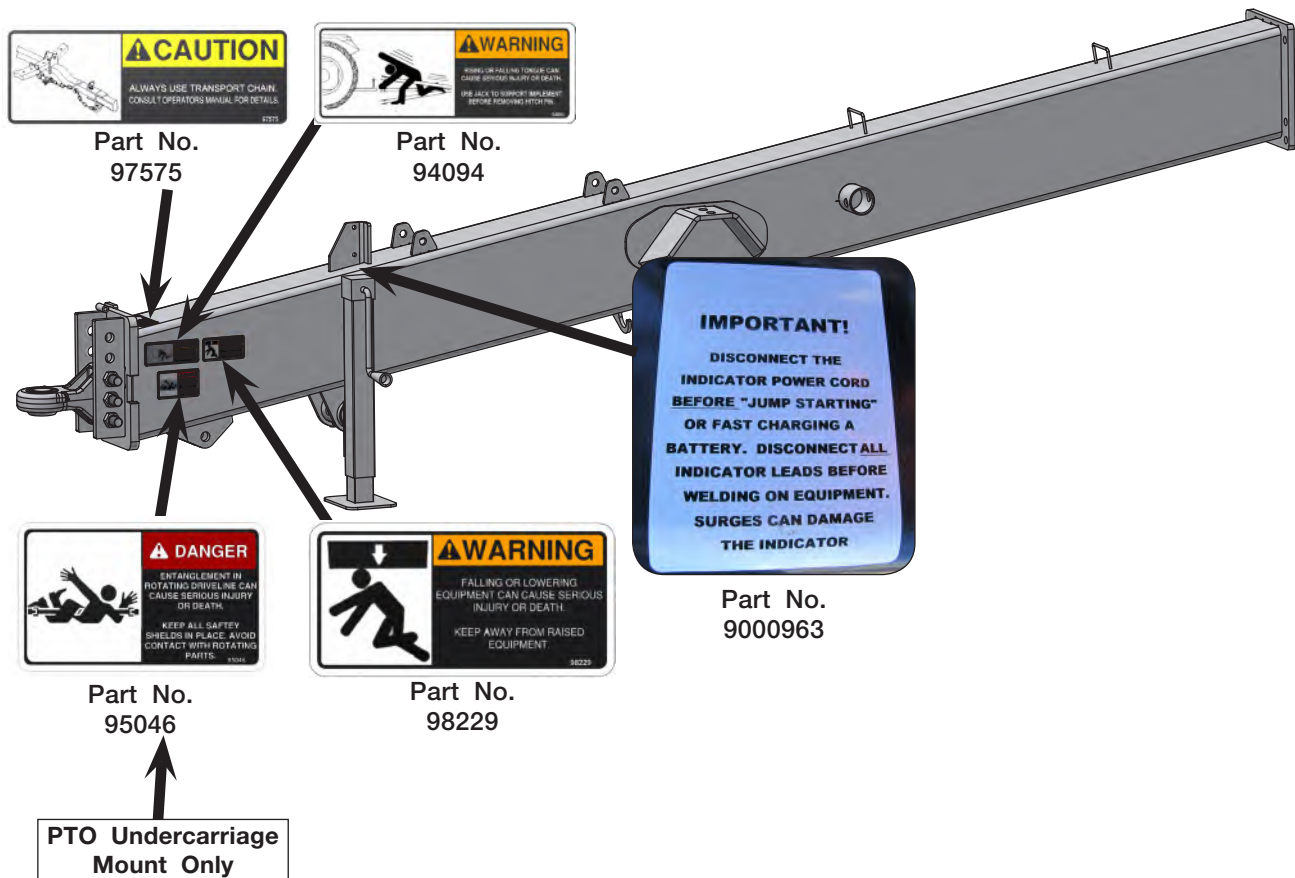


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Part No.
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Safety Decals (Undercarriage Mount)



Following Safety Instructions

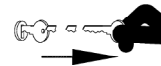
- Read and understand this operator's manual before operating.



- All machinery should be operated only by trained and authorized personnel.

- To prevent machine damage, use only attachments and service parts approved by the manufacturer.

- Always shut chassis engine off and remove key before servicing.



- Avoid personal attire such as loose fitting clothing, shoestrings, drawstrings, pants cuffs, long hair, etc., that may become entangled in moving parts.

- Do not allow anyone to ride on the implement. Make sure everyone is clear before operating machine or towing vehicle.



- Never attempt to operate implement unless you are in driver's seat.



- Never enter a spreader containing granular material. Flowing granular material traps and suffocates victims in seconds.



Before Servicing or Operating

- Avoid working under an implement; however, if it becomes absolutely unavoidable, make sure the implement is safely blocked. 
- Ensure that all applicable safety decals are installed and legible.
- Sharp edges on the machine can cause injury. Be careful when working around the machine.
- To prevent personal injury or death, always ensure that there are people who remain outside the dry spreader to assist the person working inside, and that all safe workplace practices are followed. There is restricted mobility and limited exit paths when working inside the implement.
- Add sufficient ballast to vehicle to maintain steering and braking control at all times. Do not exceed vehicle's lift capacity or ballast capacity.
- Check equipment for leaks. Repair any leaks before beginning or resuming operation.
- Do not stand between towing vehicle and implement during hitching. 
- Verify that all safety shields are in place and properly secured. 
- Always make certain everyone and everything is clear of the machine before beginning operation.
- This spreader is intended to apply only agricultural materials. Attempting to apply other materials may cause equipment damage and introduce unexpected personal hazards.
- Hot parts can cause severe burns. Use caution when working around power system/ground engaging components. Allow parts to cool before servicing.

During Operation

- Comply with all laws and product label directions governing safe product application.
- Regulate speed to working conditions. Maintain complete control at all times.
- Never service or lubricate equipment when in operation.
- Use extreme care when operating close to ditches, waterways, fences, or on hillsides.
- Do not leave towing vehicle unattended with engine running.

Before Transporting

- Check for proper function of all available transport lights. Make sure that all reflectors are clean and in place on machine. Make sure the SMV emblem and SIS decals are visible to approaching traffic.
- The dry spreader chassis mount box is not equipped with brakes. Ensure that the towing vehicle has adequate weight and braking capacity to tow this implement.
- Do not exceed the gross vehicle weight rating (GVWR). Improper chassis loading can cause loss of control or machine damage resulting in injury or death.

During Transport

- Comply with all laws governing highway safety when moving machinery.
- Use transport lights as required by all laws to adequately warn operators of other vehicles.
- Regulate speed to road conditions and maintain complete control.
- Maximum transport speed of the dry spreader should never exceed 20 m.p.h. as indicated on the machine. Maximum transport speed of any combination of implements must not exceed the lowest specified speed of the implements in combination. Do not exceed 10 m.p.h. during off-highway travel.
- Slow down before making sharp turns to avoid tipping. Drive slowly over rough ground and side slopes.
- It is probable that this implement is taller, wider and longer than the towing vehicle. Become aware of and avoid all obstacles and hazards in the travel path of the equipment, such as power lines, ditches, etc.

Driveline Safety

- Do not allow children near equipment that is running or engaged.
- Do not exceed 1000 r.p.m. PTO speed.
- Disengage the PTO, stop the tractor engine, and remove key from ignition before making inspections, or performing maintenance and repairs.
- Inspect the driveline, quick disconnect, constant velocity body, and shielding often. Repair immediately. Use replacement parts and attaching hardware equivalent to the original equipment. Only alterations described in this manual for overall length adjustment are allowed. Any other alteration is prohibited.
- Avoid excessively long hardware or exposed and protruding parts which can snag and cause entanglement.
- Lubricate the driveline as recommended in the MAINTENANCE section.
- Keep hoses, wiring, ropes, etc. from dangling too close to the driveline.
- Install driveline and shields according to recommended lengths and attaching methods with recommended hardware. The driveline shield should rotate independently a full rotation and telescope freely. The retaining chain must be secured to the implement safety shield.
- Adjust drawbar to height and length recommended in the OPERATION section.
- Use caution when turning to avoid contact between tractor tires and driveline.
- Check the length of the telescoping members to ensure the driveline will not bottom out or separate when turning and/or going over rough terrain. Refer to “PTO Shaft Length Adjustment” in MAINTENANCE section.
- Proper extended and collapsed lengths of the telescoping PTO shaft must be verified before first operation with each and every tractor. If the extended length of the PTO shaft is insufficient, it may become uncoupled during operation and cause serious injury or death from contact with uncontrolled flailing of PTO shaft assembly components. Refer to “PTO Shaft Length Adjustment” in MAINTENANCE section.



Pressurized Oil

- Relieve the hydraulic system of all pressure before adjusting or servicing. See tractor operator's manual for procedure to relieve pressure.
- High-pressure fluids can penetrate the skin and cause serious injury or death. Leaks of high-pressure fluids may not be visible. Use cardboard or wood to detect leaks in hydraulic system. Seek medical treatment immediately if injured by high-pressure fluids. 
- Hydraulic system must be purged of air before operating to prevent serious injury or death.
- Do not bend or strike high-pressure lines. Do not install bent or damaged tubes or hoses.
- Repair all oil leaks. Leaks can cause fires, personal injury, and environmental damage.
- Route hoses and lines carefully to prevent premature failure due to kinking and rubbing against other parts. Make sure that all clamps, guards and shields are installed correctly.
- Check hydraulic hoses and tubes carefully. Replace components as necessary if any of the following conditions are found:
 - End fittings damaged, displaced, or leaking.
 - Outer covering chafed/cut or wire reinforcing exposed.
 - Outer covering ballooning locally.
 - Evidence of kinking or crushing of the flexible part of a hose.

Fertilizer and Chemical Hazards

- Always wear personal protective equipment when working with or near fertilizers and/or chemicals. This equipment includes, but is not limited to: protective eye wear, gloves, shoes, socks, long-sleeved shirt, and long pants. Additional protection may be required for many types of fertilizers and/or chemicals.
- Seek and receive fertilizer and/or chemical product training prior to using agricultural fertilizers and/or chemicals.
- Read and understand the entire label of every fertilizer and/or chemical being applied with this dry spreader.
- Wash hands before eating, drinking, chewing gum, or using the toilet.
- Remove clothing immediately if fertilizers and/or chemicals penetrate clothing and contact skin. Wash thoroughly and put on clean clothing.
- Dispose of unused fertilizer and/or chemical in accordance with fertilizer and/or chemical label directions and local/national regulations.

Preparing for Emergencies

- Keep a first aid kit and properly rated fire extinguisher nearby.



- Keep emergency numbers for fire, rescue, and poison control personnel near the phone.



Wearing Protective Equipment

- Wear clothing and personal protective equipment appropriate for the job.



- Wear steel-toed shoes when operating.



- Wear hearing protection when exposed to loud noises.



- Do not wear additional hearing impairing devices such as radio headphones, etc.



Section II

Set Up

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FOR SCALE, AUTO GREASER, AND / OR ELECTRIC TARP
INFORMATION, PLEASE REFER TO THE INDIVIDUAL MANUALS.

Pre-Delivery Checklist

After the dry spreader has been completely assembled, use the following checklist and inspect the dry spreader. Check off each item as it is found satisfactory or after proper adjustment is made.

- ☐ Program RCM controller. See “Rate Control Module (RCM) Spreader Set Up” in this section.
- ☐ Power wash any road salt off this unit to help prevent corrosion.
- ☐ Check hydraulic level in reservoir is centered on the sight gauge. See “Lubrication” and “Hydraulic Reservoir Tank” in MAINTENANCE section.
- ☐ For 18, 22, 2650 undercarriage PTO units, set or calibrate tractor PTO control engagement to MINIMUM setting. Refer to tractor operator's manual for setting information.
- ☐ For 18, 22, 2650 undercarriage PTO units, using a safe lifting device for 100 lbs., remove PTO from tongue, install onto implement PTO shaft and set in PTO holder.
- ☐ For chassis units, using a safe lifting device rated for 250 lbs., remove standard pallet, spinner deflectors, and, if equipped, mud flaps, from inside the hopper. Remove pallet shipping brackets. See “Unpacking Loose Parts” in this section.
- ☐ For chassis units, complete spinner deflectors set up as specified in this section.
- ☐ Complete sideboards, fenders, mud flaps, and tarp set up, if equipped. Remove tarp/sideboard shipping brackets. See install procedures in this section.
- ☐ Lubricate stainless steel capscrew threads with anti-seize compound.
- ☐ Torque hardware as specified in MAINTENANCE section.
- ☐ Lubricate all grease fittings and check gearbox oil level as specified in MAINTENANCE section.
- ☐ Complete chassis mounted hydraulic oil cooler install, if equipped. See “Hydraulic Oil Cooler Install (Optional - Chassis Mount)” in this section.
- ☐ Verify all safety decals are correctly located and legible. Replace if damaged.
- ☐ Verify all reflective decals are correctly located.
- ☐ Check SMV emblem and SIS decals are in place, clean and visible.
- ☐ Verify transport lights are working properly.
- ☐ Install ladder, if removed, as specified in OPERATION section.
- ☐ Install tail lights, if removed.
- ☐ Align and properly tension conveyor chain. See “Chain Tension” in MAINTENANCE section.
- ☐ Paint all parts scratched during shipment and dealer set up.
- ☐ Test run the conveyor and spinner. See “Spreader Constant For Gate Setting” and “Spinner Disc Operation” in OPERATION section.
- ☐ Check hydraulic components for leaks and check hose routing.

Driveline Install (If Equipped With PTO Hydraulic System)

DANGER

- ENTANGLEMENT WITH THE DRIVELINE WILL CAUSE SERIOUS INJURY OR DEATH. KEEP ALL GUARDS AND SHIELDS IN GOOD CONDITION AND PROPERLY INSTALLED AT ALL TIMES. AVOID PERSONAL ATTIRE SUCH AS LOOSE FITTING CLOTHING, SHOE STRINGS, DRAWSTRINGS, PANTS CUFFS, LONG HAIR, ETC. THAT CAN BECOME ENTANGLED IN A ROTATING DRIVELINE.

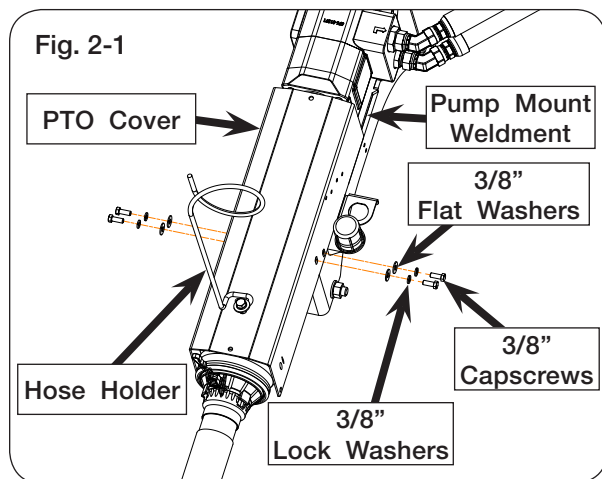
WARNING

- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.
 - TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
 - EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
 - KEEP HANDS CLEAR OF PINCH POINT AREAS.
 - FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.
1. Park the empty spreader on a firm, level surface. Attach machine to tractor. Block the machine to keep it from moving. Set the tractor parking brake, shut off the engine, remove the ignition key, and disconnect hydraulics from the tractor to the spreader.



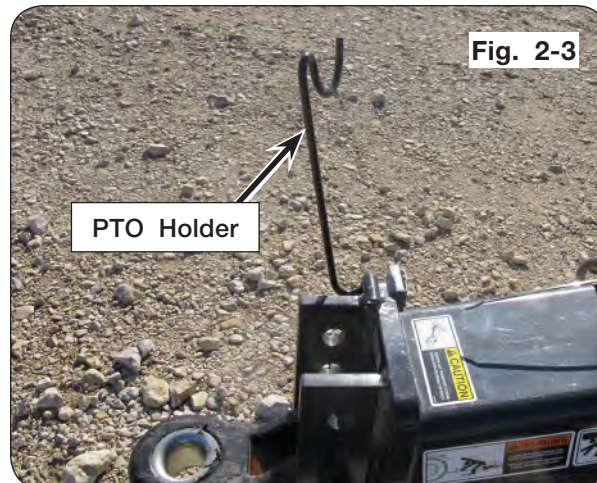
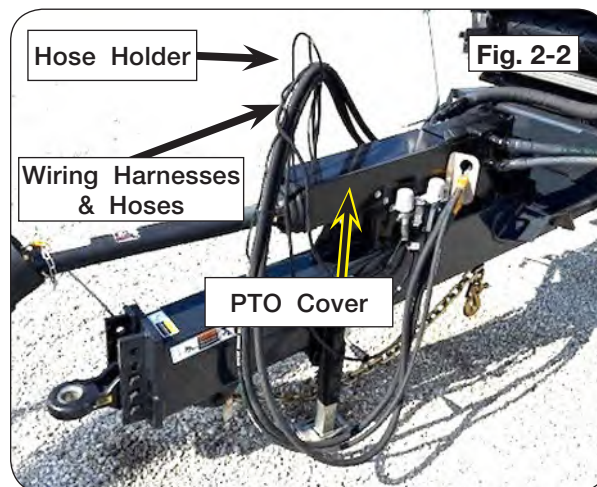
2. Remove four 3/8"-16UNC x 1" capscrews (900900-055), four 3/8" lock washers (900903-021), and 3/8" flat washers (900902-038) from PTO cover (417402B). (FIG. 2-1)

NOTE: Keep hardware for re-assembly.



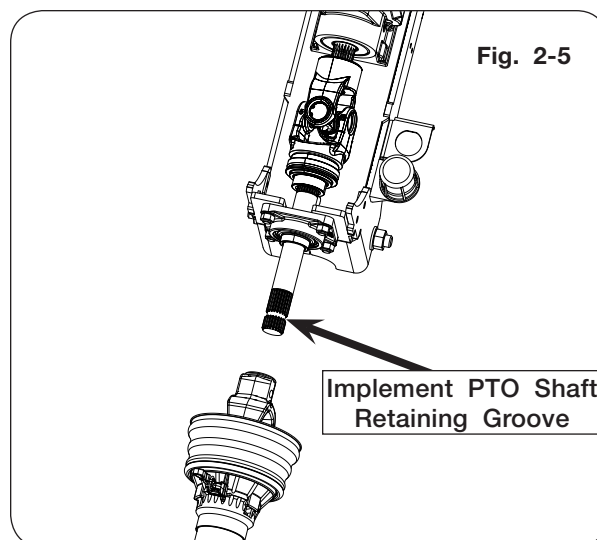
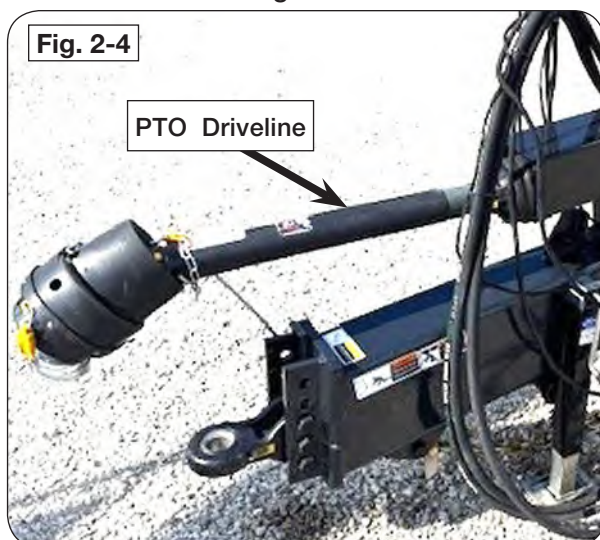
Driveline Install (If Equipped With PTO Hydraulic System) (continued)

3. Store wiring harnesses and tractor SCV hoses, if present, to prevent kinking and rubbing against other parts or sharp edges. (FIGS. 2-1 & 2-2)
4. Remove and retain PTO cover from pump mount weldment (417007B). (FIGS. 2-1 & 2-2)
5. Clean and grease the implement PTO splined shaft (9010132).
6. Move PTO holder (417286) out into position to hold PTO driveline (9010109). (FIG. 2-3)
7. Using a safe lifting device rated for 100 lbs., remove PTO driveline from the tongue. Remove conic bolt from the end yoke on the PTO driveline.



NOTE: Constant velocity joint (9010375) on PTO driveline goes on the tractor end.

8. With the conic bolt removed, slide PTO driveline end yoke onto the implement PTO splined shaft until retaining groove of implement PTO shaft aligns with conic bolt hole as shown in figures 2-4 and 2-5.

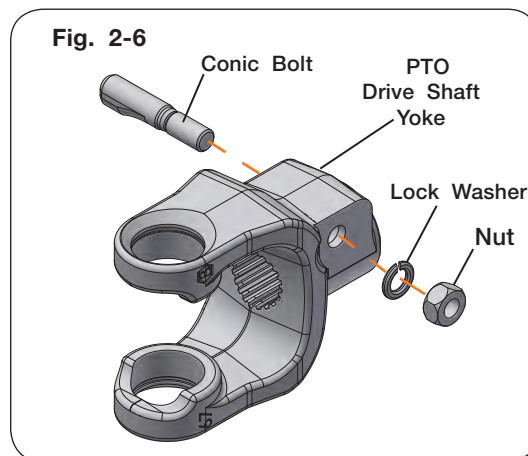


Driveline Install (If Equipped With PTO Hydraulic System) (continued)

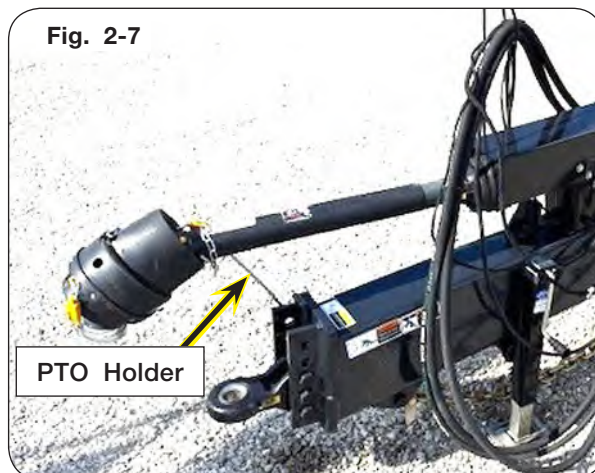
NOTE: The conic bolt will only go into the yoke in one direction. (FIG. 2-6)

9. Insert conic bolt, removed in step 7, into yoke threaded hole. Secure with lock washer and nut, hand tighten. (FIG. 2-6)

10. Torque conic bolt to 74 ft.-lb. (FIG. 2-6)



11. After the conic bolt is torqued, support the driveline with the PTO holder. (FIG. 2-7)

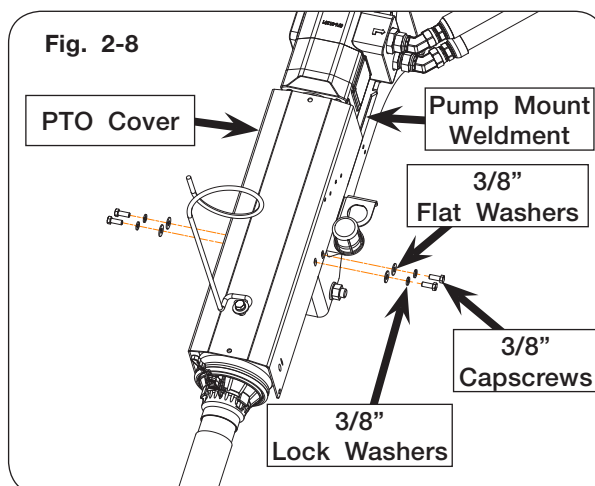


12. Reattach PTO cover (417402B), from step 4, to pump mount weldment. (FIG. 2-8)

13. Torque 3/8" hardware to specifications. See "Complete Torque Chart" in MAINTENANCE section.

14. Clip PTO driveline anti-rotation chain to the PTO cover (417402B).

15. Check hydraulic reservoir oil level before running the PTO pump and fill hydraulic reservoir as needed. See "Lubrication" and "Hydraulic Reservoir Tank" for oil specifications in MAINTENANCE section.



IMPORTANT

- Running the PTO pump without oil will result in pump damage.

Unpacking Loose Parts (Chassis Mount)

WARNING

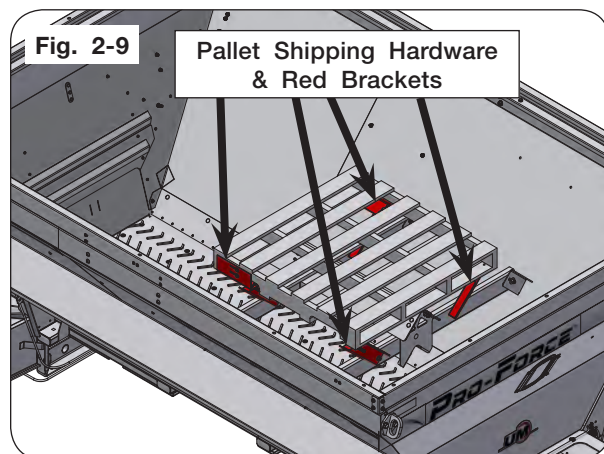
- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.
- NEVER ENTER DRY SPREADER WITH CHASSIS OR TRACTOR RUNNING. SERIOUS OR FATAL INJURY CAN OCCUR DUE TO ENTANGLEMENT WITH ROTATING COMPONENTS. ALWAYS STOP ENGINE AND REMOVE KEY BEFORE ENTERING THE DRY SPREADER.
- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 250 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

1. Park empty spreader on a firm, level surface. Block the machine to keep it from moving. Set vehicle's parking brake, shut off the engine, remove the ignition key and disconnect hydraulics to the spreader.



NOTE: Spinner deflectors, box mounts and mud flaps are removed in figure 2-9 for illustration only.

2. Use a safe lifting device rated for 250 lbs., lift all loose/shipping parts and assemblies from inside the hopper. Remove and discard red shipping brackets retaining the pallet as shown. (FIGS. 2-9 & 2-10)



Adjustable Inverted Vee Positions

WARNING

- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE IMPLEMENT.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYEWEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- NEVER ENTER DRY SPREADER WITH CHASSIS OR TRACTOR RUNNING. SERIOUS OR FATAL INJURY CAN OCCUR DUE TO ENTANGLEMENT WITH ROTATING COMPONENTS. ALWAYS STOP ENGINE AND REMOVE KEY BEFORE ENTERING THE DRY SPREADER.
- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

IMPORTANT

- *Stainless steel hardware has natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*

In extreme loading conditions, it may be necessary to move the inverted vee to lowered position in order to reduce torque on the conveyor belt drive. In lowered position, material flow may be compromised depending on material consistency. If weight on the conveyor belt needs to be reduced and the material flow is good, see the following steps to lower inverted vee.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



Adjustable Inverted Vee Positions (continued)

NOTE: Inverted vee (416851 - 11'-14' box; 416850 - 16'-26' box) is in standard position when the spreader arrives from the factory as shown in figure 2-11.

2. Support inverted vee using a safe lifting device rated for 100 lbs.
3. Remove 3/8"-16UNC x 1" carriage bolts (9007908-051), 3/8" flat washers (900902-038) and 3/8"-16UNC elastic nut (900905-012) from inverted vee. (FIGS. 2-11 & 2-12)

NOTE: Keep all hardware for assembly to lowered position.

4. Remove 1/2"-13UNC x 1 1/4" carriage bolts (PF1200-401), 1/2" flat washers (900902-044) and 1/2"-13UNC elastic nut (900905-016) from inverted vee brackets (417232). (FIG. 2-12)
5. Rotate inverted vee brackets 180° as shown and reattach using 1/2" hardware. (FIG. 2-13)
6. Attach inverted vee to the bottom of inverted vee brackets reusing 3/8" hardware. (FIG. 2-14)
7. Torque all hardware to specification. See "Torque Chart" in MAINTENANCE section.

Fig. 2-11

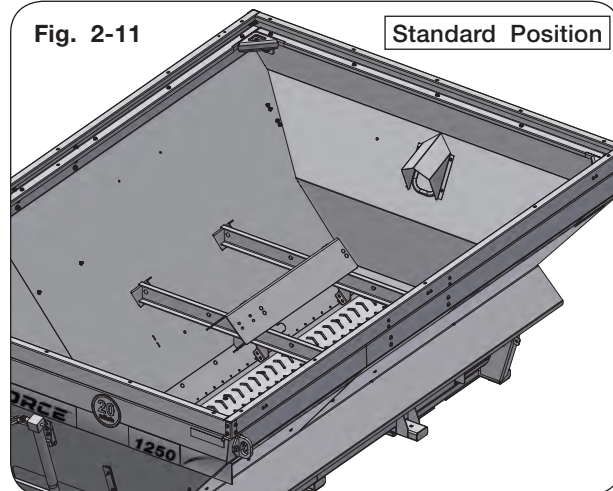


Fig. 2-12

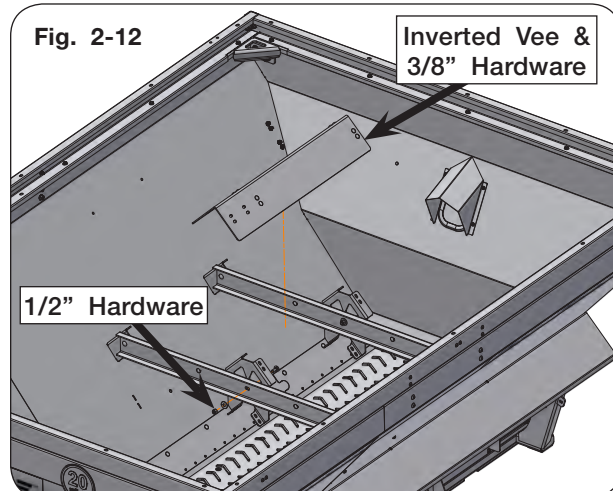
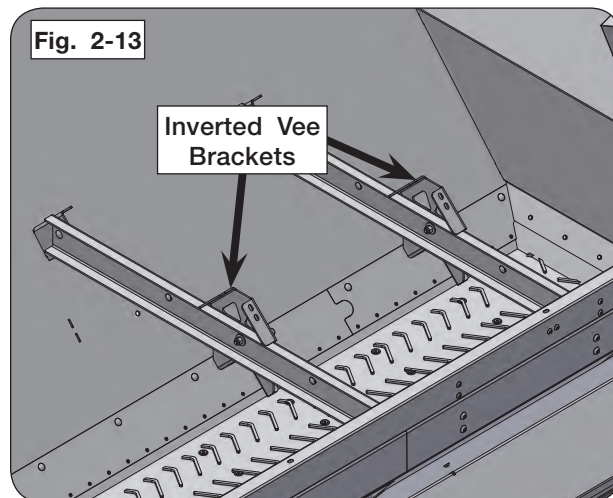
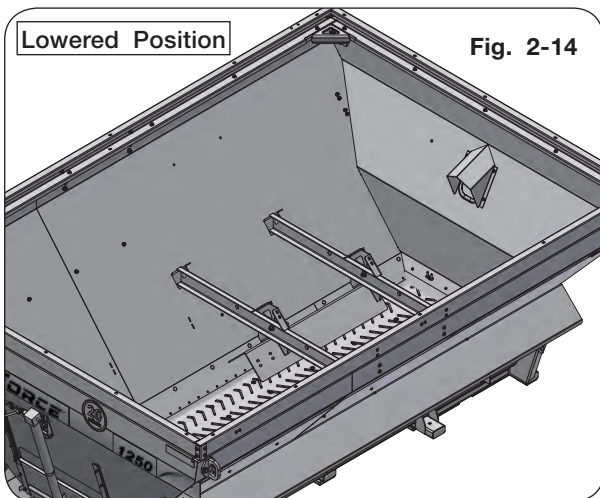


Fig. 2-13



Lowered Position

Fig. 2-14

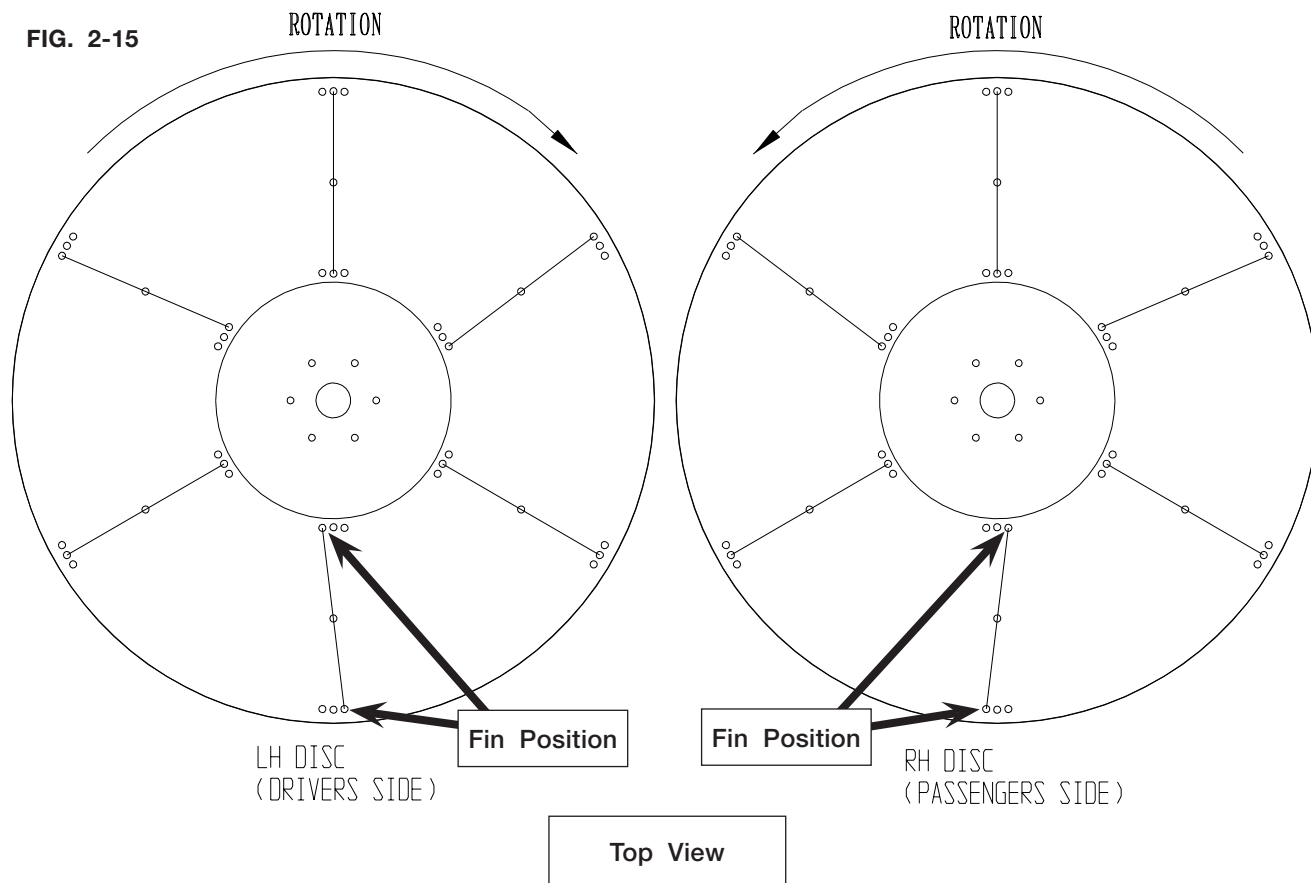


Fin Assembly Location

NOTE: Left-hand fins rotate clockwise and right-fins rotate counter-clockwise.

NOTE: Verify the fin position in both the inner and outer three holes as shown in FIG. 2-15.

FIG. 2-15



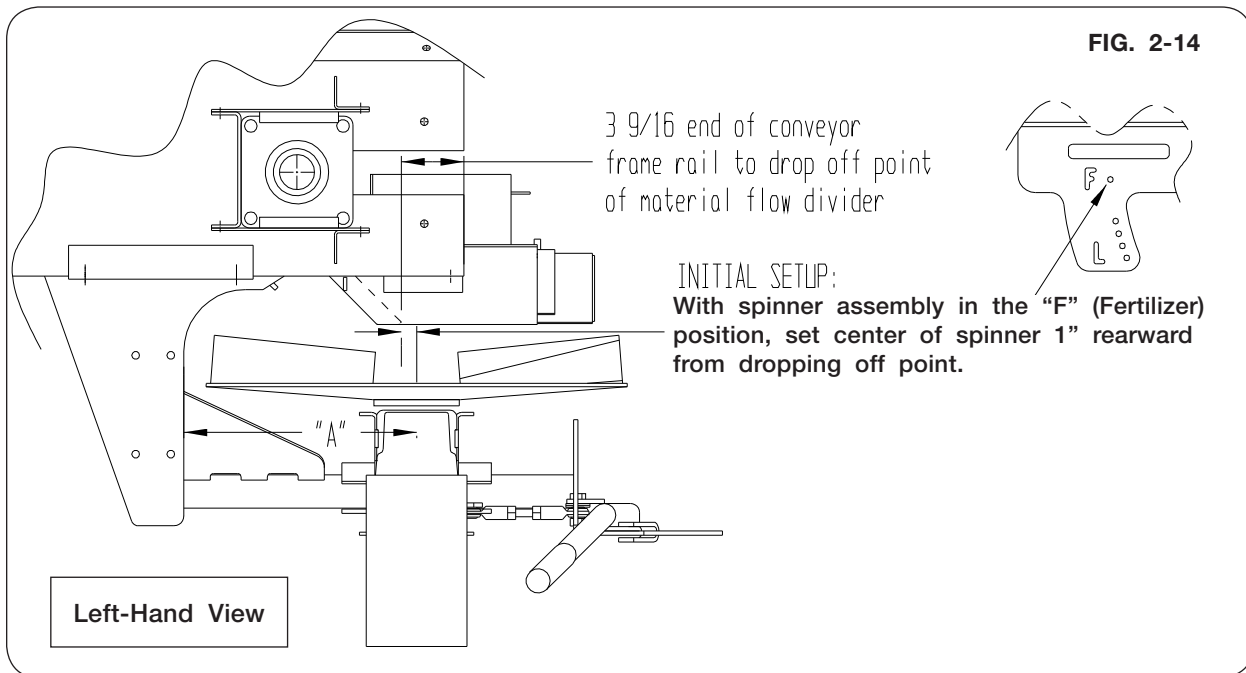
Spinner Disc Set Up

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

IMPORTANT

- Owner and/or operator is responsible for setting the spinner location to acquire and maintain correct spread pattern.



Adjust spinner fore/aft with the threaded rod between the lever arm and spinner frame to get the following dimensions:

1. With spinner assembly in the "F" (Fertilizer) position, set center of spinner 1" rearward from dropping off point of material flow divider.
2. Verify dimension "A" is the same for both spinner motors. Verify both spinner motors are level to the frame. (FIG. 2-14)

Spinner Deflectors Install (Chassis Mount)

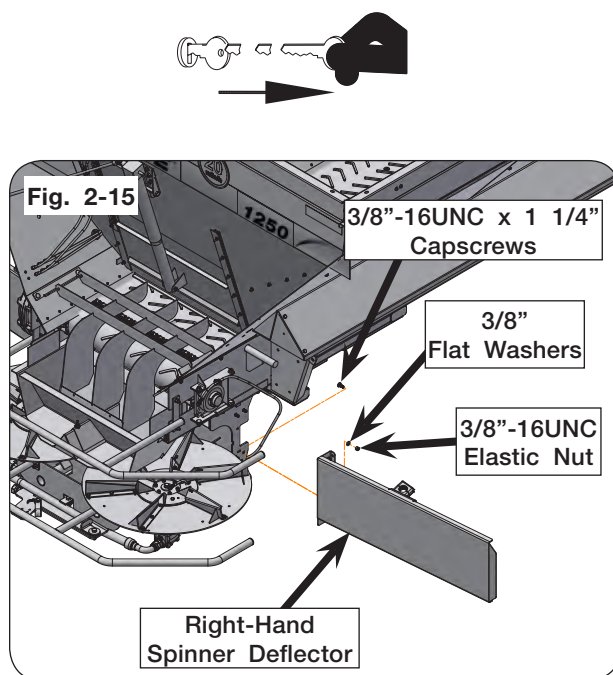
WARNING

- NEVER ENTER DRY SPREADER WITH CHASSIS OR TRACTOR RUNNING. SERIOUS OR FATAL INJURY CAN OCCUR DUE TO ENTANGLEMENT WITH ROTATING COMPONENTS. ALWAYS STOP ENGINE AND REMOVE KEY BEFORE ENTERING THE DRY SPREADER.
- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

IMPORTANT

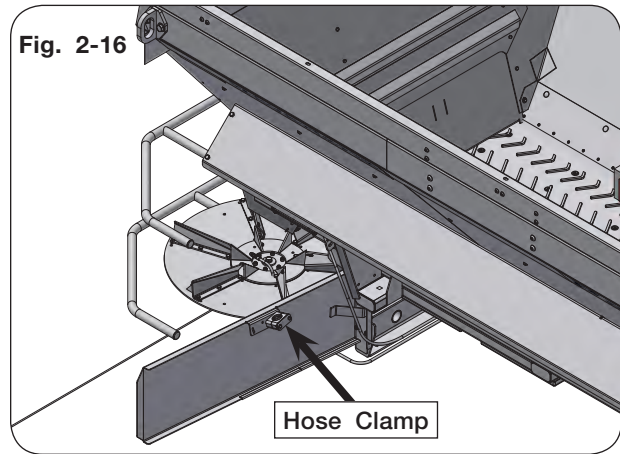
- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.
 2. Using a safe lifting device rated for 100 lbs., install right-hand spinner deflector (416606) to spinner weldment (417371) using four each 3/8"-16UNC x 1 1/4" capscrews (900900-056), 3/8" flat washers (900902-037), and 3/8"-16UNC elastic nut (900905-012). (FIG. 2-15)

(Continued on next page.)

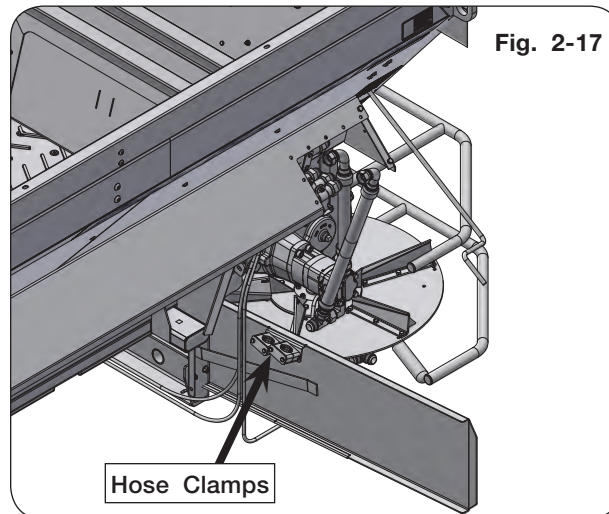


Spinner Deflectors Install (Chassis Mount) (continued)

3. On right-hand spinner deflector, route hydraulic hose (PF1207-065) through hose clamp (9009026). (FIG. 2-16)



4. Repeat step 2 for left-hand spinner deflector (416604).
5. On left-hand spinner deflector, route hydraulic hoses (PF1207-075 and PF1207-055) through hose clamps (9009026). (FIG. 2-17)
6. Torque all hardware to specification. See “Complete Torque Chart” in MAINTENANCE section.



1450 Undercarriage Sideboards Install

WARNING

- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.
- NEVER ENTER DRY SPREADER WITH CHASSIS OR TRACTOR RUNNING. SERIOUS OR FATAL INJURY CAN OCCUR DUE TO ENTANGLEMENT WITH ROTATING COMPONENTS. ALWAYS STOP ENGINE AND REMOVE KEY BEFORE ENTERING THE DRY SPREADER.
- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 150 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

IMPORTANT

- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*

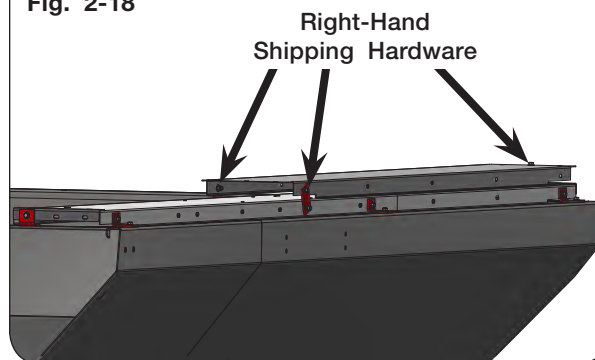
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

NOTE: If equipped with a tarp, continue with step 2. Otherwise, skip to step 3.

2. Use a safe lifting device rated for 150 lbs., remove tarp shipping bundle from inside the spreader.
3. Remove and discard both sides' shipping hardware and red shipping brackets fastening front and rear sideboards as shown. (FIG. 2-18)
4. Remove front and rear sideboards from the spreader.



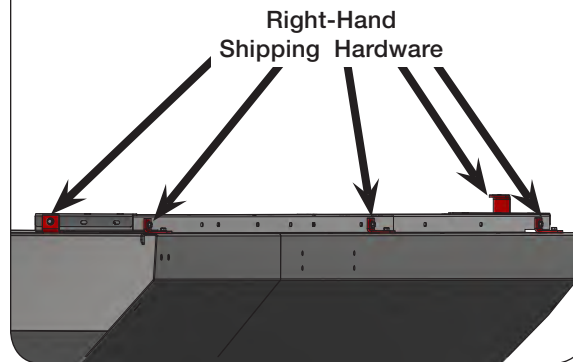
Fig. 2-18



1450 Undercarriage Sideboards Install (continued)

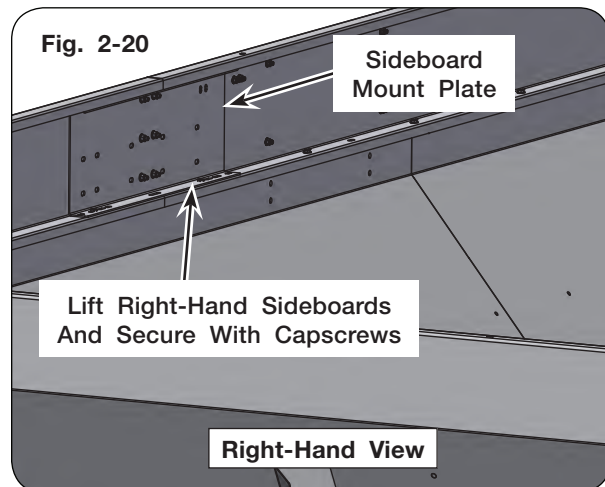
5. Remove and discard right-hand and left-hand shipping hardware and red shipping brackets. (FIG. 2-19)

Fig. 2-19 Left-Hand Similar



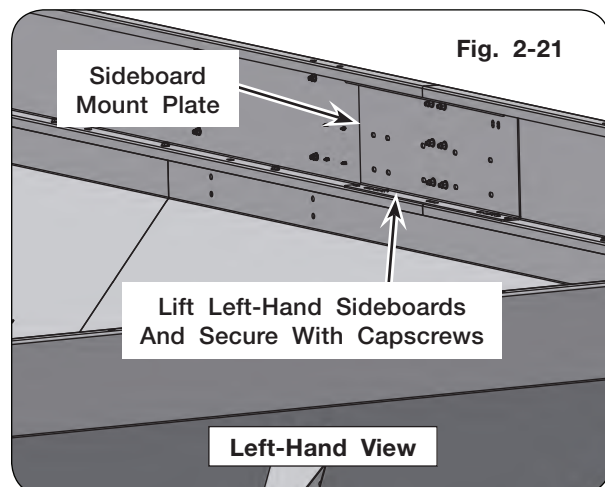
6. Lift the right-hand sideboards (416422 - front; 416420 - rear) including mount plate (416406) into position and loosely secure sideboards into place using 3/8" stainless steel capscrews, flat washers and elastic lock nuts along sideboard bottom edge. (FIG. 2-20)

Fig. 2-20



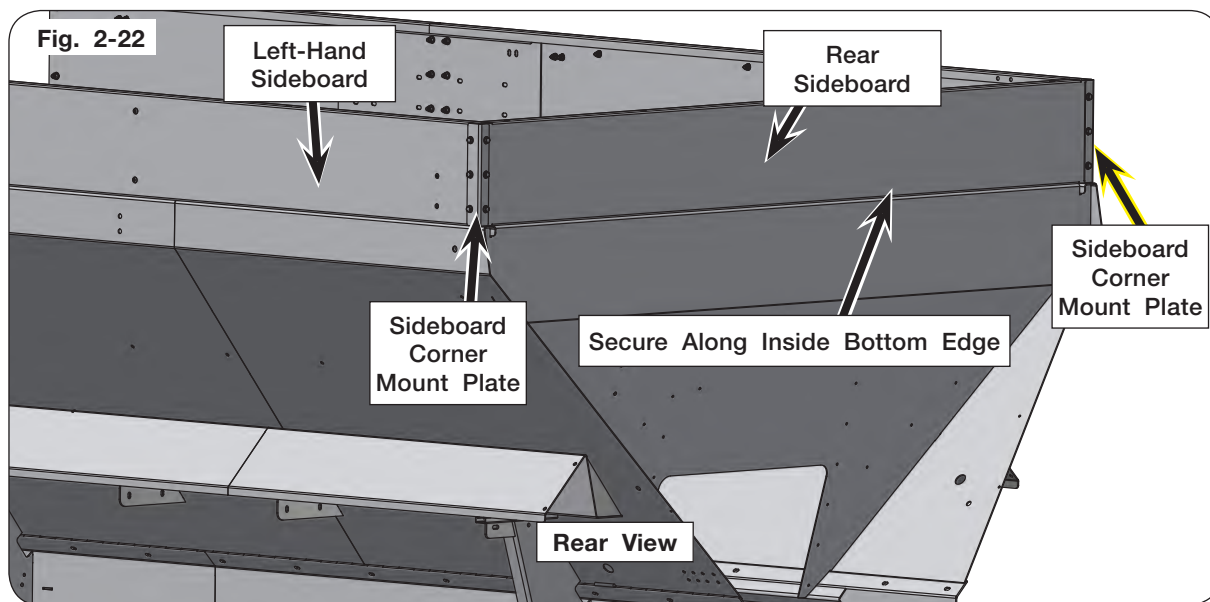
7. Lift the left-hand sideboards (416421 - front; 416418 - rear) including mount plate (416406) into position and loosely secure left-hand sideboards with 3/8" stainless steel capscrews, flat washers and elastic lock nuts along the bottom. (FIG. 2-21)

Fig. 2-21



1450 Undercarriage Sideboards Install (continued)

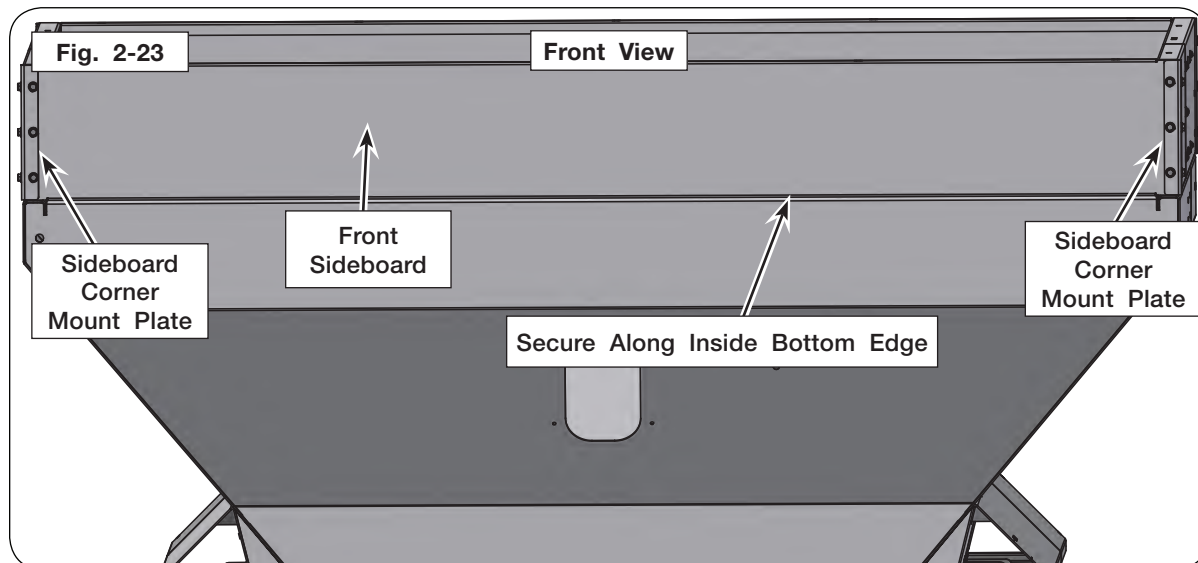
8. Lift rear sideboard (PFFES-EXT-1-12) into position and loosely secure with 3/8" stainless steel capscrews, flat washers and elastic lock nuts along inside bottom edge. (FIG. 2-22)
9. Connect rear sideboard to right-hand and left-hand sideboard using two sideboard corner mount plates (416409). Loosely secure using 3/8" stainless steel hardware. (FIG. 2-22)



10. Lift front sideboard (PFFES-EXT-1-12) into position and loosely secure with 3/8" stainless steel capscrews, flat washers and elastic lock nuts along inside bottom edge. (Fig. 2-23)
11. Connect front sideboard to right-hand and left-hand sideboard using two sideboard corner mount plates (416409). Loosely secure using 3/8" stainless steel hardware. (FIG. 2-23)

NOTE: If equipped with a tarp, DO NOT tighten hardware at this time. Wait until tarp bows are in place before torquing hardware. Continue to "Tarp Install" on next page.

If NOT equipped with tarp, torque all hardware to specification. See "Complete Torque Chart" in MAINTENANCE section.



Tarp Install (Optional)

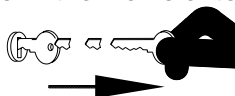
End Caps, Ratchet Straps and Bows Install

WARNING

- **TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.**
- **EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.**
- **KEEP HANDS CLEAR OF PINCH POINT AREAS.**
- **FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 250 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.**

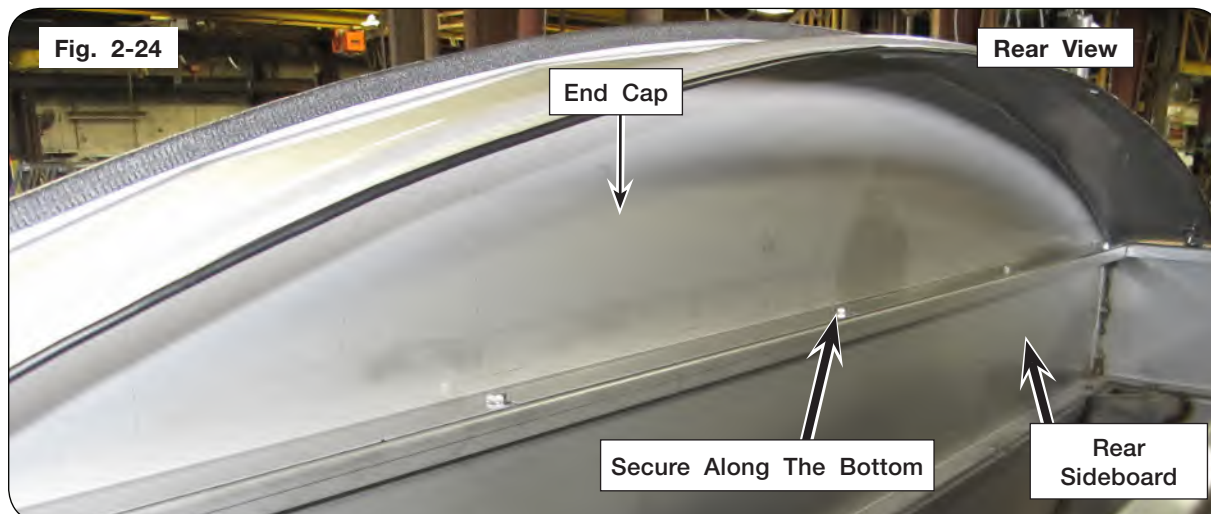
IMPORTANT

- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



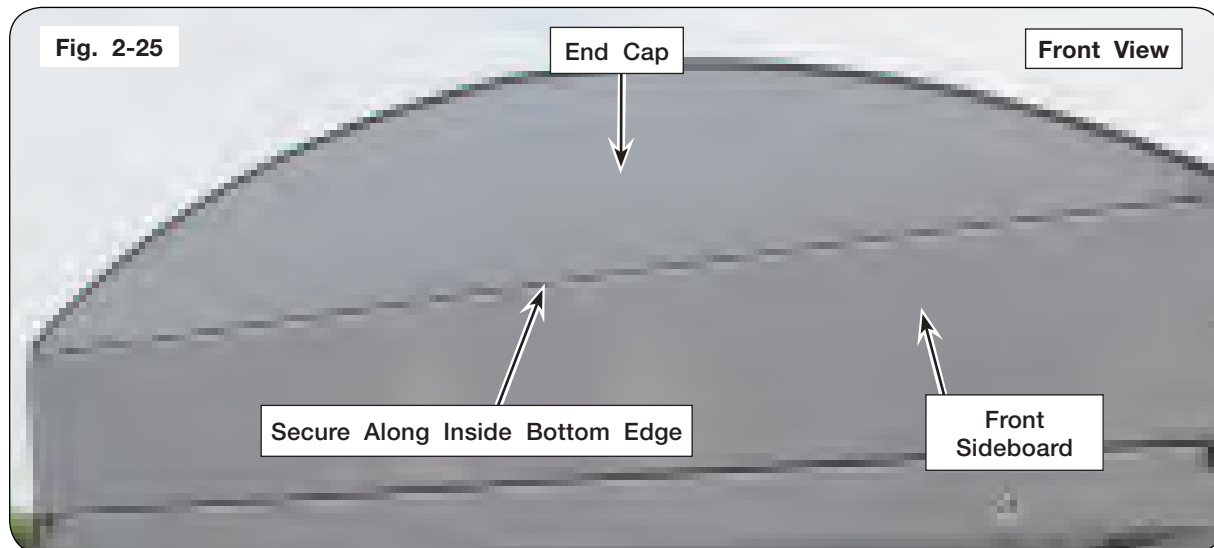
NOTE: The 1850 spreader is shown in the following figures. See “Tarp Assembly Components” in PARTS section for additional information on other units.

2. Using a safe lifting device rated at 100 lbs., attach end cap (PFF2444) on top of rear sideboard using 3/8” stainless steel hardware along inside bottom edge. (FIG. 2-24)



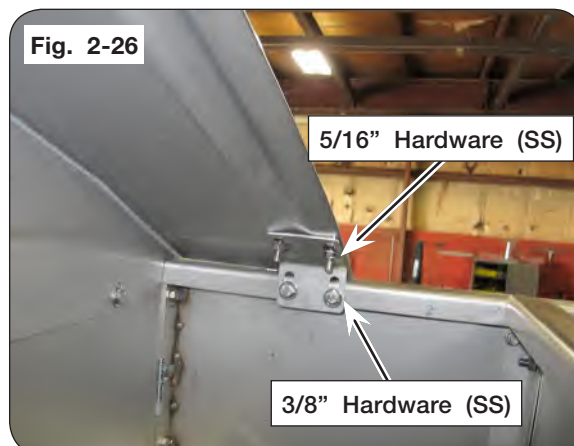
Tarp Install (Optional) (continued)

- Using a safe lifting device rated at 100 lbs., attach end cap (PFF2444) on top of front sideboard using 3/8" stainless steel hardware along inside bottom edge. (FIG. 2-25)



- Attach four end cap brackets (9009554) to end caps using stainless steel 5/16" button head screws (9009195), flat washers (900902-035), lock washer (900903-019), and hex nuts (900901-004) and to sideboards using stainless steel 3/8" capscrews (900900-055), lock washers (900903-021) and hex nuts (900901-006). (FIG. 2-26)

NOTE: DO NOT tighten hardware at this time. Wait until tarp bows are in place before torquing hardware.

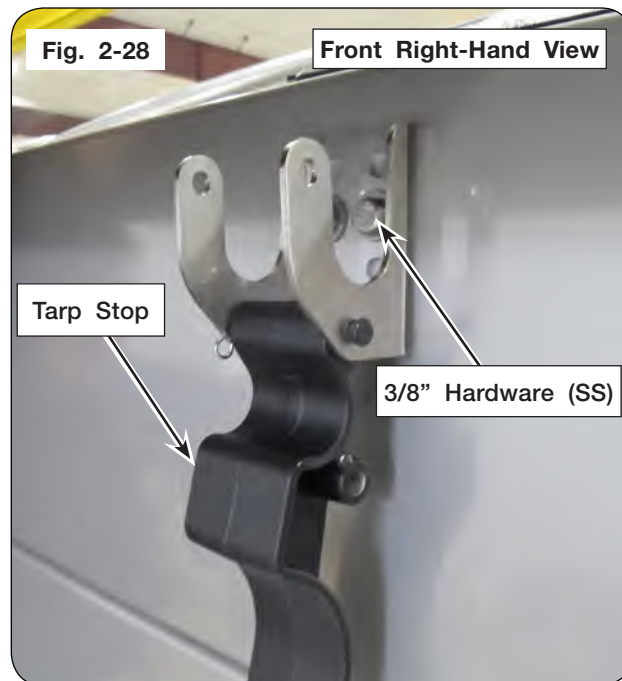


Tarp Install (Optional) (continued)

5. Install two ratchet strap assemblies (PFF2608) to left-hand side of hopper using 3/8" stainless steel hardware. (FIG. 2-27)

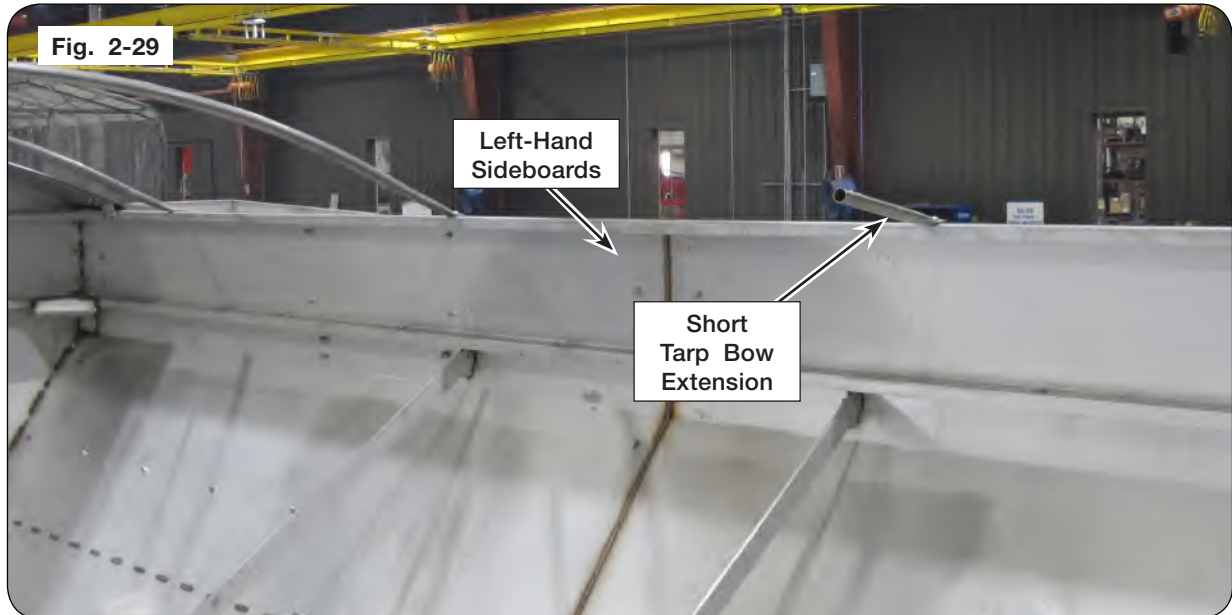


6. Install three tarp stop assemblies (9009140) to right-hand side of hopper using 3/8" stainless steel hardware. (FIG. 2-28)
7. Keep tarp stops open to accept the tarp fixed tube. (FIG. 2-28)



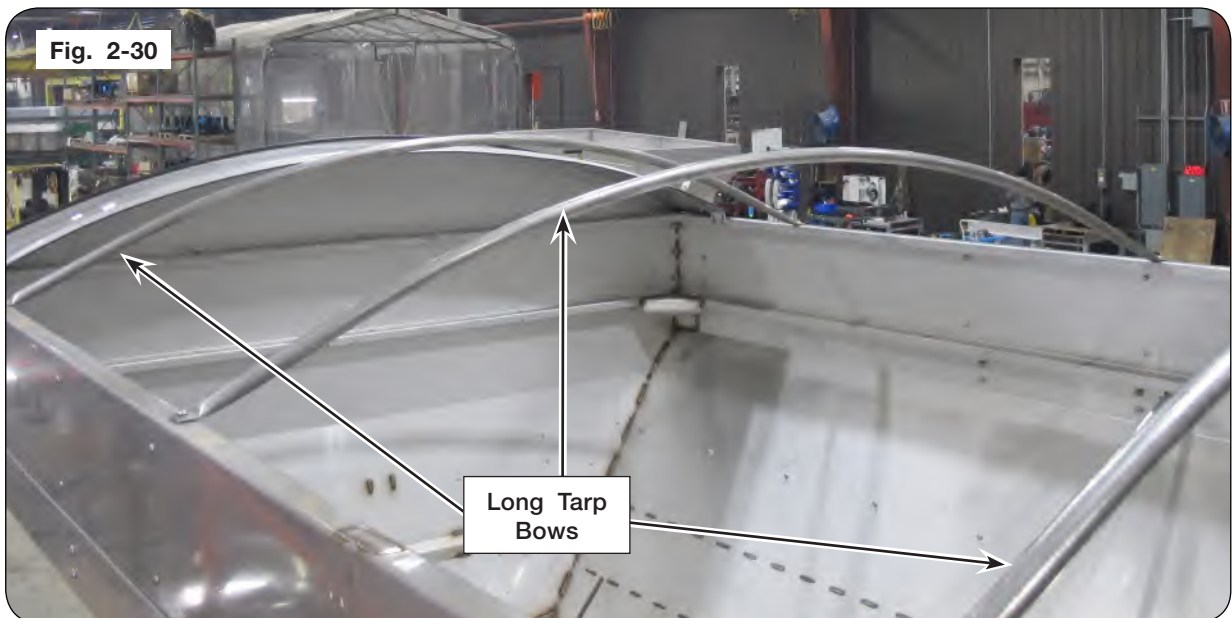
Tarp Install (Optional) (continued)

8. Install short tarp bow extensions (PFF8624) along top of the left-hand sideboards using stainless steel 3/8" hardware. (FIG. 2-29)



9. Install long tarp bows (PFF9622) along top of the right-hand sideboards using stainless steel 3/8" hardware. (FIG. 2-30)

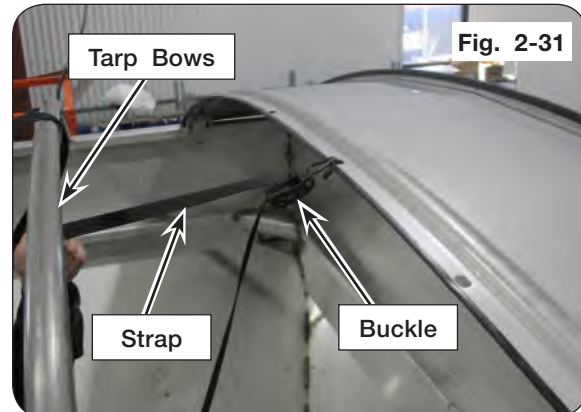
10. Insert long top mount bows into short top mount bow extensions. (FIG. 2-30)



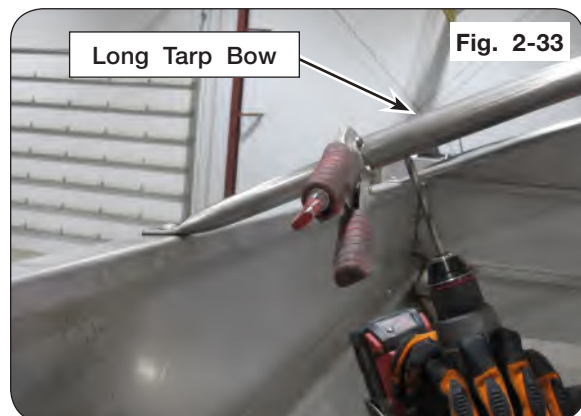
Tarp Install (Optional) (continued)

11. Insert ridge strap through buckle as shown in figure 2-31.
12. Lay ridge strap across top of tarp bows and hook to end caps as shown in figures 2-31 and 2-32.

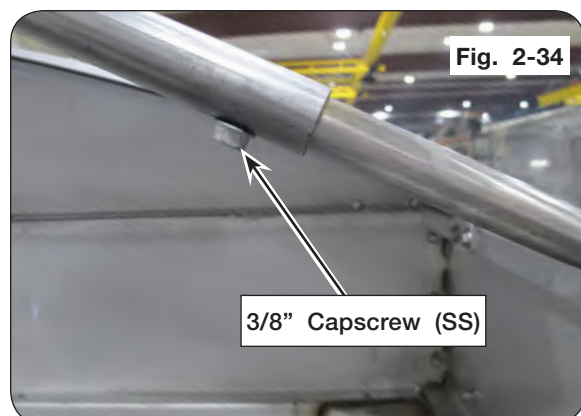
NOTE: DO NOT tighten strap at this time. Wait until tarp bows are fastened before tightening strap.



13. Use 5/16" drill bit to set tarp bow height, drill through hole in long tarp bow as shown in figure 2-33.



14. Attach stainless steel 3/8" capscrew (900900-055) into hole to secure tarp bows. (FIG. 2-34)



15. Repeat steps 13 and 14 for remaining tarp bows.
16. With sideboards aligned and straight, tighten all hardware on sideboards, end caps, tarp bows, ratchet straps, and tarp stops.
17. Torque all hardware to specification. See "Complete Torque Chart" in MAINTENANCE section.
18. Tighten ridge strap on the top of tarp bows.

Tarp Install (Optional) (continued)

Roll Tube and Tarp Install

NOTE: There are two different ends on the roll tube. Rear spring is red. Rear spool is marked “R”. Front spring is black. Front spool is marked “L”.

1. Using a safe lifting device rated at 250 lbs., lift tarp roll tube on top of the hopper. (FIG. 2-35)
2. Ensure the tarp fixed tube is set 4 5/8” inches from the front of the fixed tube to the front of the hopper. (FIG. 2-35)
3. Clamp fixed tube into the tarp stops. (FIG. 2-36)
4. Secure tarp stops using pins and cotter pins. (FIG. 2-36)
5. Drill one 3/16” diameter hole on each side of the middle tarp stop into the tarp and fixed tube as shown in figure 2-37. Use care not to drill through both sides of the fixed tube.
6. Insert two 1/4”-20UNC x 3/4” self-drilling screws (9004978) and two 1/4” poly washers (9009199) into holes to secure tarp to tube. (FIG. 2-38)

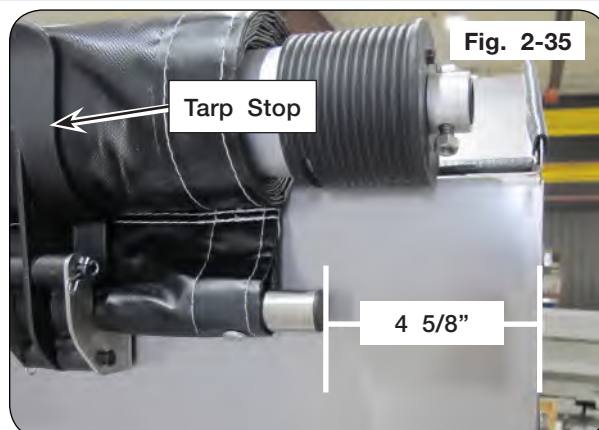


Fig. 2-35

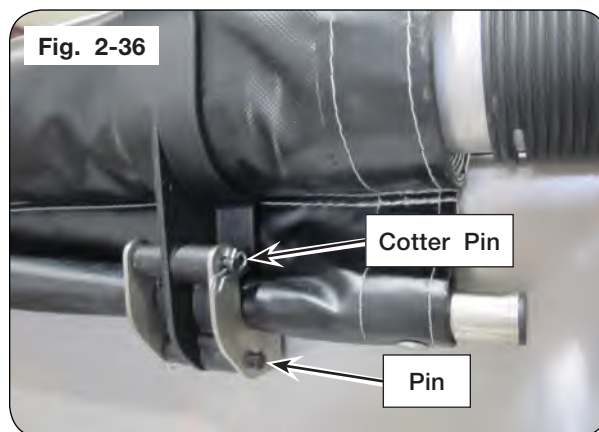


Fig. 2-36

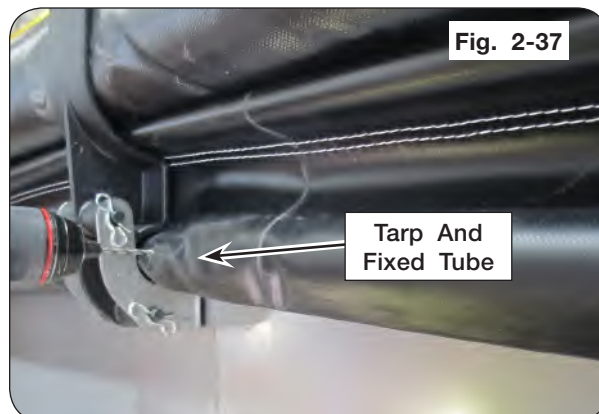


Fig. 2-37

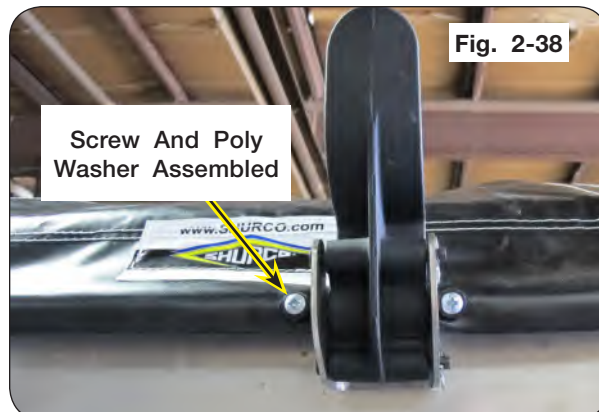


Fig. 2-38

Tarp Install (Optional) (continued)

NOTE: There are two different ends on the tarp spool cable (PFF5280). Ensure the tarp cables are installed to the front and rear ends of the roll tube as shown in figure 2-39.

7. Roll tarp across the spreader and allow roll tube to hang over the left-hand side. Wind tarp cables around the front and the rear ends of the roll tube. (FIG. 2-39)

8. Secure tarp cables to ratchet straps. (FIG. 2-39)

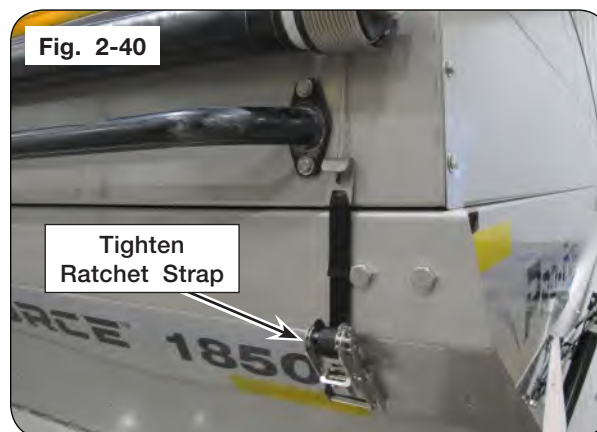
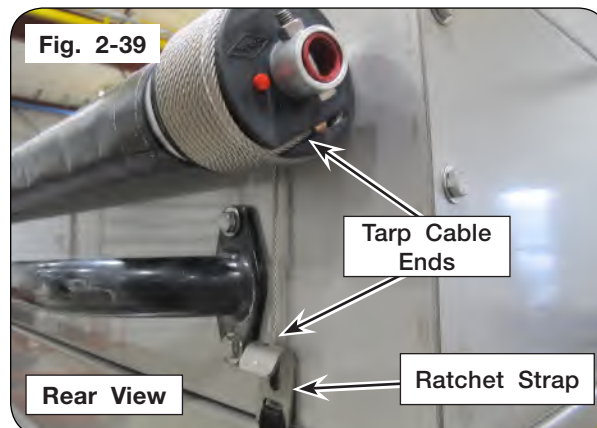
9. Tighten ratchet straps. (FIG. 2-40)

NOTE: For chassis units, install crank arm (PFF3809) and brackets on the rear. Steps 10 and 11 are for undercarriage units. (FIG. 2-41)

10. Attach the crank arm to the front tarp roll tube. Once secure, roll tarp across the spreader to the open position. (FIG. 2-41)

11. If not already affixed, attach the crank arm to brackets underneath on the front of the spreader. (FIG. 2-41)

12. Test tarp for proper working motion. (FIG. 2-41)



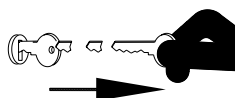
Fenders and Mud Flaps Install (Optional)

WARNING

- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.
- NEVER ENTER DRY SPREADER WITH CHASSIS OR TRACTOR RUNNING. SERIOUS OR FATAL INJURY CAN OCCUR DUE TO ENTANGLEMENT WITH ROTATING COMPONENTS. ALWAYS STOP ENGINE AND REMOVE KEY BEFORE ENTERING THE DRY SPREADER.
- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 150 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

IMPORTANT

- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



Fenders and Mud Flaps Install (Optional) (continued)

NOTE: The 1850 spreader is shown in the following figures. See “Fender, Mudflap and Handrail Components” in PARTS section for additional information on other units.

2. Attach angle mounting fender (PF50-026) to the left-hand side of the spreader using stainless steel 3/8” hardware. (FIG. 2-42)

NOTE: DO NOT tighten hardware at this time. Wait until fenders and mounts are in place before torquing hardware.

3. Attach left-hand middle fender bracket using stainless steel 3/8” hardware. (FIG. 2-43)

4. Attach left-hand fender mount weldment using stainless steel 3/8” hardware. (FIG. 2-44)

5. Attach left-hand rear fender bracket (PF50-057-L) using stainless steel 3/8” hardware. (FIG. 2-45)

Fig. 2-42

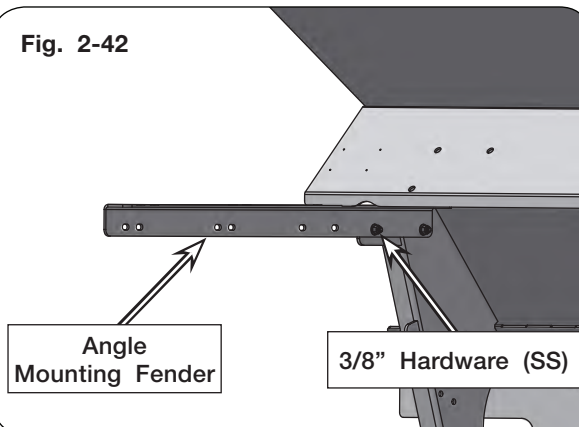


Fig. 2-43

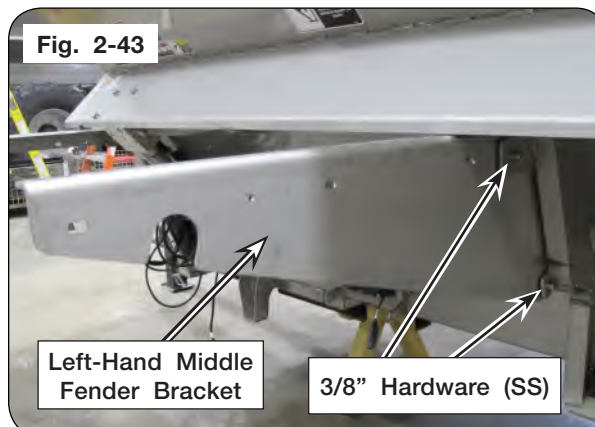


Fig. 2-44

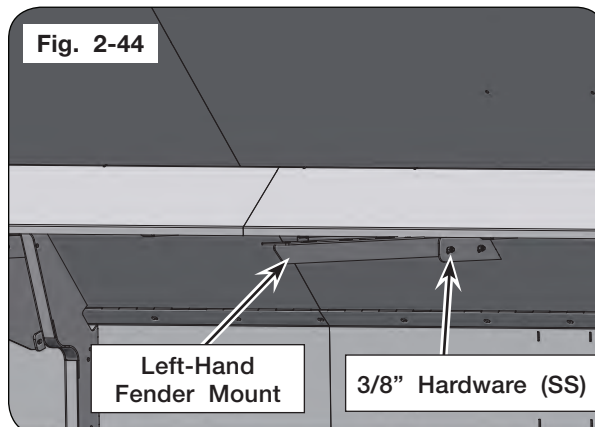
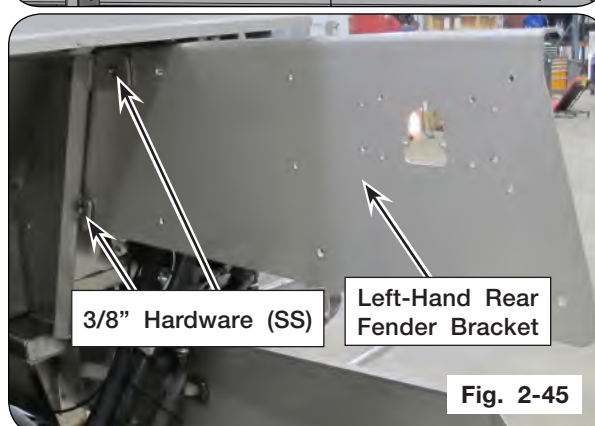


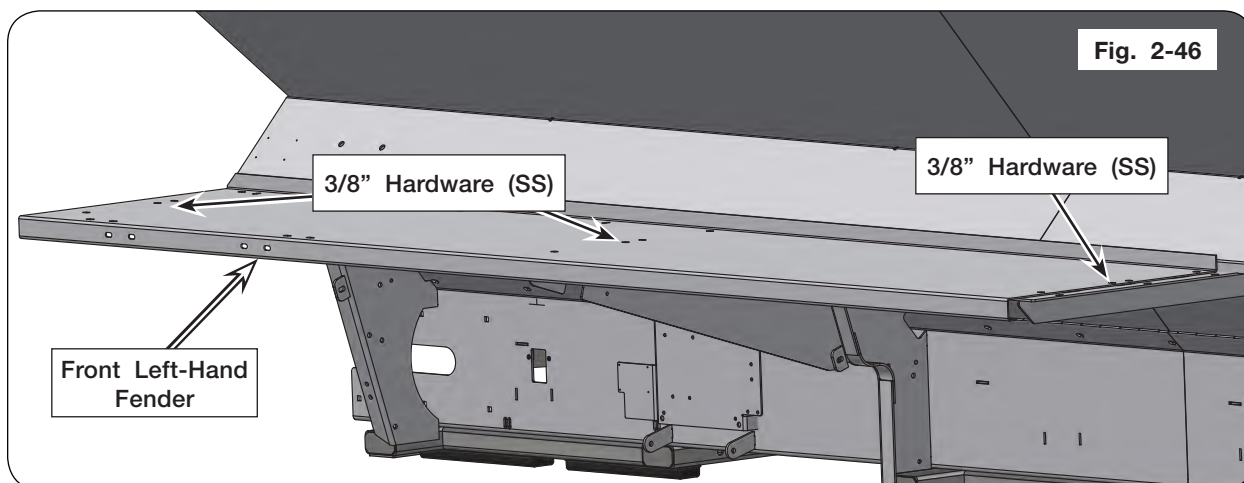
Fig. 2-45



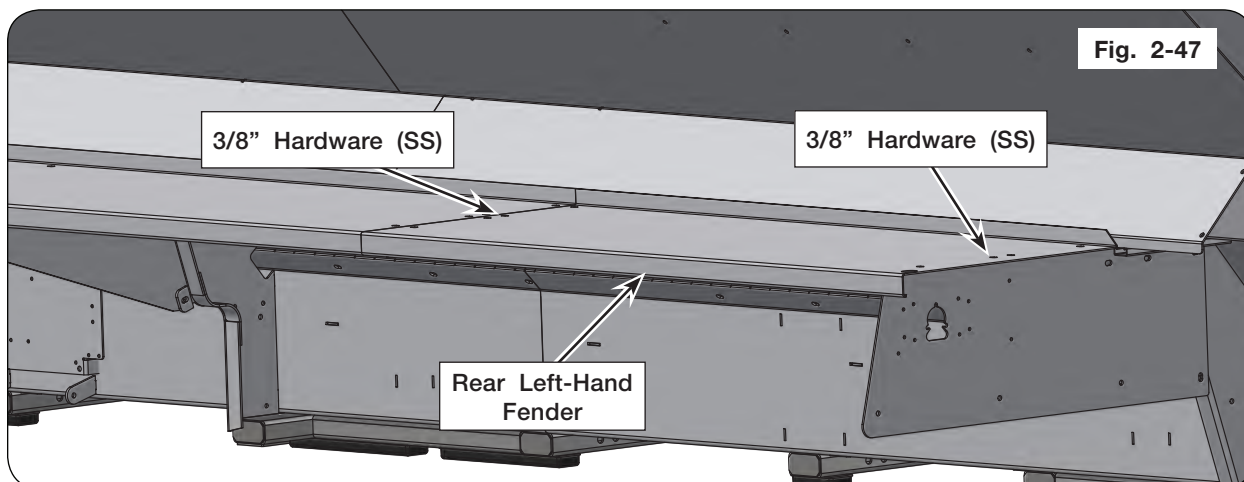
Fenders and Mud Flaps Install (Optional) (continued)

NOTE: The 1350 unit has only right-hand and left-hand fenders. 1450 to 2250 units have front and rear right-hand and left-hand fenders. 2650 has front, middle and rear right-hand and left-hand fenders.

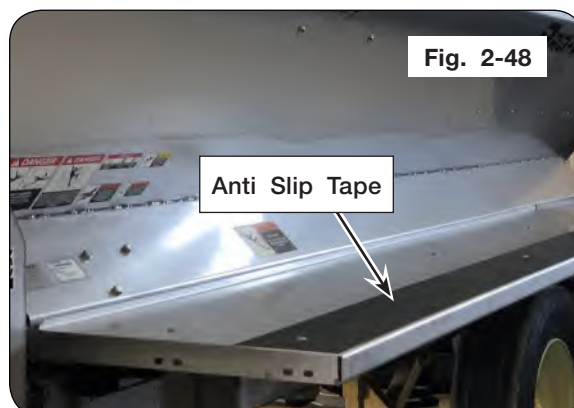
- Using a safe lifting device rated at 150 lbs., install front left-hand fender to angle mounting fender, middle fender bracket and fender mount weldment using 3/8" stainless steel hardware. (FIG. 2-46)



- Using a safe lifting device rated at 150 lbs., install rear left-hand fender to fender mount weldment and rear fender bracket using 3/8" stainless steel hardware. (FIG. 2-47)



- Repeat steps 2 through 7 for the right-hand side of the spreader.
- Tighten all hardware on angle mounting fenders, middle fender brackets, fender mount weldments, rear fender brackets, and fenders.
- Attach anti slip tape (PF1234-702) to the left-hand fenders. (FIG. 2-48)



Fenders and Mud Flaps Install (Optional) (continued)

NOTE: Front mud flap bracket (PFF3238PBA) is used to attach the front mudflap (9009172) ahead of the existing fender bracket if there is tire interference with the mud flap.

11. Attach front mud flap bracket (PFF3238PBA) to left-hand middle fender bracket using two each 3/8"-16UNC x 1" carriage bolts (9007908-051), 3/8" flat washers (900902-037) and 3/8"-16UNC elastic nuts (900905-012). (FIG. 2-49)

NOTE: DO NOT tighten hardware at this time. Wait until mud flaps and brackets are in place before torquing hardware.

12. Hand tighten the front mud flap in the gap between the two brackets. Insert three 3/8"-16UNC x 1 1/2" button head bolts (PF1200-3047), 3/8" flat washers (900902-037) and 3/8"-16UNC elastic nuts (900905-012) from the front side. Affix with 3/8" hardware ONLY on the outside capscrew. (FIG. 2-50)

13. Slide front anti-sway weldment (PFF3238PB) over the two inside capscrews and affix with 3/8" hardware. (FIG. 2-51)

14. Attach front anti-sway weldment to the mud-flap with two 3/8" hardware at the bottom. (FIG. 2-51)

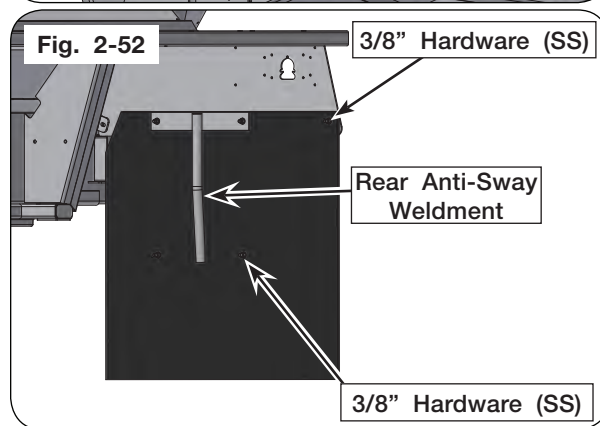
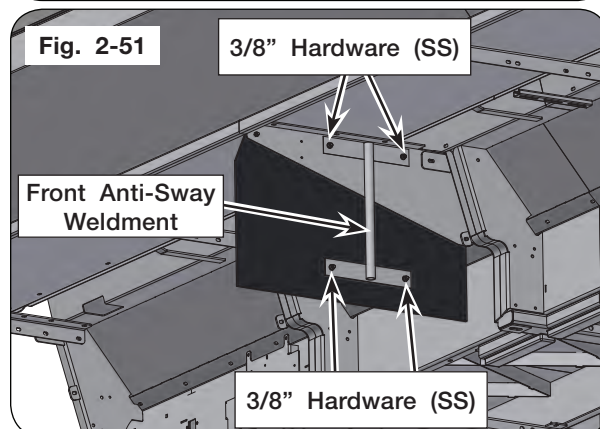
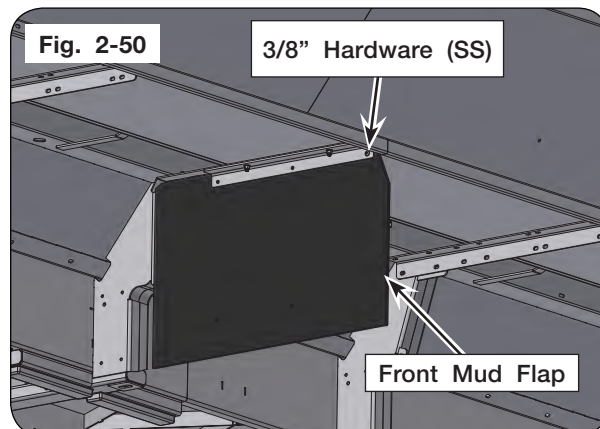
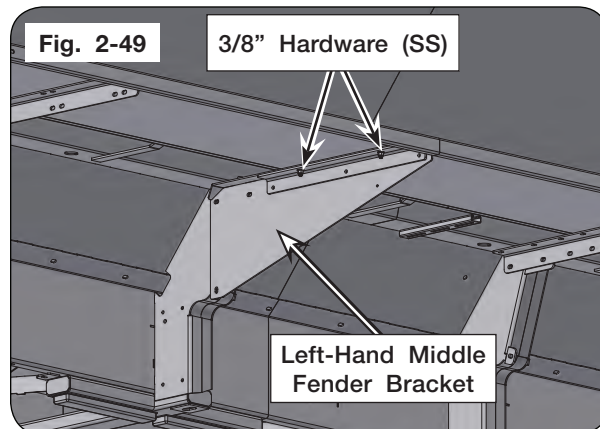
15. Hand tighten the rear mud flap (9009173) to rear fender bracket. Insert three 3/8" hardware from the rear side. Affix with 3/8" hardware ONLY on the outside capscrew. (FIG. 2-52)

16. Slide rear anti-sway weldment (PFF3238PB) over the two inside capscrews and affix with 3/8" hardware. (FIG. 2-52)

17. Attach rear anti-sway weldment to the mud-flap with two 3/8" hardware at the bottom. (FIG. 2-52)

18. Repeat steps 11 through 17 for the right-hand side of the spreader.

19. Torque all 3/8" hardware to 12-15 Ft-Lbs.



Chassis Box Mounting

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 14,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

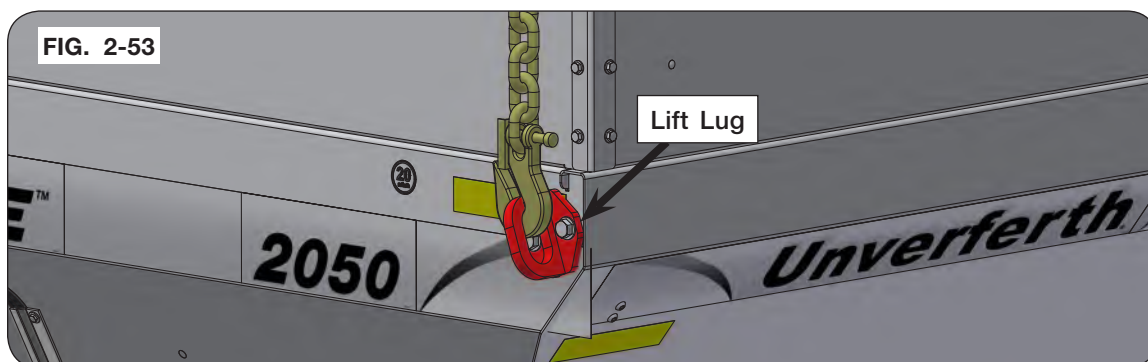
IMPORTANT

- Disconnect the unit completely from the towing vehicle before welding on the equipment. Damage may occur to the electrical system.
 - Disconnect all scale indicator leads, if applicable, before welding on equipment, jump starting or fast charging. Damage may occur to the indicator and load cells.
 - Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.
1. Park the empty chassis on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off engine and remove ignition key. Completely disconnect the unit from the vehicle to prevent electrical and/or hydraulic damage. Consult chassis unit operator's manual before welding.



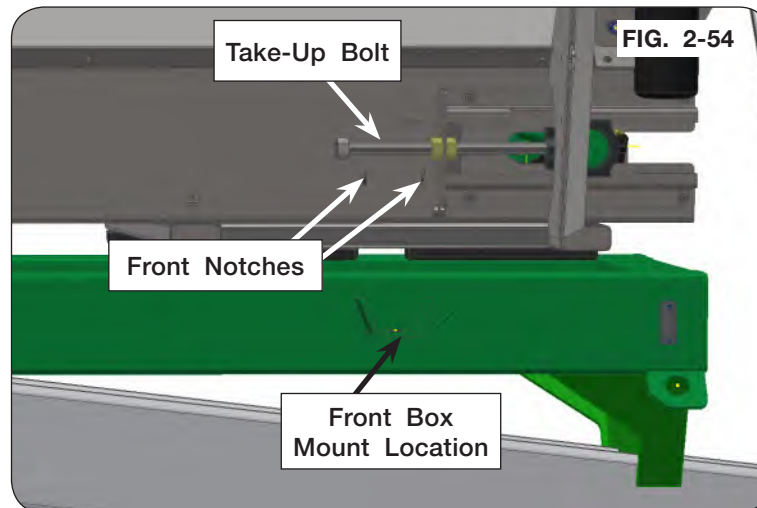
NOTE: Lift lugs (416178R) are in place when spreader arrives from factory as shown. (FIG. 2-53)

2. Fasten one lift lug to each corner of the hopper with 5/8"-11UNC x 2" (SS) capscrews (900900-124), 5/8" (SS) flat washers (900902-049), 5/8" (SS) lock washers (900903-029), and 5/8"-11UNC (SS) hex nuts. (FIG. 2-53)
3. Torque 5/8" capscrews to specification. See "Complete Torque Chart" in MAINTENANCE.



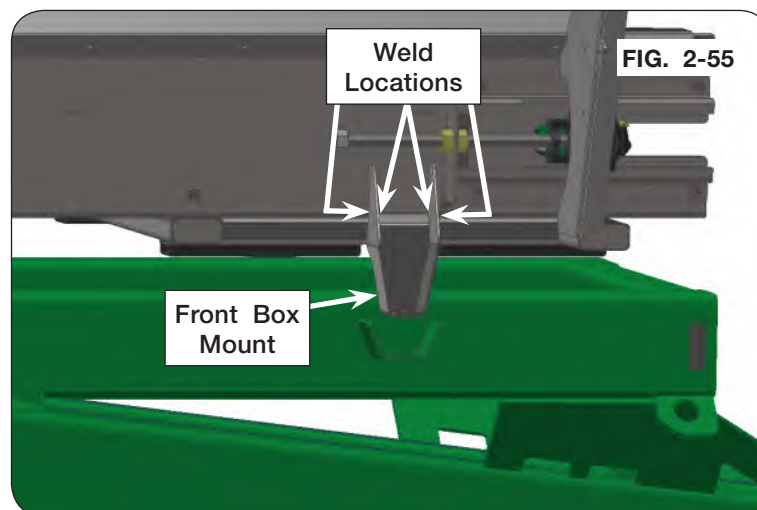
Chassis Box Mounting (continued)

4. Using lift lugs and a safe lifting device rated at 14,000 lbs., lift unit and mount as far forward as possible. (FIG. 2-54)
5. Locate the box mounts (PF1236-80) to the chassis frame cross member tubes on the bottom of the box.
6. Position the front box mount centered under front notches below take-up bolt on each side of the unit. (FIG. 2-54)



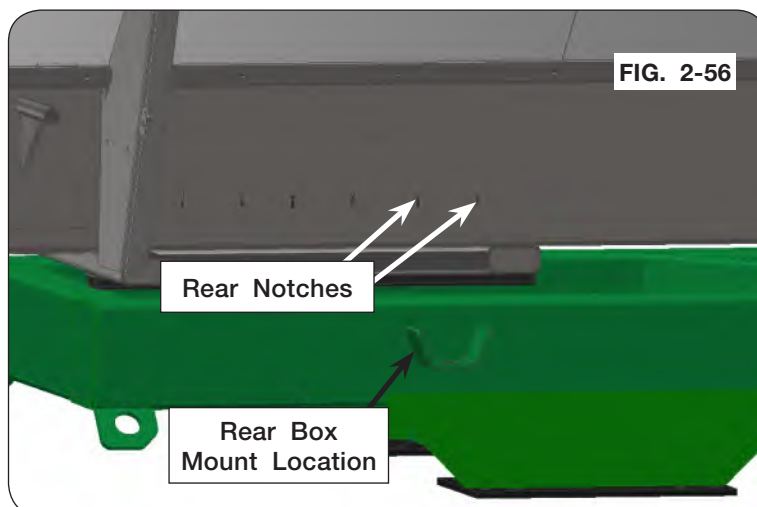
NOTE: Do not weld box mounts to the chassis frame cross member tubes. Only weld the box mounts to the frame side rails.

7. Weld the box mount to the box and box frame rails on each side of the unit as shown. (FIG. 2-55)



Chassis Box Mounting (continued)

- Align box mount to the rear notches on side of the box with chassis mount plate slots on each side of the unit as shown. (FIG. 2-56)



- Weld the box mount to the box and box frame rails at the same locations as the front box mounts on each side of the unit.
- Insert 3/4"-10UNC x 2 1/4" capscrew (9503634-146) through 3/4" flat washer (9503636-104), box mount bolt hole, chassis mount plate slot, and 3/4"-10UNC top locknut (9503653-037).
- Torque 3/4" hardware to 150 ft.-lbs.
- Remove safe lifting device from the hopper.
- Once chassis unit is mounted, lift lugs may be left in place. If lift lugs are removed, reinstall hardware to fill holes in the hopper.

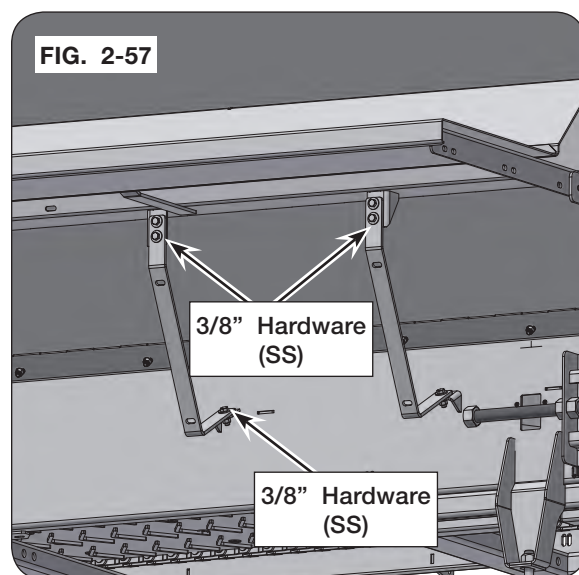
Hydraulic Oil Cooler Install (Optional - Chassis Mount)

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- RELIEVE THE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE CHASSIS OPERATOR'S MANUAL FOR PROPER PROCEDURES.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

IMPORTANT

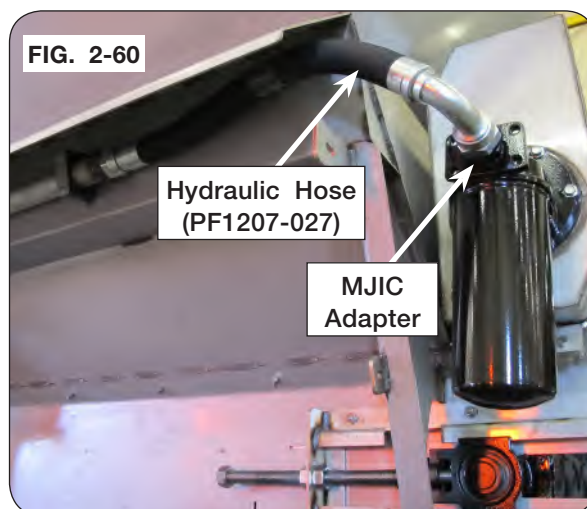
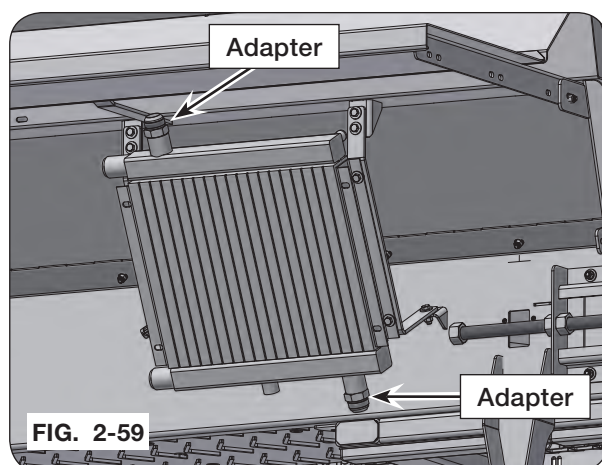
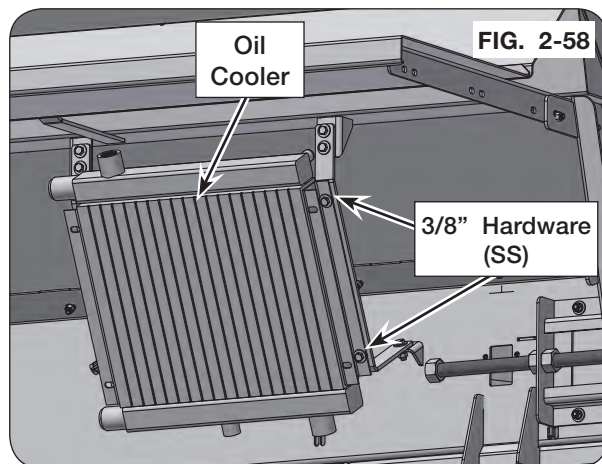
- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, and disconnect hydraulics from the vehicle to the spreader.
 2. Loosely affix two mounting brackets (415505) to the front right-hand side brackets using six 3/8"-16UNC x 1 1/4" capscrews (900900-056) (SS), twelve 3/8" flat washers (900902-038) (SS), six 3/8" lock washers (900903-021) (SS), and six 3/8" hex nuts (9000901-006) (SS). (FIG. 2-57)



Hydraulic Oil Cooler Install (Optional - Chassis Mount) (continued)

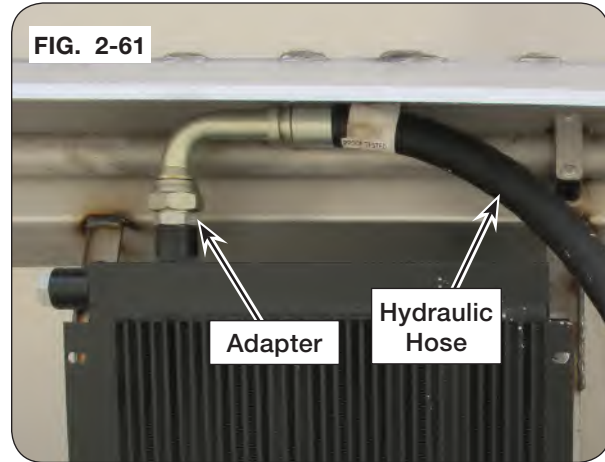
3. Place hydraulic oil cooler (9009177) to the mounting brackets with the 120°F temperature switch (9009169) port and oil cooler 12V fan harness (9010193) at bottom of oil cooler. (FIG. 2-58)
4. Attach hydraulic oil cooler to the mounting brackets using four 3/8"-16UNC x 1 1/4" capscrews (900900-056) (SS), eight 3/8" flat washers (900902-038) (SS), four 3/8" lock washers (900903-021) (SS), and four 3/8" hex nuts (9000901-006) (SS). (FIG. 2-58)
5. Torque all hardware on mounting brackets and oil cooler to specification. See "Complete Torque Chart" in MAINTENANCE section.
6. Insert and tighten adapters (9009365) to the top and bottom of the oil cooler. (FIG. 2-59)
7. Remove hydraulic hose (PF1207-027) from conveyor return line hydraulic pipe and filterhead adapter. Discard hose (PF1207-027). (FIG. 2-60)

(Continued on next page)

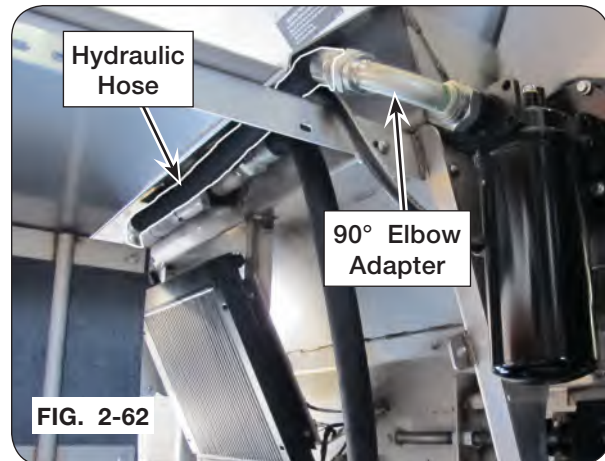


Hydraulic Oil Cooler Install (Optional - Chassis Mount) (continued)

8. Attach hydraulic hose (PF1207-0285) 90° elbow end to the adapter on top of the oil cooler. (FIG. 2-61)

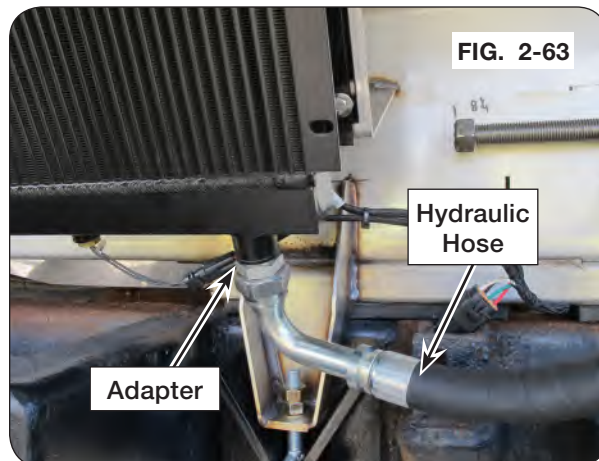


9. Route other end of hydraulic hose (PF1207-0285), from previous step, as shown to the oil filter. (FIG. 2-62)
10. Attach 90° elbow adapter (PF1202-66) to adapter (PF1202-1027) on oil filter. (FIG. 2-62)
11. Attach hydraulic hose (PF1207-0285) to 90° elbow adapter. (FIG. 2-62)

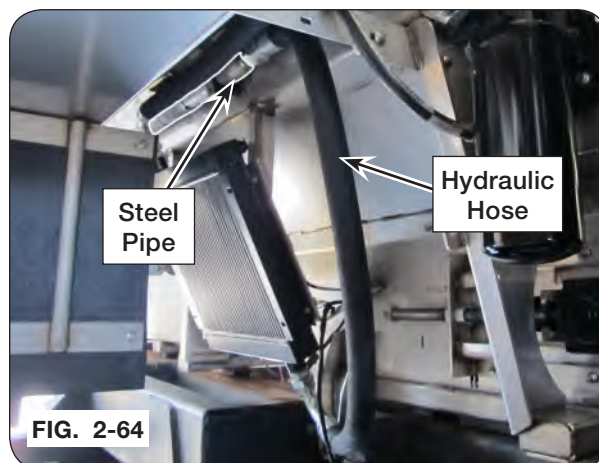


Hydraulic Oil Cooler Install (Optional - Chassis Mount) (continued)

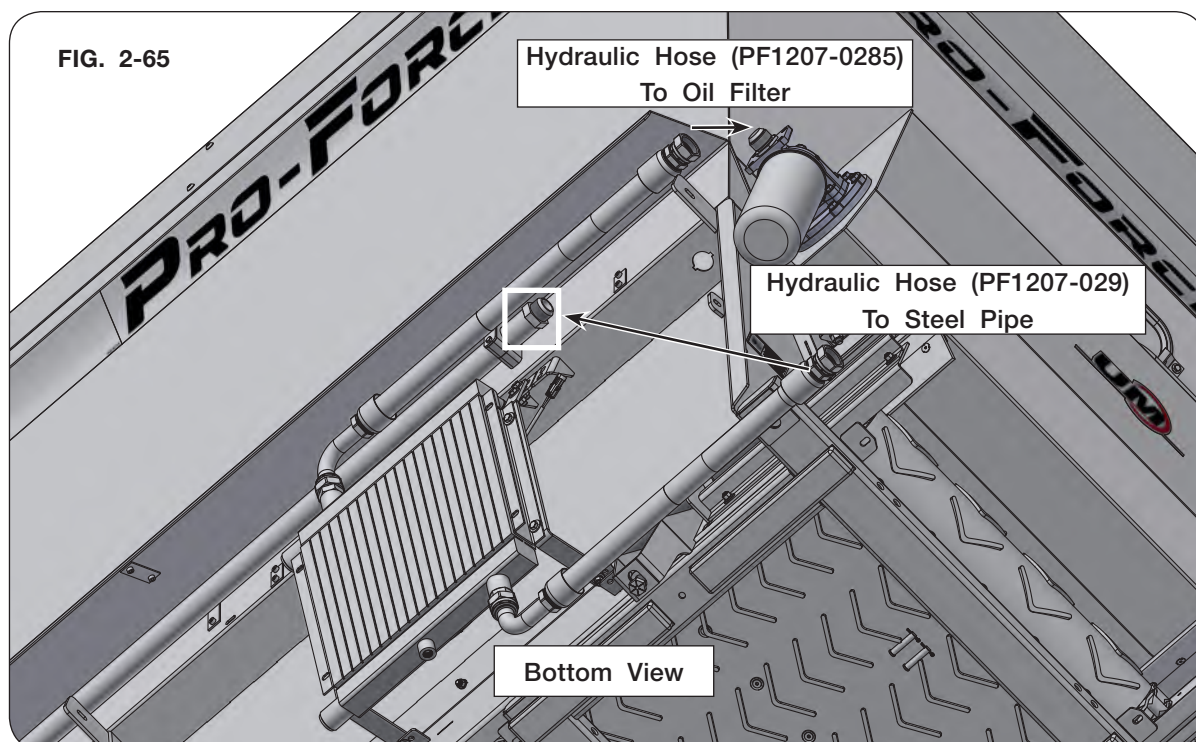
12. Attach hydraulic hose (PF1207-029) 90° elbow end to the adapter on bottom of the oil cooler. (FIG. 2-63)



13. Attach other end of hydraulic hose (PF1207-029) to the hydraulic steel pipe as shown. (FIG. 2-64)



(Continued on next page)



Hydraulic Oil Cooler Install (Optional - Chassis Mount) (continued)

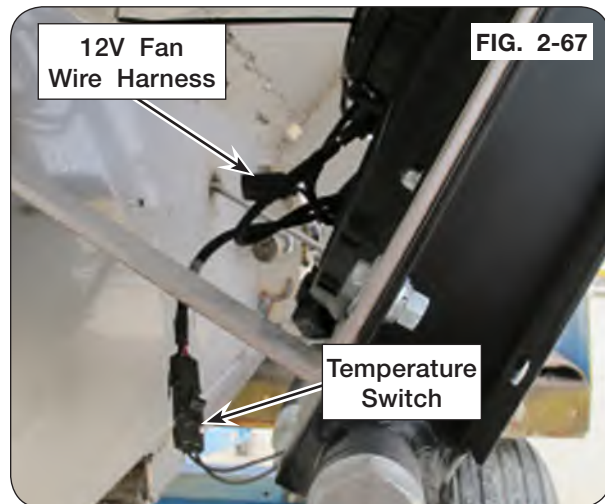
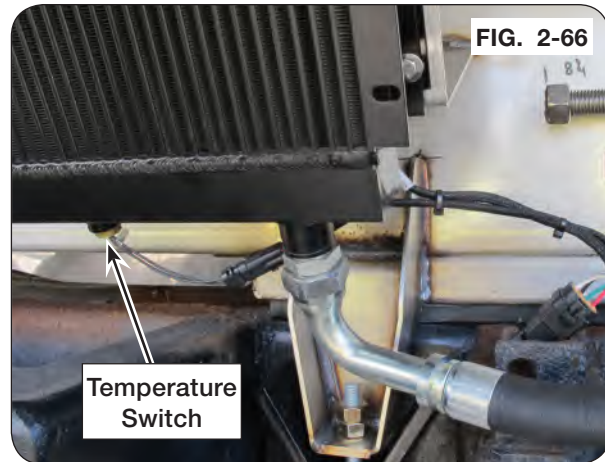
14. Connect 120°F temperature switch (9009169) to bottom of oil cooler. (FIG. 2-66)
15. Route chassis oil cooler wiring harness (PF1223-544A) to temperature switch and oil cooler 12V fan harness (9010193). (FIGS. 2-66 and 2-67)
16. Attach other end of temperature switch to the chassis oil cooler wiring harness (PF1223-544A) as shown. (FIG. 2-66)
17. Connect oil cooler 12V fan harness (9010193) to chassis oil cooler wiring harness. (FIG. 2-67)
18. Connect oil cooler wiring harness to the chassis battery. See next page for oil cooler wiring harness diagram.

NOTE: Oil cooler harness has inline 30 amp fuse.

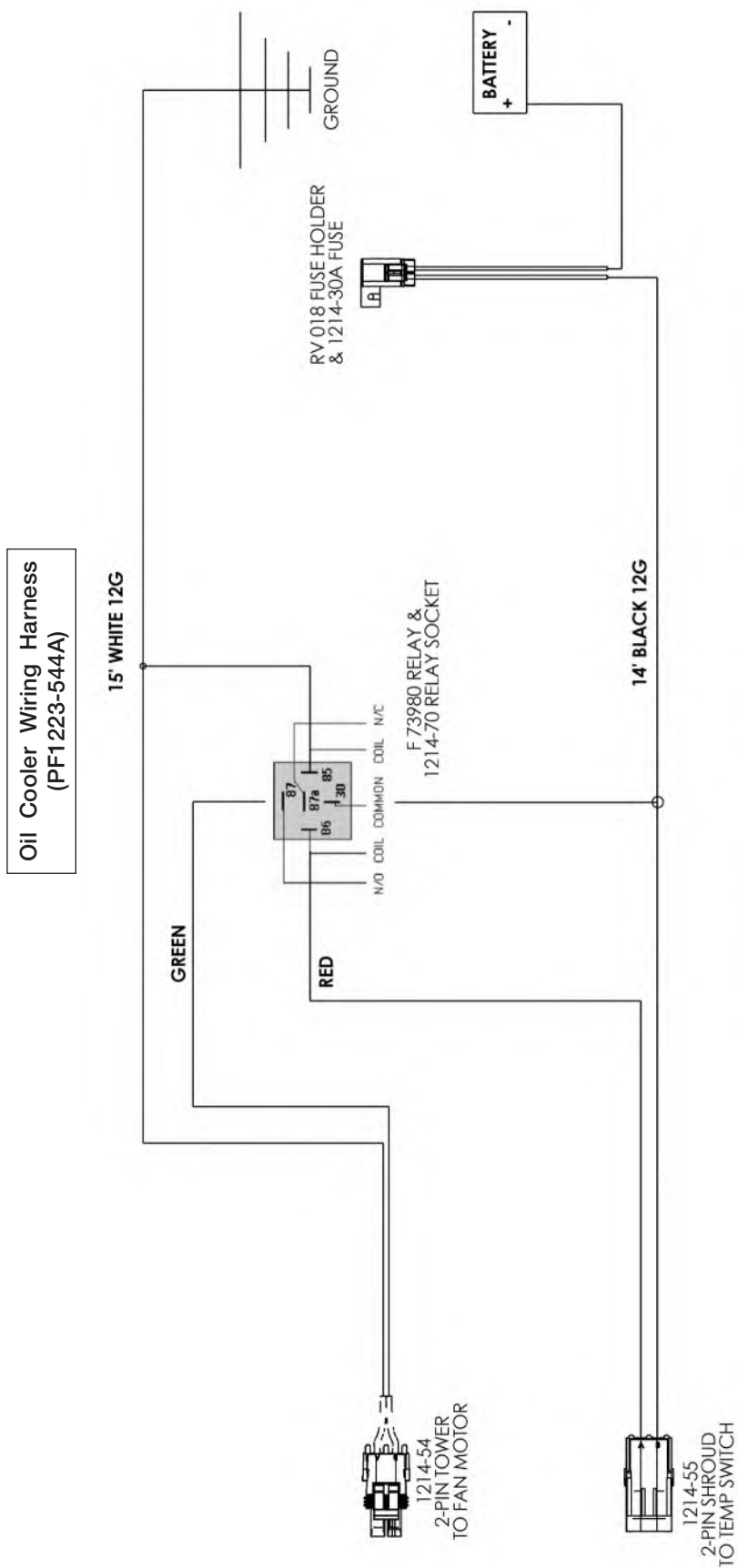
19. Check hydraulic reservoir oil level and fill as needed. See “Lubrication” and “Hydraulic Reservoir Tank” for oil specifications.

IMPORTANT

- *Running the hydraulic pump without oil will result in pump damage.*
20. Enable hydraulics to the spreader and check for leaks and proper function.



Hydraulic Oil Cooler Install (Optional - Chassis Mount) (continued)



SMV Emblem & SIS Decals

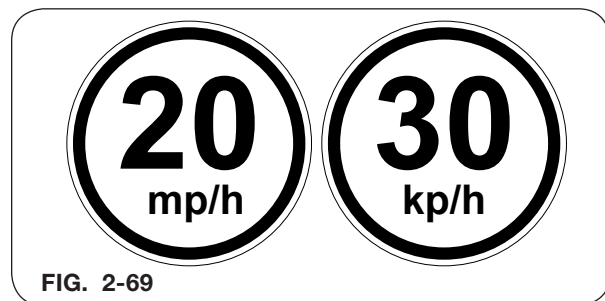
WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

1. Before the spreader is used, the reflective surface of the SMV must face rearward. This may require removal of film protecting the reflective surface or removing and reinstallation of the SMV. (FIG. 2-68)
2. When reinstalling the SMV, make sure that it is placed with the wide part of the SMV at the bottom. (FIG. 2-68)
3. For the SIS decals (one on the front and one on the rear of the spreader) make sure both decals are clean and visible. (FIG. 2-69)

For 20 M.P.H SIS decals, order 9008715 for the front & 9008714 for the rear.

For 30 K.P.H SIS decals, order 9008721 for the front & 9008720 for the rear.



Video System (Optional)

The video system includes its own installation instruction sheet. Reference the provided instruction sheet.

Rate Control Module (RCM) Spreader Set Up

When turning on the RCM for the first time, the following steps will have to be performed in order for the RCM to function properly right away.

NOTE: Before programming the RCM, ensure the RCM monitor is connected to the battery.

NOTE: This set up guide uses the latest RCM software at the time of printing.

1. Connect RCM to +12VDC battery power.
2. Initial start-up screen. At “Profile Name” box, name as “Spreader”. Click “Machine Type” and select “Pull-Behind Spreader” or “Self-Propelled Spreader” depending on spreader type. Next, enter 90 FT. for “Application Width”. Click next page icon. (FIG. 2-70)

NOTE: Highest value for “Application Width” is 90 FT.

NOTE: “Application Width” will be changed once a spread pattern test is complete.

NOTE: The question mark provides additional information and outlines what happens when adjusting each setting. (FIG. 2-71)

3. Default for “ECU” box is 1. Click “Number of Products” box and unless your spreader is equipped with optional dual/tri/quad hoppers, stay with the default 1 in this box. Click next page icon. (FIG. 2-71)
4. Default for “Number of Spinner RPM Sensors” box is 1. Ensure “Enable Spinner RPM Control” box is checked. Click next page icon. (FIG. 2-72)

FIG. 2-70 Name Profile

Profile Name
*

Machine Type
*

Application Width (ft)

Software Version Number

Hardware Serial Number

RAVEN 

FIG. 2-71 Setup System

ECU S/N	ECU #	Number of Products
RCM-2032	1	4 ?

 RAVEN 

Setup Fan/Spinner RPM

Select the number of spinner or fan RPM sensors installed on the Implement used for fan or spinner RPM monitoring or control

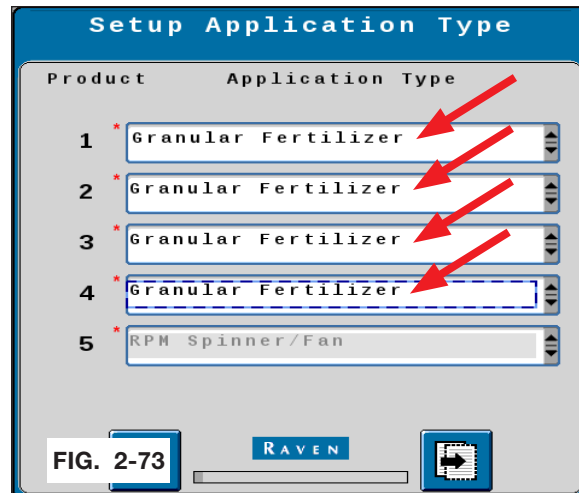
Enable Fan/Spinner RPM Control ☒

FIG. 2-72 RAVEN 

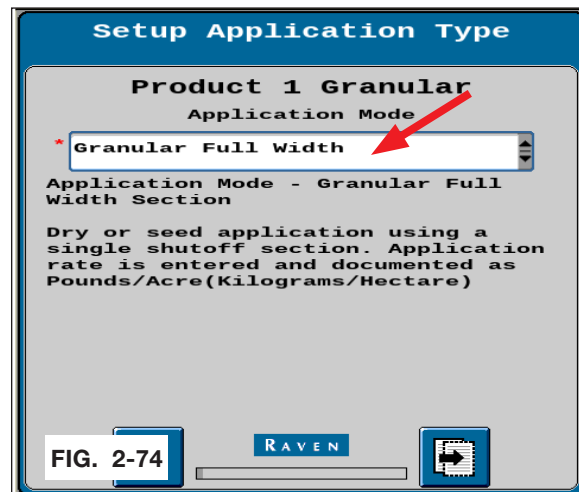
RCM Spreader Set Up (continued)

- Under “Application Type”, select “Granular Fertilizer” for product type. The number of products selected correlates with the number of products in figure 2-73. Click next page icon. (FIG. 2-73)

NOTE: A quad-force spreader with four products is shown figure 2-73. The final entry is always RPM Spinner/Fan. For example, if a single product is spread, RPM Spinner/Fan is the second line.



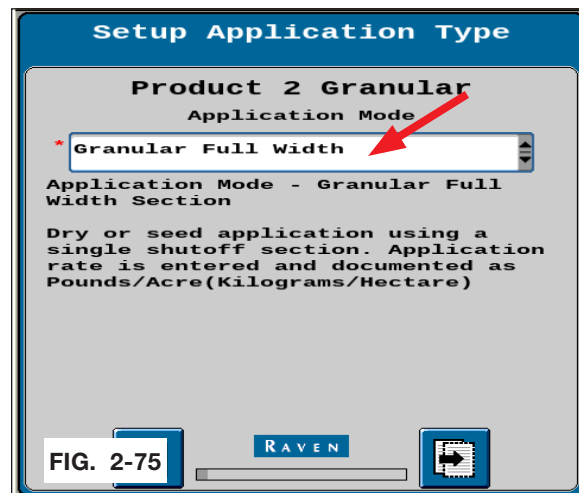
- Under “Product 1 Granular Application Mode”, select “Granular Full Width”. Click next page icon. (FIG. 2-74)



NOTE: This screen will not be displayed if using one product. (FIG 2-75)

NOTE: If using one product, skip to step 10.

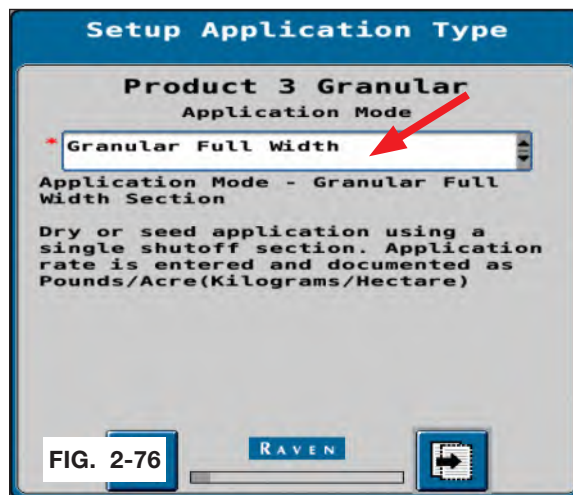
- Under “Product 2 Granular Application Mode”, select “Granular Full Width”. Click next page icon and continue with next bins, if equipped. (FIG. 2-75)



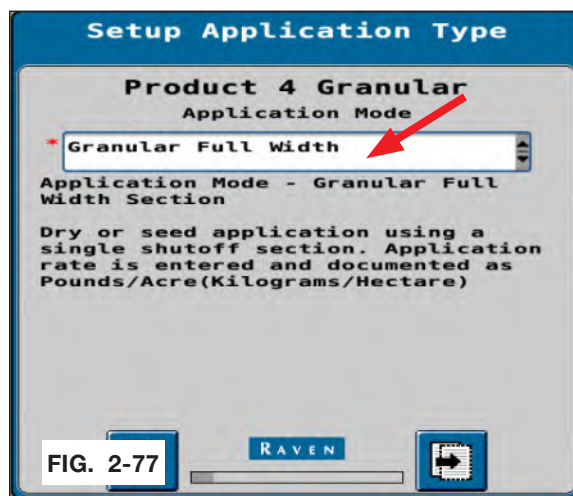
RCM Spreader Set Up (continued)

- Under “Product 3 Granular Application Mode”, select “Granular Full Width”. Click next page icon. (FIG. 2-76)

NOTE: If using three products, skip to step 10.



- Under “Product 4 Granular Application Mode”, select “Granular Full Width”. Click next page icon and continue with next bins, if equipped. (FIG. 2-77)



RCM Spreader Set Up (continued)

10. Ensure “AUX-N Enabled” box is unchecked. Click next page icon. (FIG. 2-78)

AUX-N Setup

AUX-N Enabled ☐

FIG. 2-78

RAVEN

11. Make sure this box is YES. Click next page icon. (FIG. 2-79)

Setup Section Groups

Are section drivers shared between all products in product harness? ?

Yes No

60.00ft 60.00ft

Product 1 Sections Product 1 Sections

15.00	15.00	15.00	15.00
1	2	3	4

Product 2 Sections Product 2 Sections

15.00	15.00	15.00	15.00
1	2	3	4

Yes

FIG. 2-79

RAVEN

12. Next to “Auxiliary Driver 1”, select “Aux Driver 4”. (FIG. 2-80)

NOTE: Aux Driver 4 is for the boundary control feature.

13. Ensure “Auxiliary Driver 2-6” boxes are selected as “None”. Click next page icon. (FIG. 2-80)

Setup Auxiliary Drivers

Auxiliary Driver 1 Aux Driver 4 ?

Auxiliary Driver 2 None

Auxiliary Driver 3 None

Auxiliary Driver 4 None

Auxiliary Driver 5 None

Auxiliary Driver 6 None

FIG. 2-80

RAVEN

RCM Spreader Set Up (continued)

14. Ensure “Auxiliary Driver 7-12” boxes are selected as “None”. Click next page icon. (FIG. 2-81)

Setup Auxiliary Drivers

Auxiliary Driver 7: None

Auxiliary Driver 8: None

Auxiliary Driver 9: None

Auxiliary Driver 10: None

Auxiliary Driver 11: None

Auxiliary Driver 12: None

FIG. 2-81

15. Ensure “Latched Aux Output 1” box is checked. Click next page icon. (FIG. 2-82)

Auxiliary Drivers Assignment

Latched Aux Output 1: ☒

FIG. 2-82

NOTE: FIG. 2-83 shows how many bins are equipped.

16. No action required on this screen. Shows product width summary. Continue to next page. (FIG. 2-83)

Section Summary

89.999 (ft)

Product 1

Liquid Section Width	90
Granular Section Width	1
Wired Signal Driver	1

Product 2

Liquid Section Width	90
Granular Section Width	1
Wired Signal Driver	1

FIG. 2-83

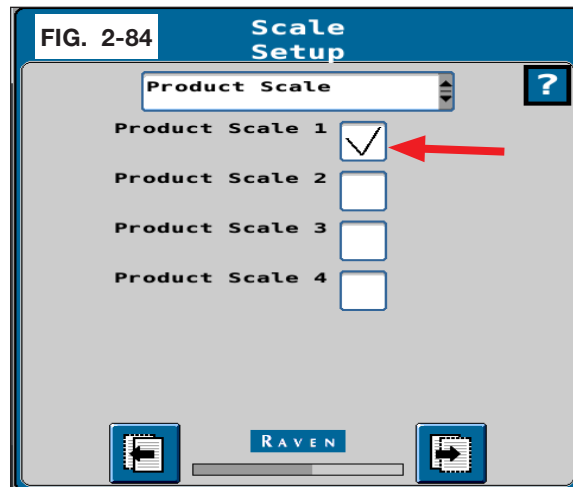
RCM Spreader Set Up (continued)

NOTE: If unit is NOT equipped with a scale and is single bin, leave boxes blank and skip to step 22.

17. If the unit is equipped with a scale and is single bin, select “Product Scale” box. (FIG. 2-84)

18. Ensure only “Product Scale 1” box is checked. Click next page icon. (FIG 2-84)

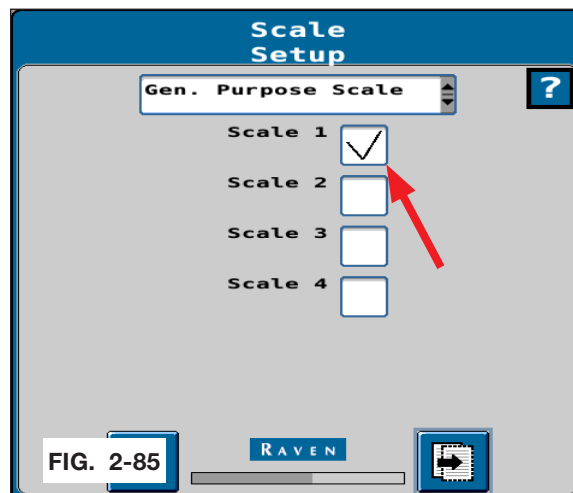
NOTE: Product Scale 1 detects the combined weight of **ALL** products.



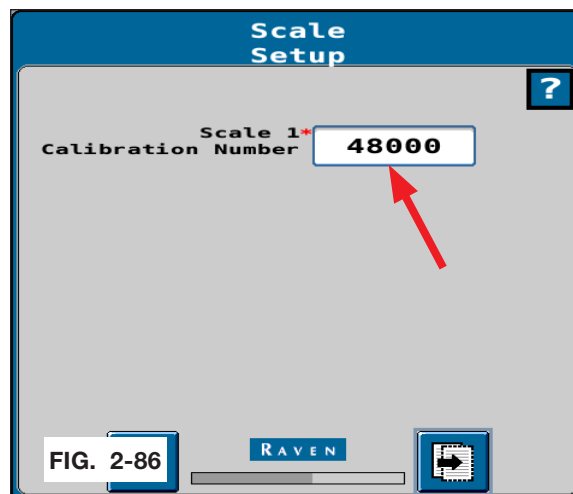
NOTE: If unit is NOT equipped with a scale and has multiple bins, leave boxes blank and skip to step 22.

19. If the unit is equipped with a scale and multiple bins, select “Gen. Purpose Scale” box. (FIG. 2-85)

20. Ensure only “Scale 1” box is checked. Click next page icon. (FIG. 2-85)

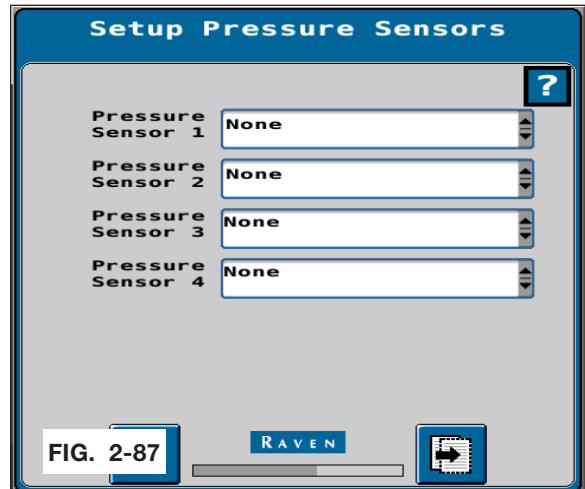


21. Enter “32000” for Calibration Number for 4-point scale spreader models 1050 through 1450. Enter “48000” for 6-point scale spreader models 1650 through 2650. Click next page icon. (FIG. 2-86)

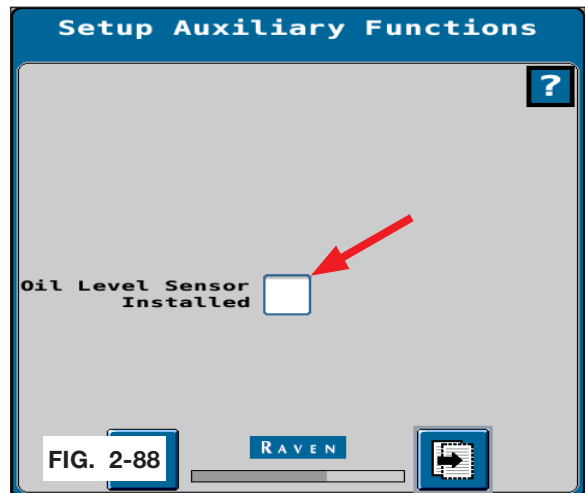


RCM Spreader Set Up (continued)

22. Ensure all the “Pressure Sensor” boxes are selected as “None”. Click next page icon. (FIG. 2-87)



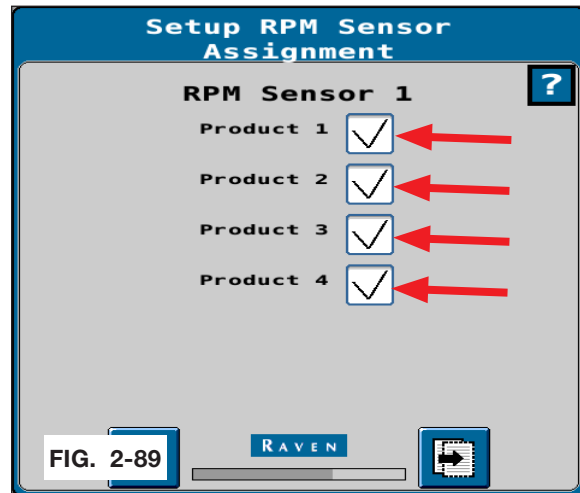
23. Ensure “Oil Level Sensor Installed” box is unchecked. Click next page icon. (FIG. 2-88)



RCM Spreader Set Up (continued)

NOTE: The question mark provides additional information and outlines what happens when adjusting each value setting.

24. Ensure each box is checked for all products. The number of products will correspond to the number of compartments on the spreader. Click next page icon. (FIG. 2-89)



RCM Spreader Set Up (continued)

25. “Product 1” is the set up for the main conveyor. For “Control Valve Type” and model 2650, select “Fast Close” and skip to step 30. All other models select “PWM Close”. (FIG. 2-90)

NOTE: Model 2650 spreader uses 2 servo valves on the 2 flow control valve blocks. (FIG. 2-91)

NOTE: For “Fast Close” valve type and model 2650, skip to step 30. (FIG. 2-91)

NOTE: Model 2250 & 1850 undercarriage spreaders use 1 servo valve and 1 PWM valve on the 2 flow control valve blocks. (FIG. 2-92)

NOTE: Model 2050 & shorter spreaders use 1 servo valve and 1 PWM valve on the main hydraulic valve block. (FIG. 2-93)

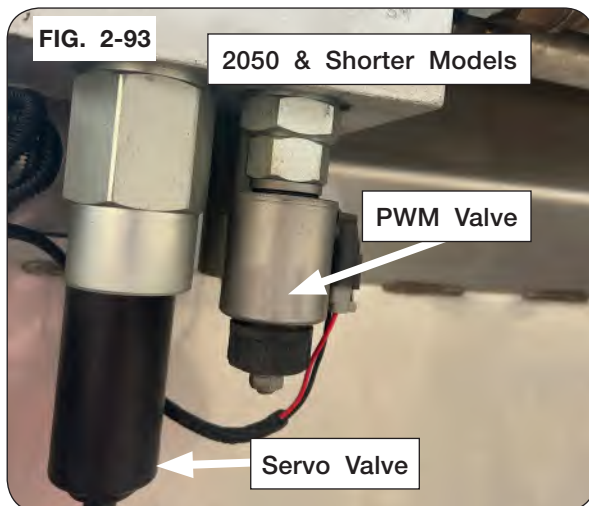
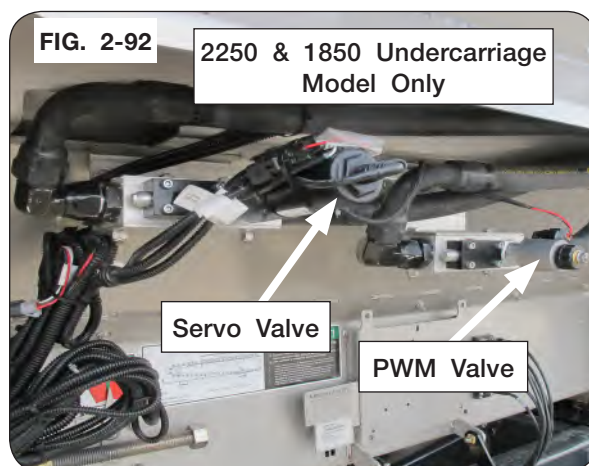
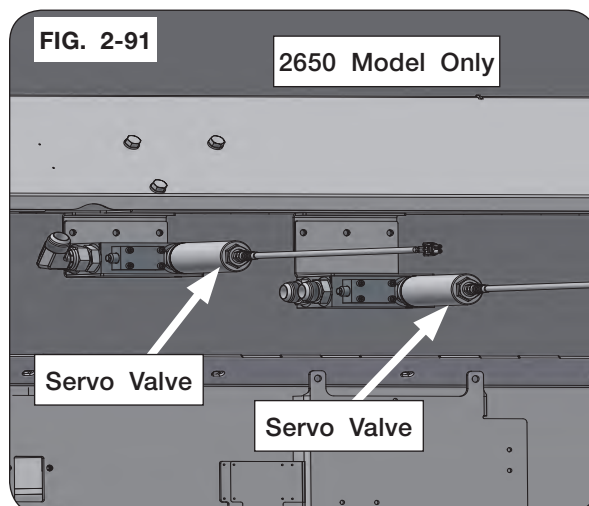
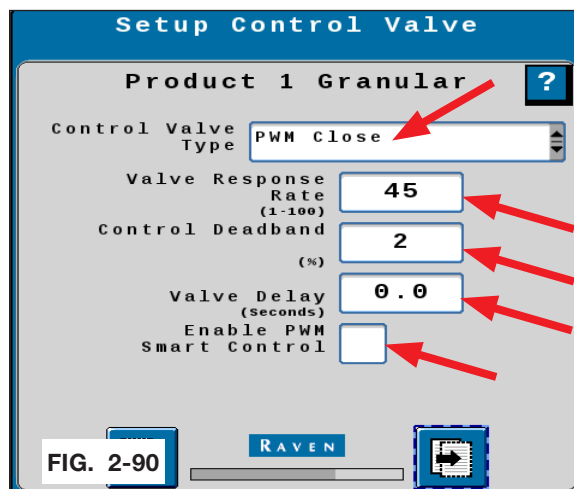
26. For “PWM Close” valve type, set “Valve Response Rate” at 45 as shown in figure 2-90. This is how fast the valve responds.

NOTE: If valve is hunting, reduce rate 2%. Repeat as needed. If valve is not responding quickly, increase rate 2%. Repeat as needed.

27. Ensure “Control Deadband %” box is 2.

28. “Valve Delay” box remains at 0.

29. Ensure “Enable PWM Smart Control” box is unchecked as shown in figure 2-90. Click next page icon and skip to step 33.

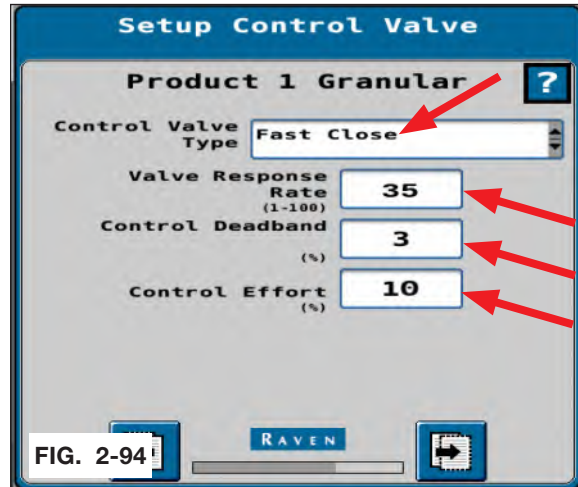


RCM Spreader Set Up (continued)

30. For “Fast Close” valves on 2650 units, set “Valve Response Rate” at 35. This is how fast the valve responds. (FIG. 2-94)

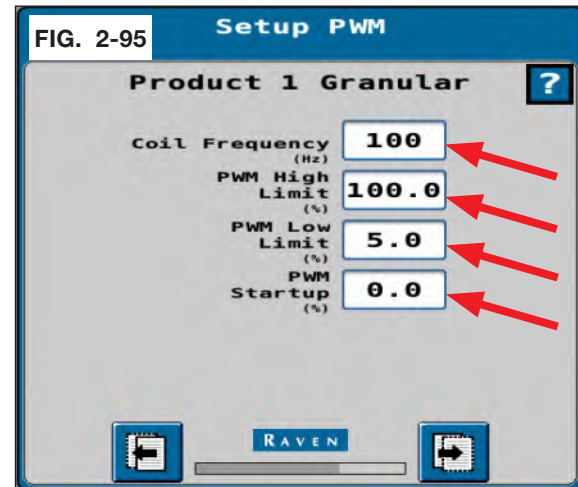
31. Ensure “Control Deadband %” box is 3.

32. “Control Effort” box is at 10. Click next page icon. (FIG. 2-94)



33. For the PWM valve (9009773) “Coil Frequency”, this value defaults to 60. Change value to 100. (FIG. 2-95)

34. Set “PWM High Limit” at 100, “PWM Low Limit” at 5 and “PWM Startup” at 0. Click next page icon. (FIG. 2-95)



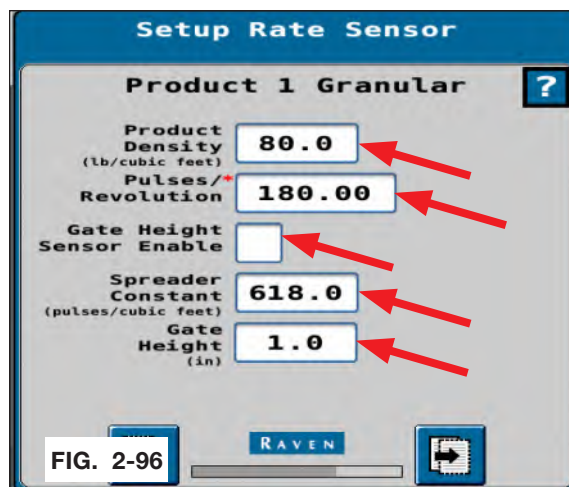
RCM Spreader Set Up (continued)

35. Use Density Scale in spread pattern kit 414542R to determine material product density. Enter this value. For quick setup, enter “Product Density” to 80 lbs./cu.ft. This value can be changed later. (FIG. 2-96)

36. Enter recommended “Spreader Constant” and desired “Gate Height”. These values are only used for product 1 on main conveyor. Ensure “Gate Height Sensor Enable” box is unchecked. See single and Duo-Force tables below. (FIG. 2-96)

NOTE: Perform catch test calibration to achieve proper spreader constant.

37. Enter 180 for “Pulses/Revolution”. This value is only used for product 1 on main conveyor motor. Click next page icon. (FIG. 2-96)



Primary Bin with Single Bin Only	
Gate Setting	Spreader Constant
1 INCH	618
2 INCH	309
3 INCH	206
4 INCH	154
5 INCH	123
6 INCH	103
7 INCH	88
8 INCH	77
9 INCH	69
10 INCH	62
11 INCH	56
12 INCH	51
13 INCH	48
14 INCH	44
15 INCH	41
16 INCH	39
17 INCH	36
18 INCH	34
Primary Bin with Duo-Force	
Gate Setting	Spreader Constant
0.5 INCH (A)	1382
1.5 INCH (B)	461
2.5 INCH MAX (C)	276

RCM Spreader Set Up (continued)

38. “Tank Capacity” of primary bin depends on number of bins and size of spreader. For testing purposes, entering 15000 is recommended. Multiplying product density by struck capacity determines tank capacity. (FIG. 2-97)

39. “Current Tank Level” box remains at 0.

40. “Low Tank Level” is the value an alarm is set off for a low bin level. This setting remains at 0 and ensure the “Alarm” box is unchecked.

41. Ensure “Low Bin Level Sensor” box is checked and “Bin Level Sensor Type” is Default.

42. Ensure “Mid Bin Level Sensor” box is unchecked and “Mid Tank Level” is 0. Click next page icon. (FIG. 2-97)

43. “Set Up Rates” page controls the application rates for main conveyor speed and determines how much product is being applied for “Product 1” and main conveyor. Enter three “Preset Rate Values”, as desired, which can be clicked between on the homescreen. On the homescreen, rates can be entered as well. (FIG. 2-98)

44. Enter “Rate Bump” value in an increment as desired.

45. For “Rate Selection”, manually input a selection or select “Predefined or Rx”. This enables selection of rate from the preset value choices or from a prescription map that is imported from a Universal Terminal.

46. “Display Smoothing” needs to be checked and “Decimal Shift” remains at 0. Click next page icon. (FIG. 2-98)

47. Enter 20 for “Off Rate Alarm” and check “Alarm” box. (FIG. 2-99)

NOTE: Alarm prompts when over 20% off target rate.

48. Do not check “Shaft Sensor Alarm” box. Click next page icon. (FIG. 2-99)

FIG. 2-97

Setup Tank/Bin

Product 1 Granular

Tank Capacity (Lb) **15000**

Current Tank Level (Lb) **0**

Low Tank Level (Lb) **0** Alarm? ☐

Low Bin Level Sensor ☒

Mid Bin Level Sensor ☐ Mid Tank Level (%) **0**

Bin Level Sensor Type Default **?**

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FIG. 2-98

Setup Rates

Product 1 Granular **?**

	Rate 1	Rate 2	Rate 3
Preset* Rate Values (lb/ac)	100	200	500

Rate Bump (lb/ac) **10**

Rate Selection **Predefined or Rx**

Display Smoothing ☒

Decimal Shift **0**

RAVEN

FIG. 2-99

Setup Alarms

Product 1 Granular **?**

Off Rate Alarm (% off target rate) **20** Alarm? ☒

Shaft Sensor Alarm ☐

RAVEN

RCM Spreader Set Up (continued)

NOTE: The question mark provides additional information and outlines what happens when adjusting each value setting.

NOTE: If equipped with a single bin, skip to step 109.

49. “Product 2” is the set up for the Duo-Force conveyor. For “Control Valve Type”, always select “PWM Close” for conveyor. (FIG. 2-100)

50. Set “Valve Response Rate” at 45.

51. Ensure “Control Deadband %” box is 2.

52. “Valve Delay” box remains at 0.

53. Ensure “Enable PWM Smart Control” box is unchecked. Click next page icon. (FIG. 2-100)

54. For the PWM valve “Coil Frequency”, this value defaults to 60. Change the value to 100. (FIG. 2-101)

55. Set the “PWM High Limit” at 100, “PWM Low Limit” at 5 and “PWM Startup” at 0. Click next page icon. (FIG. 2-101)

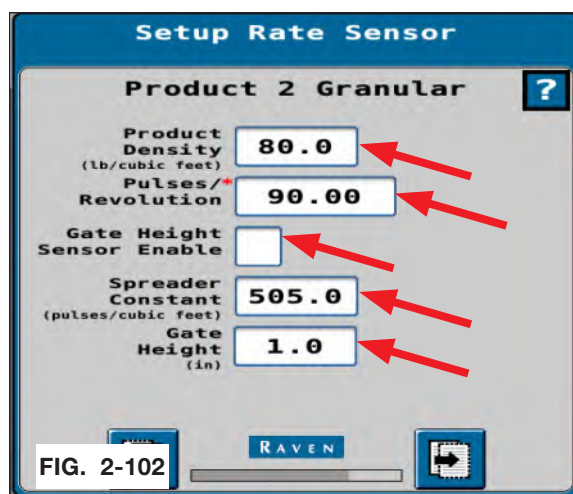
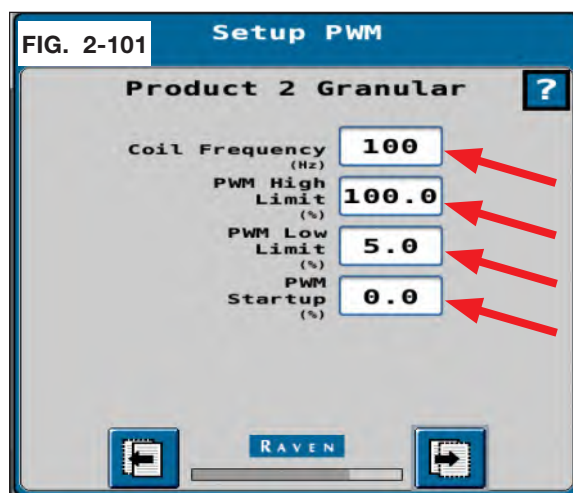
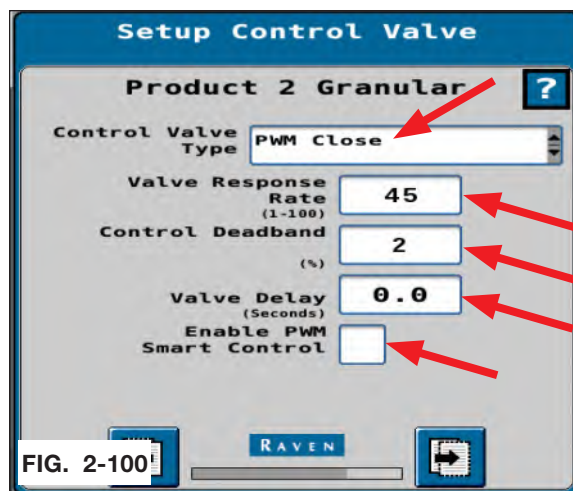
56. Use Density Scale in spread pattern kit 414542R to determine material product density. Enter this value. For quick setup, enter “Product Density” to 80 lbs./cu.ft. This value can be changed later. (FIG. 2-102)

NOTE: When measuring gate opening for Duo Force, add 1/2” to measurement to account for chain material depth.

57. Enter recommended “Spreader Constant” and desired “Gate Height”. These values are only used for product 2 on Duo-Force conveyor. Ensure “Gate Height Sensor Enable” box is unchecked. See table below. (FIG. 2-102)

Gate Setting	Spreader Constant
1 INCH	505
2 INCH	253
3 INCH MAX	168

58. Enter 90 for “Pulses/Revolution”. This value is only used for product 2 on Duo-Force conveyor motor. Click next page icon. (FIG. 2-102)



RCM Spreader Set Up (continued)

59. “Tank Capacity” of the secondary bin will depend on product density and spreader configuration. For testing purposes, entering 15000 is recommended. (FIG. 2-103)
60. “Current Tank Level” box remains at 0.
61. “Low Tank Level” is the value an alarm is set off for a low bin level. This setting remains at 0 and ensure the “Alarm” box is unchecked.
62. Ensure the “Low Bin Level Sensor” box is checked, the “Mid Bin Level Sensor” is unchecked, “Mid Tank Level” is 0, and “Bin Level Sensor Type” is Default. Click next page icon. (FIG. 2-103)
63. “Set Up Rates” page controls the application rates for Duo-Force conveyor speed and determines how much product is being applied for “Product 2” and Duo-Force conveyor. Enter three “Preset Rate Values”, as desired, which can be clicked between on the homescreen. On the homescreen, target rates can be entered as well. (FIG. 2-104)
64. Enter “Rate Bump” value in an increment as desired.
65. For “Rate Selection”, manually input a selection or select “Predefined or Rx”. This enables selection of rate from the preset value choices or from a prescription map that is imported from a Universal Terminal.
66. “Display Smoothing” needs to be checked and “Decimal Shift” remains at 0. Click next page icon. (FIG. 2-104)
67. Enter 20 for “Off Rate Alarm” and check “Alarm” box. (FIG. 2-105)
68. Ensure “Shaft Sensor Alarm” box is unchecked. Click next page. (FIG. 2-105)

Setup Tank/Bin

Product 2 Granular

Tank Capacity (Lb)

Current Tank Level (Lb)

Low Tank Level (Lb)

Low Bin Level Sensor ☒

Mid Bin Level Sensor ☐

Mid Tank Level (%)

Bin Level Sensor Type

Alarm? ☐

FIG. 2-103

RAVEN

FIG. 2-104 Setup Rates

Product 2 Granular

	Rate 1	Rate 2	Rate 3
Preset* Rate Values (lb/ac)	50	100	500
Rate Bump (lb/ac)	0		
Rate Selection	Predefined or Rx		
Display Smoothing	☒		
Decimal Shift	0		

FIG. 2-104

RAVEN

FIG. 2-105 Setup Alarms

Product 2 Granular

Off Rate Alarm (% off target rate)

Shaft Sensor Alarm ☐

Alarm? ☒

FIG. 2-105

RAVEN

RCM Spreader Set Up (continued)

NOTE: The question mark provides additional information and outlines what happens when adjusting each value setting.

NOTE: If equipped with Duo-Force only, skip to step 109.

69. “Product 3” is the set up for the Tri-Force conveyor. For “Control Valve Type”, always select “PWM Close” for conveyor. (FIG. 2-106)

70. Set “Valve Response Rate” at 45.

71. Ensure “Control Deadband %” box is 2.

72. “Valve Delay” box remains at 0.

73. Ensure “Enable PWM Smart Control” box is unchecked. Click next page icon. (FIG. 2-106)

74. For the PWM valve “Coil Frequency”, this value defaults to 60. Ensure the value is set at 100. (FIG. 2-107)

75. Set the “PWM High Limit” at 100, “PWM Low Limit” at 5 and “PWM Startup” at 0. Click next page icon. (FIG. 2-107)

76. Use Density Scale in spread pattern kit 414542R to determine material product density. Enter this value. For quick setup, enter “Product Density” to 80 lbs./cu.ft. This value can be changed later. (FIG. 2-108)

77. Enter 1498 for “Spreader Constant” and 0.6 for desired “Gate Height”. These values are only used for product 3 on Tri-Force conveyor. Ensure “Gate Height Sensor Enable” box is unchecked. (FIG. 2-108)

78. Enter 90 for “Pulses/Revolution”. This value is only used for product 3 on Tri-Force conveyor motor. Click next page icon. (FIG. 2-108)

Setup Control Valve

Product 3 Granular ?

Control Valve Type: PWM Close

Valve Response Rate (1-100): 45

Control Deadband (%): 2

Valve Delay (Seconds): 0.0

Enable PWM Smart Control: ☐

FIG. 2-106

Setup PWM

Product 3 Granular ?

Coil Frequency (Hz): 100

PWM High Limit (%): 100.0

PWM Low Limit (%): 5.0

PWM Startup (%): 0.0

FIG. 2-107

Setup Rate Sensor

Product 3 Granular ?

Product Density (lb/cubic feet): 80.0

Pulses/Revolution: 90.00

Gate Height Sensor Enable: ☐

Spreader Constant (pulses/cubic feet): 1498.0

Gate Height (in): 0.6

FIG. 2-108

RCM Spreader Set Up (continued)

79. “Tank Capacity” of the third bin will depend on product density and spreader configuration. For testing purposes, entering 2100 is recommended. (FIG. 2-109)

80. “Current Tank Level” box remains at 0.

81. “Low Tank Level” is the value an alarm is set off for a low bin level. This setting remains at 0 and ensure the “Alarm” box is unchecked.

82. Ensure the “Low Bin Level Sensor” box is checked, the “Mid Bin Level Sensor” is unchecked, “Mid Tank Level” is 0 and “Bin Level Sensor Type” is Default. Click next page icon. (FIG. 2-109)

83. “Set Up Rates” page controls the application rates for Tri-Force conveyor speed and determines how much product is being applied for “Product 3” and Tri-Force conveyor. Enter three “Preset Rate Values”, as desired, which can be clicked between on the homescreen. On the homescreen, target rates can be entered as well. (FIG. 2-110)

84. Enter “Rate Bump” value in an increment as desired.

85. For “Rate Selection”, manually input a selection or select “Predefined or Rx”. This enables selection of rate from the preset value choices or from a prescription map that is imported from a Universal Terminal.

86. “Display Smoothing” needs to be checked and “Decimal Shift” remains at 0. Click next page icon. (FIG. 2-110)

87. Enter 20 for “Off Rate Alarm” and check “Alarm” box. (FIG. 2-111)

88. Do not check “Shaft Sensor Alarm” box. Click next page icon. (FIG. 2-111)

Setup Tank/Bin

Product 3 Granular

Tank Capacity (Lb)

Current Tank Level (Lb)

Low Tank Level (Lb) Alarm? ☐

Low Bin Level Sensor ☒

Mid Bin Level Sensor ☐ Mid Tank Level (%)

Bin Level Sensor Type ?

FIG. 2-109

RAVEN

FIG. 2-110 Setup Rates

Product 3 Granular ?

	Rate 1	Rate 2	Rate 3
Preset Rate Values (lb/ac)	20	22	25
Rate Bump (lb/ac)	1		
Rate Selection	Predefined or Rx		
Display Smoothing	☒		
Decimal Shift	0		

RAVEN

FIG. 2-111 Setup Alarms

Product 3 Granular ?

Off Rate Alarm (% off target rate) Alarm? ☒

Shaft Sensor Alarm ☐

RAVEN

RCM Spreader Set Up (continued)

NOTE: If equipped with Tri-Force only, skip to step 109.

89. “Product 4” is the set up for the Quad-Force conveyor. For “Control Valve Type”, always select “PWM Close” for conveyor. (FIG. 2-112)

90. Set “Valve Response Rate” at 45.

91. Ensure “Control Deadband %” is 2.

92. “Valve Delay” box remains at 0.

93. Ensure “Enable PWM Smart Control” box is unchecked. Click next page icon. (FIG. 2-112)

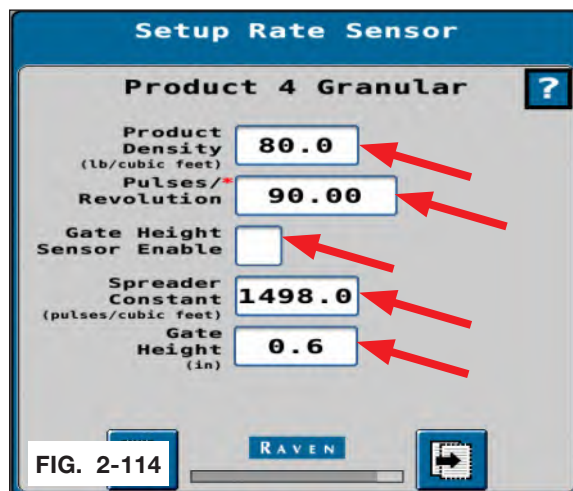
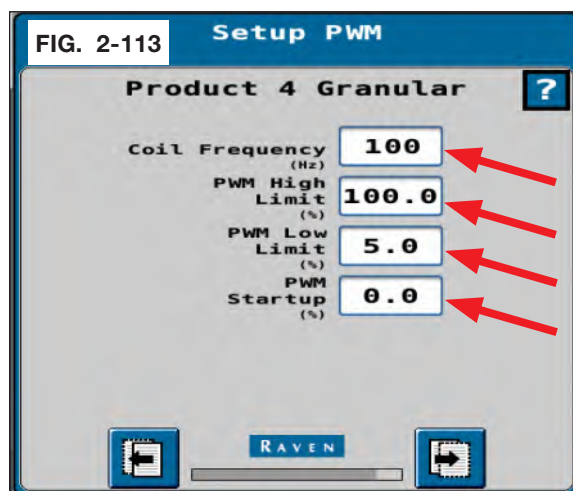
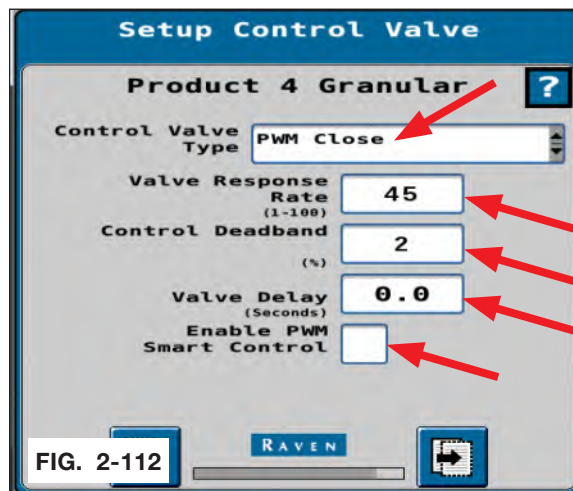
94. For the PWM valve “Coil Frequency”, this value defaults to 60. Ensure the value is set at 100. (FIG. 2-113)

95. Set the “PWM High Limit” at 100, “PWM Low Limit” at 5 and “PWM Startup” at 0. Click next page icon. (FIG. 2-113)

96. Use Density Scale in spread pattern kit 414542R to determine material product density. Enter this value. For quick setup, enter “Product Density” to 80 lbs./cu.ft. This value can be changed later. (FIG. 2-114)

97. Enter 1498 for “Spreader Constant” and 0.6 for desired “Gate Height”. These values are used for product 4 on Quad-Force conveyor. Ensure “Gate Height Sensor Enable” box is unchecked. (FIG. 2-114)

98. Enter 90 for “Pulses/Revolution”. This value is used for product 4 on Quad-Force conveyor motor. Click next page icon. (FIG. 2-114)



RCM Spreader Set Up (continued)

99. “Tank Capacity” of the fourth bin will depend on product density and spreader configuration. For testing purposes, entering 2100 is recommended. (FIG. 2-115)
100. “Current Tank Level” box remains at 0.
101. “Low Tank Level” is the value an alarm is set off for a low bin level. This setting remains at 0 and ensure the “Alarm” box is unchecked.
102. Ensure the “Low Bin Level Sensor” box is checked, the “Mid Bin Level Sensor” is unchecked, “Mid Tank Level” is 0 and “Bin Level Sensor Type” is Default. Click next page icon. (FIG. 2-115)
103. “Set Up Rates” page controls the application rates for Quad-Force conveyor speed and determines how much product is being applied for “Product 4” and Quad-Force conveyor. Enter three “Preset Rate Values”, as desired, which can be clicked between on the homescreen. On the homescreen, target rates can be entered as well. (FIG. 2-116)
104. Enter “Rate Bump” value in an increment as desired.
105. For “Rate Selection”, manually input a selection or select “Predefined or Rx”. This enables selection of rate from the preset value choices or from a prescription map that is imported from a Universal Terminal.
106. “Display Smoothing” needs to be checked and “Decimal Shift” remains at 0. Click next page icon. (FIG. 2-116)
107. Enter 20 for “Off Rate Alarm” and check “Alarm” box. (FIG. 2-117)
108. Do not check “Shaft Sensor Alarm” box. Click next page icon. (FIG. 2-117)

Setup Tank/Bin

Product 4 Granular

Tank Capacity (Lb)

Current Tank Level (Lb)

Low Tank Level (Lb) Alarm? ☐

Low Bin Level Sensor ☒

Mid Bin Level Sensor ☐ Mid Tank Level (%)

Bin Level Sensor Type ?

RAVEN

FIG. 2-115

Setup Rates

Product 4 Granular ?

Preset Rate Values (lb/ac)

Rate 1	Rate 2	Rate 3
5	10	15

Rate Bump (lb/ac)

Rate Selection

Display Smoothing ☒

Decimal Shift

RAVEN

FIG. 2-116

Setup Alarms

Product 4 Granular ?

Off Rate Alarm (% off target rate) Alarm? ☒

Shaft Sensor Alarm ☐

RAVEN

FIG. 2-117

RCM Spreader Set Up (continued)

NOTE: Spinner control is numbered as a product. The product number is 1 more than the number of bin(s) equipped.

NOTE: For example: if four products were selected during initial set up. Fifth product is spinner control.

109. “Product 5 RPM” is the set up for spinner speed. For “Control Valve Type”, always select “Fast Close” for spinners. (FIG. 2-118)
110. For “Valve Response Rate”, enter 35 to start. If spinners overshoot, then enter lower value as desired.
111. Default for “Control Deadband %” is 3 and “Control Effort” range is 10 to 15. If spinner speed does not change when changing desired speed, increase “Control Effort” until spinner speed control is achieved up to a maximum of 70. Click next page icon. (FIG. 2-118)
112. Enter 4 for “RPM Cal”. Click next page icon. (FIG. 2-119)
113. Enter “Preset Rate Values” for spinner target speed, as desired. For less dense products, lower RPM is recommended. For denser products, higher RPM, up to 650 is recommended. (FIG. 2-120)
114. For “Rate Bump” enter 0 for rates to run in manual mode or enter 10 if a rate bump is desired. (FIG. 2-120)
115. “Display Smoothing” needs to be checked. Click next page icon. (FIG. 2-120)

Setup Control Valve

Product 5 RPM

Control Valve Type: Fast Close

Valve Response Rate (1-100): 35

Control Deadband (%): 3

Control Effort (%): 10

FIG. 2-118

RAVEN

Setup Rate Sensor

Product 5 RPM

RPM Cal* Pulses/Rev: 4

FIG. 2-119

RAVEN

Setup Rates

Product 5 RPM

	Rate 1	Rate 2	Rate 3
Preset Rate Values (RPM)	500	600	650
Rate Bump (RPM)	50		
Rate Selection	Predefined or Rx		
Display Smoothing	☒		

FIG. 2-120

RAVEN

RCM Spreader Set Up (continued)

116. Enter 20 for “Off Rate Alarm” and check “Alarm” box. Click next page icon. (FIG. 2-121)

FIG. 2-121 Setup Alarms

Product 5 RPM ?

Off Rate Alarm (% off target rate) 20 Alarm? ☒

 **RAVEN** 

NOTE: “Number of Products” corresponds to bins. 1 for single bin, 2 for Duo-Force, 3 for Tri-Force, and 4 for Quad-Force. (FIG. 2-122)

117. No action required on this screen. Shows the set up summary. Continue to next page and then click the next page icon to finish the RCM set up. (FIG 2-122)

FIG. 2-122 Setup Summary

Profile Spreader
Name
Machine Type Pull-Behind Spreader

Number of Products 4
Number of Sections 1
Implement Width(ft) 90.000
Switchbox Present No
Master Clutch No

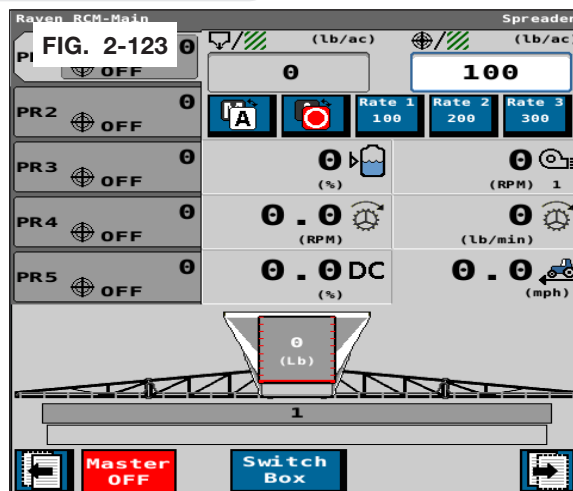
Granular Product Sections Power to Apply Yes

 **RAVEN** 

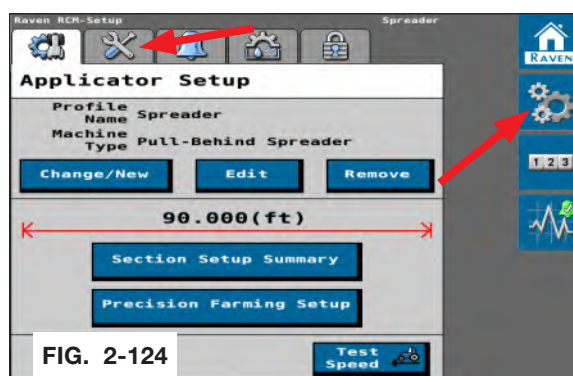
RCM Spreader Set Up (continued)

Scale Calibration Procedure

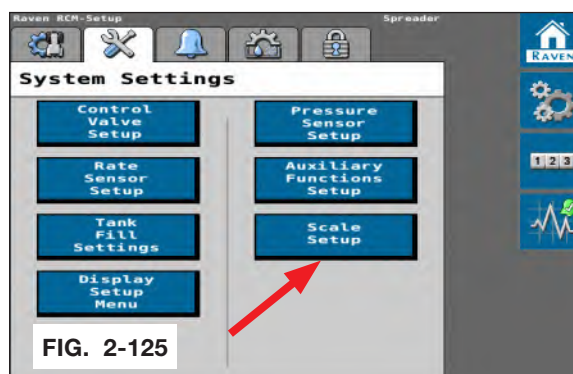
1. Go to the Main Home Screen shown. (FIG. 2-123).



2. To set scale calibration, go to Settings page - the 3 gears tab. (FIG. 2-124)
3. In the Settings page, select the “System Settings” tab. (FIG. 2-124)

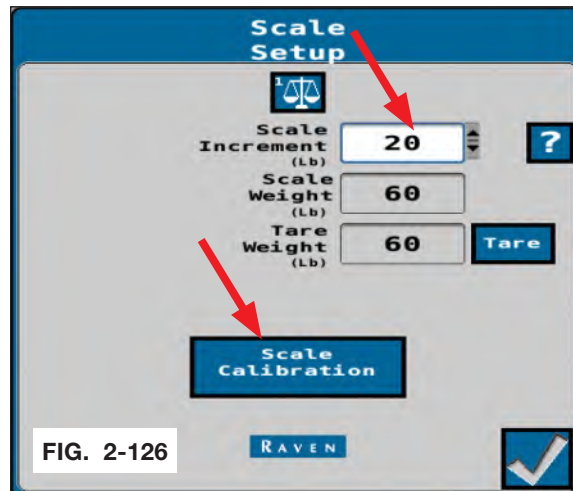


4. In the “System Settings” page, click the “Scale Setup” button shown. (FIG. 2-125)



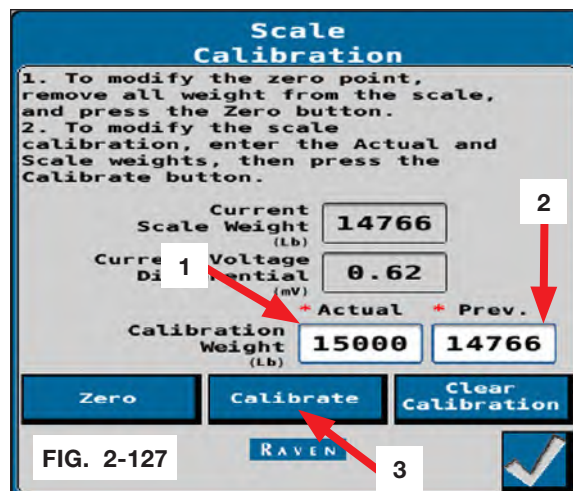
RCM Spreader Set Up (continued)

5. Click “Scale Increment” and set to 20 lbs. (FIG. 2-126)
6. Click the “Scale Calibration” button. (FIG. 2-126)



NOTE: If dashes are displayed for “Current Scale Weight”, skip to step 11. If a numerical value is displayed for “Current Scale Weight”, the scale can be calibrated without going to zero. (FIG. 2-127)

7. Enter the certified weight into the “Actual Weight” box. (FIG. 2-127)
8. Enter the “Current Scale Weight” into the “Prev. Weight” box. (FIG. 2-127)
9. Click “Calibrate” box to accept the changed calibration number. (FIG. 2-127)
10. If the scale becomes inaccurate as the unit empties, click “Zero” button to zero the scale when empty. Continue to step 11.



RCM Spreader Set Up (continued)

NOTE: If dashes are displayed for “Current Scale Weight”, follow steps 11 to 16. (FIG. 2-128)

11. Ensure the spreader is completely empty.
12. Click the “Zero” button to zero the scale. (FIG. 2-128)
13. Load the spreader with a known weight of product.
14. Enter the known weight into the “Actual Weight” box. (FIG. 2-128)
15. Click “Calibrate” box to accept the changed calibration number. (FIG. 2-128)
16. Repeat the calibration process if an unacceptable weight is displayed.

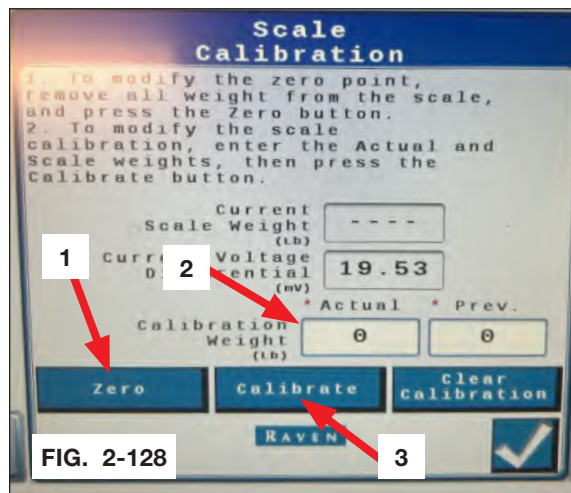


FIG. 2-128

RCM Spreader Set Up (continued)

Catch Test Calibration Chute Install

WARNING

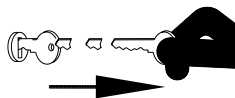
- **UNEXPECTED SPINNER MOVEMENT CAN CAUSE SERIOUS INJURY OR DEATH. BEFORE PERFORMING CATCH TEST, ENSURE SPINNER CONTROL VALVE IS DISCONNECTED AND EVERYONE IS AWAY FROM MACHINE.**
- **EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.**
- **KEEP HANDS CLEAR OF PINCH POINT AREAS.**

IMPORTANT

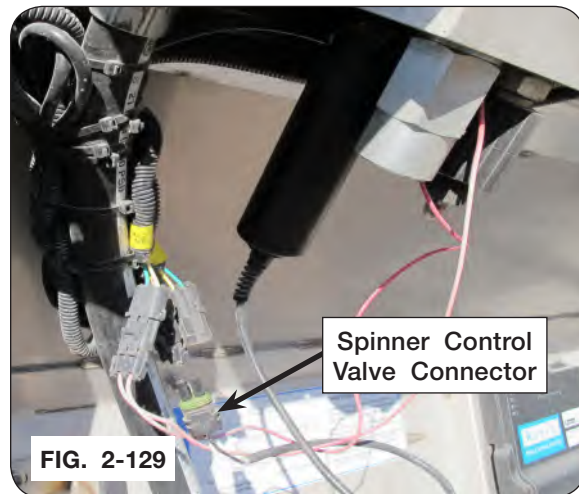
- *Catch all product in approved spread pattern pan(s) (PF1218-9991). Avoid product spills that may cause contamination.*
- *Clean and dispose of any product in accordance with product label directions and local/national regulations.*

NOTE: Complete a catch test for each product bin.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



2. Unplug the spinner control valve connector (PF1211-01A) as shown. (FIG. 2-129)
3. Turn on spinner controls to verify spinners do not spin. **Do not proceed until this step is complete!**
4. Turn off spinner controls after verifying spinners do not spin.

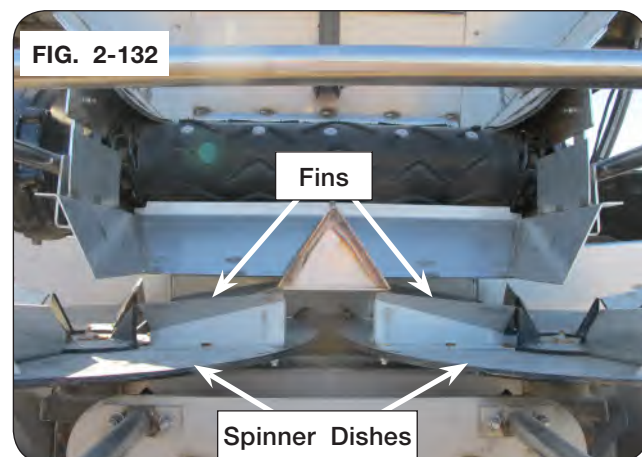
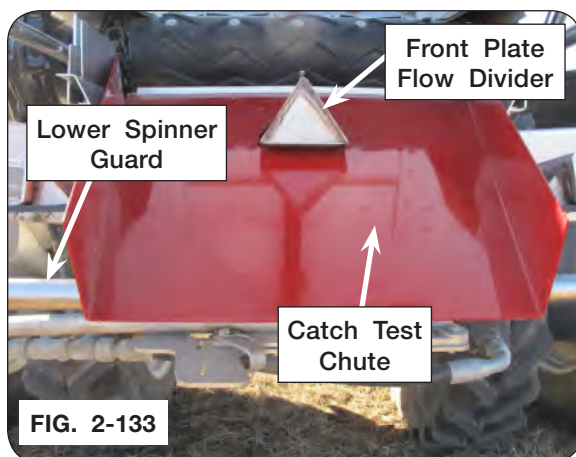
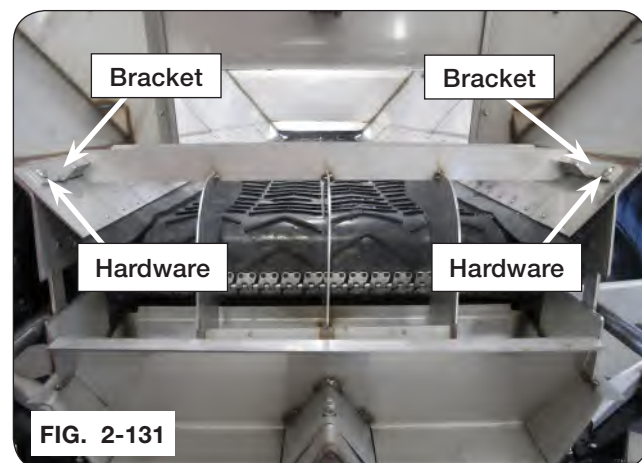
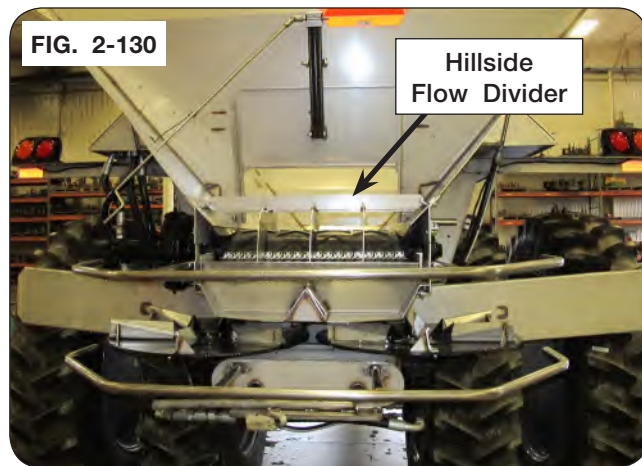


RCM Spreader Set Up (continued)

5. Remove current hillside flow divider (PF1236-451), brackets (PF1234-452 and PF1234-452L) and hardware. Retain these parts for future use. Duo-Force uses different hillside flow divider, brackets and hardware. (FIG. 2-130 and 2-131)

NOTE: Ensure spinner assembly is in the “F” position before starting catch test calibration. (FIG. 2-132 & FIG. 2-133)

6. For the catch test calibration chute (415543R) to fit, left- and right-hand spinners must be aligned with each other. (FIG. 2-132)
7. Slide the catch test calibration chute onto the front plate flow divider (PF1236-402) and on top of lower spinner guard (PF1236-308). (FIG. 2-133)
8. Position one spread pattern pan (PF1218-9991) under the catch test calibration chute.



RCM Spreader Set Up (continued)

Catch Test Procedure

1. Complete “Catch Test Calibration Chute Install” in the previous section before starting catch test procedure.

NOTE: If using the spreader scale to determine unloaded weight, record the current scale reading before beginning catch test. (FIG. 2-137)

2. From the home screen, go to Settings page - the 3 gears tab. Select “System Settings” tab.
3. In the “System Settings” page, click the “Rate Sensor Setup” button shown. (FIG. 2-134)

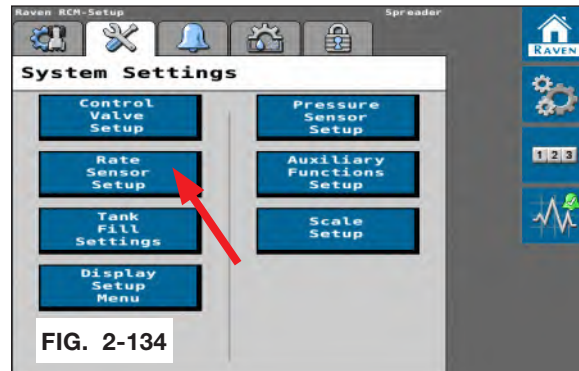


FIG. 2-134

NOTE: Complete a catch test for each product bin.

4. Click the product bin button “PR1”, “PR2”, etc. that corresponds to the catch test being performed. (FIG. 2-135)
5. Verify the product density and the gate height are correct and set up for the product bin. (FIG. 2-135)
6. Click “Catch Test Calibration” button. (FIG. 2-135)

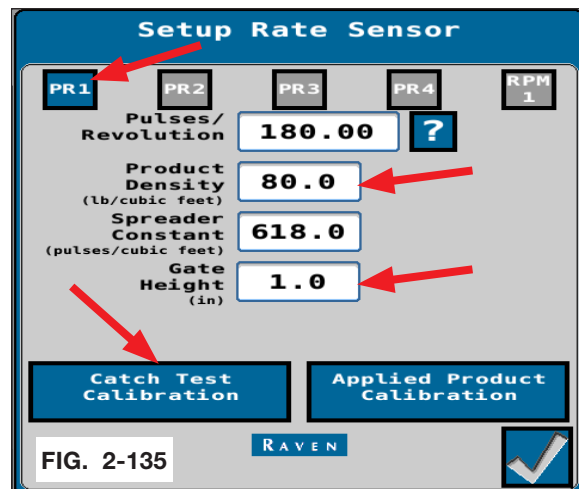


FIG. 2-135

7. Enter a “Test Speed” close to in-field operation. (FIG. 2-136)
8. Enter a “Rate” related to in-field operation. (FIG. 2-136)

NOTE: Recommended to collect at least 500 lbs. of product. Catch test is more accurate using a larger sample.

9. Enter a “Desired Weight” the catch container can hold. Click next page icon. (FIG. 2-136)

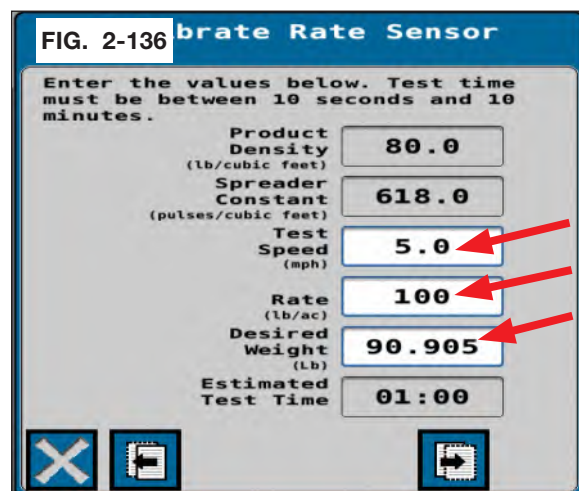


FIG. 2-136

RCM Spreader Set Up (continued)

10. Turn on the “Master Switch”. Click “Start” to begin the catch test. (FIG. 2-137)

NOTE: Initial test is to prime the conveyor belt.

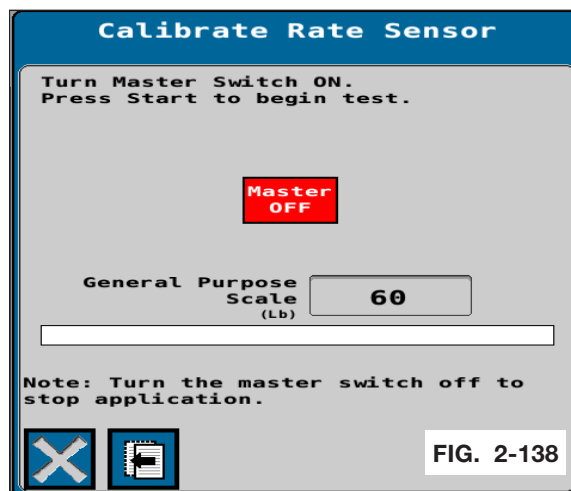
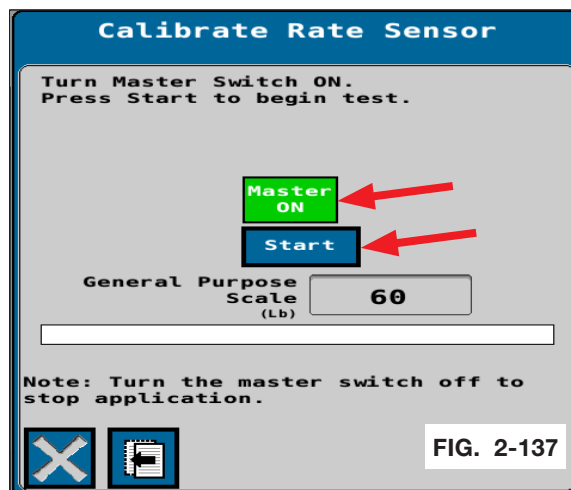
11. Cancel the catch test after product begins to collect into the container.

12. Return the contents in the catch container to the product bin. You have now primed the conveyor system and are ready for a full test.

13. Repeat steps 2 through 10.

14. Once the catch test is finished, weigh the collected sample using a certified scale.

NOTE: If using the spreader scale to determine unloaded weight, take scale reading and subtract it from the reading recorded from before the test.



RCM Spreader Set Up (continued)

Applied Test Procedure

1. Ensure pulses/revolution, product density, spreader constant, and gate height values are as shown in figure 2-139. Click “Applied Product calibration”. (FIG. 2-139)

Setup Rate Sensor

PR1 Pulses/Revolution 180.00 ?

PR2 Product Density (lb/cubic feet) 56.0

PR3 Spreader Constant (pulses/cubic feet) 618.0

PR4 Gate Height (in) 1.0

RPM 1

Catch Test Calibration Applied Product Calibration

RAVEN FIG. 2-139

2. Click check mark to accept. (FIG. 2-140)

Calibrate Rate Sensor

Applied Product Test description:
Adjusts the calibration value by comparing the rate controller's amount applied to the actual amount applied.

1. Configure the control valve and rate sensor in Setup.
2. Press Accept to begin accumulating applied product.
3. Apply product to field.
4. After desired amount of product has been applied press the Stop button on the flow/rate sensor setup page.

FIG. 2-140

3. Verify product density is correct for current product and gate height is appropriate. (FIG. 2-141)
4. Apply approximately 1,500 lbs. of product to the field.
5. Click stop accumulating. (FIG. 2-141)
6. New spreader constant value is shown. Click check mark to accept new spreader constant.

Setup Rate Sensor

PR1 Pulses/Revolution 180.00 ?

PR2 Product Density (lb/cubic feet) 56.0

PR3 Spreader Constant (pulses/cubic feet) 618.0

PR4 Gate Height (in) 1.0

RPM 1

Stop Accumulating 0

RAVEN FIG. 2-141

RCM Spreader Set Up (continued)

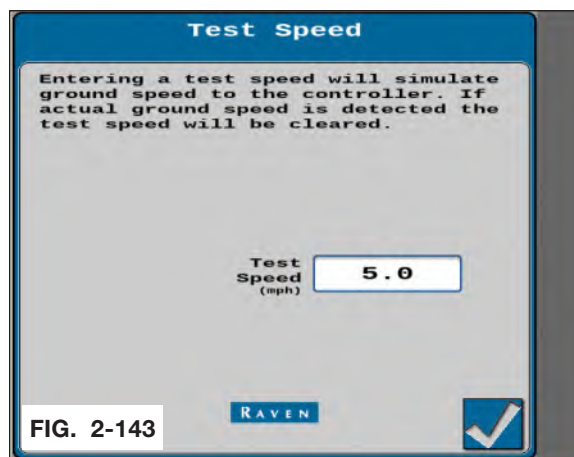
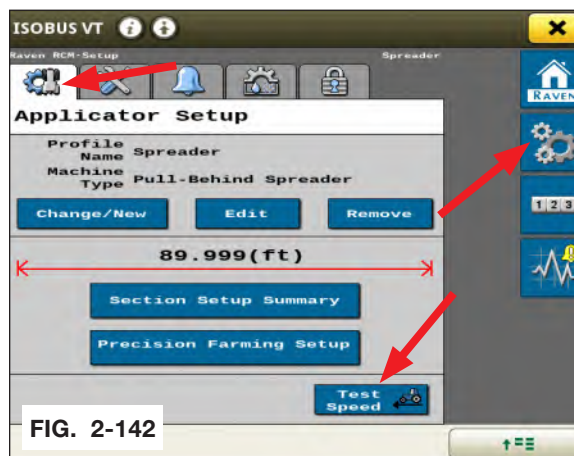
Test Speed Procedure

Test speed procedure is a test for conveyor function. Entering a test speed value ensures the belt moves. Changing test speed value up or down ensures the belt speeds up or slows down.

NOTE: The hydraulic system must be connected and function properly to perform test speed procedure, refer to “Hydraulic Connections Set Up” in this section.

NOTE: If equipped with PTO hydraulic system, ensure PTO is running at 1,000 RPM.

1. To set spreader test speed, go to Settings page - the 3 gears tab. (FIG. 2-142)
2. In the Settings page, select the “Applicator Setup” tab and then click the “Test Speed” button at the bottom of the screen. (FIG. 2-142)
3. Enter test speed value as desired. Click check box. (FIG. 2-143)



RCM Spreader Set Up (continued)

Tuning Control Valve Response

1. To change control valve settings, go to Settings (Gear), “System Settings” (Screwdriver/Wrench), and click the “Control Valve Setup” button. (FIG. 2-144)

NOTE: For product bins, go to step 2. For spinner control valve, go to step 3.

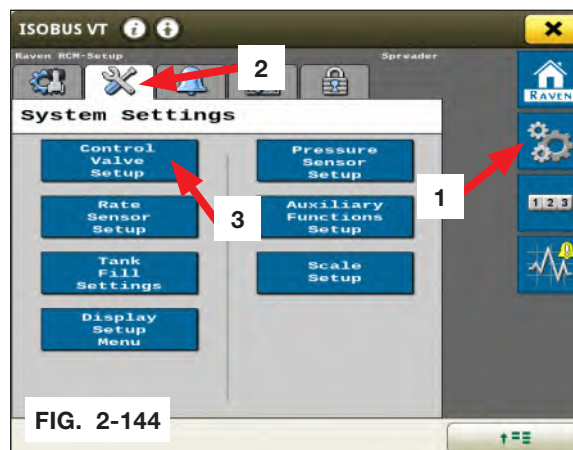


FIG. 2-144

2. Change the valve settings as desired. For product bins, the “Valve Type” is “PWM Close”. For “Valve Response Rate”, this is how fast the valve responds. If belt is slow to reach target rate, increase response rate 5% and recheck. If belt overshoots target rate, decrease response rate 5% and recheck. For “Control Deadband %”, is the percent target rate for the control valve. If 2% is entered, rate controller will adjust the flow rate until the actual rate is within 2% of the target rate. For “Valve Delay”, is amount of time in seconds between when the first section is turned on and the rate controller starts the flow rate. (FIG. 2-145)

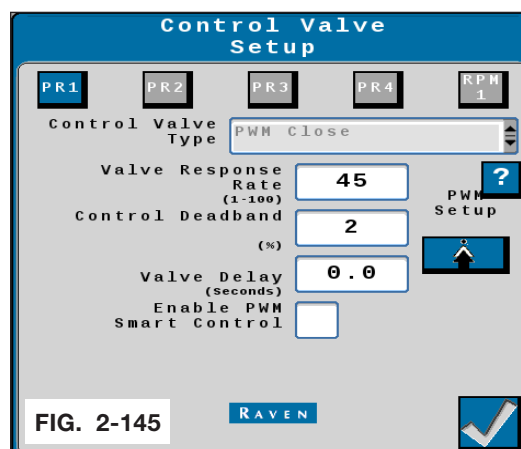


FIG. 2-145

3. Change valve settings as desired. For spinner control valve, the “Valve Type” is “Fast Close”. For “Valve Response Rate”, this is how fast the valve responds. If spinners are slow to reach target rate, increase response rate 5% and recheck. If spinners overshoots target rate, decrease response rate 5% and recheck. If spinners continue to overshoot target after adjusting response rate, reduce control effort 1% and recheck. If spinner speed is not able to adjust/change speed, increase control effort 1% and recheck. For “Control Deadband %”, is the percent target rate for the control valve. If 2% is entered, rate controller will adjust the flow rate until the actual rate is within 2% of the target rate. For “Control Effort”, enter minimum percent needed for control valve to change position. (FIG. 2-146)

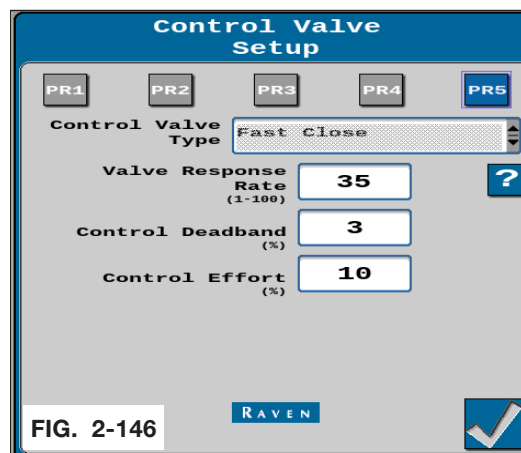
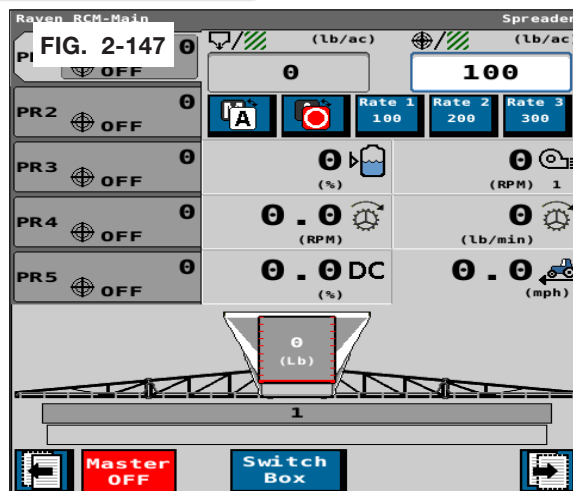


FIG. 2-146

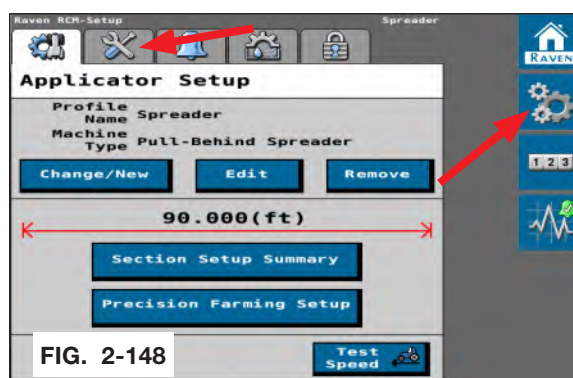
RCM Spreader Set Up (continued)

Add Boundary Control Button to Home Page

1. Go to the Main Home Screen shown. (FIG. 2-147).

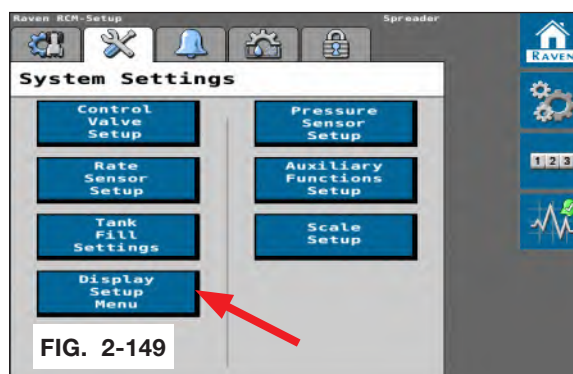


2. To add boundary control button, go to Settings page - the 3 gears tab. (FIG. 2-148)
3. In the Settings page, select the “System Settings” tab. (FIG. 2-148)



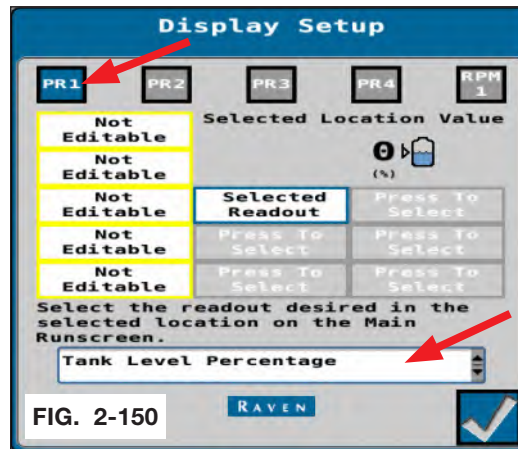
4. In the “System Settings” page, click the “Display Setup Menu” button shown. (FIG. 2-149)

(Continued on next page)

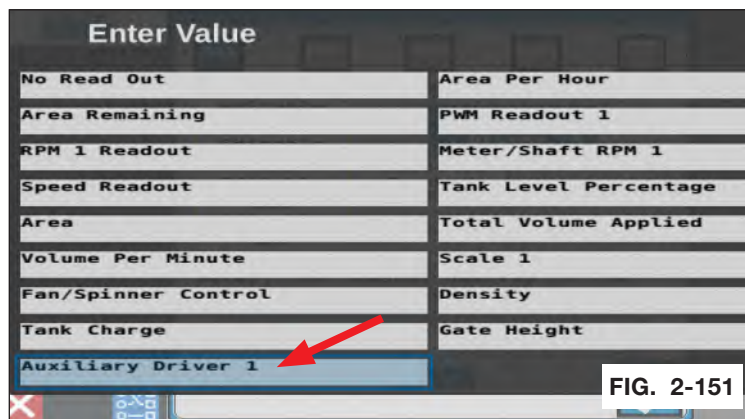


RCM Spreader Set Up (continued)

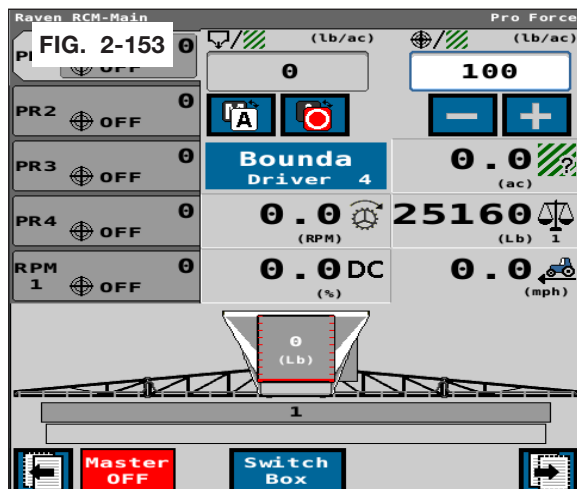
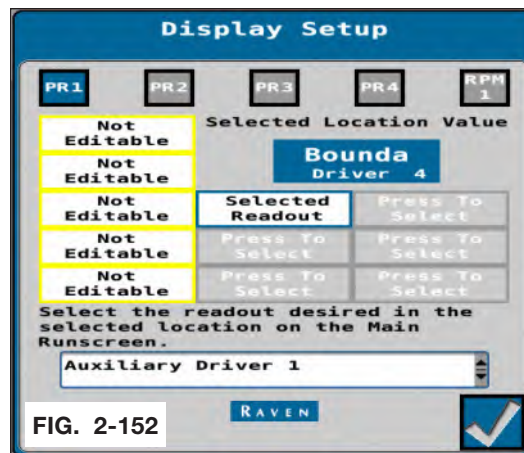
- After selecting “PR1”, click any gray box labelled “Press To Select” and the box changes to “Selected Readout”. This is where the boundary control button appears on the Main Home Screen. (FIG. 2-150)
- Click drop down box. (FIG. 2-150)



- Select “Auxiliary Driver 1” from the list. (FIG. 2-151)



- Click the check box. (FIG. 2-152)
- Click the “Home” button and return to the Main Home Screen. (FIG. 2-153)
- The boundary control button appears. When engaged, button background turns green. (FIG. 2-153)



Single Product Node Set Up Information

NOTE: For calibration chute (415552R) install and catch test procedure, refer to SET UP section “RCM Spreader Set Up - Catch Test Calibration Chute Install” and “Catch Test Procedure”.

Calibrating the Spread Rate:

1. Run material through the gate and measure its depth to determine gate setting.
2. Spread a known amount of product to fine tune the gate opening.
3. Mark both the box and tailgate so you can find this setting in the future.

Control Valve Settings – Raven Controllers:

Servo Valve:

Granular, C-FC and a Valve Cal of 743. (FIG. 2-154)



FIG. 2-154

PWM Valve (9009773):

Granular, PWM Close Valve, Freq of 100 Hz,
Valve Cal of 23, Min Pw = 35, Pre Set Pw
= 253 (FIG. 2-155)



FIG. 2-155

Rear Feedgate Door Set Up

Setting Feedgate Door to 6"-18" High-Range

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYEWEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE MACHINE TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.

IMPORTANT

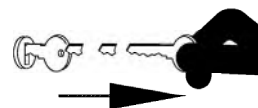
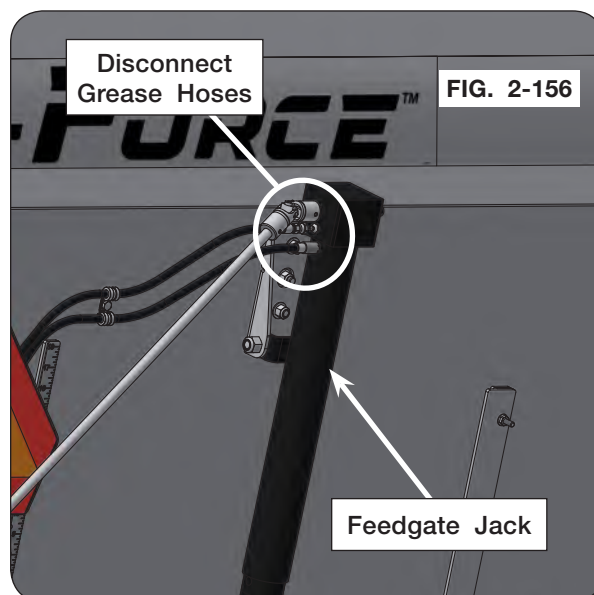
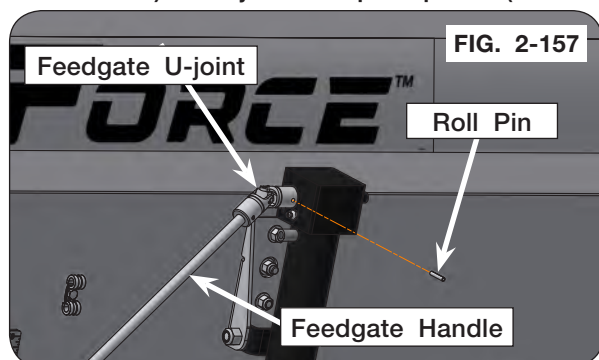
- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*

Standard feedgate maximum height is 12". If spreading high volume product requiring larger feedgate opening for more product output, perform next steps for maximum feedgate height of 18".

NOTE: If spreading fertilizer, feedgate door starting height is 2".

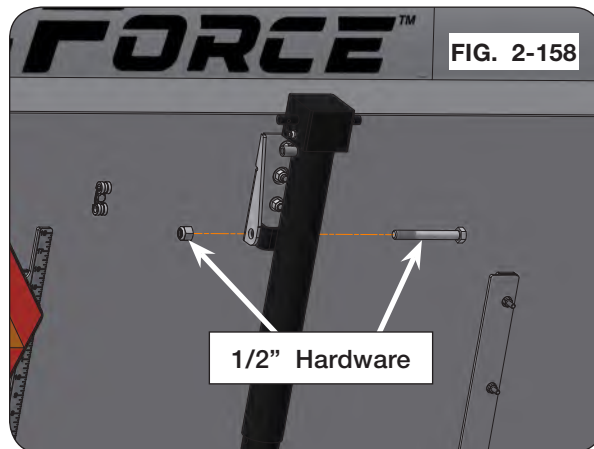
If spreading lime, feedgate door starting height is 7".

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.
2. Disconnect grease hoses (9009895) from feedgate jack (PF1218-80). (FIG. 2-156)
3. Remove roll pin (900909-097), feedgate u-joint (PF1218-85), and feedgate handle (PF1218-81LTD) from jack. Keep all parts. (FIG. 2-157)

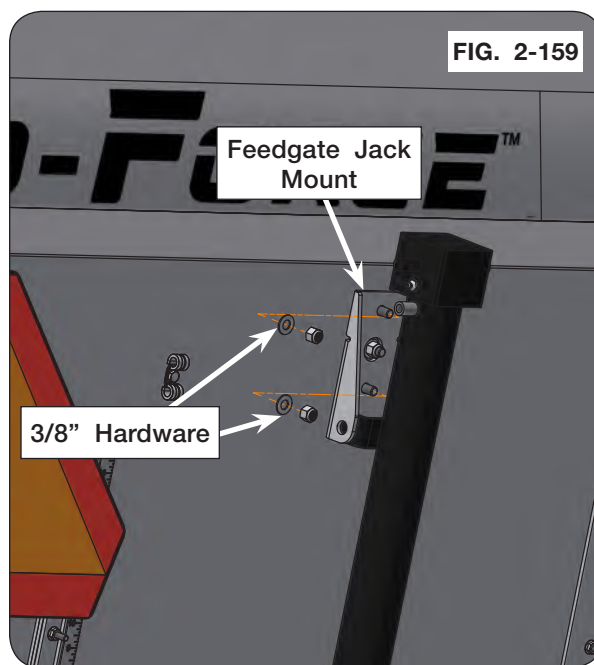


Rear Feedgate Door Set Up (continued)

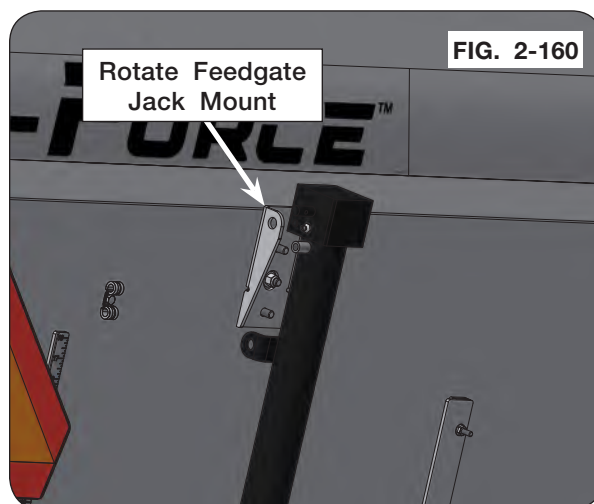
4. Support feedgate door with blocking, remove and retain 1/2" hardware from feedgate jack upper mount. (FIG. 2-158)



5. Remove and retain top and bottom 3/8" hardware from feedgate jack mount (416671). (FIG. 2-159)

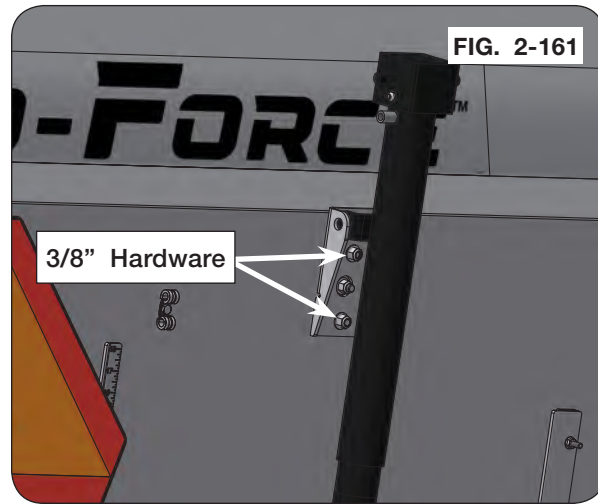


6. Rotate feedgate jack mount 180° so the mounting holes for jack are at top position. (FIG. 2-160)
(Continued on next page.)

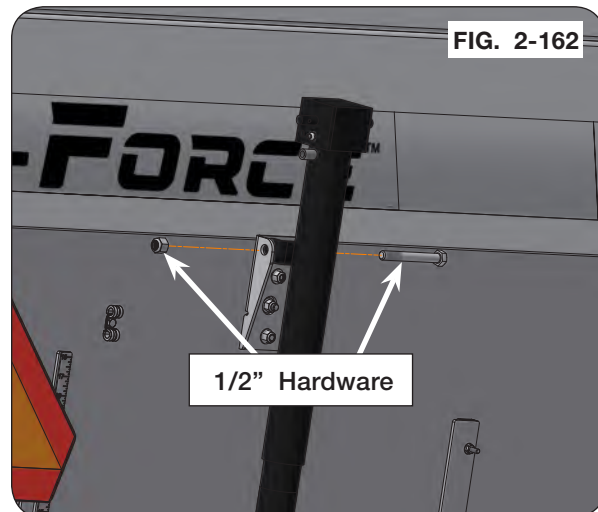


Rear Feedgate Door Set Up (continued)

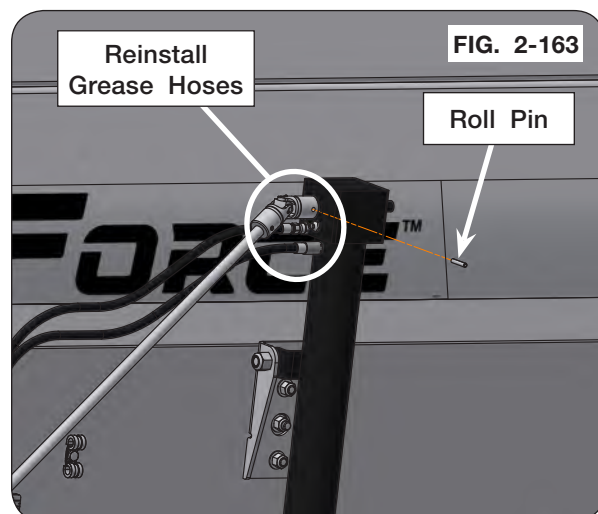
7. Torque 3/8" hardware to feedgate jack mount. (FIG. 2-161)



8. Torque feedgate jack to feedgate jack mount using 1/2" hardware. (FIG. 2-162)



9. Reinstall roll pin for feedgate u-joint and grease hoses (FIG. 2-163)

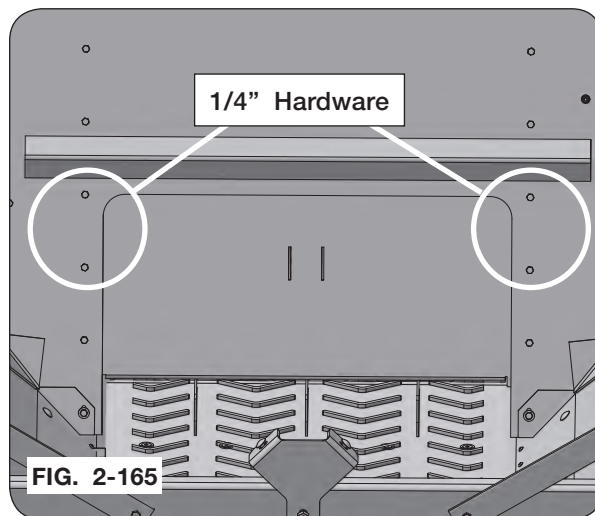
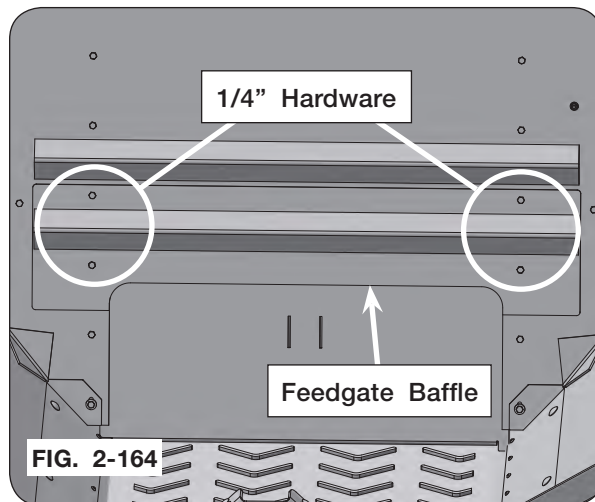


Rear Feedgate Door Set Up (continued)

NOTE: If spreading fertilizer, feedgate door starting height is 2".

If spreading lime, feedgate door starting height is 7".

10. From inside the spreader box, remove and retain middle sets of 1/4" hardware attached to feedgate guide plates (416670). (FIG. 2-164)
11. Remove and retain internal feedgate baffle (416673) for future use. (FIG. 2-164)
12. Reinstall feedgate guide plate hardware. (FIG. 2-165)
13. Torque all hardware to specification. Refer to "Torque Chart" in MAINTENANCE section.
14. If desired spread rate is not achieved, adjust the feedgate door.
15. Once feedgate door is adjusted, change spreader constant for the new feedgate setting. See "RCM Spreader Set Up" in this section.



Notes

Section III

Operation

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FOR SCALE, AUTO GREASER, AND / OR ELECTRIC TARP
INFORMATION, PLEASE REFER TO THE INDIVIDUAL MANUALS.

Preparing Spreader

Perform the service checks as outlined below. Repair or replace any damaged or worn parts before operating.

Hardware

Check for loose bolts and nuts, and tighten as needed. Check again after the first half-day of operation.

Hydraulic System

WARNING

- RELIEVE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE CHASSIS OPERATOR'S MANUAL FOR PROPER PROCEDURES.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARD-BOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

Check all hoses and cylinders for signs of leakage. Hoses should not be kinked, twisted or rubbing against sharp edges. Re-route or repair hoses as necessary. Refer to SAFETY section for additional information on safe repair and inspection of hydraulic components.

CHASSIS HYDRAULIC REQUIREMENTS:

Recommended chassis-supplied hydraulic pressure is 2900-3300 psi.

COMBINED HYDRAULIC SYSTEM PUMP REQUIREMENTS:

38 - 45 gpm @ 3500 psi. If more than 45 gpm is used, it must be done with a "load sensing" variable displacement pump.

OPTIONAL SPLIT HYDRAULIC SYSTEM PUMP REQUIREMENTS:

76 gpm @ 3500 psi. If more than 45 gpm is used, it must be done with a "load sensing" variable displacement pump.

IMPORTANT

- *Warranty is void if this requirement is not followed.*

PTO DRIVE PUMP HYDRAULIC SYSTEM REQUIREMENTS:

1-3/4"-20 spline PTO connection operated at 1000 RPM.

Lubrication

Lubricate the spreader as outlined in the MAINTENANCE section.

Transporting

WARNING

- USE EXCEPTIONAL CARE WHEN OPERATING DRY SPREADER EQUIPPED WITH SINGLE TIRES. THE POSSIBILITY OF TIPPING OVER DURING TURNS OR TRAVEL ON ROUGH ROADS IS INCREASED UNDER THESE CONDITIONS.

WARNING

- DO NOT EXCEED THE GROSS VEHICLE WEIGHT RATING (GVWR). IMPROPER CHASSIS LOADING CAN CAUSE LOSS OF CONTROL OR MACHINE DAMAGE RESULTING IN INJURY OR DEATH.

CAUTION

- THE DRY SPREADER CHASSIS MOUNT BOX IS NOT EQUIPPED WITH BRAKES. ENSURE THAT THE TOWING VEHICLE HAS ADEQUATE WEIGHT AND BRAKING CAPACITY TO TOW THIS IMPLEMENT.

IMPORTANT

- *Chassis must be rated for applied loads. Rated capacity is for the spreader box only.*

IMPORTANT

- *Hydraulic brakes are optional for dry spreader pull type units equipped with the undercarriage.*

See towing vehicle manual for towing and towing capacity. Regulate speed to road conditions. Maximum transport speed of spreader should never exceed 20 m.p.h. as indicated on the machine. Do not exceed 10 m.p.h. during off-highway travel.

Regulate speed to road conditions and maintain complete control.

It is probable that this implement is taller, wider, and longer than the towing chassis. Become aware of and avoid all obstacles and hazards in the travel path of the equipment, such as power lines, ditches, etc.

Slow down before making sharp turns to avoid tipping. Drive slowly over rough ground and side slopes.

Spreader Start Up Procedure

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- RELIEVE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE CHASSIS OPERATOR'S MANUAL FOR PROPER PROCEDURES.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.
- MOVING OR ROTATING COMPONENTS CAN CAUSE SERIOUS INJURY OR DEATH. ENSURE FEEDGATE DOOR, CHAIN/BELT COVERS AND SERVICE COVERS ARE IN PLACE BEFORE OPERATING THE DRY SPREADER.

1. Start vehicle / power unit and keep the key in the ON position.
2. For PTO units, ensure the PTO is off, driveline stopped, and check hydraulic reservoir oil level before running the PTO pump and fill hydraulic reservoir as needed. See "Lubrication" and "Hydraulic Reservoir Tank" for oil specifications in MAINTENANCE section.

IMPORTANT

- *Running the PTO pump without oil will result in pump damage.*
3. On the ISO product control screen, ensure the master is OFF and all products are OFF.

NOTE: For PTO units, skip to step 5. Otherwise, continue to step 4.

4. For chassis units, engage vehicle / power unit hydraulics and bring engine RPMs to operating range. Skip to step 7.
5. Engage tractor PTO at low engine RPM.
6. Increase engine RPM until 1,000 PTO RPM is reached.
7. Turn spinner RPM ON.
8. Turn Product 1 ON.
9. Begin driving forward (or input a test speed for stationary / test operation).
10. To get the spinners running, quickly cycle the Master Switch ON then OFF. The spinners continue to spin but the conveyor will stop.
 - a. **NOTE:** Spinner will hold speed at the time master switch cycled to OFF and may be lower than operation target speed.
11. If the spreader is equipped with multiple bins, turn those products to ON.
12. Move to the area of operation and cycle the Master Switch to ON to begin spreading.
13. To slow or stop material flow, turn off Product 1, do not reduce vehicle RPM.

Spinner Disc Adjustments

WARNING

- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.

NOTE: 2650 is not designed for lime spreading.

1. Verify the spinner and material flow divider are in position according to “Spinner Disc Set Up” in SET UP section.

Spread Test Procedure

2. Lay out 110 feet of rope (415242) in a straight line.
3. On the rope, there are red tape marks every 5 feet. The red piece of tape is the center of the pattern. Place a pan (PF1218-9991) at tape marks past 5 feet from the center on either side. This allows for driving through.
4. Set spinner speed to obtain desired spread width.

NOTE: Do not operate spinners faster than necessary to obtain the required material spread width. Materials have limitations to spread width. Particle size affects how far material can be spread.

	Spinner
Fertilizer (100' Pattern)	650 RPM
Lime (50' to 60' Pattern)	550 RPM

5. Set RCM to target rate.
6. Do a test run: Accelerate to target applying speed. Begin spreading 50 feet before reaching the rope/pans and continue to spread until 50 feet past the pans.
7. Once the rear of the machine is at least 50 feet past the rope/pans, slow down the unit and stop.

NOTE: Only perform a single-pass spread test. Do not turn around and repeat spread test.

8. Put test tubes (PF1218-999) in a line using test tube platform (PF1218-9994).
9. Use included funnel, empty the pans into the tubes to volumetrically measure the difference in pans.
10. If equipped with Duo, Tri, or Quad-Force, perform a spread test for each product individually. The spread test may need to be repeated four times.

(Continued on next page.)

Spinner Disc Adjustments (continued)

Spinner Fore/Aft Adjustment

11. After spread test, adjust spinner assembly frontwards or rearwards according to spread pattern test results from the spread test procedure. See Figure 3-1.

- Ideal Spread Test Results

Flat and taper off towards the outside 5 to 10 ft.

- Heavy in the Center Spread Test Results

To correct, increase spinner speed and adjust spinner assembly forward.

- Light in the Center Spread Test Results

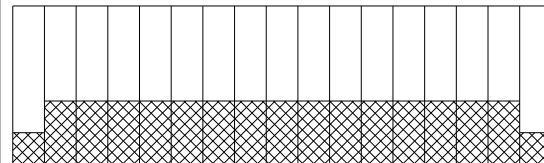
To correct, decrease spinner speed and adjust spinner assembly rearwards.

12. After adjustments are made, repeat spread test.

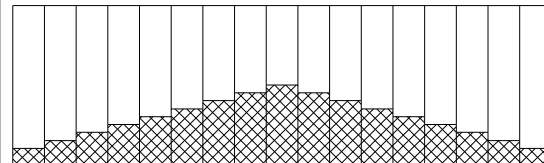
NOTE: Repeat spread test when products change.

NOTE: If the previous adjustments have been made and the spread pattern still is not desirable, refer to MAINTENANCE section “Spinner and Material Flow Divider”.

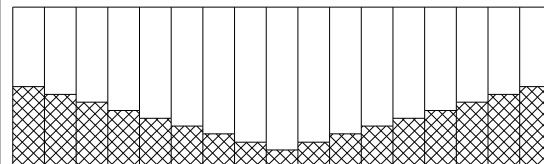
FIG. 3-1



Ideal Spread Results



Heavy in Center Spread Results



Light in Center Spread Results

Spreading Operation

Lime Spreading

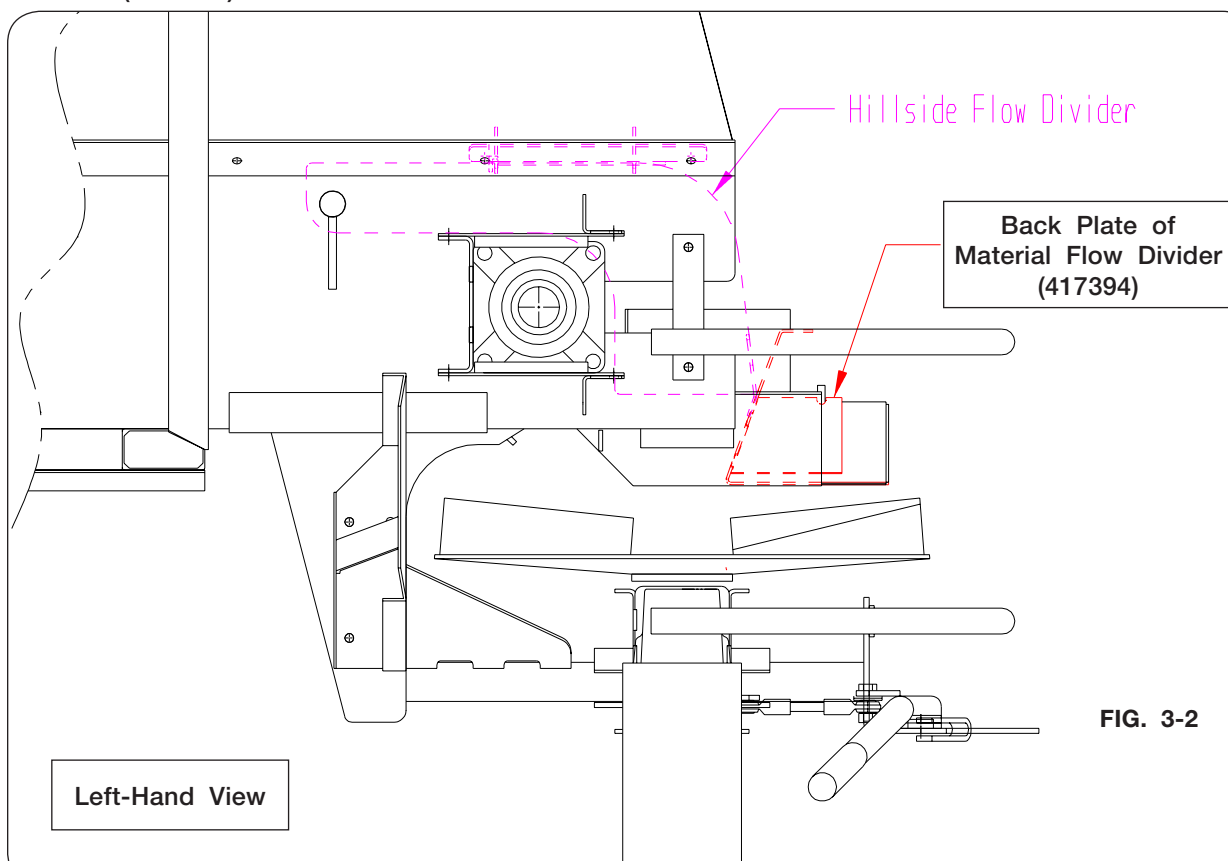
WARNING

- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

NOTE: 2650 is not designed for lime spreading.

NOTE: The hillside flow divider must be removed when the rear feedgate is set to a height higher than 3". If hillside flow divider is not removed, material will build on the hillside flow divider and screed off the unit.

1. Remove the back plate of material flow divider (417394) by unscrewing the single lock nut.
2. Reattach lock nut back in place after the back plate is removed.
3. Remove the back plate of material flow divider (417394) and slide the hillside flow divider off the rails. (FIG. 3-2)



Spreading Operation (continued)

4. Open the feedgate to at least 7 inches.

NOTE: The four “L” positions can also be used for litter, gypsum and compost. The 2650 undercarriage mounted spreader can only use these positions. (FIG. 3-3)

NOTE: The lower the hole, the farther back the spinner assembly is positioned. See “Spinner Disc Set Up” in SET UP section.

5. Adjust the spinner to one of the four “L” (lime) positions depending on spread pattern test results. (FIG. 3-3)

NOTE: Lime DENSITY and PARTICLE SIZE varies greatly. When adjusting DENSITY, do not adjust the spreader constant or gate.

6. Adjust spreader constant for the new gate setting. See “RCM Spreader Set Up” in SET UP section.
7. See “Spinner Disc Adjustments” section for spread test, spinner speed setting & spread pattern info.

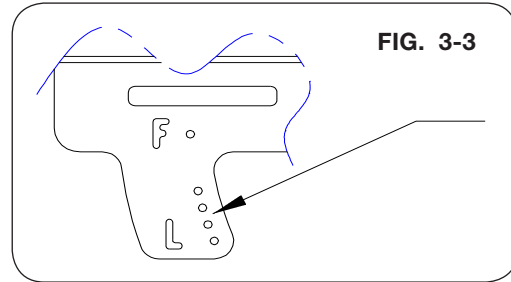


FIG. 3-3

Fertilizer Spreading

NOTE: 2650 undercarriage mounted spreader only uses litter and compost materials.

NOTE: The hillside flow divider must be installed when the rear feedgate is set to a height 2” or lower. If hillside flow divider is removed, material will not flow evenly off the unit to the spinners.

NOTE: If going from spreading lime to fertilizer, follow the next steps.

1. Reinstall the back plate of material flow divider (PF1236-403) and slide the hillside flow divider onto the rails. (FIG. 3-2)
2. Screw the lock nut back in place after the back plate is reinstalled.
3. Reattach the back plate of material flow divider (417394) by screwing the single lock nut.
4. Open the feedgate to 2 inches or lower.
5. Adjust the spinner to the “F” (fertilizer) position. (FIG. 3-4)

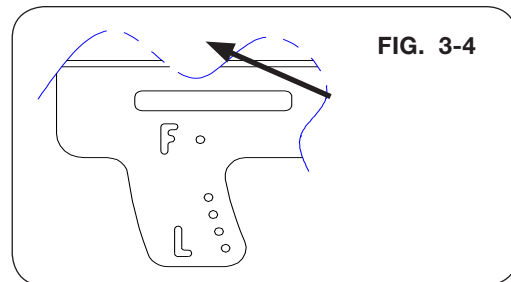


FIG. 3-4

NOTE: When the spinner is in the “F” position, the closest forward the spinner assembly is positioned. See “Spinner Disc Set Up” in SET UP section.

Spreading Operation (continued)

6. Adjust spreader constant for the new gate setting. See “RCM Spreader Set Up” in SET UP section.
7. See “Spinner Disc Adjustments” section for spread test, spinner speed setting & spread pattern info.

NOTE: The chart below lists common fertilizer densities.

Fertilizer	Density (Lbs./Cu.Ft.)
Prilled Urea	45-51
Granular Urea	45-51
Prilled Ammonium Nitrate	53-61
Crystalline Ammonium Sulfate	62-69
Ammonium Sulfate	49-65
Diammonium Phosphate (DAP)	54-66
Granular Monoammonium Phosphate (MAP)	54-66
Powdered Monoammonium Phosphate (MAP)	53-62
Granular Triple Superphosphate (TSP)	59-75
Ammonium Phosphate	56-75

Adjusting Spreader Constant & Feedgate Height Guide

Use the following procedure to assist with adjusting spreader constant when the operator has determined either too much or too little product is being applied. The procedure assumes that an electronic rate controller is being used.

To help calibrate the rate, a new spreader constant number needs to be calculated by using the formula below.

$$\frac{\text{Total Said Applied}}{\text{Total Actually Applied}} \times \text{Current Spreader Constant} = \text{New Spreader Constant}$$

Example when under applying:

Amount rate controller said applied = 3,000 lbs.

Amount actually applied = 2,860 lbs.

Current spread constant = 618 inches

$$\frac{3,000 \text{ lbs.}}{2,860 \text{ lbs.}} \times 618 = 648 \text{ is the new spreader constant}$$

Example when over applying:

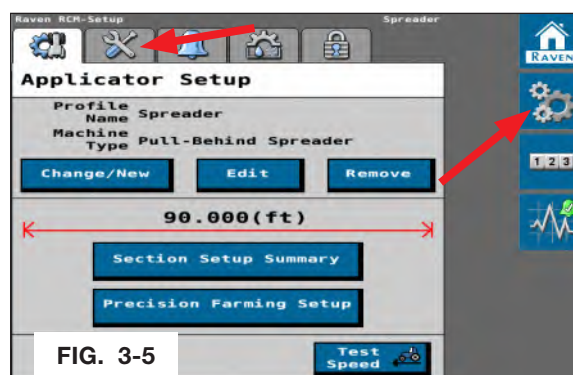
Amount rate controller said applied = 2,800 lbs.

Amount actually applied = 3,200 lbs.

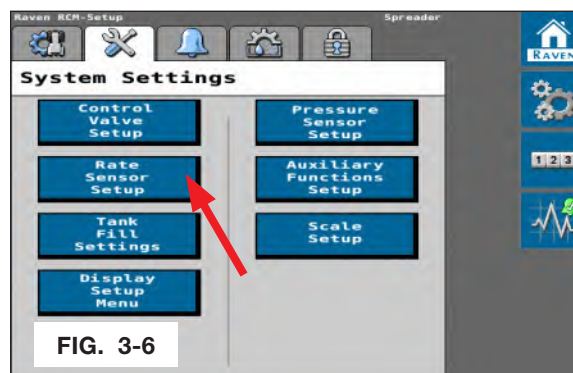
Current spread constant = 618 inches

$$\frac{2,800 \text{ lbs.}}{3,200 \text{ lbs.}} \times 618 = 540 \text{ is the new spreader constant}$$

1. To update spreader constant, go to Settings page - the 3 gears tab. (FIG. 3-5)
2. In the Settings page, select the “System Settings” tab. (FIG. 3-5)



3. In the “System Settings” page, click the “Rate Sensor Setup” button shown. (FIG. 3-6)

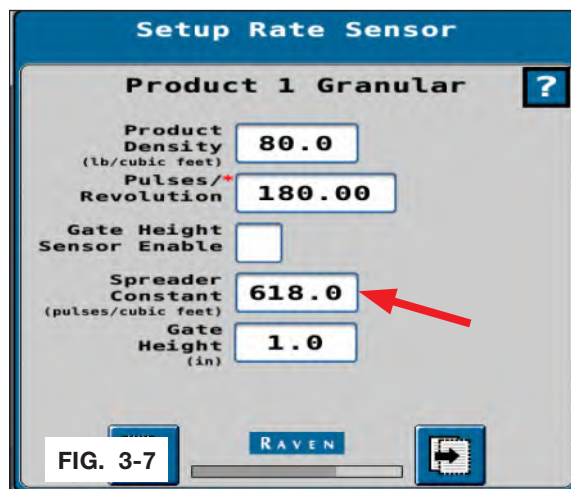


Adjusting Spreader Constant & Feedgate Height Guide (continued)

- Click “Spreader Constant” number shown and change to new number. (FIG. 3-7)

NOTE: Refer to “RCM Spreader Set Up” in SET UP section for more spreader constant information.

- Click “next page” icon or “check mark” when complete.



NOTE: The chart below lists initial feedgate heights and rates for first time operator.

Product	Density (Lbs./Cu.Ft.)	Spread Width (Ft.)	Ground Speed (MPH)	Feedgate Height (In.)	Spinner Frame Setting	Spinner (RPM)	Rate (Lbs./Acre)
Lime	70	50-60	8	6	L	500	275-5800
			10				220-4600
			15				150-3100
			8	12			550-11500
			10				440-9200
			15				300-6200
Fertilizer	65	100	8	2	F	650	50-1100
			10				40-850
			15				25-575

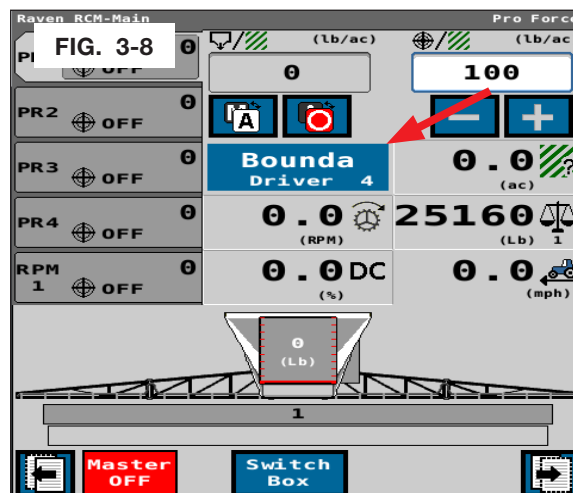
Boundary Control Operation

The Pro Force spreader is delivered from the factory with a boundary control assembly. The spreader has either Raven RCM components or less-ISOBUS Raven RCM components. This feature is controlled by either the RCM or stand-alone rocker switchbox (9009814). See “Rate Control Module (RCM) Wiring Harness Components” or “Less ISOBUS Rate Control Wiring Harness Components” in PARTS section.

For Raven RCM:

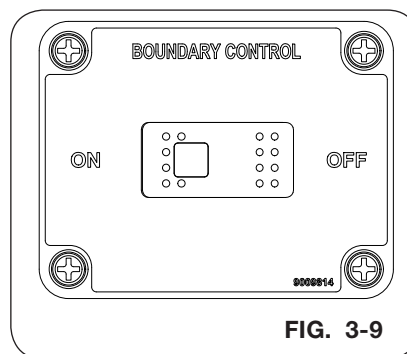
Turn RCM to “ON” and ensure the ECU for the spreader powers on. To turn boundary control “ON” or “OFF”, press the boundary control icon on the main home screen. (FIG. 3-8)

NOTE: If boundary control button is not on the main home screen, refer to “RCM Spreader Set Up - Add Boundary Control Button to Home Page” in SET UP section.



For Less-ISOBUS Raven RCM:

Turn RCM to “ON” and turn “ON/OFF” boundary control rocker switch (9009814) to “ON”. (FIG. 3-9)



Rate Control Module (RCM) Spreader Reset

When turning on the RCM for the first time, refer to “Rate Control Module (RCM) Spreader Set Up” in the SET UP section. The procedure in this section will have to be performed in order for the RCM to function properly right away.

Ladder Operation With Fenders (Undercarriage Mounts)

WARNING

- FALLING OR LOWERING EQUIPMENT CAN CAUSE SERIOUS INJURY OR DEATH. KEEP EVERYONE AWAY FROM EQUIPMENT WHEN SUSPENDED, RAISING, OR LOWERING.
- DO NOT ALLOW ANYONE TO RIDE ON THE LADDER. MAKE SURE EVERYONE IS CLEAR BEFORE OPERATING MACHINE OR TOWING VEHICLE.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.
- NEVER ENTER A DRY SPREADER CONTAINING FERTILIZER. FLOWING FERTILIZER TRAPS AND SUFFOCATES VICTIMS IN SECONDS.

NOTE: Ensure ladder and steps are free from snow/debris before changing ladder positions and climbing.

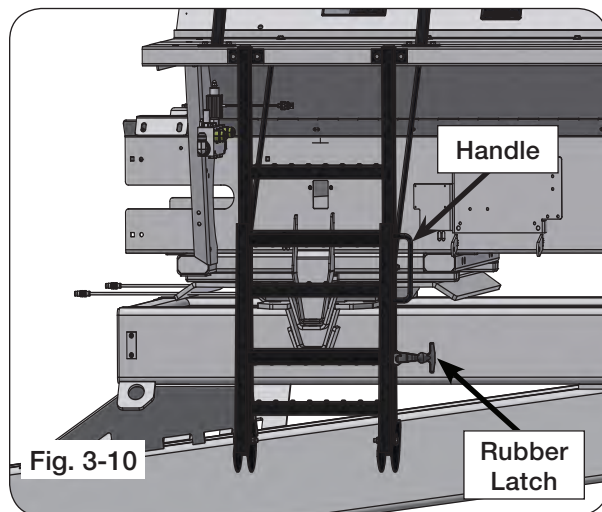
NOTE: The lower ladder section must be latched in the folded position when not used.

Storage to Working Position

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



2. While holding ladder handle, remove rubber latch from holder. (FIG. 3-10)



Ladder Operation With Fenders (Undercarriage Mounts) (continued)

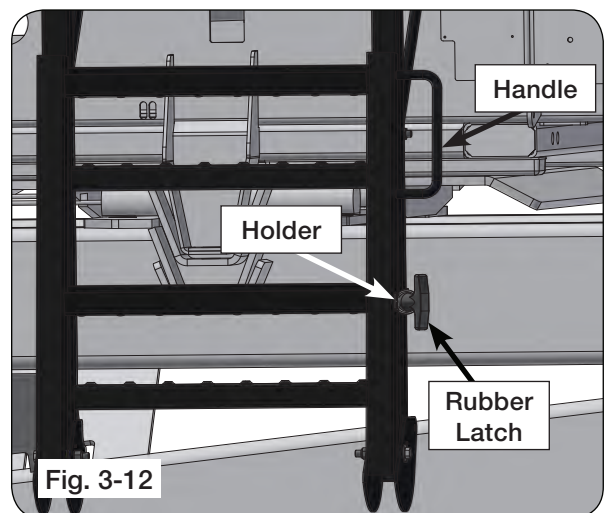
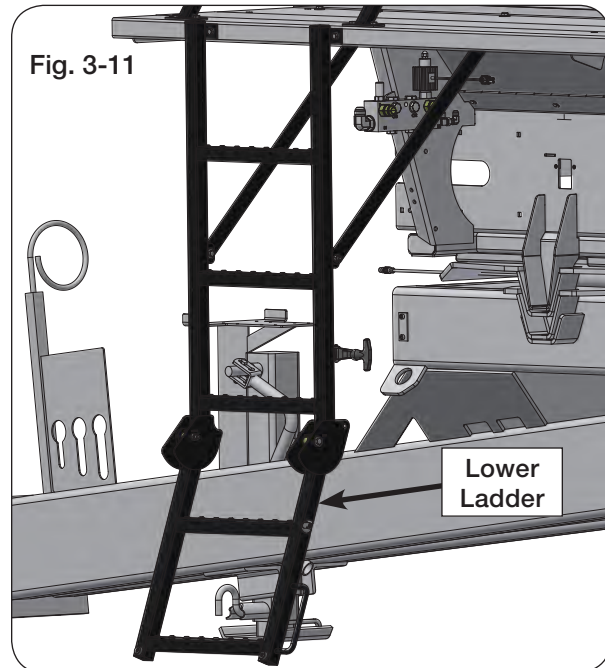
3. Slowly swing the lower ladder section completely down to working position. (FIG. 3-11)

Working to Storage Position

1. Slowly lift and swing the lower ladder section up to storage position. (FIG. 3-11)

2. While holding ladder handle, attach rubber latch into holder to lock ladder in storage position. (FIG. 3-12)

For the undercarriage ladder operation and parts information, refer to Pro-Force Undercarriage manual - 417548 - "Ladder Operation" in the OPERATION section and "Ladder Assembly" in the PARTS section for more details.



Video System (Optional)

IMPORTANT

- *Do not operate video system below 15°F. Damage to video system can occur.*

The video system kit includes its own operation instruction sheet.

Tarp Operation

WARNING

- **TO PREVENT PERSONAL INJURY OR DEATH, DO NOT ALLOW ANYONE ON A CLOSED TARP. TARP SYSTEM IS NOT DESIGNED TO SUPPORT A PERSON.**
- **FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. REMOVE ACCUMULATED WATER/SNOW/ICE OR ANY OTHER OBJECTS FROM TARP BEFORE OPENING TARP.**

IMPORTANT

- *Do not open or close tarp while moving or in high wind conditions. Damage to the tarp may occur.*
- *Tarp should not be used if it is torn or the spool cables are frayed or show damage. Fully close tarp with tension on the latch plate to prevent water from pooling.*

For tarp operation, refer to Operating Instructions decal (9009211) and “Safety Decals” in the SAFETY section for more details.

Always use adequate caution when operating tarp.

If equipped, refer to electric roll tarp manual for operation details.

Open and close the tarp evenly.

Make sure tarp is open before unloading or loading.

Make sure all persons are clear of the tarp system before and during operating.

Do not operate tarp with dry spreader hoisted in an elevated position.

If tarp is covered with snow, it is important to remove snow before operating.

End caps must be free from fertilizer that may be piled on them. Fertilizer should not be heaped higher than the end caps or tarp bows.

Tarp may be fully opened or completely closed while in transit. However, the closed position is recommended.

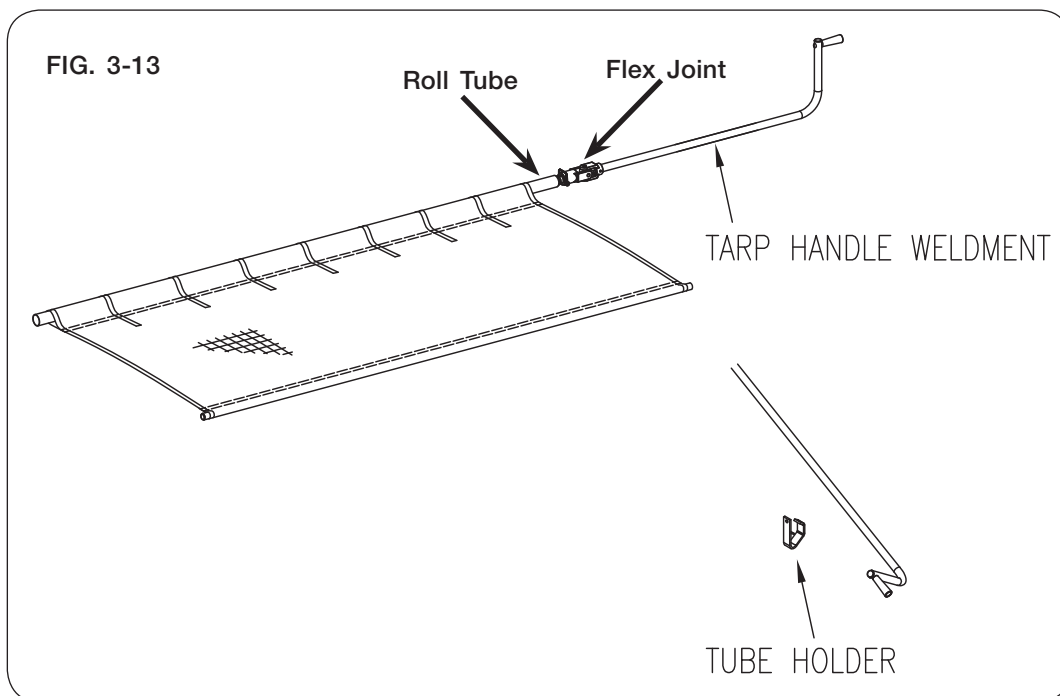
Ensure everyone who operates the tarp is familiar with the correct procedures outlined in this manual.

Tarp Operation (continued)

1. Using both hands, carefully remove the tarp handle weldment from the tube holder. (FIG. 3-13)
2. Roll tarp to the desired location, choosing either a fully open or fully closed position.
3. To close the tarp, rotate the roll tube counter-clockwise to left-hand sideboards.
4. Make sure tarp is positioned evenly along front and rear ratchet straps.
5. Bring the tarp handle weldment down perpendicular to the ground. Continue by lifting it up into the tube holder.

NOTE: Tarp handle weldment flex joint may need to be re-indexed on roll tube to achieve correct tension.

6. To open tarp, turn the roll tube clockwise until the tarp is fully open. Place tarp handle weldment in tube holder.



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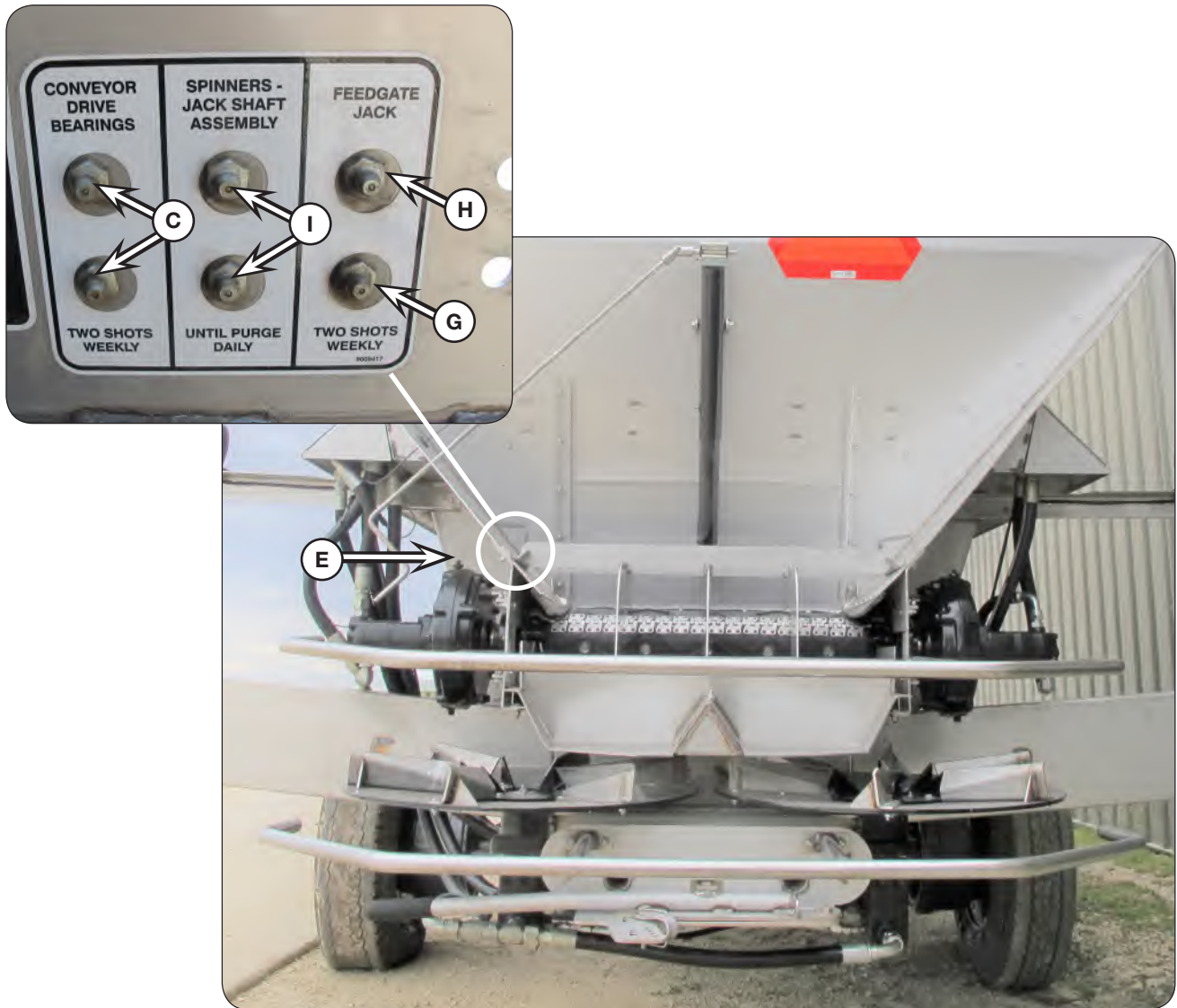
FOR SCALE, AUTO GREASER, AND / OR ELECTRIC TARP
INFORMATION, PLEASE REFER TO THE INDIVIDUAL MANUALS.

Lubrication

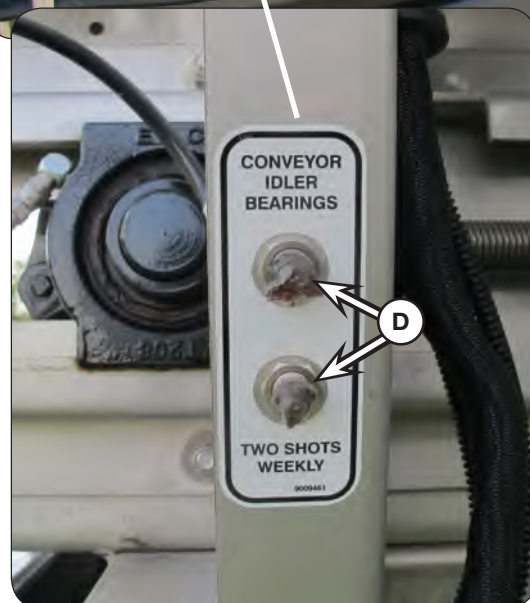
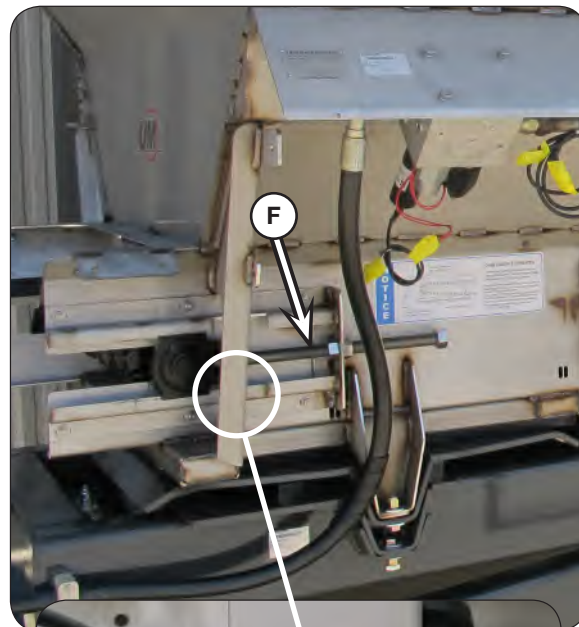
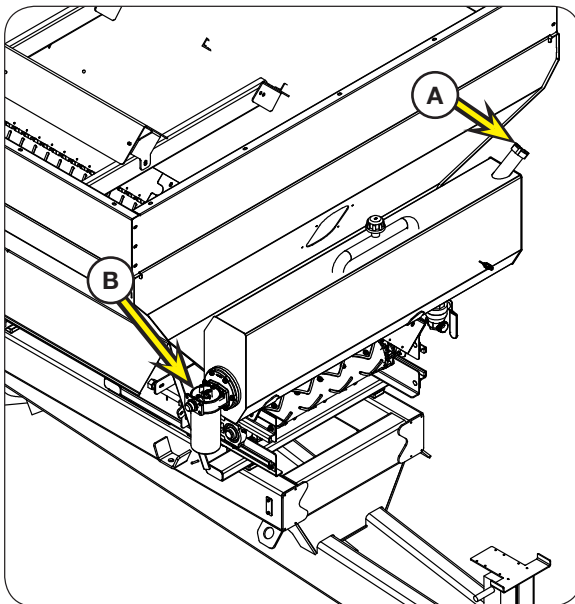
To keep your spreader in top operating condition and to assure its proper performance and reliability for a long period of time, periodic inspection and lubrication is a must.

Unverferth Mfg. recommends use of NLGI #2 Extreme Pressure grease.

The lubrication locations and recommended schedule are as follows:



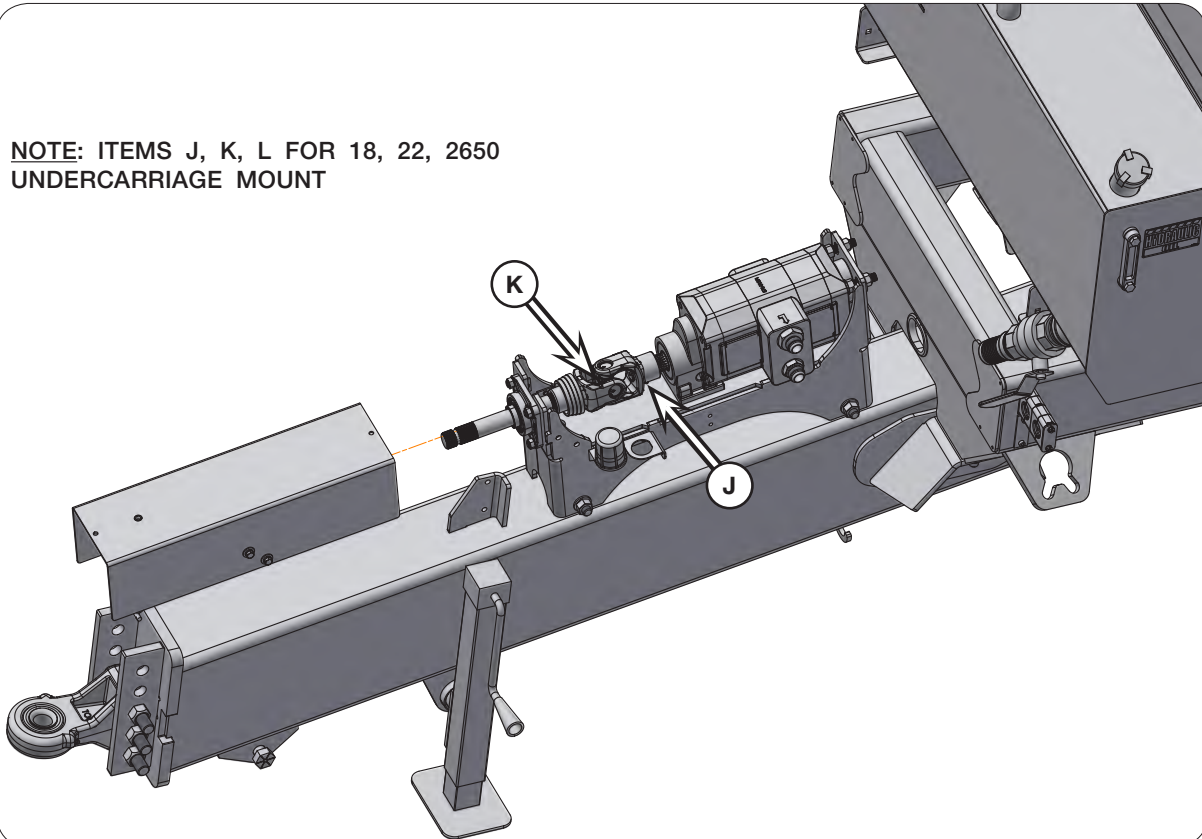
Lubrication (continued)



(Continued on next page)

Lubrication (continued)

NOTE: ITEMS J, K, L FOR 18, 22, 2650
UNDERCARRIAGE MOUNT



Lubrication (continued)

ITEM	DESCRIPTION	POINT	LUBRICANT	QTY.	INTERVAL
A	Reservoir Tank	1	Hydraulic Oil SAE 15W-40	Tank Capacity 36 1/2 gal. (For Chassis Units) 69 gal. (For 18', 22', 26' Undercarriage Units)	Check Daily, Change Every 2-3 years
B	Filter	1			Check Weekly, See Next Pages
C	Grease Bank For Bearings - Conveyor Drive	2	EP-2	2 Shots	Weekly
D	Grease Bank For Bearings - Conveyor Idler	2	EP-2	2 Shots	Weekly
E	Gearbox	1	Synthetic SAE 80W90	Approx. 46 oz.	Check Monthly, Change Annually
F	Bolt, Take-Up	2	Never Seize	Recoat	Annually
G	Grease Bank For Gears - Feedgate Jack	1	EP-2	2 Shots	Weekly
H	Grease Bank For Tube - Feedgate Jack	1	EP-2	2 Shots	Weekly
I	Grease Bank For Spinner - Jack Shaft Assembly	2	EP-2	Until Purge	Daily
J	Splined Yoke - PTO Dual Pump U-Joint (18, 22, 2650 Undercarriage)	1	EP-2	3 Shots	Weekly
K	U-Joint Cross Bearing - PTO Dual Pump U-Joint (18, 22, 2650 Undercarriage)	1	EP-2	1 Shot	8 Hours
L	PTO Driveshaft (18, 22, 2650 Undercarriage)	5	EP-2	Varies	See Next Page

NOTE: Low viscosity hydraulic oils 10W and lower are not recommended.

NOTE: Grease Bearings, Feedgate Jack & Jack Shaft Assembly until grease purges.

NOTE: After any period of unused time, unit should be greased and operated to check function of conveyor drive bearings, spinners - jack shaft assembly, and feedgate jack.

NOTE: Completely lubricate all locations and check oil levels at the end of the season.

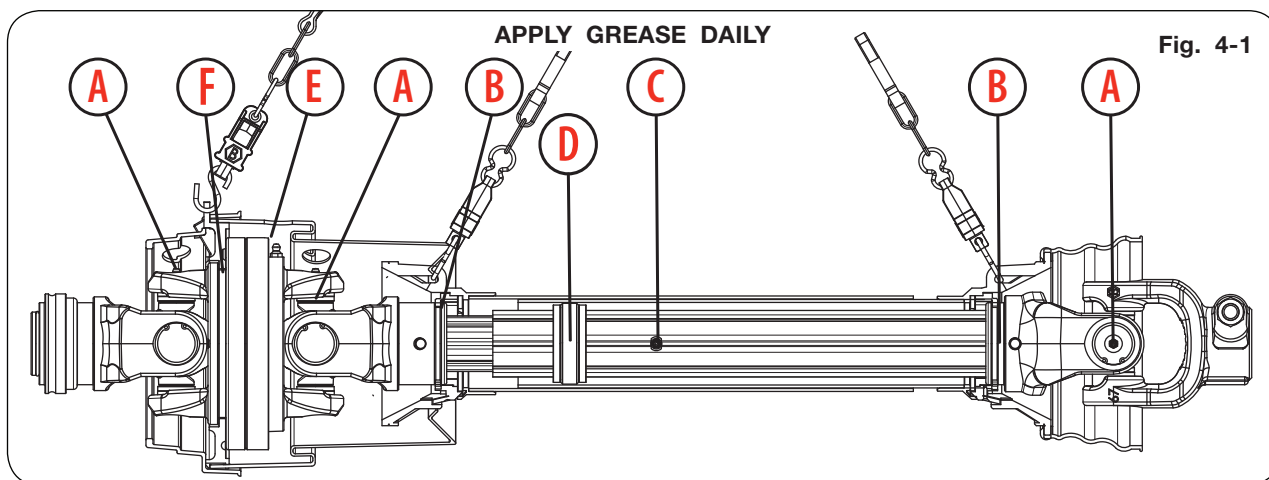
Lubrication (continued)

PTO Driveshaft Lubrication - Benzi PTO

Lubricate with NLGI grade 2 grease before starting work and every 8 operating hours. Clean and grease PTO driveshaft before each prolonged period of non-use. Molded nipples on the shield near each shield bearing are intended as grease fittings and should be lubricated every 8 hours of operation! Check and grease the guard tubes in winter to prevent freezing.

NOTE: Inner & outer profile tubes must have lubrication to operate successfully regardless of whether a grease fitting is provided for that purpose! Inner & outer profile tubes without fittings should be pulled apart and grease should be added manually.

- Grease the constant velocity joint, Item E, on front half driveline assembly every 8 operating hours. Contact your dealer for more greasing information.

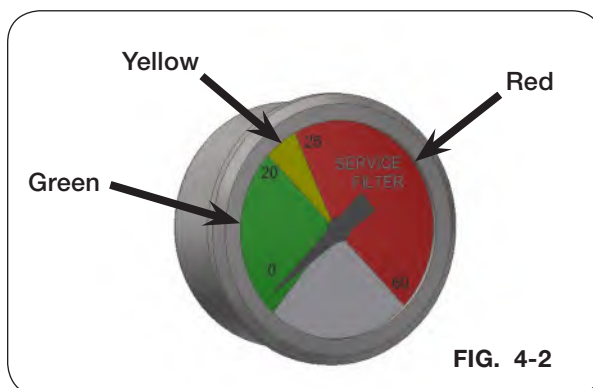


ITEM	DESCRIPTION	POINT	LUBRICANT	QTY.	HOURS
A	U-Joint Cross Kit	3	EP-2	1 Shot	8 Hours
B	Inner & Outer Yoke Groove	1	EP-2	1 Shot	8 Hours
C	Inner & Outer Profile Tube	1	EP-2	26 Shots	Start and End of Each Season 50 Hours
D	Anti-Vibration Bushing	1	EP-2	6 Shots	Start and End of Each Season 50 Hours
E	Constant Velocity Joint Body	1	EP-2	11 Shots	8 Hours
F	Wideangle Retainer & CV Joint Body Groove	1	EP-2	1 Shots	8 Hours

Lubrication (continued)

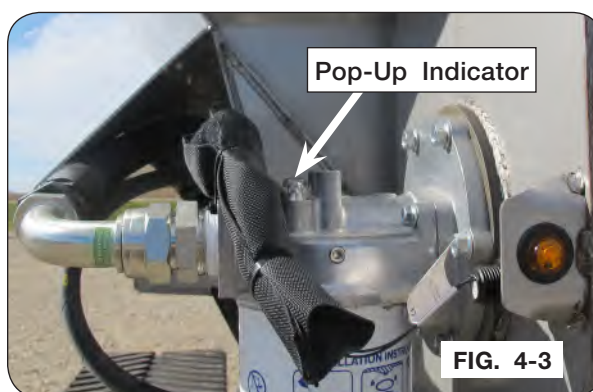
Checking In-Line Filter (1150 & 1250 Chassis Mount)

Check filter indicator with hydraulic system warm and equipment running at full RPM. Indicator will show RED if filter needs to be changed. (FIG. 4-2)



Checking Reservoir Filter

(If equipped, for chassis units.)
(Standard for 18, 22, 2650 undercarriage units.)
Check reservoir filter housing pop-up indicator. Indicator is tripped when filter needs to be changed. (FIG. 4-3)



Conveyor Chain

Pressure wash to clean chain, then oil the conveyor chain monthly and at the end of the season.

A mixture of 50% used motor oil and diesel fuel is recommended. Use a hand sprayer and do not get the mixture on the belt.

Changing Gearbox Oil

Refer to "Gearbox Removal and Oil Change" in MAINTENANCE section for details.

Hydraulic Reservoir Tank

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- HYDRAULIC COOLER RADIATOR AND OIL MUST BE COOL BEFORE DISCONNECTING ELECTRICAL COMPONENTS AND CLEANING TO PREVENT SERIOUS INJURY.

Chassis Mount (If Equipped)

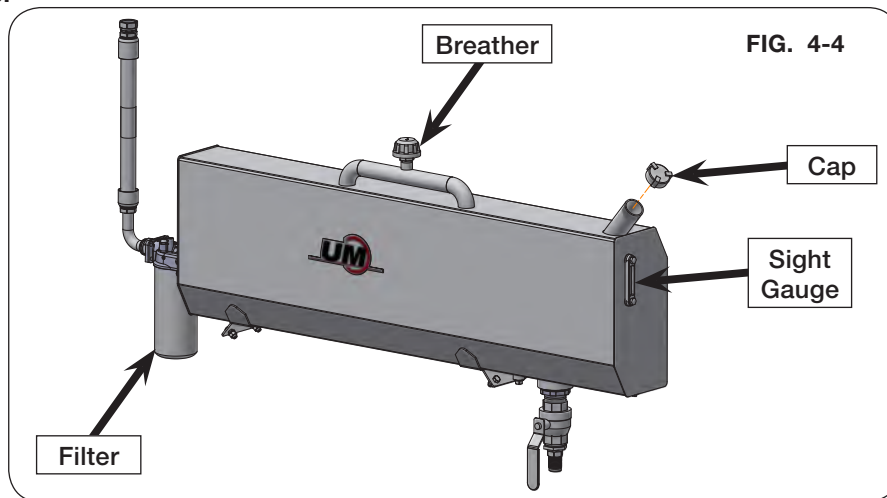
FILLING RESERVOIR TANK:

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



2. Remove cap (PF1220-475). (FIG. 4-4)

NOTE: The reservoir tank capacity is 36 1/2 gal. Check hydraulic oil daily and change every 2-3 years.



Hydraulic Reservoir Tank (continued)

FILLING RESERVOIR TANK (Continued):

3. Fill reservoir tank centered on sight gauge with SAE 15W-40 hydraulic oil or equivalent. (FIG. 4-5)
4. Reattach cap.
5. Refill as required.

IMPORTANT

- Running the PTO pump without oil will result in pump damage.

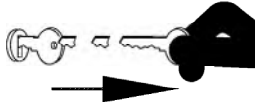


Hydraulic Reservoir Tank (continued)

18, 22, 2650 Undercarriage Mount

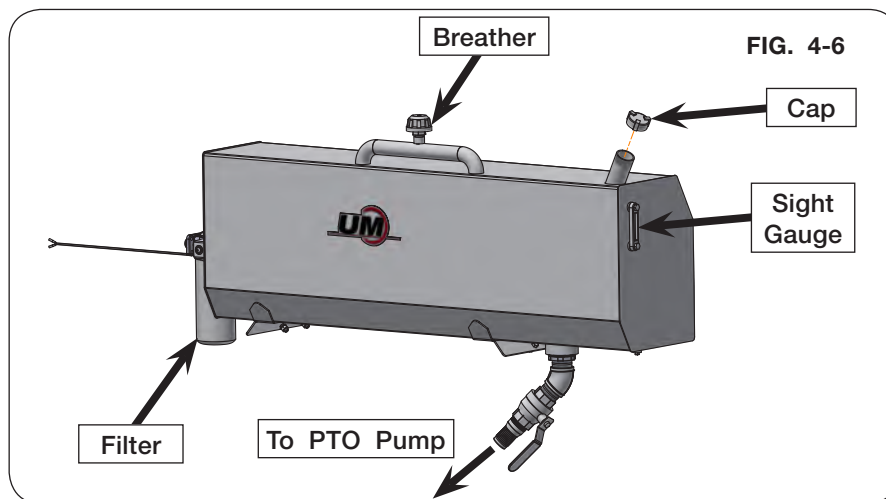
FILLING RESERVOIR TANK:

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



2. Remove cap (PF1220-475). (FIG. 4-6)

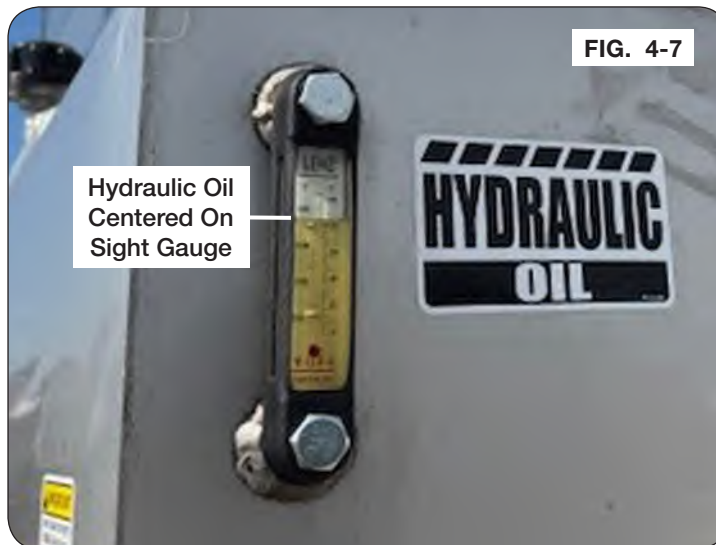
NOTE: The reservoir tank capacity is 69 gal. Check hydraulic oil daily and change every 2-3 years.



Hydraulic Reservoir Tank (continued)

FILLING RESERVOIR TANK (Continued):

3. Fill reservoir tank centered on sight gauge with SAE 15W-40 hydraulic oil or equivalent. (FIG. 4-7)



NOTE: When amber light LED is “ON”, oil in the reservoir tank is low. (FIG. 4-8)

4. If oil is low, fill reservoir tank before operating. (FIG. 4-8)
5. Reattach cap.
6. Refill as required.

IMPORTANT

- Running the PTO pump without oil will result in pump damage.



Chain Tension

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.

IMPORTANT

- Straighten or replace bent or distorted crossbars immediately.
- Proper chain tension is an essential factor in chain & sprocket life.
- Chains that are TOO TIGHT tend to stretch & will cause excess sprocket wear & eventually breakage.
- Chains that are TOO LOOSE present the possibility of catching on the subframe parts which will cause damage to the chain and body.
- Worn sprockets will cause excessive chain wear, skipping, and chain hooking.

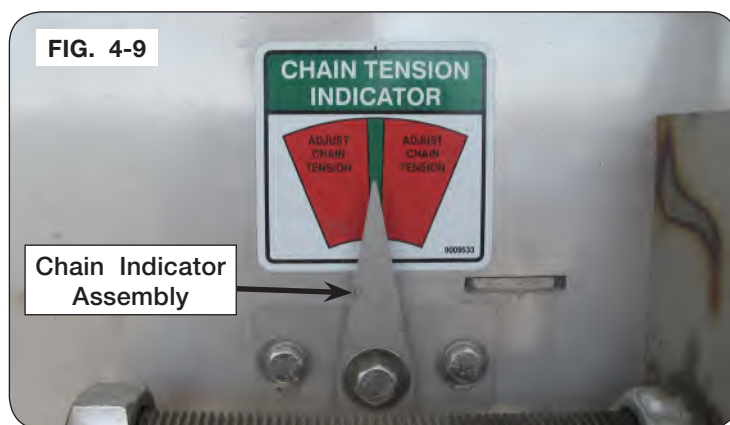
NOTE: When repairing or replacing chain links, install a cotter key & tack weld the cotter key side of the pin to each connector link.

NOTE: See the “Lubrication” section located on the previous pages for chain lubrication.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

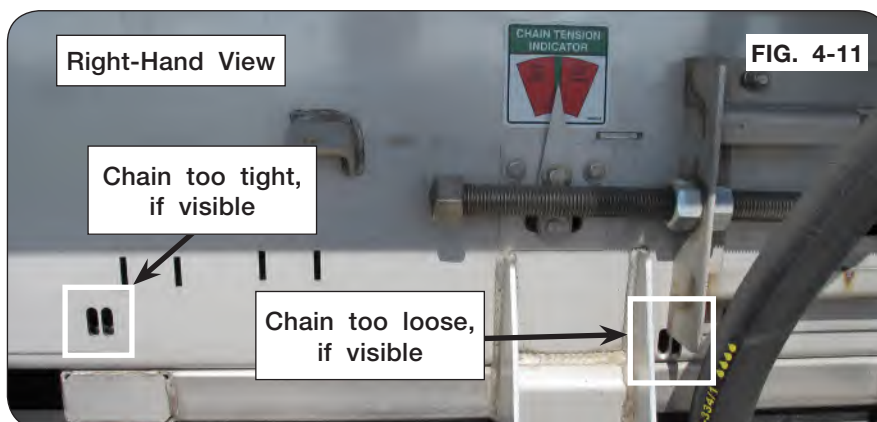
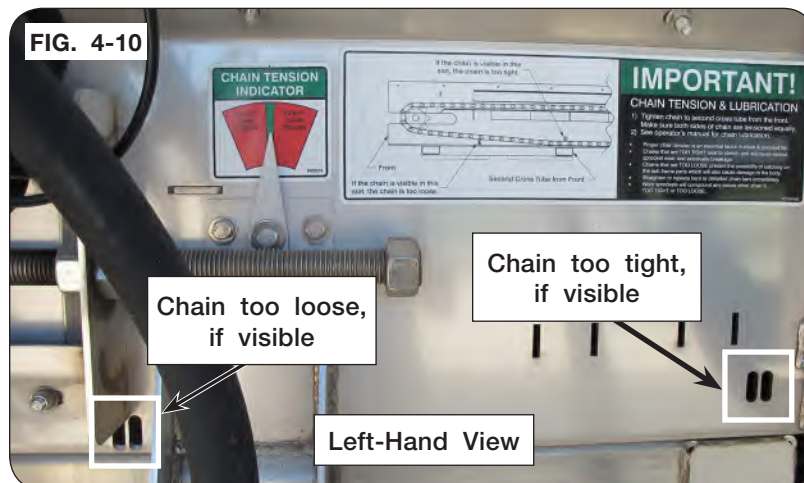


2. Adjust the chain to align the chain indicator assembly (416057 - left-hand; 416058 - right-hand) with the middle of the chain tension indicator decal (9009533). (FIG. 4-9)



Chain Tension (continued)

3. If the chain tension indicator decal is not present, illegible, or is inoperable, use the slots to perform a visual check of the chain tension as shown in figures 4-10 and 4-11.



4. After adjusting chain, verify chain tension using visible slots as indicated on FIG. 4-10 and 4-11.
5. Check for possible feedgate interference with belt/chain before operation.

Gearbox Removal & Oil Change

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



GEARBOX REMOVAL:

1. Remove check plug (95826). (FIG. 4-12)
2. Using 1/4" allen wrench, remove socket head capscrew (99888-034). (FIG. 4-12)
3. Using a safe lifting device rated for 100 lbs., slide off gearbox from shaft.

GEARBOX INSTALL:

NOTE: Coat all parts with anti-seize.

NOTE: When installing gearbox, ensure keys are in the down position.

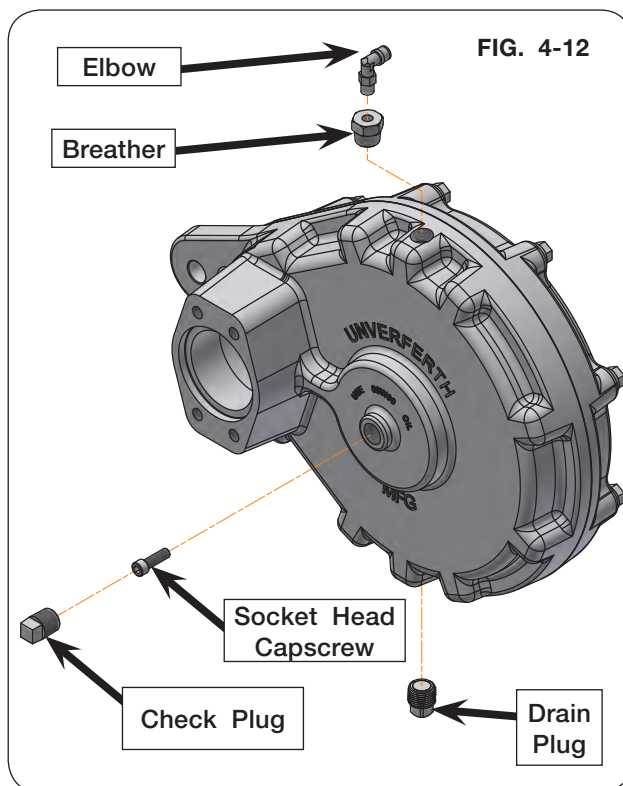
1. Using a safe lifting device rated for 100 lbs., slide gearbox onto shaft.
2. Insert socket head capscrew into gearbox. Tighten capscrew with 1/4" allen wrench and attach check plug. (FIG. 4-12)

CHANGING GEARBOX OIL:

1. Remove drain plug (PF1201-238M), breather (9003453), and elbow (9005072). (FIG. 4-12)
2. Clean any metal shavings off of magnetic square head plug.
3. After oil has drained, reattach drain plug.
4. Remove check plug.

NOTE: The gearbox capacity is approx. 46 oz. Check oil monthly and change oil annually.

5. Fill gearbox through breather hole with synthetic SAE 80W90 oil until the oil starts to run out of the check plug hole.
6. Reattach check plug, breather, and elbow.



Spreader Maintenance

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- AVOID BREATHING CHEMICALS AND FUMES.
- WASH HANDS BEFORE EATING, DRINKING, CHEWING GUM, OR USING TOILET.
- NEW HYDRAULIC SYSTEMS OR SYSTEMS THAT HAVE BEEN MAINTAINED MUST BE PURGED OF AIR BEFORE OPERATING OR MOVING MACHINE TO PREVENT SERIOUS INJURY OR DEATH.
- HYDRAULIC COOLER RADIATOR AND OIL MUST BE COOL BEFORE DISCONNECTING ELECTRICAL COMPONENTS AND CLEANING TO PREVENT SERIOUS INJURY.

CAUTION

- SHARP EDGES ON DRY SPREADER CAN CAUSE SERIOUS INJURY. BE CAREFUL WHEN WORKING AROUND DRY SPREADER.

Seasonal Storage

Before storing the spreader in freezing climates, refer to “Winterizing” outlined in MAINTENANCE section.

After season is finished, completely wash machine thoroughly to remove corrosive fertilizer/chemicals inside and out before storing. When using pressure washers, maintain an adequate distance so not to blast water into bearings, hydraulic seals or electrical connections.

After washing machine, spray an oil/diesel mixture inside hopper to avoid corrosion.

Clean debris from hydraulic cooler radiator and fan.

Repaint all areas where paint has been removed to keep rust from developing.

Inspect machine for parts that may need to be replaced so they may be ordered in the off season. Perform seasonal cleaning of strainer located on the reservoir / pump hydraulics.

See the “Lubrication” section for machine lubrication.

Check hydraulic hoses for weather cracks and replace accordingly.

After any period of unused time, unit should be operated to check function of hydraulic system.

Ensure ladder is latched and in storage position.

Keep tarp open, if equipped.

Spreader Maintenance (continued)

Purging Hydraulic System

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- RELIEVE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE CHASSIS OPERATOR'S MANUAL FOR PROPER PROCEDURES.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

1. Purge air from system as follows:

- A. Turn on SCVs and engage hydraulic oil supply lines with engine at low idle. Allow 1 minute for oil to fill the spreader hydraulic system.
- B. Turn on the spinner and conveyor. Check that all hydraulic valves have opened.
- C. Start hydraulic system and run for 1 minute or until hydraulic motor starts turning.
- D. Check oil reservoir in hydraulic power source and re-fill as needed.
- E. Check for hydraulic oil leaks using cardboard or wood. Tighten connections according to directions in Torque Specifications in MAINTENANCE section.
- F. De-pressurize hydraulic system.
- G. Check hydraulic reservoir oil level and fill as needed. See “Lubrication” and “Hydraulic Reservoir Tank” for oil specifications.

IMPORTANT

- *Running the PTO pump without oil will result in pump damage.*

Setting Hydraulic System Flow

1. Set system flow as follows:

- A. Set spinner speed to 650 RPM.
- B. Reduce SCV flowrate equally between the two SCV remotes.
- C. Once spinner speed starts to decrease below 650 RPM, increase SCV flowrate slightly until spinners maintain 700 RPM.
- D. Check for hydraulic oil leaks using cardboard or wood. Tighten connections according to directions in Torque Specifications in MAINTENANCE section.

Driveline Removal (If Equipped With PTO Hydraulic System)

DANGER

- ENTANGLEMENT WITH THE DRIVELINE WILL CAUSE SERIOUS INJURY OR DEATH. KEEP ALL GUARDS AND SHIELDS IN GOOD CONDITION AND PROPERLY INSTALLED AT ALL TIMES. AVOID PERSONAL ATTIRE SUCH AS LOOSE FITTING CLOTHING, SHOE STRINGS, DRAWSTRINGS, PANTS CUFFS, LONG HAIR, ETC. THAT CAN BECOME ENTANGLED IN A ROTATING DRIVELINE.

WARNING

- MOVING OR ROTATING COMPONENTS CAN CAUSE SERIOUS INJURY OR DEATH. ENSURE SERVICE COVERS AND CONVEYOR CHAIN/BELT COVERS ARE IN PLACE AND SECURELY FASTENED BEFORE OPERATING UNIT.
 - FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE REMOVAL INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

 2. Remove and retain four 3/8"-16UNC x 1" capscrews (900900-055), four 3/8" lock washers (900903-021), and 3/8" flat washers (900902-038) from PTO cover (417402B). (FIG. 4-13)
 3. Store wiring harnesses and tractor SCV hoses, if present, to prevent kinking and rubbing against other parts or sharp edges. (FIGS. 4-13 & 4-14)
 4. Remove and retain PTO cover from pump mount weldment (417007B). (FIGS. 4-13 & 4-14)

Fig. 4-13

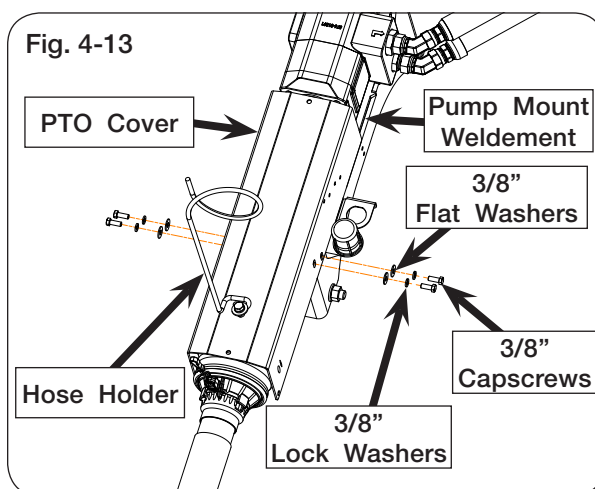
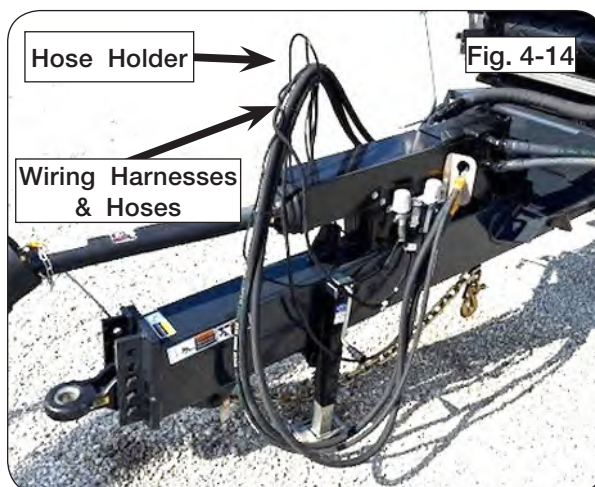
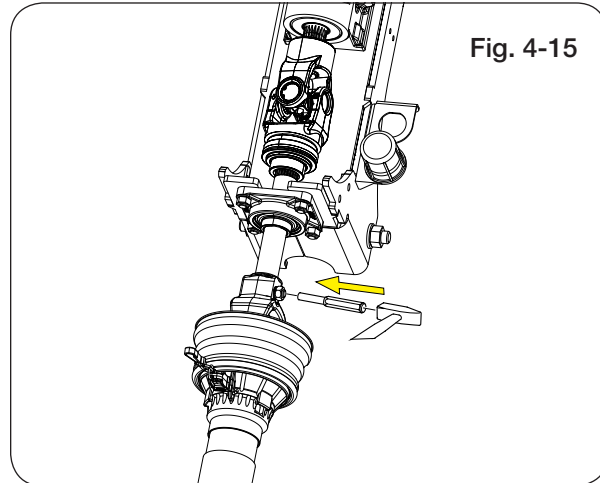


Fig. 4-14

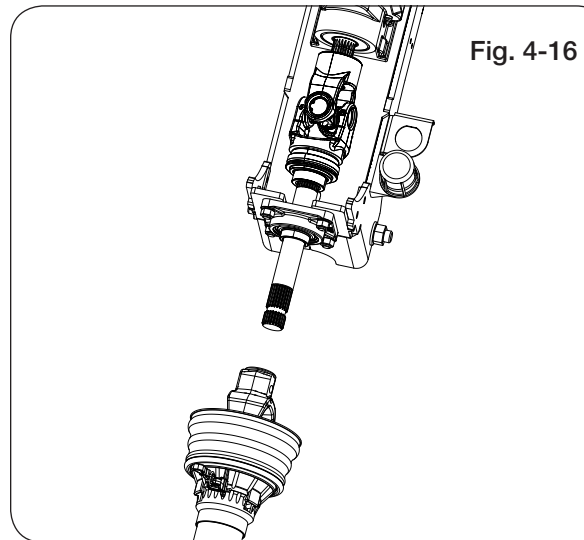


Driveline Removal (If Equipped With PTO Hyd. System) (continued)

5. Use a hammer and punch, if needed, to moderately hit the end of conic bolt, as shown. (FIG. 4-15)
6. Remove and retain conic bolt, lock washer, and nut.



7. Support driveline using a safe lifting device rated for 100 lbs., slide driveline yoke off implement PTO splined driveshaft. (FIG. 4-16)



Verify Telescoping PTO Shaft Length

WARNING

- PROPER EXTENDED AND COLLAPSED LENGTHS OF THE TELESCOPING PTO SHAFT MUST BE VERIFIED BEFORE FIRST OPERATION WITH EACH TRACTOR. IF THE EXTENDED LENGTH OF THE PTO SHAFT IS NOT SUFFICIENT, IT MAY BECOME UNCOUPLED IN OPERATION AND CAUSE SERIOUS INJURY OR DEATH FROM CONTACT WITH UNCONTROLLED FLAILING OF PTO SHAFT ASSEMBLY COMPONENTS.

IMPORTANT

- Check the length of the telescoping members to ensure the driveline will not bottom out or separate when turning and/or going over rough terrain.

An excessive collapsed length can result in damage to the PTO driveline and attached components. This is most likely to occur during extreme turning angles and/or travel over rough terrain. Conditions are amplified on tractors with tracks operating in uneven terrain, particularly rice levies. Damaged driveline components can result in unsafe operation and severely reduced driveline component life.

NOTE: Do not exceed 10 degrees beyond a straight pull line while operating the PTO. To verify proper extended and collapsed lengths, use the following procedure:

1. Fully collapse PTO shaft and measure length “L” (Figure 4-17).

Enter here: _____(1)

(Verify that outer tube does not bottom out on surrounding plastic shield components).

2. Pull apart PTO telescoping shaft ends and measure lengths “T” & “C” (Figure 4-18)

Add “T” + “C” measurements together

Enter total here: _____(2)

3. Calculate maximum recommended extended length:

- a. Subtract line 1 from line 2

Enter here: _____(a)

- b. Divide line (a) by 2

Enter here: _____(b)

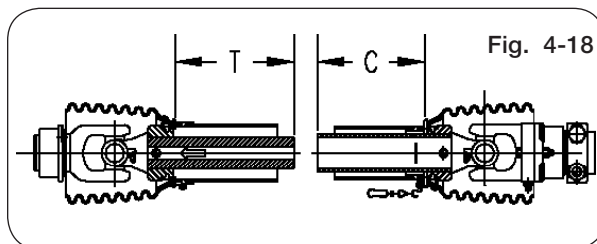
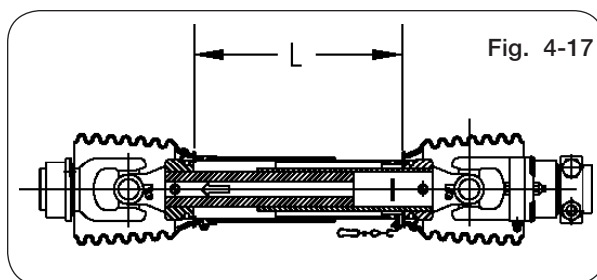
- c. Add line (b) to line 1.

Enter here: _____(c)

- d. Subtract 3 inches from line (c)

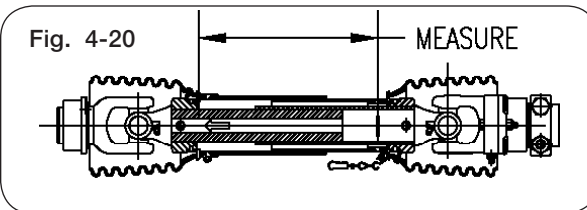
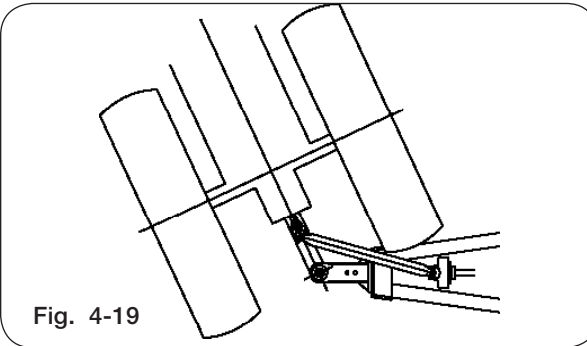
Enter here: _____(d)

This is the maximum recommended extended length.



Verify Telescoping PTO Shaft Length (continued)

4. Hitch tractor drawbar to spreader, ensuring that tractor and spreader are on level ground and coupled as straight as practical.
5. Connect PTO shaft to tractor, and measure length “L” from same points as used in step 1. Ensure that this measurement does not exceed the maximum recommended extended length calculated in step 3 above. If necessary, choose a shorter drawbar position, or obtain a longer PTO shaft assembly before operating spreader.
6. Position the tractor to obtain the tightest turning angle, relative to the spreader (Figure 4-19).
7. Measure the length “L” from the same points as used in step 1. **This distance must be at least 1.5 inches greater than the distance measured in step 1.** If necessary, adjust the length of the PTO shaft by cutting the inner and outer plastic guard tubes and inner and outer sliding profiles by the same length. Round off all sharp edges and remove burrs before greasing and reassembling shaft halves. (FIG. 4-20)



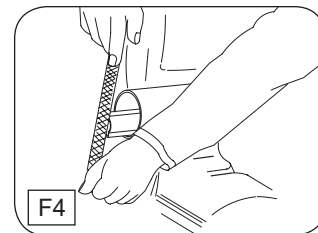
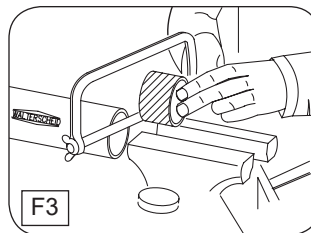
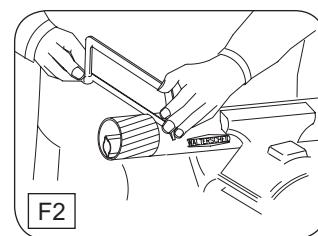
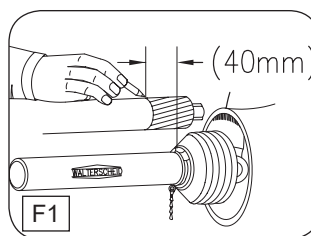
PTO Shaft Length Adjustment

WARNING

- CHECK THE LENGTH OF THE TELESCOPING MEMBERS TO ENSURE THE DRIVELINE WILL NOT BOTTOM OUT OR SEPARATE WHEN TURNING AND/OR GOING OVER ROUGH TERRAIN.

NOTE: Maximum operating length LB. (Refer to “Verify Telescoping PTO Shaft Length” in this section for LB length.)

1. To adjust length, hold the half-shafts next to each other in the shortest working position and mark them.
2. Shorten inner and outer guard tubes equally.
3. Shorten inner and outer sliding profiles by the same length as the guard tubes.
4. Round off all sharp edges and remove burrs. Grease sliding profiles.



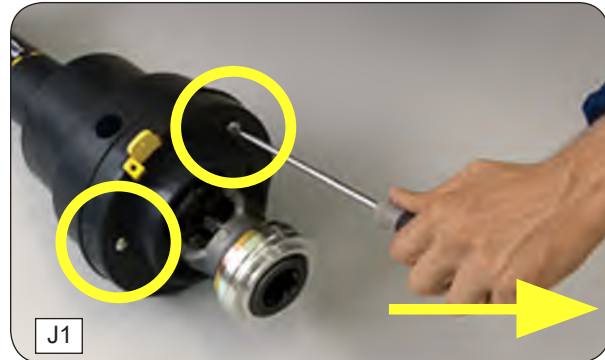
PTO Shaft and CV Joint Body - Benzi PTO

WARNING

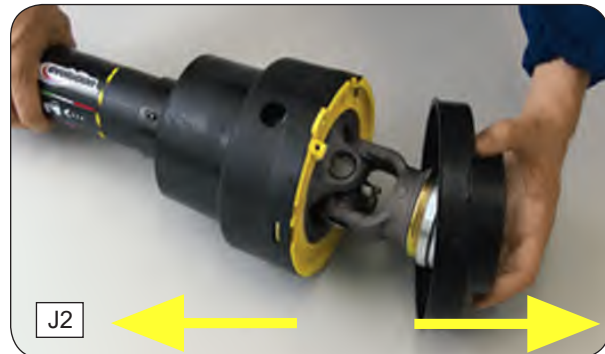
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

To Dismantle CV Joint Body Cone (Figs. J1 - J3)

1. Remove screws on the outer cone. (FIG. J1)



2. Remove outer and inner cone. (FIG. J2)



3. Open the wideangle retainer and remove from the CV joint body groove. (FIG. J3)



PTO Shaft and CV Joint Body - Benzi PTO (continued)

To Assemble CV Joint Body Cone (Figs. K1 - K3)

1. Clean and grease the wideangle retainer and CV joint body groove. (FIG. K1)
2. Grease the CV joint body. (FIG. K1)

NOTE: See “PTO Driveshaft Lubrication - Benzi PTO” for retainer and CV joint body lubrication.



3. Fit wideangle retainer in CV joint body groove. (FIG. K2)
4. Assemble retainer with Benzi logo positioned outward. (FIG. K2)



5. Slip on inner cone to retainer by aligning the inner cone holes with the retainer tabs.
6. Insert outer cone through yoke and retainer chain tab. Align screw holes. (FIGS. K3 & K4)



7. Attach screws to the outer cone. (FIG. K4)



Jack Shaft Disassembly and Replacement

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

CAUTION

- SHARP EDGES ON DRY SPREADER CAN CAUSE SERIOUS INJURY. BE CAREFUL WHEN WORKING AROUND DRY SPREADER.

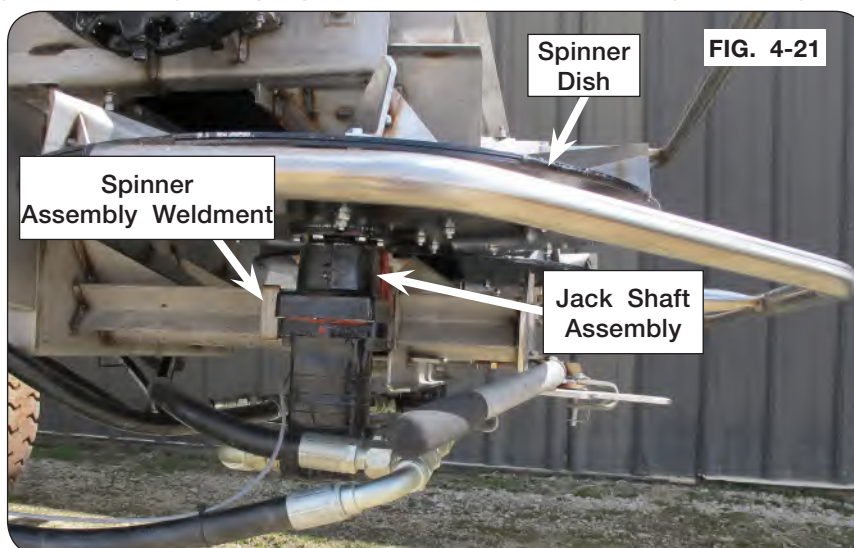
IMPORTANT

- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



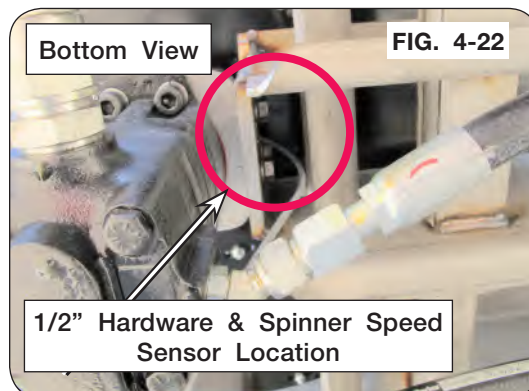
Jack Shaft Disassembly and Replacement (continued)

2. Support spinner dish using a safe lifting device rated for 100 lbs.
3. Remove six 5/16"-18UNC x 1 1/4" capscrews (900900-031; for 2650 to 1050 units) or 5/16"-18UNC x 1" capscrews (900900-030; for 1250 & 1150 chassis), six 5/16"-18UNC elastic stop nuts (900905-010), one 1/2"-13UNC x 1 1/4" capscrew (900900-100), one 1/2" lock washer (900903-025), and one 2" washer (PF1218-06) from the spinner dish and jack shaft assembly (PF1238-732B). Keep spinner dish and hardware. (FIG. 4-21)



4. Remove four 1/2"-13UNC x 1 1/4" capscrews (900900-100) and four 1/2" lock washers (900903-025) from spinner weldment. Keep hardware. (FIG. 4-22)
5. Remove the spinner speed sensor body and 1/4"-20UNC x 7/16" capscrew from the sensor hole of the jack shaft assembly. Keep capscrew. (FIG. 4-22)

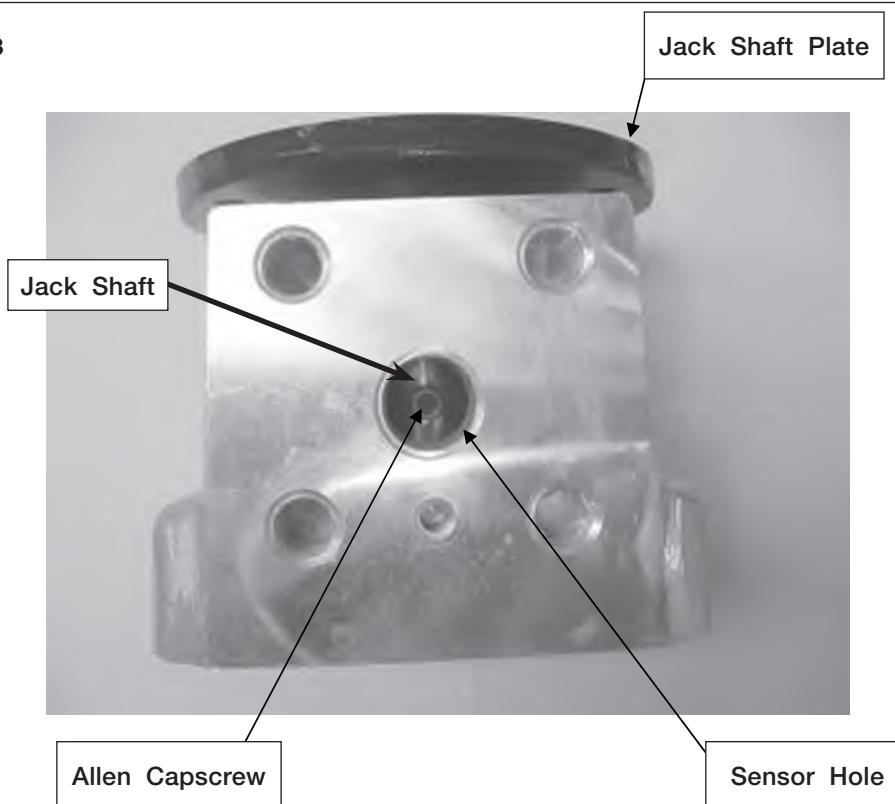
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Jack Shaft Disassembly and Replacement (continued)

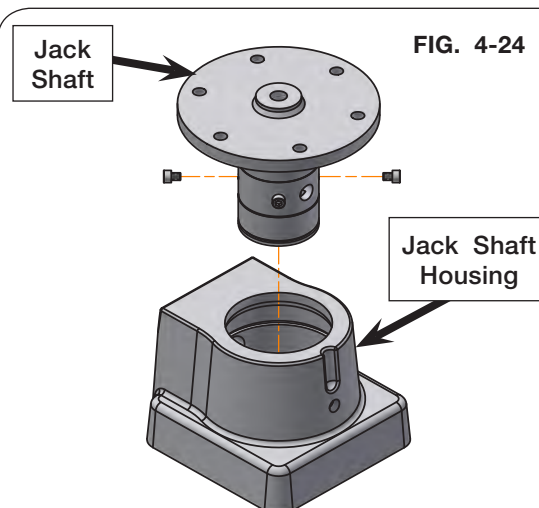
6. To disassemble jack shaft assembly, remove four allen capscrews (PF1200-245) from jack shaft by rotating jack shaft plate until the allen capscrew can be seen through sensor hole. (FIG. 4-23)
7. Once four allen capscrews are removed from the jack shaft, add blue thread locker to the allen capscrews.

FIG. 4-23



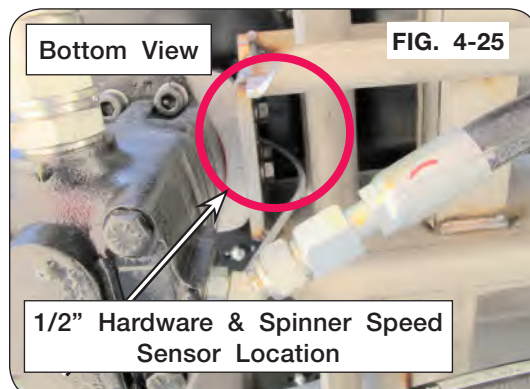
8. Remove and discard jack shaft from jack shaft housing (PF1218-732H). (FIG. 4-24)
9. Insert new jack shaft into jack shaft housing. (FIG. 4-24)
10. Reinsert four allen capscrews with blue thread locker to jack shaft by rotating jack shaft plate until the allen capscrew hole can be seen through sensor hole. (FIG. 4-23)
11. Tighten allen capscrews.

FIG. 4-24

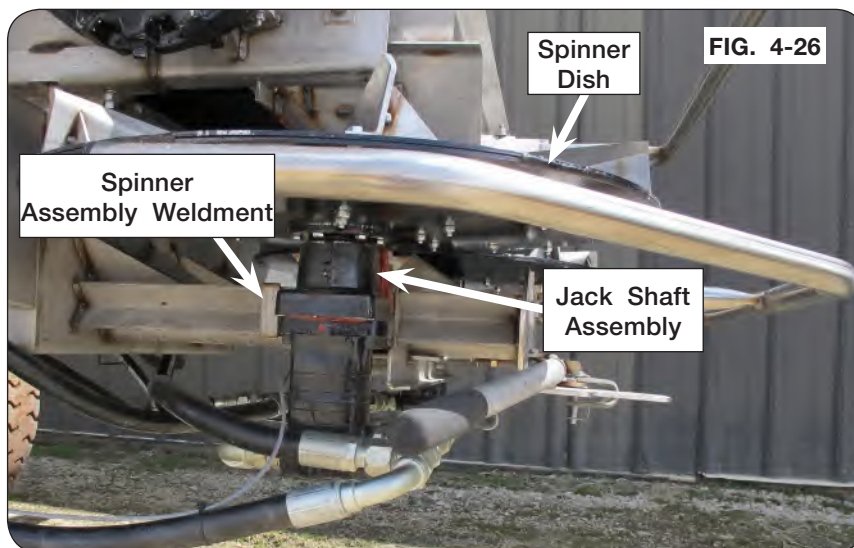


Jack Shaft Disassembly and Replacement (continued)

12. Reattach the spinner speed sensor body and 1/4"-20UNC x 7/16" capscrew to the sensor hole of the jack shaft assembly. (FIG. 4-25)
13. Reattach jack shaft assembly to the spinner assembly weldment using 1/2" hardware from step 4. (FIG. 4-25)



14. Using a safe lifting device rated for 100 lbs., lift spinner dish on top of jack shaft assembly. (FIG. 4-26)
15. Reattach spinner dish to jack shaft assembly using hardware from step 3. (FIG. 4-26)
16. Torque hardware to specification. See "Complete Torque Chart" in this section.



Fixed Depth Conveyor Speed Sensor Replacement

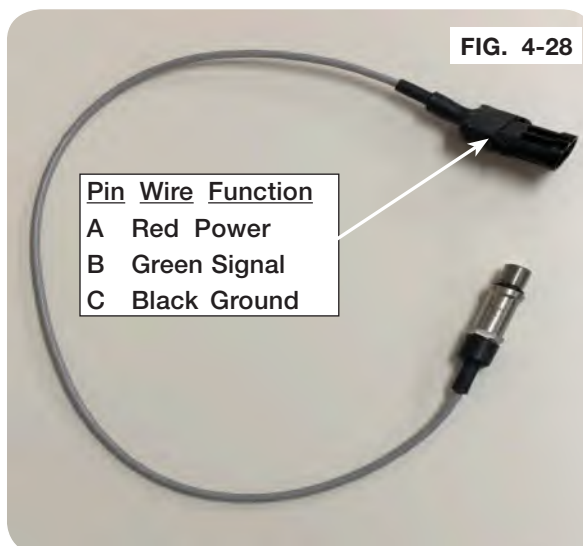
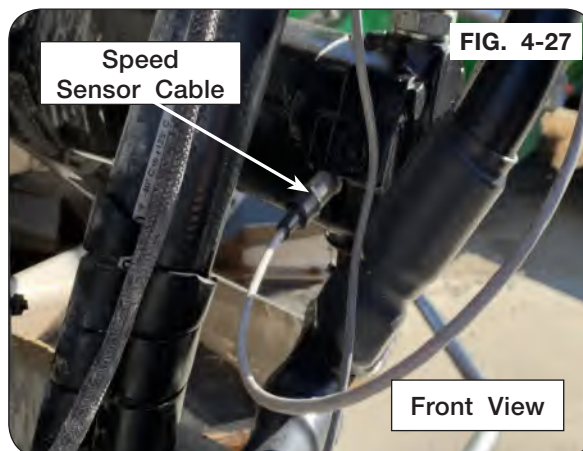
WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

NOTE: Torque values below are for clean dry threads.

2. Install sensor into conveyor motor housing by hand. See FIG. 4-27.
3. Once sensor is hand tight, torque sensor to 75–125 in-lb.
4. Connect speed sensor cable to the speed sensor, and attach other end of cable to the wiring harness. See FIG. 4-28.



Spinner Motor Speed Sensor Replacement

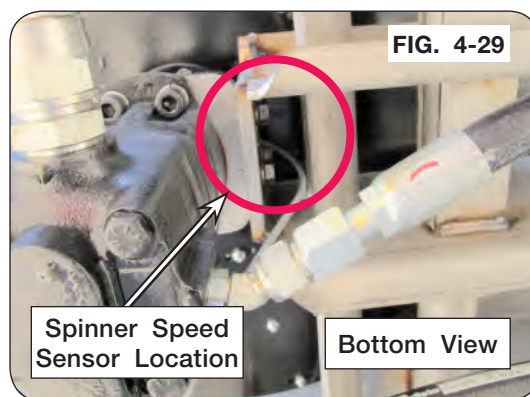
WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

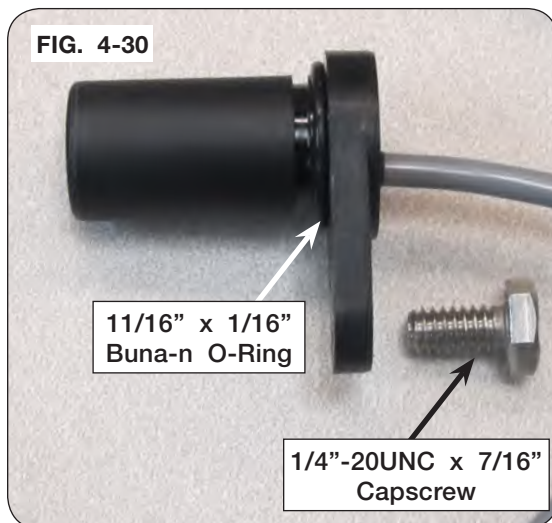


2. Remove the spinner speed sensor body from the sensor hole of the jack shaft assembly. Discard spinner speed sensor. (FIG. 4-29)



3. On new spinner speed sensor, move the o-ring flush against the speed sensor flange as shown in FIG. 4-30.

(Continued on next page.)



Spinner Motor Speed Sensor Replacement (continued)

IMPORTANT

- Do not force the sensor against the gear/target tooth, damage may occur.
4. Gently insert the spinner speed sensor body into the sensor hole of the jack shaft assembly until the sensor touches against the motor (gear/target) tooth. (FIG. 4-32)
 5. Apply anti-seize to provided 1/4"-20UNC x 7/16" capscrew (SS).
 6. Attach spinner speed sensor to the jack shaft assembly using provided 1/4"-20UNC x 7/16" capscrew (SS). (FIG. 4-32)
 7. Connect speed sensor cable to the wiring harness. (FIG. 4-33)

FIG. 4-32

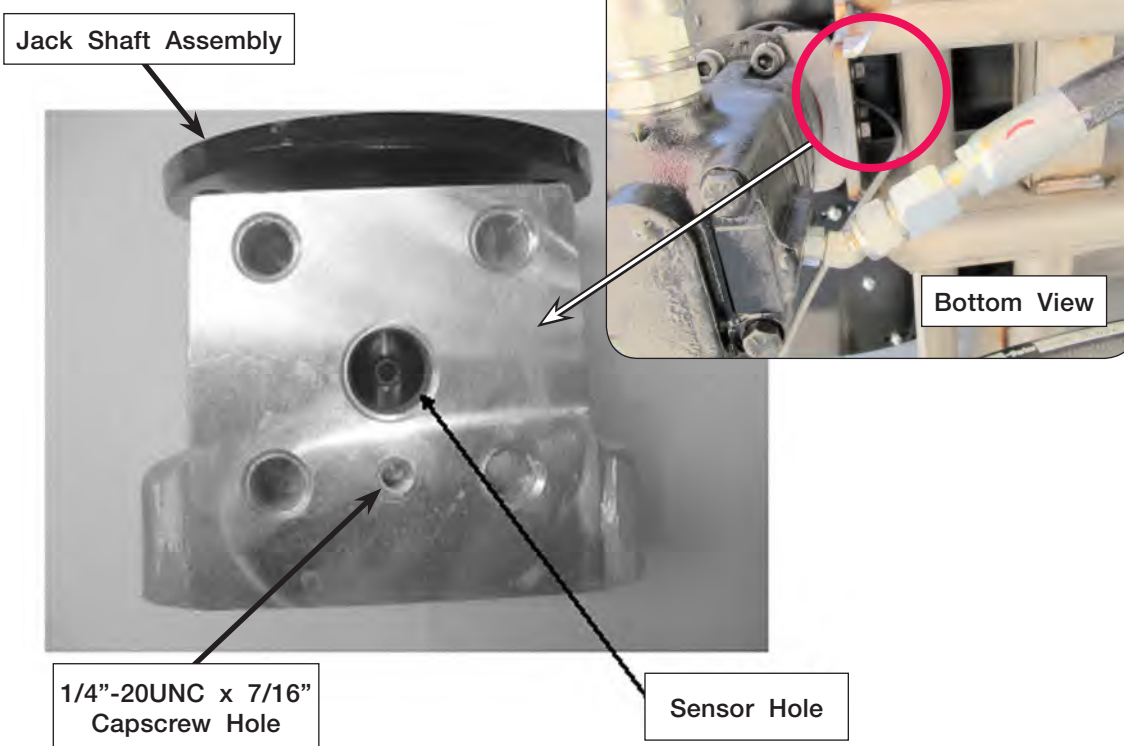


FIG. 4-33



Pressure Compensator Cartridge Valve Disassembly

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

IMPORTANT

- Running the PTO pump without oil will result in pump damage.

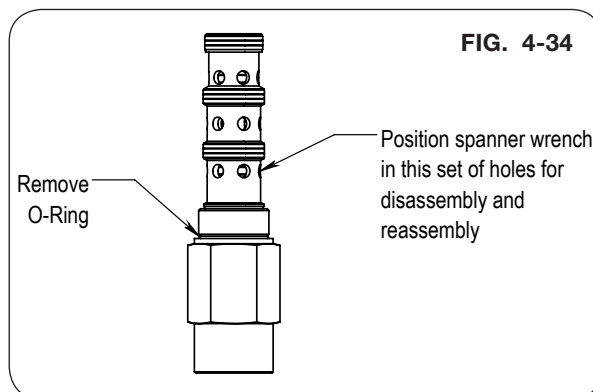
TOOLS REQUIRED:

- Spanner wrench
- Vise
- 1/4" Allen Wrench
- Red Thread Lock
- Thread Sealant

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

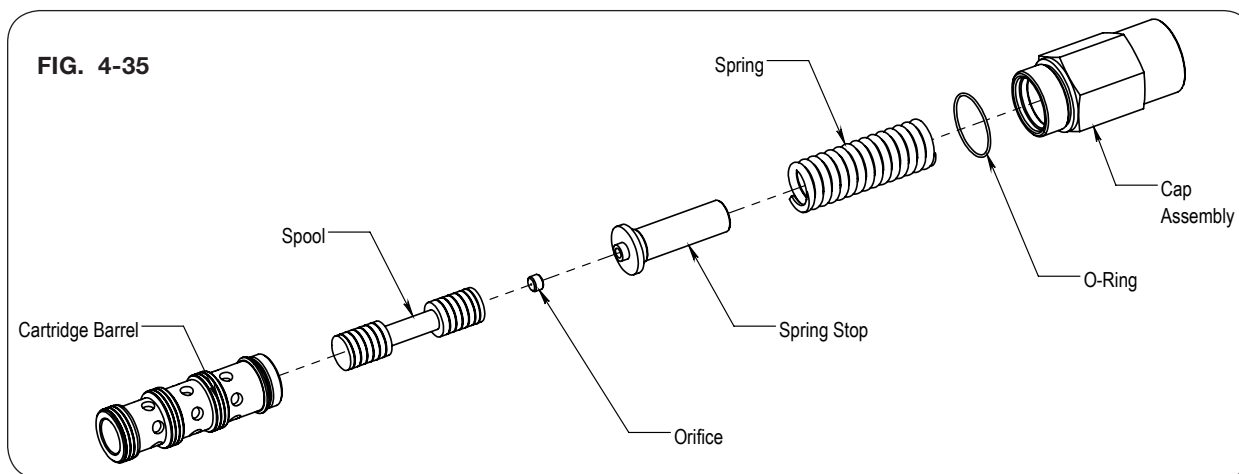


2. Remove O-ring from cap assembly. (FIG. 4-34)



3. Secure the cartridge in vise by the hex on cap and remove cartridge barrel using spanner wrench. Position spanner wrench on cartridge barrel in hole set closest to cap (FIG. 4-34)
4. Disassemble cartridge valve as shown figure 4-35. Clean and inspect all parts thoroughly. Replace worn or damaged parts.

(Continued on next page)



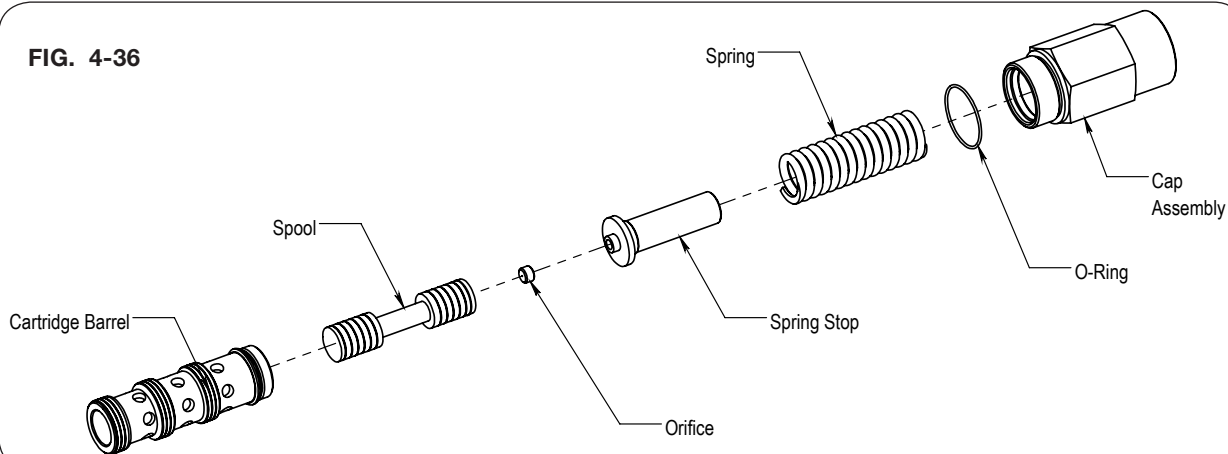
Pressure Compensator Cartridge Valve Disassembly (continued)

5. Once clean, reassemble orifice to the spring stop as shown in Figure 4-36.
6. Insert spring stop into spring. (FIG. 4-36)
7. Insert spool into cartridge. (FIG. 4-36)
8. Insert cartridge into spring. (FIG. 4-36)
9. Reassemble cartridge to cap assembly as shown in Figure 4-36.
10. Torque cap assembly to 70 Ft.-Lbs.
11. Check hydraulic reservoir oil level and fill as needed. See “Lubrication” and “Hydraulic Reservoir Tank” for oil specifications.

IMPORTANT

- *Running the PTO pump without oil will result in pump damage.*

FIG. 4-36



Hydraulic Servo Valve Manual Override & Timing

WARNING

- MOVING CONVEYOR OR ROTATING SPINNER COMPONENTS CAN CAUSE SERIOUS INJURY OR MACHINE DAMAGE. BEFORE OPERATING MANUAL OVERRIDE(S), ENSURE EVERYONE IS AWAY FROM THE DRY SPREADER.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

NOTE: Manual override operation is intended for emergency use ONLY and is not intended for continuous operation.

NOTE: Servo valve (PF1211-01A) adjusts through full range in 90° rotation. Never turn more than a total of 1 turn counter clockwise.

NOTE: Never remove valve by the electrical wiring hex. This can damage the valve electrical wiring. (FIG. 4-37)

NOTE: Figure 4-24 shows an uninstalled servo valve and provides locations of locking collar, hex head bolt and servo valve hex. (FIG. 4-37)

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake and shut off engine.
2. Unplug and locate locking collar on valve. (FIG. 4-37)
3. Draw a line on valve and lock collar. This allows the valve to be returned to the proper location. (FIG. 4-38)
4. Loosen hex head bolt on lock collar using 3/16" hex wrench. (FIG. 4-38)



Hydraulic Servo Valve Manual Override & Timing (continued)

WARNING

- MOVING CONVEYOR OR ROTATING SPINNER COMPONENTS CAN CAUSE SERIOUS INJURY OR MACHINE DAMAGE. BEFORE OPERATING MANUAL OVERRIDE(S), ENSURE EVERYONE IS AWAY FROM THE DRY SPREADER.

5. Run engine at desired RPM and engage hydraulics.
6. Hold the valve motor housing by hand and slowly turn the body clockwise to the desired flow setting. (FIG. 4-39)
7. Tighten lock collar to hold position.
8. If further adjustments are necessary, repeat steps 3 through 6 as required.
9. Re-time the valve after manual adjustments before returning to automated operation.
10. To re-time valve, turn off control switch and adjust valve motor housing slowly counter clockwise until conveyor or fans stop.
11. To manually override and operate the conveyor for cleanout, utilize the Raven system “cleanout” function under the test screen. This function runs the conveyor only. Turn on the spinner by entering a “test speed” into the rate controller. Refer to “RCM Spreader Set Up” in SET UP section for more information.



FIG. 4-39

Hydraulic PWM Valve Manual Override For 1050 To 2250 Units With 9009773 PWM Valve

WARNING

- MOVING CONVEYOR OR ROTATING SPINNER COMPONENTS CAN CAUSE SERIOUS INJURY OR MACHINE DAMAGE. BEFORE OPERATING MANUAL OVERRIDE(S), ENSURE EVERYONE IS AWAY FROM THE DRY SPREADER.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

NOTE: Manual override operation is intended for emergency use ONLY and is not intended for continuous operation.

To Manually Override PWM Valve (9009773):

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake and shut off engine.
2. Locate PWM valve on valve block. (FIG. 4-40)
3. Run engine at desired RPM and engage hydraulics.
4. Loosen jam nut using 1/2" wrench. (FIG. 4-41)
5. Turn in 5/32" hex head stem until flow starts (up to 4 turns). (FIG. 4-41)

NOTE: As hex head stem is turned in, the controlled function starts to receive oil and operates.

To Reset:

1. Turn out 5/32" hex head stem until flow stops. (FIG. 4-41)
2. While holding the 5/32" hex head stem in place, tighten the jam nut. (FIG. 4-41)

FIG. 4-40

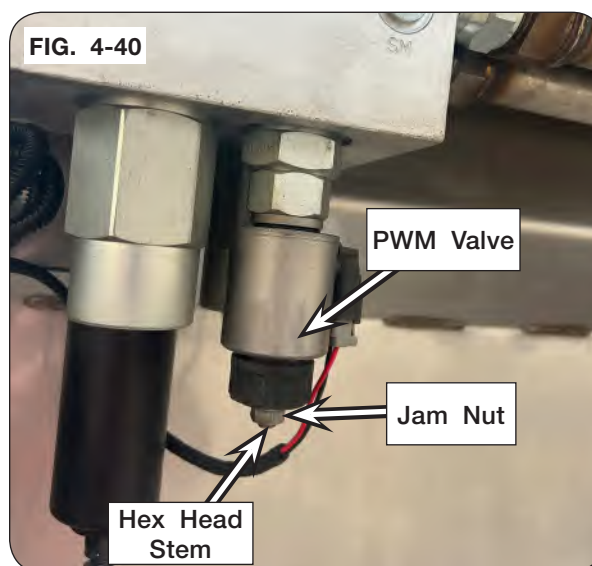
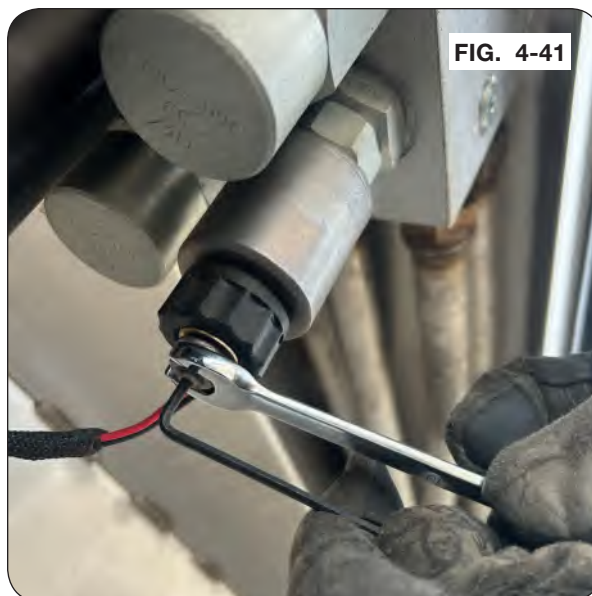


FIG. 4-41



Hydraulic PWM Valve Manual Override For 1150 & 1250 Chassis Mounted Units

WARNING

- MOVING CONVEYOR OR ROTATING SPINNER COMPONENTS CAN CAUSE SERIOUS INJURY OR MACHINE DAMAGE. BEFORE OPERATING MANUAL OVERRIDE(S), ENSURE EVERYONE IS AWAY FROM THE DRY SPREADER.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

To Manually Override PWM Valve (9009589):

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake and shut off engine.
2. Remove cap and locate knurled nut on PWM valve. Keep cap. (FIG. 4-42)
3. Run engine at desired RPM and engage hydraulics.
4. Turn in knurled nut stem until flow starts. (FIG. 4-43)

NOTE: As knurled nut stem is turned in, the controlled function starts to receive oil and operates. (FIG. 4-44)

To Reset:

1. Turn out knurled nut stem until flow stops.
2. Reattach cap.

FIG. 4-42

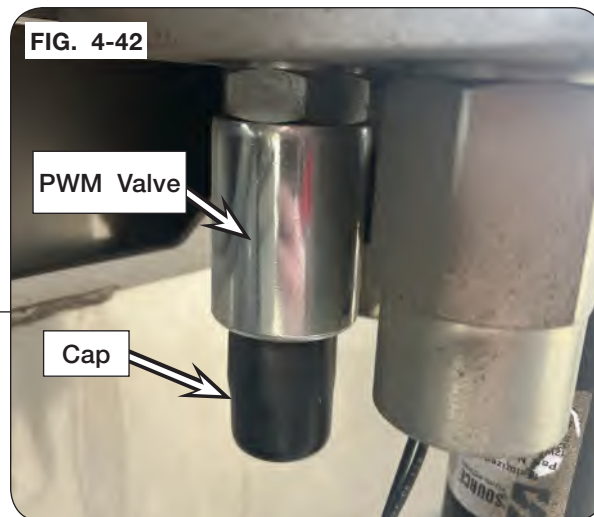


FIG. 4-43

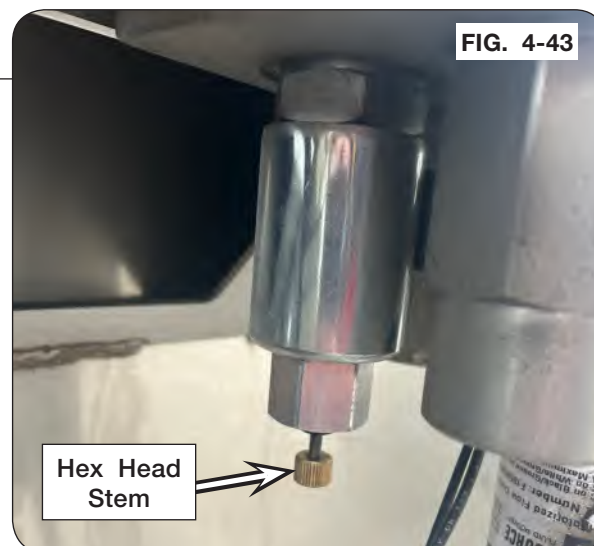
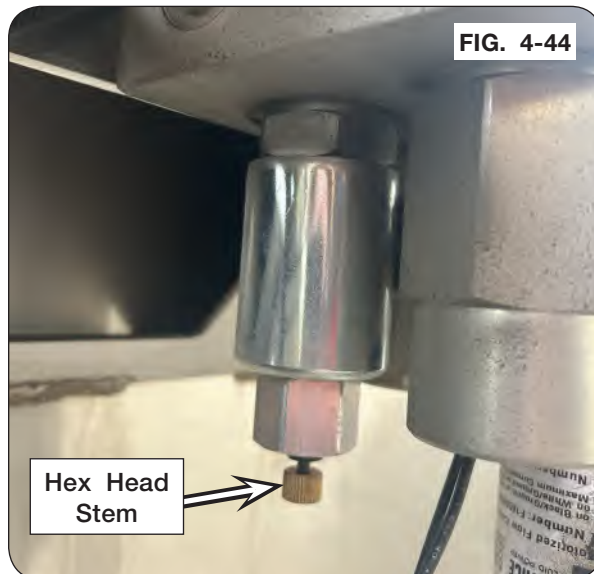


FIG. 4-44



Chain Shield Seal Strip Replacement

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYEWEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.

IMPORTANT

- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*

NOTE: Refer to “Chain Shield” in PARTS section for chain shield box length part numbers.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle’s parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.

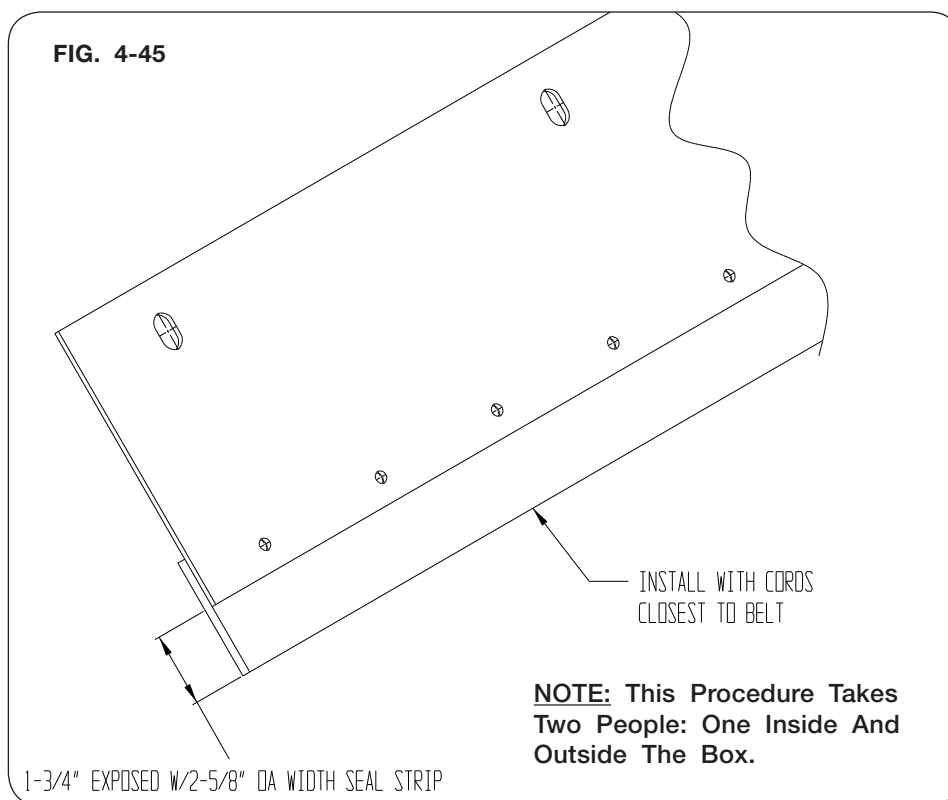


2. Remove and discard seal strips.

(Continued on next page.)

Chain Shield Seal Strip Replacement

3. Ensure the new seal strips are exposed 1 3/4" as shown in FIG 4-45.
4. Inside the spreader box, insert 3/8"16UNC x 1" SS carriage bolts (9007908-051) through the slotted holes on the chain shield and the holes on the spreader box.
5. Insert button head socket capscrews (PF1200-086SS) through the chain shield and the seal strip (standard seal strip PF1000-37 or high temperature seal strip PF1000-38).
6. Attach the seal strip to the chain shield with tee prong nuts (PF1205-86).
7. Repeat steps 2 through 6 for the other side of the spreader box.
8. Outside of the spreader box, attach the chain shields with 3/8" SS lock washers (900903-021) and 3/8"-16UNC SS nuts (9005640) to both sides of the spreader box.



Bin Level Sensor Replacement

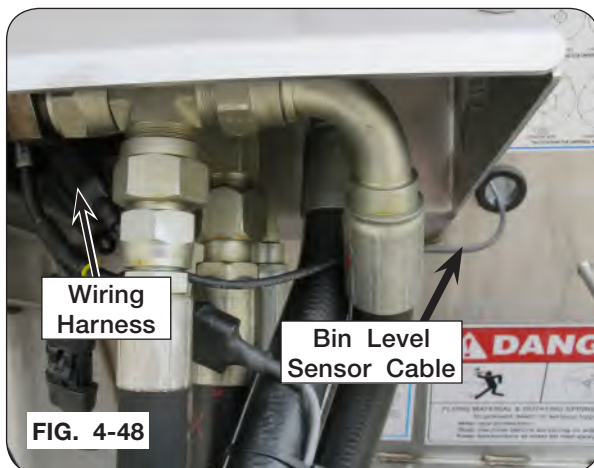
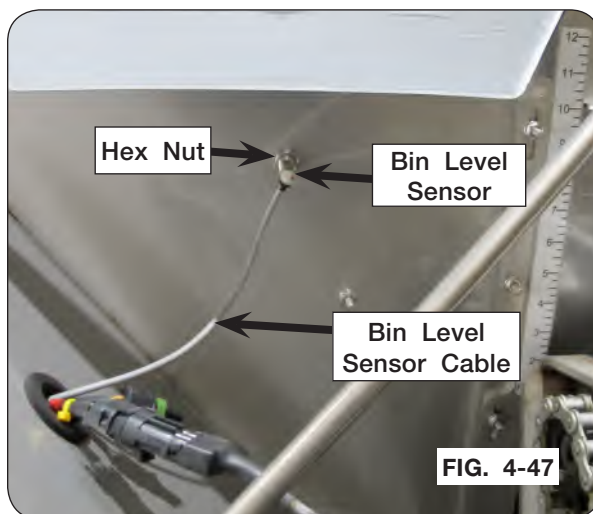
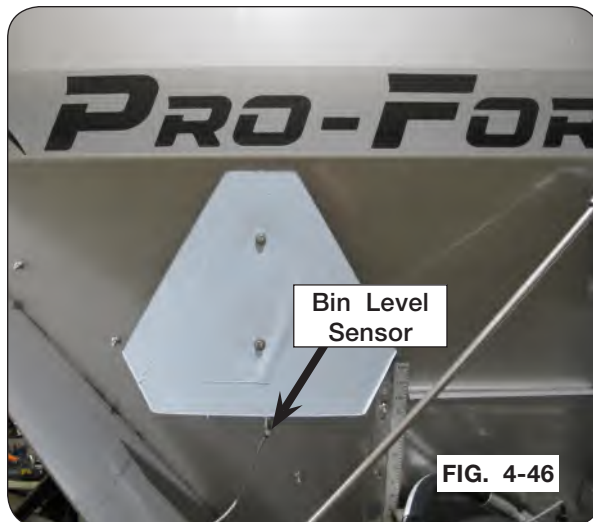
WARNING

- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE DRY SPREADER TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.

1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



2. Disconnect previous bin level sensor cable from the bin level sensor and other end from the wiring harness.
3. Remove previous bin level sensor and hardware from the spreader box. Discard bin level sensor and hardware. (FIG. 4-46)
4. Outside of the spreader box, slide one hex nut (9008808) onto new bin level sensor (9009180). (FIGS. 4-46 & 4-47)
5. Insert bin level sensor through the rear panel with connector end out of the spreader box. (FIG. 4-47)
6. Inside the spreader box, attach bin level sensor to the inside rear panel using remaining hex nut (9008808).
7. Route bin level sensor cable as shown in figures 4-47 and 4-48 and connect to wiring harness.

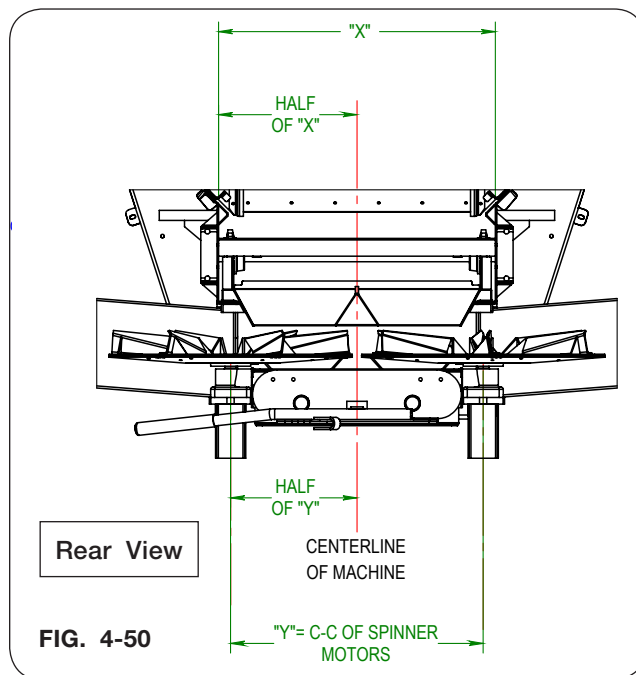
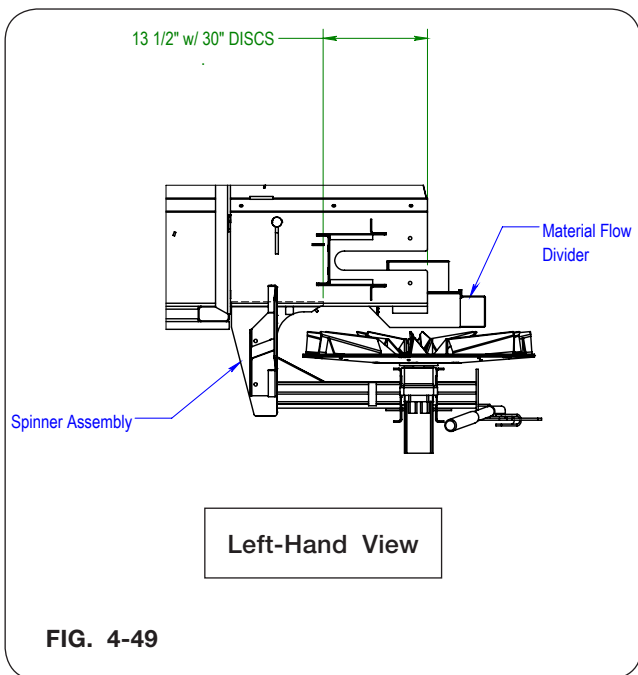


Spinner and Material Flow Divider Assembly

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 600 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

NOTE: Verify all dimensions to ensure squareness of spinner assembly and material flow divider. If these items are not located properly, the spread pattern will be affected. The material flow divider and spinner assembly **MUST** be centered in the flow of material to get an adequate spread pattern.



1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.



2. Measure from rear edge of spinner frame to end of conveyor frame rail to verify correct spinner location. (FIG. 4-49)
3. Verify that dimension is the same on both the driver's side and the passenger's side to ensure squareness. (FIG. 4-50)
4. If the dimension is not the same, using a safe lifting device rated for 600 lbs., adjust the spinner assembly.

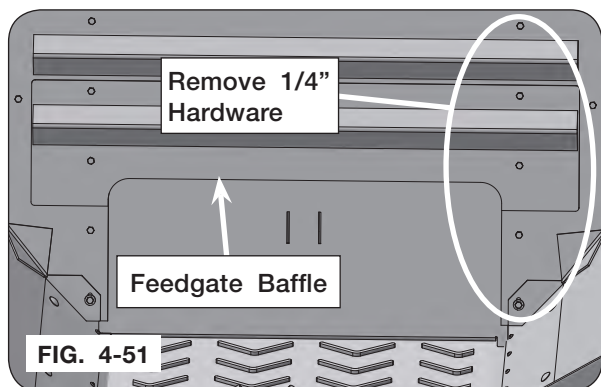
Rear Feedgate Door Replacement

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYEWEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- TO PREVENT PERSONAL INJURY OR DEATH, ALWAYS ENSURE THAT THERE ARE PEOPLE WHO REMAIN OUTSIDE THE MACHINE TO ASSIST THE PERSON WORKING INSIDE, AND THAT ALL SAFE WORKPLACE PRACTICES ARE FOLLOWED. THERE IS RESTRICTED MOBILITY AND LIMITED EXIT PATHS WHEN WORKING INSIDE THE IMPLEMENT.

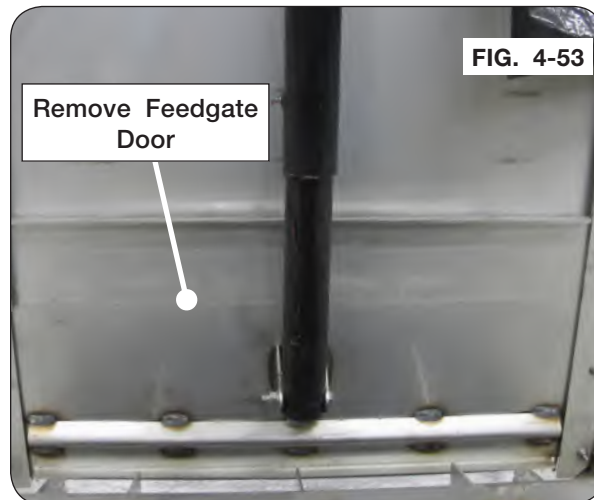
IMPORTANT

- *Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.*
1. Park the empty spreader on a firm, level surface. Block the machine to keep it from moving. Set the vehicle's parking brake, shut off the engine, remove the ignition key, disconnect PTO and hydraulics from the vehicle to the spreader.
 2. Remove and discard the 1/4" hardware from the feedgate slides. (FIG. 4-51)
 3. Remove and retain internal feedgate baffle (416673), if equipped. (FIG. 4-51)
 4. Remove and discard the 3/8" hardware attaching the feedgate jack to the gate. (FIG. 4-52)



Rear Feedgate Door Replacement (continued)

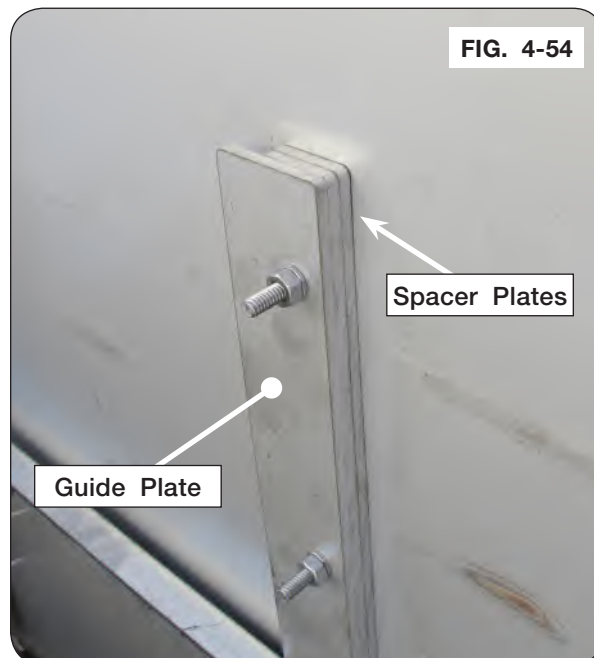
5. Remove and discard the current feedgate door (416608) from the spreader. (FIG. 4-53)



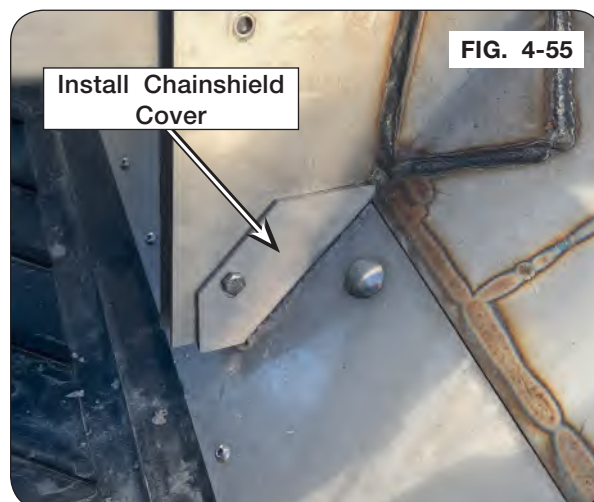
6. Align 2 feedgate guide spacer plates (416669) against the hopper and 1 feedgate guide plate (416670) against the spacer plates on both sides of the door. (FIG. 4-54)

NOTE: Do not install capscrews in the bottom position on both sides and do not install bolts in the top and middle positions of the left-hand side.

7. From inside the spreader box and using internal feedgate baffle from step 3, insert 1/4"-20UNC x 1-1/2" SS capscrews (900900-007) through the holes on the internal feedgate baffle, spreader box, feedgate guide spacer plates and feedgate guide plate to the right-hand and left-hand sides. Secure the plates to the hopper by using 1/4"-20UNC hex nuts. (FIG. 4-54)



8. On the inside of the spreader, position a chainshield cover (415236) at a lower corner of the feed gate opening. The cover should take up any gap between the rear wall and the chain shield. Use the provided 1/4" hardware to secure the cover to the rear wall. (FIG. 4-55) Repeat the process for the other side. The silicone seal in this area may need to be removed and re-applied once the cover is installed.



Rear Feedgate Door Replacement (continued)

9. Slide the new feedgate weldment (416608) into position between the hopper and the guide plates. (FIG. 4-56)

10. Attach feedgate weldment to the bottom of feedgate jack using the provided 3/8" hardware.

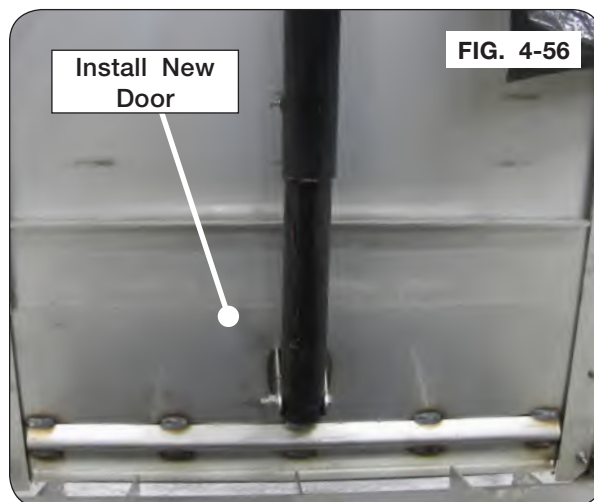


FIG. 4-56

11. On the outside of the spreader, position the indicator plate (413828) so the slotted holes are over the top and middle bolt holes on the left-hand side. The ruler edge of the plate will be near the rear feedgate door. (FIG. 4-57)

12. Measure from the top of the conveyor belt to the bottom of the feedgate. Make sure the feedgate indicator decal ruler (9010124) at the top of the feedgate matches that measurement. Once the ruler is properly adjusted, secure using the provided 1/4" hardware. (FIG. 4-57)

13. Torque the 1/4" hardware to 8-10 ft. lbs. and the 3/8" hardware to 25-28 ft. lbs.

14. Test feedgate for proper working motion.

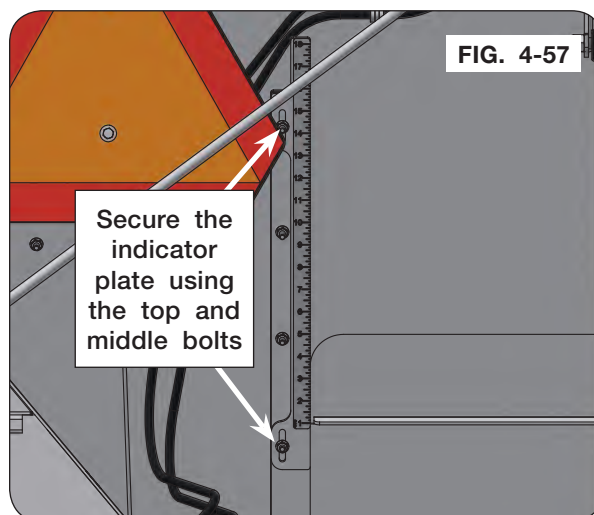


FIG. 4-57

Winterizing

WARNING

- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR FERTILIZERS AND/OR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF FERTILIZERS AND/OR CHEMICALS.

Before storing the spreader in freezing climates, perform the following winterizing procedure:

1. Remove as much water, debris, fertilizer and chemicals from the hopper as possible.
2. Wash the spreader thoroughly inside and out with a high-pressure washer. When using pressure washers, maintain an adequate distance so not to force water into bearings, hydraulic connections or electrical connections.
3. After washing machine, spray an oil/diesel mixture on conveyor chain to avoid corrosion. Refer to “Lubrication” outlined in “MAINTENANCE” section.

Tarp Troubleshooting Inspection & Maintenance

PROBLEM	SOLUTION
TARP SAGS IN MIDDLE AREAS	1. BOWS MAY BE BENT OR ADJUSTED TOO LOW 2. MISSING OR LOOSE RIDGE STRAP REPLACE OR RETIGHTEN 3. TENSION MAY BE TOO LOOSE. TARP SPOOL CABLE MAY NEED TO BE ADJUSTED ON FRONT AND REAR CABLE SPOOLS TO PROVIDE MORE TENSION
HOLES OR TEARS IN TARP	1. CONSULT YOUR LOCAL DEALER FOR REPAIRS 2. ORDER NEW TARP FROM DEALER 3. WHEN NEW TARP OR PARTS ARE NEEDED ALWAYS REPLACE WITH ORIGINAL PARTS

Inspection and Maintenance

WARNING

- TO PREVENT PERSONAL INJURY OR DEATH, DO NOT ALLOW ANYONE ON A CLOSED TARP. TARP SYSTEM IS NOT DESIGNED TO SUPPORT A PERSON.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. REMOVE ACCUMULATED WATER/SNOW/ICE OR ANY OTHER OBJECTS FROM TARP BEFORE OPENING TARP.

IMPORTANT

- *Do not open or close tarp while moving or in high wind conditions. Damage to the tarp may occur.*
- *Tarp should not be used if it is torn or the spool cables are frayed or show damage. Fully close tarp with tension on the tarp stops to prevent water from pooling.*

Periodic preventive maintenance should be practiced. Inspect tarp and hardware often for abrasions or loosened bolts that may need adjustment and/or repair. Check spool cables for wear and adjust tension at the beginning of the season and again half way through the season.

Tears in tarp should be addressed before further tarp operation. If water pools on tarp, adjust tension of tarp cables and/or crank handle tension.

If installed correctly, tarp should always operate as well as when first installed. If tarp does not pass this simple inspection, make all appropriate repairs or adjustments immediately before serious damage occurs.

Troubleshooting

Problem	Possible Cause	Corrective Action
Spinner will not run	Incorrect start up sequence	Refer to “Spreader Start Up Procedure” section in OPERATION.
	No hydraulic flow	Verify hydraulic connectors are fully engaged into the SCVs. Verify flow is in constant and the pressure side is on the hoses marked “+”. If equipped with PTO, ensure PTO is running at 1,000 RPM. Pressure check if necessary.
	Faulty speed signal	Swap spinner and conveyor speed sensor connections on the harness. If the issue now shows up on the conveyor, replace spinner speed sensor and return wiring to original. If the issue remains with the spinner, inspect harness and repair or replace.
	Servo valve not responding	Increase control effort in control valve settings.
		Manually override servo valve. Refer to the “Hydraulic Servo Valve Manual Override & Timing” section in MAINTENANCE. If the spinners spin when valve is overridden, issue is electrical. If the spinners do not spin, issue is hydraulic.
	Faulty control valve	Replace valve.
	No voltage at control valve	Verify spinner RPM control is ON and master switch is ON.
		Verify spinner RPM target is entered.
Verify valve type and settings are correctly configured.		
	Verify harness is in good working condition.	
Spinners not achieving target speed	Master Switch OFF	Cycle Master Switch to ON. Allow 3–4 seconds for the spinners to achieve target speed.
	Oil flow too low	Flow requirement for a combined hydraulic system (2 SCV sets used) is 46 GPM. Flow requirement for a split hydraulic system (4 SCV sets used) is 76 GPM.
	Control valve settings incorrect	Adjust control valve settings to correct spinner speed.
		Manually override servo valve to verify. Refer to the “Hydraulic Servo Valve Manual Override & Timing” section in MAINTENANCE. If the spinners operate smoothly, issue is in electronics. Verify valve type and settings are correctly configured. NOTE: Verify Control Effort and Response Rate settings. If spinners continue to operate erratically, issue is in hydraulics.
	Conveyor hydraulic demand too high	Lower conveyor hyd. requirements by opening feedgate 1” and re-calibrating flow. See “RCM Spreader Set Up” section.
	Faulty speed signal	Ensure retaining bolt is properly holding sensor in place.
		Verify there are 4 screws installed in the jack shaft assembly for the speed sensor to read.
		Swap spinner and conveyor speed sensor connections on the harness. If the issue now shows up on the conveyor, replace spinner speed sensor and return wiring to original. If the issue remains with the spinner, inspect harness and repair or replace.
	Faulty control valve	Replace valve.
Spinners running separate RPMs	Boundary Control ON	Turn Boundary Control OFF.
	50/50 valve malfunction	Disassemble valve and clean out any debris. Replace if necessary.
	Fault in jack shaft assembly	Inspect jackshaft assembly. Grease or replace bearings.
Spinners will not turn off	Valve is manually overridden or out of time	Re-time valve. See “Hydraulic Servo Valve Manual Override & Timing” in MAINTENANCE.
	Faulty control valve	Replace valve.

Troubleshooting (continued)

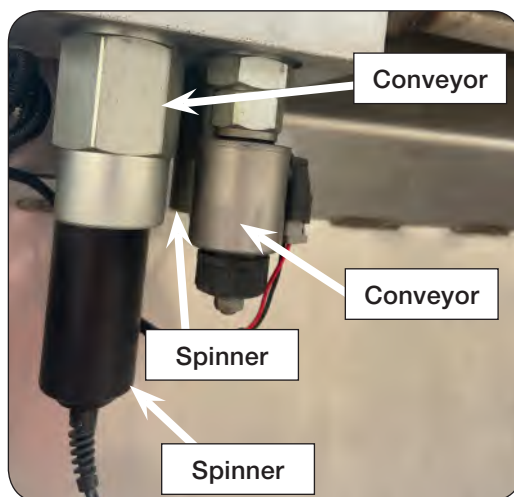
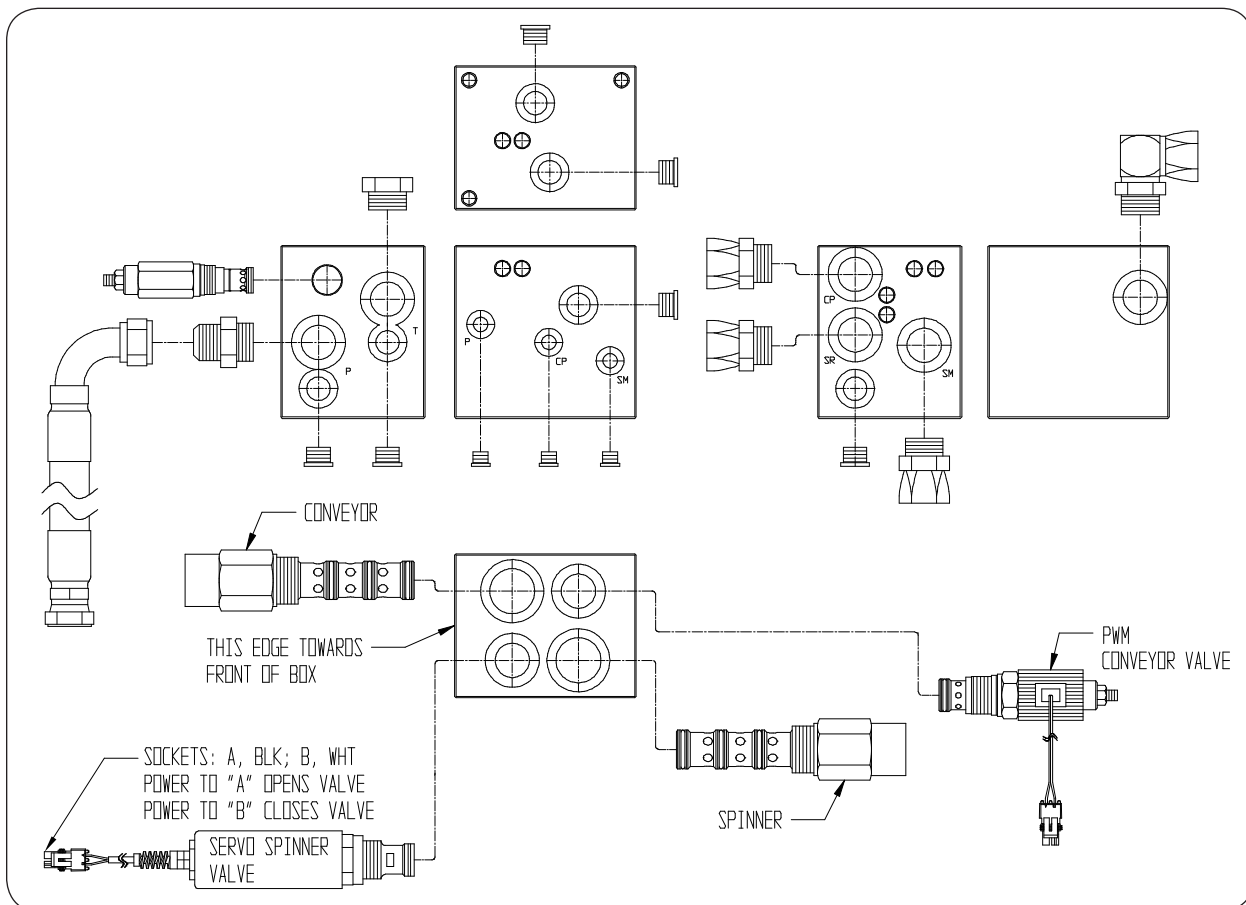
Problem	Possible Cause	Corrective Action
Spinners running erratic	Oil flow too high	Flow requirement for a combined hydraulic system (2 SCV sets used) is 46 GPM. Flow requirement for a split hydraulic system (4 SCV sets used) is 76 GPM. Flow requirement for a spinner circuit hydraulic system is 38 – 46 GPM.
	Control valve settings incorrect	Adjust control valve settings to correct spinner speed.
		Manually override servo valve to verify. Refer to the “Hydraulic Servo Valve Manual Override & Timing” section in MAINTENANCE. If the spinners operate smoothly, issue is in electronics. Verify valve type and settings are correctly configured. NOTE: Verify Control Effort and Response Rate settings. If spinners continue to operate erratically, issue is in hydraulics.
	Faulty speed signal	Ensure retaining bolt is properly holding sensor in place.
		Verify there are 4 screws installed in the jackshaft assembly for the speed sensor to read.
		Swap spinner and conveyor speed sensor connections on the harness. If the issue now shows up on the conveyor, replace spinner speed sensor and return wiring to original. If the issue remains with the spinner, inspect harness and repair or replace.
Conveyor will not run	Incorrect start up sequence	Refer to “Spreader Start Up Procedure” section in OPERATION.
	No hydraulic flow	Verify hydraulics are hooked up correctly and engaged in the proper direction. If equipped with PTO, ensure PTO is running at 1,000 RPM. Pressure check if necessary.
	No travel speed present	Ensure machine is moving or a test speed is entered.
	Swath control boundary or applied area	Ensure machine is within a boundary and not in a previously applied area.
	Prescription rate	Ensure machine is within a boundary and not in a 0-rate area.
	PWM valve not responding	Manually override PWM valve to verify. Refer to the “Hydraulic Servo Valve Manual Override & Timing” section in MAINTENANCE. If the conveyor operates smoothly, issue is in electronics. Verify valve type and settings are correctly configured. If conveyor does not operate smoothly, issue is in hydraulics.
	Conveyor hydraulic demand too high	Lower conveyor hyd. requirements by opening feed gate 1” and re-calibrating flow. See “RCM Spreader Set Up” section.
Conveyor not achieving target rate	Incorrect spreader set up	Perform a product density test and verify setting.
		Measure gate height and verify setting.
		Verify spreader constant setting.
	Faulty speed signal	Ensure retaining bolt is properly holding sensor in place.
		Swap spinner and conveyor speed sensor connections on the harness. If the issue now shows up on the spinner, replace conveyor speed sensor and return wiring to original. If the issue remains with the conveyor, inspect harness and repair or replace.
	Faulty control valve	Replace valve.
	Conveyor hydraulic demand too high	Slow down application speed.
		Lower conveyor hyd. requirements by opening feed gate 1” and re-calibrating flow. See “RCM Spreader Set Up” section.

(Continued on next page)

Troubleshooting (continued)

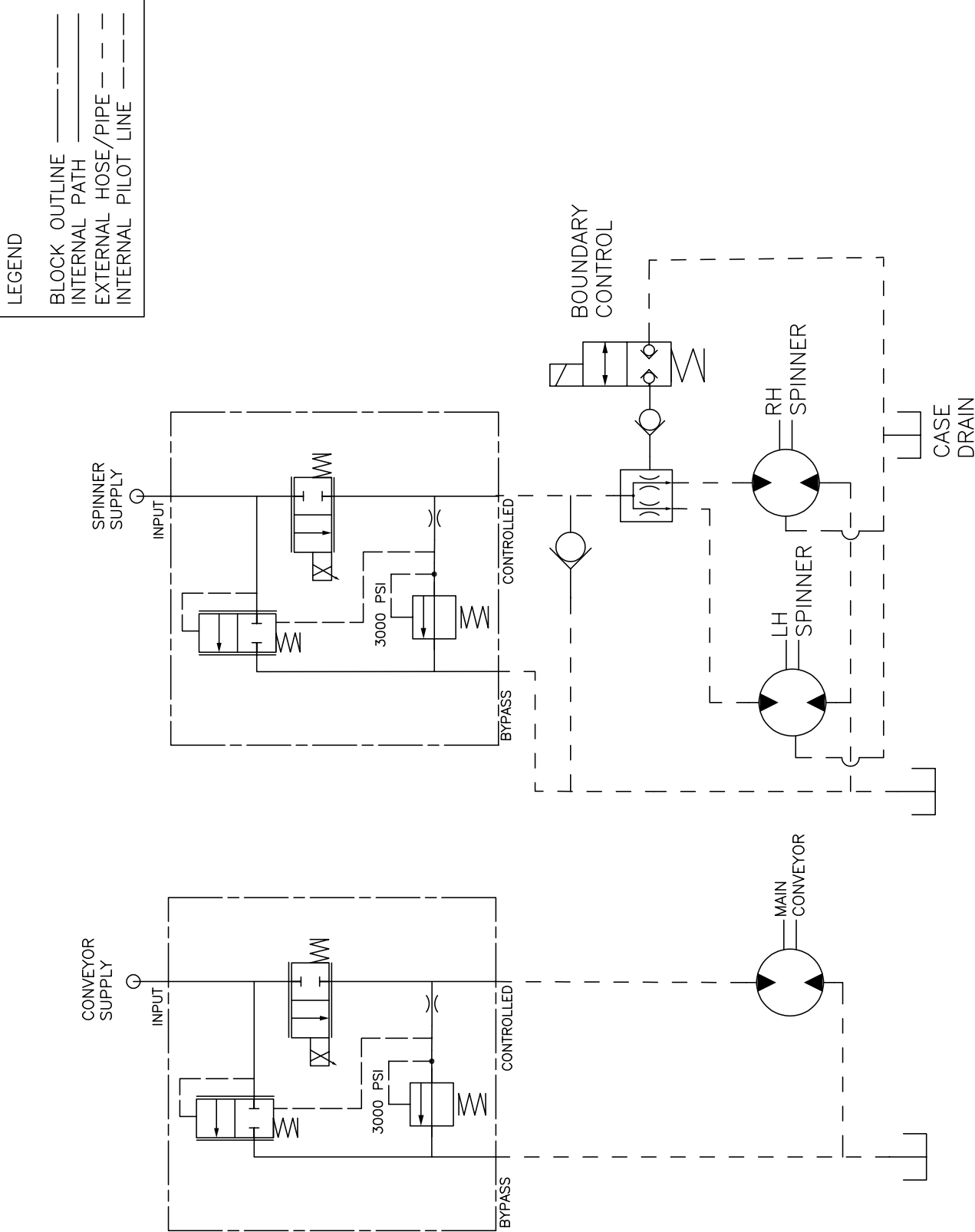
Problem	Possible Cause	Corrective Action
Conveyor running erratic	Control valve settings incorrect	Adjust control valve settings to correct conveyor speed.
		Manually override servo valve to verify. Refer to the “Hydraulic Servo Valve Manual Override & Timing” section in MAINTENANCE. If the conveyor operate smoothly, issue is in electronics. Verify valve type and settings are correctly configured. NOTE: Verify Control Effort and Response Rate settings. If conveyor continue to operate erratically, issue is in hydraulics.
	Faulty speed signal	Ensure retaining bolt is properly holding sensor in place.
		Swap spinner and conveyor speed sensor connections on the harness. If the issue now shows up on the spinner, replace conveyor speed sensor and return wiring to original. If the issue remains with the conveyor, inspect harness and repair or replace.
Conveyor will not shut off	Faulty control valve	Replace valve.
	Servo valve installed and manual overridden or out of time	Re-time valve. See “Hydraulic Servo Valve Manual Override & Timing” section in MAINTENANCE.
	Faulty control valve	Replace valve.

Main Valve Block Assembly - Spinner & Conveyor (Chassis Mount)

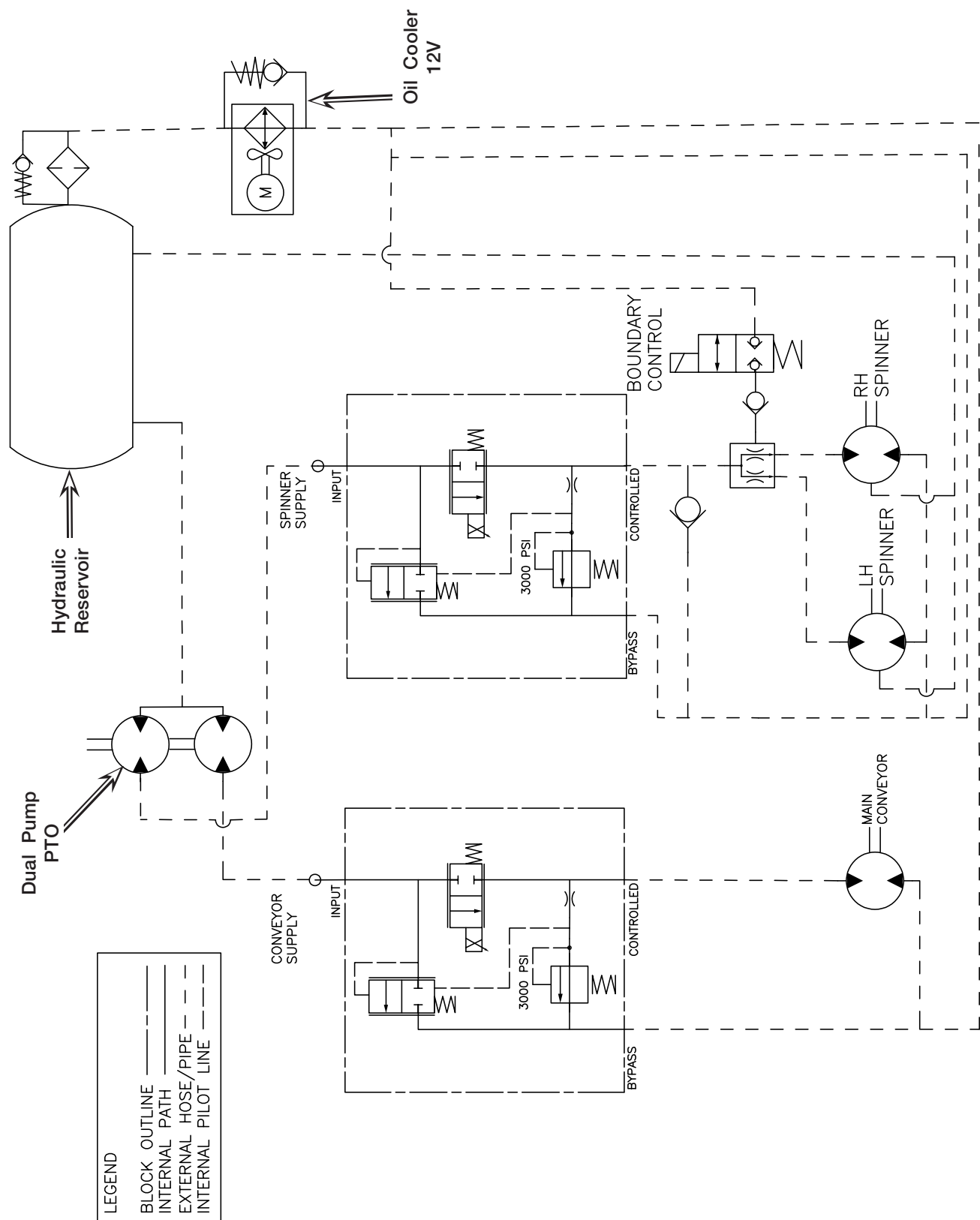


See "Hydraulic Fittings" and "Hydraulic System Valves & Steel Pipe Adapters" in the MAINTENANCE section for torque specifications.

**Schematics - SCV Split Hydraulics With Boundary Control (Opt.)
(18, 22, & 2650 Undercarriage Mount)**

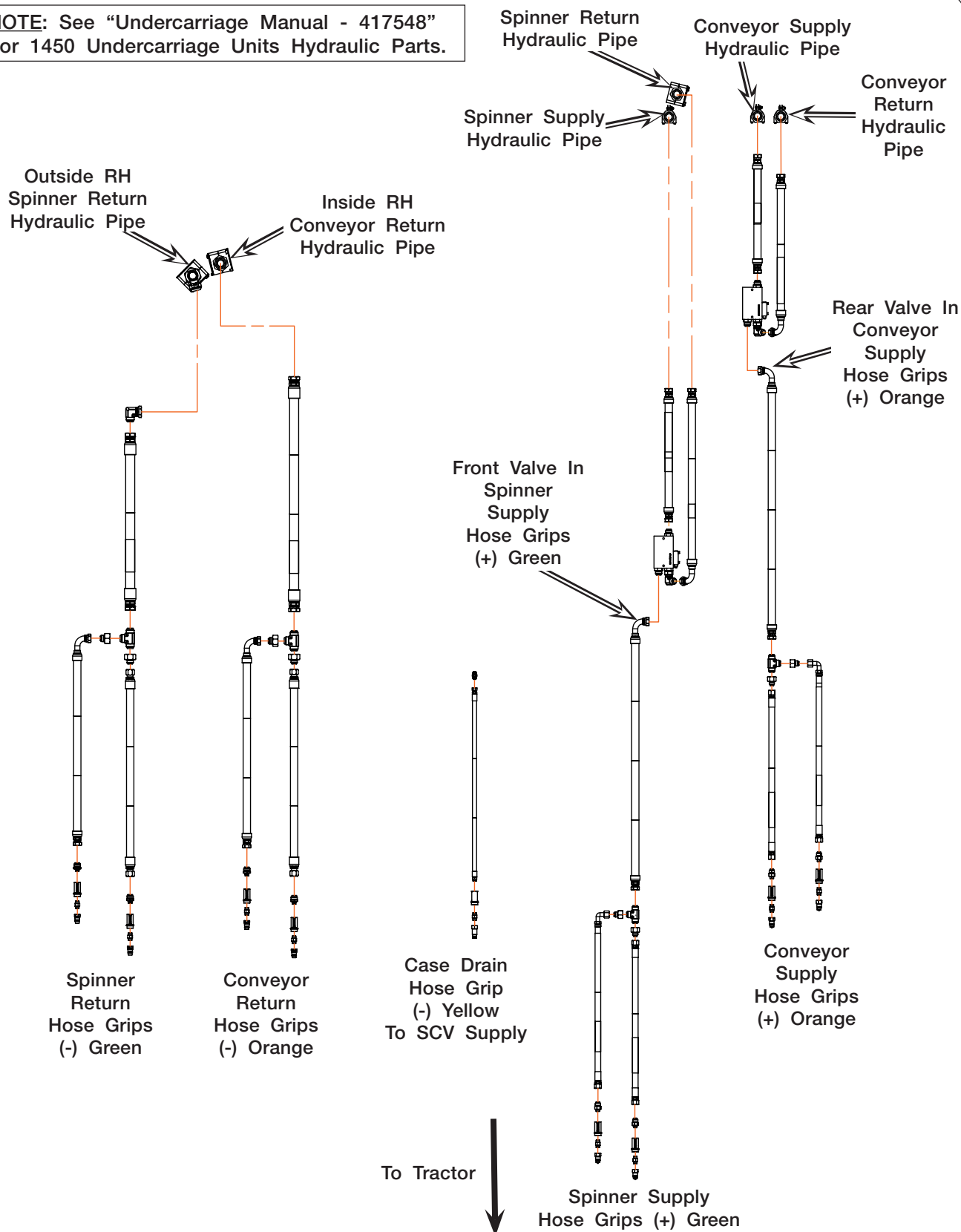


Schematics - Dual Pump PTO Hydraulic Drive
(18, 22, & 2650 Undercarriage Mount)



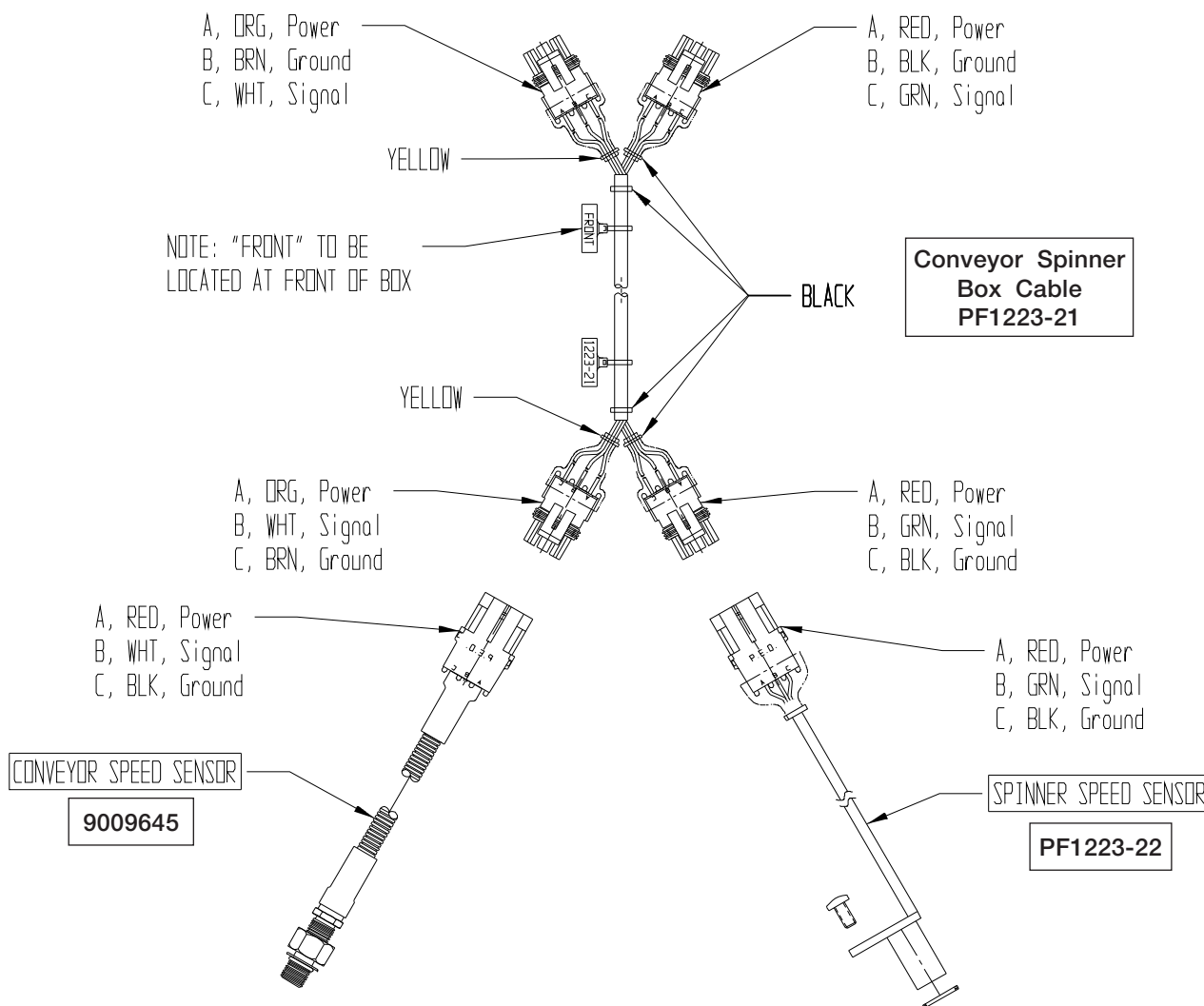
Hose Connections — SCV Split Hydraulics (Opt.) (18, 22, & 2650 Undercarriage Mount)

NOTE: See “Undercarriage Manual - 417548”
For 1450 Undercarriage Units Hydraulic Parts.



Schematic — Electrical — Troubleshooting Spinner & Conveyor Speed Sensor Wiring Harness

NOTE:
For operating set up, maintain tie
strap color coding between sensors
and console harness.

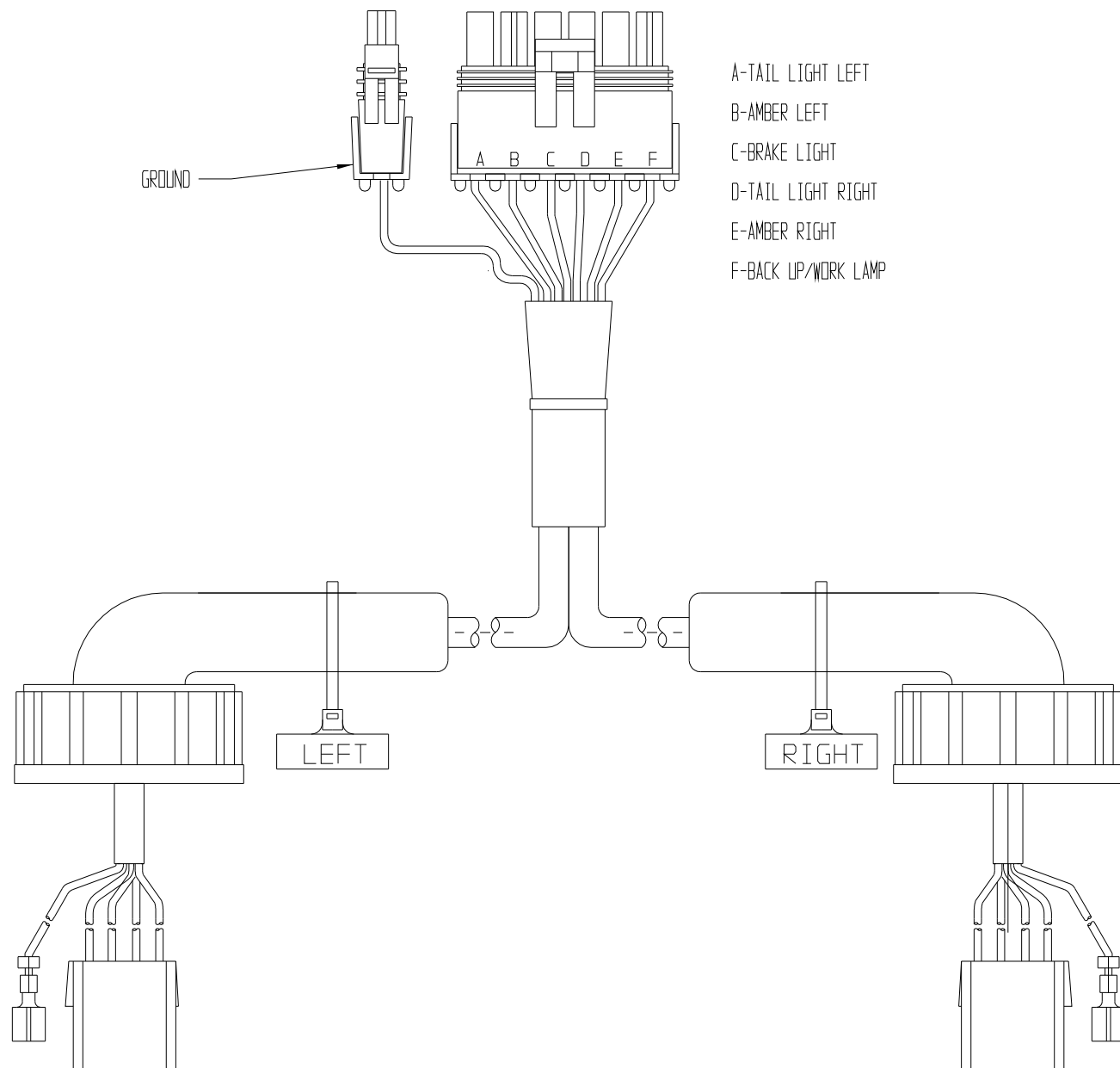


If console loses rate or spinner speed and the function is moving, the connectors shown on this page can be swapped at the rear of the spreader to troubleshoot the system.

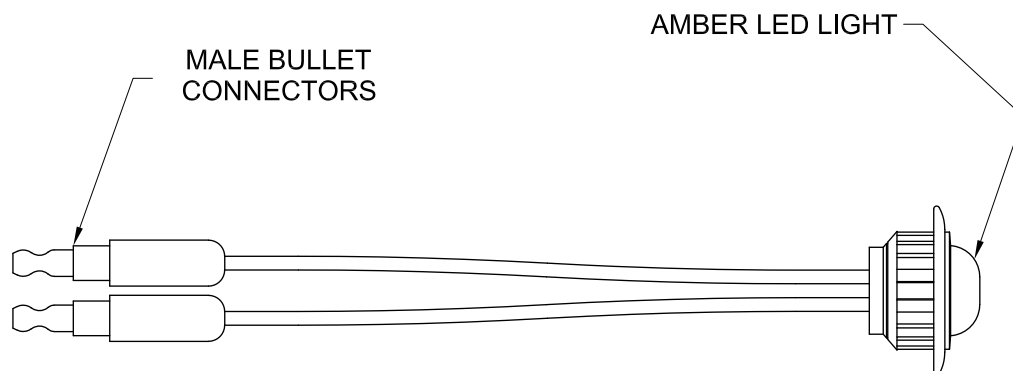
EXAMPLE: If the spinner's speed is working and the connectors are switched, the spinners should show up as an application rate. If the application rate still is not reading, there is a controller or cable problem. Check the programming numbers and cables. If a rate reading is received, the sensor could be bad.

Different controllers supply different voltages. There should be at least 5 volts on the power and signal leads

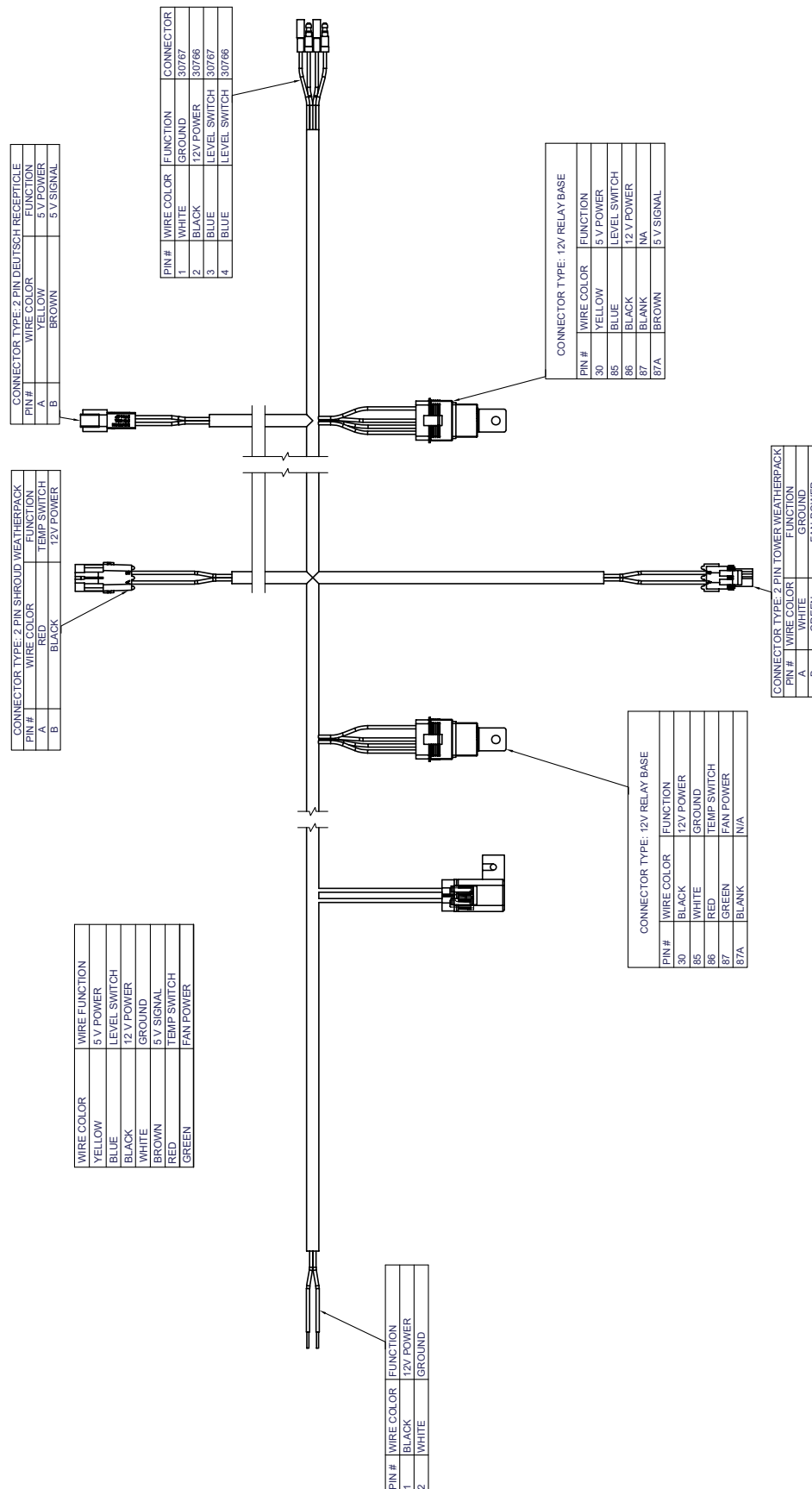
**Schematic — Electrical — Chassis Mounted Unit
Tail Light Wiring Harness (PF1223-752)**



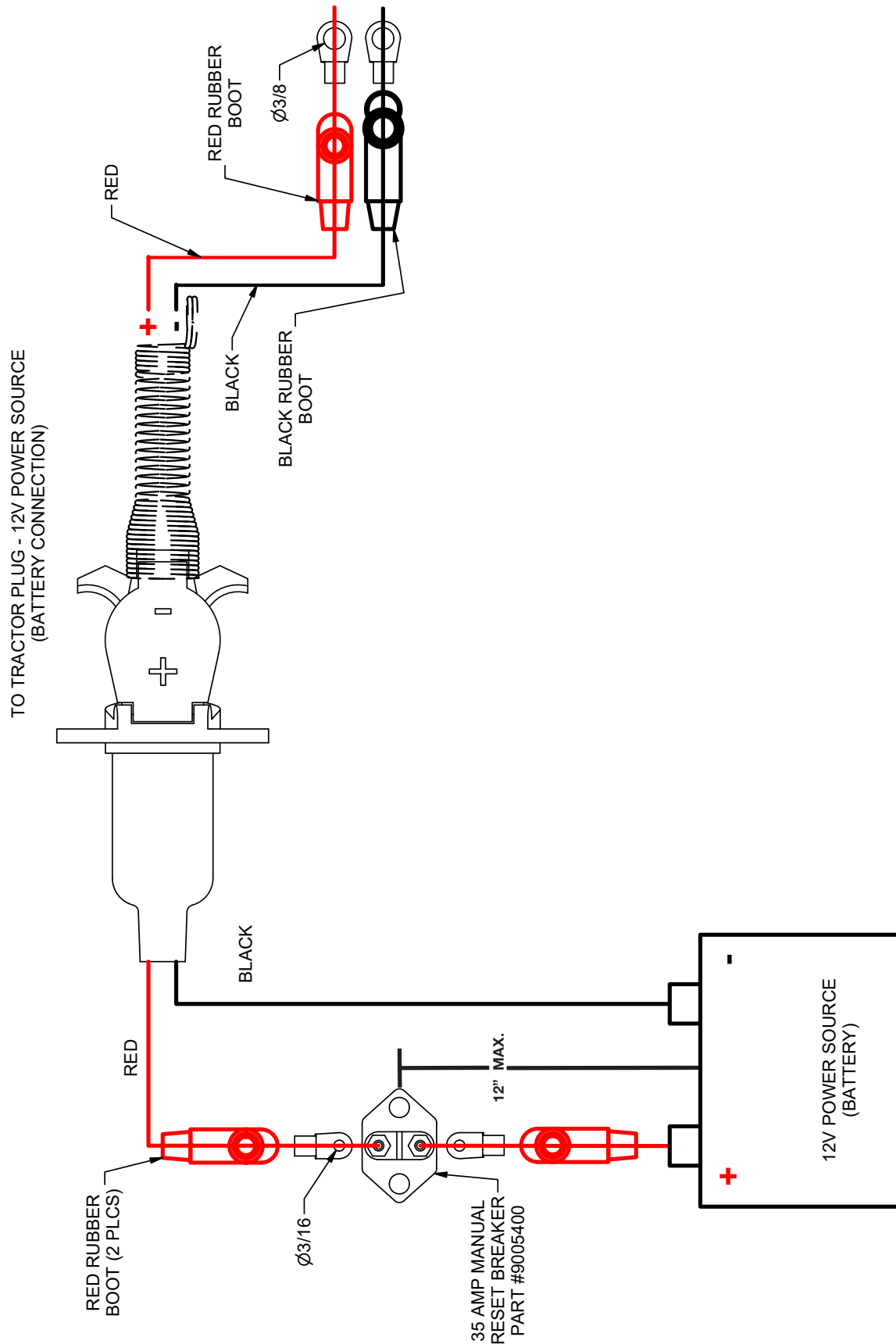
**Schematic — Electrical — (18, 22, 2650 Undercarriage Mount)
Micro Dot, LED Light #9006107**



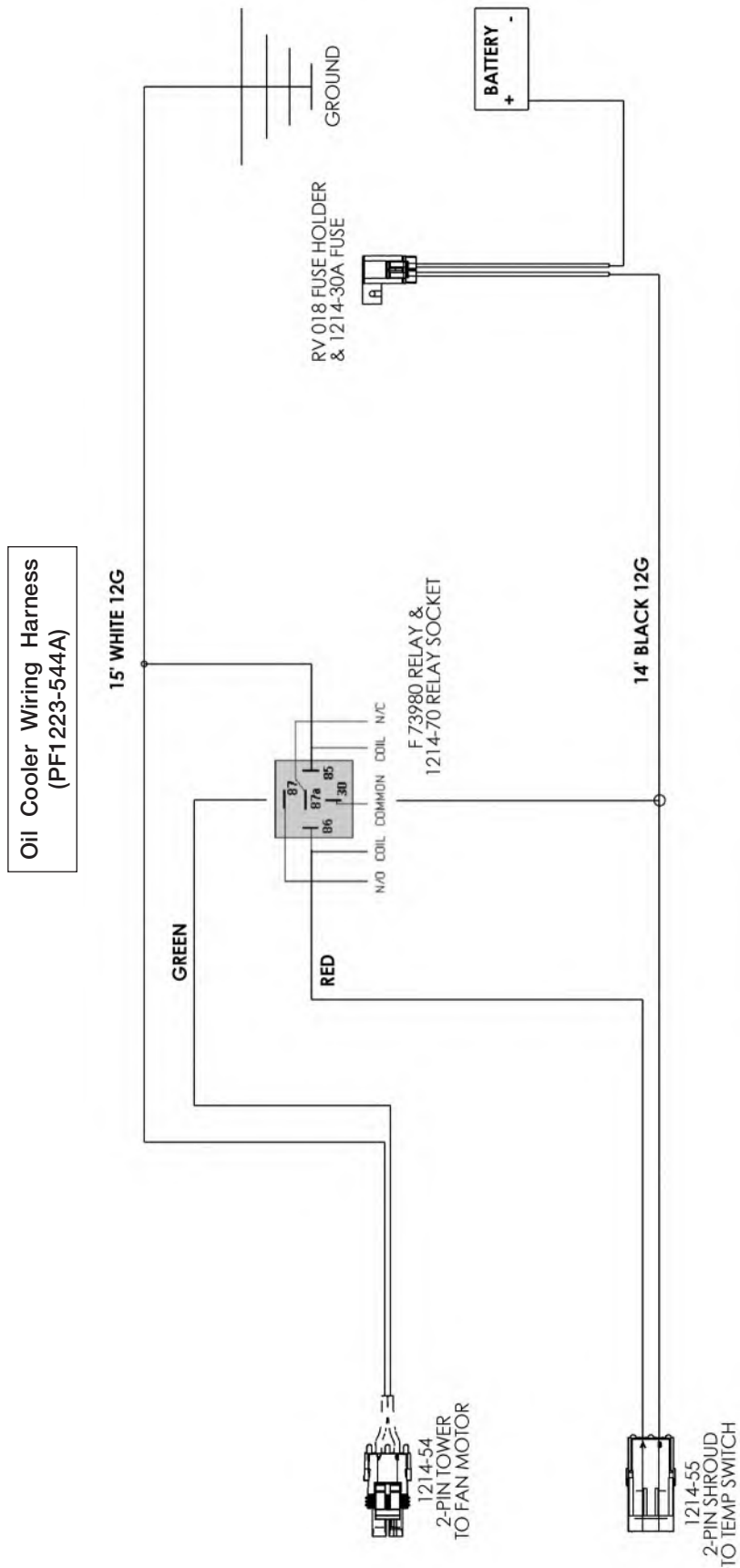
Schematic — Electrical — (18, 22, 2650 Undercarriage Mount)
PTO Oil Cooler Fan #9010277



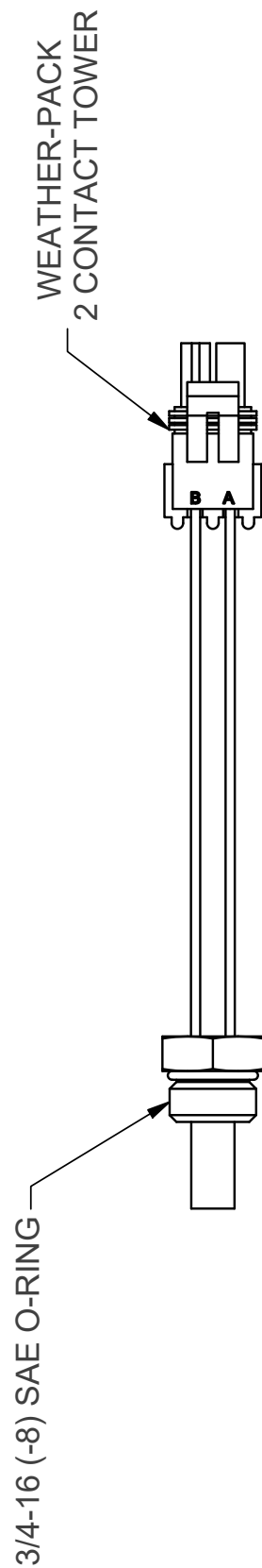
Schematic — Electrical — (18, 22, 2650 Undercarriage Mount) PTO Oil Cooler Wiring Harness Connection



Schematic — Electrical — (Chassis Mount)
Oil Cooler Fan #PF1223-544A

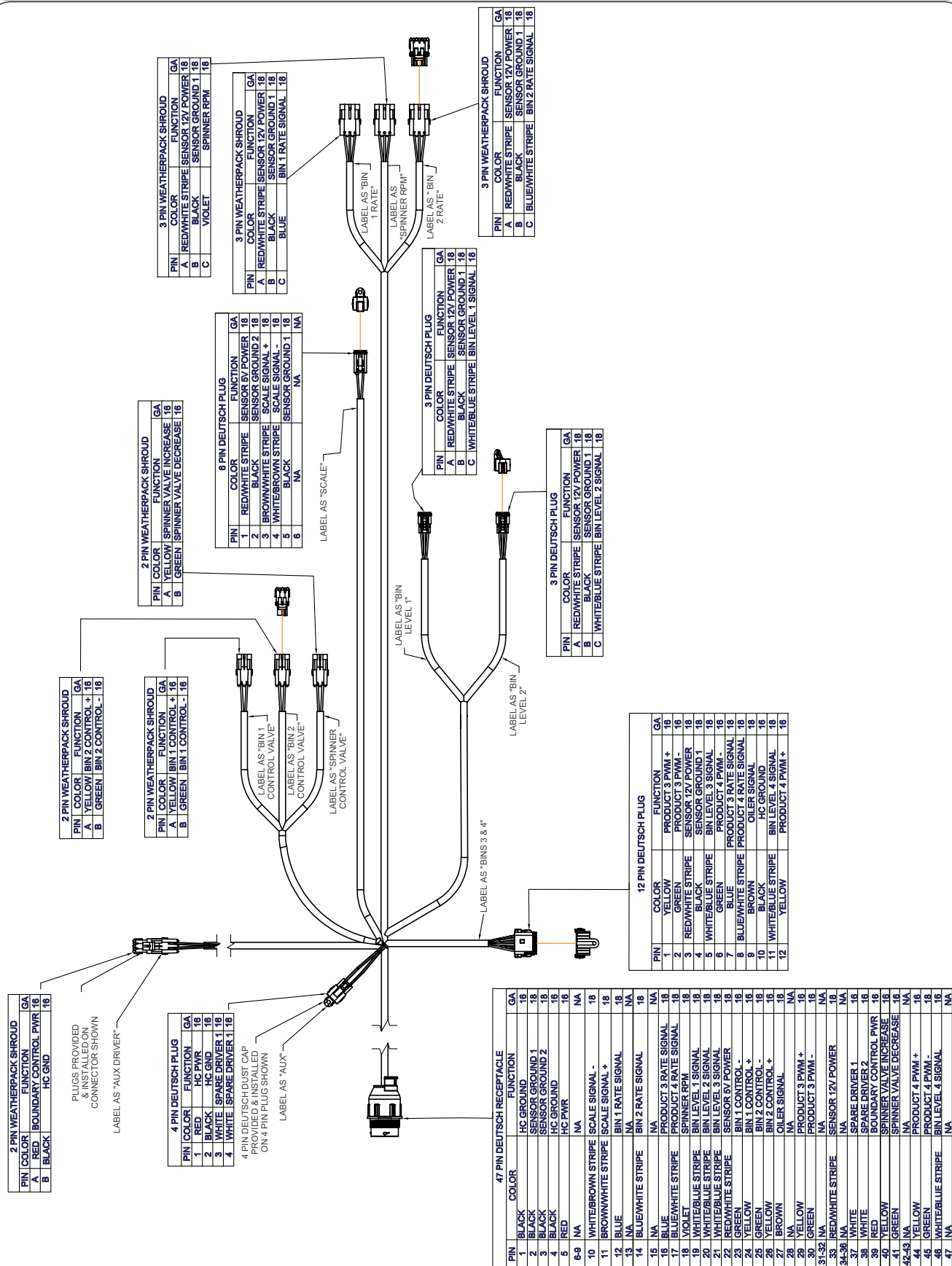


**Schematic — Electrical — (Chassis Mount)
Temperature Switch #9009169**

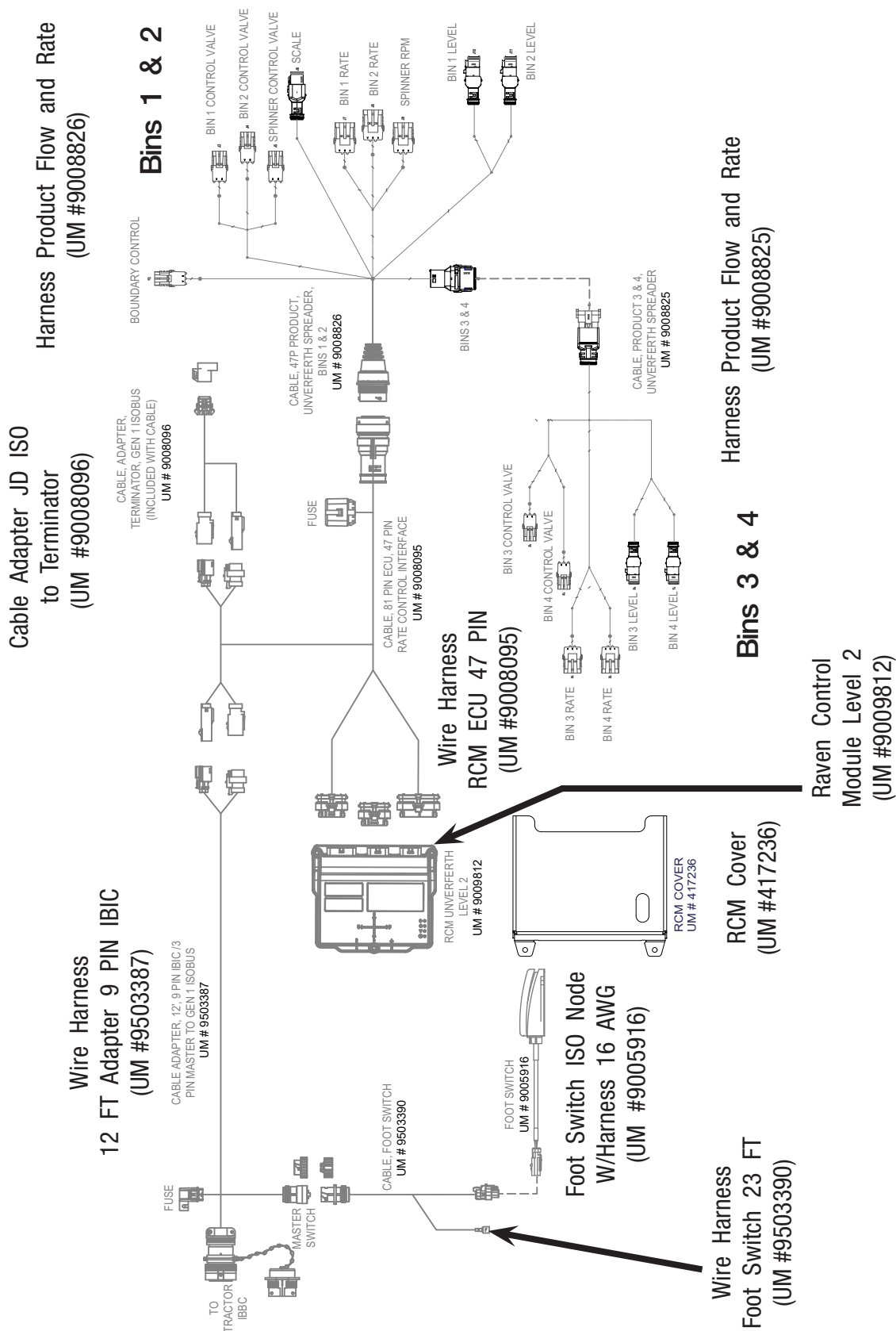


PROBE LENGTH: 3/4"
CIRCUIT FORM: A (SPST-NO)
FIXED SET POINT: 120°
SET POINT DIRECTION: RISING
CONTACTS: GOLD DIFFUSED, FINE SILVER
CONTACTS (3A @ 240 VAC-2A @ 24 VDC)

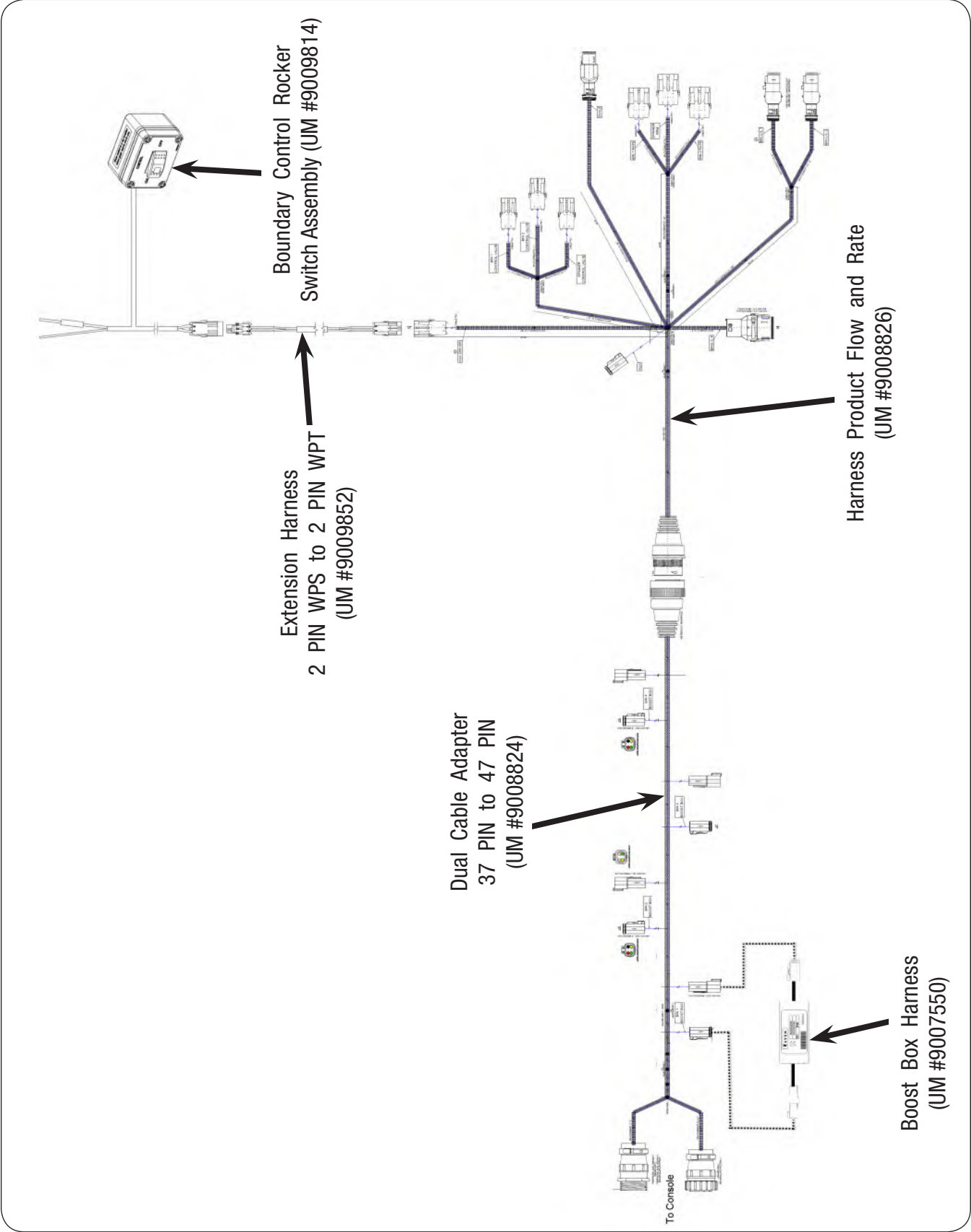
Schematic – Product Flow & Rate Harness (9008826)



Schematic – RCM Wiring Harness



Schematic — Less Raven ISOBUS Rate Control Wiring Harness



Fertilizer Density Chart

Fertilizer	Density (Lbs./Cu.Ft.)
Prilled Urea	45-51
Granular Urea	45-51
Prilled Ammonium Nitrate	53-61
Crystalline Ammonium Sulfate	62-69
Ammonium Sulfate	49-65
Diammonium Phosphate (DAP)	54-66
Granular Monoammonium Phosphate (MAP)	54-66
Powdered Monoammonium Phosphate (MAP)	53-62
Granular Triple Superphosphate (TSP)	59-75
Ammonium Phosphate	56-75

Complete Torque Chart

Stainless Steel Capscrews - ASTM F593

IMPORTANT

- Stainless steel hardware has a natural tendency to cold weld/gall when installed/uninstalled at high speeds and/or high torques. It is recommended to apply a thread lubricant approved for stainless steel such as graphite-based anti-seize or molybdenum disulfide based anti-seize when performing an assembly/disassembly of stainless steel hardware. Unverferth PN 9504206 or equivalent.
- The torque recommendations below are for lubricated stainless steel hardware.

SIZE	INCH POUNDS	NEWTON METERS
1/4-20	62	7
1/4-28	71	8
5/16-18	128	15
5/16-24	142	16

SIZE	FOOT POUNDS	NEWTON METERS
3/8-16	19	26
3/8-24	21	29
7/16-14	30	41
7/16-20	34	46
1/2-13	46	63
1/2-20	52	71
9/16-12	67	91
9/16-18	74	100
5/8-11	92	125
5/8-18	104	141
3/4-10	113	153
3/4-16	126	171
7/8-9	182	247
7/8-14	201	273
1-8	273	370
1-14	306	415
1 1/4-7	545	739
1 1/4-12	604	819
1 3/8-6	715	970
1 3/8-12	813	1102
1 1/2-6	949	1287
1 1/2-12	1067	1447

Complete Torque Chart (continued)

Capscrews - Grade 5

NOTE:

- Grade 5 capscrews can be identified by three radial dashes on the head.
- Capscrews have a yellow or clear appearance.



SIZE	FOOT POUNDS	NEWTON METERS
1/4-20	8-10	11-13
1/4-28	9-11	12-15
5/16-18	15-17	20-23
5/16-24	17-19	23-26
3/8-16	25-28	34-38
3/8-24	28-31	38-42
7/16-14	40-45	54-61
7/16-20	45-50	61-68
1/2-13	62-68	84-92
1/2-20	68-75	92-102
9/16-12	90-98	122-133
9/16-18	100-110	134-148
5/8-11	120-135	162-183
5/8-18	124-137	168-186
3/4-10	200-220	270-300
3/4-16	210-230	285-310
7/8-9	330-350	425-475
7/8-14	360-380	460-515
1-8	500-525	675-710
1-14	540-560	730-760
1 1/8-7	600-635	815-860
1 1/8-12	665-700	920-950
1 1/4-7	850-895	1150-1215
1 1/4-12	940-990	1275-1340
1 3/8-6	1125-1175	1525-1590
1 3/8-12	1280-1335	1735-1810
1 1/2-6	1500-1560	2035-2115
1 1/2-12	1685-1755	2285-2380

IMPORTANT

- Follow these torque recommendations except when specified in text.

Complete Torque Chart (continued)

Capscrews - Grade 5 MagniCoated SAE J429

NOTE:

- Grade 5 capscrews can be identified by three radial dashes on the head.
- Capscrews have a black appearance.
- Capscrews have a K value of 0.15



SIZE	INCH POUNDS	NEWTON METERS
1/4-20	76	9
1/4-28	87	10
5/16-18	157	18
5/16-24	174	20

SIZE	FOOT POUNDS	NEWTON METERS
3/8-16	23	32
3/8-24	26	36
7/16-14	37	51
7/16-20	41	56
1/2-13	57	78
1/2-20	64	87
9/16-12	82	112
9/16-18	91	124
5/8-11	113	154
5/8-18	127	173
3/4-10	200	272
3/4-16	223	303
7/8-9	322	437
7/8-14	355	482
1-8	483	655
1-14	542	735
1 1/4-7	840	1139
1 1/4-12	930	1261
1 3/8-6	1102	1495
1 3/8-12	1254	1701
1 1/2-6	1462	1983
1 1/2-12	1645	2231

IMPORTANT

- Follow these torque recommendations except when specified in text.

Complete Torque Chart (continued)

Capscrews - Grade 8

NOTE:

- Grade 8 capscrews can be identified by six radial dashes on the head.
- For wheel torque requirements, refer to Wheels and Tires.



SIZE	FOOT POUNDS	NEWTON METERS
5/16-18	20-22	27-30
5/16-24	21-23	28-31
3/8-16	35-39	47-53
3/8-24	36-41	49-55
7/16-14	54-58	73-78
7/16-20	55-60	75-80
1/2-13	82-88	110-120
1/2-20	94-99	125-135
9/16-12	127-134	170-180
9/16-18	147-155	199-210
5/8-11	160-170	215-230
5/8-18	165-175	225-235
3/4-10	280-295	380-400
3/4-16	330-365	445-495
7/8-9	410-430	555-580
7/8-14	420-440	570-595
1-8	630-650	850-880
1-14	680-700	920-950
1 1/8-7	900-930	1220-1260
1 1/8-12	930-950	1260-1290
1 1/4-7	1250-1300	1695-1760
1 1/4-12	1280-1320	1735-1790

IMPORTANT

- Follow these torque recommendations except when specified in text.

Complete Torque Chart (continued)

Capscrews - Grade 8 MagniCoated SAE J429

NOTE:

- Grade 8 capscrews can be identified by six radial dashes on the head.
- Capscrews have a black appearance.
- Capscrews have a K value of 0.15



SIZE	INCH POUNDS	NEWTON METERS
1/4-20	107	13
1/4-28	123	14
5/16-18	221	25
5/16-24	245	28

SIZE	FOOT POUNDS	NEWTON METERS
3/8-16	33	45
3/8-24	37	51
7/16-14	52	71
7/16-20	58	79
1/2-13	80	109
1/2-20	90	123
9/16-12	115	156
9/16-18	128	174
5/8-11	159	216
5/8-18	180	245
3/4-10	282	383
3/4-16	315	428
7/8-9	455	617
7/8-14	502	681
1-8	681	924
1-14	765	1038
1 1/4-7	1363	1848
1 1/4-12	1509	2046
1 3/8-6	1786	2422
1 3/8-12	2034	2758
1 1/2-6	2371	3215
1 1/2-12	2668	3618

IMPORTANT

- Follow these torque recommendations except when specified in text.

Hydraulic Fittings - Torque and Installation

WARNING

- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING THE IMPLEMENT.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.
- HYDRAULIC SYSTEM MUST BE PURGED OF AIR BEFORE OPERATING TO PREVENT SERIOUS INJURY OR DEATH.
- RELIEVE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE TRACTOR OPERATOR'S MANUAL FOR PROPER PROCEDURES.



Tightening O-Ring Fittings

1. Inspect components for damage or contamination. Do not connect any other type of fitting to an O-ring fitting.
2. For adjustable fittings, ensure the jam nut and washer are fully backed up.
3. Lubricate the O-ring and threads on the fitting with hydraulic oil.
4. Turn the fitting into the port until it is finger tight.
5. For adjustable fittings, set in the desired position.
6. Using a wrench, torque the fitting to the value in the below table. For adjustable fittings the jam nut will be tightened.

NOTE: Never use a power tool to install a fitting.

Dash Size	Thread Size	Straight Stud Torque (Ft-Lbs)	Adjustable Stud Torque (Ft-Lbs)
-5	1/2-20	14-19	10-14
-6	9/16-18	18-24	12-16
-8	3/4-16	27-43	20-30
-10	7/8-14	36-48	30-36
-12	1-1/16-12	65-75	44-54
-14	1-3/16-12	75-99	53-70
-16	1-5/16-12	85-123	59-80
-20	1-5/8"-12	115-161	75-100
-24	1-7/8"-12	125-170	105-125

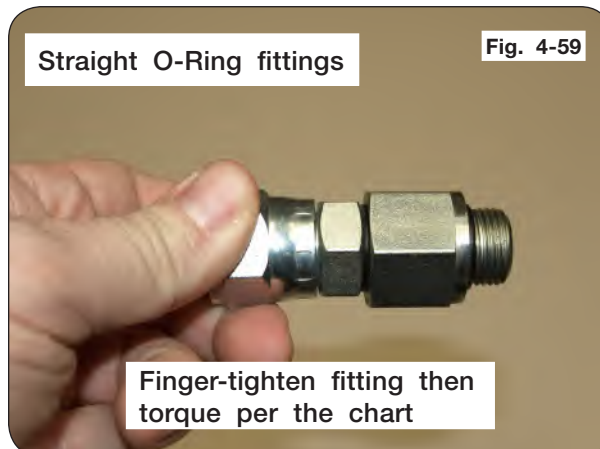
O-Ring fittings

Fig. 4-58



Straight O-Ring fittings

Fig. 4-59



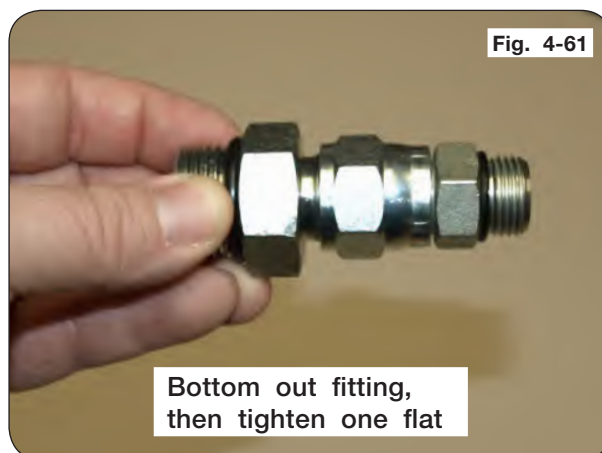
Finger-tighten fitting then torque per the chart

Hydraulic Fittings – Torque and Installation (continued)

Tightening JIC Fittings

1. Inspect all components for damage or contamination. Do not connect any other type of fitting to a JIC fitting.
2. Lubricate the threads with hydraulic oil.
3. Turn the fitting into the port until it bottoms out.
4. Use one wrench on the fixed hex on the hose to prevent twisting and a second on the swivel. Tighten the fitting another 60 degrees (or one flat)

NOTE: Never use a power tool to install a fitting



Steel 37° JIC Adapters		
DASH SIZE	FLARED THREAD SIZE	TORQUE FT.-LBS
-6	9/16"-18	18-20
-8	3/4"-16	27-39
-10	7/8"-14	36-63
-12	1 1/16"-12	65-88
-14	1 3/16"-12	75-103
-16	1 5/16"-12	85-113
-20	1 5/8"-12	115-133
-24	1 7/8"-12	125-167

Hydraulic System Valves & Steel Pipe Adapters - Torque

Hydraulic System Valves

Hydraulic System Valves		
PART NUMBER	TORQUE FT.-LBS.	COIL NUT TORQUE
PF1211-01 (Valve - Hyd Servo)	46-54	
PF1211-08 (Proportional Valve - 10 NC)	55-60	Hand Tighten
416452 (Proportional Valve - 16 NC)	70-75	Hand Tighten
PF1211-80 (Cartridge - PSI Compensator)	65-75	
PF1211-945 (3500 PSI Relief Valve)	45-50	9 Ft.-Lbs.
PF1211-95 (4000 PSI Relief Valve)	45-50	9 Ft.-Lbs.
PF1222-108 (Valve - Cartridge, Logic Element)	65-75	
1222-109 (Solenoid Valve)	18-20	4-5 Ft.-Lbs.

Steel Pipe Adapters

Steel Pipe Adapters		
DASH SIZE	FLARED THREAD SIZE	TORQUE FT.-LBS
-4	1/4"-18	25
-6	3/8"-18	40
-8	1/2"-14	54
-12	3/4"-14	78
-16	1"-11 1/2	112
-20	1 1/4"-11 1/2	154
-24	1 1/2"-11 1/2	211

Notes



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