

# **APACHE<sup>TM</sup>**

## **A5720**

### **2012 Owner's Manual**



DO NOT OPERATE THIS EQUIPMENT UNTIL THIS MANUAL HAS BEEN READ AND UNDERSTOOD. ONLY PROPERLY TRAINED PERSONS SHOULD OPERATE THIS MACHINE.

**EQUIPMENT  
TECHNOLOGIES** 

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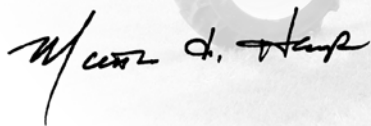


Dear Valued Customer,

Congratulations on the purchase of your new Apache Sprayer and welcome to the Apache family of owners. We hope that your new sprayer exceeds your expectations and gives you years of satisfaction. We invite you to visit us at [www.apachesprayer.com](http://www.apachesprayer.com) or in person at our plant in Mooresville, Indiana if you are in the area.

On behalf of all of our employees we thank you for your business.

Yours Faithfully,

A handwritten signature in black ink, appearing to read "Matthew F. Hays", is positioned over the lower portion of the Apache sprayer image.

Matthew F. Hays  
Chief Executive Officer

## *NOTICE*

Before applying chemicals or fertilizers with your Apache Sprayer, please check and calibrate the following precision agricultural equipment depending on the machine's configuration:

1. Check all settings and calibrations in your SCS 5000, Envisio Pro II or Viper Pro consoles:
  - Swath Width
  - Boom Section Calibration
  - Receiver Fore/Aft Settings
  - Valve Calibration
  - Flow Meter Calibration
  - Rate Calibration
  - Low Limit Setting
  - Valve Advance and Delay
2. Please review your Autoboom and Accuboom settings, if equipped.
3. Calibrate the SmarTrax™ autosteer, if equipped. SmarTrax calibration must be performed on a large, flat, open area. Make sure all settings are entered properly and that you perform the calibration in its entirety. This includes driving on an A-B line for roughly 20 minutes after automatic calibration is complete to allow the yaw sensor to learn how to acquire the line properly.



# APACHE™

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## CHAPTER 1

### GENERAL INFORMATION

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The graphics and text in this manual generally describe the AS720 Apache Sprayers. Apache Sprayers differ by model and by optionally installed equipment. Your Apache Sprayer may not exactly match the graphics and/or text descriptions in this manual. Please contact your dealer or Equipment Technologies with any questions regarding this manual or the instructions within.

#### 2012 AS720 Specifications

Tank Capacity .....	750 gallons [2839 liters]
Engine .....	160 hp [119.3 kW] Tier III Cummins
Transmission .....	ITL/JCB Power shift 4-speed, torque converted
Speed Ranges.....	1st 0-5 mph [0-8.04 km/h], 2nd 0-9 mph [0-14.5 km/h], 3rd 0-16 mph [0-25.7 km/h], 4th 0-28 mph [0-45 km/h]
Brakes .....	Internal, wet disc self adjusting
Front Suspension .....	Center oscillating with independent oil-filled, accumulated struts at each wheel
Rear Suspension .....	Patented accumulated hydraulic suspension with load compensation for diminishing/increasing loads and sway control for boom stability
Cab .....	ET custom pressurized cab
Crop Clearance .....	42 in. [106.6 cm] or 50 in. [127 cm]
Axles.....	120 to 160 in. [304.8 to 406.4 cm] adjustable, 120 in. [304.8 cm] fixed
Final Drive .....	ITL/JCB planetary gear set
Weight .....	17,400 lb [7892.5 kg] dry weight
Fuel Capacity .....	100 gallons [379 liters]
Width .....	12 ft [3.6 m]
Length .....	24 ft [7.3 m]
Height .....	144 in. [365.7 cm]
Wheel Base .....	15 ft [4.6 m]
Turning Radius .....	17 ft [5.1 m]
Tires.....	380/80R38 front, 380/90R46 rear, or optional 320/90R50
Booms .....	80 ft [24.3 m], 90 ft [27.4 m], 100 ft [30.4 m], 60 / 80 ft [18.2 / 24.3 m], 60 / 90 ft [18.2 / 27.4 m]
Boom Height.....	42 in. CC [106.6 cm] CC: 14 to 74 in. [35.5 to 187.9 cm] 50 in. CC [127 cm] CC: 22 to 82 in. [55.9 to 208.3 cm]
Product Pump.....	Hypro 9306C HM1C, hydraulically driven centrifugal pump
Roto-Flush .....	Pump pressured

## Apache AS720 Fluids, Filters and Capacities

Component	Lubrication	Capacity Quarts [Liters]	Filter Part Number
Engine Oil	Lucas 15W-40 Magnum Motor Oil	16 [15]	201450241
Engine Coolant	KostGuard Universal Antifreeze 50/50	24 [22.7]	----
Engine Primary Air Filter	----	----	201300116
Engine Safety Air Filter	----	----	201300117
Transmission	Lucas Universal Hydraulic Fluid	16 [15]	300000101
Differential (Rear Axle)	Lucas Universal Hydraulic Fluid	11.9 [11.26]	----
Planetary	Lucas 80/90 Gear Oil	2.2 [2]	----
Rear Drop Box	Lucas 80/90 Gear Oil	21 [20]	----
Engine Fuel	Diesel	100 Gallons [379 Liters]	Filter: 201450243 Separator/Filter: 201450242 Tank Strainer: 201450001
Hydraulic System	Lucas Universal Hydraulic Fluid	40 Gallons [151.42 Liters]	Filter: 880000026 Strainer: 840000010 Hydraulic Filter Kit: K65000209 Hydraulic Filter Kit with Oil: K65000210
Front Suspension	Lucas Universal Hydraulic Fluid	as required	----
A/C System	R134a	2.6 lbs	----
Cab Filters	----	----	Cab Filter Kit: K65000190 Charcoal Filter: 490003651* Recirculating Filter: 490006661*
* - Included in kit K65000190 NOTE: Any oil and fluid substitutions must meet or exceed recommended fluid specifications.			

### Tire Pressure (Cold)

320/85R38 . . . . .	41psi [2.82 bar]
320/90R50 . . . . .	78 psi [5.37 bar]
380/80R38 . . . . .	35 psi [2.41 bar]
380/90R46 . . . . .	60 psi [4.31 bar]
480/70R34 . . . . .	46 psi [3.17 bar]
520/85R46 . . . . .	23 psi [1.58 bar]
30.5x32R-3 . . . . .	26 psi [1.79 Bar]

### Lug Nut Torque

All Wheels . . . . .	420 lb-ft [570 N•m]
----------------------	---------------------

### Wet System Capacities

Product Tank . . . . .	750 gallons [2839 Liters]
Rinse Tank . . . . .	100 gallons [379 Liters]
Hydraulic Pump Output . . . . .	2400 psi [165 bar]

## AS720 Optional Equipment

The following chart lists optional kits available for the AS720 Apache Sprayer. The kits include all parts, brackets and mounting hardware needed for installation.

Part Number	Description
K65000171	Fence row nozzle 1 side 60/80 and 80 ft. booms. Order 2 kits for both sides.
K65000172	Fence row nozzle 1 side 90 and 100 ft. booms. Order 2 kits for both sides.
K65000197	Foam marker for straight booms.
K65000198	Foam marker for combo booms.
K65000205	3" quick fill for poly tank.
K65000238	3" quick fill for stainless tank.
K65000212	Flowmax fill station flow meter.
K65000191	Sprayer survival kit.
K65000209	Hydraulic filter kit (without oil)
K65000210	Hydraulic filter kit (with oil)
K65000234	Yearly service filter kit (720)
K65000196	Hypro chemical eductor kit for poly product tank.
K65000240	Hypro chemical eductor kit for stainless steel product tank.
K65000223	SCS 5000 monitor. Includes hardware and adapter.
K65000224	Envizio Pro II console. Includes hardware and MBA 6 antenna.
K65000225	Viper Pro console. Must choose Phoenix 200 or 300 antenna kit.
K65000226	Precision wiring, includes harnesses, switchbox, boom speed/sense node and product node.
K65000231	PowerGlide Plus auto boom kit
K65000232	UltraGlide with 3 sensors (ultrasonic eye autoboom)
K65000236	UltraGlide with 5 sensors (ultrasonic eye autoboom)
K65000239	Add UltraGlide to existing PowerGlide
K65000213	Add PowerGlide to existing UltraGlide
K65000227	Antenna kit with Phoenix 200. (Viper Only)
K65000228	Antenna kit with Phoenix 300. (Viper Only)
K65000229	SmarTrax autosteer kit. Must have Envizio Pro II or Viper Pro.
K65000230	Accuboom kit. Must have Envizio Pro II or Viper Pro.
K65000222	Hydraulic Adjust On the Go 2012
K65000202	Fender kit: front tires 42 and 50 in. CC (cannot be used with semi- or full-float tires)
K65000203	Fender kit: rear axle 42 in. CC (cannot be used with semi- or full-float tires)

Part Number	Description
K65000204	Fender kit: rear axle 50 in. CC (cannot be used with semi- or full-float tires)
K65000222	Hydraulic adjust on the go (120-160 adjustable axles only)
K65000079	Rear semi-float tires and rims for 42 in. CC AS720; tire size 520/85R46
K65000081	Rear semi-float tires and rims for 50 in. CC AS720; tire size 520/85R46
K65000080	Front semi-float tires and rims; tire size 480/70R34
K65000083	Rear full-float tires and rims for rear of 50 in. CC only; tire size 30.5x32R-3 (no full-float front tire option)
K65000106	Dual rear tire kit for 50 in. CC; tire size 380/90R46 (standard tires)
K65000218	Dual rear tire kit for 50 in. CC; tire size 320/90R50 (narrow tires)

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## CHAPTER 2

# SAFETY

---

Apache is committed to the safe design and operation of its products. This Apache Sprayer has been designed and manufactured with your personal safety while operating this Apache Sprayer as a primary concern.

### Safety Symbols, Signal Words and Statements

Safety symbols, signal words and statements, and symbols are used in this manual and on the Apache Sprayer to identify and alert you of potential hazards where personal safety precautions are required.



The safety alert symbol is used to alert you of potential personal injury hazards. Carefully read the safety message associated with safety symbol and follow any instructions provided to ensure your safety.

Safety signal words are used to alert you of potential personal injury hazards. Carefully read the safety message associated with safety signal word and follow any instructions provided to ensure your safety.

Safety statements are used to explain and inform you of potential personal injury hazards and provide precautionary instructions. Read, understand and follow all safety messages and information contained in this

manual and on the Apache Sprayer to prevent personal injury and ensure safe reliable Apache Sprayer operation.



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



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



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

*NOTICE: Indicates a potentially hazardous situation which, if not avoided, may result in improper Apache Sprayer operation and/or damage to equipment, property and the environment.*

## Safety Precautions

There is no substitute for common sense and following careful operation and service practices. Improper practices and carelessness can cause personal injury or even death.

The following safety precautions and guidelines must be followed in addition to the specific safety precautions listed throughout this manual and on the Apache Sprayer to reduce the risk of personal injury.

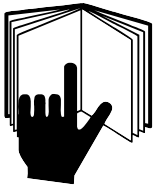
Keep this manual and all included literature in a safe and convenient location. Contact your Apache dealer or Apache at (317) 834-4500 to obtain replacement owner's manuals and safety decals.

To ensure your safety, the safety of others, and the safe operation of the sprayer, read, follow and practice the following:

### **WARNING**

*The safety messages that follow have WARNING level hazards.*

## Pre-Operation Hazards



*Read and understand this Owner's Manual before operating or servicing the Apache Sprayer to ensure that safe operating practices and maintenance procedures are followed. If you do not understand any part of this manual and need assistance, see your Apache dealer for assistance.*

- *NEVER permit anyone to operate the Apache Sprayer without proper training. Obtain proper knowledge and training before attempting to perform any operation or service procedure in this manual.*
- *This Apache Sprayer and its attachments are designed to spray liquid product. Use of this Apache Sprayer in any other manner other than its intended use is prohibited.*
- *Remove or clean contaminated clothing before entering the cab.*
- *Some components and systems of Apache Sprayers are manufactured by companies other than Apache and have specific safety, inspection, adjustment and maintenance procedures outlined by their manufacturer. Carefully read and understand all non-Apache Sprayer and sprayer manufacturer instructions and manuals supplied with the Apache Sprayer. These include, but are not limited to the Engine Owner's Manual, Sprayer Monitor System Manual, Radio Manual, Chemical Eductor Manual, Product Pump Instructions and other optional equipment.*

## Fire and Explosion Hazards



*Diesel fuel is flammable and explosive under certain conditions. Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.*



- *NEVER use a shop rag to catch spilling fuel.*
- *Wipe up all fuel spills immediately.*
- *NEVER refuel with the engine running.*
- *ALWAYS have appropriate safety equipment available. Have all fire extinguishers checked periodically for proper certification, operation and/or charge capacity.*
- *ALWAYS read and follow safety-related precautions found on containers of hazardous substances like parts cleaners, primers, sealants and sealant removers.*



## Burn Hazards

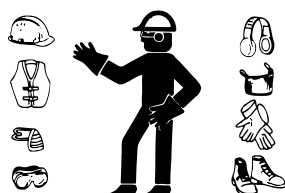


*Some of the engine surfaces become very hot during operation and shortly after shut-down. Keep hands and other body parts away from hot engine surfaces.*

## Lifting Hazards

- *ALWAYS use lifting equipment with sufficient capacity to lift the Apache Sprayer or equipment.*
- *If transport is needed for repair, acquire assistance when using a hoist and when loading and unloading.*

## Exposure Hazard



*ALWAYS wear the appropriate personal protective equipment as required by the task at hand, including but not limited to:*

- *Relatively tight and belted clothing*
- *Safety gloves*
- *Safety shoes/boots*
- *Safety eye glasses/goggles/shields*
- *Hearing protection, ear plugs*
- *Head protection, hard hats*
- *ALWAYS wear a respirator, goggles and gloves in addition to wearing long shirt sleeves and long pants when handling chemicals. Read the chemical safety label or instructions before usage.*

## Entanglement / Sever Hazard



*NEVER wear jewelry, watches, unbuttoned cuffs, ties or loose-fitting clothing and ALWAYS tie long hair back when working near moving/rotating parts.*



- *ALWAYS Keep hands, feet, hair and clothing away from all moving/rotating parts.*
- *NEVER operate the engine without the guards in place.*

## Alcohol and Drug Hazard

- *DO NOT operate or service the Apache Sprayer while under the influence of alcohol, awareness-altering drugs or medications that would affect your ability to operate or maintain the sprayer safely.*

## Exhaust Emissions Safety

Carefully read all safety information and observe any exhaust or pollution safety instructions. Be aware of and follow all regulations and policies as outlined by the engine OEM to maintain exhaust emission compliance with the Environmental Protection Agency (EPA), California Air Resources Board (CARB) and Environment Canada where applicable.

It is the owner's responsibility to keep the Apache Sprayer maintained and within compliance.

The state of California, U.S., has special regulations that may exceed the EPA regulations. If the Apache Sprayer is operated or serviced in the state of California, observe all exhaust and pollution regulations.

### **WARNING! Exhaust Gas Exposure Hazards**

- ***All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisoning. Prolonged exposure to carbon monoxide will cause brain damage or death.***
- ***ALWAYS operate the engine outside in a well-ventilated area.***
- ***NEVER block windows, vents or other means of ventilation if the engine is operating in an enclosed area.***
- ***ALWAYS ensure that all connections are tightened to specifications after repair is made to the exhaust system.***

## Environmental Precautions

The safety messages that follow have NOTICE level hazards.

- *Thoroughly clean any spilled fluids from the equipment and/or ground after service is completed. Dispose of used fluids and filters as required by law.*
- *ALWAYS be environmentally responsible. Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.*
- *NEVER dispose of hazardous materials by dumping them into a sewer, on the ground, or into ground water or waterways.*

## Safety Belt

### **WARNING! Impact Hazards.**

- ***ALWAYS fasten your seat belt when operating the Apache Sprayer. The safety belt must be worn properly by the driver anytime the Apache Sprayer is in motion.***
- ***NEVER alter or tamper with any safety belt system components.***

Safety belt systems are designed to limit occupant motion by restraining occupants' bodies within the cab and prevent, or reduce the severity of, injuries during most types of collisions. When safety belts are used properly, they are effective in reducing the risk of injury.

Inspect the safety belt system regularly for cuts, frays, wear, discoloration or abrasion. The hardware, mounts, retractor and belt should work freely. The belt and/or components must not show signs of deterioration. If you suspect any part of the system is in need of repair, have the system repaired or replaced immediately and use only parts designed for the safety system.

**WARNING! Impact Hazard. DO NOT operate the Apache Sprayer if any part of the seat belt system is damaged. The system must be repaired or replaced before operating the Apache Sprayer.**

**NOTICE:** DO NOT use harsh cleaners, bleach or any products which could cause the safety belt material to deteriorate.

## **Safety Decals**

***CAUTION! ALWAYS read and follow the safety decals on the Apache Sprayer. Safety decals are additional reminders for safe operating and maintenance techniques.***

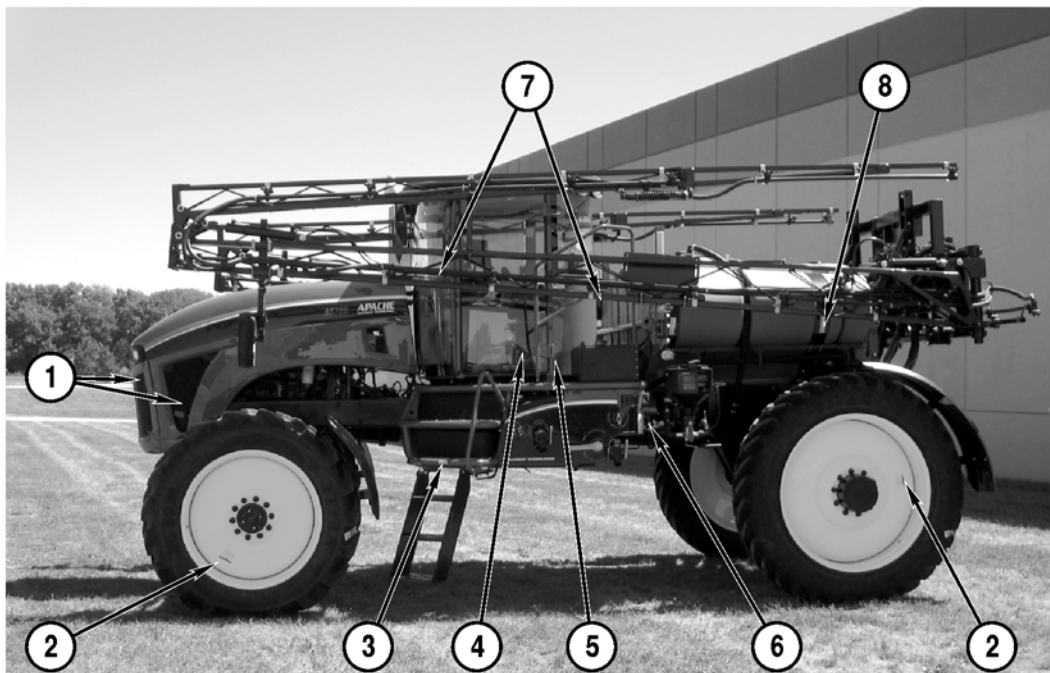
Safety decals are used to explain and inform you of potential personal injury hazards and provide precautionary instructions. Read, understand and follow all safety decals on the Apache Sprayer to prevent personal injury and ensure safe reliable Apache Sprayer operation.

*NOTICE: Prevent safety decals from becoming dirty or damaged and replace them immediately should they become damaged or are missing. Should an Apache Sprayer part that has a decal attached to it need replacement, obtain a new decal with the new part.*

Contact your Apache dealer or Apache at (800) 861-2142 to obtain replacement safety decals.

To ensure your safety, the safety of others and the safe operation of the sprayer, read, follow and observe the following safety decals.

## Exterior Decal Locations



1. 

	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p style="text-align: center;"><b>BURN / SEVER HAZARD</b></p> <p>Keep fingers clear of hot surfaces and rotating parts while engine cover is open and engine is running.</p> <p style="text-align: right; font-size: small;">420306036</p>
--	--
2. 

<b>⚠ WARNING</b>	
<p style="text-align: center;"><b>TIRE HAZARD</b></p> <ul style="list-style-type: none"> <li>Torque wheel bolts to 420 ft-lb (570 N•m). Check torque daily for first week of operation and weekly thereafter.</li> <li>Replacement tire must meet or exceed original tire specifications. Failure to comply may cause tire failure resulting in serious injury or death.</li> </ul> <p style="text-align: right; font-size: small;">420306033</p>	
3. 

	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p style="text-align: center;"><b>STRIKING BYSTANDER HAZARD</b></p> <p>Keep bystanders away from automatic ladder; it may move unexpectedly.</p> <p style="text-align: right; font-size: small;">420306059</p>
--	--
4. 

	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p style="text-align: center;"><b>FALLING HAZARD</b></p> <p>Never allow riders on the machine.</p> <p style="text-align: right; font-size: small;">420305530</p>
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5.

	<h3>NOTICE</h3> <p>Use a charcoal element when replacing the cab air filter and cab recirculating air filter.</p> <p>(A) Cab Charcoal Air Filter –P/N 490003651 (B) Cab Recirculating Air Filter –P/N 490006661</p> <p>420306057</p>
	<h3>NOTICE</h3> <ol style="list-style-type: none"> <li>1. Tighten bolts on each tank strap without pulling the top of the tank down or bending the bolts or tank skid.</li> <li>2. Tighten tank straps evenly side-to-side.</li> <li>3. Fill the tank with water.</li> <li>4. Drive tractor.</li> <li>5. Allow tank to settle.</li> <li>6. Retighten straps.</li> <li>7. Repeat for first three tank loads.</li> <li>8. After the first three tank loads, readjust tank straps every 250 hours.</li> </ol> <p>420306030</p>

7.

	<h3>WARNING</h3> <h4>BURN HAZARD</h4> <p>Keep hands away from the muffler and exhaust system until the engine is completely cool.</p> <p>420306058</p>
--	--

8.

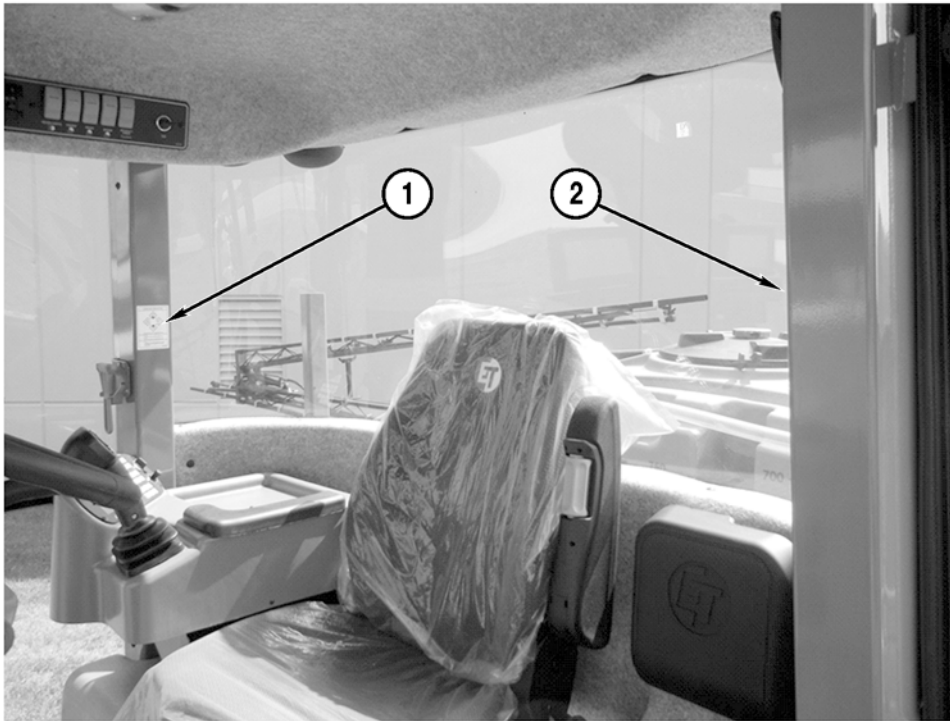
<h3>WARNING</h3> <p>Failure to comply with this warning may result in severe personal injury or death. Inspect before each use. Not to be used for lifting. Do not use if any signs of burning, melting, cuts, fraying, or abrasion of fibers or alterations are present. Hardware shall not be used if any signs of damage or alterations are present.</p>
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6.

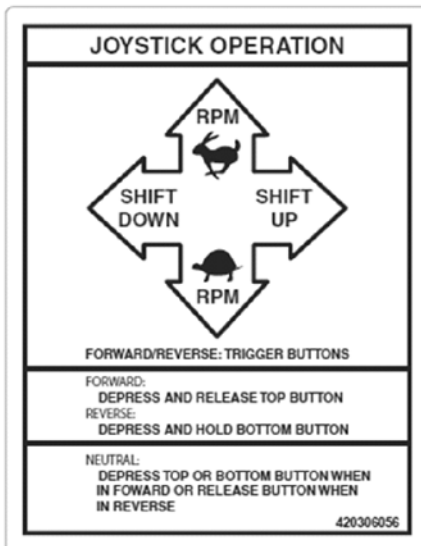
	<h3>WARNING</h3> <h4>HIGH-PRESSURE FLUID HAZARD</h4> <p>High-pressure hydraulic fluid leaks can penetrate skin resulting in serious injury, gangrene or death.</p> <ul style="list-style-type: none"> <li>• Check for leaks with cardboard; never use your hand.</li> <li>• Before you loosen a fitting: <ul style="list-style-type: none"> <li>- Lower load.</li> <li>- Release pressure.</li> </ul> </li> <li>• Make sure hydraulic fluid is cool.</li> <li>• Consult physician immediately if skin penetration occurs.</li> </ul> <p>420305513</p>
	<h3>WARNING</h3> <h4>EXPOSURE HAZARD</h4> <p>Agricultural chemicals can be dangerous:</p> <ul style="list-style-type: none"> <li>• Improper selection or use can seriously injure persons, animals, plants, soil or other property.</li> <li>• Select the correct chemical for the job.</li> <li>• Handle the chemicals with care.</li> <li>• Follow the instructions on the container label and instructions from the equipment manufacturer.</li> </ul> <p>420305518</p>
	<h3>WARNING</h3> <h4>NON-POTABLE WATER HAZARD</h4> <p>This water is for rinsing or washing purposes only. Do not drink it. It may be contaminated by sprayer chemicals. Fill with clean water only.</p> <p>420306032</p>
	<h3>WARNING</h3> <h4>ENTANGLEMENT HAZARD</h4> <p>Keep body parts away from rotating driveshaft.</p> <p>420306035</p>
	<h3>NOTICE</h3> <ul style="list-style-type: none"> <li>• Fill the rinse, foamer or product tank slowly.</li> <li>• Rapidly filling, or overfilling, any of these tanks may cause them to rupture.</li> </ul> <p>420305740</p>



## Interior Decal Locations



1.



2.



# APACHE™

## CHAPTER 3

### OPERATION

---

Before performing any operation procedures, read the following safety messages and read the Safety Section.

**WARNING! Control Hazard. DO NOT operate the Apache Sprayer while wearing a headset to listen to music or radio because it will be difficult to hear the warning signals.**

**WARNING! Impact Hazard. Secure any loose items in cab. Items that are unsecured may cause injury in case of a roll-over.**

**WARNING! Roll-Over Hazards**

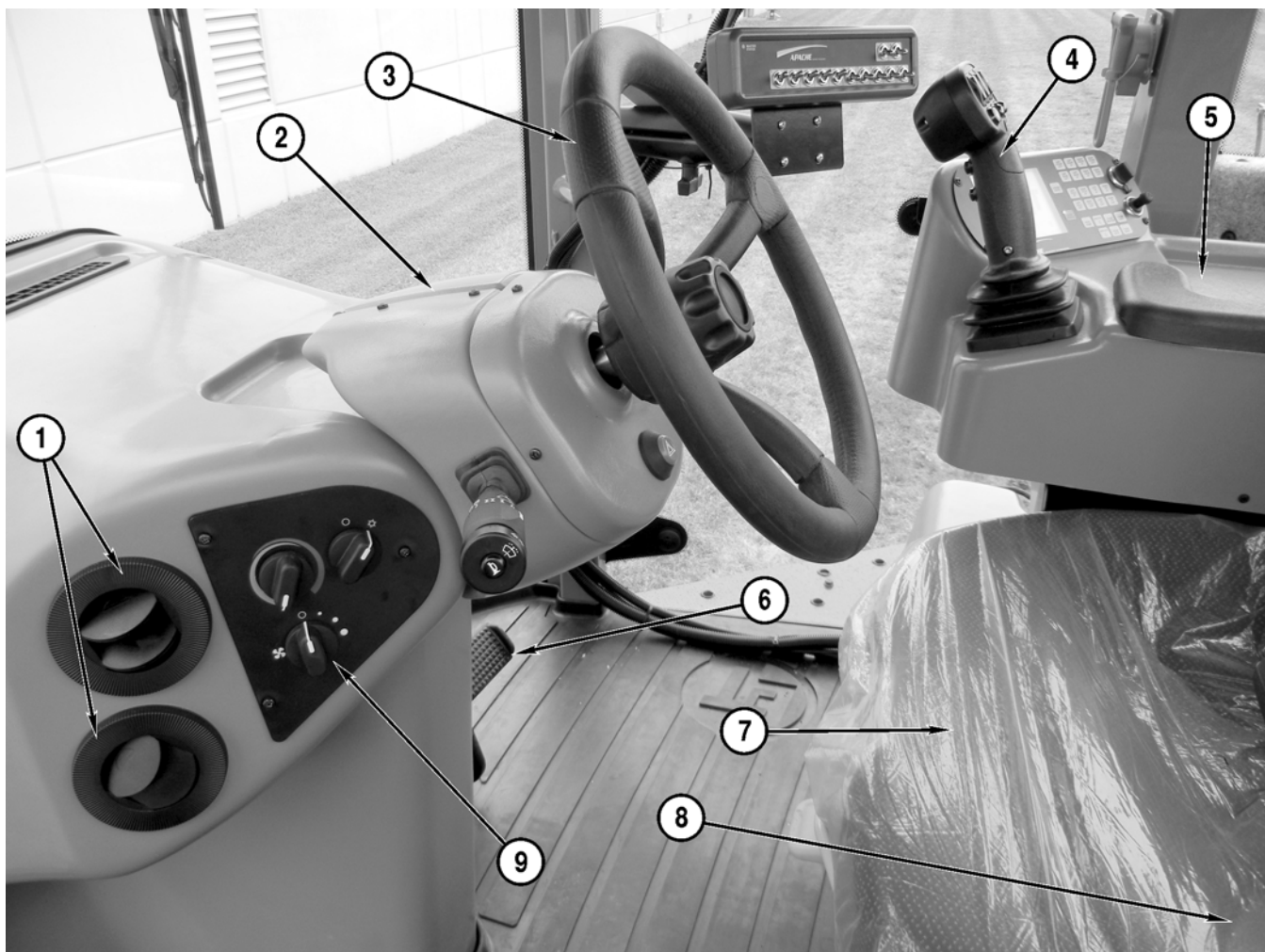
- ***DO NOT operate on steep slopes.***
- ***DO NOT drive across a slope. Drive up and down slopes.***
- ***DO NOT turn down a slope.***
- ***Slow down when turning.***
- ***Keep booms as close to the ground as possible.***
- ***Drive slowly across rough ground.***
- ***DO NOT operate on public roads or highways with product in the product tank.***
- ***ALWAYS come to a complete stop before reversing directions.***

#### Pre-Operation Checks

Before operating the Apache Sprayer, perform the following safety and equipment checks.

- Read and understand this manual before operating the Apache Sprayer.
- Read and follow all safety messages and safety decal instructions in this section. See "Safety" on page 2-1.
- Check the condition of all safety decals. Replace if damaged.
- Check that all shields and guards are properly installed and in good working condition. Replace if damaged.
- Check all hardware for proper installation and torque. See "Torque Value Charts" on page 7-1.
- Check the operating area for bystanders and obstruction before operating.
- Check that all hydraulic hoses and fittings are in good condition and not leaking. Make sure the hoses are routed to prevent damage, not twisted, sharply bent, kinked, frayed, or pulled tight or rubbing, before starting the Apache Sprayer. Replace any damaged hoses or fittings immediately.
- Check the operation and condition of the seat belt. Immediately repair or replace the seat belt if damaged or if it does not operate properly.
- Check tires for proper inflation pressure according to tire manufacturer's recommendations. Specifications are also provided on the back cover of this manual. See "Check Tire Pressure" on page 5-11.
- Check engine oil level and add oil as needed. See "Check Engine Oil Level" on page 5-11.
- Check transmission fluid level and add fluid as needed. See "Check Transmission Fluid Level" on page 5-13.
- Check differential, gearboxes and/or planetaries fluid levels and add fluid as needed. See "Check Differential Fluid Level" on page 5-17.
- Check coolant level and add coolant as needed. See the engine manufacturer's manual for details.
- Check hydraulic reservoir fluid level and add fluid as needed. See "Check Hydraulic Fluid Level" on page 5-13.

## Cab Overview



- |                    |                                       |
|--------------------|---------------------------------------|
| 1. Air vents       | 6. Brake Pedal(s)                     |
| 2. Steering Column | 7. Air Seat                           |
| 3. Steering Wheel  | 8. Fire Extinguisher<br>(behind seat) |
| 4. Joystick        | 9. Climate Controls                   |
| 5. Side Console    |                                       |

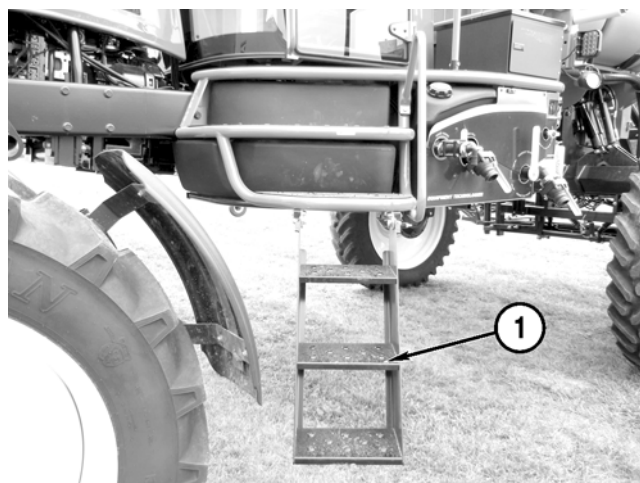


## Cab Access Ladder

### 1. Access Ladder

The cab access ladder is automatically actuated by the parking brake switch.

- When the parking brake is applied, the ladder folds down.
- When the parking brake is released, the ladder folds up.



## Steering Column

NOTE: DO NOT drill or alter in any way, the plastic of the steering column.

### 1. Steering Column Tilt Adjustment Lever

- Step forward on the foot lever.
- Adjust the tilt to the desired position.
- Release the foot lever to lock the column.

### 2. Steering Wheel

### 3. Steering Wheel Telescope Adjustment Knob

- Turn center knob counterclockwise to unlock.
- Position steering wheel to desired height.
- Turn center knob clockwise to lock.

### 4. Hazard Flasher Button

### 5. Horn Button

Push to sound horn.

### 6. Turn Signal Lever

- Push lever up for right turn signal.
- Push lever down for left turn signal.

### 7. Windshield Washer

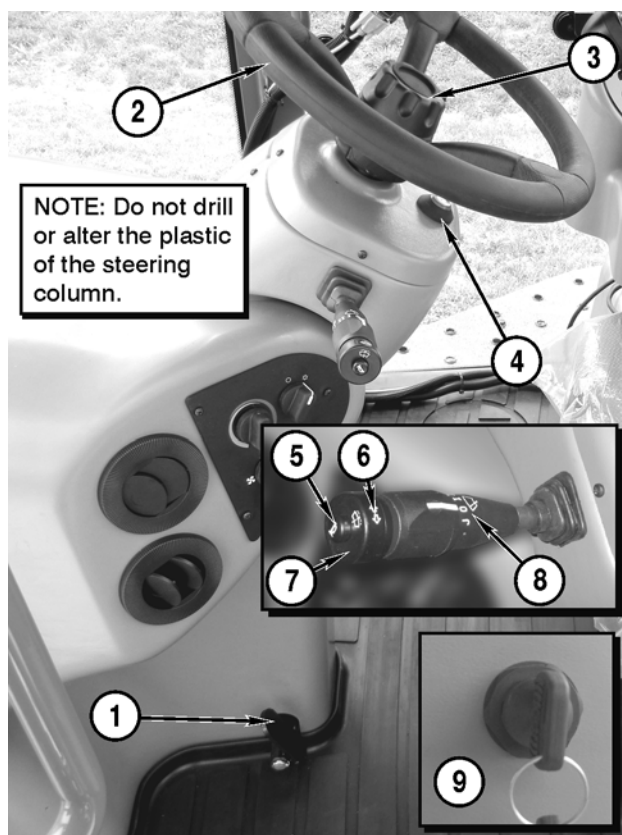
- Push ring to operate washer.

### 8. Windshield Wiper Switch

- Turn lever to the "I" position for low speed wiper.
- Turn lever to the "II" position for high-speed wiper.

### 9. Key Switch

Shown in the "OFF" position. See "Starting and Stopping the Engine" on page 3-12.



## Fault Code Indicator:

### 1. Fault Code Indicator on Console

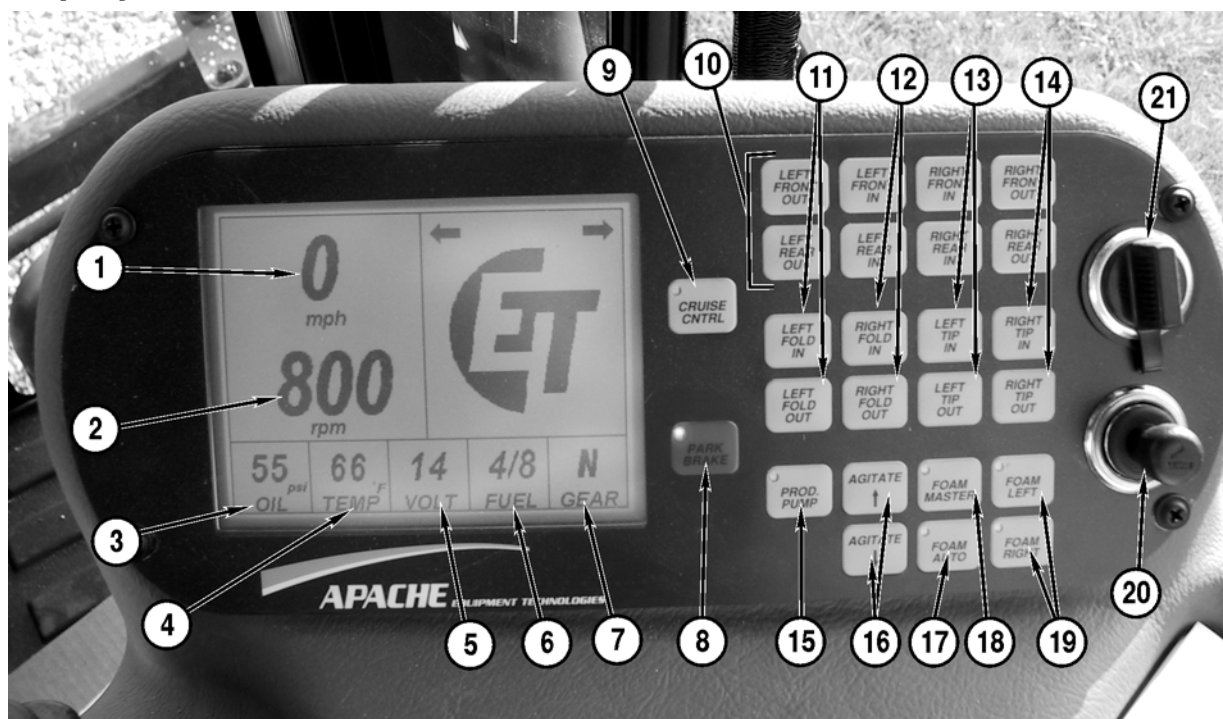
When a fault code is logged, the ET logo will disappear on the right side of the console display and one or more of the following fault codes will appear:

- Stop Engine
- Check Engine
- Water In Fuel
- Wait To Start
- Water Temperature
- Failed Fuse F11
- Low Oil Pressure
- Change Air Filter
- High Hydraulic Temp
- High Trans Temp
- Low Coolant
- ECU Failure
- SPN 00000 FMI 00

Refer to Cummins Engine Fault Codes on page 6-1.



## Apache Sprayer Console



- |  |  |
|--|--|
| 1. MPH Readout   | 12. Right Boom Fold In and Fold Out                |
| 2. Engine RPM  | 13. Left Boom Tip Fold In and Fold Out             |
| 3. Engine Oil Pressure                                   | 14. Right Boom Tip Fold In and Fold Out            |
| 4. Engine Water Temperature                              | 15. Product Pump On/Off Switch                     |
| 5. Voltage Level   | 16. Agitation Pressure Increase and Decrease       |
| 6. Fuel Level  | 17. Foam Auto On/Off                               |
| 7. Direction and Gear Indicator                          | 18. Foam Master On/Off Switch                      |
| 8. Park Brake Switch                                     | 19. Turn Foam Drop On for Right Side and Left Side |
| 9. Cruise Control Master Switch                          | 20. Cigarette Lighter                              |
| 10. Axle Hydraulic Adjust Switches In and Out (Optional) | 21. Auxiliary Power Outlet                         |
| 11. Left Boom Fold In and Fold Out                       |  |

The console displays the machine hours, software version, and instructions for screen contrast adjustment and speed calibration for the first 5 seconds of the key being turned from the off position to run position.

### 1. Number of Hours On Machine

### 2. Software Version Number

### 3. Console Display Contrast Adjust

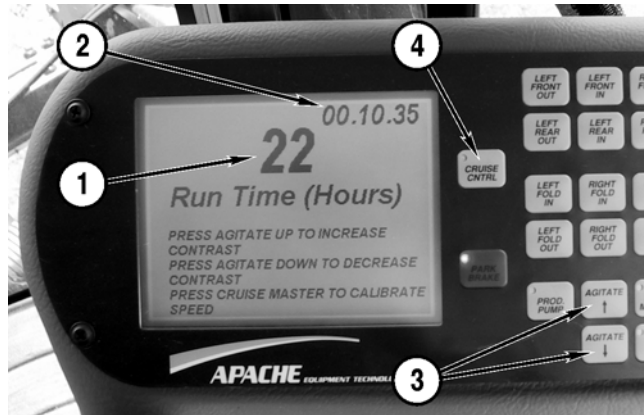
To adjust the contrast of the console display:

- Press the agitate increase button and hold to increase the contrast of display.
  - Press the agitate decrease button to decrease the contrast of display.
- Both must be done before start up of the Apache Sprayer while the display is in this mode.

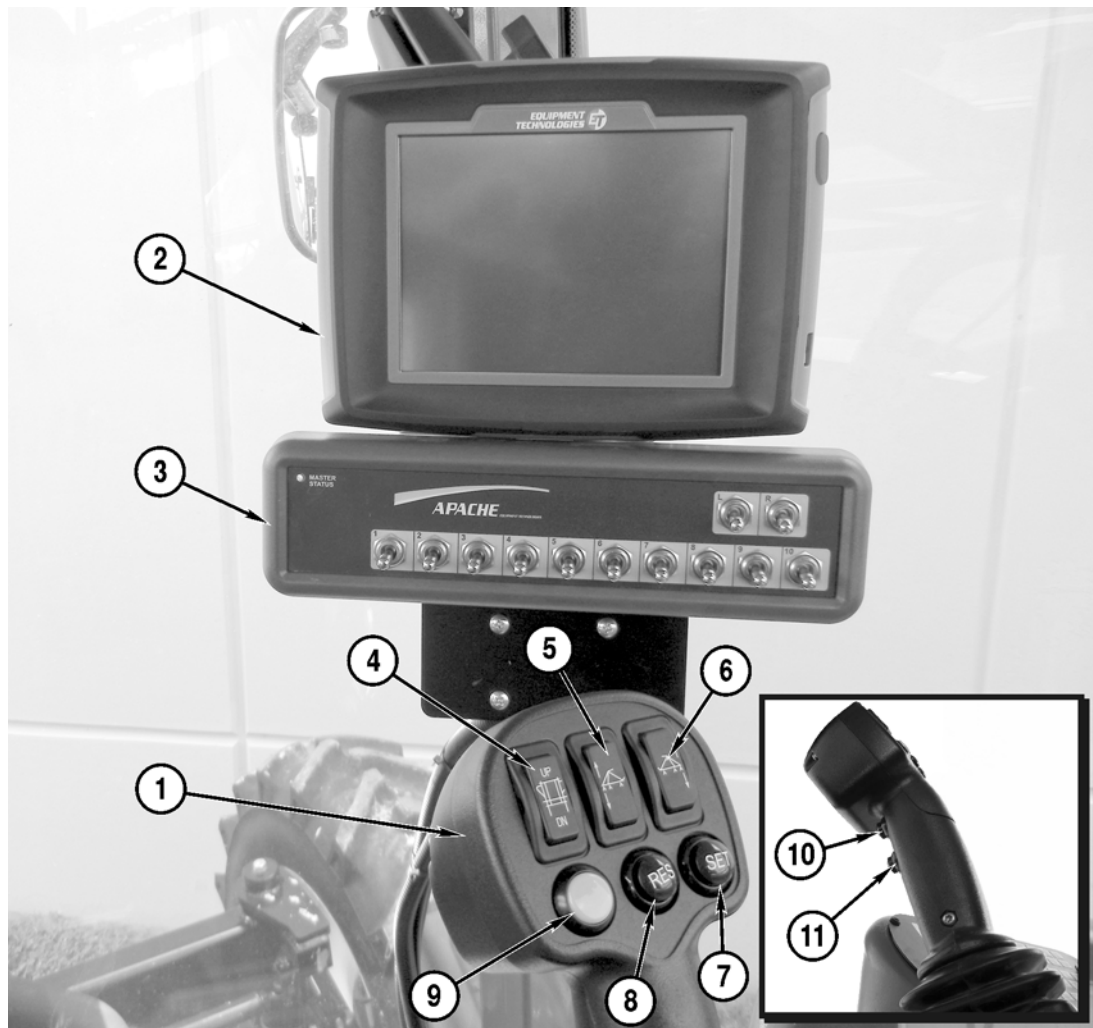
### 4. Speed Calibration

To calibrate the speed of the Apache Sprayer:

- Press the cruise master button (while the board is in this state).
- Press the cruise master a second time.
- Drive a measured mile, 5,280 feet [1.6km].
- Drive through the mark at end of measure mile, pushing the cruise master when the front wheels are crossing the mile mark. This will automatically reset the speed reading on the Apache Sprayer.



## Joystick and Envisio Pro II Console



1. **Joystick**  
See "Apache Sprayer Direction and Speed" on page 3-14. for complete operations.
2. **Envisio Pro II Console**
3. **Boom Switch Box**
4. **Boom Rack**  
Press to move the boom rack up or down.
5. **Left Boom Tilt**  
Press to tilt the left boom up or down.
6. **Right Boom Tilt**  
Press to tilt the right boom up or down.
7. **Set Button for Cruise**  
Press to set cruise control.
8. **Resume Button for Cruise**  
Press to resume cruise control.
9. **Master Spray Switch**  
Press to turn all five spray sections on or off.
10. **Transmission Forward Direction Trigger Button**
11. **Transmission Reverse Direction Trigger Button**  
The reverse button must be held in to move.

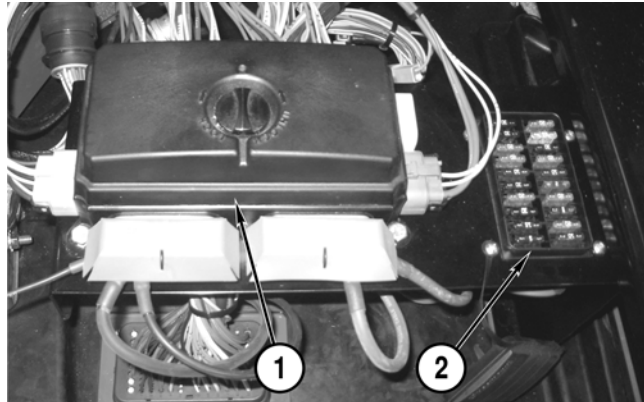


## Fuse Blocks

The fuse blocks are located under a service cover inside the right, rear, of the cab. The cover is shown removed for clarity.

The main fuse block (1) contains both mini spade fuses and relays, as well as a fuse removal tool. The small fuse block (2) contains only regular spade fuses.

To access the main fuse block fuses, remove the cover by rotating the knob on top 1/4 turn to the UNLOCK position. To access the fuses in the small fuse block, flip up the snap-on lid.



## Light Switches

### 1. Headlights

- Press the switch down to turn on the hood-mounted headlights, marker lights and tail lights.
- Press the switch up to turn off the lights.

### 2. Cab Front Lights

- Press the switch down to turn on the cab-mounted, front-facing work lights.
- Press the switch up to turn off the lights.

### 3. Cab Rear Lights

- Press the switch down to turn on the cab-mounted, rear-facing work lights.
- Press the switch up to turn off the lights.

### 4. Boom Lights

- Press the switch down to turn on the dual beam boom lights.
- Press the switch up to turn off the lights.

### 5. Product Rinse (Flow Back)

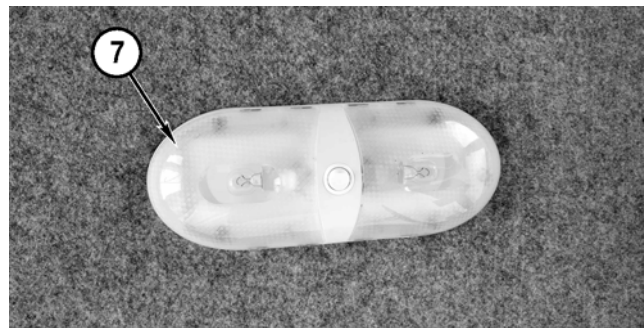
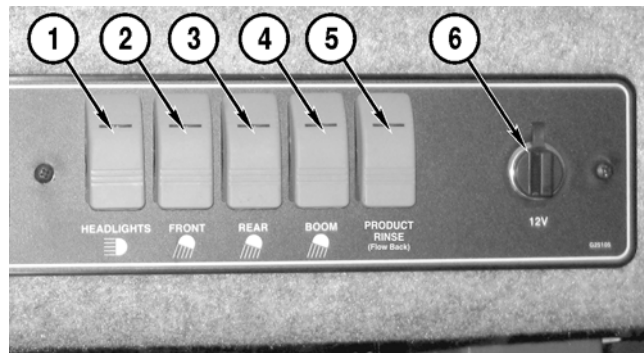
See "Flushing Booms" on page 4-25.

### 6. Auxiliary Power Outlet

### 7. Dome Light

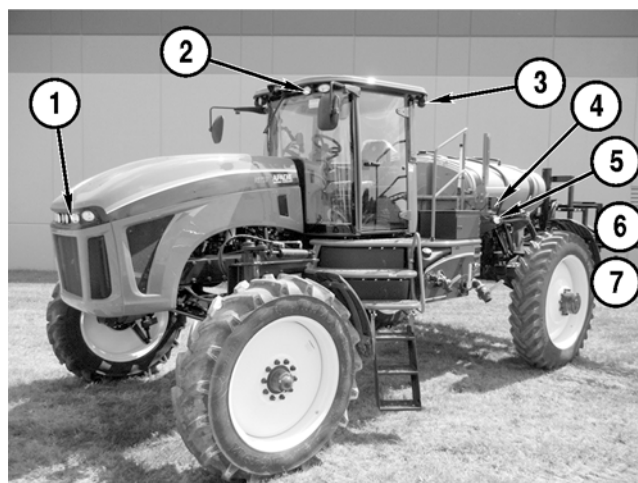
- Press the switch to turn the light on and off.

**NOTICE:** The dome light can drain the battery if left on without the engine running.



## Apache Sprayer Lighting

1. **Headlights**
2. **Cab Front Work Lights**
3. **Cab Rear Work Lights**
4. **Side Hazard and Turn Signal Lights**
5. **Dual Beam Boom Work Lights**
6. **Rear Hazard and Turn Signal Lights**  
(Mounted to back rack - not shown)
7. **Brake Lights**  
(Mounted to back of chassis - not shown)



Turn Signal and Hazard Light Function:

- When the hazard lights are turned on, light sets #5, #7 and #8 will all flash.

Turn Signal Function:

- When the left turn signal is turned on, the left side of light sets #5, #7 and #8 will all flash.
- When the right turn signal is turned on, the right side of light sets #5, #7 and #8 will all flash.

If the hazard lights are already flashing when the turn signal is activated, the lights opposite the turn indicator will glow steady while the lights on the side of the turn will flash.

## AM/FM Radio with Weather Band and CD Player

1. **AM/FM, Satellite Radio with Weather Band, NOAA / SAME Severe Weather Alert Programmable, USB Ready, and CD Player**  
See manufacturer instructions for operation, and local NOAA / SAME alert settings.
2. **Equipment Technologies is pleased to provide you with 6-months of free Sirius Satellite Radio!**  
See Activation Information on the next page or find the instructions at the bottom of page 2 of the quick reference guide of your Apache's Jensen radio set.



## Sirius Satellite Radio Activation Information

Activation is easy and does not start until you are ready. This way, you are able to enjoy 120+ channels of crystal clear satellite radio throughout the majority of your application season.

### Activating your Sirius® Subscription

Before you can listen to SIRIUS Satellite Radio, you must subscribe to the service.



1. With the power ON, press the Mode button to enter Sirius Ready mode. After displaying the SIRIUS logo, the Receiver will update all the SIRIUS channels. NOTE: Don't push any buttons or perform any operations until updating has been completed
2. Once updated and the SIRIUS channels are received, the display will change to "Call 1-888-539-SIRIUS to Subscribe" and will place you in SIRIUS Satellite Radio's Preview Channel. Channel 184 is the SIRIUS preview channel. You will not be able to tune any other Sirius Radio channels until you activate your subscription.
3. You will need to access your SIRIUS ID, which is displayed on channel 000. Press and hold the INFO/ENTER button on the radio to enter to enter Direct Tuning mode. Press << or >> to select digits 000. Press ENTER to make your selection. This display your unit's unique 12-digit SIRIUS ID Number.
4. Write the SIRIUS ID number down.
5. Contact SIRIUS on the internet: <https://activate.siriusradio.com/> Follow the prompts to activate your subscription. You can also call SIRIUS toll free at: 1-888-539-SIRIUS (1-888-539-7474).

### Renewal information

There is absolutely no obligation to renew. At the end of your 6-months of free service, you will be contacted by a Sirius representative or you may contact your Apache dealer ahead of time to have the billing transferred to you directly. It is entirely up to you, but again, there is no obligation to renew.

### Channel Information

Visit <http://www.siriusxm.com/channellineup> for an up-to-date listing of channels.

Enjoy!



## Seat Adjustment

### 1. Height

- Lift lever to raise the seat.
- Push the lever down to lower the seat.

### 2. Fore-Aft Position of Whole Seat

- Pull lever up to adjust seat forward or backward.

### 3. Fore-Aft Position of Seat Cushion Only

- Pull lever up to adjust seat cushion forward or backward.

### 4. Seat Cushion Tilt

- Pull lever up to tilt seat cushion up or down.

### 5. Fore-Aft Isolator

- Turn the lever to the left to allow front-to-back movement of the seat.
- Return the lever to the right to lock-out movement.

### 6. Ride Firmness

- Turn the knob counter-clockwise for firm ride.
- Turn the knob clockwise for soft ride.

### 7. Lumbar Support

- Turn the knob counter-clockwise for more lumbar support.
- Turn the knob clockwise for less lumbar support.

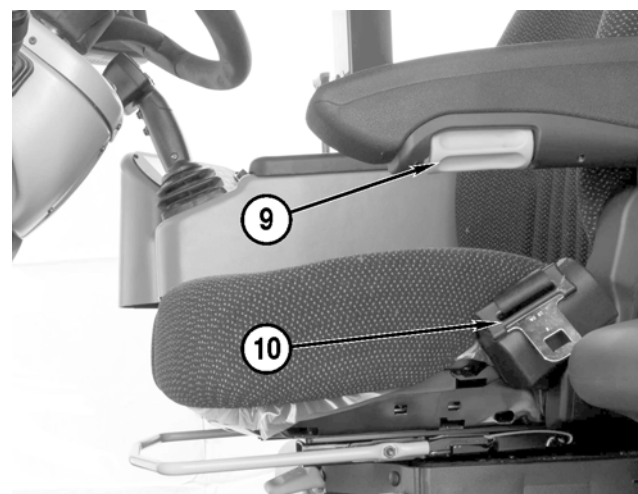
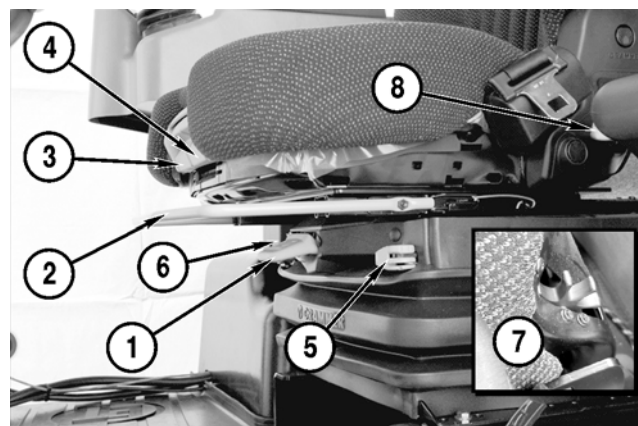
### 8. Backrest

- Lift the lever.
- Position the backrest.
- Release the lever.

### 9. Armrest

- Turn knob to adjust armrest angle.

### 10. Seat Belt



## Starting and Stopping the Engine

### Starting

**WARNING! Impact Hazard. ALWAYS** fasten your seat belt when operating the Apache Sprayer. The safety belt must be worn properly by the driver anytime the Apache Sprayer is in motion. Refer to *Safety Belt* on page 3-11.

**WARNING! Sudden Movement Hazards**

- **ALWAYS** start the engine from the operator's seat.
- **ALWAYS** set the parking brake (1) before starting the engine.
- **ALWAYS** fasten your seat belt before starting the engine.

**WARNING! Fire Hazard. NEVER** start the engine by shorting across the starter terminals.

The key switch has 4 positions:

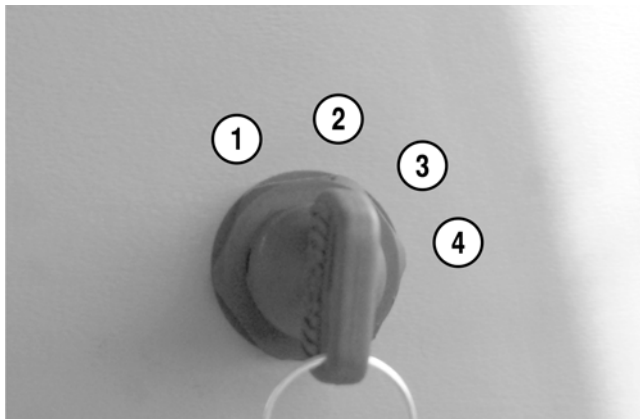
1. **Position 1 - Accessory**
2. **Position 2 - OFF position**
3. **Position 3 - RUN position**
4. **Position 4 - START position**

- Turn the key switch to the RUN position (3) and wait for the "Wait-To-Start" lamp on the console display to go out.
- Turn the key to the START position (4) and crank the engine.
- When the engine starts, release the key.

**NOTICE:** NEVER continuously crank the starter more than 30 seconds. Stop cranking and allow the starter to cool for 2 minutes between cranking to avoid damaging the starter.

**NOTICE:** If the engine stalls under load, immediately stop the Apache Sprayer and shift the transmission into NEUTRAL. Restart the engine immediately to avoid damaging the turbocharger.

- If the engine does not start after four attempts, see the Troubleshooting section in the engine manufacturer's service manual or contact your dealer.
- After the engine is started, check all gauges for normal engine operation. If the gauges indicate a problem, stop the engine and determine the cause.



## Warm-up

Check the engine oil pressure gauge (1) as soon as the engine starts.

- If the oil pressure gauge does not reach the minimum pressure of 15 psi [1.03 bar], stop the engine and determine the cause.
- Normal engine oil pressure is 50 psi [3.45 bar] when the engine oil is 240°F [116°C].

NOTE: Engine oil pressure can vary depending on conditions. See the engine manufacturer's service manual, supplied with the Apache Sprayer.

Check the engine coolant gauge (2).

- Normal operating temperature is 180°F [82°C].
- If the engine coolant rises above 234°F [112°C], reduce the load on the engine.
- If the coolant temperature does not drop, stop the engine and determine the cause.

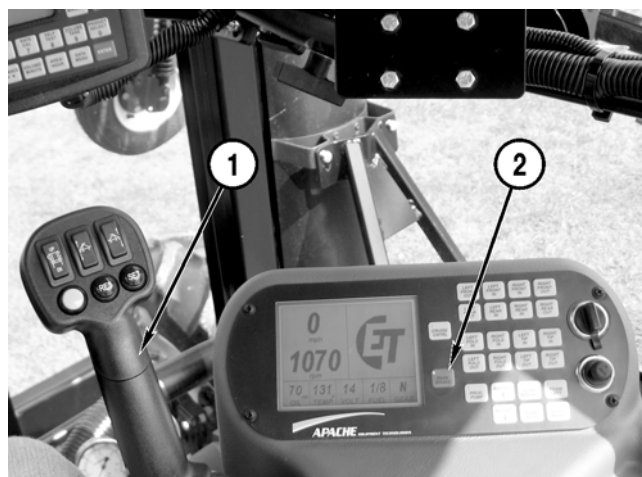


## Stopping

**NOTICE:** After operating the engine under load, allow the engine to idle for 2 minutes before stopping to avoid damaging the turbocharger.

### To stop the Apache Sprayer:

- Lower the engine rpm.
- Bring the Apache Sprayer to a complete stop.
- Shift the transmission to NEUTRAL by squeezing the trigger button on the joystick (1).
- Apply the parking brake (2).
- Turn the key to the OFF position and remove the key.



## Apache Sprayer Direction and Speed

### **WARNING! Sudden Movement Hazards**

- **NEVER** leave the operator's seat or cab when the Apache Sprayer is in gear. **ALWAYS** stop the Apache Sprayer, shift the transmission into **NEUTRAL** and then apply the parking brake before exiting the cab.
- **ALWAYS** stop the Apache Sprayer and apply the parking brake before changing direction. The Apache Sprayer must be at a complete stop before shifting the transmission into or from **FORWARD**, **REVERSE** OR **NEUTRAL**.

**NOTICE:** NEVER shift the transmission into **NEUTRAL** when the Apache Sprayer is moving. The transmission is only lubricated when in gear. Coasting will damage the transmission.

### Neutral

At start-up, the Apache Sprayer transmission is reset to **NEUTRAL** and an indicator lamp on the console will indicate "N" (1).

Squeeze and hold either one of the trigger buttons to put into gear.

- Use the top button for **FORWARD** and the bottom button for **REVERSE**.
- Once the transmission is in gear, the gear indicator will show the current gear.

Return to **NEUTRAL** by squeezing either of the trigger buttons.

- The transmission will immediately shift to **NEUTRAL**.

**NOTE:** The joystick will not shift the transmission into **NEUTRAL**. The trigger buttons must be used.

- To obtain **NEUTRAL** from a forward gear, squeeze either trigger button on the joystick.
- To obtain **NEUTRAL** from a reverse gear, release the bottom trigger button on the joystick.



## Forward

### To move the Apache Sprayer forward:

Apply the foot brakes and release the parking brake.

NOTE: The transmission will not shift if the parking brake is applied.

To move forward:

Release the park brake.

Apply the Apache Sprayer brakes.

Squeeze and hold the top trigger button (1) on the joystick until the transmission shifts into first gear FORWARD. The Apache Sprayer will begin rolling forward at this time.

Once the Apache Sprayer is in first gear FORWARD, release the button.

- Push the joystick forward to increase the engine rpm and ground speed.
- Pull the joystick back to decrease the engine rpm.

NOTE: The joystick will not shift the transmission into NEUTRAL. To obtain NEUTRAL from a FORWARD gear, squeeze either trigger button (1 or 2) on the joystick.

NOTE: If the Apache Sprayer is moving forward and either trigger button on the joystick is squeezed, the machine will shift to NEUTRAL. Once the Apache Sprayer is below 1200 rpm and 4 mph [6.4 km/h], squeezing and holding the top trigger button on the joystick shifts the Apache Sprayer into the gear the transmission was in before NEUTRAL.



## Shifting Forward Gears

The Apache Sprayer is equipped with a torque converter. This allows the Apache Sprayer to take off in any gear. Once the Apache Sprayer is moving, you may up shift or down shift without returning the transmission to the neutral position. The Apache Sprayer is equipped with four forward gears. Be aware of speed ranges for each gear. Use the Gear Speed Ranges chart for reference.

Gear Speed Ranges	
Gear	Speed
1st	0 to 5 mph [8.04 km/h]
2nd	0 to 9 mph [14.5 km/h]
3rd	0 to 16 mph [25.7 km/h]
4th	0 to 28 mph [45 km/h]



Upshifting and downshifting are achieved with a sideways rock and release movement or bump of the joystick. The joystick should return to the center (side-to-side) position between shifts and some time must be allowed for the transmission to respond.

## Upshifting:

- While the Apache Sprayer is in either the FORWARD or REVERSE direction, bump the joystick to the right one time to shift up to the next higher gear. Repeat this motion to upshift the transmission one gear at a time.

## Downshifting:

- Pull back on the joystick slightly to decrease engine rpm, lightly apply the Apache Sprayer brakes, then bump the joystick to the left one time to downshift to the next lower gear. Repeat this motion to downshift the transmission one gear at a time.

**NOTE:** The transmission is equipped with shift protect; the transmission will not downshift, even if the display readout changes on the console, until the engine rpms drop down to the appropriate speed range.

**NOTICE:** NEVER shift the transmission into NEUTRAL while the Apache Sprayer is in motion. The transmission is only lubricated while in gear. Coasting will cause damage to the transmission.

## Reverse

### To move the Apache Sprayer in REVERSE:

**NOTE:** The transmission will not shift if the parking brake is applied.

Apply the foot brakes.

Release the parking brake.

To shift into REVERSE from NEUTRAL, squeeze and hold the bottom trigger button (2) on the joystick.

- Push the joystick forward to increase the engine rpm and ground speed.
- Pull the joystick back to decrease the engine rpm.

The reverse button (2) must be held in at all times to move in REVERSE.

**NOTE:** The joystick will not shift the transmission into NEUTRAL. To obtain NEUTRAL from a REVERSE gear, release the bottom trigger button (2) on the joystick.

**NOTE:** If the Apache Sprayer is moving in REVERSE and the reverse button (2) is released, the transmission will shift to NEUTRAL. Once the Apache Sprayer is below 1200 rpm and 4 mph [6.4 km/h], squeezing and holding the bottom trigger button (2) shifts the transmission into the gear the transmission was in before NEUTRAL.



## Cruise Control

To use the cruise control function:

Turn the master cruise button (1) located on the console on.

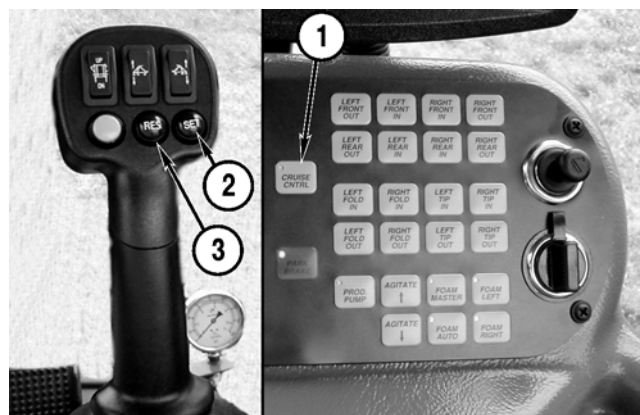
Once the desired speed is reached, push and release the SET button (2) on the joystick.

If the engine rpms are increased or decreased using the joystick, the cruise control will disengage; to resume cruise speed, press the RES button (3) on the joystick to return to the previously set cruise control speed.

If the transmission is up- or down-shifted, the cruise control will disengage.

The cruise control will operate between 6 and 20 mph [9.7 and 32.2 km/h]. If the SET button (2) is pressed while the speed is out of range, the command will be ignored.

**NOTICE:** Use of the brakes WILL NOT disengage the cruise control.



## Towing

ALWAYS use towing safety equipment and proper emergency warning lighting when towing the Apache Sprayer.

If the Apache Sprayer's transmission should become disabled, it may be towed for approximately 1 mile [1.6 km] at speeds less than 3 mph [4.8 km/h]. While towing the Apache Sprayer, the engine should be running at idle and the parking brake released.

If the Apache Sprayer should become disabled and the engine will not start, chock the wheels to insure the machine will not roll and remove the drive shaft between the differential and transmission. The Apache Sprayer may be towed up to 1 mile [1.6 km] at speeds less than 3 mph [4.8 km/h].

**NOTICE:** The brakes depend on supply oil from the hydraulic system. If the engine is not running, you will have no brakes.

**NOTICE:** The brakes are located in the rear differential housing. If the driveshafts from the rear differential to the planetaries / drop boxes are removed, you will have no brakes.

**NOTICE:** DO NOT tow the Apache Sprayer if the:

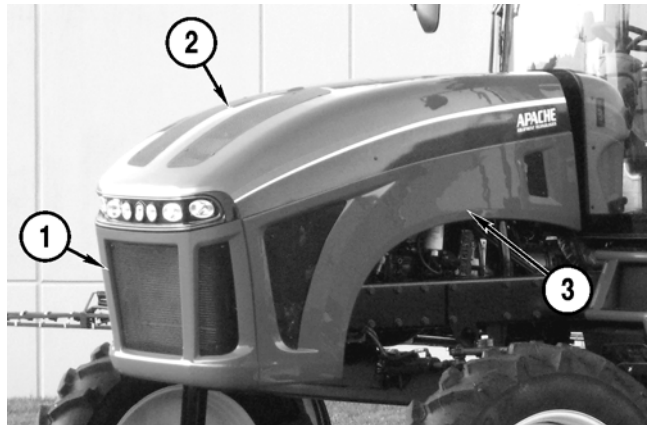
- Driveshaft is connected and it has no hydraulic supply to release parking brake.
- Rear differential is damaged (contact dealer for repair).

**NOTICE:** DO NOT use the Apache Sprayer as a tow vehicle.

**NOTICE:** DO NOT use any part of the Apache Sprayer as a tow bar which is not designed for use as a tow bar or tow hook-up.

## Hood Panel Removal

The hood assembly is comprised of four panels; the front (1), top (2) and two sides (3).



### Side

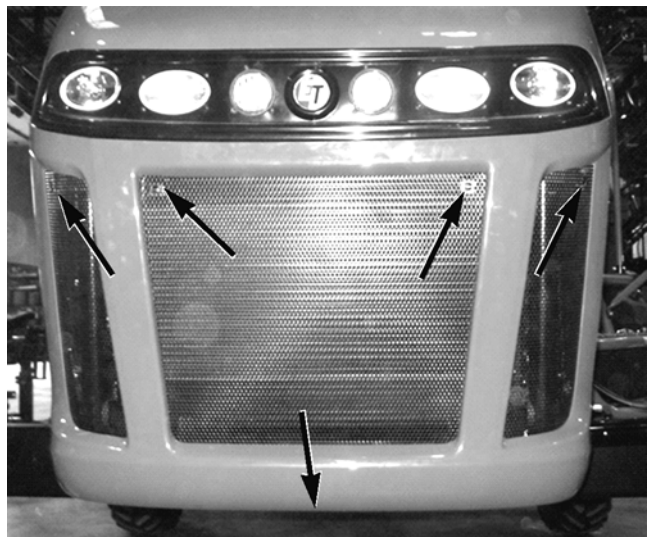
To remove the side panel, remove the 2 screws in the front of the side panel, 2 screws on the underside of the panel, and 2 screws at the back of the side panel.



### Front

Remove the 5 screws on the front of the grill.

Once the screws are removed, the front panel can be removed to access the radiator.

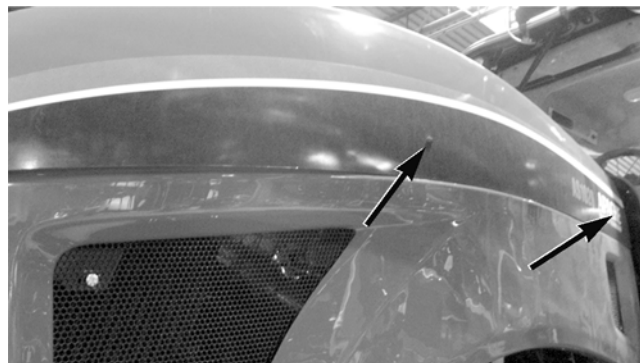




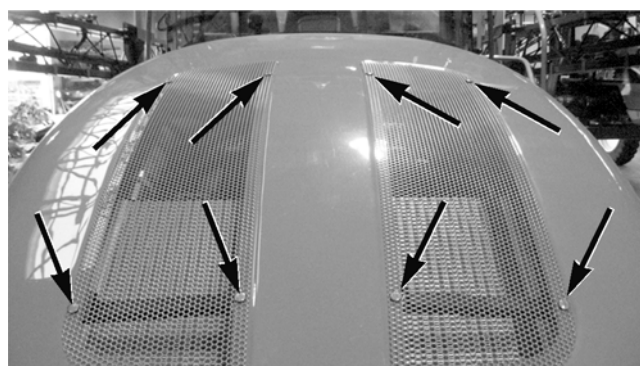
## Top

The front panel must be removed before the top panel can be removed.

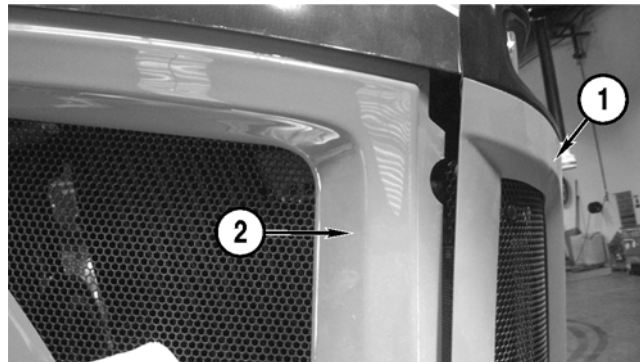
Remove the 2 screws along each side of the hood.



Remove the 8 screws holding the front of the hood. Then remove 3 more screws on the bottom front of the top panel, just below the headlights.



**TIP:** When installing panels, put the front panel (1) on first, then slide the side panel (2) into front panel.



## Battery

The batteries are located under the hood, between the engine and the cab.

A side panel must be removed to access the batteries. See "Hood Panel Removal" on page 3-18.



The Apache Sprayer features a battery disconnect switch, located on the left hand, rear of the engine compartment.

Turn the battery disconnect switch to the OFF position when the machine is not in use.

NOTE: The negative battery cable must still be disconnected when servicing the machine.



## Antenna Mounting Plate

On machines equipped with GPS, a steel plate is mounted at the roof-line at the front, center of the cab for magnetic base GPS antennas.



## Raven Radar Gun

The Raven radar gun is located on the right side of the Apache Sprayer, mounted under the muffler.



## Axle Adjustment (Manual)

The front and rear axles on the Apache Sprayer are adjustable from 120 to 160 in. [304.8 to 406.4 cm] (measured from center of left tire to center of right tire).

### Front

Safely lift the front of the Apache Sprayer so the front tires are slightly off of the ground.

Remove the two inner bolts (1) from the locking bar.

Loosen the six jam nuts (2) and six bolts (3) on the axle brace. The right front axle is shown.

**NOTICE:** *DO NOT extend the axle beyond 160 in. [406.4 cm] (measured from center of left tire to center of right tire).*

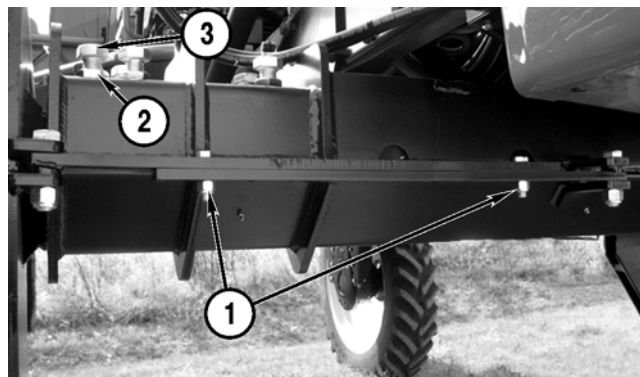
Manually slide the wheel to the desired width, making sure the locking bar holes are aligned.

Tighten the six bolts (3) to 80 lb-ft [108 N•m] to secure the axle in place.

Tighten the jam nuts (2).

Install the two locking bar bolts (1) and tighten.

Repeat the steps to adjust the other front axle.



### Rear

Safely lift the rear of the Apache Sprayer so the rear tires are slightly off of the ground.

Remove the three inner bolts (1) from the locking bar.

Loosen the twelve jam nuts (2) and twelve bolts (3) on the two axle braces. The left rear axle is shown.

**NOTICE:** *DO NOT extend the axle beyond 160 in. [406.4 cm] (measured from center of left tire to center of right tire).*

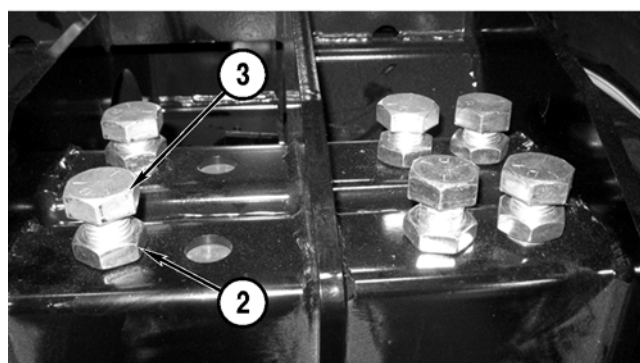
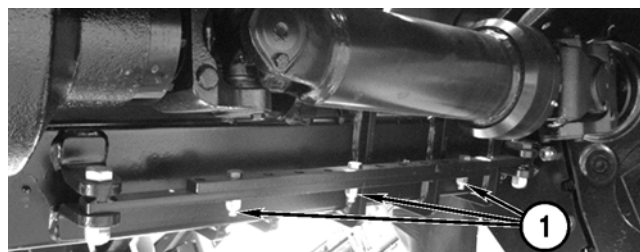
Manually slide the wheel to the desired width, making sure the locking bar holes are aligned.

Tighten the twelve bolts (3) to 80 lb-ft [108 N•m] to secure the axle in place.

Tighten the twelve jam nuts (2).

Install the three locking bar bolts (1) and tighten.

Repeat the steps to adjust the other rear axle.



## Axle Adjustment (Optional) (Adjust On The Go)

The front and rear axles on the Apache Sprayer are adjustable from 120 to 160 in. [304.8 to 406.4 cm] (measured from center of left tire to center of right tire).

NOTE: The Adjust On The Go system will not allow the axle to be adjusted beyond 160 in. [406.4 cm].

### To adjust the axles:

While the engine is idling, operate the Apache Sprayer in the forward direction at approximately 3 mph [4.8 km/h].

Press the desired switch(es) (1) on the console to move the wheels in or out.

The axles can be adjusted individually, in combination or all together.

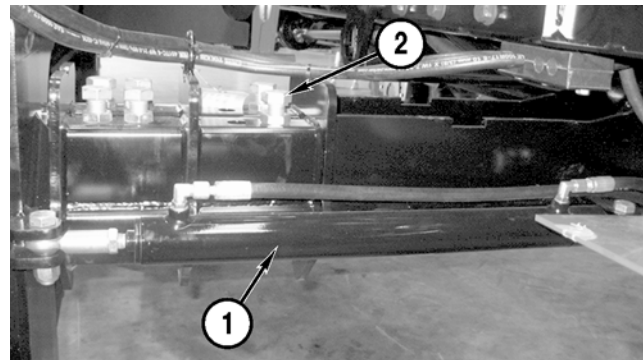


### Front

When activated, the Adjust On The Go cylinder (1) adjusts the axle inward or outward as desired. The front wheels/axles are actuated by one cylinder per wheel. The left front Adjust On The Go axle is shown.

**NOTICE:** The bolts (2) should be torqued to 15 lb-ft [20 N•m] at all times. Check and adjust the torque weekly. See "Adjust On The Go Axles" on page 5-19.

NOTE: Grease the axles daily when using the Adjust On The Go feature. See "Grease Axle Components" on page 5-16.



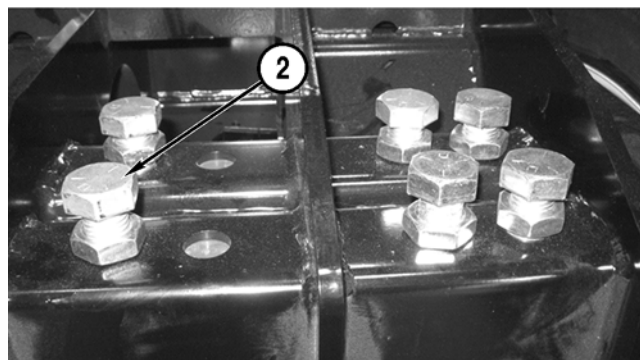
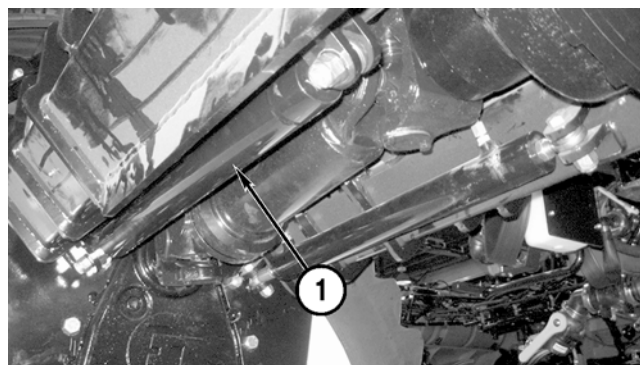


## Rear

When activated the Adjust On The Go cylinder (1) adjusts the axle inward or outward as desired. The rear wheels/axles are actuated by two cylinders per wheel. The left rear Adjust On The Go axle is shown.

**NOTICE:** The bolts (2) should be torqued to 15 lb-ft [20 N•m] at all times. Check and adjust the torque weekly. See "Adjust On The Go Axles" on page 5-19.

**NOTE:** Grease the axles daily when using the Adjust On The Go feature. See "Grease Axle Components" on page 5-16.



## Precision Equipment

The following are factory installed precision sprayer control options.

- SCS 5000 (console controller)
- Envisio Pro II (console controller)
- Viper Pro (console controller)
- SmarTrax (integrated autosteer)
- AccuBoom (sectional spray control)
- AutoBoom (boom height control)

Refer to the respective operators manual included with the machine before use.

**NOTE:** Raven-based precision equipment is designed in a joint effort with Equipment Technologies and Raven and contains items that are specific to Apache Sprayers. Please note this with your service provider when seeking service.

If your Apache Sprayer is equipped with anything other than factory installed precision equipment, please contact your dealer for assistance.

## This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal black lines running across the width of the page, typical of notebook or primary writing paper. The background is white, and there are no margins, text, or other markings present.

# APACHE™

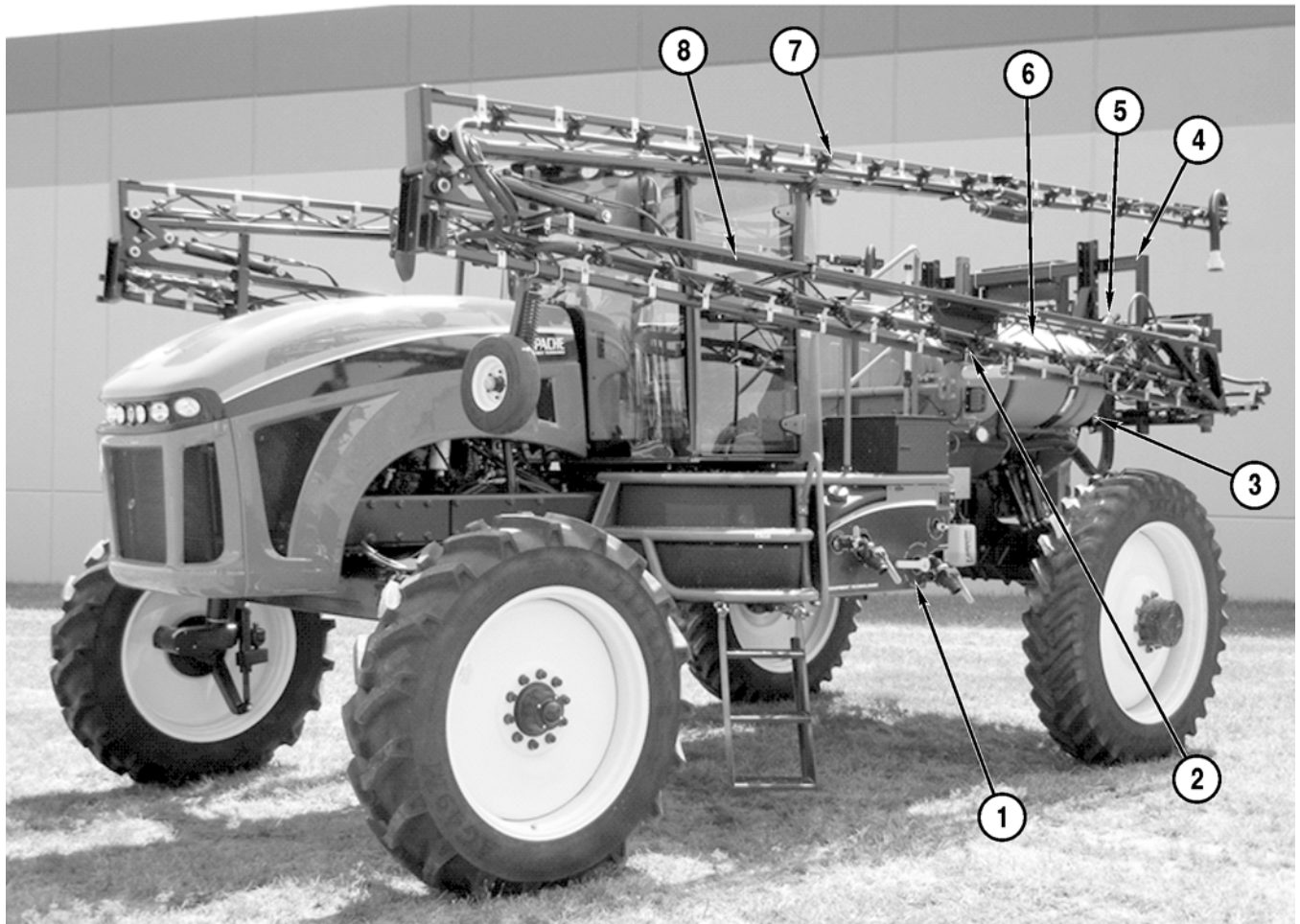
## CHAPTER 4

### WET SYSTEM OPERATION

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*NOTICE: Before performing any wet system operation procedures, read the Safety Section on page 2-1.*

#### Wet System Overview



- 1. Fill Station
- 2. Boom Cradle
- 3. Rinse Tank
- 4. Boom Rack

- 5. Flow Controls
- 6. Product Tank
- 7. Left Boom Tip
- 8. Left Boom

## Fill Station

### 1. Hand Rinse Valve

This valve allows water from the rinse tank on the right side to be used for hand rinsing.

### 2. Rinse Tank Quick Fill

### 3. Product Valve (shown in CLOSED position)

This valve directs flow from the product tank to the pump or from the rinse tank to the pump.

### 4. Product Tank Quick Fill

### 5. Roto-Flush/Agitate Valve

Directs flow between the roto-flush and agitation.

### 6. Fill Station Light Switch

### 7. Remote Product Pump Switch

This switch turns the product pump while outside of the cab.

### 8. Increase/Decrease Agitation Switch

Used to increase or decrease agitation from the fill station. Must hold down while adjusting.

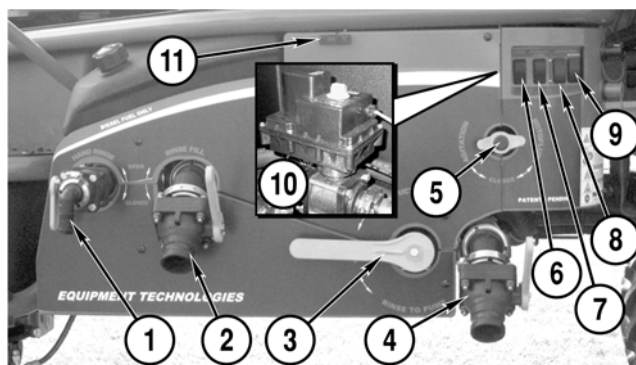
### 9. Activate Agitation Switch

Used to activate the fill station agitation adjust switch. Must hold down while increasing or decreasing agitation from the fill station.

### 10. Agitation Valve

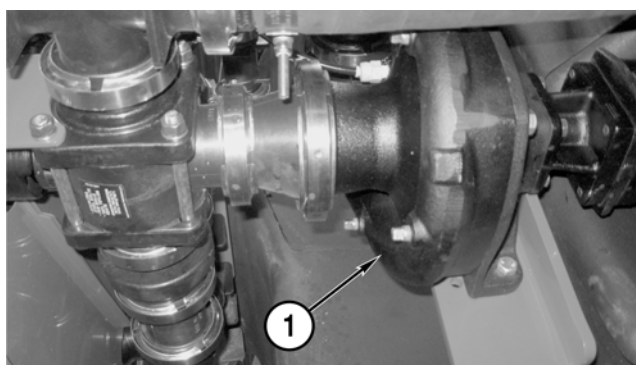
During normal spraying operation, this valve is electronically actuated and controlled by a switch on the side console in the cab.

### 11. Fill Station Light



## Product Pump and Valves

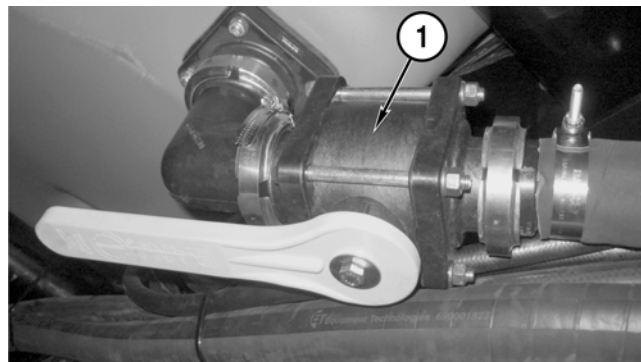
### 1. Product Pump





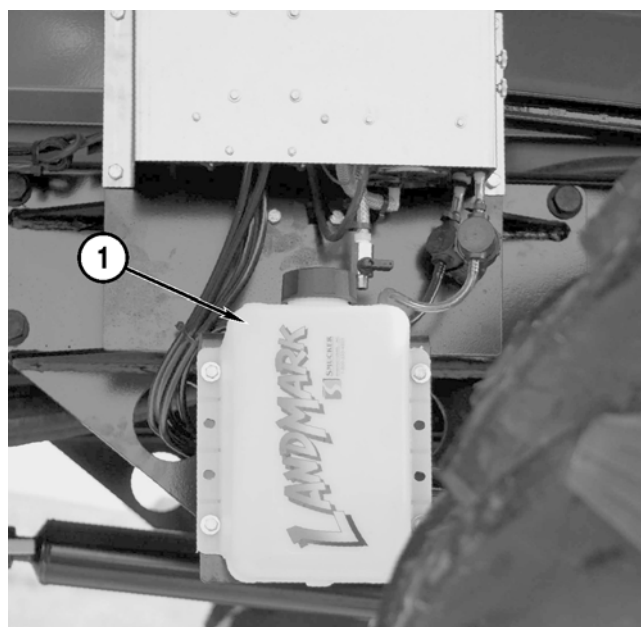
## Sump Valve

1. **Product Tank Sump Valve**  
Shown in the OPEN position.



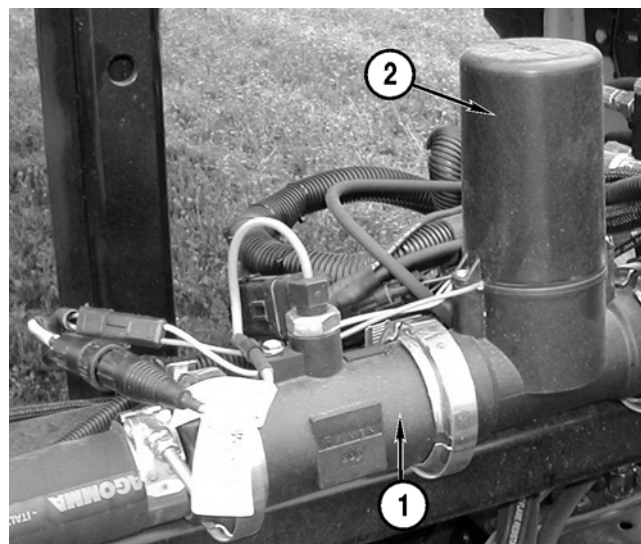
## Foam Tank

1. **Foam Concentrate Bottle**



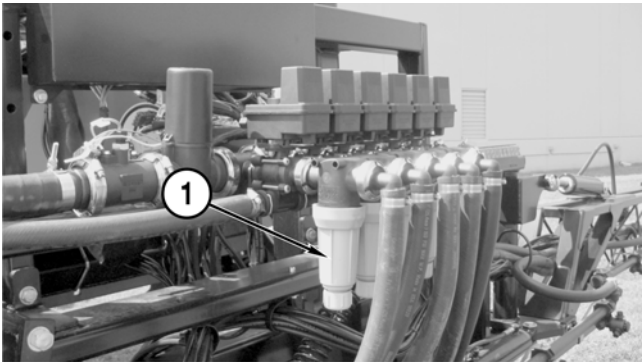
## Flow Control

1. **Raven Flowmeter**
2. **Raven Standard Flow Control Valve (Servo Valve)**



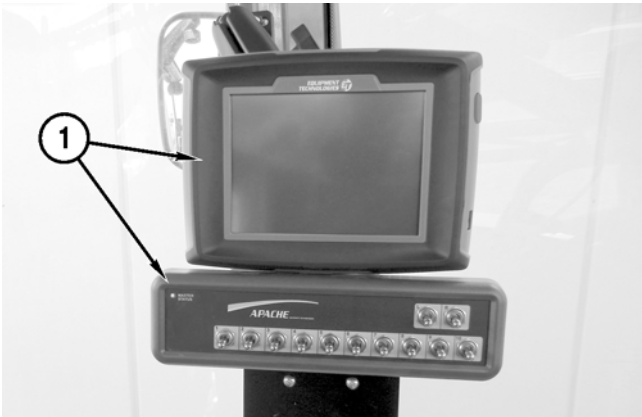
Electronic Boom Valves

The strainers (1) on the electronic boom valves (five section boom valve shown) have 50 mesh screens, that must be cleaned periodically.



Envizio Pro II Monitor

1. **Envizio Pro II Monitor and Apache Switchbox**  
This monitor is built for Equipment Technologies by Raven. On equipped Apache Sprayer models, the monitor and switchbox are located in the right side of the cab.  
See the manufacturer’s instructions, provided with the Apache Sprayer, for complete operating, calibration, and service information.



Monitor Calibration Information  
(for all Raven built monitors)

Valve cal .....	2123
Speed cal (radar gun equipped).....	565
Speed cal (GPS for speed) .....	785
Meter cal.....	See tag on the flowmeter, located on the rear boom rack.
Boom cal .....	The boom cal numbers are specific for each sprayer and are dependent on the boom width, number of sections and nozzle spacing.
NOTE: All console calibration numbers should be recorded in the Apache owner’s manual for future reference.	
NOTE: These are factory presets. All controls must be calibrated before applying chemicals.	
NOTE: The radar gun is not factory-calibrated. See the manufacturer’s instructions, provided with the Apache Sprayer, for proper calibration.	

NOTE: The SCS 5000 Monitor, Envivio Pro II and Viper Pro are the only three console controller options. If your Apache Sprayer has a different console, please contact your Apache dealer for information.

### SCS 5000 Monitor



### Envivio Pro II Monitor



### Viper Pro Monitor



## Side Console



1. Envisio Pro II Controller
2. Switchbox
3. Cruise Control Master Switch
4. Left Boom Fold In and Out
5. Right Boom Fold In and Out
6. Left Boom Tip In and Out
7. Right Boom Tip In and Out
8. Axle Width Adjustment Switches (Optional Adjust on the Go)
9. Auxiliary Power Point

10. Cigarette Lighter
11. Foam Switch for Left and Right Side
12. Foam Master Switch
13. Foam Auto  
When switched on, foam can be switched from left to right using the yellow Master Switch on the joystick.
14. Agitate Increase and Decrease
15. Product Pump Switch
16. Parking Brake Switch  
A red light indicates when the parking brake is applied.

## Joystick

### 1. Boom Center Rack Up/Down

Press to raise or lower the boom mast. Press the top of the switch to raise and press the bottom of the switch to lower.

### 2. Left Boom Tilt

Press to tilt the left boom up or down. Press the top of the switch to raise and press the bottom of the switch to lower.

### 3. Right Boom Tilt

Press to tilt the right boom up or down. Press the top of the switch to raise and press the bottom of the switch to lower.

### 4. Master Spray Switch

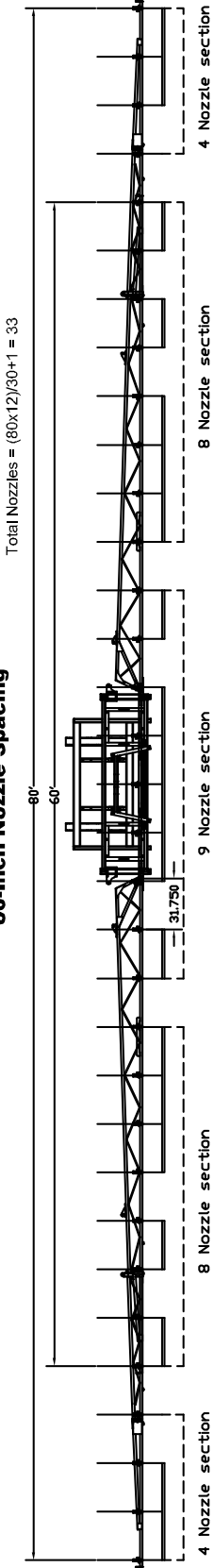
Press to turn on or off all boom sections that are in the on position on the switchbox.



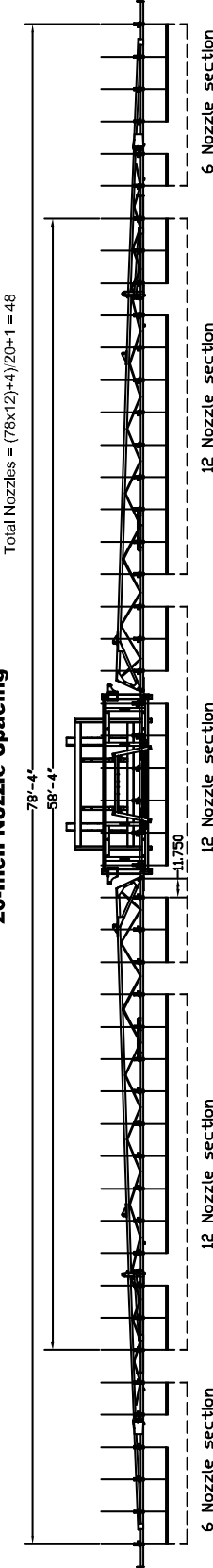
60’/80’ Nozzle Layout

NOTE:  
-15" and 30" spacing, nozzle is in center of boom  
-10" and 20" spacing, nozzle is offset to center of boom

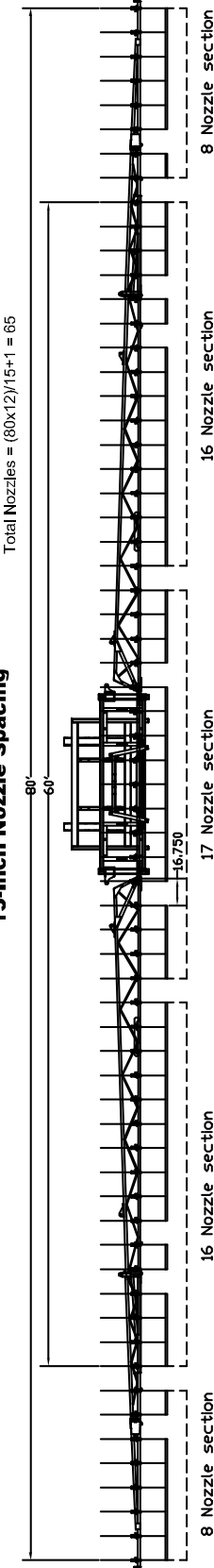
30-Inch Nozzle Spacing



20-Inch Nozzle Spacing



15-Inch Nozzle Spacing



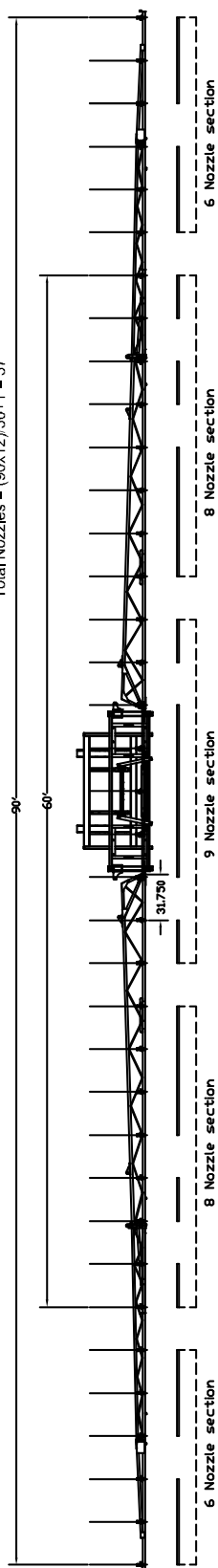


## 60'/90' Nozzle Layout

NOTE:  
-15" and 30" spacing, nozzle is in center of boom  
-10" and 20" spacing, nozzle is offset to center of boom

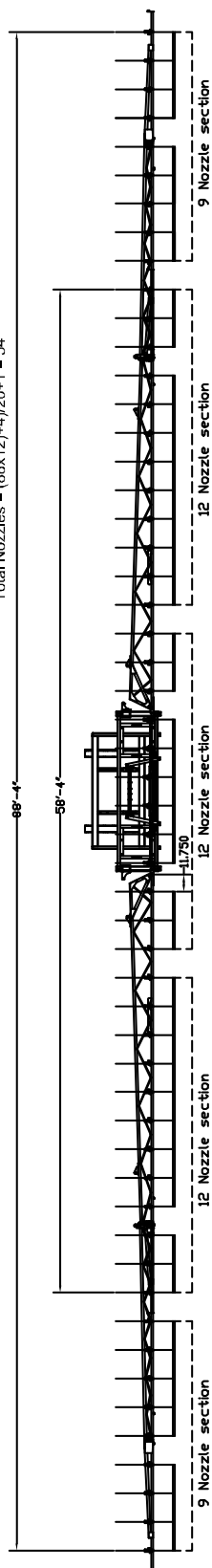
### 30-Inch Nozzle Spacing

$$\text{Total Nozzles} = (90 \times 12) / 30 + 1 = 37$$



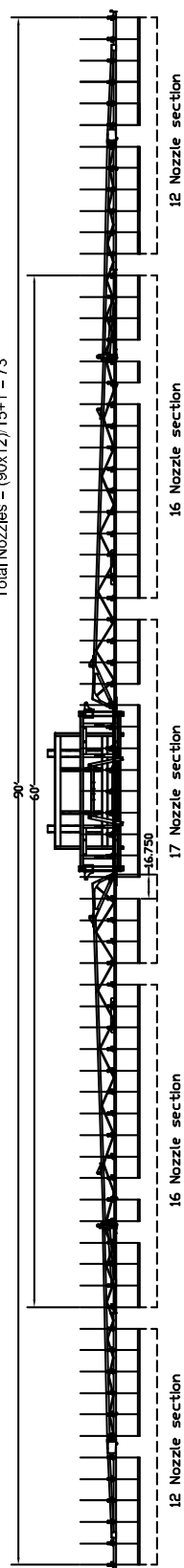
### 20-Inch Nozzle Spacing

$$\text{Total Nozzles} = (88 \times 12) / 20 + 1 = 54$$



### 15-Inch Nozzle Spacing

$$\text{Total Nozzles} = (90 \times 12) / 15 + 1 = 73$$

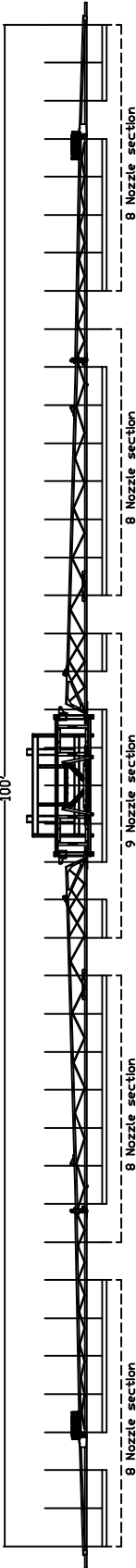


100' Straight Nozzle Layout

NOTE:  
-15" and 30" spacing, nozzle is in center of boom  
-10" and 20" spacing, nozzle is offset to center of boom

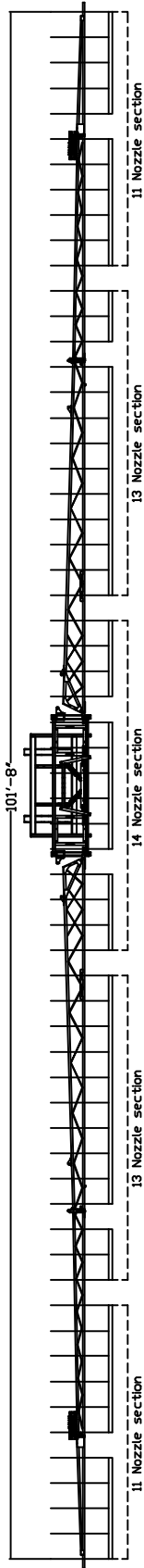
30-Inch Nozzle Spacing

Total Nozzles =  $(100 \times 12) / 30 + 1 = 41$



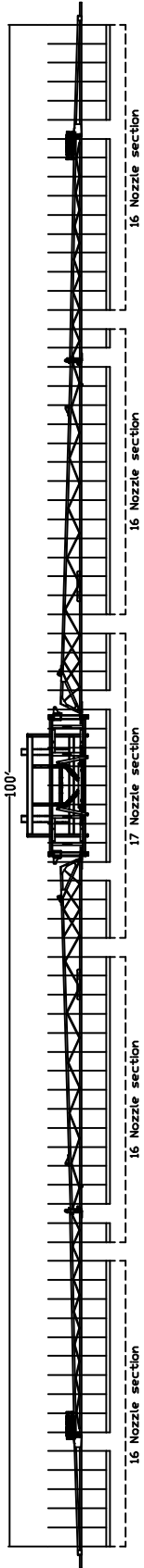
20-Inch Nozzle Spacing

Total Nozzles =  $(101 \times 12) / 20 + 1 = 62$



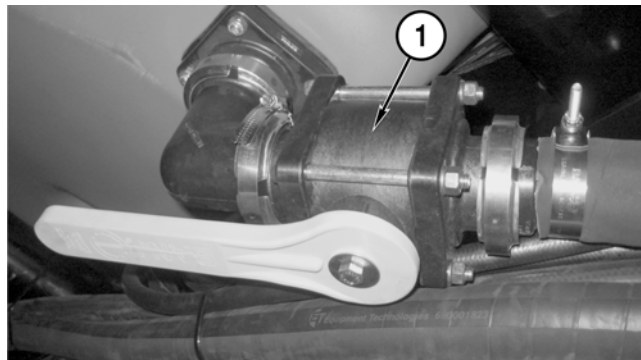
15-Inch Nozzle Spacing

Total Nozzles =  $(100 \times 12) / 15 + 1 = 81$



## Filling Product Tank

Open the sump valve (1) on the underside of the product tank.

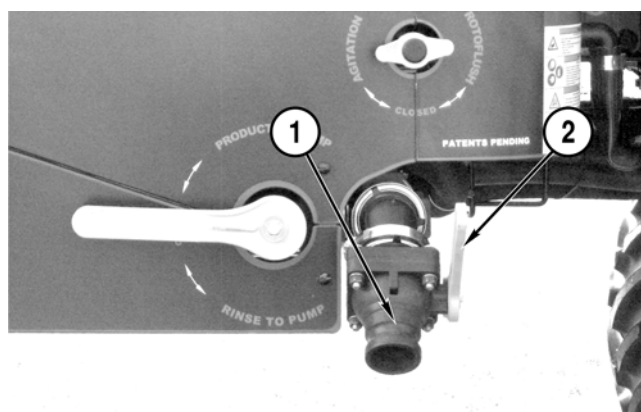


Remove the cap from the product quick fill inlet (1) and connect the hose from the nurse tank to the inlet.

Open the product fill valve (2), shown in the CLOSED position, and fill tank to desired level. There is a tank level indicator tube on the front left corner of the tank, just behind the cab entrance door.

When filling is complete, close the valve on the nurse tank, then close the product fill valve.

Disconnect the hose from the inlet and install the quick fill inlet cap.



## Filling Rinse Tank

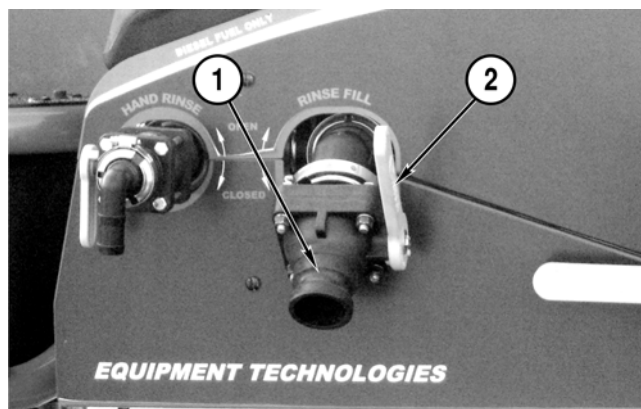
Remove the cap from the foam/rinse quick fill inlet (1) and connect the hose from the nurse tank to the inlet.

Open the rinse valve (2), shown in the CLOSED position and fill to the desired level. There is a tank level indicator tube on the back side of the tank.

**IMPORTANT:** Fill the tank slowly. Rapid filling or overfilling may rupture the tank.

When filling is complete, close the valve on the nurse tank, then close the rinse fill valve.

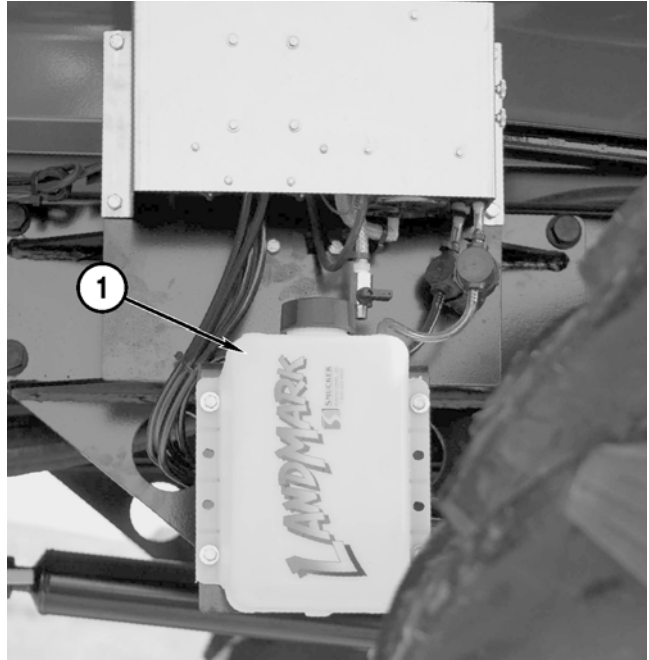
Disconnect the hose from the inlet and install the quick fill inlet cap.



### Filling Foam Marker Tank

Remove the lid on the top of the foam tank (1), add the appropriate amount of foam concentrate, and install the lid.

Water for the foam marker is supplied by the rinse tank. Therefore, it must have water in it for the foam marker to operate. the rinse tank has a level indicator on the rear of the tank.



## Operating Booms

Before performing any boom operations, read all the following safety messages and take all necessary precautions to avoid personal injury and equipment damage.

**WARNING! Electrocuting Hazard. DO NOT fold or unfold the booms near power lines.**

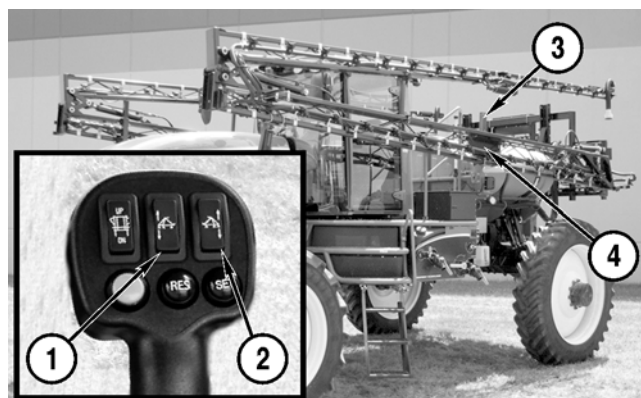
**WARNING! Control Hazard. NEVER fold or unfold the booms while the Apache Sprayer is moving over 5 mph [8.04 km/h] or with the optional Auto Boom height control turned ON.**

**NOTICE:** The boom tips must be folded before the booms can be retracted. The cab can be damaged if the boom tips are not folded properly.

## Tilt to Remove Boom from Cradle

### All Boom Sizes

On the joystick, press the top of the left (1) and right (2) boom tilt raise/lower switches to raise the booms and boom hangers (3) off of the boom cradles (4).



## Unfold Booms

**IMPORTANT:** DO NOT fold or unfold the booms near power lines.

**NOTICE:** The boom hangers must be tilted off of the boom cradles before they can be unfolded.

On the side console, press the Left Fold Out and Right Fold Out switches (1) until the booms are fully extended. After the booms are fully extended, the boom tips can be unfolded.

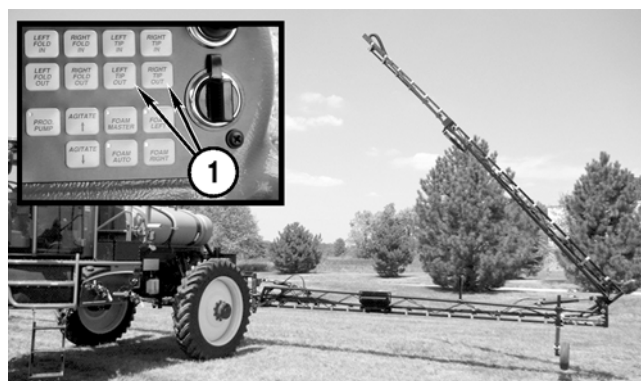


## Unfold Boom Tips

### All Boom Sizes

**NOTICE:** The booms must be unfolded before the boom tips can be extended. The machine can be damaged if the booms are not unfolded properly.

On the side console, press the Left Tip Out and Right Tip Out switches (1) until the boom tips are fully extended.

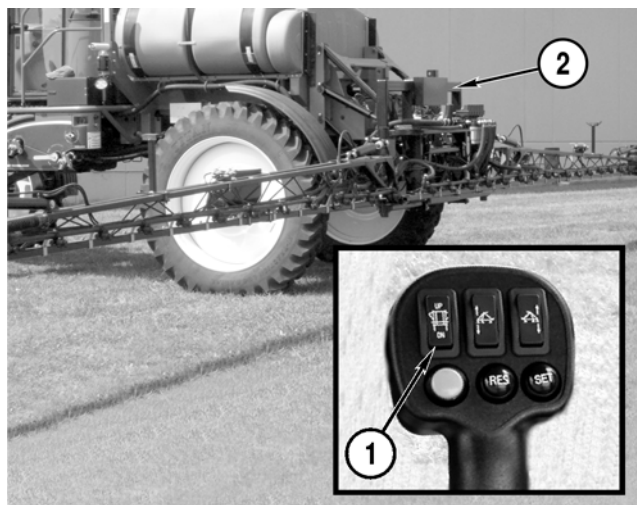


## Height Adjustment

### All Boom Sizes

On the joystick, press the bottom of the boom rack raise/lower switch (1) to lower the boom rack (2) to the desired height.

Press the top of the switch to raise the boom rack.

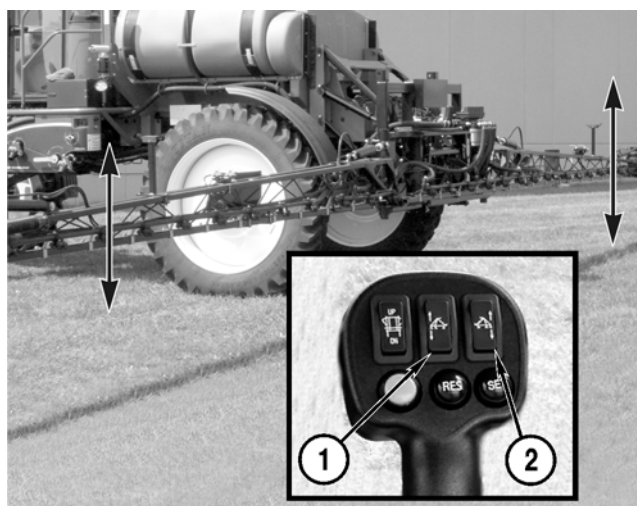


## Tilt to Level Boom

### All Boom Sizes

On the joystick, use the left (1) and/or right (2) boom tilt raise/lower switches to adjust the booms to level.

Press the top of the switches to tilt the boom up and the bottom of the switches to tilt the boom down.

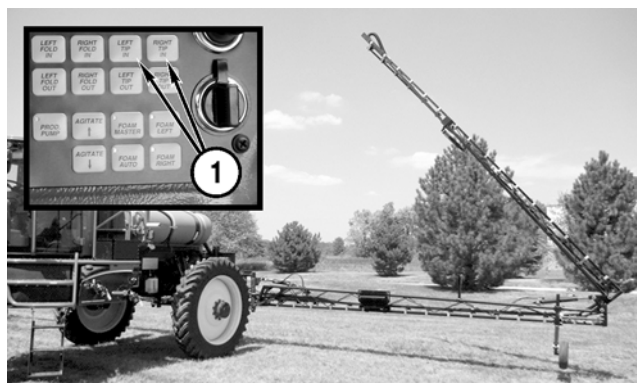


## Fold Boom Tips

### All Boom Sizes

On the side console, press the Left Tip In and Right Tip In switches (1) until the boom tips are fully folded.

After the boom tips are fully folded, the booms can be folded.





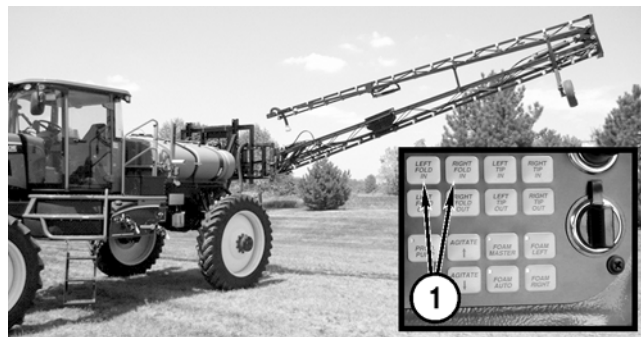
## Fold Booms

**NOTICE:** Fold the booms slowly to reduce the possibility of the booms hitting the cab.

**NOTICE:** ALWAYS raise the rack and the left and right boom tips completely before folding the booms.

### All Boom Sizes

On the side console, press the Left Fold In and Right Fold In switches (1) until the booms are fully folded.

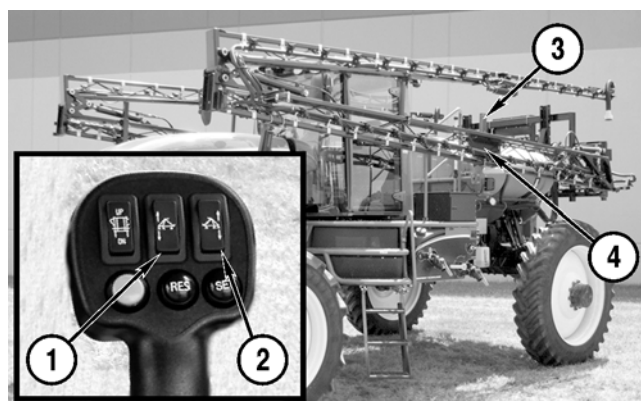


## Tilt to Return Boom to Cradle

### All Boom Sizes

On the joystick, press the bottom of the left (1) and right (2) boom tilt raise/lower switches to tilt the booms (3) onto the boom cradle (4).

With the booms properly stored, the Apache Sprayer is ready for transport.



## Spraying

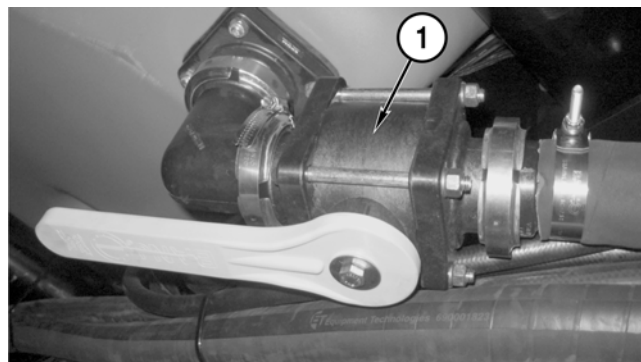
Make sure the product, rinse, and foam marker tanks are filled. See “Filling Rinse Tank” on page 4-11. See “Filling Product Tank” on page 4-11. See “Filling Foam Marker Tank” on page 4-12.

Level the booms and boom tips using the tilt and unfold switches. See “Operating Booms” on page 4-13

Set the boom height using the boom rack switch. See “Height Adjustment” on page 4-14.

Open the sump valve (1) on the underside of the product tank.

**NOTICE:** ALWAYS read and follow all chemical labels and follow all federal and state laws when applying chemicals.

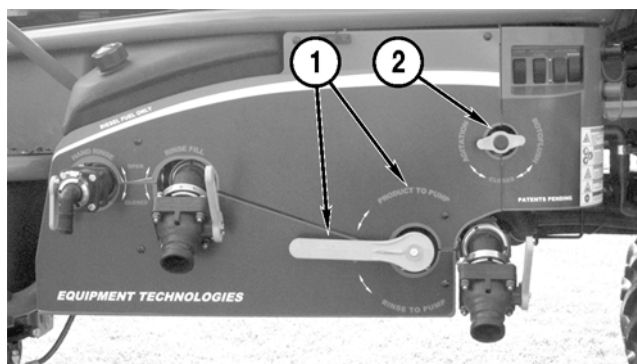


## WET SYSTEM OPERATION

**APACHE™**

Set the product valve (1) to PRODUCT TO PUMP.

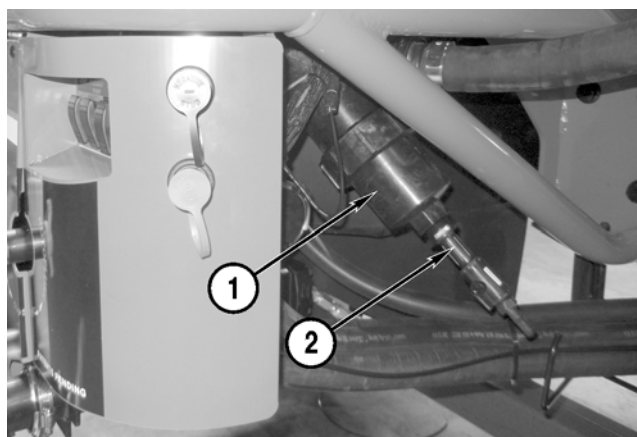
Set the flush/agitation knob (2) to AGITATION.



The product strainer (1) features 50 mesh screens, which should be checked and cleaned after every 50 hours of operation or as needed.

The strainer also features a drain valve (2). This valve can be used to ease the draining of the strainer housing before removal for cleaning, or while flushing, or winterizing.

NOTE: Depending on the chemicals being applied, it may be necessary to substitute the 50 mesh screen with a more coarse strainer. See the chemical manufacturer's instructions for complete details.



Power up the SCS 5000, Envivio Pro II or Viper Pro controller (SCS 5000 shown) and check the settings.

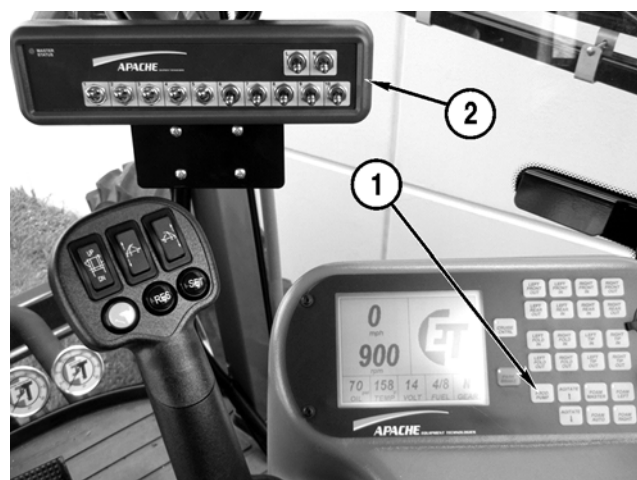
Select a saved flow rate or enter the desired rate. See the respective controller's manual supplied with the Apache Sprayer for complete operating instructions.



Set the product pump switch (1) to the ON position.

Set the desired boom section switches (2) to the ON position.

**IMPORTANT:** DO NOT run the product pump dry. Damage to the pump seals will result. DO NOT intentionally dead-head the pump with high pressures. Damage to the pump seals will result. Product pump dead-head pressure with agitation closed should be 120 psi.

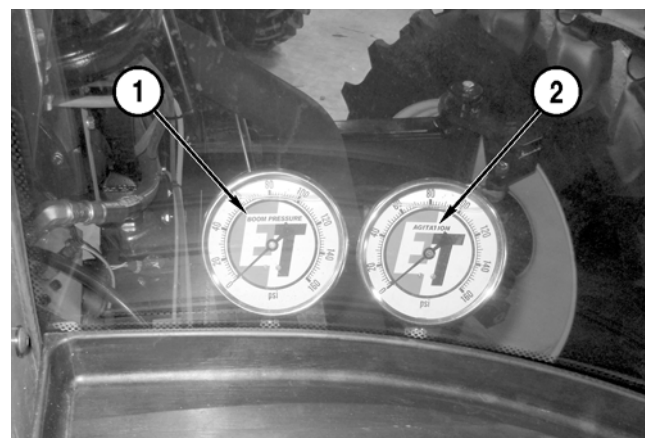


The boom pressure (1) and agitation (2) gauges are mounted outside at the lower right of the cab.

- The boom pressure gauge reads pressure at the right side of the boom valve manifold.
- The agitation gauge reads pressure at the agitation valve.

**NOTE:** When the agitation valve is fully open, the agitation pressure gauge and the boom pressure gauge should show approximately the same pressure.

**IMPORTANT:** Selecting the correct spray tip is critical to obtain proper application. See the spray tip manufacturer's instructions for proper selection.



Select an appropriate gear for the desired Apache Sprayer speed during spraying. See "Shifting Forward Gears" on page 3-15. Under typical operating conditions, second or third gear is recommended.

Use the master product on/off switch (1) on the joystick to start and stop spraying.

Use the Apache boom control switchbox (2) to start and stop product flow to individual boom sections if necessary. The console controller will automatically adjust the product flow for the remaining sections.

Use the Apache boom control switchbox to control the two optional fence row sections (3).





## Valve Advance and Valve Delay

Apache Sprayers use TeeJet Flow Back boom valves. These valves are designed with an extra by-pass port in the shut-off balls to allow a small amount of pressure from the boom pipe to be relieved back to the product tank when the valve is switched off. The rapid pressure relief helps eliminate the unwanted waste of liquid out of the spray tips after the valve is shutoff that is typically seen with standard boom valves. Only a small amount of liquid from each valve must be diverted back to the product tank to eliminate pressure so the boom pipe remains full of liquid.

The use of the Flow Back valves will provide benefits such as improving application accuracy, allows you to spray all the way to the end of rows, reduce overlaps, and reduce chemical expense due to waste.

Because the Flow Back valves relieve a small amount of pressure back to the product tank there have been a few questions about what to do to improve the boom pressure after the valves have been turned back on while using lower rate applications. There are two settings that are available in the Raven controllers that will help in this area. The settings are called Valve Advance and Valve Delay. These settings are in both the SCS controllers (4000/5000) and Field Computers (Envizio Pro, Envizio Pro II, and Viper Pro).

### Valve Advance

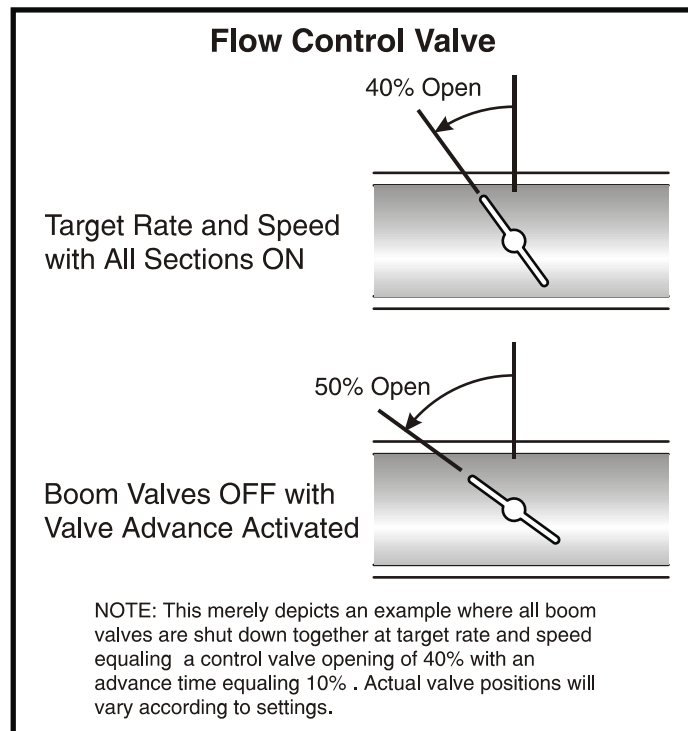
The Valve Advance feature allows the user, while in automatic mode, to set the amount of time (in seconds) in which the flow control valve will open over and above the position it is at when the last remaining boom section that is on, is turned off by AccuBoom, or by simply turning them all off using the master switch. A value of 1-9 means the flow control valve is allowed to move further open 1-9 seconds respectively. Think of it as a percentage that the valve is open. For example, you are spraying X rate at X MPH. Say that rate requires the control valve to be 40% open at target rate and speed with all sections on. You now approach your headland at target speed, and your boom sections all shut off at the same time either by AccuBoom, or you simply shut them all off using the master switch, your control valve will now be allowed to open the amount that it is able to open in X amount of seconds (your advance setting). So, if in X amount of seconds, the valve is able to open 10 more percent, your valve will now be open a total of 50%. This example (depicted on next page) would be in a perfect condition where the valves all shut off at the same time at target rate and speed.

If you came into an angled headland, or into the headland at a lower speed, the flow control valve would compensate for that and shut down to maintain target rate as sections shut off, or your speed slows. Therefore, the control valve would be opened for X seconds (or 10% in this example) further than the position it is at when either the AccuBoom shuts down the last section remaining on, or you manually shut them down using the master switch. So if the valve is 20% open at this time, it will open a total of 30% after the advance. This will result in quicker section turn on when returning to spray.

The Valve Advance setting basically does just what it says. It “advances” the amount that the control valve is open at boom shut down to increase the amount of flow available when you re-enter the headland to recover the pressure dropped off by the flowback valves, insuring a more responsive return to spray. Rate, speed, driving habits and field condition are all factors in the valve advance setting.

**NOTE:** The Advance button is only displayed if a Standard, Fast, or Fast Close valve is selected and if the product control node has a software version 1.50 or higher.

- To set the Valve Advance in an SCS (4000/5000) controller start by pushing the “Data Menu” button until “Product” is highlighted. Then use the up or down arrows to scroll over to “Valve Advance” then push “Enter”. Input the number “2” and push “Enter” again.



- To set the Valve Advance in a Field Computer (Envizio Pro, Envizio Pro II, and Viper Pro) start by selecting the “Product Control” menu, then chose the “Valve” box. Inside the “Valve Calibration” menu chose “Advance” and enter a number of “2”.
- Valve Advance is preset from Equipment Technologies at 2.

### Valve Delay

The Valve Delay feature allows the user to set a delay between the time the booms start turning back on and when the console begins to control the flow rate. A value of 1-9 means a delay of 1-9 seconds respectively. For example, you have a valve delay setting of X and you have entered your headland to turn around. As previously explained, your valve advance setting will now advance the control valve whatever amount you have it set at. As you re-enter the unapplied area and the first boom valve turns back on whether it be by the AccuBoom or master switch, the valve delay will take over and continue hold the flow control valve at your advance setting position for X second before the console controller starts to control the flow rate. A value of 0 would mean there is no delay and the console will begin to control rate as soon as the first boom valve turns back on. It is best that you have some sort of delay set that will compliment your field conditions and driving style so that the console can start to control the flow valve out in the open unapplied area with all boom sections charged so that it does not get confused and try to hunt for a rate as your speed is picking up and sections are turning on, especially in uneven headlands and no spray zones.

NOTE: The valve delay feature is active if the time between turning OFF and turning ON the booms is less than 30 seconds. For example when turning around on headlands this will leave the control valve at a fixed setting for 30 seconds

- Setting the Valve Delay in an SCS (4000/5000) controller start by pushing the “Data Menu” button until “Product” is highlighted. Then use the up or down arrow to scroll over to “Valve Delay” then push “Enter”. Input a value of “1” then push “Enter” again.
- Setting the Valve Delay in a Field Computer (Envizio Pro, Envizio Pro II, and Viper Pro) start by selecting the “Product Control” menu, then chose the “Calibration Settings” box. Inside the Calibration Settings menu chose the “Valve Delay” box and enter a number of “1”. • Valve Delay is preset from Equipment Technologies at 1.

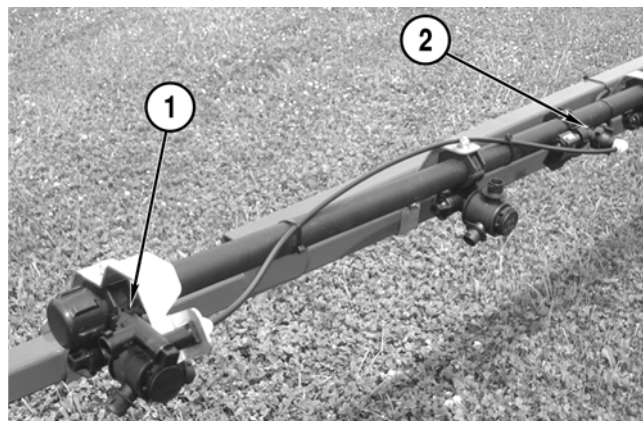
NOTE: The numbers suggested above of 1 for Valve Delay and 2 for Valve Advance are only good starting points and may need to be adjusted. These settings will need to be tailored to each individual user because they are based on application rates, speed, and pressure. For best results, approach the headlands at consistent speeds while turning all boom sections OFF.

### Optional Fence Row Nozzle

The Apache sprayer can be equipped with optional left, and/or right fence row nozzles. If equipped, the fence row nozzles (1) and actuator solenoids (2) are plumbed into the first boom section on the left and the last boom section on the right (left side shown). Therefore, the respective section must be on for the fence row nozzle to operate.

To operate the left fence row nozzle, boom section 1 and boom section L must both be switched on.

To operate the right fence row nozzle, the highest configured boom section and boom section R must both be switched on.



## Operating Foam Marker

To turn on the foam marker, push the Foam Master button (1) on the console.

- Push the Foam Left button (2) to drop foam on the left.
- Push the Foam Right button (2) to drop foam on the right.

If the Apache Sprayer has the optional combo boom, open the foam valves on each of the booms to drop foam at 60'. The valves are located at the midpoint of each boom.



## Auto Foam

To use the Auto Foam feature, turn on the Foam Master switch (1), then turn on the Auto Foam button (3). Foam will drop from whichever side was used last.

When the boom section switches are turned on or off with the yellow master spray switch on the joystick, the foam will switch from left to right.

**NOTE:** The yellow master spray switch on the joystick must be turned on before the Auto Foam feature is activated.

**NOTE:** The LandMark injection foam marker is the only factory-installed foam marker. If your Apache Sprayer is equipped with a different foam marker, contact your dealer.

**NOTE:** After filling the foam tank, the foam marker may need to run for 1 to 2 minutes before the foam begins.

## LandMark Injection Foam Marker

Your new foam marker is designed to produce the longest lasting foam, and provide you with the convenience of not having to mix your foam concentrate and fill the foam marker tank as often. Accuracy in spraying is critical to your operation.

**NOTICE:** *The LandMark injection marker draws fresh water in one line and soap concentrate in the other before it reaches the liquid pump. It is very important that when you first begin, or if you change brands of foam concentrate, that you properly set the "soap injection valve" and the "output valve". This will produce the best results in foam quality and ensure the proper amount of soap concentrate is used.*



### Injection Marker Operation Instructions

See page 4-23 for injection marker feature location.

Turn on the injection marker and allow the liquid pump to prime. If the liquid pump does not prime, open the priming valve until liquid begins to flow, then close the priming valve.

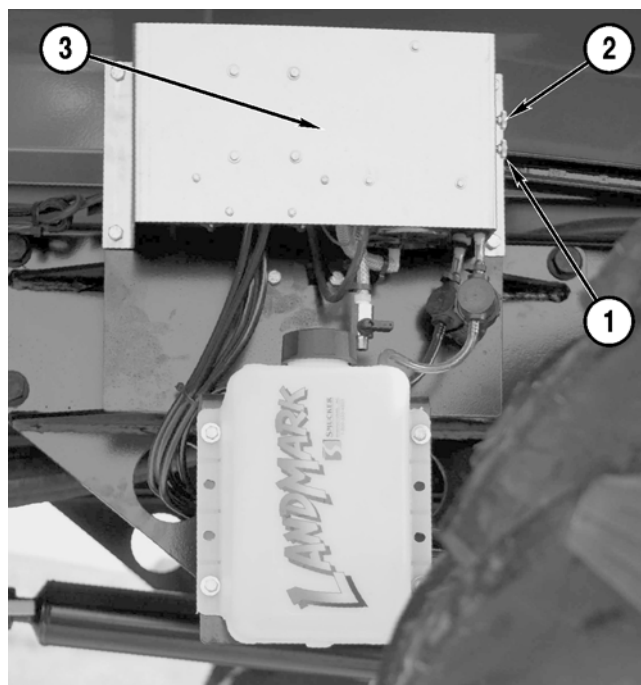
To adjust the foam quality, open the soap injection valve (1) by turning the knob counterclockwise. Adjust the foam quality until foam is rich and thick.

To adjust the total foam output, open the output valve (2) by turning the knob counterclockwise. Adjust as needed.

- Opening the valve too far will flood the chambers and produce soupy foam.
- Closing the valve too far will not produce enough foam.

The water pump and air compressor are located behind the panel (3).

When the foam marker is set properly, quality foam will be produced at 60 drops per minute. See the following table.



NOTE: This foam should stick to your hand when turned upside down.

NOTE: The foam marker pulls water from the rinse tank to create foam.

Output	Drops per Minute (based on 3 in. [7.6 cm] boot)	Foam Spacing @ 5 mph [8.04 km/h]	Foam Spacing @ 10 mph [16 km/h]	Foam Spacing @ 15 mph [24.1 km/h]
5 gpm [18.9 lpm]	62	7.1 [2.16 m]	14.2 [4.32 m]	21.3 [6.9 m]

### Optional Combo Boom Drops

#### 1. Optional Foam Marker Boot and Drop

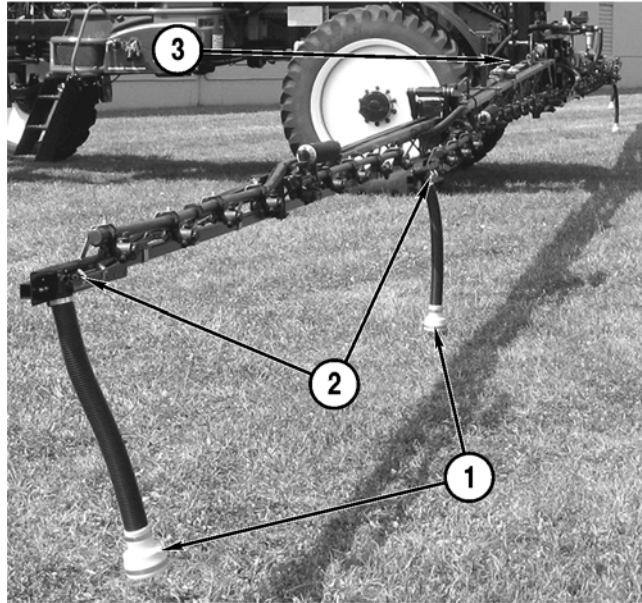
If your Apache Sprayer is equipped with the Land-Mark injection foam marker, then the boot is located near the end of each boom.

#### 2. Foam Marker Mixing Chamber

The foam marker mixing chamber is located near the end of each boom.

#### 3. Combo Boom Diverter Valves

On machines equipped with combo booms, these valves are used to switch between inner and outer foam drops. Both valves, one for air supply and one for foam mix supply, must be turned in the same respective direction for proper operation.



### Maintenance

Clean and replace the air pump and in-line solution filters regularly to extend the life of the pump. The air pump has one sponge and one felt filter.

### Freezing

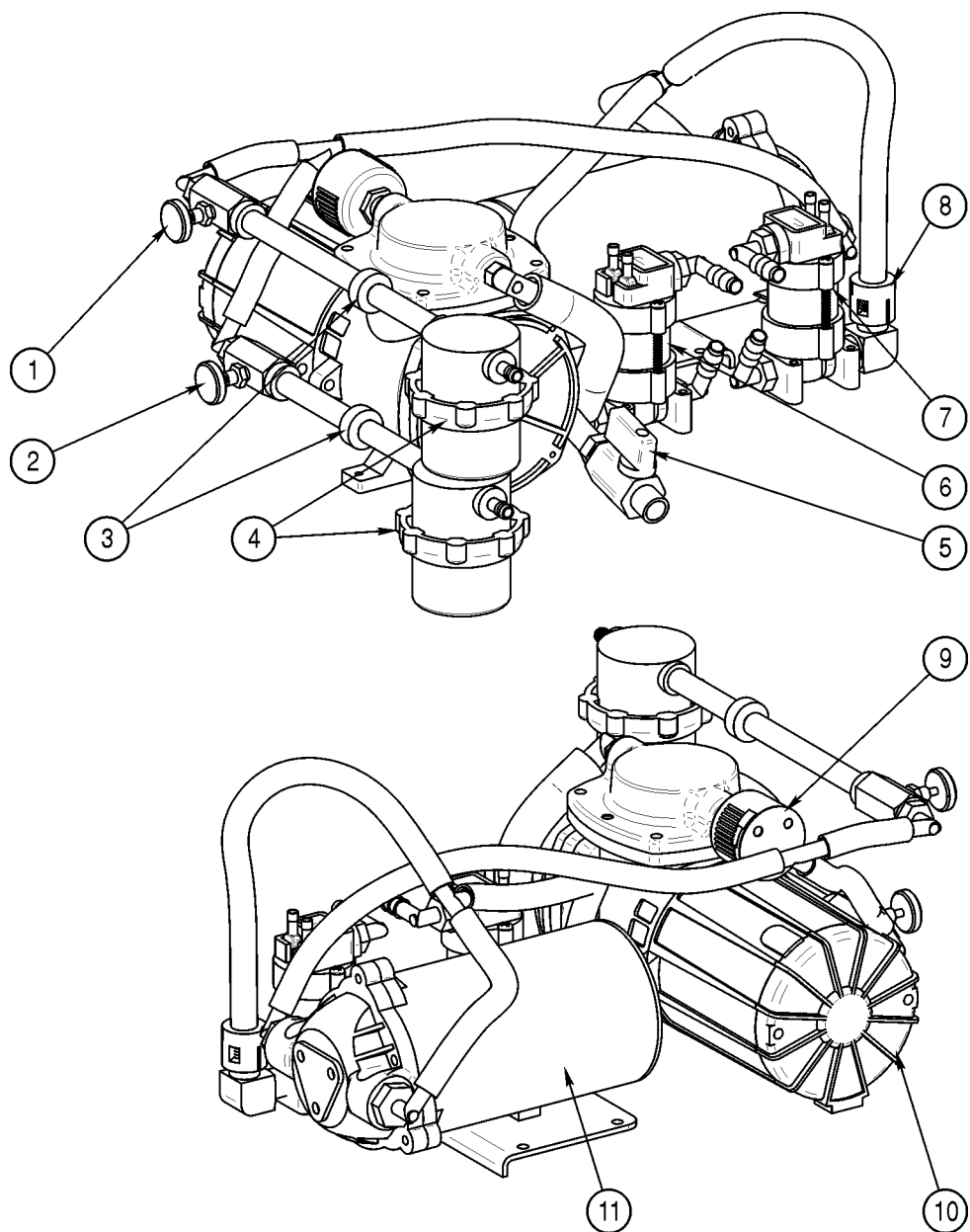
When operating in temperatures at or below freezing, ethylene-glycol-based antifreeze may be added to the water and soap tanks.

If the system will be exposed to freezing temperatures overnight:

1. Pull the suction tube out of the tank and expose it to the air.
2. Close the soap valve and run the system for 10 to 15 seconds to clear the foam solution from the pump and solenoids.

For long-term storage:

1. Drain the tank of the foam solution and run fresh water through the entire system.
2. While the unit is running, blow air through the suction tube until the system is dry.
3. Flip the power switch to dry the other side.



- |   |                                  |
|---|----------------------------------|
| 1. <b>Output Valve</b><br>Labeled "More Foam Less Foam" | 6. <b>Air Solenoid</b>           |
| 2. <b>Soap Injection Valve</b>                          | 7. <b>Soap Solenoid</b>          |
| 3. <b>Check Valve</b>                                   | 8. <b>Check Valve</b>            |
| 4. <b>Strainer</b>                                      | 9. <b>Compressor Breather</b>    |
| 5. <b>Priming Valve</b>                                 | 10. <b>Thomas Air Compressor</b> |
|   | 11. <b>Liquid Pump</b>           |

## Flushing Product Tank

**NOTICE:** Read and follow chemical labels for flushing, disposal, and protective clothing requirement instructions.

**NOTICE:** DO NOT run the product pump dry. Damage to the pump seals will result. DO NOT intentionally dead-head the pump with high pressures. Damage to the pump seals will result.

Fill the rinse tank with clean, fresh, water. See “Filling Rinse Tank” on page 4-11.

Turn the product valve to RINSE TO PUMP (1).

Turn the Agitate/Roto-Flush knob to ROTO-FLUSH (2).

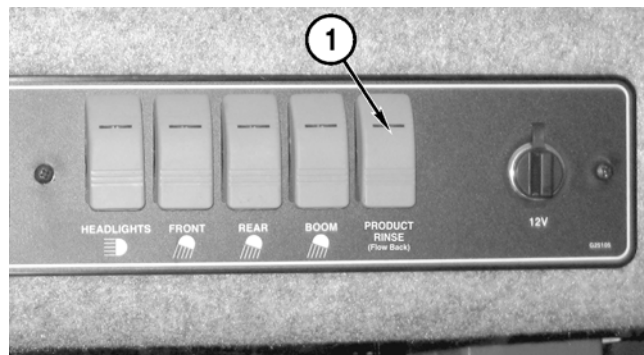
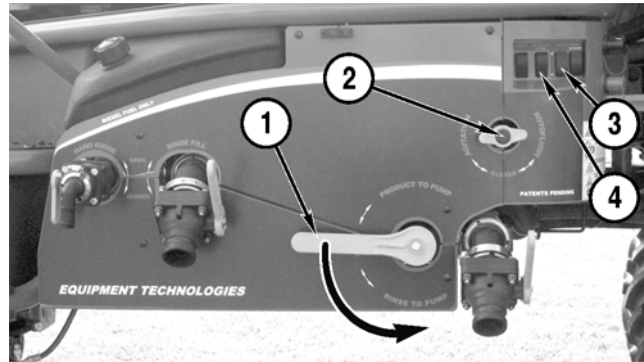
Start the engine.

Use the Agitation switch (3) to increase agitation to its highest level.

Set the product pump switch (4) to the ON position and increase the engine speed to approximately 1500 rpm.

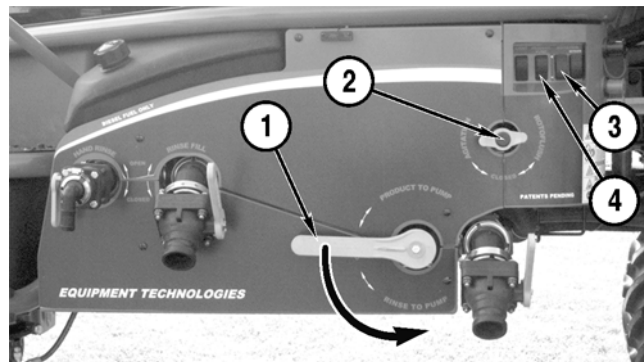
**NOTICE:** The rinse tank will empty quickly. Monitor the process closely to reduce the possibility of running the product pump dry.

While rinsing the tank, press the Flow Back Rinse switch (1) in the cab and hold it about 10 seconds to rinse the flow back line.



After the tank is rinsed:

- Return the engine to IDLE.
- Set the product pump switch (4) to OFF.
- Turn the product lever (1) to PRODUCT TO PUMP.
- Turn the Agitate/Roto-Flush knob (2) to OFF.



### Flushing Booms

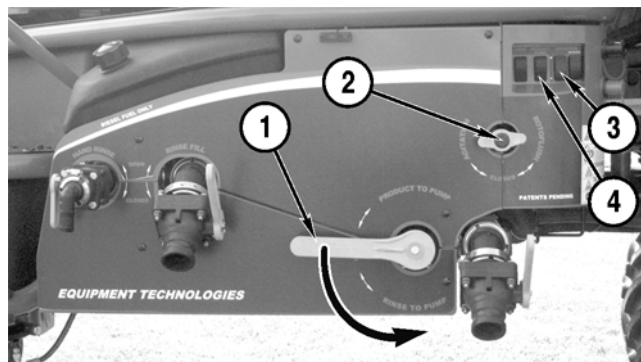
**NOTICE:** Read and follow chemical labels for proper usage, flushing, disposal and protective clothing requirement instructions. ALWAYS dispose of chemicals and contaminated rinse water in a safe location in accordance with chemical label recommendations and local laws.

**NOTICE:** Some chemicals may require multiple tank flushings.

**NOTICE:** DO NOT run the product pump dry. Damage to the pump seals will result. DO NOT intentionally dead-head the pump with high pressures. Damage to the pump seals will result.

To flush the booms:

- Unfold the booms.
- Set the product valve (1) to RINSE TO PUMP.
- Set the product pump switch (4) to the ON position.
- Increase engine speed to 1800 rpm.
- Turn the agitate/roto-flush knob (2) to ROTO-FLUSH.
- Set the boom section switches to the ON position.

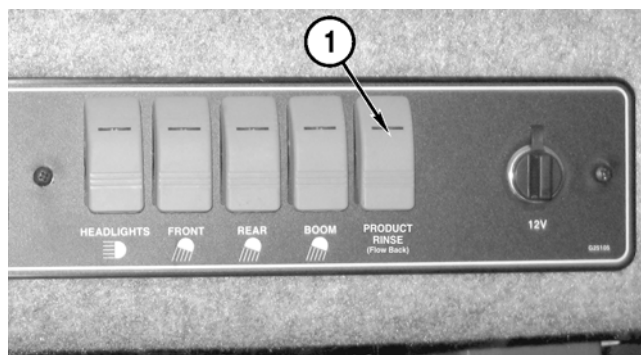


After flushing the booms, press the Flow Back Rinse switch (1) in the cab and hold it about 10 seconds to rinse the flow back line. Make sure the flowback switch is shut off when finished.

**NOTE:** If the Apache Sprayer is equipped with an optional chemical eductor, flush the eductor at the same time as the booms.

After the booms are flushed:

- Return the engine speed to IDLE.
- Set the boom section switches to OFF.
- Set the product pump switch (4) to OFF.
- Set the product valve (1) to PRODUCT TO PUMP.
- Set agitate/roto-flush knob (2) to AGITATE.
- Return agitate switch (3) to original setting.
- Fold the booms, and turn off the engine.





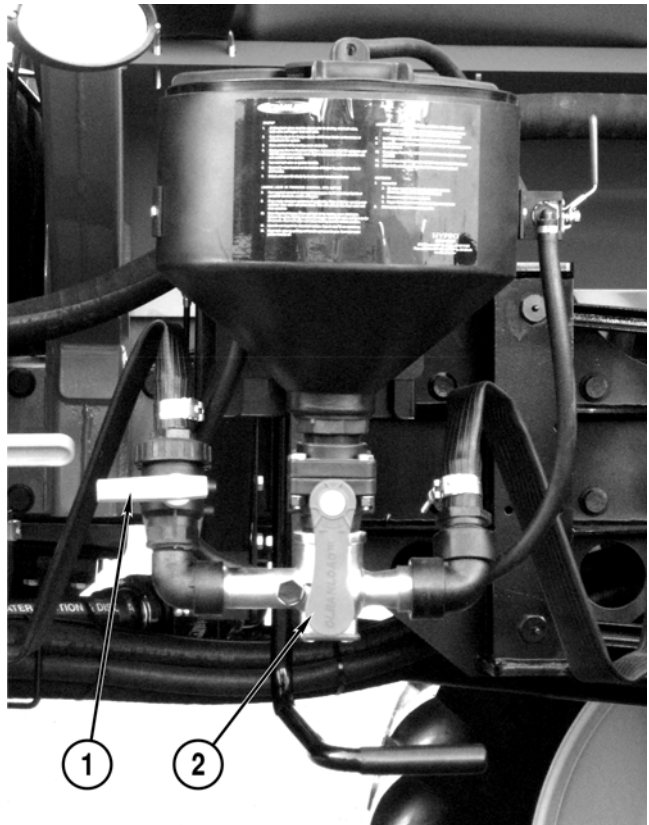
## Cleanload Chemical Eductor

### Startup

1. All eductor valves must be closed prior to starting. Close the inlet ball valve (1) and the hopper ball valve (2).
2. Open the lid to check for foreign objects which may hinder performance or contaminate the system.
3. Close and lock the lid by turning the cover clockwise.
4. Divert pump flow to the eductor inlet line.

**NOTICE:** A pressure of 30 psi [2.06 bar] minimum and 150 psi [10.3 bar] maximum must be used. Higher pressures increase eduction rate and available wand suction.

5. Turn the yellow handle of the inlet ball valve (1) to the open position.
6. Open the hopper ball valve (2), located on the bottom of hopper, by rotating the handle into a vertical position.
7. Unlock and open the lid slowly by turning the cover counterclockwise.
8. Load the eductor. Loading instructions differ for eductors equipped with an optional suction lance. Use the procedure that is appropriate for your application.



### Loading Liquid or Powdered Chemical into Hopper

**NOTICE:** DO NOT at any point put your face directly over the hopper.

**NOTICE:** Avoid splashing liquids or powdered chemicals outside of the hopper.

1. Pour required amount of chemical into the hopper.
2. Rinse empty chemical containers if applicable. Place container opening over the container rinse valve and press down. This will activate the rinse valve and rinse the container.
3. Rinse the Cleanload hopper.
4. Close and lock the lid by turning the cover clockwise.
5. Release the safety locking band on the hopper rinse ball valve and open the valve for 20 seconds.
6. Close the ball valve and return the locking band to the locked position.
7. Open the lid and inspect for chemical residue. Repeat steps 3 to 6 as necessary.
8. Close the hopper ball valve (2) by rotating the handle into a horizontal position (shown). Turn the inlet valve (1) (yellow handle) off.

**NOTE:** The eductor hoses are flexible and may be kinked while in the up position. This is normal and will not cause any damage to the hoses or equipment.



### Loading Liquid and/or Powdered Chemical with Suction Lance

NOTE: The suction lance must be purchased separately. It is not included with the chemical eductor.

NOTE: Lance suction is dependent on eductor pressure and flow. For best results, use highest pressure available (up to 150 psi [10.3 bar] maximum).

1. Insert lance body with o-ring into eductor until the o-ring is sealed.
2. Use the free end of the lance to vacuum powdered or liquid chemical.
3. Rinse lance. Place lance end into a clean container of water to rinse lance assembly.
4. Remove lance body from eductor and drain any remaining fluid into hopper.
5. Close hopper ball valve. Turn inlet valve (yellow handle) off.

### Shutdown

1. Before shutdown, make sure:
  - All valves are closed. Be sure to close the hopper ball valve first. (Close by moving handle into a horizontal position.)
  - Chemical residue has been cleaned.
  - Hopper lid is closed and locked by turning cover clockwise.
2. Divert pump flow back to normal operation.
3. Raise eductor to up positions and insert latch pin.

**NOTICE:** *DO NOT store a contaminated lance in the Apache Sprayer cab.*



[illegible]

# APACHE™

## CHAPTER 5

# LUBRICATION AND MAINTENANCE

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Before performing any maintenance procedures, read the Safety Section on page 2-1.

### Maintenance Precautions

- Any part which is found defective as a result of inspection or any part whose specifications are not adequate must be replaced.
- ALWAYS tighten components to the specified torque. Loose parts can cause equipment damage or cause it to operate improperly.
- Only use Apache-approved replacement parts. Other replacement parts may affect warranty coverage.
- NEVER attempt to modify the Apache Sprayer design or safety features.
- If a warning alarm or indicator activates during engine operation, stop the Apache Sprayer and engine immediately and contact your Apache dealer. Determine the cause and repair the problem before continuing operation. To ensure your safety, the safety of others, and the safe operation and maintenance of the sprayer, read, follow and practice the following:

#### **WARNING! Exposure Hazards**

- ***ALWAYS wear appropriate eye protection to prevent the risk of eye injury. Wear safety glasses to prevent eye contact with debris, chemicals and fluids.***
- ***ALWAYS wear ear plugs when working around loud noises to prevent hearing loss.***
- ***ALWAYS wear the appropriate gloves to protect your hands, especially when handling extremely hot or cold equipment and fluids.***

#### **WARNING! Entanglement Hazards**

- ***NEVER leave the key in the key switch when servicing the Apache Sprayer. Attach a “Person working on vehicle. DO NOT Start or Operate” tag near the key switch while performing maintenance on the equipment.***
- ***ALWAYS stop the engine before beginning service.***
- ***NEVER operate the engine without the guards in place.***
- ***ALWAYS remove any tools or shop rags used during maintenance from the area before operation.***
- ***NEVER engage the transmission or driven equipment by hand from underneath the Apache Sprayer when the engine is running.***

#### **WARNING! Piercing Hazards**

- ***Avoid skin contact with high-pressure diesel fuel spray caused by a fuel system leak such as a broken fuel injection line. High-pressure fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure fuel spray, obtain prompt medical treatment.***
- ***NEVER check for a hydraulic leak with your hands. ALWAYS use a piece of wood or cardboard.***

**WARNING! Flying Object Hazard.**

- **ALWAYS wear eye protection when servicing the engine or when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.**

**WARNING! Crush Hazards**

- **ALWAYS make sure the Apache Sprayer is on flat, solid ground before getting under the Apache Sprayer.**
- **ALWAYS block front and rear axle wheels before getting under the Apache Sprayer.**
- **If using a hydraulic jack or jack stands, ensure they are of the proper capacity and used in a proper manner under the frame of the Apache Sprayer.**
- **Use a hoist or use assistance when lifting components that weigh 50 lb [23 kg] or more. Make sure all lifting devices such as chains, hooks or slings are in good condition, of the correct capacity, positioned correctly and have current, valid inspection labels.**
- **ALWAYS use lifting equipment with sufficient capacity to lift the Apache Sprayer or equipment.**
- **If transport is needed for repair, acquire assistance when using a hoist and when loading and unloading.**

**WARNING! Fire/Explosion Hazards**

- **While the engine is running or the battery is charging, hydrogen gas is being produced and can be easily ignited. Keep the area around the battery well-ventilated and keep sparks, open flame and any other form of ignition out of the area.**
- **ALWAYS turn off the battery switch or disconnect the negative (-) battery cable before servicing the equipment**

**WARNING! Explosion Hazard.**

- **Batteries contain sulfuric acid. NEVER allow battery fluid to come in contact with clothing, skin or eyes. Severe burns could result. If battery fluid contacts the eyes and/ or skin, immediately flush the affected areas with a large amount of clean water and obtain prompt medical treatment.**

**WARNING! Exposure Hazard.**

- **ALWAYS wear safety goggles and protective clothing when servicing the battery.**

**WARNING! High-Pressure Compressed Air - Exposure and Impact Hazards**

- **Pneumatic components store compressed air and can separate violently during disassembly or removal. Before servicing any part of the pneumatic (air) system, slowly release all compressed air from the system.**
- **NEVER exceed the recommended working air pressure.**
- **NEVER connect or disconnect a hose or line containing air pressure.**
- **ALWAYS wear safety glasses when working with compressed air systems. NEVER look into the area of escaping air when draining air tanks or disconnecting lines. Dirt or moisture may be expelled, causing eye injury.**

**WARNING! Shop Equipment Hazards**

- **ALWAYS check before starting the engine that any tools or shop rags used during maintenance have been removed from the area.**
- **ALWAYS use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.**
- **ALWAYS use the proper tools and equipment for servicing the Apache Sprayer. Ensure the tools are rated and approved for use with this Apache Sprayer.**

- ***If an Apache Sprayer is to be operated with test equipment connected, precautions must be taken to ensure that all equipment and related components are securely attached to prevent movement and interference.***
- ***Before performing any maintenance procedure, have all the correct tools you need to perform the required tasks.***
- ***Ensure that the work area is adequately illuminated. ALWAYS install wire cages on portable safety lamps.***

## **Environmental Precautions**

*The safety messages that follow have NOTICE level hazards.*

- Thoroughly clean any spilled fluids from the equipment and/or ground after service is completed. Dispose of used fluids and filters as required by law.
- ALWAYS be environmentally responsible. Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.
- NEVER dispose of hazardous materials by dumping them into a sewer, on the ground, or into ground water or waterways.

## **Non-Apache Equipment Maintenance**

Some components and systems of Apache Sprayers are manufactured by companies other than Apache and have specific safety, inspection, adjustment and maintenance procedures outlined by their manufacturer.

***NOTICE: ALWAYS perform maintenance procedures for all OEM equipment in addition to procedures for the Apache Sprayer.***

Some non-Apache equipment operator's and maintenance manuals are included with the Apache Sprayer. These include, but are not limited to, the Engine Owner's Manual, Sprayer Monitor System Manual, Chemical Educator Manual, Product Pump Instructions and other optional equipment manuals.

***NOTICE: ALWAYS perform and reference the original equipment manufacturers' service information when performing service or maintenance procedures on equipment manufactured by companies other than Apache. Before servicing original equipment manufacturer (OEM) systems or components, properly identify the OEM model and serial number to ensure correct service and replacement part information is referenced.***

## **Cleaning Guidelines**

The following guidelines are recommended when cleaning mechanical and electrical parts of the cab.

### ***WARNING! Fire Hazard***

- ***Cleaning solvents can cause death or serious injury.***
- ***Cleaning solvents are extremely flammable and toxic if inhaled.***
- ***DO NOT use near sparks or flame and avoid inhaling.***
- ***Use in a well-ventilated area and follow the manufacturers' warnings on use and handling.***

### ***WARNING! Exposure Hazard.***

- ***Wear safety glasses, gloves, and other proper protective clothing or gear when handling part cleaners or other hazardous cleaning agents.***

The safety messages that follow have NOTICE level hazards.

- Use caution when using power washers to avoid damaging rubber, plastic or electrical components.



**Mechanical Parts**

- Clean mechanical parts with a noncombustible cleaning agent.
- Clean mating surfaces thoroughly after removing a part to which an O-ring or gasket is attached. If you replace a part, ALWAYS use a new O-ring or gasket.

**Electrical Parts**

- NEVER spray water or cleaners directly on electrical parts.
- Electrical parts are susceptible to water damage and insulations leaks. Current leakage can develop if electrical parts become wet or the insulation is damaged.

**Body and Cab Exterior**

- The use of a low-pressure water supply system and mild automotive-type soap is recommended to wash and rinse the Apache Sprayer.
- DO NOT use abrasive cleaning materials on the Apache Sprayer, as brushes, chemicals and cleaners may damage the finish or components.
- DO NOT remove ice or snow from painted surfaces with a scraper or blade.
- DO NOT allow diesel fuel, oils, lubricants or antifreeze to come in contact with painted surfaces.
- When cleaning chrome, stainless-steel or aluminum parts, use clean water and a soft cloth.
- Avoid scratching or damaging polished metal finishes; DO NOT use abrasive cleaners.
- NEVER use pressurized water or cleaners to clean the cab interior.
- NEVER use corrosive cleaning solutions or any type of abrasives. Part or equipment damage caused by use of corrosive cleaners or abrasives is not covered under Apache warranty.
- Periodically clean the interior dash, gauge panels, floor and seat with a mild cleanser or water-dampened cloth.
- Periodically clean all interior glass with a water-dampened cloth or approved glass cleaning materials.

## Apache Sprayer Service Interval Chart

Perform and repeat the prescribed maintenance at each interval ○ = Conditional Service ● = Regular Service  NOTE: DO NOT overlook the "After First 100 Hours" interval.	Before Initial Use	After First 10 Hours	As Required	Daily	Every 40 Hours	After First 100 Hours	Every 100 Hours	Every 250 Hours	Every 500 Hours or Yearly	Every Year	Every 1000 Hours or Yearly
Grease Boom	○			●							
Torque Lug Nuts	○	○			●						
Torque Boom Lead Bolts	○	○			●						
Grease Steering Components	○				●						
Grease Axle Components	○		○		●						
Grease Driveline	○						●				
Adjust Poly Tank Straps	○	○	○			○	●				
Adjust Boom	○	○	○								
Change Cab Filters			○						●		
Adjust Toe-In			○							●	
Change Engine Safety Air Filter			○							●	
Winterize Wet System			○							●	
Inspect Front Accumulators			○								●
Flush Wet System (including product pump)			○	●							
Check Tire Pressure				●							
Check Oil Engine Level				●							
Check Coolant Level, Cooling Package, and Hoses				●							
Check Transmission Fluid Level				●							
Check Hydraulic Fluid Level				●							
Grease Rear Suspension					●						
Grease Front Strut and King-pins					●						
Check Differential Fluid Level					●						
Check Differential for Leaks					●						
Torque Axle Extension Bolts			○				●				
Change Fuel Primary Filter							●				
Change Fuel Separator Filter							●				
Clean Fuel Tank Strainer			○				●				
Clean/Change Primary Engine Air Filter			○		○			●			
Change Differential Fluid						○		●			
Change Hydraulic Fluid Filter (Immediately if indicator is red.)						○		●			
Clean Hydraulic Fluid Strainer								●			
Change Engine Oil and Filter						○			●		
Change Transmission Fluid and Filter and Clean Strainer						○			●		
Inspect Front Accumulator and Suspension Cylinder									●		
Check Front Suspension Cylinder Fluid Level									●		
Check Front Accumulator Charge									●		
Recalibrate Raven Radar Gun									●		
Inspect and Repack Wheel Hub and Flex Bearings									●		
Change Final Drive Fluid (drop box or planetary)									●		
Change Hydraulic Fluid											●

## Before Initial Use

The following services must be performed before initial use of the Apache Sprayer and repeated at the interval prescribed in the Apache Sprayer Service Interval Chart. See “Apache Sprayer Service Interval Chart” on page 5-5.

- Grease Boom. See “Grease Boom” on page 5-9.
- Torque Lug Nuts. See “Torque Lug Nuts” on page 5-14.
- Torque Boom Lead Bolts. See “Torque Boom Lead Bolts” on page 5-16.
- Grease Steering Components. See “Grease Steering Components” on page 5-14.
- Grease Axle Components. See “Grease Axle Components” on page 5-16.
- Grease Driveline. See “Grease Driveline Components” on page 5-18.
- Adjust Poly Tank Straps. See “Adjust Poly Tank Straps” on page 5-20.
- Adjust Boom. See “Adjust Boom” on page 5-6.

## After First 10 Hours

The following services must be performed after the first 10 hours of operation and repeated at the interval prescribed in the Apache Sprayer Service Interval Chart. See “Apache Sprayer Service Interval Chart” on page 5-5.

- Torque Lug Nuts. See “Torque Lug Nuts” on page 5-14.
- Torque Boom Lead Bolts. See “Torque Boom Lead Bolts” on page 5-16.
- Adjust Poly Tank Straps. See “Adjust Poly Tank Straps” on page 5-20.

## Adjust Boom

**NOTICE:** All boom adjustments should be performed with the boom fully unfolded and lowered.

### Boom Lead

The outermost tip of the booms should lead the boom rack by 3 to 4 inches [76.2 to 101.6 mm].



To adjust the boom lead:

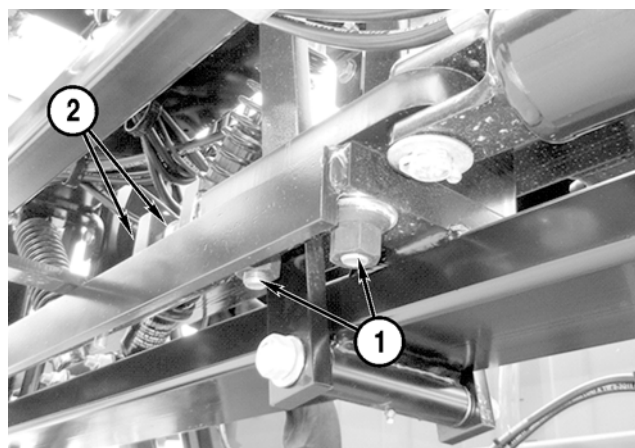
Loosen the boom lead bolts (1) near the bottom of the boom rack.

- Turn the jam nuts (2) toward the end of the boom to increase boom lead.
- Turn the jam nuts (2) toward the center of the boom rack to reduce boom lead.

Tighten the jam nuts and lead bolts after correct lead is set.

Torque the boom lead bolts to 420 lb-ft [569 N•m]

Repeat the steps for the remaining boom, as required.



### Boom Breakaway

Each left and right boom is equipped with one or two boom breakaways depending on boom configuration. A right, boom tip breakaway is shown.

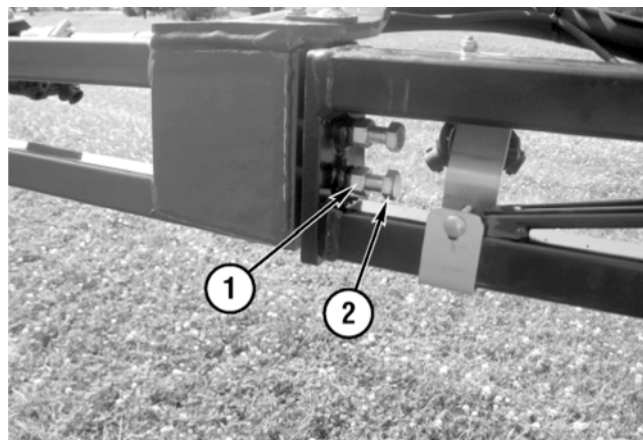
The breakaways should be adjusted so the boom sections on both sides of the breakaways are straight and aligned as they extend from the boom rack.

To adjust the breakaway:

Loosen the jam nut (1) and turn the adjusting screw (2) to align the booms.

Tighten the jam nut.

Repeat the steps for the remaining breakaways, as required.



### Boom Stabilizer

There are four boom stabilizers mounted on the boom rack. The upper and lower right-side stabilizers (1) are shown.

The gap between the nylon wear pads and the steel frame should be 0.093 to 0.125 in. [2.4 to 3.2 mm] with the booms unfolded.

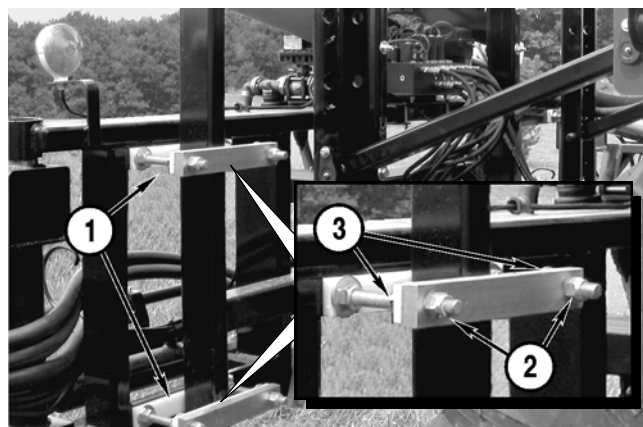
To adjust the gap:

Loosen both lock nuts (2) on the stabilizer and equally adjust the jam nuts (3) until the gap is correct.

Tighten the lock nuts (2).

Repeat the steps for the other stabilizers, as required.

NOTE: For best performance, the jam nuts must be adjusted so the stabilizer halves are parallel and provide the 0.093 to 0.125 in. [2.4 to 3.2 mm] gap.



### Boom Tip (80 ft, 90 ft, and 100 ft Booms)

The boom tips should be level with the main boom.

The left boom tip is shown.

To adjust the boom tip level:

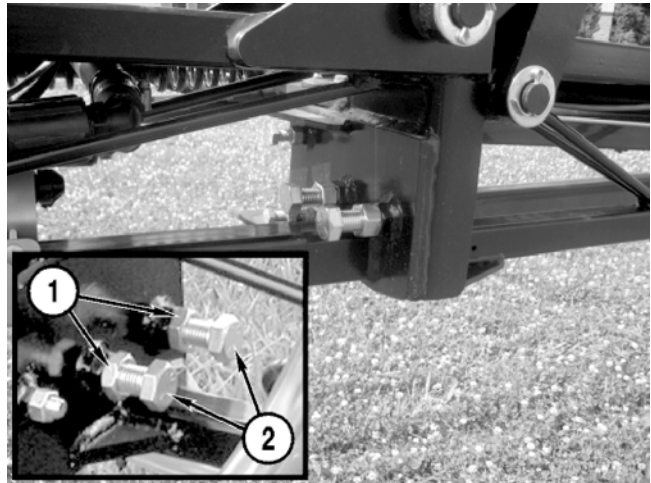
Loosen the jam nuts (1) on the leveling bracket.

Turn the leveling bolts (2) clockwise to raise the boom tip or counter-clockwise to lower the boom tip.

NOTE: When the boom tip is adjusted properly, there will be some side-to-side movement in the cylinder and in the linkage bars.

NOTE: Adjust the bolts equally for best performance.

Repeat the steps for the other boom tip, as required.



### As Required

The following services will be required at various intervals depending on Apache Sprayer use and environmental conditions. Repeat these services as prescribed by the Apache Sprayer Service Interval Chart. See “Apache Sprayer Service Interval Chart” on page 5-5.

- Grease Axle Components. See “Grease Axle Components” on page 5-16.
- Adjust Poly Tank Straps. See “Adjust Poly Tank Straps” on page 5-20.
- Adjust Boom. See “Adjust Boom” on page 5-6.
- Check Axle Extension Bolt Torque. See “Torque Axle Extension Brace Bolts” on page 5-19.
- Adjust Toe-In. See “Adjust Toe-In (Standard 120” Axles)” on page 5-31.
- Clean or Change the Primary Engine Air Filter. See “Clean or Change Engine Primary Air Filter” on page 5-22.
- Change Engine Safety Air Filter. See “Change Engine Safety Air Filter” on page 5-33.
- Winterize Wet System. See “Winterize Wet System” on page 5-34.
- Change Cab Air Filters. See “Change Cab Recirculating Air and Charcoal Filter” on page 5-29.
- Flush Wet System. See “Flushing Booms” on page 4-25.
- Inspect Front Accumulator. See “Inspect Front Accumulator and Suspension Cylinder” on page 5-24.
- Clean the Fuel Tank Strainer. See “Clean Fuel Tank Strainer” on page 5-21.



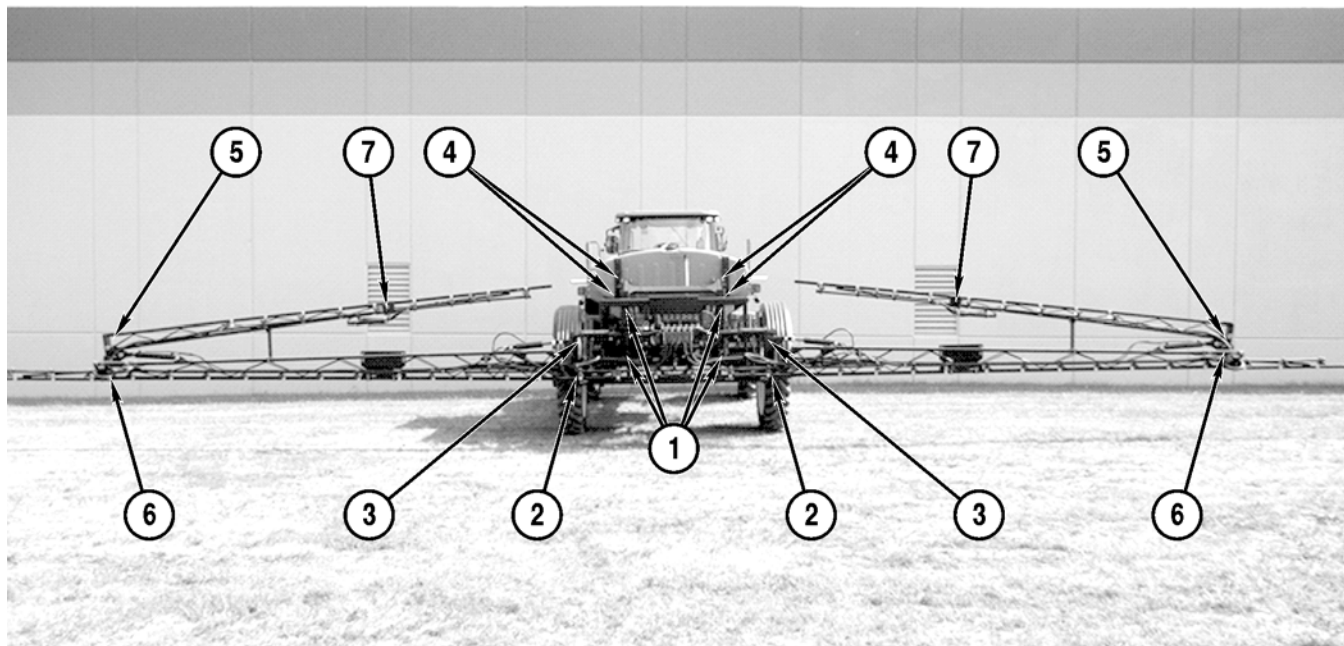
## Daily

The following services must be performed daily, before operation of the Apache Sprayer.

- Clean or Change Primary Engine Air Filter as needed. See “Clean or Change Engine Primary Air Filter” on page 5-22.

**NOTICE:** NEVER clean the inner engine air filter (engine safety air filter). When it is dirty, ALWAYS replace it with a new one.

## Grease Boom

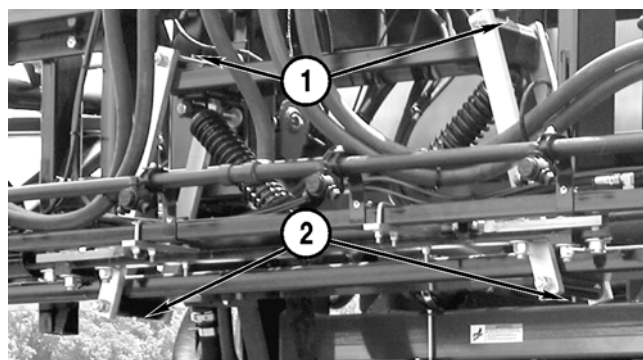


The boom is equipped with seven sets of grease fittings. Apply an ample amount of lithium grease through each of the grease fittings.

- |                    |                                       |
|--------------------|---------------------------------------|
| 1. Boom Stabilizer | 5. Boom Tip                           |
| 2. Boom Tilt       | 6. Boom Inner Breakaway (if equipped) |
| 3. Boom Fold       | 7. Boom Outer Breakaway               |
| 4. Boom Rack       |                                       |

### Boom Stabilizer

There are two upper (1) and two lower (2) boom stabilizer grease fittings.



## Boom Tilt

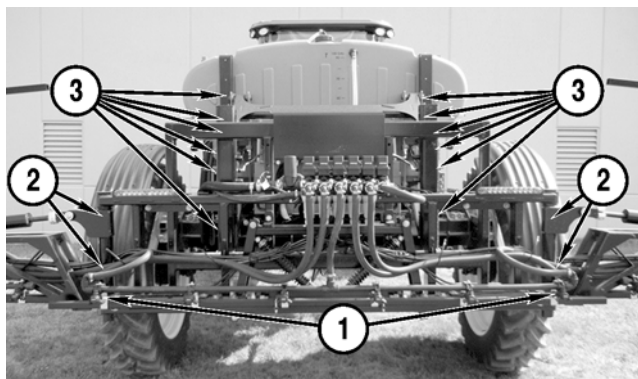
There are two boom tilt grease fittings (1).

## Boom Fold

There are four boom fold grease fittings (2).

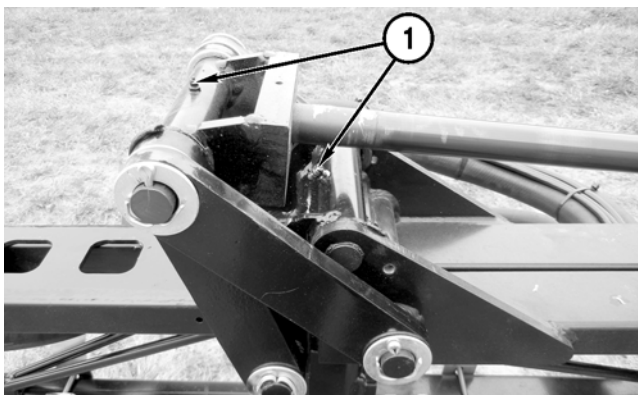
## Boom Rack

There are 12 boom rack grease fittings (3). One on each flag pin.



## Boom Tip

There are four boom tip grease fittings (1), two on each boom tip. The left side is shown.



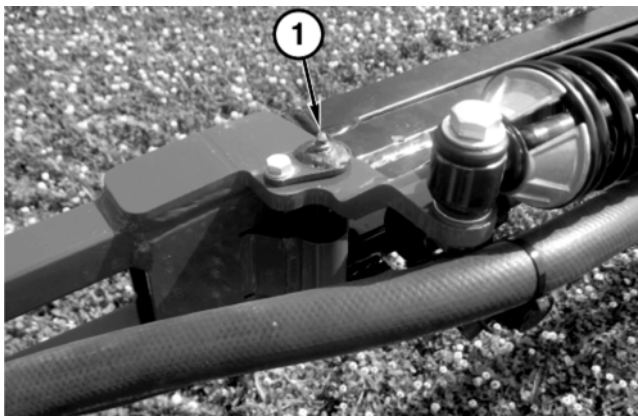
## Boom Inner Breakaway (if equipped)

There is one boom inner breakaway grease fitting (1) on each boom. The left side is shown.



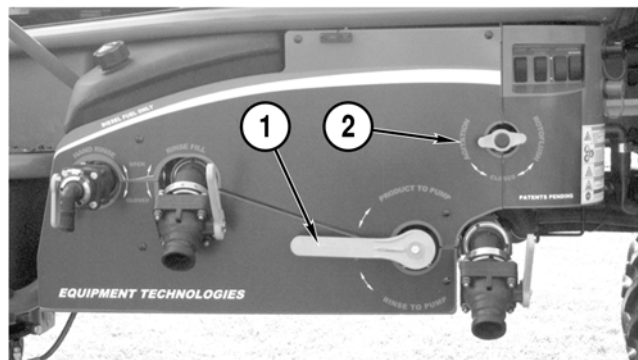
## Boom Outer Breakaway

There is one boom outer breakaway grease fitting (1), on each boom tip. The left side is shown.



### Flush Wet System

Drain and flush the product tank and wet system after use and when changing chemicals. See “Flushing Product Tank” on page 4-24. See “Flushing Booms” on page 4-25.



### Check Tire Pressure

Perform the following:

- Check the tires for damage. Replace tires that have cuts or bubbles.
- Check the tires for proper inflation pressure. Inflate tires according to the tire manufacturer's recommendations. Tire pressures are listed on the back cover of this manual.
- Check the rims for cracks and other damage. Replace damaged rims.



### Check Engine Oil Level

**NOTICE:** If the engine has been running, shut off and wait 10 minutes before checking oil level.

The dipstick is located in the engine compartment, on the left side of the engine.

While parked on level ground, remove the dipstick and check the oil level.

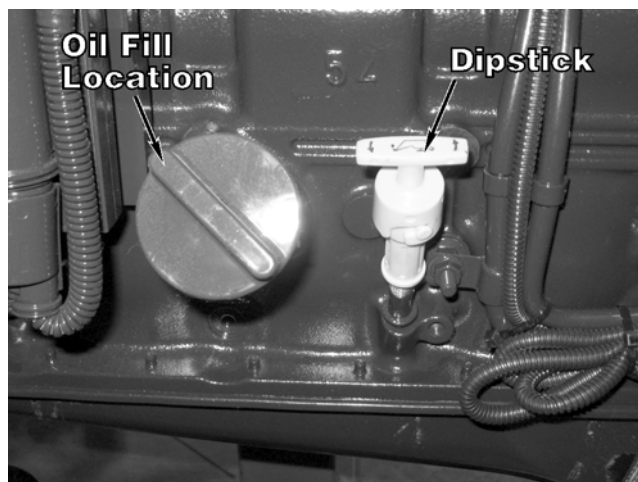
The oil level should be within the hatched area on the dipstick.

If the oil level is below the ADD mark, add high quality Lucas 15W-40 Magnum motor oil at the oil fill location on top of the engine.

Add oil as needed to bring the level to the hatched area on the dipstick.

Replace the dipstick.

Additional lubricating oil system information is available in the engine manufacturer's manual provided with the Apache Sprayer.





### Check Cooling System

**WARNING! Fire Hazard.** Coolant may be flammable under certain conditions. NEVER allow coolant to come into contact with hot surfaces.

**WARNING! Exposure Hazard.** Wear eye protection and rubber gloves when handling engine coolant. Avoid skin contact with coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.

**WARNING! Burn Hazard.** NEVER remove the radiator cap if the engine is hot. Steam and hot engine coolant will spray out and seriously burn you. Allow the engine to cool down before you attempt to remove the cap.

Remove the small grille on the top, left of the hood assembly to gain access to the radiator fill cap.

Remove the radiator cap and check the coolant level. Remove the radiator cap slowly to relieve internal pressure. The coolant should be level with the bottom of the fill neck.

Add coolant as necessary. DO NOT overfill the cooling system, as this may cause the coolant to spray from the system during operation.

**NOTICE:** See the engine manufacturer's manual for coolant requirements and additional cooling system information. Coolant specifications must meet or exceed ASTM D3306 / D6210 or RP-329.

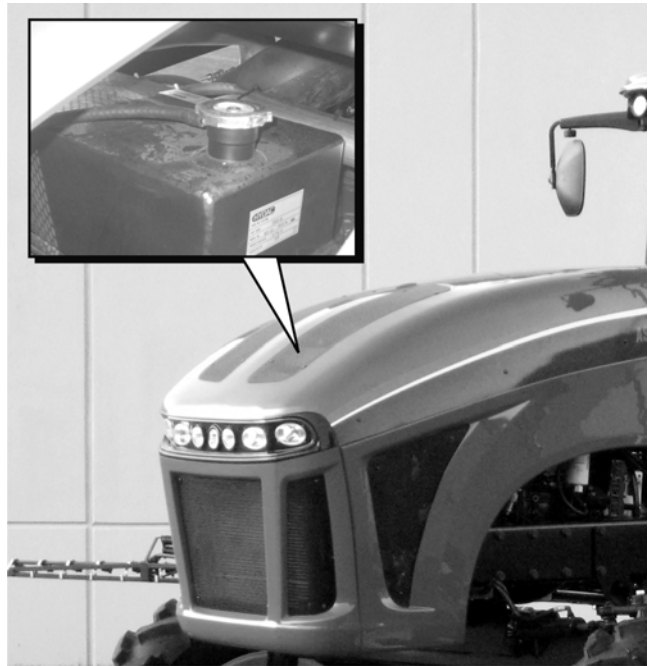
Install the radiator cap.

**WARNING! Burn Hazard.**

ALWAYS tighten the radiator cap securely after checking the coolant. Steam can spray out during engine operation if the cap is loose.

Inspect the cooling system components for damage and debris.

- Check tubes, hoses and other components for damage and leaks.
- Replace damaged components as necessary.
- Clean debris from around or between cooling package components.



## Check Transmission Fluid Level

**NOTICE:** While parked on level ground, check the transmission fluid level with the oil at operating temperature and the engine off.

The transmission fluid dipstick is located in the engine compartment, on the left side of the engine, and toward the cab.

**NOTE:** The transmission fluid should be at operating temperature and the engine should be off.

Turn the dipstick handle counter-clockwise to loosen.

Remove the dipstick and check the transmission fluid level.

The fluid level should be between the two dots on the dipstick.

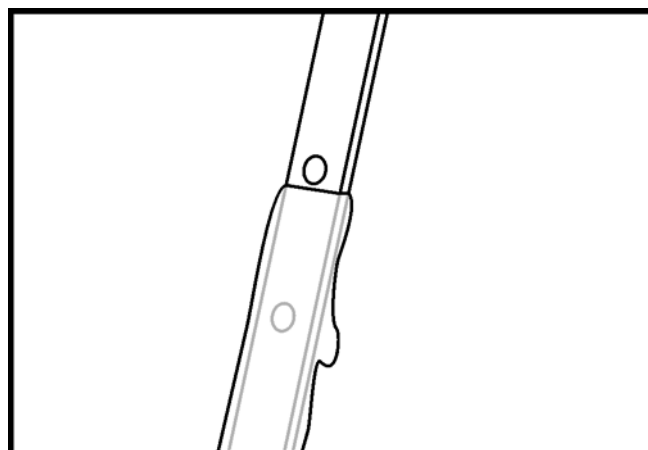
**NOTICE:** DO NOT overfill the transmission fluid. Overfilling can damage the transmission or cause the transmission to malfunction or overheat.

**NOTICE:** Use only Lucas Universal Hydraulic Fluid or equivalent.

If the fluid level is below the lower dot on the dipstick, use a funnel to add fluid through the dipstick tube.

Add Lucas Universal Hydraulic Fluid, or equivalent, to bring the level between the dots on the dipstick.

Replace the dipstick and turn the handle clockwise to tighten.



## Check Hydraulic Fluid Level

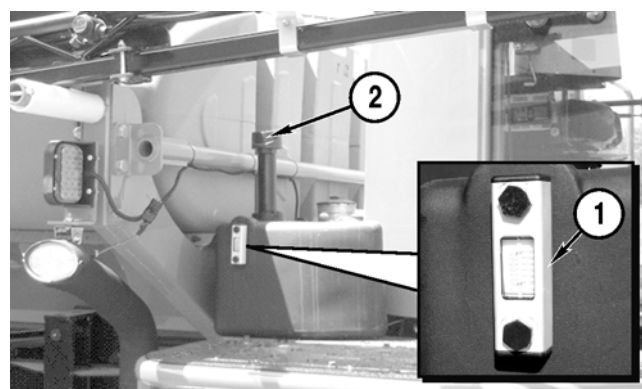
**NOTICE:** The machine must be on level ground with the booms folded and in the transport position for an accurate hydraulic fluid level reading.

The hydraulic fluid reservoir is located on the right side of the Apache Sprayer and a sight glass (1) indicates the hydraulic fluid level and temperature.

**NOTICE:** Use only Lucas Universal Hydraulic Fluid, or equivalent, for the Apache Sprayer hydraulic system.

If no fluid is visible in the sight glass, remove the fill cap (2) and add Lucas Universal Hydraulic Fluid, or equivalent, until fluid is visible in the bottom of the sight glass.

**NOTICE:** DO NOT fill more than 3/4 up on the sight glass.





## Every 40 Hours

The following services must be performed after every 40 hours of operation of the Apache Sprayer.

- Clean or Change Primary Engine Air Filter as needed. See “Clean or Change Engine Primary Air Filter” on page 5-22.

## Torque Lug Nuts

Torque the 14.9 x 38 in. front wheel lug nuts to:

- 420 lb-ft [569 N•m]

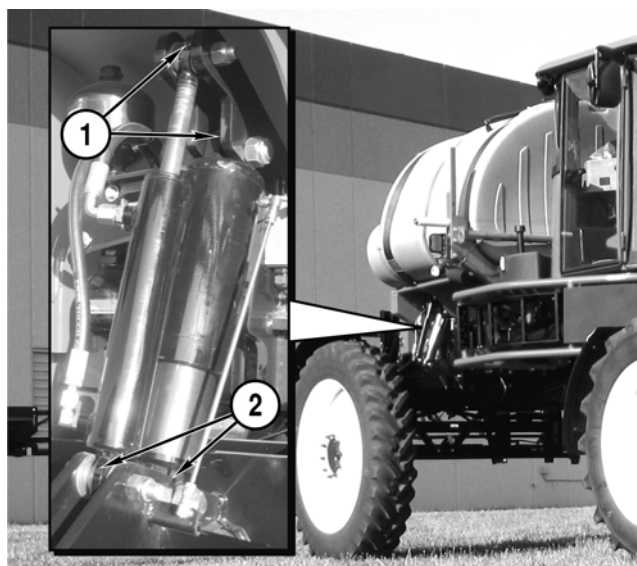
Torque all rear wheel lug nuts to:

- 420 lb-ft [569 N•m]



## Grease Rear Suspension

Apply Lucas lithium grease or equivalent to the upper (1) and lower (2) grease fittings at each end of the suspension cylinder.

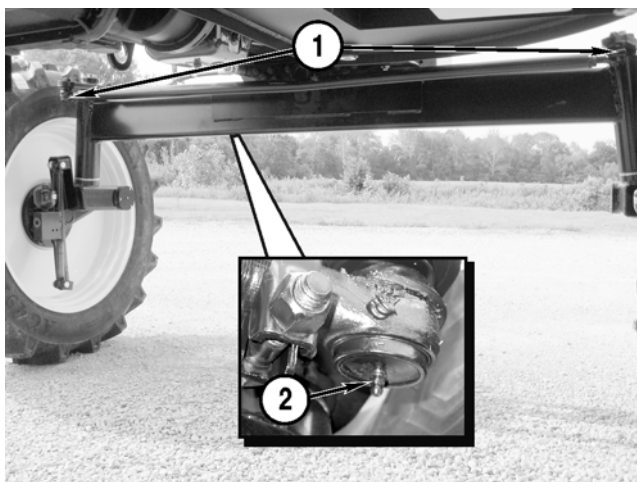


## Grease Steering Components

**NOTICE:** DO NOT over-grease the ball joints. Damage to the dust cover will result.

The AS720 has four ball joint grease fittings, four king-pin grease fittings and two hub grease fittings.

Apply Lucas lithium grease or equivalent through the ball joint grease fittings on each end of the tie rod (1) and on the steering cylinder (2).



### Grease Front Strut and King-pins

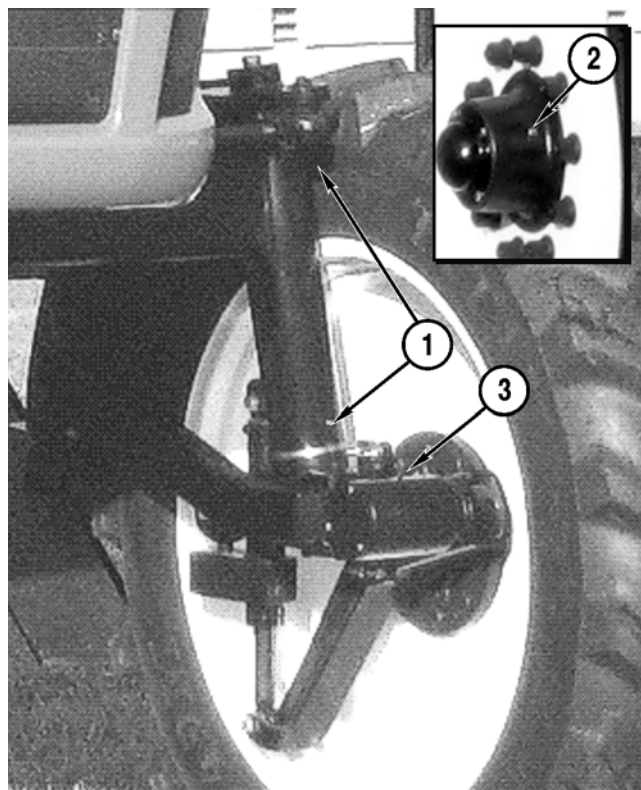
The king-pin at each front wheel has two grease fittings. Apply Lucas lithium grease or equivalent through the two kingpin grease fittings (1) at each front wheel.

Apply Lucas lithium grease or equivalent through the hub grease fitting (2) on each front wheel.

Apply Lucas lithium grease or equivalent through the inter-flex bearing grease fitting (3).

NOTE: The inter-flex (3) and hub (2) bearings are sealed chambers and once greased require very little grease to maintain.

Repeat these steps for the other front wheel.



The front strut is equipped with one upper (1) and one lower (2) grease fitting per side.

Apply Lucas lithium grease or equivalent through each grease fitting.

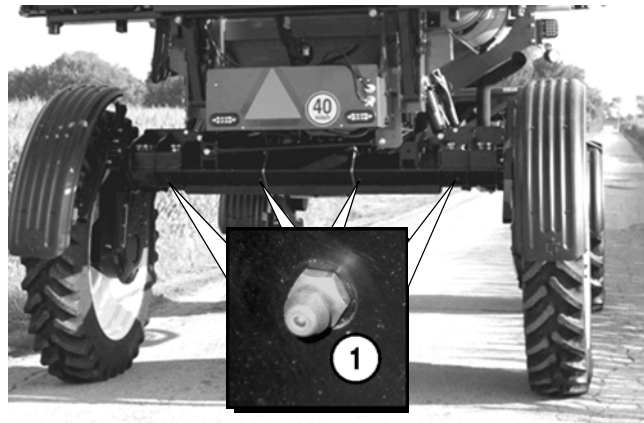


## Grease Axle Components

The rear axle is equipped with 16 grease fittings, installed in two square-tube axle extension assemblies. Eight fittings point downward from the bottom faces of each square tube. Shown are the four rear-most fittings (1).

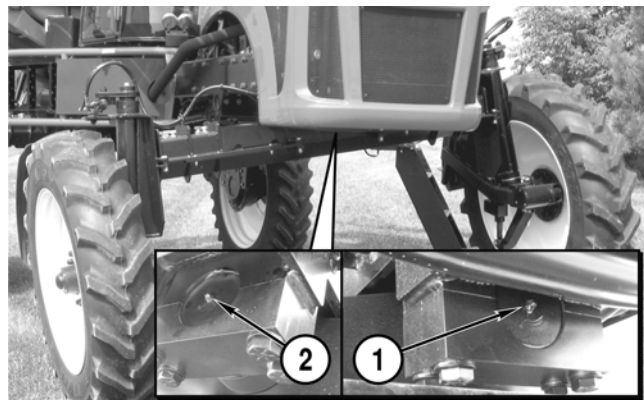
The front axle is equipped with eight grease fittings.

Apply an ample amount of Lucas lithium grease or equivalent through each of the fittings.



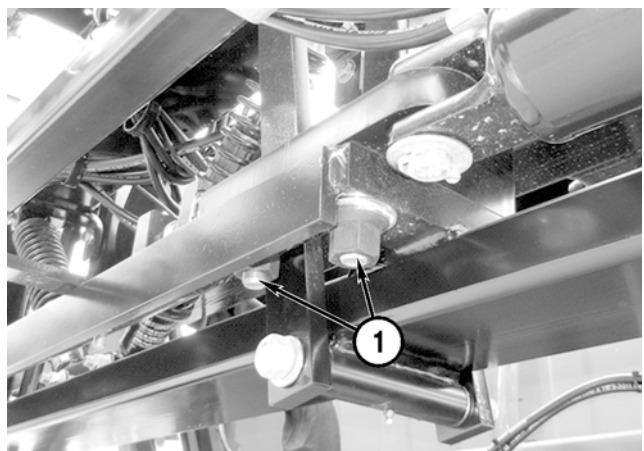
An axle pivot is located under the vehicle on the front axle. The pivot is equipped with a grease fitting on front (1) and rear (2) of the front axle.

Apply an ample amount of Lucas lithium grease or equivalent through each of the fittings.



## Torque Boom Lead Bolts

Torque the boom lead bolts (1) on the boom rack to 420 lb-ft [569 N•m]. Torque the bolts on both the right hand side and left hand side of the boom rack.



### Check Differential Fluid Level

The differential is located under the Apache Sprayer, on the rear axle. The fill/level plug is directly above the drain plug on the rear of the differential.

With the machine parked on level ground, remove the differential fill/level plug (1) and check the fluid level. The fluid should be level with the bottom of the fill/level hole.

*NOTICE: Use only Lucas Universal Hydraulic Fluid, or equivalent, for the differential fluid.*

If required, add Lucas Universal Hydraulic Fluid, or equivalent, to fill the differential to the bottom of the fill/level hole.

Install the plug and tighten.



### Check Rear Differential for Leaks

Inspect the differential for leaks at the U-joint, near the drop boxes, and between inner and outer housings. Repair the leaks before operating the Apache Sprayer.

### After First 100 Hours

The following services must be performed after the first 100 hours of operation and repeated as prescribed by the Apache Sprayer Service Interval Chart.

- Adjust Poly Tank Straps. See “Adjust Poly Tank Straps” on page 5-20.
- Change Differential Fluid. See “Change Differential Fluid” on page 5-22.
- Change Hydraulic Fluid Filter. See “Change Hydraulic Fluid Filter” on page 5-23.
- Change Engine Oil and Filter. See “Change Engine Oil and Filter” on page 5-25.
- Change Transmission Fluid and Filter. See “Change Transmission Fluid and Filter and Clean Strainer” on page 5-26.



## Every 100 Hours

The following services must be performed after every 100 hours of operation of the Apache Sprayer.

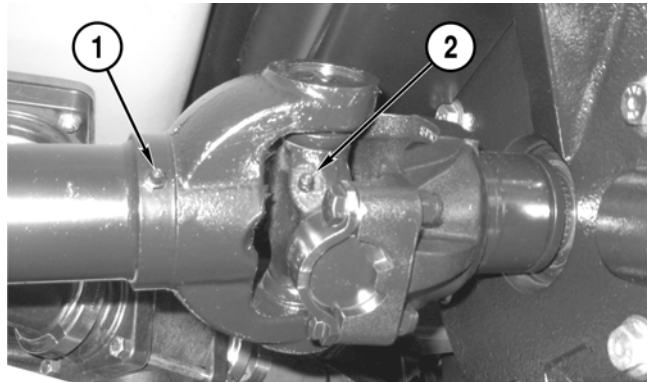
### Grease Driveline Components

The Apache Sprayer has a total of ten driveline grease fittings. Three of these fittings are slip joint fittings and seven are U-joint fittings.

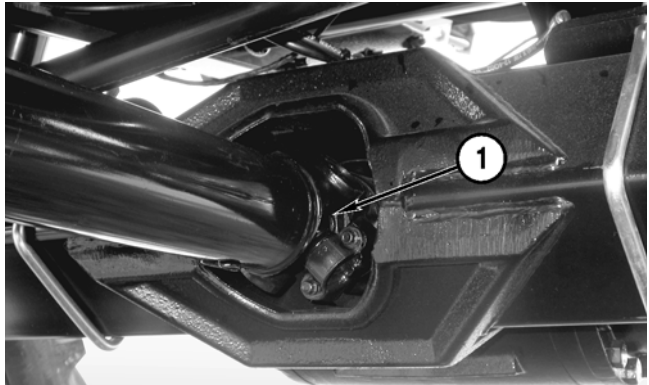
Apply an ample amount of Lucas lithium grease or equivalent through each of the fittings.

One slip joint grease fitting (1) is located under the Apache Sprayer, between the transmission and the rear axle.

A U-joint fitting is located at the transmission output U-joint (not shown) and another fitting (2) is located on the U-joint connected to the slip joint.



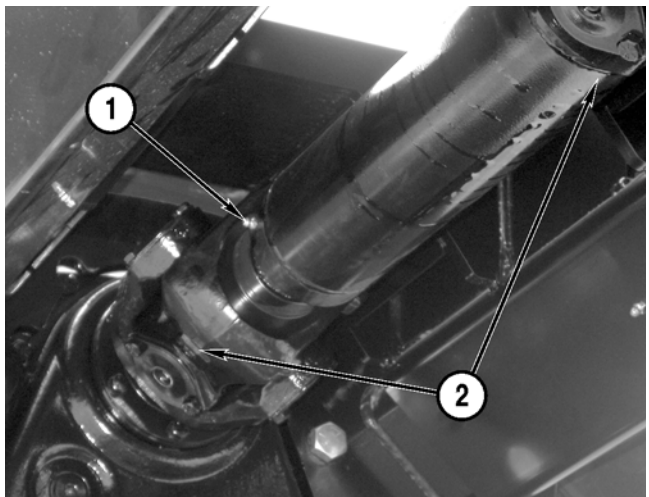
A U-joint fitting (1) is located at the differential input.



The other two slip joint grease fittings (1) are located under the Apache Sprayer, between the differential and each drop box U-joint.

The remaining U-joint fittings (2) are located on the U-joints at each end of the left and right axles.

The left axle is shown.





## Torque Axle Extension Brace Bolts

*NOTICE: There are different axle brace bolt torque values for manual and Adjust On The Go axles. Follow the instructions for your application.*

### Manual Adjust Axles

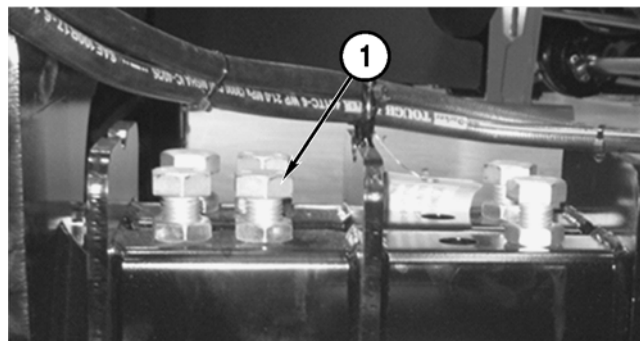
There are six axle brace bolts (1) on each front brace.

Loosen all the jam nuts.

Tighten the axle brace bolts (1) to 80 lb-ft [108 N•m].

Tighten the jam nuts.

Repeat the process for the other front axle brace.



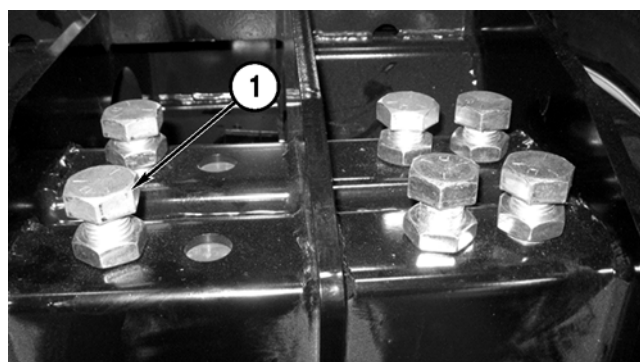
There are twelve axle brace bolts (1) on each rear brace.

Loosen all the jam nuts.

Tighten the bolts (1) to 80 lb-ft [108 N•m].

Tighten the jam nuts.

Repeat the process for the other rear axle brace.



### Adjust On The Go Axles

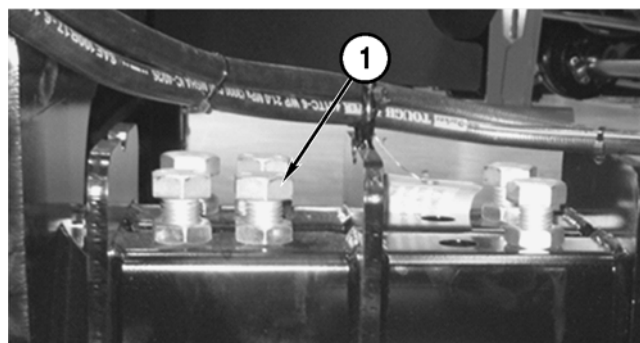
There are six axle brace bolts (1) on each front brace.

Loosen all the jam nuts.

Tighten the axle brace bolts (1) to 15 lb-ft [20 N•m].

Tighten the jam nuts.

Repeat the process for the other front axle brace.



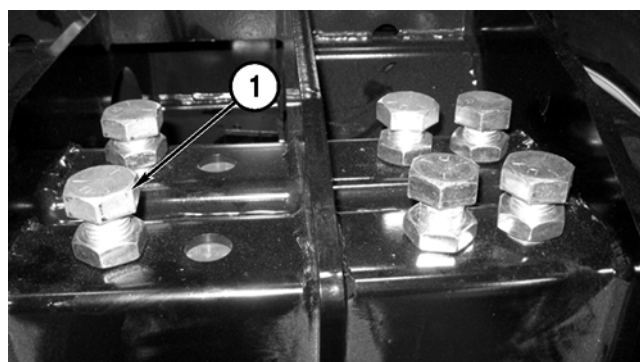
There are twelve axle brace bolts (1) on each rear brace.

Loosen all the jam nuts.

Tighten the bolts (1) to 15 lb-ft [20 N•m].

Tighten the jam nuts.

Repeat the process for the other rear axle brace.



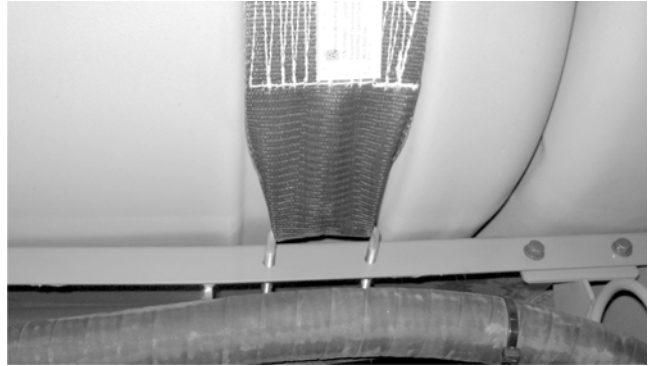
### Adjust Poly Tank Straps

Tighten the bolts on each tank strap without deforming the tank, bolts or tank skid. Tighten the bolts evenly from side to side.

Fill the product tank with water and drive the Apache Sprayer to allow the tank to settle.

Stop the Apache Sprayer and check the straps.

Adjust the straps as needed.



### Change Fuel Filter

The fuel filter (1) is located in the engine compartment on the left side of the engine.

**WARNING! Fire Hazard. Wipe up fuel spills immediately. Fuel will spill from the filter and fuel lines when loosened or removed. Use a suitable container to collect the fuel and dispose of properly.**

Turn the filter counter-clockwise to remove. Dispose of the filter properly.

**NOTICE:** ALWAYS replace the fuel filter with a new fuel filter.

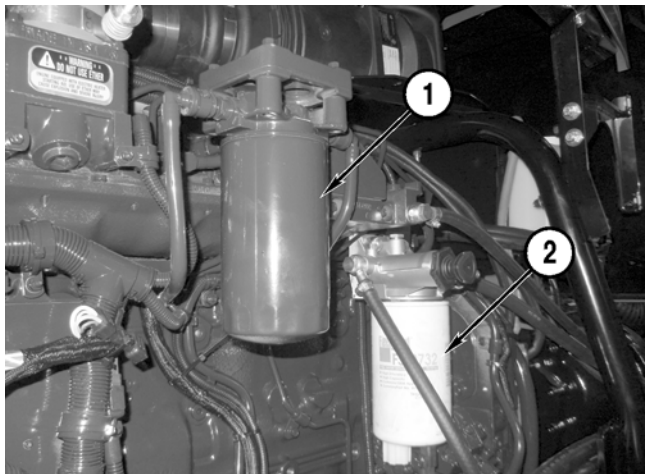
- Fuel Filter Part Number: 201450243

Fill the new filter with diesel fuel before installing.

Tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.

**NOTE:** It is not necessary to bleed the fuel system after replacing fuel filters.

Additional fuel system information is available in the engine manufacturer's manual provided with the Apache Sprayer.



### Change Fuel Separator Filter

The fuel separator filter (2) is located in the engine compartment on the left side of the engine.

Turn the filter counter-clockwise to remove.

Dispose of the filter properly.

**NOTICE:** ALWAYS replace the fuel separator filter with a new separator filter.

- Fuel Separator Filter Part Number: 201450242.

Fill the new filter with diesel fuel before installing.

**NOTICE:** DO NOT overtighten the filter. Damage to the seal can result.

Tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.

**NOTE:** It is not necessary to bleed the fuel system after replacing fuel filters.

Additional fuel system information is available in the engine manufacturer's manual provided with the Apache Sprayer.

### **Clean Fuel Tank Strainer**

The fuel tank strainer is located in the fuel tank, behind the fuel supply line fitting (1).

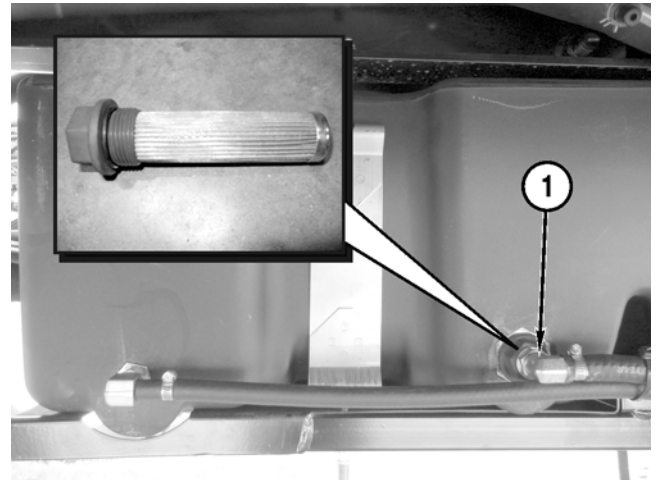
An opportune time to clean the fuel tank strainer is when the fuel level is low.

Drain the fuel tank and remove the 1/2" supply line fitting (1) from the tank strainer.

Unscrew the strainer from the tank and clean any debris from inside or outside of the screen. The strainer has a bypass built into the end that can potentially let debris into the inside of the strainer if it becomes completely clogged.

*NOTICE: Replace the strainer if it has a hole or is damaged in any way.*

- Fuel Strainer Part Number: 201450001.



## Every 250 Hours

The following services must be performed after every 250 hours of operation of the Apache Sprayer.

### Clean or Change Engine Primary Air Filter

**NOTICE:** When operating in severe conditions, the primary air filter should be cleaned after every 40 hours of use or if indicated by the console display.

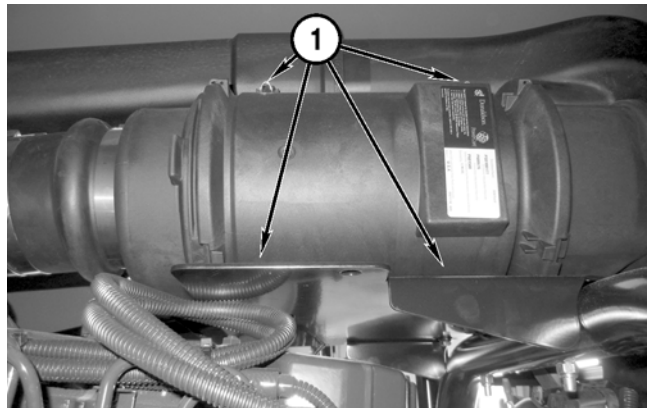
**NOTICE:** If a "Change Air Filter" fault is indicated on the console display, stop immediately and remove and clean or replace the primary air filter as needed.

The primary air filter is mounted in the engine compartment, above the engine and toward the cab.

Clean the outside of the air cleaner and surrounding area to keep dust from entering the cleaner assembly.

Release the four latches (1) and remove the cover from the air cleaner assembly.

**NOTICE:** NEVER clean the inner engine air filter (engine safety air filter). When it is dirty, ALWAYS replace it with a new one.



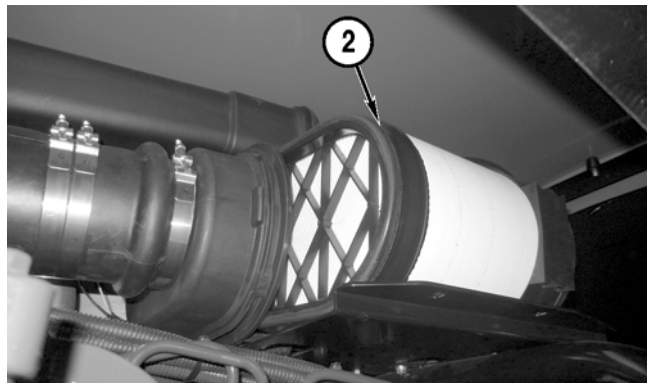
Use a rocking motion to release the primary air filter (2) from the assembly.

Clean the filter using compressed air. Blow the filter from the inside-out.

If installing a new primary engine air filter:

- Primary Engine Air Filter Part Number: 201300116.

Install the filter, the air cleaner cover, and engage the cover latches.



### Change Differential Fluid

The differential is located under the Apache Sprayer, on the rear axle. The fill/level plug (1) is directly above the drain plug on the rear of the differential.

Remove the differential drain plug and drain the fluid into a suitable container. Dispose of the fluid properly.

Install the drain plug and tighten.

**NOTICE:** Use only Lucas Universal Hydraulic Fluid, or equivalent, for the differential fluid.

Remove the differential fill/level plug (1). Add fluid until it is level with the bottom of the fill/level hole.

- Differential Fluid Capacity:  
Approximately 11.9 quarts [11.26 liters].

Install the fill/level plug (1) and tighten.





### Change Hydraulic Fluid Filter

The hydraulic fluid filter is located between the cab and product tank on the right side of the Apache Sprayer.

Remove the cover (1) from the filter housing.

Remove the filter from the assembly.

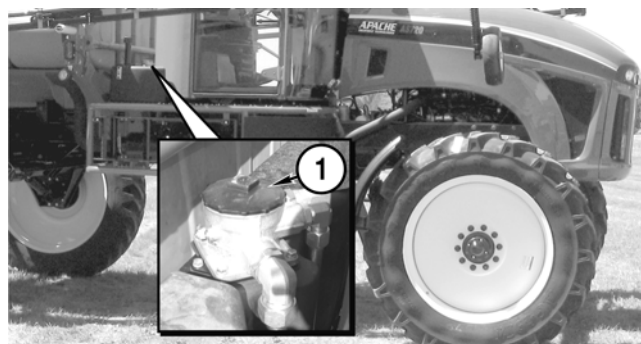
Discard the filter into an appropriate container.

Install an o-ring on the filter housing and lubricate it with clean Lucas Universal Hydraulic Fluid or equivalent.

Install the filter into the filter housing.

Install and tighten the filter housing cover.

Use the sight glass to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-13.

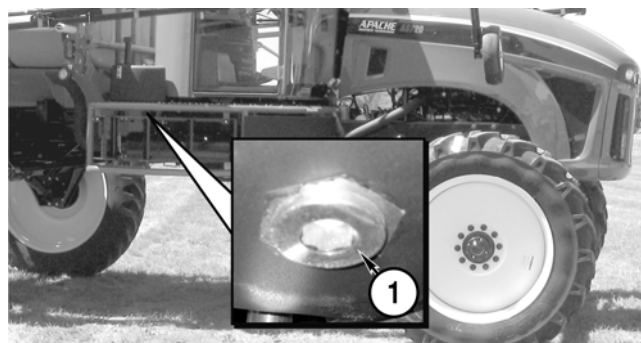


### Clean Hydraulic Fluid Strainer

The hydraulic fluid strainer is located under the Apache Sprayer, on the side of the hydraulic fluid reservoir. The strainer is in line with the hydraulic fluid line.

Remove the hydraulic fluid drain plug (1) from the bottom of the reservoir and drain the fluid into a suitable container with a capacity of approximately 40 gallons [151.42 liters].

Install the drain plug.



Remove the hydraulic fluid line (1).

Remove the strainer (2).

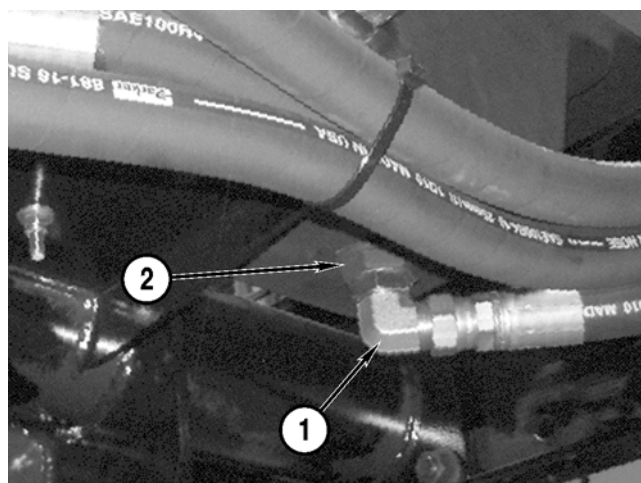
Clean the strainer with diesel fuel and allow to air dry. Dispose of the fuel properly.

**NOTICE:** If the strainer cannot be cleaned or has holes in the screen, replace with new a strainer.

Install the hydraulic fluid strainer (2).

- Hydraulic Fluid Strainer  
Part Number: 840000010.

Install the hydraulic line (1).



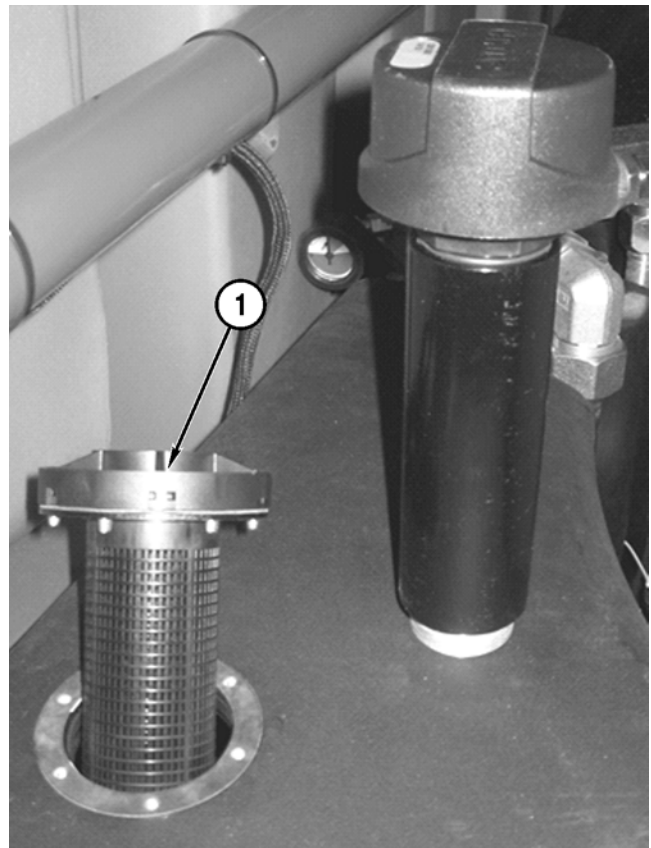


**NOTICE:** Use only Lucas Universal Hydraulic Fluid, or equivalent, for the Apache Sprayer hydraulic system.

**NOTE:** The hydraulic fluid fill location has a screen (1) in the fill neck. Fill the reservoir slowly to reduce the possibility of spilling.

Fill the hydraulic fluid reservoir with Lucas Universal Hydraulic Fluid or equivalent. The reservoir capacity is approximately 40 gallons [151.42 liters].

Use the sight glass to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-13.



### Every 500 Hours or Yearly

**NOTE:** Some services at this interval were performed at the “After First 100 Hours” interval. If the service was performed as prescribed, measurement of 500 hours should begin at the 100 hour mark.

The following services must be performed after every 500 hours of operation or yearly.

### Inspect Front Accumulator and Suspension Cylinder

Inspect the front accumulators and suspension cylinders for hydraulic leaks and correct operation. Typically, the cylinder should have 4 to 6 in. [101.6 to 152.4 mm] of the cylinder ram showing while the Apache Sprayer is on level ground.

**NOTE:** Additional cylinder ram may be exposed when the Apache Sprayer is new. Several hours of operation will break in the seals.



## Check Front Suspension Cylinder Fluid Level

Safely raise the front of the Apache Sprayer so the front tires are just off of the ground.

Remove the plug (1) from the front of each front suspension cylinder and check the fluid level. The fluid should be level with the bottom of the fill hole.

**NOTICE:** If the fluid is foamy, the cylinder has failed. Contact your dealer for repair.

**NOTICE:** Use only Lucas Universal Hydraulic Fluid, or equivalent, for the suspension cylinder fluid.

If required, add Lucas Universal Hydraulic Fluid, or equivalent, to fill the suspension cylinder to the bottom of the fill hole.

Install the plug (1) and tighten.



## Check Accumulator Charge

Safely raise the front of the Apache Sprayer so the front tires are just off of the ground.

Remove the cap (2) and install a nitrogen valve and gauge on the accumulator.

Open the valve and check the nitrogen pressure.

- AS720 Accumulator Nitrogen Pressure:  
800 psi [55.2 bar]

**NOTE:** It may be necessary to top off the nitrogen level yearly.

## Change Engine Oil and Filter

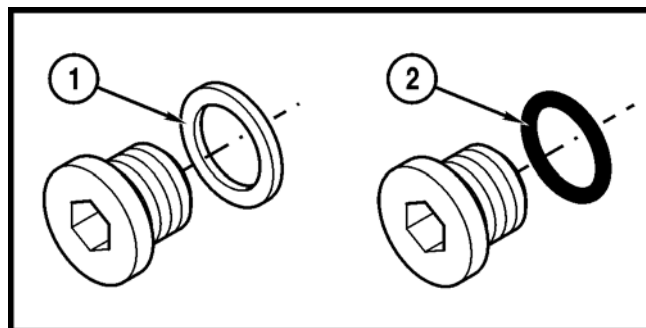
**WARNING! Burn Hazard. If you must drain the engine oil while it is still hot, stay clear of the hot engine oil to avoid being burned. ALWAYS wear eye protection.**

Operate the engine for approximately five minutes to warm the engine oil. Shut off the engine.

The engine oil drain plug is located on the right side of the oil pan. Remove the engine oil drain plug and drain the oil into a suitable container. Properly dispose of the used engine oil.

Install the drain plug and tighten to the torque value below:

- 1.Plug with Copper Washer:  
52 lb-ft [71 N•m]
- 2.Plug with O-ring:  
37 lb-ft [50 N•m]



The engine oil filter is located on the right side of the engine.

Turn the engine oil filter counter-clockwise to remove. Dispose of the filter properly.

**NOTICE:** *DO NOT overtighten the filter. Damage to the seal can result.*

Lubricate the seal on the engine oil filter.

- Engine Oil Filter Part Number: 201450241.

Install and tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.

**NOTICE:** *DO NOT overfill the engine oil. Crankcase oil capacity can vary. ALWAYS use the dipstick to determine if the engine oil is to the appropriate level.*

Fill the engine with high quality Lucas 15W-40 Magnum motor oil or equivalent at the oil fill location on the left side of the engine.

- Engine Oil Capacity:  
Approximately 16 quarts [15 liters].

Add oil as needed to bring the level to the hatched area on the dipstick.

Install the dipstick.

Operate the engine and check for leaks.

Shut off the engine and wait 10 minutes. Check the engine oil level and add oil as needed to bring the level to the hatched area on the dipstick.

Additional lubricating oil system information is available in the engine manufacturer's manual provided with the Apache Sprayer.

### Change Transmission Fluid and Filter and Clean Strainer

The transmission drain plug is located under the machine on the front side of the transmission.

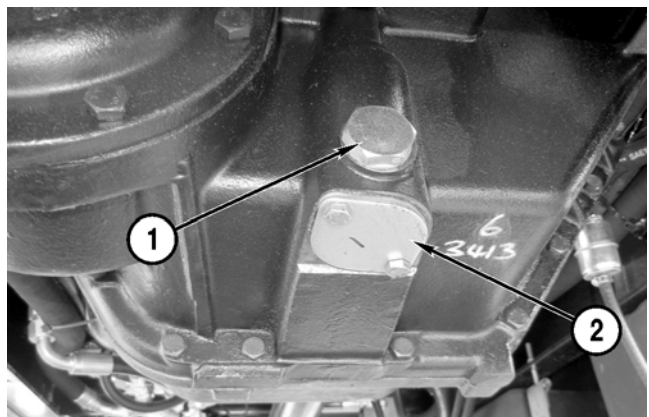
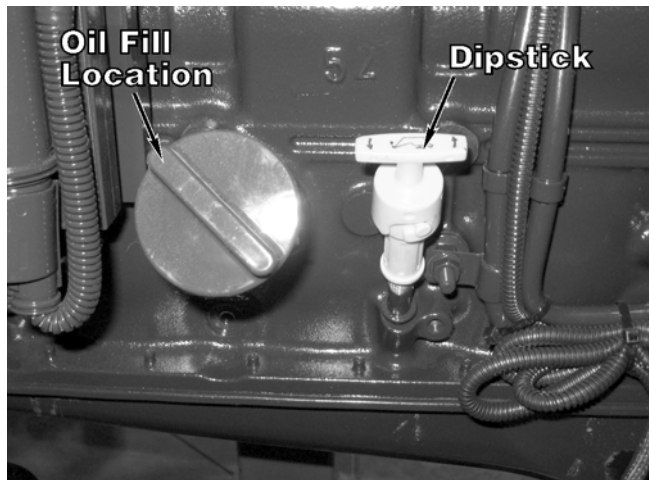
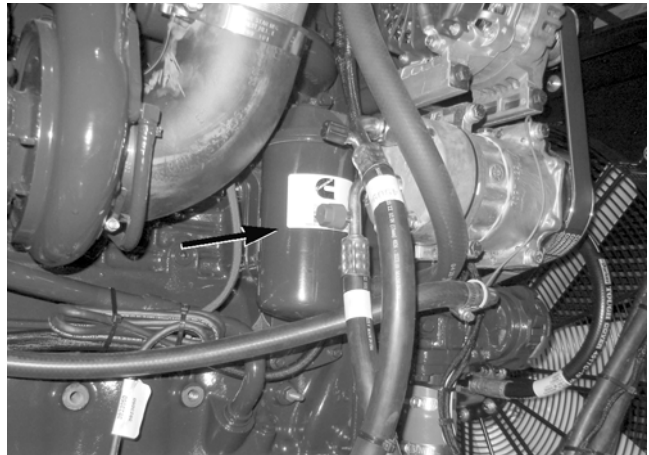
Remove the drain plug (1) and drain the transmission fluid into a suitable container. Dispose of the fluid properly.

Install the drain plug (1).

Remove the strainer cover plate (2) and clean the strainer with diesel fuel. Replace the strainer if it is damaged in any way.

Install the strainer and cover plate (2).

- Transmission Fluid Strainer  
Part Number: 300000095



The transmission filter is located on the right side of the transmission, next to the park brake canister.

Turn the filter counter-clockwise to remove. Dispose of the filter properly.

**NOTICE:** *DO NOT overtighten the filter. Damage to the seal can result.*

Lubricate the seal on the transmission fluid filter.

- Transmission Fluid Filter  
Part Number: 300000101

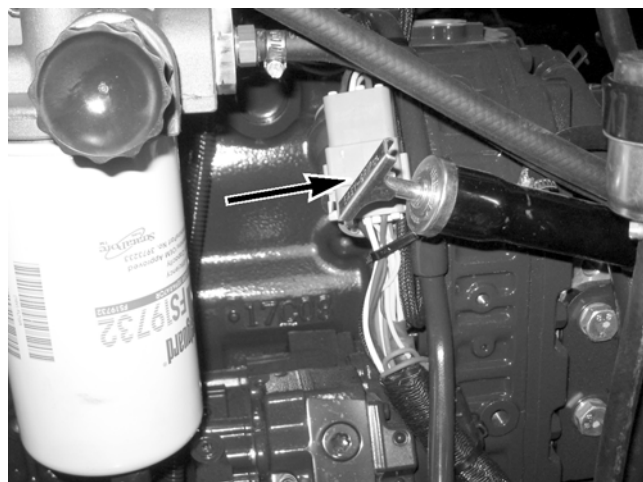
Install and tighten the filter, by hand, 3/4 to 1-1/4 turns after the seal contacts the filter housing.

**NOTICE:** *DO NOT overfill the transmission fluid. Overfilling can damage the transmission or cause the transmission to malfunction.*

**NOTICE:** *Use only Lucas Universal Hydraulic Fluid or equivalent.*

Use a funnel to fill the transmission fluid at the transmission dipstick tube on the left side of the engine.

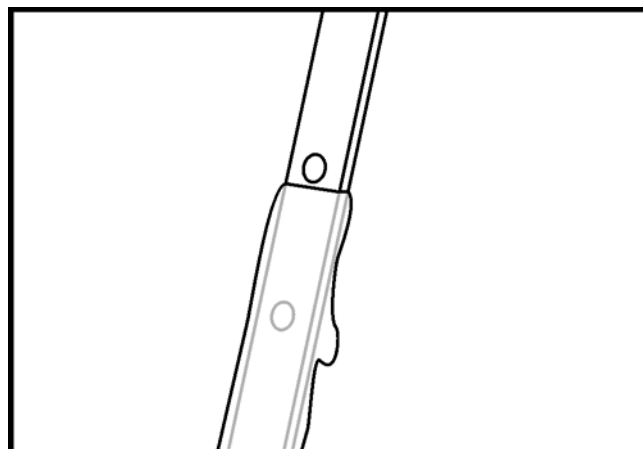
- Transmission Fluid Capacity:  
Approximately 16 quarts [15 liters].



Check the transmission fluid level with the transmission fluid at normal operating temperature, transmission in NEUTRAL position, and the engine off.

The fluid level should be between the two dots on the dipstick.

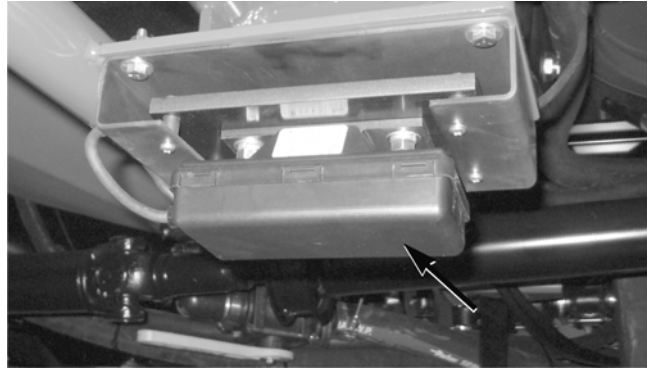
Install the dipstick and turn the handle clockwise to tighten.





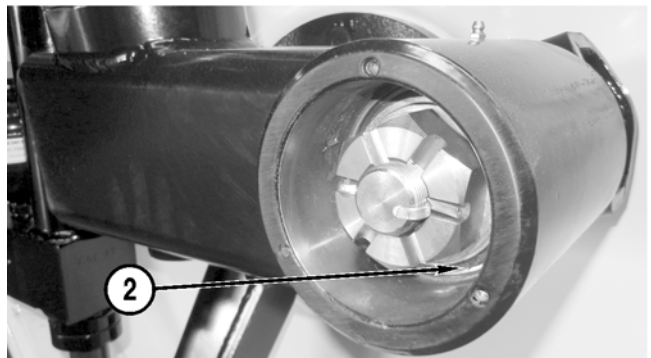
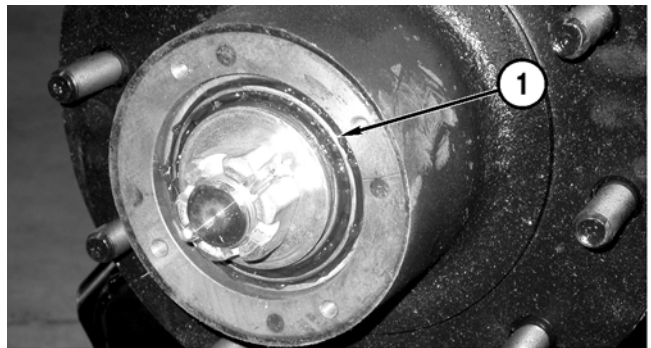
### Recalibrate Raven Radar Gun

The Raven radar gun should be calibrated every year. See the Raven manufacturer's instructions, provided with the Apache Sprayer.



### Inspect and Repack Wheel and Inter-Flex Bearings

Contact your dealer to inspect and repack the wheel (1) and inter-flex (2) bearings.





## Change Cab Recirculating Air and Charcoal Filter

**NOTICE:** DO NOT attempt to clean the old cab air filters. ALWAYS replace with a new filter.

The recirculating air filter (1) and charcoal air filter (2) are located under the cab, inside the A/C box.

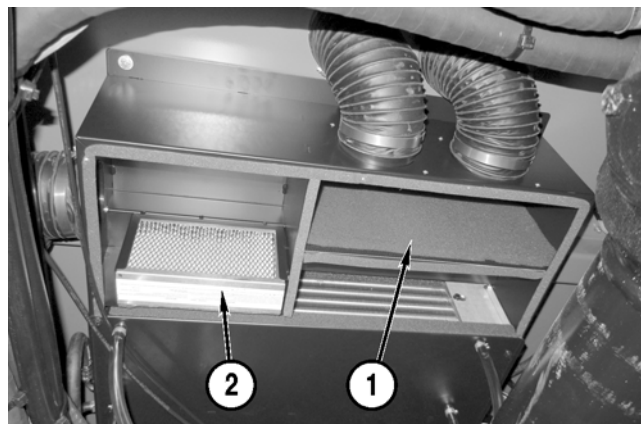
Use a 10 mm socket to remove the 5 bolts securing the back half of the A/C box bottom cover. Remove the cover slowly because the charcoal filter (2) is held in place by this cover. The recirculating filter (1) is held in place with Velcro.

Remove and discard the old filters.

Insert new filters into the frame with the air-flow arrow pointing toward the front of the Apache Sprayer.

- Cab Recirculating Air Filter (1)  
Part Number: 490006661
- Charcoal Air Filter (2)  
Part Number: 490003651
- Cab Filter Kit (includes both filters)  
Part Number: K65000190

Close the cover and install the five bolts.



## Change Final Drive Fluid

Depending on the machine's crop clearance, the Apache sprayer is equipped with either a drop box or planetary final drive.

### Drop Box

The drop box drain, level and fill plugs are located on the drop box at each rear wheel. The left drop box is shown.

Remove the drain plug (1) and drain the fluid into a suitable container. Dispose of the fluid properly.

Install the drain plug (1).

**NOTICE:** Use only Lucas 80/90 Gear Oil or equivalent for the drop box fluid.

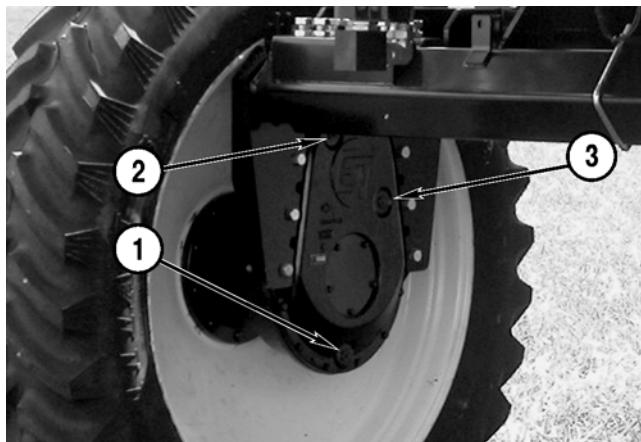
Remove the drop box fill plug (2) and level plug (3).

Add fluid until it is level with the bottom of the level hole (3).

- Drop Box Fluid Capacity:  
Approximately 21 quarts [20 liters]

Install and tighten the fill plug (2) and the level plug (3).

Repeat the steps for the other drop box.



### Planetary

The planetaries are located on each rear wheel. The plug (1) on the planetary serves as the drain and fill location.

To drain the planetary fluid, position the wheel so the plug on the planetary is in the 6 o'clock position.

Remove the plug in the planetary, drain the fluid into a suitable container and dispose of the fluid properly.

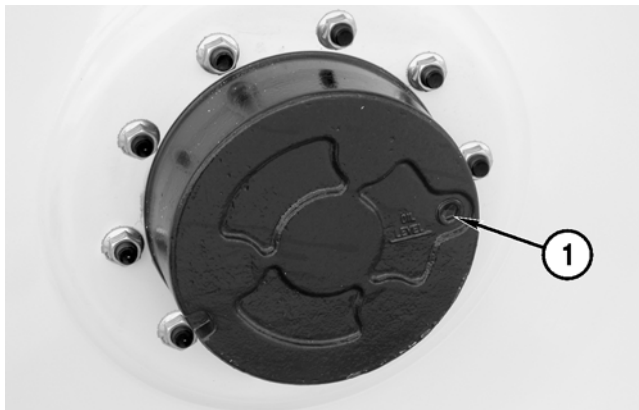
To fill the planetary fluid, position the wheel so the plug on the planetary is in the 3 o'clock position.

**NOTICE:** Use only Lucas 80/90 Gear Oil or equivalent for the planetary fluid.

Fill each planetary with Lucas 80/90 Gear Oil or equivalent to the bottom of the fill hole.

- Planetary Fluid Capacity:  
Approximately 2.2 quarts [2.0 liters].

Install the plug (1) and tighten.



## Every Year

The following services must be performed every year.

### Adjust Toe-In (Standard 120" Axles)

#### Measure Toe-In

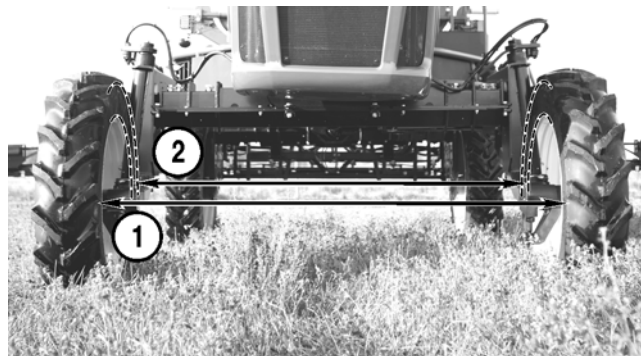
Safely lift the front of the Apache Sprayer so the front tires are slightly off of the ground.

Turn the steering wheel so the front wheels are pointing straight.

Measure and note the distance between the left and right tires at the front (1) of the tires and at the rear (2) of the tires.

The distance at the front (1) of the tires should be 0.25 in. [6.35 mm] less than at the rear (2) of the tires.

If the toe-in is not approximately 0.25 in. [6.35 mm], the toe-in must be adjusted.



#### Adjust Toe-in

Loosen the jam nut (1) at each end of the tie rod (2).

Turn the tie rod clockwise (as viewed from the left side) to increase toe-in.

Turn the tie rod counterclockwise (as viewed from the left side) to decrease toe-in.

Position the tie rod so the bend (3) is pointing downward and tighten the jam nuts.

Once the toe-in is set, turn the wheels all the way to the left and measure the distance between the left strut tower (1) and the axle tube (2).

Turn the wheels all the way to the right and measure the distance between the right strut tower and axle tube.

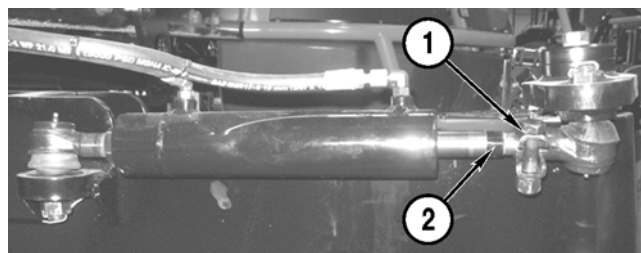
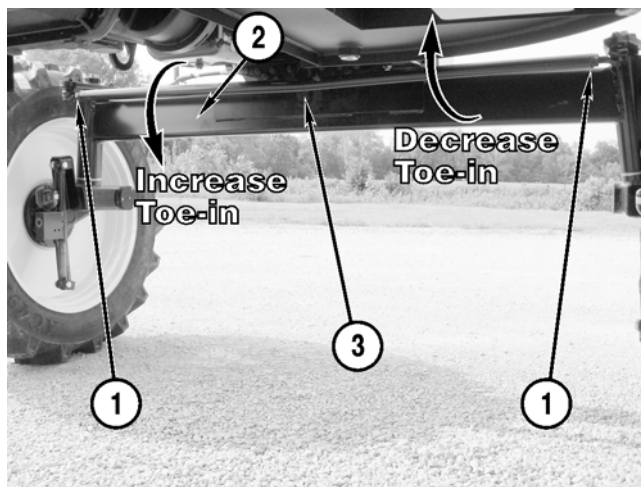
The distance should be equal on both sides. If the distance is not equal, the steering cylinder rod must be adjusted.

To adjust the steering cylinder rod:

Loosen the nut and bolt on the steering cylinder clamp (1).

Use a wrench on the ball joint end (2) to adjust the spacing.

- If distance between the strut tower and axle tube is greater on the left wheel, turn the ram counterclockwise (as viewed from the ram end of the cylinder).
- If distance between the strut tower and axle tube is greater on the right wheel, turn the ram clockwise (as viewed from the ram end of the cylinder).



## Adjust Toe-In (120" to 160" Adjustable Axles)

**NOTICE:** On adjustable axle machines, the steering must be re-phased before measuring or adjusting the toe-in. Once the front wheels are off the ground, turn the wheel to the left extreme and continue to turn 100 complete revolutions. Repeat this procedure turning to the right. This process will be easier with warm oil.

### Rephase the Steering

**NOTE:** This process will be easier with warm oil.

Lift the front wheels off the ground.

Turn the wheel to the left extreme and continue to turn 100 complete revolutions.

Turn the wheel to the right extreme and continue to turn 100 complete revolutions.

This process will be easier with warm oil.

### Measure Tie Rods

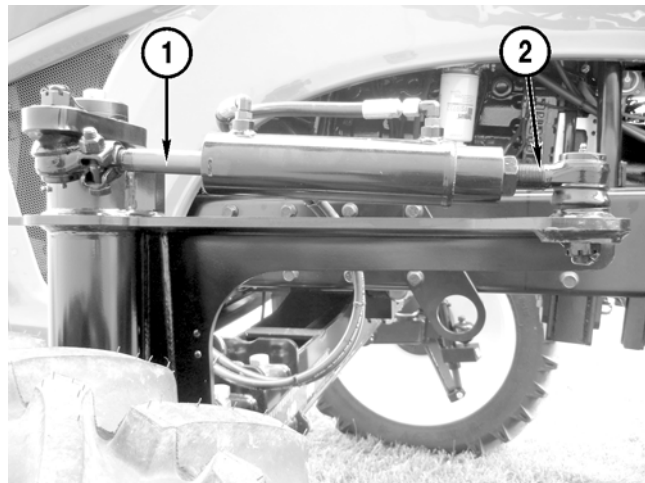
Measure the rear tie rod ends (2) on the left and right steering cylinder. The measurements must be equal and between 4.125 in. [104.7 mm] and 4.5 in. [114.3 mm]. Adjust the tie rods if necessary.

Safely lift the front of the Apache Sprayer so the front tires are slightly off of the ground and turn the steering wheel so the front wheels appear to be pointing straight.

Make sure the tie rod end's ball joints are fully seated in the taper.

Measure the distance that the steering cylinder ram is extended on the left and right wheel. The measurements must be equal and between 3.87 in. [98.4 mm] and 4.125 in. [104.7 mm].

Adjust the steering cylinder rams by turning the wheel to the left or to the right until they have an equal amount of ram protruding.



### Measure Toe-in

Safely lift the front of the Apache Sprayer so the front tires are slightly off of the ground.

Turn the steering wheel so the front wheels are pointing straight.

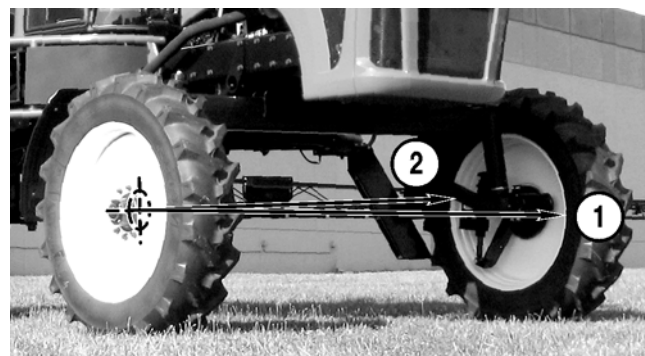
Measure and note the distance (1) from the center of the right hub to the front of the left rim.

Measure and note the distance (2) from the center of the right hub to the rear of the left rim.

If distance (1) is 0.25 in. [6.35 mm] less than distance (2), the toe-in is correct for the right wheel. If the toe-in is not correct, it must be adjusted.

Repeat the steps, measuring from the left hub to the right rim, to measure toe-in for the right wheel.

Adjust the toe-in on each wheel until it meets specification.



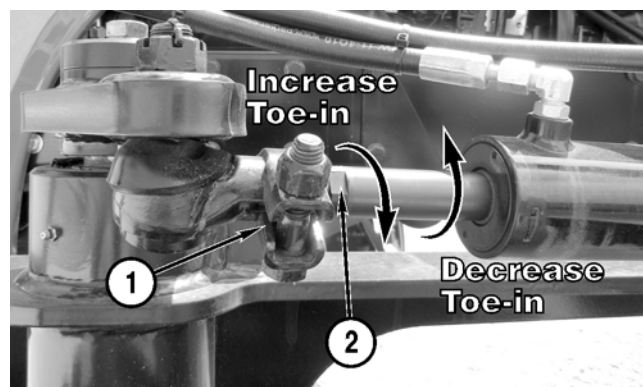


### Adjust Toe-in

Toe-in adjustments should be made at the ram end of the steering cylinder.

Loosen the nut and bolt on the tie rod clamp (1).

Use a wrench on the end of the ram (2) to increase or decrease toe-in.



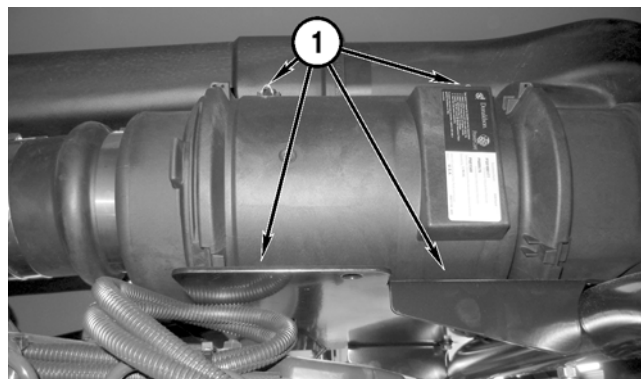
### Change Engine Safety Air Filter

**NOTICE:** DO NOT attempt to clean the engine safety air filter. ALWAYS replace with a new filter.

The engine safety air filter is mounted in the engine compartment, above the engine and toward the cab. It is in the same housing as the primary engine air filter.

Release the four latches (1) remove the cover from the air cleaner assembly and remove the primary air filter and set it aside.

**NOTICE:** DO NOT leave the intake opening uncovered. If not replacing the filter immediately, cover the opening to prevent dirt and debris entering the intake system.

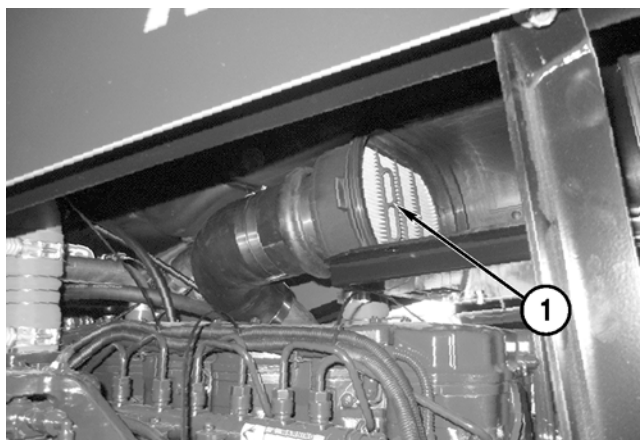


Use a rocking motion to remove the engine safety air filter (1) and discard the old filter.

Install the new engine safety air filter.

- Engine Safety Air Filter Part Number: 201300117.

Install the primary filter, air cleaner cover, and engage the four latches.





## Winterize Wet System

The product tank and wet system must be flushed before winterizing. See “Flushing Product Tank” on page 4-24.

Open the product tank fill valve, foam marker fill valve, rinse tank valve, and roto-flush valve to drain any remaining water in the tanks and roto-flush line.

Close the rinse tank valve, foam marker valve, and sump valve.

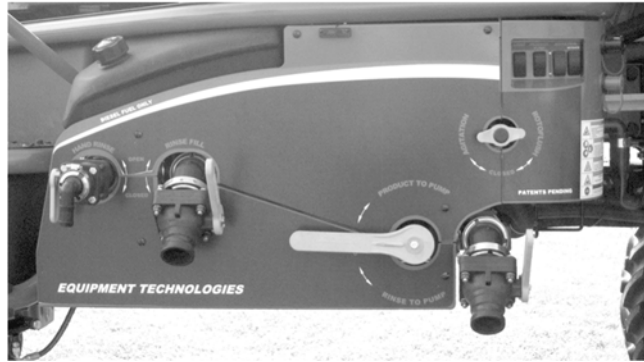
Set all boom section switches to the ON position and press the agitation decrease button to turn agitation off.

Connect a compressed air line to the main fill valve (1). Apply compressed air at 40 psi [2.7 bar] to blow out the wet system and booms.

Cycle the boom section switches (2) off and on several times to purge water from around the valves.

Disconnect the air line and close the product fill valve.

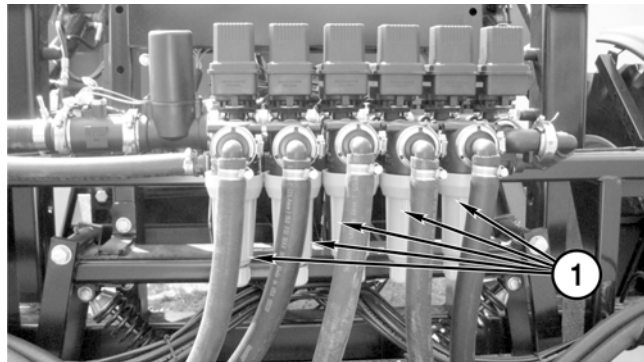
**NOTICE:** *Drain the rinse tank and foam tank to prevent damage during storage.*



Remove all boom section strainers (1) and the product strainer.

Reinstall the strainer bowls.

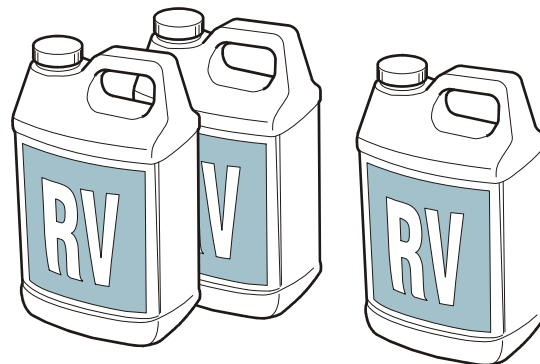
Store the strainers in a warm, dry location.



Pour approximately 20 gallons [76 liters] of RV anti-freeze into the product tank.

**NOTICE:** *Boom lengths over 60 ft will require more than 20 gallons [76 liters] of antifreeze.*

Pour 1 gallon [4 liters] of RV antifreeze into the rinse tank.



Repeatedly open and close the sump valve (1) and rinse tank /product valve (2), to allow the antifreeze to surround the ball valves.

Close the rinse tank valve (2) and open the sump valve (1).

Except for one nozzle at the end of each boom section, turn off all the nozzle bodies.

Open all manual valves halfway and then close to allow any trapped water to escape.

**NOTICE:** *DO NOT* run the product pump dry. *Damage to the pump seals will result. DO NOT intentionally dead-head the pump with high pressures. Damage to the pump seals will result.*

Start the engine.

Unfold and lower the booms as far as possible.

Set all boom section switches (2) to the OFF position and press the agitation increase button (3).

Set the product pump switch (1) to the ON position.

Press the agitation decrease button (3) to turn agitation off.

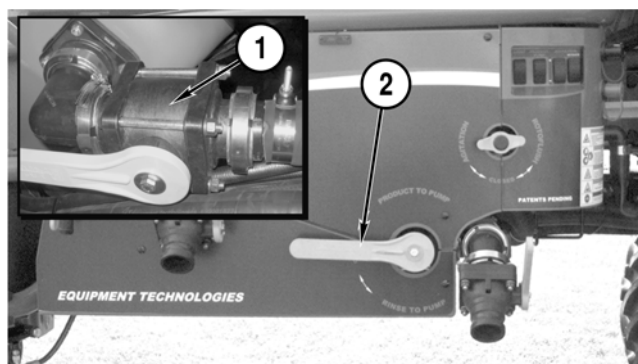
One at a time, set the boom section switches (2) to the ON position until antifreeze flows from the open nozzle in each boom section.

Turn the boom section switches (2) to OFF.

Set the product pump switch (1) to the OFF position.

NOTE: Excess antifreeze may be left in the sprayer.

Winterize the foamer. See "Freezing" on page 4-20.



## Every 1000 Hours or Yearly

The following services must be performed after every 1000 hours of operation or yearly.

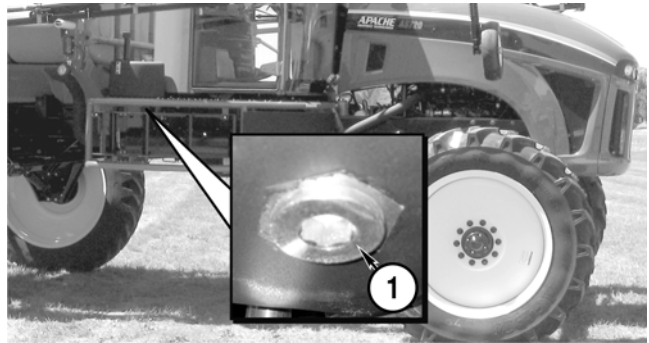
- Inspect Front Accumulator and Suspension Cylinder. See “Inspect Front Accumulator and Suspension Cylinder” on page 5-24.

## Change Hydraulic Fluid

The hydraulic fluid drain plug (1) is located on the hydraulic fluid reservoir, between the cab and the product tank.

Remove the hydraulic fluid drain plug (1) from the bottom of the reservoir and drain the fluid into a suitable container with a capacity of more than 40 gallons [151.42 liters]. Dispose of the fluid properly.

Install the drain plug (1).



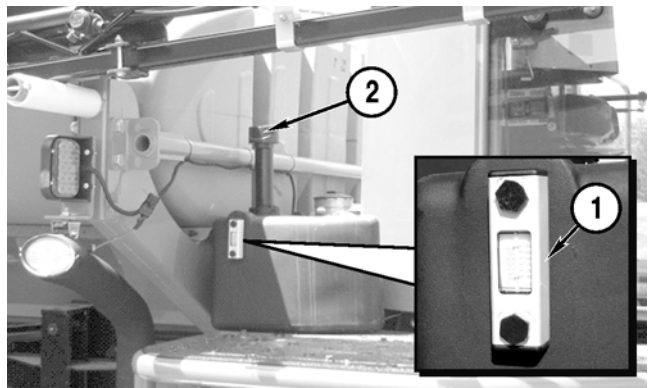
**NOTICE:** Use only Lucas Universal Hydraulic Fluid, or equivalent, for the Apache Sprayer hydraulic system.

Remove the hydraulic fluid reservoir cap (2) and fill with Lucas Universal Hydraulic Fluid or equivalent.

- Hydraulic Fluid Reservoir Capacity:  
Approximately 40 gallons [151.42 liters]

Use the sight glass (1) to check the fluid level. See “Check Hydraulic Fluid Level” on page 5-13.

**NOTE:** The sight glass also shows hydraulic fluid temperature.



# APACHE™

## CHAPTER 6

### CUMMINS ENGINE FAULT CODES

Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
719	22	3	Extended Crankcase Blow-by Pressure Circuit - Voltage Above Normal, or Shorted to High Source
729	22	4	Extended Crankcase Blow-by Pressure Circuit - Voltage Below Normal, or Shorted to Low Source
2111	32	3	Coolant Temperature 2 Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2112	52	4	Coolant Temperature 2 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2113	52	16	Coolant Temperature 2 - Data Valid but Above Normal Operational Range - Moderately Severe Level
2114	52	0	Coolant Temperature 2 - Data Valid but Above Normal Operational Range - Most Severe Level
241	84	2	Vehicle Speed Sensor Circuit - Data Erratic, Intermittent, or Incorrect
242	84	10	Vehicle Speed Sensor Circuit tampering has been detected ñ Abnormal Rate of Change
131	91	3	Voltage Above Normal, or Shorted to High Source
132	91	4	Voltage Below Normal, or Shorted to Low Source
147	91	1	Abnormal Frequency, Pulse Width, or Period
148	91	0	Abnormal Frequency, Pulse Width, or Period
287	91	19	SAE J1939 Multiplexing Accelerator Pedal or Lever Sensor System Error - Received Network Data In Error
1242	91	2	Data Erratic, Intermittent, or Incorrect
528	93	2	Auxiliary Alternate Torque Validation Switch - Data Erratic, Intermittent, or Incorrect
268	94	2	Fuel Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
2215	94	18	Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level
2216	94	1	Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range ñ Moderately Severe Level

Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
418	97	15	Water in Fuel Indicator High - Data Valid but Above Normal Operational Range ñ Least Severe Level
428	97	3	Water in Fuel Sensor Circuit - Voltage Above Normal, or Shorted to High Source
429	97	4	Water in Fuel Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
135	100	3	Oil Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
141	100	4	Oil Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
143	100	18	Operational Range - Moderately Severe Level
415	100	1	Operational Range - Most Severe Level
435	100	2	Oil Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
122	102	3	Intake Manifold Pressure Sensor Circuit ñ Voltage Above Normal, or Shorted to High Source
123	102	4	Intake Manifold Pressure Sensor Circuit ñ Voltage Below Normal, or Shorted to Low Source
433	102	2	Erratic, Intermittent, or Incorrect
2973	102	2	Erratic, Intermittent, or Incorrect
595	103	16	Turbocharger #1 Speed High - Data Valid but Above Normal Operational Range ñ Moderately Severe Level
687	103	18	Turbocharger #1 Speed Low - Data Valid but Below Normal Operational Range ñ Moderately Severe Level
2345	103	10	Turbocharger speed invalid rate of change detected - Abnormal Rate of Change
153	105	3	Intake Manifold Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
154	105	4	Intake Manifold Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
155	105	0	Intake Manifold Air Temperature High ñ Data Valid but Above Normal Operational Range - Most Severe Level
488	105	16	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
2964	105	15	Severe Level
221	108	3	Barometric Pressure Sensor Circuit ñ Voltage Above Normal, or Shorted to High Source
222	108	4	Barometric Pressure Sensor Circuit ñ Voltage Below Normal, or Shorted to Low Source
295	108	2	Barometric Pressure Sensor Circuit - Data Erratic,
231	109	3	Coolant Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
232	109	4	Coolant Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
233	109	18	Operational Range - Moderately Severe Level



Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
144	110	3	Coolant Temperature Sensor Circuit ñ Voltage Above Normal, or Shorted to High Source
145	110	4	Coolant Temperature Sensor Circuit ñ Voltage Below Normal, or Shorted to Low Source
146	110	16	Coolant Temperature High - Data Valid but Above Normal Operational Range - Moderately Severe Level
151	110	0	Coolant Temperature Low - Data Valid but Above Normal Operational Range - Most Severe Level
334	110	2	Coolant Temperature Sensor Circuit ñ Data Erratic, Intermittent, or Incorrect
2963	110	15	Engine Coolant Temperature High - Data Valid but Above Normal Operational Range - Least Severe Level
195	111	3	Coolant Level Sensor Circuit - Voltage Above Normal, or Shorted to High Source
196	111	4	Coolant Level Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
197	111	18	Operational Range - Moderately Severe Level
235	111	1	Operational Range - Most Severe Level
422	111	2	Coolant Level - Data Erratic, Intermittent, or Incorrect
449	157	0	Fuel Pressure High - Data Valid but Above Normal Operational Range ñ Moderately Severe Level
451	157	3	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
452	157	4	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
553	157	16	Injector Metering Rail #1 Pressure High ñ Data Valid but Above Normal Operational Range - Moderately Severe Level
554	157	2	Fuel Pressure Sensor Error - Data Erratic, Intermittent, or Incorrect
559	157	18	Injector Metering Rail #1 Pressure Low ñ Data Valid but Below Normal Operational Range - Moderately Severe Level
1911	157	0	Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level
2249	157	1	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Most Severe Level
951	166	2	Cylinder Power Imbalance Between Cylinders - Data Erratic, Intermittent, or Incorrect
596	167	16	Electrical Charging System Voltage High ñ Data Valid but Above Normal Operational Range - Moderately Severe Level
597	167	18	Electrical Charging System Voltage Low ñ Data Valid but Below Normal Operational Range - Moderately Severe Level
598	167	1	Electrical Charging System Voltage Low ñ Data Valid but Below Normal Operational Range - Most Severe Level
441	168	18	Battery #1 Voltage Low - Data Valid but Below Normal Operational Range ñ Moderately Severe Level

Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
442	168	16	Battery #1 Voltage High - Data Valid but Above Normal Operational Range ñ Moderately Severe Level
249	171	3	Ambient Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
256	171	4	Ambient Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
261	174	16	Engine Fuel Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
263	174	3	Engine Fuel Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
265	174	4	Engine Fuel Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source
212	175	3	Engine Oil Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
213	175	4	Engine Oil Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source
214	175	0	Engine Oil Temperature - Data Valid but Above Normal Operational Range - Most Severe Level
425	175	2	Engine Oil Temperature -Data Erratic, Intermittent, or Incorrect
234	190	0	Engine Speed High - Data Valid but Above Normal Operational Range - Most Severe Level
689	190	2	Primary Engine Speed Sensor Error ñ Data Erratic, Intermittent, or Incorrect
2321	190	2	Engine Speed / Position Sensor #1 - Data Erratic, Intermittent, or Incorrect
319	251	2	Real Time Clock Power Interrupt - Data Erratic, Intermittent, or Incorrect
293	441	3	Auxiliary Temperature Sensor Input # 1 Circuit -Voltage Above Normal, or Shorted to High Source
294	441	4	Auxiliary Temperature Sensor Input # 1 Circuit -Voltage Below Normal, or Shorted to Low Source
431	558	2	Data Erratic, Intermittent, or Incorrect
432	558	13	Out of Calibration
551	558	4	Voltage Below Normal, or Shorted to Low Source
238	611	4	Sensor Supply Voltage #3 Circuit ñ Voltage Below Normal, or Shorted to Low Source
523	611	2	OEM Intermediate (PTO) Speed switch Validation -Data Erratic, Intermittent, or Incorrect
757	611	31	Electronic Control Module data lost - Condition Exists
2185	611	3	Sensor Supply Voltage #4 Circuit ñ Voltage Above Normal, or Shorted to High Source
2186	611	4	Sensor Supply Voltage #4 Circuit ñ Voltage Below Normal, or Shorted to Low Source

Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
2292	611	16	Normal Operational Range - Moderately Severe Level
2293	611	18	expected - Data Valid but Below Normal Operational Range - Moderately Severe Level
115	612	2	Engine Speed/Position Sensor Circuit lost both of two signals from the magnetic pickup sensor - Data Erratic, Intermittent, or incorrect
434	627	2	Power Lost without Ignition Off - Data Erratic, Intermittent, or Incorrect
1117	627	2	Power Lost With Ignition On - Data Erratic, Intermittent, or Incorrect
111	629	12	Engine Control Module Critical internal failure - Bad intelligent Device or Component
343	629	12	Engine Control Module Warning internal hardware failure - Bad Intelligent Device or Component
351	629	12	Injector Power Supply - Bad Intelligent Device or Component
341	630	2	Engine Control Module data lost - Data Erratic, Intermittent, or Incorrect
342	630	13	Electronic Calibration Code Incompatibility - Out of Calibration
2217	630	31	ECM Program Memory (RAM) Corruption - Condition Exists
2311	633	31	Fueling Actuator #1 Circuit Error ñ Condition Exists
285	639	9	SAE J1939 Multiplexing PGN Time-out Error - Abnormal Update Rate
286	639	13	SAE J1939 Multiplexing Configuration Error ñ Out of Calibration
2384	641	4	VGT Actuator Driver Circuit - Voltage Below Normal, or Shorted to Low Source
2385	641	3	VGT Actuator Driver Circuit - Voltage Above Normal, or Shorted to High Source
237	644	2	External Speed Input (Multiple Unit Synchronization) -Data Erratic, Intermittent, or Incorrect
245	647	4	Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source
2377	647	3	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source
322	651	5	Injector Solenoid Cylinder #1 Circuit ñ Current Below Normal, or Open Circuit
1139	651	7	Injector Cylinder #1 - Mechanical System Not Responding Properly or Out of Adjustment
331	652	5	Injector Solenoid Cylinder #2 Circuit ñ Current Below Normal, or Open Circuit
1141	652	7	Injector Cylinder #2 - Mechanical System Not Responding Properly or Out of Adjustment
324	653	5	Injector Solenoid Cylinder #3 Circuit ñ Current Below Normal, or Open Circuit
1142	653	7	Injector Cylinder #3 - Mechanical System Not Responding Properly or Out of Adjustment
332	654	5	Injector Solenoid Cylinder #4 Circuit ñ Current Below Normal, or Open Circuit
1143	654	7	Injector Cylinder #4 - Mechanical System Not Responding Properly or Out of Adjustment
323	655	5	Injector Solenoid Cylinder #5 Circuit ñ Current Below Normal, or Open Circuit
1144	655	7	Injector Cylinder #5 - Mechanical System Not Responding Properly or Out of Adjustment

Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
325	656	5	Injector Solenoid Cylinder #6 Circuit ñ Current Below Normal, or Open Circuit
1145	656	7	Injector Cylinder #6 - Mechanical System Not Responding Properly or Out of Adjustment
584	677	3	Starter Relay Circuit - Voltage Above Normal, or Shorted to High Source
585	677	4	Starter Relay Circuit - Voltage Below Normal, or Shorted to Low Source
2557	697	3	Auxiliary PWM Driver #1 - Voltage Above Normal, or Shorted to High Source
2558	697	4	Auxiliary PWM Driver #1 - Voltage Below Normal, or Shorted to Low Source
527	702	3	Auxiliary Input/Output 2 Circuit - Voltage Above Normal, or Shorted to High Source
529	703	3	Auxiliary Input/Output 3 Circuit - Voltage Above Normal, or Shorted to High Source
779	703	11	Warning Auxiliary Equipment Sensor Input # 3 (OEM Switch) - Root Cause Not Known
2195	703	14	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions
731	723	7	Mechanical System Not Responding Properly or Out of Adjustment
753	723	2	Engine Speed/Position #2 Camshaft sync error -Data Erratic, Intermittent, or Incorrect
778	723	2	Engine Speed Sensor (Camshaft) Erratic, Intermittent, or Incorrect
2322	723	2	Engine Speed / Position Sensor #2 - Data Erratic, Intermittent, or Incorrect
2555	729	3	Intake Air Heater #1 Circuit - Voltage Above Normal, or Shorted to High Source
2556	729	4	Intake Air Heater #1 Circuit - Voltage Below Normal, or Shorted to Low Source
133	974	3	Circuit ñ Voltage Above Normal, or Shorted to High Source
134	974	4	Circuit ñ Voltage Below Normal, or Shorted to Low Source
288	974	19	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Data Error - Received Network Data In Error
284	1043	4	Engine Speed/Position Sensor (Crankshaft) Supply Voltage Circuit - Voltage Below Normal, or Shorted to Low Source
387	1043	3	Accelerator Pedal or Lever Position Sensor Supply Voltage Circuit - Voltage Above Normal, or Shorted to High Source
443	1043	4	Accelerator Pedal or Lever Position Sensor Supply Voltage Circuit - Voltage Below Normal, or Shorted to Low Source
2362	1072	4	Engine Brake Actuator Circuit #1 ñ Voltage Below Normal, or Shorted to Low Source
2366	1072	3	Engine Brake Actuator Circuit #1 ñ Voltage Above Normal, or Shorted to High Source
2363	1073	4	Engine Brake Actuator Circuit #2 ñ Voltage Below Normal, or Shorted to Low Source
2367	1073	3	Engine Brake Actuator Circuit #2 ñ Voltage Above Normal, or Shorted to High Source

Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
2265	1075	3	Fuel Priming Pump Control Signal Circuit ñ Voltage Above Normal, or Shorted to High Source
2266	1075	4	Fuel Priming Pump Control Signal Circuit ñ Voltage Below Normal, or Shorted to Low Source
352	1079	4	Sensor Supply Voltage #1 Circuit ñ Voltage Below Normal, or Shorted to Low Source
386	1079	3	Sensor Supply Voltage #1 Circuit ñ Voltage Above Normal, or Shorted to High Source
187	1080	4	Sensor Supply Voltage #2 Circuit ñ Voltage Below Normal, or Shorted to Low Source
227	1080	3	Sensor Supply Voltage #2 Circuit ñ Voltage Above Normal, or Shorted to High Source
697	1136	3	ECM Internal Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
698	1136	4	ECM Internal Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
691	1172	3	Turbocharger #1 Compressor Inlet Temperature Sensor Circuit ñ Voltage Above Normal, or Shorted to High Source
692	1172	4	Turbocharger #1 Compressor Inlet Temperature Sensor Circuit ñ Voltage Below Normal, or Shorted to Low Source
338	1267	3	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source
339	1267	4	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Below Normal, or Shorted to Low Source
271	1347	4	High Fuel Pressure Solenoid Valve Circuit ñ Voltage Below Normal, or Shorted to Low Source
272	1347	3	High Fuel Pressure Solenoid Valve Circuit ñ Voltage Above Normal, or Shorted to High Source
275	1347	7	Fuel Pumping Element (Front) ñ Mechanical System Not Responding Properly or Out of Adjustment
281	1347	7	High Fuel Pressure Solenoid Valve #1 ñ Mechanical System Not Responding Properly or Out of Adjustment
497	1377	2	Multiple Unit Synchronization Switch Circuit - Data Erratic, Intermittent, or Incorrect
649	1378	31	Change Lubricating Oil and Filter ñ Condition Exists
296	1388	14	Auxiliary Pressure Sensor Input 1 - Special Instructions
297	1388	3	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Above Normal, or Shorted to High Source
298	1388	4	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Below Normal, or Shorted to Low Source
211	1484	31	Additional Auxiliary Diagnostic Codes logged - Condition Exists



Cummins Fault Code	These codes will display on the console		Cummins Description
	J1939 SPN	J1939 FMI	
1256	1563	2	Control Module Identification Input State Error - Data Erratic, Intermittent, or Incorrect
1257	1563	2	Control Module Identification Input State Error - Data Erratic, Intermittent, or Incorrect
1239	2623	3	Voltage Above Normal, or Shorted to High Source
1241	2623	4	Voltage Below Normal, or Shorted to Low Source
2347	2629	15	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid but Above Normal Operational Range ñ Least Severe Level
2346	2789	15	Turbocharger Turbine Inlet Temperature (Calculated) - Data Valid but Above Normal Operational Range ñ Least Severe Level
2115	2981	3	Coolant Pressure 2 Circuit - Voltage Above Normal, or Shorted to High Source
2116	2981	4	Coolant Pressure 2 Circuit -Voltage Below Normal, or Shorted to Low Source
2117	2981	18	Operational Range - Moderately Severe Level

# APACHE™

## CHAPTER 7

### TORQUE VALUE CHARTS

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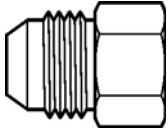
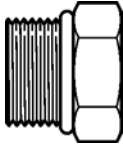
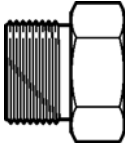
#### Fittings

ALWAYS tighten fittings to the values below unless a different torque value is specified.

Make sure fitting threads are clean and threads are engaged properly.

All torque values are adopted from SAE J514 and SAE J1453.

#### Size Chart

SAE Dash Size			
	SAE (JIC) 37° Flare Thread	O-ring Style Straight Thread	Face Seal
	Size	Size	Size
2	5/16-24	5/16-24	----
3	3/8-24	3/8-24	----
4	7/16-20	7/16-20	9/16-18
5	1/2-20	1/2-20	----
6	9/16-18	9/16-18	11/16-16
8	3/4-16	3/4-16	13/16-16
10	7/8-14	7/8-14	1-14
12	1 1/16-12	1 1/16-12	1 3/16-12
14	1 3/16-12	1 3/16-12	----
16	1 5/16-12	1 5/16-12	1 7/16-12
20	1 5/8-12	1 5/8-12	1 11/16-12
24	1 7/8-12	1 7/8-12	2-12
32	2 1/2-12	2 1/2-12	----

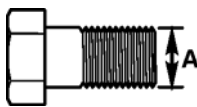
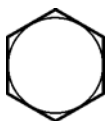


**Torque Value Chart**

SAE Dash Size	TORQUE					
	SAE 37° Flare		O-ring Straight Thread		Face Seal	
	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
2	4	5	4	5	----	----
3	8	11	9	12	----	----
4	12	16	16	22	18	25
5	15	20	22	30	---	---
6	18	25	35	48	27	37
8	37	50	60	82	40	54
10	48	65	105	143	63	86
12	74	100	140	190	92	125
14	88	120	184	250	----	----
16	100	135	221	300	122	165
20	133	180	258	350	147	200
24	166	225	317	430	166	225
32	236	320	----	----	----	----





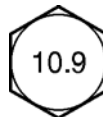

**Bolts**

ALWAYS tighten fittings to the values below unless a different torque value is specified. Fasteners must ALWAYS be replaced with the same grade. Make sure fitting threads are clean and threads are engaged properly. All torque values are adopted from SAE J1701 and SAE J1701M.

**SAE Series Torque Value Chart**

 <b>A = Bolt Diameter</b>		 <b>SAE Grade 2</b> (No Markings)		 <b>SAE Grade 5</b> (3 Radial Dashes)		 <b>SAE Grade 8</b> (6 Radial Dashes)	
<b>A</b> Diameter (Inches)	Wrench Size	GRADE					
		SAE 2		SAE 5		SAE 8	
		lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
1/4"	7/16"	6	8	10	13	14	18
5/16"	1/2"	12	17	19	26	27	37
3/8"	9/16"	23	31	35	47	49	67
7/16"	5/8"	36	48	55	75	78	106
1/2"	3/4"	55	75	85	115	120	163
9/16"	13/16"	78	106	121	164	171	232
5/8"	15/16"	110	149	170	230	240	325
3/4"	1 1/8"	192	261	297	403	420	569
7/8"	1 5/16"	306	416	474	642	669	907
1"	1 1/2"	467	634	722	979	1020	1383

**Metric Series Torque Value Chart**

 Diameter and Thread Pitch (Millimeters)	Wrench Size	 Metric Grade 8.8		 Metric Grade 10.9		 Metric Grade 8.8		 Metric Grade 10.9		 Diameter and Thread Pitch (Millimeters)
		Course Thread				Fine Thread				
		Metric 8.8		Metric 10.9		Metric 8.8		Metric 10.9		
		N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	
6 x 1.0	10	8	6	11	8	8	6	11	8	6 x 1.0
8 x 1.25	13	20	15	27	20	21	16	29	22	8 x 1.0
10 x 1.5	16	39	29	54	40	41	30	57	42	10 x 1.25
12 x 1.75	18	68	50	94	70	75	55	103	76	12 x 1.25
14 x 2.0	21	109	80	151	111	118	87	163	120	14 x 1.5
16 x 2.0	24	169	125	234	173	181	133	250	184	16 x 1.5
18 x 2.5	27	234	172	323	239	263	194	363	268	18 x 1.5
20 x 2.5	30	330	244	457	337	367	270	507	374	20 x 1.5
22 x 2.5	34	451	332	623	460	495	365	684	505	22 x 1.5
24 x 3.0	36	571	421	790	583	623	459	861	635	24 x 2.0
30 x 3.0	46	1175	867	1626	1199	1258	928	1740	1283	30 x 2.0

[illegible]



# APACHE™

## CHAPTER 8

### TROUBLESHOOTING

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#### Apache Sprayer Troubleshooting Symptoms and Solutions

SYMPTOM	SOLUTION
Parking brake will not engage.	Check electrical coil on hydraulic junction block, under cab, for power.  Check hose connections to brake canister on transmission.
Apache Sprayer will not move forward or backward.	Parking brake is engaged.  Check electrical connections on parking brake and transmission.  Contact your dealer.
Constant alarm sounds when Apache Sprayer moves forward or backward.	Check transmission fluid level.  Check wire connection at sending unit.  Check transmission temperature sensor.  Contact your dealer.
Apache Sprayer will not move forward.	Check driveshaft.  Check transmission fluid level.  Check electrical connections on transmission.  Contact your dealer.
Apache Sprayer will not move backward.	Check driveshaft.  Check transmission fluid level.  Check electrical connections on transmission.  Contact your dealer.
Engine will not start.	Check diesel fuel level.  Check neutral safety relay.  Check electrical connections in side console, at mother board.

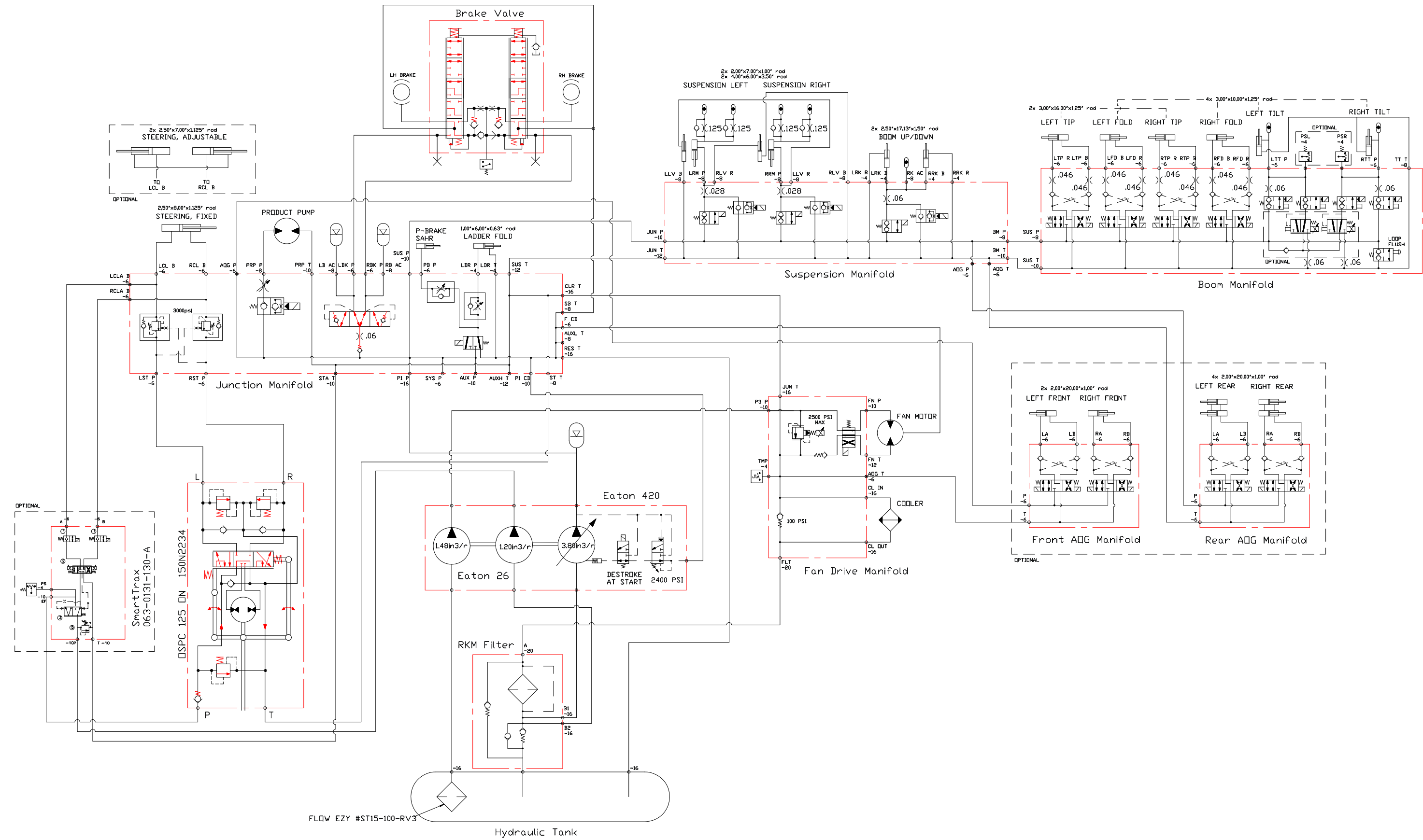
SYMPTOM	SOLUTION
Apache Sprayer steering does not work.	Check hydraulic fluid level. Check for hydraulic fluid leaks. Check steering column coupling on steering motor.
Transmission will not shift gears.	Check transmission fluid level. Contact your dealer.
Apache Sprayer brakes do not work.	Check brake hoses for leaks. Check push rods on master cylinder. Contact your dealer.
No power to console in cab.	Check electrical connections in right rear corner of cab, near fuse box.
Road and service lights do not work.	Confirm light switches in "ON" position. Check electrical connections to switches. Check for power at light housings. Contact your dealer.
Turn signals and/or flashers do not work.	Confirm lever/switch in "ON" position. Check electrical connections at light housings. Check for power at light housings.
Booms will not fold or unfold.	Confirm engine is running. Check hydraulic fluid level. Confirm booms are greased properly. Check for hydraulic fluid leaks. Check electrical connections in cab and at boom manifold.
Booms will not tilt up or down.	Confirm engine is running. Check hydraulic fluid level. Check for hydraulic fluid leaks. Check electrical connections in cab and at boom manifold.

<b>SYMPTOM</b>	<b>SOLUTION</b>
Apache Sprayer will not spray.	Confirm engine is running. Confirm product in product tank. Confirm ball valves from tank to product pump are open. Confirm product pump is turned on. Check ground speed on console controller display. Confirm boom valves are opening.
Booms will not turn off.	Check boom valves for operation. Check electrical connections at boom valves. Check electrical connections in cab.
Seat will not raise or lower.	Check wire connections at right side of seat. Check for air leaks.
Raven monitor does not turn on.	Check fuse in fuse block to right of seat. Check electrical connections at console.
Front suspension cylinder is flat.	Lift tire off ground and check suspension cylinder fluid level. If fluid is foaming, the accumulator has failed. If fluid is low, fill to top of plug. Check operation. Contact your dealer.
Rear suspension will not rise.	Check hydraulic fluid level. Check electrical connections at suspension block and switches.
Product pump will not turn on.	Confirm product pump button is on and indicator is lit. Check electrical connections at hydraulic valve block. Check electrical connections in cab.
A/C does not cool.	Confirm A/C switch in "ON" position. Confirm fan in "ON" position. Check belt to compressor. Contact your dealer.

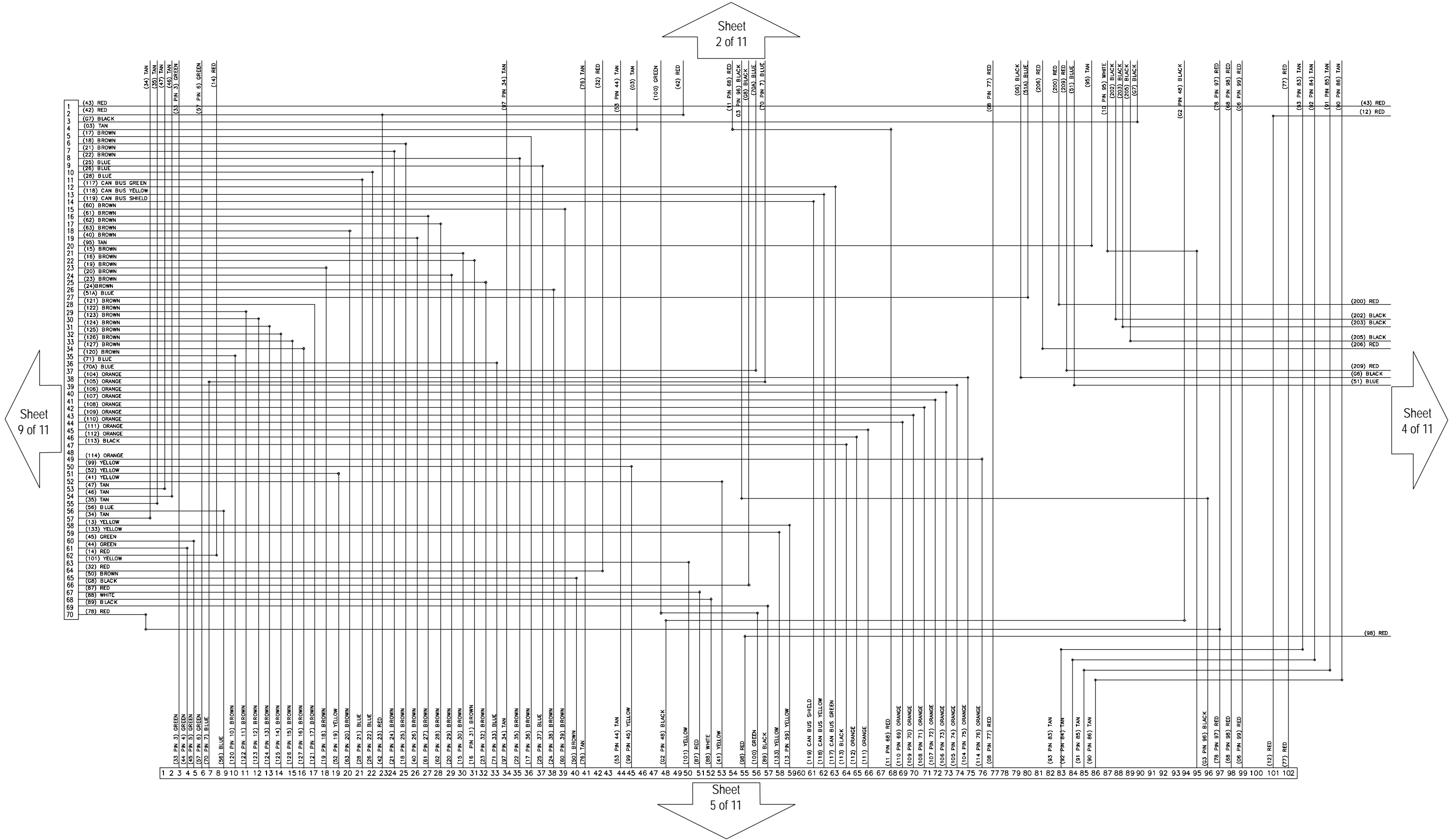
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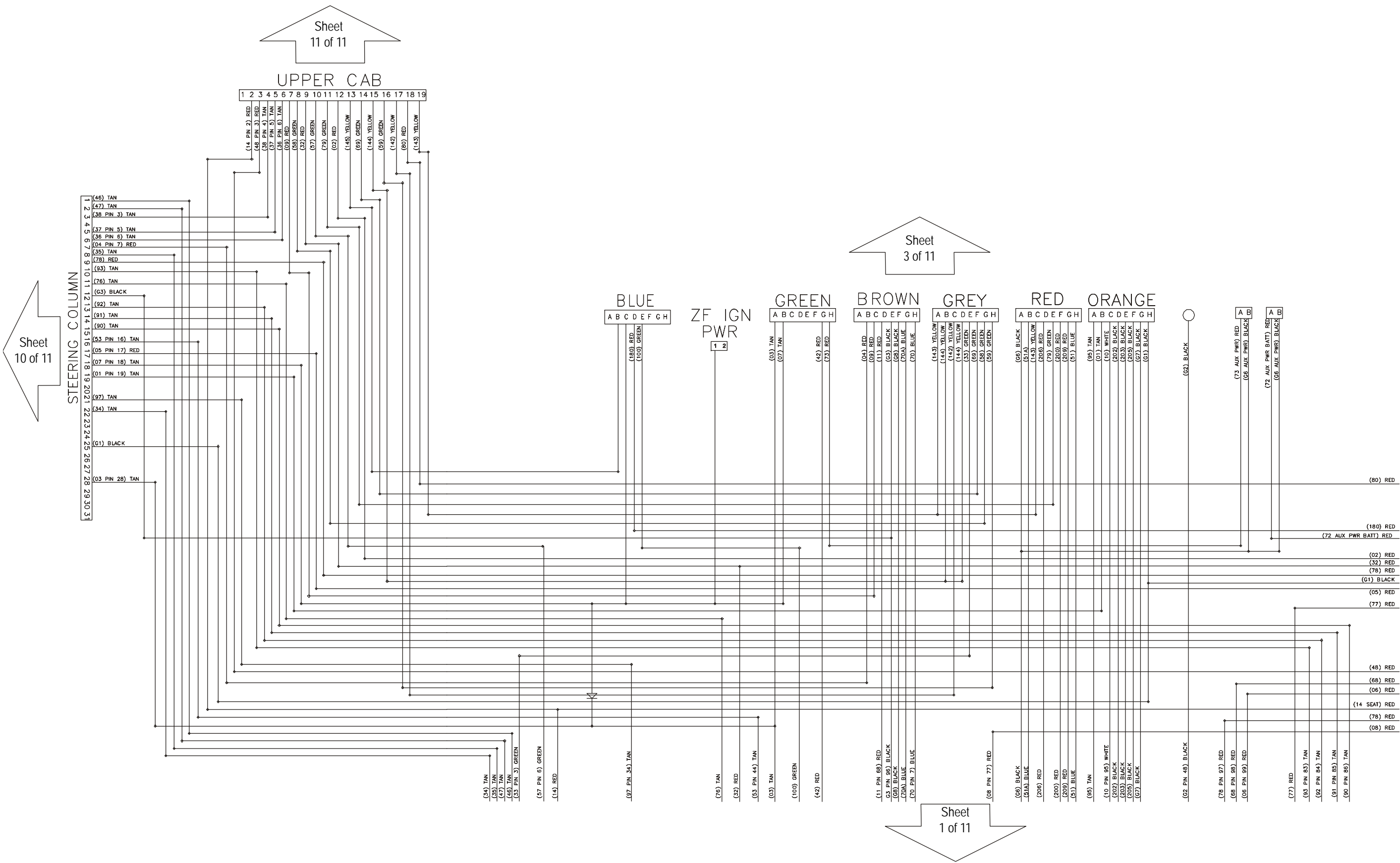
SYSTEM SCHEMATICS

Hydraulic System

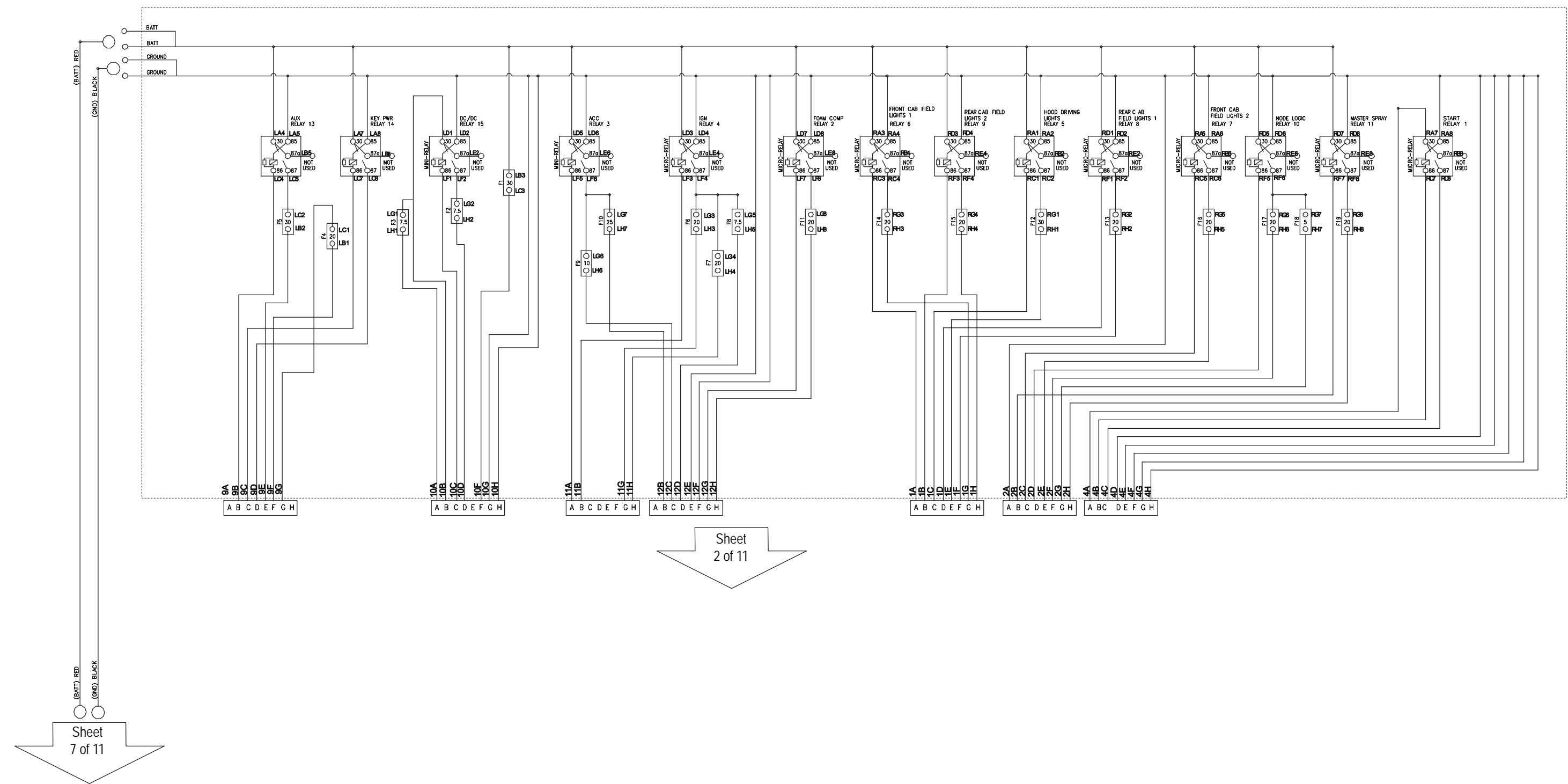


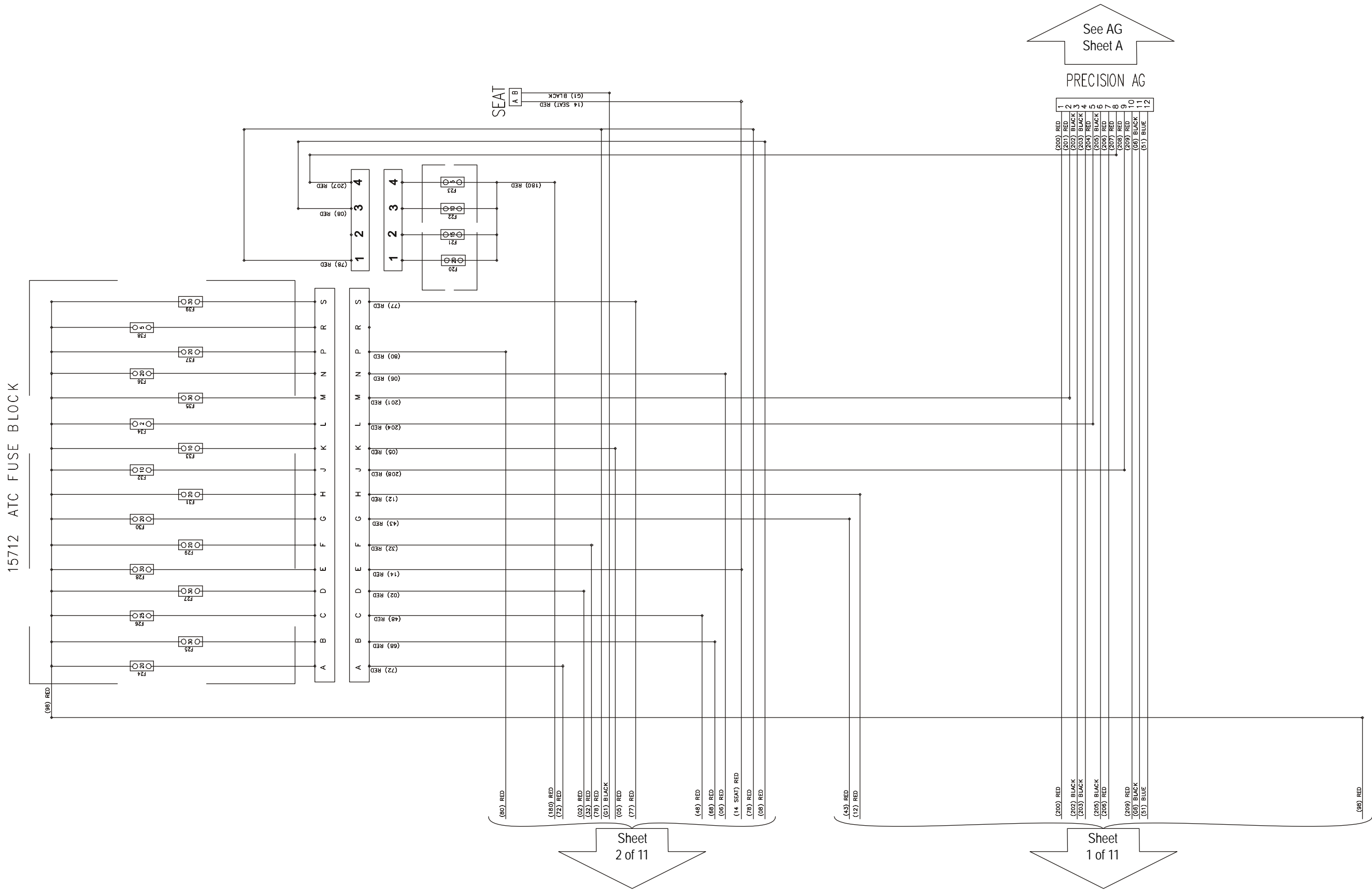




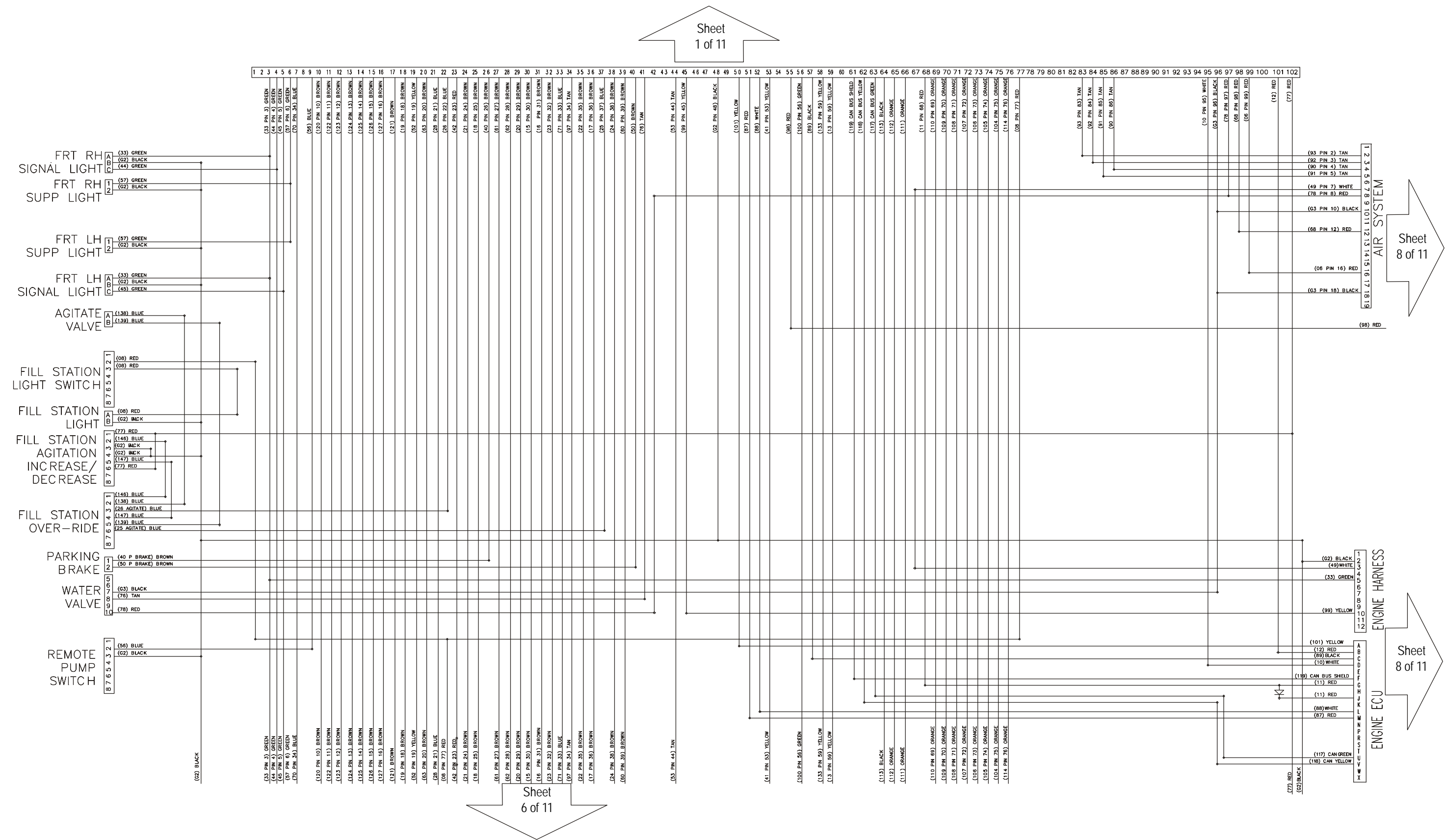


DVEC FUSE BLOCK



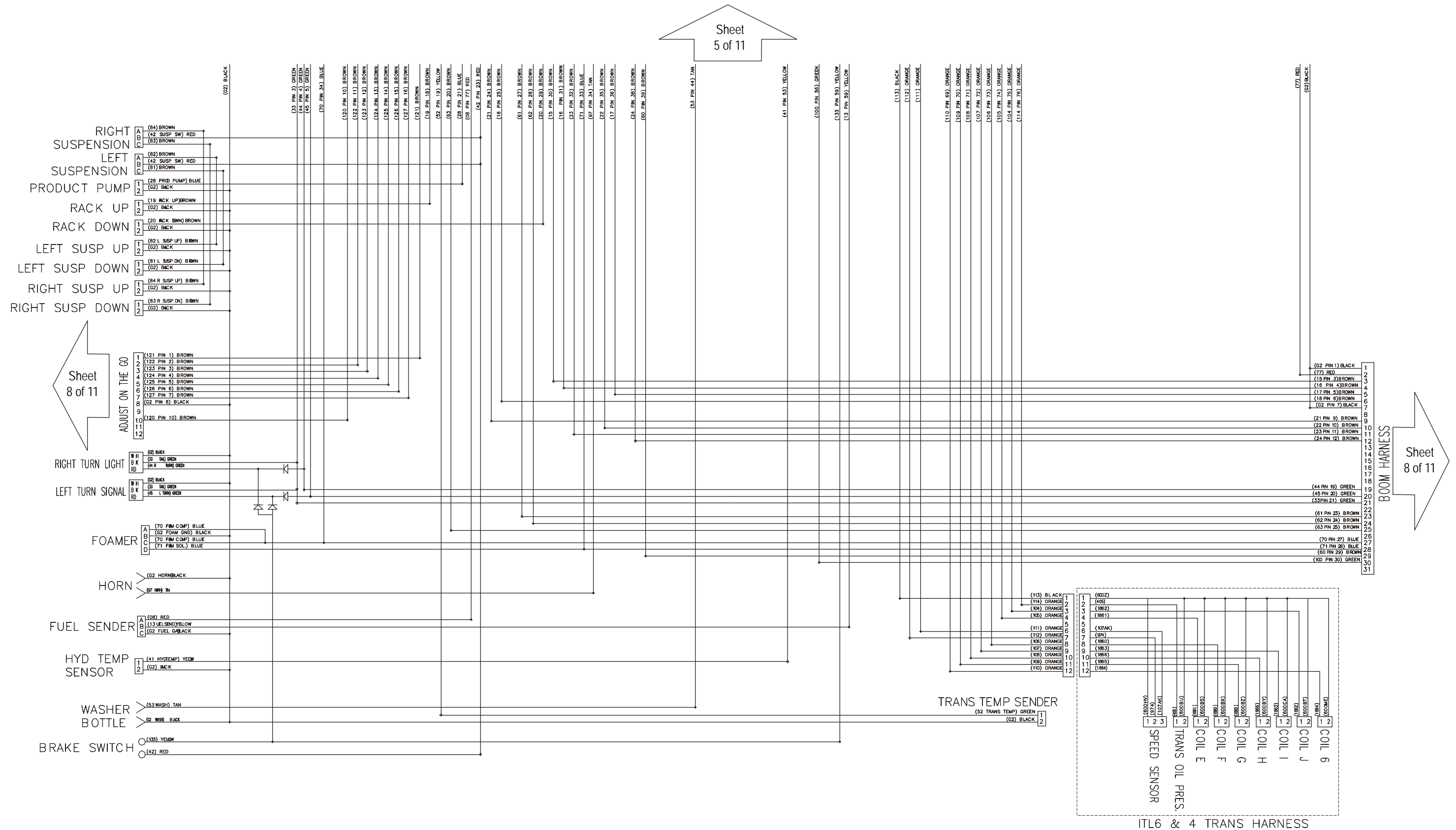


## Electrical System (Sheet 5 of 11)



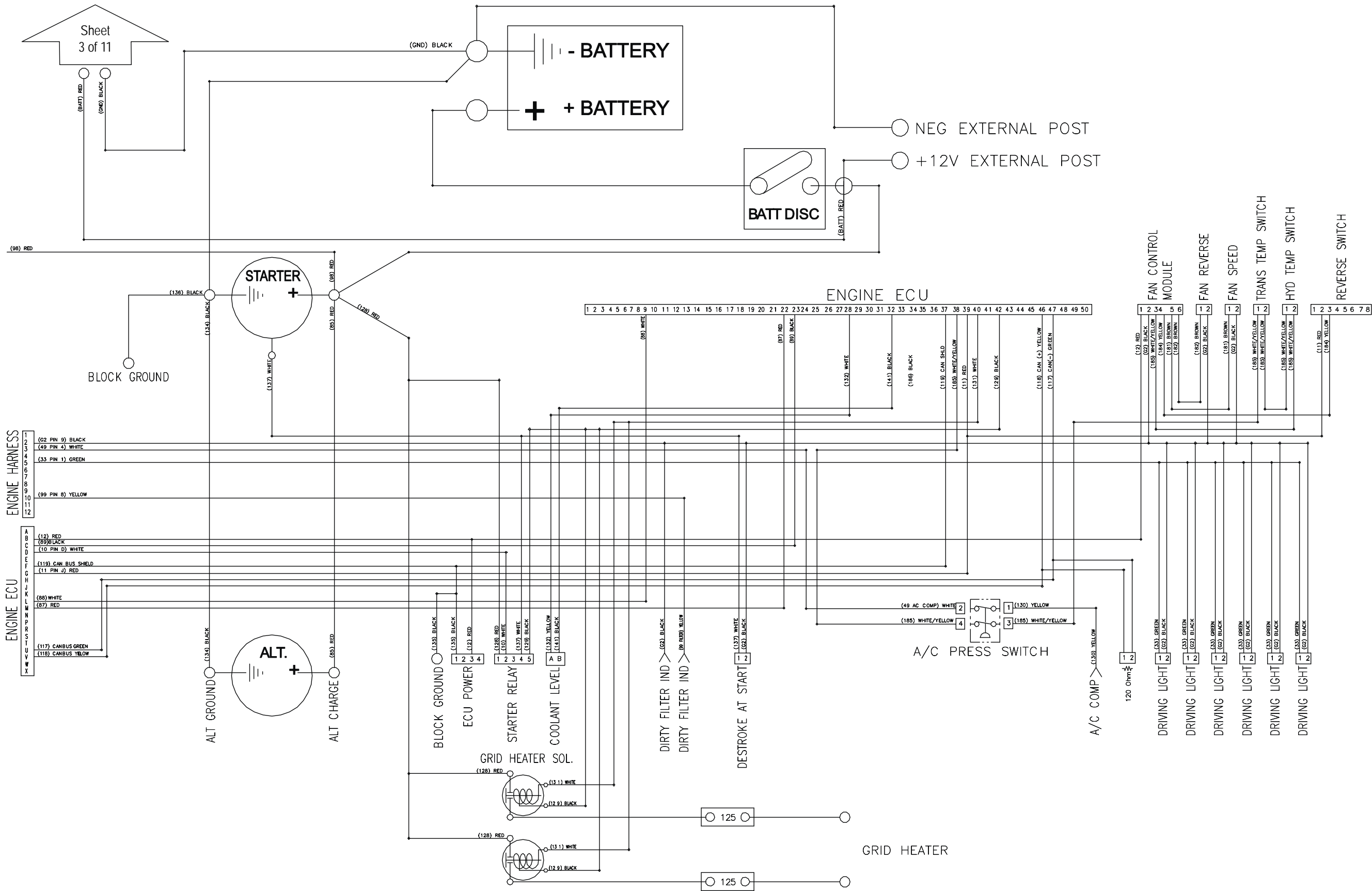


## Electrical System (Sheet 6 of 11)

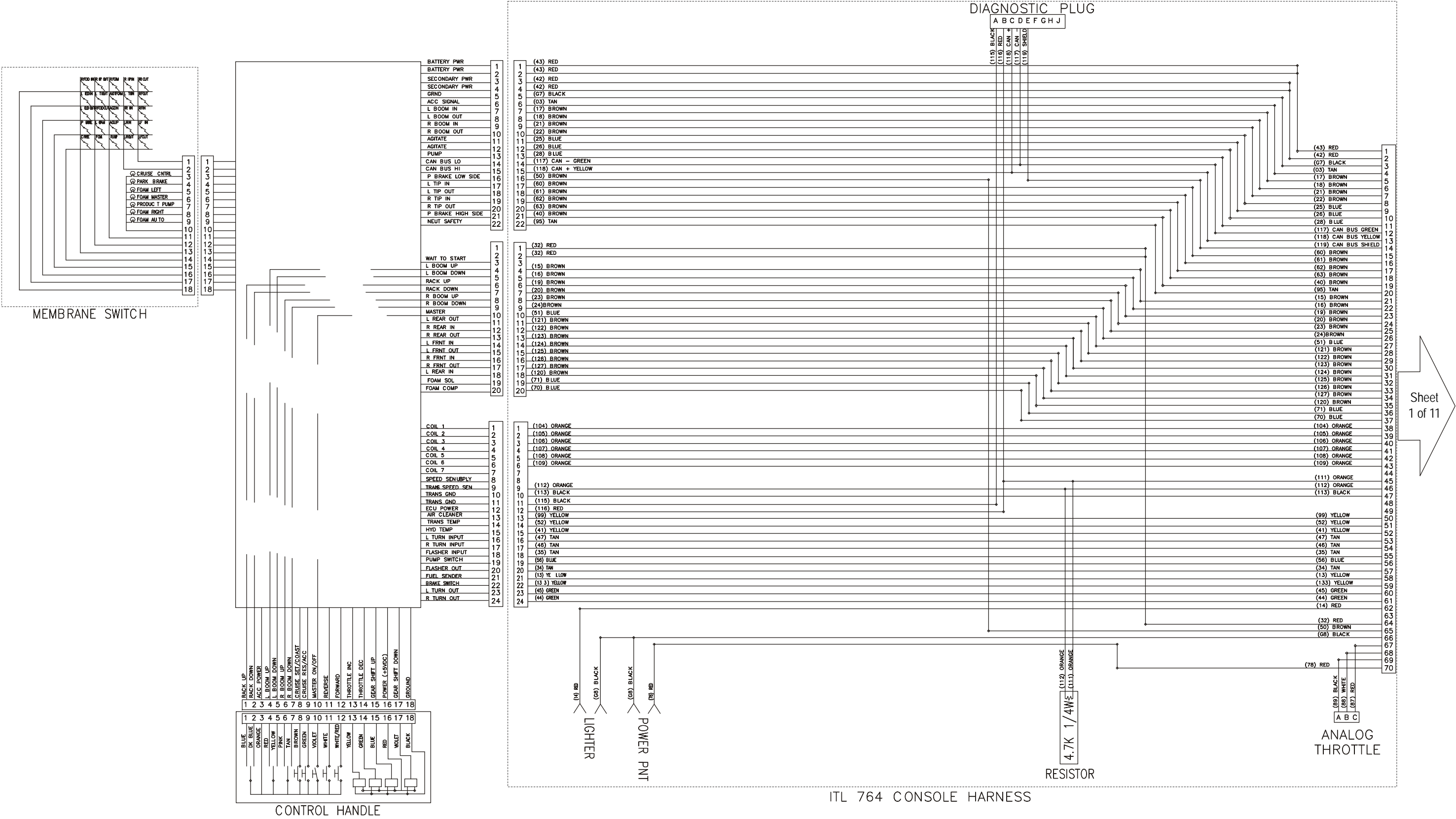


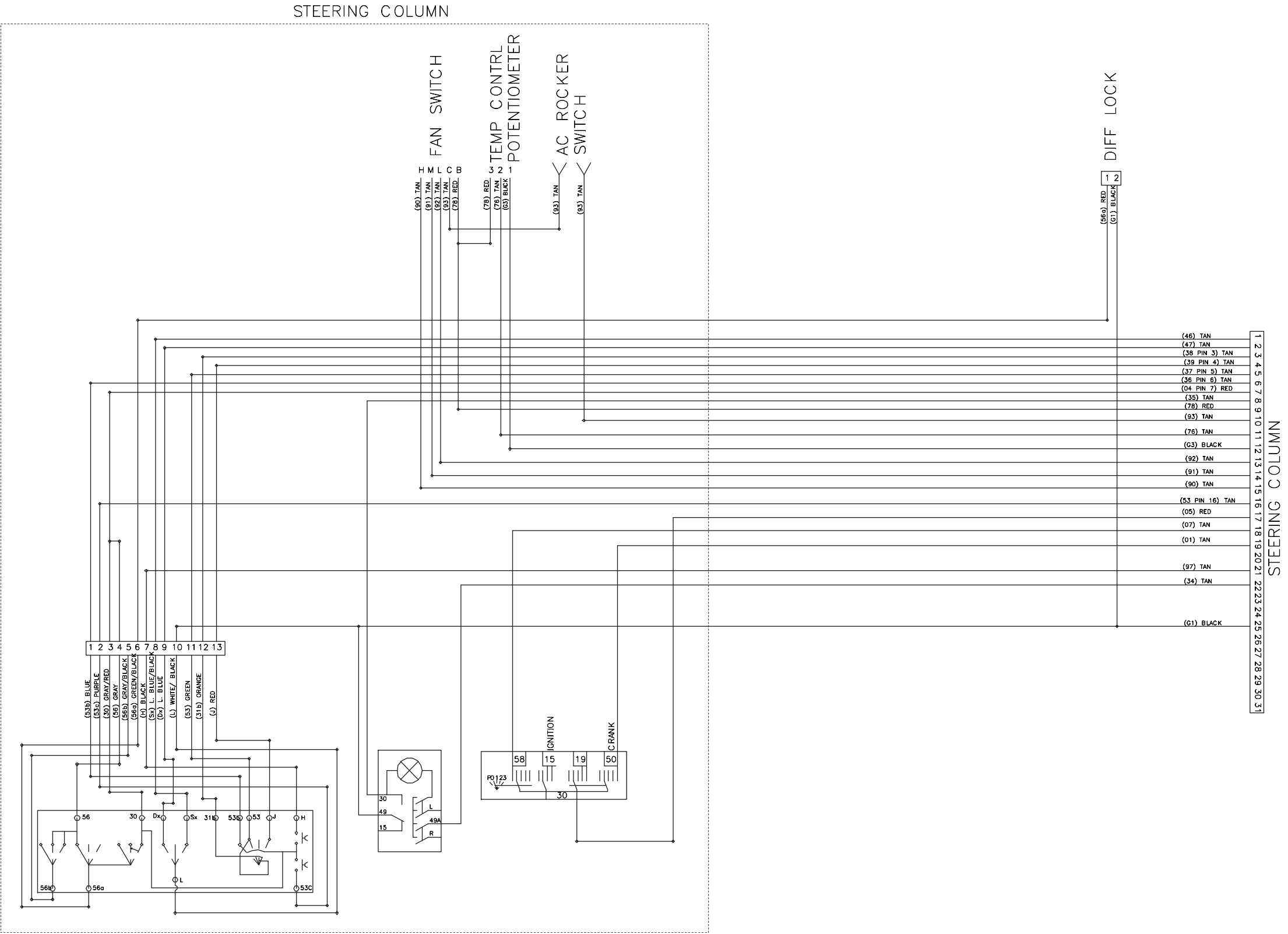
Sheet 5 of 11

Sheet 5 of 11



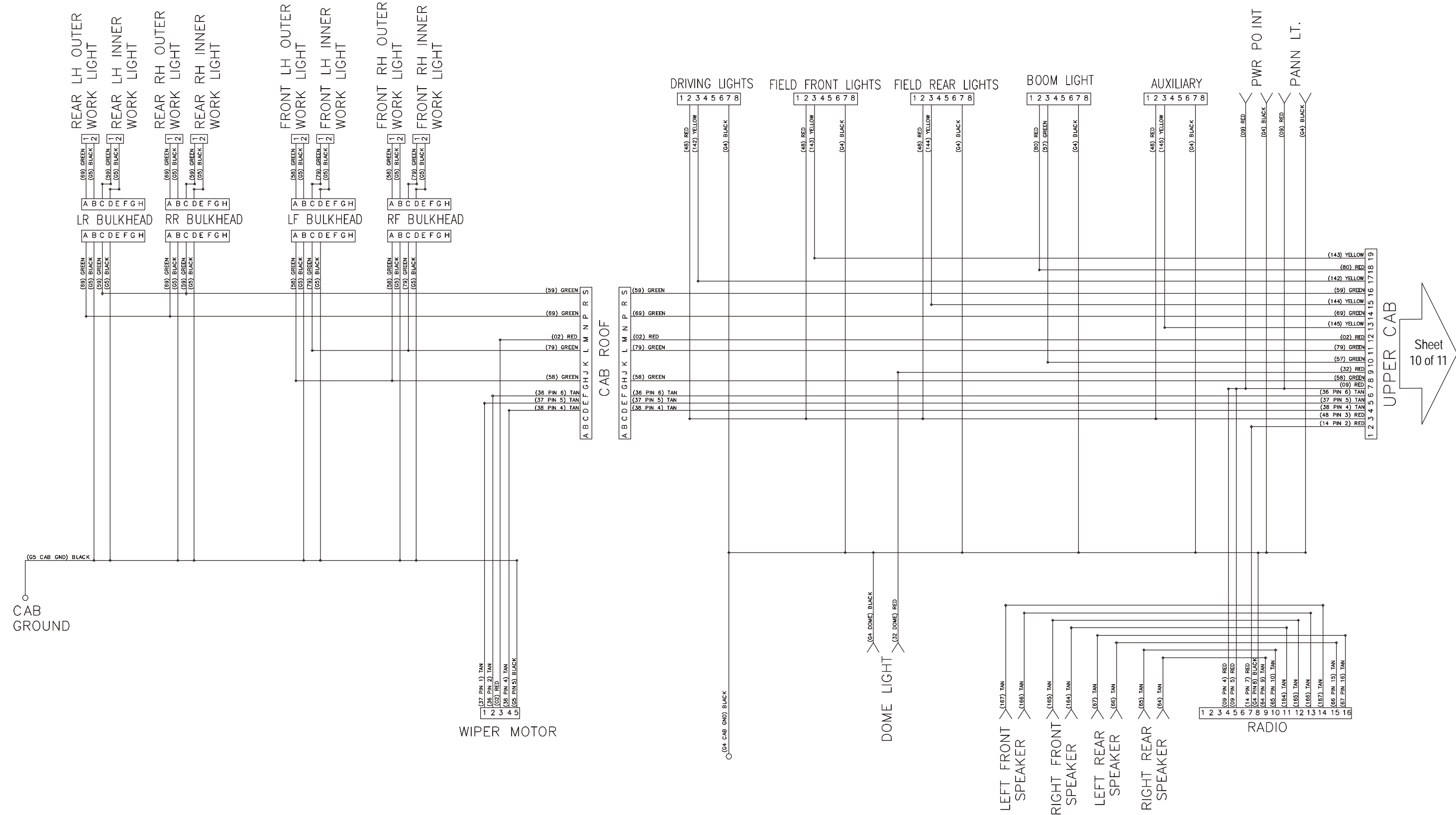




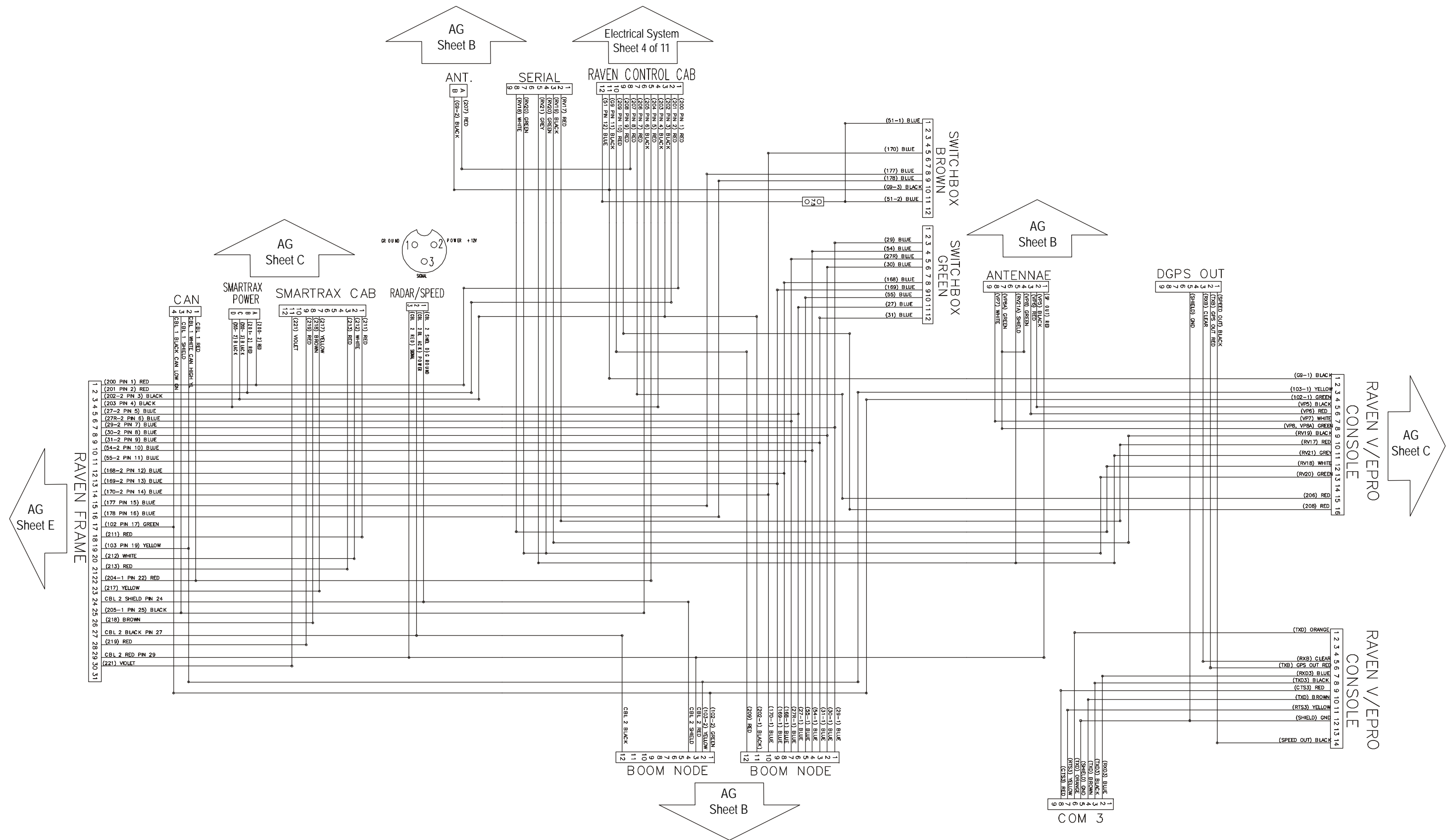


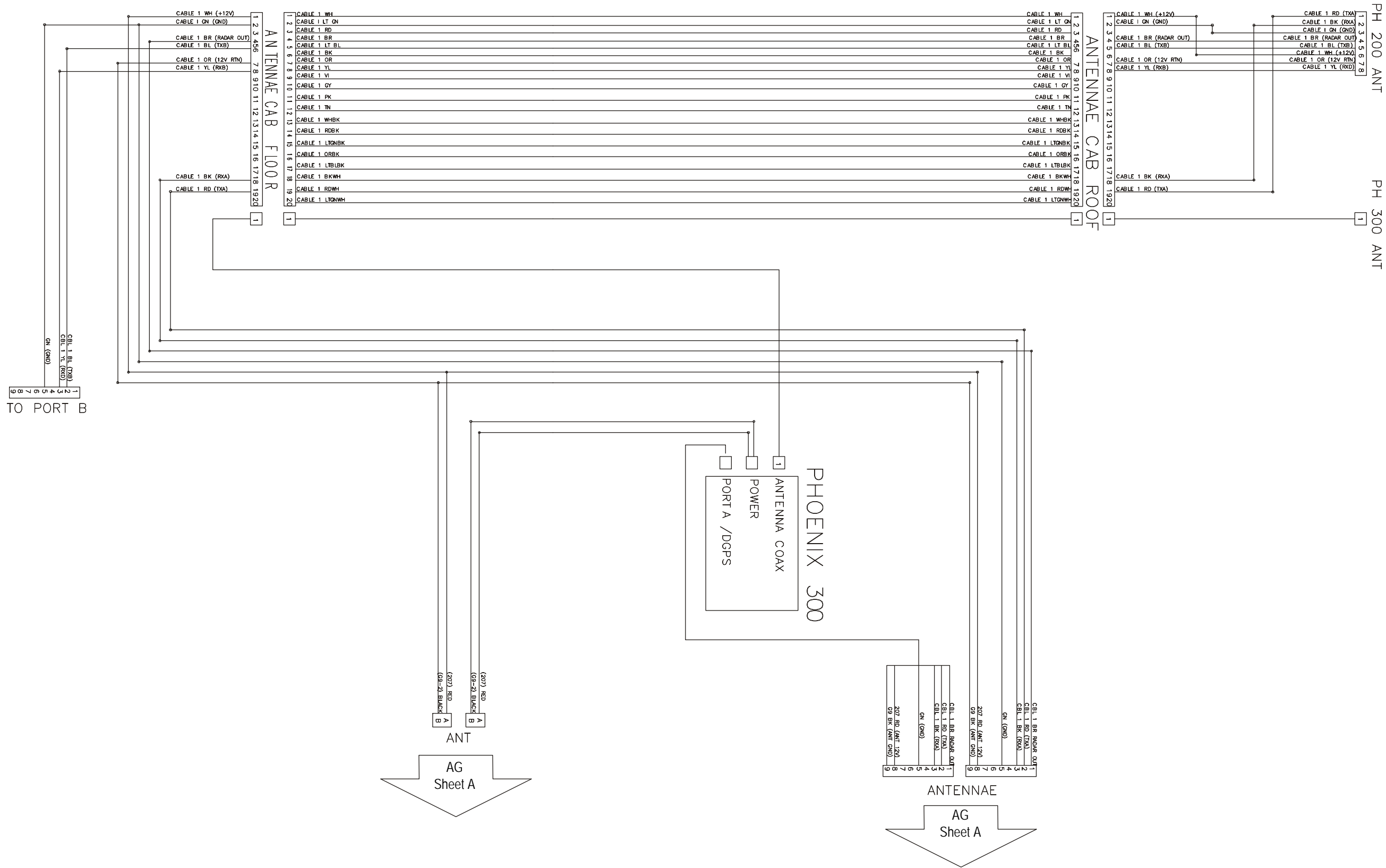
Sheet  
11 of 11



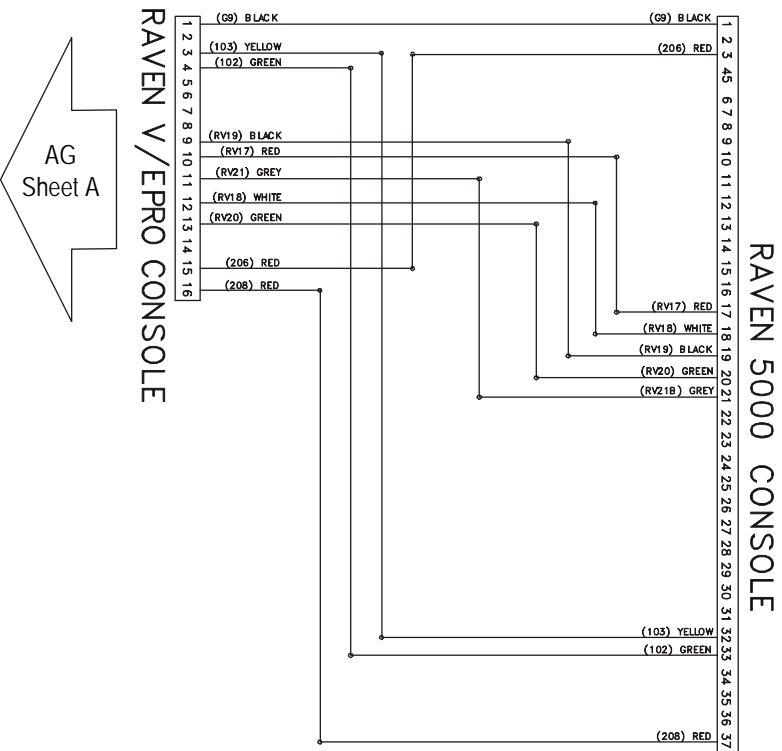
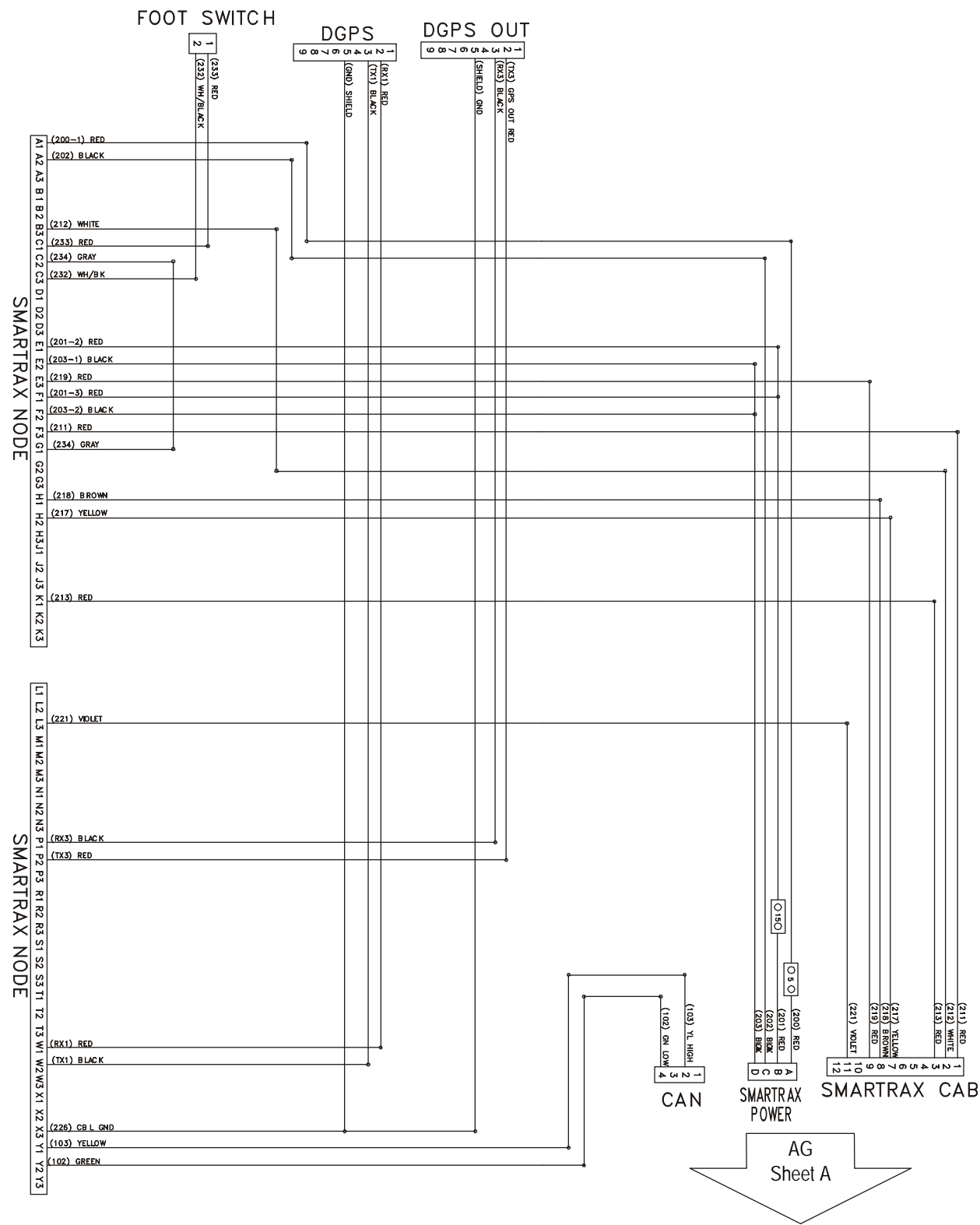


Precision AG Electrical (Sheet A)

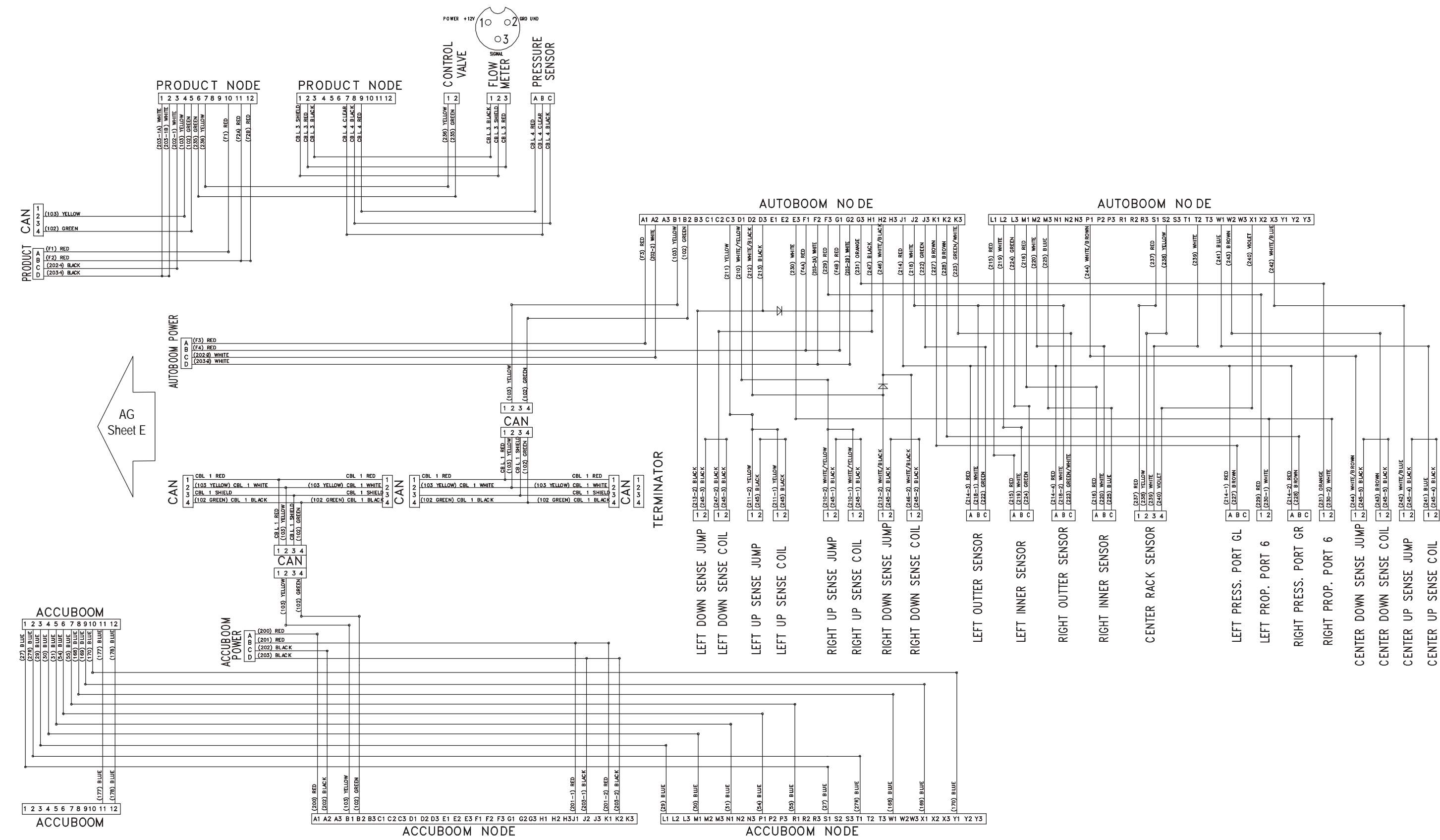




Precision AG Electrical (Sheet C)

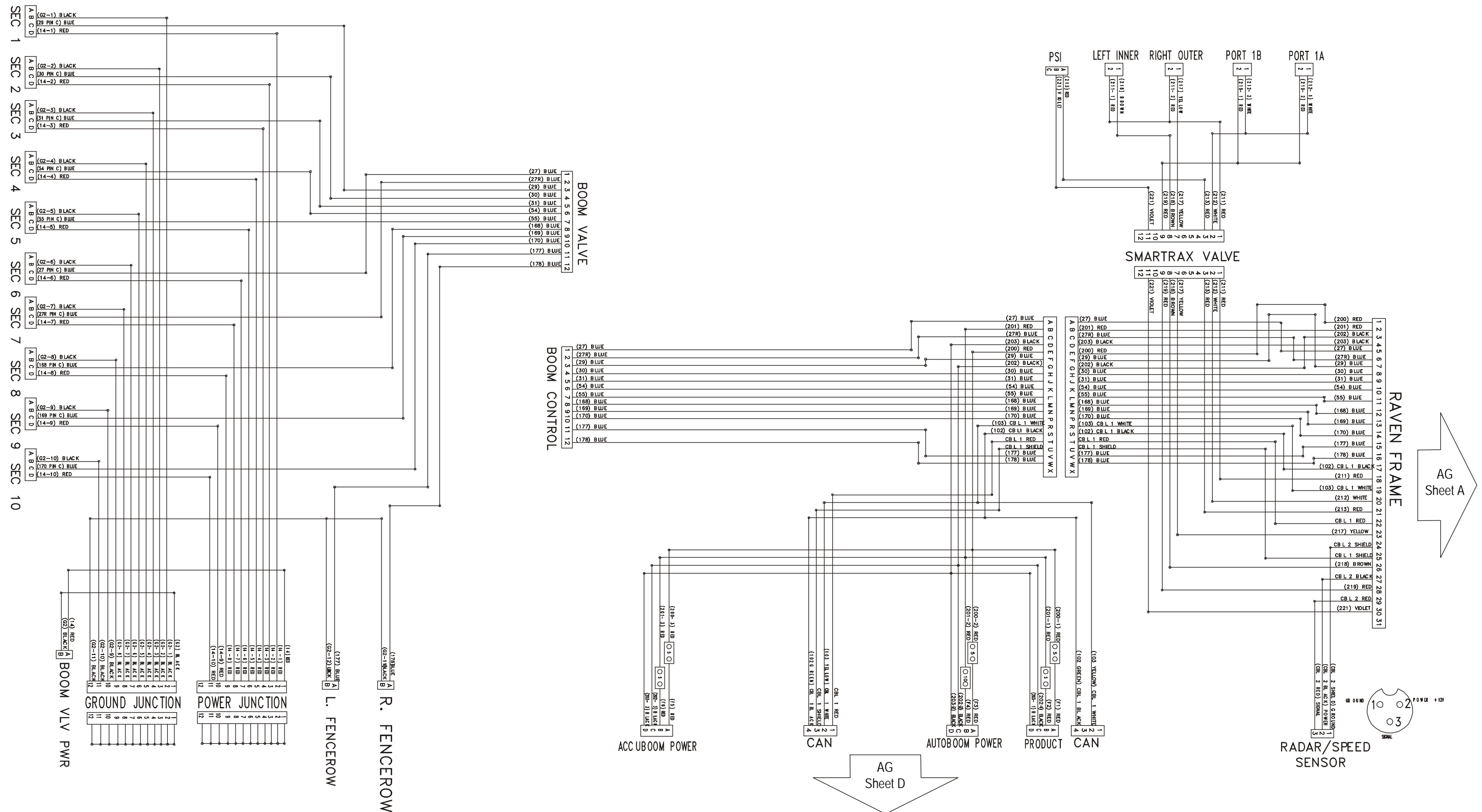


Precision AG Electrical (Sheet D)





## Precision AG Electrical (Sheet E)





## Fuse Block Layout

DVEC Block 2012				
Source	Function	Circuit		
		Pwr Source	To	Cir #
F1 (30A)	DC-DC Converter 12V Pwr In	Batt	Converter	990
F2 (7.5A)	24 Volt Ignition Pwr	Converter	TCU	900
F3 (7.5A)	24 Volt Permanent Pwr	Converter	TCU/Trans	423/468
<b>F4 (20A)</b>	<b>Not Used</b>	<b>Boom Support Light Relay 12</b>	<b>Support Lt Plg</b>	<b>***</b>
F5 (30A)	Aux Boom Pwr	Aux Relay 13	Aux Boom Pwr Plg	100 GN
F6 (20A)	Console Backup, Chassis	Ign Relay 4	Console Backup, Rt Sus, Lt Sus, Brake Sw	42 RD
F7 (20A)	Aux Acc Pwr	Ign Relay 4	Aux Acc Plg	73 RD
F8 (7.5A)	Engine Ign Pwr	Ign Relay 4	Engine ECU	11 RD
F9 (10A)	Radio, Overhead Pwr Pnt, Pann Lt	Acc Relay 3	Radio, Pwr Pnt	09 RD
F10 (25A)	Horn, Washer, Wiper Batt Pwr	Acc Relay 3	Turn Signal Lever	04 RD
F11 (20A)	Foamer	Foam Relay 2	Foamer Plgs	70 BL
F12 (30A)	Front Hood Lights	Driving Lights Relay 5	Driving Lt Plugs	33 GN
F13 (20A)	Rear Outer Cab Lights	Rear Field Lt Relay 8	Rear Outer Lt Plgs	69 GN
F14 (20A)	Front Outer Cab Lights	Frt Field Lt Relay 6	Front Outer Lt Plgs	58 GN
F15 (20A)	Rear Inner Cab Lights	Rear Field Lt Relay 9	Rear Inner Lt Plgs	59 GN
F16 (20A)	Front Inner Cab Lights	Frt Field Lt Relay 7	Front Inner Lt Plugs	79 GN
F17 (20A)	Node Logic	Node Logic Relay 10	Node Pwr	200 RD
F18 (5A)	Boom Node	Node Logic Relay 10	Node Pwr	209 RD
F19 (20A)	Master Spray Control	Mast Spry Relay 11	Switch Box	51 BL
Relay 1	Start Relay	Ignition Switch Crank	Start Relay	01 TN/10 WH
Relay 2	Foam Comp Relay	Foam Switch Board	F11	70 BL
Relay 3	Acc Relay	Acc Pwr Board out	F9/F10	03 TN/04,09 RD
Relay 4	Ign Relay	Ignition Switch Ign	F6/F7/F8	07 TN/42,73,11 RD
Relay 5	Front Hood Lights	Driving Switch	F12	142 YL / 33 GN
Relay 6	Front Cab Field 1 Outer	Field Front Switch	F14	143 YL / 58 GN
Relay 7	Front Cab Field 2 Inner	Field Front Switch	F16	143 YL / 79 GN
Relay 8	Rear Cab Field 1 Outer	Field Rear Switch	F13	144 YL / 69 GN
Relay 9	Rear Cab Field 2 Inner	Field Rear Switch	F15	144 YL / 59 GN
Relay 10	Node Logic Relay	Raven Console	F17/F18	206 RD/200,209 RD
Relay 11	Master Spray Relay	Master Switch	F19	51 BL
<b>Relay 12</b>	<b>Not used</b>	<b>Field Rear Switch</b>	<b>F4</b>	<b>***</b>
Relay 13	Aux Boom Power Relay	Auxiliary Switch	F5	145 YL / 100 GN
Relay 14	Key Pwr Relay	Ignition Switch Ign	F20/F21/F22/F23	180 RD
Relay 15	DC-DC Converter	Converter	F2	
<b>Ground</b>	<b>Function</b>			
Gnd G1	Seat, Steering Column			
Gnd G2	Chassis			
Gnd G3	Air System			
Gnd G4	Upper Cab			
Gnd G5	Cab Roof			
Gnd G6	Aux Pwr Batt, Aux Pwr Key, Raven Console, Switch Box, Antenna			
Gnd G7	Console			
Gnd G8	Power Point and Lighter			
Gnd 202	Node Logic			
Gnd 203	Node High Current			
Gnd 205	Raven CAN			
Gnd 902,3 & 4	TCU			
Gnd 995	DC-DC Converter			

15712 Block 2012				
Source	Function	Circuit		
		Pwr Source	To	Cir #
F20 (20A)	Console Pwr Pnt, Fan Switch, Boost	Relay 14	Pwr Pnt, Fan Sw	78 RD
F21 (15A)	Key Power Open	Relay 14	Open	***
F22 (10A)	Fuel Sending Unit, Fill Station Light	Relay 14	Sending Unit, Fill Station Light	08 RD
F23 (5A)	Antenna	Relay 14	Antenna Pwr	207 RD
F24 (20A)	Aux Batt Power	Batt	Aux Batt Plg	72 RD
F25 (30A)	HVAC High Med Relay Batt Pwr	Batt	HVAC Plg	68 RD
F26 (25A)	Overhead Light Switch	Batt	Light Switches	48 RD
F27 (30A)	Wiper Batt Power	Batt	Wiper Motor Plg	02 RD
F28 (30A)	Seat, Radio Batt Pwr, Lighter	Batt	Seat, Radio Batt Pwr, Lighter	14 RD
F29 (20A)	Dome Light, Hazard Batt Pwr	Batt	Dome Light, Hazard/Console	32 RD
F30 (20A)	Console Batt Pwr	Batt	Console	43 RD
F31 (20A)	Engine Batt Pwr	Batt	Engine ECU	12 RD
F32 (10A)	Raven Console	Batt	Rav Con Pwr	208 RD
F33 (10A)	Key Switch Batt Pwr	Batt	Key Switch	05 RD
F34 (2A)	Raven CAN	Batt	Can Pwr	204 RD
F35 (30A)	Node High Current	Batt	Node Pwr	201 RD
F36 (20A)	Booster Blower Relay	Batt	Blower Relay	06 RD
F37 (20A)	Boom Support Light Switch	Batt	Boom Switch	80RD/57GN
F38 (5A)	Batt Pwr Open	Batt	Open	***
F39 (30A)	Boom Valve Power	Batt	Boom Valves	77 RD

# APACHE™

## CHAPTER 10

# WARRANTY

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### Equipment Technologies Warranty Policy For all 2012 Model Year

#### NEW APACHE LIMITED WARRANTY POLICY

Equipment Technologies (hereinafter called ET) warrants each new Apache to be free from defects in materials and workmanship for a period of five (5) years or two thousand (2000) hours, whichever occurs first, from the date of delivery to the original purchaser, with the exclusions listed herein. Under no circumstances does this limited warranty cover any merchandise or component parts, which, in the sole opinion of ET, have been subject to negligent, misuse, improper storage, alteration, accident, or if repairs have been made with parts other than those manufactured, supplied, and/or authorized by ET. Under no circumstances are component parts warranted against normal wear and tear. There is no warranty on glass, parking brake pads, brake linings, filters, oils, product pump seals, product pump bearings, rubber product hoses, or pressure gauges.

**First Year** - Limited warranty covers the total machine for the first year from the date of delivery to the original purchaser or one thousand (1000) hours whichever occurs first, for both parts and labor. Under no circumstances does this limited warranty cover any merchandise or component parts, which, in the opinion of ET, have been subject to negligent, misuse, improper storage, alteration, accident, or if repairs have been made with parts other than those manufactured, supplied, and/or authorized by ET. For engine, tire, and battery warranty please see below.

**Second Year** - Limited warranty covers the driveline and chassis components for both parts and labor from the date of delivery to the original purchaser or one thousand (1000) hours which ever comes first. The following components are covered under the second year of warranty. Transmission and its internal components, rear differential and its internal components, front axle assembly (excludes seals, bearings, wear pads, suspension cylinder, accumulator, and steering cylinders), frame rails, engine bolster, rear axle assembly (excludes wear pads, drive shafts, and rear suspension components), planetaries and their internal components (excludes bearings, seals, and o rings), drop boxes and their internal components, and frame cross members and any bracket that bolts directly to the frame rails. This portion of coverage is subject to all listed conditions but further excludes oil, seals, gaskets and leakage.

**Years Three through Five** - Limited warranty covers the driveline and chassis components for parts only from the date of delivery to the original purchaser or two thousand (2000) hours which ever comes first. The following components are covered under years three through five of warranty. Transmission and its internal components, rear differential and its internal components, front axle assembly (excludes seals, bearings, wear pads, suspension cylinder, accumulator, and steering cylinders), frame rails, engine bolster, rear axle assembly (excludes wear pads, drive shafts, and rear suspension components), planetaries and their internal components (excludes bearings, seals, and o rings), drop boxes and their internal components, and frame cross members and any bracket that bolts directly to the frame rails. This portion of coverage is subject to all listed conditions but further excludes oil, seals, gaskets and leakage.

**Engine Warranty** - The limited engine warranty is covered by engine manufacturer for two (2) years or two thousand (2000) hours from the date of delivery to the original purchaser, whichever comes first. ET does warranty the

a/c compressor, a/c belt, alternator, and engine belt for the first year only. The engine manufacturer warrants all other bolt on and engine components. See engine warranty for complete details.

**Tires** - The tire manufacturer (Titan) covers the tire warranty. Contact your local authorized Titan dealer for complete warranty details.

**Batteries** - Batteries are warranted for thirty (30) months. Batteries are warranted through NAPA auto part stores. If you have no authorized NAPA auto part stores, then contact ET for warranty replacement information.

**Replacement Parts** - Replacement parts are warranted for six (6) months. Contact ET for warranty replacement information.

ET's obligation under this limited warranty is limited to repairing or replacing free of charge to the original purchaser, at a location designated by ET, any part that in ET's sole judgment, shows evidence of defect or improper workmanship, provided that the part is returned to ET within thirty (30) days of repair date. Parts must be returned through the authorized selling dealer, transportation charges prepaid. All returned parts must be clean from all chemicals and/or oils.

ET's obligation under this limited warranty is in lieu of all other warranties or representations, expressed or implied, and specifically excludes any obligations or liability for loss of crops, losses caused by harvest delays or any expense or loss of labor, supplies, rental equipment, and all incidental or consequential damages. The replacement of parts and/or repair is the exclusive remedy under this limited warranty. ET reserves the right to repair or replace any defective part or parts. No person is authorized to give any other warranties or to assume any other liability on ET's behalf. This limited warranty is void if ET's limited warranty policy maintenance standards are violated.

ET makes NO warranty of merchantability or fitness for a particular purpose.

This machine must be registered to both ET and engine manufacture within ten (10) working days from the date of delivery to the original purchaser.

All inquiries about this warranty policy should be addressed to:

**Warranty Department • 2201 Hancel Parkway • Mooresville, IN • 46158**

**Telephone: 317-834-4500**

### **Apache Machine Warranty Registration**

In the cab of each new Apache is a warranty registration sheet that is in triplicate. When the Apache is delivered to the end user this registration sheet must be completed, signed, and dated by both the dealer representative and the end user. This completed form starts the warranty period for this machine. The completed registration sheet one copy is for the end user, one copy for the dealer, and the white copy is to be faxed, emailed, or mailed to (ET) within ten (10) business days of it being signed. These forms are also on our web site [www.apachesprayer.com](http://www.apachesprayer.com) under the dealer login. On the web site you can either download the registration form in PDF print it or complete or you may enter the information under warranty registration and submit it through our web site. If you submit through the web site, then we will still need the signed form by the customer fax or mailed to us at ET.

### **Engine Warranty Registration**

There are two ways to register the engine warranty for Cummins. The first is a mail-in warranty registration card. In the cab of each new Apache with the engine book is a warranty registration card. This card needs to be completed and mailed or fax to the engine manufacture as directed on the card. The second registration method is to go online and register the engine for warranty.

To register the Cummins engine for warranty online: go to [www.cummins.com](http://www.cummins.com), click on "product registration" and read the terms and conditions, if you agree with the terms and conditions, then click on "I accept", and follow the instructions to register.



# APACHE™

## CHAPTER 11

### MAINTENANCE LOG

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\_\_\_\_\_ Season

Check and inspect each of the following items on your Apache Sprayer. Put the date on the line next to each item as it is completed.

	Check front suspension cylinders for leaks around the seal and oil level in cylinder.
	Grease the front axle assembly including all king-pins, ball joints and center pivot pin. Check all front axle bolts for proper torque.
	Check adjustment of all hood panels and make sure all screws are present and tightened. Clean radiator and cooling package of all debris, check all radiator and cooling package hoses to make sure they are tight and not leaking.
	Change engine oil and replace filter.
	Service fuel system and replace filters.
	Service transmission; change oil and replace filter, remove suction screen, clean and inspect for damage.
	Replace cab filters with new.
	Remove and replace engine air filters, check intake clamps to make sure they are tight.
	Grease the U-joints on all driveshafts and inspect each U-joint for wear and missing caps. Inspect carrier bearing on the front driveshaft for wear and damaged rubber.
	Service rear differential and bleed brake system.
	Grease the rear axle assembly and check all rear axle bolts for proper torque.
	Service the hydraulic system oil, replace return filters, remove suction screens, clean and inspect for damage.

	Remove all product screens from strainers, clean and inspect for damage. Replace as needed. Flush the wet system with clean water, remove inspection plug from product pump and inspect impeller for damage. Turn on pump and dead-head the pressure and check at gauge outside of cab, increase and decrease agitation and check gauge for operation. Fold booms out and adjust and grease.
	Inspect booms for cracks, breaks and worn hinge points.
	Inspect boom plumbing for worn hoses and bad nozzles.
	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.
	Inspect wiring harnesses for rub points.
	Inspect foam marker components for leaks and operation (if equipped).
	Verify Raven Controller calibrations:
	Flow meter
	Boom sections
	Control valve
	Speed cal
	Check A/C operation.
	Inspect frame for cracks and loose bolts.
	Inspect Tee Jet valves for operation and wear.
List any major repair work this season and date it was performed:	

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**Season**

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	Inspect all hydraulic cylinders for leaks and proper operation.

11-4 AS720 Owner's Manual

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**Season**

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	Inspect all hydraulic cylinders for leaks and proper operation.

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**Season**

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	Inspect all hydraulic hoses for rubs, worn spots and leaks.
	Inspect all hydraulic cylinders for leaks and proper operation.

[illegible]





*Your Apache Dealer:*