Seedbed Tillage

Raptor® Strip-Till Tool With 1200 Gallon Liquid Fertilizer Cart

Models 2130LT & 2115LT
Beginning with Serial Number A70820100

Operator's Manual

Part Number 47981

Refer to Part Number 47980 for Part's Manual.

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.

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.

Pre-Operation Checklist

- ☐ Wheel bolts tightened (recheck after initial use)
- ☐ Tire pressures checked
- ☐ Hardware tightened
- ☐ Machine lubricated
- ☐ Safety and operating procedures reviewed
- ☐ Field adjustment information reviewed
- ☐ Hoses properly routed/fittings tight

IMPORTANT

The information, specifications, and illustrations in the manual are on the basis of 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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SECTION I
Safety

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

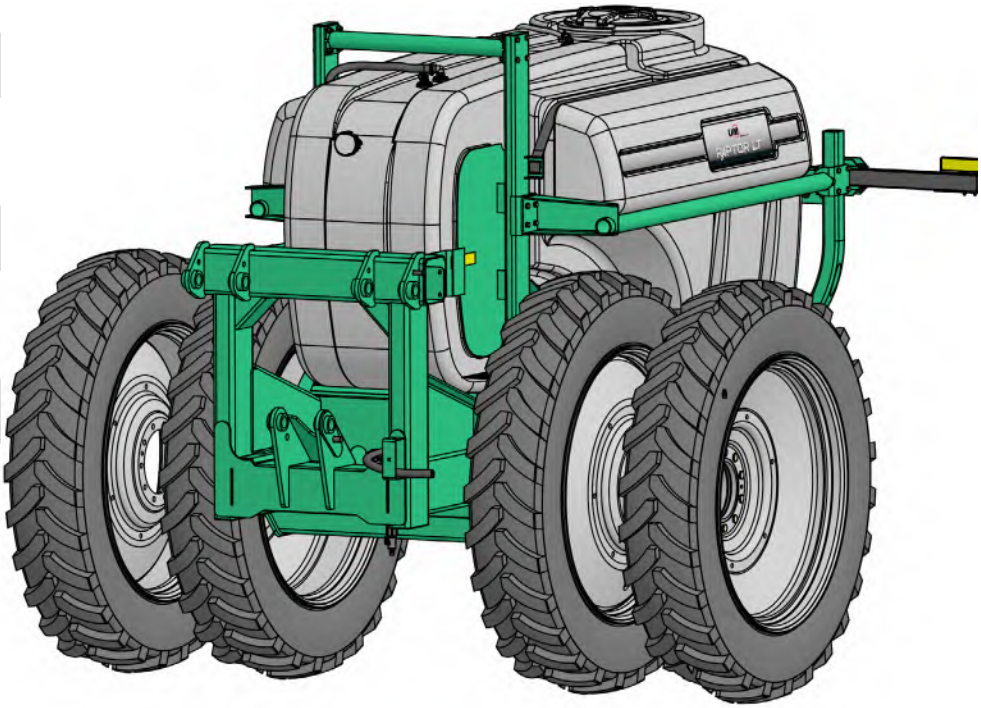
WARNING

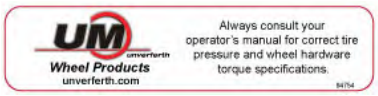
- **REPLACE LOST, DAMAGED, PAINTED, OR UNREADABLE DECALS IMMEDIATELY. IF PARTS THAT HAVE DECALS ARE REPLACED, ALSO MAKE SURE TO INSTALL NEW DECALS. THESE DECALS INFORM AND REMIND THE OPERATOR WITH OPERATIONAL INFORMATION AND SAFETY MESSAGES.**

PART NO. 9003125
Fluorescent Strip

PART NO. 9003126
Reflector RED

PART NO. 9003127
Reflector AMBER





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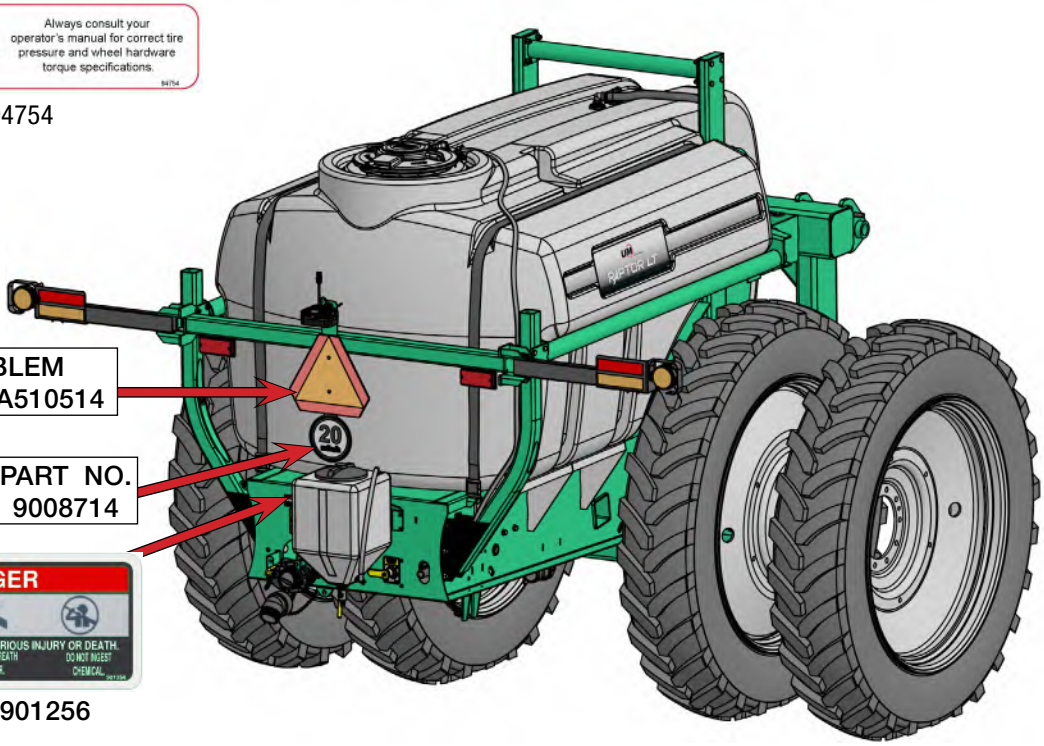
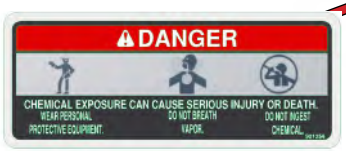


SMV EMBLEM
PART NO. TA510514

PART NO.
9008714



PART NO. 901256

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 tractor 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.

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.
- When working around the implement, be careful not to be cut by sharp edges.
- To prevent personal injury or death, always ensure that there are people who remain outside the applicator to assist the person working inside, and that all safe workplace practices are followed. There are restricted mobility and limited exit paths when working inside the implement.
- Secure drawbar pin with safety lock and lock tractor drawbar in fixed position.
- Check equipment for leaks. Repair any leaks before beginning or resuming operation.
- Explosive separation of a tire and rim can cause serious injury or death. Only properly trained personnel should attempt to service a tire and wheel assembly.

Before Servicing or Operating (continued)

- 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 applicator is intended to apply only agricultural fertilizers. Attempting to apply other liquids may cause equipment damage and introduce unexpected personal hazards.
- Ensure that the towing vehicle drawbar has sufficient strength to support the draft and vertical tongue load of a fully-loaded applicator.
- Hitch applicator to towing vehicle and clear all personnel from the surrounding area before folding and unfolding wings.
- Ensure tank access covers are fully closed before beginning or resuming operation.
- Residual pressure may exist in applicator plumbing even when unit is not in use. Remove pressure before servicing any plumbing.
- Hot parts can cause severe burns. Use caution when working around power system/ ground engaging components. Allow parts to cool before servicing.
- Add sufficient ballast to tractor to maintain steering and braking control at all times. Do not exceed tractor's lift capacity or ballast capacity.

During Operation

- Comply with all laws and product label directions governing safe product application.
- Regulate speed to field conditions. Maintain complete control at all times.
- Never service or lubricate equipment when in operation.
- Keep away from overhead power lines. Electrical shock can cause serious injury or death.
- Use extreme care when operating close to ditches, fences, or on hillsides.
- Do not leave towing vehicle unattended with the 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.

- This applicator is not equipped with brakes. Ensure that the towing vehicle has adequate weight and braking capacity to tow this unit.

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.

- Use good judgement when transporting equipment on highways. Regulate speed to road conditions and maintain complete control.

- Maximum transport speed of this implement should never exceed 20 mph 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 mph 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.

Pressurized Oil

- Relieve the hydraulic system of all pressure before adjusting or servicing. See hydraulic power unit 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 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.

- 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:
    - o End fittings damaged, displaced, or leaking.
    - o Outer covering chafed/cut or wire reinforcing exposed.
    - o Outer covering ballooning locally.
    - o 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.

- Applicator tanks may contain residual toxic chemicals. DO NOT ENTER APPLICATOR TANK FOR ANY REASON WITHOUT WEARING PROPER VENTILATION EQUIPMENT. Failure to do so may result in asphyxiation and death.

- 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.

- Avoid breathing spray mist or vapor.

- 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.

Clean Water Tank

- A clean water tank is provided as standard equipment. It is equipped with a spigot for general washing and a hose for emergency eye washing.
- Always keep clean water in tank. Water in clean water tank is not suitable for human consumption.
- For emergency eyewash, pull hose off of the top fitting and flush affected area.

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

Pre-Delivery Checklist

- ☐ Power wash any road salt off this unit to help prevent corrosion.
- ☐ Torque wheel nuts and check tire pressure as specified in MAINTENANCE section.
- ☐ All grease fittings have been lubricated.
- ☐ Check to be sure all safety decals are correctly located and legible. Replace if damaged.
- ☐ Check to be sure all reflective decals are correctly located.
- ☐ Check to be sure SMV emblem and SIS decals are in place and shipping film is removed.
- ☐ Check to be sure transport lights are working properly.
- ☐ Check hydraulic components for leaks.
- ☐ Check all plumbing components for leaks.
- ☐ Paint all parts scratched during shipment and dealer set up.

General Set Up Information

For your safety, and the safety of others, use proper tools and equipment and always use safe working procedures. Refer to these instructions before starting any work on your machine.

⚠ WARNING

- **READ AND UNDERSTAND SAFETY RULES BEFORE OPERATING OR SERVICING THIS MACHINE. REVIEW "SAFETY" SECTION IN THIS MANUAL IF NECESSARY.**
- **TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE THE MACHINE IS SECURELY BLOCKED.**
- **MOVING PARTS CAN CRUSH AND CUT. KEEP AWAY FROM MOVING PARTS.**
- **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 8,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.**
- **EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING THE IMPLEMENT.**

Basic Set Up

Due to shipping requirements and various dealer-installed options, some initial implement set up may be required after it arrives from the factory. Use the following procedures as needed for initial implement set up.

Hydraulic System

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.

Wheel/Tire Set Up

Tire Pressure

Tire pressure must be verified before first use and adjusted as necessary. Refer to MAINTENANCE section of this manual for information on tire pressure.

Wheel Nuts

⚠ CAUTION

- **IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. WHEEL NUTS/BOLTS MUST BE CHECKED REGULARLY. SEE TORQUE PAGE IN THE "MAINTENANCE" SECTION FOR PROPER WHEEL NUT/BOLT SPECIFICATIONS. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.**

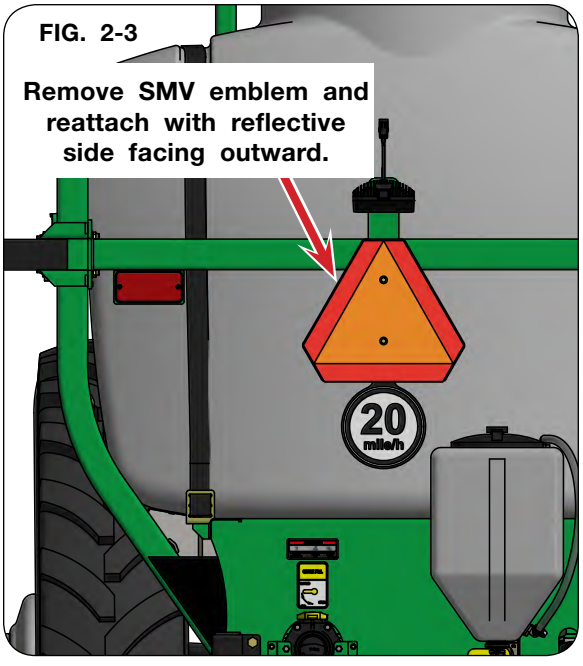
SMV Emblem & SIS Decal

Before the implement 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.

When reinstalling the SMV make sure that it is mounted with the wide part of the SMV at the bottom.

Ensure the SIS decals (one on the front and one on the rear of the implement) are clean and visible.

FIG. 2-3



Basic Set Up (continued)

Transport Lighting and Markings

Compliance with all lighting and marking laws is the responsibility of the operator at the time of travel.

See federal regulation 49 CFR 562; available at www.govinfo.gov for US federal law requirements.

See your Unverferth dealer for additional brackets, reflectors, or lights to meet your requirements.

Lamp Set Up

Pivot lamp extension arms into position at sides of implement. Be sure that the red reflector and orange fluorescent decal are facing the rear of the implement.

FIG. 2-5

Pump Set Up

For set up of a PWM (Pulse Width Modulated) or non-PWM pump, refer to your Rate controller manual for details. For specific details related to your product pump, please refer to your pump manual.

NOTE: Foot switch must be installed and connected to ISO harness behind the ISO plug at the rear of the tractor for PWM pump to function properly. Extension harness (9503390) may also be required.

FIG. 2-18

IMPORTANT

- *Do not run pump for extended periods with outlet flow fully blocked. Overheating and pump damage can result.*
- *Liquid must be in the Solution Tank. Refer to Filling Applicator in the OPERATION Section.*
- *Toolbar should be unfolded when setting the pump pressure. Refer to toolbar operation in the OPERATION Section.*
- *The Pump Inlet valve should be open.*

Setting the Pump Pressure (PWM Pump)

1. Rate controller must be calibrated. Refer to your RCM manual.
2. Select manual control on the console and turn the master switch on. Press and hold the Inc. button for 5 seconds to verify cartridge valve is fully open.
3. Turn off section valves and agitation valve if equipped.
4. Turn the tractor's hydraulic flow dial to 100%. The PWM cartridge valve is sized to divert a maximum of 11 GPM to the pump. Decrease the tractor's hydraulic flow until system pressure starts to drop, to approximately 100 PSI.

NOTE: The agitation valve is manually controlled at the rear of the tank.

5. Increase the agitation until the pump pressure drops an additional 5 PSI.

RCM Set Up

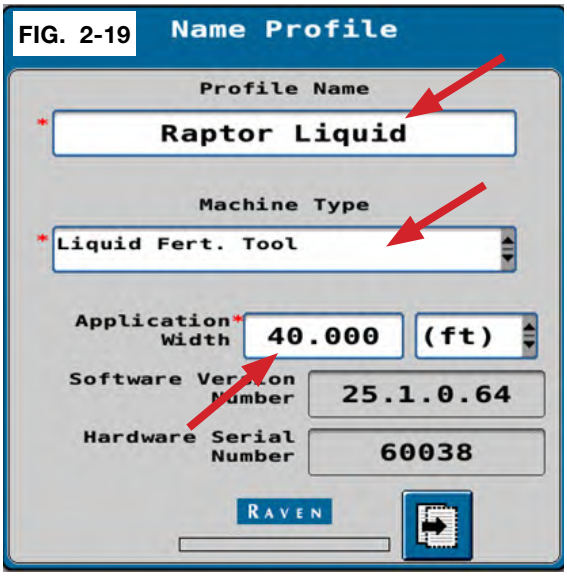
Whenever the tractor is turned off or the ECU for the applicator loses power, the following steps will have to be performed in order for the RCM to function properly right away.

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

1. Initial start-up screen. At “Profile Name” box, name as “UM Raptor”. Click “Machine Type” and select “Liquid Fert. Tool”. Next, enter the application width of your strip till toolbar. Click next arrow. (FIG. 2-19)

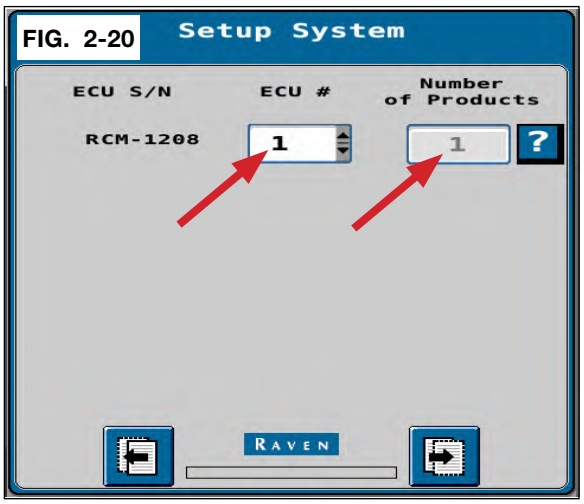
NOTE: Highest value for “Application Width” is 40 ft. or 480 in.

FIG. 2-19



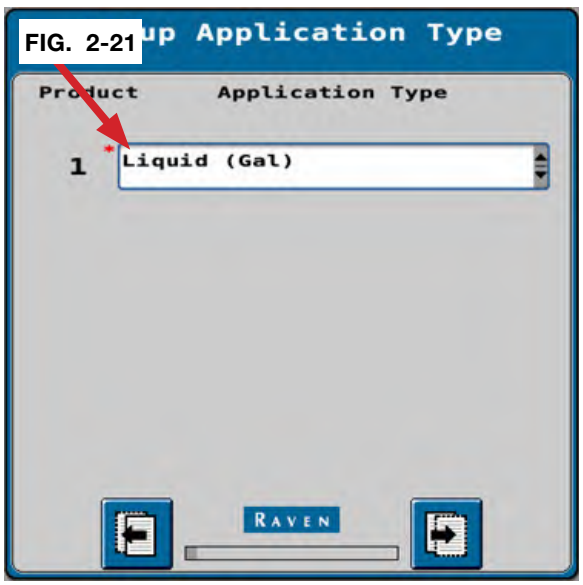
2. Default for “ECU” box is 1. Click “Number of Products” box and enter 1. Click next. (FIG. 2-20)

FIG. 2-20



3. Under “Application Type”, select “Liquid (Gal.)”. Click next. (FIG 2-21)

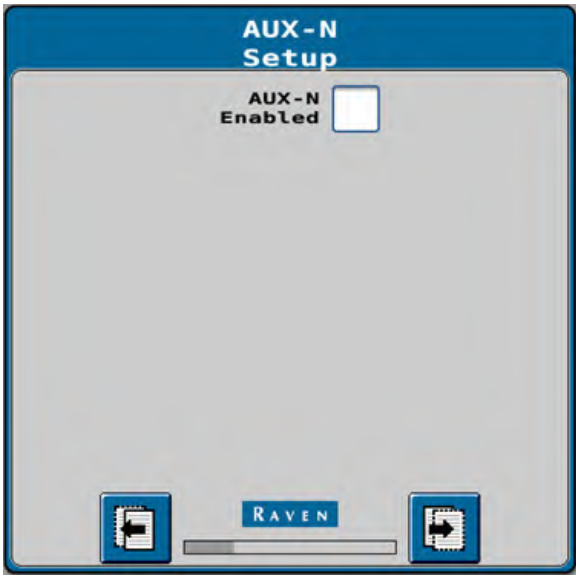
FIG. 2-21



RCM Set Up (continued)

4. Select “Liquid” from the drop down menu for Product 1 Liquid Application Mode.

5. Ensure “AUX-N Setup” is unchecked.



RCM Set Up (continued)

6. Under “Number of Sections”, select 4 for all Raptor implement configurations. Check “Equal Width Sections” box. Click next. (FIG 2-22)

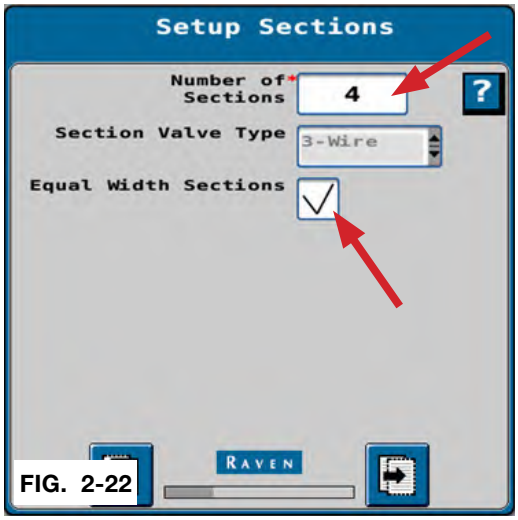


FIG. 2-22

7. Verify that all 4 sections are equal widths. For a 12 row toolbar, they should each be 7.5 ft. or 90 inches. For a 16 row toolbar, each box should be 10 ft. or 120 inches. Click next. (FIG 2-23).

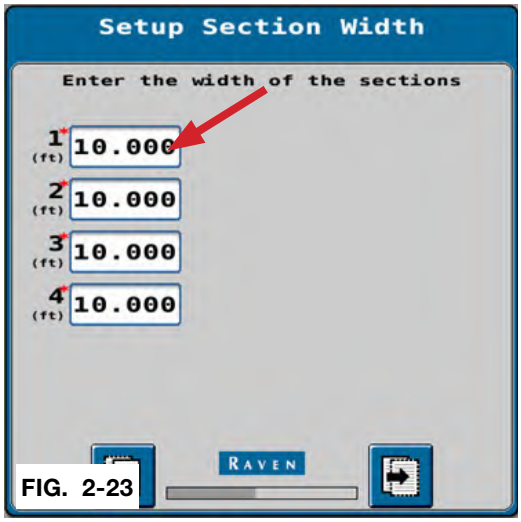


FIG. 2-23

8. Ensure all the appropriate boxes are selected as “None”. (FIG 2-24)

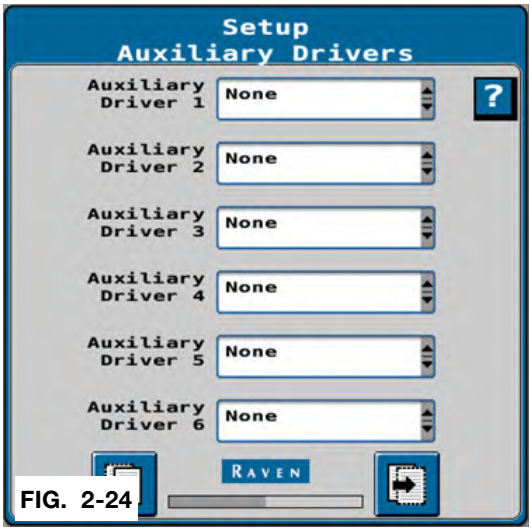


FIG. 2-24

RCM Set Up (continued)

9. No action required on this screen. Make sure this matches toolbar size and section widths. Continue to next page. (FIG 2-25)

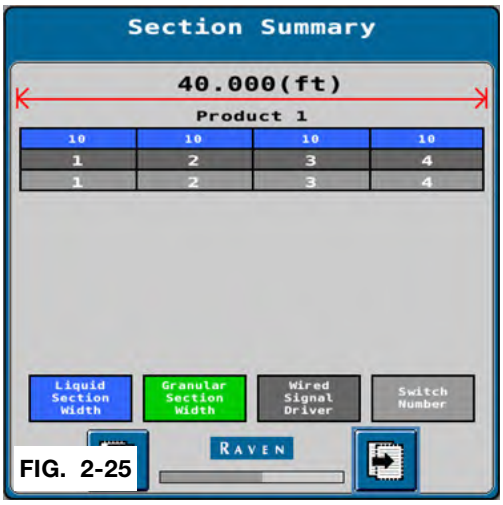


FIG. 2-25

10. Under “Pressure Sensor 1”, select “0-250 psi (1-5V)”. Under “Pressure Sensor 2”, select “None”. Click next. (FIG 2-26)

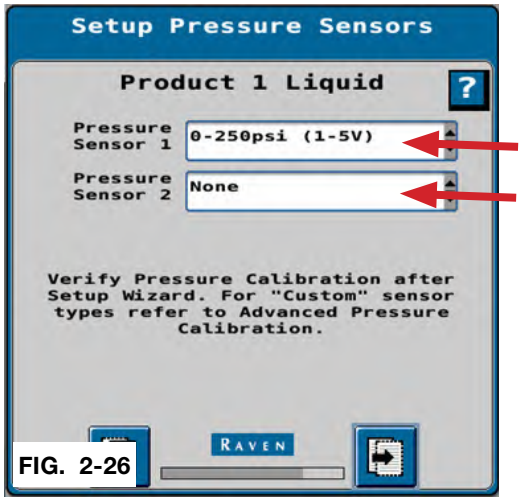


FIG. 2-26

11. Under “Pressure 1”, set minimum and maximum pressures. Recommend starting at 10 psi and 150 psi. Check box if alarm is desired when above max or below min. Click next. (FIG 2-27)

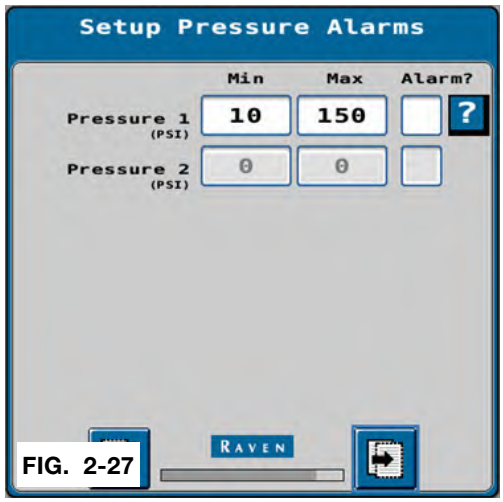


FIG. 2-27

RCM Set Up (continued)

12. For the auxiliary functions: uncheck both boxes. Click next page. (FIG. 2-28)

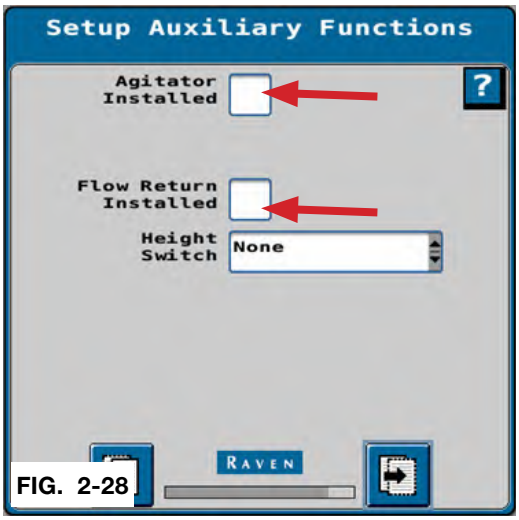


FIG. 2-28

13. "Product 1" is the set up for the liquid. For "Control Valve Type", always select "PWM". (FIG. 2-29)

14. For "Valve Response Rate", enter 40. This is how fast the valve responds.

15. Default for "Control Deadband %" box is 3 and "Valve Delay" box is 0.

16. Ensure "Enable PWM Smart Control" box is unchecked. Click next.

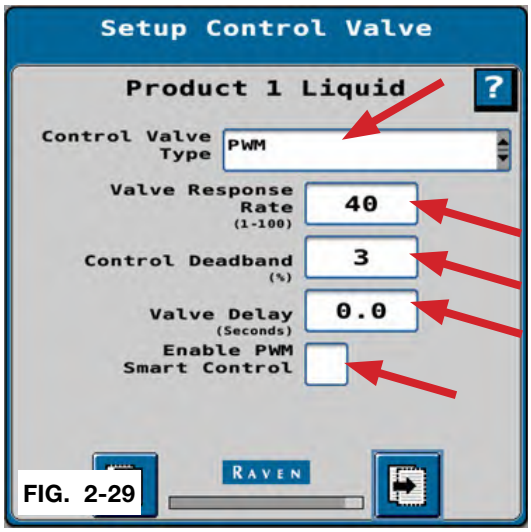


FIG. 2-29

17. For the PWM valve "Coil Frequency", ensure the value is set at 122. (FIG. 2-30)

18. Set the "PWM High Limit" at 100, "PWM Low Limit" at 10 and "PWM Standby" at 0. Click next page. (FIG. 2-30)

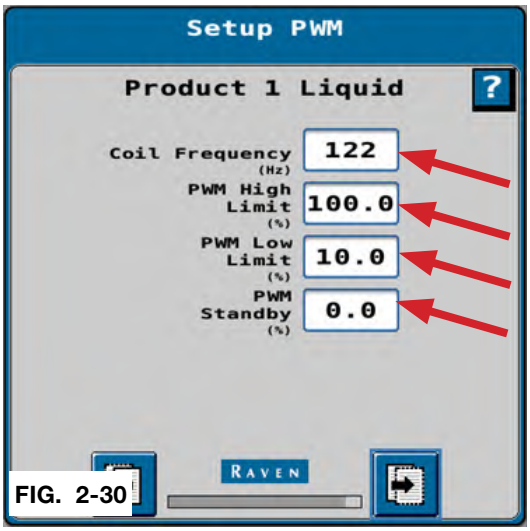


FIG. 2-30

RCM Set Up (continued)

19. For “Flowmeter Calibration”, check the tag on the flowmeter and enter the value. (FIG. 2-31)

NOTE: Flowmeter is located on top of the toolbar behind the flow ball monitor assembly.

20. Under “Flowmeter Pulse/Units” enter 10 gal. Click next page. (FIG. 2-31)

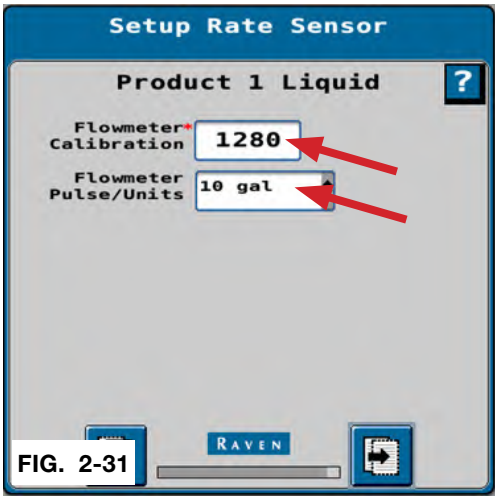


FIG. 2-31

21. For “Tank Fill/Level Sensor”, select “None”. (FIG. 2-32)

22. Enter 1200 for the gallon capacity.

23. “Low Tank Level” is the value an alarm is set off for a low bin level.

NOTE: Recommended setting is 250 and ensure the “Alarm” box is checked.

24. Click next page. (FIG. 2-32)

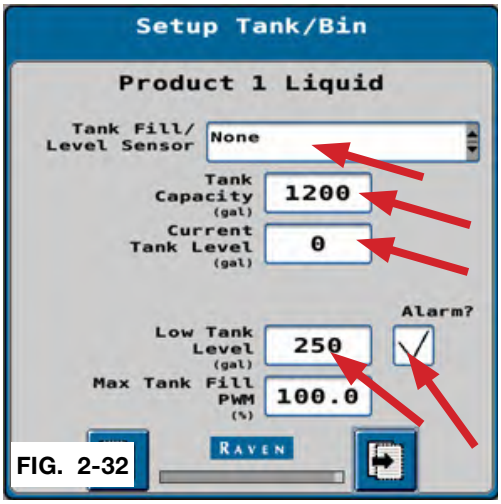


FIG. 2-32

25. “Set Up Rates” page controls the application rates for speed and determines how much product is being applied for “Product 1”. Enter three “Preset Rate Values”, as desired, which can be clicked between on the home screen. On the home screen, target rates can be entered as well. (FIG. 2-33)

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

27. For “Rate Selection”, select “Predefined or Rx”.

28. “Display Smoothing” needs to be checked and “Decimal Shift” remains at 0.

29. “Standby Pressure” remains at 0. Standby PWM valve is used instead. Click next page. (FIG. 2-33)

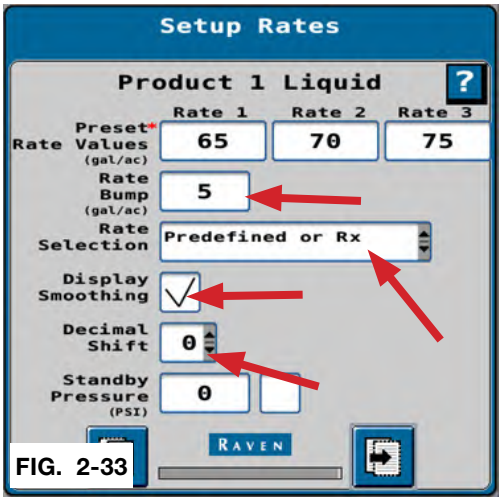


FIG. 2-33

RCM Set Up (continued)

30. Enter 20 for “Off Rate Alarm” and check box. Click next page. (FIG. 2-34)

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

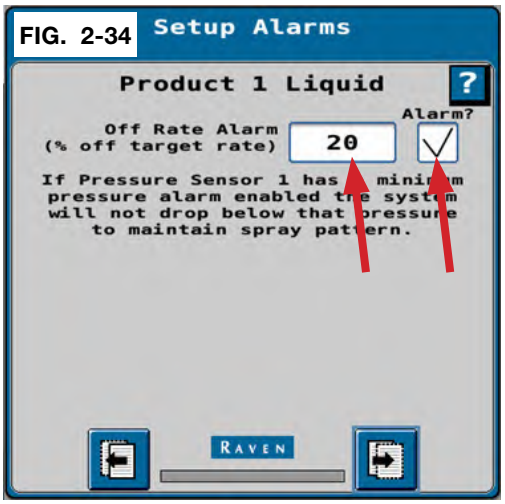


FIG. 2-34

NOTE: “Number of Products” corresponds to liquid application. (FIG. 2-35)

31. No action required on this screen. Shows the set up summary. Make sure all values are correct. Continue to next page. (FIG. 2-35)

FIG. 2-35

RCM Set Up (continued)

PWM Pump Start Up Procedure (Rate Control Module)

Whenever the tractor is turned off or the ECU for the PWM Pump loses power, the following steps will have to be performed in order for the PWM Pump to function properly right away.

1. Fill solution tank with desired product and reduce the flow on the SCV to lowest setting for the PWM pump before engaging.

   Initial start-up screen (FIG. 2-36).

2. Switch the system from Auto to Manual (FIG. 2-36).

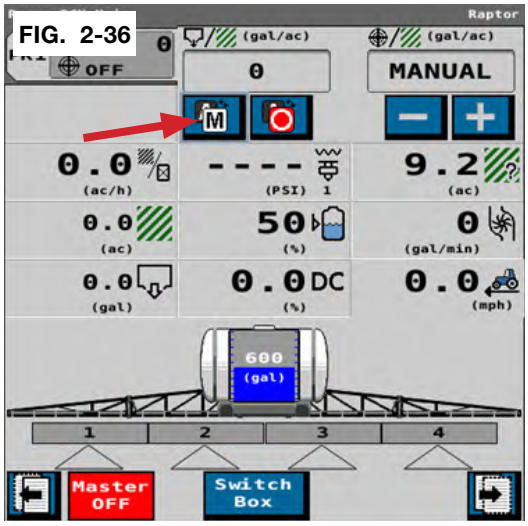


FIG. 2-36

3. Cycle the system from Off to On. (FIG. 2-37)

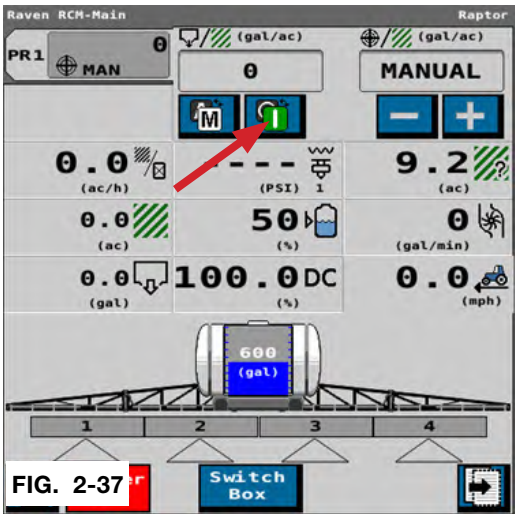


FIG. 2-37

4. Engage the SCV in continuous flow for the pump on the tractor.

5. Click the manual “+” button to increase the DC value to 100%. (FIG. 2-38)

6. Increase the hydraulic flow on the tractor until the pressure reaches 100 psi.

7. Switch the system from Manual back to Auto. The pump will go into Standby mode, and the pressure should drop.

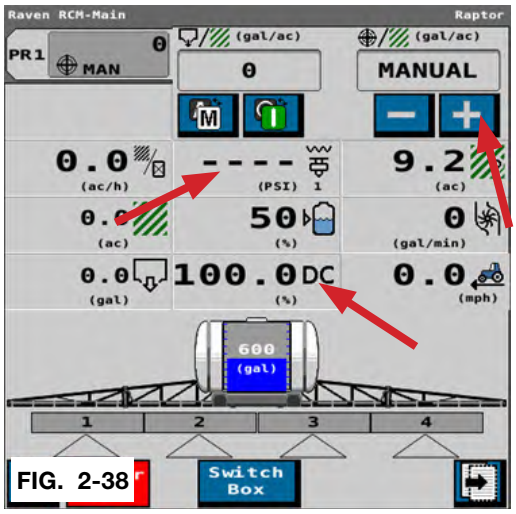


FIG. 2-38

Applicator Calibration

Determine Required Nozzle Size

Use the following procedure to assist with sizing the nozzle and calibrating the applicator. Additional information can be found in the rate controller owner's manual and also obtained from nozzle manufacturers.

The following procedure assumes that an electronic rate controller is being used.

1. Determine the typical operating speed (in MPH) and coverage rate (in GPA) that will be used.

2. Calculate nozzle flow:

$$\text{Nozzle GPM} = \frac{\text{MPH x GPA x Nozzle Spacing x DCF*}}{5940}$$

*DCF = Density Conversion Factor

Weight of Solution	Density Conversion Factor (DCF)
8.34 lb./gal. (Water)	1.00
10.65 lb./gal. (28% Nitrogen)	1.13
11.05 lb./gal. (32% Nitrogen)	1.15

Example:
Speed = 8 miles per hour
Rate = 10 gallons per acre
Nozzle Spacing = 30 inches
Liquid = Water

$$\text{Nozzle GPM} = \frac{8 \times 10 \times 30 \times 1.00^*}{5940} = 0.40 \text{ GPM}$$

3. Go to the PARTS section, "Injector Nozzles and Injector Knives" to select a nozzle tip.

   Choose a nozzle that will provide the calculated GPM within the nozzle's operating pressure range. Typically, 2 or 3 nozzle sizes will be found that meet the calculated GPM. However, it is usually a good practice to choose a flow size that lists this GPM in the mid-portion of the nozzle's advertised ratings.

4. Go to the PARTS section, "Injector Nozzles and Injector Knives" to select a nozzle and knife orifice size. Choose a type of nozzle or orifice for the given application.

INJECTOR NOZZLE & ORIFICE GUIDE			
Nozzle Size	Knife Orifice Size	P.S.I.	Approx. G.P.A. at 30" Rows at 10 M.P.H.
#0004	#57	30 P.S.I.	7
#0006	#70		10
#0008	#80		14
#0010	#89		17
#0015	#107		26
#0020	#125		34
#0030	#151		51
#0040	#177		69

SECTION III
Operation

General Operation Information

WARNING

- **READ AND UNDERSTAND SAFETY RULES BEFORE OPERATING OR SERVICING THIS MACHINE. REVIEW "SAFETY" SECTION IN THIS MANUAL IF NECESSARY.**

Read this operation section thoroughly. Acquaint yourself with the adjustments required to obtain efficient and trouble-free operations.

Preparing Tractor

Before operating implement refer to tractor operator's manual for information concerning safe methods of operation, hydraulics, hitch adjustment, tire inflation, wheel adjustments, and tractor weights.

Check tractor brakes and transport lights. Make sure they are in proper working order.

Check tractor hydraulic oil reservoir and add oil if needed.

Be sure tractor drawbar has sufficient capacity to operate the implement.

Preparing Raptor Strip-Till Tool

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

Hardware

Before going to the field, check all hardware for tightness. Recheck all bolts for tightness, after the unit has been operated for several hours.

Pins

Before going to the field, check that all pins are in place and are in good condition. Replace any worn, damaged, or missing pins.

Check that locking hardware for pins are in place and tight.

Hydraulics

Check routing of all hydraulic hoses. Hoses should not be kinked, twisted, or rubbing against sharp edges. Hoses should be secure with tie straps.

Check hoses and fittings for hydraulic leaks. Tighten or replace as required.

Lubrication

Lubricate unit as outlined in MAINTENANCE section.

Tires/Wheels

Check tire pressure, see MAINTENANCE section for recommended air pressure. Be sure tire pressure is equal in all tires.

For questions regarding new tire warranty, please contact your local original equipment tire dealer. Used tires carry no warranty. Tire manufacturers' phone numbers and web sites are listed in the MAINTENANCE section of this manual for your convenience.

⚠ CAUTION

- **IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. WHEEL NUTS/BOLTS MUST BE CHECKED REGULARLY. SEE TORQUE PAGE IN THE "MAINTENANCE" SECTION FOR PROPER WHEEL NUT/BOLT SPECIFICATIONS. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.**

Preparing Raptor Strip-Till Tool (continued)

Electrical Hook-Up

NOTE: Unverferth Manufacturing has designed the transport lighting and marking kit to meet United States federal law and ASABE standards at the time of manufacture. Machine modifications, including additional features or changes to the intended configurations, may require updates to the lighting and marking as well.

Compliance with all lighting and marking laws is the responsibility of the operator at the time of travel.

See federal regulation 49 CFR 562; available at www.govinfo.gov for US federal law requirements.

See your Unverferth dealer for additional brackets, reflectors, or lights to meet your requirements.

Connect the main light harness to the tractor.

Fertilizer cart requires ISO connection to tractor. Connect ISO harness, and route foot switch harness into tractor cab.

Hydraulic Hook-Up

⚠ WARNING

- **ALWAYS RELIEVE HYDRAULIC SYSTEM PRESSURE BEFORE DISCONNECTING HOSES FROM TRACTOR OR SERVICING HYDRAULIC SYSTEM. SEE TRACTOR OPERATOR'S MANUAL FOR PROPER PROCEDURES.**

NOTE: Refer to MAINTENANCE section when checking hydraulic circuit operation.

After cleaning hydraulic hose couplers, connect to tractor hydraulic circuits as follows:

Cart Solution Pump Hydraulics

IMPORTANT

- *The cart pump is hydraulically driven, and needs to be configured correctly to match the type of hydraulic system on the tractor (closed center, open center, load-sensing, etc.). Failure to configure the pump correctly may permanently damage the pump through over-speeding and over-pressurizing. Refer to the SET UP SECTION of this manual for guidelines on configuring the cart pump.*

Connect hoses from the cart pump to a tractor selective control valve (SCV) circuit. The pump inlet (marked PUMP PRESSURE) should be connected to the RETRACT port and the pump outlet (marked PUMP RETURN) to a low-pressure return port at the tractor (recommended) or to the EXTEND port. If connected to the EXTEND port, it is recommended to shut the pump down in float to preserve pump life.

NOTE: It is recommended to pressurize all hydraulic circuits using the retract outlets on the SCVs. This allows all circuits to be shut-off by engaging the hydraulic float feature of the tractor hydraulic system.

Filling Tank

Quick Fill

⚠ CAUTION

- **NEVER LEAVE CART UNATTENDED WHILE FILLING. TANK CONTENTS MAY SPILL OUT OF AIR VENTS IF OVERFILLED.**

IMPORTANT

- *The tank is designed with additional air expansion space in excess of the rated capacity. The full capacity can be reached with the level approximately 6”- 8” below the top surface of the tank access hatch (lid opened).*

The QUICK-FILL VALVE and indicator level are shown in FIG. 3-2 for reference.

1. Assure that QUICK-FILL VALVE and drain valve are <OFF>.
2. To fill the tank, remove the cap and attach the supply hose to the 3” quick fill coupler. Turn quick-fill valve on the tank <ON>.
3. Fill cart solution tank to desired level.
4. Return valve to <OFF> when desired fill level is reached.
5. Disconnect supply hose and reinstall the cap when finished.

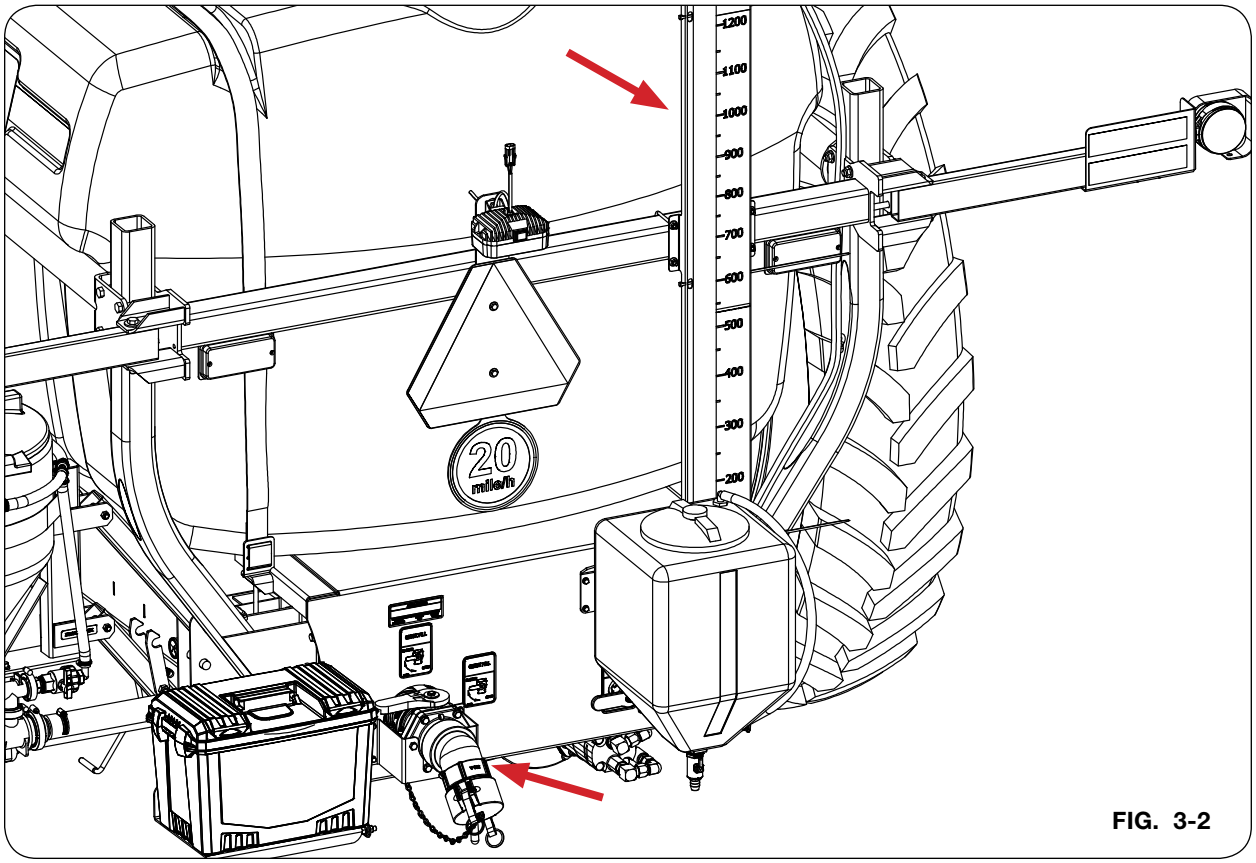


FIG. 3-2

Inductor

Tank Mixing

Fertilizer additives can be added to the solution tank through the use of the optional inductor. Before adding fertilizer additives, ensure that the tank contains at least 50 gallons of liquid.

⚠ 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.**

Basic Operation

IMPORTANT

- *The main solution tank should contain at least 50 gallons of liquid.*

The INDUCTION VALVE, INDUCTOR MIX VALVE, and tank are shown in FIG. 3-3 and 3-4 for reference.

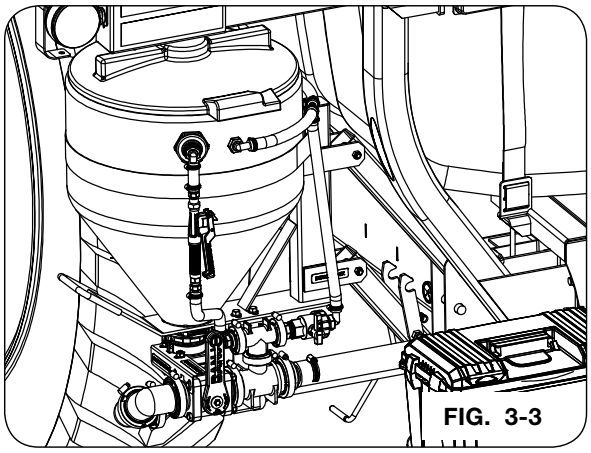


FIG. 3-3

1. Assure INDUCTION VALVE on the bottom of the inductor tank is in the <OFF> position.
2. Push on the inductor release latch lever, and lower the inductor to fill position.
3. Set valves:

VALVE SETTINGS

PUMP INLET VALVE	OPEN
INDUCTOR RINSE VALVE (OPT.)	OFF
AGITATION CONTROL (100 PSI)	PARTIALLY OPEN 1/4
INDUCTION VALVE	OFF

4. Start pump.
5. Open lid and pour chemical into inductor tank. (If using dry chemical, open INDUCTOR MIX valve to mix chemical, using care not to overfill inductor tank.) See jug rinsing instructions on following page if jug rinsing is desired.
6. Close the lid.
7. Open INDUCTION VALVE on the bottom of the inductor tank to evacuate the inductor tank.
8. Close INDUCTION VALVE when the inductor tank is empty and rinse.
9. Raise the tank to storage position.

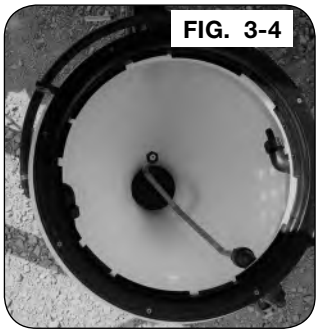


FIG. 3-4

⚠ WARNING

- **WHEN USING JUG RINSER, BE CAREFUL NOT TO SPRAY SOLUTION INTO EYES OR FACE.**

Inductor (continued)

Jug and Inductor Tank Rinsing

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.**

IMPORTANT

- *Do not allow pump to run dry. Pump damage will result.*
- *Rinse the jug, nozzle, or tank with the product in the main solution tank.*

The INDUCTION VALVE, INDUCTOR RINSE VALVE, and tank are shown in FIG. 3-5 and 3-6 for reference.

1. To rinse a chemical container, place container upside down on rinse nozzle and squeeze handle on rinse wand.
2. To rinse inductor tank, close lid, open INDUCTOR RINSE valve and squeeze rinse wand handle for approximately 10 seconds.
3. To rinse out container nozzle, close lid, and activate jug rinser for approximately 10 seconds.
4. Repeat steps 2 and 3 for additional rinsing, if desired.
5. Close INDUCTOR RINSE valve and release rinse wand when rinsing is complete.
6. When inductor tank is empty, close INDUCTOR DRAIN valve.
7. Close INDUCTOR FLOW valve then set AGITATION CONTROL to proper settings.
8. Raise tank to storage position.

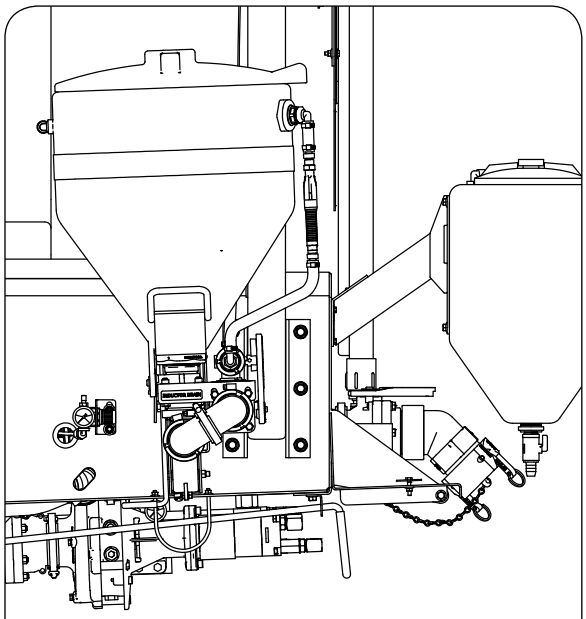


FIG. 3-5

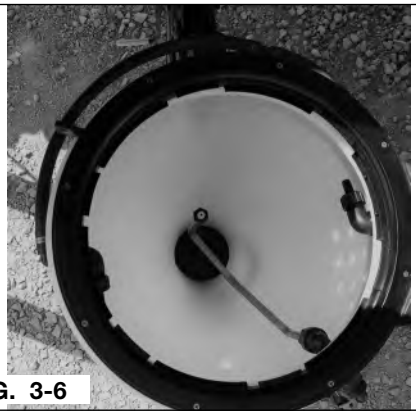


FIG. 3-6

WARNING

- **WHEN USING JUG RINSER, BE CAREFUL NOT TO SPRAY SOLUTION INTO EYES OR FACE.**

Orifice and Nozzle Installation

WARNING

- **KEEP HANDS CLEAR OF PINCH POINT AREAS.**

1. Attach the nozzle body to the nozzle mount plates at the top of the shank assembly using two 1/4”-20UNC flange nuts (9004720) and two 1/4”-20UNC x 3/4” capscrews (900900-003) (FIG. 3-7).

2. Install the desired orifice plate into each hose quick connect cap prior to attaching the hose to the nozzle body tee.

3. Route the 3/8” EPDM hose along the front of the vertical coulter post and attach each hose to the nozzle body tee (FIG. 3-7). Secure with hose clamps.

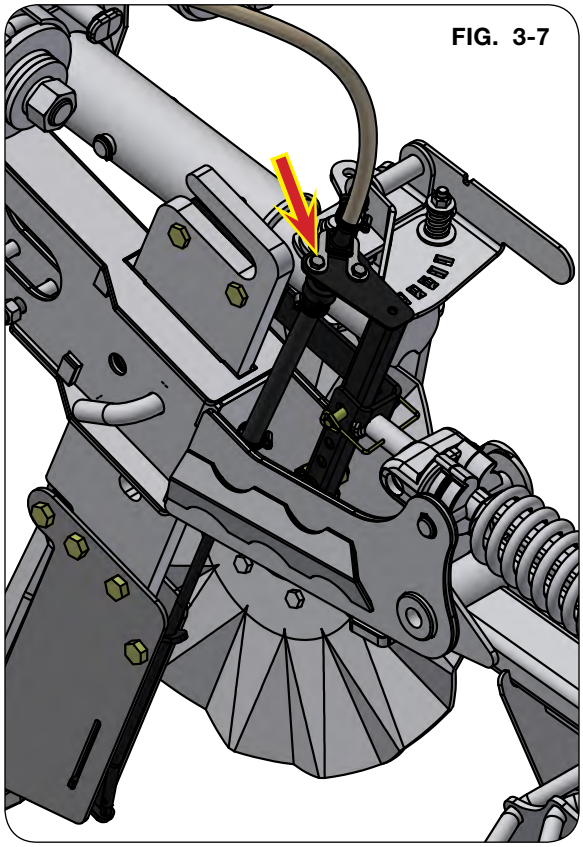


FIG. 3-7

Flow Ball Indicator

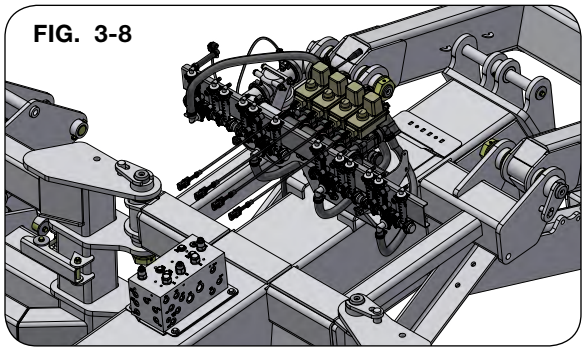
WARNING

- **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.**
- **WASH HANDS AND EXPOSED SKIN IMMEDIATELY AFTER CONTACT WITH SPRAY/FERTILIZER SOLUTION AND APPLICATION EQUIPMENT.**
- **REMOVE CLOTHING IMMEDIATELY IF CHEMICALS PENETRATE CLOTHING AND CONTACT SKIN. WASH THOROUGHLY AND PUT ON CLEAN CLOTHING.**

The Flow Ball Indicator plumbing kit allows the operator to easily determine changes occuring in the hoses. It operates by utilizing hoses of equal length and size allowing for the ball to float at equal levels.

1. When liquid is flowing evenly all balls hover at the same level.
2. A ball that is lower than the others indicates the flow is too low due to a restriction or blockage.
3. A ball that is higher than the others indicates the flow is too high due to a leaking fitting or hose.

FIG. 3-8



Selecting the Correct Flow Ball

1. Calculate the flow rate required per flow indicator with the following formula:

$$\text{Flow Rate} = \frac{\text{MPH x GPA x Nozzle Spacing (in) x DCF*}}{5940}$$

*DCF = Density Conversion Factor

Weight of Solution	Density Conversion Factor (DCF)
8.34 lb./gal. (Water)	1.00
10.65 lb./gal. (28% Nitrogen)	1.13
11.05 lb./gal. (32% Nitrogen)	1.15

Example:
Speed = 8 miles per hour
Rate = 10 gallons per acre
Nozzle Spacing = 20 inches
Liquid = 28% Nitrogen

$$\text{Flow Rate } 0.456 = \frac{\text{8 MPH x 10 GPA x 30” Nozzle Spacing (in) x 1.13 DCF*}}{5940}$$

Flow Ball Indicator (continued)

2. Select the flow indicator ball required for you application using the calculated flow rate and the guide below.

Flow Indicator Ball Selector Guide		
Part Number	Color	Flow Rate - U.S. GPM Range
9007782	Green Polyproplene	0.05 to 0.18
9007781	Red Celcon	0.09 to 0.30
9007780	Maroon Glass	0.31 to 0.72
9007779	1/2” Stainless Steel	0.40 to 1.33
9007883	7/16” Stainless Steel	1.00 to 2.70

Ball Removal/Replacement

NOTE: Flush the system with clean water before servicing.

1. Remove the fittings from the top of the flow ball manifold by removing the retaining clip (Fig. 3-9)

NOTE: During operation in the event of a blockage, each hose has been connected in order, beginning with the left most coulter nozzle representing the left most flow ball indicator. It is recommended that the fittings be removed to access the ball, be reinstalled in the same location to maintain similar visual troubleshooting capabilities.

FIG. 3-9

2. Remove the rear capscrews from the flow ball manifold mounting brackets. This will allow the flow ball manifold assembly to be rotated (Fig. 3-10).

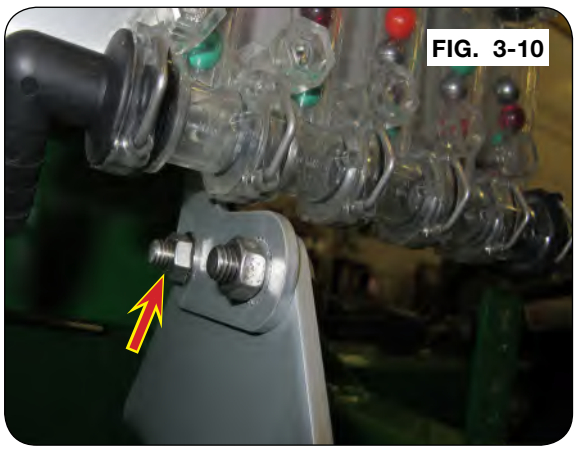


FIG. 3-10

Flow Ball Indicator (continued)

3. Rotate the manifold assembly down carefully to avoid any residual liquid that may be in the manifold to avoid coming in contact with exposed skin, eyes, or other sensitive areas. (Fig. 3-11)

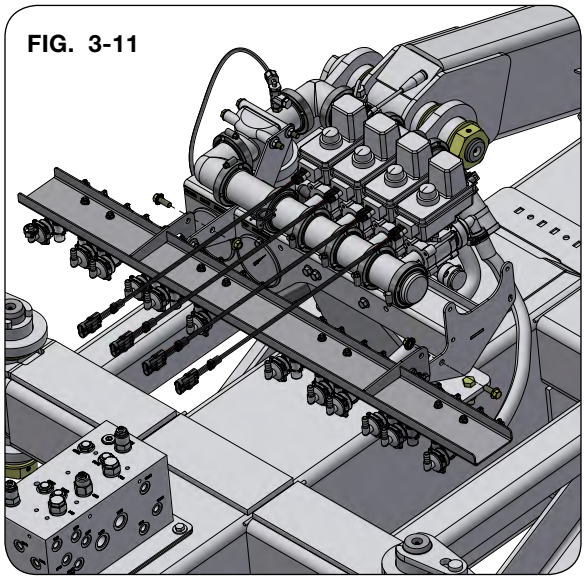


FIG. 3-11

4. Fully tilt manifold bracket down and remove plastic ball stop. This will allow indicator balls to roll out of flow monitors. (Fig. 3-12)

FIG. 3-12

5. Rotate bracket up completely, align capscrew holes, reinsert hardware removed in Step 2, and insert indicator ball into the flow monitors.

6. Reinsert the fittings removed in step 1 ensuring that the hoses marked with the gray sleeves are inserted on the flow monitors that have the balls selected for the half rate nozzles. Reinsert retaining clips.

Notes

SECTION IV
Maintenance

Daily Service

Beginning of Day

NOTE: Before initial use, ensure all lubrication points have been greased.

Check all U-bolts and bolts for tightness. This is especially important during the first days of operation. See “Torque Chart” in this section.

IMPORTANT

- *Inspect mast pins for any wear or damage. Replace any worn or damaged pins.*

Perform any daily lubrication outlined in “Lubrication” in this section.

Check stabilizer tire air pressure and inflate to correct pressure, if necessary.

IMPORTANT

- *To assure level penetration of shanks, both tires must be inflated to the same pressure.*

End of Day

Clean off dirt and residue which may have accumulated on implement during operation.

Check implement for damage which could have occurred during operation, and repair.

Annual Service

Beginning of Season

⚠ WARNING

- **READ AND UNDERSTAND SAFETY RULES BEFORE OPERATING OR SERVICING THIS MACHINE. REVIEW "SAFETY" SECTION IN THIS MANUAL IF NECESSARY.**

Check all bolts, U-bolts, and wheel bolts for tightness. Refer to “Torque Chart” in this section.

Lubricate implement (see “Lubrication” in this section).

Check air pressure in tires and inflate to correct pressure if necessary (see “Daily Service” in this section).

End of Season

Your implement is an important investment. Spend a little time to protect it from destructive rust and corrosion. You will be repaid in longer service life and better performance.

Perform the following before placing the implement in storage:
1. Remove dirt and residue which could cause rusting.
2. Repaint any chipped or scraped areas.
3. Lubricate implement (see “Lubrication” in this section).
4. Coat all earth moving surfaces with grease or suitable rust preventatives.
5. Inspect for damaged parts. Replace before next season.
6. Store implement inside, away from livestock.
7. Use support stands to keep implement tires and points up off bare ground.
8. Replace all worn, torn or faded decals and reflectors.

Seasonal Storage

Always open all valves to remove any fluids and to allow moisture to dry.

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

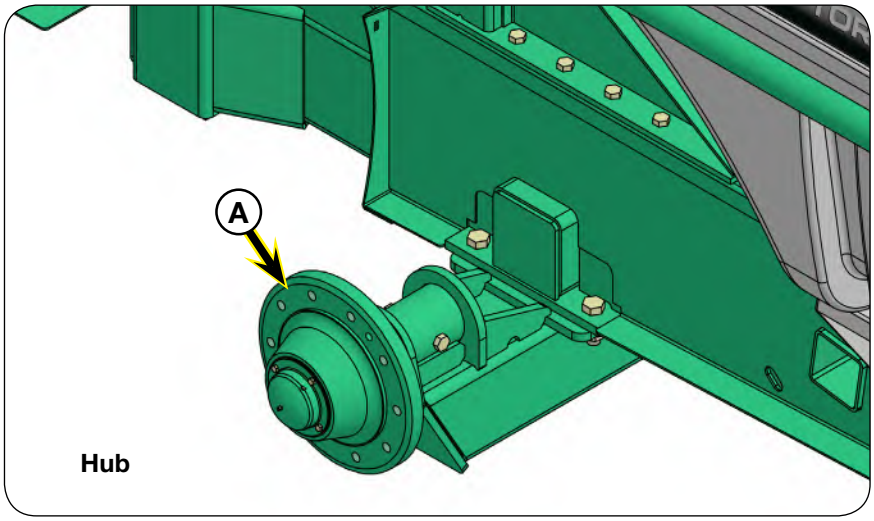
Lubrication Points

To keep your implement 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.

Use EP-2 lubricant at the locations described in the chart.

The lubrication locations and recommended schedule are as follows:

ITEM	DESCRIPTION	POINT	QTY	HOURS
A	Hubs	2	1 Shot	Weekly



Hub

Troubleshooting

Problem	Possible Cause	Corrective Action
Pressure too Low	Valve has an obstruction	Open all valves to pump and check for obstruction.
	Filter plugged	Clean or replace filters
	Hydraulic flow on tractor set too low	Increase hydraulic flow on tractor.
	Agitation is not set properly	Close agitation completely and slightly open the valve so the pump pressure decreases by 5 psi.
	Impeller has obstruction	Separate pump housing. Remove and clean the impeller.
	Impeller is not turning	Separate pump housing. Verify that shaft and impeller turn together.
Pressure too High	Hydraulic flow on tractor set too high	Decrease hydraulic flow on tractor.
	Improper nozzle size	Verify Nozzle Size.
Rate control console will not turn on	No power coming to the console	Check power source connections.
	Bad console	Check for 12 volts of power on Pin #16 with Pin #1 being ground on the cable coming into the console if equipped with 450 controller.
Do not have a rate	Not getting a speed	Press the speed button on the console to see if there is a speed.
	Not getting a flow	Press the vol/min button on the console to see if there is a flow.
Do not have a speed	Orange wire is unplugged	Verify the orange wire is plugged in to the speed sensor.
	Defective cable or sensor	Program a self test into the console and then check for a rate.
Speed is inaccurate	Loosen cable connection	Wiggle the connections for the speed cable. If accurate speed is displayed tighten connection.
	Cut in cable	Check speed cable for cuts in the cable. Fix the cable or replace the cable.
Do not have a flow	Regulating valve is not operating or PWM cartridge is not functioning	Check and remove debris from valve or PWM cartridge.
	Defective cable	Unplug the flow meter. With the plug keyway at the 12 o'clock position, check voltage between pins at the 2 o'clock and 6 o'clock positions (2 o'clock is ground). Should have 5 volts. Also check voltage between pins at the 2 o'clock and 10 o'clock positions (2 o'clock is ground). Should have 5 volts.
	Defective flow meter	Unplug the flow meter. Check for 5 volts across the 2 wires and getting voltage.
Rate is Unstable	Console is in manual	Put console into either rate 1 or rate 2 and check to see if rate becomes stable.
	Speed is inaccurate	Refer to "Speed is Inaccurate Section".
	Console is not programmed	Verify all numbers programed into console are correct.
Cannot adjust pressure when console is in manual	Defective cable or console	Unplug regulating valve or PWM cartridge. Check for 12 volts across the two wires.
	Defective Valve	Unplug regulating valve or PWM cartridge. Check for 12 volts across the two wires.

Hydraulically Driven Centrifugal Pump

ACE HYD 750/755 Barrier Fluid Charge

IMPORTANT

- *Inflation valve must be assembled in the "IN" port of the regulating valve.*

1. Turn regulating valve adjusting knob counterclockwise until it is at the minimum pressure setting. (FIG. 4-1)

2. Attach air chuck to air valve.

3. Turn adjusting knob on regulating valve clockwise until gauge reads 30 psi. (FIG. 4-1)

4. Remove the air pressure before disconnecting the hose. To add barrier fluid to the fluid chamber, disconnect the hose from the fitting on top of the hydraulically driven centrifugal pump. Remove the fitting on top of the pump. (FIG. 4-2)

5. Fill the fluid chamber by attaching a 1/8" hose to the barrier fluid and using the hose to fill the fluid chamber where the fitting was removed. (FIG. 4-3)

6. Add fluid until level is half-way up the sight gauge on the side of the pump and then pressurize.

NOTE: Any 1/8" hose will attach to the nipple of the barrier fluid bottle (9005518) to ease filling of the sight gauge. (FIG. 4-3)

At the end of each season, it is recommended to change/check the barrier fluid and seal. Follow the guidelines below.

- The pump requires pressure and/or fluid more frequently. Change barrier fluid and seal.
- The barrier fluid becomes cloudy, discolored, or water mixes with barrier fluid. Change barrier fluid and seal.
- The barrier fluid is clear. No service needed. Refill and store for the winter.

Refer to ACE pump manual and operating instructions.


FIG. 4-1

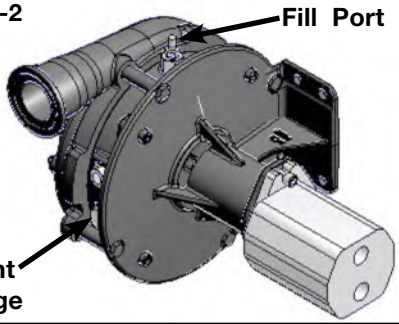


FIG. 4-2

FIG. 4-3

Filters

This applicator uses two filters to help ensure proper operation. These filters will need to be cleaned periodically during use and prior to applicator storage.

⚠ 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.**
- **RESIDUAL PRESSURE MAY EXIST IN APPLICATOR PLUMBING EVEN WHEN UNIT IS NOT IN USE. RELIEVE PRESSURE BEFORE SERVICING ANY PLUMBING.**

Primary Filter

To clean the filter located towards the front of the frame underneath the tongue, (FIG. 4-4):

1. Rotate the pump inlet valve to <OFF>.
2. Drain the strainer.
3. Unscrew the filter housing by turning counter-clockwise and remove the filter screen.
4. Clean filter by flushing strainer element with water.
5. Reassemble filter, open pump inlet valve, and check for leaks.

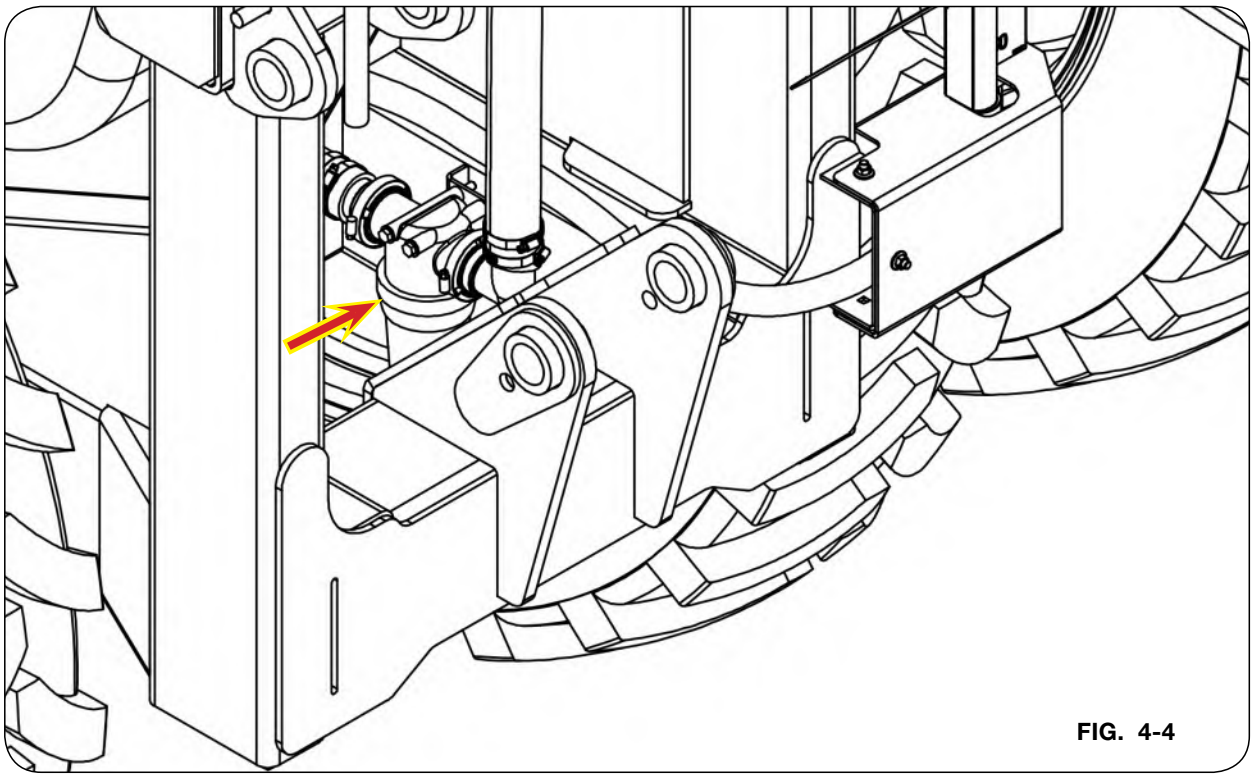


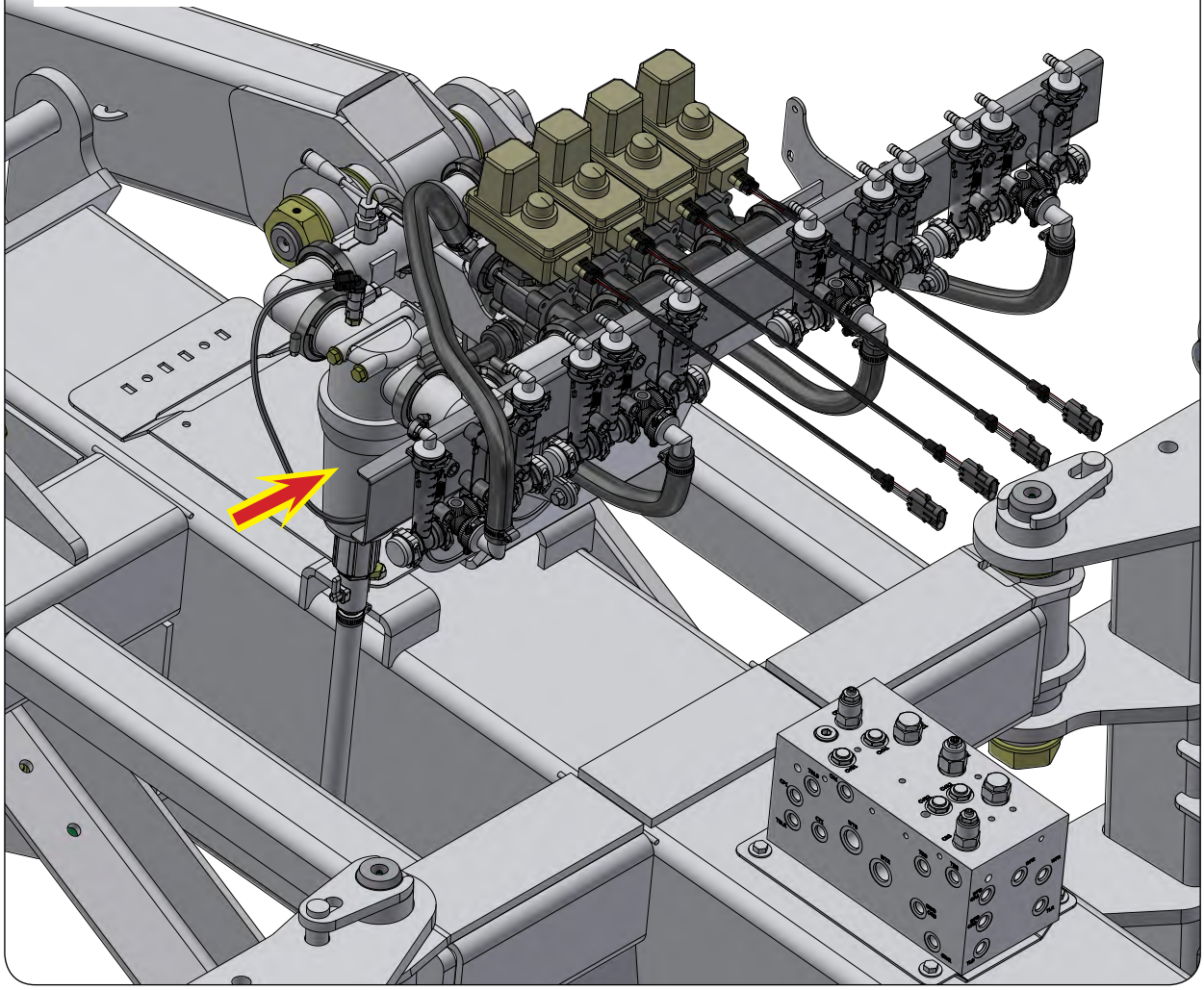
FIG. 4-4

Filters (continued)

Secondary Filter

A secondary filter is located on near the electric valves. This filter, similar in construction to the primary filter, is used to eliminate the need for strainers at the tips. To clean this filter, first drain the filter housing. Then unscrew the filter housing and remove the screen. Flush the strainer element with water. After cleaning, reassemble filter and check for leaks. (FIG. 4-5)

FIG. 4-5



Winterizing

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.**

IMPORTANT

- *Do not allow pump to run dry. Pump damage will result.*

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

1. Perform a complete system rinse using procedure in the "OPERATION SECTION, INDUCTOR - Chemical Container and Inductor Tank Rinsing" of this manual.

2. Wash the applicator thoroughly inside and out with a high-pressure washer.

3. Remove as much solution from the main tank as possible. Close drain valve on main tank after draining.

4. Pour approximately 50 gallons of R.V. antifreeze into main tank.

NOTE: If equipped with an inductor, the applicator can circulate the R.V. antifreeze.

5. Loosen diaphragm caps on nozzle bodies to relieve pressure and allow excess antifreeze to drain from wings.

6. Repaint any exposed metal. Coat ground engaging parts with a rust preventative.

Wheel, Hub & Spindle Disassembly and Assembly

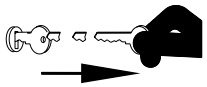
⚠ WARNING

- **TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.**
- **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 8,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.**
- **EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.**
- **KEEP HANDS CLEAR OF PINCH POINT AREAS.**

⚠ CAUTION

- **IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. TORQUE WHEEL NUTS/BOLTS TO VALUES IN TABLE. CHECK TORQUE BEFORE USE, AFTER ONE HOUR OF UNLOADED USE OR AFTER FIRST LOAD, AND EACH LOAD UNTIL WHEEL NUTS/BOLTS MAINTAIN TORQUE VALUE. CHECK TORQUE EVERY 10 HOURS OF USE THERE-AFTER. AFTER EACH WHEEL REMOVAL START TORQUE PROCESS FROM BEGINNING. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.**

1. Hitch unit to tractor. Park the empty unit on a firm, level surface. Block the tires to keep the machine from moving. Set the tractor's parking brake, shut off engine and remove key from tractor.



2. Use a safe lifting device rated at 8,000 lbs. to support the weight of your empty liquid applicator cart. Place the safe lifting device under the axle closest to the tire.
3. Use a minimum of 1,500 lbs. safe lifting device to support the wheel and tire during removal.

⚠ WARNING

- **ON UNITS WITH DUAL WHEELS, INNER WHEEL AND TIRE MAY FALL FROM HUB CAUSING SERIOUS INJURY OR DEATH. ALWAYS SUPPORT INNER WHEEL WHEN REMOVING OUTER WHEEL AND/OR THE WHEEL EXTENSION.**

4. If only changing wheel and tire, skip to Step 8; otherwise continue with Step 4.

   Remove the hardware retaining the hubcap. Next, remove the hubcap, gasket, capscrew, castle nut, and spindle washer. Remove hub with bearings from old spindle using a 200 lbs. lifting device.

Wheel, Hub & Spindle Disassembly and Assembly (continued)

5. Inspect the spindle and replace if necessary. If spindle does not need to be replaced, skip to Step 6; otherwise continue with Step 5.

   Remove the bolt and lock nut that retain the spindle to the axle. Using a safe lifting device rated for 150 lbs., replace the old spindle with a new spindle. Coat axle contact length of spindle shaft with anti-seize lubricant prior to installation. Reuse bolt and lock nut to retain spindle to axle. Tighten as outlined in MAINTENANCE Section.

6. Remove seal and inspect bearings, spindle washer, castle nut and cotter pin. Replace if necessary. Pack both bearings with approved grease and reinstall inner bearing. Install new seal in hub with garter spring facing the hub by tapping on flat plate that completely covers seal while driving it square to hub. Install until flush with back face of hub. Using a 200 lb. rated lifting device, install hub assembly onto spindle. Install outer bearing, spindle washer and castle nut.

IMPORTANT

- *Do not use an impact wrench!*

7. Slowly tighten castle nut while spinning the hub until drag causes the hub to stop freely spinning. Turn castle nut counterclockwise until the hole in the spindle aligns with the next notch in castle nut. Hub should spin smoothly with little drag and no end play. If play exists, tighten to next notch of castle nut. If drag exists, then back castle nut to next notch of castle nut. Spin and check again. Install bolt and nut. Clean face for hub cap gasket and install gasket, grease filled hub cab and retain hubcap with hardware removed. Tighten hubcap hardware in alternating pattern.

8. Attach the wheel(s) and tire(s) to the hub using the same rated safe lifting device for removal. Tighten wheel nuts to appropriate requirements and recheck as outlined in the Wheel and Tire section of this manual.

9. Raise dry applicator cart, remove lifting device and lower unit to the ground.

Wheels and Tires

Wheel Nut Torque

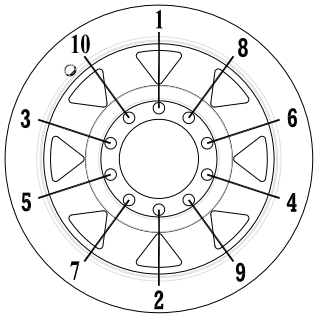
⚠ CAUTION

- **IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. TORQUE WHEEL NUTS/BOLTS TO VALUES IN TABLE. CHECK TORQUE BEFORE USE, AFTER ONE HOUR OF USE, AND EACH HOUR UNTIL WHEEL NUTS/BOLTS MAINTAIN TORQUE VALUE. CHECK TORQUE EVERY 10 HOURS OF USE THERE-AFTER. AFTER EACH WHEEL REMOVAL START TORQUE PROCESS FROM BEGINNING. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.**

Failure to check torque before first use may damage wheel nut/bolt seats. Once seats are damaged, it will become impossible to keep nuts/bolts tight. Tighten nuts/bolts to applicable torque value shown in table. Start all nuts/bolts by hand to prevent cross threading. Torque nuts/bolts in the recommended sequence as shown in Diagram 1.

WHEEL HARDWARE	
SIZE	FOOT-POUNDS
M22-2.5P	450 Ft.-Lbs.
7/8”-14 (UNF)	450 Ft.-Lbs.

Diagram 1



10 Bolt

Tire Pressure

- The following is to be used as a general guide for tire inflation and figures can vary depending on specific brand of tire used. **It is important that tires are inspected after unit is loaded.** Start with minimum pressure indicated. The tire should stand up with no side-wall buckling or distress as tire rolls. Record the pressure needed to support the full load and maintain this pressure to achieve proper tire life. **Do not exceed maximum recommended tire pressure.**

TIRE	INFLATION
380/90R46 R-1W - 159A8	max. 58 PSI

(All tire pressures in psi)

Wheels and Tires

Tire Warranty

For questions regarding new tire warranty, please contact your local original equipment tire dealer. Used tires carry no warranty. Following are phone numbers and Websites for your convenience:

Firestone	www.firestoneag.com Phone 800-847-3364
Continental/Mitas	www.mitas-tires.com Phone 704-542-3422 Fax 704-542-3474
Titan or **Goodyear**	www.titan-intl.com Phone 800-USA-BEAR Fax 515-265-9301
Carlisle/Ironman	www.carlisletire.com Phone 800-260-7959 Fax 800-352-0075

Complete Torque Chart

Capscrews - Grade 5

NOTE:

- Grade 5 capscrews can be identified by three radial dashes on the head.
- For wheel torque requirements, refer to Wheels and Tires.
- Tighten U-bolts evenly and equally to have the same number of threads exposed on each end.

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

IMPORTANT

- *Follow these torque recommendations except when specified in text.*

Complete Torque Chart - Stainless Steel Capscrews

IMPORTANT

- *Stainless steel fasteners tend to gall, especially with long run downs, prevailing torque fasteners, impact drivers, and lack of lubrication. It is highly encouraged to use a lubricant such as graphite-based anti-seize or molybdenum disulfide based anti-seize or other commercially available anti-galling compounds and assemble with a slow and continuously applied torque to avoid galling.*

SIZE	INCH POUNDS	NEWTON METERS
1/4-20 1/4-28	62 71	7 8
5/16-18 5/16-24	128 142	15 16
3/8-16 3/8-24	19 21	26 29
7/16-14 7/16-20	30 34	41 46
1/2-13 1/2-20	46 52	63 71
9/16-12 9/16-18	67 74	91 100
5/8-11 5/8-18	92 104	125 141
3/4-10 3/4-16	113 126	153 171
7/8-9 7/8-14	182 201	247 273
1-8 1-14	273 306	370 415
1 1/4-7 1 1/4-12	545 604	739 819
1 3/8-6 1 3/8-12	715 813	970 1102
1 1/2-6 1 1/2-12	949 1067	1287 1447

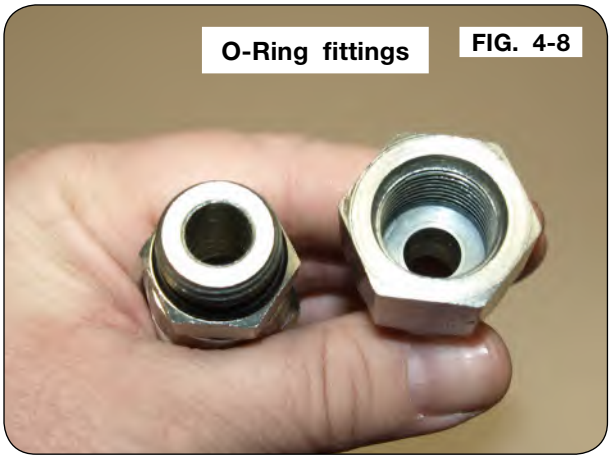
Hydraulic Fittings – Torque and Installation

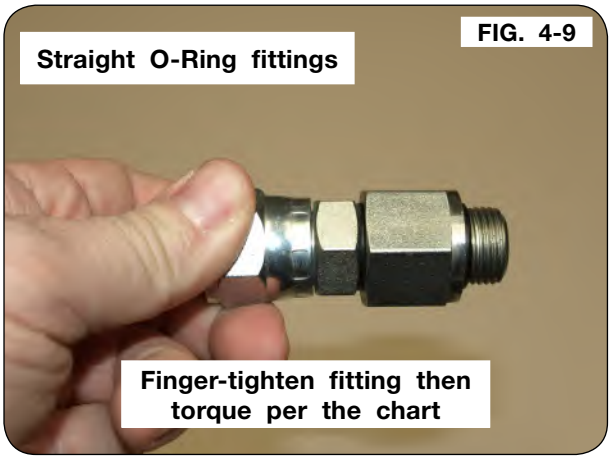
Tightening O-Ring Fittings

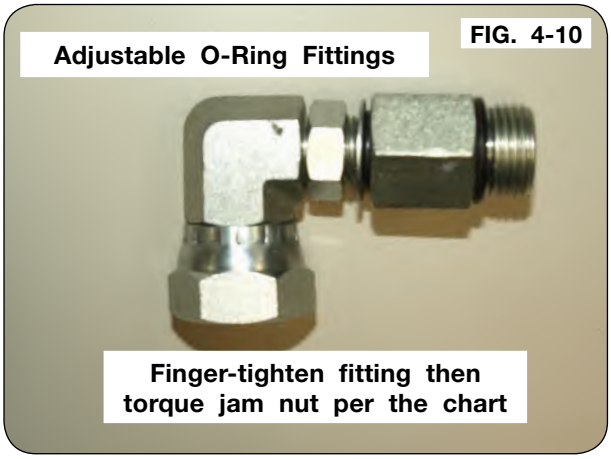
1. Inspect components for damage or contamination. Do not connect any other type of fitting to an O-ring fitting.
2. For adjustable fittings, insure the jam nut and washer are fully backed up.
3. Lubricate the O-ring and threads on the fitting.
4. Turn the fitting into the port until it is finger tight.
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







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.

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.

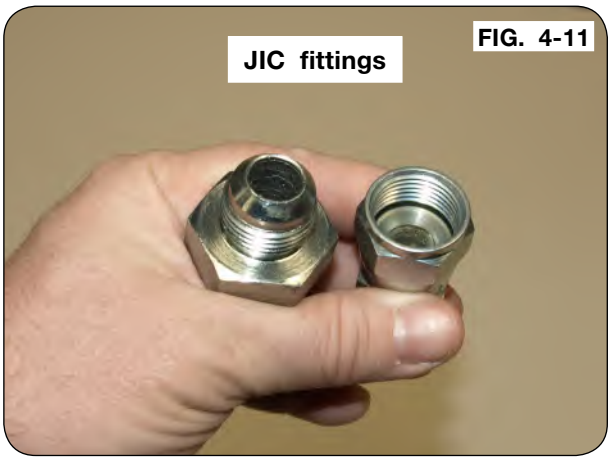


FIG. 4-11

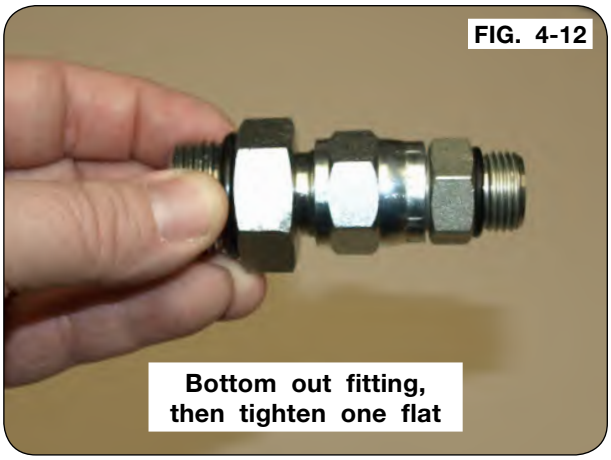
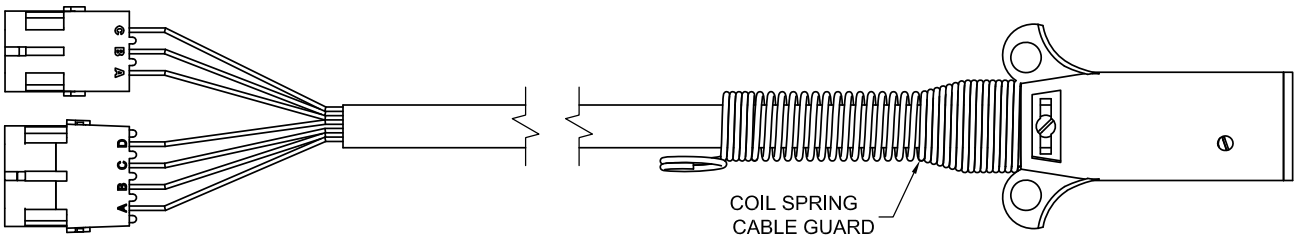
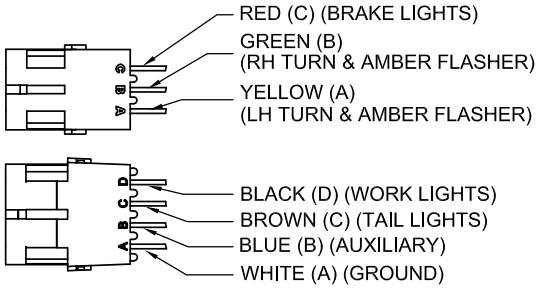


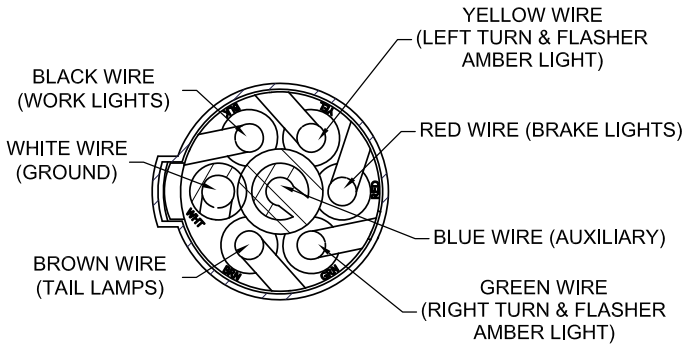
FIG. 4-12

Schematics - Electrical

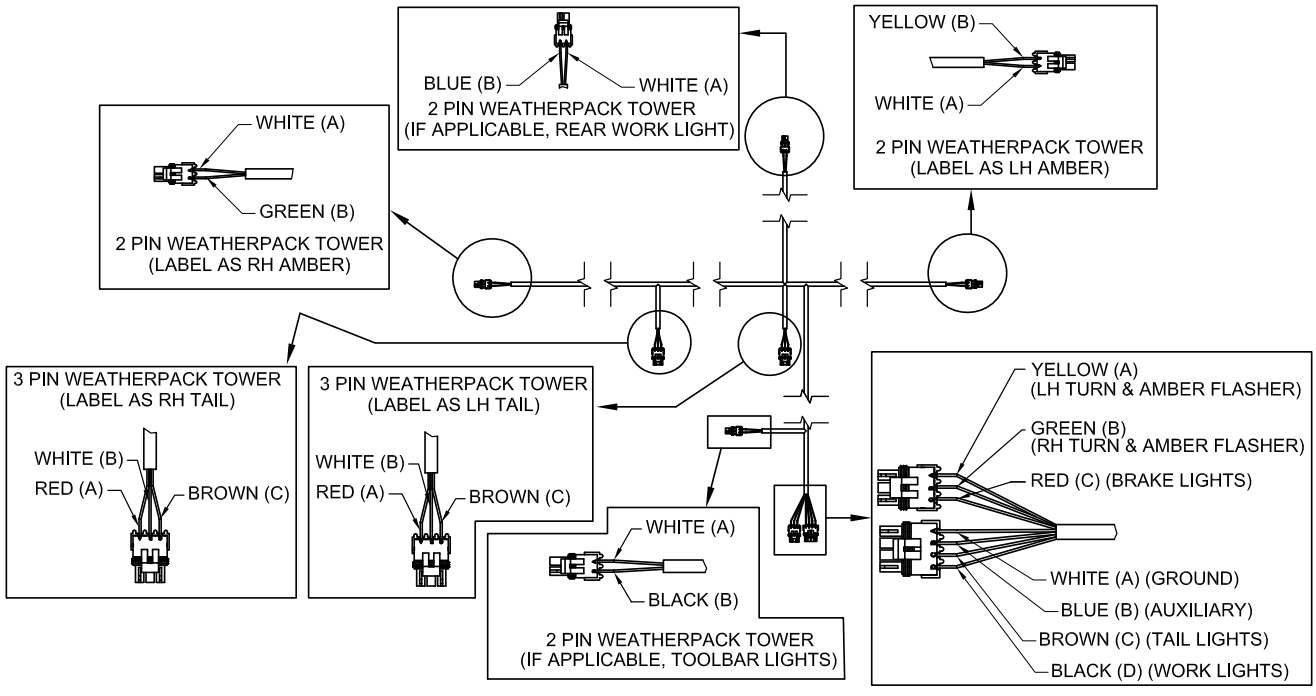
Electrical Harness - Main 480” (45000)





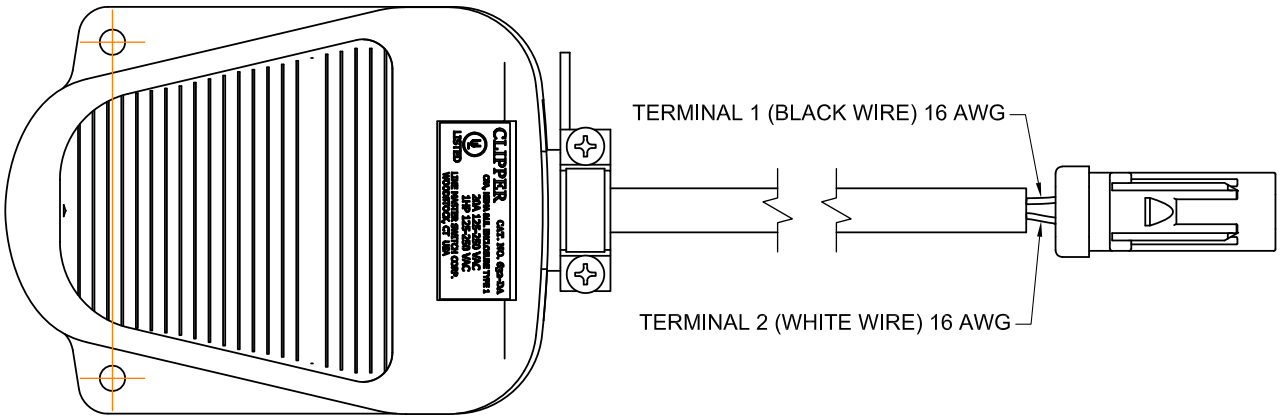


Electrical Harness - Light 418” (44999)

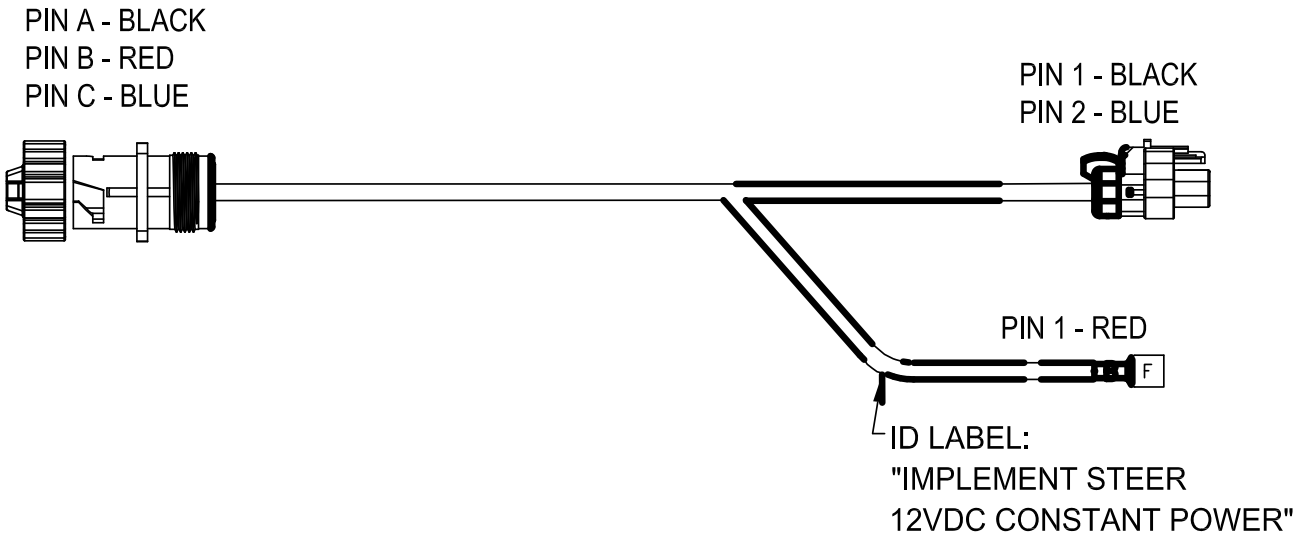


Schematics - Electrical

Foot Switch (9005916)



Foot Switch Cable (9503390)



Schematics - Electrical

Node Cable, RCM ECU (9008095)

CONNECTOR - J1	
PIN	COLOR
1	Red
2	Red
3	Red
4	Black
5	Black
6	Black
7	Black
8	Red/White
9	Red
10	NONE
11	White/Brown
12	Blue
13	Gray
14	Black
15	NOTE
16	Black
17	NONE
18	Green
19	Yellow
20	Brown/White
21	White/Brown
22	Brown/White
23	Red/White

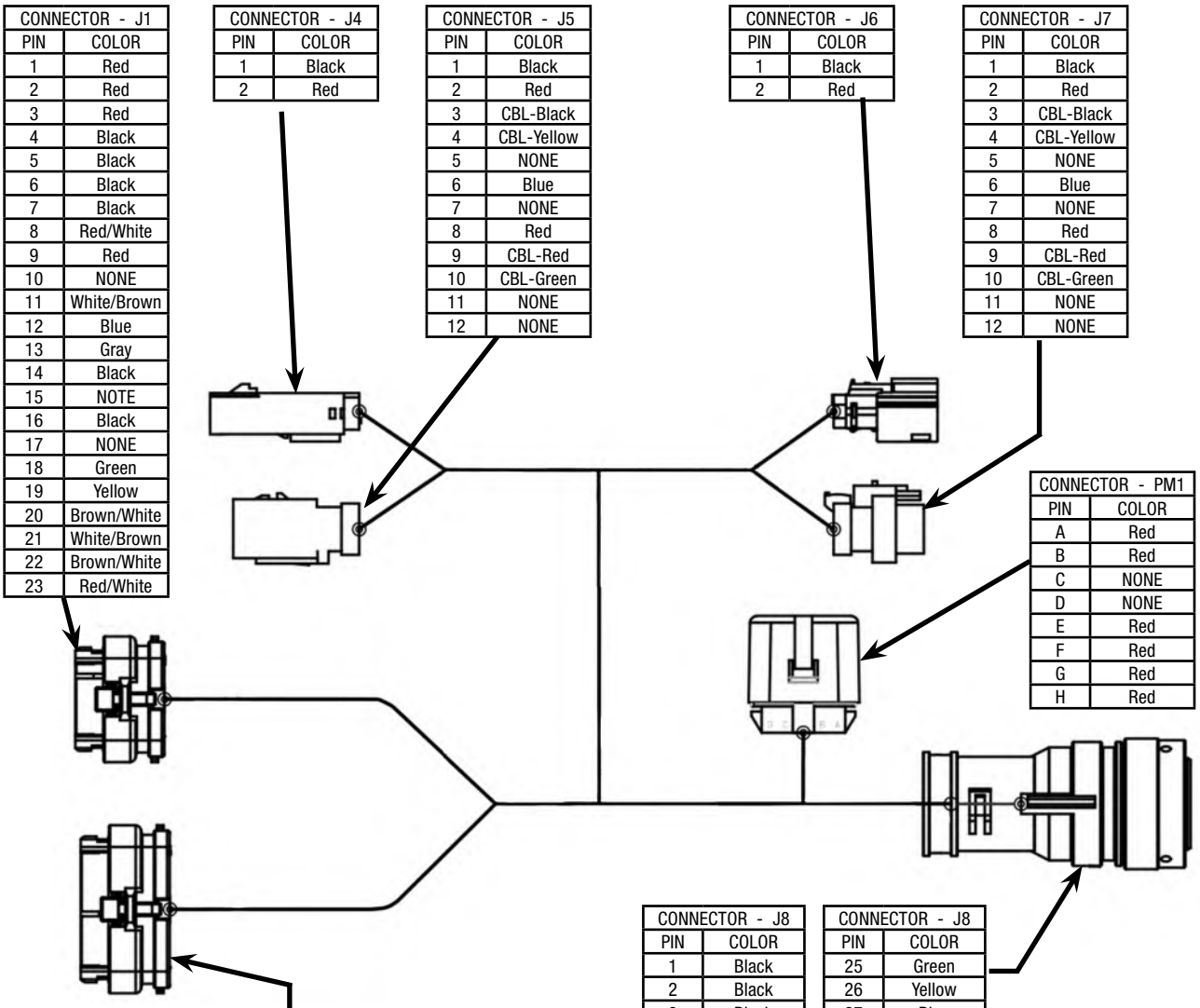
CONNECTOR - J4	
PIN	COLOR
1	Black
2	Red

CONNECTOR - J5	
PIN	COLOR
1	Black
2	Red
3	CBL-Black
4	CBL-Yellow
5	NONE
6	Blue
7	NONE
8	Red
9	CBL-Red
10	CBL-Green
11	NONE
12	NONE

CONNECTOR - J6	
PIN	COLOR
1	Black
2	Red

CONNECTOR - J7	
PIN	COLOR
1	Black
2	Red
3	CBL-Black
4	CBL-Yellow
5	NONE
6	Blue
7	NONE
8	Red
9	CBL-Red
10	CBL-Green
11	NONE
12	NONE

CONNECTOR - PM1	
PIN	COLOR
A	Red
B	Red
C	NONE
D	NONE
E	Red
F	Red
G	Red
H	Red



CONNECTOR - J3	
PIN	COLOR
1	Gray
2	Brown
3	Blue
4	Black/White
5	Brown/White
6	Blue/White
7	White/Black
8	White/Brown
9	White/Blue
10	Violet
11	Brown/White
12	Blue/White
13	Yellow
14	Blue
15	Blue/White
16	Gray
17	Brown
18	Violet

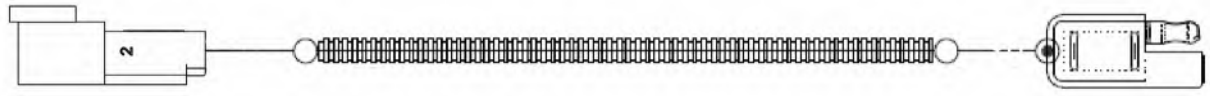
CONNECTOR - J3	
PIN	COLOR
19	Yellow
20	White/Blue
21	White/Blue
22	Black
23	Yellow
24	Green
25	Gray
26	Brown
27	Blue
28	Black/White
29	Orange
30	NONE
31	Blue
32	Blue
33	Blue
34	Blue/White
35	Green

CONNECTOR - J8	
PIN	COLOR
1	Black
2	Black
3	Black
4	Black
5	Red
6	Red
7	Gray
8	Brown
9	Brown/White
10	White/Brown
11	Brown/White
12	Blue
13	Blue/White
14	Blue
15	Blue/White
16	Blue
17	Blue
18	Violet
19	White/Blue
20	White/Blue
21	White/Brown
22	Orange
23	Green
24	Yellow

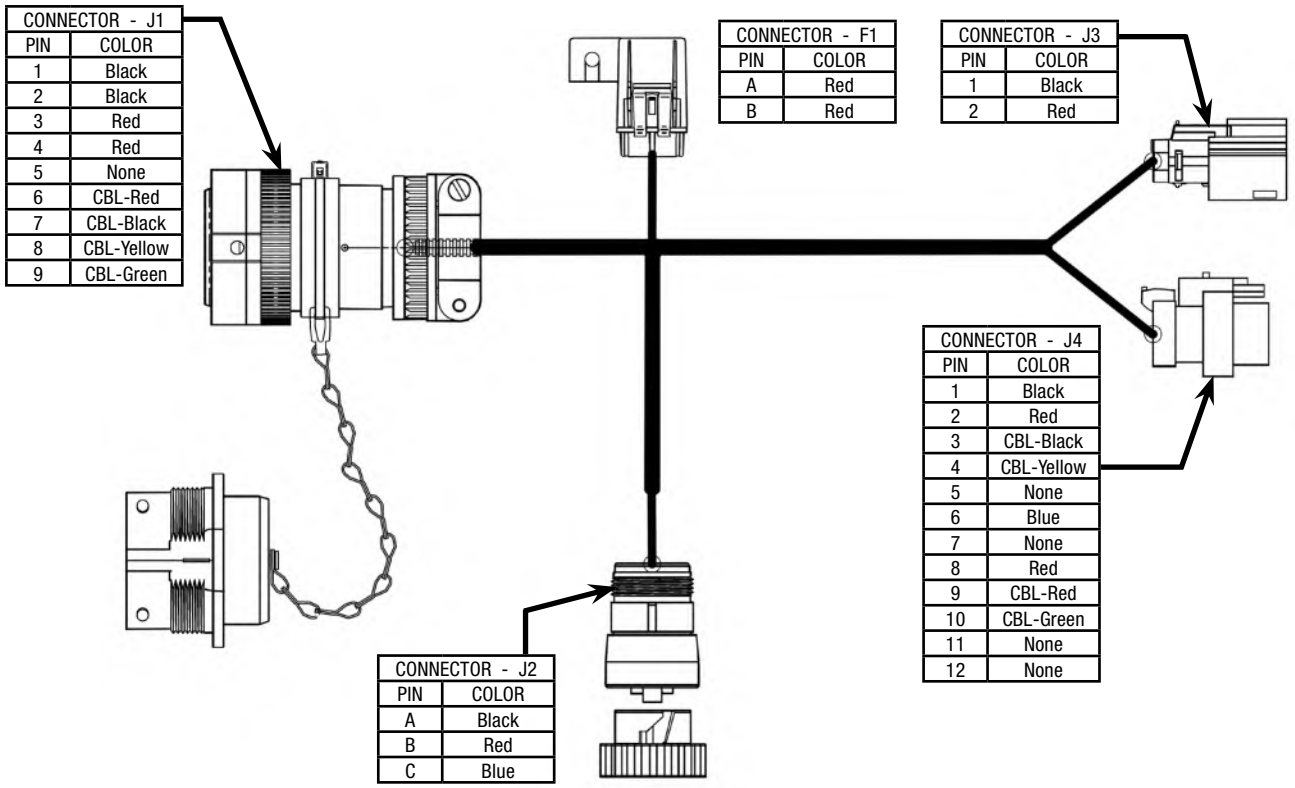
CONNECTOR - J8	
PIN	COLOR
25	Green
26	Yellow
27	Blue
28	Black/White
29	Brown/White
30	Blue/White
31	Gray
32	Red/White
33	Red/White
34	Black
35	Yellow
36	Gray
37	Brown
38	Blue
39	Black/White
40	Brown/White
41	Blue/White
42	White/Black
43	White/Brown
44	White/Blue
45	Violet
46	Gray
47	Brown

Schematics - Electrical

Extension Cable (9007524)



GEN 1 ISO To IBIC Hitch Cable (9503926)



CONNECTOR - J1	
PIN	COLOR
1	Black
2	Black
3	Red
4	Red
5	None
6	CBL-Red
7	CBL-Black
8	CBL-Yellow
9	CBL-Green

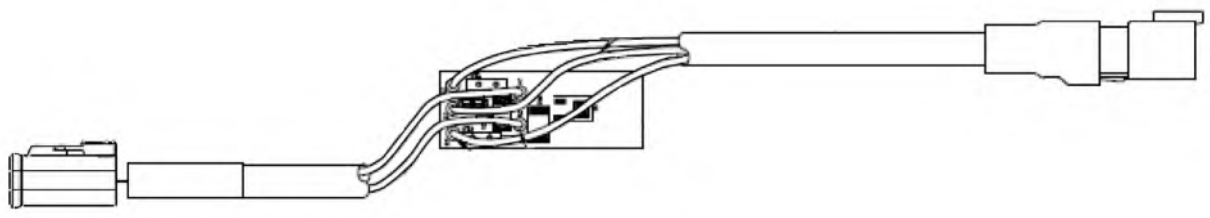
CONNECTOR - F1	
PIN	COLOR
A	Red
B	Red

CONNECTOR - J3	
PIN	COLOR
1	Black
2	Red

CONNECTOR - J4	
PIN	COLOR
1	Black
2	Red
3	CBL-Black
4	CBL-Yellow
5	None
6	Blue
7	None
8	Red
9	CBL-Red
10	CBL-Green
11	None
12	None

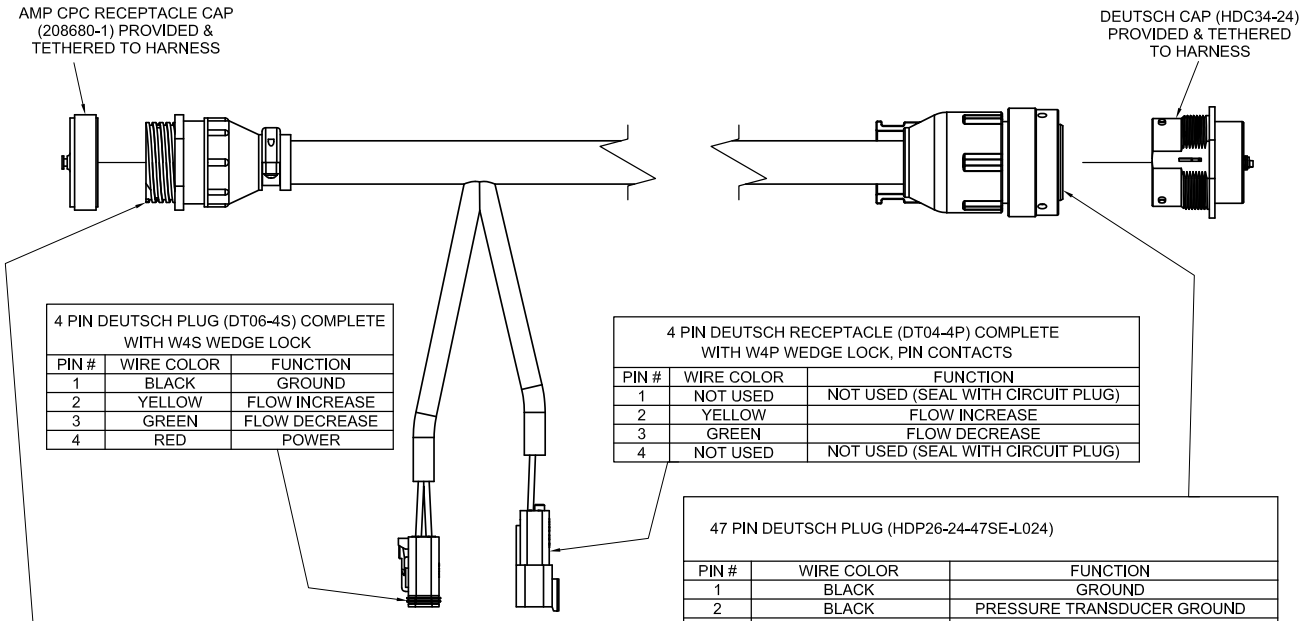
CONNECTOR - J2	
PIN	COLOR
A	Black
B	Red
C	Blue

Boost Box Harness (9007550)



Schematics - Electrical

Product Flow & Rate Harness (9009175)



4 PIN DEUTSCH PLUG (DT06-4S) COMPLETE WITH W4S WEDGE LOCK

PIN #	WIRE COLOR	FUNCTION
1	BLACK	GROUND
2	YELLOW	FLOW INCREASE
3	GREEN	FLOW DECREASE
4	RED	POWER

4 PIN DEUTSCH RECEPTACLE (DT04-4P) COMPLETE WITH W4P WEDGE LOCK, PIN CONTACTS

PIN #	WIRE COLOR	FUNCTION
1	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
2	YELLOW	FLOW INCREASE
3	GREEN	FLOW DECREASE
4	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)

37 PIN AMP CPC RECEPTACLE (206151-2)

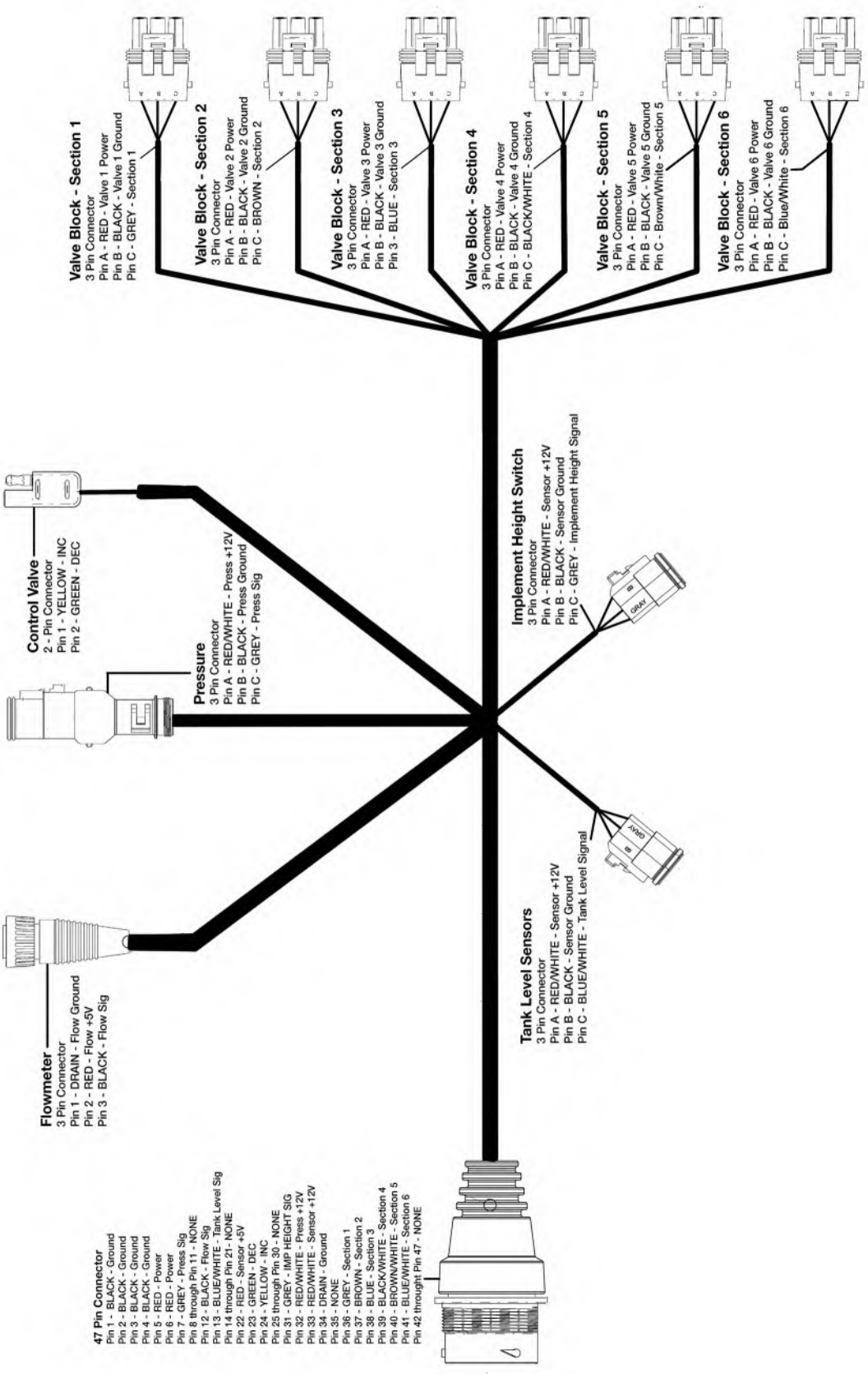
PIN #	WIRE COLOR	FUNCTION
1	BLACK	GROUND
2	BLACK	GROUND
3	NOT USED	NOT USED
4	GRAY	BOOM 1
5	BROWN	BOOM 2
6	BLUE	BOOM 3
7	BLACK/WHITE STRIPE	BOOM 4
8	BROWN/WHITE STRIPE	BOOM 5
9	BLUE/WHITE STRIPE	BOOM 6
10	WHITE/BLACK STRIPE	BOOM 7
11	WHITE/BROWN STRIPE	BOOM 8
12	WHITE/BLUE STRIPE	BOOM 9
13	PINK	BOOM 10
14	NOT USED	NOT USED
15	GREEN	FLOW DECREASE
16	YELLOW	FLOW INCREASE
17	NOT USED	NOT USED
18	NOT USED	NOT USED
19	NOT USED	NOT USED
20	NOT USED	NOT USED
21	BLACK	FLOW METER GROUND
22	NOT USED	NOT USED
23	NOT USED	NOT USED
24	NOT USED	NOT USED
25	RED	FLOW METER +5V POWER
26	NOT USED	NOT USED
27	NOT USED	NOT USED
28	VIOLET	FLOW METER SIGNAL
29	BLACK	PRESSURE TRANSDUCER GROUND
30	RED	PRESSURE TRANSDUCER POWER
31	ORANGE	PRESSURE TRANSDUCER SIGNAL
32	NOT USED	NOT USED
33	NOT USED	NOT USED
34	NOT USED	NOT USED
35	NOT USED	NOT USED
36	RED	POWER
37	RED	POWER

47 PIN DEUTSCH PLUG (HDP26-24-47SE-L024)

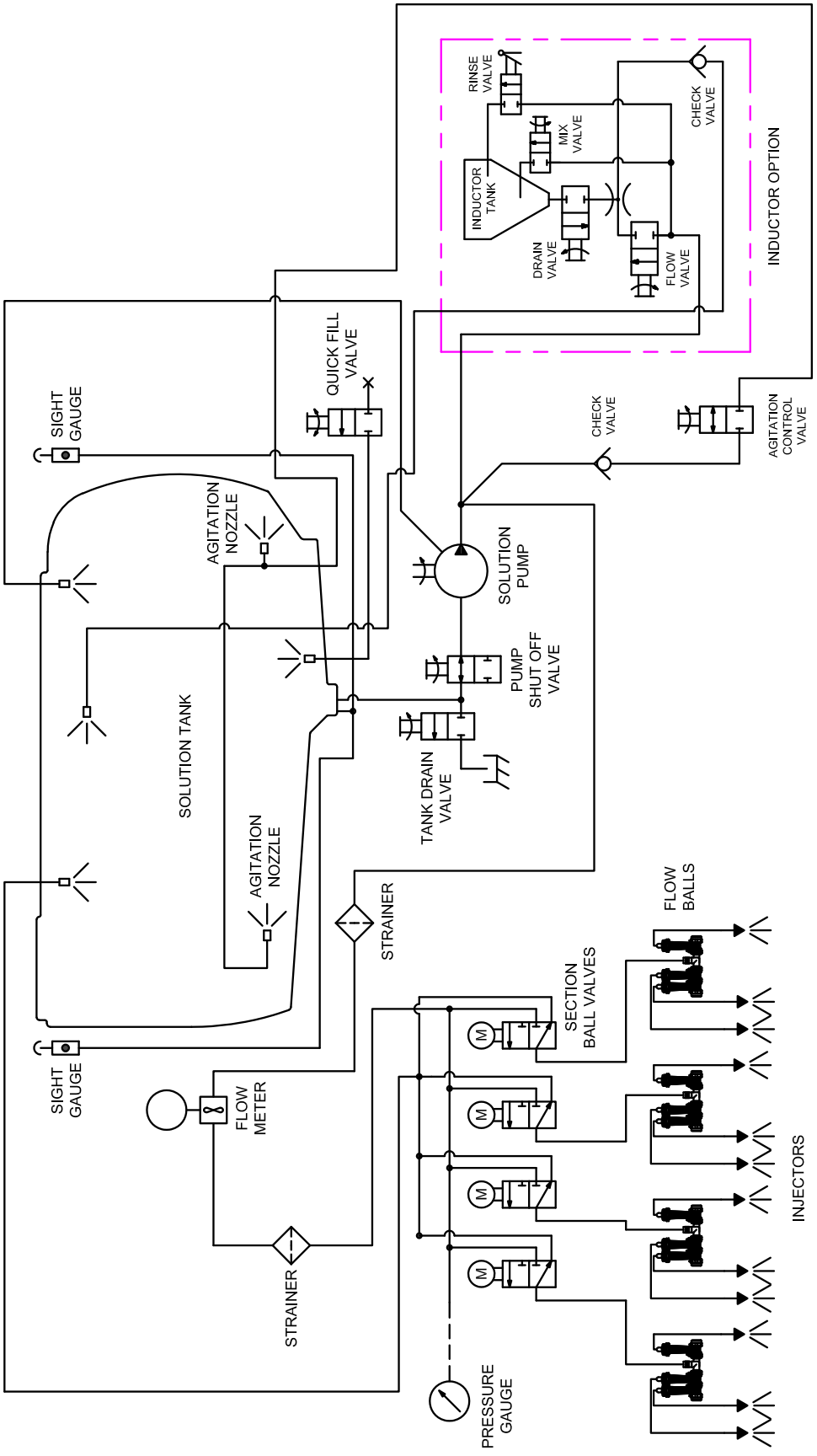
PIN #	WIRE COLOR	FUNCTION
1	BLACK	GROUND
2	BLACK	PRESSURE TRANSDUCER GROUND
3	BLACK	GROUND
4	BLACK	GROUND
5	RED	POWER
6	RED	POWER
7	ORANGE	PRESSURE TRANSDUCER SIGNAL
8	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
9	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
10	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
11	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
12	VIOLET	FLOW METER SIGNAL
13	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
14	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
15	RED	POWER
16	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
17	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
18	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
19	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
20	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
21	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
22	RED	FLOW METER +5V POWER
23	GREEN	FLOW DECREASE
24	YELLOW	FLOW INCREASE
25	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
26	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
27	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
28	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
29	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
30	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
31	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
32	RED	PRESSURE TRANSDUCER POWER
33	RED	POWER
34	BLACK	FLOW METER GROUND
35	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
36	GRAY	BOOM 1
37	BROWN	BOOM 2
38	BLUE	BOOM 3
39	BLACK/WHITE STRIPE	BOOM 4
40	BROWN/WHITE STRIPE	BOOM 5
41	BLUE/WHITE STRIPE	BOOM 6
42	WHITE/BLACK STRIPE	BOOM 7
43	WHITE/BROWN STRIPE	BOOM 8
44	WHITE/BLUE STRIPE	BOOM 9
45	PINK	BOOM 10
46	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
47	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)

Schematics - Electrical

Flow Cable, 6 Section (9503472)



Schematics - Plumbing



Notes

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